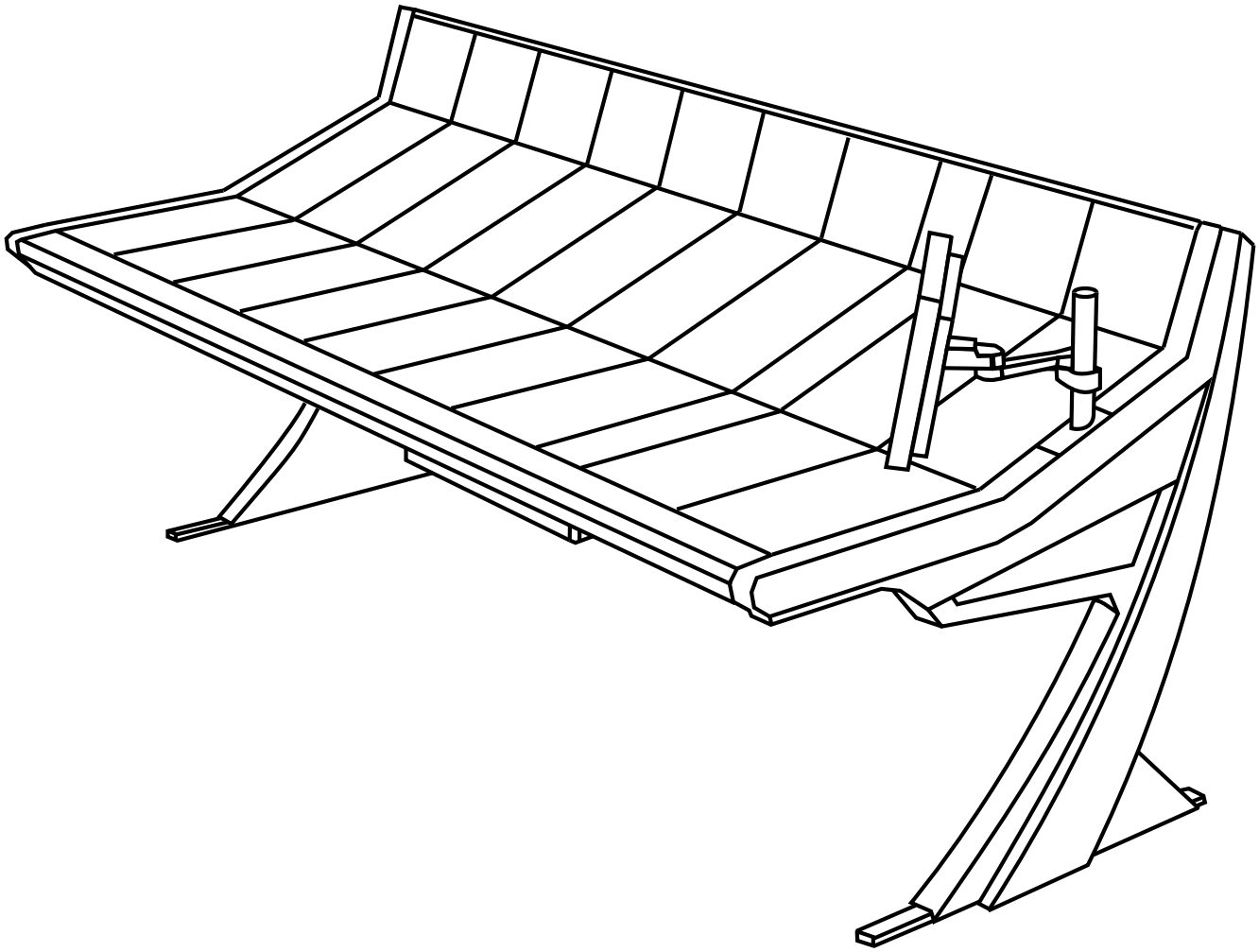
APOLLO INSTALLATION & TECHNICAL MANUAL



Digital Broadcast Production Console

CALREC

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IMPORTANT INFORMATION

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

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

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

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.

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.

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

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

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

FIGURE 1 - LEAD FREE

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. See Figure 1.

In the unlikely event of a customer having to carry out any re-soldering on Apollo, Artemis 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 Figure 2) 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.

FIGURE 2 - LEAD FREE STICKER

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 (Figure 3) and RAB (Figure 4) registration, is the most comprehensive of the ISO9000 international standards. Granted in recognition of excellence across design, development, manufacture and after-sales support, the certification follows a rigorous and thorough review of Calrec's internal and external communication and business procedures.

FIGURE 3 - UKAS REGISTRATION

FIGURE 4 - RAB REGISTRATION

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 should be connected to Earth using Earth cable at least 6mm^2 in cross section (10 AWG).

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.

FIGURE 5 - DANGEROUS VOLTAGES

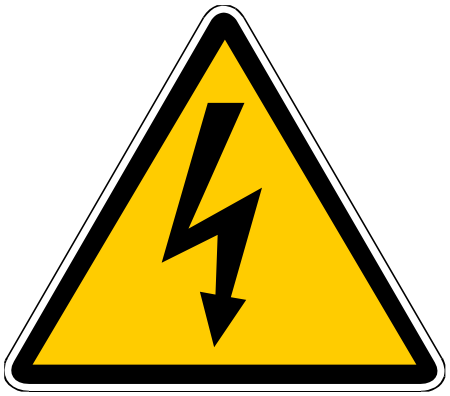


FIGURE 6 - IMPORTANT INSTRUCTIONS

TECHNICAL SUPPORT

Telephone: (9:00am-5:30pm)	+44 (0) 1422 842159
Email - Technical:	support@calrec.com
Email - General:	enquiries@calrec.com
Postal address:	Calrec Audio Ltd. Nutclough Mill, Hebden Bridge, West Yorkshire, HX7 8EZ, U.K.
Fax:	+44 (0) 1422 842159
Website:	www.calrec.com

Should you require any technical assistance with your Calrec product then 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.

For pre-delivery technical enquiries, UK and Ireland customers should contact the Calrec project manager assigned to their order. Post delivery, the Calrec Customer Support team will take care of your technical enquiries.

Our UK customer support team work 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.

Calrec UK customer support and our global technical team provide free of charge technical support and advice by phone or email to all customers.

Once your console is installed we can provide an engineer on site to carry out system commissioning. Commissioning ensures the equipment is correctly installed and fully functioning before it goes into use. During commissioning, our engineers can also help and advise with configuration and setup.

Calrec after sales support includes:

- Free of charge comprehensive technical advice and support by phone and email.
- Software and hardware upgrades.
- Repairs.
- Quick supply of replacement or loan hardware in the event of a failure.
- Providing export documentation for the return of faulty parts.
- On site commissioning visits.
- On site service and health check visits.
- Emergency engineer visits.
- On site on-air support, for complete peace of mind - providing operational guidance, and technical engineering support for new installations or high profile events.
- Operational training.
- Maintenance / technical training.
- Supply of replacement components.
- Supply of documentation.

Service contracts

We offer a range service contracts to our UK and Ireland customers, offering 24/7 telephone support, regular health checks and extended warranty amongst other benefits. Please contact our customer support team for more information on service contracts.

Product Warranty

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

Repairs

If you need to return goods to Calrec, for whatever reason, please contact 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 the issues. Calrec welcomes all customer feedback.

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

APOLLO
CONTROL SURFACE

CALREC

SURFACE DIMENSIONS AND ASSEMBLY

The Apollo control surface can be customised in terms of width and fader count and can be provided with various stand and trim options.

Desk-top mounting

The control surface can be supplied without a floor stand to allow for desktop mounting, or for mounting into a custom stand or control room furniture. Figure 1 shows the end elevation with no stand fitted.

Floor stand options

The standard height stand sits the surface of the fader panels at a height of 740mm [29.13'] above the floor. A reduced height stand is also available, positioning the surface of the fader panels at 700mm [27.56'], the overall height being reduced by 40mm [1.57']. Both versions of the stand have inline fixing holes to allow the stand to be secured to the floor without affecting the footprint, typically when being used in mobile or 'Outside Broadcast' units. The standard height stand fixing holes are 10mm in diameter. The reduced height fixing holes are 8.5mm, designed to be used with M10 tapping screws, or alternatively adjustable feet can be added here to bring the fader height up to 720mm [28.35']

FIGURE 1 - END ELEVATION, NO FLOOR STAND FITTED

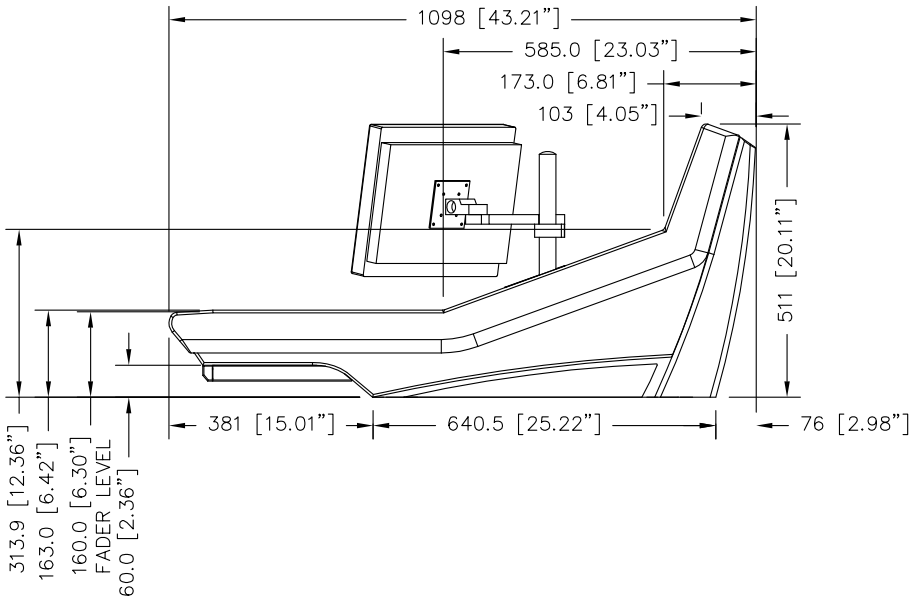


FIGURE 2 - END ELEVATION, STANDARD HEIGHT FLOOR STAND FITTED

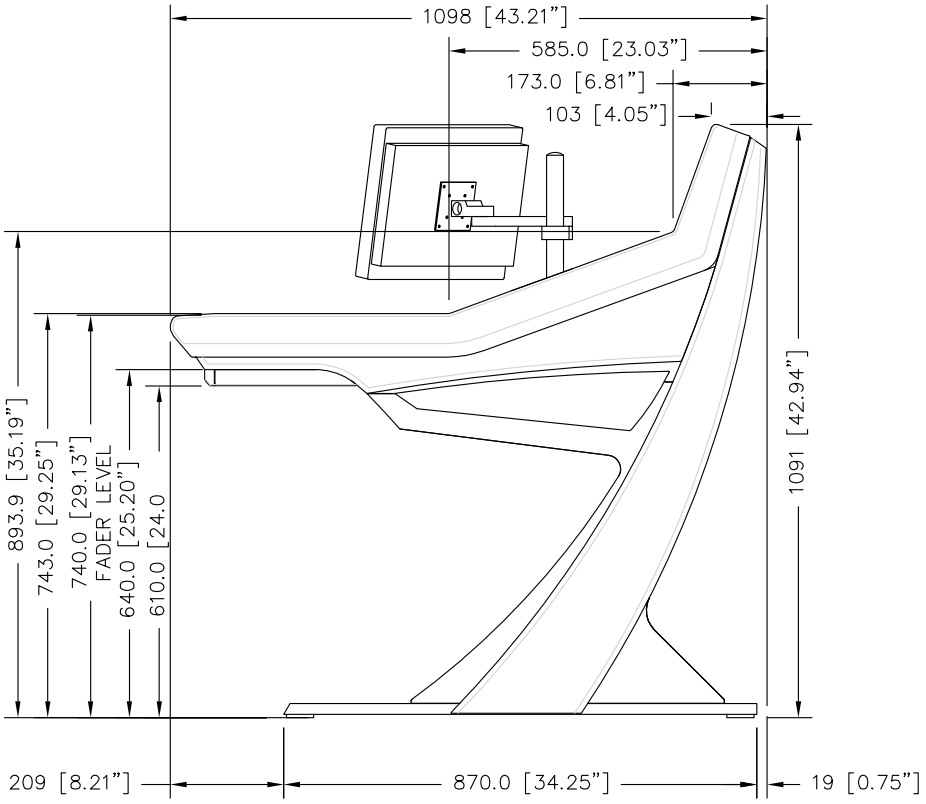


FIGURE 3 - STANDARD HEIGHT, INLINE BOLT-DOWN FIXINGS

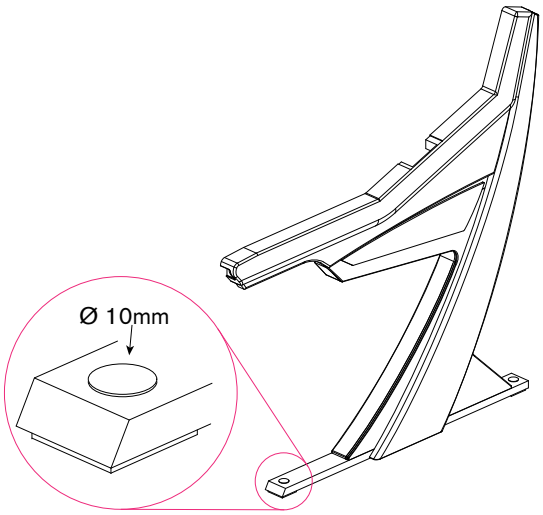
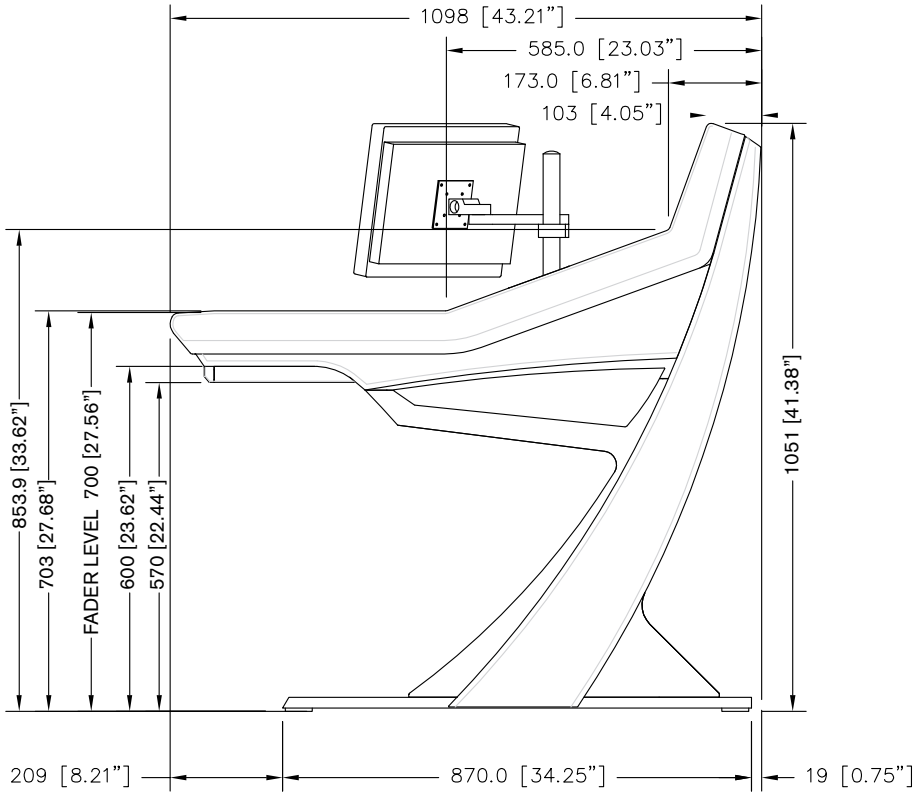
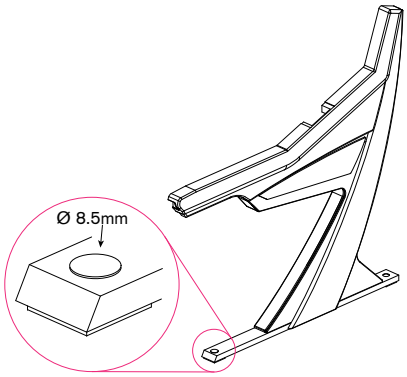
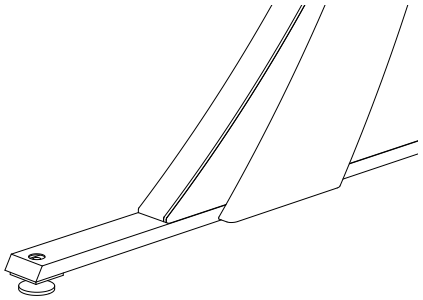


FIGURE 4 - REDUCED HEIGHT FLOOR STAND, INLINE BOLT-DOWN FIXINGS





ADJUSTABLE FEET



Surface sizes

Surface sizes are stated in the number of faders they can contain. A number of chassis sections are fitted together to provide a control surface of a suitable width to contain the number of faders required, or to fit the physical space available. Often chassis' are ordered to be larger than is required at the time to allow for a future increase in the quantity of faders.

Chassis sections come in a variety of widths and are defined by the number of control panels that they can contain across their width. Chassis sections currently available are '2', '2.5', '3' & '3+'.

Each section contains two rows of panels in the control bed. A standard Apollo layout consists of a number of fader panels and a dedicated monitor panel fitted in the bottom row, and a number of assignable panels along with a joystick panel in the upper row. Both control bed panel rows are the same height and panels can be fitted in either. Standard panels are 250mm [9.84'] wide, these include the assignable panels and fader panels. The dedicated monitor and joystick panels are 130mm [5.12'] wide and loosely termed as 'half-width'.

Therefore, for example, a 2.5 section would generally be fitted with 2 fader panels and a 'half-width' monitor panel in the bottom row, and 2 assign panels and a 'half-width' joystick panel in the upper row. A 3+ section allows for a joystick and monitor panel to be fitted in the same row as each other alongside 2 standard panels. 3 standard panels can be fitted in the other row which would then also be fitted with a 10mm blank panel to fill the remaining space.

FIGURE 5 - INTERNAL / EXTERNAL LEG MEASUREMENTS

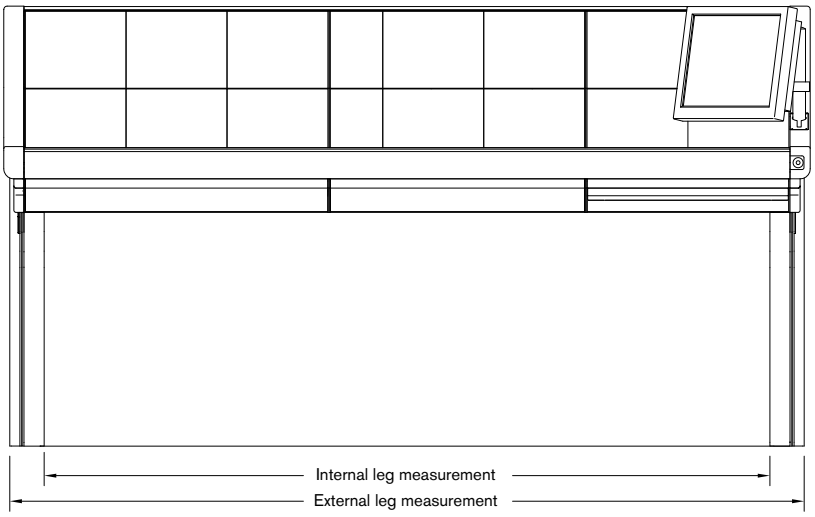
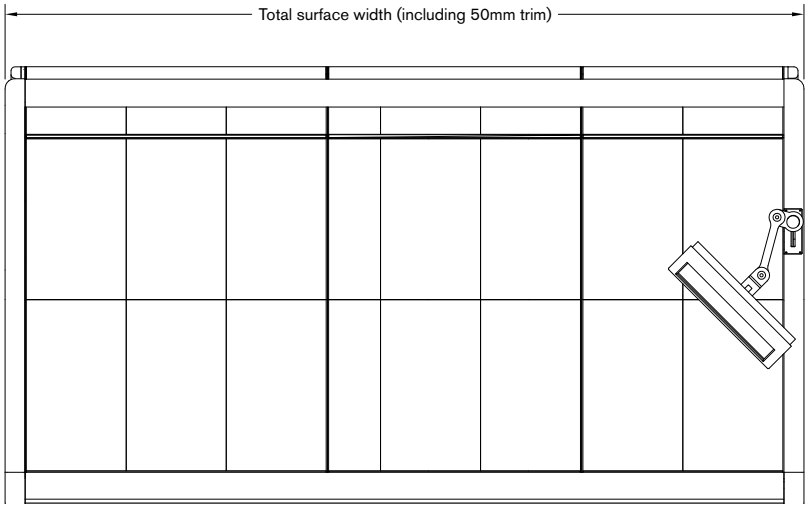


FIGURE 6 - OVERALL SURFACE WIDTH



Each frame section is as wide as the modules it can contain, (2 section - 500mm, 2.5 section - 630mm, 3 section - 750mm, 3+ section - 760mm) plus a 3mm wide bulkhead at either end. Once assembled, the overall chassis is fitted with a side trim at each end. The standard trim is 50mm, adding 100mm [3.94'] to the overall width of the control surface.

Consoles without a floor stand can be supplied with optional 10mm [0.39'] wide side trims instead if physical space is limited. Note however that the PC monitor mount cannot be fitted to the 10mm wide trim, therefore a suitable alternative will need to be provided by the installers to give the operator a conveniently located PC monitor display.

A standard chassis build is fitted with a PC monitor and keyboard tray at the right hand side of the control surface. As an option, these can be fitted at the left hand side. If required, monitor mounts and keyboard trays can be fitted at both ends of the console. One of these would typically be used as a convenient location to control / display other equipment such as playout devices.

FIGURE 7 - TYPICAL CONTROL SURFACE WIDTH DIMENSIONS

Fader Count	Section Make-up	Max Surface Width, including 50mm trim at each end	Max Surface Width, including 10mm trim at each end (no monitor mount)	Internal Leg*	External Leg*
32	2/2.5	1242mm [48.90']	1162mm [45.75']	1042mm [41.02']	1212mm [47.72']
48	2/2.5/2	1748mm [68.82']	1668mm [65.67']	1548mm [60.04']	1718mm [67.64']
56	3/2.5/2	1998mm [78.66']	1918mm [75.51']	1798mm [70.79']	1968mm [77.48']
64	3/2.5/3	2248mm [88.50']	2168mm [85.35']	2048mm [80.63']	2218mm [87.32']
72	3/3+/3	2378mm [93.62']	2298mm [90.47']	2178mm [85.75']	2348mm [92.44']
72	2/3/2.5/2	2504mm [95.58']	2424mm [95.43']	2304mm [90.71']	2474mm [97.40']
80	3/2/2.5/3	2754mm [108.43']	2674mm [105.28']	2554mm [100.55']	2724mm [107.24']

*Internal / external leg widths do not include the floor fixing plates fitted on OB version.

REAR CONNECTION INTERFACE AND COVERS

Access to surface connections
Data connections from the control surface to the processing core are made to the back interface panel, located next to the left hand leg when viewed from the back, as shown below.

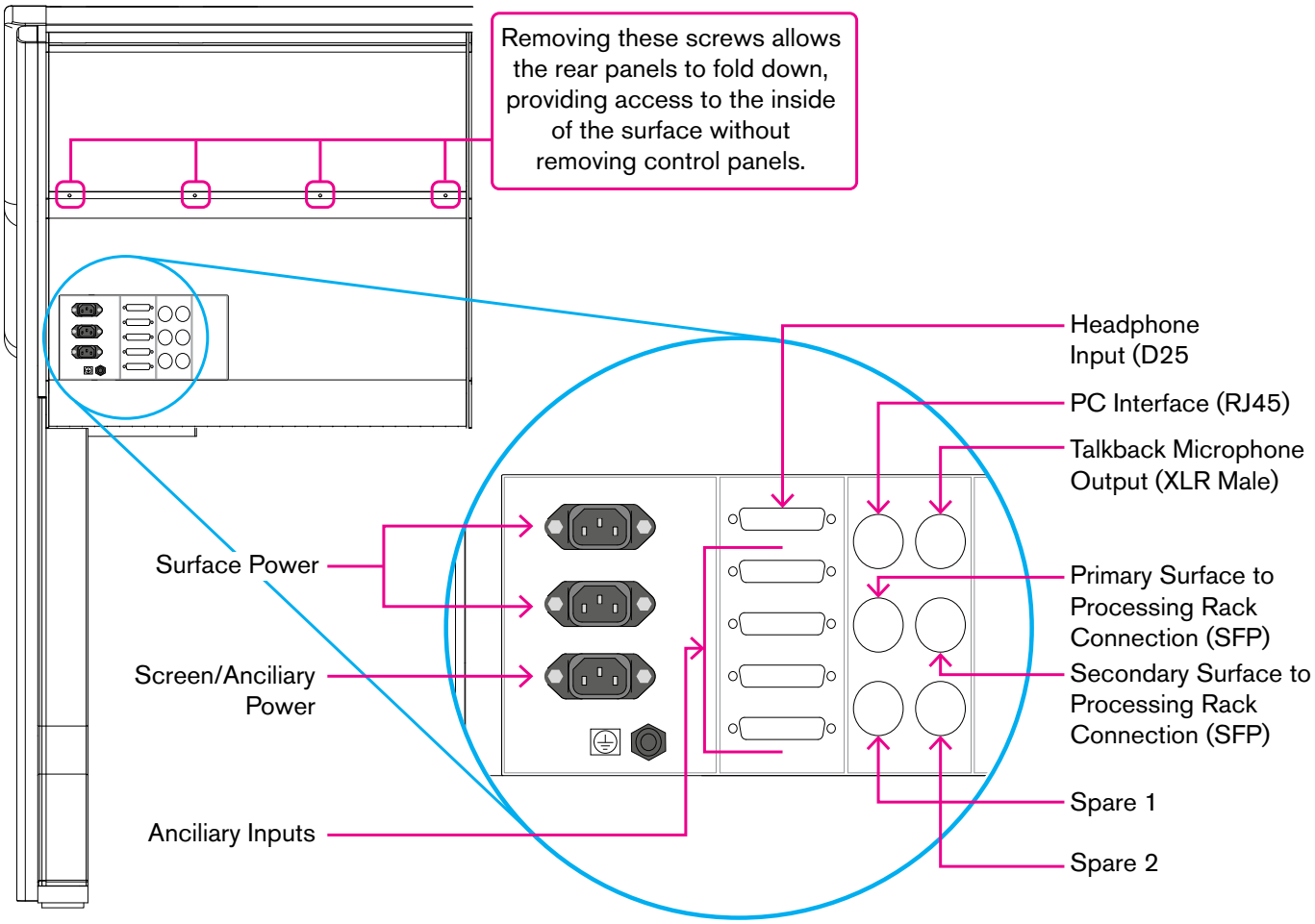
Two fibres or Cat5e cables (depending on connection SFP type ordered) should be connected to the back panel from where they are routed internally to the two Surface Switches.

The rear interface panel provides power connections on three IECs along with a connection point for earthing the chassis.

Audio and data connections are provided for interfacing to audio driven devices along with ancillary data connections.

The format of the interface plate may vary depending on the optional hardware fitted within the surface. Connector and pin-out information is provided in the Connection Information section of this document.

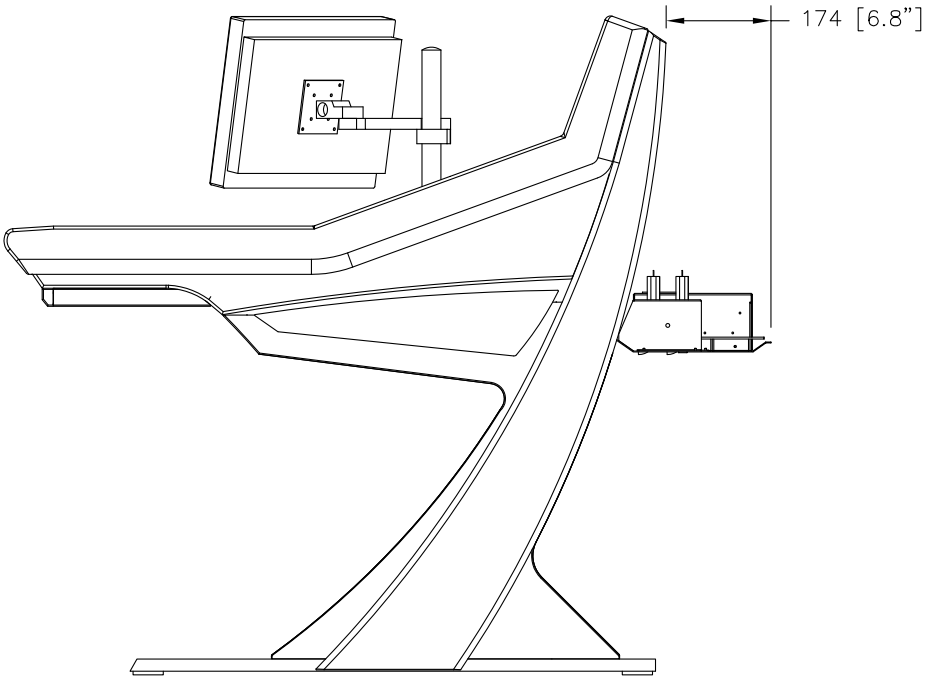
FIGURE 1 - REAR OF APOLLO CONTROL SURFACE



Access to internal surface components

The rear cover of the surface is hinged to provide access to internal surface components. The hinged panels are fixed by screws along their upper edges as shown above right. Once unscrewed they can be carefully lowered. They will support their own weight at the end of their travel and require a certain amount of space at the rear of the surface for access as shown on the right. Alternatively, the internal components can be accessed from the front by removing control surface panels.

FIGURE 2 - ACCESS SPACE REQUIRED BEHIND SURFACE



FLOOR STAND LEG ASSEMBLY

The floor stand legs are made up of a number of structural components and external trims.

Figure 1 illustrates each component that makes up the left and right surface floor stands. The same colours and labels are used in the assembly procedure shown in Figures 2-10.

FIGURE 2 - STAND ASSEMBLY STEP 1

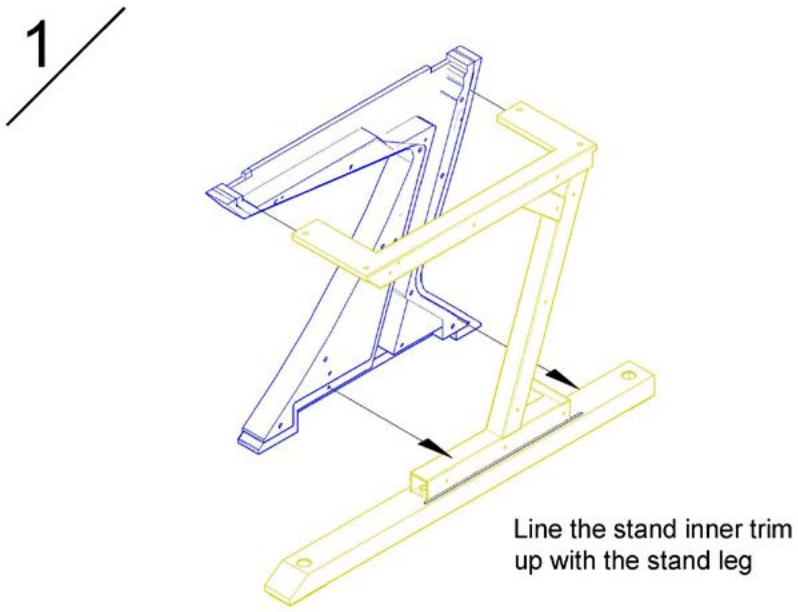


FIGURE 1 - STAND COMPONENTS

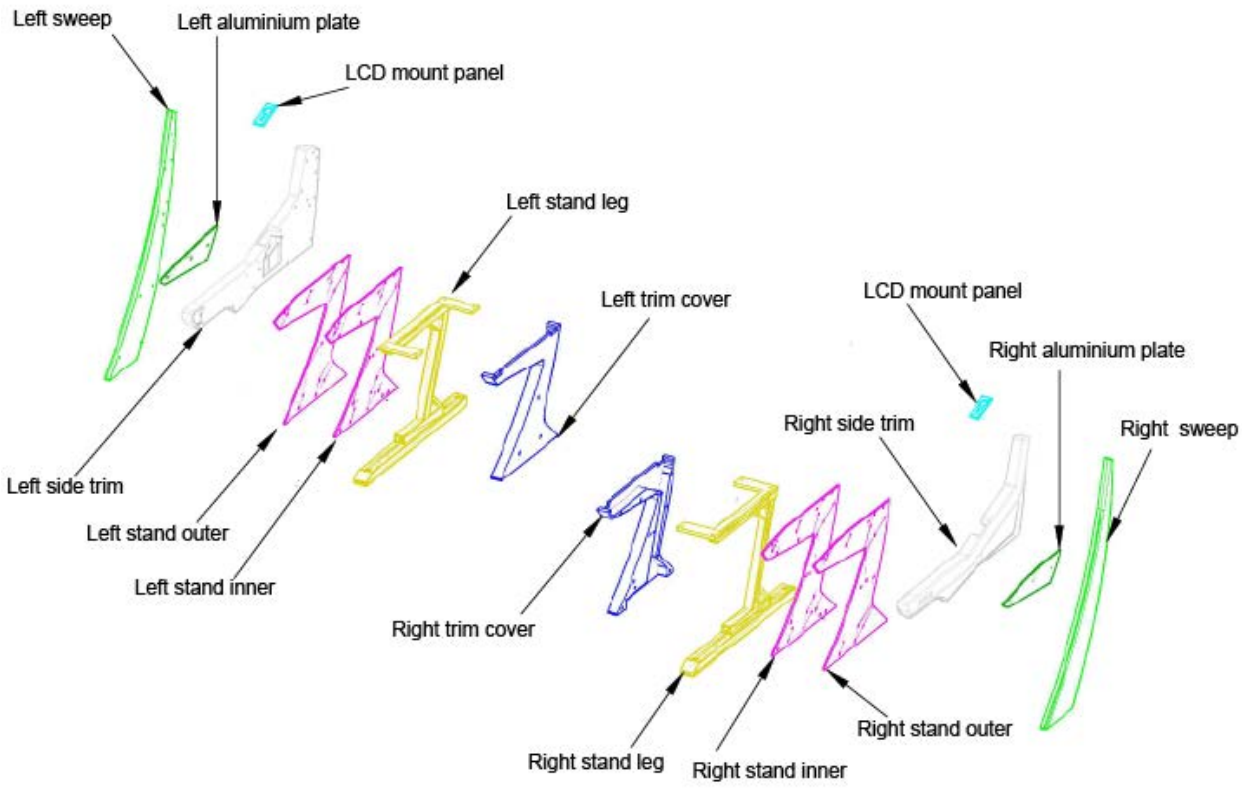


FIGURE 3 - STAND ASSEMBLY STEP 2

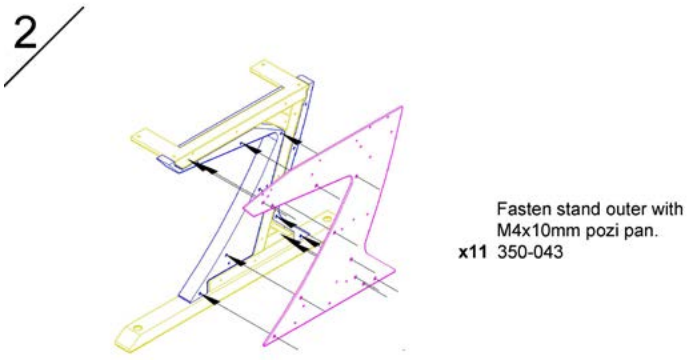


FIGURE 4 - STAND ASSEMBLY STEP 3

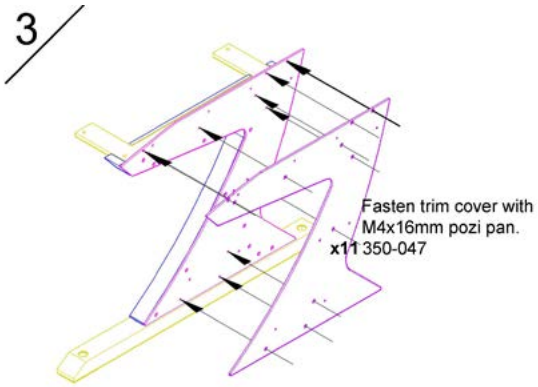


FIGURE 5 - STAND ASSEMBLY STEP 4

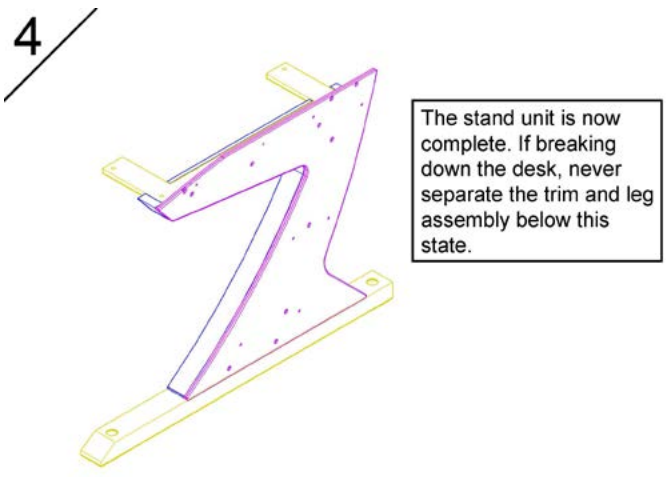


FIGURE 6 - STAND ASSEMBLY STEP 5

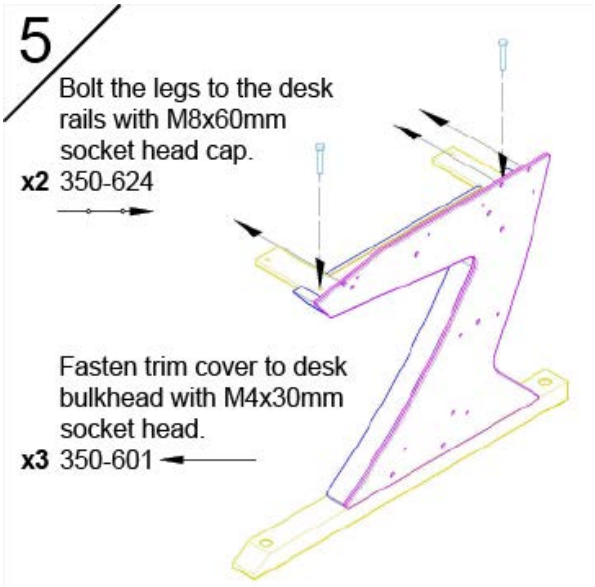


FIGURE 7 - STAND ASSEMBLY STEP 6

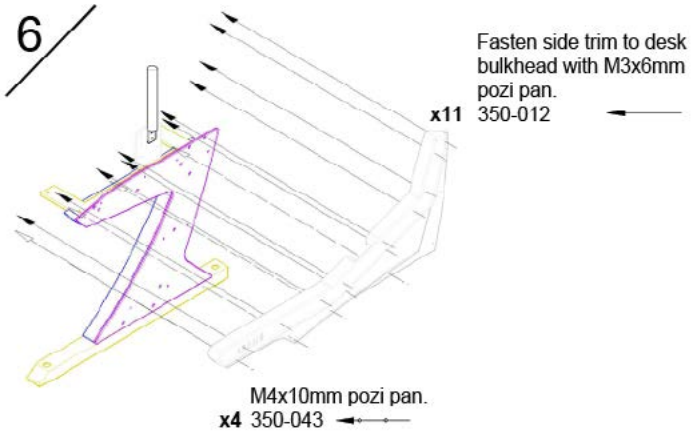


FIGURE 8 - STAND ASSEMBLY STEP 7

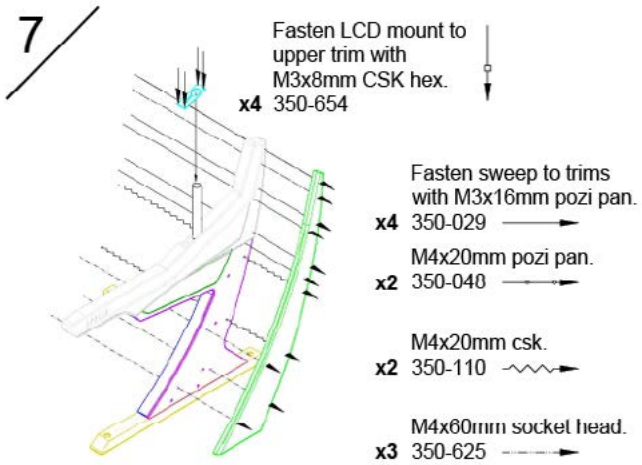
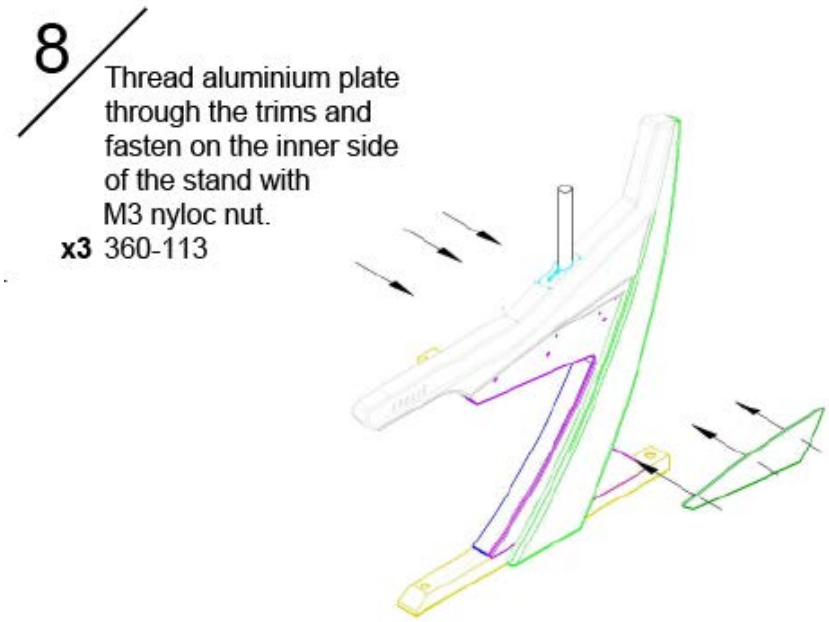


FIGURE 9 - STAND ASSEMBLY STEP 8



SURFACE COMPONENTS

There are a range of components within the surface. This section explains how these components are connected, receive power and communicate with each another.

POE (Power Over Ethernet) switch
Control panels in the surface have a single connection that carries all data and power via an RJ45 connector from a POE switch. The number of POE switches fitted in a control surface is determined by the number of panels fitted. Each POE switch can connect to up to six control panels.

POE switches are mounted to the inside of the rear cover and are accessible by removing control panels, or by opening the rear covers as shown in the Rear Connection Interface and Covers section of this document.

Each POE switch has two AC mains inputs and two PSU's to provide internal and external power redundancy. 'Power Good' LED's 1 & 2 indicate each power supply is receiving mains and active. A PSU failure or loss of a mains input will generate a System Status error message.

Each POE switch has 16 RJ45 connections, split into two groups - A & B. The A group of connectors are full POE - carrying both data and power. Status LED's are provided for these ports which should display a steady, regular flashing pattern once the system is booted and comms have been established.

Connections P1 to P6 are used to connect to control panels. Control panels must be connected to the correct POE unit and port, as defined by the Surface Layout page in the Main application. The Surface Layout page, and other utility software refers to these ports simply as POE ports 1 - 6.

When a surface reset command is received by a POE switch it momentarily cuts the power on ports P1 – P6. Control surface panels are 'reset' by cycling power to them.

Each POE switch requires a connection to both the primary and secondary Surface Switches. POE connector S1 connects to the primary Surface Switch and connector S2 connects to the secondary Surface Switch. Although S1 and S2 are full POE, power and data, Surface Switches do not use the power from this feed.

Ports SPR1 and SPR2 are uninterrupted during reset and are used to provide power to the Surface Switches, PC and any other items that may need to remain powered during reset, such as ancillary audio feeds. The SPR connections also contain the reset lines from the upstand reset panel for the surface, control and DSP which the active Surface Switch acts upon accordingly. All other hardware, such as the PC will ignore the reset lines in the SPR feed.

The B group of connectors do not pass data. Ports AP1 – AP4 are ancillary power, used to power 'non-intelligent' units with no control processor or data connection, such as moving coil meters. AP connections drop power during surface reset.

Upstand TFT panels do not have a direct data connection from a POE. They have a connection to a fader panel which carries out the processing and passes on the data to the display.

FIGURE 1 - POE SWITCH

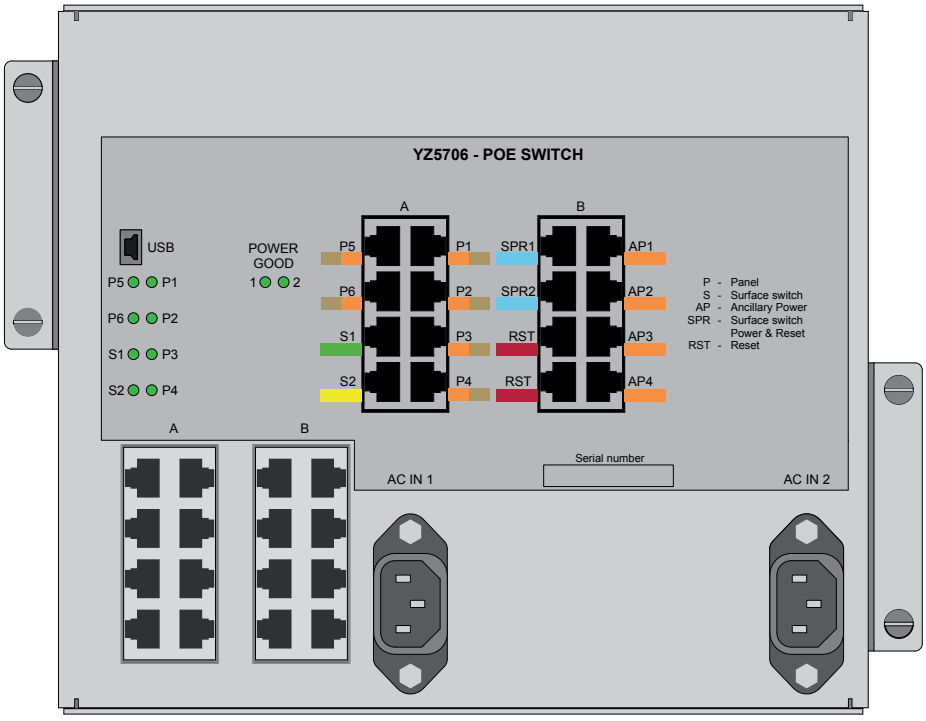
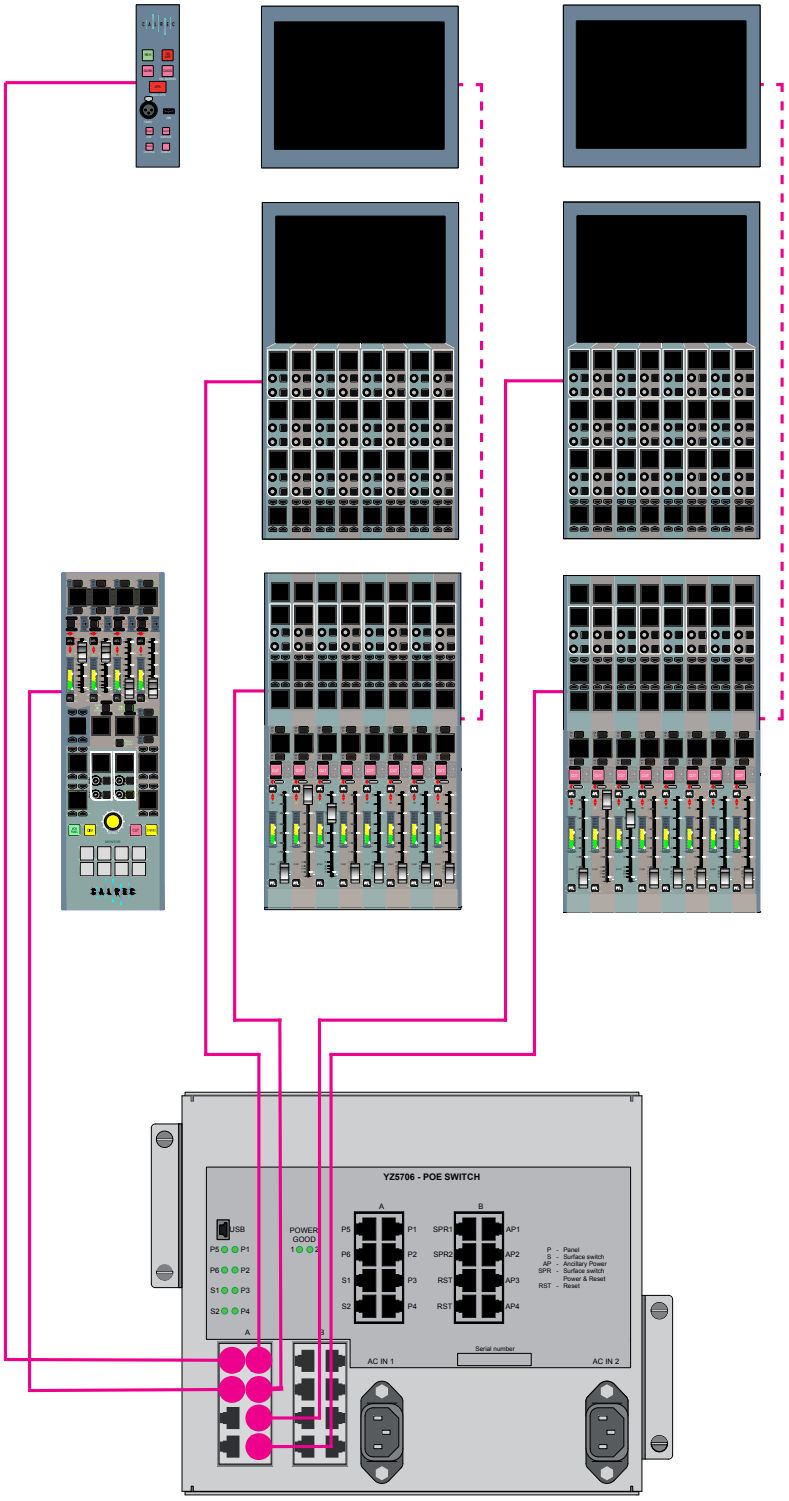


FIGURE 2 - POE TO PANEL CONNECTIONS, DATA AND POWER

P1-P6 Panel Connections - Data & Power

Up-stand TFT Connection via DVI Cable from Fader Panel - Data & Power (Not DVI Compatible!)



POE Reset connections

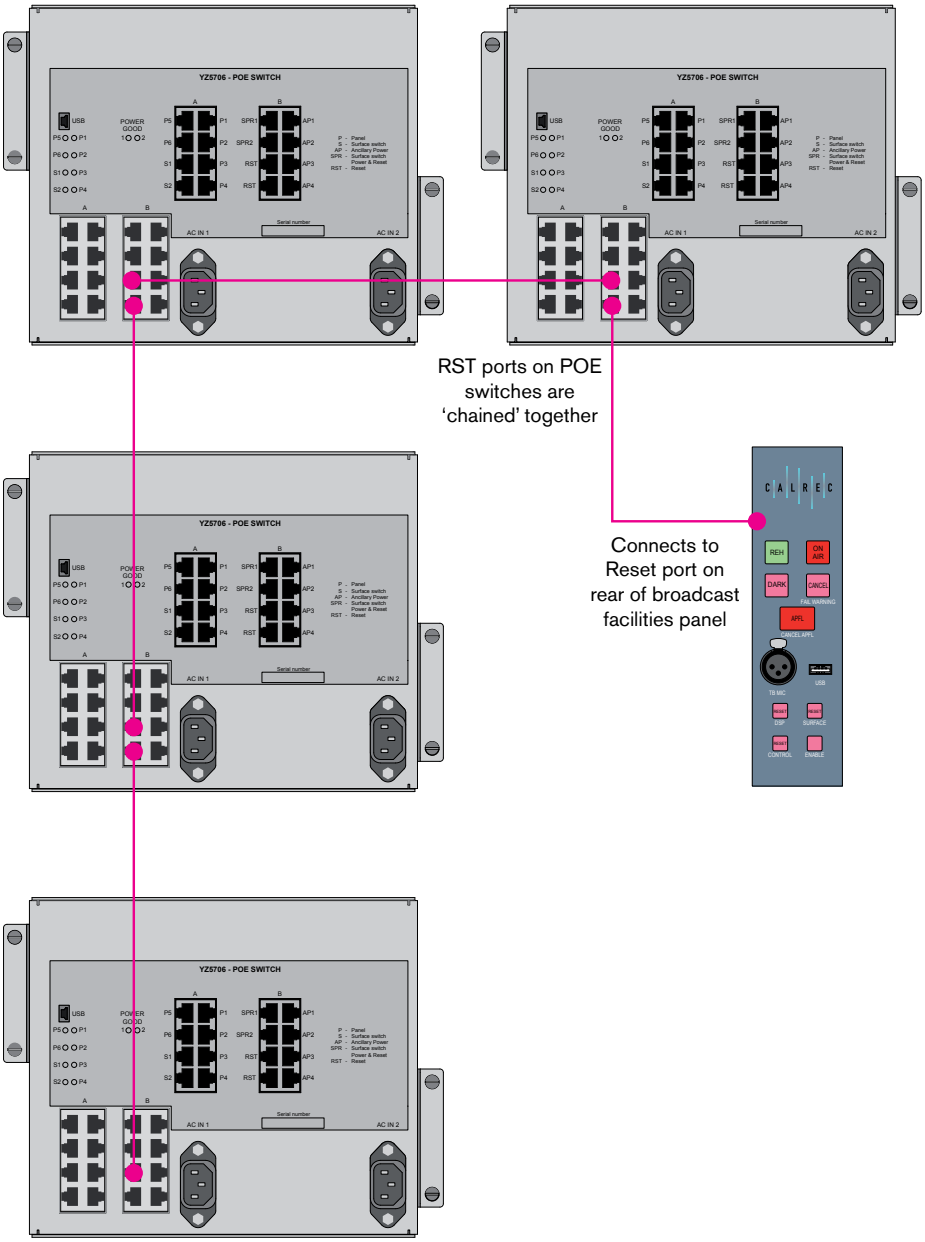
The up-stand reset / broadcast facilities panel has two RJ45 ports - a power and data connection and a reset connection which carries hard logic lines from the reset switches. The reset port should be connected to one of the RST ports on one of the POE switches. The other RST port on that switch is then connected to an RST port on another POE switch and so on, daisy-chaining the reset lines through all the POE switches in the system.

It does not matter which RST is used for 'in' & 'out' or in what order the POEs are connected. These are hard logic lines rather than data, ensuring reset commands can be passed throughout the system irrespective of the functioning state of each piece of hardware.

During surface reset, all POEs & Surface Switches reboot and power is momentarily dropped to all panels forcing them to reboot. DSP and control resets are passed on to the processing core via the active Surface Switch.

All Calrec fitted Cat5e cables conform to standard Ethernet pairings and are wired 'straight-through' or 'pin to pin' as shown in the Category 5e Cables section of this document. Panel cables and I/O to Router cables can be either straight-through or cross-over, however POE RST and SPR cables MUST be wired straight-through.

FIGURE 3 - RESET CONNECTIONS



Surface Switches

The Surface Switch is the interface between the control surface and the processing core. To provide redundancy, two Surface switches are fitted, primary and secondary. The system will always attempt to boot and run on the primary, however if there is a problem with the primary or its connections, the secondary will automatically take over.

Like POE's, the Surface Switches are mounted to the inside of the rear cover, usually in the same section as the IEC inlets. Access is gained by removing control panels or the rear cover as shown in the Rear Connection Interface and Covers section of this document. When viewed from the front, the primary Surface Switch is always the left hand unit.

To communicate with all the control panels and PC, each Surface Switch requires a direct connection to each POE switch. POE switches MUST be connected to specific ports in the correct order - POE #1 connects to surface switch port PS1, POE#2 to PS2, POE #3 to PS3 etc. POE's are numbered by location from left to right across the console. Figure 6 shows the correct data connections for a 3 x POE system. On each POE, port S1 connects to the primary Surface switch, port S2 to the secondary. LEDs 1 - 6 show activity on these ports and should display a regular flashing pattern once booted and comms established. Although the POE sends power down these lines, the Surface Switches do not use it.

Any POE SPR ports can be used to feed Surface Switch PR1 / PR2 ports to power the Surface Switch as well as passing on the reset signals. LEDs I/P1 and I/P2 indicate if power is present on these ports.

Ports A & B are SFP slots. Port A is used to interface with the control processor in the processing core, port B is currently unused. The primary Surface Switch should connect to the primary Control processor's MAC7 connector.

The secondary Surface Switch should connect to MAC7 on the secondary Control processor. These connections are NOT supplied by Calrec and need to be made by the installer. Please see the Surface to Core Connection section of this document for more details.

FIGURE 5 - SURFACE SWITCH

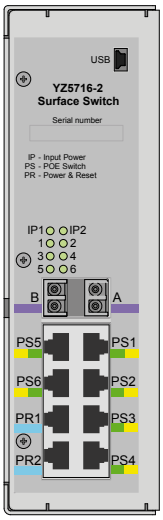
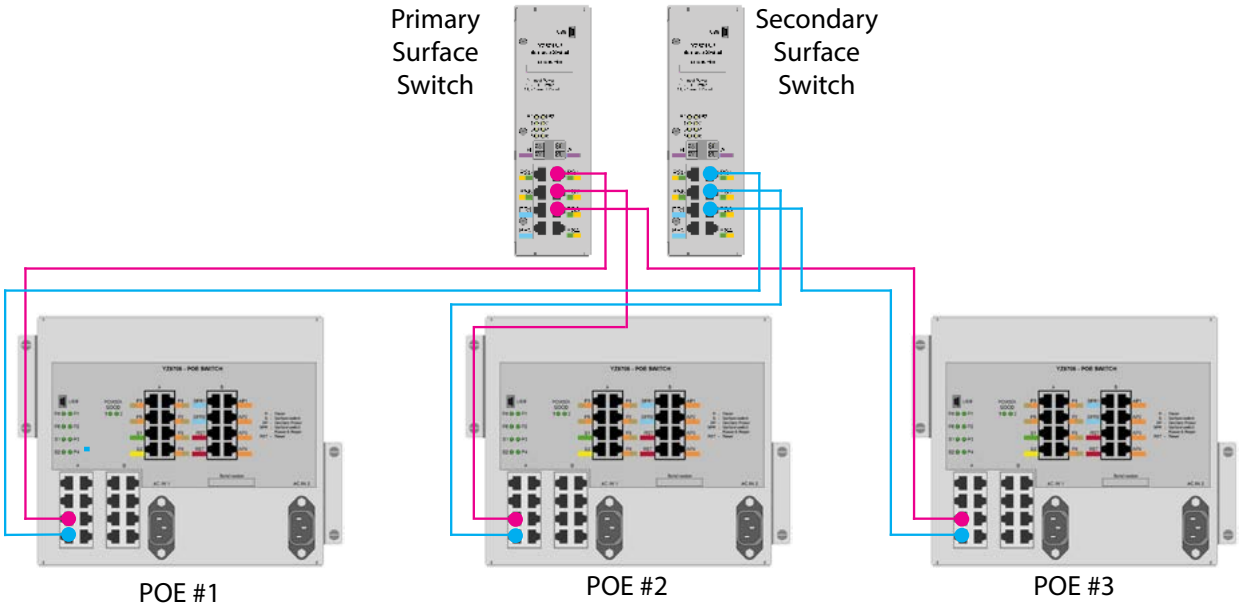


FIGURE 6 - POE TO SURFACE SWITCH DATA CONNECTIONS



SURFACE POWER – AC

Apollo control surfaces have 3 x IEC AC mains inputs requiring 100 - 240V AC.

The AC power inlets are wired internally to three distribution blocks mounted to the base of the inside of the control surface.

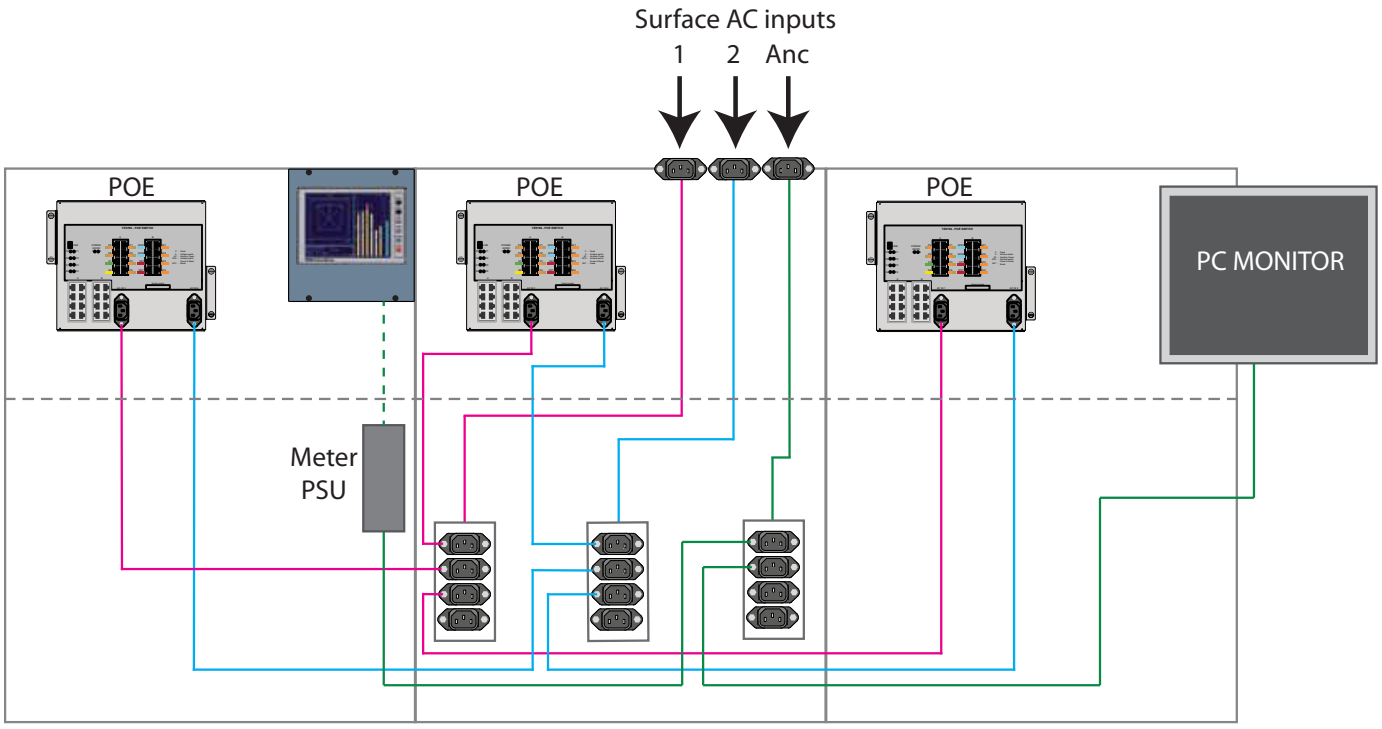
The POE switches have dual power supplies for redundancy and take two AC inputs, one from each of the first two mains sources. The majority of the remaining hardware in the control surface, including the PC is DC powered via POE connections.

The third IEC input and distribution block is used to power ancillary or third party items with a single mains input, such as DK/RTW meters and PC monitors.

To ensure all equipment is powered and redundancy is applied where available, all three IEC inputs to the control surface need to be fed with 100-240V AC. If only one of the first two inputs is fed, System Status error messages will be generated by each POE indicating they are not receiving power on both inputs.

It is recommended that these two mains inputs are fed from two separate AC supplies where possible to provide redundancy against external power failure.

FIGURE 1 - SURFACE AC POWER CONNECTIONS



SURFACE POWER – DC

The surface switches and configuration PC take DC power via RJ45 connectors. These should be fed from SPR connections on POE switches. These connections are for power only - no data is carried over the POE SPR connections.
SPR connections do not drop power during surface reset.

The power input connectors on the surface switches are labelled PR1 and PR2. Only one input needs to be connected for full functionality and redundancy. If power to the primary surface switch is lost, or the switch fails, data is automatically routed via the secondary Surface Switch. Therefore the two surface switches should be powered from two different POE units to maintain overall console functionality in the event of a failure of a POE feeding power.

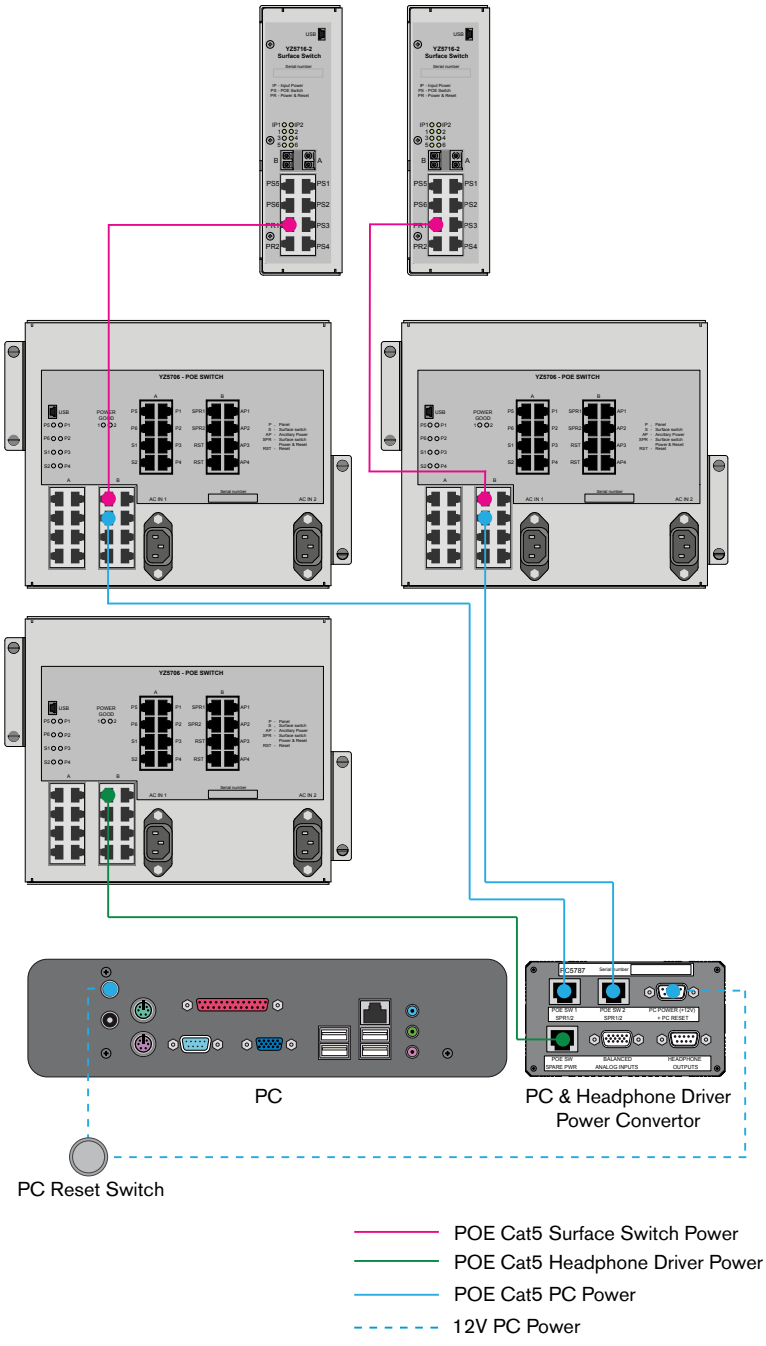
The PC is powered via a DC convertor unit. This unit has two power inputs on RJ45s for the PC. Only one of these is required for operation, the second is provided for power redundancy. These connections should be fed from two different POE's. SPR connections on POE's should be used so the PC power is maintained during surface reset. The PC power convertor outputs 12V DC via a 9 way D-type connector. This wires via a momentary switch in the keyboard tray to the PC's DC input jack. The switch acts as a PC reset by interrupting the power. The PC has 2 DC input jack sockets, either can be used. Only one DC connection to the PC itself is provided as the redundancy is catered for by the power convertor unit.

The PC power convertor box also contains the headphone driver circuitry and has a 3rd RJ45 power input for this, situated in the bottom row of connectors. The headphone driver can be powered from an SPR port or an AP depending on whether or not power needs to be maintained during surface reset.

Control panels take power and data on the same RJ45 connection and therefore need to be connected from a P1 - P6 POE port.

Upstand TFT meter panels, moving coil meters and miscellaneous optional panels take power via POE AP ports.

FIGURE 1 - SURFACE SWITCH, PC AND HEADPHONE DRIVER POWER



CONTROL SURFACE CAT5 CABLE CODING

Cat5e network cabling inside the control surface is ID coded at both ends with a number of cable markers.

One marker is used on each to ID the function of the cable by colour, matching the colour key used for the connector labelling on the POE switch - for example the data connection to the primary surface switch has a green marker and the one to the secondary has a yellow one.

Depending on the function of the cable, some have a prefix and/or suffix to the function marker.

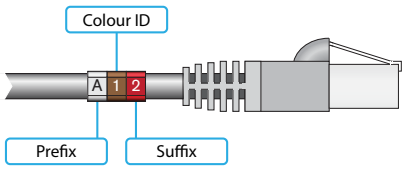
Prefixes are used to identify the control surface section the related POE is fitted in. Viewing the console from left to right, the first frame section is 'A', second is 'B', third is 'C' etc. Where there is more than one POE switch fitted in a section, two letters are used to prefix the label, for example 'AA' & 'AB' where AA is the first POE in the first section and AB is the second POE in the first section.

Panel connection cables use a suffix to ID the POE port. For example, if a cable is labelled 'A11' - The prefix 'A' refers to the POE switch in section 1. The next character '1' is a colour marker (brown) to identify the cable as a panel connection, and the last character, or suffix - '1' refers to port P1.

Blue SPR connections use a suffix to identify the device being powered by the POE switch.

The table to the right lists the functions with prefix and suffix by colour ID. Figures 2 & 3 give examples of the cable labels that would be used for the first POE's A & B group of ports.

FIGURE 1 - ID CODED NETWORK CABLE



Colour ID	Function	Prefix	Suffix
A 1 1	Control panel connection, data & power	Section ID	1-6, relates to POE P1-P6 port ID
2	Reset connection (RST)	None	None
A 3	Ancillary power (AP1-4)	Section ID	None
A 4	Secondary Surface Switch (S2), data	Section ID	None
A 5	Primary Surface Switch (S1), data	Section ID	None
6 1	Uninterrupted power + reset (SPR1-2)	None	1 = Primary Surface Switch 2 = Secondary Surface Switch 3 = PC Power 1 4 = PC Power 2

FIGURE 2 - POE 'A' CONNECTIONS

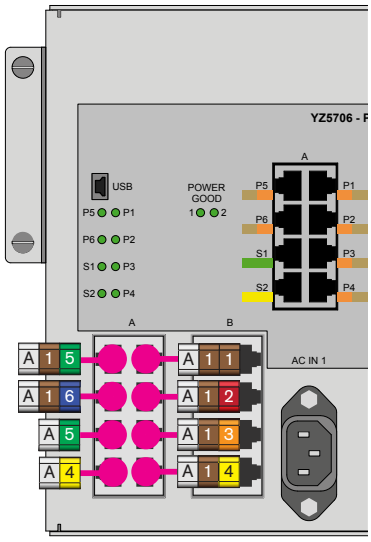
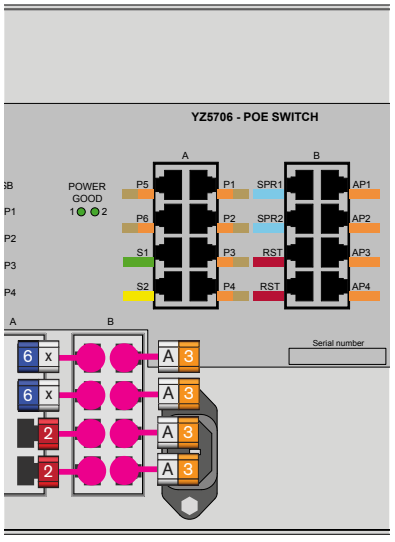


FIGURE 3 - POE 'B' CONNECTIONS



SYSTEM PC

A high quality, low power fanless PC is mounted to the baseplate inside the control surface. The design of the PC used ensures reliability alongside minimal heat and acoustic noise.

The PC is supplied as standard with a traditional magnetic hard drive (HDD) or as an option can be supplied with a solid state drive (SSD). SSDs have no moving parts and are therefore quieter and more shock-resistant than traditional HDD's.

The system PC is not relied upon - it does not carry out any audio or control processing. The control surface, control and audio processors all boot and are fully functional irrespective of whether the PC is on or connected.

The PC is used as an interface, providing a comprehensive GUI for control as well as being used for configuration and diagnostics.

The PC monitor and keyboard tray are fitted at the right hand side of the control surface as standard. As an option, consoles can be ordered with keyboard and monitor at the left side of the surface. The keyboard tray slides out from underneath the fader bed. If required, 2 PC monitors and / or keyboard trays can be fitted, one at each end of the control surface. The second set would typically be used as a convenient location for the operator to display / control other, non-Calrec PC's. Consoles can also be supplied without the monitor mount and / or keyboard tray, this is usually done when space is restrictive. In such a case, the installer should provide a suitable alternative to view and control the system PC.

PC power and reset

The PC should start up automatically when the control surface is powered. The Windows shutdown procedure should be followed whenever possible before removing power to the control surface. A reset switch for the PC is located at the back of the keyboard tray.

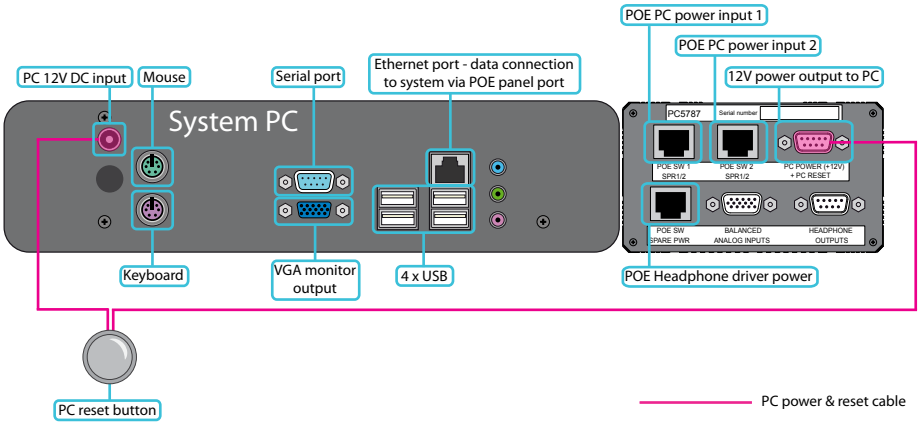
The power supply for the PC is located in the adjacent unit which also contains the headphone drivers. The PC power supply inputs POE DC voltage via RJ45s and outputs 12V DC on a 9 pin D-type connector. Two input connections provide redundancy against power loss and should be fed from two different POE switches, using their SPR feeds to maintain power to the PC during surface reset. The 9 pin connector also contains a reset line for the PC which wires out to a switch in the back of the keyboard tray. The power input to the PC itself is via a DC jack socket.

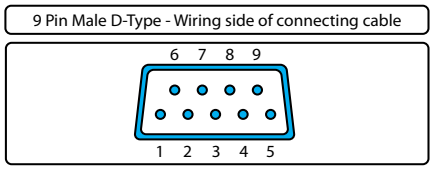
System network data connection

The PC connects to the system in the same way as a control panel. The RJ45 Ethernet port on the PC itself is its data connection to the system and can connect to any available POE switch port P1 – P6.

Note that P1 – P6 ports are full POE and contain power. The PC's supplied do not take power from this connection, however they are designed to be protected from damage by POE voltage. Connecting other PC's or equipment to a POE switch may damage them. The Ethernet-USB adaptors supplied with the console (as shown in Figure 2) are POE protected and can be used to connect a replacement or backup PC via the backup / replacements USB port if required. One of these adaptors is supplied loose along with the miscellaneous items such as the backup discs and hex screwdrivers.

FIGURE 1 - PC POWER AND RESET





Pin	Signal	Wired to
1	+12V	DC jack center pin
2	+12V	No connection
6	+12V	No connection
7	+12V	No connection
3	0V	DC jack outer
4	0V	Reset switch Common
8	0V	No connection
9	0V	No connection
5	Reset	Reset switch normally open

FIGURE 2 - USB TO ETHERNET

As an option, the console can be supplied with an additional accessible USB port, wired internally via an adaptor to a POE panel port, allowing for a backup PC to be connected quickly.

LAN connection

An RJ45 socket on the rear interface panel labelled 'PC I/F' provides a second network connection to the PC. Internally, this wires via a USB-Ethernet adaptor which is fitted into a USB port on the PC. If connecting to a LAN or the internet, the security / firewall settings can be selected per connection. Security / firewall settings should NOT be changed for the main system network port - 'CalrecDeskConnection'.

Providing an internet connection to the PC allows Calrec engineers access for diagnostics by agreement using a secure connection.

Keyboard and mouse

As standard, a keyboard with trackball is located in the pull-out keyboard tray under the fader bed. The keyboard has two colour coded PS2 connectors which fit directly in the PS2 ports on the PC. UK and US keyboard layouts are available.

Touchscreen monitor

The PC monitor is AC mains powered (100-240V) by a single IEC input, wired via the ancillary AC input to the control surface. The graphics output from the PC to the monitor is a direct VGA connection. Touch data from the monitor is connected by USB. To correctly display all the Calrec PC applications, a minimum resolution of 1280 x 1024 is required. Using an alternative higher resolution monitor such as 1920 x 1080 will display the Calrec software correctly but the content will not scale up higher than the 1280x1024 monitor size it was designed for.

Accessible PC USB port

The USB port on the upstand reset panel is connected internally to a PC USB port providing easy access for USB devices, for example for making backups of shows / user memories to a USB memory stick.

Operating system

Calrec system PCs are supplied with Microsoft Windows 7 Professional installed. Calrec software is currently only tested using the Windows 7 and Windows XP Professional platforms and we cannot guarantee functionality using any other operating system.

3rd Party software

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

Serial port

The current specification PC has one external serial port. This is connected to the DK meter serial port when fitted to allow convenient access for DK configuration in the factory.

Antivirus Protection

Antivirus protection is not pre-installed on console and router core PCs as standard but if you wish to protect your PC you can install a package of your choice. Exceptions will need to be configured within the antivirus software to allow the following to communicate with the Calrec system:

- C:\Calrec\WindowsService\DeskPcWs.exe
- C:\Calrec\ProgramUpdater\Calrec.ProgramUpdater.exe

BACKUP PC

Any standard specification modern PC running Windows 7 or Windows XP Professional can be used as a backup or replacement to connect to the console and run the various Calrec applications.

Connection by the PC's USB port, via the supplied USB-Ethernet adaptor into a spare POE switch P1 – P6 port ensures the PC's network port is not damaged by POE power. Note, not all available USB-Ethernet adaptors have protection against POE power, please refer to the manufacturers specification if not using ones supplied by Calrec.

Starting the Calrec Main Application on a second PC will disable it on the first PC.

If using a laptop, or a different monitor screen to the one supplied, a minimum screen resolution of 1280 x 1024 is required to display the Calrec software correctly. Currently, such pixel height is not widely supported by budget range laptops. Using an alternative higher resolution monitor such as 1920 x 1080 will display the Calrec software correctly but the content will not scale up higher than the 1280x1024 monitor size it was designed for.

Calrec can supply pre-configured laptops and replacement PC's ready to work out of the box. The setup instructions on this page can be used to configure a non-Calrec supplied PC. Minimum requirements for the PC are listed below.

FIGURE 1 - MINIMUM PC SPEC

OS	Windows XP Pro
CPU	1.6 GHz Dual Core
RAM	1GB
HDD	160 GB
Ports	1 x USB or 1 x POE protected Ethernet port

FIGURE 2 - APOLLO BACKUP PC SETUP FOR WINDOWS

1. Download the latest version of Java Runtime Environment from www.java.com and install it on the Backup PC.

2. Download the latest version of .net Framework from www.microsoft.com/net and install it on the Backup PC.

3. Copy folder **C:\Calrec** from the Console PC onto the **C:** drive of the Backup PC.

4. Copy the folder **Drivers\WINXP\32 BIT** from the DUB E-100 Ethernet to USB adaptor installation CD onto the **C:** drive of the Backup PC

5. Plug the USB connection of the DUB E-100 USB network adapter into the Backup PC. Windows will automatically detect and start to install it. When prompted, select **Install from a specific location** and browse to the location the drivers were copied to in the previous step. Follow the on-screen prompts to complete the installation

6. Once the DUB E-100 has been successfully installed, go to **Start>Control Panel>Network Connections**, right click on the connection which uses the DUB E-100 and choose Rename. Rename the connection to **CalrecDeskConnection** (case sensitive) and click **OK**.

7. Right click on **CalrecDeskConnection** and select **Properties**, this will open the **Network Properties** window. Scroll down the list to find **Internet Protocol (TCP/IP)** and double click on it. Select **Use the following IP address**. In the IP address field enter **xxx.yyy.135.0** (where xxx.yyy match the first two bytes of the console IP address. If uncertain, open the Calrec program updater application which will list all the IP's in the system. They all have the same first two bytes). In the **Subnet Mask** field enter **255.255.0.0**, leave all other fields blank. Click on **OK**. You will be returned to the Network Properties window

8. Select the **Advanced** tab and click on the **Windows Firewall Settings** button. Turn the firewall off and click **OK** to confirm, then **OK** again to exit Network Properties.

9. Navigate to **C:\Calrec\WindowsService** on the Backup PC and double click on install.bat.

10. Go to **Start>Control Panel>Administrative Tools>Services**. Right click on **CalrecService** and click **Start**.

11. Go to **Start>Control Panel>System** and open the Computer Name tab and make a note of the full computer name. Go to **Start>Run** and type **cmd** then press **<enter>**. This will open a DOS command prompt. At the prompt type **c:** and press **<enter>**, then type **Calrec\Utils\setcacls** then press **<enter>**. When prompted enter the full computer name and press **<enter>**.

12. Connect the DUB E-100 to the console using a spare panel port (P1-P6) on one of the POE switches.

13. Navigate to **C:\Calrec\ConsolePC** on the Backup PC and double click on **run.bat**. This will open the Main Application. Note that the Main Application and Program Updater should not be running on the Console PC whilst the Backup PC is in use.

APOLLO
PROCESSING CORE

CALREC

CORE DIMENSIONS AND MOUNTING

The Apollo processing core is an 8U 19' rack mount enclosure designed for installation in standard 19' equipment bays.

Airflow

The core is cooled by fan assisted convection. Air is drawn in from the front into the cable-tray and up through the base of the card frame. Fans mounted in the top of the core pull air through the card frame which then exits through vents across the top of the rear of the core. All fans are speed monitored and System Status error message are generated for any failures. To ensure air can flow through the card frame freely, the air vents at the rear of the core should be left clear and unobstructed. Also, the cable-tray should not be overfilled, leaving space at the base of the card-frame by using the cable-tidy clips in the cable tray. No clearance is required above or below the core for cooling.

Acoustic Noise

A fully populated core has been measured to produce <40dB acoustic noise (A-weighted at 1 metre from front).

Support

The weight at the rear of the core should be adequately supported to prevent stress on the front racking angles. This is particularly important when the units are mounted in mobile installations. Calrec will not accept liability for damage caused by insufficient support.

Connections

All connections, including power are made to the front of the core which is recessed from the racking angles to allow cable clearance within the bay.

A cable tray in the base of the core allows for cables to be routed from the rear of the bay to the front of the core.

FIGURE 1 - SIDE PROFILE VIEW - DIMENSIONS & AIR FLOW

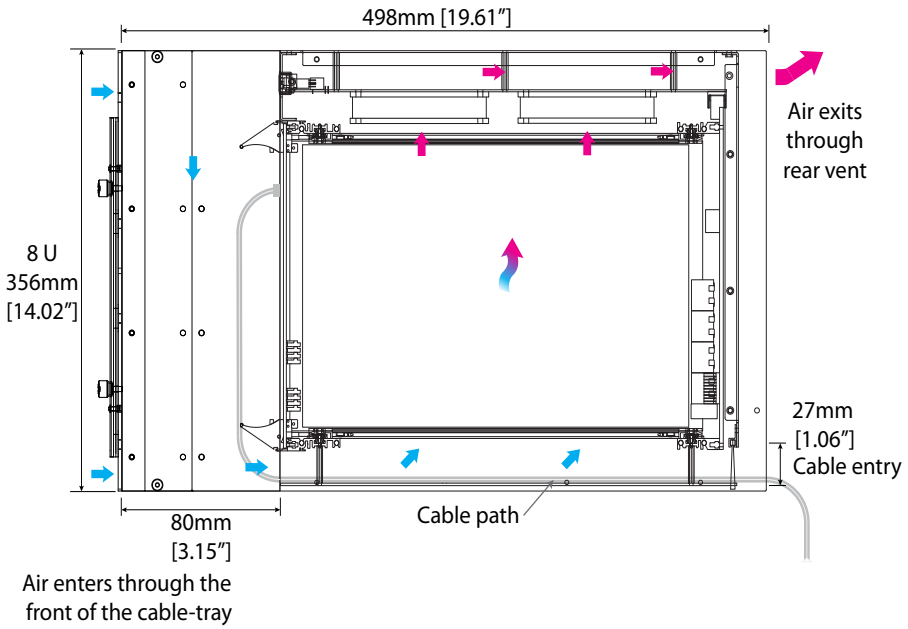


FIGURE 2 - CORE SPECIFICATIONS

ED5708 Core	
Height	8U (356mm)
Depth	498mm
Width	19' rack
Weight	17kg (max)
Heat Dissipation	300W (max)

Cable tidy clips in the cable tray keep cables at the base ensuring airflow into the cardframe is not restricted.

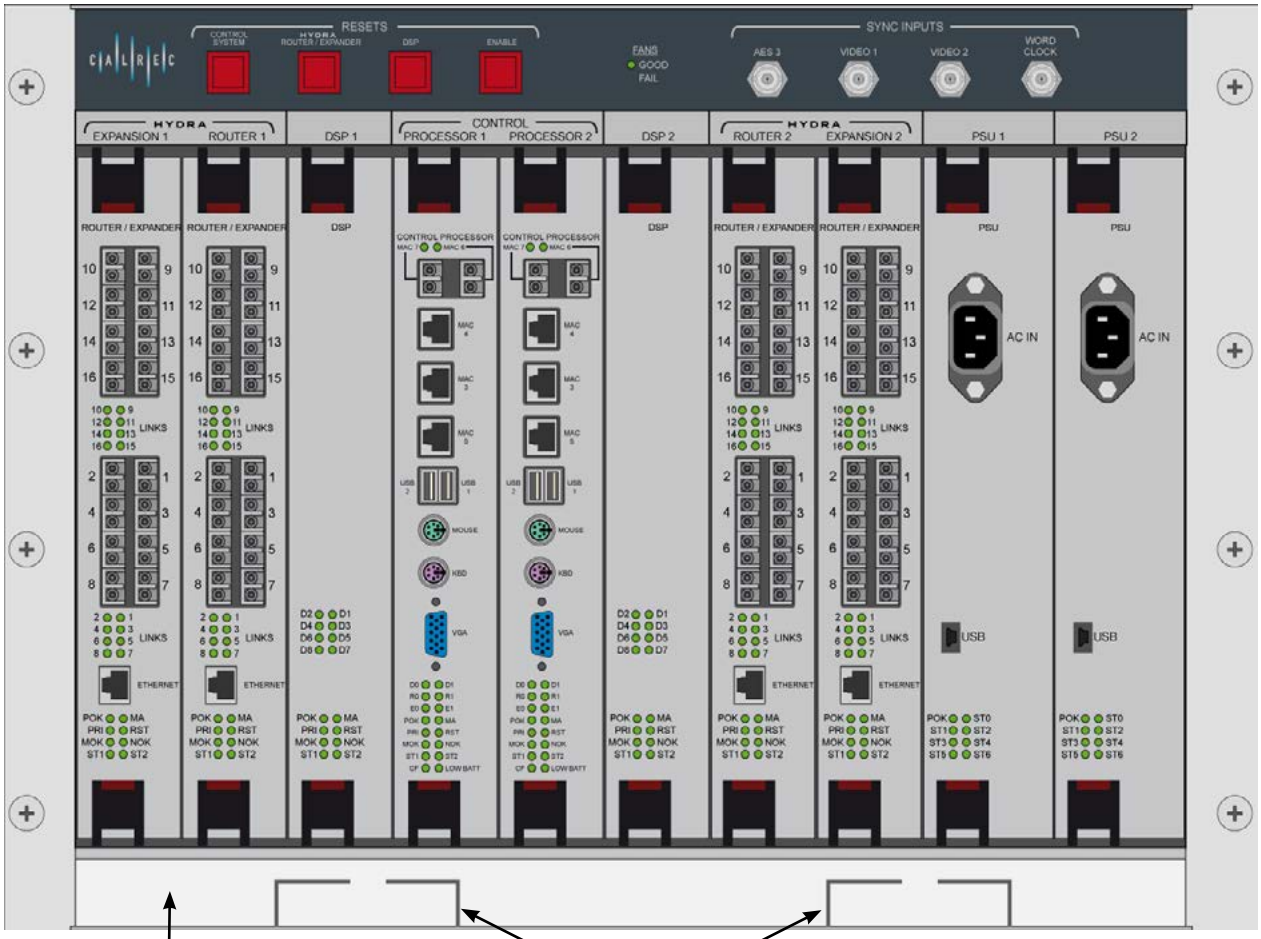
When routing cables through the cable tray and up to front panel connectors, observe the minimum bend radii recommended by the cable manufacturers. This is especially important for fibres and high speed data conductors.

Take care also to 'dress' cables neatly so that they cause minimal restriction to the air flow.

Please refer to the Hydra2 installation manual for detail regarding specific router connections.

CARD TYPES AND LAYOUT

FIGURE 1 - FRONT VIEW - FULLY POPULATED 8U APOLLO CORE



Card layout
The Apollo core has 10 module/card slots. A slot should only be fitted with a module of the correct type for the slot. Slots are labelled for their type across the top.

Two of each type of processing card are fitted to provide comprehensive redundancy. The left hand card of each pair, labelled #1 is the primary/normally active card. The right hand of each pair, labelled #2 is the secondary, hot-spare card.

A second pair of router cards can be fitted in the expansion slots if required to double the number of Hydra2 I/O ports available.

Both PSU cards when fitted are active and share the load of the whole core.

Only one PSU is required to power the core however we recommend that both are fitted and fed to provide redundancy.

Reset, sync interface & fan status
Across the top of the card frame are the resets and sync interface. Three buttons can individually reset the control, router and DSP cards within the core. A fourth button is the enable which must be pressed at the same time as any of the resets as a safety precaution. Be cautious if resetting the routers/expanders, other consoles on the same Hydra2 network may be using I/O connected to the routers in the core being reset.

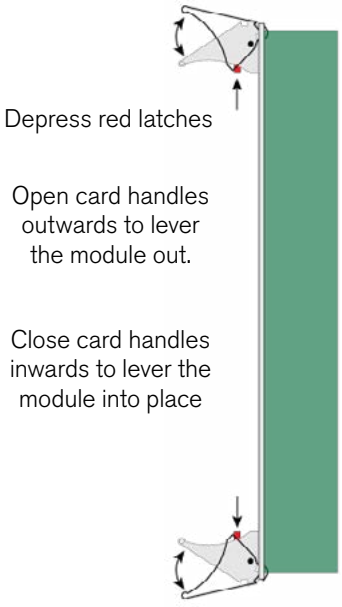
4 x BNC connectors provide sync inputs, allowing for redundancy and a range of formats. Two inputs are for SD / HD video sync signals, one for AES DARS and one for TTL wordclock.

The upper section of the core also contains LED indication to show the status of the fans fitted within. Failures are also reported by the console's System Status system.

Installing / removing cards

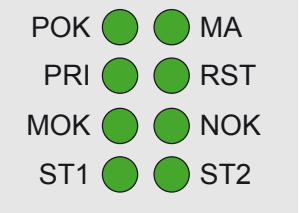
To remove a module from the core, take hold of both top and bottom card handles, press both of the red latches and open the card handles outwards to lever the module away from the backplane connectors. The module can then be slid out of the core. Avoid touching any exposed parts of the circuit board unless observing ESD precautions.

To install a module, line up the card edges with the card guides in the rack slot and gently slide it in. Ensure the handles are in the open position and push the card fully into the core whilst closing the card handles to lever the module into place. A click should be heard when the module is seated fully.



Standard Status LEDs

Control, DSP and router cards have a standard set of front panel status LED's.



- POK - Power OK, module is receiving power.
- MA - Module active. Indicates which of the primary / secondary pair is actively in control.
- PRI - Indicates if the module is fitted in a primary slot.
- RST - Illuminates when the module receives a reset command.
- MOK - Module OK. Indicates the module has booted and is running, either actively or as a hot-spare.
- NOK - Neighbour OK. Indicates the presence and status of the alternate card of the same type. Neighbours are primary / secondary counterparts, rather than physically adjacent modules.
- ST1 & ST2 are Calrec engineering status LED's, the function of which varies by card type and can be subject to change with software version.

Master Control processor

Slots 4 & 5 are for control processor modules, slot 4 for the primary / normally active card, slot 5 for the secondary / hot-spare. The active Control processor is the central processor in the system, handling all control parameters and directing data between control surface, DSP and router.

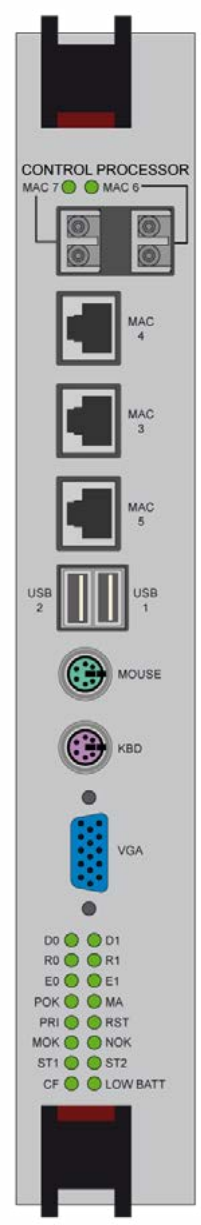
At the top of the module are two SFP slots that can be fitted with copper or fibre SFPs for interfacing with the control surface. The left hand 'MAC7' SFP on the primary Control processor connects to the primary surface switch, MAC7 on the secondary Control processor connects to the secondary surface switch. MAC6 connectors are only used for very large control surfaces fitted with a second pair of surface switches, or to connect a sidecar containing its own pair of surface switches.

If the core is configured as a Master Router, RJ45 port MAC5 should be used to connect standalone (outside of a console) PCs for accessing H20; the network administrator user interface. Ports MAC4 and MAC3 are for use by Calrec engineers only.

USB ports, keyboard, mouse and VGA connections are for use only by, or under the guidance of Calrec engineers.

As well as the standard status indicators, front panel LEDs are also provided to show the status of other cards in the core - D0 for the primary DSP card, D1 for the secondary, R0 for the primary router, R1 for the secondary, E0 for the primary expansion card, and E1 for the secondary. The CF LED indicates write activity to the module's compact flash card and LOW BATT is a low battery warning for the module's BIOS. The Control processor's ST1 & ST2 LEDs indicate heartbeats from the module's two processing cores.

FIGURE 2 - MASTER CONTROL



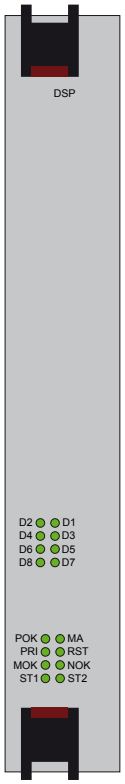
DSP

The primary, normally active DSP card fits in slot 3, the secondary, hot-spare in slot 6. DSP cards are not required in standalone router cores without a control surface.

This audio processing module has no front panel connectors. All audio and data is passed to / from the Control processor and router cards via the core backplane.

As well as the standard status LEDs, LEDs D1-D8 indicate the status of the signal processing cores within the module.

FIGURE 3 - DSP MODULE



Router / Expander
The primary, normally active router card fits in slot 2, the secondary in slot 7. As an option, slots 1 and 8 can be fitted with additional router modules of the same type to double the number Hydra2 I/O ports in the core.

The Apollo router card has 16 SFP ports that can be fitted with copper or fibre SFP's to allow connection of Hydra2 I/O boxes and connections to other consoles' routers and standalone router cores. A single RJ45 port labelled Ethernet allows for the connection of 3rd party equipment supporting the SW-P-08 or Ember protocols for remote control.

As well as standard status LED's there are front panel LED indicators to show activity on each port.

Power Supply
Card slots 9 & 10 are for PSU modules. Both slots share the power load for the whole core. One PSU module is sufficient to power the whole core, two are fitted to provide redundancy.

Each card has an IEC AC mains input connector, requiring 100-240V AC.

FIGURE 4 - ROUTER / EXPANDER

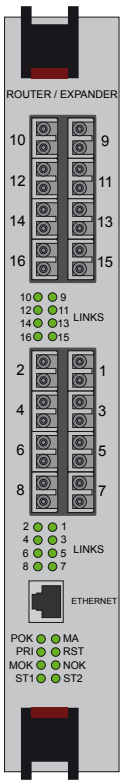
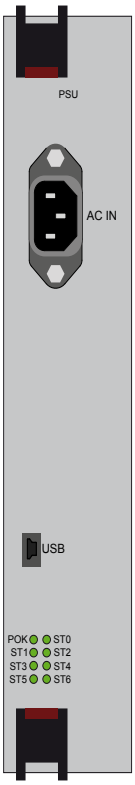


FIGURE 5 - PSU MODULE



APOLLO
CONNECTION INFORMATION

CALREC

SFP - OVERVIEW

The connections between control surface and processing core, as well as all Hydra2 network connections - connections between I/O boxes and routers, and router to router connections between different cores, are made via SFP modules (Small Form-factor Pluggable Gigabit Interface Converters).

SFPs can be provided for RJ45 copper connections, as well as for singlemode or multimode fibre on duplex LC connectors. This allows for each port's connection type to be chosen depending on the distance of the run or to match the infrastructure present. SFPs can easily be changed on a port by port basis as and when required.

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.

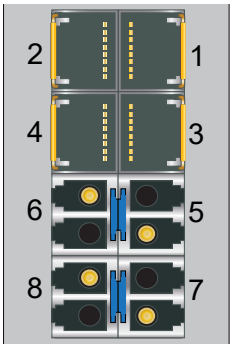
SFP slot orientation

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

Note the orientation of the SFP modules, as shown in the illustrations on this page - modules fitted in even numbered router ports (left hand column) are fitted the opposite way around to those in the odd numbered router ports (right hand column). 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.

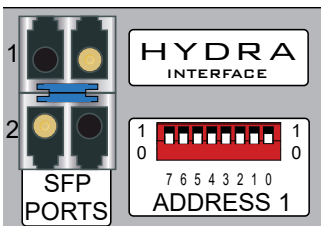
For modular I/O box controller cards, both SFP slots are orientated so that the release catch on the cable / fibre connector are on the right-hand side.

ROUTER CARD SFP ORIENTATION



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

FIXED FORMAT I/O BOX SFPS



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

MODULAR I/O BOX SFPS

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

SFP latching and extraction

Calrec source SFP modules from various manufacturers. All types used conform to the same specification, however the latching mechanism on them can vary slightly.

The standard copper SFPs 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.

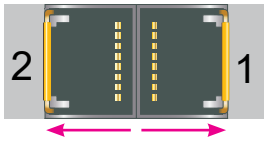
To remove this style of SFP, remove the cable / fibre and slide the handle (copper) or lift the handle out (fibre) to the inside edge position as shown in the diagram below. The module can then be removed by pulling on the handle.

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

SFPS WITH HANDLES - LATCHED



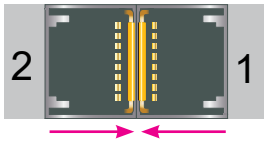
- Both SFPs shown are locked in place - Latch / extraction handles in outer position (or 'down' position for fibre).

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.

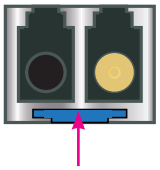
Calrec will not be liable for lost or missing SFP modules, or damage due to poor storage.

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.

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

Hydra 2 network connections and control surface to processing core connections made via copper SFP modules require shielded F/UTP Category 5e or Category 6 cables with shielded RJ45 mating connectors.

Calrec do not supply these 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 standard EN55022, 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 shield on the connector mates 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.

SHIELDED RJ45 CONNECTOR

Conductive connector mating screen clamped / bonded to cable shield

Maximum cable length

The maximum length of Cat5e/Cat6 cables is 90m / 295ft. 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 installation practise can seriously impact upon this. The following are general good rules of practise, 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 the outer appearance.

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.

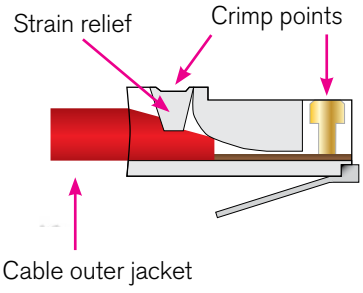
Cable-ties should not be over-tightened as this also deforms the internal structure of the cable. Cable ties should be tight enough only to support the cable weight but not so tight as to cause any visible deformation to the cable's outer jacket. Large, heavy bundles of cables can be difficult to support 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 decrease cross-talk immunity 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 strain relief the data cores, the outer jacket of the cable should be inserted into the RJ45 housing and held in place once crimped by the strain-relief point, as shown in the following diagram. This also maintains the integrity of the twist rate and shield into the termination,

STRAIN RELIEVED RJ45 TERMINATION



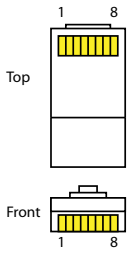
- Note, this is a simplified diagram that does not include the shield.

and therefore the full length of the cable conforms to its' intended specification. Slide on outer boots offer additional strain-relief protection but are not sufficient on their own. 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 quite 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.

STANDARD HYDRA2 RJ45 PIN-OUT



RJ45 PIN NUMBERING

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

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.

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

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 importantly, low 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 requires a higher powered laser.

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 become more important.

SFP modules are available for both 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 for singlemode, Black for multimode. Blue LC connectors, as shown below should be used to terminate singlemode fibre, and beige coloured ones for multimode.

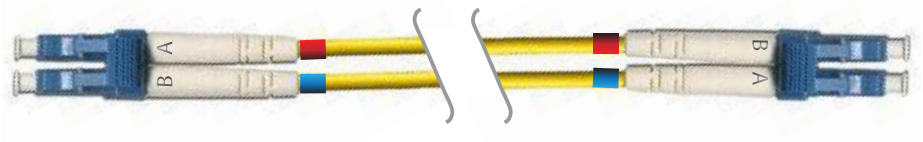
Connectors / terminations

All Calrec fibre SFPs, 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 being used.

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



SFP COPPER / FIBRE SPECIFICATIONS

Type of Cable	Maximum Distance	Connector	GBIC Type	Optical Power Budget
Copper Cat 5e/6 Ethernet	90m	RJ45	N/A	N/A
Fiber 62.5/125µm Multimode	275m	LC Duplex	SX	7.5dB
Fiber 50/125µm Multimode	550m	LC Duplex	SX	7.5dB
Fiber 8/125µm Singlemode	10km	LC Duplex	LX	8dB
Fiber 8/125µm Singlemode	70km	LC Duplex	LH	23dB

FIBRE – GENERAL RULES

Testing / certification
Calrec strongly recommends that all fibres are properly tested or certified prior to onsite 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 <0.3dB per termination. Poor termination results in higher loss.

Connector loss occurs at the point where the connector meets the SFP / optical transceiver, or another connector, such as extension interconnects or patch-points. Connector loss should typically be <0.5dB per interconnect. Dust or other contamination between interconnects and 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 transceivers such as 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 3.5dB per Km for multimode down to 0.4dB 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 be adequately strain relieved 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, 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
For temporary / re-usable fibre runs , or runs unprotected by conduit, fibre that is 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.

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 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, including fingers.

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 to properly clean fibre optic cables.

- Do not allow the end of the fibre optic cable to make contact with any surface including fingers.
- Do not excessively bend the fibre cable. Bending the cable 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 lens paper dry as dry lens paper 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 power is off and handle the modules with care.
- Always use Clean Dry Air or an approved canned compressed air supply.
- Always hold the can of compressed air upright. Tipping may release liquids into the air stream.
- Do not touch the inner surfaces of the module including the Optical Sub-Assemblies (OSA), or insert any foreign objects into the ports.
- Use of finger cots or powder free surgical gloves are not required but may be used for cleanliness.

Cleaning procedure

1. With the clean dry air, blow the inner barrel of the Transmitter and Receiver Optical Sub-Assemblies (OSA). This will dislodge loose particles.
2. Examine the surface of the OSA lens under high intensity light using the inspection microscope. If contaminants still remain, repeat the process.

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

For further information or advice please feel free to contact Calrec.

SYNCHRONISATION

The Apollo processing core has 4 inputs to allow connection of external sync. If no external sync is connected and selected, the console will free-run on its own synchronisation clock, generated by the active router card.

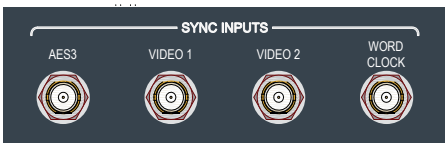
General rules of good practise require that all equipment connected to the audio console's digital inputs and outputs are all locked to the same referenced sync source as the console to ensure clean audio.

In systems with multiple Calrec processing cores; i.e. where more than one Apollo/Artemis consoles are connected together, or where standalone Calrec router cores are used, it is of paramount importance that all connected processing cores are locked to the same referenced sync source.

One or more cores receiving a sync signal that is not locked from the same clock reference as other cores will cause interruptions to both audio and data carried by the routers. 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 the 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 changing the reference source or free-running.

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 facilities' sync distribution system.

FIGURE 1 - SYNC INPUTS



External sync sources can be fed to the BNC connectors at the top of the processing core (Figure 1). Two inputs are available for video formats, as well as an input for TTL Wordclock and an input for AES3 digital audio reference.

Sync source selection

The sync sources to be used have to be selected from the Console Main Application, **>System Settings>Sync** page, or by the Hydra2 Organiser.

The Main Application must be in technician mode (enter username and password on the Tech page) to change sync settings.

Only one sync source is active and locked to at any given time. Multiple sources can be selected by priority to determine the next choice to use in the event of the active source failing.

The Sync page shows the available sources on the left and the selected sources on the right. The last of the 'selectable' sources is actually fixed as Internal to ensure that console will run on its own clock when no external sync is present.

On boot up or reset, the console attempts to lock to the first sync source in the selection list. If it cannot lock to the first choice, it will move down the list in order until a choice can be locked to.

The source currently locked to is displayed on the screen. Any sync failures to the local core will be reported by System Status. If a failed sync input becomes good, the console will NOT automatically re-lock to it as any changeover in sync could affect audio. Switching back to the primary sync choice is done manually by clicking 'Reset to 1st' on the sync page, or automatically after the next boot / reset.

To change the sync sources selected, click on the desired source on the left, the desired destination on the right and then click 'Patch'.

The video inputs can be fed with analogue or digital video in NTSC, PAL or a variety of HD / tri-level formats.

The correct video format for each video input being used needs to be specified from the Sync page.

Synchronisation at different sample rates

From Version 8 onwards, Artemis can operate at 48kHz or 96kHz. 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.

Hydra2 always runs at 48kHz, 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.

SURFACE TO CORE CONNECTION

A connection is required between the Control processors in the processing core and the Surface Switches inside the control surface.

These connections are via SFPs, the SFP type will be either fibre or copper, as requested at order depending on the distances and infrastructure involved.

Calrec do not provide these interconnecting fibres / cables as the length, type and quality will vary depending on the specific requirements of each installation.

Copper connections should be made using screened Cat5e or Cat6 cable. For more information on copper connections, SFPs and fibres, please see the Connection Types and Cat5e Cables sections.

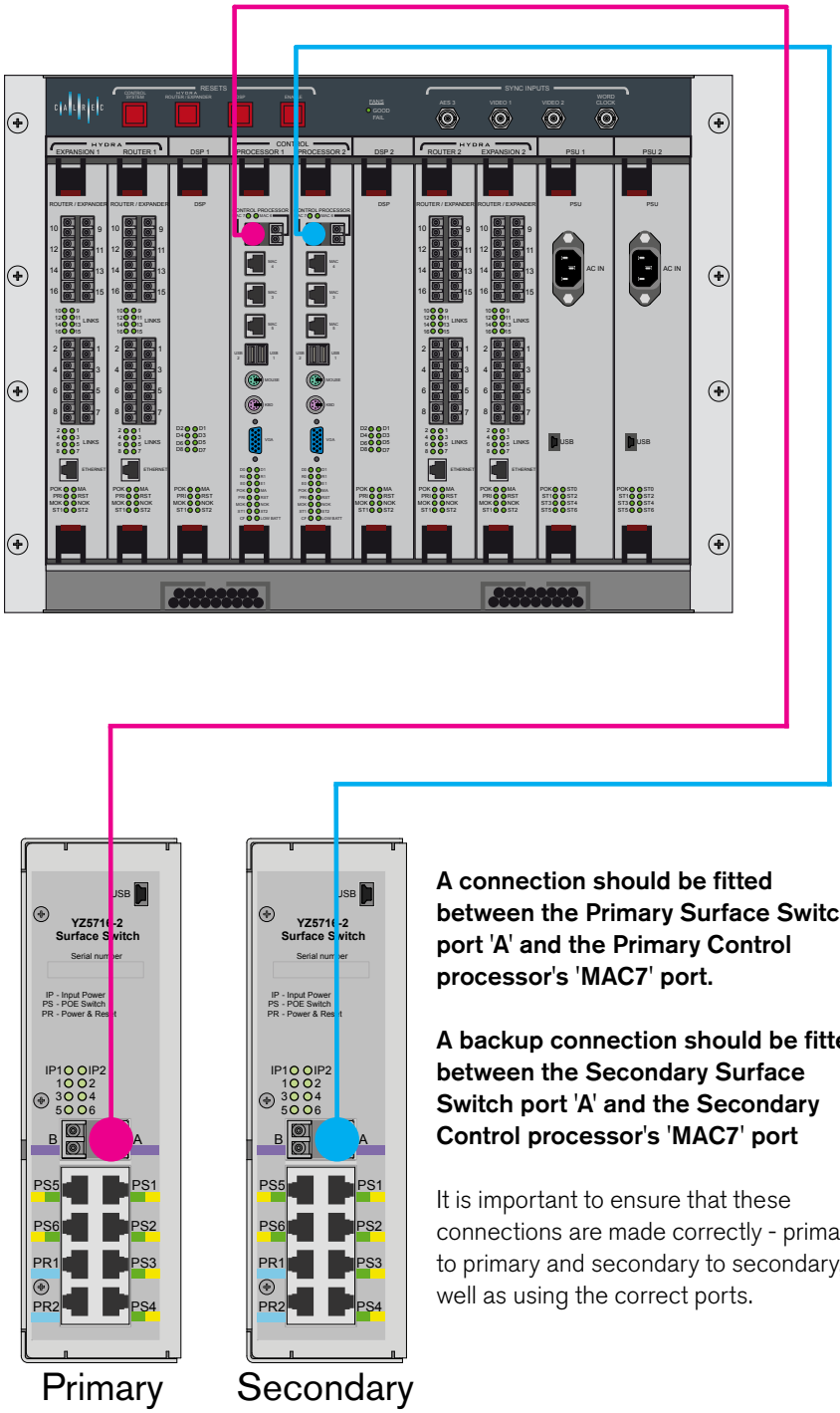
The illustration to the right shows the location of the connections on the core and surface switches.

The two surface switches are located inside the control surface, mounted to the rear cover of the section containing the IEC mains power inlets. These can be accessed by removing the control surface panels and upstand meter panels in that area of the console.

The two surface switches should be easily identifiable on the rear cover. The left hand unit, when viewed from the front is the primary Surface Switch, the right hand unit is the secondary Surface Switch.

In the processing core, the card labelled 'Control Processor 1', in slot 4 is the Primary Control processor, whilst slot 5 'Control Processor 2' is the secondary Control processor.

CORE TO CONSOLE CONNECTIONS



A connection should be fitted between the Primary Surface Switch port 'A' and the Primary Control processor's 'MAC7' port.

A backup connection should be fitted between the Secondary Surface Switch port 'A' and the Secondary Control processor's 'MAC7' port

It is important to ensure that these connections are made correctly - primary to primary and secondary to secondary, as well as using the correct ports.

CONTROL SURFACE SIDECAR CONNECTION

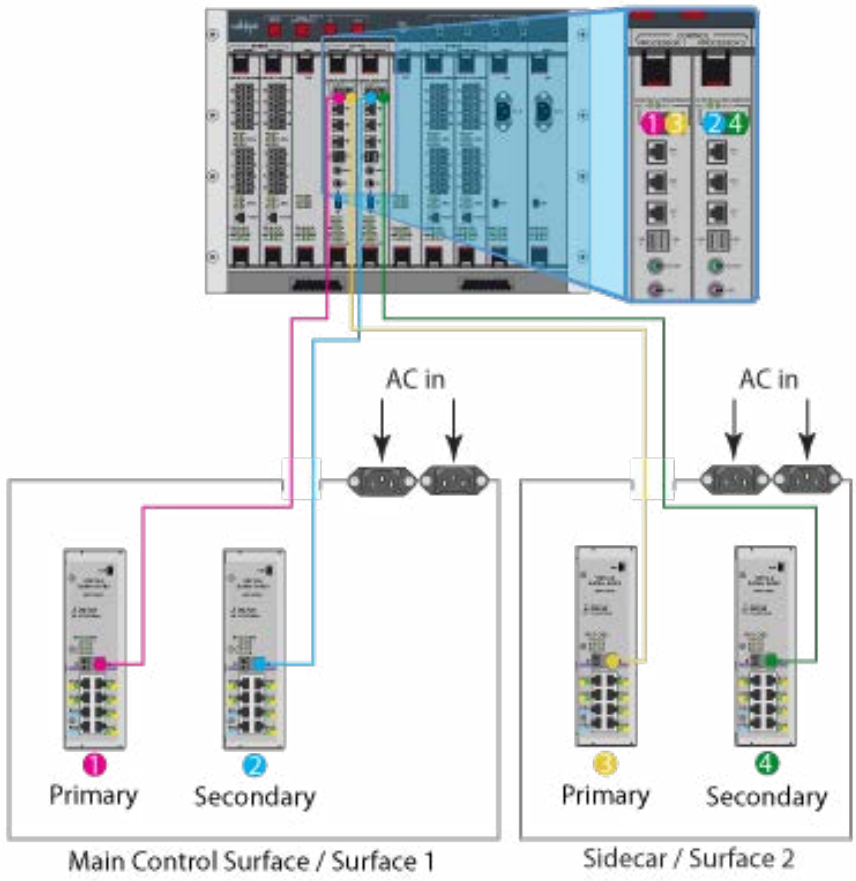
The processing core supports an additional connection for a second control surface known as a sidecar.

A sidecar surface, unlike a surface extension is fitted with its own pair of surface switches and connects to the MAC6 SFP ports on the Control processor cards in the processing core, as shown in the adjacent diagram. The primary surface switch needs to be connected to the primary controller card, and secondary switch to secondary card to provide redundancy.

The Calrec Main Application, **>System Settings>Surface Layout** page defines the control surface panels that are fitted. The layout shown on the 'Surface 1' tab relates to the main control surface, connected to the control processor MAC7 ports. The layout shown on the 'Surface 2' tab relates to a sidecar surface connected to MAC6. The surface layout numbers the POE switches starting from #1 for both surface 1 and surface 2. The surface layout page allows for different console layouts to be created, edited, saved and loaded onto the control surface(s). For systems that have temporary sidecars it is advisable to have two surface layouts saved, one with a sidecar/surface 2 and one without. Loading a surface layout with a surface 2 sidecar enables the sidecar control panels. Loading a surface layout without a surface 2 configuration prevents error messages being generated for panels that are not present when the sidecar is removed or not powered, as well as preventing paths being placed on faders that are not currently present.

As with the main surface, the sidecar can be supplied with copper or fibre connections depending on the distance required between the processing core and the control surface.

MAIN SURFACE / SURFACE 1 & SIDECAR / SURFACE2 CONNECTIONS



Both control surfaces have full access to the DSP within the processing core as well as to all of the I/O that the processing core has been given access to. To prevent control conflicts, user splits can be put in place between the two surfaces and different monitoring outputs can be set up for each one. Please refer to the console operator manual for further information on user splits and monitoring.

Both the main surface 1, and the sidecar surface 2 can be physically split further using extended control surface's if required.

Extremely large control surface's would require 2 pairs of surface switches fitting in the single chassis surface in order to be able to communicate with the high number of control panels. In such a case, the single chassis would connect to both MAC6 & MAC7. The surface layout for the single control surface would be split across the surface 1 and surface 2 screens. In such a case, a separate sidecar cannot be added, though surface extensions may be.

EXTENDED CONTROL SURFACE CONNECTIONS

In addition to sidecars, console chassis' can also be split using extended control surfaces.

This can be to allow multiple operators the comfort of more space, to create a 'wrap around' surface for small rooms or large consoles to bring faders closer, or to provide control from a different location.

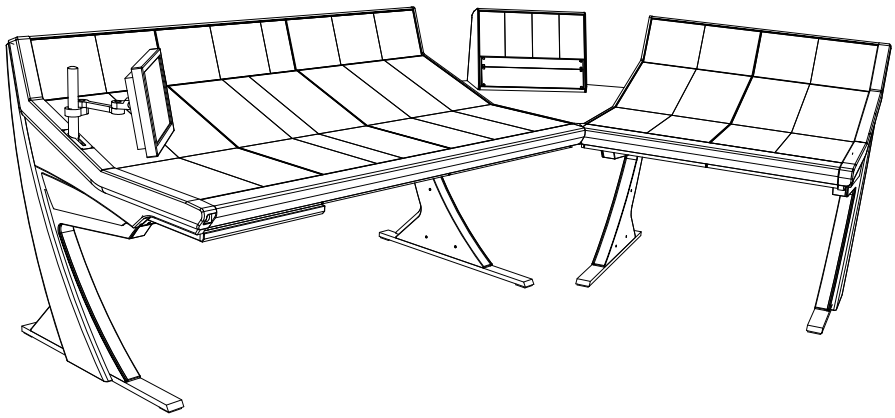
Unlike a sidecar, a control surface extension is not fitted with its own surface switches and therefore does not connect directly to the processing core. Instead, console extensions connect to the main control surface via its' surface switches. Multiple surface extensions can be added, limited only by the maximum number of POE's that can be connected to the surface switches. Surface extensions can also be used in conjunction with sidecar surfaces.

Using surface extensions and / or sidecars in conjunction with user splits and multiple monitor or headphone outputs, along with the huge resources of both input channels and output buses allows multiple operators to work independently on a single core system.

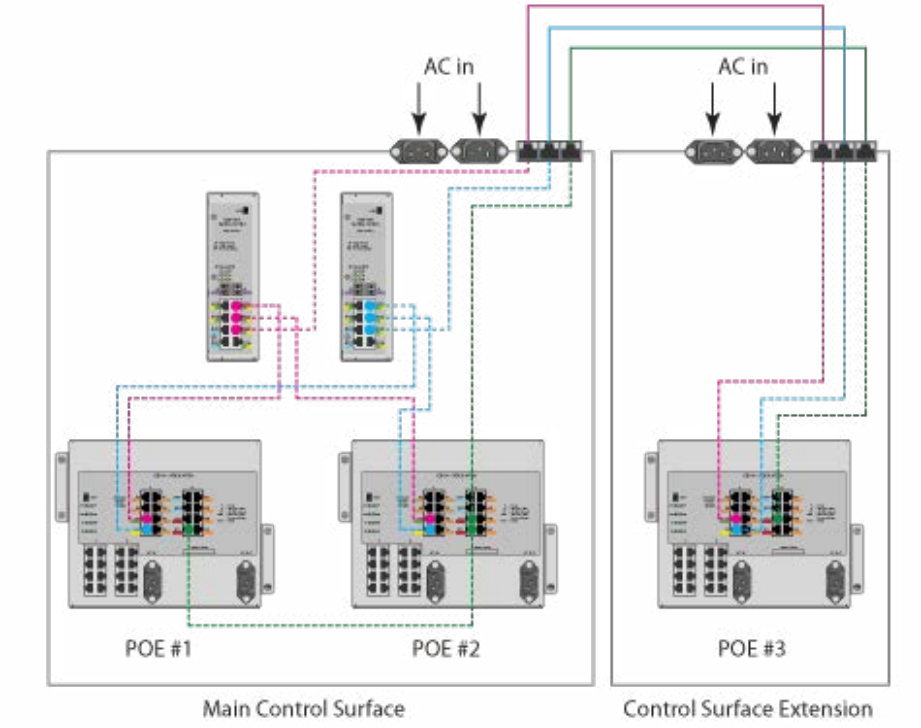
Consoles built with the intention of connecting to extensions will have RJ45's mounted and labelled in the rear interface for this purpose. A primary and secondary data connection between the surface and the extension are required. A third RJ45-RJ45 connection, carrying the reset lines is optional, depending on whether the extension is fitted with its own reset button or not.

Screened Cat5e cable should be used to guarantee performance. These connections use standard Ethernet pin-outs and pairings. The reset cable, if used needs to be a 'straight-through' pin out, NOT a 'cross-over'. See Category 5e Cable section for further info. As these are copper only connections, the cable distance between surfaces is 90m [295 ft] maximum.

CONTROL SURFACE EXTENSION USED TO CREATE 'WRAP-AROUND' CONSOLE



SURFACE EXTENSION CONNECTIONS



AUDIO I/O CONNECTIONS

All audio inputs and outputs to / from the console signal processing engine are Hydra2 based.

Audio Formats

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

Power

All Hydra2 I/O units are fitted with dual power supplies & IEC mains input connectors operating from 100-240VAC. Both power inputs should be fed, preferably from two separate AC sources to provide full redundancy. IEC 'Y' cords are supplied to allow both inputs to be fed from a single cable source in the event that this is all that is available, ensuring both PSU's can always be fed.

ID configuration

Each I/O box in a system needs to be given a unique ID, set by a DIP switch accessible from the rear of a fixed format box, or on the side of the controller card within a modular I/O box.

Box ID's, as well as system IP addresses are factory pre-configured and recorded prior to despatch. When ordering additional Hydra2 I/O, please discuss with your sales person or Calrec project engineer to select suitable ID's for the system it is to be used with.

If fitting a replacement I/O box, settings its ID to the same as the unit it is replacing allows it to function as a drop in replacement with existing user memories and requiring no further configuration (as long as the box types are the same).

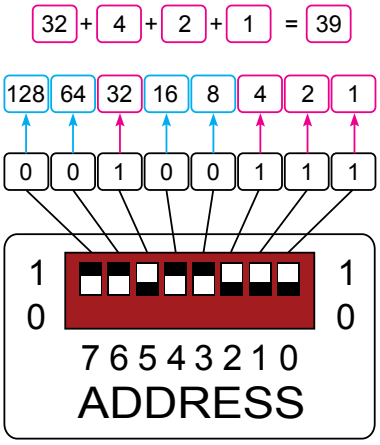
Care should be taken when setting HID's to avoid accidentally duplicating the same ID on more than one box. Duplicate box ID's can cause network conflicts. I/O boxes should be disconnected from the network before changing their HID, and reset or power cycled once the DIP switch is set to ensure the new HID is active before reconnecting to the network.

Do not change I/O box ID's or add extra I/O to the system unless you are confident it will not cause a conflict on the network.

Fixed format I/O box ID's

The 8 way DIP switch 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 representing a binary 1. Each switch / binary bit equates to a decimal value,

STANDARD SWITCH FOR HID SETTING



- The above diagram shows how each switch relates to a decimal value. The setting shown in the example provides a decimal HID value of 39

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.

Modular I/O box ID setting

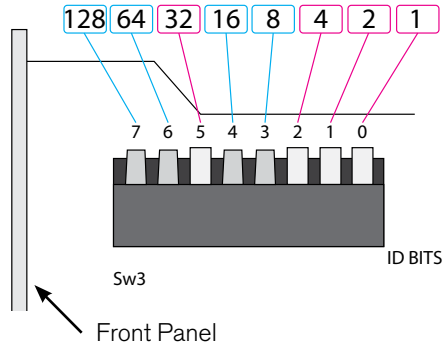
The ID for modular I/O boxes is set by a DIP switch on the controller card and is only accessible by removing the card. Please refer to the Hydra2 installation manual and ensure ESD precautions are observed before removing any modular I/O box cards.

ID switches on modular I/O controller cards are orientated differently. Ignore any labelling on the 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.

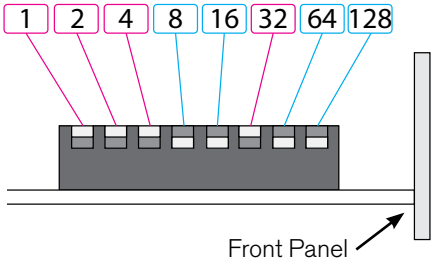
The following illustrations show the ID switch on the modular I/O controller card from the side and top views.

Again the decimal value of 39 is used for the example.

MODULAR I/O CONTROLLER - SIDE



MODULAR I/O - VIEWED FROM TOP



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.

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.

Modular I/O card slots
Please note that changing the card type fitted in a modular I/O box slot requires a change to the network configuration. If the order that cards are fitted in a modular frame matters, please discuss this with your Calrec project engineer 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 being required. Additional cards can be fitted in previously empty slots without further configuration.

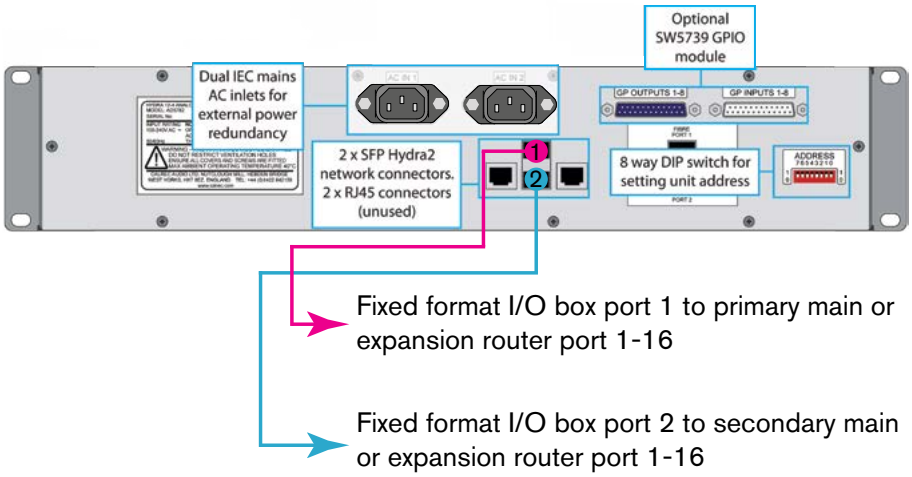
Hydra2 connection
I/O boxes require a direct connection to a front panel Hydra2 port on the main router card, or the expansion router card if fitted. Each I/O box has two Hydra2 ports to provide redundancy. Port 1 should always connect to a primary main or expansion router, port 2 to the secondary main or expansion router located in the same core.

Like the Hydra2 ports on the router card, Hydra2 connections on I/O boxes are made via SFPs and therefore the connection type required (copper / single mode fibre / multimode fibre) needs to be specified at the time of order.

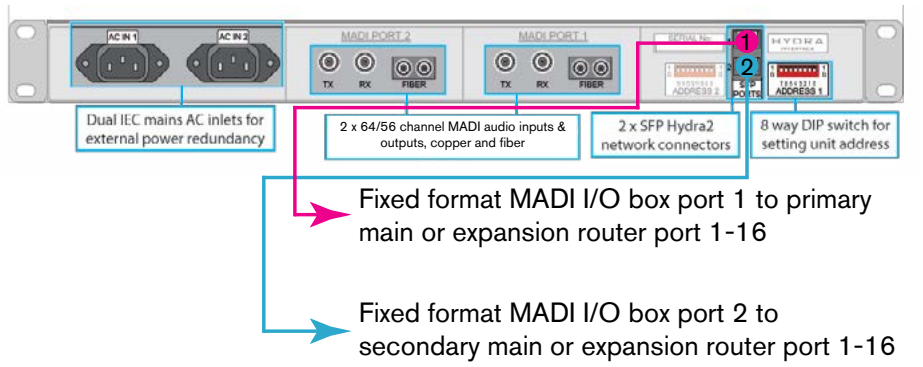
Note that any fixed RJ45s on the rear of Hydra2 I/O boxes are not functional if copper connections are required, copper SFPs should be specified.

Please refer to the Hydra2 installation manual and H20 user guide for more comprehensive details on Hydra2 I/O options and connectivity.

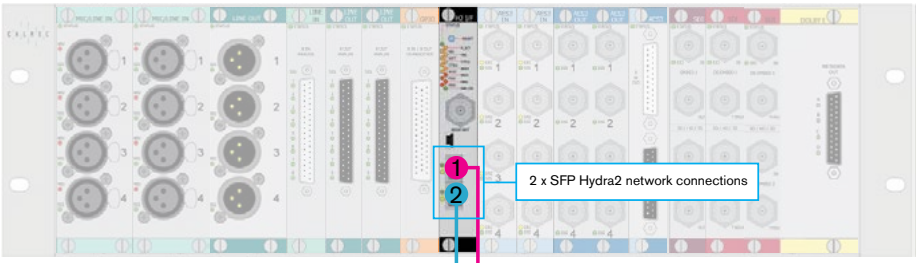
FIXED FORMAT (NON-MADI) HYDRA2 I/O, REAR INTERFACE



FIXED FORMAT MADI HYDRA2 I/O, REAR INTERFACE



MODULAR HYDRA2 I/O, CONTROLLER CARD FRONT INTERFACE



GPIO CONNECTIONS

GPIO in Apollo and Artemis systems is a Hydra2 option. GPIO cards provide logic inputs and outputs that can be assigned to various functions on the control surface; allowing console functions to trigger external devices such as fader starts for playback devices and for external devices to trigger console functions, for example auto-fades controlled by a video switcher.

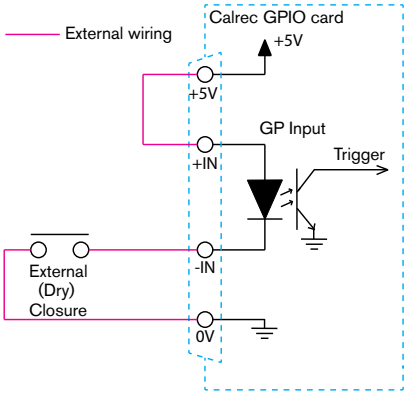
If GPIO is required, please discuss this with your sales person or Calrec project engineer. Optional GPIO cards can be fitted in modular Hydra2 I/O frames, or any fixed format Hydra2 box with a height of 2U or greater. Multiple boxes can be fitted with GPIO cards to make up the required quantity. The 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.

GP 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 below. This prevents potential problems in connecting power between different manufacturers' hardware.

GP INPUT WIRING EXAMPLE



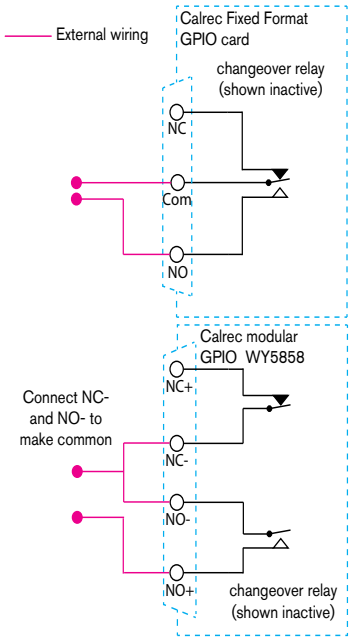
GP outputs

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.

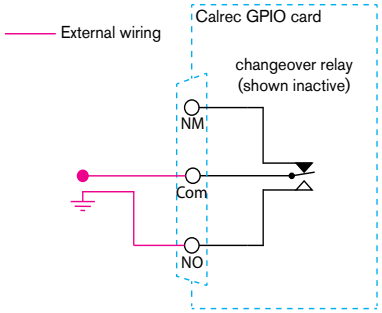
Normally open (NO) contacts short to the common or negative pin when the relay is activated by the selected function. Normally closed (NC) contacts are shorted to common or negative when the function is NOT active.

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



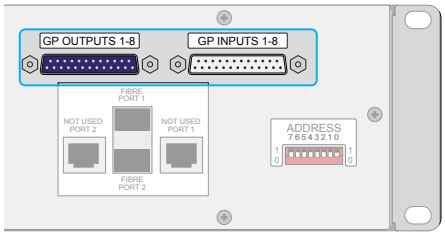
- Changeover relay shown wired to provide a ground when activated. The ground can come from a 0V pin in the GPIO card connector itself as long as the receiving equipment has the same ground reference. For WY5858 and WY5859 common setup see above.

Dry closure only outputs

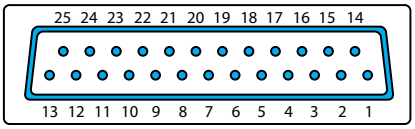
The WY5859 version of modular I/O card provides the same 8 inputs along with 16 dry closure only relay connections that short when activated (NO+ & NO-).

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

FIXED FORMAT GPIO CONNECTIONS - 8 IN, 8 OUT



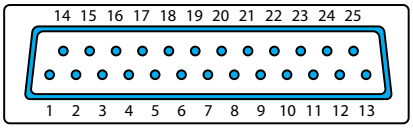
25 Pin Female D-Type - Wiring side of connecting cable



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

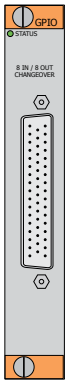
25 Pin Male D-Type - Wiring side of connecting cable

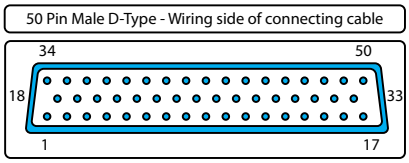


Function		Pin
Opto 1	+	1
	-	14
Opto 2	+	15
	-	3
Opto 3	+	4
	-	17
Opto 4	+	18
	-	6
Opto 5	+	7
	-	20
Opto 6	+	21
	-	9
Opto 7	+	10
	-	23
Opto 8	+	24
	-	12
+5V		2
		5
		8
		11
Ground		16
		19
		22
		25
		13

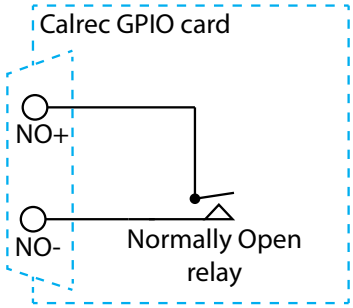
- Calrec connector is female, requiring male terminated cable

WY5858 - MODULAR GPIO 8 IN + 8 OUT

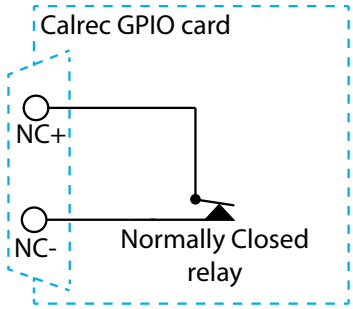




Function		Pin
GPI 1	+	1
	-	34
GPI 2	+	18
	-	2
GPI 3	+	35
	-	19
GPI 4	+	3
	-	36
GPI 5	+	20
	-	4
GPI 6	+	37
	-	21
GPI 7	+	5
	-	38
GPI 8	+	22
	-	6
Supply	+5V	17
Supply	0V	50
GPO 1	NO+	39
	NO-	23
	NC+	7
	NC-	40
GPO 2	NO+	24
	NO-	8
	NC+	41
	NC-	25
GPO 3	NO+	9
	NO-	42
	NC+	26
	NC-	10
GPO 4	NO+	43
	NO-	27
	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

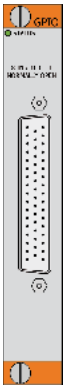


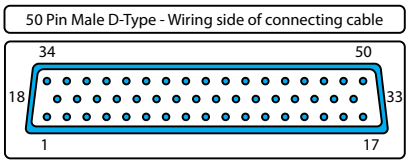
- Closes when activated



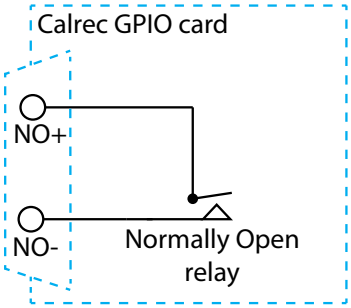
- Opens when activated

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
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



- Closes when activated

CONNECTING TO OTHER CONSOLES/ROUTERS

Multiple Apollo and Artemis consoles can be connected together and to standalone Calrec Hydra2 routers, allowing them to share each other's I/O resources.

Before connecting a console to an active Hydra2 network it is essential to be aware of IP address compatibility and the master router status. Please refer to the Hydra2 installation manual for more comprehensive details on all aspects of Hydra2 networks and I/O.

A single, standalone console with its processing core and I/O forms a basic Hydra2 network. All Hydra2 networks require that one, and only one of the processing cores is configured as the Master Router. Therefore, consoles specified at order to be standalone have their processing core pre-configured as a master router. It is vital that this is changed before connecting to an active network.

Consoles are joined together by any of their 16 main primary router I/O ports. Current software supports a single path between any two main routers giving a bandwidth of 512 channels of audio in each direction.

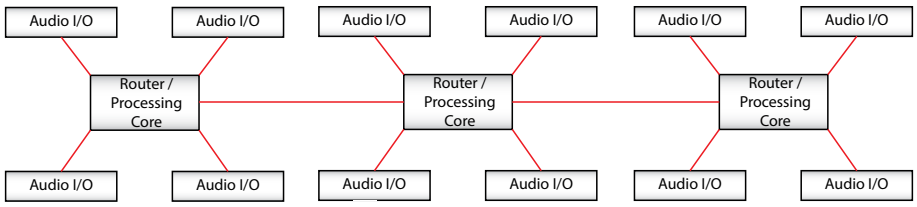
Note, it is important to ensure that when Hydra2 routers are networked together, they are on separate VLANs.

Router to router connections are not currently supported by expansion router ports.

For large systems, network topology should be considered to manage bandwidth. Using a processing core as a central point to connect others, rather than daisy-chaining several or more together minimises the number of cores a signal has to pass through to get from I/O port to console, optimising the available bandwidth on each router to router link.

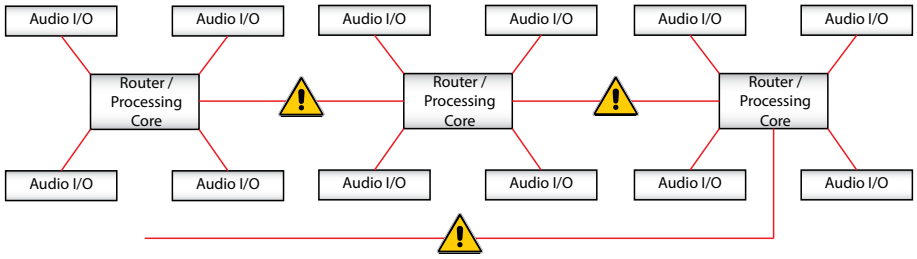
It is important that there is only one path (not counting dedicated secondary paths) between any two points on the network.

FIGURE 1 - CORRECT CONNECTION OF A THREE CONSOLE NETWORK



Three router cores connected with no duplicate paths.

FIGURE 2 - INCORRECT CONNECTION OF A THREE CONSOLE NETWORK



Incorrect connection! The additional link creates a duplicate path.

The path between I/O port and console router may pass through other routers. Figure 2 shows an incorrectly connected network - the addition of a third router to router links creates a duplicate path. This will cause network collisions as data can take two paths between any two routers - one path is direct, the other is via the third router. Removing any one of the router to router links corrects this, effectively changing the topology to match that in Figure 1.

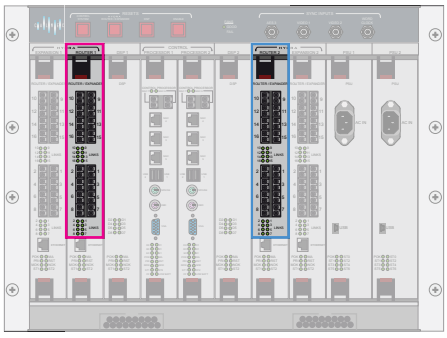
Figure 3 shows the 16 full bandwidth router ports available on both the primary and secondary main routers (as oppose to expansion routers). Any of the 16 ports can be used to connect to another Hydra2 router. Connections should always be made from primary router to primary router. To provide redundancy, a backup connection should be made from secondary router to secondary router.

When multiple cores are networked, it is essential that they are all receiving and are locked to the same derived sync source.

From software version 1.16 onwards Auto Promote can be used to specify which routers in a Hydra2 network can automatically take over the master router status in the very unlikely event of a master router failure. Please contact Customer Support for guidance on configuring auto-promoting routers. See the Master Router section of the Hydra2 installation manual for more information.

Please refer to the Hydra2 installation manual and H20 user guide for more information regarding Hydra2 and I/O.

FIGURE 3 - MAIN ROUTER PORTS



SURFACE REAR CONNECTOR PIN-OUTS

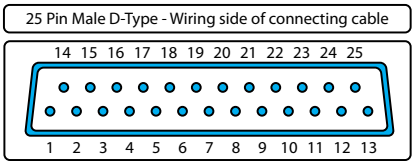
All audio is processed within the core, the system does not pass audio to or from the control surface on its own. Calrec TFT and LED metering in the control surface functions on proprietary meter data which is not decoded for listening and cannot be used by 3rd party or ancillary hardware.

Ancillary audio items such as moving coil meters, 3rd party meters such as DK or RTW, headphones, talkback mics, optional loudspeaker panels etc all require an audio connection to the rear interface panel of the control surface if they are to be used.

If these items are to be fed directly from console I/O, they should be provisioned for in the quantity of Hydra2 I/O ordered.

Loudspeaker and some moving coil meter panels are fitted with DIP switches that can disable inputs and set levels. Please refer to the Panel Options section of this document for more detail on each panel type.

All D-type audio connectors on the interface panel are all 25 pin female, requiring male terminated cabling.



Moving coil meters

Important notes on moving coil meter wiring:

- If feeding unbalanced AES digital, BOTH signal pins and BOTH ground pins shown for each leg need to be connected.
- Input 2 not used for twin single needle VU meter, or single dual needle meter panels.
- One D25 connector per single / dual or quad meter panel (multiple panels are not combined onto a single rear connector).
- 6 way VU panels require a second D25 connection for meters 5 & 6, pinned out as per the Left1/ Right1 / AES1 inputs shown.
- Analogue and digital inputs are both active, not switched. Therefore only one format should be fed to the meter at any given time.
- Refer to Panel Options section for DIP switch setup information about moving coil meters.

MOVING COIL METER INPUTS

Analogue Inputs		Pins
Left 1	+	1
	-	14
	Ground	2
Right 1	+	15
	-	3
	Ground	4
Left 2	+	7
	-	20
	Ground	22
Right 2	+	21
	-	9
	Ground	23

Balanced Digital Inputs		Pins
AES 1	+	18
	-	6
	Ground	5
AES 2	+	24
	-	12
	Ground	25

Unbalanced Digital Inputs		Pins
AES 1	Signal	4 + 18
	Ground	5 + 6
AES 2	Signal	10 + 24
	Ground	11 + 12

RTW meters
RTW meters can be supplied with either balanced or unbalanced AES I/O. Unbalanced versions are wired out to BNC connectors on the rear interface. Balanced versions are wired to a D25 connector pinned out as below:

RTW METER DIGITAL I/O

Digital Inputs		Pins
1	+	24
	-	12
	Ground	25
2	+	10
	-	23
	Ground	11
3	+	21
	-	9
	Ground	22
4	+	7
	-	20
	Ground	8

Digital Outputs		Pins
1	+	18
	-	6
	Ground	19
2	+	4
	-	17
	Ground	5
3	+	15
	-	3
	Ground	16
4	+	1
	-	14
	Ground	2

All RTW meters have 8 analogue inputs as well as digital I/O.

RTW METER ANALOGUE INPUTS

Analogue Inputs		Pins
1	+	24
	-	12
	Ground	25
2	+	10
	-	23
	Ground	11
3	+	21
	-	9
	Ground	22
4	+	7
	-	20
	Ground	8
5	+	18
	-	6
	Ground	19
6	+	4
	-	17
	Ground	5
7	+	15
	-	3
	Ground	16
8	+	1
	-	14
	Ground	2

DK meters

DK meters can be fitted with up to 4 input cards. Card types available from Calrec are:

- Unbalanced digital only, providing 4 AES3id inputs per card, wired out to BNC connectors on the console's rear interface.
- Balanced digital only, providing 4 AES inputs per card, wired to female D25 connectors on the console's rear interface.
- Unbalanced digital and balanced analogue mixed, providing 2 analogue inputs and 1 AES3id input per card. Analogue inputs are wired to female D25s, digital to BNC's, both on the console rear interface.
- Balanced digital and balanced analogue mixed, providing 2 analogue inputs and one AES input per card, wired to female D25 connectors on the console's rear interface.
- Analogue only, providing 8 balanced analogue inputs per card, wired to a female D25 connector on the rear console's interface.

The input card types required affect the internal wiring of the control surface and should be specified at the time of order.

BALANCED AES ONLY DK INPUTS

Input		Pins
1	+	1
	-	14
	Ground	2
2	+	15
	-	3
	Ground	16
3	+	4
	-	17
	Ground	5
4	+	18
	-	6
	Ground	19
5	+	7
	-	20
	Ground	8
6	+	21
	-	9
	Ground	22
7	+	10
	-	23
	Ground	11
8	+	24
	-	12
	Ground	25

- Quantity of inputs available dependent on the number of input cards ordered.
- If more than two cards ordered, an additional D25 connector is fitted in the rear interface for inputs above #8, pinned out the same as inputs 1-8.

MIXED AES & ANALOGUE DK INPUTS

Input		Pins
AES 1 (3)*	+	1
	-	14
	Ground	2
Analogue 1 (3) L	+	4
	-	17
	Ground	5
Analogue 1 (3) R	+	18
	-	6
	Ground	19
AES 2 (4)*	+	7
	-	20
	Ground	8
Analogue 2 (4) L	+	10
	-	23
	Ground	11
Analogue 2 (4) R	+	24
	-	12
	Ground	25

- Quantity of inputs available dependent on the number of input cards ordered.
- If more than two cards ordered, an additional D25 connector is fitted in the rear interface for inputs above 3 & 4.
- If unbalanced digital inputs are specified for this card type, only the analogue inputs are on D25s, the digital inputs are on BNC connectors.

BALANCED ANALOGUE ONLY DK INPUTS

Input		Pins
1	+	1
	-	14
	Ground	2
2	+	15
	-	3
	Ground	16
3	+	4
	-	17
	Ground	5
4	+	18
	-	6
	Ground	19
5	+	7
	-	20
	Ground	8
6	+	21
	-	9
	Ground	22
7	+	10
	-	23
	Ground	11
8	+	24
	-	12
	Ground	25

- Quantity of inputs available dependent on the number of input cards ordered.
- Each analogue only input card has a female D25 connector on the console rear interface, pinned out as above.

Headphone sockets

The headphone driver unit in the control surface has capacity for 3 stereo balanced analogue inputs. The actual quantity in use is dependent on the number of headphone jack sockets fitted / requested at order.

HEADPHONE INPUTS

Input		Pins
1 Left	+	1
	-	14
	Ground	2
1 Right	+	15
	-	3
	Ground	16
2 Left	+	18
	-	6
	Ground	19
2 Right	+	7
	-	20
	Ground	8
3 Left	+	21
	-	9
	Ground	22
3 Right	+	24
	-	12
	Ground	25

Loudspeaker panels

Each loudspeaker panel fitted has 4 stereo balanced analogue inputs.

LOUD SPEAKER INPUTS

Input		Pins
1 Left	+	1
	-	14
	Ground	3
1 Right	+	2
	-	15
	Ground	3
2 Left	+	16
	-	4
	Ground	18
2 Right	+	17
	-	5
	Ground	18
3 Left	+	6
	-	19
	Ground	8
3 Right	+	7
	-	20
	Ground	8
4 Left	+	21
	-	9
	Ground	23
4 Right	+	22
	-	10
	Ground	23
Logic	Ext Cut	11
	Ext Dim	24
	Ground	13

- Refer to the panel options section for LS panel DIP switch input enabling information.

APOLLO
EXTERNAL CONTROL

CALREC

SW-P-08 REMOTE CONTROL

The Hydra2 router allows for cross-point matrix routing of Hydra inputs direct to Hydra outputs without using console DSP or control surface space. Control over input to output cross-point routing can be from the console PC, a standalone PC running the Hydra2 Organiser 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, enabling them to change sources on console DSP inputs and access to console DSP outputs.

The following 3rd party SW-P-08 systems have been proven with, and are supported by Calrec:

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

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

Connection

The 3rd party SW-P-08 controller should be connected to the single front panel RJ45 'Ethernet' on the main (not expansion) router card. A secondary, backup connection can be made to the secondary main router card. Systems requiring both SW-P-08 and Ember control need to use the same single Ethernet port and therefore an Ethernet switch is required. The two control systems are separated by using different TCP socket port settings.

On Hydra2 networks with more than one processing core, the SW-P-08 connections should be made to the router cards in the processing core configured as the Master Router. Slaved processing cores do not support SW-P-08 connections. Connections made to the Master Router can be given access to any I/O on the network, irrespective of which processing core the I/O is connected to.

The Ethernet port on the router cards is a 100MHz connection which uses standard Ethernet straight-through or cross-over pin-outs and pairings. Screened Cat5e cable should be used to guarantee performance.

The default IP address of the SW-P-08 ports are the same as that of the router cards themselves - xxx.yyy.5.0 for the primary and xxx.yyy.6.0 for the secondary. xxx.yyy is different for each processing core and can be checked using the Calrec Program Updater application on the PC associated with the core in question. The user must be logged into Windows as **CalrecAdmin** with the password **calrec** in order to run the Calrec Program Updater which can be found in the Calrec folder in the Windows Start menu. Upon launch, the application checks for the presence of local hardware and reports back with IP addresses. All hardware associated with the same processing core has the same first two bytes of IP address. The router cards themselves can be identified in the list by their unit number being prefixed with 'RY'. IP addresses for the SW-P-08 connections can be aliased if required to make them more suitable for use with the 3rd party network, however this will require a Calrec Engineer to carry out and as such should be discussed prior to commissioning.

Note, as well as addressing the routers by IP, the SW-P-08 controller needs to be configured to use the TCP socket port of 61000.

Configuration

SW-P-08 configuration requires the use of the Hydra2 Organiser GUI. Please refer to the H2O user guide for information.

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 Apollo, Artemis and Hydra2 range to allow various remote control functionality, both over consoles and the wider Hydra2 network.

Currently, Calrec support the use of 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 Apollo / Artemis / Hydra2 network:

- Loading of shows and user memories onto control surfaces.
- Loading / removing alias files used by consoles, instructing them to use different pre-defined sets of I/O ports.
- Please refer to the console operator manual for more information on the use of alias files.
- Input port settings - mic input gain, mic input phantom power switching and SRC switching on digital inputs.
- EMBER controllers can 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 output of Hydra2 embedders.

Connection

The 3rd party EMBER client should be connected to the single front panel RJ45 labelled 'Ethernet' on the main (not expansion) router card. A backup secondary connection can be made to the secondary main router card. Systems using both EMBER and SW-P-08 control require the use of an external Ethernet switch to allow both control systems to connect to the same Ethernet port. The two control systems are separated by using different TCP socket port settings.

On Hydra2 networks with more than one processing core, the EMBER connections should be made to the router cards in the processing core configured as the Master Router. Slaved processing cores do not support EMBER connections. Connections made to the Master Router can be given access to any console and I/O on the network, irrespective of which processing core they are connected to.

The Ethernet port on the router cards is a 100MHz connection which uses standard Ethernet straight-through or cross-over pin-outs and pairings. Screened Cat5e cable should be used to guarantee performance.

The default IP address of the Ethernet ports are the same as that of the router cards themselves - xxx.yyy.5.0 for the primary and xxx.yyy.6.0 for the secondary. xxx.yyy is different for each processing core and can be checked using the Calrec Program Updater application on the PC associated with the core in question. The user must be logged into Windows as **CalrecAdmin** with the password **calrec** in order to run the Calrec Program Updater which can be found in the Calrec folder in the Windows Start menu. Upon launch, the application checks for the presence of local hardware and reports back with IP addresses. All hardware associated with the same processing core has the same first two bytes of IP core. The router cards themselves can be identified in the list by their unit number being prefixed with 'RY'. IP addresses for the SW-P-08 connections can be aliased if required to make them more suitable for use with the 3rd party network, however this will require a Calrec Engineer to carry out and as such should be discussed prior to commissioning.

As well as addressing the routers by IP, the EMBER controller needs to be configured to use the TCP socket port of 62000.

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.
- L-S-B VSM

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 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 Apollo and Artemis consoles.

Faders controlled by CSCP

Third party systems with a CSCP connection to an Apollo or Artemis console have access to control and read back the status of 192 path faders. Starting with the lowest numbered fader (usually #1) on layer 1A, up to the highest consecutively numbered fader, followed by the same fader numbers on layer 1B, then layer 2A, 2B, 3A, 3B etc. up to a total of 192 faders.

If required, the faders exposed to CSCP control can be zoned, preventing remote control over the entire surface width by intentionally inserting gaps in fader numbering. The 8 faders within a panel are always consecutively numbered, but they do not need to be so between panels. Under technician level access to the console's Main Application, the surface layout page allows a number to be chosen for the first fader on each panel. If for example, the first panel is numbered 1-8, but the second panel, instead of starting with fader 9, is actually set to start at 10 (or any higher number), CSCP would only have access to faders on the first panel, ensuring faders in the remaining surface area cannot be remotely controlled by third parties. Using this example of exposing only one fader panel to CSCP control, all layers of that panel can be accessed by the protocol (12 layers x 2 A/B sub-layers x 8 faders on a single panel = 192 faders total). It is also worth noting, that the lowest numbered faders in a control surface do not have to physically be at the left hand side.

Controls available via CSCP

CSCP V1.0 allows third party controllers:

- Control over and read back of the position of 192 path faders.
- Read back of the 192 faders' path / port labels.
- Control over and read back of the Cut / On status for the same 192 faders.
- Control over and read back of the PFL status for the same 192 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 being made available:

- Control over and status read back of the same 192 faders' routing to the first 20 Auxiliary output buses.
- Control over and read back of the first 20 Aux bus output levels.
- Read back of the path types allocated to the 192 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 192 faders' routing to Main output buses.
- Control and status read back over Left to Both & Right to Both input controls for stereo paths on the same 192 faders.

Connection

Although the protocol is based on and passes serial data, the Calrec connection is made via TCP/IP. If interfacing to third party systems who 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.

The CSCP connection should be made to the MAC5 RJ45 front panel port on the primary Controller card fitted in the Calrec processing core associated with the console being controlled (Unlike H2O / SW-P-08 / EMBER connections which are always made to the Hydra2 network's Master Router core). If multiple consoles are to be controlled, each will require its own CSCP connection.

To enhance redundancy, and minimise the amount of change-over required in

the event of a failure, both the primary and secondary Calrec controller cards can communicate over each other's front panel ports - in the event of a primary controller card failing, the secondary would automatically become active, but would still send and receive CSCP data over the connection made to the primary card.

Secondary connections
Third party CSCP controllers that support redundant secondary connections should be connected to one of the MAC5 ports on both the primary and secondary Calrec controller cards to provide complete redundancy, protecting against cable / port failure and card removal. If required, this connection can be via an Ethernet switch, e.g. to allow a single RJ45 port on a 3rd party controller to connect to both primary and secondary Calrec ports.

Multiple consoles
If CSCP connections from multiple Calrec consoles are to be networked together, the consoles need to connect via a layer3 (IP) Ethernet switch in order to prevent MAC address conflicts.

Connecting via corporate LAN
DHCP servers run on the Calrec control processor cards to allow easy connection of H2O access PCs and configuration PCs via the MAC5 port. If a CSCP or other connection is to be made to these ports via a corporate LAN, it is important that the Calrec DHCP servers are disabled and the connections are manually configured as appropriate.

Configuration
Please discuss your installation requirements with your Calrec sales representative or distributor prior to delivery. CSCP connections should be configured and tested by, or under the guidance of a Calrec approved engineer.

The following points should be noted when communicating your requirements:

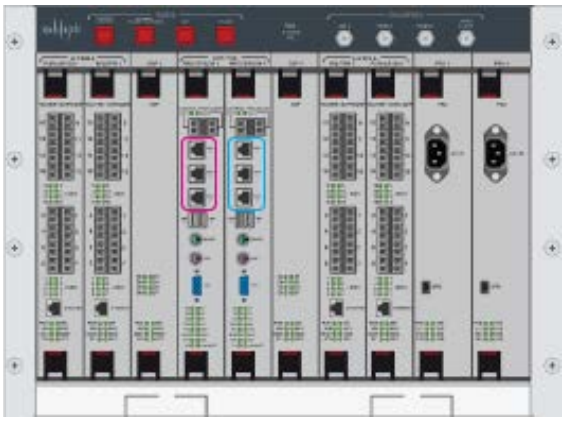
The default Calrec IP addresses are xxx.yyy.1.0 for the primary, and xxx.yyy.2.0 for the secondary control processor cards. xxx.yyy is unique for each Apollo / Artemis / Standalone Router processing core and can be confirmed by running the Program Updater GUI. If the default addresses are not suitable, please supply alternative IP addresses and a subnet mask which can be configured pre-delivery or during commissioning.

If required, the Calrec system can be configured to connect via an IP gateway.

In addition to connecting by 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**.

User & boot up enable / disable
Once configured, CSCP can be enabled or disabled from the console's Main Application, **>System Settings>Ext Control** screen. Being part of the System Settings, the enabled / disabled selection is automatically saved for recall after a reset or power cycle. System Settings 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.

FIGURE 1 -PORTS AVAILABLE FOR CSCP CONNECTIONS



- Standard 8U processing core

Primary Calrec controller ports

Secondary Calrec controller ports

SYSTEM STATUS OVER SNMP

All Calrec consoles feature System Status - an advanced warning and correction system. System Status messages can be managed centrally using an SNMP (Simple Network Management Protocol) server.

All Calrec console and Master Router PCs provide an SNMP agent to forward error and warning messages to a central SNMP server, allowing equipment faults to be monitored and managed from a central location. A connection can also be made to a second SNMP server if required for redundancy.

Connecting to the SNMP server
A USB to ethernet adapter is provided with each console PC for connecting to your central SNMP server. If multiple SNMP servers are used this connection should be made to a network switch to allow multiple onwards connections.

Router cores are provided with a rack mount PC which has a spare ethernet port to be used for connecting to your central SNMP server.

In both cases the ethernet ports used must be configured to be in range of your central SNMP server before configuration can continue.

Configuring the SNMP Agent
Each console/router core PC's SNMP agent must be configured individually. This can be done from the local PC by opening Google Chrome and entering 'localhost' in the address bar as shown here. SNMP agents can also be configured remotely by entering the IP address of the PC where the SNMP agent is running, including the port number (default: 80).

The SNMP Agent interface has 3 tabs. The System Status tab shows a list of the current System Status errors and warnings for the console or router that you are accessing.

Enter the IP address of the facility's main SNMP server within the SNMP configuration tab under 'address 1'; this is where the SNMP agent and SNMP server are connected together. If a second SNMP server is used enter its IP address under 'address 2'. After making any changes, click SUBMIT & RESTART.

The HTTP configuration tab allows you to set the port number for access to the SNMP agent configuration interface, the default is port 80. If changes are made here, the port will need to be specified when accessing the SNMP agent interface, for example, if the port is changed to 10, type 'Localhost:10' in Chrome's address bar to access the SNMP agent interface. After making any changes, click SUBMIT & RESTART.

Scope of System Status over SNMP
Only System Status error and warning messages are sent via SNMP, information messages are not sent. When errors are corrected, the relevant System Status messages are cleared from the Main application and are simultaneously cleared from the SNMP server.

FIGURE 1 -SNMP AGENT - SYSTEM STATUS TAB

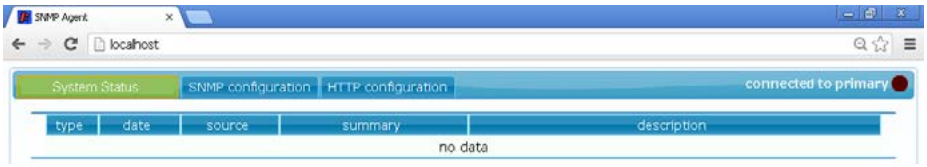
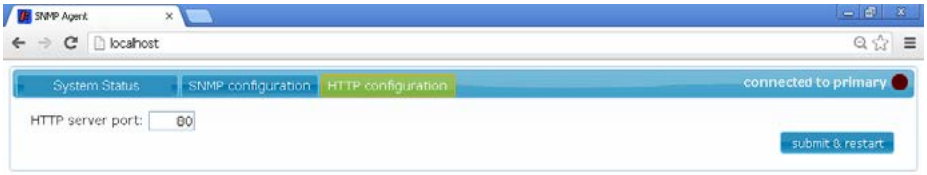


FIGURE 2 -SNMP AGENT - SNMP CONFIGURATION TAB

FIGURE 3 -SNMP AGENT - HTTP CONFIGURATION TAB



WIRELESS ROUTER CONFIGURATION – ASSIST

Calrec's Assist apps are connected to the console via a wireless router. The setup options provided by different router manufacturers can differ substantially so this setup guide should be used along with the manufacturer's instructions for your particular router configuration application. Also, some basic networking knowledge is assumed.

Calrec serial control protocol (CSCP) allows communication with Calrec consoles using the TCP/IP protocol at a pre-determined TCP port number.

Assist apps run on iPad devices which connect to the Calrec system through a wireless router, through which console functions can be controlled using CSCP.

Console Configuration

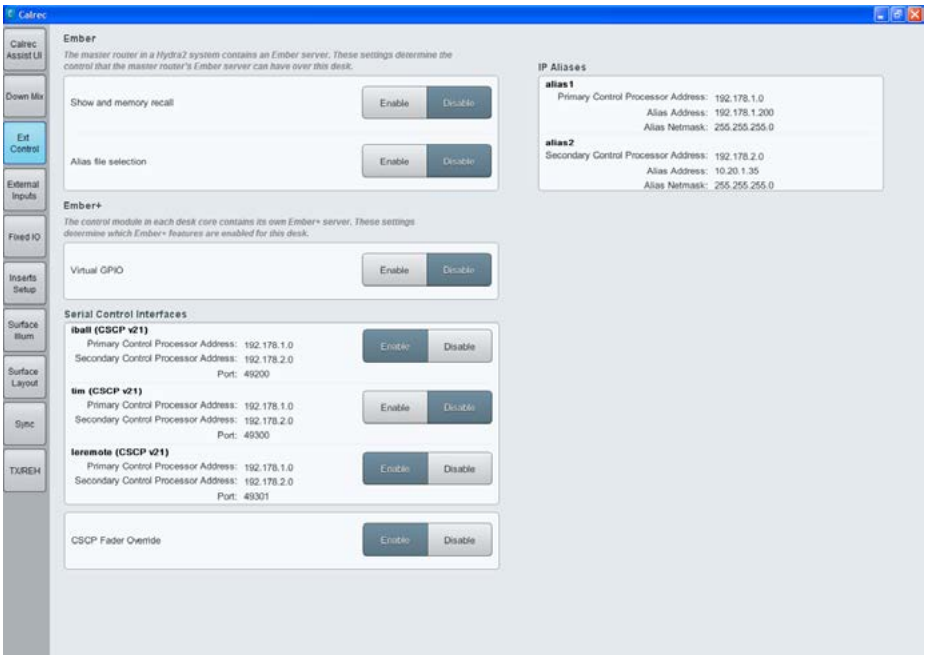
From software version 1.14.7 onwards, Calrec consoles are pre-configured with a basic 'Assist' CSCP configuration which is disabled by default.

This basic configuration assumes a simple, point to point connection with a wireless router on a 192.168.1/24 subnet. This basic setup is unlikely to be suitable for connection to a more complex corporate network.

To enable the basic Assist connection, select **>System Settings** >**Ext Control** from the left hand menu and click to **ENABLE** '**assist(CSCP v21)**'.

The console will now be providing the CSCP connections shown in this table.

FIGURE 1 - ASSIST CSCP ENABLE



	IP Address	Subnet Mask	Port Number
Primary Control Processor	192.168.1.1	255.255.255.0	49300
Secondary Control Processor	192.168.1.2	255.255.255.0	49300

Wireless Router Configuration
When the basic 'Assist' configuration has been enabled the console provides CSCP connections on the 192.168.1/24 subnet so the wireless router LAN connection must be configured to be part of this subnet. We advise that the wireless router is configured with a LAN IP address of 192.168.1.3 and an IP subnet mask of 255.255.255.0

DHCP Configuration
To connect hand held wireless devices, such as the iPad, the wireless router should be configured to provide a DHCP (Dynamic Host Configuration Protocol) server to distribute IP addresses to these hand-held devices.

The wireless router should be configured as a **DHCP server**: The **IP Start address** or **IP Pool address** should be configured to be **192.168.1.100** and the **IP** or **DHCP pool size** should be set to **4**.

This allows up to four wireless devices to be connected to the console simultaneously. They will be allocated IP addresses in the range: 192.168.1.100 to 192.168.1.103.

DNS (Domain Name System) parameters are not required for this setup.

Other Configuration Parameters
Wireless routers provide many different services and it is not possible to cover all setup permutations in this document. Some common considerations are:

- Firewalls should be disabled if possible. If not then the firewall should be configured to enable TCP/IP traffic in both directions on port 49300.
- NAT (Network Address Translation) should be avoided.
- Packet filtering and MAC address filtering should be avoided.

FIGURE 2 - IPAD, CONSOLE AND WIRELESS ROUTER CONNECTIONS

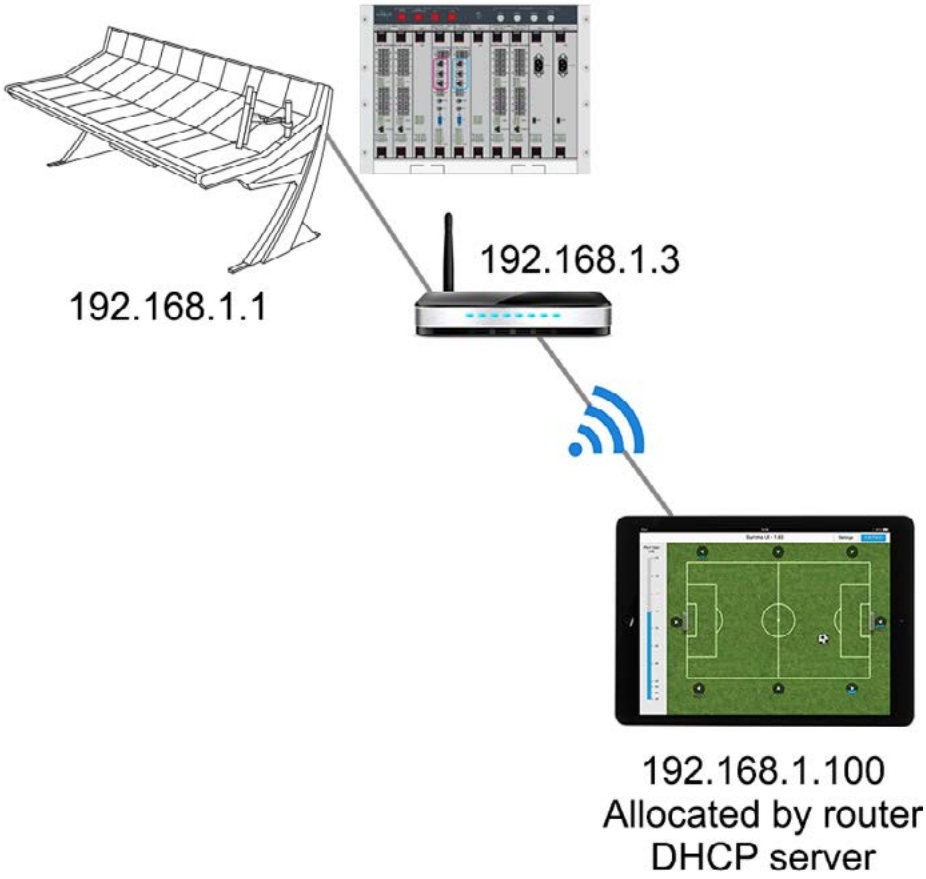
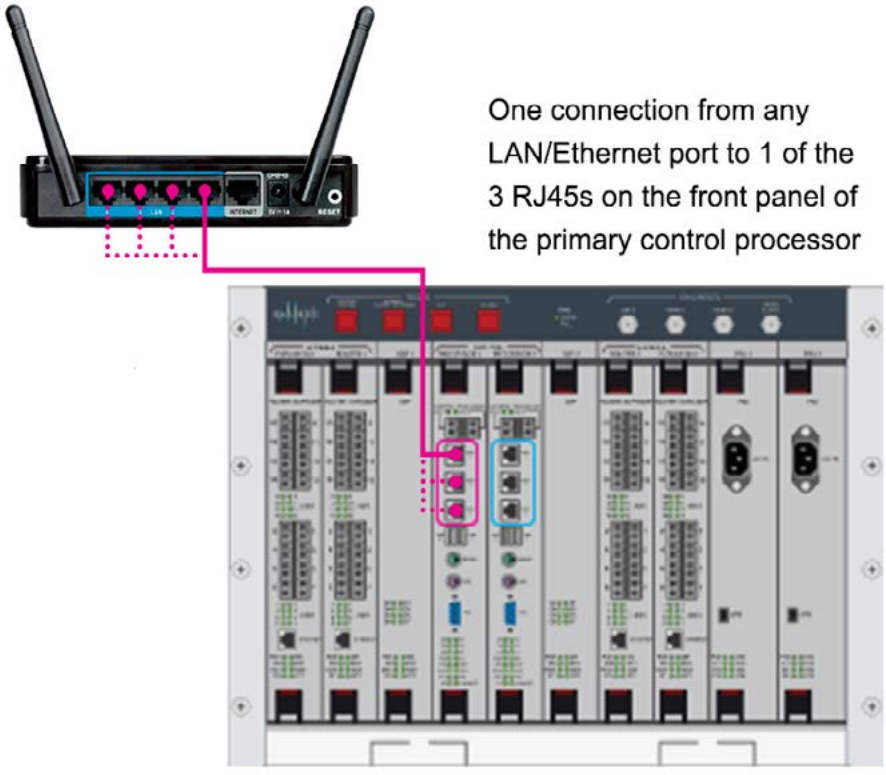


FIGURE 3 - WIRELESS ROUTER TO CONTROL PROCESSOR CONNECTION

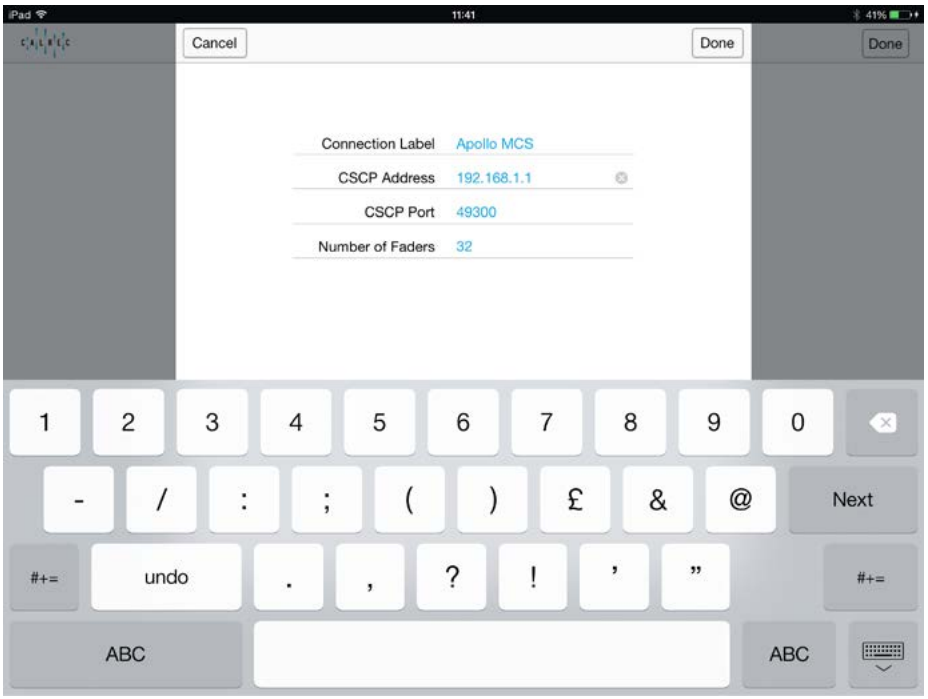


Security Considerations
The wireless LAN (and therefore the console) is open to any devices that can discover the wireless network and have access to the encryption keys. It is strongly recommended that the wireless LAN is configured to use some method of encryption. WEP is considered to be insecure so as a minimum you should select WPA(2)-PSK. This requires both communicating parties to agree on the same keyword or passphrase before access is allowed.

Assist Application Configuration
Assist applications should be configured with a CSCP IP address of 192.168.1.1 to connect to the primary control processor or 192.168.1.2 to connect to the secondary control processor. The CSCP port number should be set to 49300.

To access these settings, launch one of the Assist apps on an iPad and tap **NEW** in the top right hand corner to add a new connection. Enter your settings, as shown here, then press **DONE**. (The number of faders should reflect the number of faders on your desk and the 'Connection Label' can be customised to reflect your particular connection.)

FIGURE 4 - ASSIST APP CONFIGURATION



RS232/422 CONVERSION

Remote control connections to Calrec Apollo, Artemis and Hydra2 systems are made via TCP/IP. 3rd party controllers that use point to point true RS232/422 serial will require convertors to connect to the Calrec system.

Various options are available for serial to TCP/IP conversion, Calrec recommend the use of, and can supply dual PSU Perle IOLAN SCS8's. Calrec chose this unit specifically for its dual power supply option, its 1U rack mount enclosure, and its flexible data routing options.

Fitted with 8 x RS232 serial ports and 2 x Ethernet ports. Data can be routed from a single serial port controller to both primary and secondary Calrec connections. Controllers with a backup port, or systems with backup controllers can route the normally active port to the Calrec primary card, and the backup to the secondary.

For 3rd party controllers that operate on RS422, Calrec can also supply in-line RS232-422 cable convertors (Calrec stock code 312-269) to use in conjunction with the Perle SCS8.

The Perle unit needs to be configured to connect to the Calrec Hydra2 network's Master Router card/s (SW-P-08 / EMBER) or each console's Controller card/s (CSCP) by their IP addresses. In cases where the default Calrec card IP addresses are not suitable, as can be the case if data is being passed over a shared Ethernet infrastructure, the Calrec hardware can be configured to be accessed by alternative IP addresses.

FIGURE 1 - PERLE IOLAN SCS8 - FRONT

FIGURE 2 - PERLE IOLAN SCS8 - REAR

FIGURE 3 - CONNECTIVITY EXAMPLES

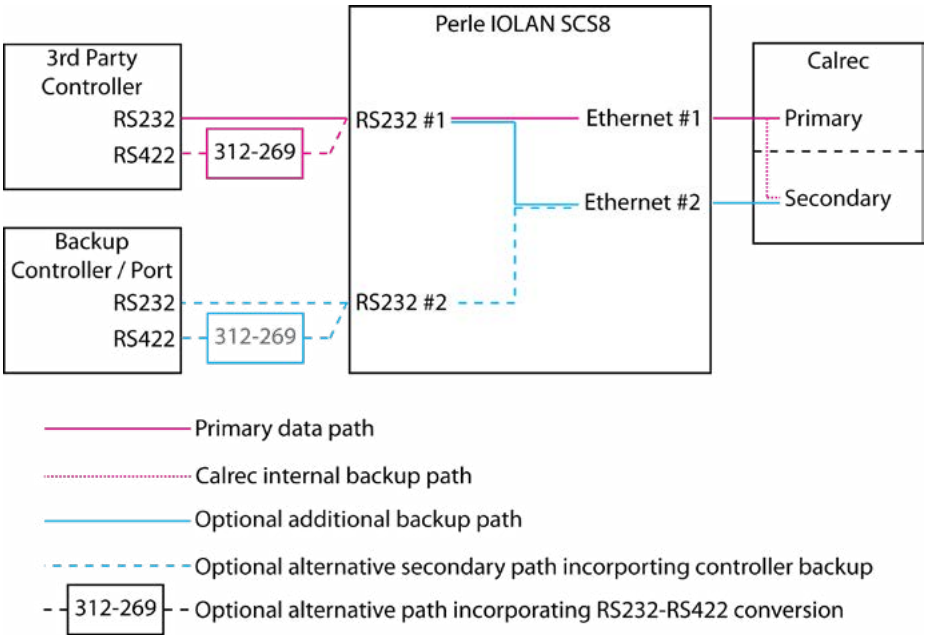


FIGURE 4 - PERLE RS232 SERIAL RJ45 PIN-OUT

Perle RJ45 pins	Signal (Perle I/O)	Standard D9 pins
1	DCD (in)	1
2	RTS (out)	7
3	DSR (in)	6
4	TxD (out)	3
5	RxD (in)	2
6	Gnd	5
7	CTS (in)	8
8	DTR (out)	4

PERLE IOLAN CONFIGURATION

Perle units supplied by Calrec can be pre-configured if the connectivity requirements are communicated prior to delivery. Please discuss 3rd party control integration with your Calrec sales representative or assigned project leader.

Configuration requires that the IP addresses of the Perle unit itself are known. If the addresses are not known, or have yet to be configured, the first stage requires a serial Telnet connection to the front panel console port, labelled Admin.

Telnet IP configuration
The front panel Admin console port, like the rear panel serial ports is RS232 on an RJ45 connector.

Perle supply the units with a number of various cable adaptors. Use the female D9 to RJ45 socket adaptor, along with an Ethernet cable, to connect a PC serial port to the Perle front panel Admin console port (the RJ45 plug to RJ45 socket cable adaptor, labelled 'Console Port' is not required).

Launch a Telnet application on the PC. The following instructions are based around using HyperTerminal, which is normally pre-installed on Windows PCs. HyperTerminal can be found under **Windows Start>All Programs>Accessories> Communications**.

On starting a new HyperTerminal session, you are required to enter a name of your choice and select an icon. On the following page, select **COM1** (or the PC port being used if different) from the **Connect Using** drop-down menu.

Enter the port settings on the following page as follows; **bits per second: 9600, data bits: 8, parity: none, stop bits: 1, flow control: none.**

Once the connection is configured, the main HyperTerminal window should be in view. Ensure the connection is active by clicking the **Call** icon (telephone with handset down) at the top of the HyperTerminal window. If the icon is greyed out, it is already connected.


Call (connect) icon


Disconnect icon

Once HyperTerminal is connected, power up the Perle unit. On boot up, messaging from the Perle unit should be displayed in the HyperTerminal window. Once booted, you should be greeted with a login prompt.

To login, enter **`admin`** , for the password, enter **`superuser`** . A successful login is greeted with the unit's model number (SCS8#).

Enter the following to set the IP address for the Perle Ethernet port 1: **`set server internet eth1 xxx.xxx.xxx.xxx`** (substituting xxx.xxx.xxx.xxx with the desired IP address). Enter the following to set port 2: **`set server internet eth2 xxx.xxx.xxx.xxx`** Enter **`save`** then **`y`** to confirm and retain the changes.

Note, the IP addresses chosen for the Perle unit need to be in a range compatible with those of the Calrec cards being connected to (or their alternate, aliased IP addresses).

Cycle the power to the Perle unit to reboot and view the startup messaging to confirm the IP addresses have been set correctly. Note, in the boot up messaging, port 1 is displayed as 'eth0' and port 2 'eth1' - this is contrary to the commands required to set the IP's.

Main configuration - Web Manager
Once the IP addresses of the Perle unit are known, the main configuration can be carried out.

Connect an Ethernet cable from a PC Ethernet port to one of the two Ethernet ports on the rear of the Perle unit. Configure the network connection of the PC to be in a compatible IP address range with the Perle unit. Launch a web browser on the PC and enter the IP address of the Perle's port 1 into the browsers address field to bring up the Perle Web Manager application.

Enter **`admin`** for the username and **`superuser`** for the password to log in.

Select the **Configuration>Network>IP Address / IP Settings** page, either from the tree on the left, or by the selection buttons in the main screen (screenshot shown overleaf). The addresses of both Perle ports are shown on the IPv4 settings page. If required, the subnet mask for each port can be changed, and also the IP addresses themselves can be changed. Click **Apply** if any changes are made.

Note, that Web Manager page changes can be slow and do not always fully display the content. If content is missing, change away from the page and back, rather than just refreshing. Check the browser's progress bar to see when pages have finished loading.

Select the **Network>Advanced** page (Not the Network>IP Address>advanced page). Click **Add** to add a new host to the host table. Enter a name, eg 'Calrec-Primary' and the IP address (or alternate, aliased IP address) of the primary Calrec

card that the Perle will connect to. Repeat to add the secondary Calrec card as another host. Click **Apply** to save the changes.

Select the **Serial>Serial Port** page. Select port 1 and click **Edit** to view the details for the serial port. At the top of the page, below the port label, click **Change** to select the **TCP sockets profile**, click **Apply** and then **Return to Serial 1**.

Select the **Hardware** tab and enter serial port settings that match that of the 3rd party controller. Common settings are; **Serial Interface: EIA-232, Speed: 115200, Data Bits: 8, Parity: Odd, Stop Bits: 1, Flow Control: None**. Click **Apply**.

If a backup controller serial connection is being used, repeat the above for serial port 2.

Select the **General** tab for serial port 1. Check **Connect To**, and select the primary Calrec card from the **Host** drop-down list (as was previously defined from the Network>Advanced page). Enter a **TCP Port** number to match the protocol being setup (61000 for SW-P-08, 62000 for EMBER. The CSCP port is selectable, as defined by Calrec StudioSetup, the default value being 49200).

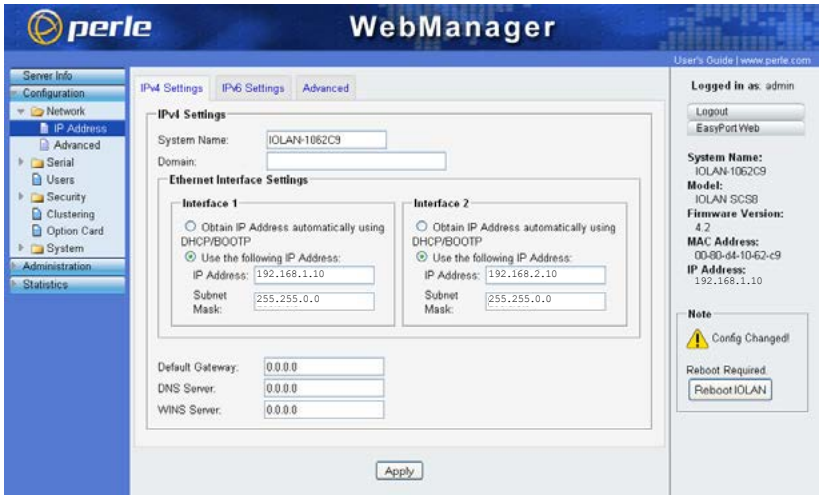
Select **Initiate Connection Automatically**, and check **Send Name On Connect**.

If Ethernet cable and port redundancy is required from a single serial port controller, check **Connect To Multiple Hosts**, then click **Define Additional Hosts**. Click **Add** and select the Calrec secondary card from the Host list, and enter the TCP port number required for the protocol being used. Click **OK**. Ensure that **Define primary and backup hosts to connect to** is **NOT** selected, and then **Apply**.

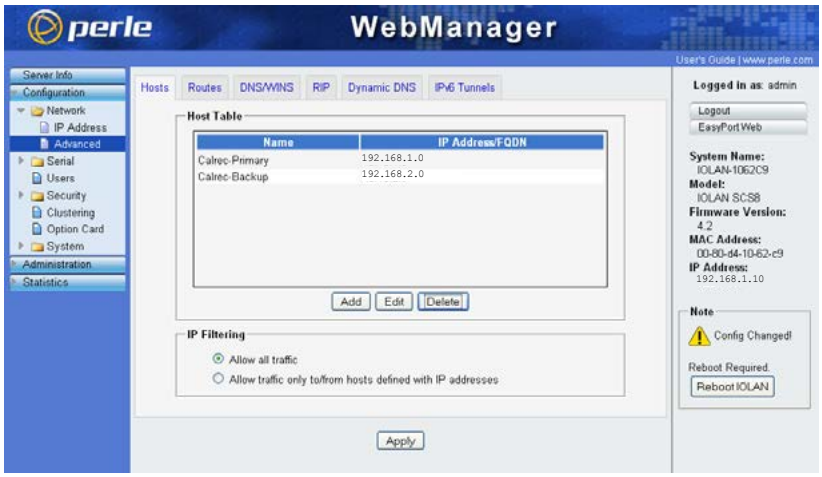
If there is a backup 3rd party controller serial connection, do not select serial port 1 to connect to multiple hosts. Instead, Configure serial port 2 to connect to the Calrec secondary card.

Once completed, click Reboot IOLAN or cycle the power to the unit for the configuration changes to take.

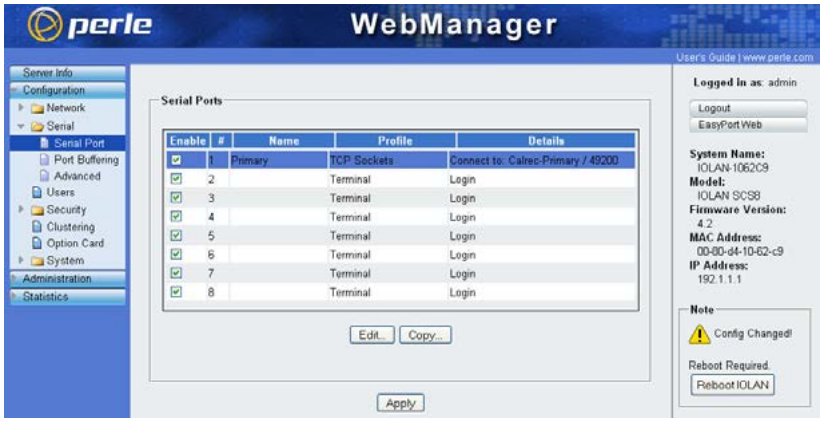
PERLE WEB MANAGER - NETWORK>IP ADDRESS PAGE



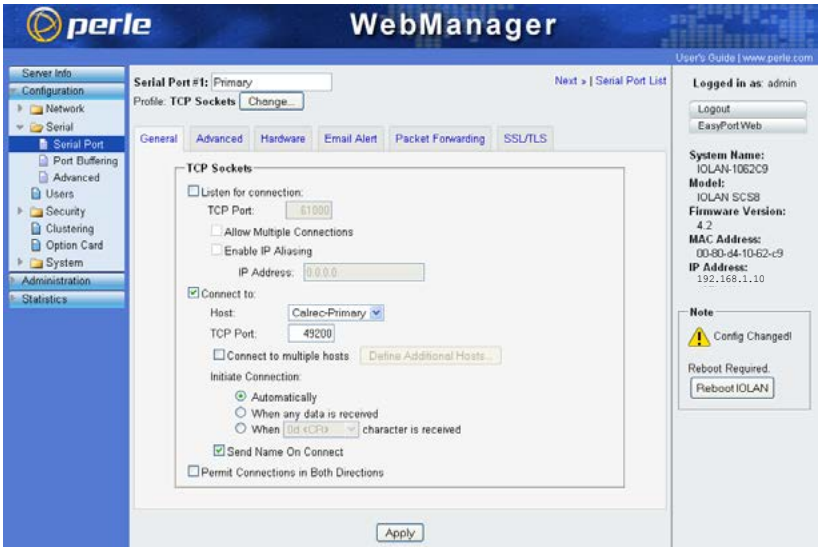
PERLE WEB MANAGER - NETWORK>ADVANCED PAGE



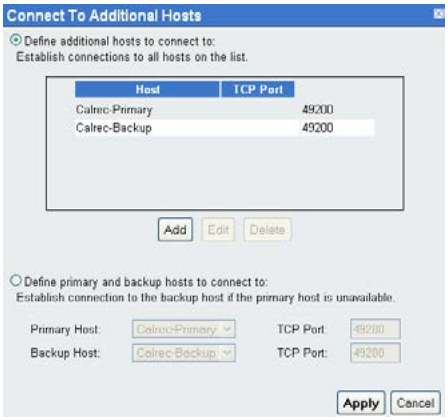
PERLE WEB MANAGER - SERIAL>SERIAL PORT PAGE



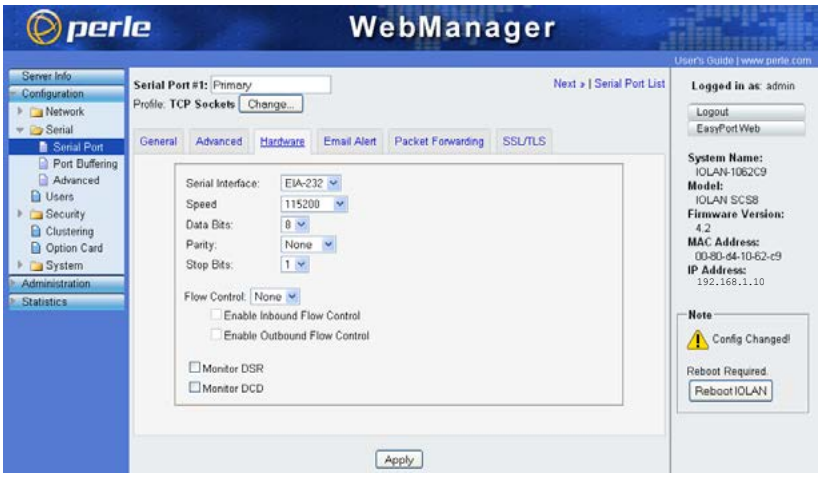
PERLE WEB MANAGER - SERIAL>SERIAL PORT, PORT 1, GENERAL PAGE



ADDITIONAL HOSTS



PERLE WEB MANAGER - SERIAL>SERIAL PORT, PORT 1, HARDWARE PAGE



APOLLO
SETUP AND CONFIGURATION

CALREC

OVERVIEW AND GUI ACCESS

This section covers areas often required by installation engineers to carry out the initial setup and configuration that is required to test the installation and provide a starting template for operators to work with.

Please refer to the console operator manual and the H20 user guide for more comprehensive information on user functionality.

The console PC should boot from power on, the default Windows user is 'calrec' and requires no password. Once logged in, the Calrec Main Application should start up. If the Main Application is closed, it can be restarted from the Windows Start menu. Once open, the main pages can be selected by clicking on their icons across the bottom of the GUI. Most pages have sub-pages which can be accessed by the menu buttons at the left hand side of each main page. Some settings within the Main Application are protected and to make changes the user must be logged in as a Technician. Technician access is gained from the **Tech** page by clicking on **Technician**. If no users have been setup, the system allows the creation of a supervisor login. Supervisors are able to create and delete other technician user logins.

H20 - Hydra2 Organiser is an administrator level GUI that provides control over the whole network. H20 can be accessed via a web browser running on a PC connected to the Master Router. This can be a console PC (if the master router core has a console directly attached to it), or a PC connected directly to a spare RJ45 on the front of the active Control processor card in the Master Router core. H20 is fully supported by Google Chrome which is pre-installed on Calrec supplied PC's with a bookmark to the H20 address (IP address of the Control processor)

Once open, H20 screens are accessed using the menu across the top of the GUI window.

Some features, such as accessing the Calrec program updater and admin level Windows settings require the user to log into Windows as an administrator. The user **CalrecAdmin** is setup up with the password **calrec**.

CREATING A CLEAN STARTING POINT

To ensure you are starting from a clean setup, before beginning configuration it is a good idea to create a new show.

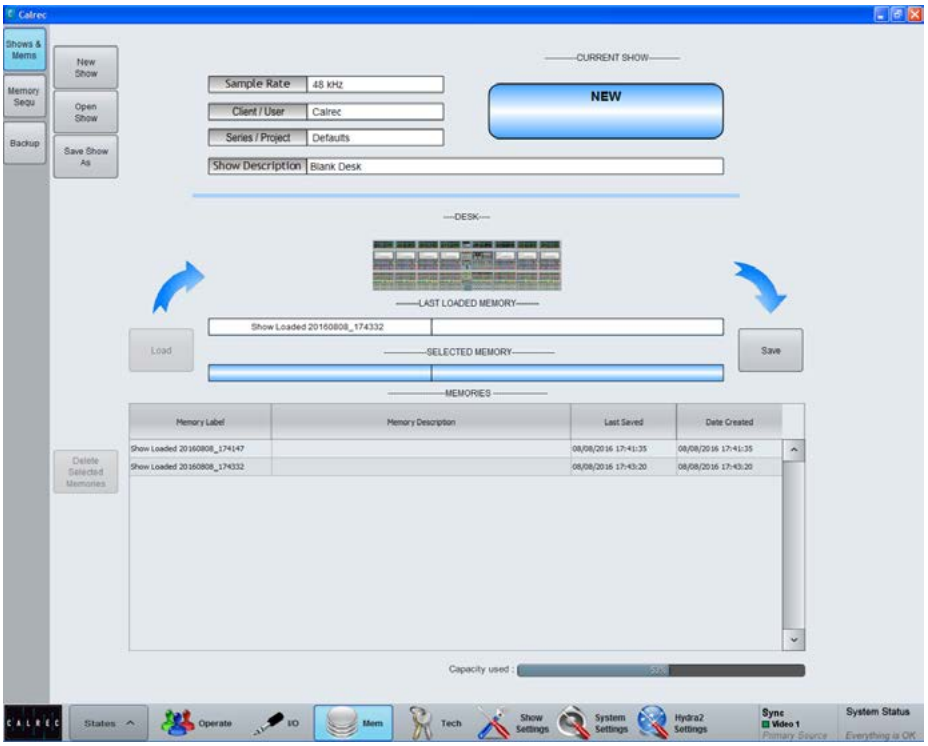
Shows contain default settings for the console, including monitor patching, GPI patching and port labelling. Shows can contain multiple user memories which save normal I/O patching, fader assignment and path parameter settings.

To create a new show, go to the **Mem** page and select **New Show**. Choose the Calrec Default as the starting template, enter the details as prompted and click **Next** to load the new, clean show onto the console.

The same Mem page allows changes to the show to be saved, as well as other shows to be loaded, and for user memories within shows to be loaded and saved.

Note that from V8.0 it is possible to create shows at 96kHz please refer to the Artemis Operator Manual V8.0 or later for details on 96kHz operation.

MAIN APPLICATION - MEM SCREEN



SCREENSAVER TIMEOUT – 'DARK MODE'

The control surface display brightness can be adjusted and the surface enters a screen saver / 'Dark Mode' after a period of inactivity.

During dark mode, the displays are switched off, but all control and audio processing continues. The displays will instantly switch on if any control is changed. Touching a fader knob (without even moving the fader) will activate its touch sensor and bring the surface out of dark mode straight away, without changing control parameters. A 'Dark' button/LED on the monitor panel flashes to indicate when the console is in this mode.

Pressing the Dark button on the monitor panel will also put the console into this mode, without waiting for the timeout.

The above settings can be accessed from the Main Application, **>System Settings>Surface Illum** page. Note that the maximum dark mode timeout is 1 hour and cannot be disabled.

SYNC SETUP

The Apollo processing core is capable of running on its own internally generated synchronisation clock, however where more than one core is networked together, it is essential that they are all fed and locked to the same derived sync source to ensure clean audio and seamless system data transmission.

Even with a single console, general rules of good practise dictate that the audio console should be locked to the same derived sync source as the surrounding digital equipment for clean transfer of audio between devices.

Physically, sync inputs are on BNC connectors located across the top of the processing core, as described in the Connection Information section.

By default, the system will choose to lock to its internal clock. On initial setup, each console's external sync input priority should be setup.

Sync input priority can be set locally on each console's Main Application, or it can be set via H20. Neither GUI has priority over sync choice. Changes made on either user interface are reflected by the other.

Where standalone router cores (without a control surface attached) are used to expand the network, it is essential that the same sync source(s) are connected and selected as the other cores on the network. Sync settings for standalone cores can only be accessed via H20.

Main Application Sync

Using the local user interface on each console, sync is set from the **>System Settings>Sync** page. To make any changes to this page, the user must be logged in as a technician (see overview and GUI access).

The Sync page displays the available sync sources on the left hand side, and the priority list on the right hand side. The priority list displays six sources, the last of which is fixed as internal. The first 5 sources can be selected by highlighting the chosen source on the left, highlighting the chosen priority list entry on the right and clicking **patch**. When selecting a video source, the user should also select the specific video format being used from the central list.

On startup, the system attempts to lock to the first entry in the priority list. If there is a problem with this source, the system moves down the list until a source is found that can be locked to. The 'current' column shows which of the sources the system is locked to. System Status error messages are generated for any sources that fail when the system attempts to lock to them. Once running and locked, the system will not automatically go back to a higher priority source if it becomes available. Clicking **Reset to first** instructs the system to go back through the list attempting to lock to the highest priority source it can find. This can be an important requirement for systems that get powered down as a whole, such as outside broadcast units, as sync generators can often take longer than the console to boot up.

H20 Sync

The **Sync Sources** page displays the sync settings for all consoles and router cores that have been added to H20's client database. If the console being configured does not exist in the client list on the left of the screen it should be added to the client database from the **Manage Clients** page (See H20 User Guide for more information). On the sync page, select any console or core from the clients list on the left to view their sync settings on the right. The right hand side of the screen acts the same as the Main Application, displaying the currently locked source, allowing the sources in the sync priority list to be changed and providing a 'reset to first' function. Changes made via H20 are reflected in the Main Application on the console they affect. Likewise, any subsequent changes made locally will be reflected by H20.

I/O BOXES & HYDRA PATCHBAYS SAMPLE RATE SELECTION IN H2O

From Version 8, Apollo consoles can now work at 96kHz sampling frequency.
There are 2 elements to 96kHz operation of Artemis consoles:- Configuring the DSP and configuring the I/O to run at different sample rates.

Consoles at 96kHz
The consoles can switch between 48kHz & 96kHz working as required and they switch their sampling frequency by loading a show at the required sample rate built from a template at that rate.

The numbers of channels and buses are reduced at 96kHz but the numbers at 48kHz are the same as before.

There is no reduction in the numbers of monitor inputs and outputs at 96kHz.

I/O and Hydra2 Patchbays at 96kHz
Before the I/O can be used with a 96kHz console its sample rate has to be changed to match. In H2O a new button labelled "Sample Rate" is made available, selecting this opens the list of I/O boxes connected to the Hydra2 Network.

The list shown in Fig 1 shows the sample rate set for each I/O box or Hydra2 Patchbay. In order to change the sample rate the user first selects the required I/O box or Hydra2 Patchbay box, this enables the Set Sample Rate button at the bottom left of the screen.

Clicking on this opens the Set Sample Rate popup, allowing the I/O boxes and Hydra2 Patchbays to be set to 48kHz or 96kHz, or to follow the sample rate of a specific console. This is shown in Fig 2, please note that certain older I/O boxes cannot be set to run at 96kHz such as the fixed format MADI box.

The Hydra2 network supports 48kHz and 96kHz consoles and I/O boxes simultaneously, it achieves this by running 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.

FIGURE 1 - I/O BOXES & HYDRA2 PATCHBAYS SAMPLE RATE SCREEN IN H2O

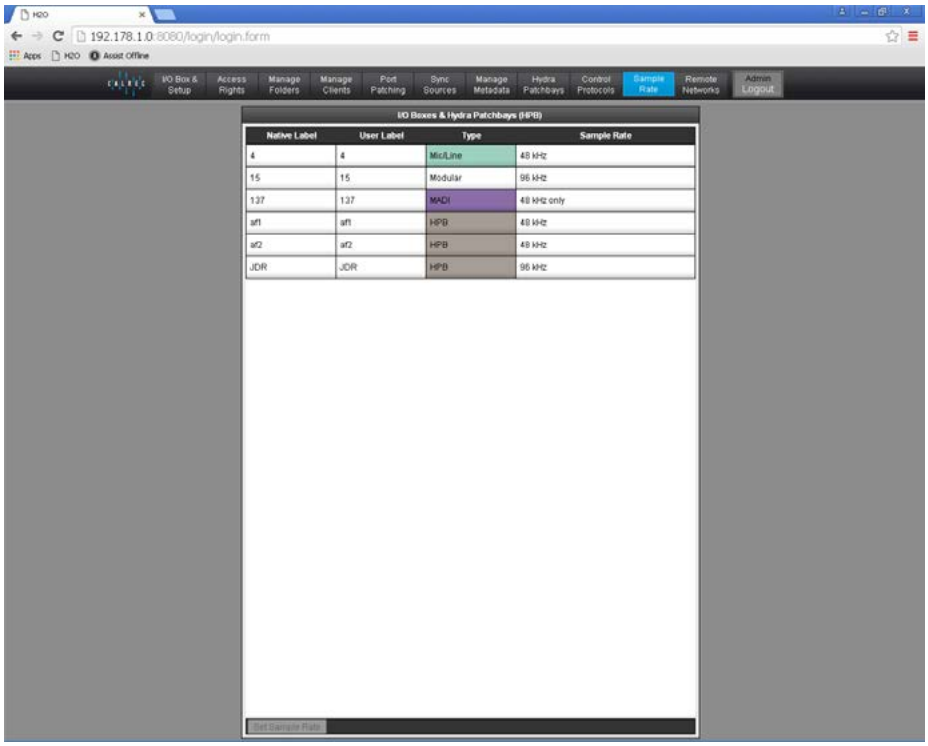
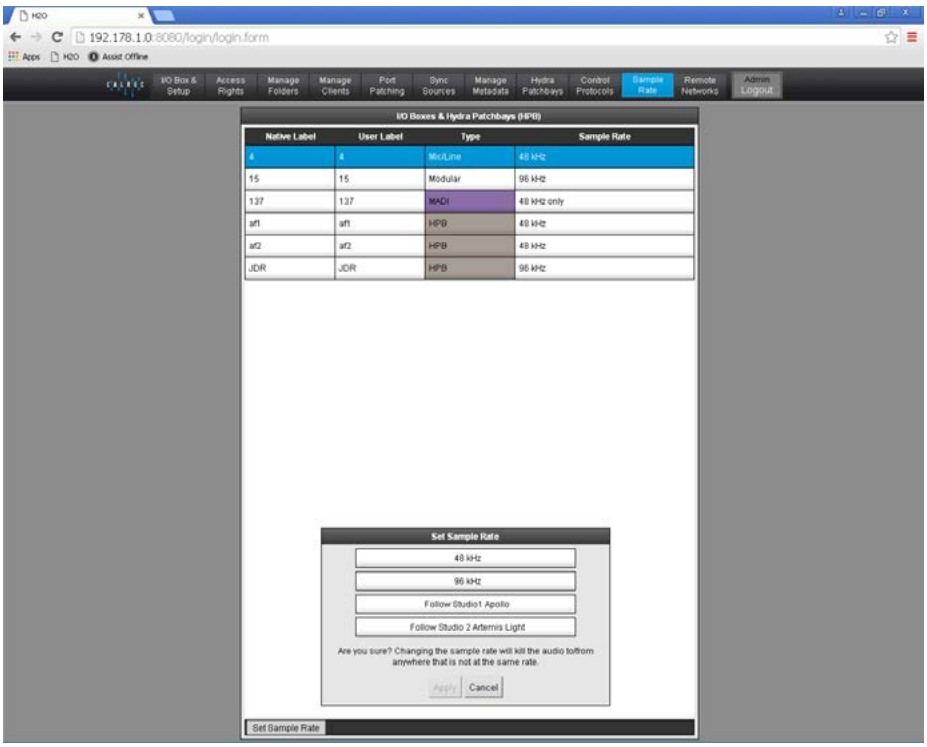


FIGURE 2 - SET SAMPLE RATE POPUP SCREEN IN H2O



I/O CONFIGURATION

Input sources may take the form of physical audio input ports, DSP outputs from the same console, Hydra2 Patchbay outputs from other consoles connected to the same Hydra2 network, or Hydra2 patchbay inputs, the sources of which can be switched remotely by H2O or 3rd party controllers.

Filtering the Hydra2 network

Given the shared and hugely scalable nature of the Hydra2 system, your console may be able to access a large number of I/O boxes. Many of these will not be relevant to the show or project that is currently being worked on and their inclusion in any source lists would only reduce clarity and result in clutter. Artemis provides a method to filter out unwanted I/O boxes so that they do not appear in the patching lists, or anywhere else in the software. As shown right.

Open >Hydra2 Settings>Edit Network screen in the Hydra2 Settings section of the main application. There will be two lists shown. The left list shows all Hydra2 boxes connected to the network. Selecting a box in this list and pressing the 'Add' button will add that box to the list on the right. This means it will now be visible in the console patching screens.

Boxes can be removed in a similar way by selecting one in the right hand list and pressing the 'Remove' button.

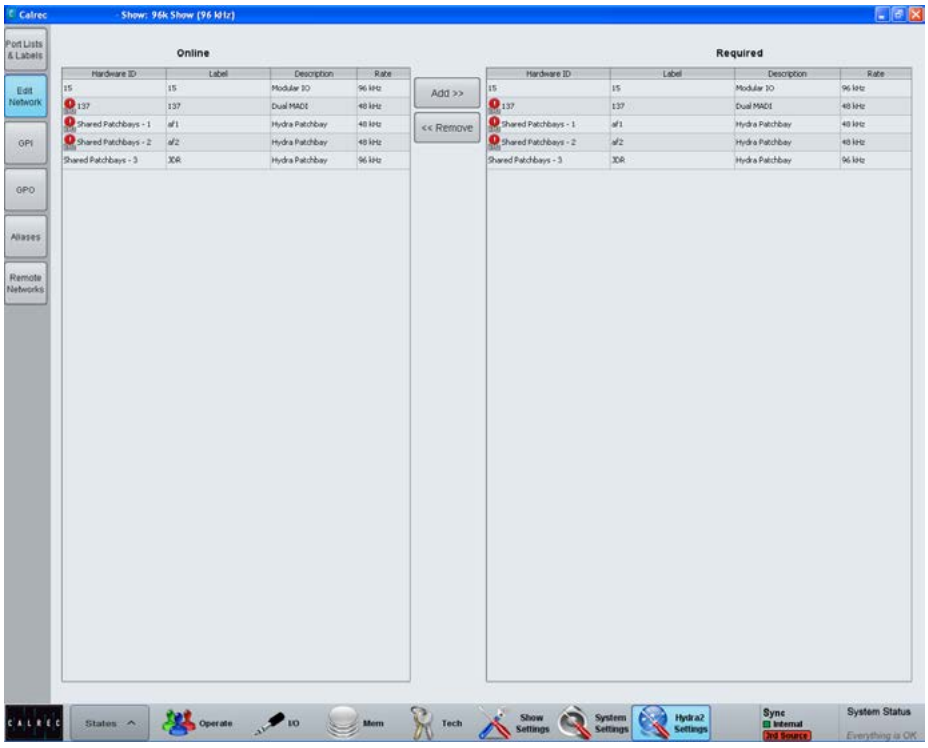
Boxes at different sample rates

Note that now different sample rates are available, boxes whose I/O is set to a different sample rate to that of the show appear with the SR kHz warning icon to indicate that it cannot be used unless the sample rate of the I/O box is changed in H2O, or a different show is loaded using the correct sample rate. See above right.

Input ports

A port is a physical input to, or output from the Artemis system. As all I/O is contained in a Hydra2 network, each input socket on a Hydra2 box can be termed an input port.

FIGURE 1 - EDIT NETWORK SCREEN



Hydra2 Patchbays

Virtual patch-points can be created within the Hydra2 domain on a console by console basis using the H2O network administrator application.

Once configured in H2O, Hydra2 patchbays appear as online in the Edit Network screen and can be added to the Required list to make them available from the I/O patching screens on each console.

DSP outputs patched to Hydra2 patchbays are available for other users on the Hydra2 network as sources, allowing consoles to share their DSP outputs without having to use physical I/O ports.

As well as having other console's outputs available as inputs, Hydra2 patchbays can also be patched to / from physical I/O ports by H2O network administrators or SW-P-08 controllers, allowing them to remotely control which consoles are feeding which outputs, and the ability to change audio sources feeding console input.

Hydra2 Patchbays at different sample rates

Note that now different sample rates are available, Hydra2 patchbays can be created to operate at a different sample rate (as shown in the rate column above) to that of the show appear with the SR kHz warning icon to indicate it cannot be used unless the sample rate of the Hydra2 patchbay is changed in H2O or a different show is loaded using the correct sample rate.

Port labels

I/O boxes have default native port labels based on the box ID and port number. These labels can be changed using the H2O application. H2O edited labels will appear on all consoles on the Hydra2 network. Labels can also be edited at a console level using the main application. Console level edits overrule H2O and native labels but are only visible on the console they were edited on.

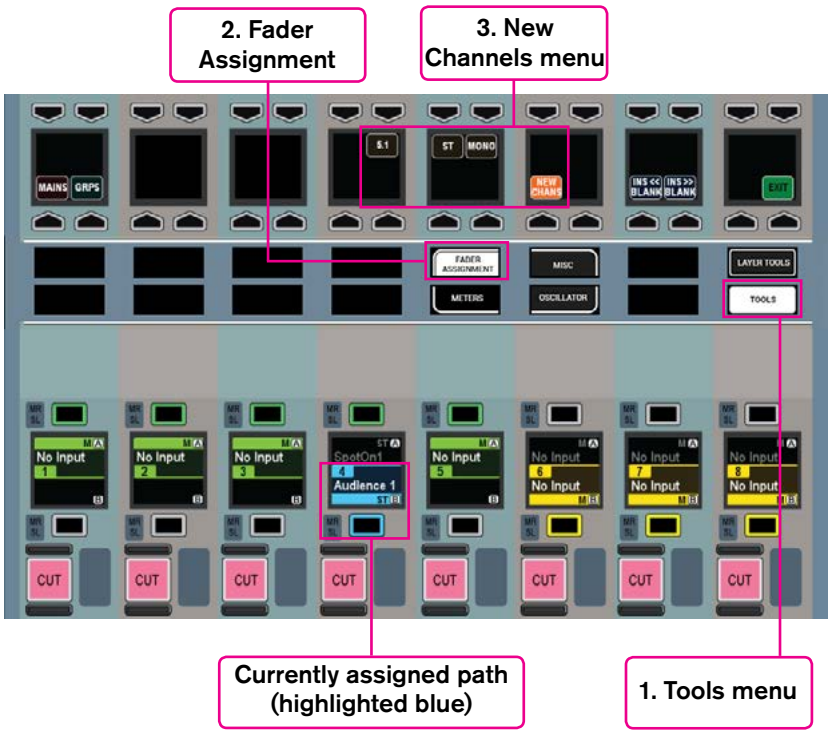
ASSIGNING PATHS TO FADERS

Assignable faders
Each fader has an A and B sub-layer, which can be switched between by pressing the assign buttons above and below the fader's label display. The two sub-layers, A & B are not related by default and can control two distinct, unrelated audio paths. The upper half of the fader label display is green and refers to the A layer, the lower half is yellow and refers to the B layer. An open fader will remain open and passing audio after the layer is changed.

Pressing the assign button above (A layer) or below (B layer) the label display makes it the currently assigned path and highlights it blue. Only one path (unless user splits are in place) can be the currently assigned path at any given time. Path specific changes are applied to the currently assigned path. For example, adjusting settings on an assignable panel in PROCESSING or SEND-ROUTE mode will affect the currently assigned (highlighted blue) path.

In addition to A & B sub-layers, there are in fact a total of 12 fader layers, each with an A & B sub-layer. All layers and A/B sub-layers are active irrespective of which is currently visible. Fader layer is selected from the row of touch sensitive displays above the fader label row of any fader panel.

FIGURE 1 - ASSIGN APPLICATION - CONSOLE PANEL



Assigning paths
A or B layer faders with a blank label field have no DSP path assigned. Path assignment is achieved from the **Tools>Fader Assignment** menu (see the highlighted drawing to the right). Select **New Channels** to assign input channels. Three channel widths are currently supported - Mono, Stereo and 5.1. Pressing one of these buttons will assign that channel type to the currently assigned fader (as long as no path is already assigned on that fader).

To assign the same channel type to multiple faders, press and hold the channel type button whilst selecting the faders you wish to be assigned.

To clear a path from a fader, select the **Layer Tools** menu (touch sensitive display above Tools). Press **Remove / Delete Path** from the row above then **Exec** to clear the currently assigned path. To clear multiple paths, press and hold Clear Path whilst selecting the faders to clear before confirming by pressing Exec.

USING TONE

Use of the console's internal oscillator helps to verify connectivity and configuration during installation.

Tone can be selected to path inputs from the **PROCESSING** panel mode.

The tone to input select button is located on the left side of the TFT screen. Selecting this switches tone onto the currently assigned path's input.

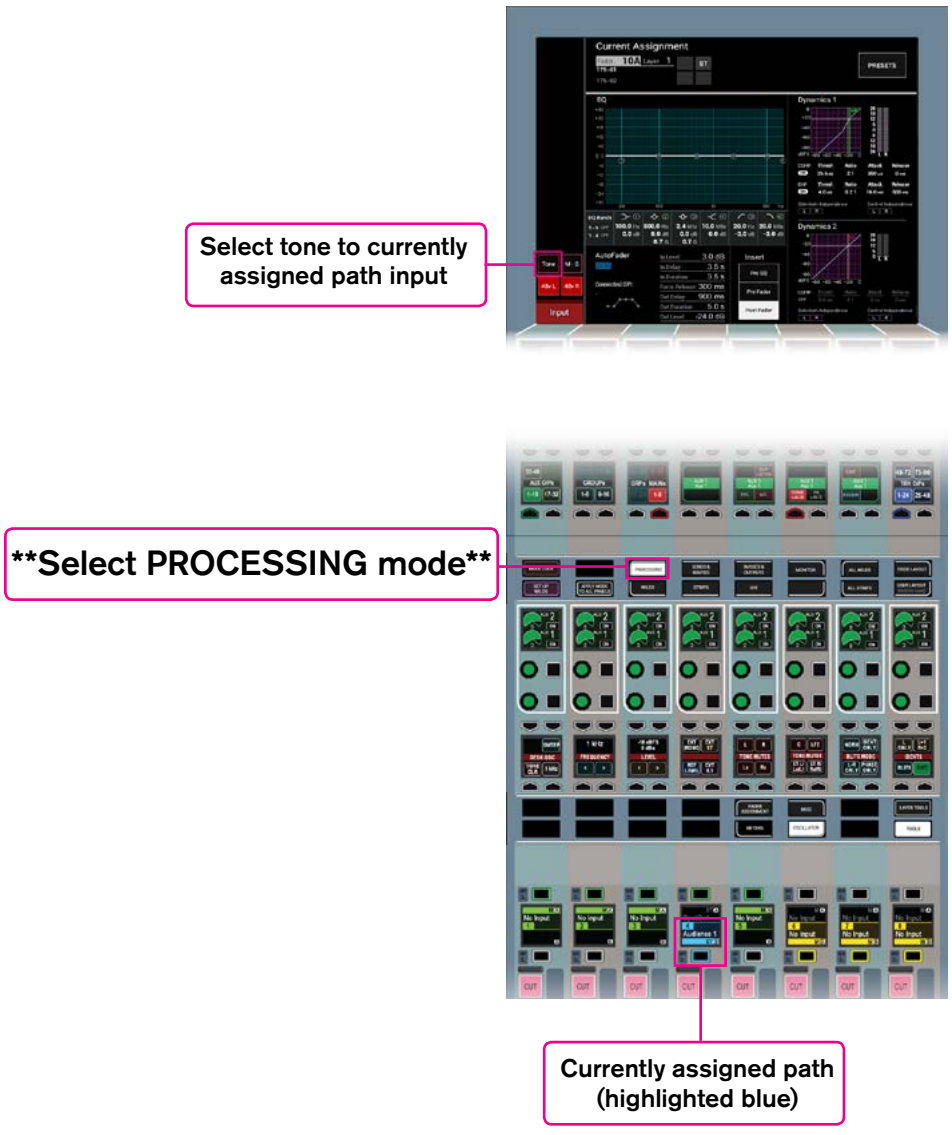
Selecting the **Tools>Oscillator** menu on any fader panel brings up oscillator controls on the row above to allow adjustment of tone level, frequency and idents.

The **Tone Clear** button in this menu will cancel all tone to path selections across the console.

Select the **Send / Route** panel mode to route the currently assigned fader to bus outputs from the TFT touch screen above.

Note, tone can only be selected to faders that have a DSP path assigned (see previous page).

FIGURE 1 - TONE SELECTION - CONSOLE PANEL



MONITORING OUTPUT SETUP

Apollo does not have dedicated outputs for feeding monitors. Monitor outputs can be patched to any Hydra2 audio output port on the network.

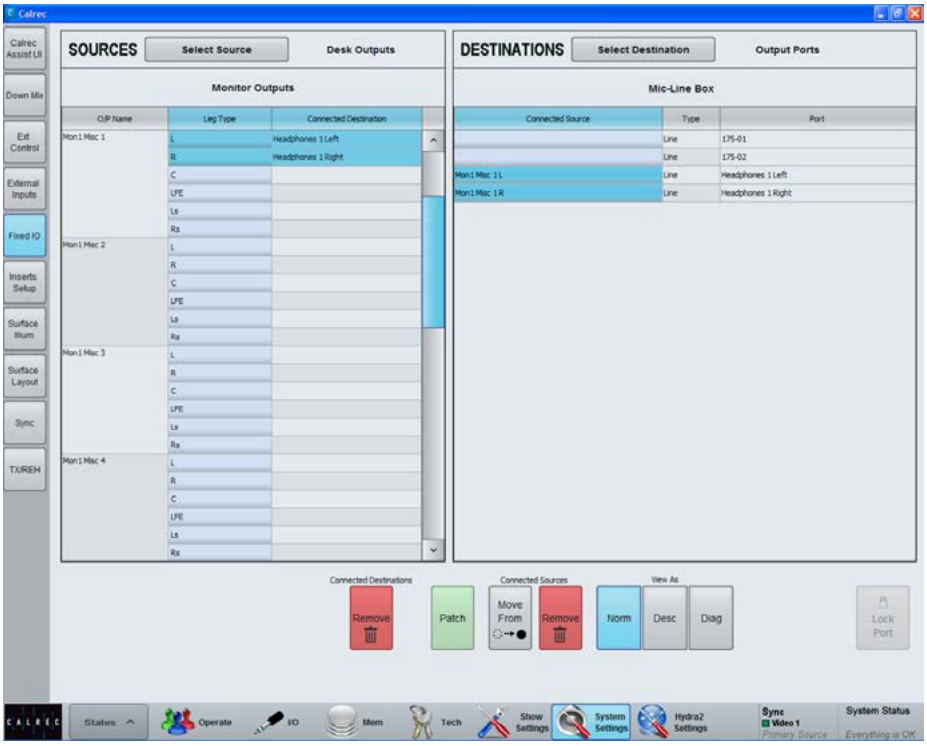
Monitor output patching is separated from other I/O patching as it generally remains fixed irrespective of operators and the shows being worked on. Patches made from the System Settings pages are saved as part of the show.

Monitor outputs can be found on the **>System Settings>Fixed I/O** screen.

Click on the **Sources** button at the top left of the screen to bring up the source lists available and select **Monitor Outputs** from the **My Desk Outputs** group to display the monitor output sources in the left hand list. The normal default monitor output is at the top of the list, labelled **Mon1 Main LS**. Other monitor sources that are likely to be of interest for initial setup are PFL1/RTB LS and Mon1 Small LS. PFL/RTB LS outputs carry the pre-fader listen bus mixed with any reverse talkback inputs that have been enabled. Mon1 Small LS is often a preferable way to monitor PFL which is routed to the small LS output by default. In changeover mode, the main monitor output is muted and instead sent to the small LS.

Patching monitor outputs is similar to normal I/O patching - click on the **destinations** button above the right hand list and select the list containing the I/O ports that the monitor speakers are physically connected to from the **Output Ports** group. Select the specific port a speaker is connected to within that list by highlighting it on the blue column as shown in the adjacent screenshot.

FIGURE 1 - MAIN APPLICATION, SYSTEM SETTINGS > FIXED I/O



Select the required monitor output source on the left, again by highlighting in the blue column (as shown in the screenshot) and click patch. Once patched, the destination list should display the patched audio source.

As well as the standard Main Mon LS1 and PFL outputs there are also Mon2 and APFL2 outputs that are independent for when multiple operators are using the same system simultaneously. A number of Misc Monitor outputs are also available and can be used to feed anywhere that needs an independent selector with a level control. One potential use for these can be to feed the analogue headphone inputs to the control surface.

Speaker configuration

The detailed setup of monitor systems should always follows the recommendations of the loudspeaker manufacturer. When surround monitor systems and others with a separate LFE or sub-bass channel are in use, it is often good practise to use a bass management system. Such controllers frequently provide not only for their primary function of optimising the speaker performance, but also individual level trim functions. The Calrec system itself does not provide level adjustments or delay for adjusting the individual channels within the monitor output.

METERING SETUP

Calrec TFT meters
The high resolution upstand TFT metering can display fader input audio, bus output audio as well as external meters that display audio fed to chosen Hydra2 input ports. As well as audio, upstand meters can display dynamics' gain reduction. Audio data for the TFT meters (and fader bed bargraphs) is generated by DSP and sent to the control surface via the Control processor to console Surface Switch link.

TFT metering is customisable from the Main Application **>Show Settings>Meter Layout** screen.

This screen shows one TFT meter panel at a time, different panels can be selected from the column on the left hand side of the screen. Selecting **Grid** allows the layout to be changed. Highlighting a meter cell and selecting **Edit Meter** brings up a choice of meters that can be displayed. **Set Scale** provides a choice of VU or PPM meter ballistics and scales. Once happy with the meter setup, it is transferred to the console by clicking **Apply new layout to surface** at the top right of the screen. The meter layout can also be saved as a Meter Layout Preset for later use, note that the meter layout is now saved with the show rather than a separate file. The Meter Presets can be reloaded back into the layout screen and applied to the surface when required.

Moving coil and third party meters
Traditional PPM / VU moving coil meters and 3rd party meters such as RTW / DK surround scopes cannot access DSP meter data and need to be fed audio via the control surface rear interface. If required, this audio can be fed from Hydra2 output ports. This may be a fixed feed, such as Main1 Line, patched from the regular I/O page, or it can be a changeable source, patched from **>System Settings>Fixed I/O.**

Under the sources>desk outputs group, as well as monitor outputs, there are also **External Meter Outputs.** Various sources are available in this list, including **Mon LS Pre** which outputs / follows the same audio as being monitored by the Main LS but pre the LS listening level control.

Also available are Meter selectors 1-4. These are four selectors without level controls accessible on the monitor panel which have access to all the sources that the monitor LS does but independent of the LS selection.

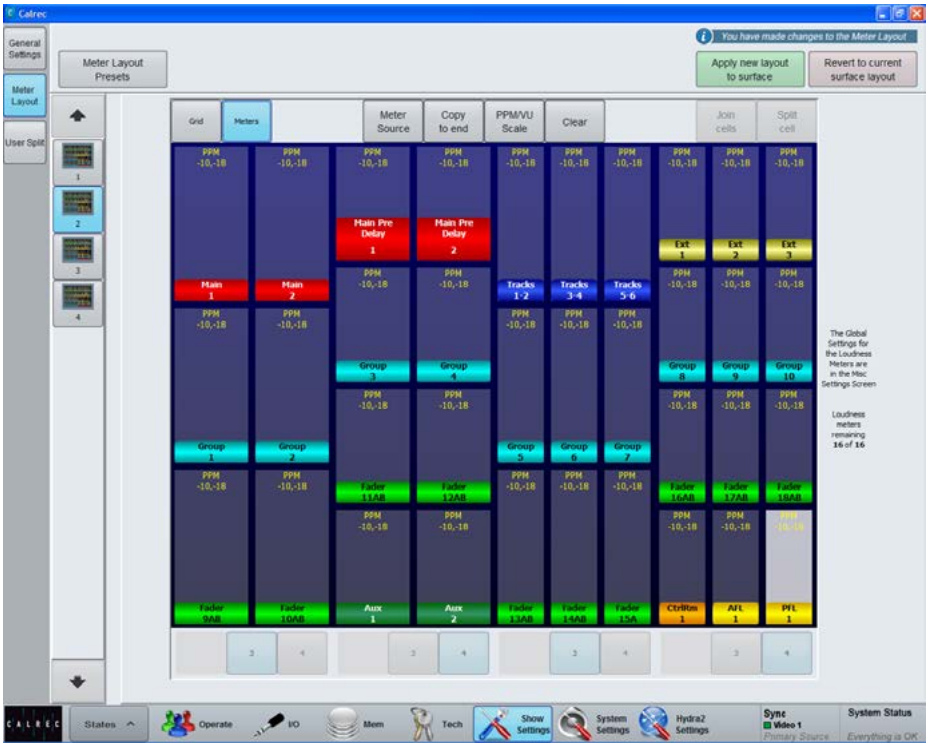
Meter selector outputs can also be displayed on Calrec TFT meters without patching them to Hydra2 outputs.

Loudness meters
16 loudness meters are available to freely assign to any source or output. Loudness meters can be assigned to TFT meter panels. The Meter Layout screen in the main application displays how many loudness meters are available at any time.

Loudness metering at different sample rates
From version 8.0 the desk can be configured to operate at different sample rates such as 48kHz & 96kHz.

At the higher sample rate the number of loudness meters is halved, meaning that 8 Loudness meters are available at 96kHz. instead of 16 Loudness meters at 48kHz.

FIGURE 1 - MAIN APPLICATION - SHOW SETTINGS > METER LAYOUT SCREEN



MONITOR / METER SOURCE SELECTION

The dedicated monitor panel on the control surface provides access to the commonly used monitoring controls. Access to the full set of monitor controls can be gained from any assignable panel by selecting Monitor mode.

The following page shows a panel in Monitor mode with important areas highlighted.

Assignable panel mode selection is chosen from the row of touch sensitive displays at the top of the fader panel as shown on the following page.

Ensure the panel is controlling the required output - Monitor 1 or Monitor 2 (control cell highlighted on the following page).

Four pre-selectors determine the audio being monitored. Switch between the pre-selector sources by pressing the 'Hear' buttons. To select a different source on a pre-selector, press its' 'Sel' button to make it the focus of the selector panel on the TFT screen above. Selectable sources are separated into categories, chosen from the 'Selector Type' menu at the bottom of the TFT screen.

A control cell on the dedicated monitor panel, to the left of the large yellow level control, shows the sources on each pre-selector and allows for switching between them without accessing the full monitor panel.

In the full monitor panel mode, to the left of the 4 monitor pre-selectors are the 4 meter selectors. Press 'Sel' on the appropriate meter selector to change the source in the same way as for the monitor selectors.

To the left of the Main monitor LS level control, on both the dedicated and full monitor panel is a Small LS control cell.

By default, the Small LS outputs PFL audio. If Small LS C/O (Change-over) is selected, it will kill the main monitor output and instead send the selected audio to the small LS outputs, irrespective of whether the small LS is patched to physical output ports / speakers.

Another control cell sets the listening level of PFL and AFL audio.

Individual LS channel cuts provide a convenient way to check patching and connectivity.

FIGURE 1 - ASSIGNABLE MONITOR MODE

Source Selection

Source Type Selection

Individual LS channel cuts

LS output level control and cut

Select to control Mon1 or Mon2 output

LS pre-selectors 1-4 Press 'Hear' to listen, press 'Sel to select a different source

Select Monitor mode

INPUT & OUTPUT PORT PATCHING

Regular Input and output port patching is similar to that of patching monitor outputs but done from the I/O screen of the Main Application and the patches are saved as part of the user memory.

Note that the same input and output ports are available on the I/O screens as the Fixed I/O screens. Patches made from the Fixed I/O screen are visible on the I/O screens and denoted by the System Settings page icon. Likewise when viewing the Fixed I/O screen, patches made to ports from the I/O screen are visible and denoted by the jack icon used for the I/O page.

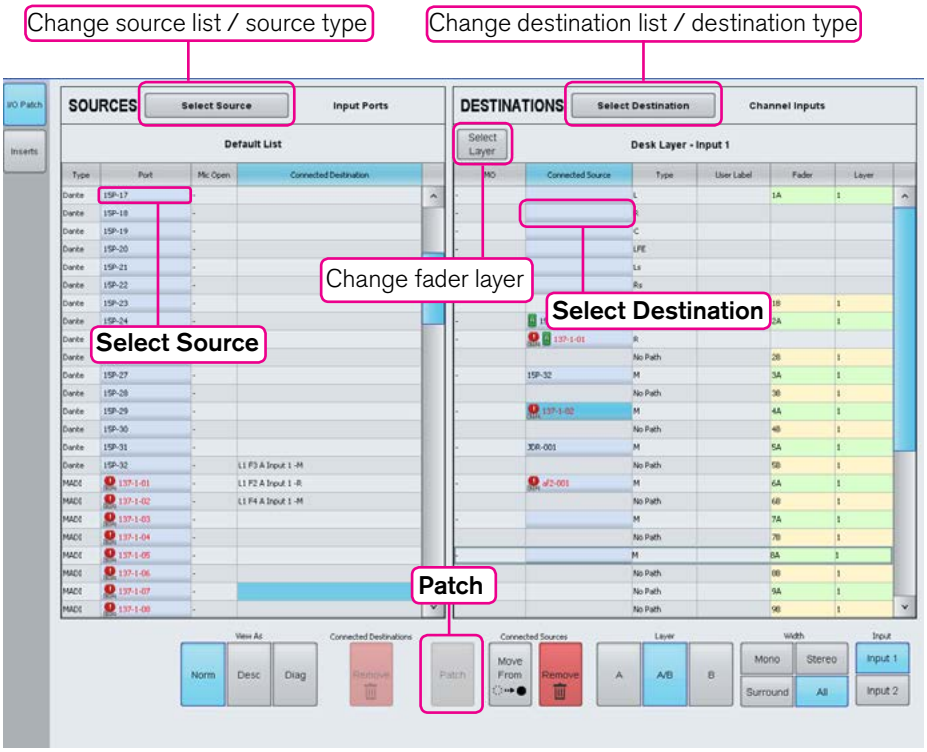
The I/O screen shows sources on the left, and destinations on the right. To patch input ports to channel paths on faders, press **Select Destination**, then select **Channel I/P's** from the **My Desk Inputs** group. The destinations field now displays the faders on the console.

From the **Select Source** button, the **Input Ports** contains the input port lists. If the port lists have not yet been edited, there will be a default list containing all ports, and a list for each I/O box labelled with the box ID.

Highlight the chosen input port/s on the left by clicking on the blue cell. Highlight the chosen fader by selecting the blue cell/s and click patch to put the input port on the fader. Faders with no DSP path assigned cannot be patched to.

To patch console output audio to Hydra2 output ports, press **Select Source** and choose **My Desk Outputs**. Select the required output port list from the **Output Ports** group of the **Select Destination** menu. Again, patching is achieved by highlighting the blue source cell, the blue destination cell and clicking patch.

FIGURE 1 - MAIN APPLICATION, I/O>I/O PATCH SCREEN SHOWING DESK INPUTS



Ports at different sample rates

Note that now different sample rates are available, ports set to a different sample rate to that of the show appear with the SR kHz warning icon to indicate that it cannot be used unless the sample rate of it's associated I/O box is changed in H2O or a different show is loaded using the correct sample rate. See image above.

TALKBACK AND EXTERNAL TONE

All Calrec consoles have a comprehensive talkback system to allow operators to talk over output buses and channel direct outputs / mix-minus outputs.

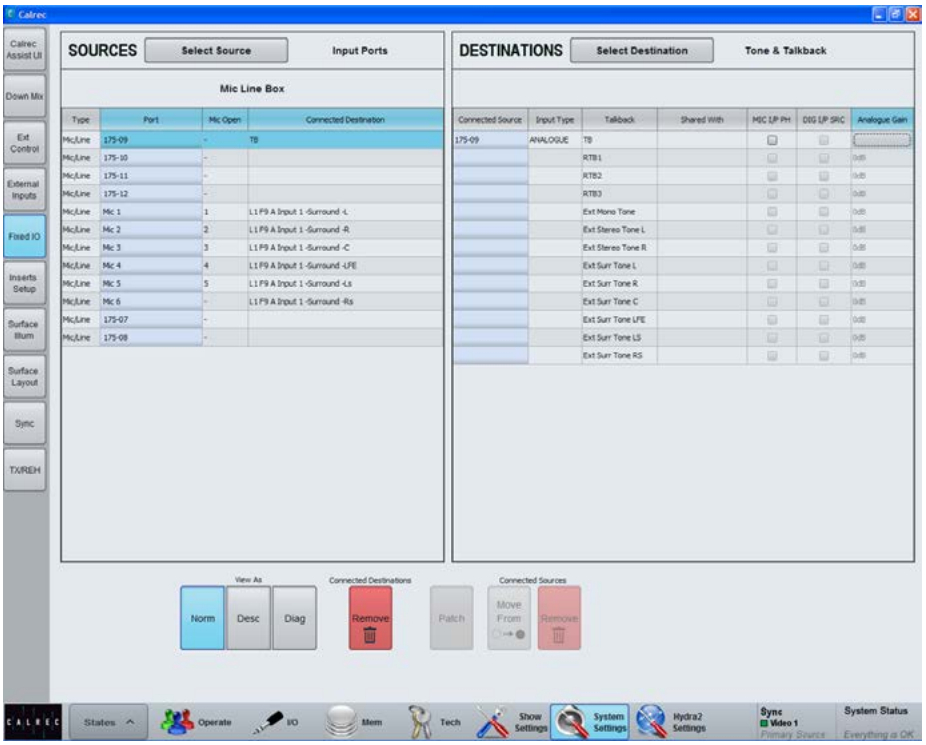
An XLR on the upstand reset panel provides a convenient location to mount the supplied gooseneck microphone. This is wired internally to an XLR on the console rear interface. To use this as part of the console's talkback system it should be connected to a Hydra2 mic input. If the console talkback system is not going to be used, the mic can be wired into an external comms system if it is convenient, i.e. for use as a hot-mic or in conjunction with a foot switch, or an assignable monitor panel button patched to GPO.

The Hydra2 input port with the mic connected should be patched to the talkback input from the >System Settings > Fixed I/O screen - Select Destinations>My Desk Inputs>Tone & TB. The top entry in this list is the Talkback mic input.

The same screen allows for patching of reverse talkback and external tone inputs. Audio from Hydra2 inputs patched as reverse talkback is sent to the PFL/RTB LS outputs. Ports patched as external tone inputs replace the consoles internal tone generator when the oscillator controls from panel tools mode are set to external.

Ports are patched in the same way as normal I/O - View the appropriate port list using the select source button, then select the required source on the left by highlighting the blue cell. Select the destination on the right, again by selecting the blue cell, and then click patch from the central area. Additional fields on the right allow the switching of SRC, phantom power and analogue input gain, dependent on the type of input port patched.

FIGURE 1 - MAIN APPLICATION - SYSTEM SETTINGS > FIXED I/O



ASSIGNING GPIO

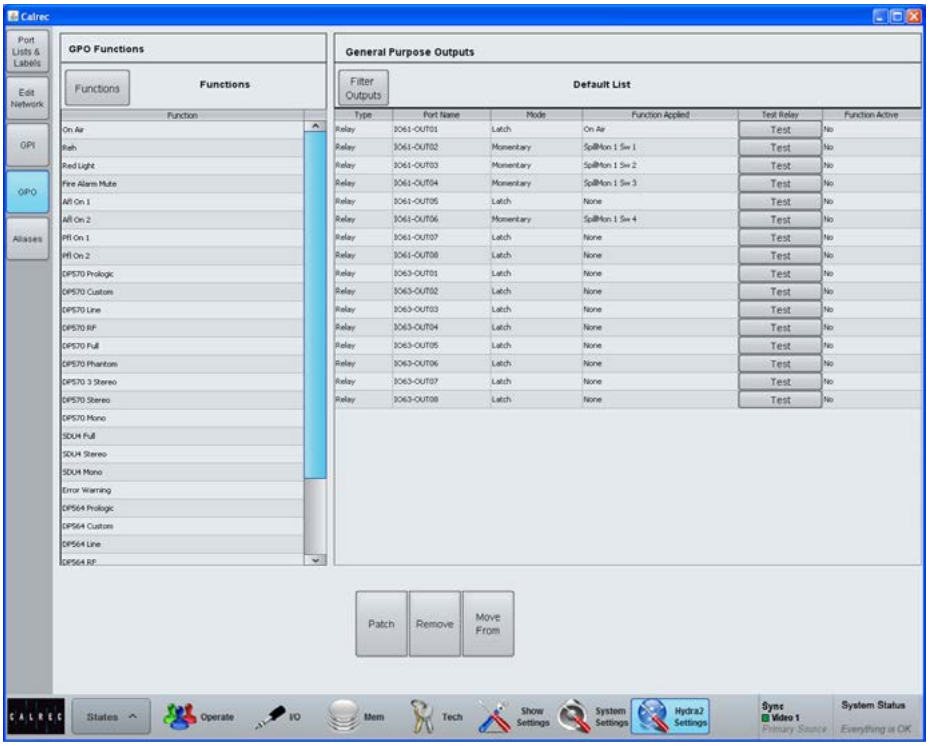
GPIO assignment is achieved from the >Hydra Settings > GPI & GPO pages.

Select the GPO page to patch functions to GP output relays. The left hand side of the screen shows the functions available to patch. Click on the functions button at the top of the list to view different function types by group. The relay outputs are shown on the right and the list can be filtered by I/O box using the Filter button. To make an assignment, highlight the function and the relay, and then click patch. The Test button allows each relay to be triggered to check wiring.

GP inputs are assigned from the GPI screen in a similar way. The inputs are shown on the left and can be filtered by I/O box. The functions to be triggered are on the right and are split in to groups by function type, selectable from the Filter Functions button.

GPIO patching is saved as part of the show, rather than in each user memory.

FIGURE 1 - MAIN APPLICATION - HYDRA SETTINGS > GPO PATCHING SCREEN



USER CONTROL LOGGING SETUP

The requirement for comprehensive control change logging, has been provided to allow after-the-fact analysis of production problems.

Basically the system captures control data and attaches a timestamp to establish when various controls changes were applied by the operator on Apollo, Artemis and Summa Consoles and puts the results into a logging file. The logging file is held on the MCS cards and requires the following entry to be added to the Studio Setup File as shown below:-

FIGURE 1 - STUDIO SETUP FILE - USER CONTROL LOGGING SECTION

```
##########################################################################################
#####################
#           User Logging
#
##########################################################################################
#####################
# set to ‘true’ if wanting to enable user logging i.e. 'UserLoggingEnabled = true' (if commented out or
# missing it will default to false)
UserLoggingEnabled = true
# The time between file updates in seconds e.g 'UserLoggingFileUpdatePeriod = 5' Minimum value is 1 second
# (if commented out, missing or too low it will default to 1 sec). Note that this also affects the refresh
# period of the shaft and fader level logging so, if you want more resolution on fader movement, then make
# this number smaller, or bigger if you want less fader/shaft messages
UserLoggingFileUpdatePeriod = 1
# Clock time when the current logging file is closed and a new one is started. Format is 24 hour format
# hour:minutes e.g. 'UserLoggingFileRolloverTime = 08:04' (if commented out or missing it will default to
# 00:00). Range is 00:00 to 23:59
UserLoggingFileRolloverTime = 00:00
# The maximum disk space on the Master Controller card to allocate to the logging files in MB. When this
# space is exceeded, older files shall be deleted e.g 'UserLoggingFileFolderMaxStorage = 5' (if commented
# out or missing it will default to 10 MB). It is up to the user to put in sensible values here but, as a
# guide, 100MB would be much much more than you ever needed.
UserLoggingFileFolderMaxStorage = 10
# You can filter out event types that are logged by adding them to the following list where:
# 0 = PATH_CONTROL_EVENT
# 1 = DESK_CONTROL_EVENT (fader section and panel events)
# 2 = MEMORY_EVENT
# 3 = PRESET_EVENT
# 4 = TIME_EVENT
# 5 = FADER_OPENCLOSE_EVENT
# 6 = PATH_COPYPASTE_EVENT
# 7 = CSCP_EVENT
# So, for example, if you only wanted Path and fader open/close events but wanted to know when a logged fader
# event might be caused by CSCP then you would use: 'UserLoggingIncludeEvents = 1,2,3,4,6'. If not present
# then all events are enabled
# UserLoggingFilterEvents = 0,1,2,3,4,5,6,7
# Note: User logs can be found in /home/MasterControl/Jetty/webapps/root/UserLogs and are accessible by the
# user from a web browser at <MCS IP address>:8080/UserLogs e.g. 192.178.1.0:8080/UserLogs
```

Once the User Logs are created on the MCS cards they can be opened using a Web-Browser which initially displays a Directory of User Logs. When the required log a selected log is accessed a timestamped Table of Control data appears for further analysis.

As well as memory, preset, fader open/close, path copy/paste,time, CSCP and Path events, logging is implemented for as many of the desk controls listed below as possible.. These are shown in a list of Path Controls on the following pages.

Those marked as (U) are unavailable and indicate that either the control was not available or that the control does not exist..

Filtered events (F) will only be filtered when showing absolute values ('set to') but not when showing changes i.e. ('modified by').

Path Controls Logged

Memory save/load

Preset load
Preset copy
Preset Paste

Time change

CSCP Aux Send On
CSCP Fader Cut
CSCP Fader PFL
CSCP Fader Level
CSCP Input LB
CSCP Main Route

Fader copy/paste
Fader Open/Close
Fader Level (F)
Fader Shaft Level (F)
Fader Level default
Fader Level line-up

Downmix Level (F)
Downmix Shaft Level (F)
Downmix Level default

Fader AFL
Fader PFL
Fader Cut
Fader ext control
Fader rear AFL
Fader Sidechain Listen

Main Pre/Post Delay
Main Routing
Group Pre/Post Delay
Group Routing
Width Control (F)
Width In

Pan Centre Only
Front Back Pan (F)
Front Back Pan In
Front Pan Divergence (F)
Front Pan Divergence In
Front LR Pan (F)
Front Pan In
Front Pan LCR
Pan Joystick Active
Pan LFE Level (F)
Pan LFE In
Pan Non-LFE Level (F)
Pan Non-LFE In
Pan Bypass
Pan Front Format
Pan Mono
Pan Rotate (F) (U)
Pan Rotate In (U)
Rear Pan Divergence (F) (U)
Rear Pan Divergence In (U)
Rear LR Pan (F)
Rear Pan In
Rear LCR Pan (U)

Mix Minus AFL
Mix Minus Level (F)
Mix Minus Talkback
Mix Minus Tone

Output Delay Assign
Output Delay In
Output Delay Time (F)

Input Balance (F)
Input RB
Input LB
Input Leg Routing LBRB
Input MS
Input Patch (disabled)
Input Select
Input Tone
Input Trim
Input Trim Link

Master Input Gain
Master Nudge Input Gain
Master Input Phantom Power
Master Input Phantom Power Left
Master Input Phantom Power Right
Master Input SRC
Master Input SRC Left
Master Input SRC right
Master Input Phase Reverse
Master Input Phase Rev Left
Master Input Phase Rev Right
Mono Input Gain
Mono Nudge Input Gain
Mono Input Phantom Power
Mono Input Phantom Power Left
Mono Input Phantom Power Right
Mono Input SRC
Mono Input SRC Left
Mono Input SRC Right
Mono Input Phase Reverse
Mono Input Phase Rev Left
Mono Input Phase Rev Right

Input Delay Assign
Input Delay In
Input Delay Time (F)
Input Delay Nudge (F)

Insert Allocate
Insert In
Insert Position

Direct Output AFL
Direct Output Apply Spill
Direct Output Defeat Downmix
Direct Output Delay In
Direct Output Delay Time (F)
Direct Output Level (F)
Direct Output Mix Minus Bus
Direct Output Mix Minus On
Direct Output MM Position
Direct Output OPL
Direct Output Position
Direct Output Talk Back
Direct Output Tone

Track Send Position
Track Route All
Track Send Routing
Track Send Apply Spill
Track Send Defeat Downmix
Track Send Level (F)
Track Send Split

Path Delay In
Path Delay Time (F)
Path Delay Position

Aux Send Position
Aux Send Routing
Aux Send apply spill
Aux Send Defeat Downmix
Aux Send Level (F)
Aux Route All

Dyn Automixer In
Dyn Automix Link
Dyn Bypass
Dyn Comp Auto
Dyn Comp In
Dyn Compressor Active
Dyn Comp Sidechain Iso
Dyn Soft Attack
Dyn Control Independence
Dyn Automix Disable
Dyn Exp Gate Auto
Dyn Exp Gate Fast Attack
Dyn Exp Gate In
Dyn Exp Ratio 2:1/Var
Dyn Exp Gate Sidechain Iso
Dyn Follow Primary
Dyn Gate
Dyn Key Input (U)
Dyn Key Invert (U)
Dyn Link
Dyn Link Independence
Dyn Link Select
Dyn Primary Position
Dyn Secondary Position
Dyn Sidechain Listen
Dyn Automix Link Select (F)
Dyn Automix Weight (F)
Dyn Comp Attack (F)
Dyn Comp Knee (F)
Dyn Comp Ratio Fine (F)
Dyn Comp Ratio (F)
Dyn Comp Recovery (F)
Dyn Comp DSP Threshold (U) (F)
Dyn Comp Threshold (F)
Dyn Automix Attack (F)
Dyn Automix Recovery (F)
Dyn Exp Gate Attack (F)
Dyn Exp Gate Recovery (F)
Dyn DSP Threshold (U) (F)
Dyn Threshold (F)
Dyn Gate Delay (F)
Dyn Gate Depth (F)
Dyn Link Select (F)
Dyn Make Up Gain (F)
Direct Input Patch (disabled) (U)
Direct Input On (U)
Direct Input Level (F) (U)

External Input Patch (disabled) (U)

Auto Minus Position (U)
Auto Minus Routing (U)
Auto Minus Apply Spills (U)
Auto Minus Defeat Downmix (U)

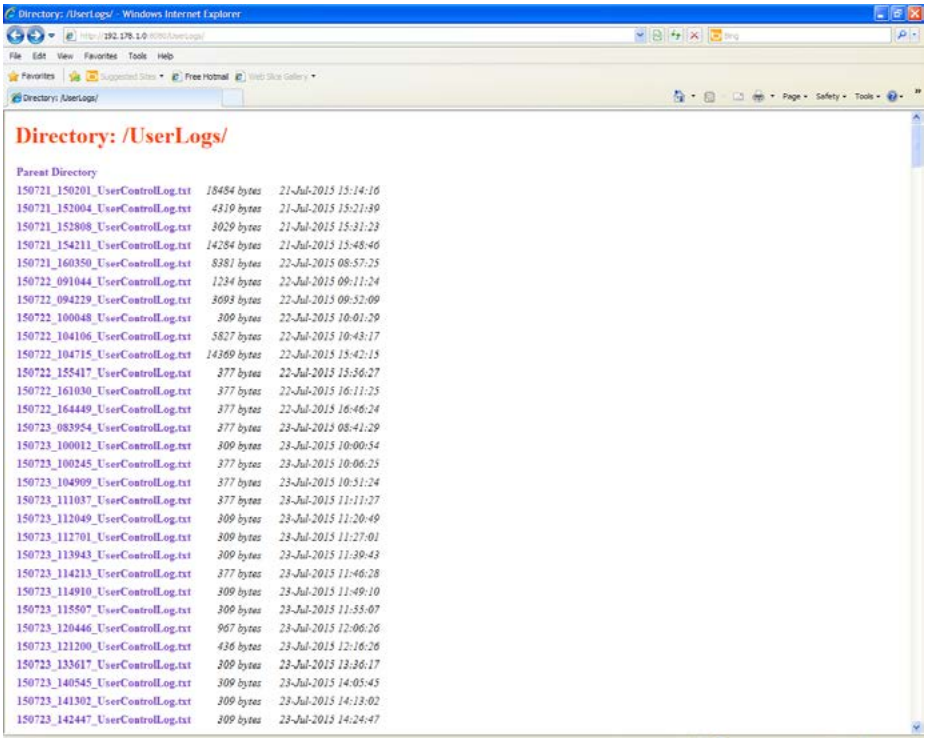
All EQ In
EQ Alt = Normal
EQ Alternate
EQ Bypass
EQ Dyn Selected
EQ Reset
EQ In
EQ Independence
EQ Level (F)
EQ A = EQ B
EQ Q (F)
EQ Response
EQ Response Type (F)
EQ Frequency (F)

Delay Popup Coarse Up (F)
Delay Popup Coarse Down (F)

Tone In

User Logs

The logging files are written to:----------> **/home/MasterControl/Jetty/webapps/root/UserLogs**



These logs can be found on each of the MCS cards and in order to view the files the user can access them via a Web-Browser at the following address:-

<MCS IP address>:8080/UserLogs

where the MCS IP address can be found from Program Updater so in this example:-

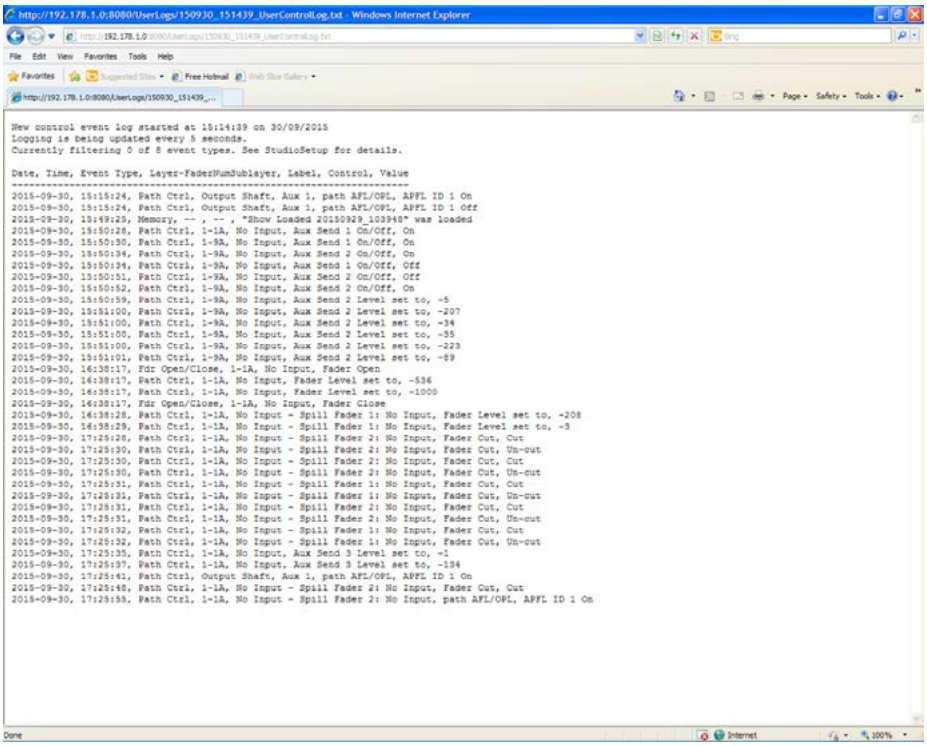
192.178.1.0:8080/UserLogs

Once accessed the directory of user logs appears as shown right:

The logs are saved as .txt files and has a naming convention that allows easy sorting of oldest to newest:----------> **<YearMonthDay_HoursMinutesSeconds>_UserControlLog.txt**

e.g. if started at 30th September 2015 at 15:14:39 then this becomes:

150930_151439_UserControlLog.txt



Once the selected log has been accessed the data appears as a formatted table showing Date, Time, Event Type, Layer-Fader Number Sub Layer, Label, Control and Value all ordered by earliest timestamp first as shown right:

The table can then be searched and analysed to find out the sequence of events that occurred around the time of interest.

APOLLO
PANEL OPTIONS

CALREC

FADER PANEL - IC5701

Fader panels take up a large portion of the control surface, multiple panels being fitted to make up the required fader quantity.

Usually, fader panels are fitted in the bottom row of the control bed, though if required can be fitted in the upper row as well.

The IC5701 is fitted with 8 x 100mm throw faders.

As standard, the panel is fitted with 'Cut' buttons to mute fader paths. As an option, 'On' buttons can be fitted and the software configured for reverse functionality - the fader path is active when On is lit and muted when it is not. If On buttons are required, this should be specified at the time of order.

Connections

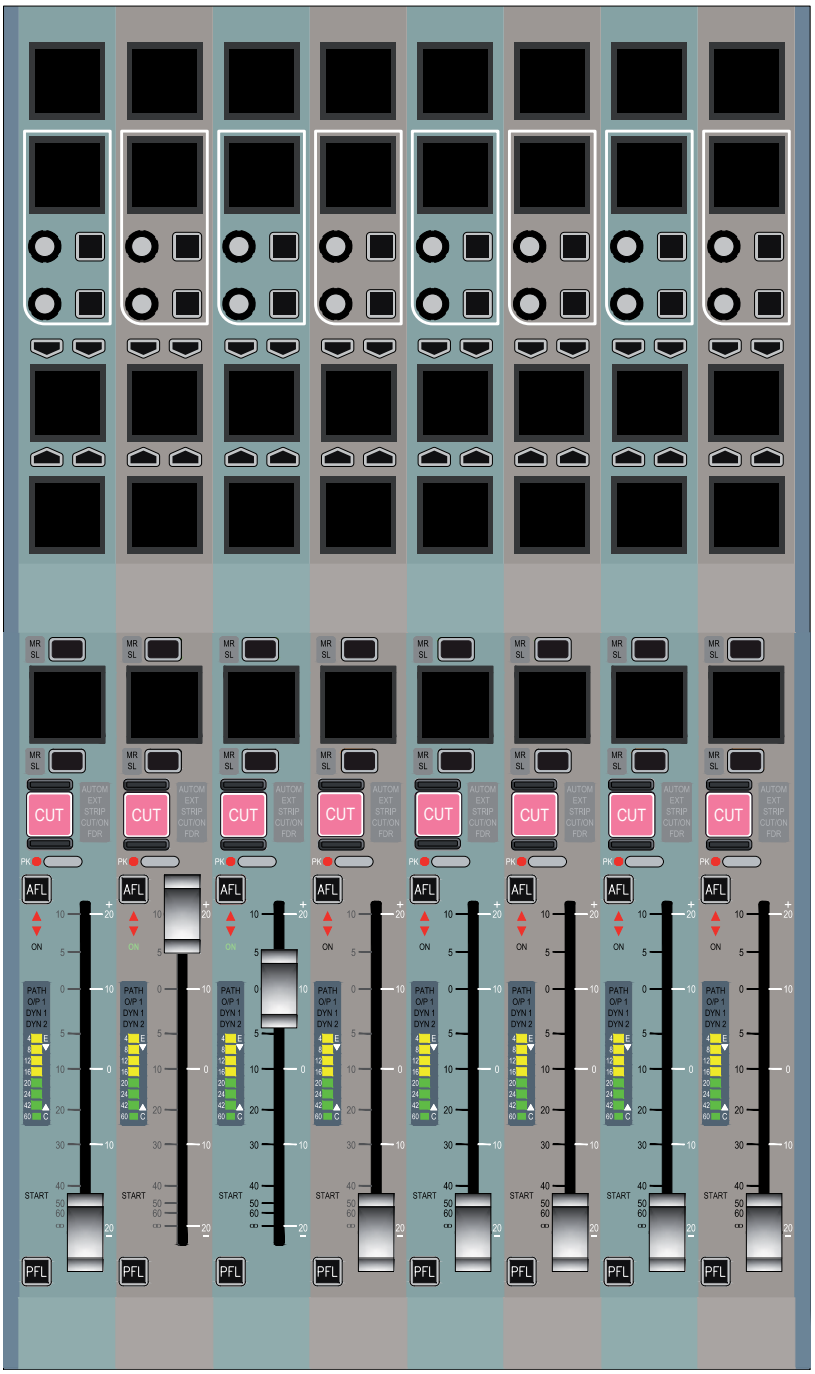
This panel has a single RJ45 POE connection for its data and power. Fader panels connect to specific POE switches / ports, as defined by the surface layout configuration set in the Main Application.

A (NOT*) DVI connector is used to send data to the associated up-stand TFT screen above the fader panel, if fitted.

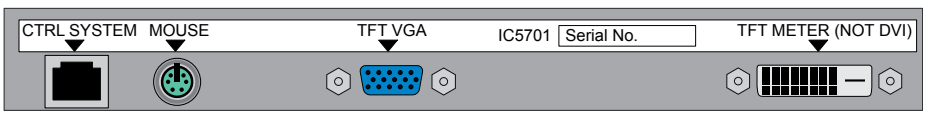
*Note, the connector type is DVI, but the format is not DVI - This should not be connected to anything other than Calrec TFT panels, doing so may damage the equipment.

Mouse and TFT VGA connections are used for factory configuration only.

IC5701 - APOLLO FADER PANEL



CONNECTOR LAYOUT



DUAL FADER PANEL - IC5717

The IC5717 is a dual fader panel, fitted with 8 x 100mm throw faders and a second row above of 8 x 60mm faders.

The panel is the same physical size as the IC5701 with some strip functionality removed to make space for the second row of faders. The dual fader panel gives physical access to both A & B layers simultaneously.

Control surfaces can be fitted with a mixture of single and dual fader panels if required.

As standard, the panel is fitted with 'Cut' buttons to mute fader paths. As an option, 'On' buttons can be fitted and the software configured for reverse functionality - the fader path is active when On is lit and muted when it is not. If On buttons are required, this should be specified at the time of order.

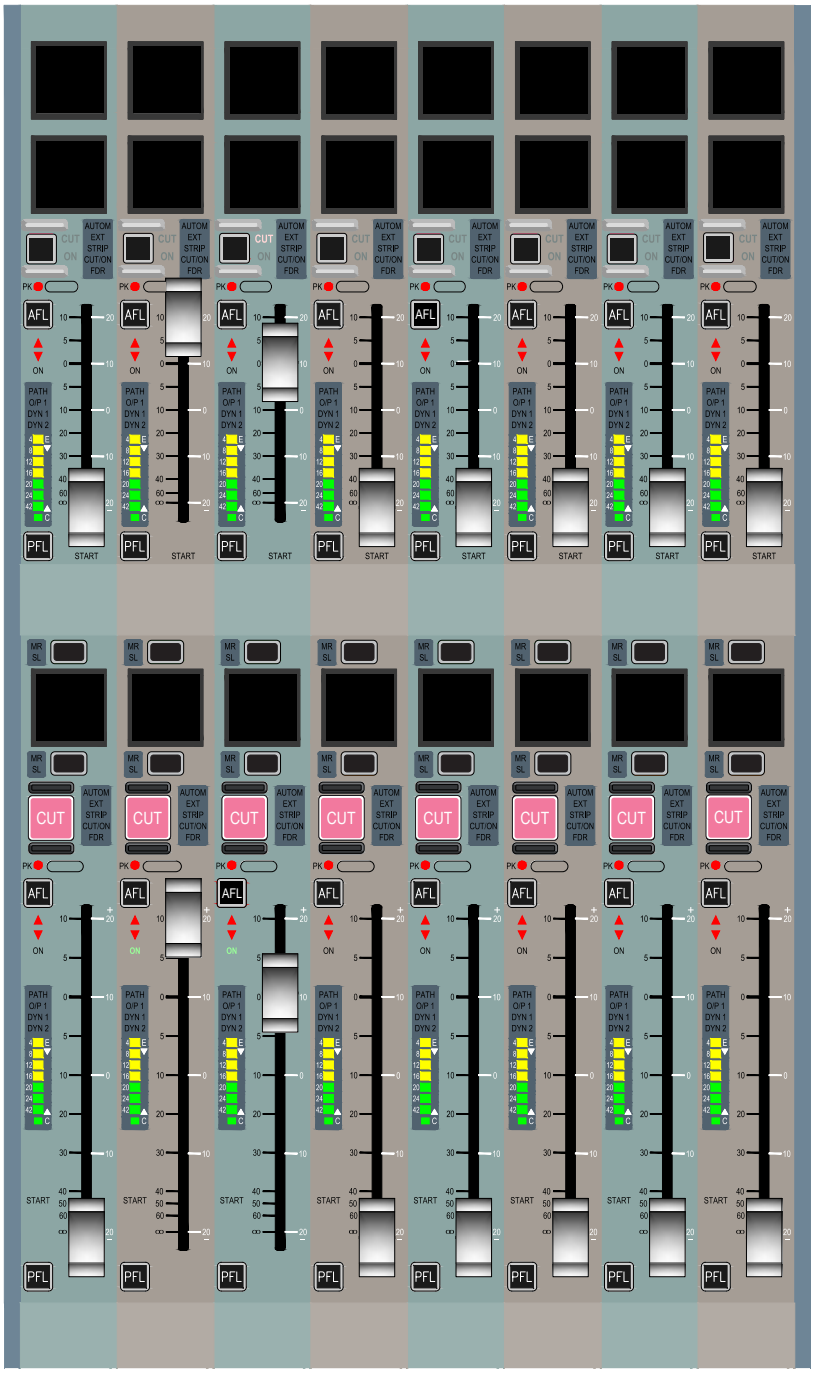
Connections

The additional faders require extra power that cannot be delivered by a single POE connection, therefore this panel has 2 x RJ45 ports. CTRL SYSTEM is the main data and power connection from a POE switch panel port, AUX POWER provides the additional power required and connects to a POE switch ancillary power port. As with all intelligent surface control panels, the data connection needs to be connected to the POE switch / port as defined by the console layout in the Main Application.

A (NOT*) DVI connector is used to send data to the associated up-stand TFT screen above the fader panel, if fitted.

*Note, the connector type is DVI, but the format is not DVI - This should not be connected to anything other than Calrec TFT panels, doing so may damage the equipment.

IC5717 - APOLLO DUAL FADER PANEL



CONNECTOR LAYOUT

ASSIGNABLE CONTROL PANEL – CA5700

Assignable control panels can quickly switch between 4 main operating modes, giving access to the majority of operational functionality and can also be used in 'wilds' mode to provide inline control functions for the fader directly below each strip.

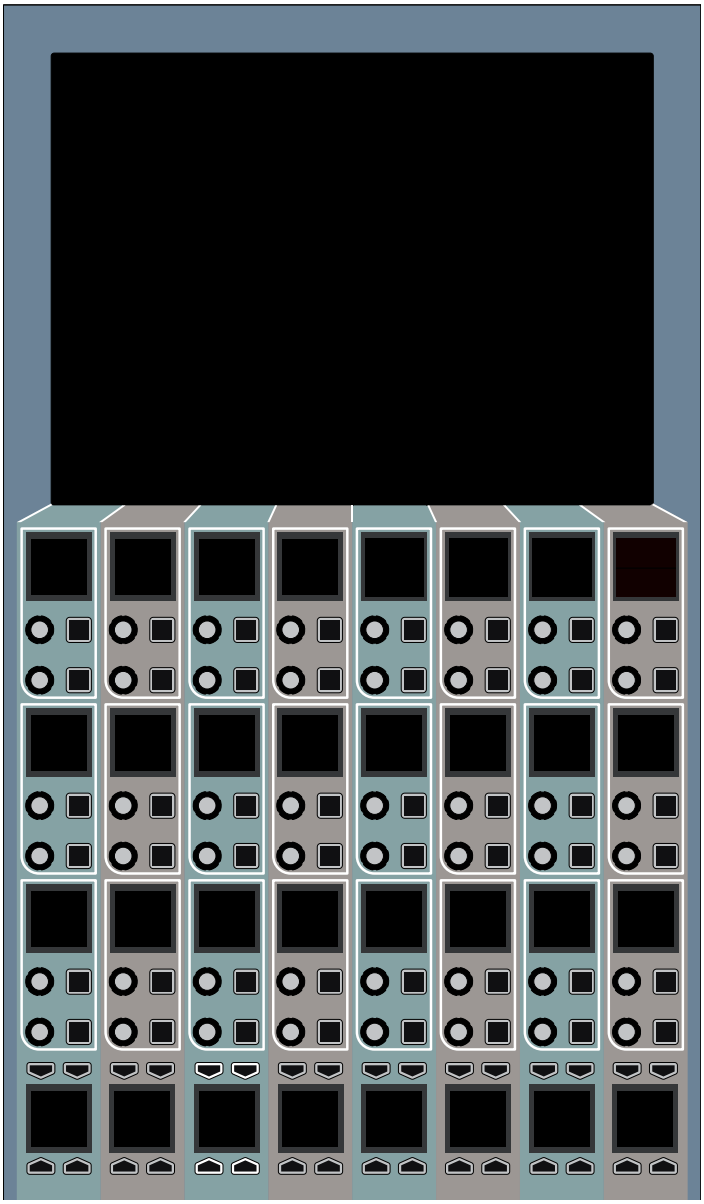
An assignable panel needs to be located above a fader panel in order for it to be fully functional and for mode selection to be performed. Multiple assignable panels can be fitted in order to provide multiple modes of control parameters at the same time, as well as giving control to all functions from various physical locations across the console and also to provide control to multiple operators working on the same console at the same time.

Connections

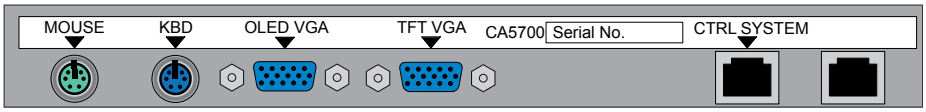
A single RJ45 connection labelled CTRL SYSTEM provides all data and power for this panel type.

A second, unlabeled RJ45 is unused. Keyboard, Mouse and VGA connectors are for factory configuration.

CA5700 - APOLLO ASSIGNABLE CONTROL PANEL



CONNECTOR LAYOUT



MONITOR PANEL - IM5705

The monitor panel fits in either row of the control bed, providing a dedicated set of the main monitoring controls.

As well as monitoring controls, this panel provides surround spill and downmix faders for in-depth control over surround paths. The faders on this panel can also be used to control Main Output bus levels if required.

Eight buttons with LED tallies are fitted at the bottom of the panel that can be assigned to GPIO for the triggering of external devices, for example for talkback or remote start of playout devices.

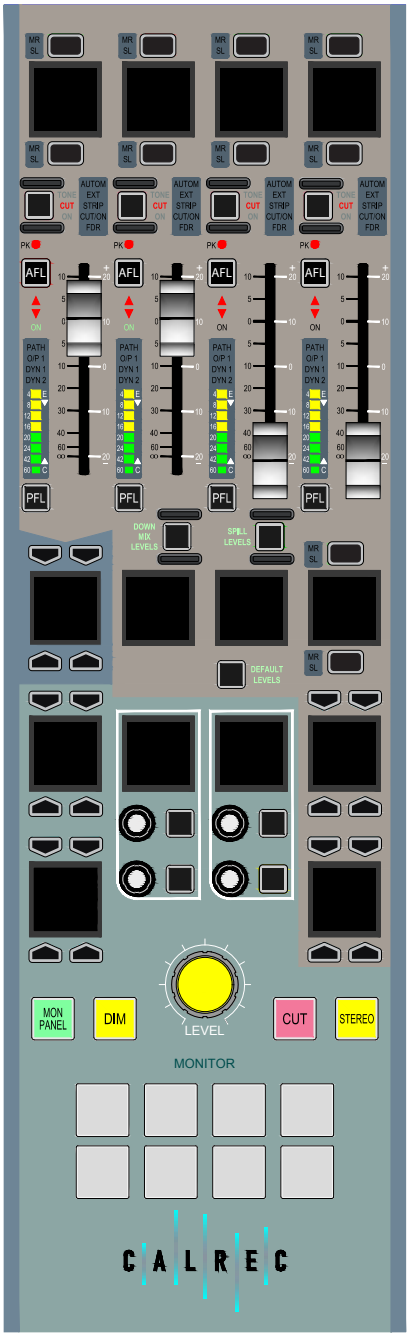
If required, for example on a large console, or for multiple operators, multiple monitor panels can be fitted in the same control surface. Each can switch between controlling monitor 1 or monitor 2 outputs as well as having access to miscellaneous monitor and headphone outputs.

Connections

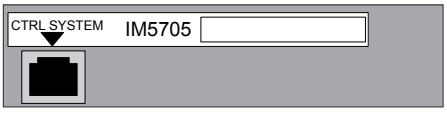
A single RJ45 carries all data and power for this panel type and should be connected to a POE switch panel port, as determined by the console layout settings in the Main Application.

'Half width' Apollo panels such as this require a fader or assignable control panel to carry out their main processing functions. Any fader or assign panel in the surface can be allocated as the master to a half-width panel from the console layout screen of the Main Application. As standard, the panel to the left of the half-width panel is configured to be its master. The master panel must be fitted and functional for the slaved half-width panel to be functional.

IM5705 - APOLLO NARROW MONITOR PANEL



CONNECTOR LAYOUT



JOYSTICK PANEL – IW5718

The joystick panel, like the monitor panel is 'half-width' and can fit in either row of the control bed. Typically it would be located above the monitor panel.

This panel provides joystick control over surround panning / output positioning from mono and stereo paths.

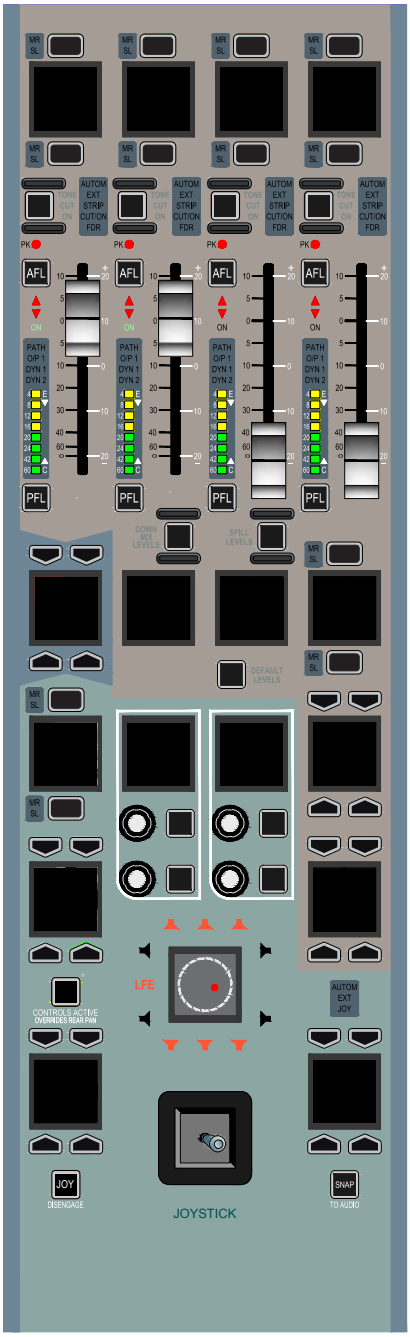
Like the monitor panel, the joystick panel also provides assignable control over surround paths spill and downmix settings, as well as allowing its faders to be assigned to Main output buses if required.

Connections

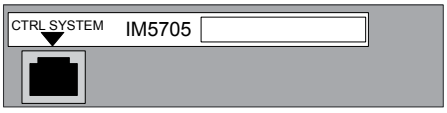
A single RJ45 carries all data and power for this panel type and should be connected to a POE switch panel port, as determined by the console layout settings in the Main Application.

'Half width' Apollo panels such as this require a fader or assignable control panel to carry out their main processing functions. Any fader or assign panel in the surface can be allocated as the master to a half-width panel from the console layout screen of the Main Application. As standard, the panel to the left of the half-width panel is configured to be its master. The master panel must be fitted and functional for the slaved half-width panel to be functional.

IW5718 - APOLLO NARROW JOYSTICK PANEL



CONNECTOR LAYOUT



TFT METER PANEL - MD5702

A number of TFT meter panels can be fitted in the control surface upstand to display input and output audio metering and dynamics gain reduction.

Each up-stand meter panel requires a fader panel to carry out its processing and therefore the maximum number of up-stand meter panels fitted in a console is the same as the number of fader panels fitted.

Each panel can display numerous meters, the size and sources displayed are user configurable from the Main Application. TFT meter panels are the same width as fader and assignable panels, and as such are often configured to display 8 meters across the width in the bottom row, to line up with the faders beneath them and to display fader input signals.

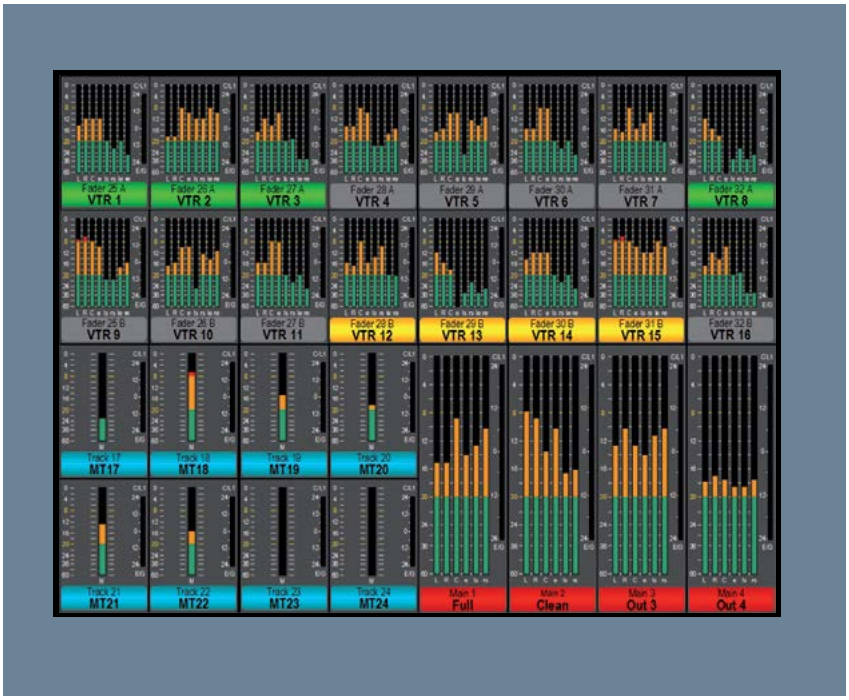
As well as all fader inputs and all bus outputs, meters can be set to follow monitoring, console meter selectors and external inputs.

Connections

Each TFT meter panel receives its data and power via a single (*NOT) DVI connection, direct from a fader panel.

*Note, the connector type is DVI, but the format is not DVI - This should not be connected to anything other than Calrec fader panels, doing so may damage the equipment.

MD5702 - TFT METER PANEL



RTW TM7 METER - MU5993

The MU5993 console up-stand panel is fitted with an RTW TM7 meter, providing a visual surround field representation along with comprehensive surround phase monitoring and other features such as loudness metering and optional moving coil meter emulation.

Multiple types of metering instruments can be displayed simultaneously on each TM7 meter, the layout and sizing of each element is configurable. The images on this page show examples of meter types and layouts available. For full details on TM7 functions, please refer to the RTW website. Multiple meter panels can be fitted into a control surface if required.

The TM7 is supplied with 8 balanced analogue inputs, 8 AES digital inputs and 8 digital outputs. Digital I/O can be supplied as either 75 Ohm unbalanced AES3id on a BNC connector interface, or as 110 Ohm balanced AES3 on a D-type connector interface. Digital I/O format for the TM7 should be specified at the time of order.

The TM7 does not access Calrec meter data, it requires audio feeds via the console's rear interface panel. If the meter is to be fed directly from console outputs, this should be provisioned for in the quantity of Hydra2 output ports ordered.

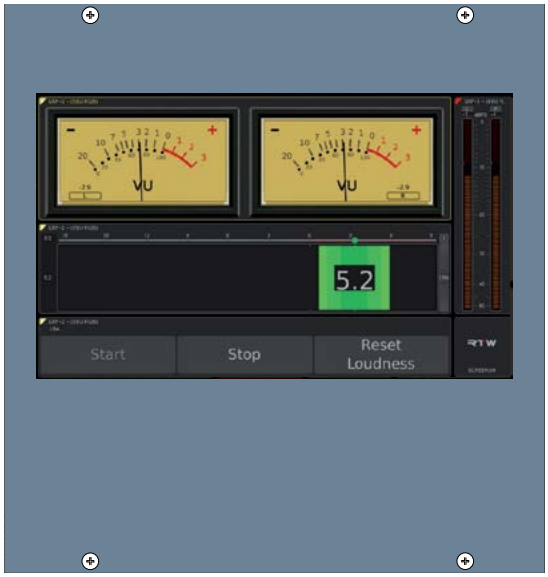
Being 195mm [7.68'] wide, this panel is often located next to the RT5707 reset / facilities panel, the two panels having a combined width of 250mm [9.84'] - the same as standard panels such as faders, assignable's and up-stand TFT panels.

Connections

Analogue inputs are on a 25 pin female D-Type, AES I/O is either on a 25 pin female D-Type if balanced, or on BNC's if unbalanced, depending on the type ordered.

MU5993 - EXAMPLE 1 OF METER TYPES AND LAYOUT AVAILABLE

MU5993 - EXAMPLE 2 OF METER TYPES AND LAYOUT AVAILABLE



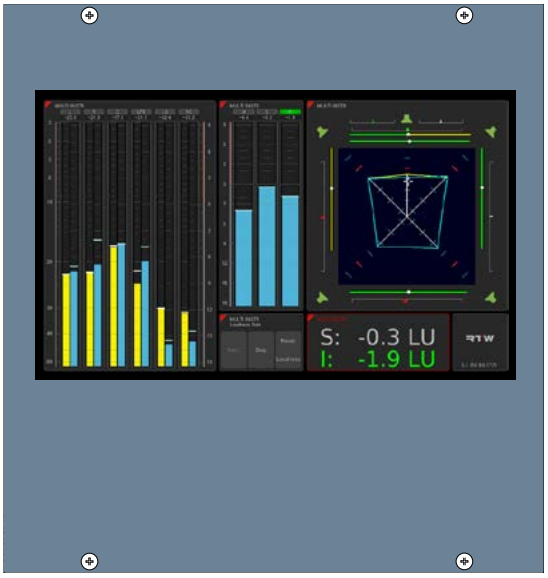
See the Surface Rear Connector Interface Pin-Outs section for wiring detail.

The RTW meter is powered from a single RTW PSU located within the control surface and fed from the ancillary AC mains input on the rear connector interface.

RTW TM9 METER – MU6194

The MU6194 is a 250mm wide panel that takes up the same width as a fader or assign panel. The panel accommodates version 9 of RTW's TouchMonitor range. For full details on TM9 functions, please refer to the RTW website.

MU6194 - EXAMPLE OF METER TYPE AND LAYOUT AVAILABLE



DK MSD600++ METER - MU5799

The MU5799 console up-stand panel is fitted with a DK Audio MSD600++ surround meter, providing a visual surround field representation along with comprehensive surround phase monitoring and other features such as loudness metering.

The MSD600++ has 4 I/O slots that can be fitted with various formats of card:

- AES & Analogue - Each card has 1 x digital stereo input and a pair of analogue inputs. Fully populating the meter with this card type provides 4 stereo digital and 8 analogue inputs.
- AES only - Each card having 4 stereo digital inputs.
- Analogue only - Each card having 8 analogue inputs.

DK's digital inputs are available either as AES3id unbalanced 75 Ohm on BNC connectors, or AES3 balanced 110 Ohms on D-type connectors.

Card types required should be specified at the time of order as it affects the internal wiring and rear interface plate layout of the console. Multiple RTW meters can be fitted in the same control surface if required.

This meter does not access Calrec meter data, it requires dedicated audio feeds. If it is to be fed directly from console outputs, these should be provisioned for in the quantity of Hydra2 output ports being ordered.

Being 195mm [7.68'] wide, this panel is often located next to the RT5707 reset / facilities panel, the two panels having a combined width of 250mm [9.84'] - the same as standard panels such as faders, assignable's and up-stand TFT panels.

MU5799 - EXAMPLE OF DK MSD600++ METER

Connections

Analogue inputs are on a 25 pin female D-Type, AES I/O is either on a 25 pin female D-Type if balanced, or on BNC's if unbalanced, depending on the type ordered. See the Surface Rear Connector Interface Pin-Outs section for wiring detail.

The DK meter is powered from a single DK PSU located within the control surface and fed from the ancillary AC mains input on the rear connector interface.

LOUDSPEAKER PANEL - LS5930

The LS5930 is an optional loud speaker panel for the Apollo upstand. Multiple panels can be fitted in each control surface if required.

The panel is fitted with a single (mono) loudspeaker, fed by 4 balanced stereo analogue inputs, accessible on the rear interface panel (pin-outs shown in the Connection Information section). DIP switches accessible from the rear of the panel enable or disable each leg of each input. From each of the 4 inputs, the loudspeaker can output left, right, both or neither. If inputs are wired but unused / left unterminated, they should be disabled to eliminate noise picked up by the cable run.

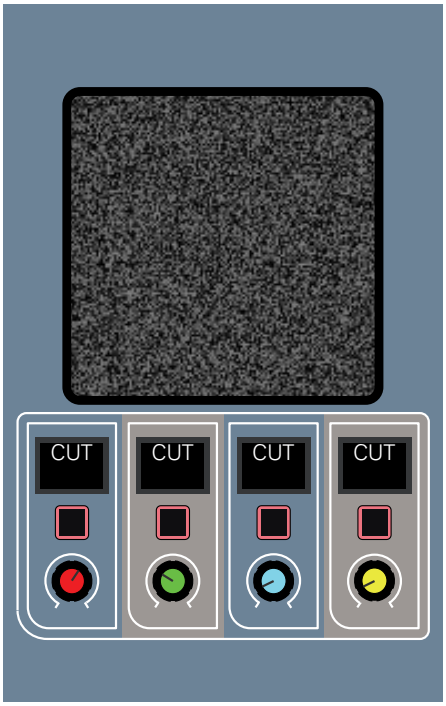
Each pair of stereo inputs has a front panel level control, the range of which is set by DIP switch to be either ∞ to +10dB, or -20 to +10dB.

Each level control knob is illuminated to aid identification, the colour of each can be set independently using PCB mounted rotary switches, accessible from the rear of the panel.

A front panel button, located above each level control functions as a Cut or an On switch. DIP switches accessible from the rear of the panel set this functionality, which is shown in the front panel display above the button, and also sets the button LED to light appropriately for the chosen function. Another DIP switch is used to set the cut / on status at power up. All four inputs can simultaneously be remotely cut or dimmed by applying a ground to the relevant pin on the console's rear interface (see Connection Information section).

DIP switches are also used to set the frequency response of the signal feeding the speaker.

LS5930 - LOUDSPEAKER PANEL



The flat response is +/-0.5dB 20Hz-20KHz. A high frequency filter (4k7Hz) and / or a low frequency filter (215Hz) can be switched in.

Connections

This panel receives POE power from a POE switch ancillary power (AP) or SPR port. The audio interface and external cut / dim lines are on a 25 pin D-type connector wired internally to the rear interface panel of the control surface.

SWITCH 1-4 - INPUT ENABLE/DISABLE

Switch	Function
DIP switch 1/1	Input 1 Left disable
DIP switch 1/2	Input 1 Right disable
DIP switch 2/1	Input 2 Left disable
DIP switch 2/2	Input 2 Right disable
DIP switch 3/1	Input 3 Left disable
DIP switch 3/2	Input 3 Right disable
DIP switch 4/1	Input 4 Left disable
DIP switch 4/2	Input 4 Right disable

- Set switch **on (1)** to disable, **off (0)** to enable.

SWITCH 9/1 - BUTTON FUNCTION

Sw 9/1	Function
0	Button = CUT
1	Button = ON

SWITCH 9/2 - MINIMUM POT LEVEL

Sw 9/2	Function
0	Min pot level = -20
1	Min pot level = ∞

ROTARY SET - LEVEL CONTROL COLOUR

Rotary Switch	Input knob
5	Input 1
6	Input 2
7	Input 3
8	Input 4

- Turn the appropriate switch to cycle through the colours available.

SWITCH 14 - BOOT STATUS

Switch	Boot-up status
14/1	Input 1
14/2	Input 2
14/3	Input 3
14/4	Input 4

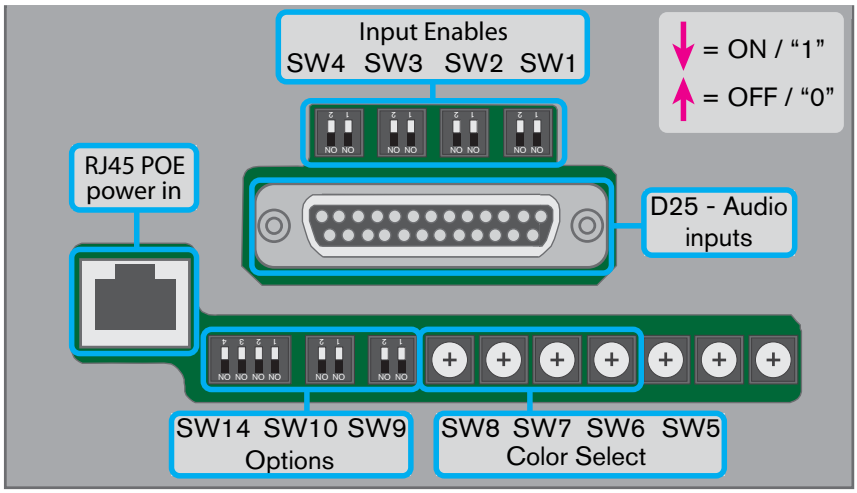
SWITCH 10/1 - LOW FREQ FILTER

Sw 10/1	LF filter status
0	LF filter active
1	LF filter bypassed

SWITCH 10/2 - HIGH FREQ FILTER

Sw 10/2	HF filter status
0	HF filter active
1	HF filter bypassed

REAR OF PANEL - CONNECTOR AND DIP SWITCH LOCATIONS



D25 - REAR OF PANEL AND REAR INTERFACE LS CONNECTOR PIN-OUT

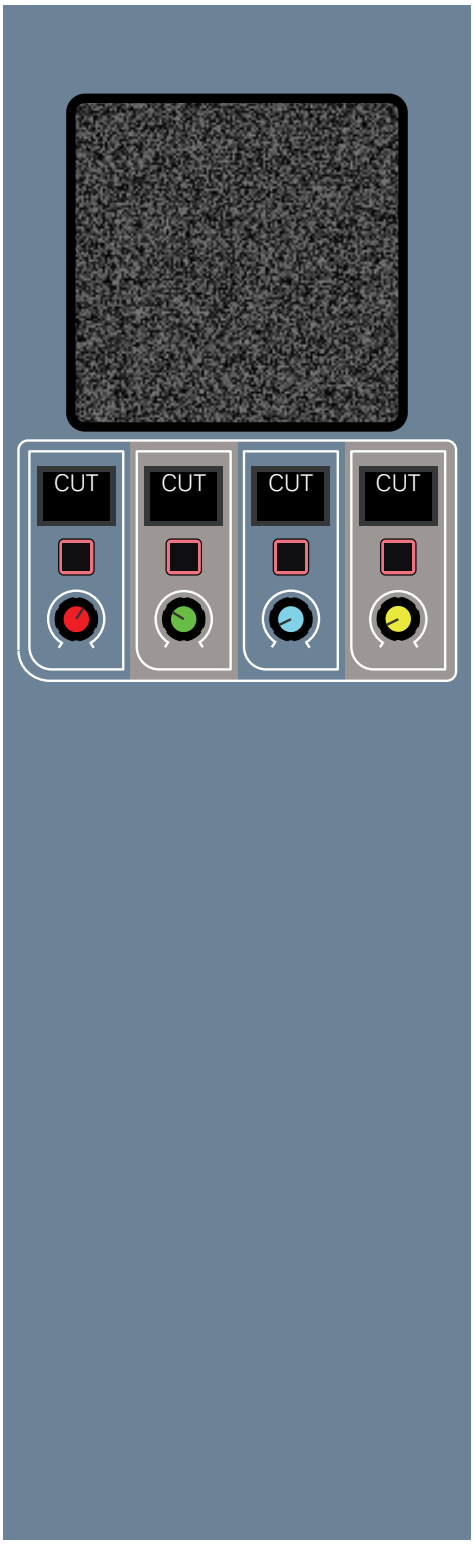
Analog input		Pin
1 Left	+	1
	-	14
	Ground	3
1 Right	+	2
	-	15
	Ground	3
2 Left	+	16
	-	4
	Ground	18
2 Right	+	17
	-	5
	Ground	4
3 Left	+	6
	-	19
	Ground	8
3 Right	+	7
	-	20
	Ground	8
4 Left	+	21
	-	9
	Ground	23
4 Right	+	22
	-	10
	Ground	23
Logic	Ext Cut	11
	Ext Dim	24
	Ground	13

LOUDSPEAKER PANEL - LS5957

The LS5957 is an optional loud speaker panel designed to fit in either row of the Apollo control bed.

This panel is identical in functionality and connectivity to the LS5930 up-stand mounting version. Please refer to the LS5930 information for detail.

LS5957 - LOUDSPEAKER PANEL



LOUDSPEAKER PANEL – LS6053

The LS6053 provides the same functionality as the LS5930, with the addition of a level control for an external analogue audio path.

The level control is a dual gang potentiometer, allowing for a balanced analogue mono audio feed to be passed through it. Typically, this would be used to control the audio level to an ancillary control room loudspeaker, such as a 'hot-mic' or communications output, that does not have its' own level control, or is not within the physical reach of the audio operator.

Like the LS5957, the LS6053 will fit in either row of the Apollo control bed.

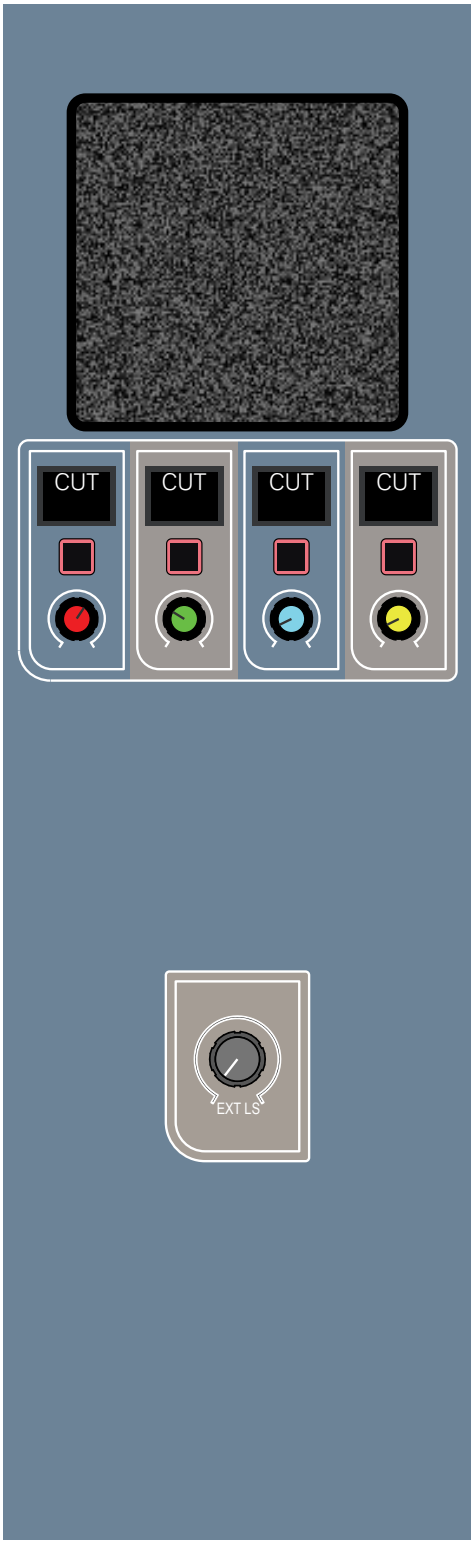
Please refer to the LS5930 information for details on the standard functionality and connectivity of this panel.

Additional level control connection
The analogue audio feed to be passed via the central level control should be connected to the female D9 connector on the rear of the control panel itself. Cabling should be routed via the surface cable entry point by the rear connector interface panel.

Connection	Pin
Input +	1
Input -	6
Output +	3
Output -	9
Ground	2 / 4 / 7 / 8

- Cable requires MALE D9 termination

LS6053 - LOUDSPEAKER PANEL



FACILITIES PANEL RT5707

Each control surface requires that a Broadcast Facilities panel is fitted in the upstand.

This panel is 55mm [2.17'] wide and as such is ideally fitted alongside a 3rd party surround meter, or twin/quad moving coil VU meters to take up the same width as a standard panel.

The Broadcast Facilities panel provides the following:

Resets

Three reset buttons along with an enable button are located at the bottom of this panel. As a safety precaution, to activate a reset, the enable button must also be pressed as well as the desired reset button. The resets are split into three areas -

- 'DSP' resets the audio signal processing cards in the processing core.
- 'Control' resets the Master Control processors in the processing core.
- 'Surface' resets the control surface panels.

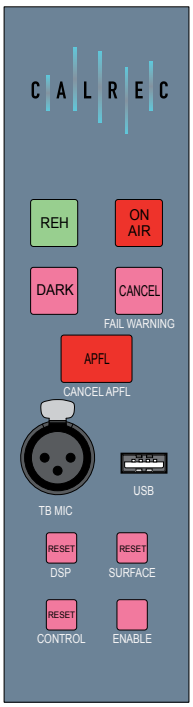
Talkback mic

A female XLR is provided to connect the supplied goose-neck microphone. This connects directly to an XLR on the rear interface panel (no gain or power is applied in the console). The microphone can be connected into an external talkback system, or the console's own talkback system via a Hydra2 input. Please refer to the console configuration section for details on console talkback setup.

USB port

The USB port on this panel connects directly to a USB port on the console PC, providing convenient access for file transfer, such as memory backups.

RT5707 - FACILITIES PANEL



The spare USB-Ethernet adaptor can also be connected to this USB port to provide a temporary second network connection to the PC if the rear interface panel is not as convenient to access.

Facilities buttons / indicators

A large red button in the centre of the panel illuminates to indicate when the selected monitoring source is overruled by an AFL or PFL. Pressing this button will cancel any selected AFL or PFL, returning the monitor to its selected source.

The 'Dark' button, when pressed turns off all displays on the control surface and illuminates to indicate the console is in dark mode.

A System Status warning indicator flashes to alert the user of any console errors, pressing this button acknowledges the errors and stops it flashing.

The on-air and rehearse buttons can be used to set the mode of the desk and disable functions such as tone.

Connections

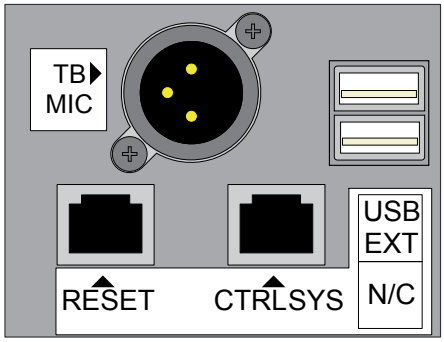
Power and data is fed via an RJ45 labelled CTRL SYS, connected from a POE switch panel port.

An RJ45 labelled RESET connects to a POE switch RST port (which is then daisy-chained through the rest of the POE switches)

The front panel USB port connects inside the panel to one of the ones on the rear which is in turn connected to a USB port on the system PC. The other USB on the rear of this panel is unused.

The front panel XLR connects inside the panel to the XLR on the rear which is in turn connected inside the console chassis to an XLR on the rear interface panel.

REAR CONNECTORS



APOLLO
MOVING COIL METERS*

* High quality moving coil meters are no longer being manufactured. With a lack of supply, Calrec has regretfully had to withdraw them from the product range. Users who still prefer to use this style of meter should order up-stand mounting RTW TM7 / TM9 meter panel/s (see previous Panel Options section), specifying that moving coil emulation software is enabled. This package provides accurate VU and PPM response with appropriate scaling on a clear, wide viewing-angle display using graphics and sizing that compares well with true mechanical versions.

  The following section is included only in order to provide information to support the many customers using existing moving coil meter panels.

STEREO MOVING COIL METERS

The MV5778 has VU scaling and ballistics, the MU5775 has PPM scaling and ballistics. Both are dual needle, stereo moving coil meters.

These panels are 130mm [5.12'] wide, and as such are often fitted above the monitor or joysticks panels which are the same width.

Moving coil meters do not access the meter data system and require an audio feed via the console's rear connector interface. If the meter is to be fed directly from console outputs, this should be provisioned for in the quantity of Hydra2 output ports ordered.

Moving coil meters can be fed with either digital or analogue audio signals. The inputs are mixed rather than switched however so only one format should be fed at any given time.

Connections

Audio is received via a female D25 connector on the console's rear interface panel. This wires internally to a female D9 on the back of the meter panel itself. See the Surface Rear Connector Pin-outs section for wiring detail.

The meter panels are powered via a single RJ45 connection fed from a POE switch ancillary power port.

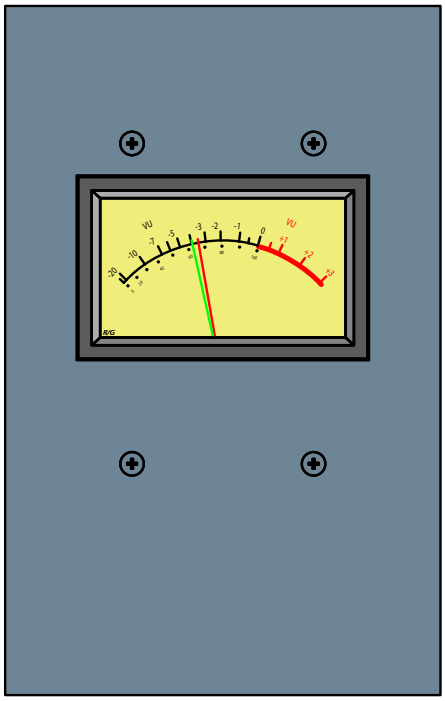
DIP switch configuration

PCB mounted DIP switches provide some configuration options for moving coil meters. To access these switches, the panel needs to be removed from the control surface. Once removed, the drive card for the meters is accessible from the rear.

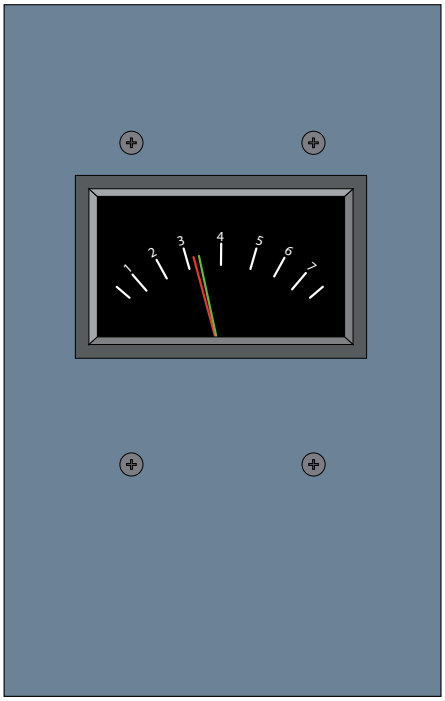
Level

A bank of 4 switches is used on each audio leg to set the level to be displayed on the meters at line-up.

MV5778 - STEREO VU METER



MU5775 - STEREO PPM METER



These are adjusted to compensate for the meter type fitted and operating level. The table below shows which bank of switches is used for each audio channel.

Each bank of four switches should be set as per the table below for the required line-up level.

CHANNEL LEVEL SWITCHES

Audio Path	Switch
Left	SW 2
Right	SW 3

LEVEL SWITCH SETTINGS

1	2	3	4	Level
0	0	0	0	0
0	0	0	1	-2
1	0	0	1	-4
1	1	0	1	-6
1	1	1	1	-15

TWIN STEREO MOVING COIL METER

The MU5891 is fitted with two dual needle moving coil meters with PPM scaling and ballistics. The left hand meter has red / green needles for displaying stereo audio. The right hand meter has white / orange needles, intended to display the M/S content of the stereo signal fed.

This panel type is a standard 250mm [9.84'] wide, the same as fader panels, assignable panels and up-stand meter panels.

As with all moving coil and 3rd party meters, this panel does not access meter data and requires an audio feed via the console's rear interface.

If it is to be fed directly from the console, this should be provisioned for in the quantity of Hydra2 output ports ordered.

Moving coil meters can be fed with either digital or analogue audio signals. The inputs are mixed rather than switched however so only one format should be fed at any given time.

Connections

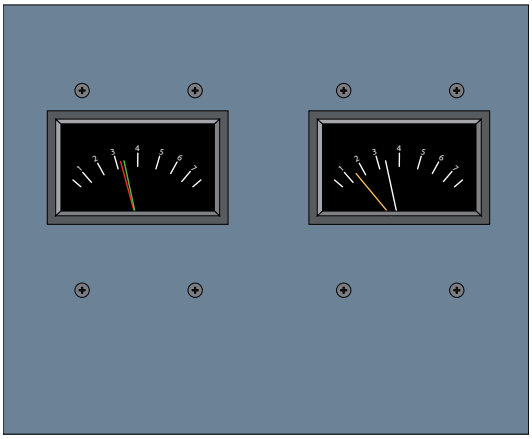
Audio is received via a female D25 connector on the console's rear interface panel. This wires internally to a female D25 on the back of the meter panel itself. See the Surface Rear Connector Pin-outs section for wiring detail.

The panel is powered via a single RJ45 connection fed from a POE switch ancillary power port.

DIP switch configuration

PCB mounted DIP switches provide some configuration options for moving coil meters. To access these switches, the panel needs to be removed from the control surface. Once removed, the drive card for the meters is accessible from the rear.

MU5891 - TWIN STEREO MOVING COIL METER



Level

A bank of 4 switches is used on each audio leg to set the level to be displayed on the meters at line-up. These are adjusted to compensate for the meter type and operating level. The table below shows which bank of switches is used for each audio channel.

CHANNEL LEVEL SWITCHES

Audio Path	Switch
1 Left	SW 2
1 Right	SW 3
2 Left	SW 1
2 Right	SW 4

Each bank of four switches should be set as per the table below for the required line-up level:

LEVEL SWITCH SETTINGS

1	2	3	4	Level
0	0	0	0	0
0	0	0	1	-2
1	0	0	1	-4
0	1	0	1	-6
0	0	1	1	-9

L/R or M/S

The right hand meter can be set to display left / right stereo, or M/S (mid/side / sum/difference). DIP switch 5 should be set accordingly as shown in the following table. In M/S mode, the mono sum can be a standard A+B-6, or it can be set to A+B-3, using DIP switch 6.

SWITCH 5 - L/R / M/S

1	2	3	4	Operation
1	0	1	0	L/R
0	1	0	1	M/S

SWITCH 6 - A+B-6/-3

1	2	Operation
1	1	A+B-3
0	0	A+B-6

TWIN VU MOVING COIL METER – MV5943

The MV5943 is fitted with two, single needle moving coil meters with VU scaling and ballistics.

This panel type is 195mm [7.68'] wide, the same width as a 3rd party surround meter and is therefore ideally suited to be located next to the reset / facilities panel, or a 55mm blank panel to give a combined width of 250mm [9.84'] - that of a standard panel such as faders, assignables and upstand TFTs.

Moving coil meters do not access the meter data system and require an audio feed via the console's rear connector interface. If the meter is to be fed directly from console outputs, this should be provisioned for in the quantity of Hydra2 output ports ordered.

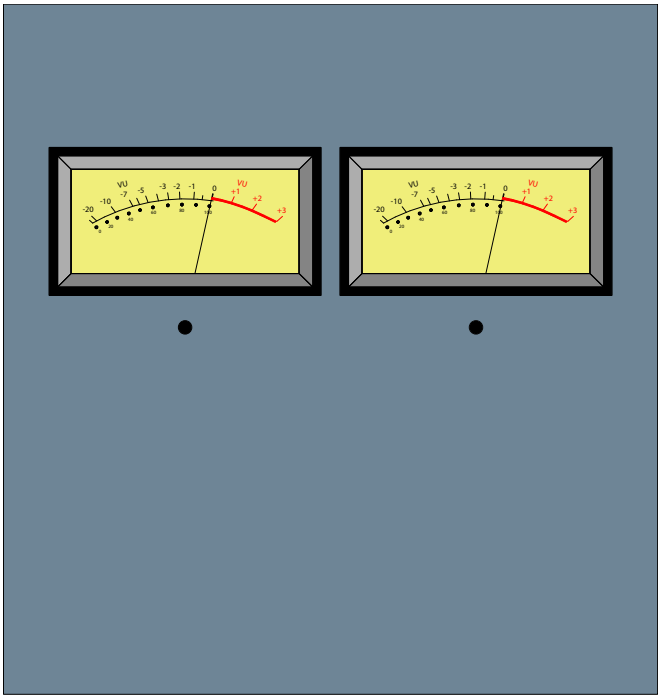
Moving coil meters can be fed with either digital or analogue audio signals. The inputs are mixed rather than switched however so only one format should be fed at any given time.

Connections
Audio is received via a female D25 connector on the console's rear interface panel. This wires internally to a female D37 on the back of the meter panel itself. See the Surface Rear Connector Pin-outs section for wiring detail.

Meter panels are powered via a single RJ45 connection fed from a POE switch ancillary power port.

DIP switch configuration
The drive card for this panel type is designed to work only with VU meters and as such has no DIP switch configuration options.

MV5943 - TWIN VU MOVING COIL METER



QUAD VU MOVING COIL METER - MV5889

The quad moving coil option is fitted with four, single needle moving coil meters with VU scaling and ballistics.

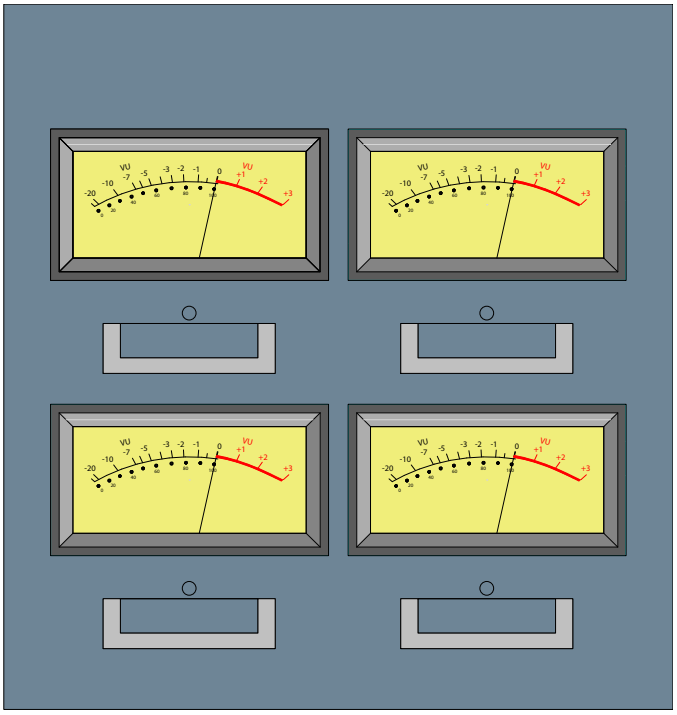
This panel type is 195mm [7.68'] wide, the same width as a 3rd party surround meter and is therefore ideally suited to be located next to the reset / facilities panel, or a 55mm blank panel to give a combined width of 250mm [9.84'] - that of a standard panel such as faders, assignables and up-stand TFT's.

The same panel is also available as an MV5970 which is slightly narrower at 185mm [7.28'], designed specifically to sit in a 3+ chassis section alongside a 6 way VU panel, a reset / facilities panel and a standard TFT meter panel.

Moving coil meters do not access the meter data system and require an audio feed via the console's rear connector interface. If the meter is to be fed directly from console outputs, this should be provisioned for in the quantity of Hydra2 output ports ordered.

Moving coil meters can be fed with either digital or analogue audio signals. The inputs are mixed rather than switched however so only one format should be fed at any given time.

MV5899 - QUAD VU MOVING COIL METER



Connections

Audio is received via a female D25 connector on the console's rear interface panel. This wires internally to a female D37 on the back of the meter panel itself. See the Surface Rear Connector Pin-outs section for wiring detail.

Meter panels are powered via a single RJ45 connection fed from a POE switch ancillary power port.

DIP switch configuration

The drive card for this panel type is designed to work only with VU meters and as such has no DIP switch configuration options.

6 WAY VU MOVING COIL METER - MV5916

The MV5916 is fitted with six, single needle moving coil meters with VU scaling and ballistics.

This panel type is unusual at 270mm [10.63'] wide, 20mm wider than standard control panels and would therefore need to be fitted along with blank panels in many chassis configurations. It does however fit perfectly alongside the reduced width MV5970 4 way VU panel in a 3+ chassis section along with a standard TFT meter panel and the reset / facilities panel.

Moving coil meters do not access the meter data system and require an audio feed via the console's rear connector interface. If the meter is to be fed directly from console outputs, this should be provisioned for in the quantity of Hydra2 output ports ordered.

Moving coil meters can be fed with either digital or analogue audio signals. The inputs are mixed rather than switched however so only one format should be fed at any given time.

Connections

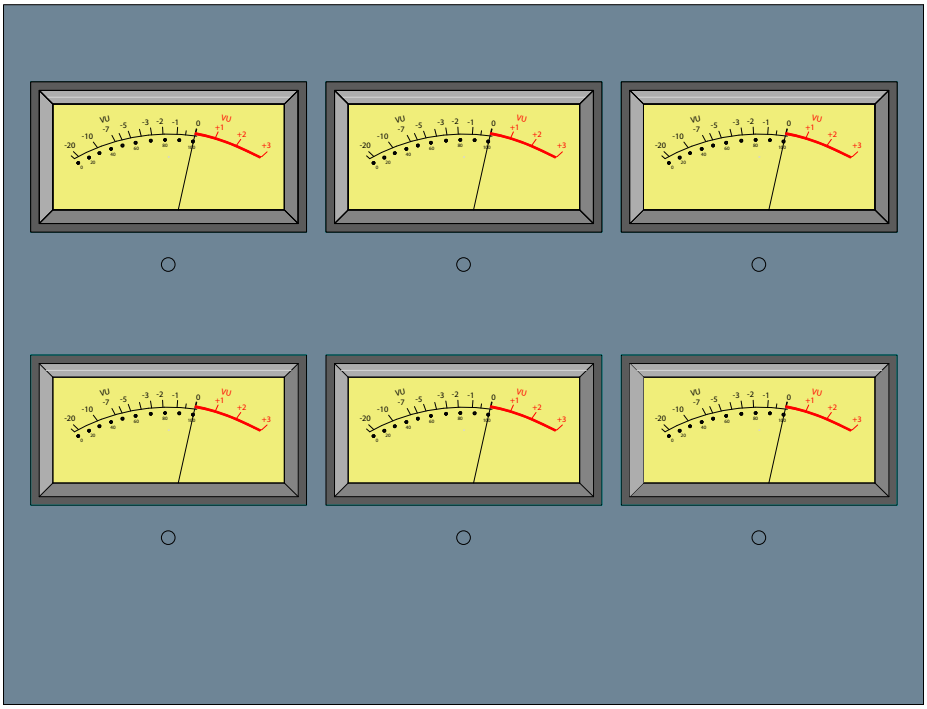
Audio is received via female D25 connectors on the console's rear interface panel. These wire internally to a female D37 on the back of the meter panel itself. See the Surface Rear Connector Pin-outs section for wiring detail.

Meter panels are powered via a single RJ45 connection fed from a POE switch ancillary power port.

DIP switch configuration

The drive card for this panel type is designed to work only with VU meters and as such has no DIP switch configuration options.

MV5916 - SIX WAY VU MOVING COIL METER



APOLLO
SPECIFICATIONS

CALREC

GENERAL SPECIFICATIONS – APOLLO

SIGNAL PROCESSING

Apollo	Sample Rate @ 48kHz	Sample Rate @ 96kHz
Input Channels	1020	510
Main Output Buses and LtRt outputs	Up to 16 from Main/Group pool of 128 mono legs Up to 16 LtRt outputs	Up to 8 from Main/Group pool of 64 mono legs Up to 8 LtRt outputs
Audio Group Buses	Up to 48 from Main/Group pool of 128 mono legs	Up to 24 from Main/Group pool of 64 mono legs
Track Output Buses	96	48
Aux Output Buses	Up to 48 mono / stereo from pool of 48 mono legs	Up to 24 mono / stereo from pool of 24 mono legs
Direct / Mix-Minus Outputs	Up to 4 sends per path from pool of 512 mono legs	Up to 4 sends per path from pool of 256 mono legs
Insert Send & Returns	Pool of 256 mono legs	Pool of 128 mono legs
Input Delay	Up to 2.73s per input from pool of 256 mono legs	Up to 2.73s per input from pool of 128 mono legs
Output Delay	Up to 2.73s per output from pool of 256 mono legs	Up to 2.73s per input from pool of 128 mono legs
EQ	6 full bands of parametric EQ on each channel, group & main	6 full bands of parametric EQ on each channel, group & main
Dynamics	2 x compressor / limiter & 1 x expander / gate on each channel, group & main path	2 x compressor / limiter & 1 x expander / gate on each channel, group & main path

ROUTER

Apollo	Sample Rate @ 48kHz	Sample Rate @ 96kHz
Integral Router	8192x8192	4096x4096 (minimum) 1 x 96 kHz route = 2 x 48 kHz routes
Hydra2 ports	16 / 32	16/32
Audio Channels per Port	Up to 512	Up to 256

CONTROL SURFACE

Apollo	
Max Physical Faders	80 (160 with dual faders)
Fader Layers	12 dual layers

POWER / ENVIRONMENTAL SPECIFICATION

CONTROL SURFACE

AC Power	**The operating AC voltage is 100-240V +/-10%, 50-60Hz.** Two IEC AC power inlets on the rear of the control surface are internally distributed to twin PSU POE switches located within the surface chassis which in turn power the main surface components. Feeding either of these IEC connectors with mains power is sufficient for console operation, however it is recommended that both are fed, and where possible from separate sources to provide full redundancy in the event of an internal PSU or external power source failure. The inrush current is actively limited to 13A peak at 230 VAC (6.5A at 115VAC) per internal PSU (Total number of internal PSU's is dependent on the number of POE switches fitted, typically between 2 and 5 depending on the size of the control surface. Each switch contains two PSU's, separately fed from the two IEC inputs). Limiting the inrush current reduces the chances of a nuisance trip or blown fuse from brown-out conditions or black-out recovery. The peak operating current is when all fader motors are active simultaneously, max 5W per fader for less than 120mS. The internal PSU's are high efficiency and employ active PFC (Power Factor Correction). The power factor is > 0.9 under all operating conditions. A third IEC AC power inlet powers third party manufactured hardware in the control surface, such as RTW / DK meters and the PC monitor screen).
DC Power	Internal AC-DC power supplies output 56V DC via POE (power over Ethernet) to the main control surface components. DC power and data is shared over a common RJ45 connection. All components can safely be 'hot-plugged', are self initialising and sync with the system on receiving power. Each module locally performs isolated DC-DC conversion, operating over a wide input range of 36-75V to provide a high level of immunity against surges, transients and dips in supply.
Heat Output & Efficiency	The heat output from the console is typically 0.9 x total RMS VA. PSU efficiency is typically > 85% under all operating conditions, depending on the control surface size.
Cooling	The control surface is cooled by natural convection. Air intakes are located on the underside of the chassis, outlet vents are located across the top of the rear. At least 50mm (2') clearance should be maintained around the intakes and outlets to ensure airflow is unimpeded.
Operating Ambient Air Temperature	Short term: 5°C - 35°C. Long term: 15°C - 30°C.
Relative Humidity	5% - 80% Non-condensing.

PROCESSING CORE

AC Power	**The operating AC voltage is 100-240V +/-10%, 50-60Hz.** The processing core has 2 slots for AC fed PSU modules. The core will be fully functional on one PSU, however both should be fitted and fed where possible from separate sources to provide redundancy against both PSU failure and external power loss. The inrush current is actively limited to 13A peak at 230V (6.5A at 115V) per power supply module, reducing the chances of a nuisance trip or blown fuse from brown-out conditions or black-out recovery. The PSU modules are high efficiency and employ active PFC (Power Factor Correction). The power factor is > 0.9 under all operating conditions.
DC Power	The core PSU modules share the load of the whole core, their DC outputs being combined and tracked across the core backplane to each card slot. All core module type's, including the PSU's are hot-pluggable and self-initialising. Core PSUs output 56V DC. Each processing module within the core performs local isolated DC-DC conversion, operating over a wide input range of 36-75V to provide a high level of immunity against surges, dips and transients in supply.
Heat Output & Efficiency	The heat output from the core is nominally 0.93 x total RMS VA. The maximum possible heat output in a fully populated core is 320W.
Cooling	The core is cooled by fan assisted convection. Fan speed is monitored and warnings generated if any fan slows or stops. 6 x 120mm low power, low speed and low noise fans are mounted inside the top of the core. Air is drawn in from the cable-tray and up through the bottom of the cardframe. Air is vented out of the top of the rear of the core. No clearance is required above or below the core for cooling or airflow. At least 50mm (2') clearance must be maintained at the top of the rear of the cores to allow the fans / vents to dissipate air. The cable tray should not be blocked and should be allowed sufficient clearance to maintain cooling. The core may be mounted in an open bay providing the ambient air temperature is within limits (see below). The core may also be housed in an air conditioned bay providing the air pressure is negative. Consult factory for positive air pressure systems.
Acoustic Noise	A fully populated core produces <40dB acoustic noise (A-weighted, 1m from front).
Operating Ambient Air Temperature	0°C - 35°C.
Relative Humidity	5% - 80% Non-condensing.

HYDRA2 FIXED FORMAT I/O

Power	**The operating AC voltage is 100-240V +/-10%, 50-60Hz.** 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, and where possible from separate sources to provide redundancy against both PSU failure and external power loss. 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 available for all types of I/O box. 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 & 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 boxes. The low power PSU efficiency is again dependent 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 dependent 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 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 - 35°C.
Relative Humidity	5% - 80% Non-condensing.

HYDRA2 MODULAR I/O

Power	**The operating AC voltage is 100-240V +/-10%, 50-60Hz.** Modular Hydra2 I/O frames are fitted with dual power supplies and have 2 IEC mains 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 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 dependent 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 & Efficiency	The Heat output from modular Hydra2 I/O boxes 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. The same amount of clearance should be provided at the rear of the core to allow the fans to vent adequately. Both fans will continue to run (and therefore cool the card-frame) in the event that one of the PSU's fails or loses its' AC mains source. 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	Dependent on loading, typically <28 dB SPL (A-weighted, 1m from front).
Operating Ambient Air Temperature	0°C - 35°C.
Relative Humidity	5% - 80% Non-condensing.

AUDIO PERFORMANCE SPECIFICATION

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 to 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 to 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	-105dB 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)

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

SYNCHRONISATION INPUTS

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

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, track or main output	30	0.626ms	0.313ms
	Analogue Outputs	Port to port	65	1.354ms	0.677ms
	Analogue Outputs	channel, group, and aux, track 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, track or main output	55	1.146ms	0.573ms
	Analogue Outputs	Port to port	90	1.876ms	0.938ms
	Analogue Outputs	channel, group, and aux, track 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 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

DYNAMIC RANGE FOR 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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