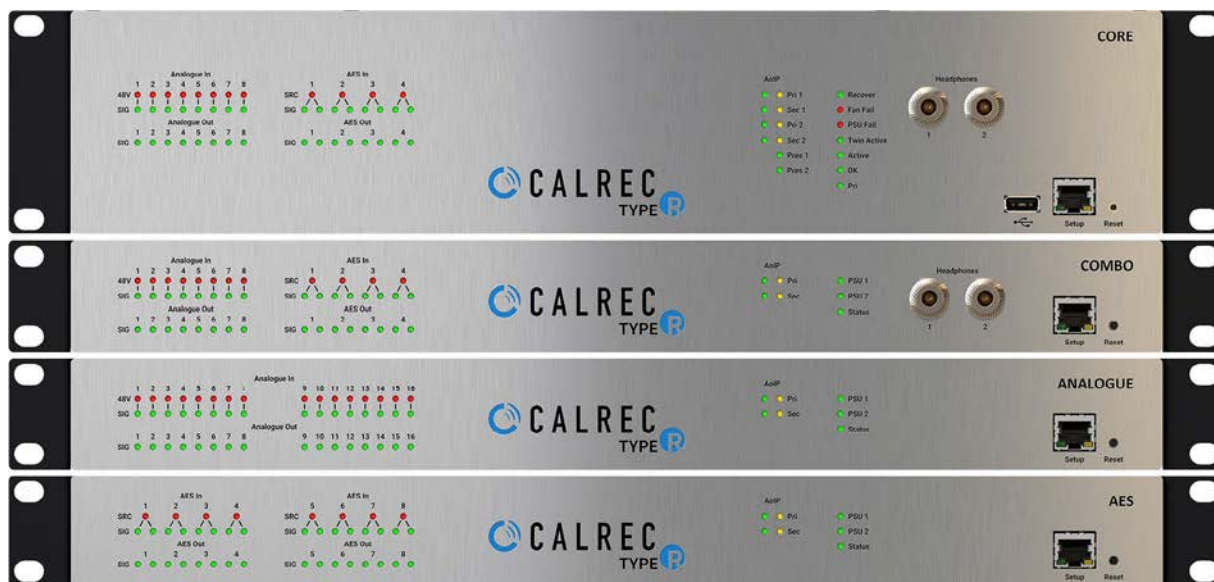


TYPE R INSTALLATION MANUAL



Radio Production System

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

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TYPE R

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TYPE R

INFORMATION

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

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

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

Product Warranty

A full list of our conditions and warranties relating to goods services is contained in Calrec's standard terms and conditions. A copy of this is available on request.

Repairs

If you need to return goods to Calrec for whatever reason, please contact your regional distributor, or Calrec customer support beforehand for guidance, as well as to log the details of the problem and receive a reference number.

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Website:

www.calrec.com

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

Standard of Service

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

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

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

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

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

Serial Numbers

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

When contacting Calrec Customer Support with a hardware inquiry it is important that the correct Calrec serial number is provided to enable the customer support team to provide a high level of service. Type R serial numbers can be found on the label on each unit of the Type R system.

After Sales Modifications

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

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

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

Installation

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

Service Personnel

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

Third Party Equipment

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

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

ESD (Static) Handling Procedures

In its completed form, this equipment has been designed to have a high level of immunity to static discharges. However, when handling individual boards and modules, many highly static sensitive parts are exposed. In order to protect these devices from damage and to protect your warranty, please observe static handling procedures, for example, use an appropriately grounded anti-static wrist band.

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

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

RoHS Legislation

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

In the unlikely event of a customer having to carry out any re-soldering on any Apollo, Artemis, Summa, Brio, Type R, Hydra2 or Impulse hardware, it is imperative that lead-free solder is used; contaminating lead-free solder with leaded solder is likely to have an adverse effect on the long-term reliability of the product. Circuit boards assembled with lead-free solder can be identified (in accordance with IPC/JEDEC standards) by a small oval logo (see below) on the top-side of the circuit board near the PCB reference number (8xx-xxx). The same logo is used on the connector hoods of soldered cable assemblies.

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

ISO 9001 and RAB Registered

Calrec Audio Ltd has been issued the ISO9001: 2008 standard by the Governing Board of ISOQAR.

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

UKAS AND ANAB REGISTRATION



LEAD FREE



LEAD FREE STICKER



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 operate 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.
- Caution - Shock Hazard
- Disconnect all power sources 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).
- An appropriate disconnect device shall be provided as part of the installation. If the plug is to be used as the disconnection device, then the socket outlet shall be easily accessible.
- 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.

The altitude warning symbol indicates that the equipment is to be used at an altitude not exceeding 2000m.

The multiple power sources symbol indicates that more than 1 power source is connected and that all power sources should be disconnected before servicing.

Earthing

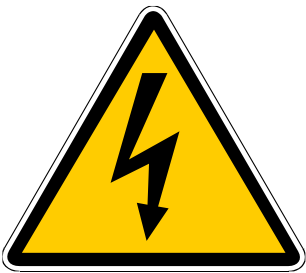
This is a Class I product. An Earth connection MUST be provided in each AC power cord.

The Earth Bolt connection at the rear of the core is provided for those users who wish to have a separate ground/ earth connection using Earth cable at least 6 mm² in cross section (10 AWG), this connection is optional and is NOT a requirement to comply with safety standards.

Lithium Battery Replacement

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

DANGEROUS VOLTAGES



IMPORTANT INSTRUCTIONS



ALTITUDE WARNING SYMBOL



MULTIPLE POWER SOURCES SYMBOL



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.

There are a number of options when ordering Type R Systems: for User Interfaces and I/O options.

The System consists of either 1 or 2 UR6500 Cores connected to a combination of IM6413 6-wide Fader Panels, MU6411 Large Soft Panels (LSP), MU6410 Small Soft Panels (SSP) connected via a PoE+ ethernet switch & Calrec Assist running on a configuration computer. The Core contains Analogue and AES I/O as well as GPIO connectivity. In addition there are a number of I/O unit types which can be connected to using AoIP interfaces. The following table shows all Type R options:

	Surfaces and Core Packs
Type R Surfaces	Type R can be supplied with various combinations of Fader Panels, Large Soft Panels and Small TFT panels together with Calrec Assist to form the user's required Console Surface. • Each IM6413 6-wide Fader Panel has a dedicated fader status display, 4 user definable large buttons F1-F4, 2 user definable small buttons R1 & R2 and a user definable rotary control cell R with its own control display for each of the 6 faders. Note that each fader can access two layers described as Layer A and Layer B, this can be switched from a user definable button. • Each MU6411 Large Soft Panel has a touch controlled TFT, 6 user definable rotary controls and 6 user definable buttons. • Each MU6410 Small Soft Panel has a touch controlled TFT, 1 user definable rotary control and 1 user definable button. In addition Calrec Assist is provided as a GUI application to run on a configuration computer optionally supplied by Calrec or provided by the customer, providing it meets the minimum specification.
Type R Core	Power, Router, Control Processor, and DSP are all self contained within the 2U Core unit which has two IEC connectors to provide PSU redundancy. Two Cores are linked together to provide full system redundancy. Twin Core Redundancy is available from v2.1 onwards. The core operates at 44.1, 48, & 96 kHz and supports up to 3 Consoles. *Note : 96kHz operation will be made available in a later release. A number of DSP packages are available for 1, 2 or 3 consoles running on a core. These are listed in the Core DSP Pack Options section of this document.
Cabling	A Y-Split IEC cable is required for supplying power to the core and each of the Optional I/O units The Power for the Console surface panels is supplied from PoE+ Gigabit Managed switches or PoE+ injectors over Cat5e or Cat6 shielded twisted pair (STP) cable.
	AoIP I/O packs
Type R Core I/O	The 2U high UR6500 Core provides 4 AES Input ports with SRC indication, 4 AES Output ports, 8 channels of analogue mic/line input with 48v phantom power indication, 8 channels of analogue line level output, 12 GPI and 12 GPO ports and 2 Stereo headphone outputs. In addition, 2 x US6493 AoIP devices (with redundant Primary and Secondary connections) may optionally be fitted inside the unit, each allowing up to 256 channels to be passed in either direction as AoIP streams to/from other I/O devices such as other Type R I/O units via Gigabit IP switches.
Type R Optional I/O	There are 3 optional 1U high Type R I/O box types that can be added to a system via the built in US6525 AoIP interface (with redundant Primary and Secondary connections) which are on the back of each I/O box: • AD6501 Combo I/O unit which provides the same I/O mix as the UR6500 core above but with 6 GPI and 6 GPO ports and 2 Stereo headphone outputs. • AD6502 Analogue I/O unit which provides 16 channels of analogue mic/line input with 48v phantom power indication, 16 channels of analogue line level output, 6 GPI and 6 GPO ports • JD6503 AES I/O unit which provides 8 AES Input ports with SRC indication, 8 AES Output ports, 6 GPI and 6 GPO ports

TYPE R CONTROL SURFACE DIMENSIONS

SURFACE MEASUREMENTS

The following diagrams show the surface measurements for the IM6413 6-way Fader Panel in millimetres (mm) & inches [in]

FIG 1 - TOP VIEW & SIDE VIEW IM6413 6 WAY FADER PANEL

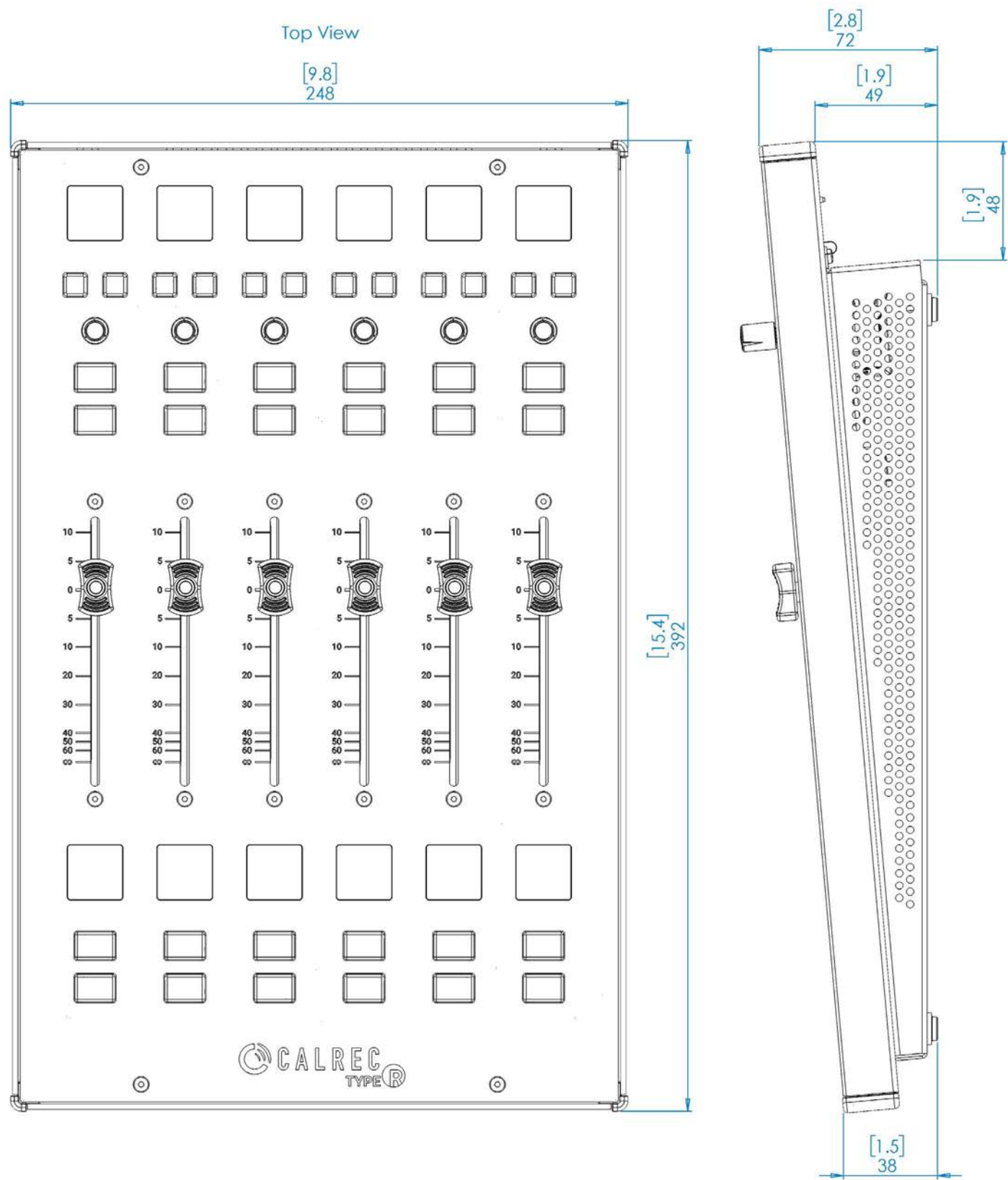


FIG 2 - FRONT VIEW IM6413 6 WAY FADER PANEL

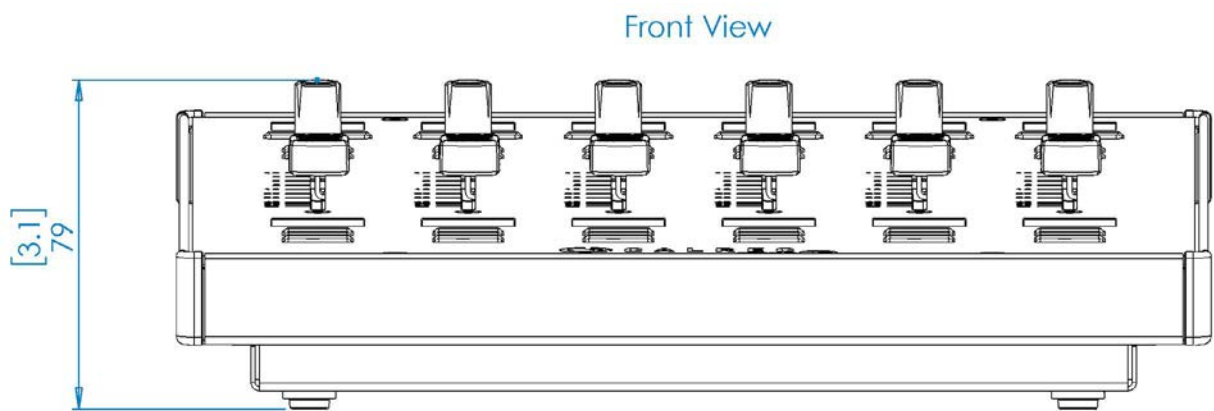
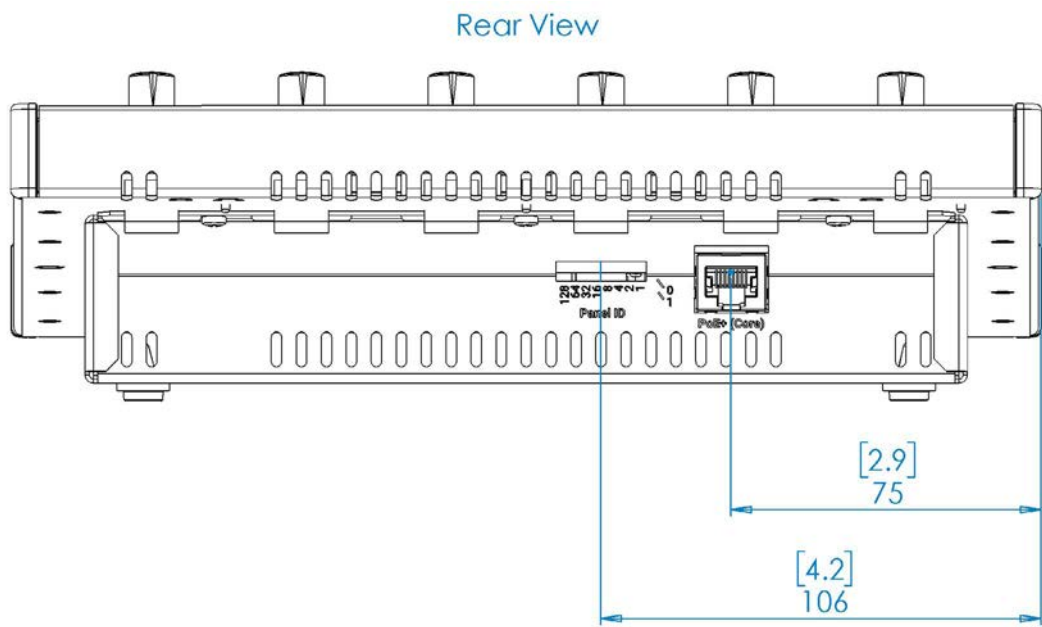


FIG 3 - REAR VIEW IM6413 6 WAY FADER PANEL



Note: These panels can be fastened together to form larger console surfaces.

The following diagrams show the surface measurements for the MU6411 Large Soft Panel in millimetres (mm) & inches [in].

FIG 4 - TOP VIEW & SIDE VIEW MU6411 LARGE SOFT PANEL

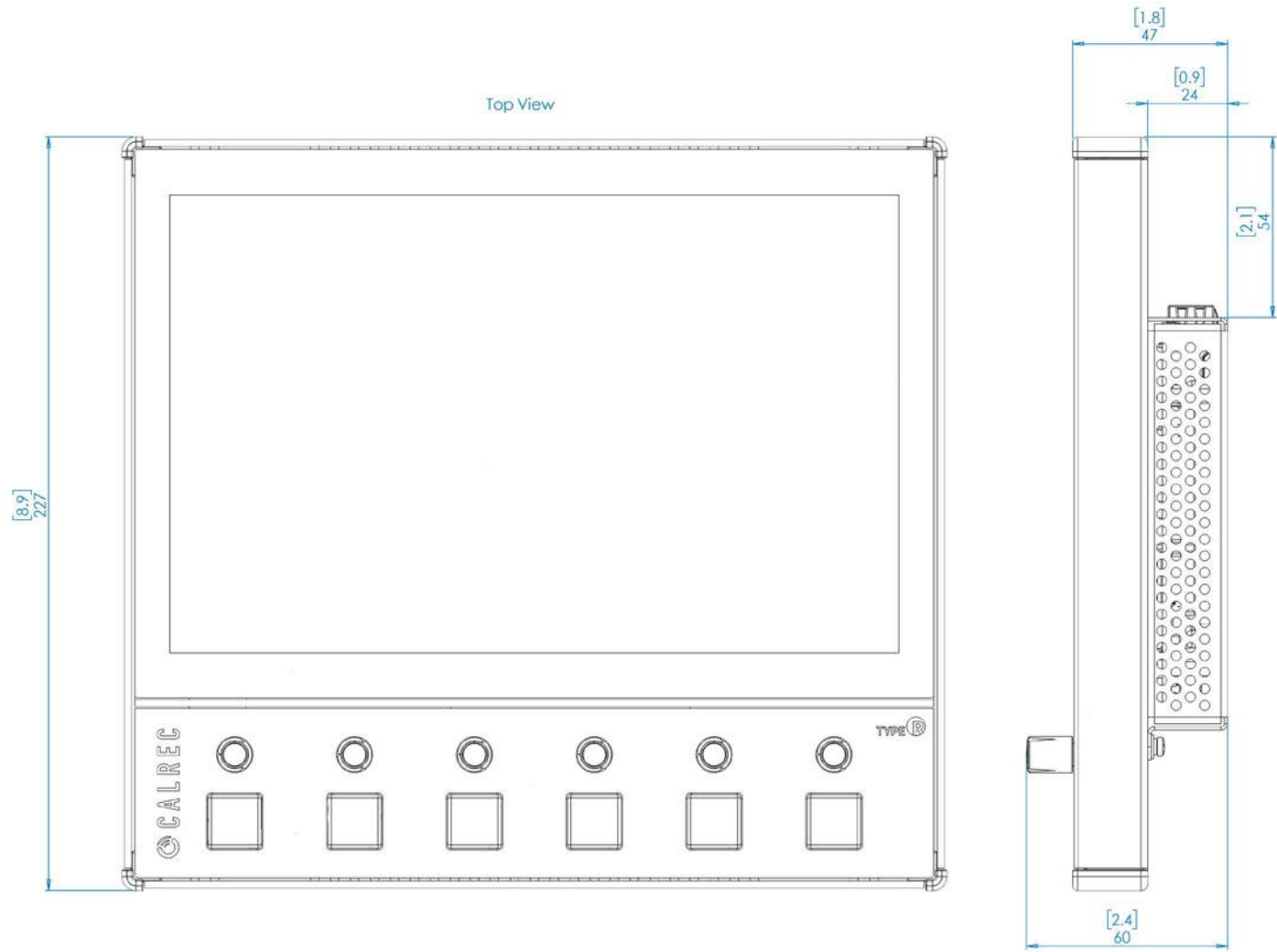


FIG 5 - FRONT VIEW MU6411 LARGE SOFT PANEL

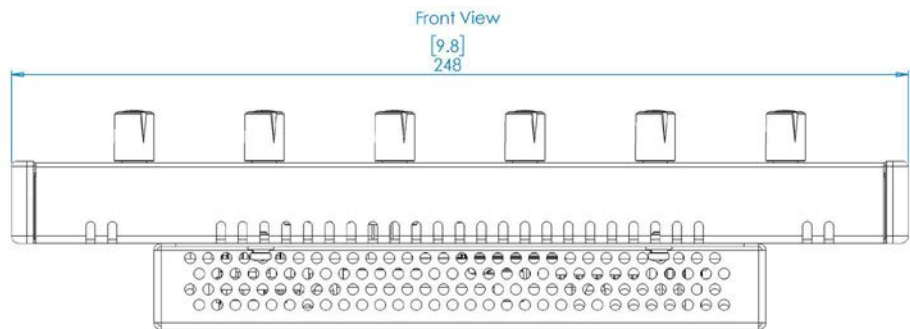


FIG 6 - BOTTOM VIEW MU6411 LARGE SOFT PANEL

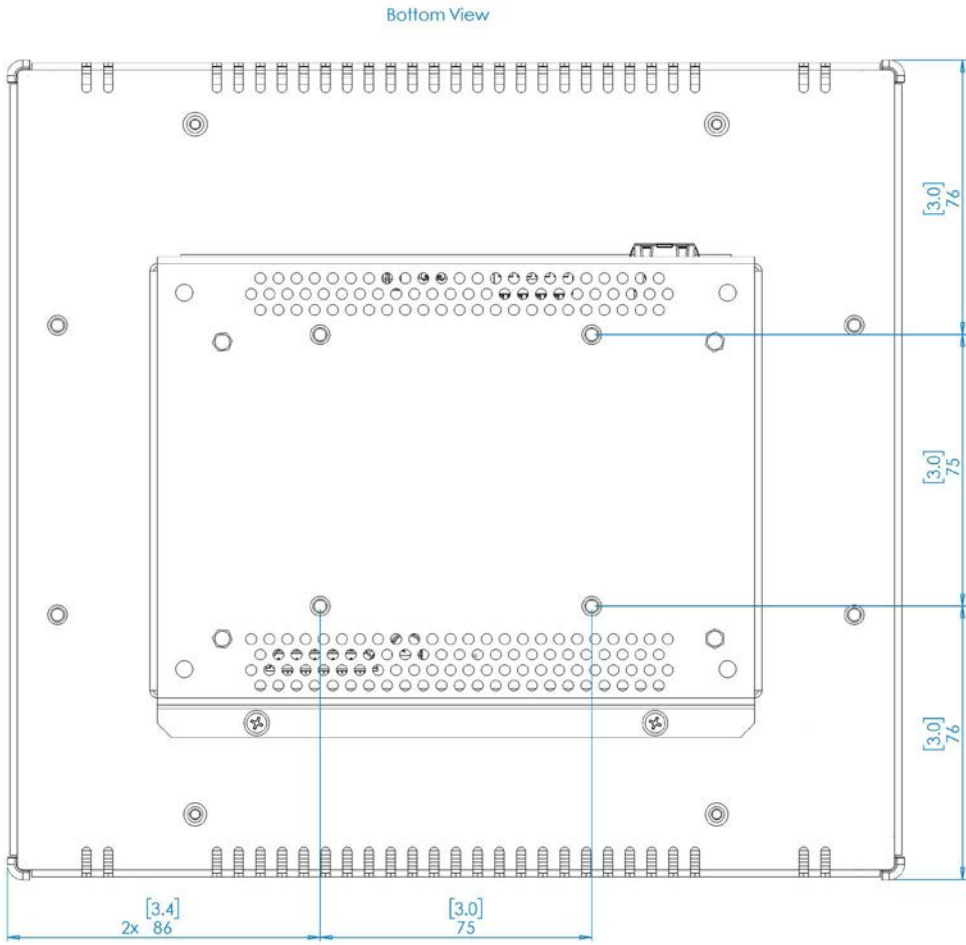
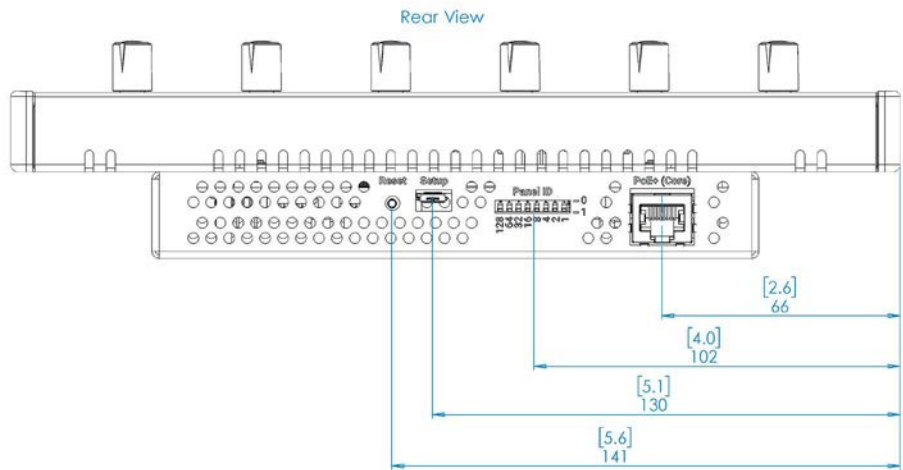


FIG 7 - REAR VIEW MU6411 LARGE SOFT PANEL



Note: These panels can be fastened together to form larger console surfaces.

The following diagrams show the surface measurements for the MU6410 Small Soft Panel all in millimetres (mm) & inches [in].

FIG 8 - TOP VIEW & SIDE VIEW MU6410 SMALL SOFT PANEL

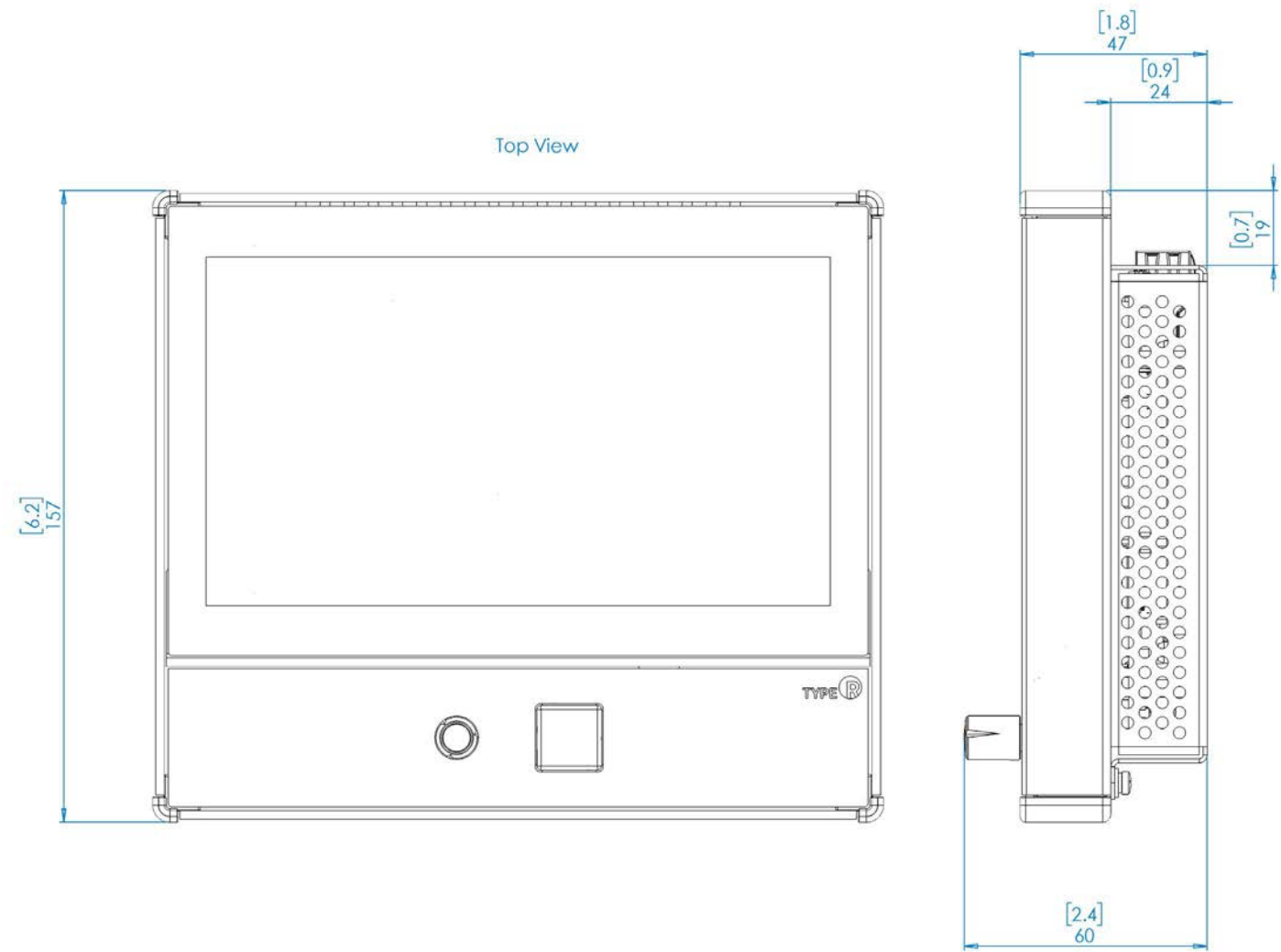


FIG 9 - FRONT VIEW MU6410 SMALL SOFT PANEL

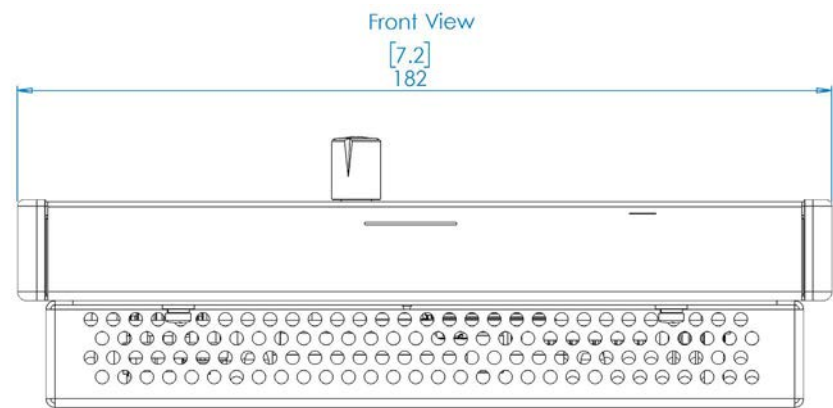


FIG 10 - BOTTOM VIEW MU6410 SMALL SOFT PANEL

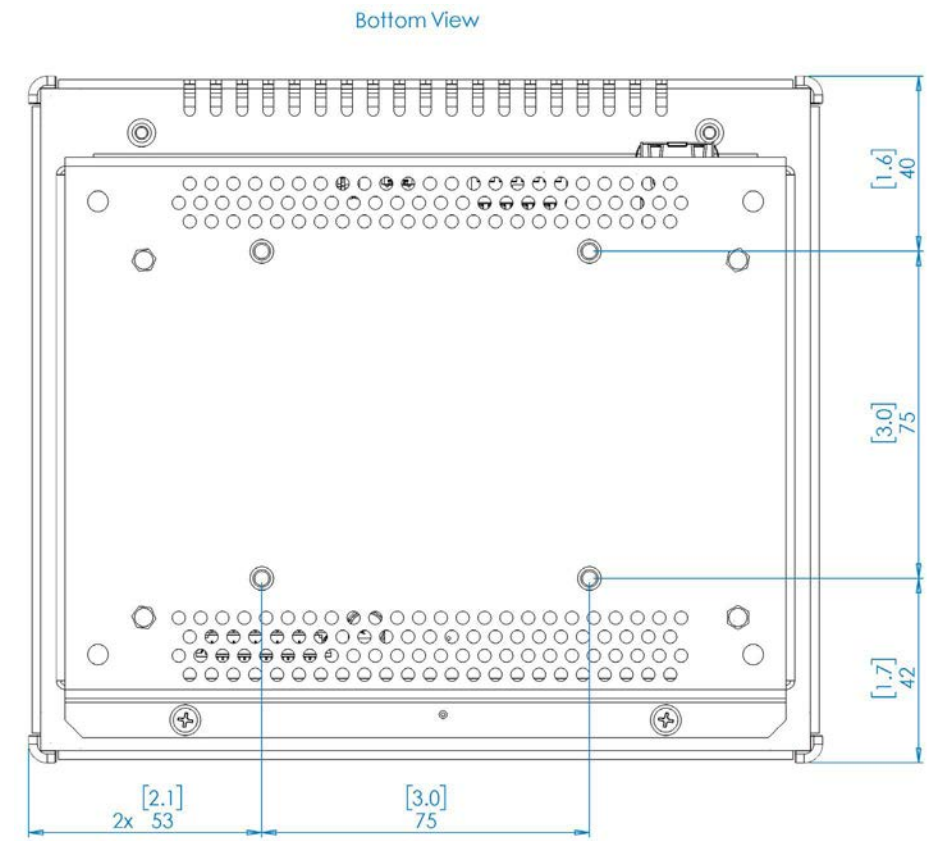
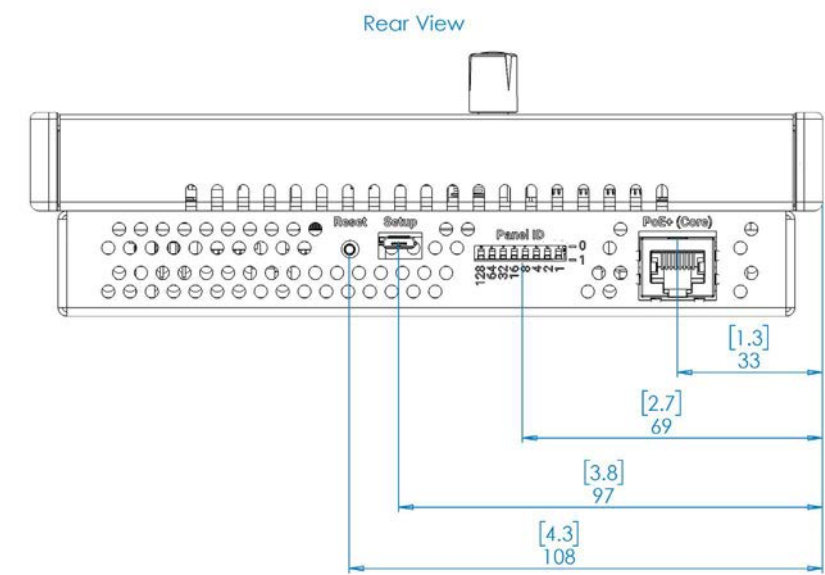


FIG 11 - REAR VIEW MU6410 SMALL SOFT PANEL



Note: These panels are designed to be located wherever a simple control interface is required.

TYPE R FIXING BRACKET ASSEMBLY INSTRUCTIONS

LARGE SOFT PANEL ON DESK STAND (720-999001)

Fig 1 shows the Large Soft Panel (LSP) with desk stand, fixed at a 50 deg viewing angle.

MU6411 Mounting options using 75mm VESA mount fixing screw holes.
The Panel can be mounted in landscape or portrait, with or without rubber feet. The panel is secured with screws. Alternatively, it can be left as free standing.

Landscape fixing hole positions, see Fig 2.

- a) bottom edge 10mm to desk surface without feet, with feet 6.5mm.
- b) bottom edge 13mm to 18mm to desk surface without feet, with feet 16.5mm to 21.5mm.
- c) bottom edge 26mm to desk surface without feet, with feet 29.5mm.

Stand Base

The stand base can be fastened with the stick on feet supplied or fixed to a desk top using screws (not supplied).

Portrait, fixing hole positions, see Fig 3

- a) N/A.
- b) bottom edge 4mm to 9mm to desk surface without feet, with feet 7.5mm to 12.5mm.
- c) bottom edge 17mm to desk surface without feet, with feet 20.5mm.

Assembly

Tools required (not supplied)

A 7mm open ended adjustable spanner/wrench and a PZ2 screwdriver/bit are required for assembly.

If feet are required.

Remove the backing off (Item 3) the adhesive feet before attaching the feet to the corners of stand base (Item 2). Ensure the fixing holes are not obscured.

If stand is to be screwed to desk surface.

Loosely attach the interface bracket (Item 1) to the base (Item 2) with 3 x M4 nuts (Item 4) and washers (Item 5). Align the holes in the bracket (Item 1) with LSP VESA mount holes and attach the stand using 4 x M4 screws (Item 6) with washers (Items 5 & 7). Note, plain washers should be nearest the bracket, see Fig 5 on the following page. Locate on the desk the required location and mark the rear two fixing holes with a pencil. Remove the LSP with the bracket (Item 1) from the base (item 2). Fix the base (Item 2) to the desk top with screws (not provided). Re-attach the interface bracket (Item 1) to the base (Item 2) with 3 x M4 nuts (Item 4) and washers (Item 5), then tighten.

FIG 1 LARGE SOFT PANEL ON DESK STAND



FIG 2 LARGE SOFT PANEL ON DESK STAND LANDSCAPE MODE

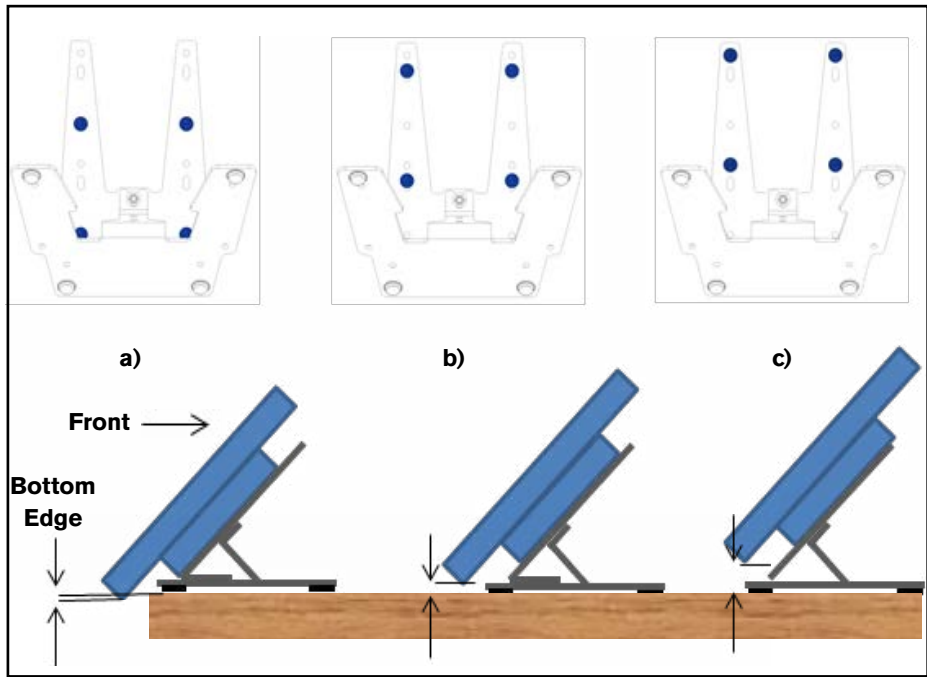
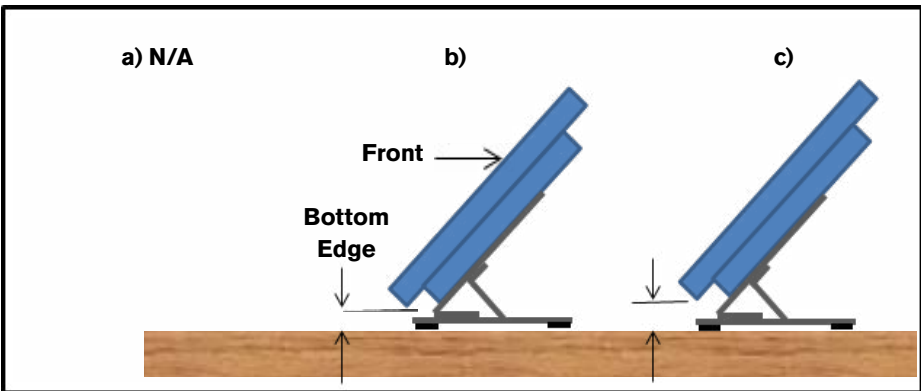


FIG 3 LARGE SOFT PANEL ON DESK STAND PORTRAIT MODE



If the stand is to be placed on a desk surface.

Attach the interface bracket (Item 1) to the base (Item 2) with 3 x M4 nuts (Item 4) and washers (Item 5). Align the holes in the bracket (Item 1) with LSP VESA mount holes and attach the stand using 4 x M4 screws (Item 6) with washers (Items 5 & 7). Note, the plain washers should be nearest the bracket, see Fig 5.

Do not over tighten. Typically 1N/m

The Fig 6 Mounting option uses:-

720-999001 LSP on desk mounting.
720-999006 Fader in desk mounting brackets.

Mounting option for desk thickness 15-25mm (See Fig 7).

Assembly Tools required (not supplied)

A 7mm open ended adjustable spanner/wrench, a PZ2 screwdriver/bit, wood screws and a saw are required for assembly.

Follow instructions for 720-999006 Fader in desk mounting kit.

The fader opening size will require extending to 418mm (16.45in) x 247mm (9.7in). Lift up the fader panel through the opening from underneath the desk. Fix the brackets (720-999006 item 2) to the underside of the desk with 4 screws (not supplied) suitable for a desk surface. Push the Fader Panel from underside until the Fader panel is flush with surface and tighten 4 x M4 nuts (720-999006 Item 5).

Do not over tighten. Typically 1N/m

FIG 4 SUPPLIED PARTS TABLE

Item Number	Part Number	Description	Quantity
1	720-985	LSP Interface Bracket	1
2	720-983	LSP/SSP Stand Base	1
3	390-193	RBS-1BK Adhesive Foot	4
4	360-124	Nut M4 Nyloc	3
5	370-007	Washer M4 Plain	7
6	350-043	M4x10mm Pozi Pan	4
7	370-008	Washer M4 Internal lock	4

FIG 5 SUPPLIED PARTS ASSEMBLY

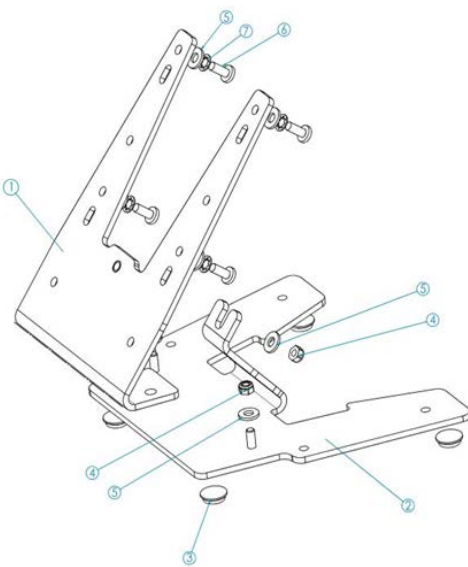


FIG 6 ASSEMBLED BRACKETS

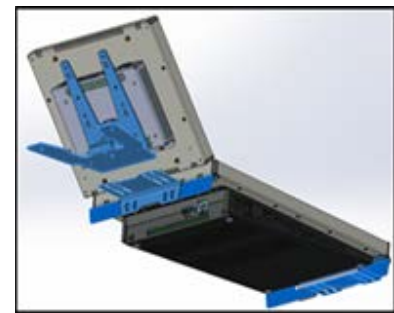
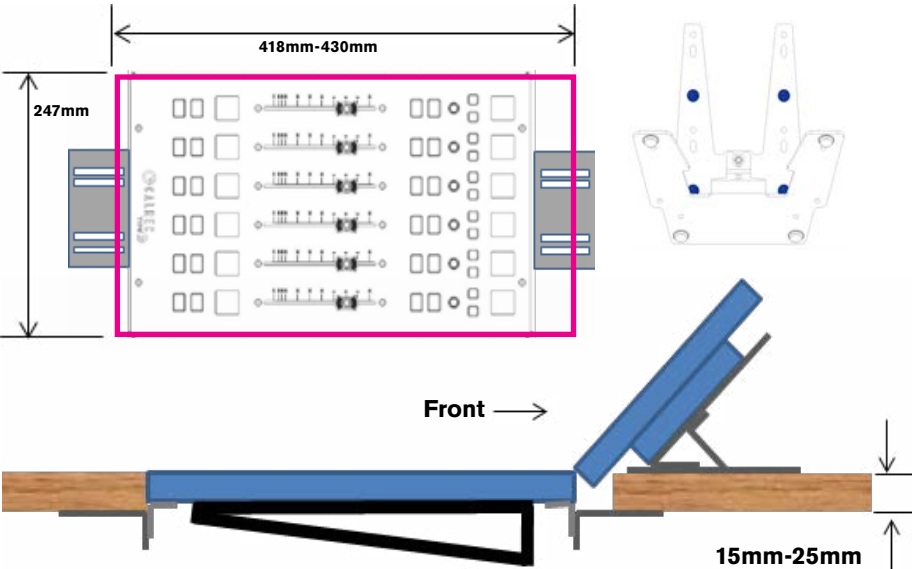


FIG 7 MOUNTING OPTION FOR DESK THICKNESS 15MM-25MM



SMALL SOFT PANEL ON DESK STAND (720-999002)

Fig 1 shows the Small Soft Panel (SSP) with desk stand, fixed at a 50 deg viewing angle.

MU6410 Mounting options using 75mm VESA mount fixing screw holes.

The Panel can be mounted in landscape or portrait, with or without rubber feet. The panel is secured with screws. Alternatively, it can be left as free standing.

Landscape, fixing hole positions, see Fig 2

- a) bottom edge 15mm to desk surface without feet, with feet 20mm.
- b) bottom edge 25mm to desk surface without feet, with feet 30mm.

Stand Base

With stick on feet (supplied).
Without stick on feet screwed down to desk top with screws (not supplied).

Portrait, fixing hole positions, see Fig 3

- a) N/A
- b) Bottom edge 15mm to desk surface without feet, with feet 20mm.

FIG 1 LARGE SOFT PANEL ON DESK STAND



FIG 2 LARGE SOFT PANEL ON DESK STAND LANDSCAPE MODE

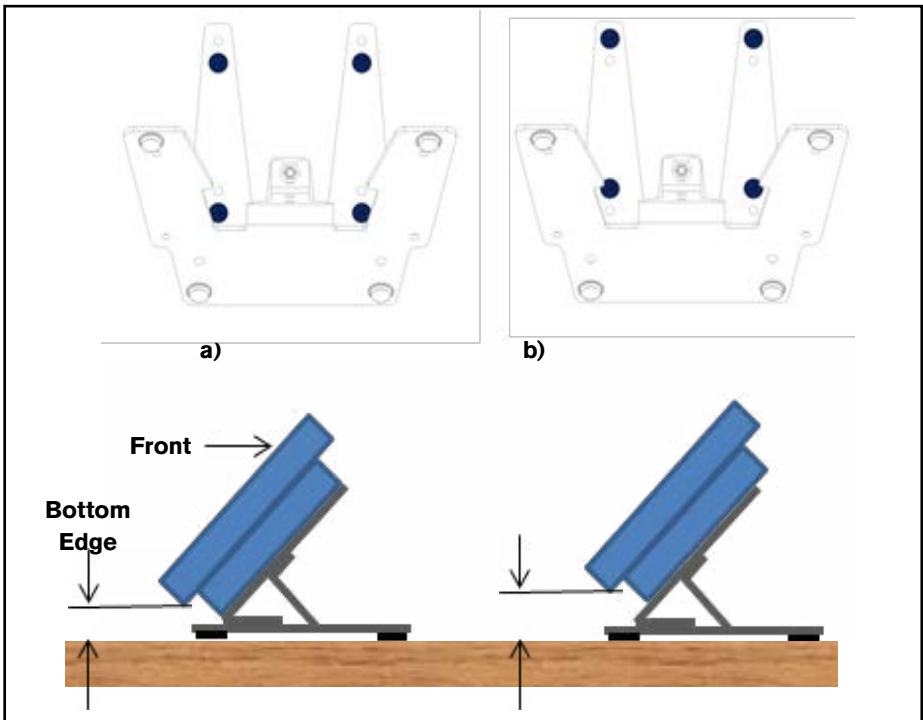
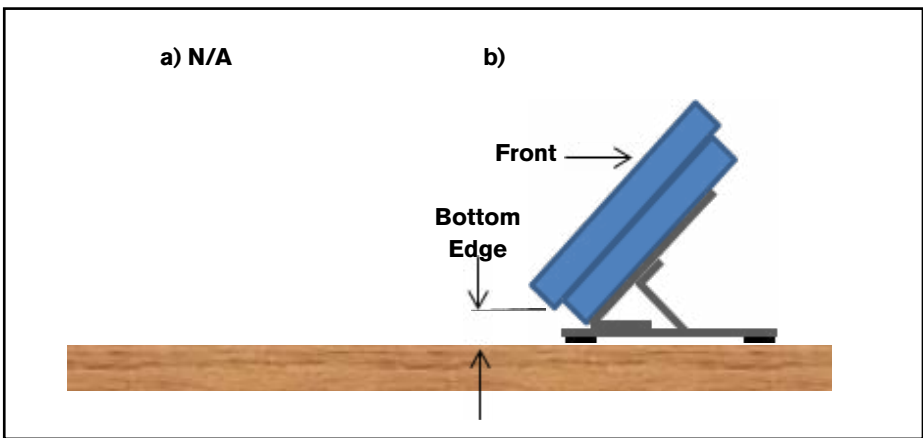


FIG 3 SMALL SOFT PANEL ON DESK STAND PORTRAIT MODE



Assembly

Tools required (not supplied)

A 7mm open ended adjustable spanner/wrench, a PZ2 screwdriver/bit, wood screws and a saw are required for assembly.

If feet are required.

Remove the backing off (Item 3) the adhesive feet before attaching the feet to the corners of stand base (Item 2). Ensure the fixing holes are not obscured.

If stand is to be screwed to desk surface.

Loosely attach the interface bracket (Item 1) to the base (Item 2) with 3 x M4 nuts (Item 4) and washers (Item 5). Align the holes in the the bracket (Item 1) with the SSP VESA mount holes and attach the stand using 4 x M4 screws (Item 6) with washers (Items 5 & 7).

Note: the plain washer should be nearest bracket, as shown in Fig 5.

Locate on the desk the required location and mark with a pencil rear 2 fixing holes. Remove the SSP with bracket (Item 1) from the base (item 2). Fix the base (Item 2) to desk top with screws (not provided) using the 2 marked fixing holes for reference. Re-attach the interface bracket (Item 1) to the base Item 2) with 3 x M4 nuts (Item 4) and washers (Item 5), the tighten.

If stand is to be placed on desk surface.

Attach the interface bracket (Item 1) to base (Item 2) with 3 x M4 nuts (Item 4) and washers (Item 5). Align the holes in bracket (Item 1) with the LSP VESA mount holes and attach the stand using 4 x M4 screws (Item 6) with washers (Items 5 & 7).

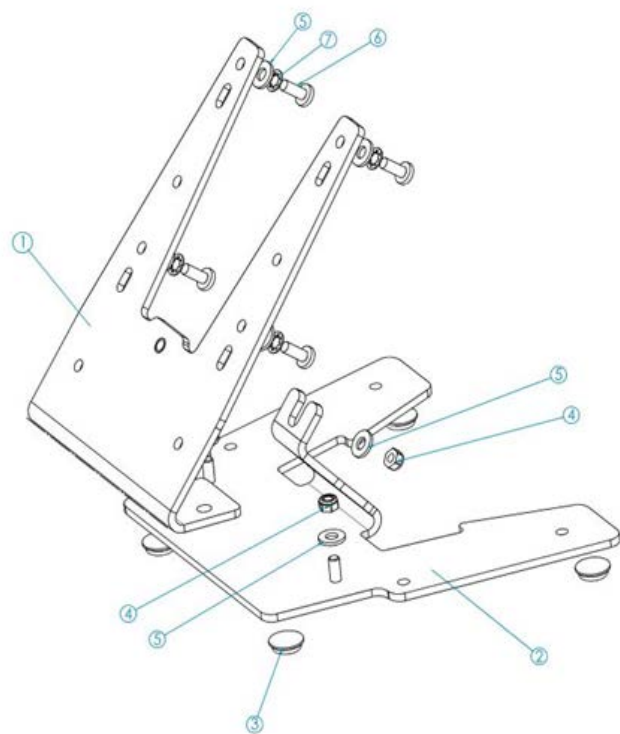
Note plain washer should be nearest bracket, as shown Fig 5.

Do not over tighten. Typically 1Nm.

FIG 4 SUPPLIED PARTS TABLE

Item Number	Part Number	Description	Quantity
1	720-987	SSP Interface Bracket	1
2	720-983	LSP/SSP Stand Base	1
3	390-193	RBS-1BK Adhesive Foot	4
4	360-124	Nut M4 Nyloc	3
5	370-007	Washer M4 Plain	7
6	350-043	M4x10mm Pozi Pan	4
7	370-008	Washer M4 Internal lock	4

FIG 5 SUPPLIED PARTS ASSEMBLY



FADER & LSP ON DESK STAND (720-999003)

Fig 1 shows the Fader and Large Soft Panel (LSP) with desk stand, fixed at a 50 deg viewing angle.

IM6413 & MU6410 Mounting options using 75mm VESA mount fixing screw holes.

The Large Soft Panel is mounted only in landscape.

Landscape, fixing hole positions, see Fig 3

- a) bottom edge 15mm to desk surface without feet, with feet 20mm.
- b) bottom edge 25mm to desk surface without feet, with feet 30mm.

Assembly

Tools required (not supplied)

A 7mm open ended adjustable spanner/wrench, a PZ2 screwdriver/bit, wood screws and a saw are required for assembly.

Stand is to be placed on desk surface.

Remove the backing off (Item 3) adhesive feet before attaching them to the corners of riser base (Item 2). Align 2 holes on the Desk Riser (item 2) with 2 holes on underside of the top edge of fader panel. Attach using 2 Screws (item 6) with washers (item 5 &7), with the plain washer towards the bracket as shown in Fig 4. Loosely attach the LSP bracket (Item 1) to the LSP with 4 screws (Item 6) and washers (item 5 &6). Align with the fixing holes as shown in Fig 4, with the plain washer towards the bracket. Align the Bracket (item 1) with the Riser (item 2) and secure with 3 x M4 nuts (Item 4) and washers (Item 5) as shown in Fig 4. Then tighten the nuts. Check alignment of the LSP with the Fader panel and tighten the fixing screws to the LSP.

Do not over tighten. Typically 1Nm. Place assembly on desk as required.

FIG 3 - FADER & LARGE SOFT PANEL ASSEMBLY

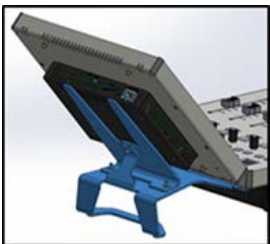


FIG 1 - FADER & LARGE SOFT PANEL ON DESK STAND LANDSCAPE MODE

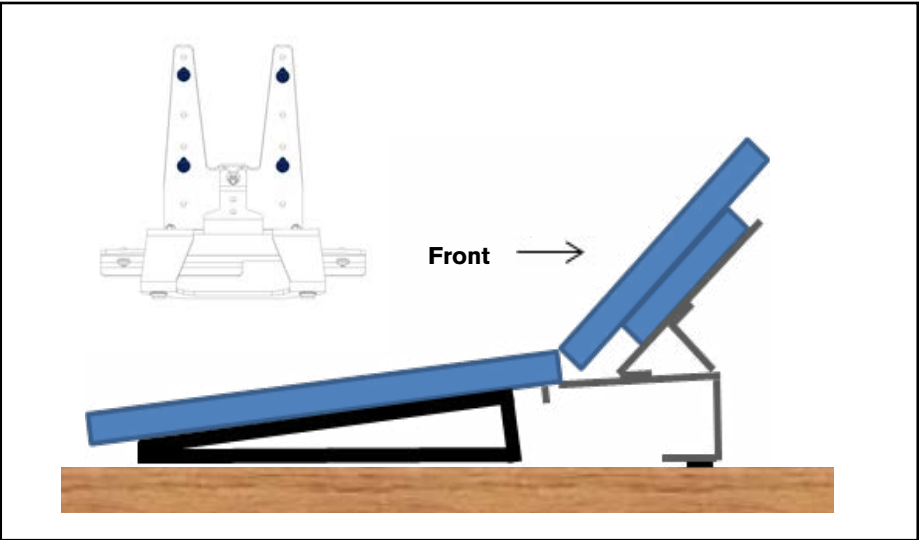
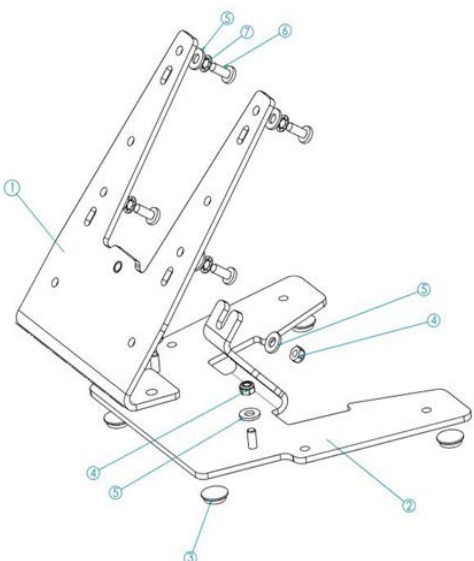


FIG 2 - SUPPLIED PARTS TABLE

Item Number	Part Number	Description	Quantity
1	720-985	LSP Interface Bracket	1
2	720-986	LSP on Desk riser	1
3	390-193	RBS-1BK Adhesive Foot	2
4	360-124	Nut M4 Nyloc	3
5	370-007	Washer M4 Plain	9
6	350-043	M4x10mm Pozi Pan	6
7	370-008	Washer M4 Internal lock	6

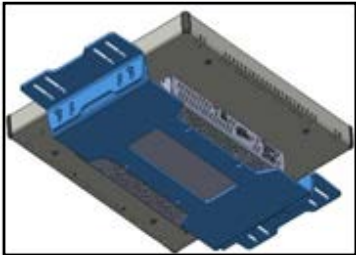
FIG 4 - SUPPLIED PARTS ASSEMBLY



LSP IN DESK MOUNTING (720-999004)

Fig 1 shows the Large Soft Panel (LSP) MU6411, desk mounted.

FIG 1 LARGE SOFT PANEL IN DESK



Flush mounting options

a) Fig 2a, for desk thickness, 9-20mm.

b) Fig 2b, for desk thickness, 40-50mm.

FIG 2 - LARGE SOFT PANEL IN DESK MOUNTING MODES A & B

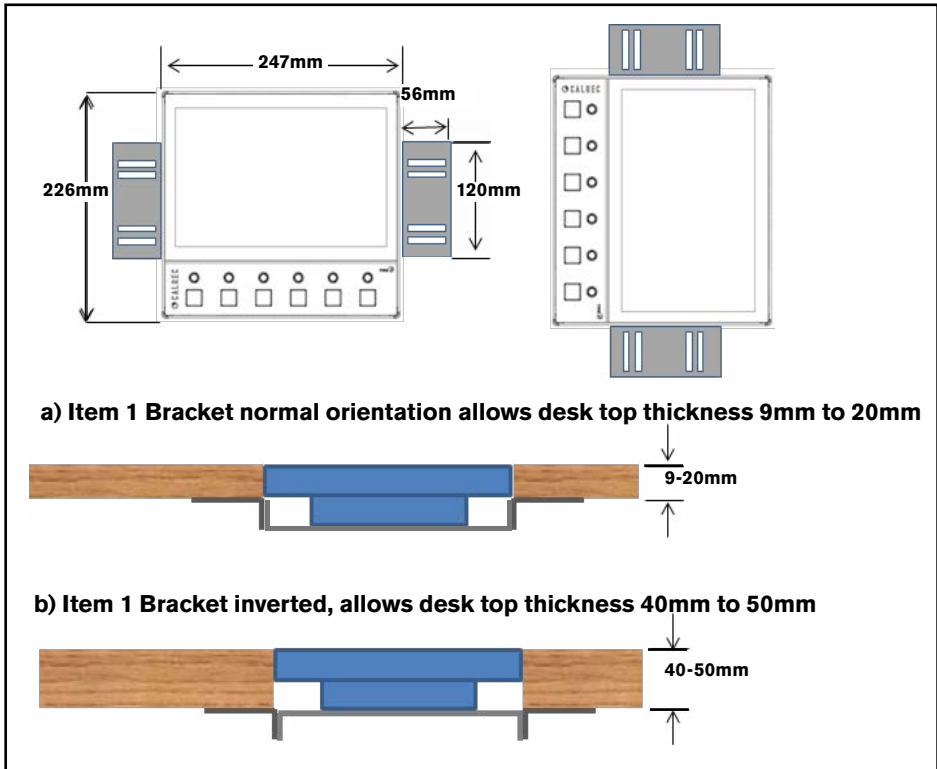
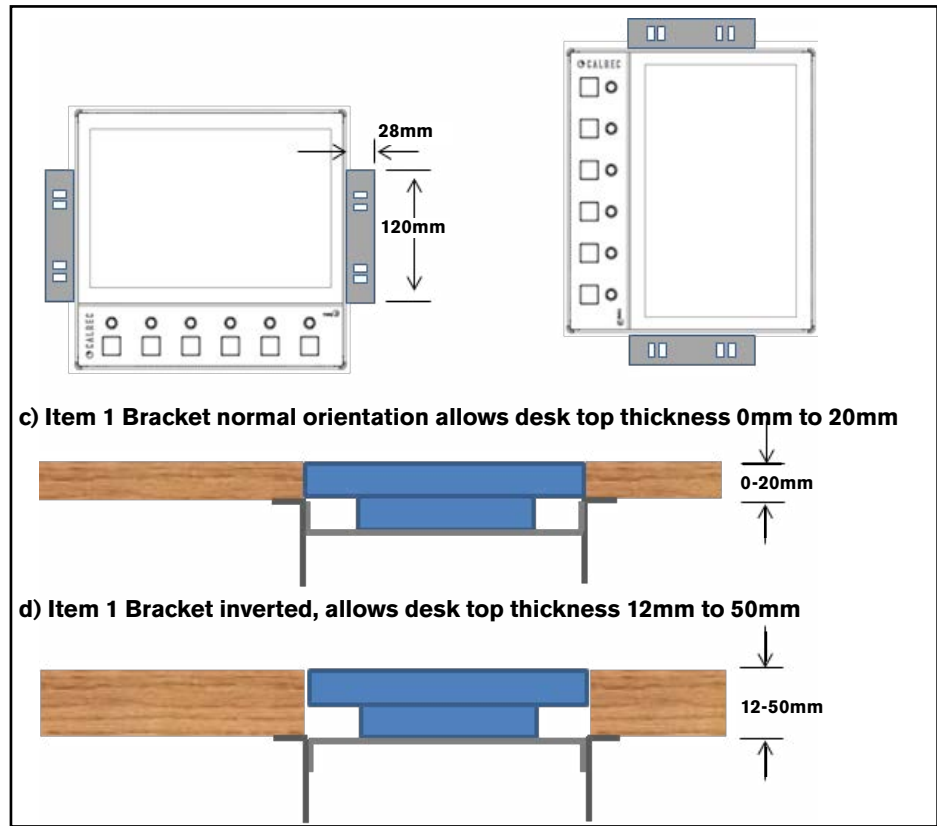


FIG 3 - LARGE SOFT PANEL IN DESK MOUNTING MODES C & D



c) Fig 3c, for desk thickness, 0-20mm.

d) Fig 3d, for desk thickness, 12-50mm.

SSP IN DESK MOUNTING (720-999005)

Assembly - See Fig 4 & 5
Tools required (not supplied)
A 7mm open ended adjustable spanner/ wrench, a PZ2 screwdriver/bit, wood screws and a saw are required for assembly.

Mounting Procedure
Mark out and cut a hole into the desk surface to accommodate the LSP - 247mm (9.7in) x 226mm (8.9in).

Ensure sufficient clearance for the bracket (item 2) from any other items on the underside of desk.

Loosely attach the brackets (Item 2) to bracket mount (Item 1) with 4 x M4 nuts (Item 6) and washers (Item 4). Mounting options a), b), c) or d) are shown in Figs 2 & 3 on the previous page. Align the holes in bracket mount (Item 1) with the LSP and attach the stand using 4 x M4 screws (Item 5) with washers (Items 3 & 4). The plain washer should be nearest bracket, see Fig 5.

Fitting to desk/surface
Cut a hole in desk - 247mm (9.7in) x 226mm (8.9in). lift the LSP through the hole in desk from underneath the desk. Fix the brackets (item 2) to underside of desk with 4 screws (not supplied) suitable for a desk surface. List LSP from underneath the desk until the LSP is flush with the surface and tighten 4 x M4 nuts (Item 6) until firmly in place.

Do not over tighten. Typically 1Nm.

FIG 4 - SUPPLIED PARTS TABLE

Item Number	Part Number	Description	Quantity
1	730-031	LSP Bracket Recess Mount	1
2	730-033	Under Desk Bracket	2
3	370-008	Washer M4 Internal lock	4
4	370-007	Washer M4 Plain	8
5	350-043	M4x10mm Pozi Pan	4
6	360-124	Nut M4 Nyloc	4

FIG 5 - LSP BRACKET MOUNT & UNDER DESK BRACKETS

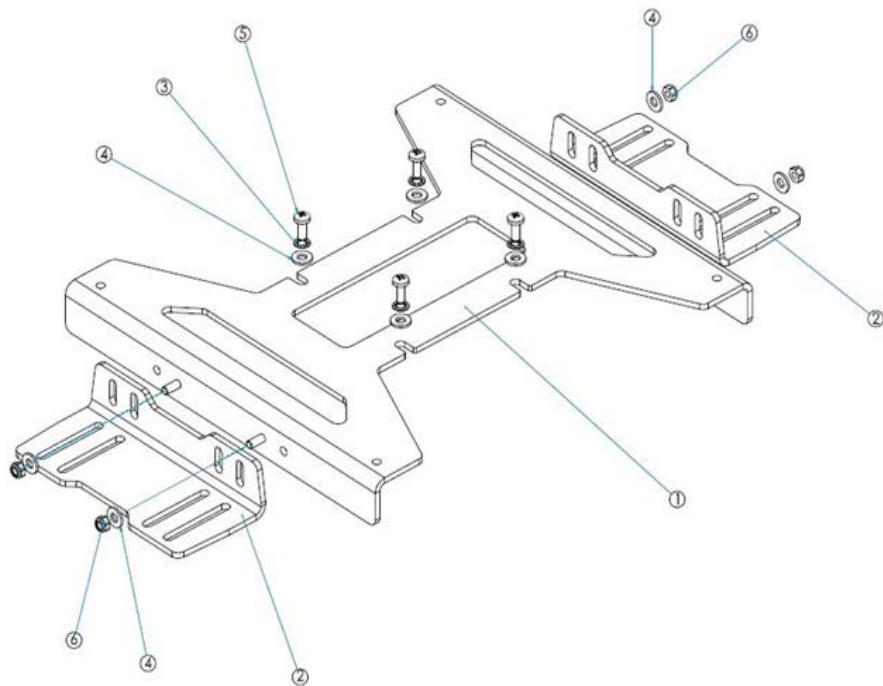
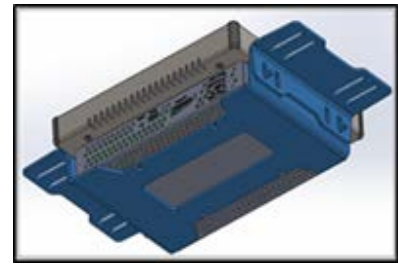


Fig 1 shows the Small Soft panel (SSP) MU6410, desk mounted.

FIG 1 - SMALL SOFT PANEL IN DESK



Flush mounting options

a) Fig 2a, for desk thickness, 10-20mm.

b) Fig 2b, for desk thickness, 40-50mm.

FIG 2 - SMALL SOFT PANEL IN DESK MOUNTING MODES A & B

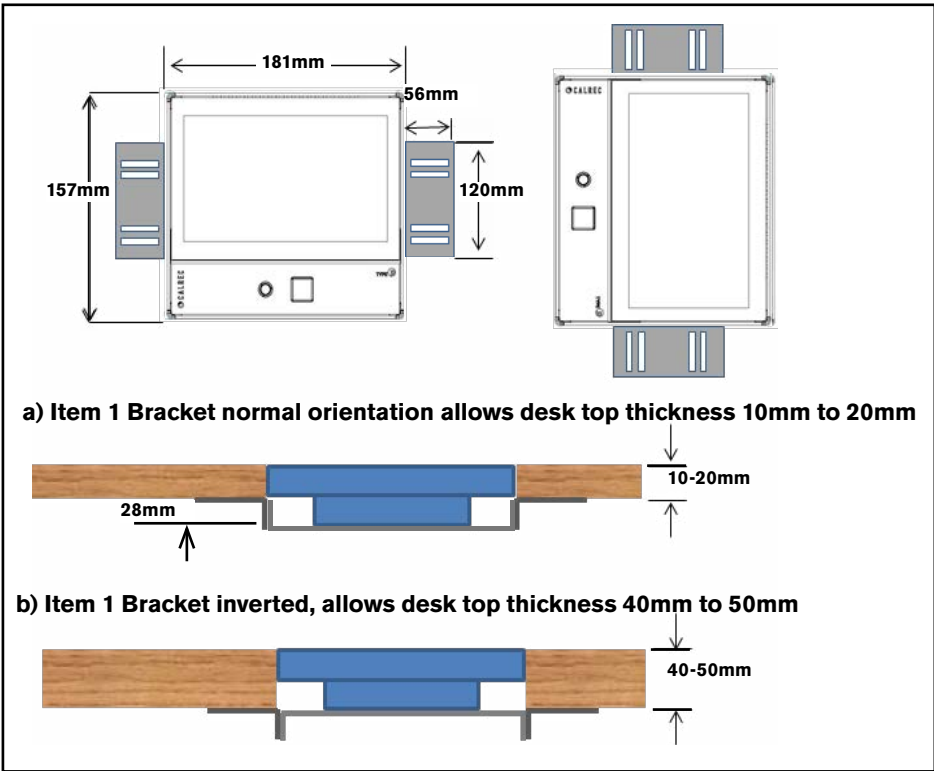
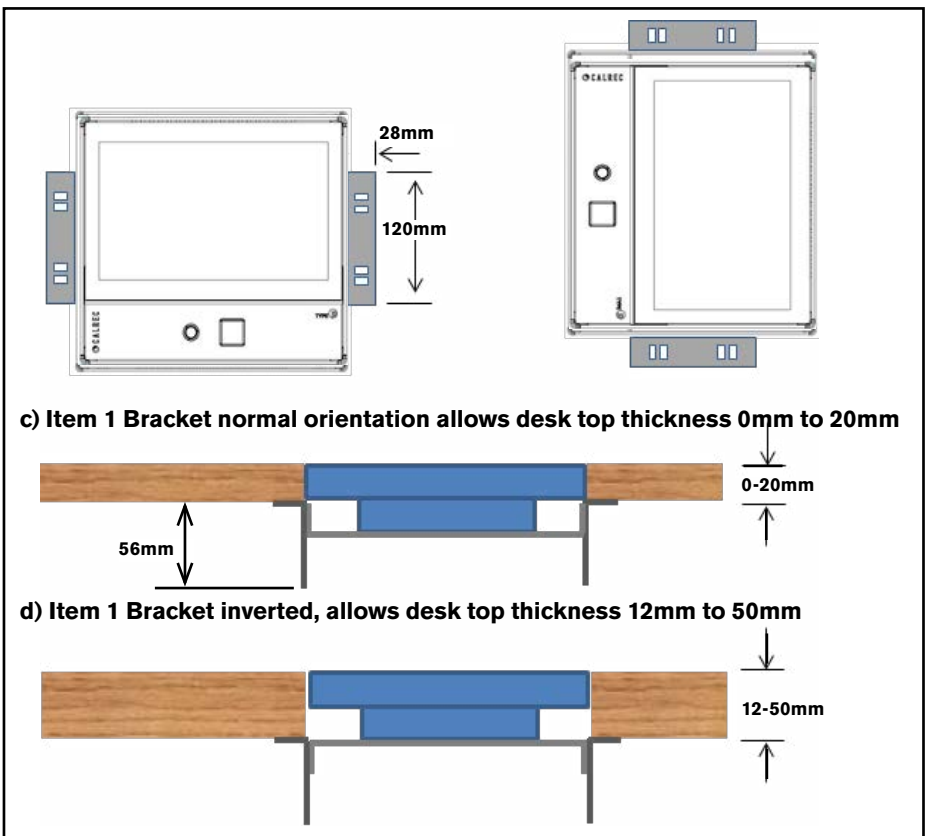


FIG 3 - SMALL SOFT PANEL IN DESK MOUNTING MODES C & D



FADER PANEL IN DESK MOUNTING (720-999006)

Assembly - See Fig 4, 5 & 6

Tools required (not supplied)

A 7mm open ended adjustable spanner/ wrench, a PZ2 screwdriver/bit, wood screws and a saw are required for assembly.

Mounting Procedure

Mark out and cut a hole in the desk surface to accommodate the SSP - 181mm (7.1in) x 157mm (6.2in).

Ensure sufficient clearance for the brackets (item 2) from any other items on the underside of desk and note any cable protrusion from the RJ45 connector.

Loosely attach the under desk brackets (Item 2) to the bracket mount (Item 1) with 4 x M4 nuts (Item 3) and washers (Item 4). Mounting options a), b), c) or d) and shown in Figs 2 & 3 on the previous page. Align the holes in the bracket (Item 1) with the SSP and attach the stand using 4 x M4 screws (Item 5) with washers (Items 4 & 6). The plain washer should be nearest the bracket, see Fig 6.

Set the Panel ID (as once fitted it may be difficult to do so) and lift the SSP through the hole in desk from underneath the desk.

Fitting to desk/surface

Fix the brackets (item2) to underside of desk with 4 screws (not supplied) suitable for a desk surface. List the SSP from underneath the desk until the SSP is flush with the surface and tighten 4 x M4 nuts (Item 3).

Do not over tighten. Typically 1Nm.

Be aware of desk top thicknesses greater than 20mm. This will require a rebate, approx. 100mm x 50mm, to allow clearance for RJ45 connector and finger, see Fig 4.

FIG 4 - FITTING TO DESK/SURFACE

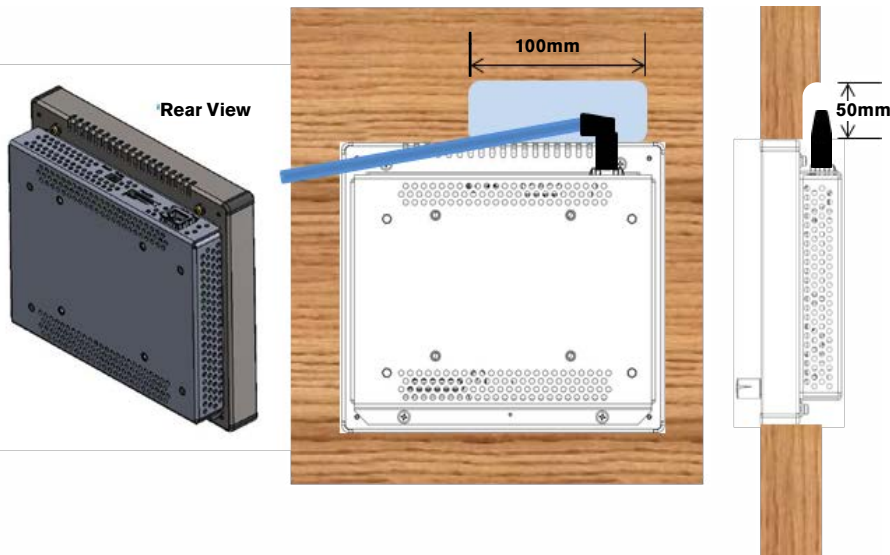


FIG 5 - SUPPLIED PARTS TABLE

Item Number	Part Number	Description	Quantity
1	730-032	SSP Bracket Recess Mount	1
2	730-033	Under Desk Bracket	2
3	360-124	Nut M4 Nyloc	4
4	370-007	Washer M4 Plain	8
5	350-043	M4x10mm Pozi Pan	4
6	370-008	Washer M4 Internal Lock	4

FIG 6 - LSP BRACKET MOUNT & UNDER DESK BRACKETS

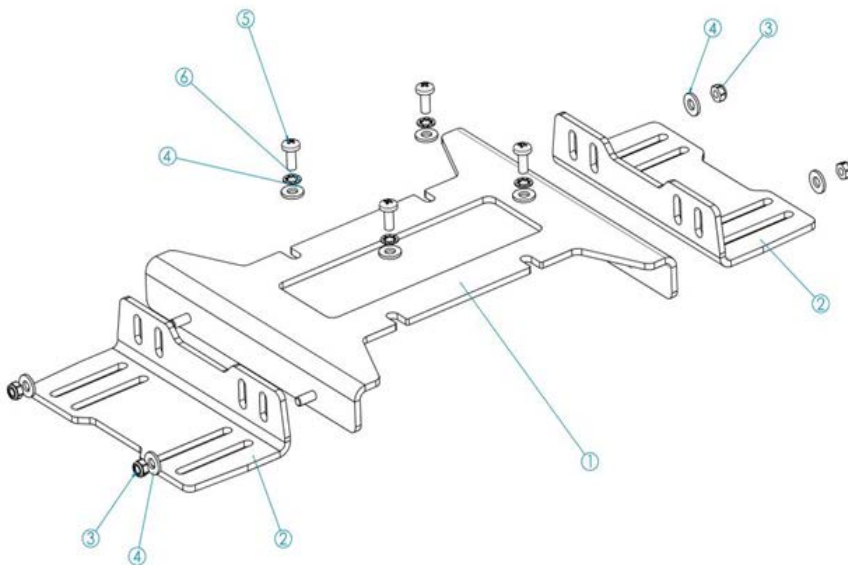


Fig 1 shows the Fader panel IM6413, desk mounted.

FIG 1 - FADER PANEL IN DESK



Flush mounting options

a) Fig 2, for desk thickness, 15-25mm.

FIG 2 - FADER PANEL IN DESK MOUNTING MODE A

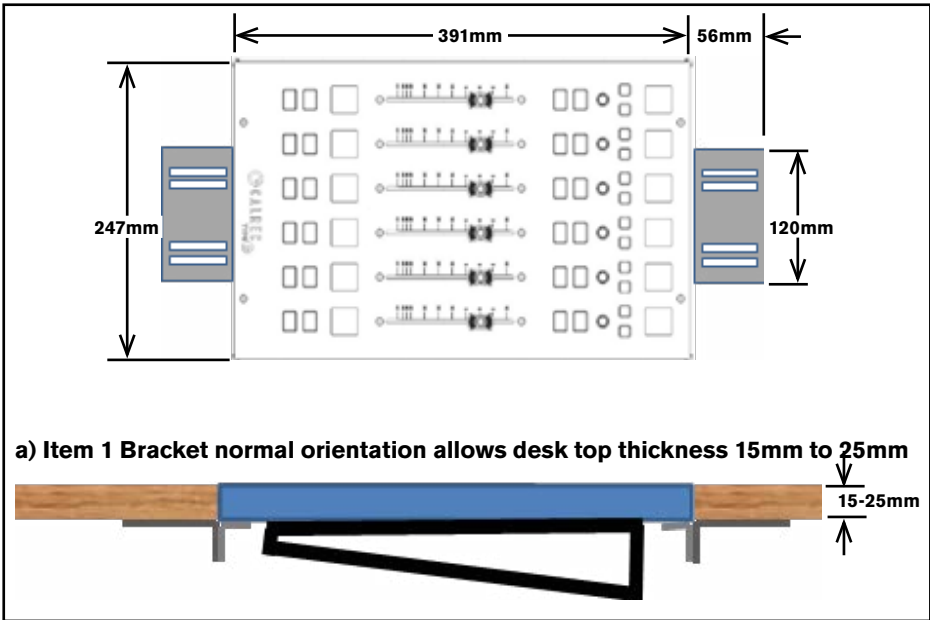
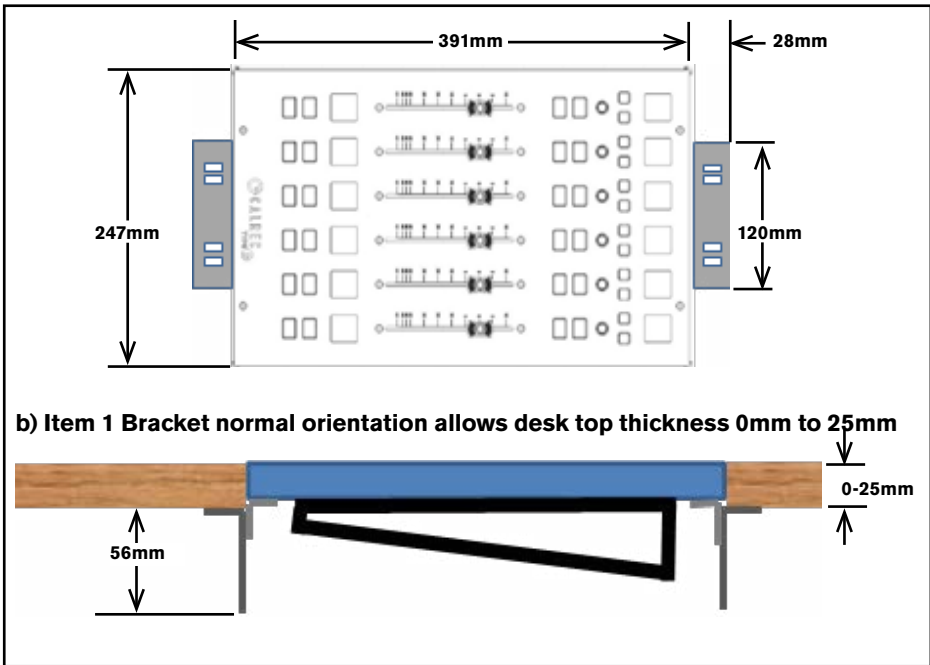


FIG 3 - FADER PANEL IN DESK MOUNTING MODE B



b) Fig 3, for desk thickness, 0-25mm.

Assembly - See Fig 4 & 5

Tools required (not supplied)

A 7mm open ended adjustable spanner/ wrench, a PZ2 screwdriver/bit, wood screws and a saw are required for assembly.

Mounting Procedure

Mark out and cut a hole in the desk surface to accommodate the Fader Panel - 391mm (15.4in) x 247mm (9.7in).

Ensure sufficient clearance for the brackets (item 2) from any other items on the underside of desk and note any cable protrusion from the RJ45 connector.

Loosely attach the under desk brackets (Item 2) to the bracket mount (Item 1) with 4 x M4 nuts (Item 5) and washers (Item 6). Mounting options a) and b) are shown in Figs 2 & 3 on the previous page. Align the holes in the bracket mount (Item 1) with the Fader Panel and attach the stand using 4 x M4 screws (Item 4) with washers (Items 3 & 6). The plain washer should be nearest the bracket, see Fig 5.

Fitting to desk/surface

Lift the Fader Panel through the hole in desk from underneath the desk. Fix the brackets (item 2) to underside of desk with 4 screws (not supplied) suitable for a desk surface. Lift the Fader Panel from underneath the desk until the Fader Panel is flush with the surface and tighten 4 x M4 nuts (Item 4).

Do not over tighten. Typically 1Nm.

FIG 4 - SUPPLIED PARTS TABLE

Item Number	Part Number	Description	Quantity
1	730-030	Fader Bracket Recess Mount	2
2	730-033	Under Desk Bracket	2
3	370-008	Washer M4 Internal lock	4
4	350-043	M4x10mm Pozi Pan	4
5	360-124	Nut M4 Nyloc	4
6	370-007	Washer M4 Plain	8

FIG 5 - FADER BRACKET MOUNTS & UNDER DESK BRACKETS

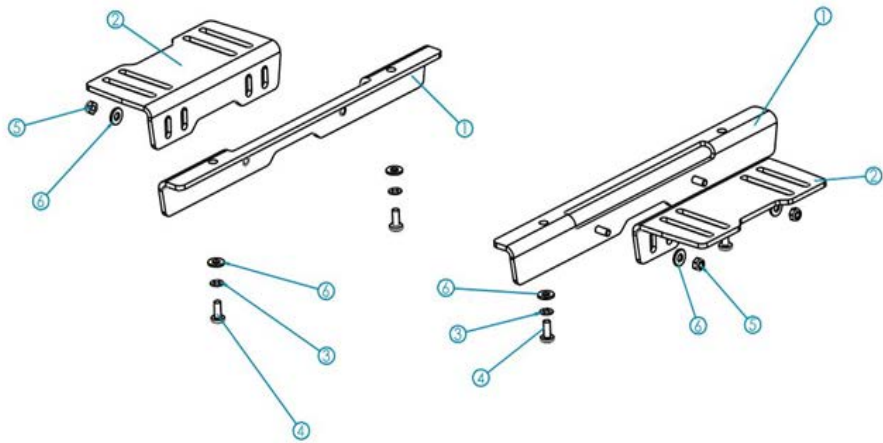


Fig 7 show the Fader Panel desk mounted, with the Large Soft Panel in landscape on a desk stand, fixed at a 50 deg viewing angle.

MU6411 and IM6413 Mounting options using:-
720-999001 LSP on desk mounting
720-999006 Fader in desk mounting brackets.

Assembly -

Tools required (not supplied)

A 7mm open ended adjustable spanner/ wrench, a PZ2 screwdriver/bit, wood screws and a saw are required for assembly.

Follow the instructions for 720-999006 Fader in desk mounting kit, but with the Fader opening size extended to 418mm (16.45in) x 247mm (9.7in). Lift the Fader Panel through the desk from underneath the desk. Fix the brackets (720-999006 item 2) to the underside of the desk with 4 screws (not supplied) suitable for a desk surface. Lift the Fader Panel from underneath the desk until the Fader panel is flush with the surface and tighten 4 x M4 nuts (720-999006 Item 4).

Do not over tighten. Typically 1N/m

Follow instructions for 720-999001 LSP on the desk stand but do not fit rubber feet to stand. VESA fixing holes are as per 720-999001, shown in Fig 2a earlier in this section.

FIG 6 - FADER IN DESK AND LSP ON DESK STAND

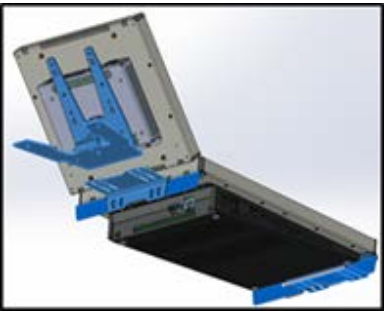
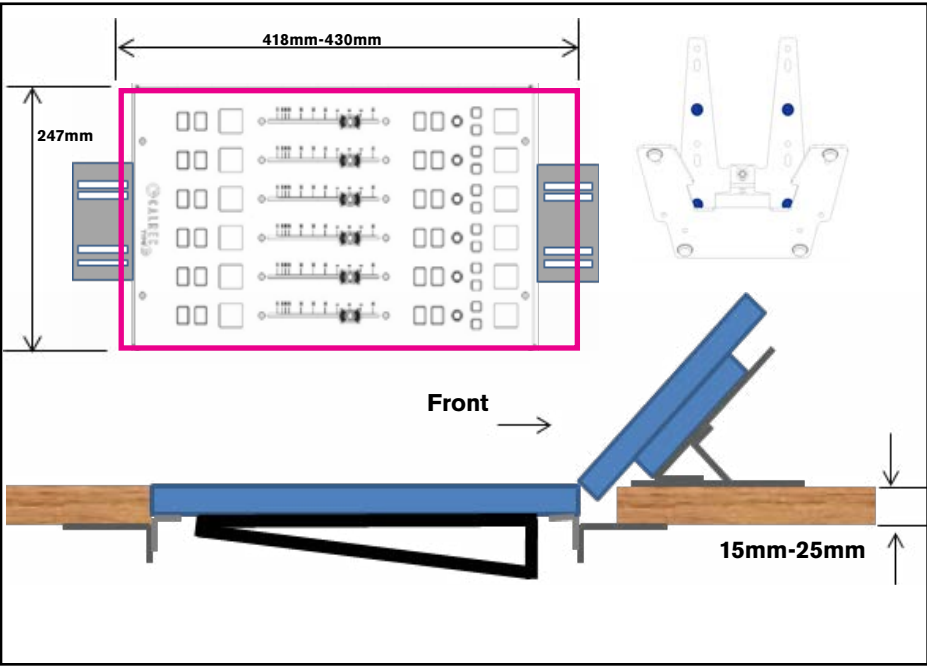


FIG 7 - MOUNTING OPTION FOR DESK THICKNESS 15MM-25MM



FADER PANEL LINKING (720-999007)

Fader panel IM6413 to Fader Panel IM6413 Linking Option:-

FIG 1 - FADER PANEL TO FADER PANEL LINKING

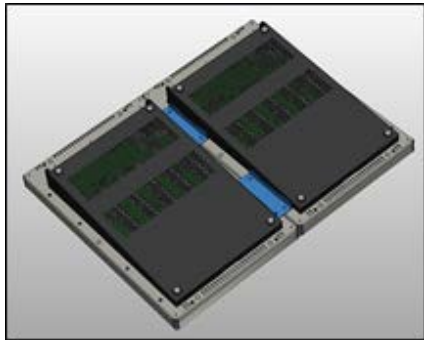
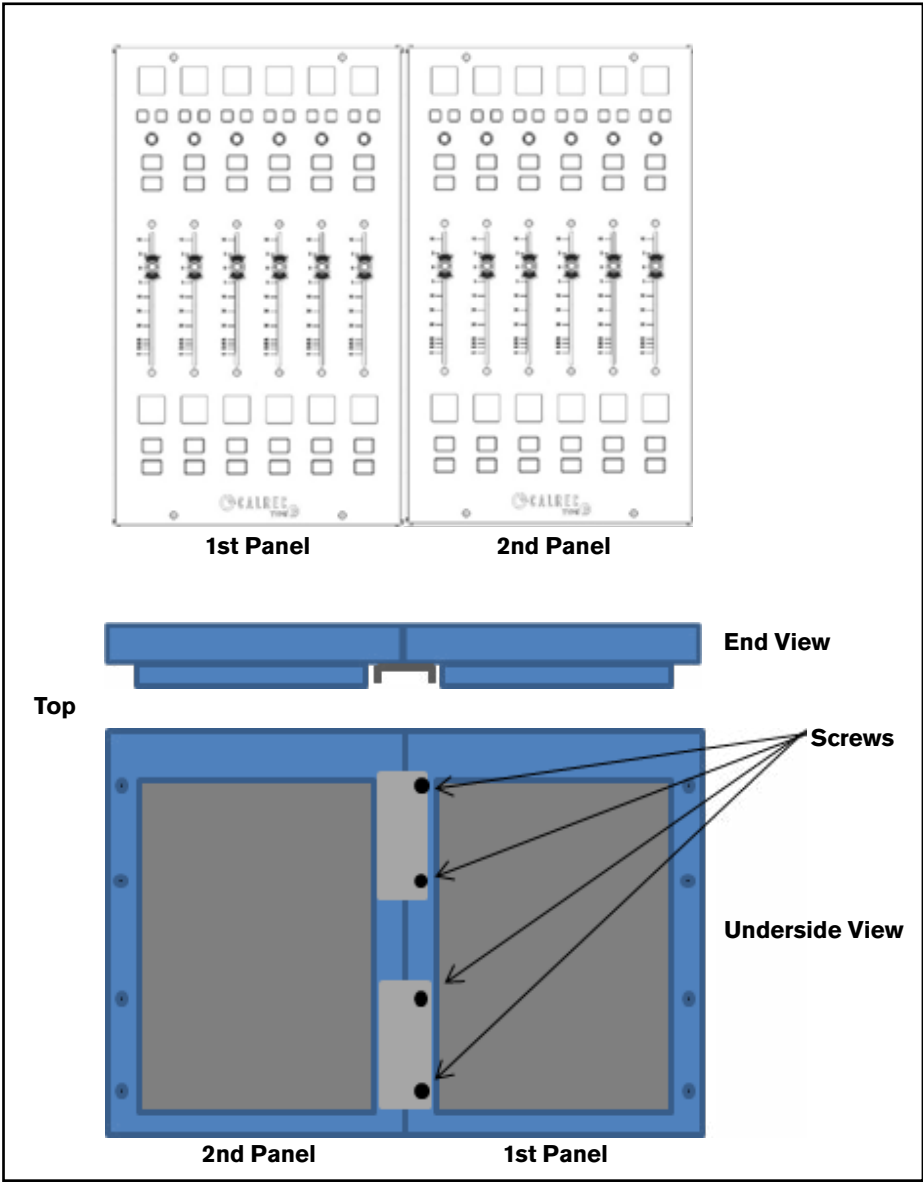


FIG 2 - LINKING PANEL PROCEDURE



Assembly -
Tools required (not supplied)
A PZ2 screwdriver/bit.

Mounting Procedure
Note that the brackets are only fitted to one of the two panels. With the Fader Panels located as required, take the Fader panel from left and **turn the Fader Panel over with the front edge towards you.**

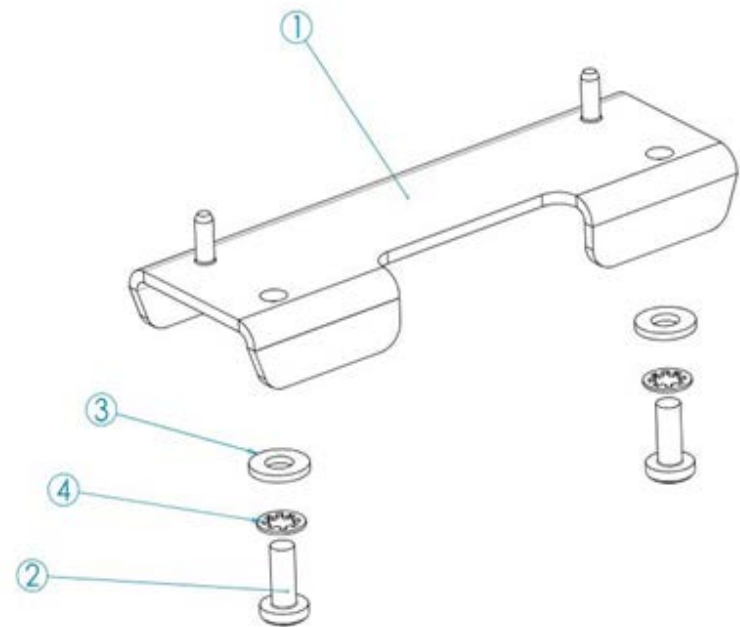
Attach 2 brackets (Item 1) to the **left-hand side** of the Fader Panel. Align the holes in bracket (Item 1) with the Fader Panel and attach using 4 x M4 screws (Item 2) with washers (Items 3 & 4). The plain washer should be nearest bracket, see Fig 4.
Do not over tighten. Typically 1N/m.

Place the fader panel in the correct orientation on desk. Take the 2nd Fader Panel. Lift and place this next to right-hand side of the 1st Fader panel, locking on to the locking pins of the bracket with the holes on the underside of left-hand side of the 2nd Fader Panel. Repeat as necessary for further Fader Panels.

FIG 3 - SUPPLIED PARTS TABLE

Item Number	Part Number	Description	Quantity
1	730-034	Fader Joining Tile Bracket	2
2	350-043	M4x10mm Pozi Pan	4
3	370-007	Washer M4 Plain	4
4	370-008	Washer M4 Internal Lock	4

FIG 4 - FADER JOINING TILE BRACKET



LARGE SOFT PANEL LINKING (720-999008)

Large Soft panel MU6411 to Large Soft Panel MU6411 Linking Option:-

FIG 1 - LARGE SOFT PANEL TO LARGE SOFT PANEL LINKING

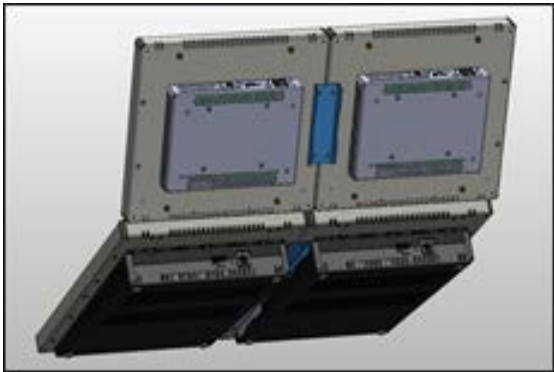
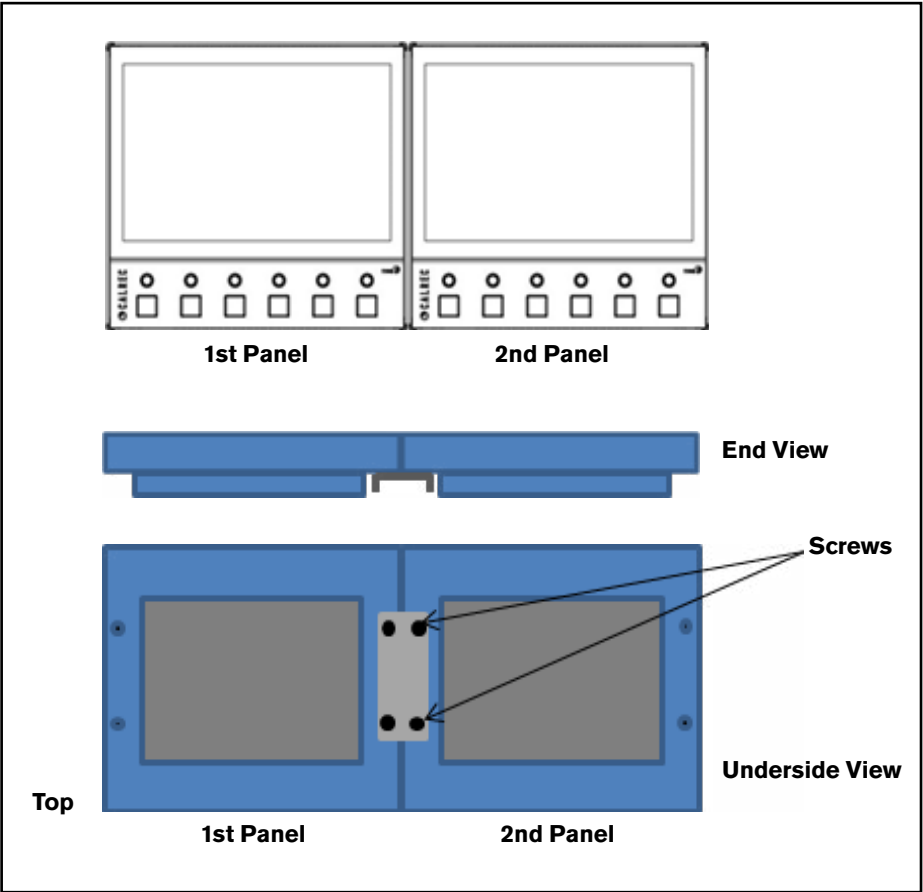


FIG 2 - LINKING PANEL PROCEDURE



Assembly -
Tools required (not supplied)
PZ2 screwdriver/bit.

Mounting Procedure
Note that the brackets are screwed to both panels. With the the Large Soft Panels located as required, take the 1st Fader panel from left and **turn the panels over so that the top of the panels faces you.** Align the holes in bracket (Item 1) with the Fader Panel and attach using 4 x M4 screws (Item 2) with washers (Items 3 & 4). The plain washer should be nearest the bracket, see Fig 4.

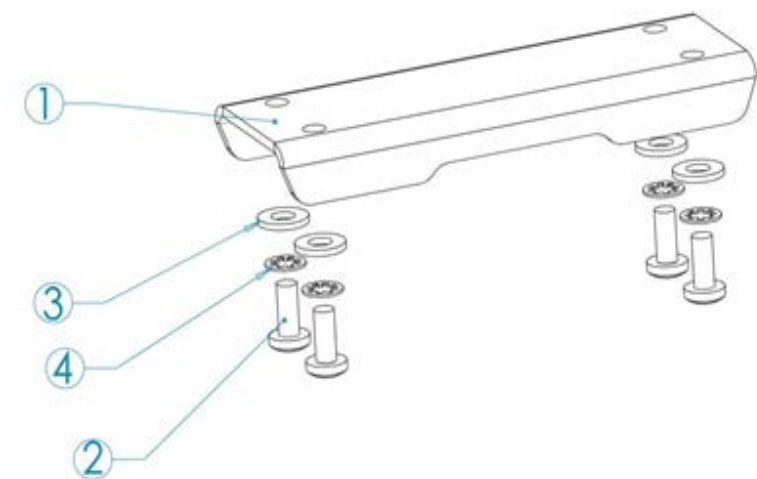
Do not over tighten. Typically 1N/m.

Return the panels to the correct orientation on the desk. If mounting linking brackets for more than 2 panels, two people should lift them after they are linked together, to avoid injury through heavy lifting. Alternatively, fix the bracket in place from the rear once they are mounted on their stands.

FIG 3 - SUPPLIED PARTS TABLE

Item Number	Part Number	Description	Quantity
1	730-035	LSP Joining Tile Bracket	1
2	350-043	M4x10mm Pozi Pan	4
3	370-007	Washer M4 Plain	4
4	370-008	Washer M4 Internal Lock	4

FIG 4 - FADER JOINING TILE BRACKET



TYPE R SYSTEM ELEMENTS

CORE LAYOUT

The UR6500 Type R core is designed to provide DSP, Routing & Control for up to three consoles. In addition, it has a basic level of I/O & GPIO, and one or two optional AoIP interface devices fitted internally, allowing a large amount of stream connectivity with other AoIP devices.

Fig 1 shows the front and back views of the Type R core unit. The left side on the front of the core shows the LED signal present indicators for the Analogue/AES inputs and outputs. Also shown are the 48V phantom power and AES SRC LED status indicators. On the right side of the front of the core are shown the AoIP LED status & activity indicators for the Primary & Secondary ports of the 2 AoIP modules, whose LED status indicators Pres 1 & 2 show if the modules are installed. Another column of LED indicators, next to the AoIP column, shows the current system status as described below:-

- Recover:** Normally OFF, slow flashing RED/GREEN when update checking at bootup or upgrading, fast flashing RED/GREEN boot hardware error.
- Fan Fail:** Lit RED if a Fan Fails.
- PSU Fail:** Lit RED if a PSU fails.
- Twin Active:** Shows active state of a twinned core with same states as Active.
- Active:** Flashing GREEN core is active, Flashing AMBER core in standby, lit RED core failure.
- OK:** Lit GREEN when the Hardware is being correctly accessed by the Software.
- Pri:** Lit GREEN when the Pri/Sec switch is set to Pri.

Further to the right are 2 x 6.35mm (1/4") headphone sockets. These outputs are optimised for Headphones with an input impedance of 250 Ohms. Next to these is an Ethernet Setup port to configure the Core, and a USB connector, used to recover/re-initialise the core system from a USB memory stick in the event of connection failure. At the far right is a Reset switch, used to restart the processor without altering stored settings.

The rear of the core is arranged into two rows:- The top row contains the external system connections from left to right as follows:- AoIP 1 & 2 RJ45 interfaces, connected to internally fitted optional US6493 AoIP devices (with redundant Primary and Secondary connections). Each of these devices can provide up to 256 channels of streamed audio in either direction. Next to these are 4 BNC connectors labelled Sync 1/2 In and Sync 1/2 Out. To the right of the BNC connectors are a secondary USB connector and a block of 8 RJ45 connectors, which connect to the various surfaces via PoE+ switches. Typically, each of these connect to a separate PoE+ switch interfacing to a number of Fader, LSP and SSP panels. More than one connection is usually made to each console area to provide control diversity. For instance, a 24 fader console may be powered from two PoE+ switches connected to the core, with each switch powering and data transferring to/from 2 x IM6413 fader panels and 2 x MU6411 Large Soft Panels.

Further to the right on the rear is a DVI debug port, reserved for development along with a PRI/SEC switch, which is used to set the core to act as the active/inactive core in a redundant twinned pair.

The bottom row is dedicated to I/O, GPIO and Power. There are 4 x 25 way 'D' Type connectors carrying audio using AES59/Tascam® pinout format. The audio is also carried as pairs of Analogue inputs or outputs or AES I/O ports on 4 x RJ45 connectors per 25 way 'D' type connector. The four connector areas from left to right provide:- 8 Mic/Line Analogue inputs with phantom power, 8 Analogue Line Outputs, 4 AES Inputs with SRC, 4 AES Outputs and 4 x RJ45 connectors for GPIO interfacing. The upper two connectors each provide 6 x GPI opto input circuits each. The lower two connectors provide 6 x GPO opto output circuits each. On the bottom row of the core are 2 x IEC power sockets labelled PSU 1 & PSU 2. Either of these can power the console. Together, they provide power redundancy. The IEC inputs should be fed from separate AC sources to protect against external power loss. In the event that only one AC outlet is available, power should be fed via an IEC Y-Split cable to provide redundancy against internal PSU failure. Metal clips provide retention to protect the IEC connectors from working loose. These clips fit snug around large IEC connectors with screw in terminals inside for wiring. The clips may not provide adequate retention on their own for some pre-fabricated IEC connector types. If there is concern over connectors working loose during transit, it is recommended that IEC sockets with built-in latching are used.

SURFACE PANEL LAYOUT

A Type R surface consists of a combination of 3 panel types:- IM6413 - a 6-wide Fader Panel, MU6411 - a Large Soft Panel and MU6410 - a Small Soft Panel. These panels are multiplied to form different surface sizes as required.

IM6413 6-Wide Fader Panel

Fig 1 shows a panel consisting of 6 x 100mm motorised faders. Each of these faders has 4 large user definable buttons and a dedicated 96 x 96 pixel TFT display for fader status information. Similarly, at the top of each fader panel are 2 user buttons, a rotary control with integrated push switch and another 96 x 96 pixel TFT display to show a range of user definable controls such as mic gain, trim etc.

Note: each fader can access two sub-layers described as A & B. This can be switched using a user definable button.

A Cat5e connector on the rear edge of the panel provides both power and data connections.

User Labels Template for 4 large buttons on 6-Wide Fader Panel

A blank button template is available to download from the Calrec website. This can be used to create bespoke User Button labels to be inserted under the large user button caps highlighted in Fig 1. These buttons are made up of blank key-mats, to which removable button caps are fitted.

The function of these buttons are customisable as defined in the Assist application see: **Type R Assist & Console Panel Operation (926-283).pdf** for setting up user button defaults.

Once defined, the user can enter images or text and print off the appropriate labels as required.

The template is called: **Type R Custom User Buttons (926-303).pdf**.

Note: the inside dimensions of the large button cap are 14mm x 9mm.

FIG 1 - IM6413 TYPE R - 6 WIDE FADER PANEL TOP & REAR VIEWS

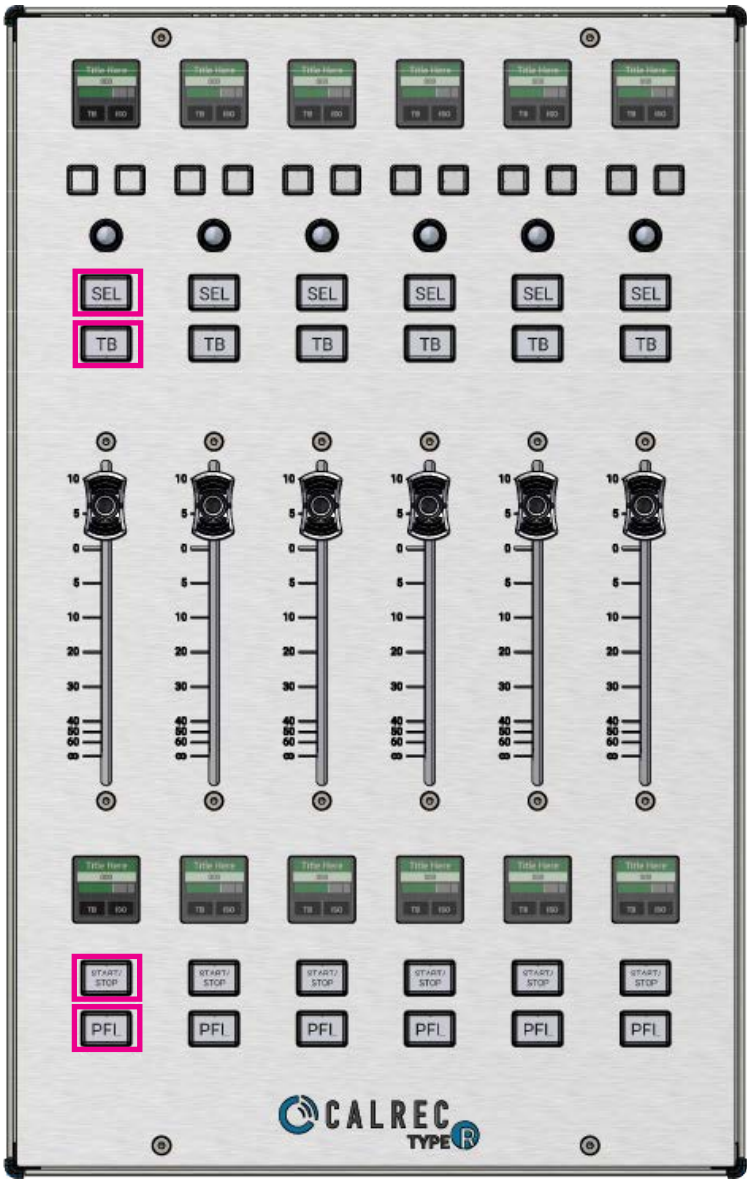
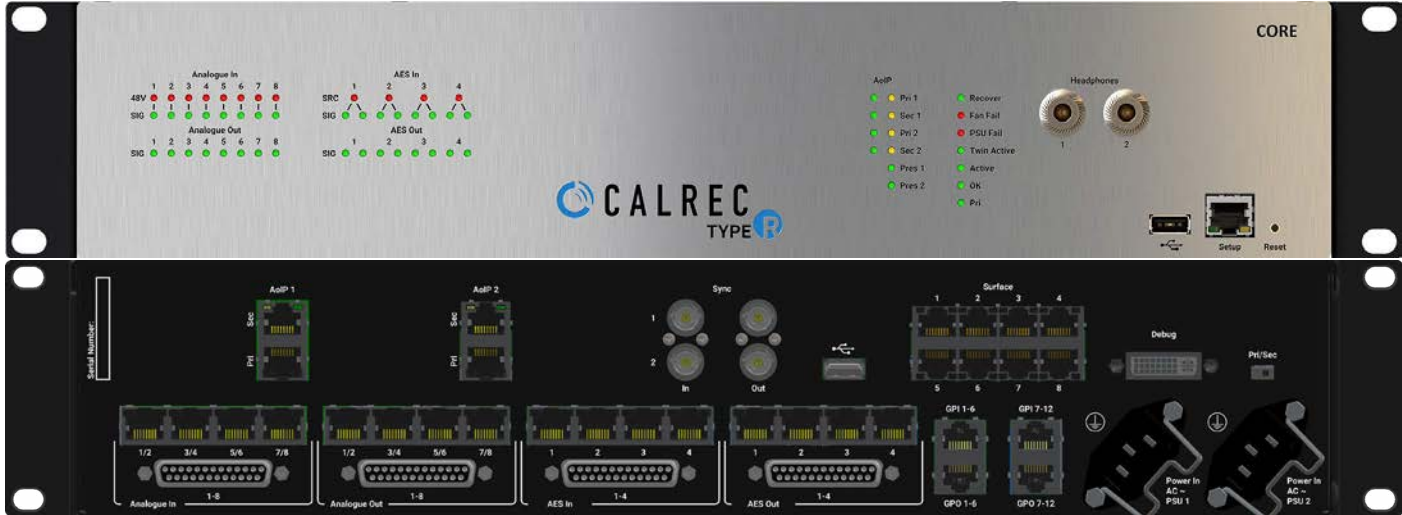


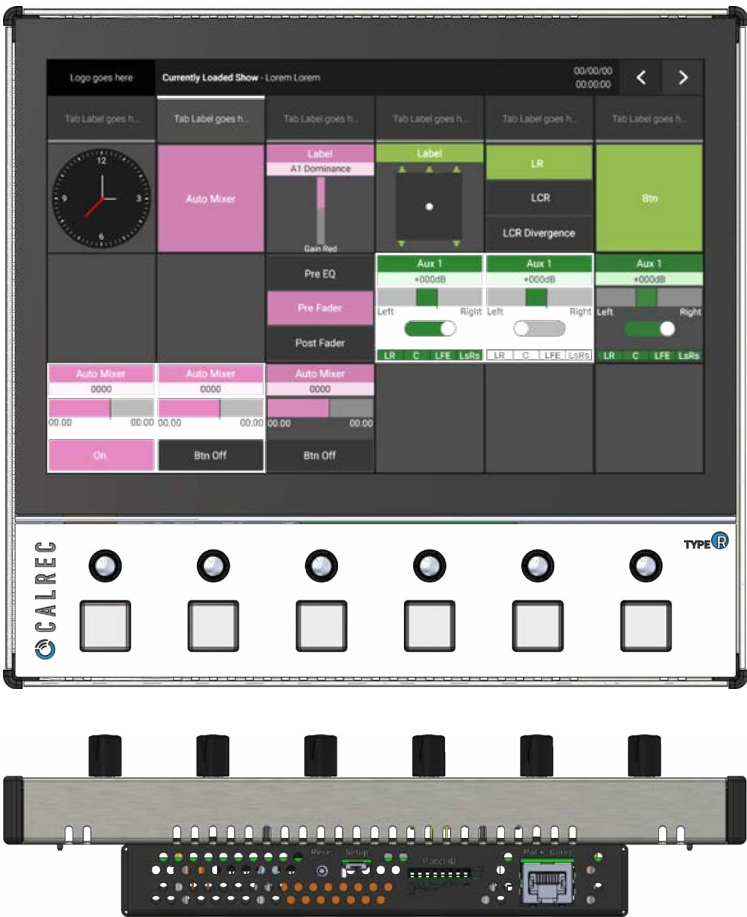
FIG 1 - UR6500 TYPE R CORE - FRONT AND BACK VIEWS



MU6411 Large Soft Panel (LSP)

The panel shown in Fig 2 consists of a large 1280 x 800 pixel touch sensitive TFT display for parameter control and status information. Likewise, below this display are 6 rotary controls and illuminating buttons, used in conjunction with the TFT screen. A Cat5e connector on the rear edge of the panel provides both power and data connections.

FIG 2 - MU6411 TYPE R - LARGE SOFT PANEL TOP & REAR VIEWS



MU6410 Small Soft Panel (SSP)

The panel shown in Fig 3 consists of a smaller 1024 x 600 pixel touch sensitive TFT display for parameter control & status information. Likewise, below this display is a rotary control and an adjacent illuminating button, which are used in conjunction with the TFT screen. A Cat5e connector on the rear edge of the panel provides both power and data connections.

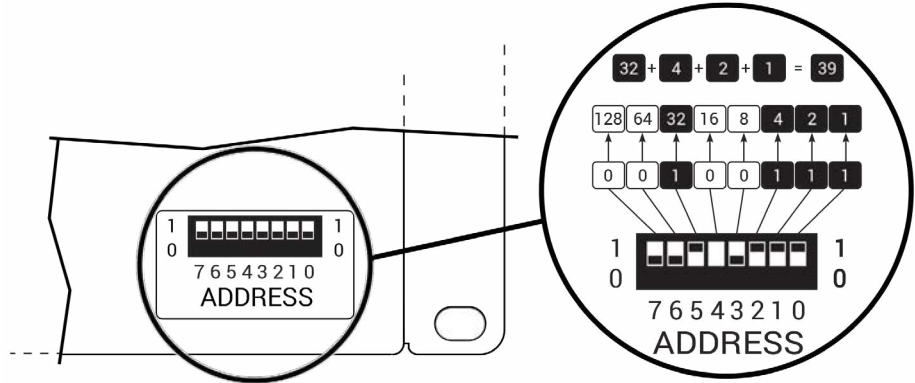
FIG 3 - MU6410 TYPE R - SMALL SOFT PANEL TOP & REAR VIEWS



PANEL ID SETTINGS

The 8-way DIP switch on the rear of all Type R panels is set as an 8-bit binary representation, 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 while a switch set in the up/on position represents a binary 1. Each switch/binary-bit equates to a decimal value, starting at 1, for the least significant bit. The remaining switches are double the value of their less significant neighbour, making the 8th/most significant bit equate to a decimal value of 128.

FIG 1 - SETTING THE ID ON A PANEL



All Panel ID switches are orientated the same way. 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.

OPTIONAL AUDIO I/O INTERFACE BOX LAYOUTS

Shown below are the three optional Audio interface units available for Type R:-
The **AD6501** is a 4 AES In with SRC & 4 AES Out, 8 Mic/Line In with 48v & 8 Line out Combo I/O box, with 6 GPI & 6 GPO interfaces. In addition, there are 2 x 6.35mm (1/4") headphone socket outputs for monitoring.

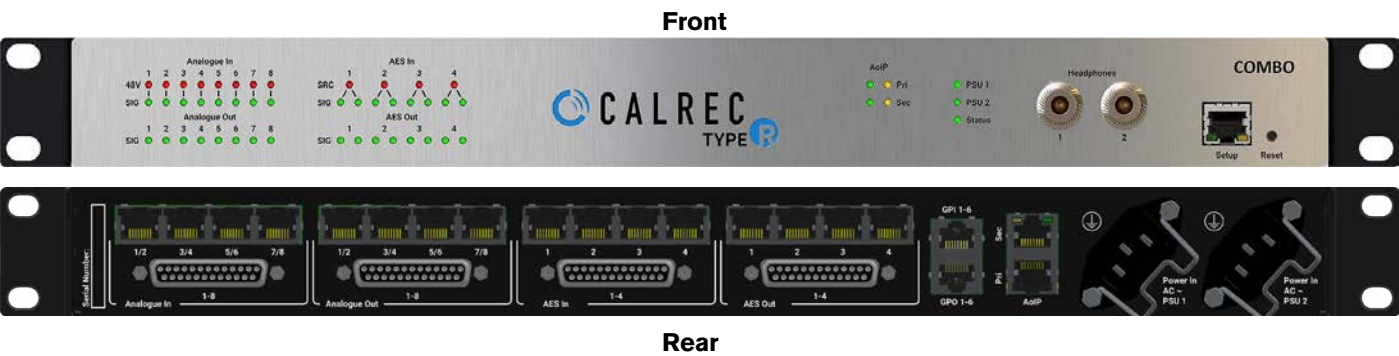
Note: These outputs are optimised for Headphones with an input impedance of 250 Ohms.

The **AD6502** is a 16 Mic/Line In with 48v and 16 Line out Analogue I/O box with 6 GPI & 6 GPO interfaces.
The **JD6503** is an 8 AES In with SRC and 8 AES Out AES I/O Box with 6 GPI & 6 GPO interfaces.

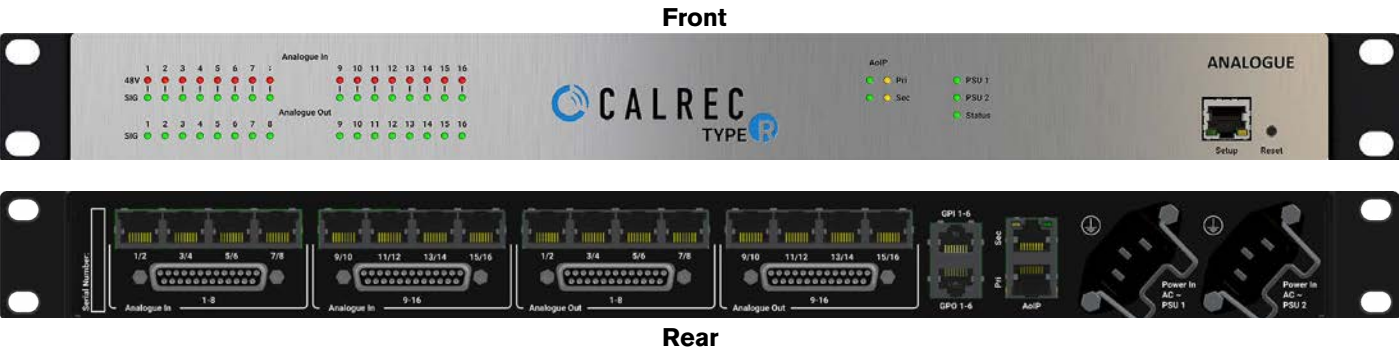
Note: the UR6500 Type R Core Box contains the same audio interfaces as the AD6501 Type R Combo I/O Box.

In addition to the 2 x IEC power connectors on the rear of each unit, there is an AoIP interface via RJ45 connectors (with redundant Primary and Secondary connections) connected to a US6525 AoIP device, allowing the I/O to be connected to the core via an IP switch network.

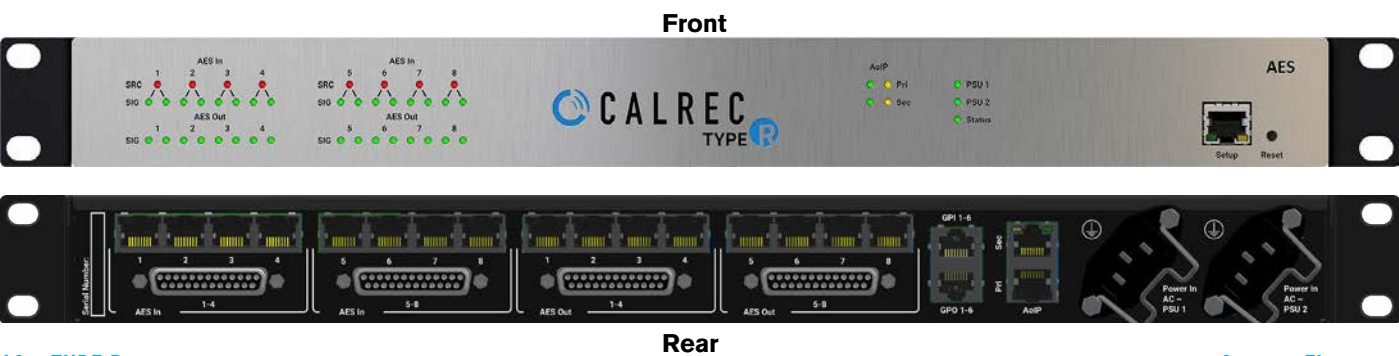
AD6501 Type R - Combo I/O Interface box



AD6502 Type R - Analogue I/O Interface box



JD6503 Type R - AES I/O Interface box



CONNECTING TYPE R SYSTEM ELEMENTS TOGETHER

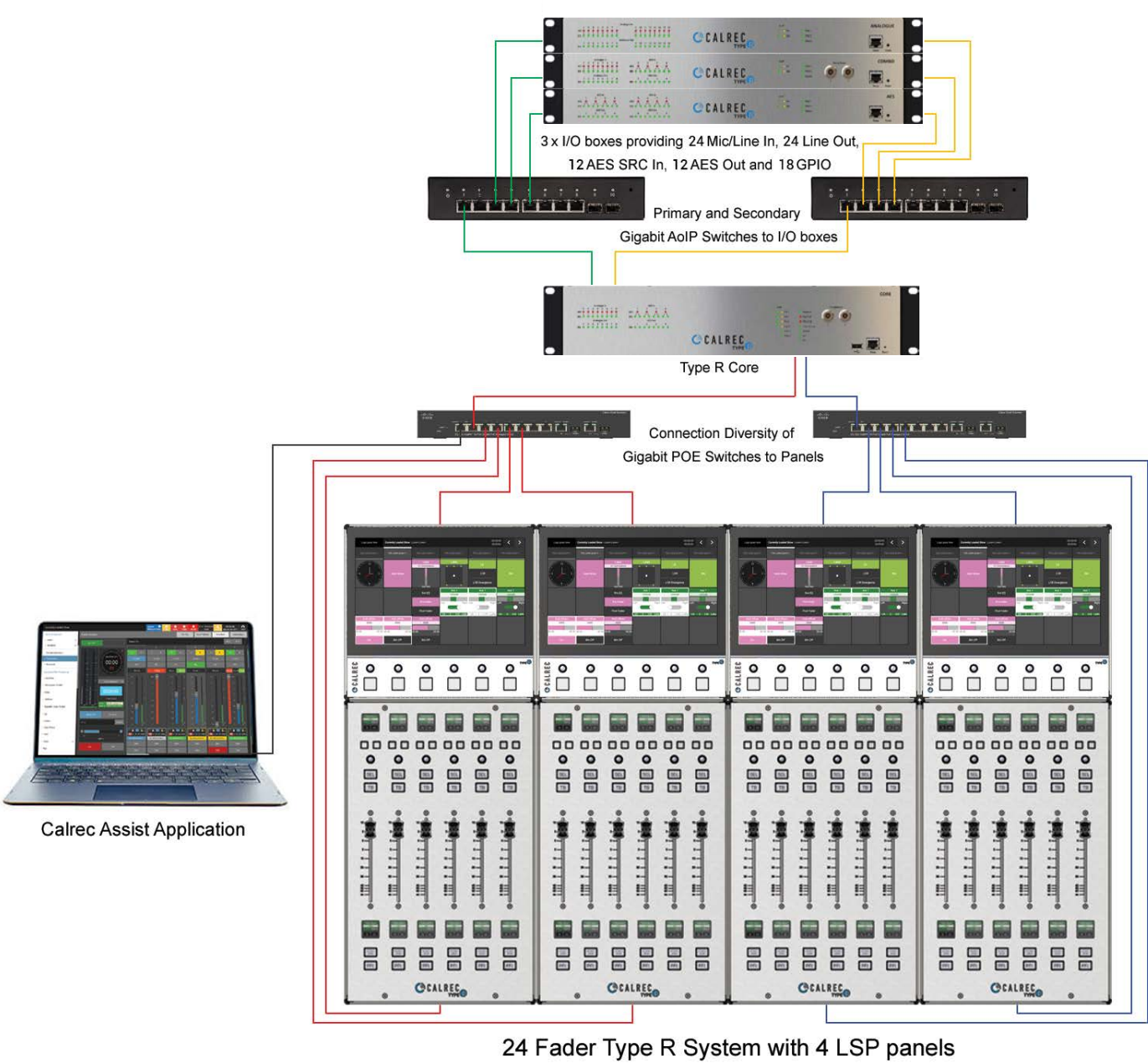
Starting from the core:-
The Console Surface panels are connected via gigabit PoE+ switches to provide both power and communications. Fig 1 shows two switches, which offer a diversity of connections to the 24 fader Console.

In addition to the panels, a PC is connected to provide the Calrec Assist application for configuration and additional parameter control.

The Audio I/O units are connected over AoIP streams using AoIP switches with both primary and secondary connections for redundancy. Please see [“Thermal Requirements when stacking Type R I/O Units” on page 119](#).

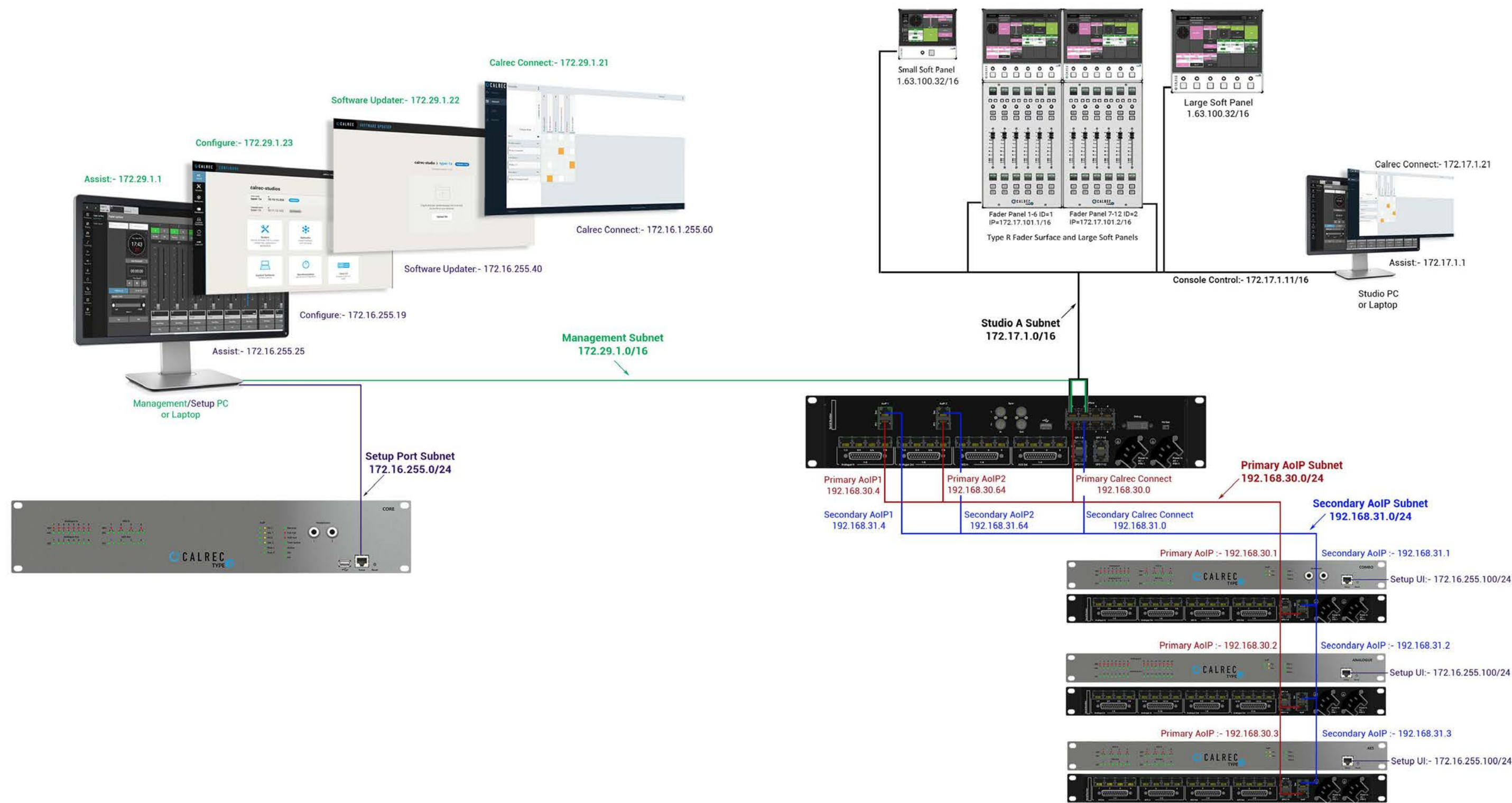
FIG 1 - A TYPICAL TYPE R SYSTEM

Type R System Example



DEFAULT NETWORK CONFIGURATION – AT A GLANCE

The drawing below shows an overview of the factory default network configuration of each device in a Type R system. Please refer to the Surface Panel Layout and AoIP Network example sections in this manual for further information.



DEFAULT NETWORK CONFIGURATION - DETAIL

Core - Rear-facing network (“Surface”) interfaces

Application	Subnets - IP address & Subnet mask**					
	Management	Studio A	Studio B	Studio C	AoIP Primary	AoIP Secondary
Assist A	172.29.1.1/16	172.17.1.1/16	-	-	-	-
Assist B	172.29.1.2/16	-	172.17.1.2/16	-	-	-
Assist C	172.29.1.3/16	-	-	172.17.1.3/16	-	-
Console A	-	172.17.1.11/16	-	-	-	-
Console B	-	-	172.17.1.12/16	-	-	-
Console C	-	-	-	172.17.1.13/16	-	-
Calrec Connect	172.29.1.21/16	172.17.1.21/16	172.17.1.21/16	172.17.1.21/16	192.168.30.100/24	192.168.31.100/24
S/W Updater	172.29.1.22/16	172.17.1.22/16	172.17.1.22/16	172.17.1.22/16	-	-
Configure	172.29.1.23/16	172.17.1.23/16	172.17.1.23/16	172.17.1.23/16	-	-
Router	172.29.1.24/16	-	-	-	-	-
Twin Controller	172.29.1.25/16	-	-	-	-	-
Rear Interface	1 & 2	1 & 2	1 & 2	1 & 2	5	6

Core - AoIP device interfaces

AoIP port	IP address & Subnet mask**
AoIP 1 - Pri	192.168.30.4/24
AoIP 1 - Sec	192.168.31.4/24
AoIP 2 - Pri	192.168.30.64/24
AoIP 2 - Sec	192.168.31.64/24

IO box - Front-facing Setup interface

Application	IP address & Subnet mask**
AoIP device UI	172.16.255.100/24

** Subnet Modes are displayed in CIDR notation

Configuring Separate Cores on the Same Management Subnet

When running multiple, separate (not as redundant cores) Type R cores on the same management subnet, Type R cores **must** be configured in separate VLANs. Meter multicast addresses cannot be changed on Type R cores, meaning that Type R panels may receive conflicting meter data if the cores are not separated. **For further information on configuration please contact Calrec support.**

Core - Front-facing Setup interface

Application	IP address & Subnet mask**
Assist A	172.16.255.25/24
Assist B	172.16.255.26/24
Assist C	172.16.255.27/24
Console A	172.16.255.5/24
Console B	172.16.255.6/24
Console C	172.16.255.7/24
Calrec Connect	172.16.255.60/24
S/W Updater	172.16.255.40/24
Configure	172.16.255.19/24
Router	172.16.255.10/24
Twin Controller	172.16.255.11/24
Other reserved addresses	172.16.255.1-4/24 172.16.255.8-9/24 172.16.255.26-28/24 172.16.255.100/24 172.16.255.200/24 172.16.255.253/24 172.16.255.254/24

HARDWARE POWER CONNECTIONS

Both the Type R Core and I/O units require mains power via standard IEC connections.

Each of these units contains two power supply units, supplied with AC power by two independent male IEC inlets. These dual power supplies provide full power redundancy: a feature of all Calrec products. While Type R hardware can be run off a single power connection, it is advised, for redundancy, that the user connects a separate power source to the primary and secondary power inlets. In the following diagrams the primary power connections are indicated by a solid arrow, while the secondary connections are indicated by a dashed arrow.

A PSU failure or a loss of AC power input will generate a system status error message. The two PSU's employ load sharing. If one PSU fails, the other will automatically take over the full load with no loss of audio or operation.

Disconnecting the PSUs

Type R units do not contain a separate Mains power switch. To safely disconnect the mains power, **both** IEC connectors need to be removed from the rear of the console, as shown below.

FIG 1 - POWER CONNECTIONS TO THE CORE

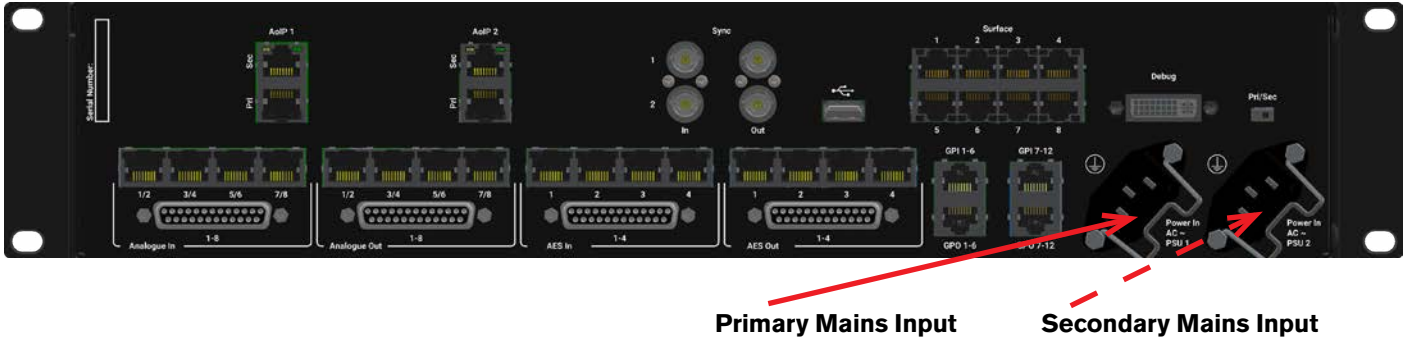
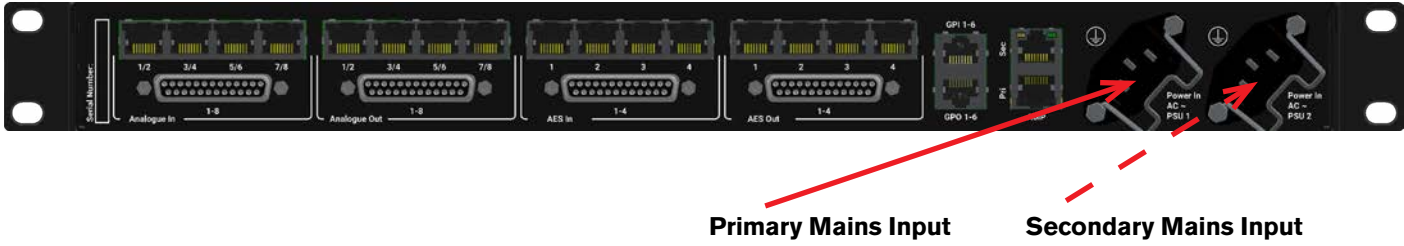
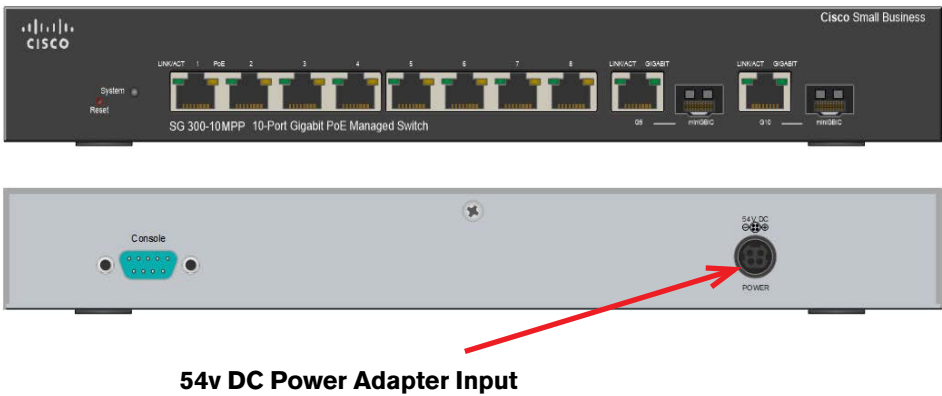


FIG 2 - POWER CONNECTIONS TO THE COMBO, ANALOGUE AND AES I/O UNITS



In addition, the console panels are powered via PoE+ switches. These in turn are powered by AC-DC power supplies. The Cisco SG350-10MP switches supplied with the Type R system are capable of supplying up to 15.4W to each of their 8 Gigabit ports. Power is derived from an external AC-DC power adapter, which supplies 54v DC to the switch.

FIG 3 - POWER CONNECTIONS TO THE PANELS VIA POE+ SWITCHES



TYPE R SETTING UP A REDUNDANT CORE SYSTEM

Overview

From Version 2.1 onwards, Type R now supports Core hardware redundancy.

This means that a Type R system can be configured with two Twinned Type R Cores, with one acting as the primary Core and the other as the secondary or backup Core. When a pair of Type R Cores are twinned, the settings and data from the primary Core are synchronized to the secondary Core. Under normal conditions, the primary Core will be 'Active' and the secondary Core 'Inactive'. In the unlikely event of a primary Core failure, the primary Core will be made 'Inactive', and the secondary Core switched to be 'Active', providing Core hardware redundancy.

Preparing to set up a Redundant Core system

Note: the set-up of a redundant Type R Core system cannot be completed when the system is On-Air. Therefore, it should only be considered when the system is Off-Air.

To set up a redundant Core Type R system, the following steps must be followed before attempting to Twin the Cores;

1. Set up both primary and secondary Cores with the same DSP configuration.
In order for the Core redundancy to work, the secondary Core must mirror the settings and data of the primary Core. Therefore, both Cores must be running on the same type of DSP license with the same DSP Pack Option selected. This can be set up for each Core from the Configure application (Configure>System>DSP Licenses) as per the procedure in the "Type R Configure Guide" (926-285).
2. Set up both primary and secondary Cores with the same number of AoIP cards.
Both primary and secondary Cores should be fitted with the same number (max 2) of AoIP cards.
3. Set secondary Core AoIP card addresses.
By default, the IP addresses for the AoIP cards are set to;

AoIP Port	IP address & Subnet mask
AoIP 1 - Pri	192.168.30.4/24
AoIP 1 - Sec	192.168.31.4/24
AoIP 2 - Pri	192.168.30.64/24
AoIP 2 - Sec	192.168.31.64/24

To avoid IP address conflicts, the IP addresses for the designated secondary Core must be changed to be unique. The exact IP addresses may depend on the IP scheme used. For example;

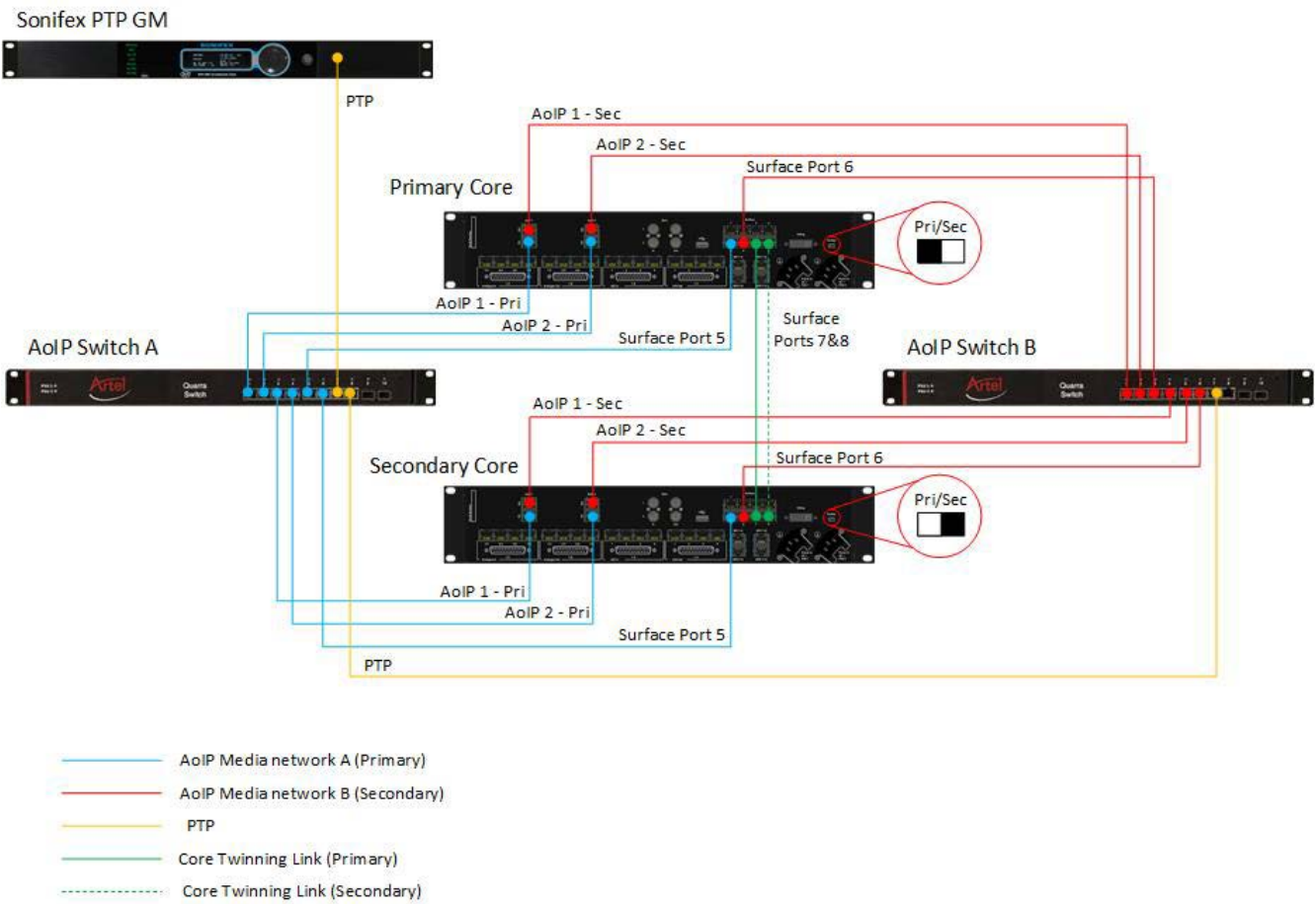
AoIP Port	IP address & Subnet mask
AoIP 1 - Pri	192.168.30.104/24
AoIP 1 - Sec	192.168.31.104/24
AoIP 2 - Pri	192.168.30.164/24
AoIP 2 - Sec	192.168.31.164/24

Core AoIP card IP addresses are set in the Type R Configure application under Configure>Networks>AoIP Interfaces. Instructions on how to change AoIP network interfaces can be found in the "Type R Configure Guide" (926-285).

4. Set the intended secondary Core to 'Secondary'.
On the rear of each Type R Core is a selector switch, allowing a specific Core to be set either as a primary Core or a secondary Core. The user must ensure the intended secondary Core is set to 'Sec' and re-power the secondary Core.

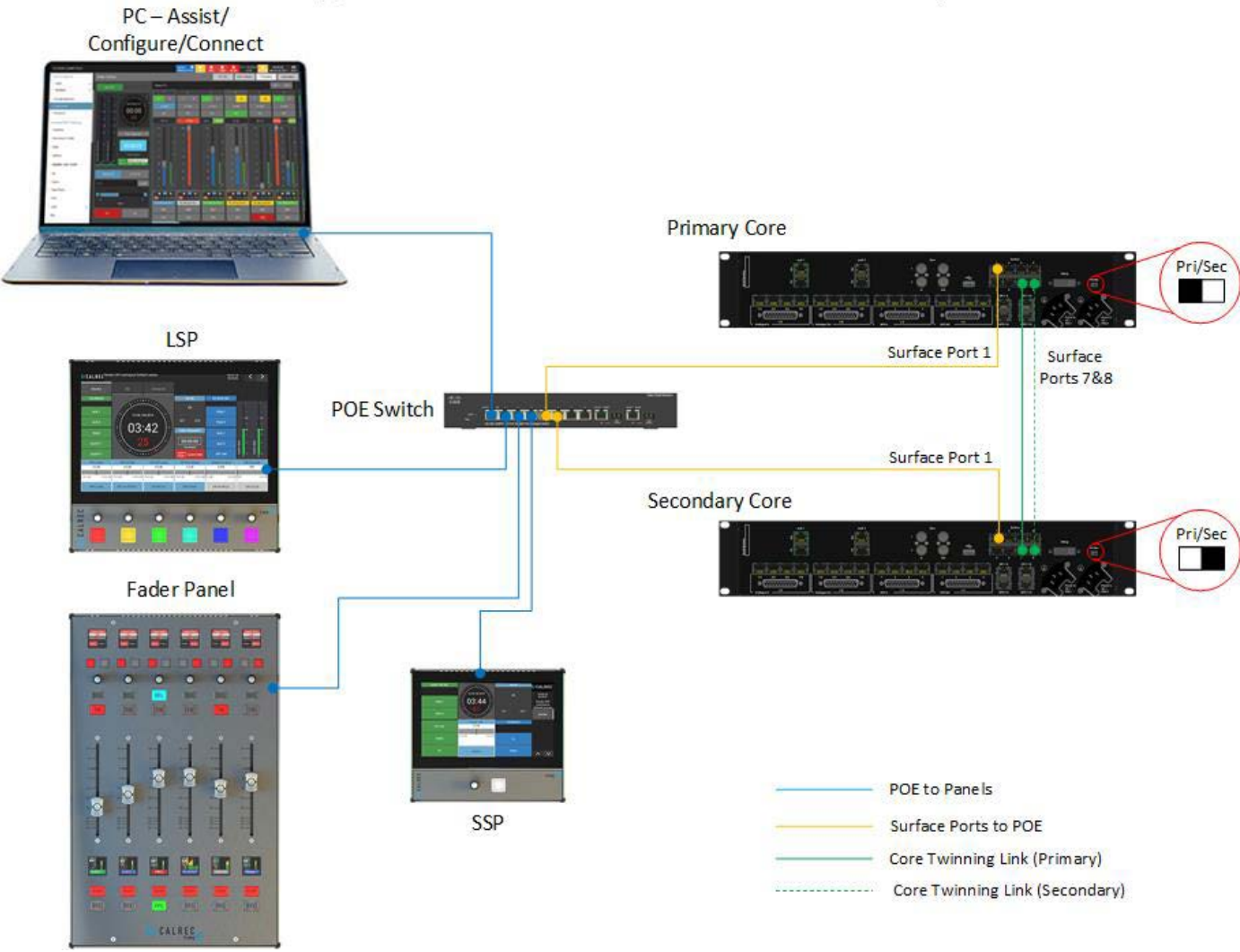
5. Define a device other than the primary or secondary Core to act as PTP Master.
In normal operating conditions, the secondary Core will be 'Inactive'. Therefore, it cannot act as a PTP Master. Similarly, in the unlikely event of a Core failure, and the primary Core swaps over to the secondary Core, the primary Core will become 'Inactive' and unable to act as the PTP Master. The user is recommend to user an external PTP Grand Master. This will depend on the scale and design of the media network. Details of how to set up PTP is outlined in the 'Calrec Connect Guide' (926-292).
6. Use networked IO instead of Local Core IO.
In the unlikely event of a redundant failover to the secondary Core, all settings are replicated on the secondary Core, meaning the secondary Core will have the same IO patching as the primary Core and that Local IO will be operational. However, the physical re-wiring for Local Core IO cannot be catered for in the redundancy scheme. External signal splitters to feed inputs to both Cores could be used, but this is not provided as part of the Type system.
7. Connectivity.
Both primary and secondary Cores will need to be connected to the same Surface and AoIP media network (or networks) with a link between them to facilitate the Core synchronization process. The following two diagrams show both example redundant AoIP media network connectivity and redundant Surface Panel connectivity.

TypeR Redundant Core AoIP Media Connectivity.



- Notes:
- a) The above Diagram shows Network redundant (ST2022-7) connectivity with both A and B media networks as well as Core hardware redundancy.
- b) Connections into both Cores show the system factory default port allocations for the Surface RJ45 ports.
- c) Two Core Twinning Links are shown providing link redundancy. Twinning and Core synchronisation will occur with a single link in place. The ability to provide two links provides redundancy on the link itself.

TypeR Redundant Core Surface Panel Connectivity.



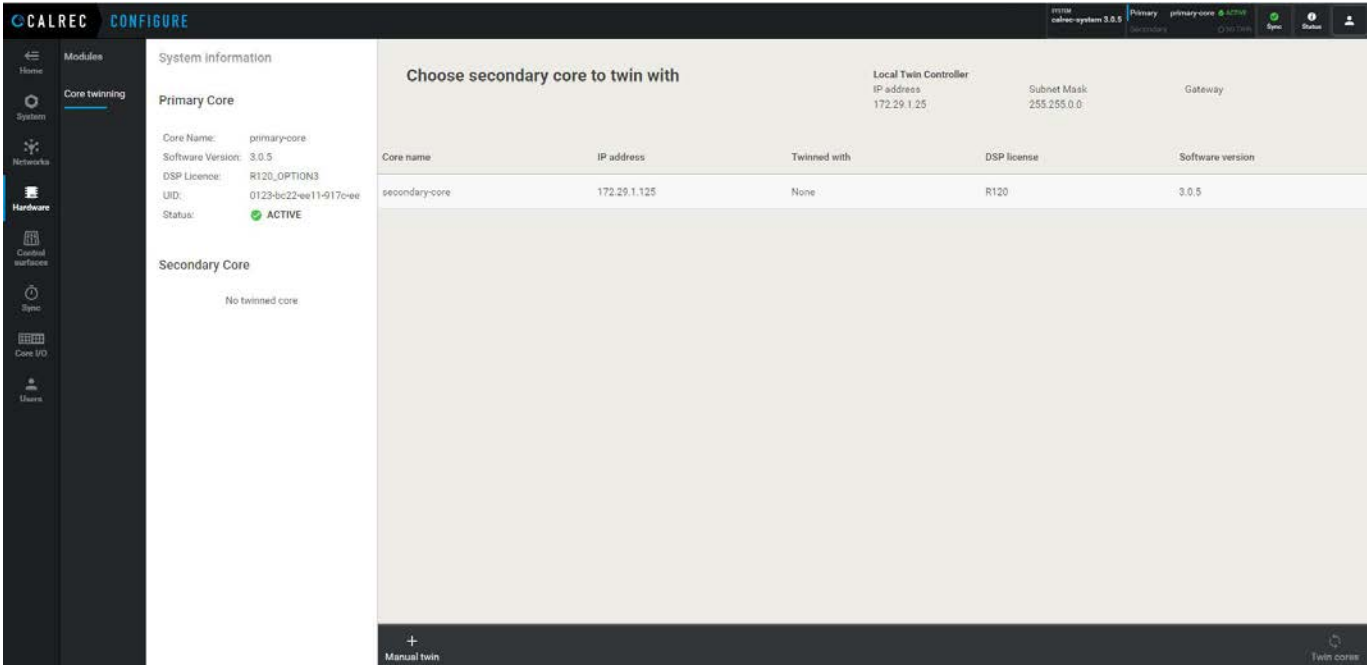
- Notes:
- a) Connections into both Cores show the system factory default port allocations for the Surface RJ45 ports.
 - b) Two Core Twinning Links are shown, providing link redundancy.
 - c) By default, Surface Port 2 can be used to connect to another POE switch.

Twinning the Secondary Core

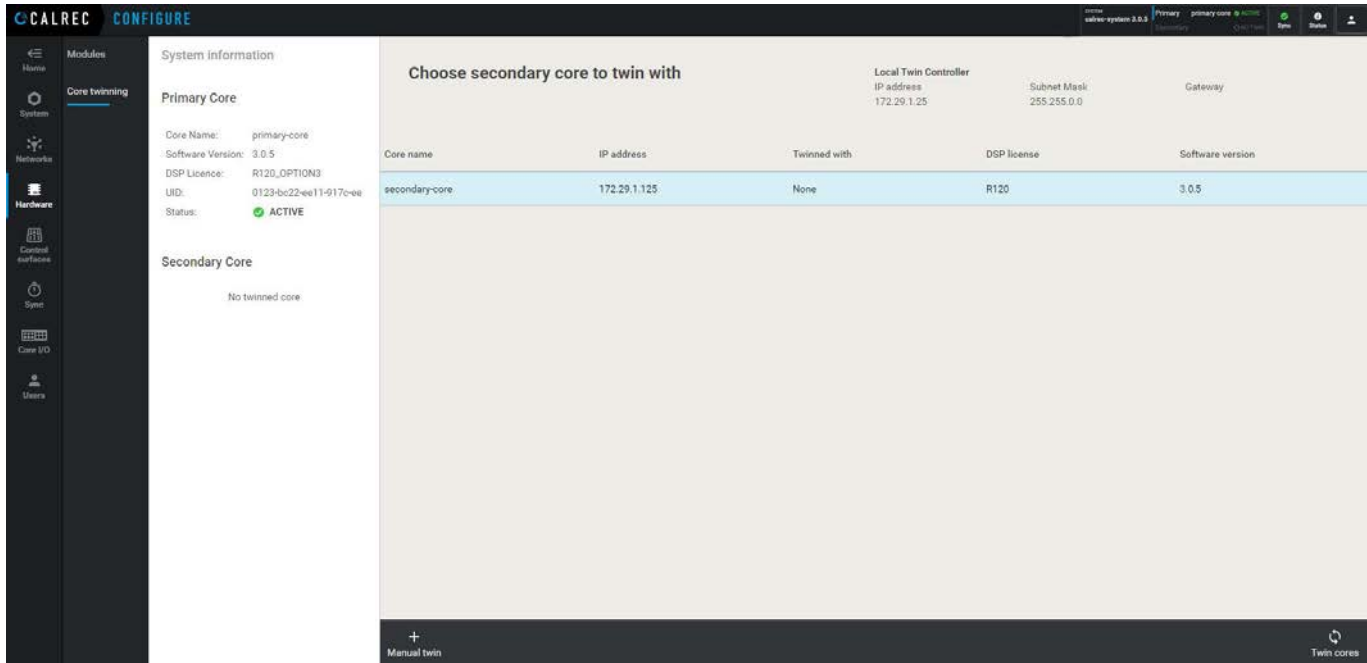
Before Twinning the secondary Core, the user is advised to power down the secondary Core and to ensure the Type R system is fully operational/passing audio across the AoIP media network as expected.

The user is then ready to Twin the primary and secondary Cores.

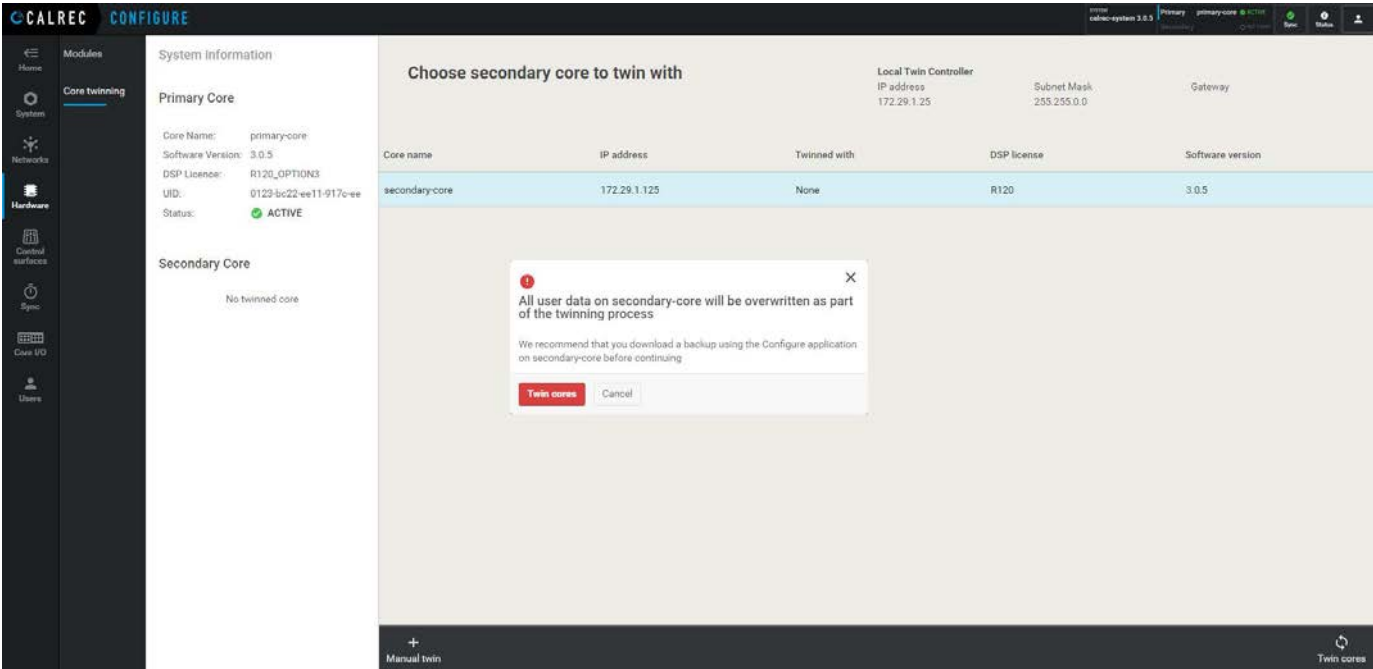
Re-power the secondary Core and navigate to the primary Core Type R Configure application. The Core Twinning menu can be found under Configure>Hardware>Core twinning.



The Secondary Cores available for Twinning will be listed.

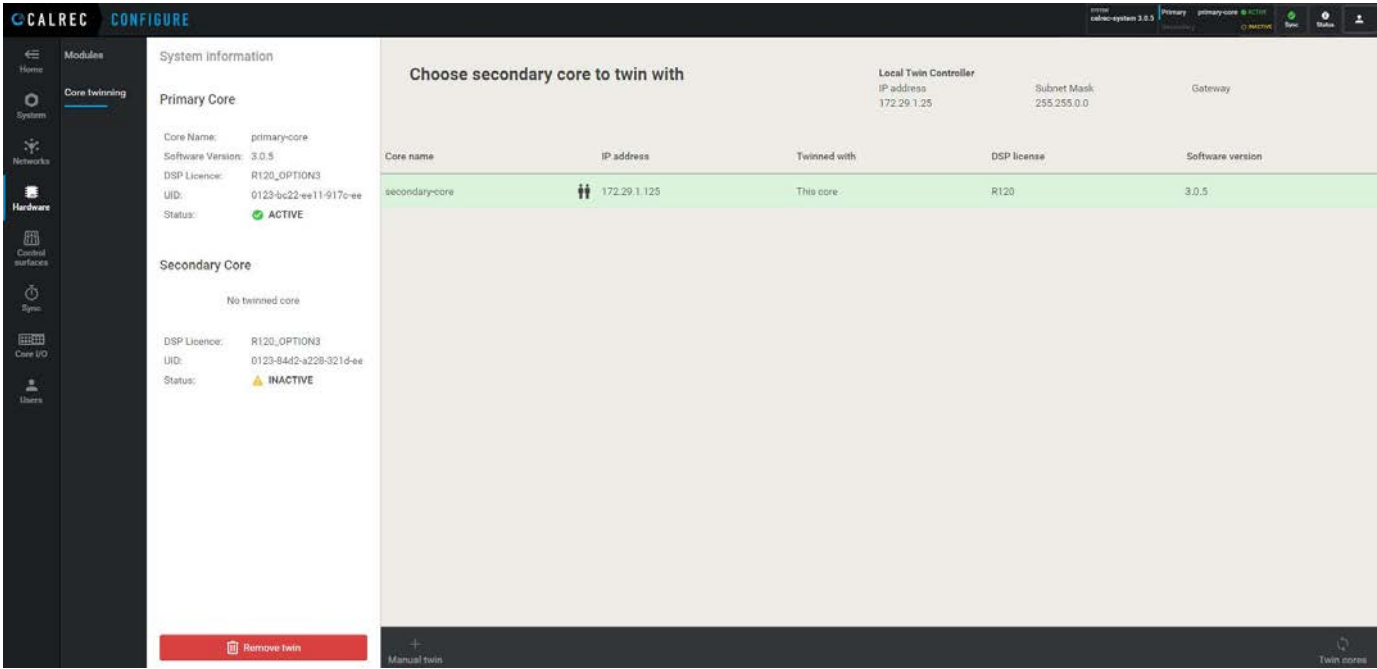
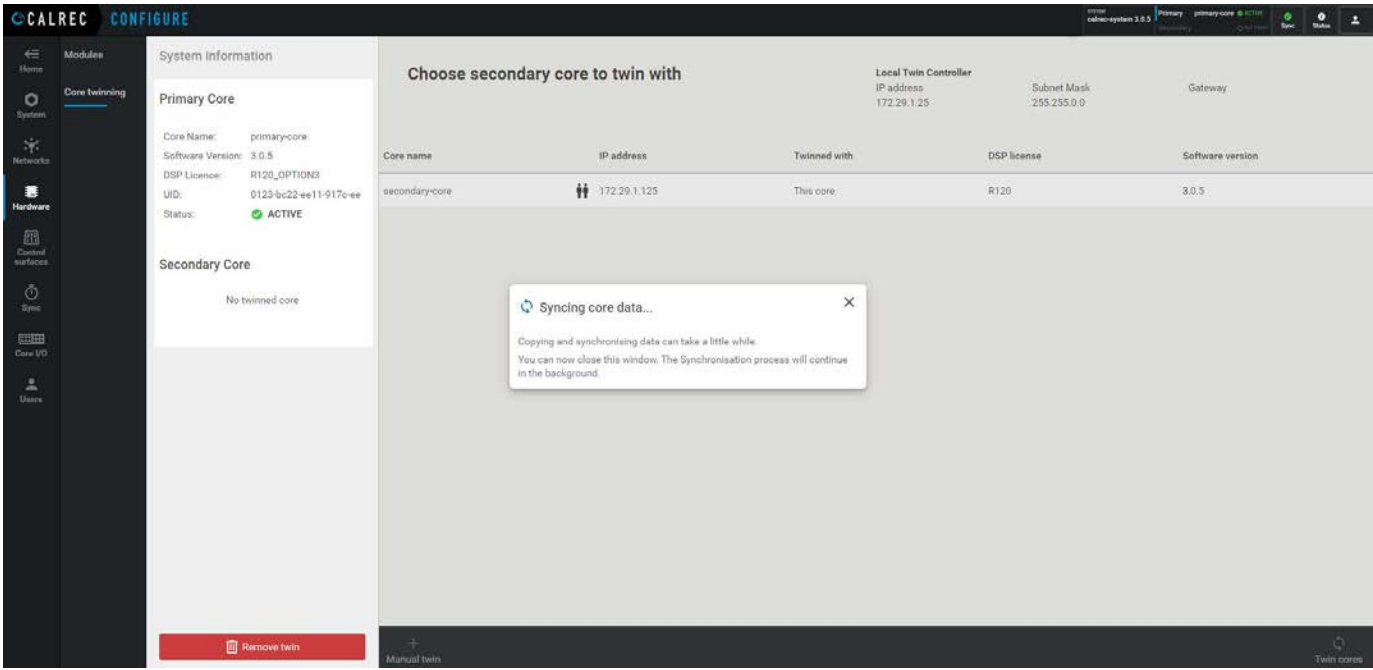


The user chooses the desired secondary Core to Twin the primary Core with. Press/click "Twin cores" at the bottom right of the Twinning page.



The user is then warned that all user data on the Secondary Core will be overwritten. Confirmation that the user wishes to continue with the Twinning process is subsequently required.

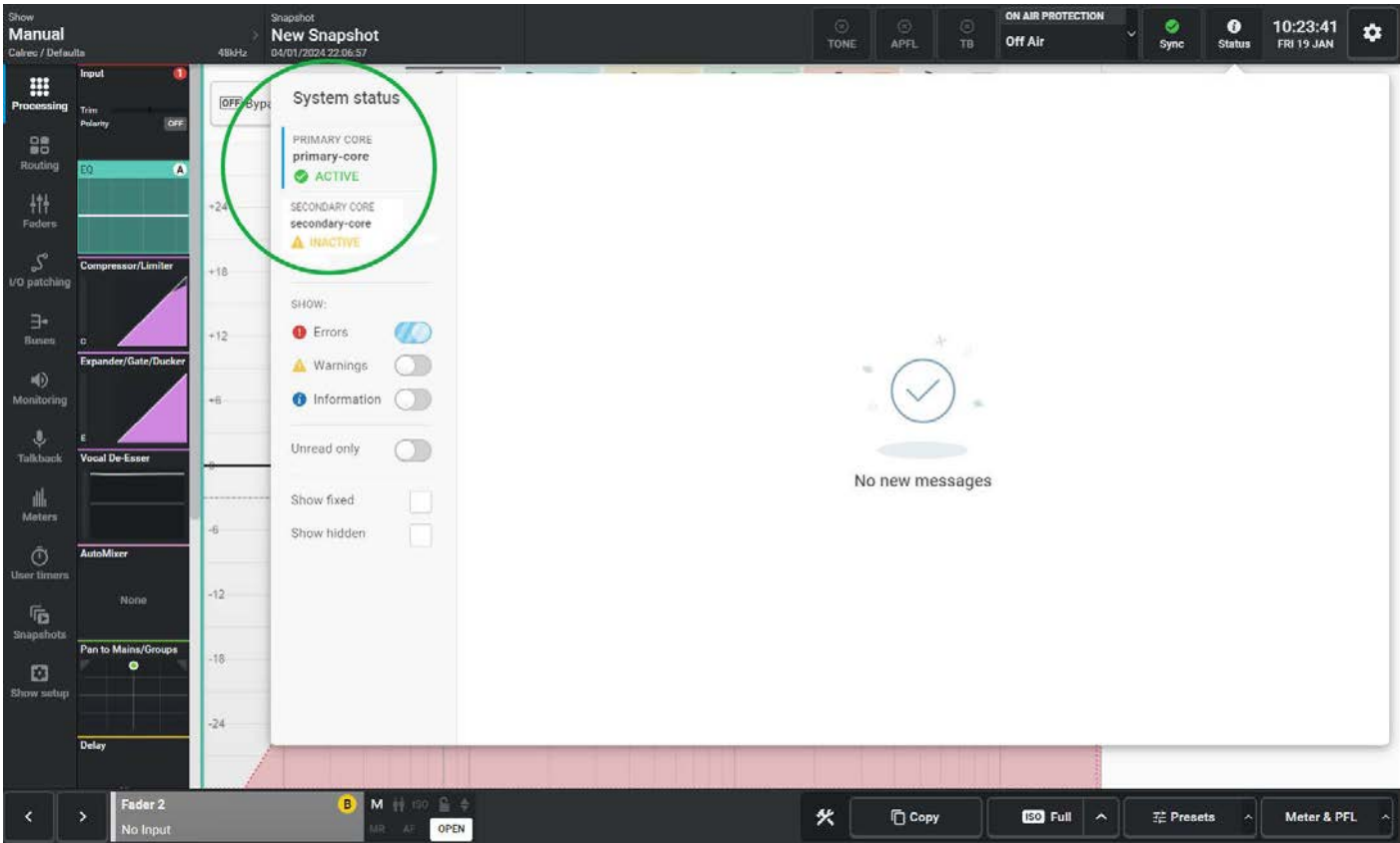
Selection “Twin cores” from the dialogue proceeds with the Twinning process, during which the secondary Core data is synchronised with the primary Core.

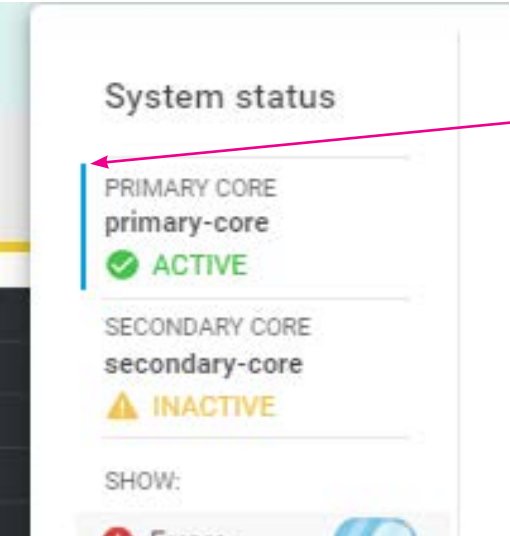


Once the Twinning process is complete, the status of both Primary and Secondary Cores is shown. The primary Core should be 'Active' and the secondary Core 'Inactive'. The redundant Cores are now Twinned, providing Core hardware redundancy.

Core Hardware Redundancy Status Indication

Once Type R Cores are Twinned, the status of both primary and secondary Cores is shown in both Assist and the Type R Configure applications. In Assist, click the System Status icon in the Header. The System Status dropdown will then display, as shown below:-



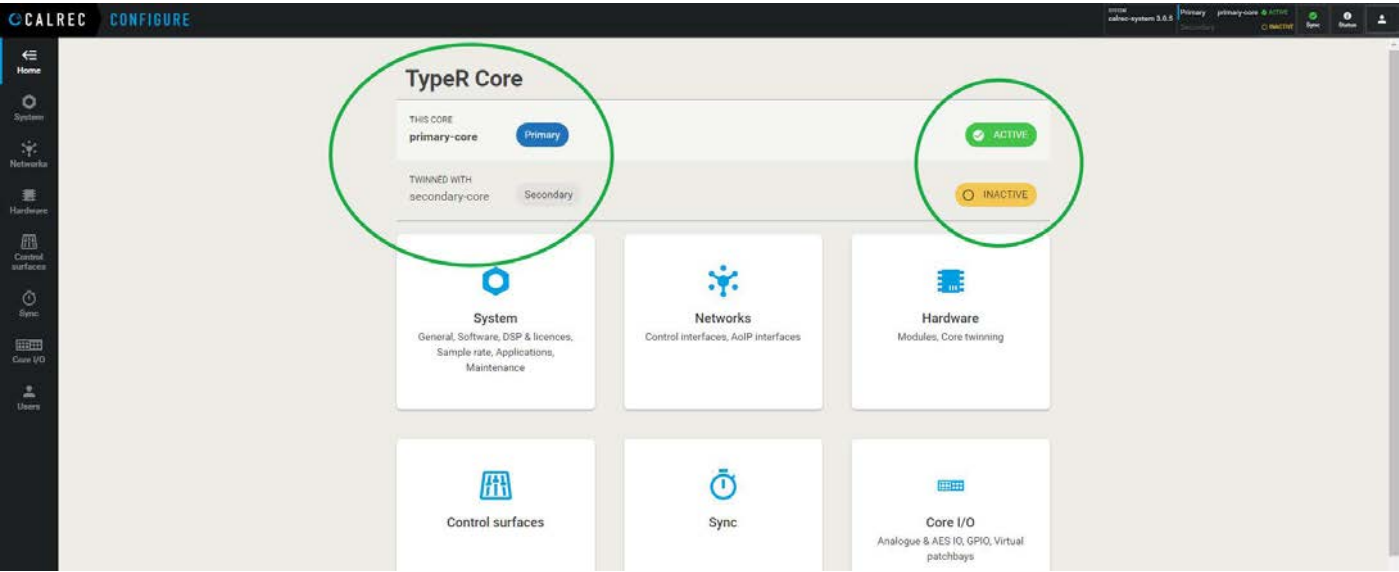


The System status shows which Core is 'Active' and which Core is 'Inactive'

The Blue bar indicates which Core's Assist application the user is viewing.

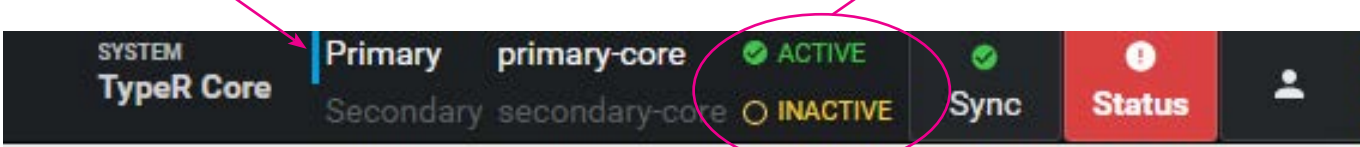
In Configure:

The 'Home' page in Configure provides primary and secondary Core 'Active'/'Inactive' status, plus indication of which Core's Configure application is currently viewed.



In the Configure application header:

The Blue bar indicates which Core's application the user is viewing.



The Core status indication key is as follows:

- 'ACTIVE' – This Core is the active Core currently in operation.
- 'INACTIVE' – This Core is the standby Core and is ready to become 'Active' should the primary Core failover.
- 'OFFLINE' – This Core is not connected, not powered or in a failed state.
- 'STANDBY' – This Core is booting and checking Twin connection.

Default Core Network for Surface Interfaces

The following tables summarise the default Application addressing and default Surface port allocation for both primary and secondary Cores:

Primary Core

Primary Core Default Surface Interface Addresses						
Application	Management	Mixer/Surface	External Control	AoIP Primary	AoIP Secondary	Surface Port
Assist A	172.29.1.1/16	172.17.1.1/16	-	-	-	1 & 2
Assist B	172.29.1.2/16	172.17.1.2/16	-	-	-	1 & 2
Assist C	172.29.1.3/16	172.17.1.3/16	-	-	-	1 & 2
Surface A	-	172.17.1.11/16	-	-	-	1 & 2
Surface B	-	172.17.1.12/16	-	-	-	1 & 2
Surface C	-	172.17.1.13/16	-	-	-	1 & 2
External Control A	-	-	172.28.1.31/16	-	-	4
External Control B	-	-	172.28.1.32/16	-	-	4
External Control C	-	-	172.28.1.33/16	-	-	4
Connect	172.29.1.21/16	172.17.1.21/16	-	-	-	1 & 2
	-	-	-	192.168.30.100/24	-	5
	-	-	-	-	192.168.31.100/24	6
Software Updater	172.29.1.22/16	172.17.1.22/16	-	-	-	1 & 2
Configure	172.29.1.23/16	172.17.1.23/16	-	-	-	1 & 2
Router	172.29.1.24/16	-	-	-	-	4
Twin Controller	172.29.1.25/16	-	-	-	-	7 & 8
NTP	172.29.1.27/16	-	-	-	-	1 & 2

Secondary Core

Secondary Core Default Surface Interface Addresses						
Application	Management	Mixer/Surface	External Control	AoIP Primary	AoIP Secondary	Surface Port
Assist A	172.29.1.101/16	172.17.1.101/16	-	-	-	1 & 2
Assist B	172.29.1.102/16	172.17.1.102/16	-	-	-	1 & 2
Assist C	172.29.1.1033/16	172.17.1.103/16	-	-	-	1 & 2
Surface A	-	172.17.1.111/16	-	-	-	1 & 2
Surface B	-	172.17.1.112/16	-	-	-	1 & 2
Surface C	-	172.17.1.113/16	-	-	-	1 & 2
External Control A	-	-	172.28.1.131/16	-	-	4
External Control B	-	-	172.28.1.132/16	-	-	4
External Control C	-	-	172.28.1.133/16	-	-	4
Connect	172.29.1.121/16	172.17.1.121/16	-	-	-	1 & 2
	-	-	-	192.168.30.100/24	-	5
	-	-	-	-	192.168.31.100/24	6
Software Updater	172.29.1.122/16	172.17.1.122/16	-	-	-	1 & 2
Configure	172.29.1.123/16	172.17.1.123/16	-	-	-	1 & 2
Router	172.29.1.124/16	-	-	-	-	4
Twin Controller	172.29.1.125/16	-	-	-	-	7 & 8
NTP	172.29.1.127/16	-	-	-	-	1 & 2

Application Access

When a pair of Cores are Twinned, the Assist, Connect, Configure and Software Updater applications can all be accessed from the "Active" Core. Only Configure and Software Updater can be accessed from the 'Inactive' Core.

	Application Access	
	Active Core	Inactive Core
Assist	✓	✗
Connect	✓	✗
Configure	✓	✓
Software Updater	✓	✓

What to expect on a Core Hardware failover

In the unlikely event of a failure on the primary Core, the redundancy system will automatically initiate a Core swap or failover. The system will swap from using the failed Core to using the 'Inactive' (usually secondary) Core. The failed Core will be marked as 'OFFLINE' and the previously 'Inactive' Core will become 'Active'.

During a redundant swap over event, it is expected that;

- a) Surface panels will lose control for approximately 1 to 3 seconds while they are re-directed to the redundant Core.
- b) Audio will be interrupted for approximately 5 to 7 seconds while AoIP streams are re-directed to the redundant Core. The exact length of the Audio interruption will depend on AoIP network topology.

Both Assist and Connect application browsers will be re-directed to access the newly 'Active' Core. The user is prompted to enter login details. Notifications that a redundant swapper has occurred are provided and reflected in the System Status messaging.

It is recommended that the user reports the redundant swapper to your technical support team immediately, ensuring the reason for the failure can be determined and redundancy re-established as soon as possible.

TYPE R
SYNC, AUDIO & GPIO CONNECTIONS

Type R Synchronisation sources.

The UR6500 Processing Engine Core primarily obtains an audio synchronisation source from the external AoIP network's PTPv2 clock via the 2 optional US6493 AoIP internal devices. It also has four BNC connectors on its rear panel for incoming and outgoing system synchronisation sources:

- 2 x TTL word clock inputs
- 2 x TTL word clock outputs

The firmware multiplexes these sources based on a prioritisation list and failover arrangement, to select and lock-on to an active reference clock or to switch to an alternative source if synchronisation is lost.

The board also includes an on-board reference clock for use when neither the external AoIP clock or the rear panel sync inputs are selected.

AoIP Clock

This can be considered the primary sync source for the UR6500. Each US6493 AoIP device provides a set of audio clocks to the UR6500's FPGA firmware incorporating a base rate clock (running at Fs rate), a BCLK bit-rate clock (64FS) and an SCLK system clock (generally either 128Fs, 256Fs or 512Fs). The FPGA uses these clock sources to sync to the external AoIP network PTPv2 clock.

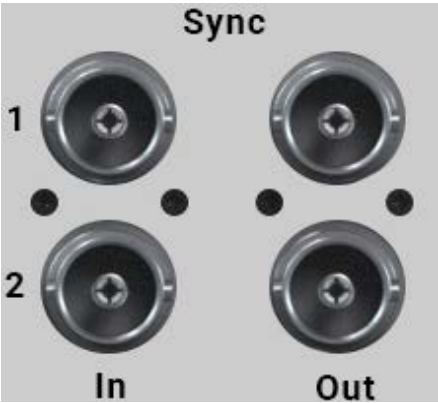
If no external sync is connected and selected, the console will free-run on its own internal reference clock.

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

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

When no optional US6493 AoIP interfaces are fitted to the core, external sync sources can be fed to the BNC connectors on the rear of the core, see Fig 1. Two TTL Wordclock inputs are available.

FIG 1 - SYNC INPUTS



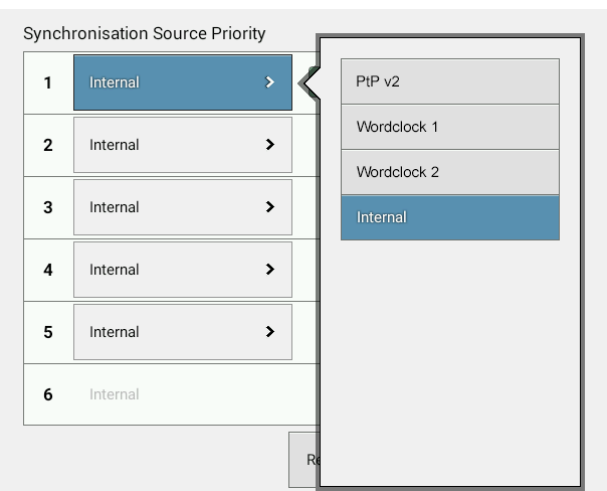
See External sources shown in Fig 2 for information on how to set up synchronisation priority.

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

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

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

FIG 2 - EXTERNAL SOURCES TABLE



There are a number of ways to pass Audio in/out of a Type R system. In addition to the audio I/O in the core, there are 3 optional I/O units carrying both Analogue inputs/outputs and AES digital inputs/outputs.

All Type R audio I/O, with the exception of the Headphone outputs, is connected via 25 way 'D' type female connectors on the units using the AES59/Tascam® standard, with a parallel set of connectors on RJ45 each carrying a pair of analogue inputs or outputs, or an AES input or output port.

Analogue Audio In 25 way 'D' type Connector

This connector is used for 8 x balanced Mic/Line inputs.

Note: there are 8 x 48v indicator LEDs to show when phantom power is being applied to each input to this connector.

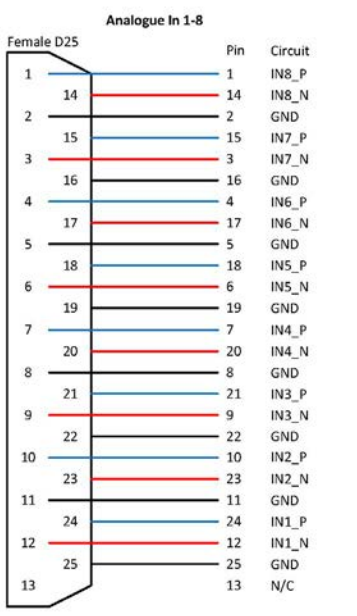
The pinout for analogue inputs 9-16 on the AD6502 Analogue I/O Box is identical to the 1-8 pinout, i.e., 1=9, 2=10 etc.

This connector appears on the UR6500 Core Box, AD6501 Combo I/O Box and the AD6502 Analogue I/O Box, and conforms to the AES59/Tascam® standard.

Analogue Audio Connector Pin-Outs
Analogue Audio In 1-8

Pin	Function
1	IN8 P
2	GND
3	IN7 N
4	IN6 P
5	GND
6	IN5 N
7	IN4 P
8	GND
9	IN3 N
10	IN2 P
11	GND
12	IN1 N
13	N/C
14	IN8 N
15	IN7 P
16	GND
17	IN6 N
18	IN5 P
19	GND
20	IN4 N
21	IN3 P
22	GND
23	IN2 N
24	IN1 P
25	GND

25-pin D-Type analogue input pin-out for input channels 1-8



25-pin D-Type analogue input pin-out for input channels 1-8

Analogue Audio In RJ45 type Connector

This connector is used for 2 x balanced Mic/Line inputs.

The pinout for analogue inputs 3-4, 5-6 and 7-8 is identical to the 1-2 pinout, i.e., 1=3, 2=4 etc.

This connector appears on the UR6500 Core Box, AD6501 Combo I/O Box and the AD6502 Analogue I/O Box, and conforms to the StudioHub+ standard pin-out.

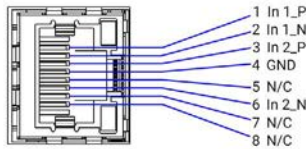
All cabling using this RJ45 connector type for audio must be CAT5e or CAT6 shielded twisted pair (STP).

Analogue Audio Connector Pin-Outs
Analogue Audio Inputs 1-2, 3-4, 5-6, 7-8

Pin	Function
1	Channel 1 Input +
2	Channel 1 Input -
3	Channel 2 Input +
4	Ground
5	Not Used
6	Channel 2 Input -
7	Not Used
8	Not Used

8-pin RJ45 analogue input pin-out for input channels 1-2, 3-4, 5-6, 7-8

Analogue Audio Inputs 1-2, 3-4, 5-6, 7-8



8-pin RJ45 analogue input pin-out for input channels 1-2, 3-4, 5-6, 7-8

Analogue Audio Out 25 way ‘D’ type Connector

This connector is used for 8 x balanced Line outputs.

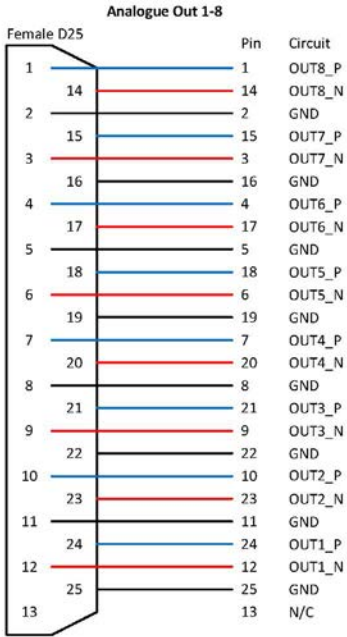
The pinout for analogue outputs 9-16 on the AD6502 Analogue I/O Box is identical to the 1-8 pinout, i.e., 1=9, 2=10 etc.

This connector appears on the UR6500 Core Box, AD6501 Combo I/O Box and the AD6502 Analogue I/O Box, and conforms to the AES59/Tascam® standard.

Analogue Audio Out 1-8

Pin	Function
1	OUT8_P
2	GND
3	OUT7_N
4	OUT6_P
5	GND
6	OUT5_N
7	OUT4_P
8	GND
9	OUT3_N
10	OUT2_P
11	GND
12	OUT1_N
13	N/C
14	OUT8_N
15	OUT7_P
16	GND
17	OUT6_N
18	OUT5_P
19	GND
20	OUT4_N
21	OUT3_P
22	GND
23	OUT2_N
24	OUT1_P
25	GND

25-pin D-Type analogue output pin-out for output channels 1-8



25-pin D-Type analogue output pin-out For output channels 1-8

AES Audio In 25 way ‘D’ type Connector

This connector is used for 4 x AES input ports.

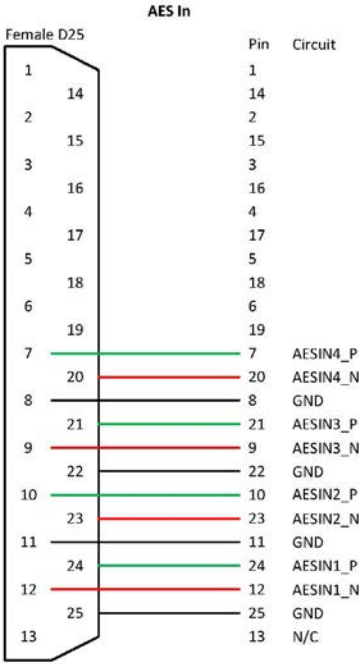
Note: there are 4 x SRC indicator LEDs on the front of the UR6500 Core Box and 8 x SRC indicator LEDs on the front of the JD6503 AES I/O Box to show when sample rate conversion is being applied to each input port.

This connector appears on the UR6500 Core Box, the AD6501 Combo I/O Box and the JD6503 AES I/O Box, and conforms to the AES59/Tascam® standard.

AES Inputs

Pin	Function
1	
2	
3	
4	
5	
6	
7	AESIN4_P
8	GND
9	AESIN3_N
10	AESIN2_P
11	GND
12	AESIN1_N
13	NC
14	
15	
16	
17	
18	
19	
20	AESIN4_N
21	AESIN3_P
22	GND
23	AESIN2_N
24	AESIN1_P
25	GND

25-pin D-Type AES input pin-out



25-pin D-Type AES input pin-out

Analogue Audio Out RJ45 type Connector

This connector is used for 2 x balanced Line outputs.

The pinout for analogue outputs 3-4, 5-6 and 7-8 is identical to the 1-2 pinout, i.e., 1=3, 2=4 etc.

This connector appears on the UR6500 Core Box, AD6501 Combo I/O Box and the AD6502 Analogue I/O Box, and conforms to the StudioHub+ standard pin-out.

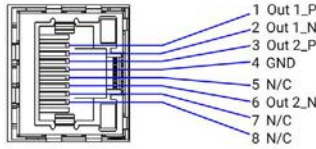
All cabling using this RJ45 connector type for audio must be CAT5e or CAT6 shielded twisted pair (STP).

Analogue Audio Outputs 1-2, 3-4, 5-6, 7-8

Pin	Function
1	Channel 1 Output +
2	Channel 1 Output -
3	Channel 2 Output +
4	Ground
5	Not Used
6	Channel 2 Output -
7	Not Used
8	Not Used

8-pin RJ45 analogue output pin-out for output channels 1-2, 3-4, 5-6, 7-8

Analogue Audio Outputs 1-2, 3-4, 5-6, 7-8



8-pin RJ45 analogue output pin-out for output channels 1-2, 3-4, 5-6, 7-8

AES Audio In RJ45 type Connector

This connector is used for 1 x AES input ports.

The pinout for AES input ports 2, 3, 4 is identical to the port 1 pinout.

This connector appears on the UR6500 Core Box, AD6501 Combo I/O Box and the JD6503 AES I/O Box, and conforms to the StudioHub+ standard pin-out.

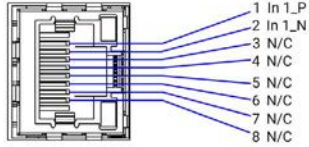
All cabling using this RJ45 connector type for audio must be CAT5e or CAT6 shielded twisted pair (STP).

AES Audio Input Ports 1, 2, 3, 4

Pin	Function
1	AES 1 Input +
2	AES 1 Input -
3	Not Used
4	Not Used
5	Not Used
6	Not Used
7	Not Used
8	Not Used

8-pin RJ45 AES input pin-out for input ports 1, 2, 3, 4

AES Audio Input Ports 1, 2, 3, 4



8-pin RJ45 AES input pin-out for input ports 1, 2, 3, 4

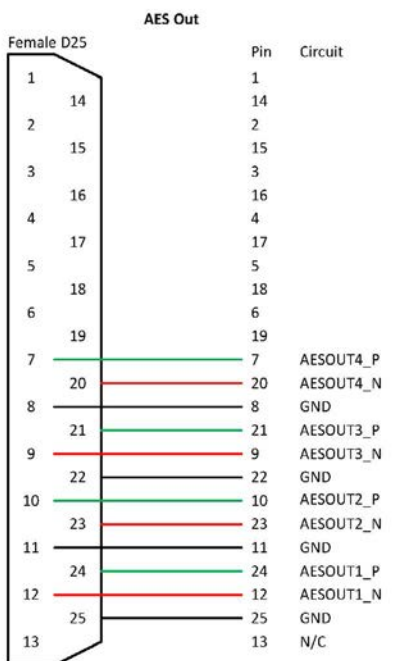
AES Audio Out 25 way ‘D’ type Connector
This connector is used for 4 x AES output ports.

This connector appears on the UR6500 Core Box, the AD6501 Combo I/O Box and the JD6503 AES I/O Box, and conforms to the AES59/Tascam® standard.

AES Outputs

Pin	Function
1	
2	
3	
4	
5	
6	
7	AESOUT4_P
8	GND
9	AESOUT3_N
10	AESOUT2_P
11	GND
12	AESOUT1_N
13	NC
14	
15	
16	
17	
18	
19	
20	AESOUT4_N
21	AESOUT3_P
22	GND
23	AESOUT2_N
24	AESOUT1_P
25	GND

25-pin D-Type AES output pin-out



25-pin D-Type AES output pin-out

AES Audio Out RJ45 type Connector
This connector is used for 1 x AES output ports.

The pinout for AES output ports 2, 3, 4 is identical to the port 1 pinout.

This connector appears on the UR6500 Core Box, AD6501 Combo I/O Box and the JD6503 AES I/O Box, and conforms to the StudioHub+ standard pin-out.

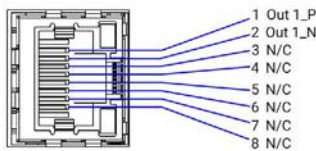
All cabling using this RJ45 connector type for audio must be CAT5e or CAT6 shielded twisted pair (STP).

AES Audio Output Ports 1, 2, 3, 4

Pin	Function
1	AES 1 Output +
2	AES 1 Output -
3	Not Used
4	Not Used
5	Not Used
6	Not Used
7	Not Used
8	Not Used

8-pin RJ45 AES output pin-out for input ports 1, 2, 3, 4

AES Audio Output Ports 1, 2, 3, 4



8-pin RJ45 AES output pin-out for input ports 1, 2, 3, 4

GPIO CONNECTIONS

GPIO connectors provide logic inputs and outputs, which can be assigned to various functions from the Type R interface. GPIO allows console functions to trigger external devices, e.g., fader starts for playback devices, and for external devices to trigger console functions, e.g., autofades controlled by a video switcher.

External GPIO interfaces

The UR6500 Type R Core and the AD6501, AD6502 and JD6503 I/O units are fitted with GPIO circuits on RJ45 type connectors. The upper connector is a 6 input opto GPI connector, while the lower connector is a 6 output opto GPO connector.

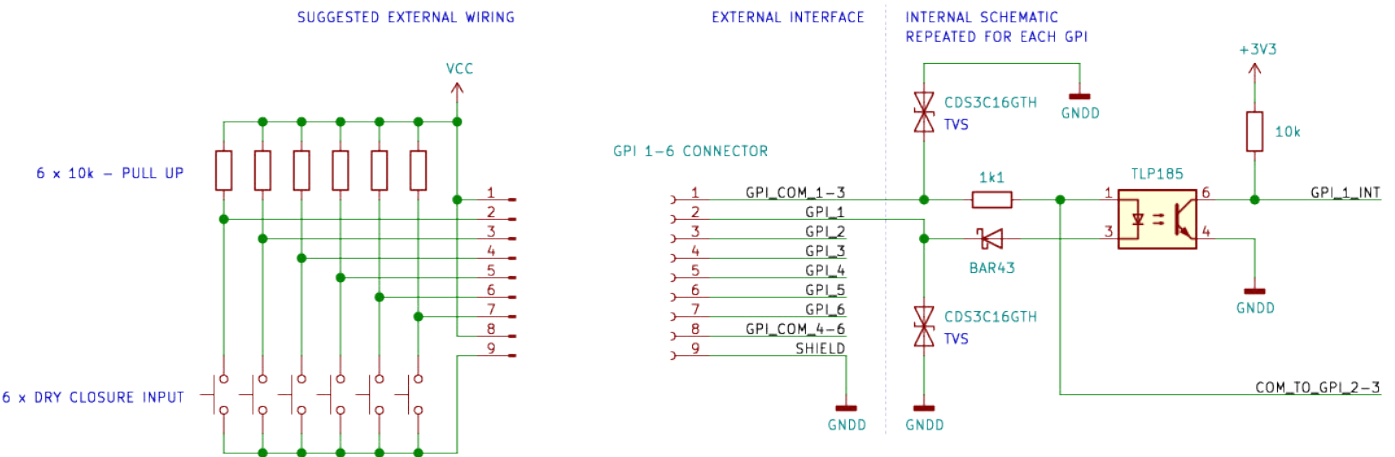
GPI (inputs)

Each GPI connector carries six GPI circuits based on a simple opto-isolated design, capable of interfacing with any DC signal between 5V and 24V.

Each input is designed to be active sink, i.e., the input must be grounded or closed to trigger logic high).

Groups of three GPI (1-3 and 4-6) share a common positive input, i.e., two common inputs in total for six GPI, which must be provided from an external connection.

FIG 1 - GP INPUT CIRCUIT



GPIO RJ45 type Connector

This connector is used for 6 x GP Inputs.

Note: the two Commons are split as 2 connections for GPI 1-3 on Pin 1 and GPI 4-6 on Pin 8.

Note: A 0v reference is available on the shield of the RJ45 connector

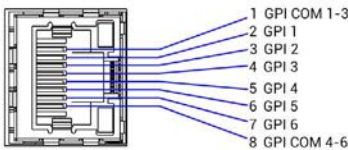
This connector appears on the UR6500 Core Box x 2, the AD6501 Combo I/O Box, the AD6502 Analogue I/O Box and the JD6503 AES I/O Box.

General Purpose Input Connections

Pin	Function
1	GPI COM 1-3
2	GPI 1
3	GPI 2
4	GPI 3
5	GPI 4
6	GPI 5
7	GPI 6
8	GPI COM 4-6

8-pin RJ45 GP input pin-out for GPI 1-6 or 7-12

GP Input Connections



8-pin RJ45 GP input pin-out for GPI 1-6 or 7-12

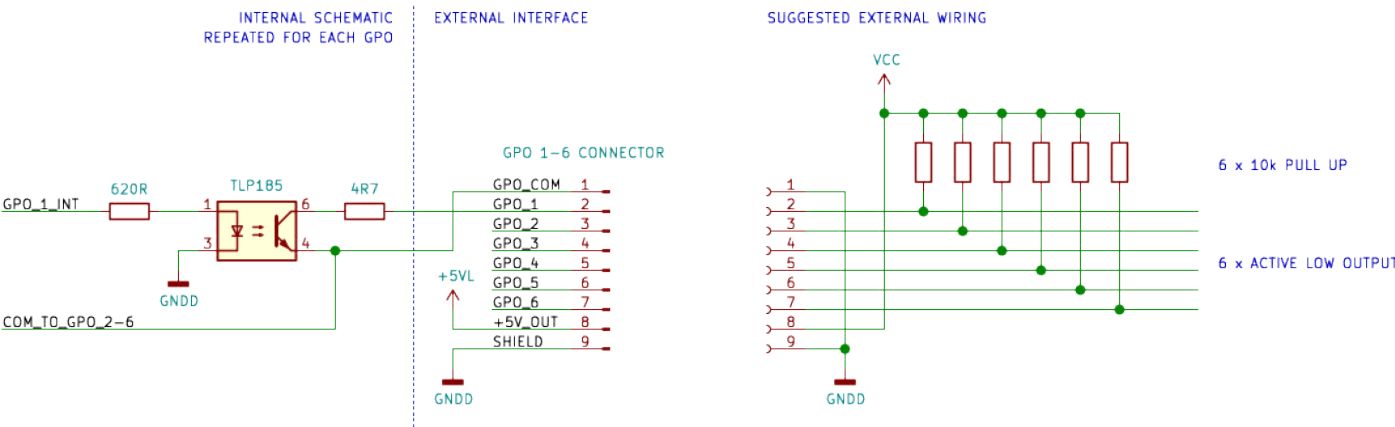
GPO (outputs)

Each GPO connector carries six GPO circuits based on a simple opto-isolated design, with each output capable of interfacing to a maximum voltage of 30V and passing a recommended maximum current of 10mA per circuit.

GPO's require an external pull up and are pulled low when active.

Note: there is one common connection for all 6 GPO and 5V is provided on the connector (Pin 8) for loopback to pull the outputs high when a voltage source is not provided by the connecting equipment.

FIG 2 - GP OUTPUT CIRCUIT



GPO RJ45 type Connector

This connector is used for 6 x GP Outputs.

Note: the Common for all the GPO on Pin 1 and a 5V O/P is made available on Pin 8.

Note: A 0v reference is available on the shield of the RJ45 connector

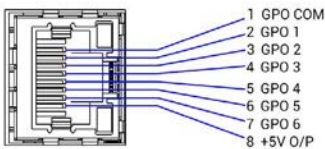
This connector appears on the UR6500 Core Box x 2, AD6501 Combo I/O Box, AD6502 Analogue I/O Box and the JD6503 AES I/O Box.

General Purpose Output Connections

Pin	Function
1	GPO COM
2	GPO 1
3	GPO 2
4	GPO 3
5	GPO 4
6	GPO 5
7	GPO 6
8	+5V O/P

8-pin RJ45 GP output pin-out for GPO 1-6 or 7-12

GP Output Connections



8-pin RJ45 GP output pin-out for GPO 1-6 or 7-12

TYPE R
CORE DSP PACK OPTIONS

DSP PACK OPTIONS

The digital signal processing element of the Type R core allows for a combination of different ‘Console Pack’ sizes. It is designed to be flexible and to provide sufficient processing for one, two or three consoles connected to a core.

DSP Pack Sizes

Type R has 4 DSP Packs available:

R20 supports up to 20 DSP input channels (mono equivalent) - This is the Base DSP pack provided with the Core.

R40 supports up to 40 DSP input channels(mono equivalent) - This is a customer option.

R80 supports up to 80 DSP input channels(mono equivalent) - This is a customer option.

R120 supports up to 120 DSP input channels(mono equivalent) - This is a customer option.

Note: to expand the capabilities of Type-R, the user can purchase DSP Licences. For further information, please refer to the **Type R Configure Guide (926-285).pdf**

Fig 1 shows the various pack sizes and how the DSP channels , buses and outputs are arranged between 1, 2 or 3 consoles.

FIG 1 - DSP PACKAGES TABLE

DSP Packs		
R20		Base 20 DSP channel paths
R40		40 DSP channel paths
R80		80 DSP channel paths
R120		120 DSP channel paths
R20		Base 20 DSP channel paths
		1 x Console: 20 DSP channel paths, 8 Aux buses, 8 Group buses, 3 Main buses
R40	Option	40 DSP channel paths
	1	1 x Console: 40 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses
	2	2 x Console: 20 DSP channel paths, 8 Aux buses, 8 Group buses, 3 Main buses
R80	Option	80 DSP channel paths
	1	1 x Console: 80 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses
	2	2 x Consoles: 40 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses
	3	1 x Console: 40 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses 2 x Console: 20 DSP channel paths, 8 Aux buses, 8 Group buses, 3 Main buses
R120	Option	120 DSP channel paths
	1	1 x Console: 120 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses
	2	2 x Consoles: 60 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses
	3	3 x Consoles: 40 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses
	4	1 x Console: 80 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses 1 x Console: 40 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses
	5	1 x Console: 60 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses 2 x Consoles: 30 DSP channel paths, 8 Aux buses, 8 Group buses, 3 Main buses

For Single Consoles

Single consoles powered by one DSP Core: There are 4 variants depending on which DSP packages have been made available, from 20 to 120 DSP channels. Mix buses will also vary depending on the DSP channel size, with only the two larger DSP packs, R80 and R120, offering 5.1 capability in a single console arrangement. DSP Packs NOT 5.1 capable (R20 and R40) will only provide mono or stereo paths/channels. It should be noted that even though there are 16 Group buses shown as available in some elements of the table, the system is designed to provide up to a maximum of 8 Groups per console, irrespective of width.

For dual consoles

Two Consoles powered by one DSP Core: There are 4 variants depending on which DSP packages have been made available from 20 to 80 DSP channels. Mix buses will also vary depending on the DSP channel size, with only the largest DSP pack, R120, offering 5.1 capability in a dual console arrangement. DSP Pack R20 does not provide a dual console arrangement, while DSP packs R40 and R80 will only provide mono or stereo paths/channels in a dual console arrangement. It should be noted that even though there are 16 Group buses shown as available in some elements of the table, the system is designed to provide up to a maximum of 8 Groups per console, irrespective of width.

For triple consoles

Three consoles powered by one DSP Core: There are 3 variants depending on which DSP packages have been made available from 20 to 60 DSP channels.. Mix buses will also vary depending on the DSP channel size, with only the largest DSP, pack R120, offering 5.1 capability on 1 console in a triple console arrangement. DSP Packs R20 and R40 do not provide a triple console arrangement. DSP Pack R80 will only provide mono or stereo paths/channels in a triple console arrangement. It should be noted that even though there are 16 Group buses shown as available in some elements of the table, the system is designed to provide up to a maximum of 8 Groups per console irrespective of width.

DSP Path and Mix Bus Tables

Fig 2 shows the DSP path and Mix Path count for the various DSP Packs across the different options.

FIG 2 - DSP PATH AND MIX PATH SUMMARY TABLE PER CONSOLE SIZE

	Type R Console Summary					
	20 CH	30 CH	40 CH	60 CH	80 CH	120 CH
DSP Paths (mono equivalent)						
Channel Paths	20	30	40	60	80	120
Aux Paths	8	8	16	16	16	16
Main & Group Paths	14	14	22	30	30	30
Total DSP Paths	42	52	78	106	126	166
Mix Paths (mono equivalent)						
Main 1/PGM1 Paths	14	14	22	30	30	30
Main 2/PGM2 Paths						
Main 3/REC Paths						
Group Paths						
Aux Paths	8	8	16	16	16	16
PFL Mix Paths	2	2	2	6	6	6
AFL Mix Paths	2	2	2	6	6	6
Mix Minus Mix Paths	11	11	11	11	11	11
Conference Mix Paths	1	1	1	1	1	1
Total Mix Paths	38	38	54	70	70	70

FIG 3 - DSP PATH/MIX PATH SUMMARY TABLE FOR R20 BASE DSP

	R20	
	Console 1	Totals
	20 CH	
DSP Paths (mono equivalent)		
Channel Paths	20	20
Aux Paths	8	8
Main & Group Paths	14	14
Total DSP Paths	42	42
Mix Paths (mono equivalent)		
Main 1/PGM1 Paths	14	14
Main 2/PGM2 Paths		
Main 3/REC Paths		
Group Paths		
Aux Paths	8	8
PFL Mix Paths	2	2
AFL Mix Paths	2	2
Mix Minus Mix Paths	11	11
Conference Mix Paths	1	1
Total Mix Paths	38	38

32 Mix Paths			
Mix Paths (mono equivalent)	Width	Paths	Note
Main 1/PGM1 Paths	Mono,Stereo or 5.1	14	Pool of 14 Paths, may be assigned as Mono, Stereo or 5.1
Main 2/PGM2 Paths	Mono,Stereo or 5.1		
Main 3/REC Paths	Mono,Stereo or 5.1		
Group Paths	Mono,Stereo or 5.1		
Aux Paths	Mono or Stereo	8	8 Mono or 4 stereo or any combination
PFL Mix Paths	Stereo	2	
AFL Mix Paths	Stereo	2	
Mix Minus Mix Paths	Mono	11	
Conference Mix Paths	Mono	1	
Total Mix Paths		38	

FIG 4 - DSP PATH/MIX PATH SUMMARY TABLE FOR R40 DSP OPTIONS

	R40 - Option 1	
	Console 1	Totals
	40 CH	
DSP Paths (mono equivalent)		
Channel Paths	40	40
Aux Paths	16	16
Main & Group Paths	22	22
Total DSP Paths	78	78
Mix Paths (mono equivalent)		
Main 1/PGM1 Paths	22	22
Main 2/PGM2 Paths		
Main 3/REC Paths		
Group Paths		
Aux Paths	16	16
PFL Mix Paths	2	2
AFL Mix Paths	2	2
Mix Minus Mix Paths	11	11
Conference Mix Paths	1	1
Total Mix Paths	54	54

	R40 - Option 2		
	Console 1	Console 2	Totals
	20 CH	20 CH	
DSP Paths (mono equivalent)			
Channel Paths	20	20	40
Aux Paths	8	8	16
Main & Group Paths	14	14	28
Total DSP Paths	42	42	84
Mix Paths (mono equivalent)			
Main 1/PGM1 Paths	14	14	28
Main 2/PGM2 Paths			
Main 3/REC Paths			
Group Paths			
Aux Paths	8	8	16
PFL Mix Paths	2	2	4
AFL Mix Paths	2	2	4
Mix Minus Mix Paths	11	11	22
Conference Mix Paths	1	1	2
Total Mix Paths	38	38	76

48 Mix Paths			
Mix Paths (mono equivalent)	Width	Paths	Note
Main 1/PGM1 Paths	Mono,Stereo or 5.1	22	Pool of 22 Paths, may be assigned as Mono, Stereo or 5.1
Main 2/PGM2 Paths	Mono,Stereo or 5.1		
Main 3/REC Paths	Mono,Stereo or 5.1		
Group Paths	Mono,Stereo or 5.1		
Aux Paths	Mono or Stereo	16	16 Mono or 8 stereo or any combination
PFL Mix Paths	Stereo	2	
AFL Mix Paths	Stereo	2	
Mix Minus Mix Paths	Mono	11	
Conference Mix Paths	Mono	1	
Total Mix Paths		54	

FIG 5 - DSP PATH/MIX PATH SUMMARY TABLE FOR R80 DSP OPTIONS

	R80 - Option 1	
	Console 1	Totals
	80 CH	
DSP Paths (mono equivalent)		
Channel Paths	80	80
Aux Paths	16	16
Main & Group Paths	30	30
Total DSP Paths	126	126
Mix Paths (mono equivalent)		
Main 1/PGM1 Paths	30	30
Main 2/PGM2 Paths		
Main 3/REC Paths		
Group Paths		
Aux Paths	16	16
PFL Mix Paths	6	6
AFL Mix Paths	6	6
Mix Minus Mix Paths	11	11
Conference Mix Paths	1	1
Total Mix Paths	70	70

	R80 - Option 2		
	Console 1	Console 2	Totals
	40 CH	40 CH	
DSP Paths (mono equivalent)			
Channel Paths	40	40	80
Aux Paths	16	16	32
Main & Group Paths	22	22	44
Total DSP Paths	78	78	156
Mix Paths (mono equivalent)			
Main 1/PGM1 Paths	22	22	44
Main 2/PGM2 Paths			
Main 3/REC Paths			
Group Paths			
Aux Paths	16	16	32
PFL Mix Paths	2	2	4
AFL Mix Paths	2	2	4
Mix Minus Mix Paths	11	11	22
Conference Mix Paths	1	1	2
Total Mix Paths	54	54	108

FIG 6 - DSP PATH AND MIX PATH SUMMARY TABLE FOR R80 DSP OPTIONS-CONTINUED

	R80 - Option 3			
	Console 1	Console 2	Console 3	Totals
	40 CH	20 CH	20 CH	
DSP Paths (mono equivalent)				
Channel Paths	40	20	20	80
Aux Paths	16	8	8	32
Main & Group Paths	22	14	14	50
Total DSP Paths	78	42	42	162
Mix Paths (mono equivalent)				
Main 1/PGM1 Paths	22	14	14	50
Main 2/PGM2 Paths				
Main 3/REC Paths				
Group Paths				
Aux Paths	16	8	8	32
PFL Mix Paths	2	2	2	6
AFL Mix Paths	2	2	2	6
Mix Minus Mix Paths	11	11	11	33
Conference Mix Paths	1	1	1	1
Total Mix Paths	54	38	38	130

64 Mix Paths			
Mix Paths (mono equivalent)	Width	Paths	Note
Main 1/PGM1 Paths	Mono,Stereo or 5.1	30	Pool of 30 Paths, may be assigned as Mono, Stereo or 5.1
Main 2/PGM2 Paths	Mono,Stereo or 5.1		
Main 3/REC Paths	Mono,Stereo or 5.1		
Group Paths	Mono,Stereo or 5.1		
Aux Paths	Mono or Stereo	16	16 Mono or 8 stereo or any combination
PFL Mix Paths	Stereo or 5.1	6	
AFL Mix Paths	Stereo or 5.1	6	
Mix Minus Mix Paths	Mono	11	
Conference Mix Paths	Mono	1	
Total Mix Paths		70	

FIG 7 - DSP PATH AND MIX PATH SUMMARY TABLE FOR R120 DSP OPTIONS

	R120- Option 1	
	Console 1	Totals
	120 CH	
DSP Paths (mono equivalent)		
Channel Paths	120	120
Aux Paths	16	16
Main & Group Paths	30	30
Total DSP Paths	166	166
Mix Paths (mono equivalent)		
Main 1/PGM1 Paths	30	30
Main 2/PGM2 Paths		
Main 3/REC Paths		
Group Paths		
Aux Paths	16	16
PFL Mix Paths	6	6
AFL Mix Paths	6	6
Mix Minus Mix Paths	11	11
Conference Mix Paths	1	1
Total Mix Paths	70	70

	R120 - Option 2		
	Console 1	Console 2	Totals
	60 CH	60 CH	
DSP Paths (mono equivalent)			
Channel Paths	60	60	120
Aux Paths	16	16	32
Main & Group Paths	30	30	60
Total DSP Paths	106	106	212
Mix Paths (mono equivalent)			
Main 1/PGM1 Paths	30	30	60
Main 2/PGM2 Paths			
Main 3/REC Paths			
Group Paths			
Aux Paths	16	16	32
PFL Mix Paths	6	6	12
AFL Mix Paths	6	6	12
Mix Minus Mix Paths	11	11	22
Conference Mix Paths	1	1	2
Total Mix Paths	70	70	140

FIG 8 - DSP PATH AND MIX PATH SUMMARY TABLE FOR R120 DSP OPTIONS-CONTINUED

	R120 - Option 3		
	Console 1	Console 2	Console 3
	40 CH	40 CH	40 CH
DSP Paths (mono equivalent)			
Channel Paths	40	40	40
Aux Paths	16	16	16
Main & Group Paths	22	22	22
Total DSP Paths	78	78	78
Mix Paths (mono equivalent)			
Main 1/PGM1 Paths	22	22	22
Main 2/PGM2 Paths			
Main 3/REC Paths			
Group Paths			
Aux Paths	16	16	16
PFL Mix Paths	2	2	2
AFL Mix Paths	2	2	2
Mix Minus Mix Paths	11	11	11
Conference Mix Paths	1	1	1
Total Mix Paths	54	54	54

	R120 - Option 4	
	Console 1	Console 2
	80 CH	40 CH
DSP Paths (mono equivalent)		
Channel Paths	80	40
Aux Paths	16	16
Main & Group Paths	30	22
Total DSP Paths	126	78
Mix Paths (mono equivalent)		
Main 1/PGM1 Paths	30	22
Main 2/PGM2 Paths		
Main 3/REC Paths		
Group Paths		
Aux Paths	16	16
PFL Mix Paths	6	2
AFL Mix Paths	6	2
Mix Minus Mix Paths	11	11
Conference Mix Paths	1	1
Total Mix Paths	70	54

	R120 - Option 5		
	Console 1	Console 2	Console 3
	60 CH	30 CH	30 CH
DSP Paths (mono equivalent)			
Channel Paths	60	30	30
Aux Paths	16	8	8
Main & Group Paths	30	14	14
Total DSP Paths	106	52	52
Mix Paths (mono equivalent)			
Main 1/PGM1 Paths	30	14	14
Main 2/PGM2 Paths			
Main 3/REC Paths			
Group Paths			
Aux Paths	16	8	8
PFL Mix Paths	6	2	2
AFL Mix Paths	6	2	2
Mix Minus Mix Paths	11	11	11
Conference Mix Paths	1	1	1
Total Mix Paths	70	38	38

FIG 9 - DSP PACK OVERVIEW FOR DIRECT/MIX MINUS OUTPUTS, DELAYS, INSERTS AND EXTERNAL INPUTS

DSP Packs									
R20	Base 20 DSP channel paths								
R40	40 DSP channel paths								
R80	80 DSP channel paths								
R120	120 DSP channel paths								
User Options for DSP Packs		Available @ 44.1/48kHz							
R20			Base 20 DSP channel paths						
R40	Option 1	✓	1 x Console: 20 DSP channel paths, 8 Aux buses, 8 Group buses, 3 Main buses	1	24	16	16	24	24
			40 DSP channel paths	40 DSP channel paths					
		✓	1 x Console: 40 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses	1	32	20	20	32	24
				Per Pack	32	20	20	32	24
R80	Option 2	✓	2 x Console: 20 DSP channel paths, 8 Aux buses, 8 Group buses, 3 Main buses	1	24	16	16	24	24
				2	24	16	16	24	24
				Per Pack	48	32	32	48	48
					80 DSP channel paths				
R120	Option 3	✓	1 x Console: 80 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses	1	64	44	44	64	72
				Per Pack	64	44	44	64	72
		✓	2 x Consoles: 40 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses	1	32	20	20	32	24
				2	32	20	20	32	24
R120	Option 4	✓	1 x Console: 40 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses	1	32	20	20	32	24
				2	24	16	16	24	24
		✓	2 x Consoles: 20 DSP channel paths, 8 Aux buses, 8 Group buses, 3 Main buses	3	24	16	16	24	24
				Per Pack	80	52	52	80	72
R120	Option 5	✓	120 DSP channel paths	120 DSP channel paths					
			1 x Console: 120 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses	1	96	64	64	96	72
		✓		Per Pack	96	64	64	96	72
			2 x Consoles: 60 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses	1	48	32	32	48	36
R120	Option 6	✓	3 x Consoles: 40 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses	2	48	32	32	48	36
				Per Pack	96	64	64	96	72
				1	32	20	20	32	24
				2	32	20	20	32	24
R120	Option 7	✓	4 x Consoles: 40 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses	3	32	20	20	32	24
				Per Pack	96	60	60	96	72
		✓	1 x Console: 80 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses	1	64	44	44	64	48
			1 x Console: 40 DSP channel paths, 16 Aux buses, 8 Group buses, 3 Main buses	2	32	20	20	32	24
R120	Option 8	✓	5 x Consoles: 30 DSP channel paths, 8 Aux buses, 8 Group buses, 3 Main buses	Per Pack	96	64	64	96	72
				1	48	32	32	48	24
		✓		2	24	16	16	24	24
				3	24	16	16	24	24

TYPE R
SURFACE PANEL LAYOUT EXAMPLES

SURFACE PANEL LAYOUTS

Creating & Connecting Up Surface Layouts

The cabling scheme used for connecting Type R Fader Panels, Large Soft Panels (LSPs) and Small Soft Panels (SSPs) to the Type R Core will depend on the required number of panels and the level of connection resilience desired.

The following examples are provided to show the recommended connectivity for Type R surface panels from a small single Core 12 Fader system to a larger architecture, with multiple console surfaces connected to a system with twin cores for redundancy.

These network examples show the surface panel to Core connectivity. Tor connecting IO Units to the Core, please refer to the AoIP Network Examples.

All Type R panels must be connected to an appropriate PoE+ switch or injector to provide the power required for each panel.

- A maximum 48 Faders (8 physical or virtual Fader Panels) can be configured for a single Type R console or mixer.
- With multi-console DSP Licences, up to three console or mixers can be supported on a single (or redundant) Core. For a three console or mixer DSP Licence, up to 48 Faders (8 physical or virtual Fader Panels) can be connected to each console or mixer, allowing a maximum of 144 Faders (24 physical or virtual Fader Panels) for a single (or redundant) Core.
- A Maximum 26 LSP or SSP can be configured for a single (or redundant) Core (in addition to the above 24 Fader panels). For multi-console DSP licences, 26 LSP or SSP can be allocated between multiple consoles or mixers.

Recommended third party equipment.

The following examples are based upon the use of the following third-party switches and Windows PC's;

1. Cisco SG350-10-MP-K9 PoE+ – 10 port (8+2) switch (Calrec 491-265)
 - 8 x Powered 1Gbps RJ45.
 - 2 x Non-powered combo RJ45/SFP 1Gbps slots that can accept 1Gbps interfaces.

Note that the use of the 2 x SFP slots will require additional SFP interfaces which are not supplied with the switch.

2. Cisco SG350-10-K9 – 10 port (8+2) switch (Calrec 491-267)
 - 8 x 1Gbps RJ45.
 - 2 x combo RJ45/SFP 1Gbps slots that can accept 1Gbps interfaces.

Note that the use of the 2 x SFP slots will require additional SFP interfaces which are not supplied with the switch.

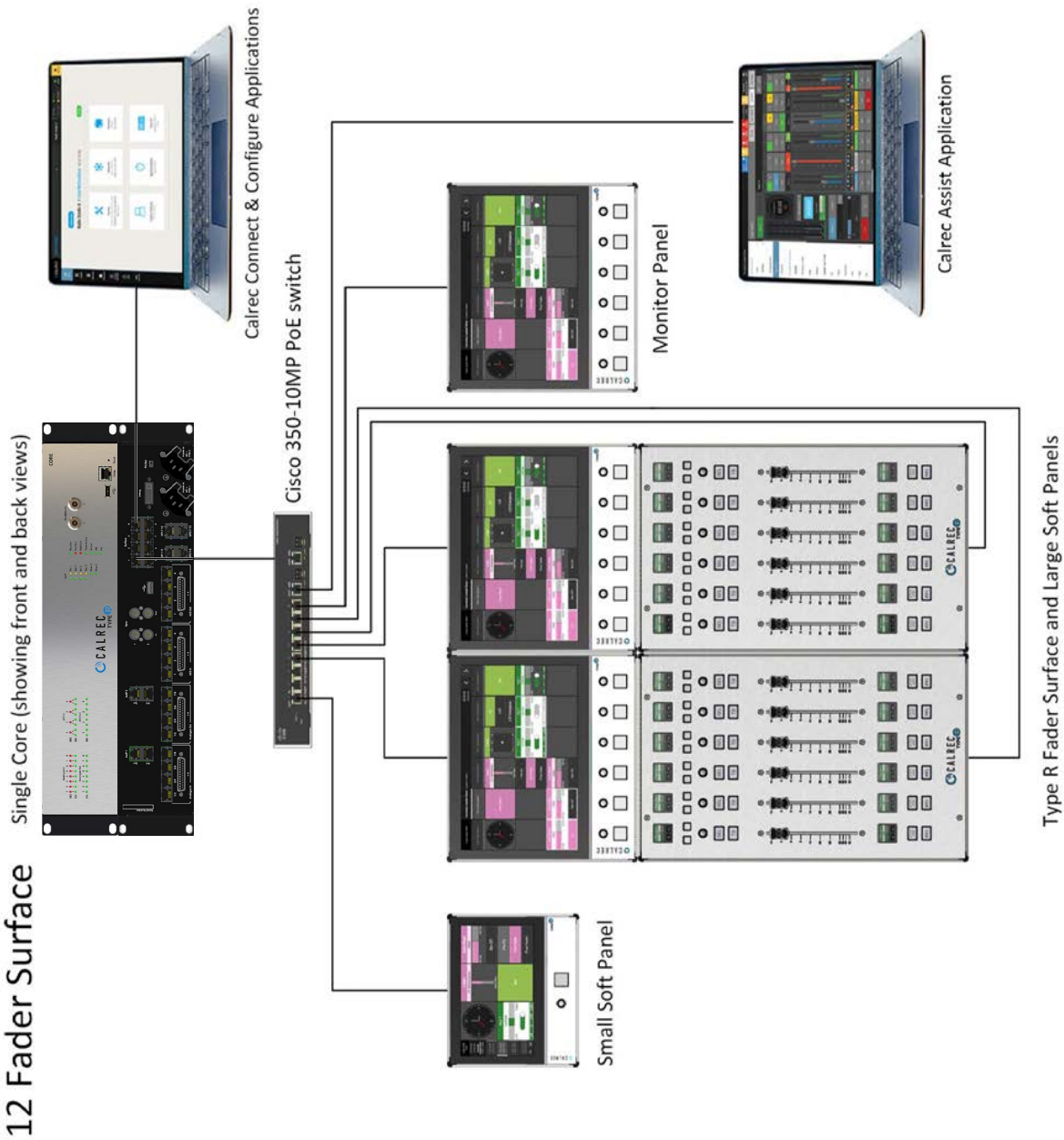
3. All cabling shown is via RJ45 Cat5e shielded twisted pair (STP) cables.
4. Windows PC: Minimum specification
 - 7th Generation Intel® Core™ i5 7400 CPU Base Frequency 3.00GHz Processor or AMD equivalent.
 - 8GB RAM memory.
 - Windows 7 or 10 - 64bit.
 - Google Chrome Browser - Version 77 or higher.

The Cisco SG350-10-MP-K9 PoE+ – 10 port (8+2) switch (Calrec 491-265) provides to total power budget of 124W. Each of the 8 PoE+ powered ports each can power one Type R panel. This means one Cisco SG350-10-MP-K9 PoE+ can provide power for up to 8 Type R panels. Ports 9 & 10 are not POE+ powered.

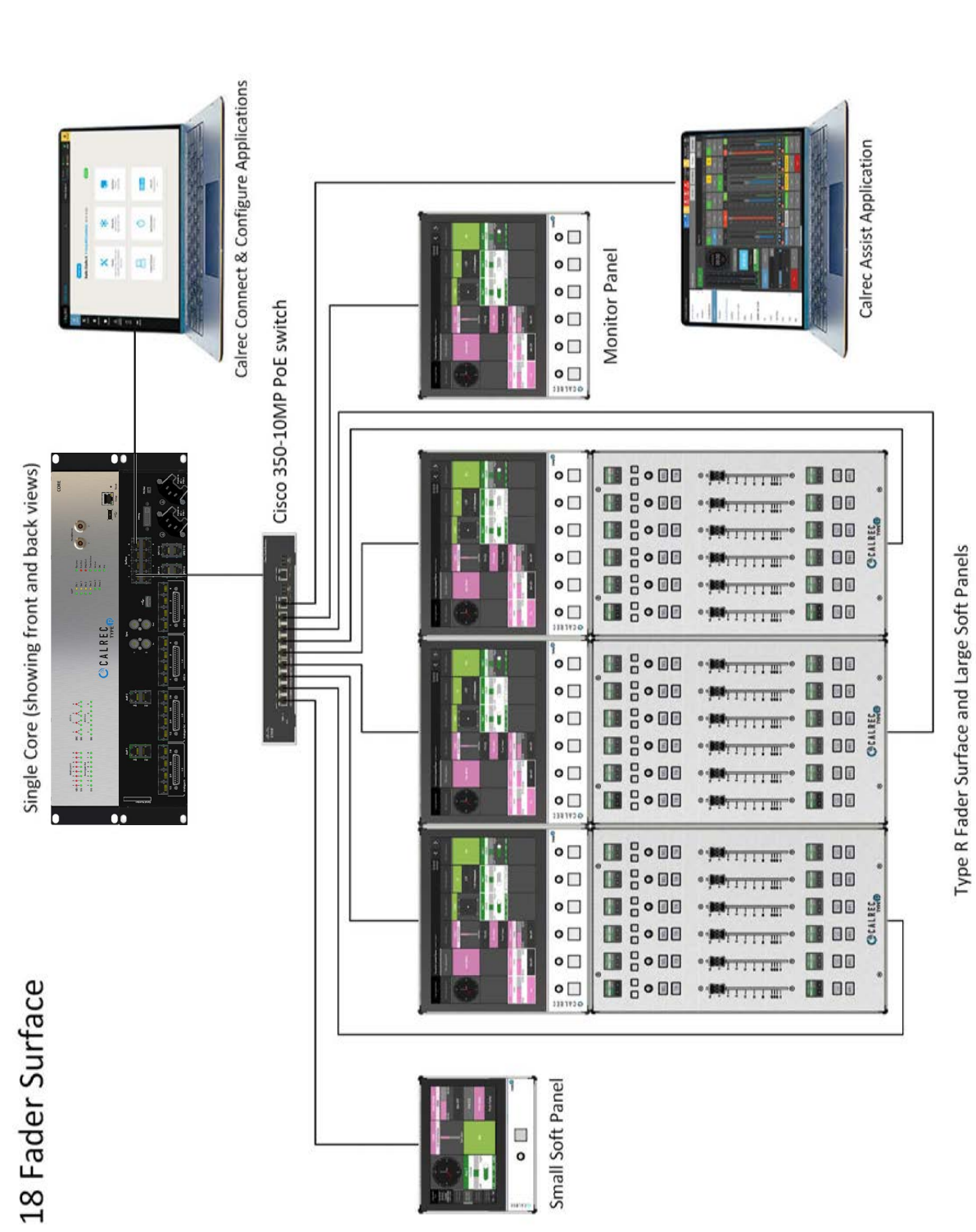
Cisco Switch Management Settings

The Cisco SG350 switches used for Control Panels must have their Energy Detect Mode, Short Reach and 802.3 Energy Efficient Ethernet Properties disabled. This is carried out in the **Port Management>Green Ethernet>Properties** page of the switch, which can be found in the **Type R Start Up Guide V2.0 (926-282).pdf** or higher, available on the Calrec Website.

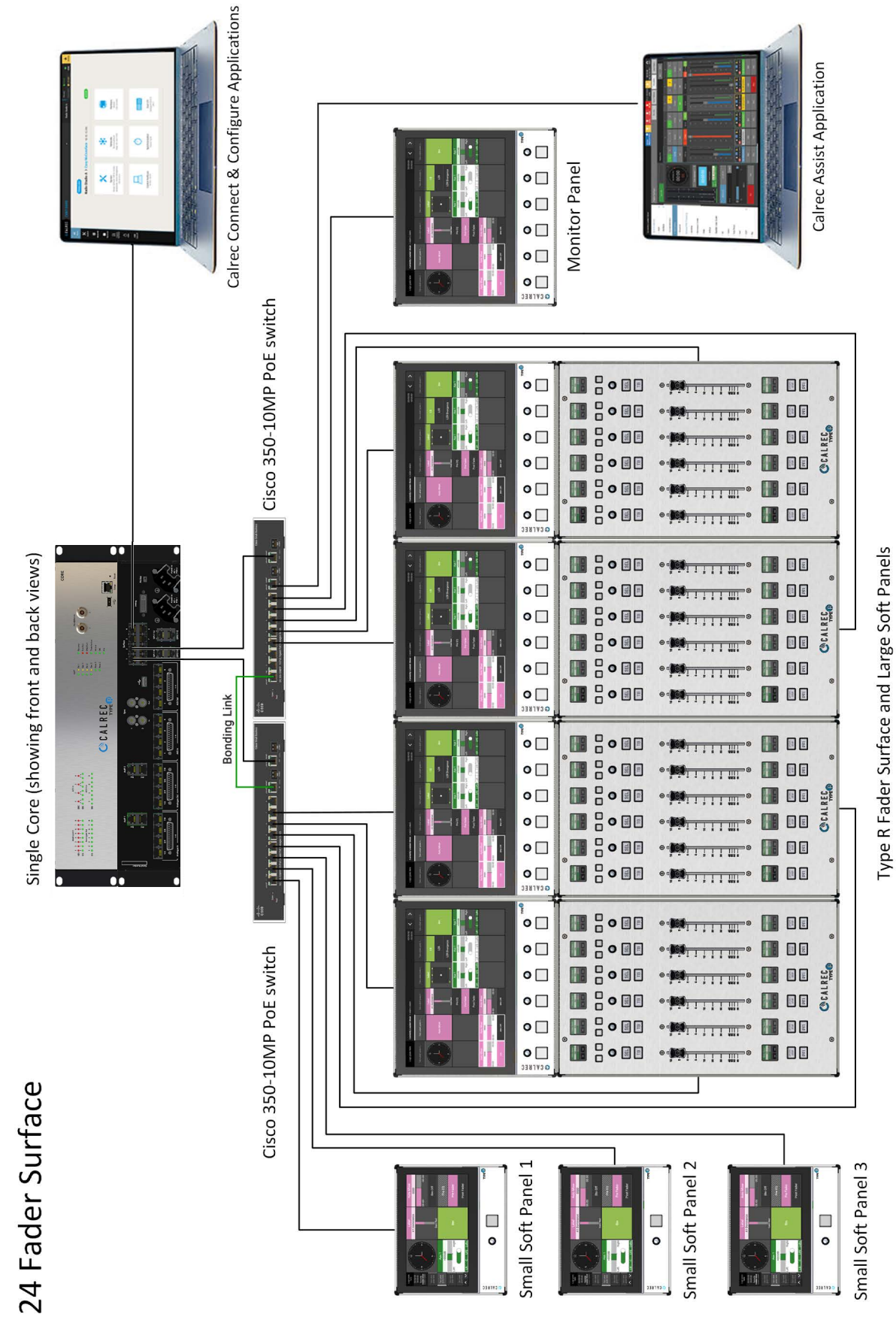
EXAMPLE 1: 12 FADER SURFACE



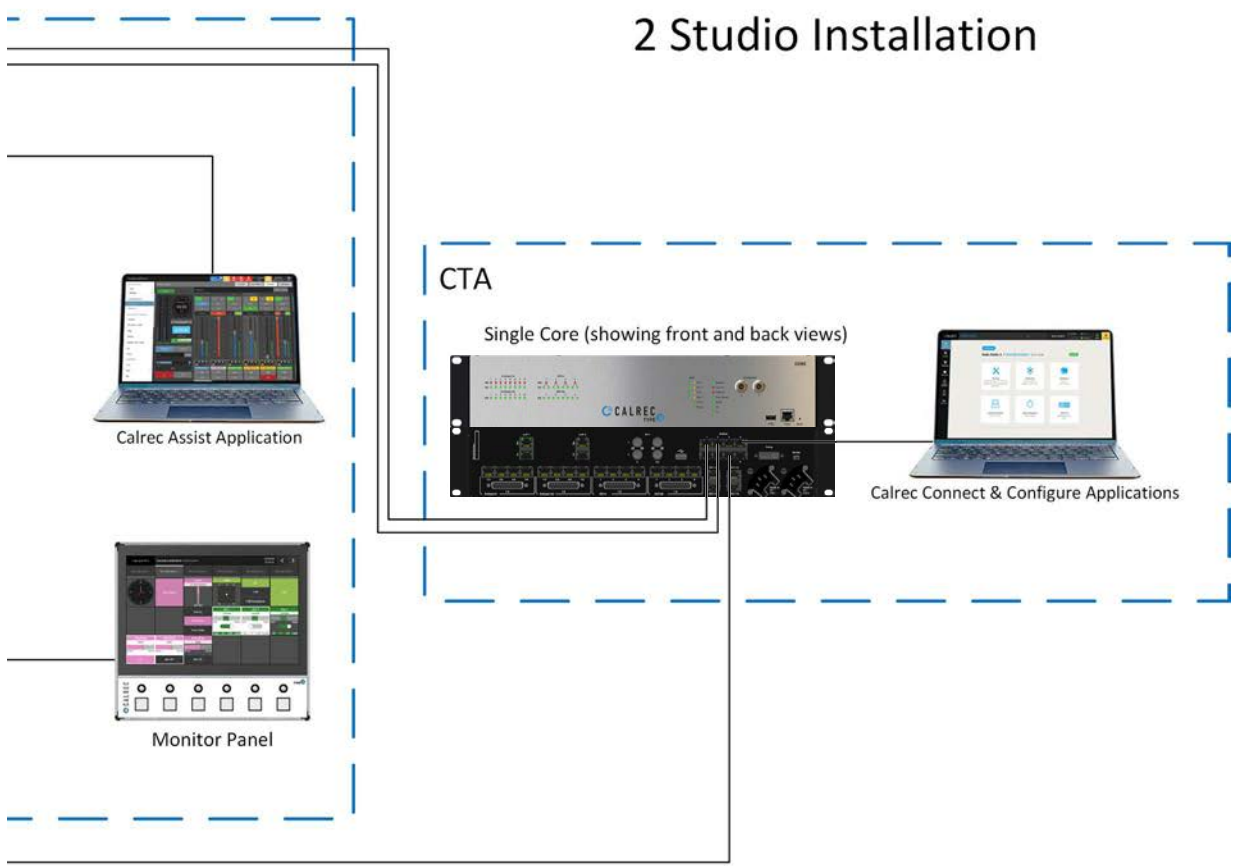
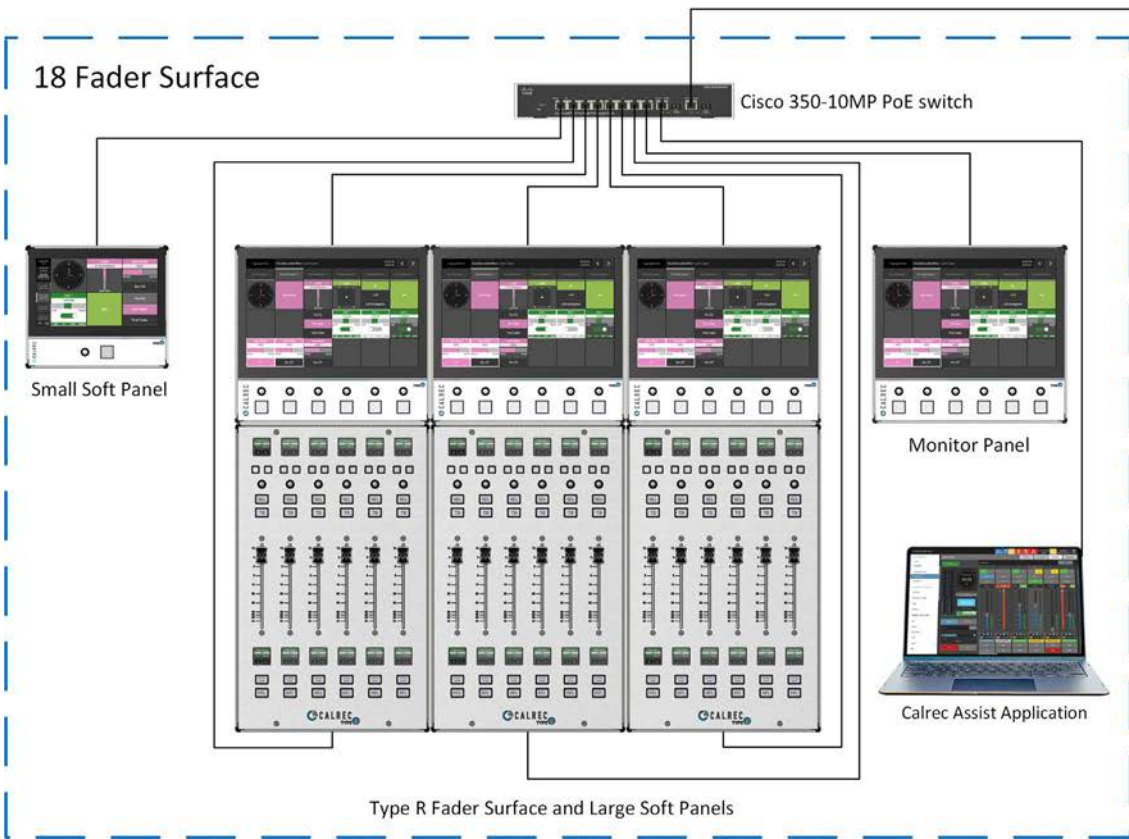
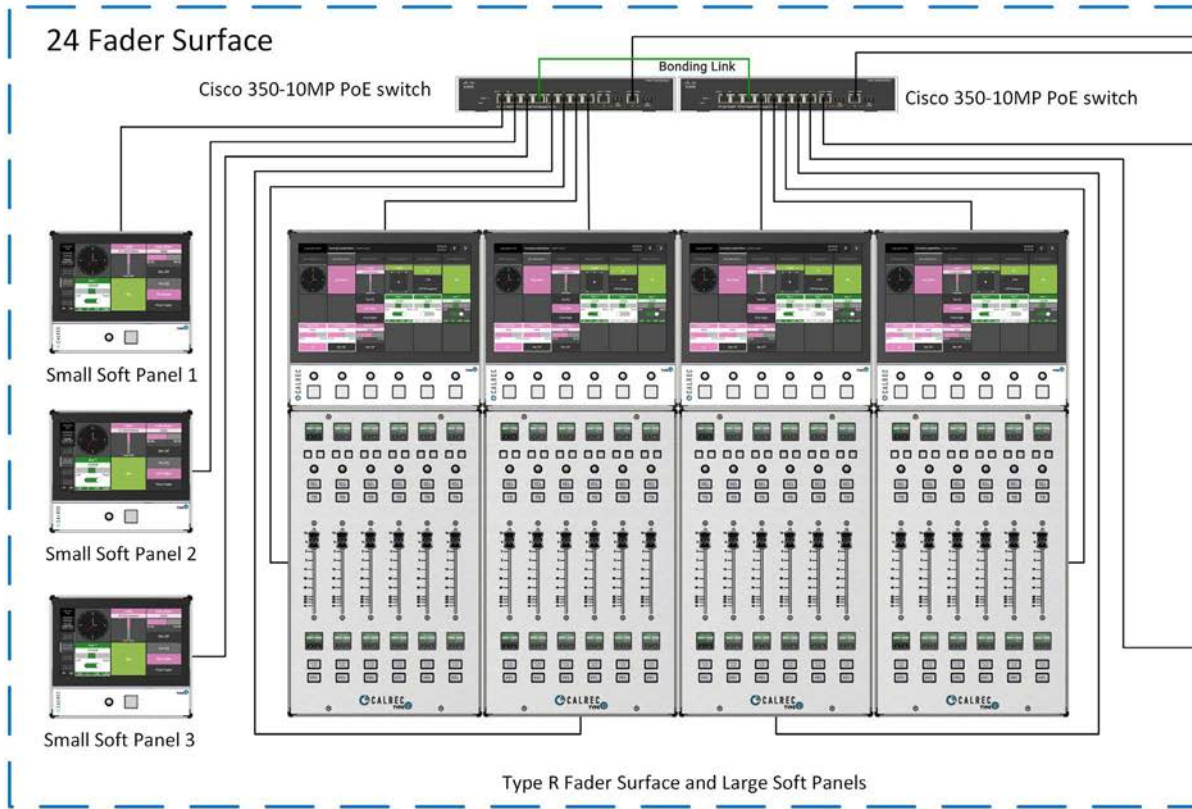
EXAMPLE 2: 18 FADER SURFACE



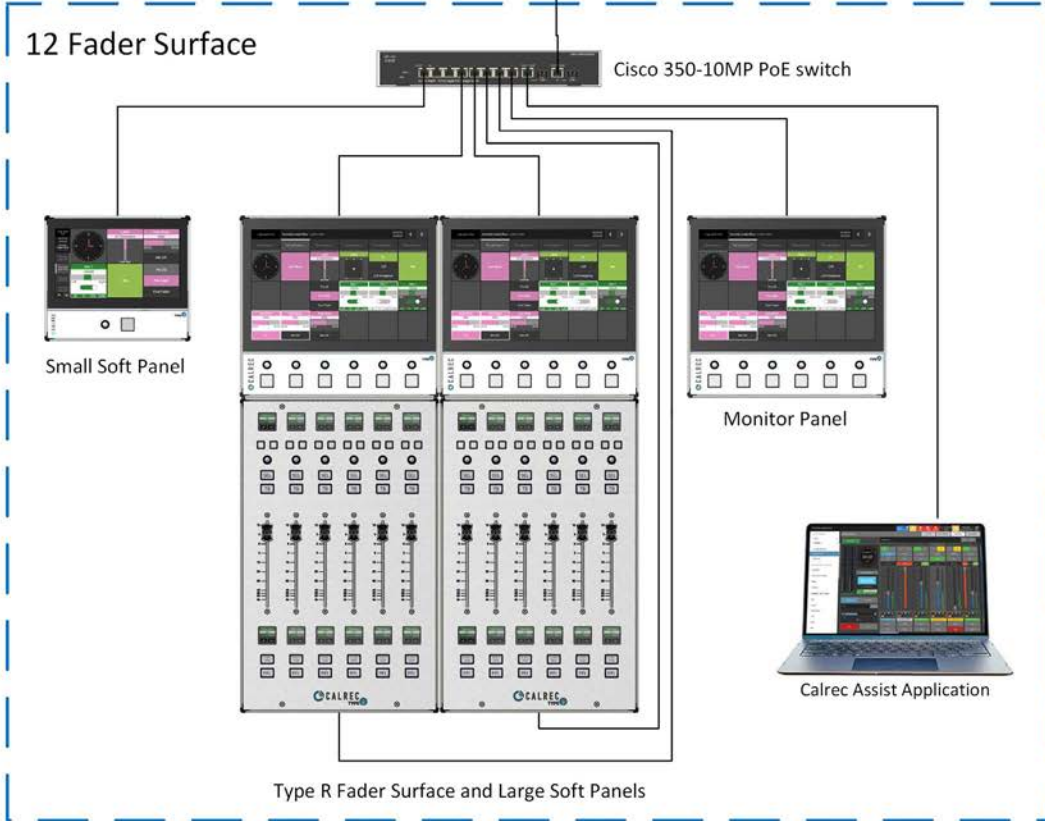
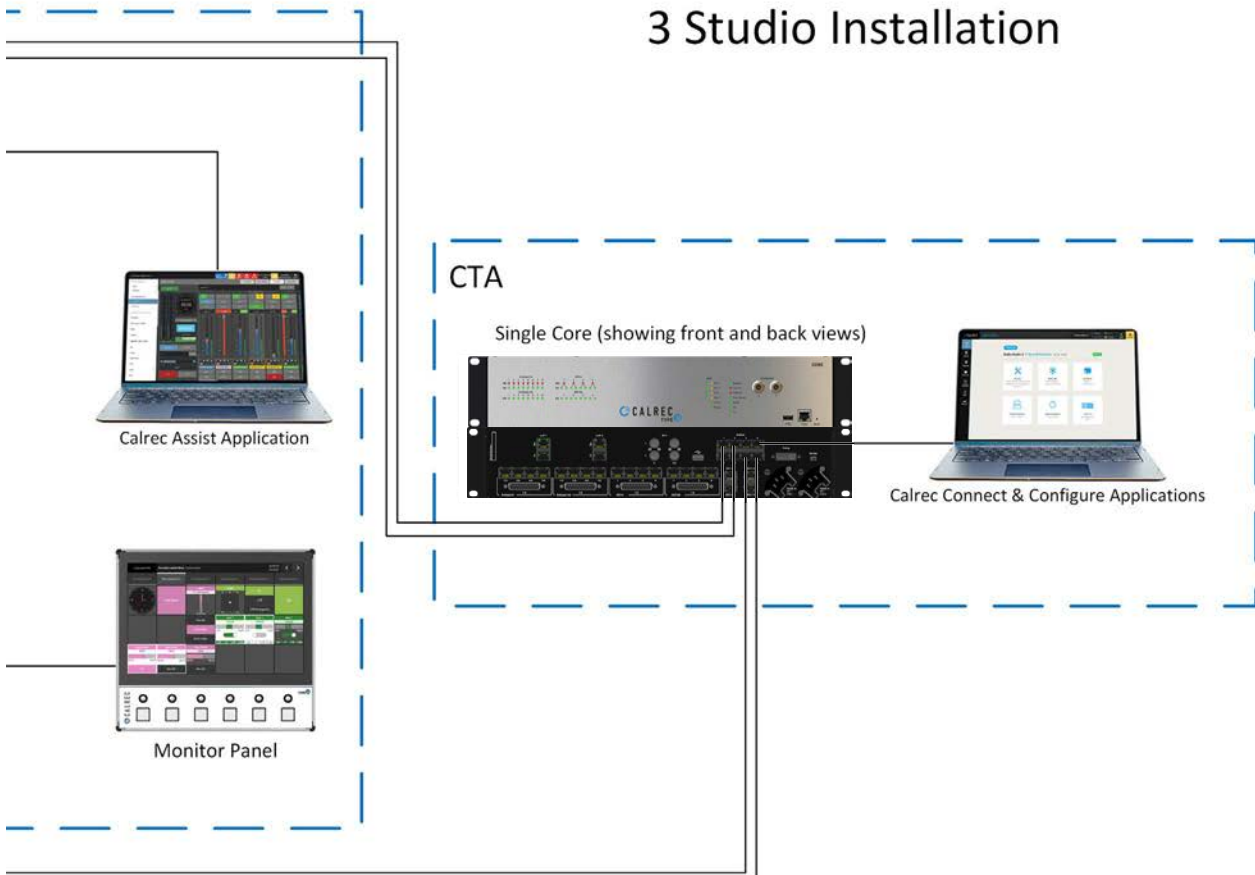
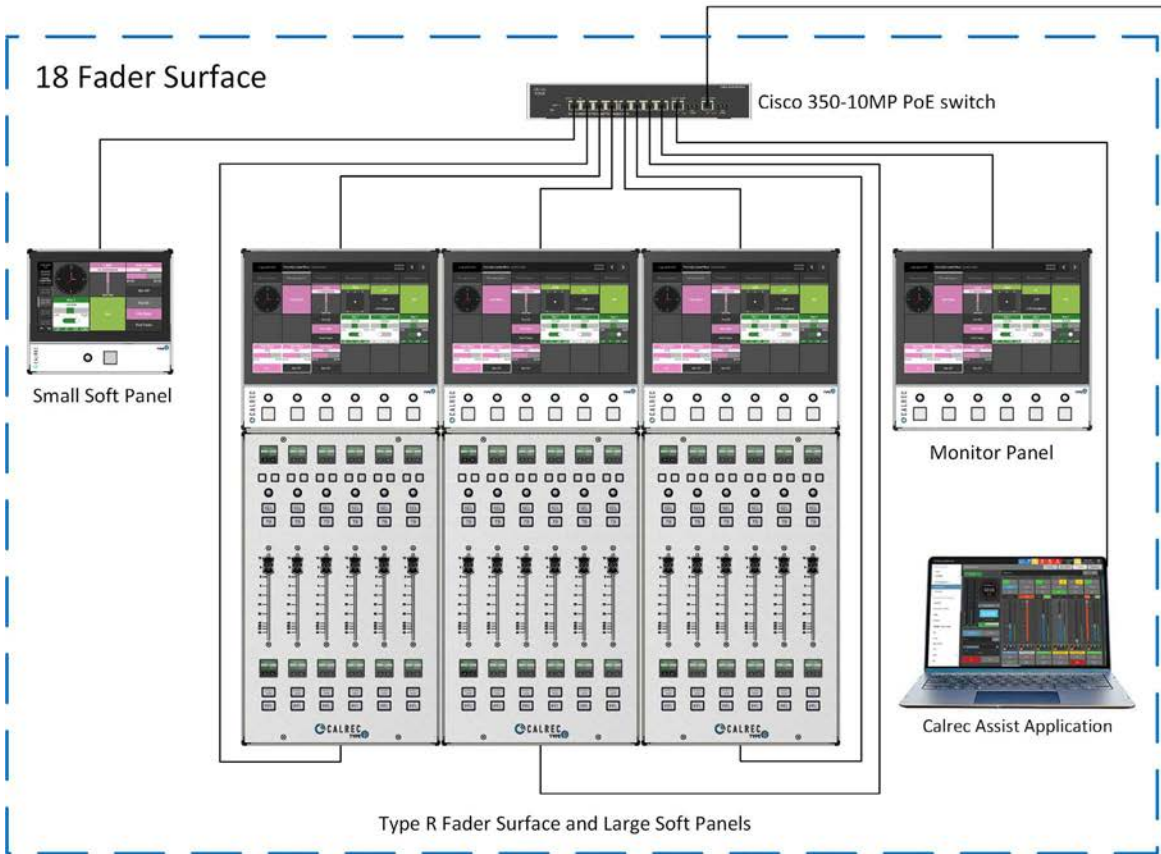
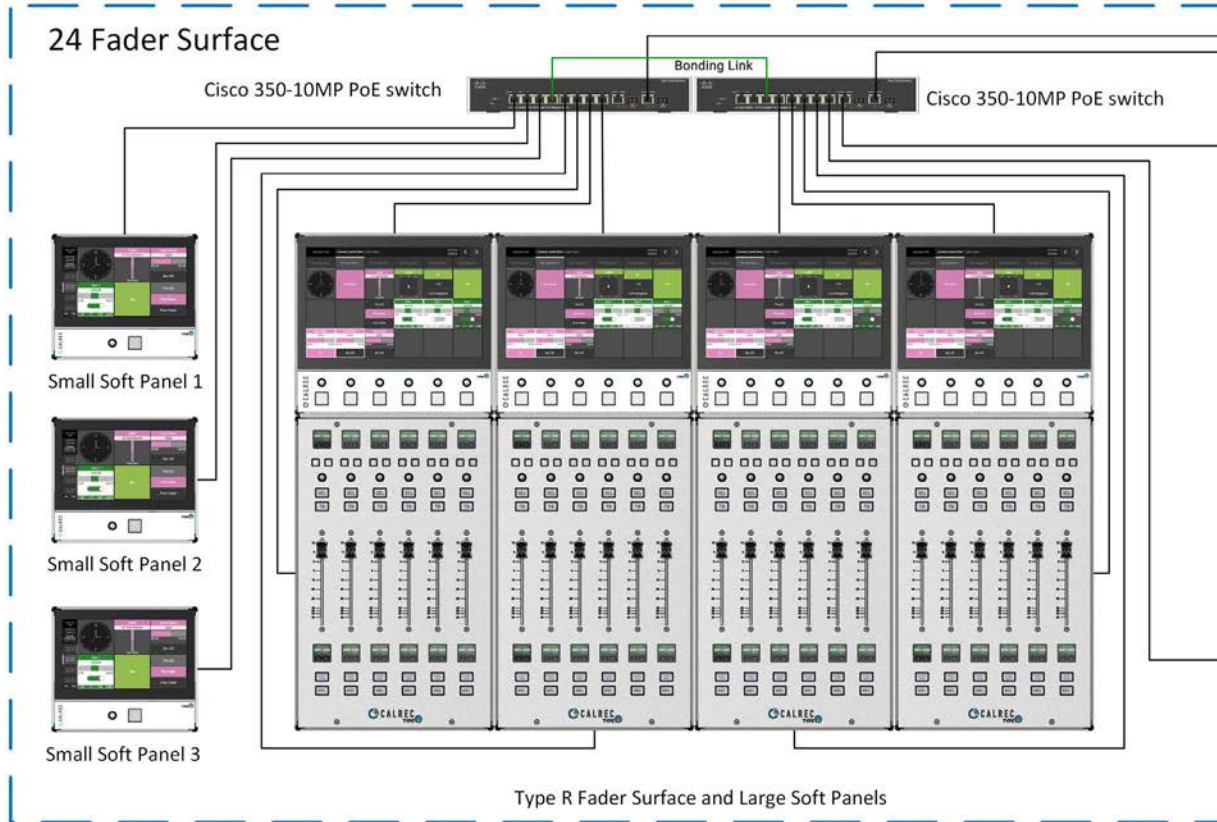
EXAMPLE 3: 24 FADER SURFACE



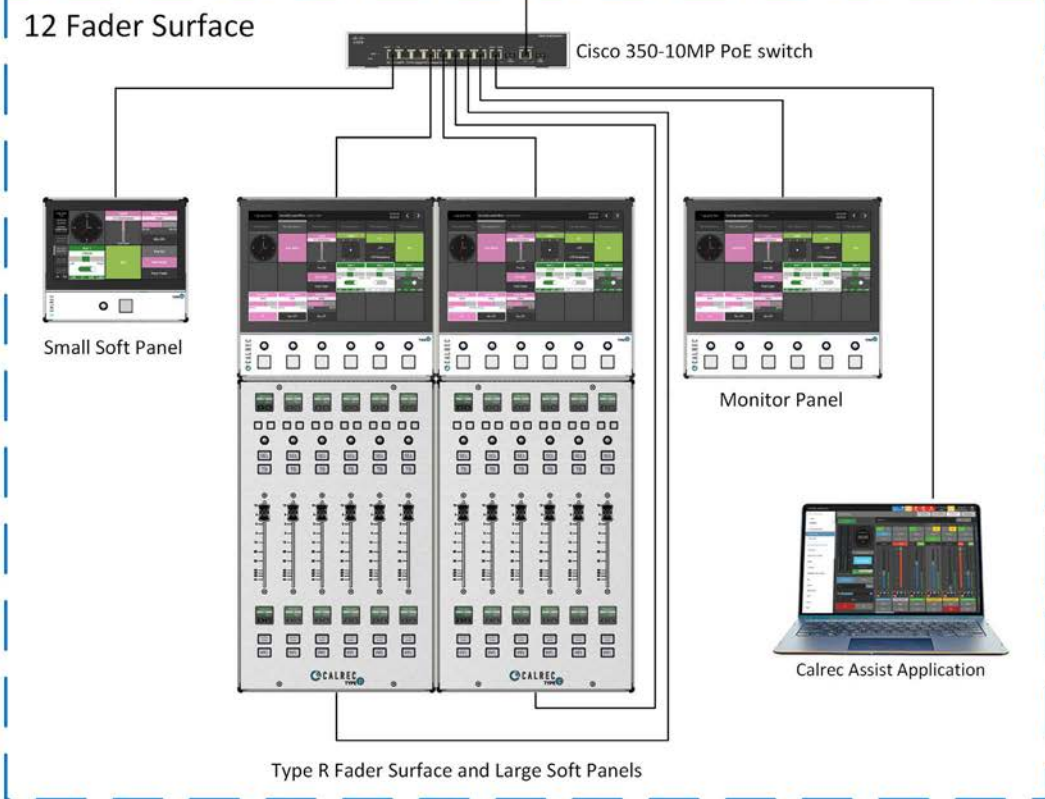
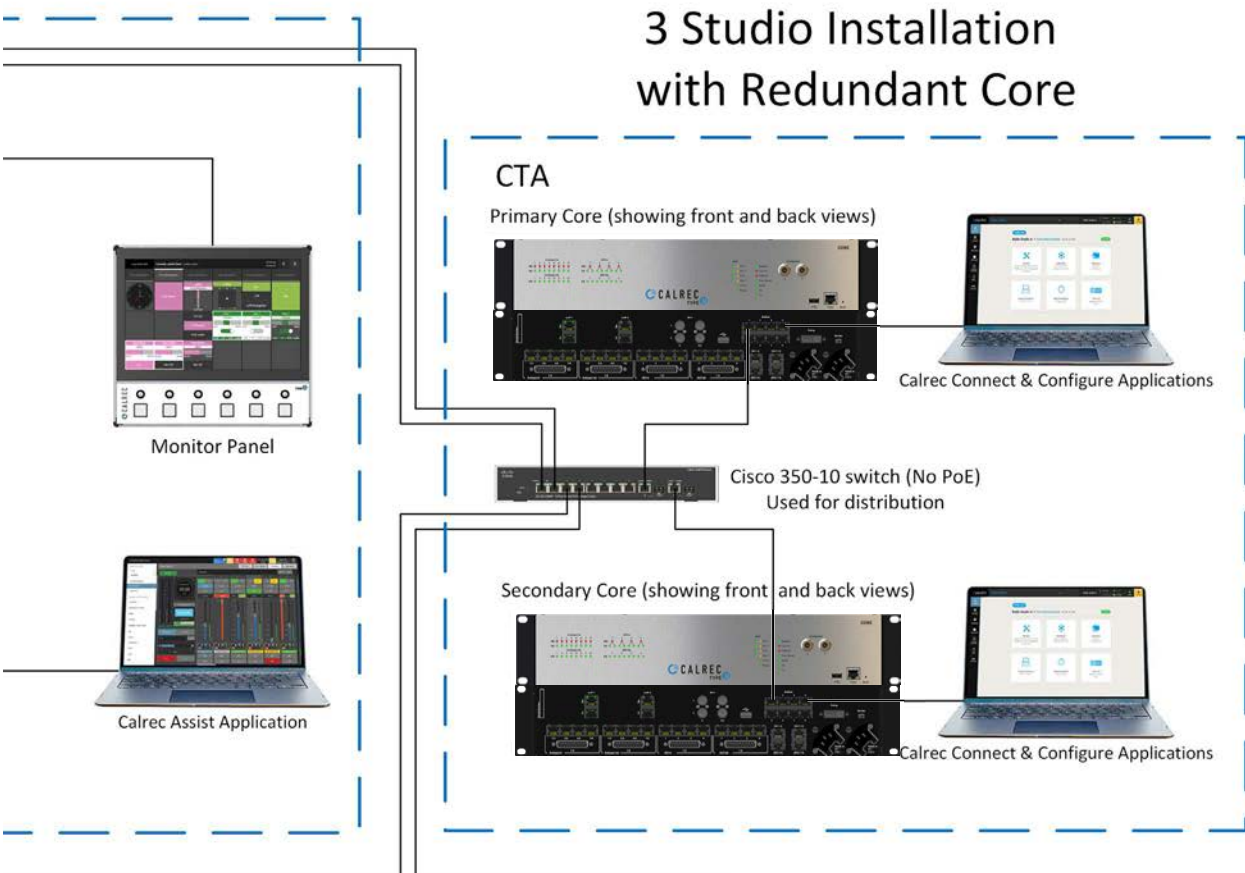
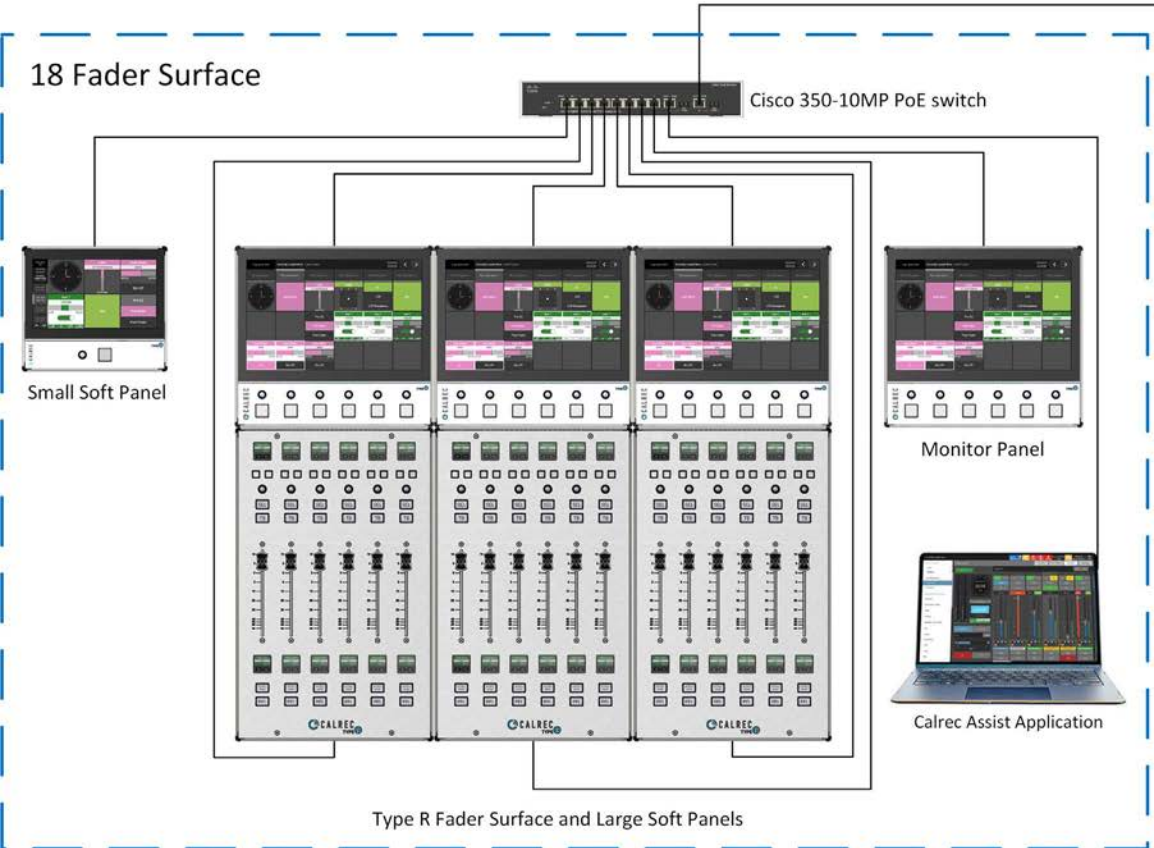
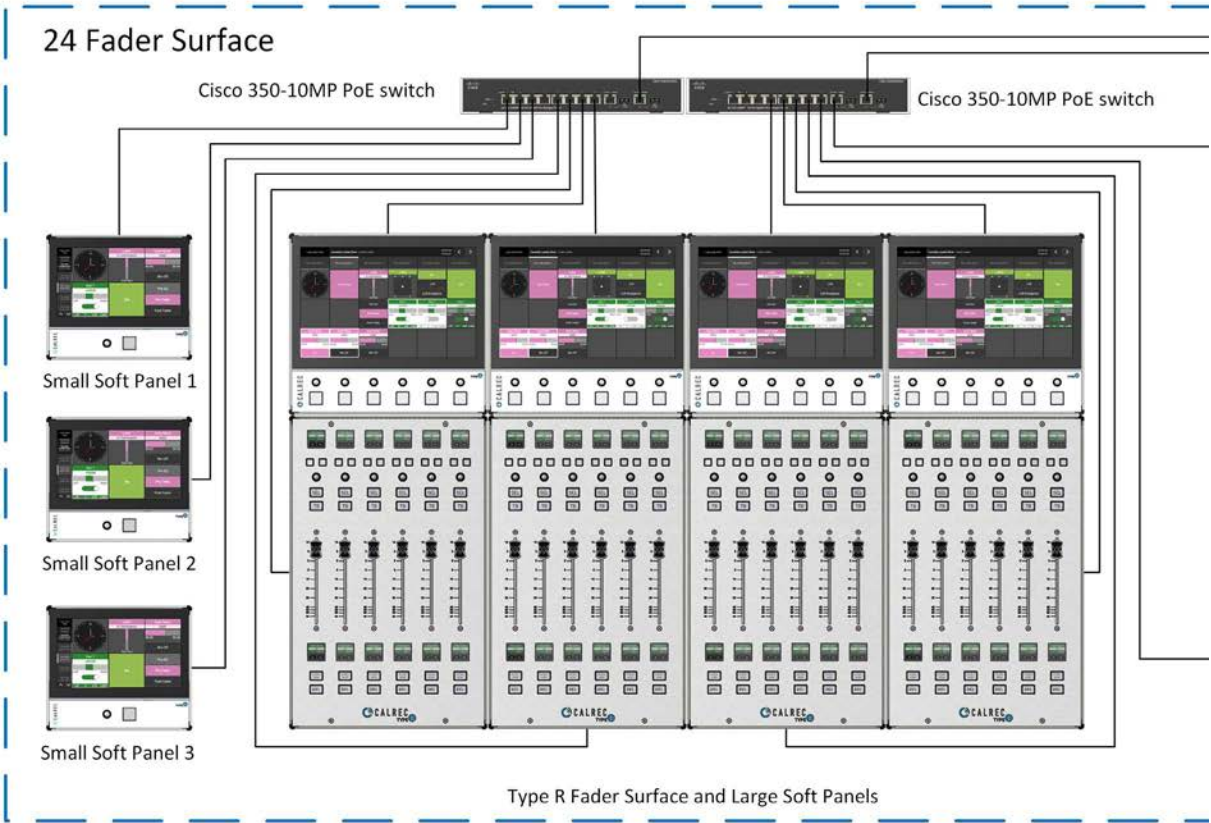
EXAMPLE 4: TWO STUDIO INSTALLATION



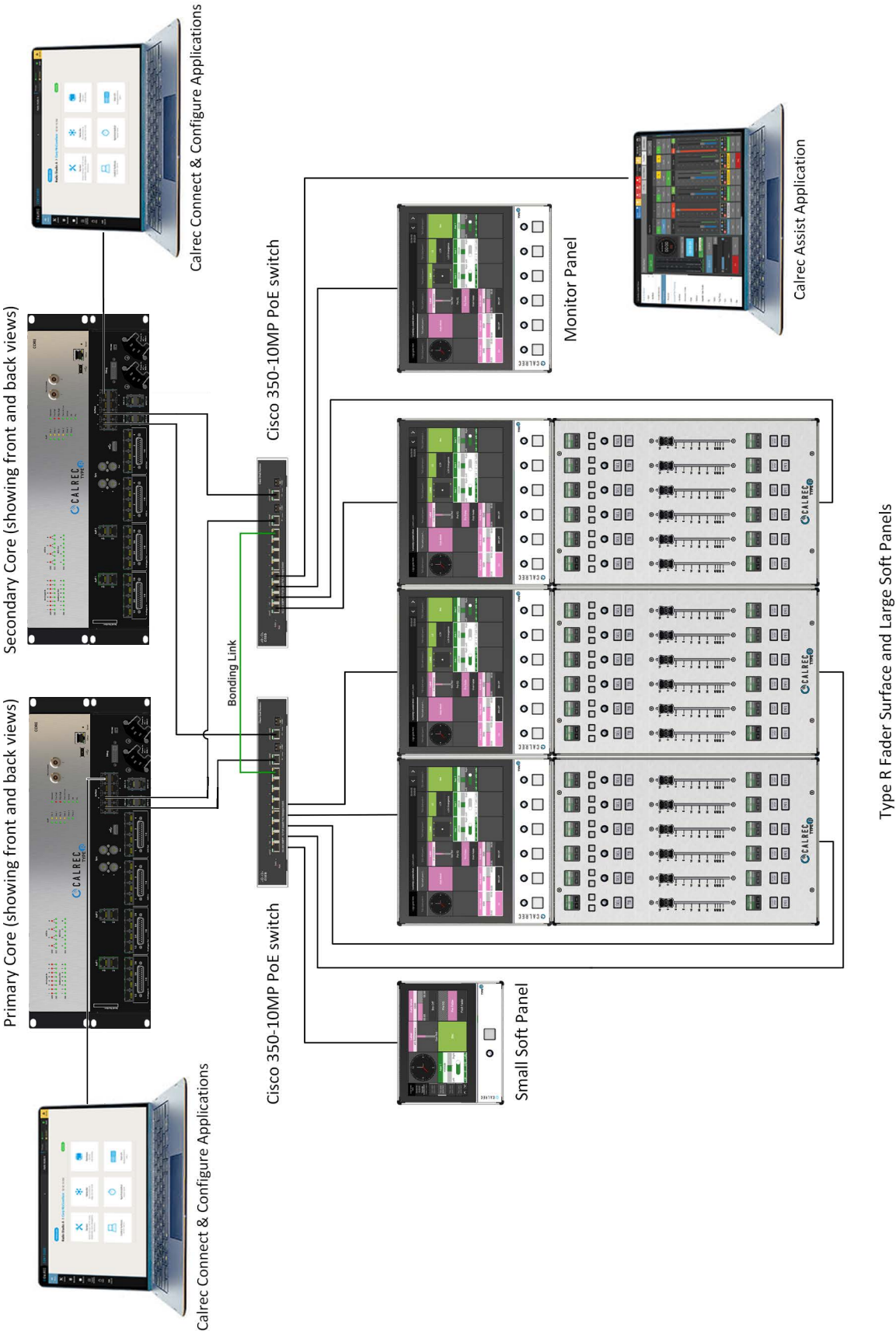
EXAMPLE 5: THREE STUDIO INSTALLATION



EXAMPLE 5: THREE STUDIO INSTALLATION WITH REDUNDANT CORE



18 Fader Surface with Redundant Core



TYPE R
AOIP NETWORK EXAMPLES

DESIGNING AN AOIP/AES67 NETWORK

Type R AoIP/AES67 network examples

The design of an AoIP/AES67 network will depend on the number of console Cores and IO Units the user wishes to connect to the network.

The following examples are provided to show the recommended connectivity for Type R networked systems from a small single Core system to larger multiple Core systems with Core redundancy.

These network examples show the AoIP/AES67 connectivity. For connecting surface panels to the Core, please refer to the Surface Panel Layout Examples on the previous pages.

Recommended third party equipment.

The following examples are based upon the use of the following third-party switches and clock;

1.

Artel Quarra “1G” - 10 port (8+2), PTPv2/AES67 switch (Calrec part number 491-270)

-

8 x 1Gbps RJ45.

-

2 x SFP slots that can accept 1Gbps or 2.5Gbps interfaces.

Note that the use of the 2 x SFP slots will require additional SFP interfaces which are not supplied with the switch.
2.

Cisco SG350-10-K9 – 10 port (8+2) switch (Calrec part number 491-267)

-

8 x 1Gbps RJ45.

-

2 x Combo RJ45/SFP 1Gbps slots that can accept 1Gbps interfaces.

Note that the use of the 2 x SFP slots will require additional SFP interfaces which are not supplied with the switch.
3.

Sonifex AVN-GMCS IEEE1588 PTP Grandmaster Clock with GPS Receiver (Calrec part number 491-268)
4.

All cabling shown is via RJ45 Cat5e shielded twisted pair (STP) cables.

Cisco and Artel Switch Management Settings for AoIP/AES67 Networks

Note: Both the Cisco switch and the Artel Quarra switch should have their Green Ethernet power saving properties disabled. This is carried out as shown in the **Type R Start Up Guide V2.0 (926-282).pdf** or higher, available on the Calrec Website.

Cisco and Artel Switch and Network Configuration for AoIP / AES67 Networks

Below are shown some useful links for AoIP/AES67 network configuration. If using a Cisco SG350 switch for AoIP (which are only recommended for very small systems) please refer to the Cisco Auto Configuration guides or Cisco Manual Configuration guides.

Important: Some of the above devices may require pre-configuration before installation. Please refer to the guidance for each device you have purchased, which is available in the Type R section on the Calrec FTP site at <http://ftp.calrec.com>, before you continue. These switches are small scale devices. Other larger switches, particularly for use with large AoIP systems, will be included in the recommended list as they are introduced.

For larger PTP based audio networking using Artel Quarra switches, please refer to the Artel links below:

Artel Quarra PTP switch range

https://www.artel.com/media-transport-products/?swoof=1&product_cat=quarra

Artel Quarra Configuration Guide for AES67

<https://www.artel.com/wp-content/uploads/2019/01/Quarra-Configuration-Guide-for-AES67-TC-and-BC-v20-6-24.pdf>

* To simplify configuration, a text based example configuration file can be uploaded for both the Cisco and Artel Quarra Switches for use with AoIP/AES67 Network devices. These can be found in the Type R section on the Calrec FTP site at <http://ftp.calrec.com>

The configuration files allow the switch to operate in the 192.168.30/24 for Primary AoIP port and 192.168.31/24 Secondary AoIP port address ranges, and can be adapted as required.

Guidance on recommendations for PTP Aware or Non-Aware switches

Devices containing Bach cards should always be connected to boundary clocks.

The following advice applies to any devices containing Calrec's AoIP implementation. This includes Type-R with Medium Capacity Cards (MCCs) fitted.

Core Guidance:

- A total of 15 AoIP devices can be connected to a non PTP aware network
- A total of 2048 channels of audio across all devices/streams is supported
- A maximum of 2 Non PTP Aware switch hops is acceptable (i.e., a series of 3 daisy chained switches)
- A maximum of 256 channels per non PTP aware link
- QoS is mandatory on switch configurations as per AES67

Core Guidance Notes:

- Core guidance assumes the GMC is either a Sonifex AVN GMC (or equivalent) or a Calrec Audio MCC AoIP Device.
- Every AoIP MCC is counted as one device, so a Core with 2 x AoIP cards counts as 2 AoIP devices.
- A redundant TypeR Core set up with 2 AoIP MCCs in both Primary and Secondary Cores counts as 4 AoIP devices.

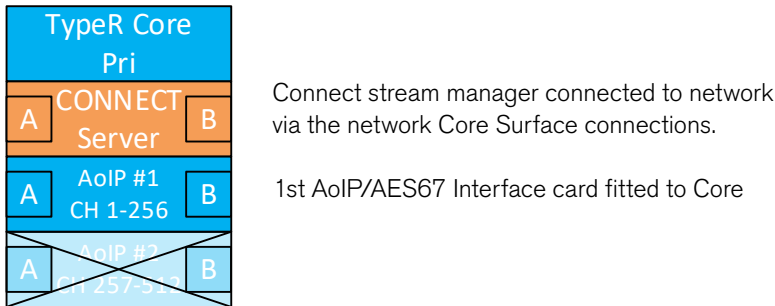
Further Guidance:

There are no situations where boundary clocks do not improve:

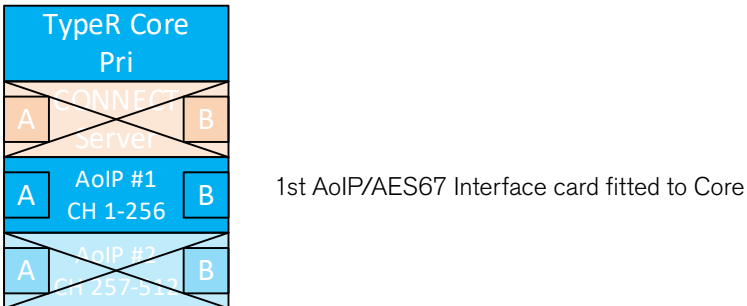
- Stability
 - Resilience
 - Accuracy
 - Flexibility
 - Scalability
 - Fault Isolation
 - Topology Confidence
- It is recommended that boundary clocks are a starting point for all projects. However, where this may not be possible, please apply the above guidance.
- PTP Aware and PTP unaware switches can co-exist. Please consider a centralised PTP aware switch to help distribute PTP to PTP unaware switches
- Cisco SG350 and Huawei S5720 switches have been tested successfully. We would expect that any Network Switches in the same bracket as the switches above would behave in a similar manner.
- If in doubt, contact your Network Specialist or your regional Calrec distributor. Customers within the UK or Ireland should contact Calrec directly.

Key for example diagrams.

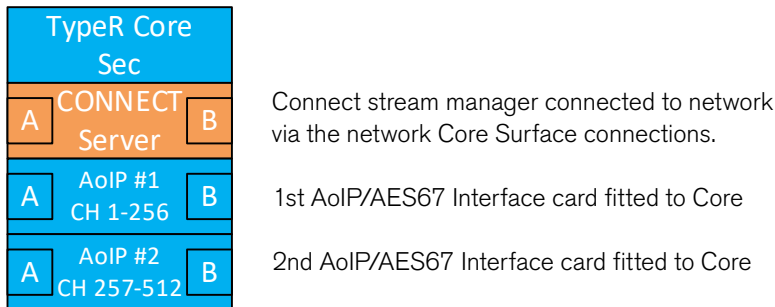
1. Type R Core with Calrec **Connect** stream management server installed, 1 AoIP/AES67 Interface card.



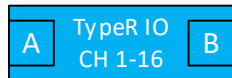
2. Type R Core without Calrec **Connect** stream management server installed, 1 AoIP/AES67 Interface card fitted.



3. Type R Core with Calrec **Connect** stream management server installed, 2 AoIP/AES67 Interface cards.



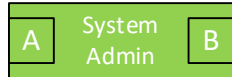
4. Type R IO Box



5. Connect stream manager installed on standalone Windows PC.



6. Connection reserved for network system administration and diagnostics.



Bandwidth, Inter-Switch Links and Larger Networks

Network topology and bandwidth management are impacted not just by the quantity, but also by the physical location of devices. Each copper Ethernet cable should be less than 100m total length (factoring in cable routing and looming, so often 90m is quoted). Fibre SFP ports or additional switch hops need to be used to extend the range beyond 100m.

Where switches are connected together, one should be mindful of the bandwidth available on the inter-switch links. Multiple links can be fitted between switches as trunks to increase bandwidth (switches need to be appropriately configured to support such connections using LACP link aggregation), and many switches have a pair or more of SFP slots that are capable of higher bandwidth, intended to be used to connect to other switches.

On the 10 (8+2) port Quarra switches that Calrec currently use, 2 of the ports are SFP slots that can be fitted with either 1Gbps or 2.5Gbps SFP interfaces. Note that switches are not supplied with the SFP interfaces.

Generally for AoIP, audio traffic should not exceed 50% of the capacity on a link. This broadly equates to 256 channels of audio over a 1Gbps link. This is a safe recommendation for critical live audio application such as broadcast.

Audio is not the only data being passed. Even on a dedicated audio network there is still additional traffic. Higher channel counts can be achieved, but deterministic network conditions are required to successfully exceed the safe working recommendations.

Type R Cores can pass up to 256 audio channels over each AoIP Interface card. Using 32 x 8 channel streams (at 32 bit/48kHz/125us packet time), the bandwidth consumption of audio for each port would be 554Mbps. With 2 cards fitted, the overall audio consumption of a Type R core can potentially be more than 1Gbps

If large amounts of audio/data have to pass over a given network segment such as an inter-switch link, then higher bandwidth SFPs should be used for those segments (or multiple aggregated links).

Type R I/O units have a single redundant pair of AoIP ports, capable of passing up to 64 channels of audio. As the largest Type R I/O units only have 16 channels of physical audio I/O ports, typical actual usage would be only 35Mbps.

If required, audio bandwidth can be reduced by using a 1ms packet time (at the cost of increased latency), or by using 24 bit audio (sacrificing the additional headroom we provide for our mic inputs).

For larger networks with multiple switches, instead of daisy-chaining them together, they should connect via an additional switch, as shown in Examples 6, 7, 11, 12 and 13, in order to limit the number of switches that data must pass through from point A to point B, providing more uniform latency and making bandwidth simpler to manage.

The dotted lines shown in Example 6 represent the option to increase bandwidth on switch links through aggregation if needed.

Redundancy

Calrec AoIP products support network redundancy, meaning that each device has pairs of A and B AoIP network connections. It is not essential for both to be connected. However, this is recommended to provide resilience for network traffic. Both A and B connections can be passed over the same physical switching hardware. However, to provide the best redundancy, it is recommended that A and B are passed over physically separate networks.

With AoIP redundancy based on ST2022-7, there is no real 'primary' and 'secondary' - devices are free to receive audio from either A or B networks seamlessly on a packet by packet basis. However, Type R Core redundancy is a complete failover system, so only one core of a redundant pair is truly active at a given time. For complete redundancy, both primary and secondary cores should each connect to both A and B audio networks.

Switch Port Quantities

Type R I/O units have two A/B pairs of 1Gbps AoIP connections. Type R Cores can be supplied without any AoIP Interfaces fitted. In this case, although the two pairs of AoIP connectors are fitted, these will not be functional. Optionally, one or two AoIP Interfaces may be fitted, with the second card doubling the Core audio capacity.

In addition to providing switch ports for each device's AoIP connections, at least one switch port must be available on each AoIP network as a whole for a Connect server to communicate with devices on that network.

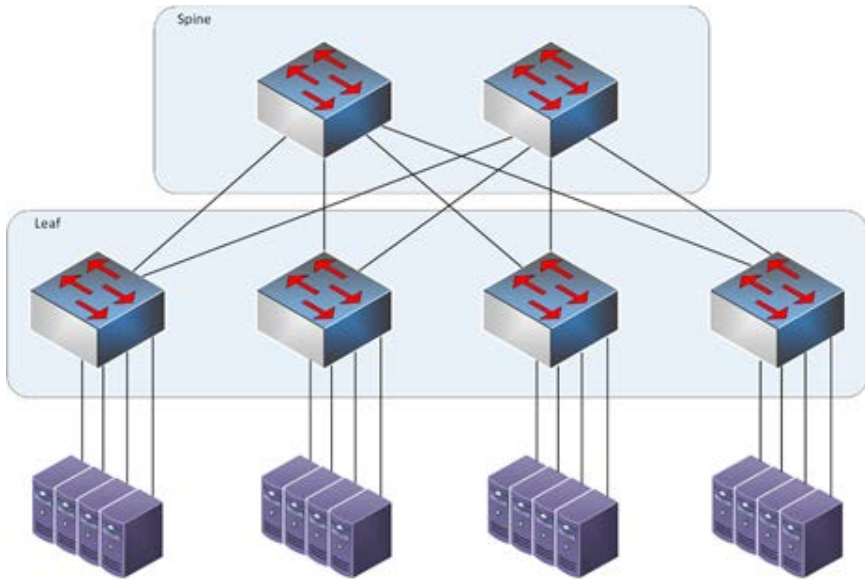
Typically, Connect will be served by a Type R core via the Core Surface connections. It should interface with both A and B networks to provide redundant communications with all devices. A backup Connect server should also be considered, though having an active Connect server will not be an on-air critical requirement for many users who will have a fairly static network configuration. Type R cores can be configured to act as Connect servers, but only one server is needed per network.

At least one spare additional AoIP network switch port should normally also be available on each network for System Administration, allowing engineers access to network and 3rd party device configuration and diagnostics.

Leaf and Spine Architecture

When scaling up, additional spine switches can be added. 'Leaf and spine' topology is common for large scale media networks. 'Leaf' switches provide connections to end-points and are interconnected by spine switches. Each leaf needs a connection to each spine.

The following diagram shows the architecture of a Leaf and Spine network.

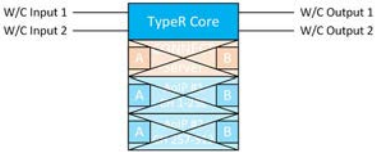


Switch Choice

Small AoIP dedicated networks with very low audio channel counts can use low cost switches, but almost all AES67 broadcast networks should use PTPv2 (IEEE1588-2008) aware switches to guarantee timing.

EXAMPLE 1: SINGLE CORE WITH LOCAL I/O ONLY

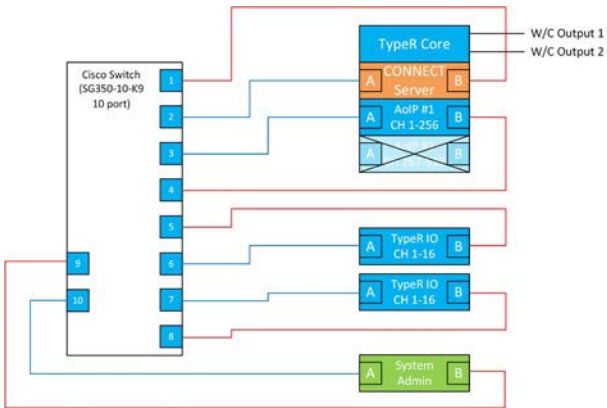
Use of Local Core IO	✓
AoIP #1 Card Fitted	✗
AoIP #2 Card Fitted	✗
Redundant AoIP Connections	✗
Redundant AoIP Switch/es	✗
Redundant Core	✗
Connect server in Core	✗
Wordclock Input	✓
PTP Grand Master Clock	✗
Redundant PTP Grand Master Clock	✗



Note:
This is the simplest case, where a single standalone console is in use with only local I/O is in use.

EXAMPLE 2: SINGLE CORE WITH LOCAL I/O + 2 AOIP I/O UNITS ON A NON-PTP SWITCH

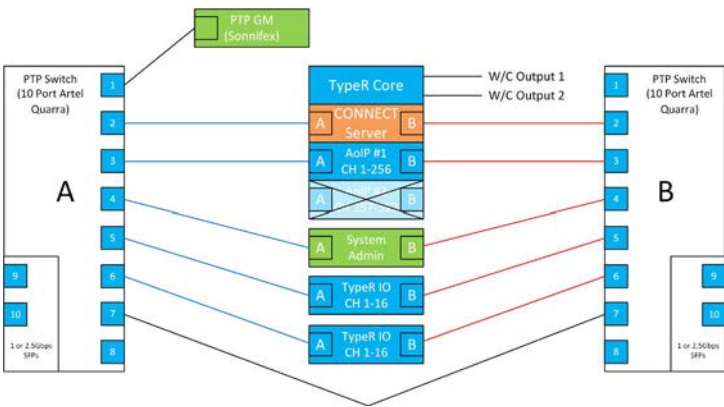
Use of Local Core IO	✓
AoIP #1 Card Fitted	✓
AoIP #2 Card Fitted	✗
Redundant AoIP Connections	✓
Redundant AoIP Switch/es	✗
Redundant Core	✗
Connect server in Core	✓
Wordclock Input	✗
PTP Grand Master Clock	✗
Redundant PTP Grand Master Clock	✗



Note:
In this case, a single switch is being used for both A and B connections to AoIP end points. This will require the A and B networks to be configured on separate VLAN's within the same switch.

EXAMPLE 3: SINGLE CORE WITH LOCAL I/O + 2 AOIP I/O UNITS ON 2 REDUNDANT PTP SWITCHES

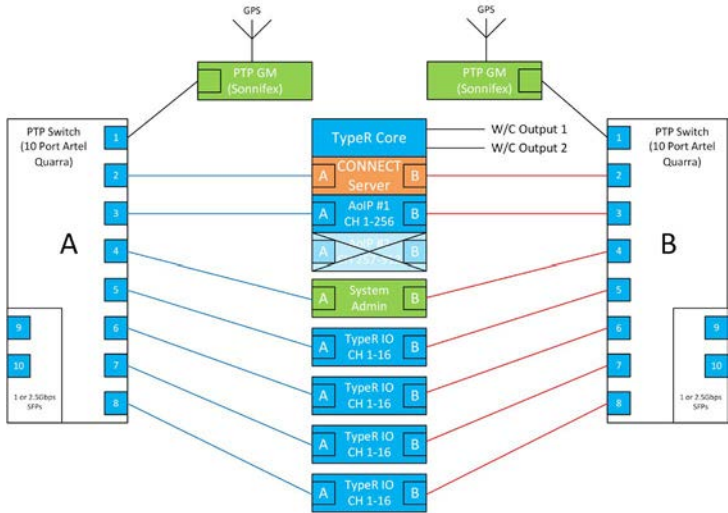
Use of Local Core IO	✓
AoIP #1 Card Fitted	✓
AoIP #2 Card Fitted	✗
Redundant AoIP Connections	✓
Redundant AoIP Switch/es	✓
Redundant Core	✗
Connect server in Core	✓
Wordclock Input	✗
PTP Grand Master Clock	✓
Redundant PTP Grand Master Clock	✗



Note:
The direct link between the A and B switches is to provide PTP sync. This will require a specific setup of the switch ports so that Switch A, Port 7, is seen as a master boundary clock.

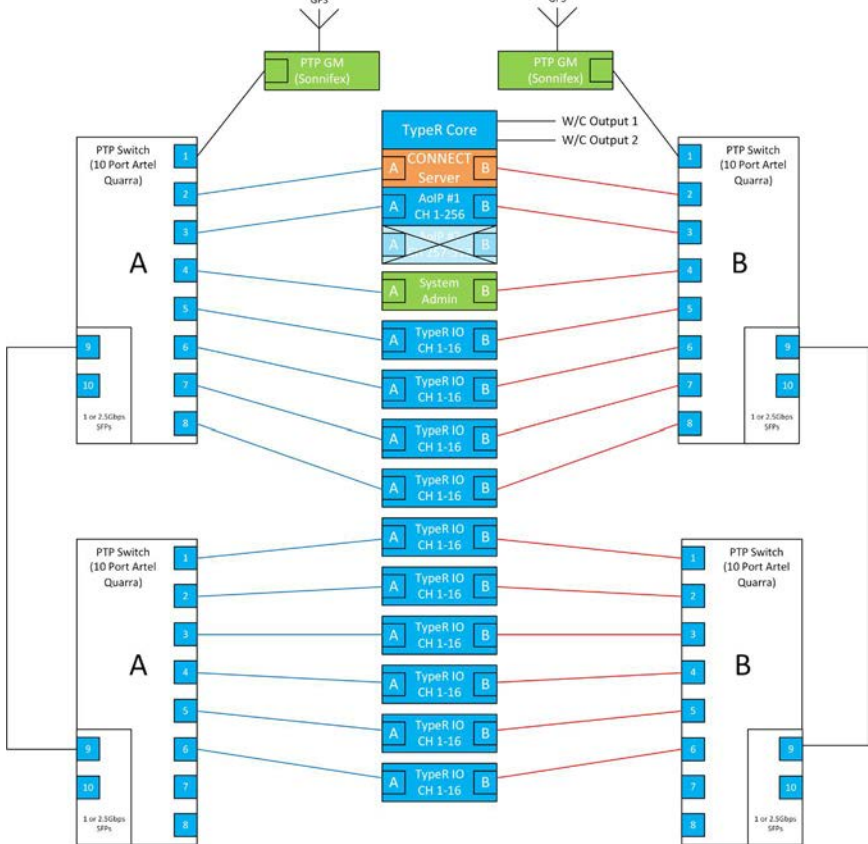
EXAMPLE 4: SINGLE CORE WITH LOCAL I/O + 4 AOIP UNITS ON 2 REDUNDANT PTP SWITCHES

Use of Local Core IO	✓
AoIP #1 Card Fitted	✓
AoIP #2 Card Fitted	✗
Redundant AoIP Connections	✓
Redundant AoIP Switch/es	✓
Redundant Core	✗
Connect server in Core	✓
Wordclock Input	✗
PTP Grand Master Clock	✓
Redundant PTP Grand Master Clock	✓



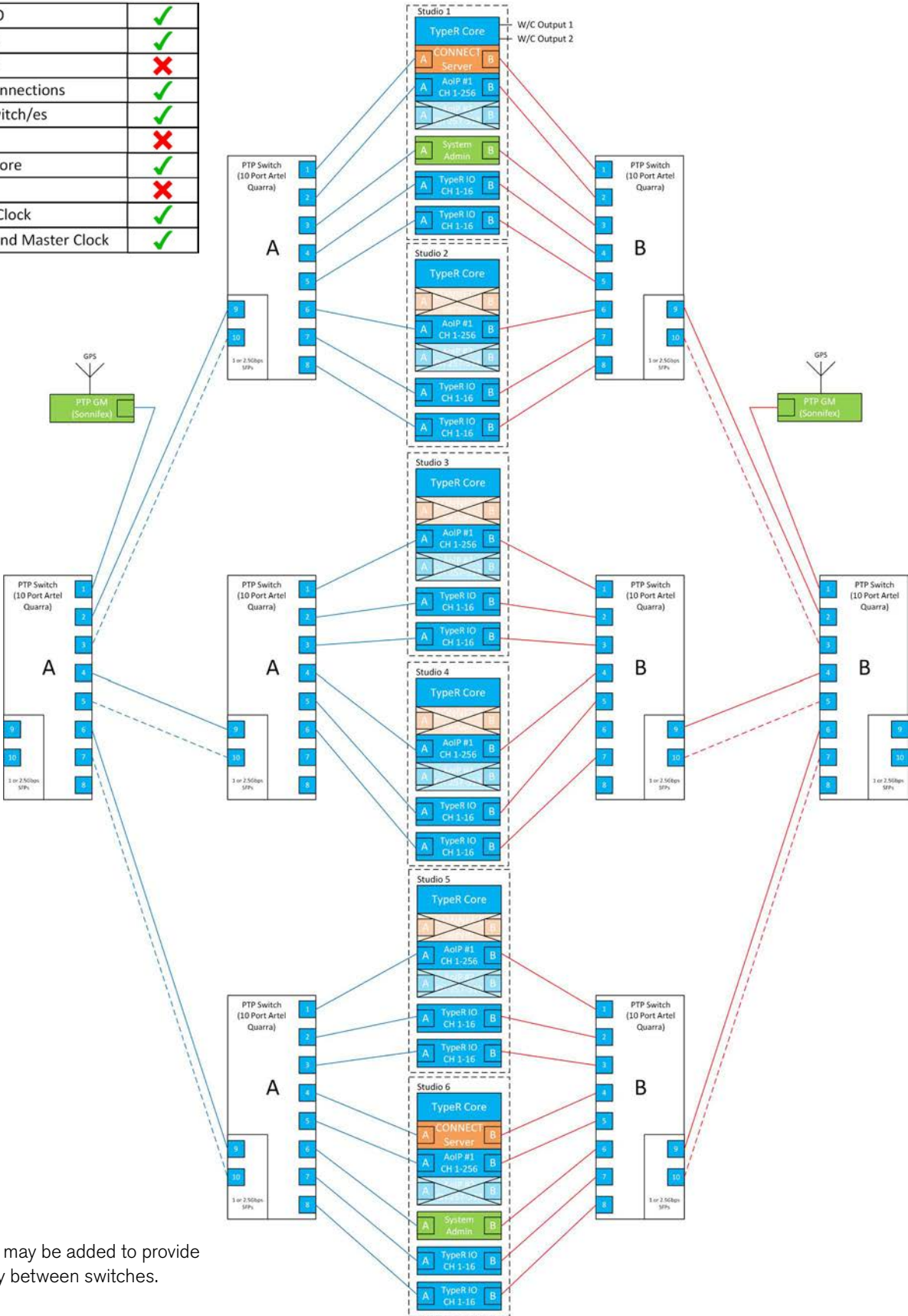
EXAMPLE 5: SINGLE CORE WITH LOCAL I/O + 10 AOIP UNITS ON 4 REDUNDANT PTP SWITCHES

Use of Local Core IO	✓
AoIP #1 Card Fitted	✓
AoIP #2 Card Fitted	✗
Redundant AoIP Connections	✓
Redundant AoIP Switch/es	✓
Redundant Core	✗
Connect server in Core	✓
Wordclock Input	✗
PTP Grand Master Clock	✓
Redundant PTP Grand Master Clock	✓



EXAMPLE 6: 6 STUDIOS, SINGLE CORE WITH LOCAL I/O + 12 AOIP I/O UNITS ON 8 REDUNDANT PTP SWITCHES

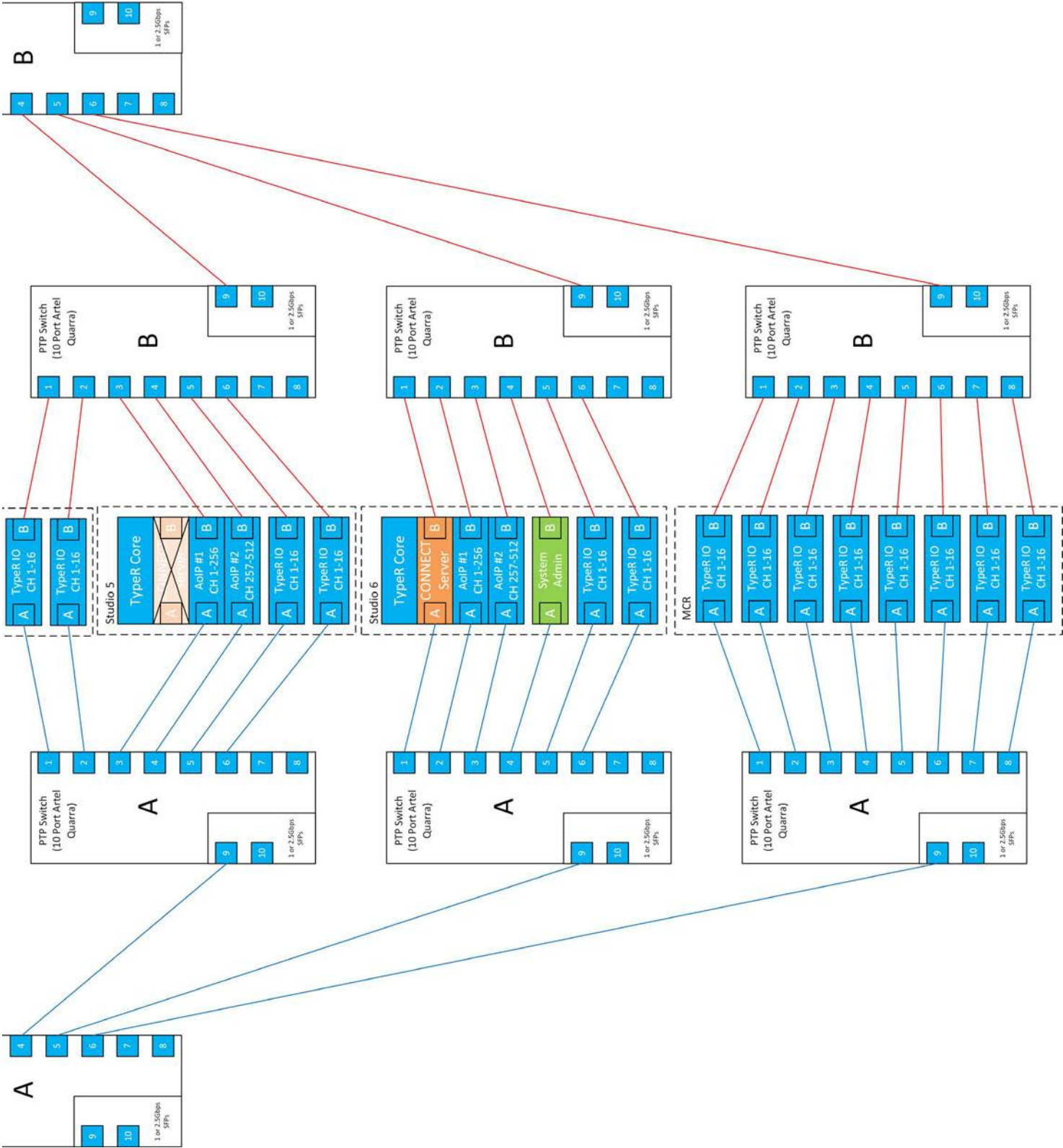
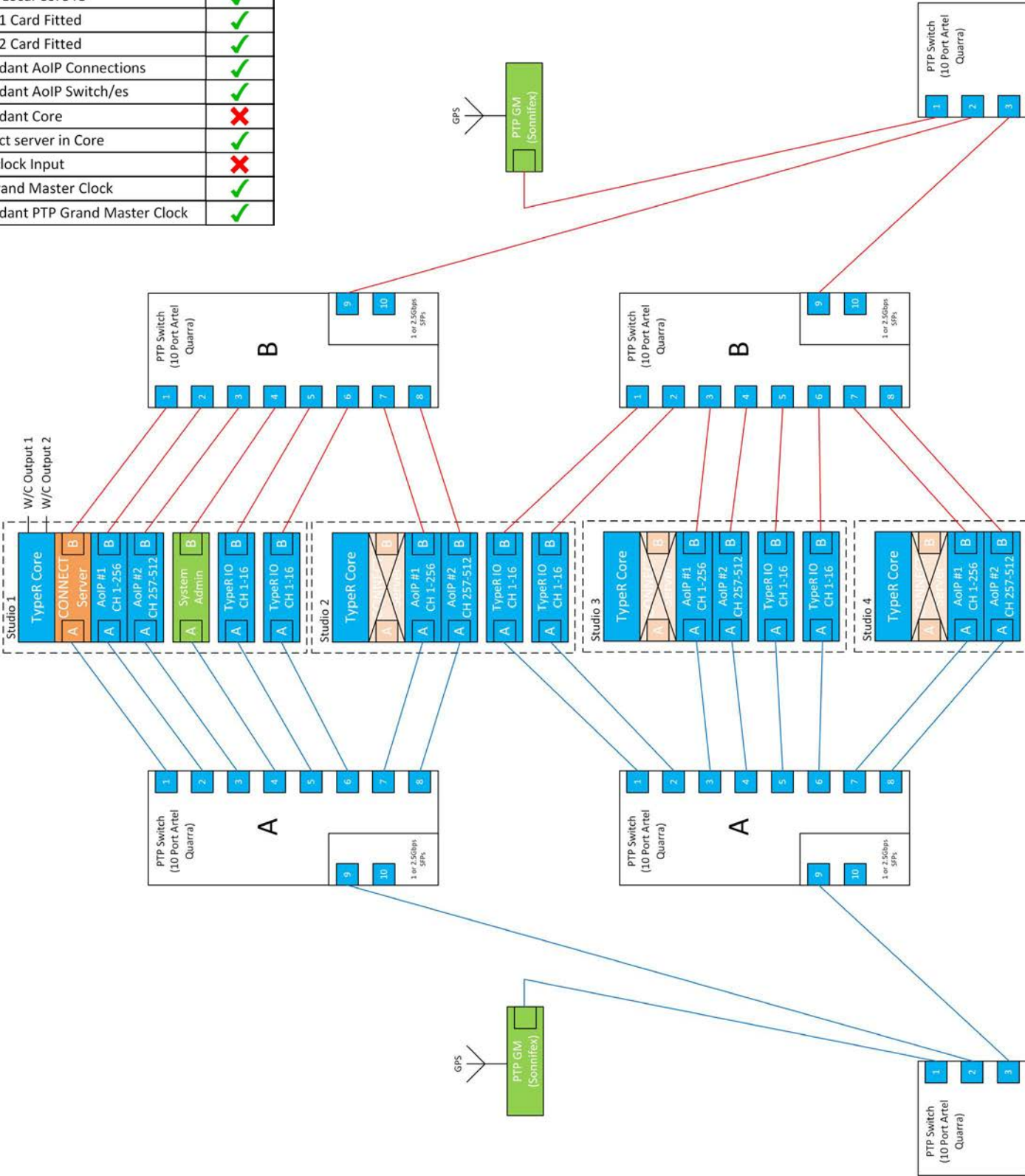
Use of Local Core IO	✓
AoIP #1 Card Fitted	✓
AoIP #2 Card Fitted	✗
Redundant AoIP Connections	✓
Redundant AoIP Switch/es	✓
Redundant Core	✗
Connect server in Core	✓
Wordclock Input	✗
PTP Grand Master Clock	✓
Redundant PTP Grand Master Clock	✓



Note:
The dotted Links may be added to provide cable redundancy between switches.

EXAMPLE 7: 6 STUDIOS + MCR, SINGLE CORES (2 AOIP CARDS/CORE)
WITH LOCAL I/O + 20 AOIP I/O UNITS ON 12 REDUNDANT SWITCHES

Use of Local Core IO	✓
AoIP #1 Card Fitted	✓
AoIP #2 Card Fitted	✓
Redundant AoIP Connections	✓
Redundant AoIP Switch/es	✓
Redundant Core	✗
Connect server in Core	✓
Wordclock Input	✗
PTP Grand Master Clock	✗
Redundant PTP Grand Master Clock	✓



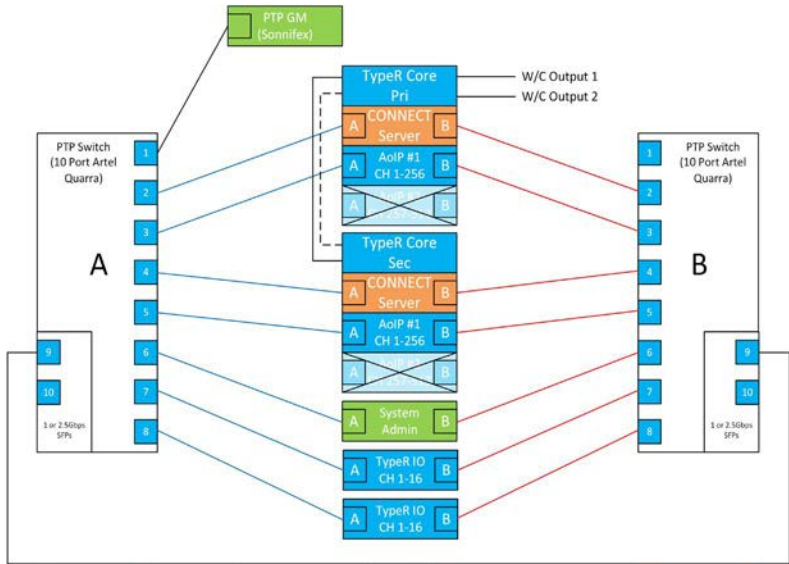
EXAMPLE 8: REDUNDANT CORE WITH LOCAL I/O + 2 AOIP UNITS ON 2 REDUNDANT PTP SWITCHES

Use of Local Core IO	✓
AoIP #1 Card Fitted	✓
AoIP #2 Card Fitted	✗
Redundant AoIP Connections	✓
Redundant AoIP Switch/es	✓
Redundant Core	✓
Connect server in Core	✓
Wordclock Input	✗
PTP Grand Master Clock	✓
Redundant PTP Grand Master Clock	✗

I/O Note:
In the event of a Redundant (Secondary) Core takeover, any I/O connected to the Primary Core local I/O will not be available on the Redundant (Secondary) Core. For I/O signals where redundancy is required, the user is recommended to use networked Type R I/O Units.

Connection Notes:

- a) The direct link between the Primary and Secondary Type R Cores is via the Core ‘Surface’ connections, keeping the Secondary Core in step with the Primary Core. The link may be wired with a single cable or two for cable redundancy.
- b) The direct link between the A and B switches is to provide PTP sync. This will require specific setup of the switch ports so that Switch A, Port 9, is seen as a master boundary clock.



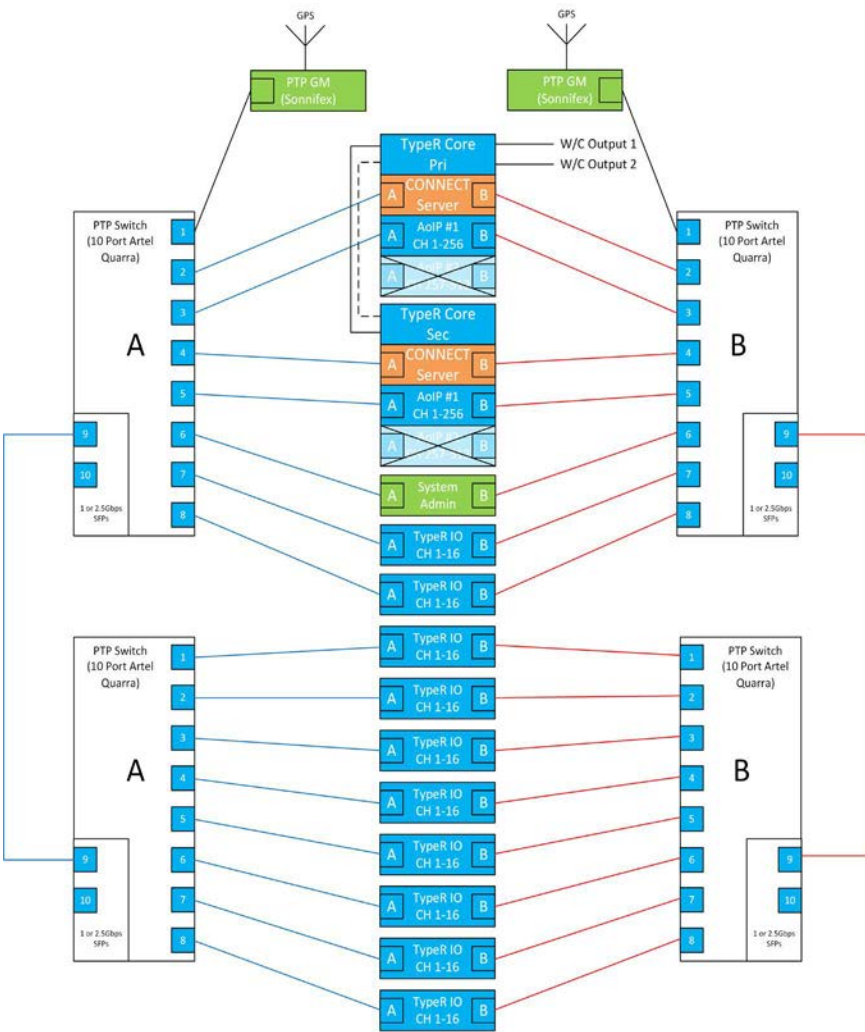
EXAMPLE 10: REDUNDANT CORE WITH LOCAL I/O + 10 AOIP UNITS ON 4 REDUNDANT PTP SWITCHES

Use of Local Core IO	✓
AoIP #1 Card Fitted	✓
AoIP #2 Card Fitted	✗
Redundant AoIP Connections	✓
Redundant AoIP Switch/es	✓
Redundant Core	✓
Connect server in Core	✓
Wordclock Input	✗
PTP Grand Master Clock	✓
Redundant PTP Grand Master Clock	✓

I/O Note:
In the event of a Redundant (Secondary) Core takeover, any I/O connected to the Primary Core local I/O will not be available on the Redundant (Secondary) Core. For I/O signals where redundancy is required, the user is recommended to use networked Type R I/O Units.

Connection Notes:

The direct link between the Primary and Secondary Type R Cores is via the Core ‘Surface’ connections, keeping the Secondary Core in step with the Primary Core. The link may be wired with a single cable or two for cable redundancy.



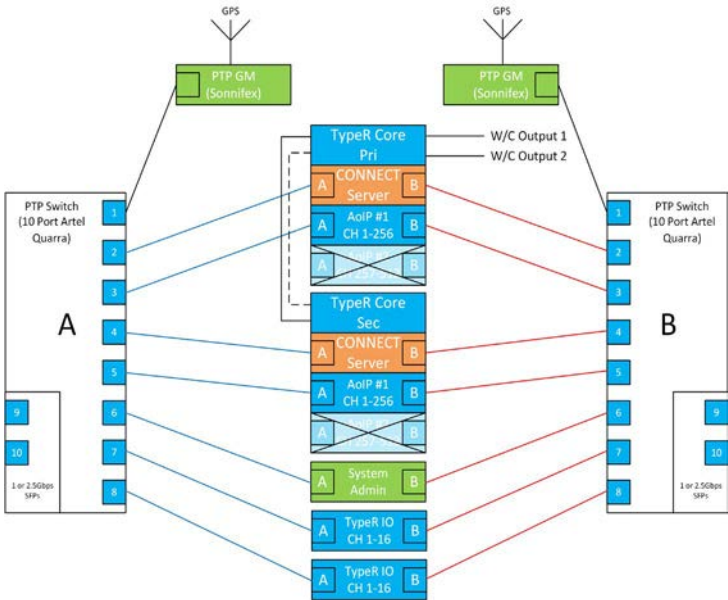
EXAMPLE 9: REDUNDANT CORE WITH LOCAL I/O + 2 AOIP UNITS ON 2 REDUNDANT PTP SWITCHES + REDUNDANT PTP

Use of Local Core IO	✓
AoIP #1 Card Fitted	✓
AoIP #2 Card Fitted	✗
Redundant AoIP Connections	✓
Redundant AoIP Switch/es	✓
Redundant Core	✓
Connect server in Core	✓
Wordclock Input	✗
PTP Grand Master Clock	✓
Redundant PTP Grand Master Clock	✓

I/O Note:
Note: In the event of a Redundant (Secondary) Core takeover, any I/O connected to the Primary Core local I/O will not be available on the Redundant (Secondary) Core. For I/O signals where redundancy is required, we recommend the use of networked Type R I/O Units.

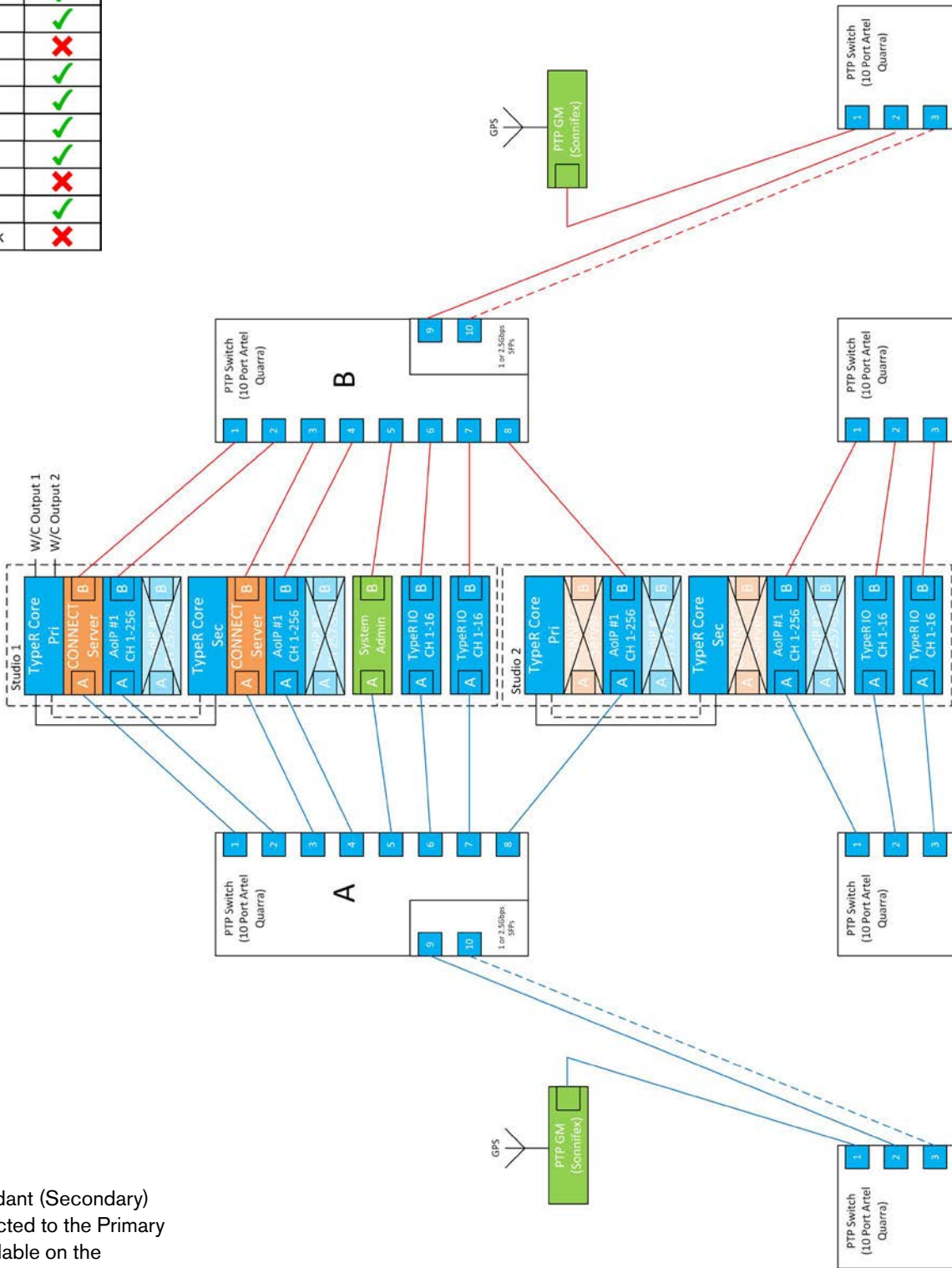
Connection Notes:

The direct link between the Primary and Secondary Type R Cores is via the Core “Surface” connections, which keep the Secondary Core in step with the Primary Core. The link may be wired with a single cable or two for cable redundancy.

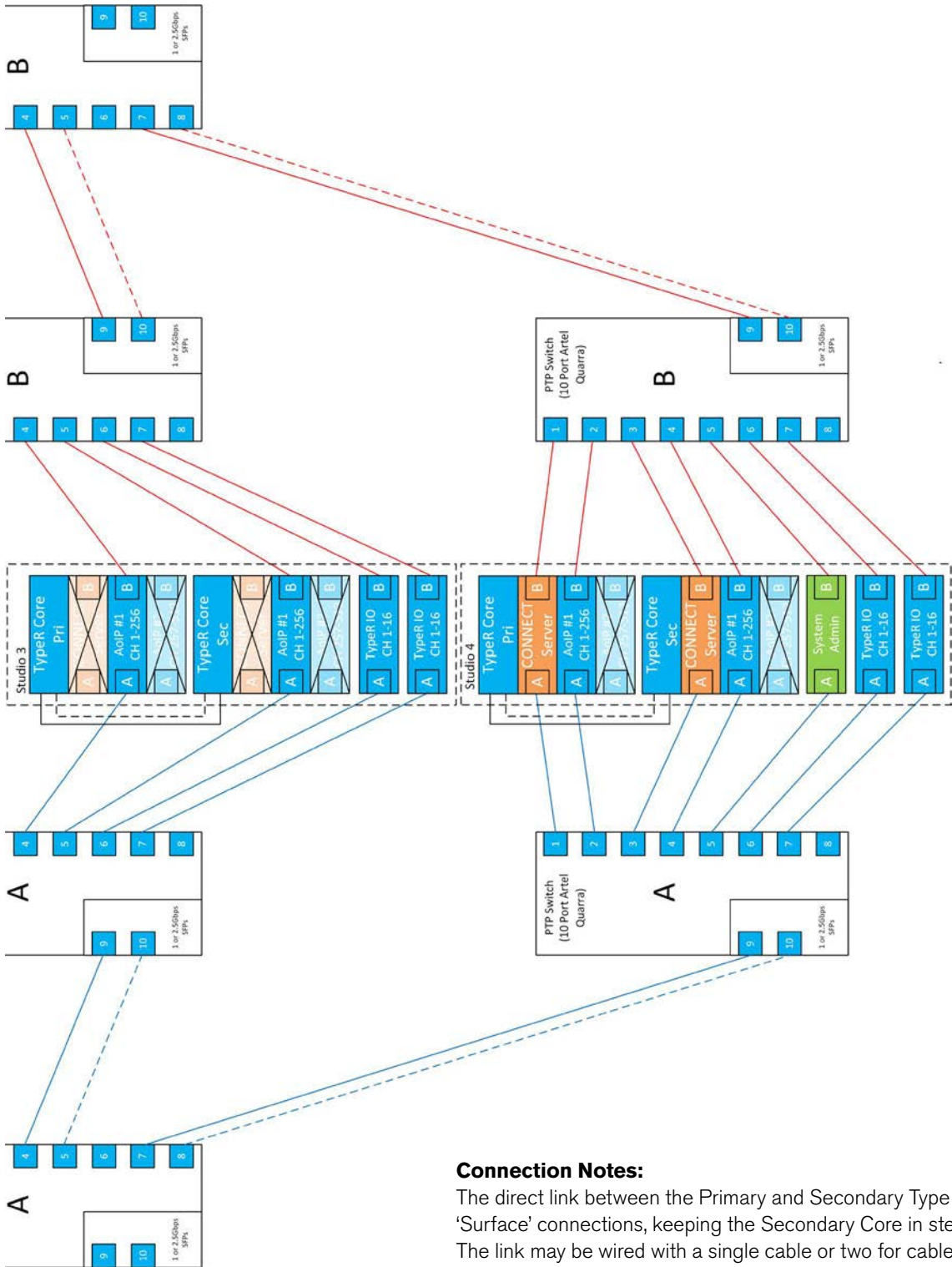


EXAMPLE 11: 4 STUDIOS REDUNDANT CORES WITH LOCAL I/O + 8 AOIP UNITS ON 8 REDUNDANT PTP SWITCHES

Use of Local Core IO	✓
AoIP #1 Card Fitted	✓
AoIP #2 Card Fitted	✗
Redundant AoIP Connections	✓
Redundant AoIP Switch/es	✓
Redundant Core	✓
Connect server in Core	✓
Wordclock Input	✗
PTP Grand Master Clock	✓
Redundant PTP Grand Master Clock	✗



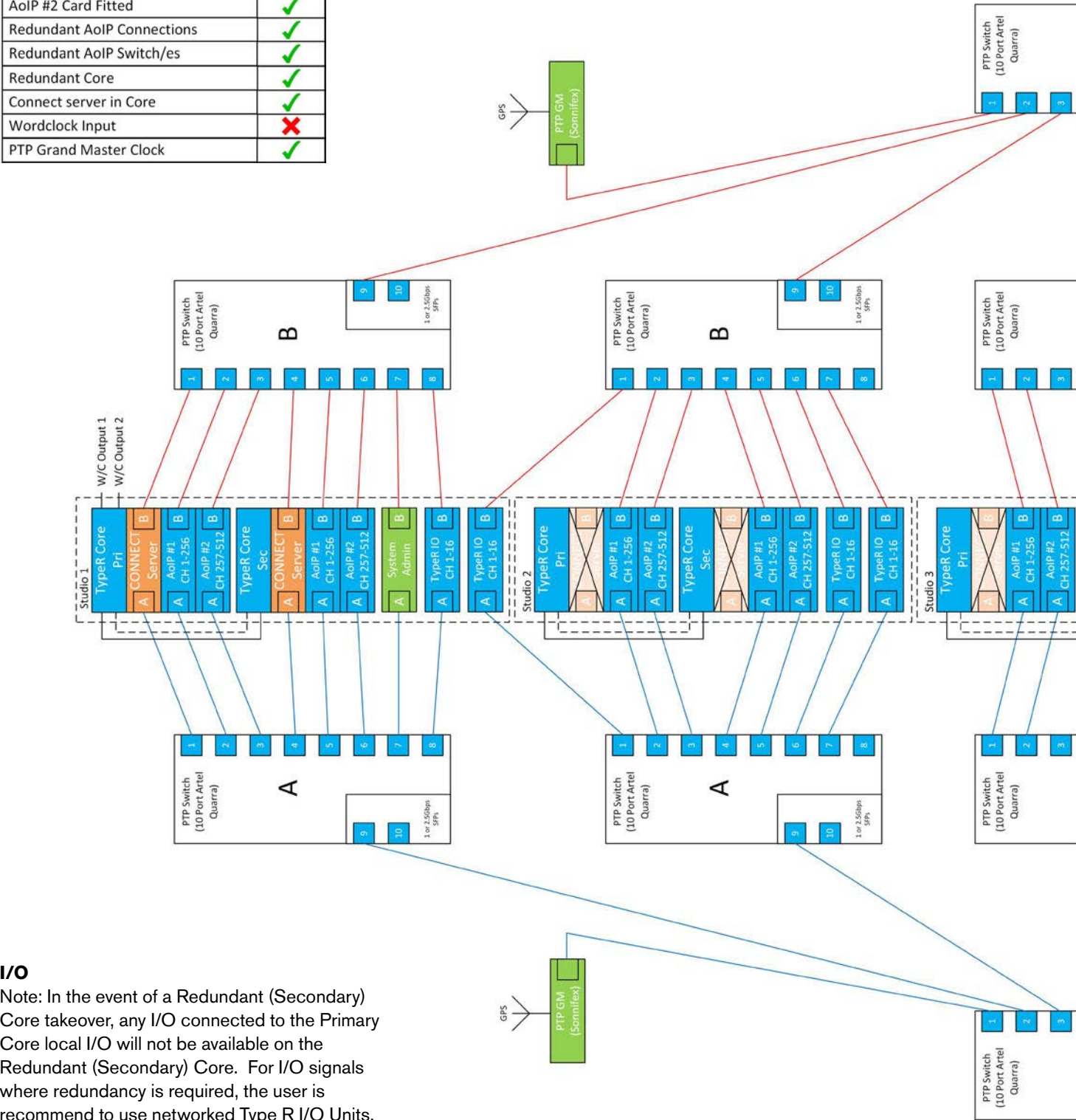
I/O
Note: In the event of a Redundant (Secondary) Core takeover, any I/O connected to the Primary Core local I/O will not be available on the Redundant (Secondary) Core. For I/O signals where redundancy is required, the user is recommend to use networked Type R I/O Units.



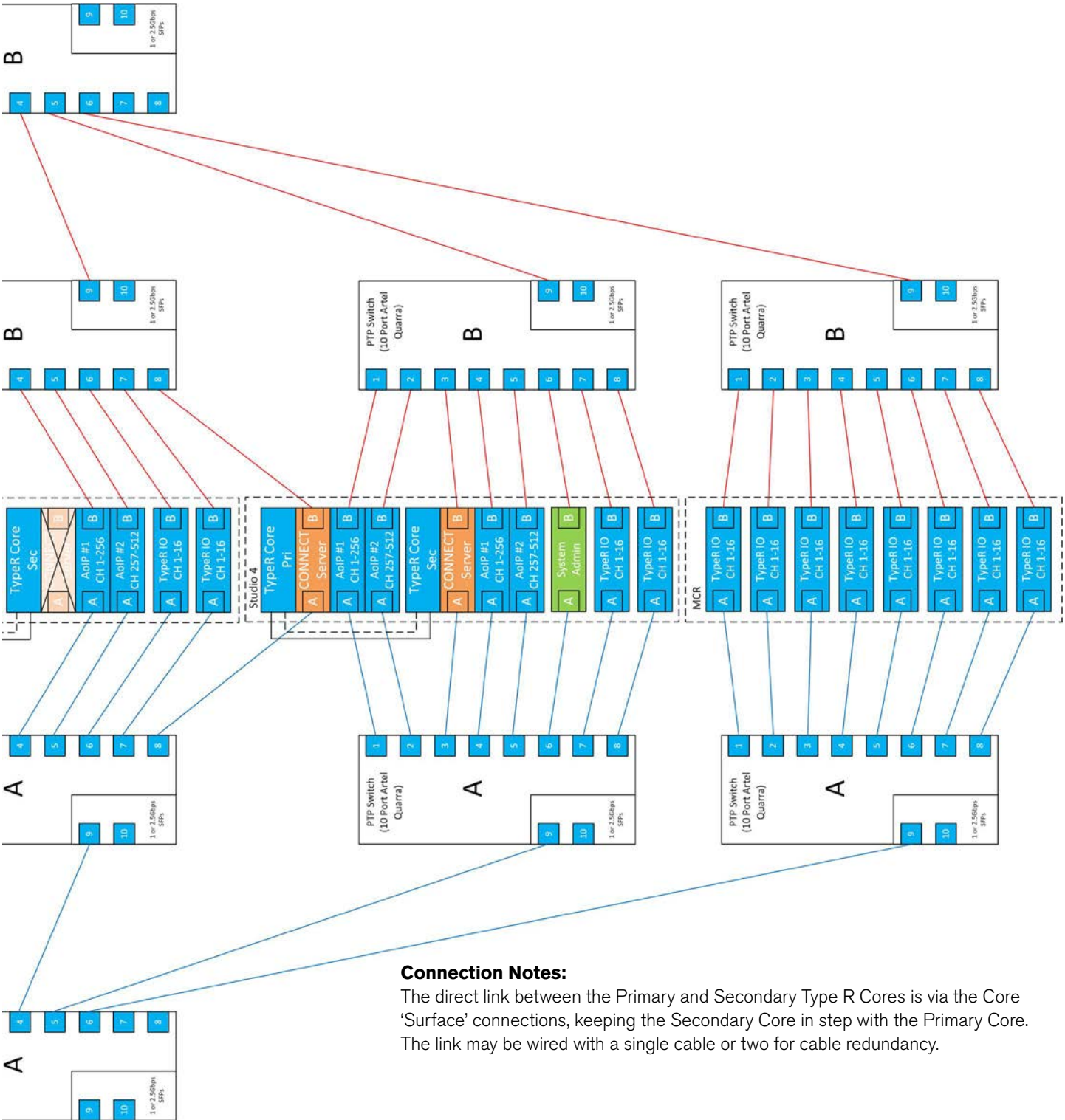
Connection Notes:
The direct link between the Primary and Secondary Type R Cores is via the Core 'Surface' connections, keeping the Secondary Core in step with the Primary Core. The link may be wired with a single cable or two for cable redundancy.

EXAMPLE 12: 6 STUDIOS + MCR, REDUNDANT CORES (2 AOIP CARDS/CORE)
WITH LOCAL I/O + 32 AOIP I/O UNITS ON 12 REDUNDANT SWITCHES

Use of Local Core IO	✓
AoIP #1 Card Fitted	✓
AoIP #2 Card Fitted	✓
Redundant AoIP Connections	✓
Redundant AoIP Switch/es	✓
Redundant Core	✓
Connect server in Core	✓
Wordclock Input	✗
PTP Grand Master Clock	✓



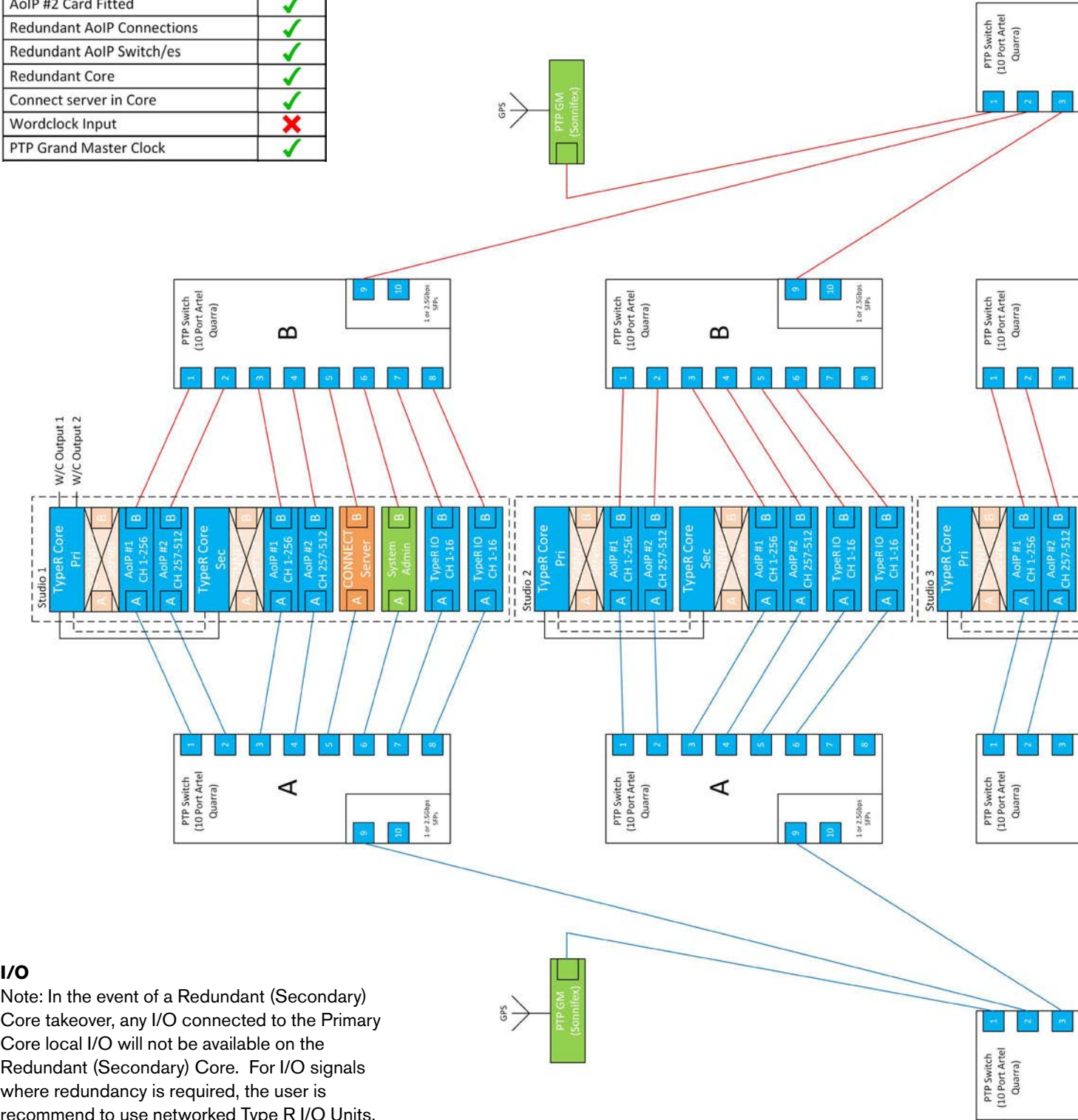
I/O
Note: In the event of a Redundant (Secondary) Core takeover, any I/O connected to the Primary Core local I/O will not be available on the Redundant (Secondary) Core. For I/O signals where redundancy is required, the user is recommend to use networked Type R I/O Units.



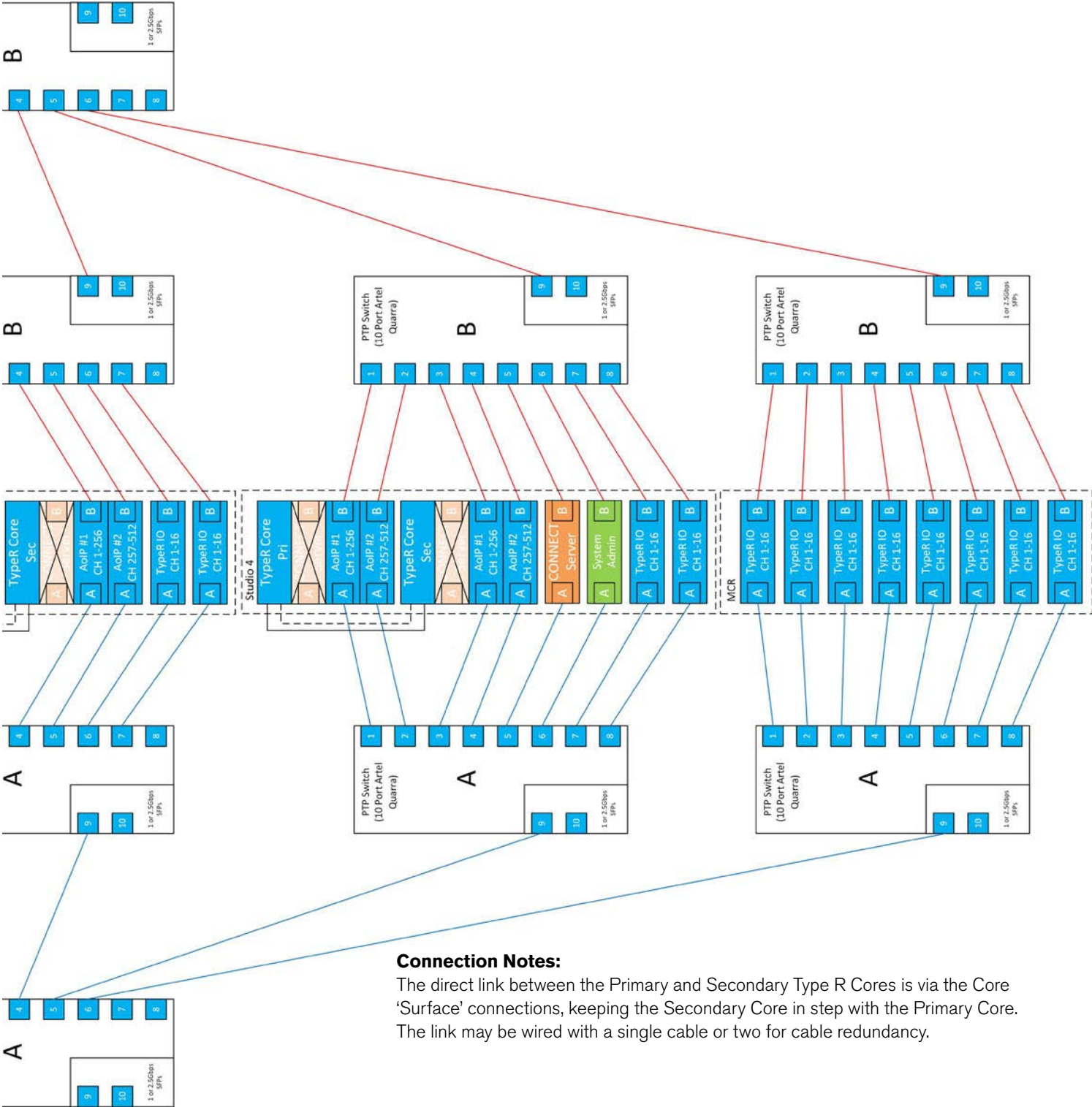
Connection Notes:
The direct link between the Primary and Secondary Type R Cores is via the Core 'Surface' connections, keeping the Secondary Core in step with the Primary Core. The link may be wired with a single cable or two for cable redundancy.

EXAMPLE 13: 4 STUDIOS + MCR, REDUNDANT CORES (2 AOIP CARDS/CORE) WITH LOCAL I/O + 32 AOIP I/O UNITS ON 12 REDUNDANT SWITCHES. NOTE CONNECT SERVERS ARE INSTALLED ON PC'S RATHER THAN CORES.

Use of Local Core IO	✓
AoIP #1 Card Fitted	✓
AoIP #2 Card Fitted	✓
Redundant AoIP Connections	✓
Redundant AoIP Switch/es	✓
Redundant Core	✓
Connect server in Core	✓
Wordclock Input	✗
PTP Grand Master Clock	✓



I/O
Note: In the event of a Redundant (Secondary) Core takeover, any I/O connected to the Primary Core local I/O will not be available on the Redundant (Secondary) Core. For I/O signals where redundancy is required, the user is recommend to use networked Type R I/O Units.



Connection Notes:
The direct link between the Primary and Secondary Type R Cores is via the Core 'Surface' connections, keeping the Secondary Core in step with the Primary Core. The link may be wired with a single cable or two for cable redundancy.

TYPE R SOFTWARE UPDATER

UPDATE TYPE R CORE TO THE LATEST SOFTWARE VERSION

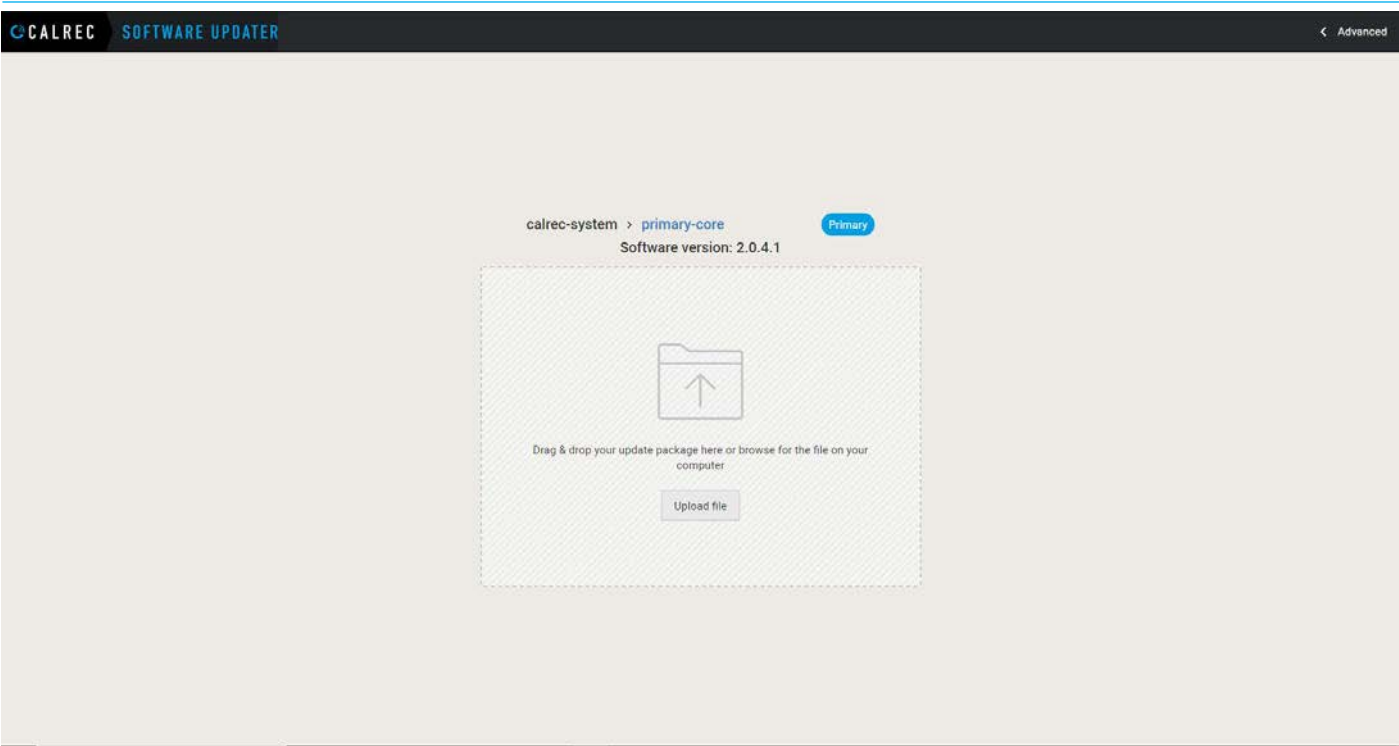
A newer software version may have been released since your Type R system left Calrec. To check the version installed on your system, follow these steps:

1. Open Google Chrome on the connected PC and enter **172.16.255.40** into the address bar to navigate to the **Software Updater** landing page, see Fig 1.

Note: If Google Chrome is not installed, navigate to <https://www.google.com/chrome/> to download and install it.

2. The installed software version is displayed below the system. Core names are above the file upload area.

FIG 1 - SOFTWARE UPDATER DISPLAYING INSTALLED SOFTWARE VERSION



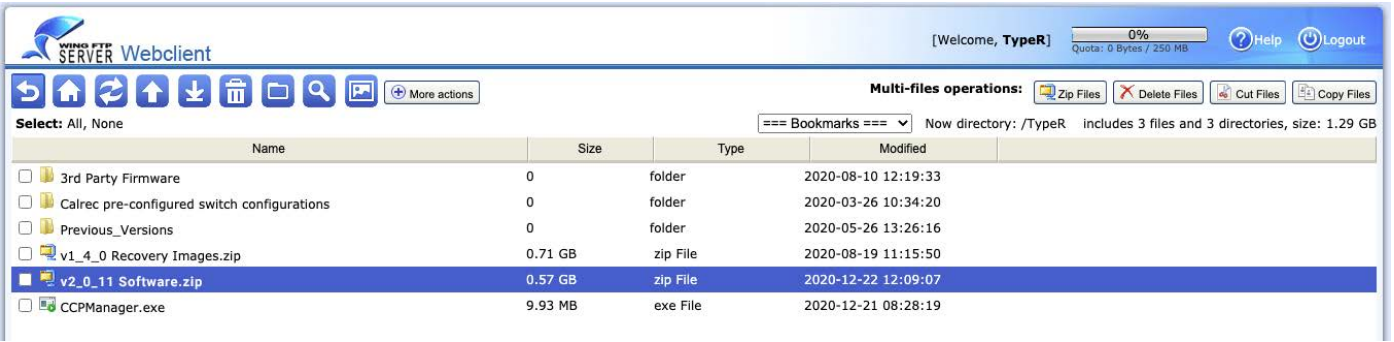
Software releases for Type R are made available online via an FTP server, see Fig 2 on the following page. To access this and to check the latest software version, follow these steps:

1. In Google Chrome, navigate to <http://ftp.calrec.com> and login with the following case-sensitive credentials (an internet connection is required):

Account: TypeR
Password: tYoarEdQ

2. Double-click the **Type R** folder to open it, then open the **Software release packages** folder. Each software release package will be displayed with the release version number in the file name and a **.calrec** file extension.
3. If a software version newer than the version installed on your system is available, double-click the release package to download it to your PC.

FIG 2 - FTP SERVER SHOWING SOFTWARE RELEASE PACKAGE FOLDER



To install a newer software version:

1. Navigate to the **Software Updater** landing page again, see Fig 1 on the previous page
2. Drag & drop your update package into the marked area within the browser or click **Upload file** to open a file explorer and browse for the file on your system. Select the required file and click on 'Open', see Fig 3. Updater will automatically upload and unpack the update package.
3. When the file upload is successful, click **Install** to begin the installation process, see Fig 4.
4. The updater will then automatically apply all the updates to the core.

Note: AoIP devices installed in the Type R core will be updated as part of this process.

5. When updates are completed, click **Reboot** to reboot the core, see Fig 5 on the following page.
6. On update completion, the **All Done** image shown in Fig 6 on the following page will appear.

FIG 3 - TYPE R RELEASE DOWNLOADED AND UNZIPPED (.CALREC FILE)

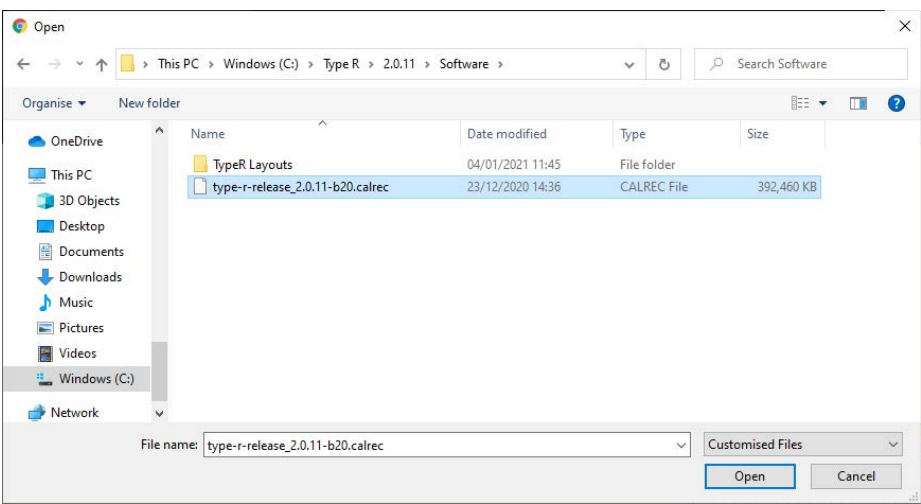
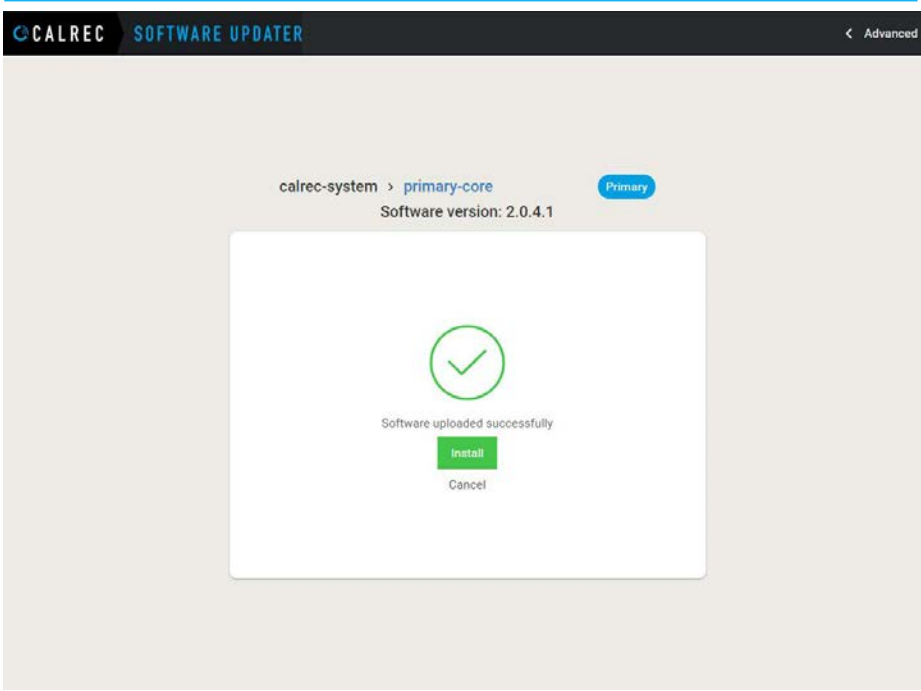


FIG 4 - SOFTWARE UPLOADED AND READY TO INSTALL



Tip: to view more information, click the **Advanced** button in the header at any time. This will open a drawer on the right side of the window to display additional detail, without interrupting the update process.

Note: Surface panels automatically check for, and install updates, on power up, when connected to a core. IO box and AoIP device updates will be described later in this guide.

It is important to wait until the **All Done** message appears before performing a full system power cycle or turning off the Type R core.

Ensure the Recover LED on the front of the is either solid green or off before doing this.

FIG 5 - TYPE R SOFTWARE INSTALLED READY TO REBOOT

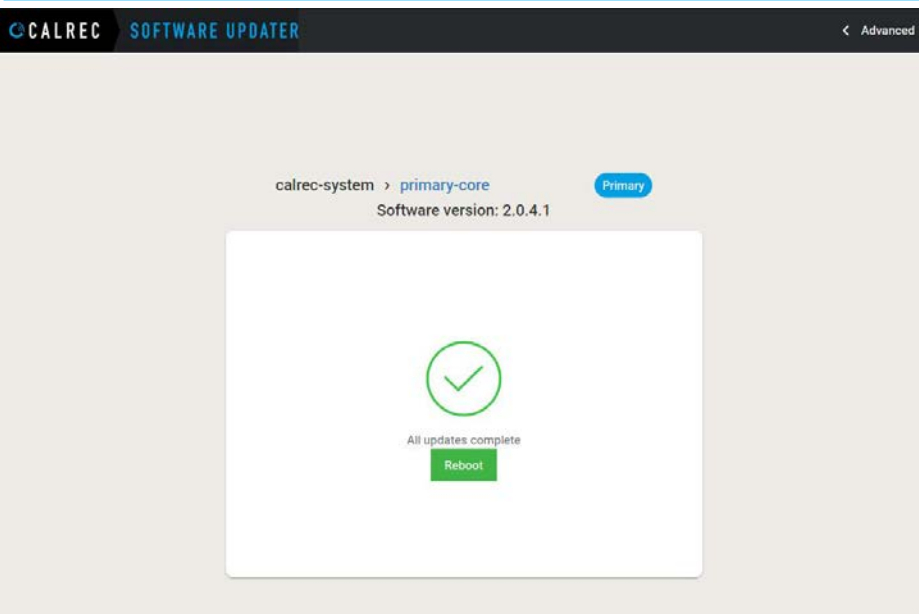
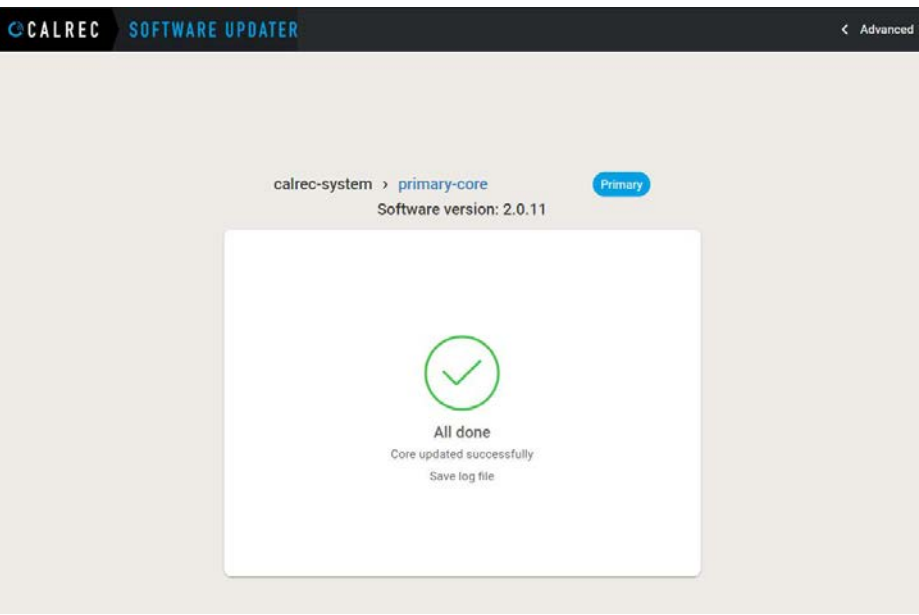


FIG 6 - TYPE R SOFTWARE INSTALLED READY TO REBOOT



UPDATE EXTERNAL AOIP DEVICES TO THE LATEST SOFTWARE VERSION

All Calrec AoIP end-points are served by AoIP devices. External I/O units may include one or two devices, and the software that runs on those devices can be updated from the Connect Application. A newer AoIP device software version for external I/O units may have been released since your Type R system left Calrec. To check and update the versions installed on a device, the user accesses the Connect application and follows the steps outlined in the **Connect Application Guide (926-292).pdf**. This information is replicated here for convenience after successfully Logging In.

Access Update Software page

This option allows the user to update the software associated with AoIP devices in the system.

Note: this software update is independent of the Core software update that is managed in Configure.

Upon clicking **Update software** from the Options dropdown, see Fig 1, the dialogue box opens, see Fig 2.

FIG 1 - DEVICES>OPTIONS- ACCESS UPDATE SOFTWARE PAGE

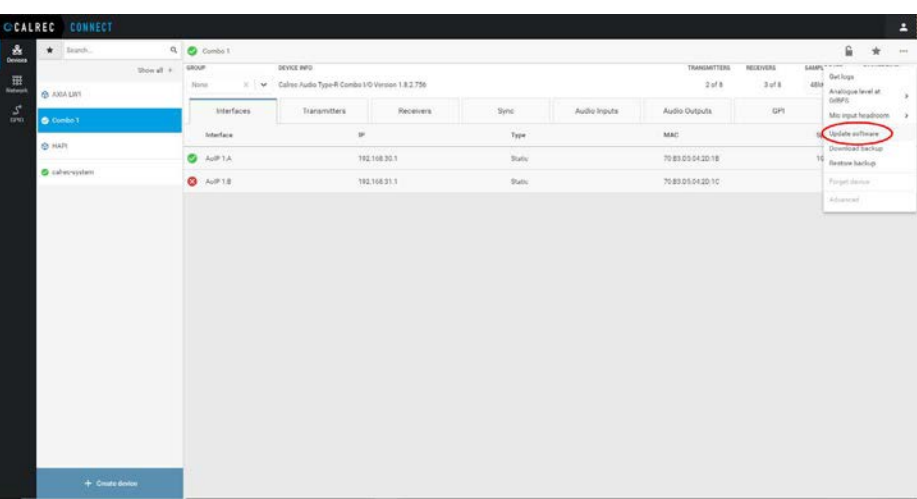


FIG 2 - DEVICES-UPDATE SOFTWARE

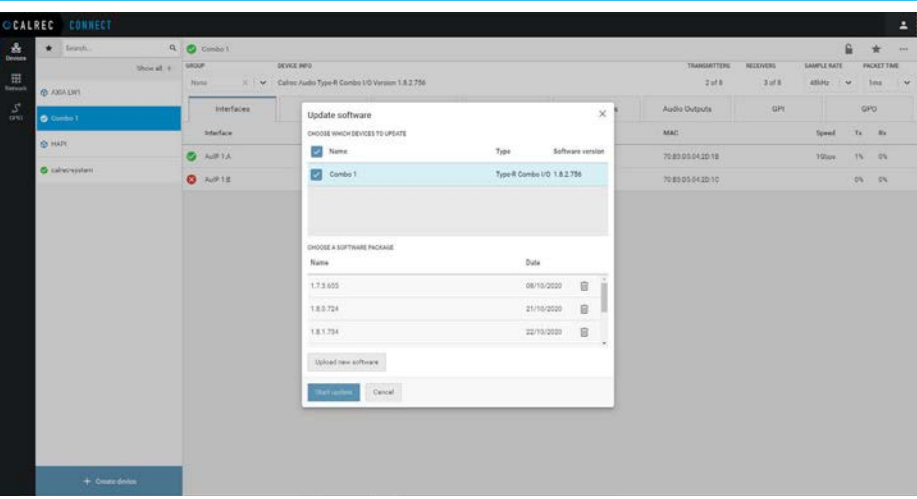
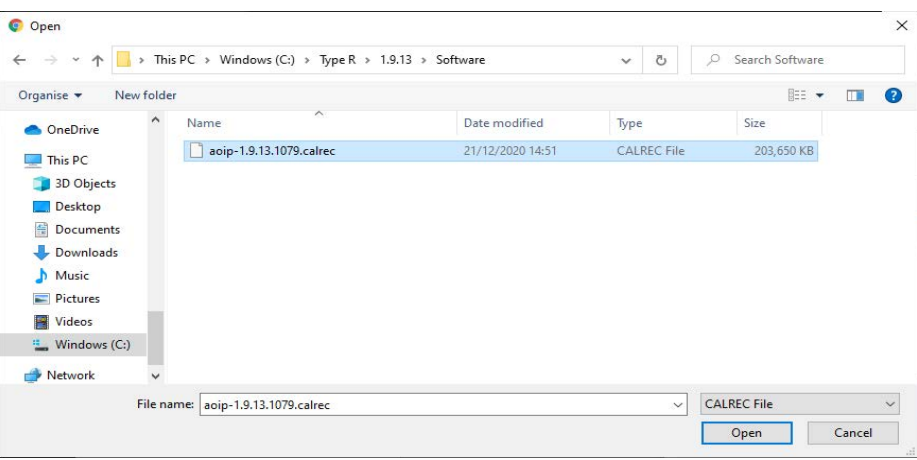


FIG 3 - AOIP RELEASE SOFTWARE DOWNLOADED FROM SERVER (.CALREC FILE)



Update New Software Packages

This shows which AoIP devices are connected and the software version last loaded.

The user can check if there is a later version available on the Calrec FTP server, where the file name takes the form '**aoip-1.9.13.1079.calrec**', where 1.9 is the version and 13 is the build number.

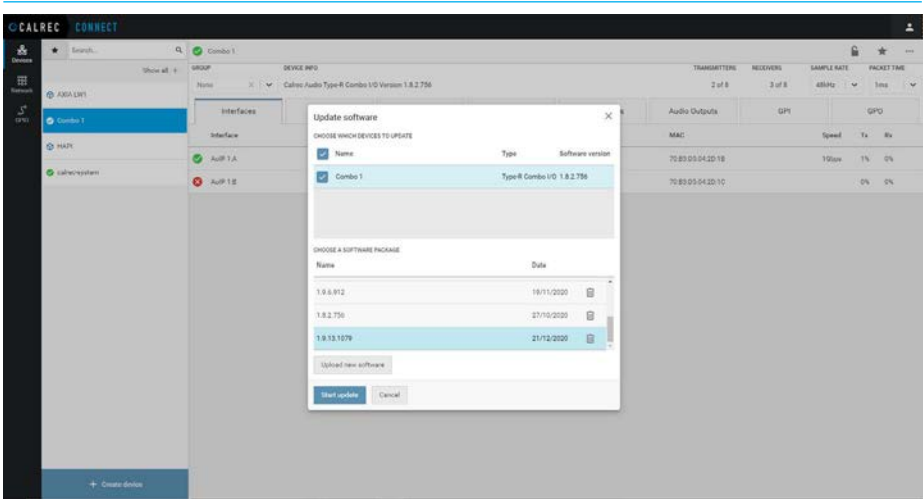
Once downloaded from the FTP server, using the same process as described for the Type R Core update, the user clicks on the button labelled '**Upload new software**' button, which asks the user to browse and find the file to upload, see Fig 3.

Select the required file and click 'Open'. The updater will automatically upload and unpack the update package, ready to be applied to the various AoIP devices attached to the Type R core.

Select and Update AoIP Devices

To update AoIP devices, the user first chooses which package to apply. Fig 4 shows that the user has selected the newly uploaded software. The user then chooses which devices to update by clicking on their tickboxes as shown for Combo 1, then clicks 'Start Update'.

FIG 4 - DEVICES-SELECT SOFTWARE UPDATE AND DEVICES TO UPDATE



This process takes a few minutes. An update progress bar shows the percentage completion.

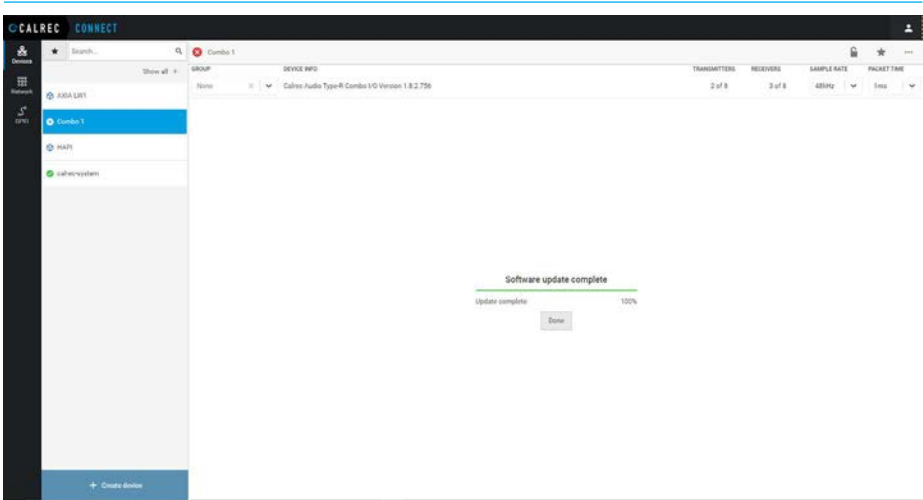
On completion, a **Software update complete** message appears, see Fig 5.

Note: as there is Firmware updating involved in this process, it is important to allow this process to complete.

Clicking **Done** returns the user to the devices page. The Device should now show a green tick having rebooted.

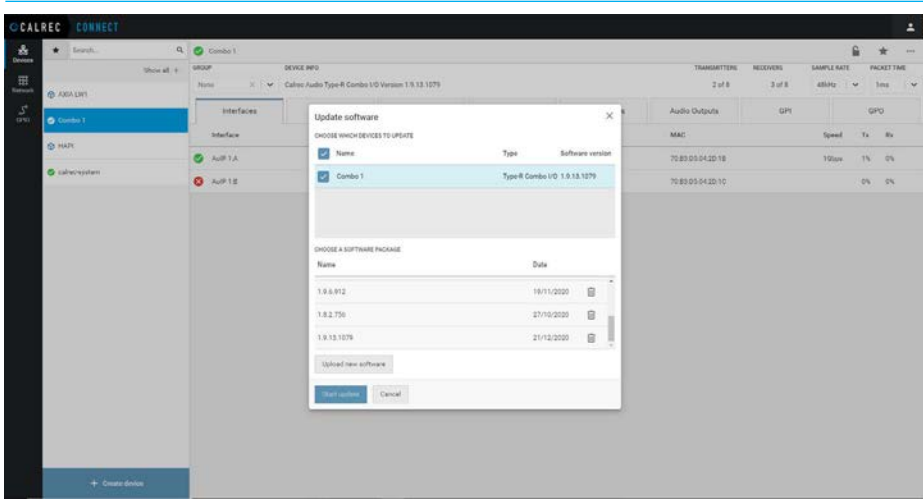
To confirm that the new software has been uploaded, check the DEVICE INFO in the header for the AoIP device. This shows the current software version.

FIG 5 - DEVICES-SOFTWARE UPDATE COMPLETE NOTIFICATION



The user can also reaccess the Update software page to show the current software version for all the Calrec Devices attached to the Type R Core rather than individually selecting each device, see Fig 6.

FIG 6 - OPTIONS-START SOFTWARE UPDATE



TYPE R SPECIFICATIONS

GENERAL SPECIFICATIONS

FIG 1 - SIGNAL PROCESSING PER CONSOLE

	UR6500 Type R Core facilities per Console
Input Channel Paths	From 20 to 120
Main Buses	Up to 3 (mono, stereo or 5.1) from a pool of 30 paths*
Group Buses	Up to 8 (mono, stereo or 5.1) from a pool of 30 paths*
Aux Buses	Up to 16 (mono or stereo) from a pool of 16 paths*
Direct Outputs	1 assignable per Channel/Group from a pool of 96 legs**
Mix Minus Outputs	1 assignable per Channel/Group from a pool of 96 legs**
Insert Sends & Returns	1 per Channel/Group/Aux/Main (mono, stereo or 5.1) from a pool of 48 legs
Monitor Inserts	Dedicated Insert available to Console LS, Studio1 LS and Misc LS
Mix Minus Buses	11 (Mono)
Off Air Conference Bus	1 (Mono)
External Monitor/Meter Inputs	48
VCA Groups	Unlimited
EQ	4 band full Parametric EQ + LF & HF filters with 12 or 24dB/octave slopes on every Channel, Group, Aux, Main
Dynamics Processing *(from v2.0 onwards)	Channel and Group Paths - expander/gate/ducker, singleband compressor/limiter sidechain EQ + key input (pool of 24 per core). Main Paths- same as channels/groups but no expander/gate/ducker. Aux Paths - same as channels/groups but no expander/gate/ducker +Automixer for every mono channel and group. (Note the Automixer replaces the expander/gate/ducker process when active) Direct Outputs & Mix Minus Outputs - compressor/limiter * De-Esser
Input Delay	5.4 s per Channel from a pool of 48 delay blocks
Path Delay	5.4 s for every path from a pool of 48 delay blocks
Output Delay	5.4 s per Output including Direct Outputs from a pool of 48 delay blocks

* Pool of Paths available for each DSP Pack is summarised under DSP Options [see “DSP Pack Options” on page 68](#)
** Pool of 96 legs shared across consoles between Direct & Mix Minus Outputs with a maximum of 96 legs available in the core, [see “Fig 9 - DSP Pack Overview for Direct/Mix Minus Outputs, Delays, Inserts and External Inputs” on page 76](#)

FIG 2 - CONTROL SURFACES

	IM6413 Type R Fader Panel
Physical Faders	Up to 48 (which can provide control of up to 96 paths using the Layer A/B button)
Talkback Microphone	External Only
Headphone Outputs	Not on Console, 2 x Stereo, 1/4" TRS Jacks on UR6500 Core and AD6501 Combo I/O Box these outputs are optimised for use with Headphones with input impedance of 250 Ohms.

FIG 3 - CORE ROUTER

	UR6500 Type R Core
Integral Router	512 ²
AoIP Connections	1 + 1 redundant connection for connecting I/O units
Audio Channels Per AoIP Port	Up to 256 in either direction

POWER/ENVIRONMENTAL SPECIFICATIONS

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

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

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

FIG 1 - CONTROL SURFACES

Type R Console	IM6413 Fader Panel	MU6411 Large Soft Panel	MU6410 Small Soft Panel
Power Dissipation (Heat) - Maximum Brightness	14.0 W	8.9 W	6.8 W
Cooling	The control surface is cooled by natural ventilation. The air intake is on the side and bottom vents of the console panels. The panels may be butted up side to side to form bigger surfaces as long as clearance is provided below the units to provide the panels with sufficient ventilation.		
Operating Ambient Air Temperature	0°C - 40°C		
Weight	3.4 kG	2.7 kG	1.4 kG

FIG 2 - 2U CORE BOX

UR6500 Type R Core	240V Operation	115V Operation	100V Operation
Supply Current	0.38 A	0.56 A	0.63 A
Power Factor	0.55	0.78	0.77
Power Dissipation (Heat)	50 W	50 W	48 W
Cooling	This 2U Rack is cooled by an 80mm low power, low speed and low noise fan mounted to the right hand side panel of each unit venting air. Fan speed is monitored and system status warnings are generated if fans fail. Air is drawn in through the left hand side panel. The side panels of the unit should be unobstructed with at least 50mm (2") clearance to allow airflow. No clearance is required above or below the unit.		
Operating Ambient Air Temperature	0°C - 40°C		
Weight	6.3 kG including 2 x US6493 AoIP Boards Note: US6493 AoIP boards weigh 0.04 kG each and 2 may be fitted to the Core.		
Dimensions	430mm Width x 88mm Height x 363mm Depth (483mm Wide Front Panel)		

FIG 3 - OPTIONAL 1U I/O UNITS

AD6501 Type R Combo I/O	240V Operation	115V Operation	100V Operation
Supply Current	0.22 A	0.37 A	0.41 A
Power Factor	0.60	0.79	0.84
Power Dissipation (Heat)	31 W	34 W	34 W
Cooling	This 1U Rack is cooled by natural ventilation and does not require fan assistance, having sufficient surface area to radiate heat adequately. The side panels of the I/O unit should be unobstructed with at least 50mm (2') clearance to allow airflow. See Thermal Requirements when stacking Type R I/O Units on page 119.		
Operating Ambient Air Temperature	0°C - 40°C		
Weight	4.6 kG (Includes US6525 AoIP Board weighing 0.04kG)		
Dimensions	430mm Width x 44mm Height x 363mm Depth (483mm Wide Front Panel)		
AD6502 Type R Analogue I/O	240V Operation	115V Operation	100V Operation
Supply Current	0.29 A	0.50 A	0.57 A
Power Factor	0.60	0.77	0.77
Power Dissipation (Heat)	41 W	44 W	44 W
Cooling	This 1U Rack is cooled by natural ventilation and does not require fan assistance, having sufficient surface area to radiate heat adequately. The side panels of the I/O unit should be unobstructed with at least 50mm (2') clearance to allow airflow. See Thermal Requirements when stacking Type R I/O Units on page 119.		
Operating Ambient Air Temperature	0°C - 40°C		
Weight	4.7 kG (Includes US6525 AoIP Board weighing 0.04kG)		
Dimensions	430mm Width x 44mm Height x 363mm Depth (483mm Wide Front Panel)		
JD6503 Type R AES I/O	240V Operation	115V Operation	100V Operation
Supply Current	0.18 A	0.20 A	0.20 A
Power Factor	0.36	0.75	0.85
Power Dissipation (Heat)	15 W	17 W	17 W
Cooling	This 1U Rack is cooled by natural ventilation and does not require fan assistance, having sufficient surface area to radiate heat adequately. The side panels of the I/O unit should be unobstructed with at least 50mm (2') clearance to allow airflow. See ‘Thermal Requirements when stacking Type R I/O Units on page 119.		
Operating Ambient Air Temperature	0°C - 40°C		
Weight	3.3 kG (Includes US6525 AoIP Board weighing 0.04 kG)		
Dimensions	430mm Width x 44mm Height x 239mm Depth (483mm Wide Front Panel)		

FIG 4 - ALL TYPE R UNITS

	Core and All Optional I/O Units
Power	The Type R Core and all Type R I/O units have two IEC AC power inlets and are fitted with dual power supplies. Units will be fully functional on one PSU, however both should be fed where possible from separate sources to provide redundancy against both PSU failure and external power loss. The operating AC supply voltage is 100 V - 240 V +/-10%. The peak inrush current is limited (cold start). Figures are available for all units. This reduces the chance of a nuisance trip or fuse blow from power up. The RMS quiescent current figures are specified on the rating label for all types of I/O box and are shown in this manual for each I/O box type.
Power Factor	All Type R I/O units require less than 75W of input power. The internal power supplies fitted have passive filtering (as opposed to active power factor correction) to reduce the harmonics to within the limits of the standard EN61000-3-2. At the time of writing the standard does not apply to equipment <75W. If the lower limit is ever reduced the units will be compliant and as such are future proof.
Heat Output and Efficiency	The heat output from Type R 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 I/O units. The low power PSU efficiency is again dependant on supply voltage and loading, generally >70%.
Thermal Requirements when stacking Type R I/O Units	The Type R Core Unit is 2U and is cooled under control with fan assistance. Operation is not dependant on the fan; it is there to extend the operating life of the unit. There is an 80mm low power, low speed and low noise fan mounted to the right hand side panel of the unit venting air. Fan speed is monitored and system status warnings are generated if fans fail. Air is drawn in through the left hand side panel. The Type R Optional I/O units are 1U and do not require fan assistance having sufficient surface area to radiate heat adequately. The side panels of all Type R I/O units should be unobstructed with at least 50mm (2') clearance to allow airflow. 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. For Ambient temperatures of 30 deg C or below :- I/O Units may be stacked in groups of up to 3 units with 1RU gaps above and below. For Ambient temperatures of 30-40 deg C :- I/O Units may be stacked in pairs with 1RU gaps above and below. Under no circumstances should more than 3 units be fitted in a single stack. The maximum ambient temperature the units should be operated in under any circumstances is 40 deg C.
Acoustic Noise Core	<27 dB SPL (A-weighted, 1m from front).
Operating Ambient Air Temperature	0°C - 40°C
Relative Humidity	5% - 80% Non-Condensing

AUDIO PERFORMANCE SPECIFICATIONS

FIG 1 - AES3 BALANCED DIGITAL INPUTS (ON UR6500, AD6501 AND JD6503)

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

FIG 2 - AES3 BALANCED DIGITAL OUTPUTS (ON UR6500, AD6501 AND JD6503)

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

FIG 3 - ANALOGUE INPUT SPECS (ON UR6500, AD6501 AND AD6502)

Analogue - Digital Conversion	24 Bit
Input	Electronically Balanced
Input Impedance	5.4k Ohms at mic/line level gain settings
Sensitivity	+18 / -78dB for Mic/Line Inputs
Maximum Input Level	24dBu
Frequency Response	20Hz to 20kHz +/- 0.25dB on Mic/Line Inputs
Distortion	-1dBFS @ 1kHz - Better than 0.005% (-86dB) -20dBFS @ 1kHz - Better than 0.003% (-90dB) -40 dBFS @ 1kHz - Better than 0.03% (-70dB)
Dynamic Range(CCIR-RMS)	-116dB
Idle Channel Noise	-116dBFS (88dBu)
Equivalent Input Noise	-126dB (150 Ohm source)
Input CMR (Common Mode Rejection)	>90dB at a 52dB gain setting >75dB at a 4dB gain setting
Crosstalk	-115dB or better on adjacent inputs with 0dBFS tone at 1kHz on Source
Phantom power current limit	9.5mA / channel

FIG 4 - ANALOGUE OUTPUT SPECS (ON UR6500, AD6501 AND AD6502)

Digital - Analogue Conversion	24 Bit
Output Balance	Electronically Balanced
Output Impedance	31 Ohms
Maximum Output Level	24dBu
Frequency Response	20Hz to 20kHz +/- 0.25dB
Distortion	-1dBFS @ 1kHz - Better than 0.002%(-93dB) -20dBFS @ 1kHz - Better than 0.003% (-90dB) -40 dBFS @ 1kHz - Better than 0.03% (-70dB)
Dynamic Range (CCIR-RMS)	-113dB
Idle Channel Noise	-113dBFS (85dBu)
Crosstalk	-105dB or better on adjacent outputs with 0dBFS tone at 1kHz on Source

FIG 5 - AUDIO PERFORMANCE DATA

Digital to Digital (AES3) Distortion	-1dBFS, 20Hz to 20kHz - Better than 0.0001%
Digital to Digital (AES3 with SRC) Distortion	-1dBFS, 20Hz to 20kHz - Better than 0.0002%
Frequency Response (Analogue Input to Output)	20Hz to 20kHz +/- 0.25dB

FIG 6 - SYNCHRONISATION INPUTS

48KHz Synchronisation	PTPv2 Grand Master Clock TTL Wordclock 1 (48kHz) TTL Wordclock 2 (48kHz) Internal Crystal Reference
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FIG 7 - LATENCY @ 48KHZ / 96KHZ SAMPLE RATE * (PROVISIONAL FIGURES)

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

*Note : 96kHz operation will be made available in a later release.

Type R has a number of Manuals associated with it. This is the Type R Installation Manual:-

1. Type R Product Info Sheet (926-272)

This information sheet shows how to collect information on Type R.

2. Type R Start Up Guide (926-282)

This guide shows how to Unpack, Power Up and access/configure the system core, Install a licence key, Configure the Core for the Surface panel layouts, Access Assist and create a New Show, Configure the network devices, Configure Panel IDs, Connect up a PC to the Surface switch, Upload control layouts to the Soft Panels, Create layouts using the Type R Soft Panel Designer, Configure and Connect an Audio Switch and AoIP Devices to the Core.

3. Type R Installation Manual (926-228)

This contains a number of chapters, including: Control surface measurements, Mounting and Assembly instructions and Defining the system elements of a Type R system. It also describes the Core, Panels and IO Box layouts, Synchronisation, Audio & GPIO Connections, Core DSP packs, Surface panel layout examples, AoIP network examples, Software Updating and Technical specifications. Note that a new licencing system is in use for DSP Packs and the introduction of True Control in V3.

4. Type R Assist Manual (926-229)

This defines how a pre-configured Type R console is setup and controlled via Calrec Assist, which is Calrec's web-based configuration tool. It includes creating/managing shows, setting up shows in terms of configuring paths, displaying and controlling the fader surface, saving and loading snapshots and patching inputs and outputs to the channels and buses. There are then various sections about parameter access including:- processing, routing, configuring and controlling the buses & outputs and setting up the monitoring & metering. The show setup and system setting sections provide configuration tools for both show and system configuration.

5. Type R Assist and Console Panel Operation (926-283)

This covers how the pre-configured Type R Console is operated via a combination of Fader Panels, Large and Small 'Soft' surface panels, and is incorporated with the Assist manual.

6. Type R Panel Designer (926-284)

This defines how different controls can be configured to appear on the Console Panels using the PanelDesigner Application which allows the user to design their own custom layouts for the Large and Small 'Soft' surface panels.

7. Type R Configure Guide (926-285)

This defines how the Type R Core(s) can be configured and partitioned into different mixing consoles with varying amounts of DSP processing channels available in different 'Pack' sizes under licence. True Control licencing can be applied, allowing the console to either control other consoles or be controlled from other consoles. It also is used to configure the Remote Network interfaces, Hardware, Control Surfaces from the available panels, setup synchronisation sources, configure Network AoIP interfaces, configure the I/O, including Virtual Patchbays, and provide User management permissions for Operators.

8. Connect (926-292)

This defines how the Impulse/Type R Core IP Input and Output streams are connected to AoIP based interfaces, and how AoIP streams are managed including GPIO devices. These can be connections to and from either Calrec AoIP Devices or other 3rd party AoIP streams.

9. AoIP I/O Manual (926-293)

This contains information about AoIP devices available for use with Impulse/Type R in terms of Control, Audio & GPIO Connections.

10. Remote Production Manual Type R (926-332)

This defines the features of RP1 that are now available to Type R.

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(926-228 Iss.28)