ARGO START UP GUIDE V1.0

IP Audio Routing & Mixing System
for Argo S and Argo Q Consoles

calrec.com

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IMPULSE
CONTENTS

IMPULSE
START UP GUIDE

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GETTING STARTED

Thank you for choosing Calrec Impulse.

This start up guide will provide the user with all the steps you need to set up the Impulse system as a single studio system, using an Argo S or Argo Q console surface and various AoIP I/O devices. For links to information about more advanced setups, as well as other manuals, please refer to the Further Reading section at the back of this start up guide, or contact Calrec Customer Support (support@calrec.com).

Before you begin, please make sure a PC with Google Chrome installed, running Windows 10 or higher, an ethernet adaptor plus an ethernet cable, and an internet connection is available to download any update packages you may require.

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

Note: The minimum recommended Windows PC specifications are as follows:

- i5 Intel Processor or AMD equivalent
- 4 Gig RAM memory
- Windows 10 - 64bit
- Google Chrome Browser - Version 77 or higher
- Ethernet adaptor for remote connectivity/media network interfaces
- Minimum Display Resolution 1366px X 768px

* Impulse is designed for use with a touch interface where possible. Calrec recommends the use of a 1920x1080 touch screen monitor.

Please also confirm that all the parts listed on the system's packing list are present, with the correct serial numbers. A print out of the packing list will have been provided alongside the shipping documentation. The packing list is a document named with the sales order number and appended with -11 (e.g. 51235-11). If any parts are missing, or sign of damage, please contact Calrec Customer Support.

Important: Please follow this guide to ensure that the system is configured correctly!
Use the checklist below to confirm each step if required.

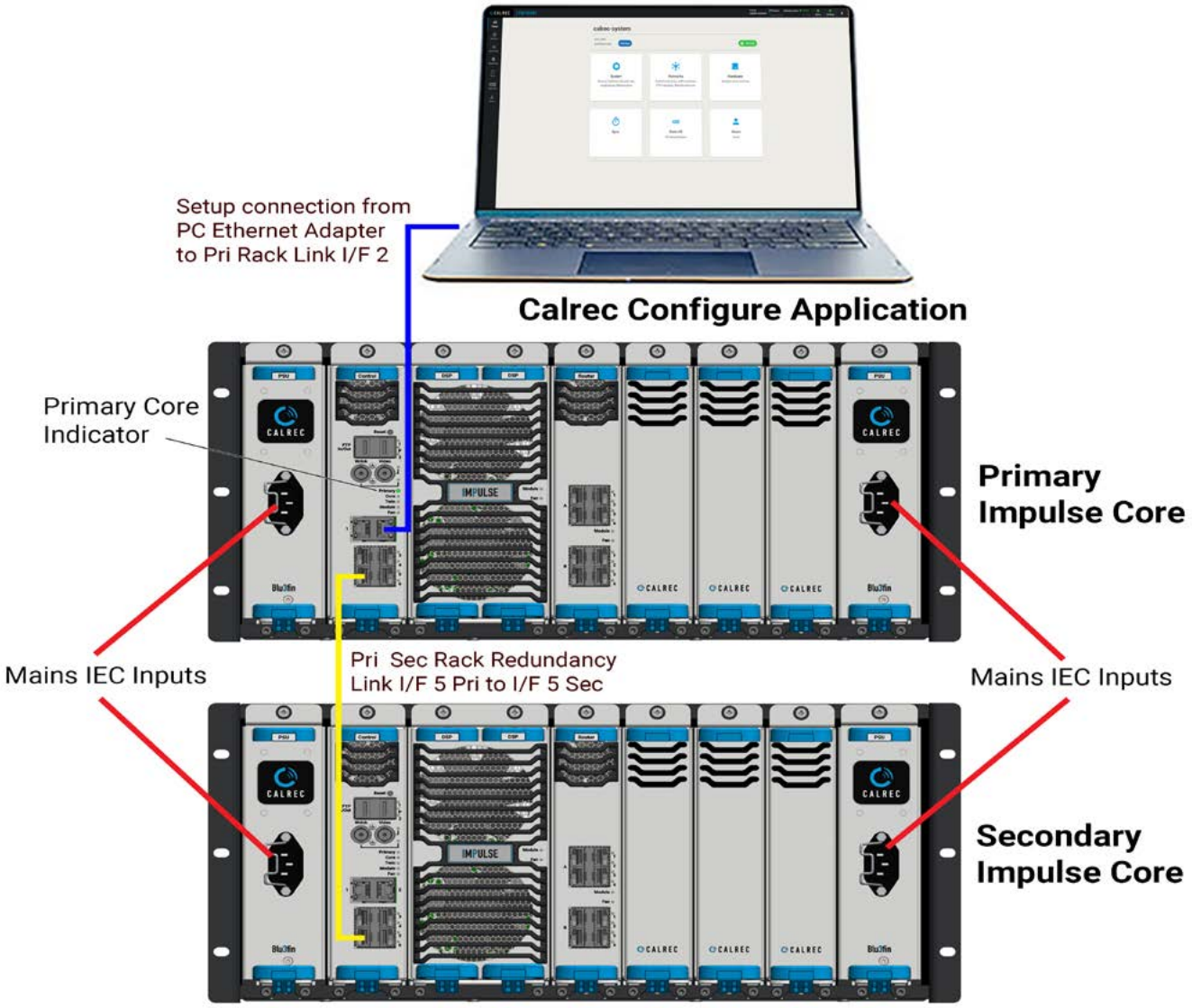
CHECKLIST

- ☐ **1. Power up the Impulse cores & connect a PC**
- ☐ **2. Access the basic core configuration**
- ☐ **3. Configure the Surface IP connections**
- ☐ **4. Connect the Surface to the Impulse cores**
- ☐ **5. Power up the Surface & Create a new show**
- ☐ **6. Configure Network Switches**
- ☐ **7. Access Configure, Connect, Software Updater & Assist***
- ☐ **8. Update the Core Software to the latest version (optional)**
- ☐ **9. Configure AoIP Router & AoIP Device IP addresses**
- ☐ **10. Connect Audio Switches & AoIP Devices to the Core**
- ☐ **11. Understand Synchronisation**
- ☐ **12. Examine an example system (Surface+Cores+Devices)**
- ☐ **13. Navigate the Console & Perform System Tests**

If the Checklist is completed then the Argo system is now ready for use

1. POWER UP THE IMPULSE CORES & CONNECT A PC

POWER CONNECTION TO CORE(S) AND PC CONNECTION TO PRIMARY CORE SETUP PORT



1. Carefully remove the Impulse core(s) and cable(s) from their packaging. If there are any signs of damage, please contact Calrec Customer Support and do not continue.

2. In a redundant system, two Impulse cores are used to provide redundancy, one core being the Primary, the other being the Secondary. These will be identified with labels and when powered the Primary core, will identify itself by lighting its Primary Core Indicator LED Green, which is located on the front of the Control Module as shown above.

3. To power the core(s), connect the power cable to both PSU inlets on the front of each core and power it on. The Primary core will boot up with the **Primary** LED lit and shortly afterwards the **Core** status LED on each core will flash Green, to show that the system is running. The **Module** and **Fan** OK LEDs should both be lit Green when running.

4. Configure the Ethernet adapter in the PC with an unused IP address such as **172.16.255.99** and Subnet mask **255.255.255.0**
Note: Please refer to the PC's operating instructions, if unsure how to configure its ethernet adapter.

5. Connect the Ethernet adapter to the Setup port on the front of the Primary Impulse Core which by default is the RJ45 connector, I/F '**2**' on the lower front of the Control Module in the Impulse Core.

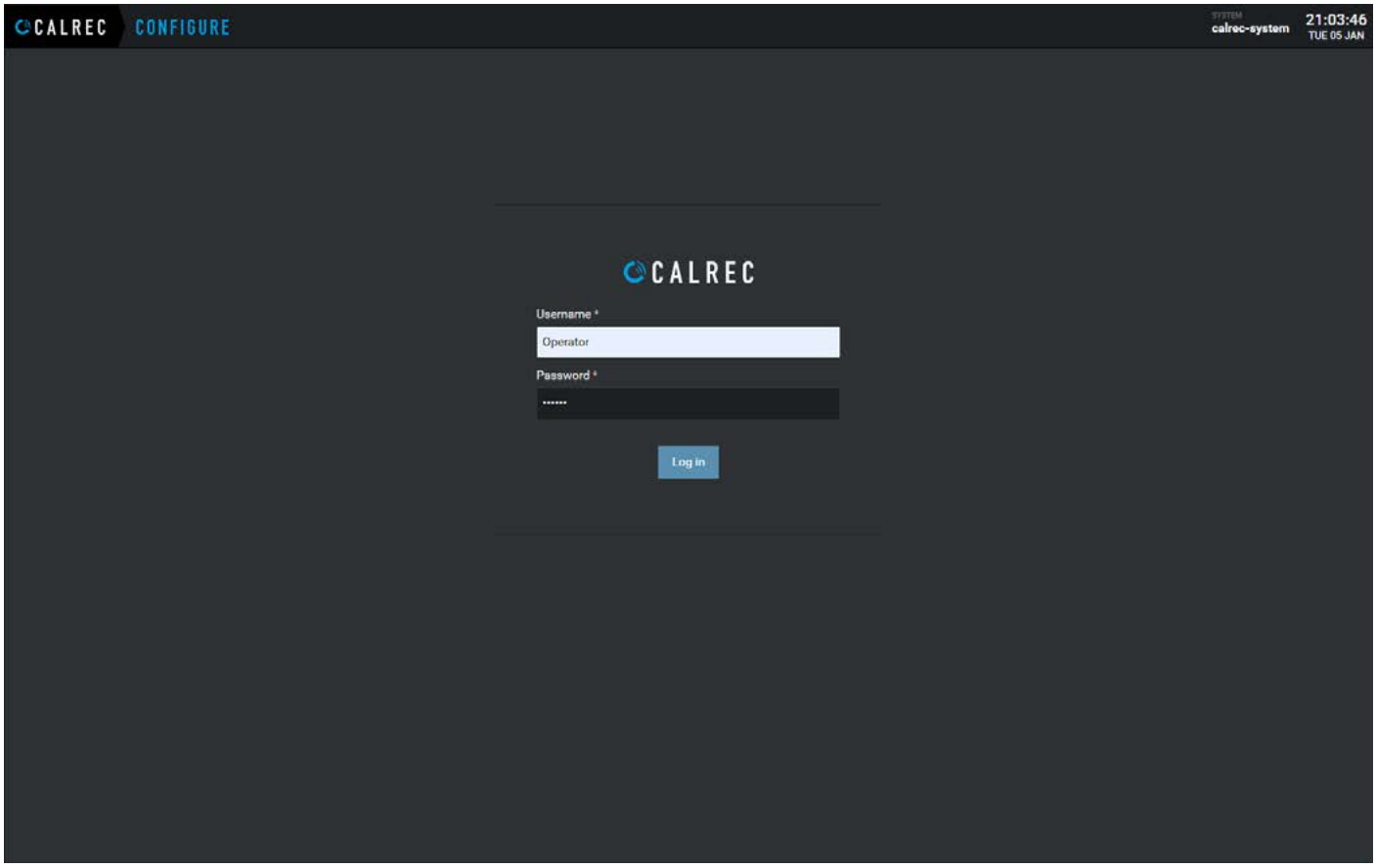
6. For Redundancy, connect the Impulse cores together, here they are directly linked via a RJ45 Ethernet cable & 2 x SFP interfaces between the two I/F '**5**' SFP connections on the lower front of the Control Module on the Primary and Secondary cores.

2. ACCESS THE BASIC CORE CONFIGURATION

Calrec Configure Login Instructions

From version 1.4 of the Impulse applications and version 2.0 of the Type R applications, security passwords have been put in place, there are currently two fixed Roles/Accounts available, the normal Operator account and an Engineer account which provides technician access to extra configuration functionality. For the Operator account, the Username should be entered as **'Operator**' with the Password **'calrec**'. Note: both the Username and Password are case sensitive.

CORE CONFIGURE LOGIN PAGE



1. To Log in to Configure, open your Web browser e.g. Chrome and browse to the address of the LAN port you are connected to e.g. the Setup port on the core of the unit which by default is **172.16.255.19** this will open up the Configure Login page shown above.

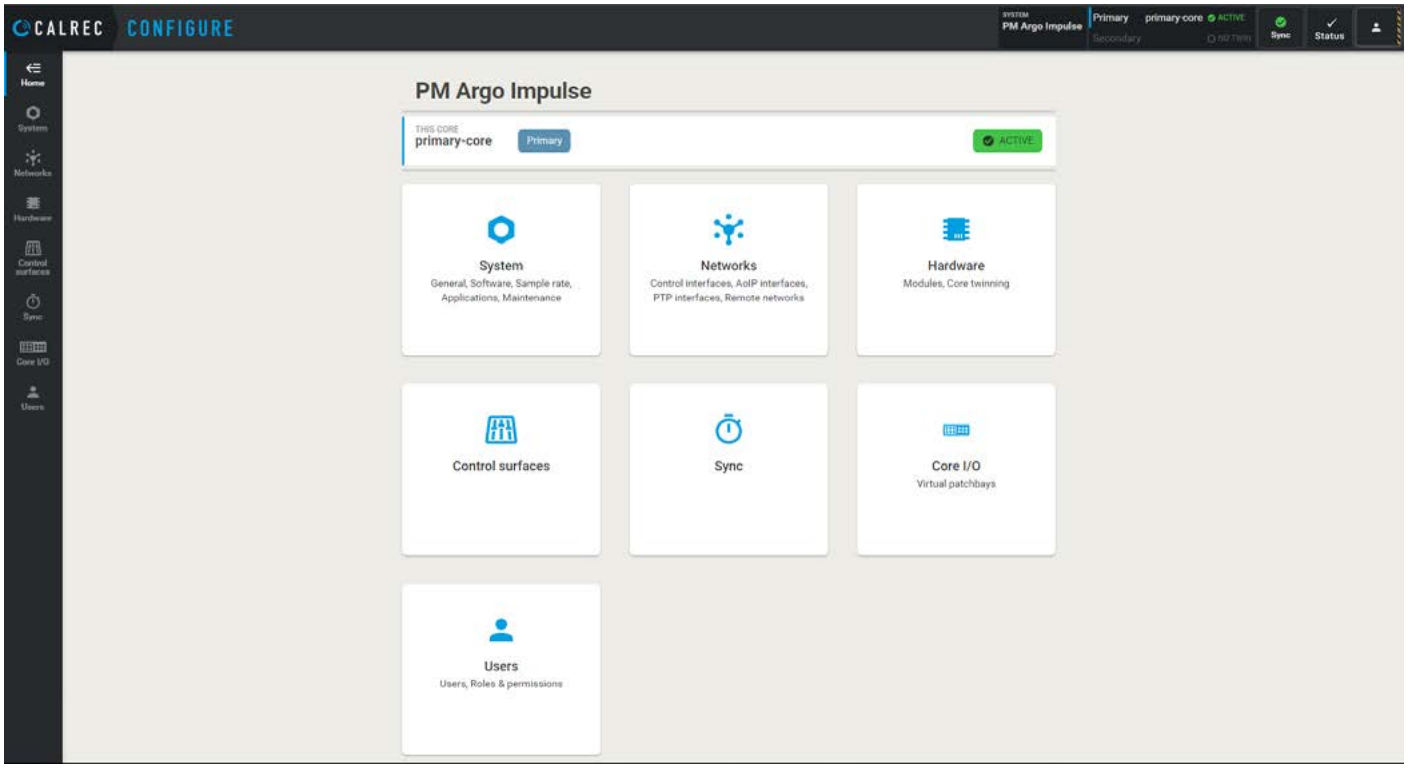
2. In order to access the Configure Application, the user will need to enter the Username and Password, the user then taps on the 'Log in' button and the Configure application then accesses the **Home** menu as shown at the top of the next page

3. Click on **System.** The System>General Configuration page will be displayed, as shown at the bottom of the next page.

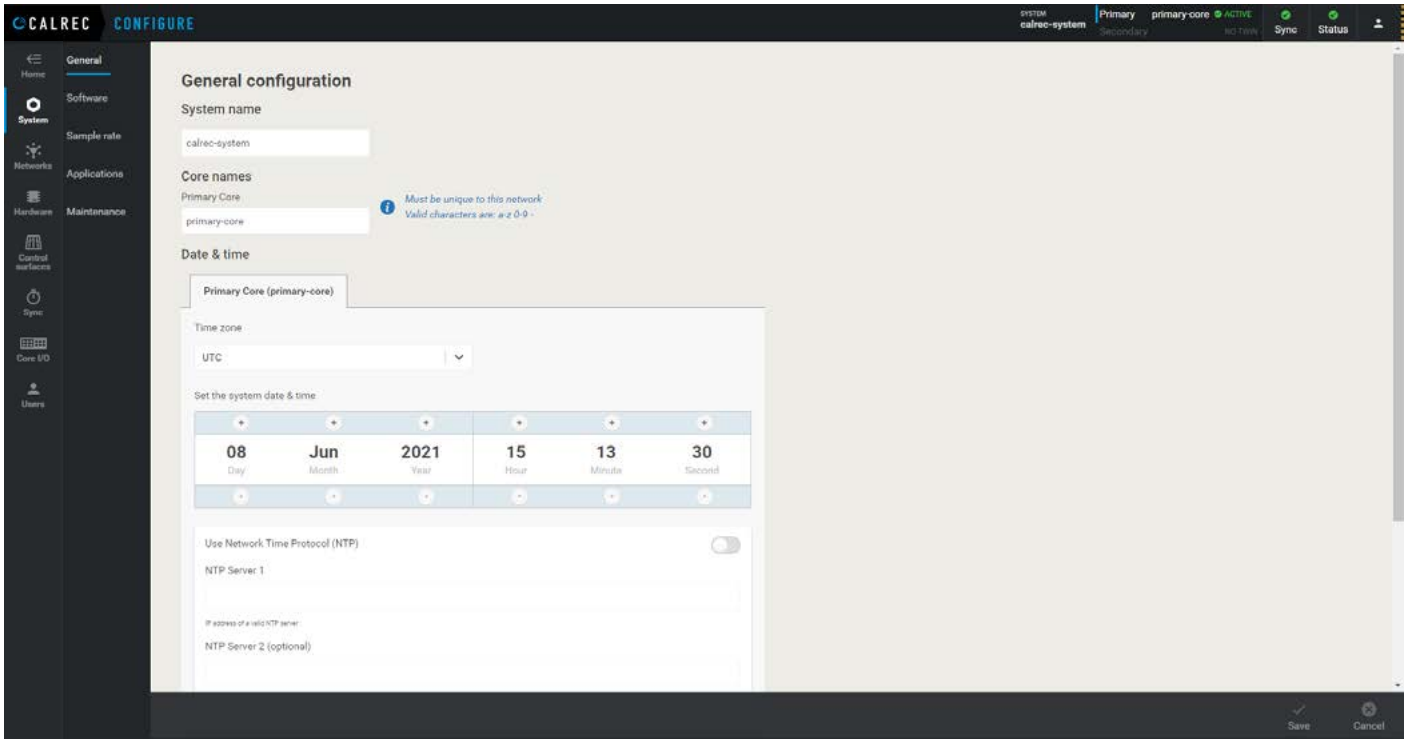
4. Set the system date & time.

5. You may also set new System and Core names here. These names will be used by the system to identify and announce cores, as well as in system status messages, so it is important for all the cores you own to be given unique names.

CONFIGURE>HOME PAGE



CONFIGURE>GENERAL CONFIGURATION PAGE



3. CONFIGURE THE SURFACE IP CONNECTIONS

Control Interface Routing Screens
The screen shown above right is accessed from the **Networks>Control interfaces** page of the '**Configure**' application. This allows the user to display and configure all the Impulse system software applications and map their virtual adapters on a routing matrix, to the six core Network Interfaces at the bottom of the UN6426 Control Processor Module labelled '**1-6**'.

The page is arranged in collapsible accordion-style folders, a folding list of virtual adapters is shown down the left side of the screen. Clicking on the '+' key on the Virtual Adapters header will open all the application containers and clicking on each application container, will reveal sub-containers holding the virtual adapters as shown below right.

Along the top are shown the network interfaces. Users can click/tap cells in the matrix grid to route an application's virtual network adapter(s) to the physical interfaces.

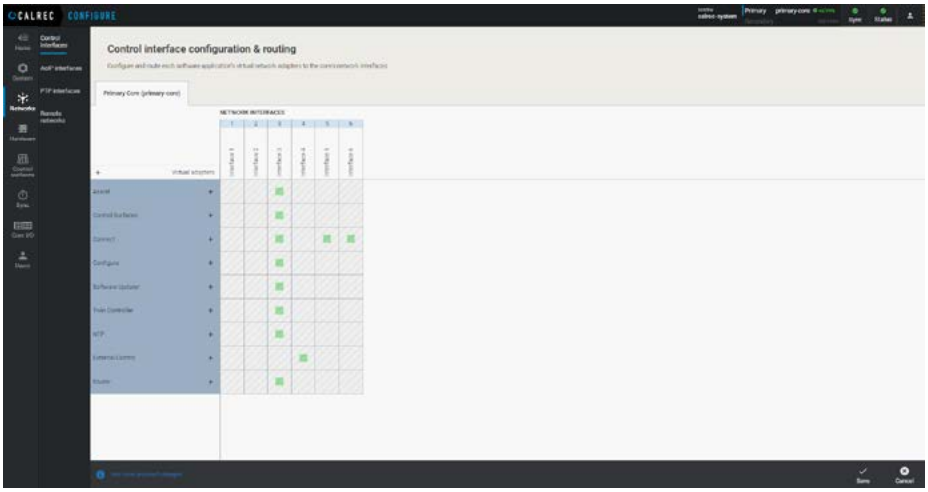
When first routed, the selected cell in the matrix will be highlighted to indicate that the route is pending. When applied by pressing the Save button in the footer, the routes in the matrix will be highlighted green with an appropriate icon.

To un-route, users can click on the now routed icon again and apply/save the change.

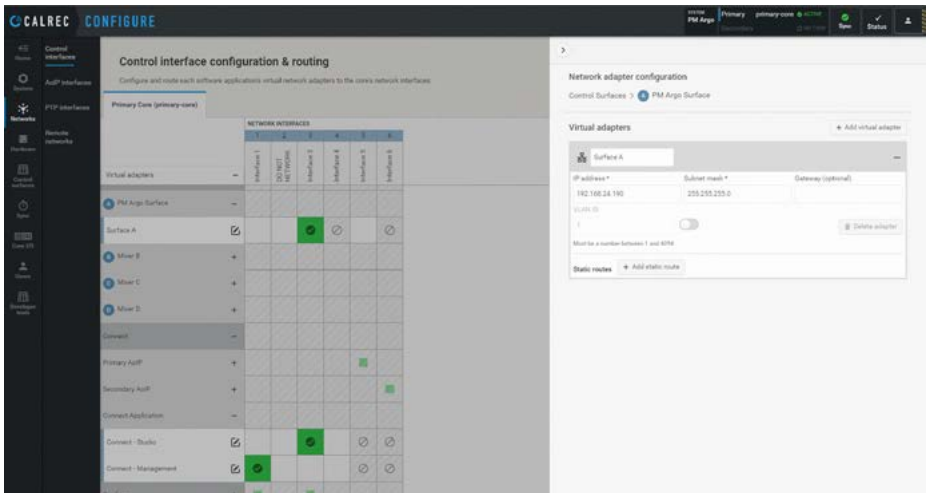
The rows to the right of the collapsible folders in the first column (not to the right of the virtual adapters), indicate routes that exist within the folder, both when collapsed and when opened.

Users can click on any of the configured virtual adapters or physical network interface representations in the user interface, to open a configuration panel that provides context-specific controls.

NETWORKS>CONTROL INTERFACES - OVERVIEW



NETWORKS>CONTROL INTERFACES - ROUTE/EDIT VIRTUAL ADAPTERS



Configure the Surface A Route
The Control interface screen shown, has accessed the **Control Surfaces> PM Argo Surface>Surface A** application container and routed it to Interface 3 which is the physical connection SFP port **3** on the front of the Core by the process just described.
This is the external connection from the core to the Console Surface switches that were made in the previous step.
It is worth noting that the Console Surface IP address is set to **192.168.24.190** with a subnet mask of **255.255.0.0** as shown, by interrogating the 'Surface A' network adapter configuration shown above.

These settings can be edited, but this address base is used to reference the addresses of the surface ethernet switches that access each section processor on the same subnet and subsequently access that section processors control panels within the surface to setup the operation of the Argo Control Surfaces.

The Console Surface secondary IP address in this example is set to **192.168.25.190** with a subnet mask of **255.255.0.0** as shown, by interrogating the 'Surface A' network adapter on the secondary core's configure.

4. CONNECT THE SURFACE TO THE IMPULSE CORES

Surface Ethernet Switches
The surface Ethernet switches are the interfaces between the control surface via the section processors and the Impulse processing cores. To provide redundancy, two surface Ethernet switches are fitted, primary and secondary. The system will always attempt to boot and run on the primary, however if there is a problem with the primary or its connections, the secondary will automatically take over.

Like the section processors, the primary and secondary surface Ethernet switches are housed in a ventilated enclosure under the upper surface at the rear of the console in any two of the console sections. In the image below they are shown in section 1 and section 3, when viewed from the rear, the primary surface Ethernet switch is usually placed in the left hand section.

The communication with all the control panels and displays is via each section processor. Each section processor is connected to the primary and secondary surface Ethernet switches using the primary and secondary GB Ethernet ports on each section processor.

The primary surface Ethernet switch typically has 10 ports and each of the sections connect to a port. In the example below ports 1-3 are connected leaving ports 4-8 available for connections to sections 4-8 depending on the size of the surface. Port 9 is used as the IP link from the primary surface Ethernet switch to the primary Impulse core on SFP Port 3 of the control processor module. See the **blue** connections in the image below.

This is repeated using the section processor's secondary ports to the secondary surface Ethernet switch and on to the secondary Impulse Core on SFP Port 3 of the control processor module. See the **red** connections in the image below.

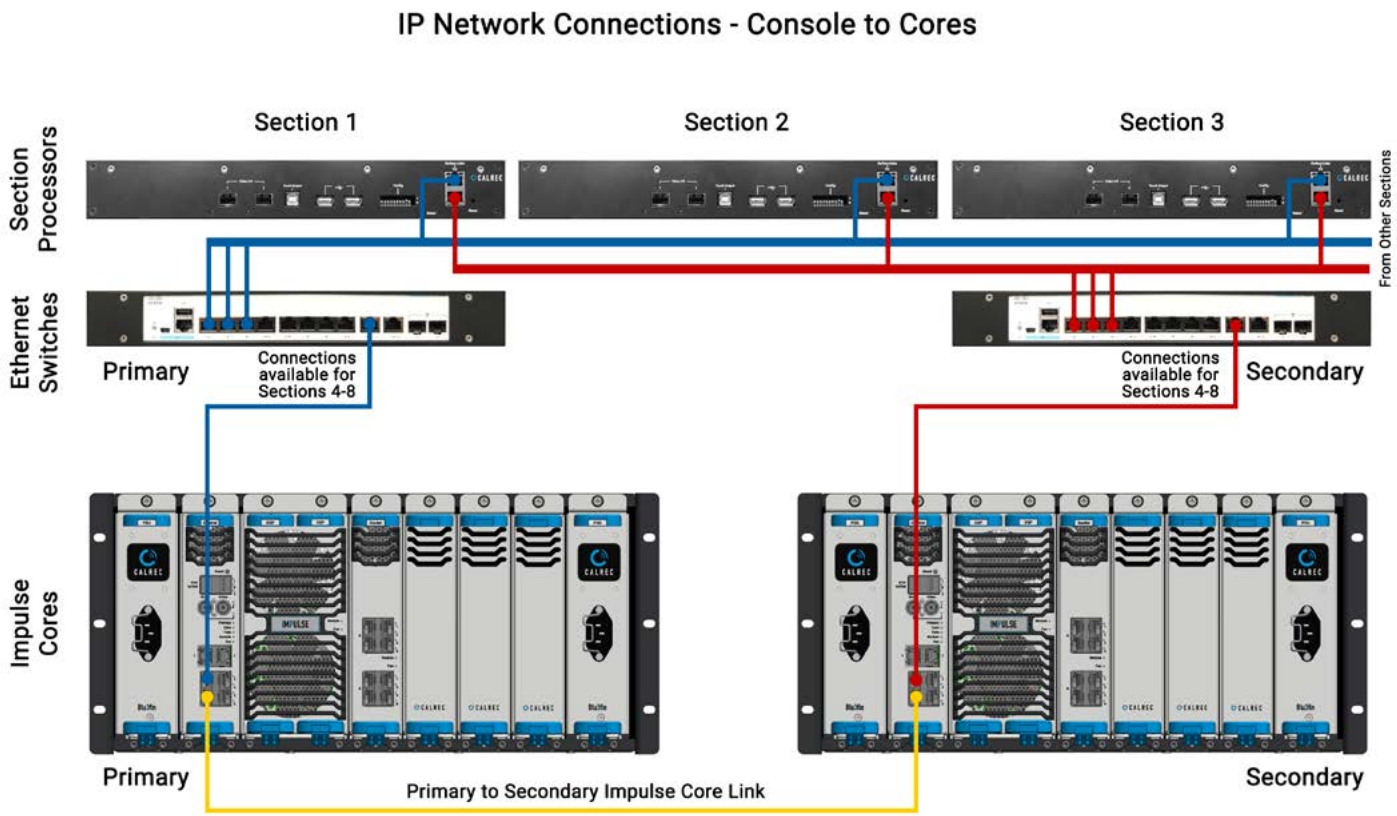
Note: the 2 Impulse cores are directly connected between both control processor modules on SFP port 5's, for IP network redundancy. See the yellow connection in the image below.

Note: if there is a requirement to add other console sections to this surface in the form of a Sidecar where say a separate console on wheels is brought into the studio, then the connections from the Ethernet switches in the sidecar or if no switches the connections directly from the section processors can be added to the Primary and Secondary Ethernet switches rather than routing the cables back to the Impulse cores separately. The sidecar may not even be in the same room as due to the nature of the IP Network the physical location of the surfaces are not a factor.

The routing of the core connections to their applications is made using the Configure application see **"3. Configure the Surface IP Connections" on page 10**

Note: the rest of the internal console connections are exactly the same as defined in the Argo Installation Manual and are generally pre-configured as per the works order.

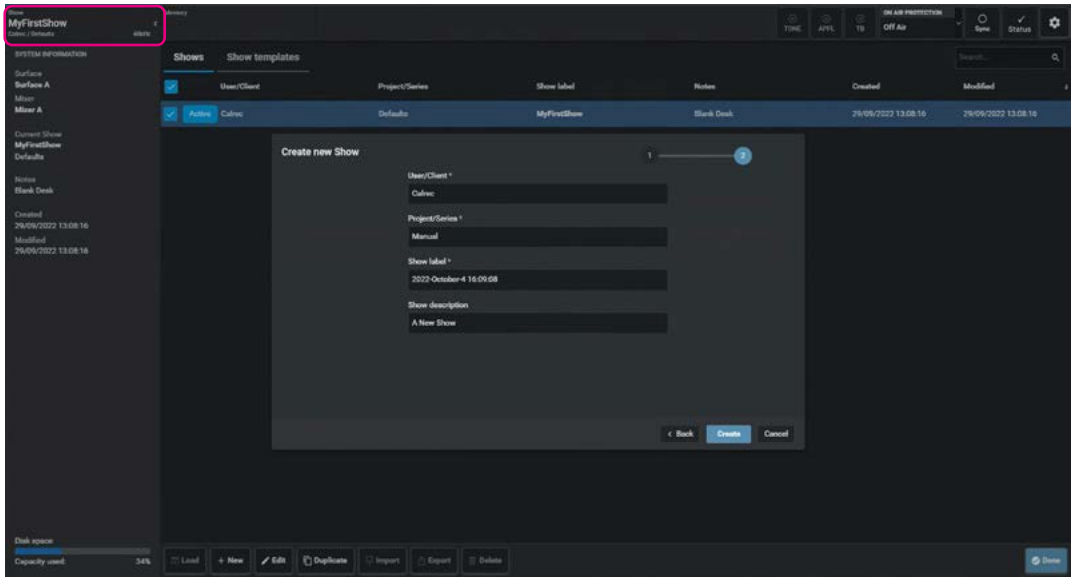
ARGO SURFACE SECTION CONNECTIONS TO IMPULSE CORES VIA BUILT IN ETHERNET SWITCHES



5. POWER UP THE SURFACE & CREATE A NEW SHOW

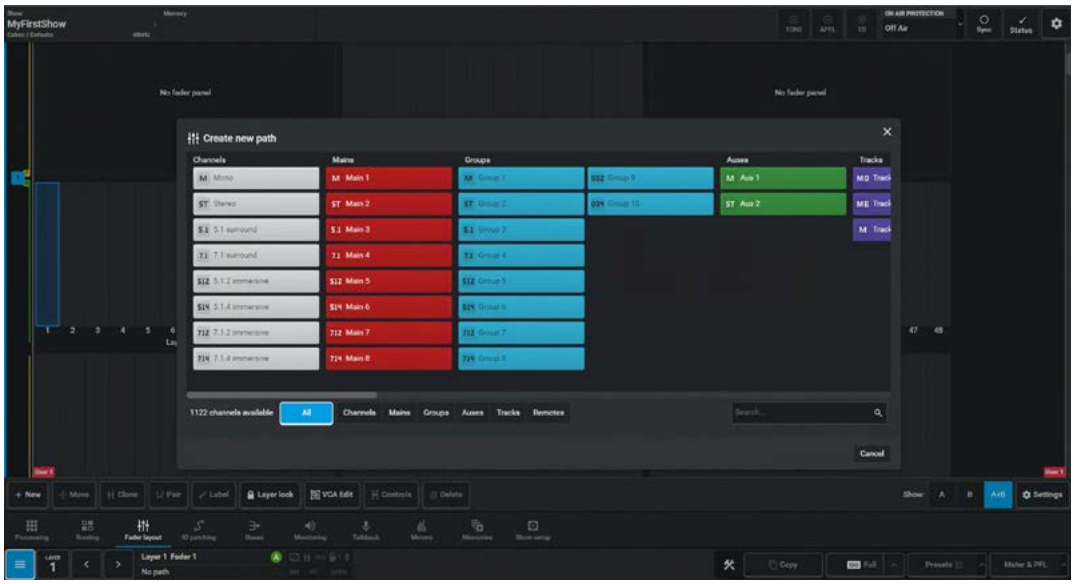
Once the connections between the Impulse core and the Argo S or Argo Q console are made and the surface IP connections routed to the surface application container in the core, the surface can be powered up. It is recommended that the Impulse cores are then restarted. On restart, the console will boot up with the last loaded show To ensure you are starting from a clean setup, before beginning configuration it is a good idea to create a new show**.** Shows contain default settings for the console, including monitor patching, GPI patching & port labelling. Shows also contain multiple user memories which save normal I/O patching, fader assignment and path parameter settings. To create a new show, go to the **Show** area highlighted (top left of the page shown below) and tap on it. This opens the Shows page and at the bottom is a '**+New**' button which when pressed allows the user to create a new show. Choose the Calrec Default as the starting template, enter the details as prompted and click '**Create**' to load the new, clean show onto the console. See the image below . The same page allows changes to the show to be saved, as well as other shows to be loaded & saved, please refer to '**Argo Operator Manual (926-313).pdf.**

SHOWS>NEW SHOW



The image shown below is accessed from the **Fader Layout** page which can be used to place Audio paths on to faders. Here the user has selected a fader position (Layer 1-Fader 1A) and is about to add their first new path. As can be seen from the New Path dialogue box there are 1122 mono channels available. The user may then begin to configure the mixer with DSP paths, routing etc, however we would recommend that the user completes the setup first. See "13. Navigate the Console & Perform System Tests" on page 34 for further information on Console operation and/or please refer to the **Argo Operator Manual (926-313).pdf.**

FADER LAYOUT>NEW CHANNEL



The DSP pack used here has **1122 channels.** Your Impulse system's DSP Pack will be pre-installed to order**.** The Impulse Core has a number of DSP Pack sizes available, which can be installed in the DSP Module and each pack size can be used in conjunction with any Argo S or Argo Q surface. The DSP Pack options available are shown in a detailed comparison table at the end of this guide. See:- **"DSP Pack Comparison" on page 38**

6. CONFIGURE NETWORK SWITCHES & DEVICES

Impulse and Type R based IP systems use 2 types of COTS switches. The first usage is to provide various VPNs for interfacing applications via IP, the second is to provide AoIP/AES67 audio streams. Calrec currently recommends and can provide the following network switches & devices. *Note: Other network devices will be added to this list, contact Calrec for further details.*

- 491-268: Sonifex AVN-GMCS Grand Master clock. (used for AoIP Synchronisation).
- 491-265: Cisco SG350-10MP 10 port PoE+ switch. (used for Type R Control Panel Interfacing).
- 491-267: Cisco SG350-10 10 port Non PoE switch (used for general interfacing over shared connections).
- 491-270: Artel 1G Quarra PTP Switch. (used for AoIP interfacing with the Core).
- 491-269: Trendnet TPE-115GI - Gigabit PoE+ Injector.(used to add PoE to an ethernet connection).
- 491-329: Cisco CBS350-8T-E-2G switch (used for Argo section processor connections)

If your system was provided with any of these devices, carefully remove each device from its packaging now. If there are any signs of damage, please contact Calrec Customer Support and do not continue to use the damaged parts.

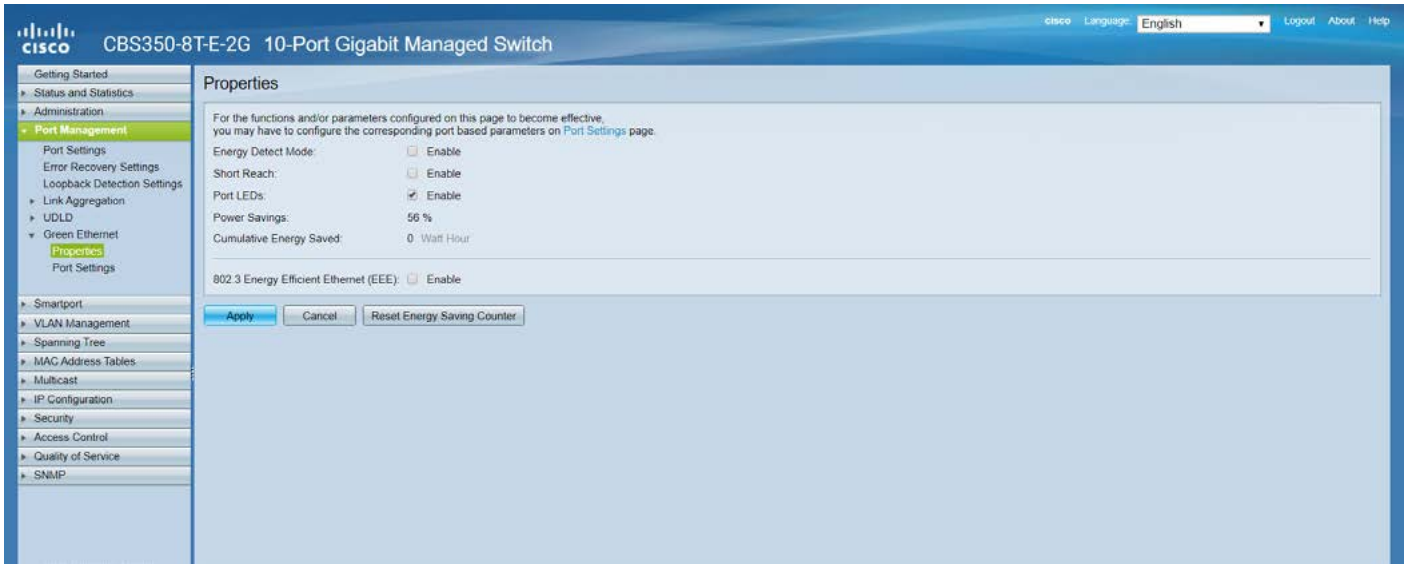
Important: Some of the above devices may require pre-configuration before installation. Please refer to the guidance for each device, you have purchased which is available at http://ftp.calrec.com, and access the information in the Type R area of the site using Account: **TypeR** & Password: **tYoarEdQ** before you continue. These switches are small scale devices, general used on Type R or small Impulse systems, other larger switches, particularly for use with large AoIP systems will be included as they are introduced.

Cisco Switch Management Settings for multiple connections

Argo S & Argo Q uses switches such as the Cisco CBS350-8T-E-2G switch, as each section processor is connected into it and then uplinked back to the Impulse Core. The switch needs to have its 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. Typically the interface ports may be shared to provide Studio or Management Subnets as described later.

The Cisco switch's default IP address is **192.168.1.254** and typing this into the address bar of the browser, takes the user to the switches Log in screen. The default Username is "**cisco**" and the default password is "**cisco**", clicking on the 'Log in' button gives access to the switch's administration page as shown below:-

CISCO SWITCH GREEN ETHERNET PROPERTIES PAGE



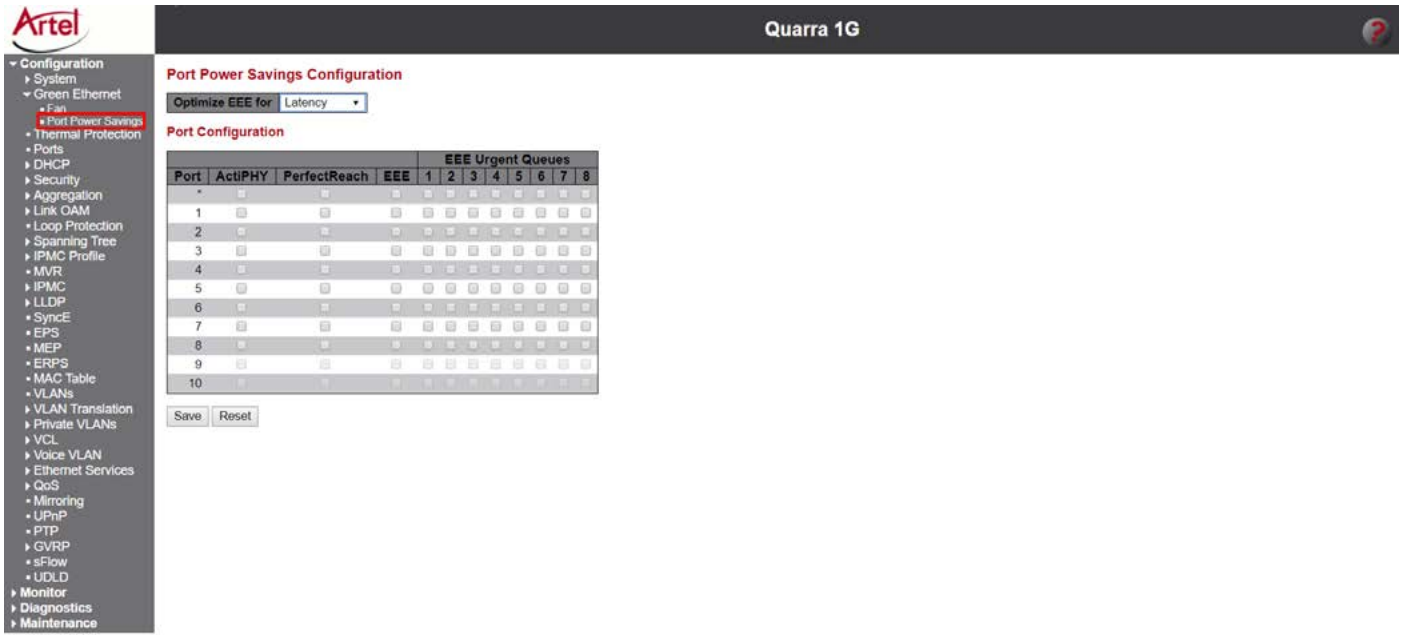
At this point, deselect the Energy Detect Mode, Short Reach and 802.3 Energy Efficient Ethernet tick boxes on the **Properties** page of the switch as shown, and apply the changes.

Note: the Argo S and Argo Q surface switches do not require POE for the console surface.

Artel Switch Management Settings for AoIP / AES67 Networks
The Artel switch is used for AoIP/AES67 Interfacing and needs to have its Port Power Savings Configuration Properties disabled, this is carried out in the **Configuration>Green Ethernet>Port Power Savings** page of the switch.

The Artel switch's default IP address is **192.168.100.100** typing this into the address bar of the browser accesses the Log in screen. The default Username is "**admin**" and there is no default Password, clicking on the 'Sign in' button gives access to the switch's configuration pages. A new Artel switch has its power saving feature disabled by default, but it's worth checking to ensure this is the case, if it isn't then proceed as shown below:-

ARTEL QUARRA SWITCH GREEN ETHERNET PROPERTIES PAGE



Deselect all the tick boxes as shown above on the **Port Power Savings** page of the switch and click on 'Save' to apply the changes. Then go to **Maintenance > Configuration > Save start-up-config** and click **Save Configuration**. This will save the currently running settings that you have just configured as the switch's startup configuration, so that it loads whenever it is turned on or rebooted.

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) then please refer to the Cisco Auto Configuration guides or Cisco Manual Configuration guides.

There are 3 basic requirements for AES67 based switch operation: - 1. Enabling IGMP Snooping & Querier V2 ,
2. Setting up the DSCP Trust mode and 3. Setting higher DSCP to Queue priorities for PTP clocks EF(46) & Audio AF41 (34) data.
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

* In order 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 on the Calrec FTP site at http://ftp.calrec.com as described earlier and access the information in the Type R area of the site using Account: **TypeR** & Password: **tYoarEdQ**

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

7. ACCESS CONFIGURE, CONNECT, SOFTWARE UPDATER & ASSIST

The Impulse System operates by using a number of application containers to manage the various subsystems, there are 3 or 4 main applications that are used to provide the user with a graphical user interface via web based browsers, these are :-

Configure application:- this defines how Impulse system core(s) can be configured and partitioned into different mixing surfaces with varying amounts of DSP processing channels available in different 'Pack' sizes.

Connect application:- this defines how the Impulse Core IP Inputs and Outputs are connected to AoIP device interfaces and how the AoIP streams are managed.

Software Updater application:- this application is used to update all the various software/firmware applications in the system, including:- Configure, Connect, Software Updater, Twin Controller (redundant links), NTP time protocol management, External Control for interfacing to Remote production and 3rd party controllers, AoIP Routers & Devices, PTP Synchronisation, DSP processing, MCS, and Assist.

Assist application:- this defines how a pre-configured Impulse system may be setup and controlled, it includes creating/managing shows, setting up shows in terms of configuring paths, displaying and controlling the fader surface, saving and loading memories 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 settings sections provide configuration tools for both show and system configuration.

Note:- These applications may be accessed via the front-facing Setup port currently set to Interface port 2 on the front of the Control Processor on the Impulse cores, by navigating to the various applications shown in the IP Addresses access table below.

However the Setup port is not usually connected to a local area network (LAN) and in a studio install scenario, may not therefore be readily accessible to an operator or engineer's PC. It is therefore recommended that these applications should be connected via either a "**Management**" or a "**Studio A**" subnet. The "**Management**" subnet resides in the **172.29/16** address space and provides access to all applications and services running on the core. The "**Studio A**" subnet resides in the **172.17/16** address space and provides access to the Configure & Connect applications, as well as the console control service.

Note:- Impulse is designed to support a Touch Interface if the PC provides this.
To use either subnet configure the PC's ethernet adaptor as follows:-

- **Management - IP address 172.29.1.99, subnet mask 255.255.0.0**
- **Studio A - IP address 172.17.1.99, subnet mask 255.255.0.0**

Note:- The IP addresses for Applications to be made accessible to the Management and Studio subnets can be setup/modified via Configure in the Networks>Control Interfaces page.

To access the **Configure, Connect, Software Updater & Assist** applications from the various connection points in the system, type the corresponding IP address shown in the table below into the Google Chrome address bar address bar. From version 1.4 of the Impulse applications and version 2.0 of the Type R applications, security passwords have been put in place for Configure, Connect and Assist, there are currently two fixed Roles/Accounts available, the normal Operator account and an Engineer account which provides technician access to extra configuration functionality. For the Operator account, the Username should be entered as **'Operator**' with the Password **'calrec**'. Note: both the Username and Password are case sensitive.

IP ADDRESSES FOR ACCESS TO CONFIGURE, CONNECT, SOFTWARE UPDATER & ASSIST USER INTERFACES

Application	Setup Port (front of core port 2)	Management subnet (front of core port selectable from Configure)	Studio A subnet (front of core port is selectable from Configure)
Configure	172.16.255.19	172.29.1.23	**172.17.1.23**
Connect	172.16.255.60	172.29.1.21	**172.17.1.21**
Software Updater	172.16.255.40	172.29.1.22	**172.17.1.22**
Assist	172.16.255.25	172.29.1.1	**172.17.1.1**

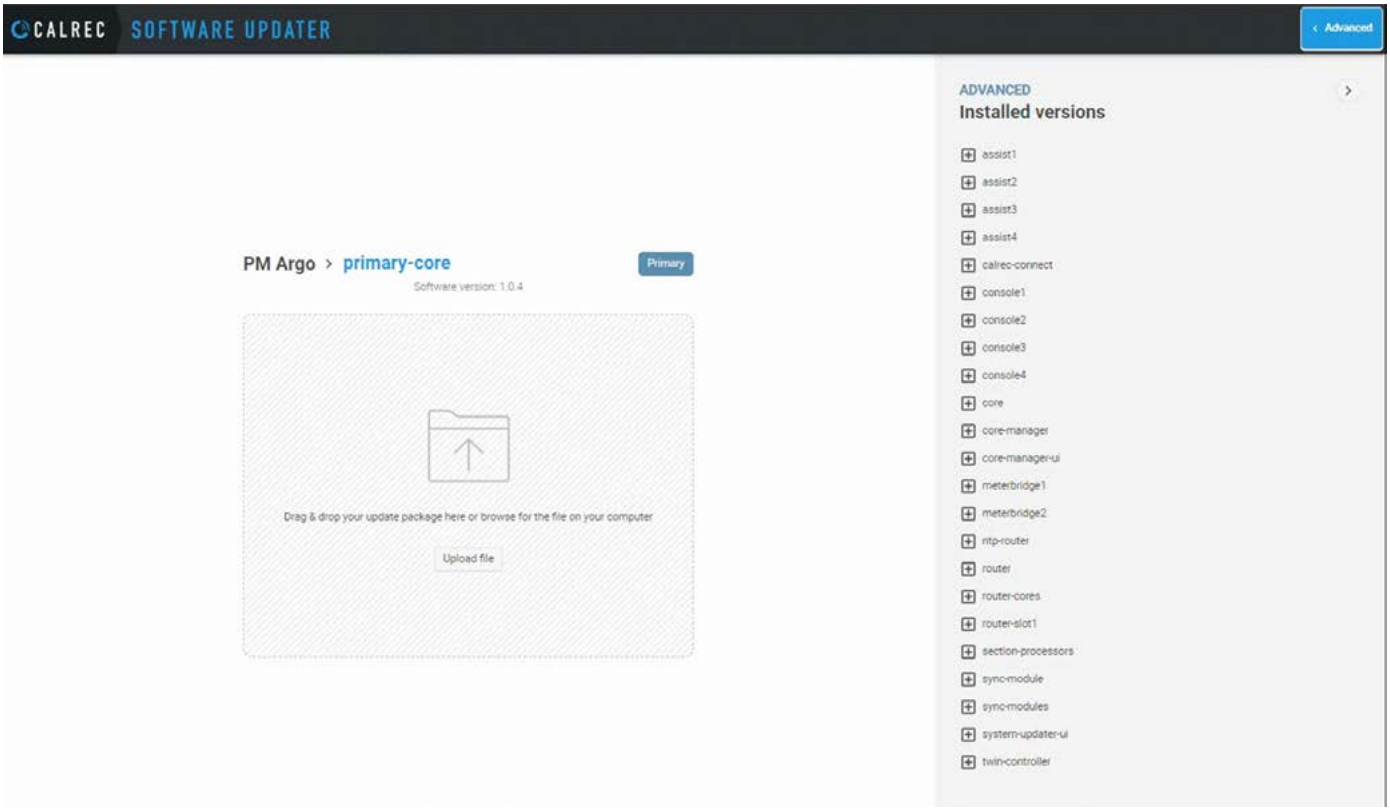
8. UPDATE THE CORE SOFTWARE TO THE LATEST VERSION (OPTIONAL)

A newer software version for the Impulse core may have been released since the Impulse system left Calrec.
To check the version installed on the system, follow these steps:

1. Open Google Chrome on the connected PC, type **172.29.1.22** into the address bar and press enter to navigate to the **Software Updater** landing page as shown below.
   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 and core names and above the file upload area.

SOFTWARE UPDATER DISPLAYING INSTALLED SOFTWARE VERSION



Software release packages will be made available on the Calrec FTP server and are displayed with the release version number.
In each package folder there are folders for Base Images, Recovery Images and the release package for the Core itself, which will have a **.calrec** extension e.g. **argo-release_1.0.4-b55.calrec** .

To install a newer software version:

1. Navigate to the **Software Updater** landing page once again.
2. Drag & drop the update package into the marked area within the browser or click **Upload file** to open a file explorer and browse for the file on the system. The updater will automatically upload and unpack the update package.
3. When the file upload is successful, click **Install** to begin the installation process.
4. The updater will automatically apply all the updates to the core.
5. When completed click **Reboot** to reboot the core.

Tip: to view more information, click on the **Advanced** button in the header at any time. This is arranged in collapsible accordion-style folders showing each areas version number. Clicking on the '+' key will open each drawer on the right side of the window to display additional detail, without interrupting the update process.

Note: AoIP devices are updated separately using the Connect Application Options-Update Software page.

9. CONFIGURE AOIP CORE ROUTER PORTS & AOIP I/O DEVICES

The next stage is to configure the AoIP Router Interfaces in the core and the AoIP Device Interfaces, so that they can be networked together to allow Audio streams to be passed between the Routers in the Core and the various AoIP I/O Devices, which provide Audio & GPIO resources. The first step is to setup the Router IP addresses in the core using the Configure application.

To do this, access the Configure Application by opening Google Chrome on the PC, type **172.29.1.23** into the address bar, press enter to navigate to the Login page, Login and go to the **'Configure**' landing page. Then go to Networks> AoIP Interfaces as shown below.

AoIP Core Router Interfaces
This page can either be accessed from the Networks Menu and appears as shown above right. Each Impulse core can accommodate up to 4 router modules and each module has 8 x 1 Gbps Ethernet ports which are arranged as 4 pairs to provide seamless packet switching redundancy.

Each port is capable of passing 512 channels of audio in each direction, however there are communications overheads including mic gain control and GPIO switching functions amongst others so Calrec suggests a practical limit of 256 bi-directional channels per router connection.

The page shown below right provides controls to view and configure the following for each of the router ports:-

IP address
Subnet mask
Gateway (optional)

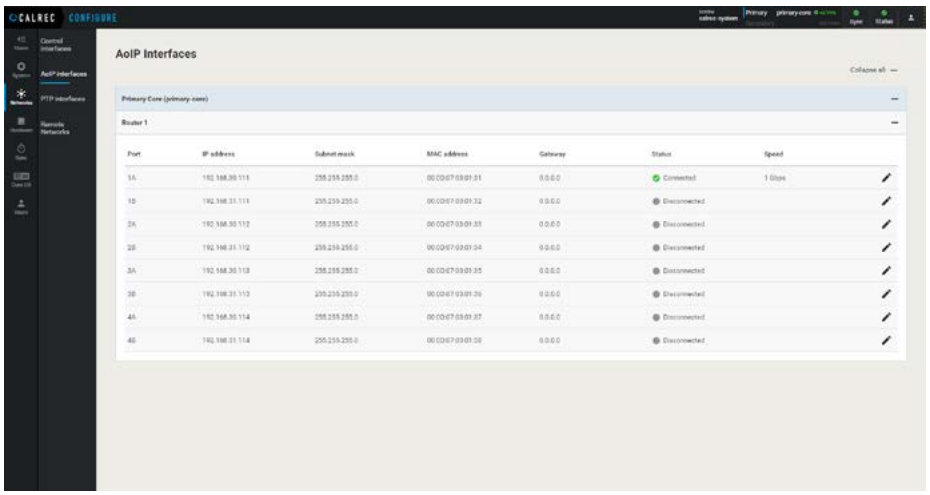
Note: the IP address and Subnet mask must be set with valid values. The Gateway is optional.

The current connectivity status of each port is displayed as either Connected or Disconnected. The images to the right show that just the 1A router port is currently connected, for seamless packet switching redundancy the 1B port should also be connected.

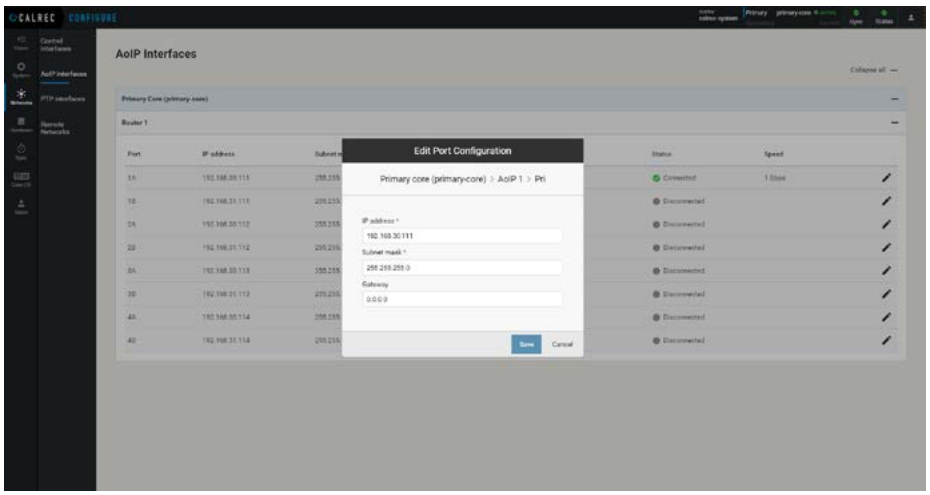
The MAC address of each port is also displayed (but is not editable). The speed of each port is displayed (in Gbps). For Impulse all ports operate at 1Gbps.

Users can edit these by clicking on the pencil icon for each port to open an 'Edit Port Configuration' dialogue box.

CONFIGURE>NETWORKS>AOIP CORE INTERFACES



CONFIGURE>NETWORKS>AOIP CORE INTERFACES-EDIT



Once the IP address, Subnet mask and optional Gateway has been edited, the user can click on the 'Save' button to update the port configuration and return to the AoIP interfaces page.

The page entries are designed to be 'folded-up' in order to show all the AoIP router interfaces that are be attached.

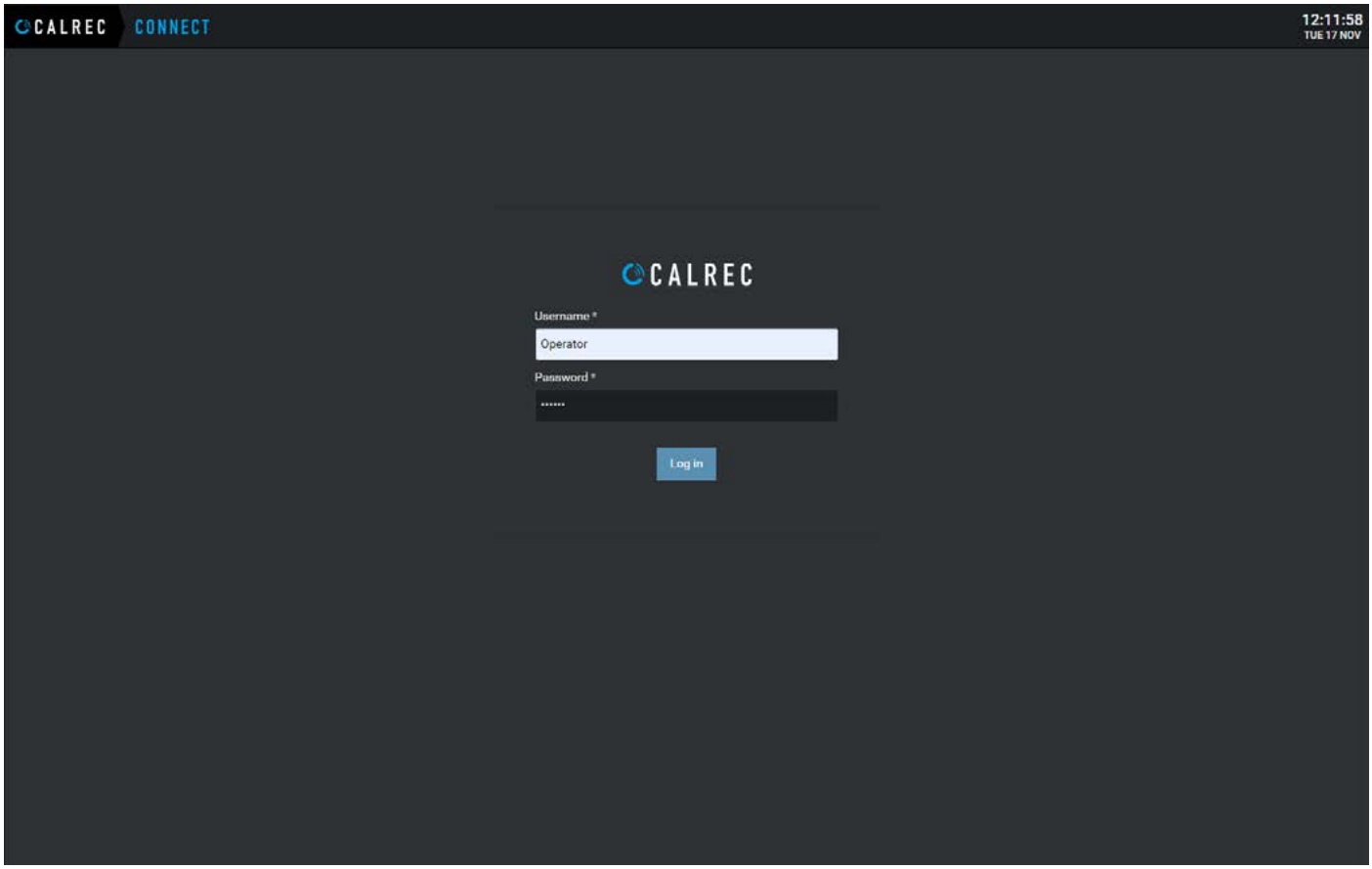
The tables at the end of this document offers suggested settings for the Primary and Secondary Router Interfaces of each of the Impulse Cores. See:-
"Primary Core - Router Interfaces - Suggested Settings" on page 41 &
"Secondary Core - Router Interfaces - Suggested Settings" on page 42

Also refer to the **Impulse Configure Application Guide (926-290).pdf** for further information.

Once the AoIP Routers are setup the next step is to setup the AoIP I/O Devices.
To do this, access the **Connect** Application as shown below:-

Calrec Connect Login Instructions
1. Open your Web browser e.g. Chrome and browse to the address of the LAN port you are connected to e.g **172.29.1.21**
This will launch Connect, which opens the Connect Login page shown below.

CALREC CONNECT LOGIN PAGE



2. In order to access the Connect Application, the user will need to enter the Username and Password, the user then taps on the 'Log in' button and the Connect application then accesses the **Devices** menu as shown at the top of the next page.

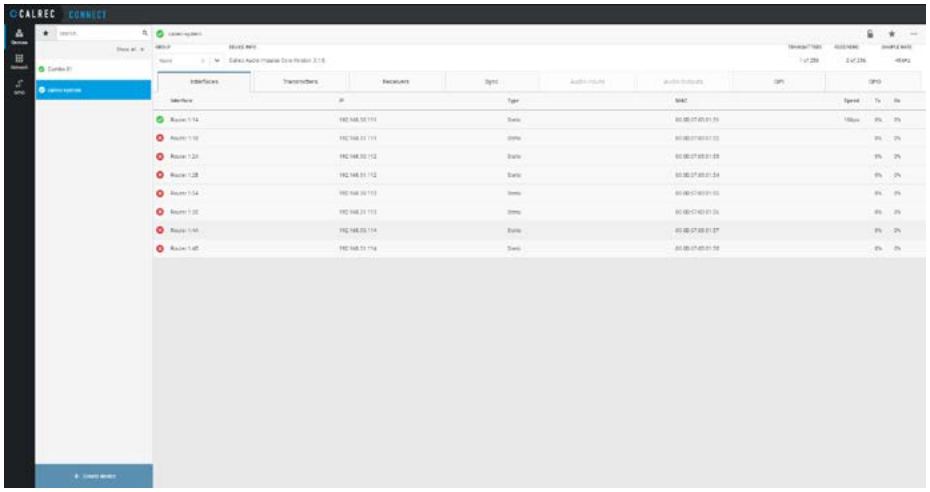
AoIP I/O Core and Device Interfaces
This page is accessed from the Devices Menu and appears as shown above right. Here we are showing two items:- '**calrec-system**' which is the chosen name for the Impulse core & '**Combo 31**', which is a Type R Combo AoIP device. The interface information for 'Combo 31' is shown middle right.

Each row on the interface sub-page table represents an AoIP interface connection, on a Type R AoIP device there is 1 set of AoIP interfaces having both a Primary and Secondary connection.
The columns in the table provide information about:-
- AoIP interface's status:- Green is active, Red is not active.
- AoIP interface name.
- AoIP interface IP address.
- Type of IP address, i.e. if the IP address type is static (manually configured) or DHCP (dynamically allocated).
- AoIP interface's MAC address.
- AoIP interface connection speed.
- AoIP interface TX use percentage.
- AoIP interface RX use percentage.

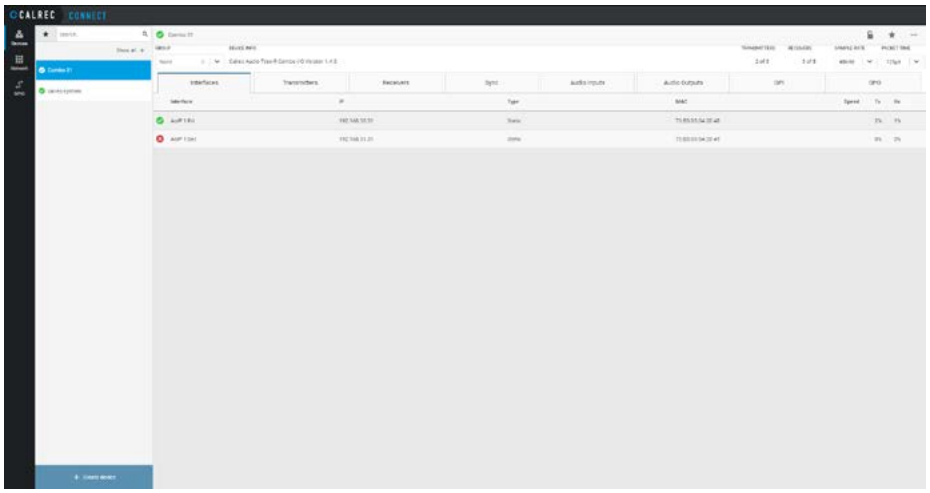
Configure IP Settings for IO Boxes
Clicking on any of the AoIP interface rows on the Core or AoIP devices, opens a dialogue box. The IP settings for the selected AoIP interface are shown below right for the AoIP 1: Pri interface for 'Combo 31'.

The user sets up the IP address by modifying the following 4 fields:-
Mode:- Type of IP address, i.e. if the IP address type is a static manually configured address or if it is a DHCP dynamically allocated address.
IP Address:- This example shows that the device & router are in the same subnet.
Subnet Mask:- Typically set to 255.255.255.0 or /24.
Gateway:- Optional.

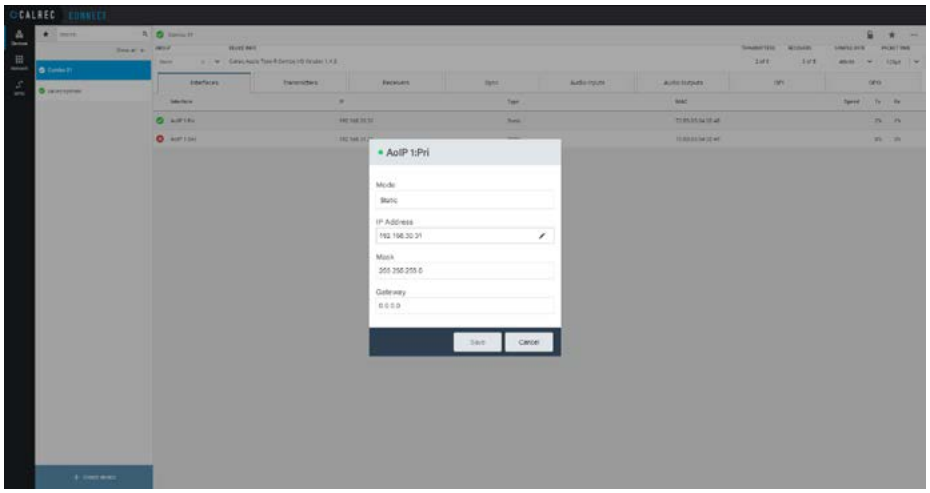
CONNECT>DEVICES>AOIP CORE INTERFACES



CONNECT>DEVICES >AOIP I/O DEVICE INTERFACES



CONNECT>DEVICES>AOIP I/O DEVICE INTERFACES-EDIT IP ADDRESS



Setup AoIP Core Transmitters and AoIP Device Receivers for Outputs configuration
Now the AoIP Core Router & AoIP Device interfaces are setup, the next step is to create transmitter and receiver streams for them using the '**Connect**' application.

AoIP Core Transmitters
The User configures AoIP transmitters in the core, the page shown above right is accessed from the Devices menu when the '**calrec-system**' device's 'Transmitters' tab is selected, it is used to add/remove and configure transmitters.

The number of available transmitters shown here for the Impulse Core is 256, this is based on one router connected having 4 AoIP interface Pri/Sec sets on each router, each of which carries 256 channels i.e. a total of 2048 channels with each stream carrying 8 channels, thus providing 2048/8=256 available transmitters.

Each row on the transmitters sub-page table represents a transmitter.

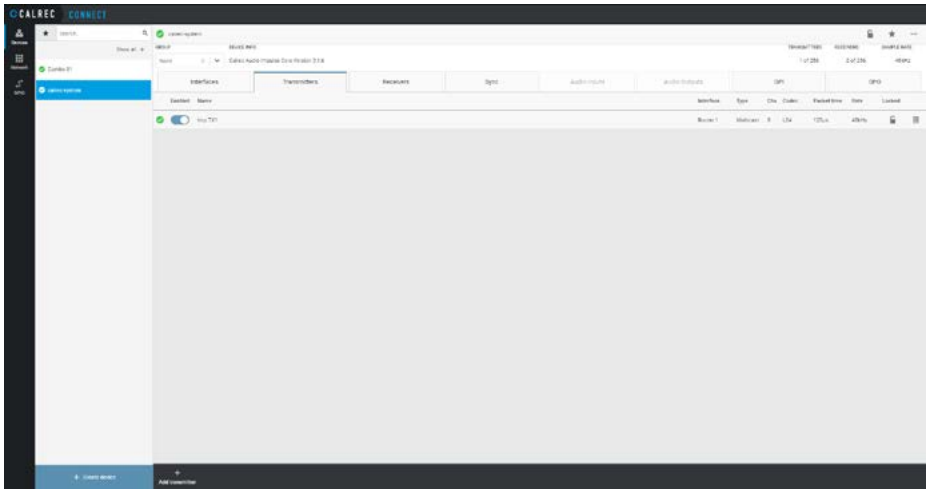
The columns in the table provide the following information about:-
- Transmitter name e.g. Imp TX1.
- Transmitter interface e.g. AoIP 1:Pri.
- Type of transmitter, normally defined as a Multicast one to many type rather that a Unicast one to one type.
- Number of channels in each transmitter e.g. 8.
- Codec used e.g. L24.
- Packet time e.g. 125us.
-Sample Rate e.g. 48000Hz.

Transmitter Settings - Core
When the user selects one of the available transmitters or clicks on 'Add Transmitter' at the bottom of the page, a dialogue box appears, allowing the user to configure the transmitter as shown below right.

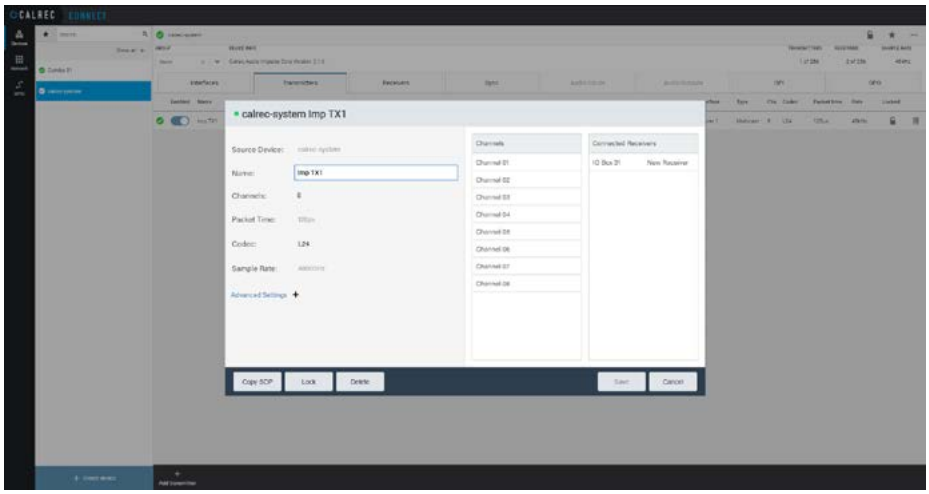
It shows information for VIEWING ONLY and also settings that can be **ADJUSTED**.

Source Device: This is set on the summary page using '**Connect**'.

CONNECT>DEVICES>AOIP CORE TRANSMITTERS



CONNECT>DEVICES>AOIP CORE TRANSMITTERS- ADD/EDIT/DELETE



Transmitter Name: The user can edit the transmitter name by clicking in the Name field and saving it.

No of Channels in the Transmitter:
The maximum number of channels that can exist in a stream is 80, however a channel count of either 8 or 16 channels is more common for transmitting groups of related channels to a destination.

Please refer to the **Connect Application Guide (926-292).pdf** for further information beyond this simple setup of a transmitter, including Advanced Settings.

AoIP Device Receivers
The user configures AoIP Receivers in the device, the page shown above right is accessed from the Devices menu when the '**Combo 31**' device's 'Receivers' tab is selected, it is used to add/remove and configure receivers.

The number of receivers shown here for a Type-R AoIP device is 8, this is based on there being 1 AoIP interface Primary/ Secondary set, each of which carries 64 channels with each stream carrying 8 channels, thus providing 64/8=8 available receivers.

Each row on the receiver sub-page table represents a receiver.

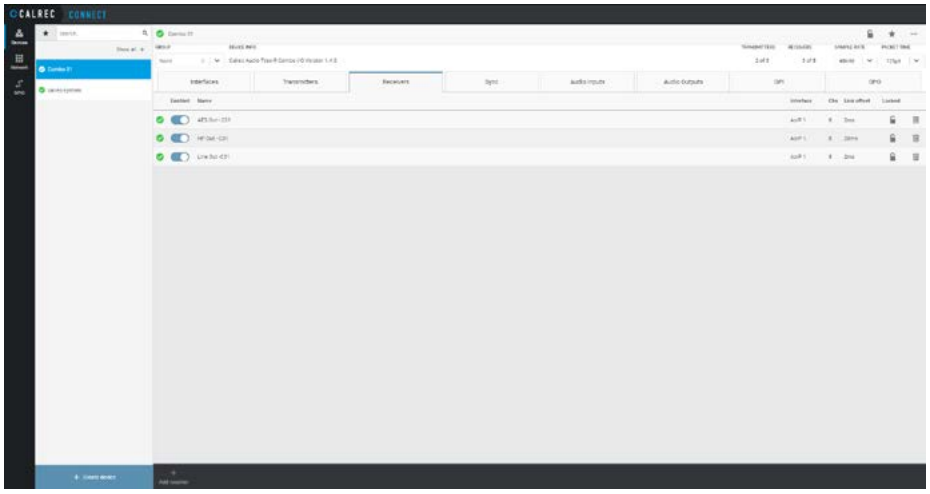
The columns in the table provide the following information about:-
- Receiver name e.g. Line Out -C31.
- Receiver interface e.g. AoIP 1:Pri.
- Number of channels in each receiver e.g. 8.
- Codec used e.g. L24.
- Packet time e.g. 125us.
-Sample Rate e.g. 48000Hz.
-Link Offset e.g. 2000us.

Receiver Settings - Device
When the user selects one of the available receivers or clicks on 'Add Receiver' at the bottom of the page, a dialogue box appears allowing the user to configure the receiver.

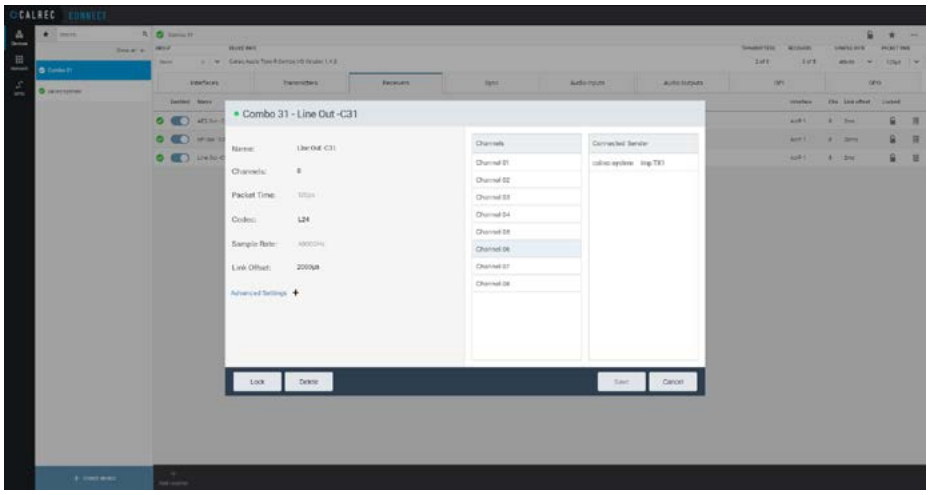
It shows information for VIEWING ONLY and also settings that can be **ADJUSTED**.

Receiver Name:
From the image below right, the user can edit the receiver name by clicking in the Name field and saving it.

CONNECT> DEVICES>AOIP I/O DEVICE RECEIVERS



CONNECT>DEVICES >AOIP I/O DEVICE RECEIVERS- ADD/EDIT/DELETE



No of Channels in the Receiver:
The maximum number of channels that can exist in a stream is 80, however a channel count of either 8 or 16 channels is more common for receiving groups of related channels from a source.

Refer to the **Connect Application Guide (926-292).pdf** for further information beyond this simple setup of a receiver, including Advanced Settings.

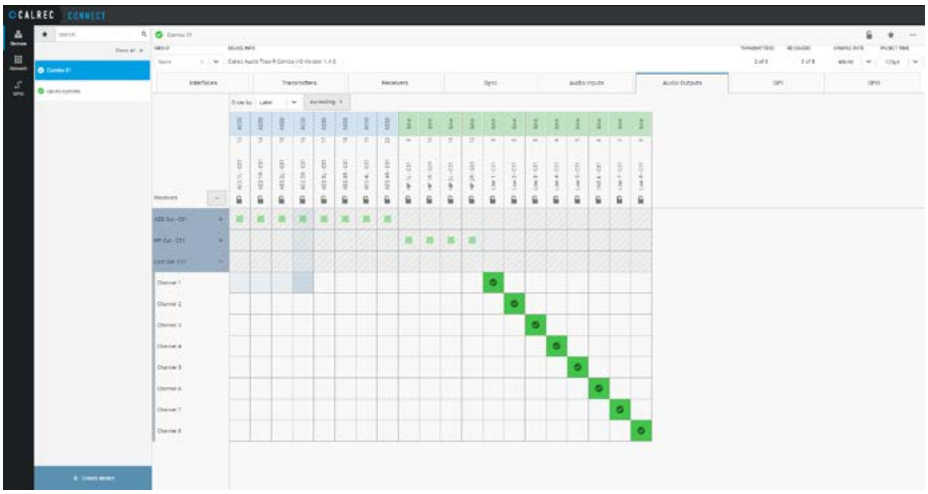
Patch Receiver Streams to AoIP Device Physical Outputs
Now the receivers for the AoIP Devices are setup, the next step is to patch those to the physical output ports in the AoIP device.

Audio Outputs configuration
This page is accessed from the Devices menu when an AoIP Device's 'Audio Outputs' tab is selected and appears as shown above right.

The page shows 3 receiver streams down the left side which can be folded open + or closed- to make the streams easier to manage. The Line Out Stream is expanded to show the stream channels.

Along the top are shown the physical Output ports available in the device and the user simply clicks on the crosspoint between the receiver stream channels and output ports to patch them together.

CONNECT>DEVICES >RECEIVER STREAMS TO AUDIO OUTPUTS



Label Selection
The user can click on the existing label and a label entry box appears. The user edits the label as required and clicks on 'Apply'.

Lock Selection
The user can click on the padlock symbol, this will prevents any parameter changes from being made and will appear as a yellow padlock when active.

Analogue level Options
Clicking on the 3 dots icon in the top right corner of the page opens a drop down shown below right, which allows the user to perform various functions. From an analogue point of view there are two of these of interest, the first being the ability to set the analogue level representing 0dBFS and the second of these is to set the 'Mic input headroom'.

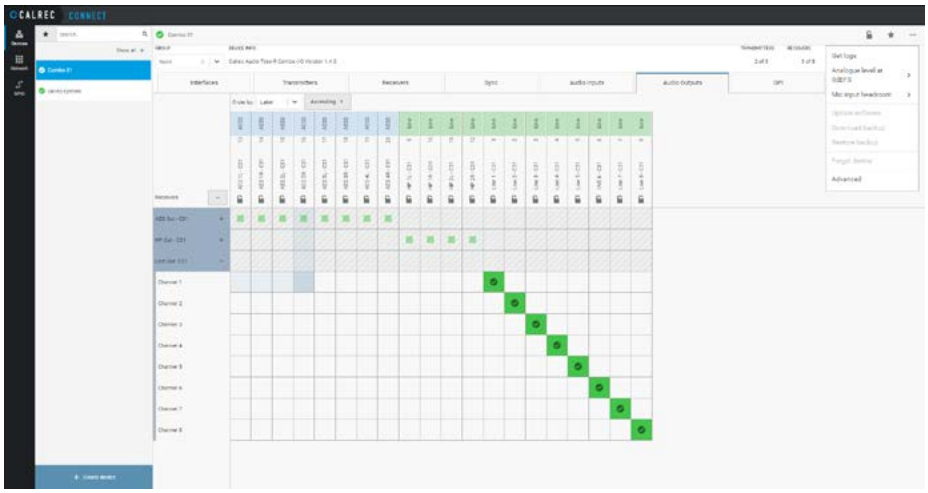
On selecting the 'Analogue level at 0dBFS' option a drop down appears as shown below at the bottom centre of this page.

The user selects the operating level required. The Calrec default for this is 0dBFS=18dBu.

On selecting the 'Mic Input Headroom' option a drop down appears as shown below at the bottom right of this page.

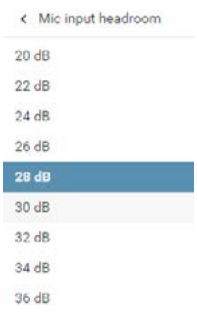
The user selects the operating headroom required. The Calrec default for this is 28dB.

CONNECT>DEVICES >OPTIONS>ANALOGUE LEVEL OPTIONS FOR AUDIO



ANALOGUE LEVEL @ 0DBFS

MIC INPUT HEADROOM



Network configuration to connect Transmitter & Receiver Streams

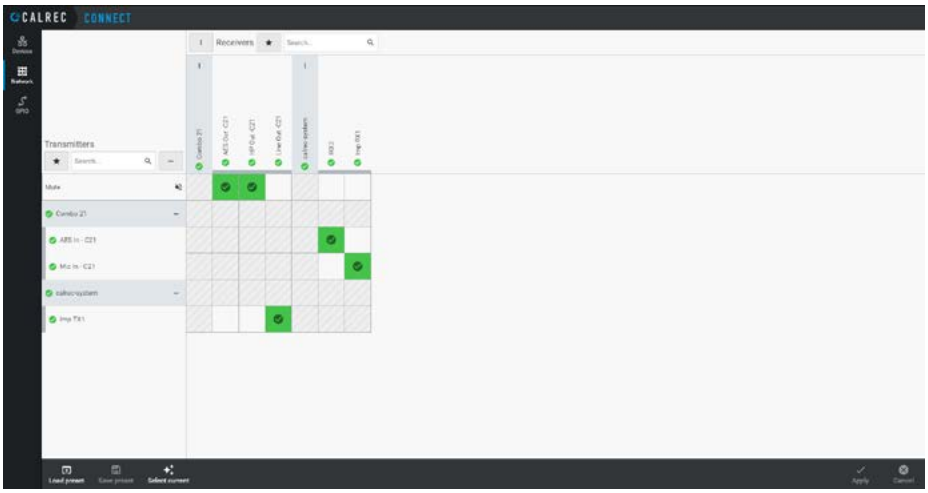
Now the receiver streams have been patched to the physical output ports in the AoIP device, the transmitter and receiver streams are networked together using a crosspoint matrix.

The user simply clicks on the crosspoint to connect audio streams between the AoIP Core and AoIP Devices. The matrix shows where valid connections can be made in white.

At the top of the transmitter rows is an extra row called 'Mute', this is where a crosspoint is placed when no connection is required, it applies a muted audio signal to that stream.

As an example, a transmitter stream from the core shown as part of **calrec-system** is called **Imp TX1** and it has been connected to a receiver in **Combo 21** called **Line Out- C21.** The stream is carrying 8 channels, one of which is the Main 1 Mono Bus Output which is to be connected to a physical output port.

CONNECT>NETWORK >CONNECT TRANSMITTER AND RECEIVER STREAMS



AoIP Stream Interfaces

The page shown above is arranged as an X-Y matrix with the transmitters in rows and the receivers in columns.
The page allows the user to open (expand) or close (collapse) the stream displays for each Core or AoIP device, so that the matrix is easier to navigate. There is also a Collapse All/Expand All option for both transmitters & receivers.

Adjacent to these, are search entry boxes which allows the user to quickly find a stream by name.

Network Presets

In the footer of the Network page are the Load Preset and Save Preset buttons, this allows the user to have a library of connection presets which can quickly be altered on demand.

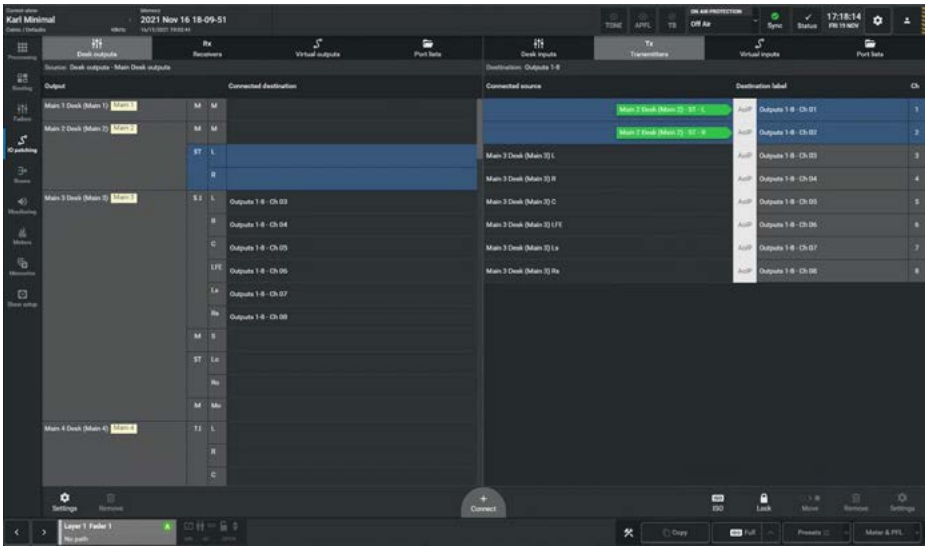
Patch a Console Output to the Core Transmitter using Assist

Now the whole of the audio output path has been configured and connected, the last step in the process is to patch the console DSP output (in this case Main 2 Desk Output) to the core transmitter. This is carried out using the IO patching facility on the Touchscreen of the Argo surface or by using the Assist Application as shown below right.

Summary for Outputs configuration

This guide has covered the whole setup of the Outputs configuration from start to finish. In normal operation, all the interfaces, transmitters, receivers, connection of the I/O box resources to the receiver streams and network connection of transmitters and receivers will have already been setup by the engineer, so that the operator just patches the output source from the console, to a physical audio output using the Assist application or a Touchscreen on the Argo surface.

ASSIST>IO PATCHING>PATCH BUS OUTPUT TO CORE TRANSMITTER



Setup AoIP Device Transmitters and AoIP Core Receivers for Inputs configuration

Now the AoIP Core Router & AoIP Device interfaces are setup, the next step is to create transmitter and receiver streams for them using the '**Connect**' application.

AoIP Device Transmitters

The user configures AoIP transmitters in the device, the page shown above right is accessed from the Devices menu when the '**Combo 31**' device's 'Transmitters' tab is selected, it is used to add/remove and configure transmitters.

The number of transmitters shown here for a Type-R AoIP device is 8, this is based on there being 1 AoIP interface Primary/Secondary set, each of which carries 64 channels with each stream carrying 8 channels, thus providing 64/8=8 available transmitters.

Each row on the transmitters sub-page table represents a transmitter.

The columns in the table provide the following information about:-

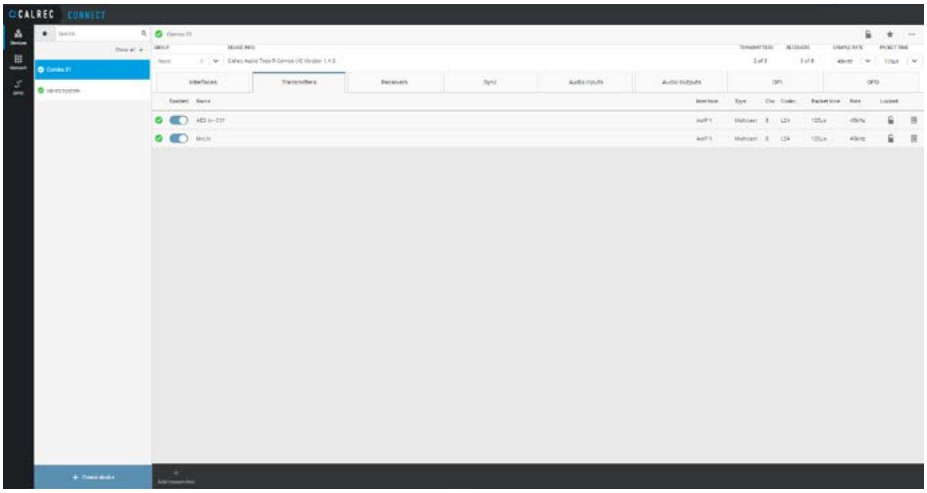
- Transmitter name e.g. Mic In.
- Transmitter interface e.g. AoIP 1:Pri.
- Type of transmitter, normally defined as a Multicast one to many type rather that a Unicast one to one type.
- Number of channels in each transmitter e.g. 8.
- Codec used e.g. L24.
- Packet time e.g. 125us.
-Sample Rate e.g. 48000Hz.

Transmitter Settings - Device

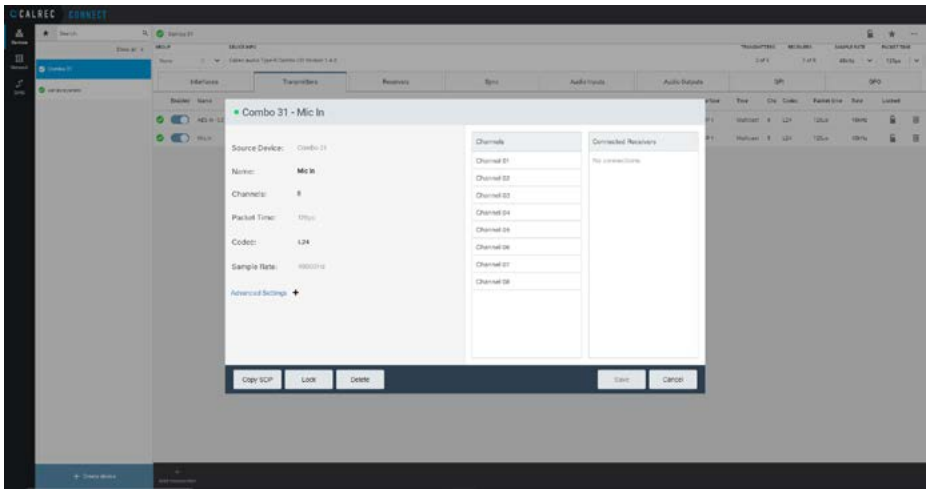
When the user selects one of the available transmitters or clicks on 'Add Transmitter' at the bottom of the page, a dialogue box appears allowing the user to configure the transmitter as shown below right.

It shows information for VIEWING ONLY and also settings that can be **ADJUSTED**.

CONNECT>DEVICES>AOIP I/O DEVICE TRANSMITTERS



CONNECT>DEVICES>AOIP I/O DEVICE TRANSMITTERS- ADD/EDIT/DELETE



Source Device: This is set on the summary page using '**Connect**'.

Transmitter Name: The user can edit the transmitter name by clicking in the Name field and saving it.

No of Channels in the Transmitter:

The maximum number of channels that can exist in a stream is 80, however a channel count of either 8 or 16 channels is more common for passing groups of related channels to a destination.

Refer to the **Connect Application Guide (926-292).pdf** for further information beyond this simple setup of a transmitter, including Advanced Settings.

AoIP Core Receivers
The user configures AoIP receivers in the core, the page shown above right is accessed from the Devices menu when the '**calrec-system**' device's 'Receivers' tab is selected, it is used to add/remove and configure receivers.

The number of available receivers shown here for the Impulse Core is 256, this is based on one router connected having 4 AoIP interface Pri/Sec sets on each router, each of which carries 256 channels i.e. a total of 2048 channels with each stream carrying 8 channels, thus providing 2048/8=256 available receivers.

Each row on the receiver sub-page table represents a receiver.

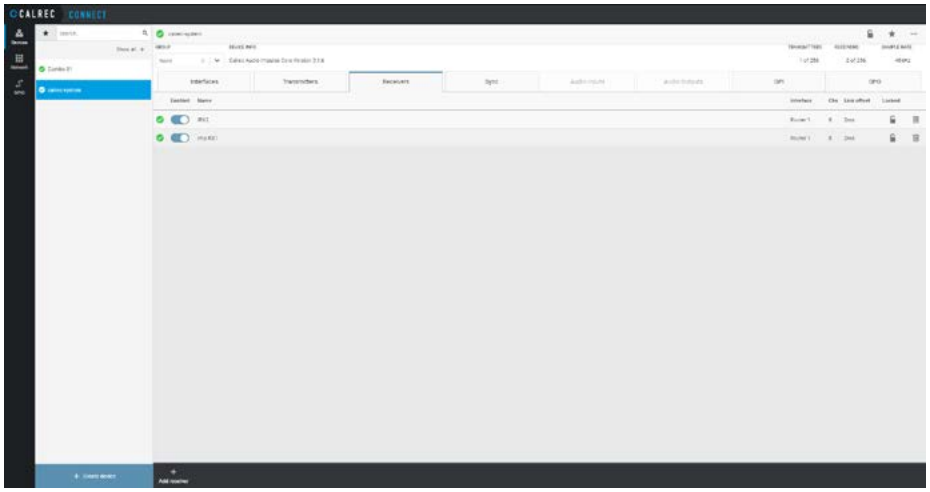
The columns in the table provide the following information about:-
- Receiver name e.g. Imp RX1.
- Receiver interface e.g. Router 1
- Number of channels in each receiver e.g. 8.
- Codec used e.g. L24.
- Packet time e.g. 125us.
-Sample Rate e.g. 48000Hz.
-Link Offset e.g. 2000us.

Receiver Settings - Core
When the user selects one of the available receivers or clicks on 'Add Receiver' at the bottom of the page, a dialogue box appears allowing the user to configure the receiver.

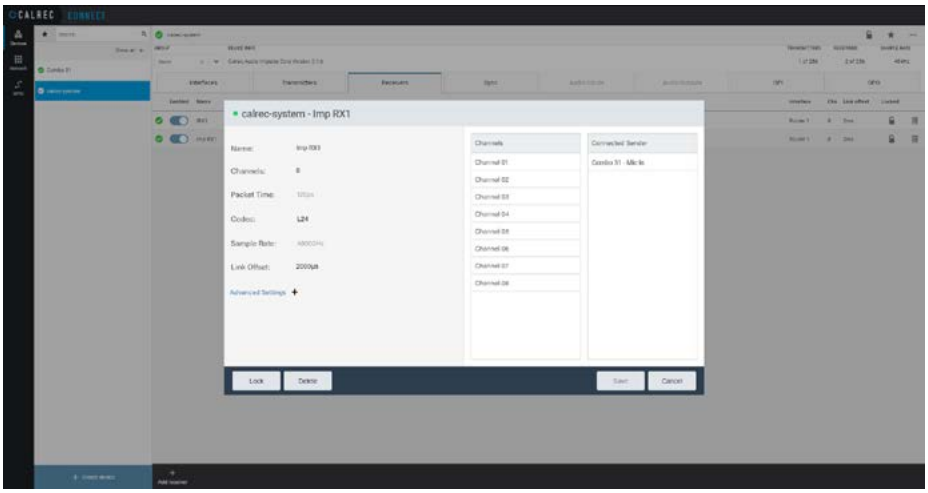
It shows information for VIEWING ONLY and also settings that can be **ADJUSTED**.

Receiver Name:
From the image below right, the user can edit the receiver name by clicking in the Name field and saving it.

CONNECT>DEVICES>AOIP CORE RECEIVERS



CONNECT>DEVICES >AOIP CORE RECEIVERS- ADD/EDIT/DELETE



No of Channels in the Receiver:
The maximum number of channels that can exist in a stream is 80, however a channel count of either 8 or 16 channels is more common for passing groups of related channels from a source.

Refer to the **Connect Application Guide (926-292).pdf** for further information beyond this simple setup of a receiver, including Advanced Settings.

Patch AoIP Device Physical Inputs to Transmitter Streams

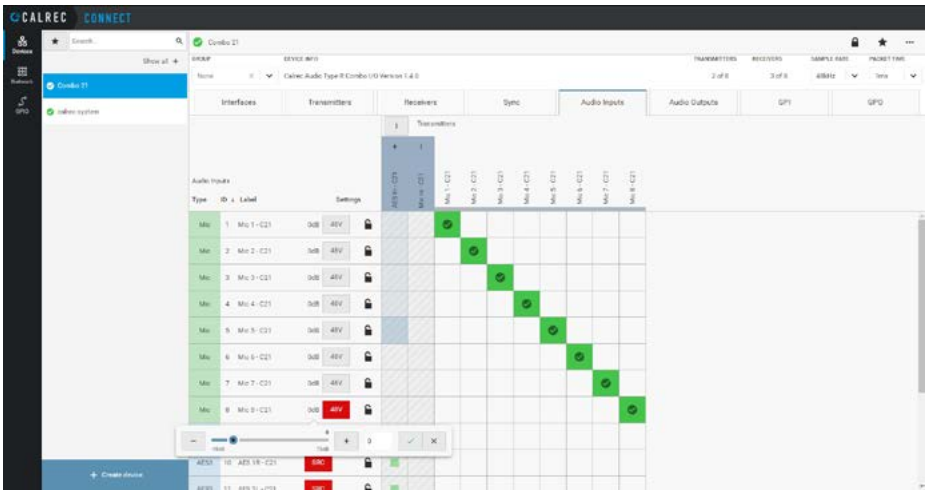
Now the transmitter streams for the AoIP devices are setup, the next step is to patch those to the physical input ports in the AoIP device.

Audio Inputs configuration

This page is accessed from the Devices menu when an AoIP Device's 'Audio Inputs' tab is selected and appears as shown above right.

This allows the user to connect the Audio Input ports to transmitter channels and give the port a Label, a Gain value and switch the 48v phantom power setting if it is a Mic/Line Input or the SRC, if it is an AES input as described below.

CONNECT>DEVICES >AUDIO INPUTS TO DEVICE TRANSMITTER STREAMS



Gain Selection (Mic/Line Only)

The user clicks on the existing gain setting and either enters a gain value or moves the slider to the desired setting and clicks on the 'tick box' to apply the change.

48v or SRC Selection (Mic or AES)

The user clicks on the 48v symbol or SRC symbol next to the gain setting this will toggle the state of that function and will appear in Red when active.

Label Selection

The user can click on the existing label and a label entry box appears. The user edits the label as required and clicks on 'Apply'.

Lock Selection

The user can click on the padlock symbol this will prevents any parameter changes from being made and will appear as a yellow padlock when active.

Analogue level Options

Clicking on the 3 dots icon in the top right corner of the page, opens a drop down shown below right which allows the user to perform various functions. From an analogue point of view there are two of these of interest, the first being the ability to set the analogue level representing 0dBFS and the second of these is to set the 'Mic input headroom'.

On selecting the 'Analogue level at 0dBFS' option a drop down appears as shown on the middle right of this page.

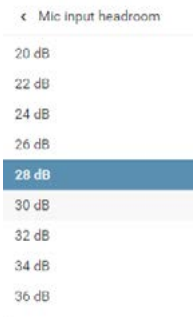
The user selects the operating level required. The Calrec default for this is 0dBFS=18dBu.

On selecting the 'Mic Input Headroom' option a drop down appears as shown on the bottom right of this page.

The user selects the operating headroom required. The Calrec default for this is 28dB.

ANALOGUE LEVEL @ 0DBFS

MIC INPUT HEADROOM



Network configuration to connect Transmitter & Receiver Streams

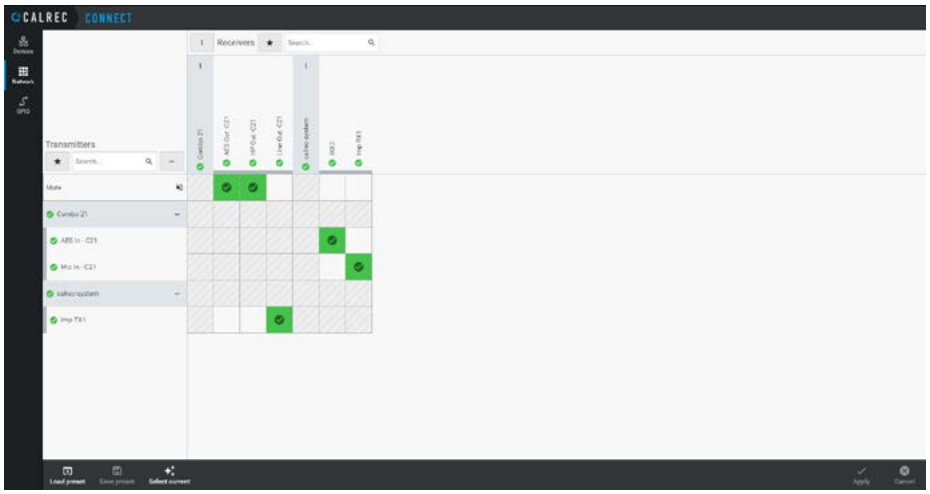
Now the transmitter streams have been patched to the physical input ports in the AoIP device, the transmitter and receiver streams are networked together using a crosspoint matrix.

The user simply clicks on the crosspoint to connect audio streams between the Core and AoIP Devices. The matrix shows where valid connections can be made in white.

At the top of the transmitter rows is an extra row called 'Mute', this is where a crosspoint is placed when no connection is required, it applies a muted audio signal to that stream.

As an example, a transmitter stream from the device shown as part of **Combo 21** is called **Mic In -C21** and it has been connected to a receiver in **calrec-system** called **Imp RX1.** The stream is carrying 8 channels, one of which is a mic input called **Mic 1** connected to a physical input port.

CONNECT>NETWORK >CONNECT TRANSMITTER AND RECEIVER STREAMS



AoIP Stream Interfaces

The page shown to the right is arranged as an X-Y matrix with the transmitters in rows and the receivers in columns. The page allows the user to open (expand) or close (collapse), the stream displays for each Core or AoIP Device, so that the matrix is easier to navigate. There is also a Collapse All/Expand All option for both transmitters & receivers.

Adjacent to these, are search entry boxes which allows the user to quickly find a stream by name.

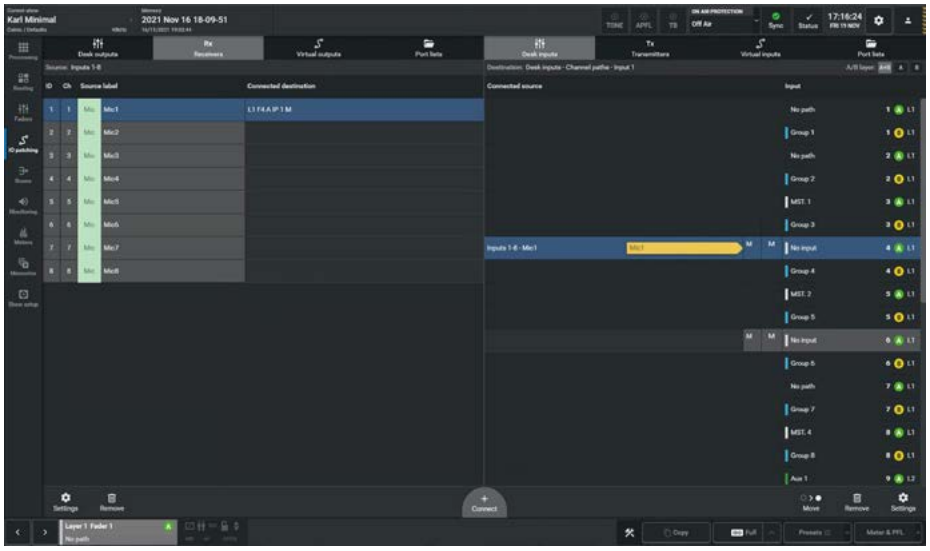
Network Presets

In the footer of the Network page are the Load Preset and Save Preset buttons, this allows the user to have a library of connection presets which can quickly be altered on demand.

Patch a Console Input from the Core Receiver using Assist

Now the whole of the audio input path has been configured and connected, the last step in the process is to patch the console input (in this case a Mic input to channel path L1-4A) from a core receiver. This is carried out using the IO patching facility on the Touchscreen of the Argo surface or by using the Assist Application as shown below right.

ASSIST>IO PATCHING>PATCH CORE RECEIVER TO MIC INPUT PATH



Summary for Inputs configuration

This guide has covered the whole setup of the Inputs configuration from start to finish. In normal operation, all the interfaces, transmitters, receivers, connection of the I/O box resources to the receiver streams and network connection of transmitters and receivers will have already been setup by the engineer, so that the operator just patches the Input source to the console using the Assist application or a Touchscreen on the Argo surface.

10. CONNECTING THE AUDIO SWITCH AND AOIP DEVICES TO THE CORE

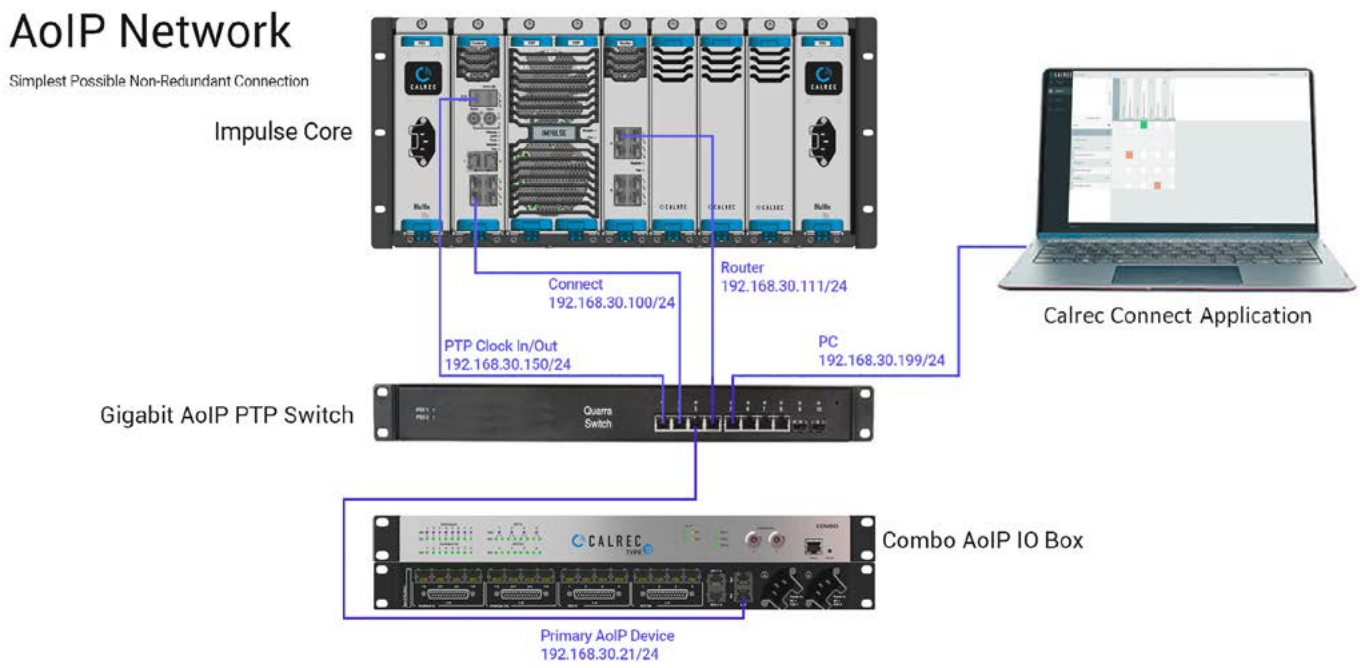
Below is shown a simple Primary connection only, (without redundancy) network example to show how to get a system working. This is only shown to make it easier to understand how it works. A real world example system connection is shown in section 12.

Note:- All the Primary Audio Connections in the system need to be on the same subnet by default the **192.168.30/24** *subnet. This includes the Audio Network Switch which will need to be configured with a VLAN accessible over a number of ethernet ports*

The audio network switch shown below connects to the following:-

The Router on the Core :- to pass audio and control data to and from the AoIP devices.
The Connect application on the Core :- so that it can configure the AoIP devices.
The AoIP Device Primary connection :- to pass audio and control to and from the Core.
The PTP clock on the Core :- to provide synchronisation. between Core and AoIP device.
The PC :- so the user can setup the system via the Connect application.

A SIMPLE EXAMPLE OF CONNECTING A COMBO AOIP BOX DEVICE TO AN IMPULSE CORE VIA A PTP SWITCH



Once all the connections are made, type **172.29.1.21** or **192.168.30.100** if connected to the Audio Subnet in the Google Chrome address bar on and press enter to navigate to '**Connect**'.

Walk through all the steps in Section 9 of this guide and the system should then be ready to test.
Note: Please refer to **"AoIP Devices - Network Interfaces - Suggested Settings" on page 43** of this document for suggested settings and reference tables. When adding more AoIP I/O devices it is recommended to add them to the system one unit at a time to ensure that the IP addresses don't overlap.

Once all the AoIP devices & AoIP core network interfaces are known to be set with unique IP addresses, they may all be connected to the same network. All AoIP devices and the Core in the same subnet should be discovered and displayed in **'Connect'**.

Please refer to the Further Reading section at the back of this guide for links to additional guidance about using Connect.

After completing the required steps, a simple system test can be made, where a Mic Input is patched to a transmitter stream, in the AoIP Device, which in turn is networked to a receiver in the core. That receiver is patched using Console PC to an input channel on the console, which will then be available on the Console. The Input channel is then routed to a Main Bus Output and patched to a transmitter stream in the core, which in turn is networked to a receiver in the AoIP Device. Finally that receiver is patched to a Line Output. If the setup is correct then the Audio Mic Input should be heard at the Audio Line Output.

11. UNDERSTANDING SYNCHRONISATION

PTP & Synchronisation
Precision Timing Protocol, specifically version 2, also known as PTPv2-IEEE-1588-2008, provides a method of synchronising clocks across a network very accurately. For Media networks of a larger scale, it is important to understand your PTP configuration and to ensure all switches and end-points are correctly configured for PTP. Getting this wrong will result in unstable audio.

All AoIP end-points contain their own clock, and PTP is used to synchronise those clocks. One device will act as the master, this could be one of the AoIP end-points, or a PTP capable switch on the network, or a clock generator such as a Sonifex AVN-GMCS Grand Master clock unit. A dedicated Grand-Master device is recommended for a broadcast media network.

The Master sends out time-of-day messages to all the slaved devices (devices that are referencing a master). It takes a finite amount of time for a message to travel across a network, so by the time a slave receives a time-of-day message, it is already out-of-date as time has moved on since it was originally time-stamped and sent out by the master. Slaves exchange "receipt request/response" messages with the master, and by timing how long it takes to get a response, they are able to adjust the timestamps to factor in the network latency, and therefore maintain their clock in relation to the master with a very high degree of accuracy.

On a small network with a few end-points connected to a single switch, cost effective non PTP aware switches like Cisco SG350 series, can be used as long as it is correctly configured for IGMP and QoS. As networks scale up though PTPv2 aware switches become very important. PTPv2 aware switches adjust the time-stamps of PTP messages that they are forwarding on, to factor in the delay caused by the switch - the amount of time it takes to receive and forward on the message.

Synchronising with PTPv2-IEEE1588
The following PTP Terms are used when deciding which device is Grandmaster.

Best Master Clock Algorithm:
This is used by all devices within the same domain to determine which device is most suitable to become the **G**rand**M**aster**C**lock.

The following attributes are used to determine this (in order of priority):-

Priority 1 – the user can assign a specific static-designed priority to each clock, preemptively defining a priority among them.

Class – each clock is a member of a given class, each class getting its own priority.

Accuracy – precision between clock and UTC, in nanoseconds (ns).

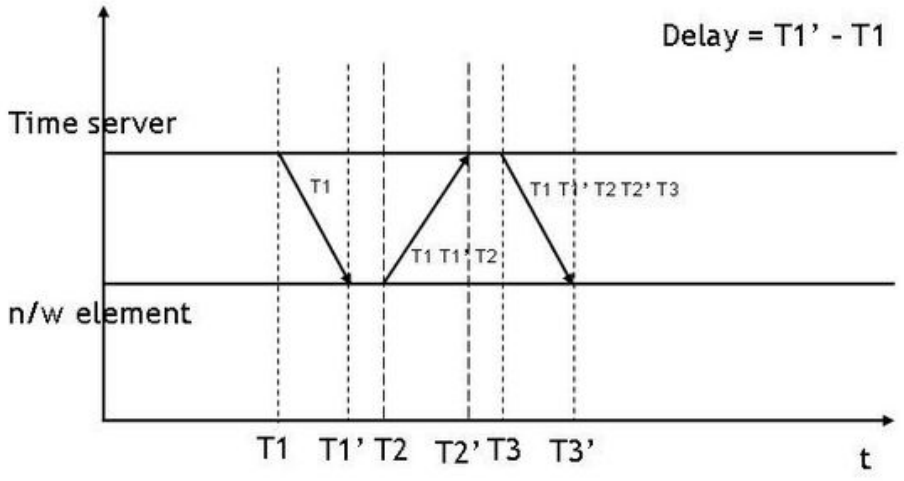
Variance – variability of the clock.

Priority 2 – final-defined priority, defining backup order in case the other criteria were not sufficient.

Source Port ID - If the BMCA has failed to choose a master from the above criteria, it resorts to using the clock with lowest port ID (usually its MAC address)

BMCA makes these checks in order, and stops as soon as it has identified a master at any stage (it does not check the next step unless there is no clear choice based on the current step).

A PTP CYCLE



Once the PTP GMC has been determined, all clocks will begin to sync to the newly elected clock.

- Master will send "sync_message" to all slaves (packet timestamped from GMC)
- Slave will timestamp the packet on reception
- Slave replies with "delay_request" to the GMC
- GMC will timestamp the packet on reception
- GMC sends "delay_response" to the slave.
- This packet will include the GMC receipt timestamp of the "delay_request"

By calculating the offset between the timestamps of these messages being sent and subsequently received. A slave device can correctly adjust its clock to match that of the GMC to less than 1ms.

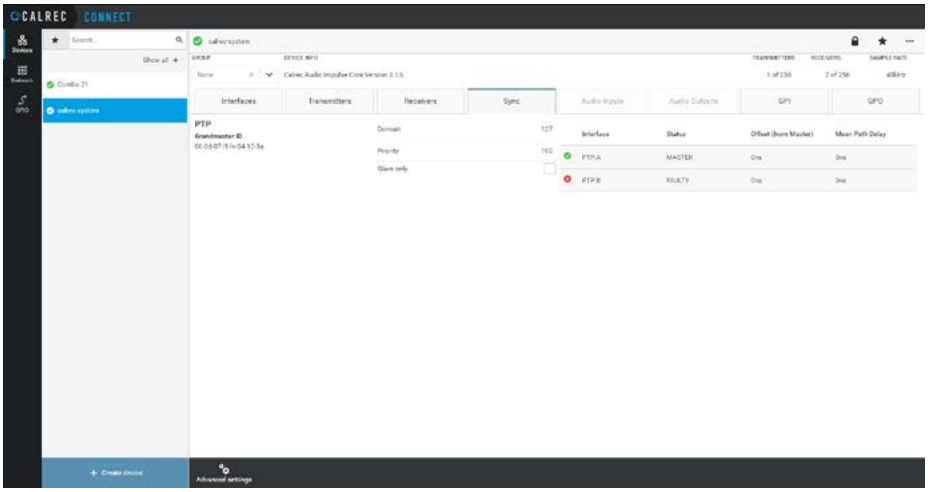
Synchronisation - Core
This page is accessed from the Devices menu when a Core device's 'Sync' tab is selected and appears as shown above right for '**calrec-system**'. It provides the ability to synchronise the network clocks of the devices by setting up PTP clocks and determine how the AoIP interfaces respond on the selected core. The two PTP interfaces on the Core are located on the front of the Control Module and are described as PTP A and PTP B on the synchronisation screens.

The sync page is split into 2 areas:-
The right hand area shows the Port Status of each PTP interface with respect to the master clock. The columns in this Port Status table provide information about:-
- Port status indicators:- Green is active, Red is not active.
- Primary and Secondary port identifiers for each device i.e. PTP A, PTP B.
- Port statuses:- MASTER provides a clock source for it's downstream connections, SLAVE follows the clock source that is in the Master state or it is defined as FAULTY or passive which is neither the master or a slave of a master, or when no connection has been made.
- Offset (from Master):- this is a measure of how accurately a slave synchronises with a master clock.
- Mean Path Delay is the average time taken for PTP frames to travel between master and slave, a large mean path delay is indicative of jitter and latency.

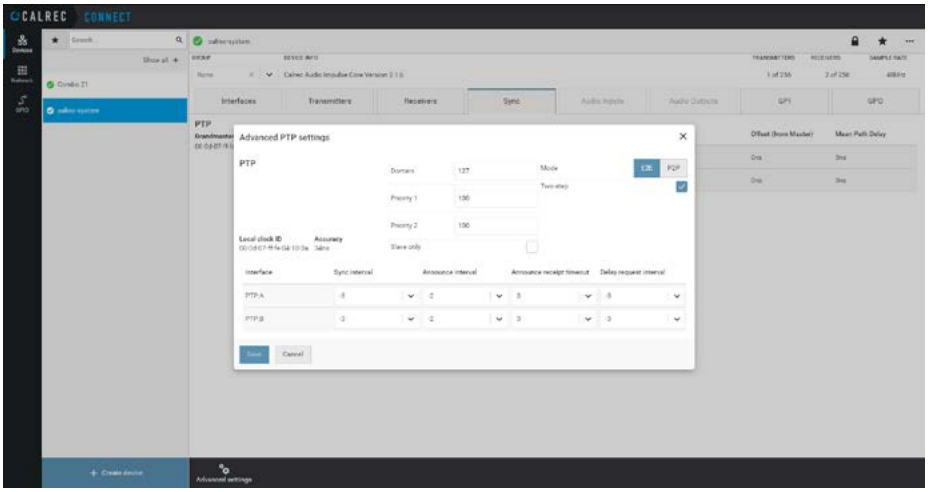
The left hand area displays the PTP Grandmaster ID of the current clock source. The settings to the right of this allow the user to modify how each of the interfaces will interact with the clock. There are basic configuration settings and advanced configuration settings which are accessed from the 'Advanced settings' button in the footer of the page.

Basic Synchronisation Settings
As shown above and below right:-
Domain: Multiple PTP clocks can exist on the same network these are kept separate by placing them in different domains. The domain number (0-255) selects the domain to be used.

BASIC CORE SYNCHRONISATION



ADVANCED CORE SYNCHRONISATION



Priority: This value (0-255) is used in the Best Master Clock Algorithm to determine which AES67 device will become the PTP Grand Master Clock in that domain.
Slave Only: This tick box is used to prevent a device from establishing itself as a Master and should be selected when locking to an external PTP clock.

Advanced Synchronisation Settings
As shown below right:-
Priority 1: Same as basic Priority setting.
Priority 2: Backup Priority setting.
Modes: These transparent clock modes calculate the required time it takes to send traffic either from E2E (end to end) or from P2P (peer to peer) and updates the PTP time correction field as required.
Two Step: This improves the flexibility of the synchronisation system by first sending the sync message followed by a separate time stamp.
Sync Interval: Time period between sync messages which can vary from -7 to +1.
Announce Interval: Time period between PTP announcement messages which can vary from -3 to +4.
Announce Receipt Timeout: Number of PTP intervals a device can miss before timing out which can vary from 2 to 10.
Delay Request Interval: Time period between PTP delay request messages which can vary from -1 to +6.

Note:- In the images above the Secondary AoIP port is not connected.

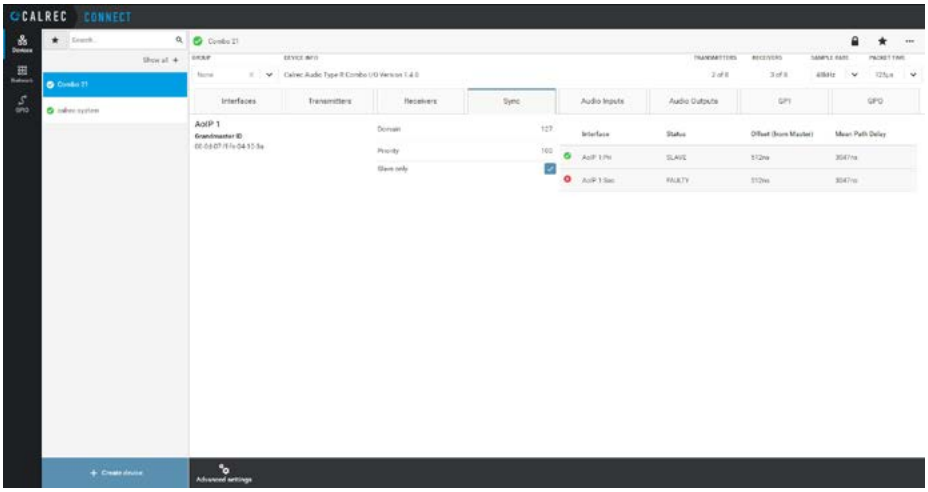
Synchronisation - AoIP Devices
This page is accessed from the Devices menu when an external AoIP device's 'Sync' tab is selected and appears as shown above right for '**Combo 21**.
It provides the ability to synchronise the network clocks of the devices.
The network clocks are carried in the ethernet data packets to/from the device and as such do not require separate synchronisation inputs. This page is used to select PTP clocks and the response of the AoIP interfaces on the devices.

The sync page is split into 2 areas:-
The right hand area shows the Port Status of the AoIP device interface primary and secondary ports with respect to the master clock. The columns in this Port Status table provide information about:-
- Port status indicators, Green is active, Red is not active.
- Primary and Secondary port identifiers for each device i.e. 1A & 1B.
- Port statuses:- MASTER provides a clock source for it's downstream connections, SLAVE follows the clock source that is in the Master state or it is defined as FAULTY or passive which is neither the master or a slave of a master, or when no connection has been made.
- Offset (from Master):- This is a measure of how accurately a slave synchronises with a master clock.
- Mean Path Delay is the average time taken for PTP frames to travel between master and slave, a large mean path delay is indicative of jitter and latency.

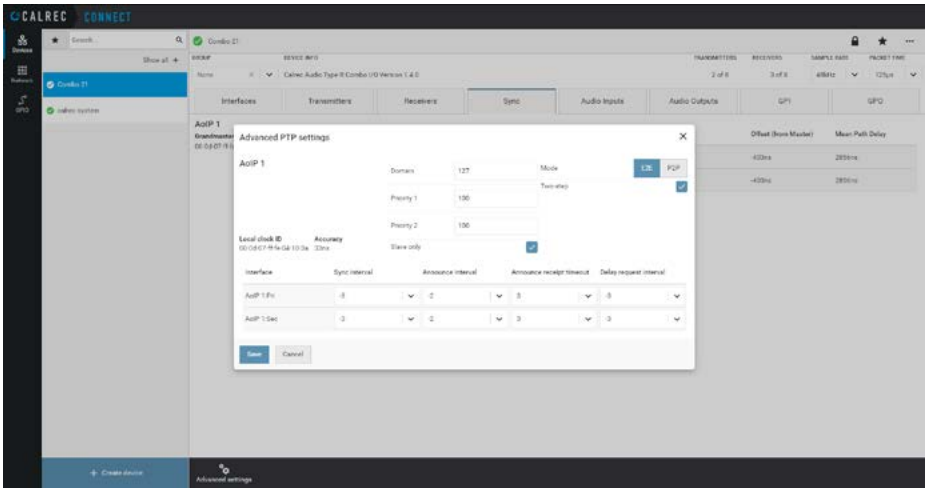
The left hand area displays the PTP Grandmaster ID of the current clock source. The settings to the right of this allow the user to modify how the interface will interact with the clock.
There are basic configuration settings and advanced configuration settings which are accessed from the 'Advanced settings' button in the footer of the page.

Basic Synchronisation Settings
As shown above and below right:-
Domain: Multiple PTP clocks can exist on the same network these are kept separate by placing them in different domains. The domain number (0-255) selects the domain to be used.

BASIC AOIP DEVICE SYNCHRONISATION



ADVANCED AOIP DEVICE SYNCHRONISATION



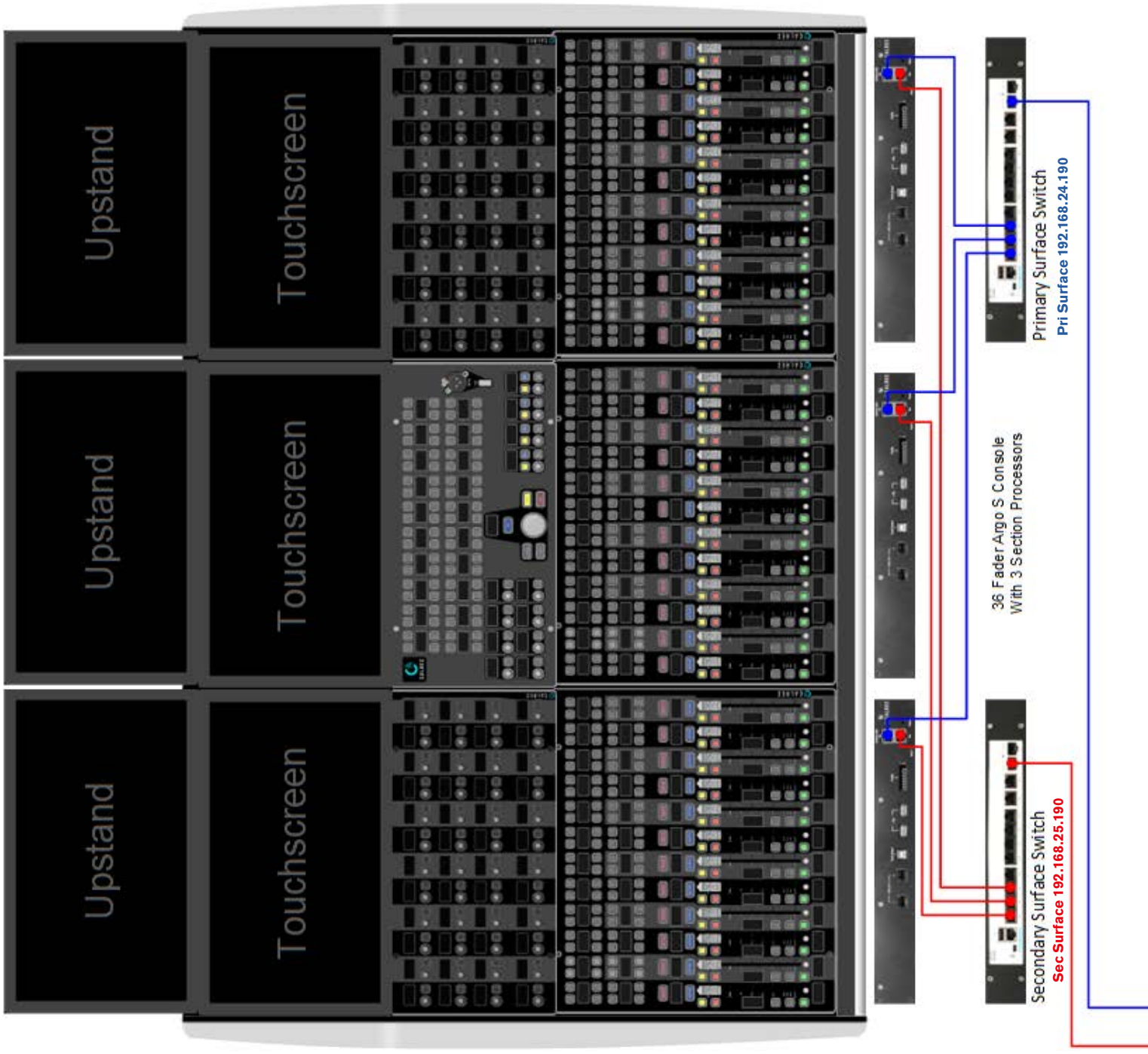
Priority: This value (0-255) is used in the Best Master Clock Algorithm to determine which AES67 device will become the PTP Grand Master Clock in that domain.
Slave Only: This tick box is used to prevent a device from establishing itself as a Master and should be selected when locking to an external PTP clock.

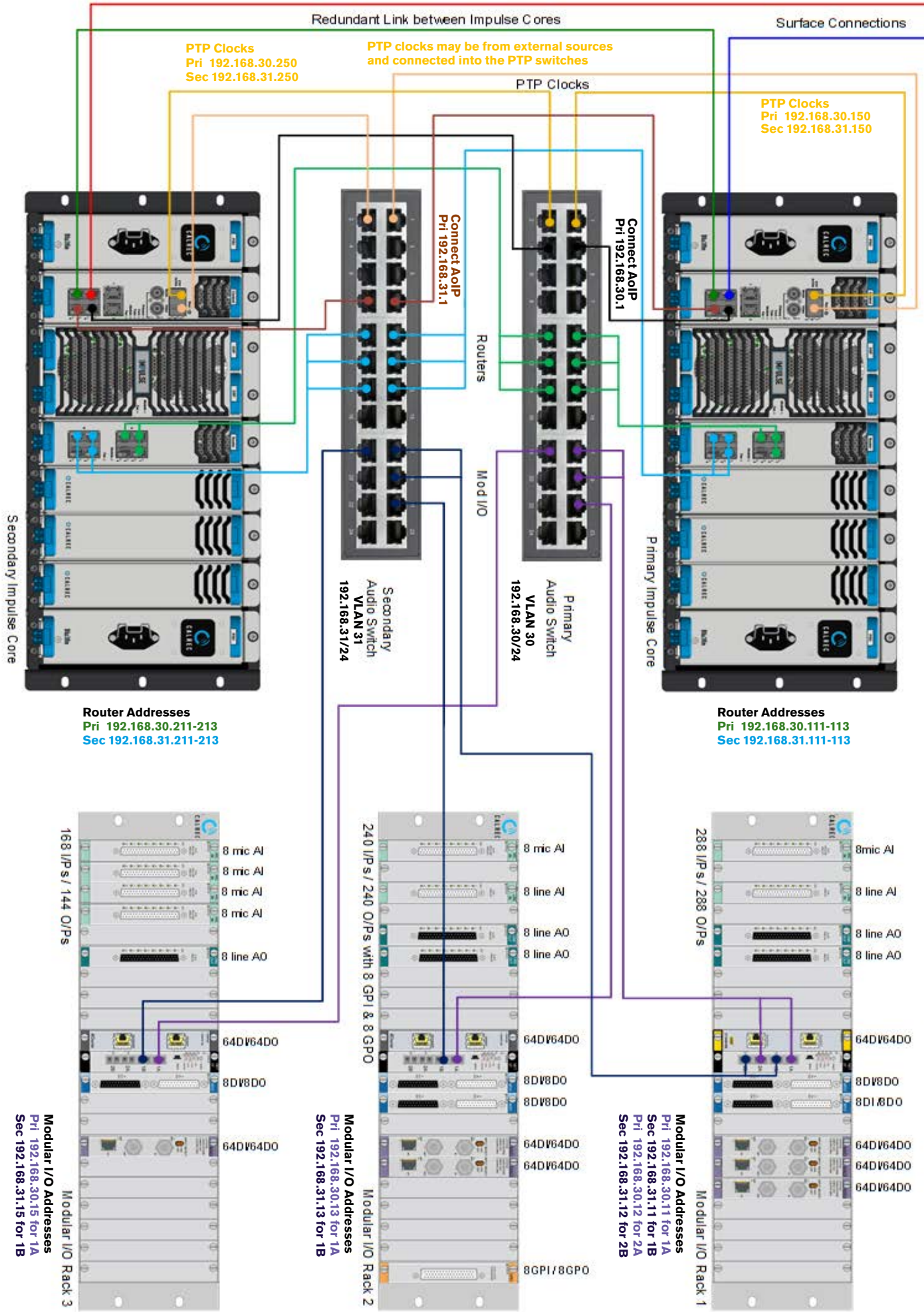
Advanced Synchronisation Settings
As shown below right:-
Priority 1: Same as basic Priority setting.
Priority 2: Backup Priority setting.
Modes: These transparent clock modes calculate the required time it takes to send traffic either from E2E (end to end) or from P2P (peer to peer) and updates the PTP time correction field as required.
Two Step: This improves the flexibility of the synchronisation system by first sending the sync message followed by a separate time stamp.
Sync Interval: Time period between sync messages which can vary from -7 to +1.
Announce Interval: Time period between PTP announcement messages which can vary from -3 to +4.
Announce Receipt Timeout: Number of PTP intervals a device can miss before timing out which can vary from 2 to 10.
Delay Request Interval: Time period between PTP delay request messages which can vary from -1 to +6.

Note:- In the images above the Secondary AoIP port is not connected.

12. EXAMINE AN EXAMPLE SYSTEM (SURFACE+CORES+DEVICES)

This example system is a 36 fader Argo S console surface, connected to a pair of Impulse cores using interface #**3** shown in **Blue** for Primary and **Red** for Secondary redundancy connections. The Impulse cores are connected to each other using Interface #**5** shown in **Green** to provide a redundant link. There are 2 PTPv2 aware audio switches providing audio redundancy. Each switch has its own VLAN setup (Primary=VLAN30 and Secondary=VLAN31) for AoIP interfacing. All Primary AoIP traffic is on the **192.168.30/24** subnet and all Secondary AoIP traffic is on the **192.168.31/24** subnet. There are 3 Modular I/O Racks with AoIP interfaces and in the case of Modular I/O rack 1, both AoIP Device interfaces have been used as the I/O count exceeds the nominal 256 limit per connection. The Modular I/O Racks are connected to the single Router fitted in each core via the switches. All the required A ports of each Router (primary & secondary cores) and Modular I/O rack AoIP Device interfaces are connected to the Primary audio switch and all the required B ports of each Router (primary & secondary cores) and Modular I/O rack AoIP Device interfaces are connected to the Secondary audio switch. The **Connect** Application can be accessed from interface #**2** of the Primary core on **172.16.255.60** or when the Management subnet is configured from **172.29.1.21** or the Primary switch on **192.168.30.100** for setup via the PC.




Redundant Link between Impulse Cores
Surface Connections
PTP Clocks
Pri 192.168.30.250
Sec 192.168.31.250
PTP clocks may be from external sources
and connected into the PTP switches
PTP Clocks
PTP Clocks
Pri 192.168.30.150
Sec 192.168.31.150
Connect AoIP
Pri 192.168.31.1
Routers
Connect AoIP
Pri 192.168.30.1
Mod I/O
Secondary Impulse Core
Secondary
Audio Switch
VLAN 31
192.168.31/24
Primary
Audio Switch
VLAN 30
192.168.30/24
Primary Impulse Core
Router Addresses
Pri 192.168.30.211-213
Sec 192.168.31.211-213
Router Addresses
Pri 192.168.30.111-113
Sec 192.168.31.111-113
168 I/Ps / 144 O/Ps
8 mic AI
8 mic AI
8 mic AI
8 mic AI
8 line AO
64DI/64DO
8DI/8DO
64DI/64DO
Modular I/O Rack 3
Modular I/O Addresses
Pri 192.168.30.15 for 1A
Sec 192.168.31.15 for 1B
240 I/Ps / 240 O/Ps with 8 GPI & 8 GPO
8 mic AI
8 line AI
8 line AO
8 line AO
64DI/64DO
8DI/8DO
8DI/8DO
64DI/64DO
64DI/64DO
8GPI/8GPO
Modular I/O Rack 2
Modular I/O Addresses
Pri 192.168.30.13 for 1A
Sec 192.168.31.13 for 1B
288 I/Ps / 288 O/Ps
8mic AI
8 line AI
8 line AO
8 line AO
64DI/64DO
8DI/8DO
8DI/8DO
64DI/64DO
64DI/64DO
64DI/64DO
Modular I/O Rack 1
Modular I/O Addresses
Pri 192.168.30.11 for 1A
Sec 192.168.31.11 for 1B
Pri 192.168.30.12 for 2A
Sec 192.168.31.12 for 2B

13. NAVIGATE THE CONSOLE & PERFORM SYSTEM TESTS

Surface Panel Overview
The image to the right shows a typical console section of an Argo S surface consisting of the following panels:-

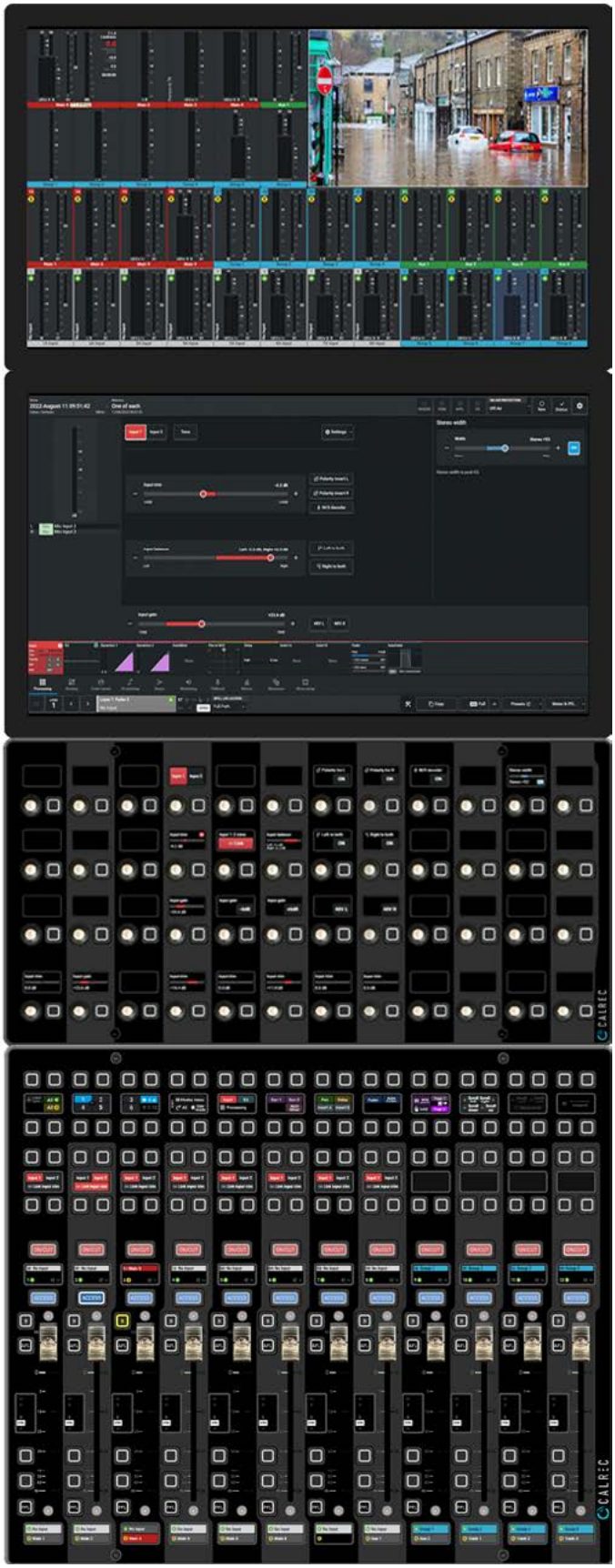
MD6573 TFT Meter panel
provides the Argo S/Argo Q with a graphical user interface to provide a 1920px x 1080px TFT video display of the various audio input and output levels of the console. Typically the Meter panel shows audio metering displays. Multiple upstand metering TFT's are fitted across the console as required.

MU6572 TFT Touchscreen panel
provides the Argo S/Argo Q with a graphical user interface to provide a 1920px x 1080px TFT video display and touch circuitry, touch control and display of the various control parameters of the console. The lower area of the screen provides a touch method of navigating the console using operational modes and layer selection. Multiple touchscreens are fitted across the console as required.

CA6575 Wild Assign panel
can be fitted in the Argo S/Argo Q central control area, for the Argo S, one row of this panel type can be fitted or two rows for the larger Argo Q, to make up the required console layout. Each rotary control cell can be configured to display and control the various continuous and switch parameters as required.

IU6576 Standard Fader panel
provides the Argo S/Argo Q fader bed, with multiple panels being fitted to make up the required fader quantity. It is fitted with 12 x 100mm throw touch sensitive faders. Each fader strip also has the following controls/displays from bottom to top:- Mini TFT layer display, PFL button, 2 user defined buttons, Mini TFT meter display, AFL button, B-Layer button, Access button, Mini TFT fader display, ON/CUT button. The upper area of the panel has 2 sets of 4 button cells with a Mini TFT Display per cell which can be configured to display the various switch parameters as required. The top row of button cells provides the physical method of navigating the console using operational modes and layer selection.

ARGO S CONTROL SURFACE SECTION



Layer Navigation
The Modes and Layer control row across the top of the panel in combination with the Access buttons row and 'B' button row allows the user to navigate across the layers of the console of which there are 24 arranged as 12 A/B layers. The 1st, 2nd & 3rd button cells (highlighted in magenta) from the left of that row, select which layer and sublayer the user is accessing and the image below shows that the user is on Layer 1 A.

The next control area to look at are the small TFT displays just above the buttons labelled **'Access'**. The label at the top of that display shows the name of the audio path that has been placed there as well as the path width.

The image below shows the path on Fader 2A has been 'Accessed' as the bottom left of that TFT display shows.

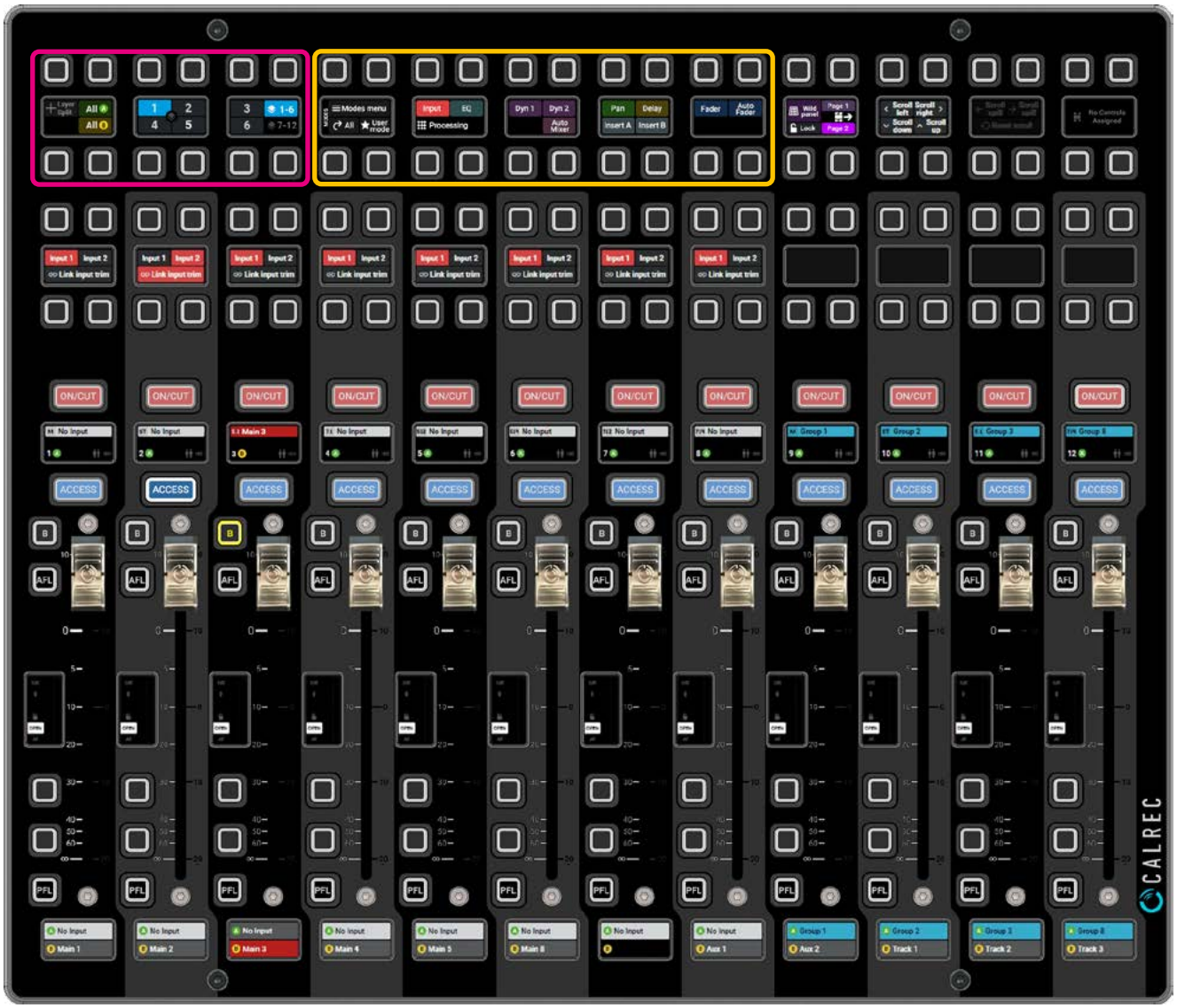
Note the 'Main 3' path on fader 3B next to it, the B-layer paths are accessed using the 'B' button.
There is a further TFT display row shown at the bottom of the panel which shows both the A and B layer paths.

Mode Navigation
Once the required path has been chosen the user can then decide which mode of control they wish to apply. There are 4 primary modes: Processing, Routing, Buses & Monitoring modes which are selected from the Modes area (highlighted in yellow).

Once selected, those button cells show the various functions within that mode. The image below shows that the user has selected the Processing mode and accessed the Input function.

The Touch screen panel (shown on the previous page) and the wild assign panel below it (if present) will change to display the Input functions page and all the control parameters that are available for that path. Those parameters can then either be controlled from the Touchscreen using touch and drag gestures, or from the Wild Assign panel using physical rotary controls and buttons cells with their own displays, these controls are shown on the next page.

IU6576 STANDARD 12 FADER PANEL DETAIL

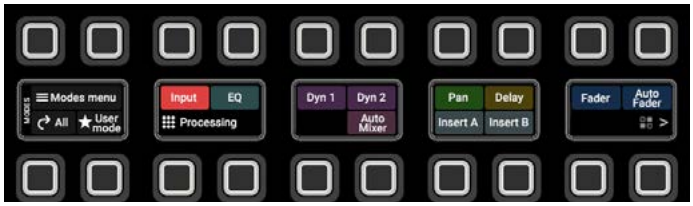


Mode Row Sets

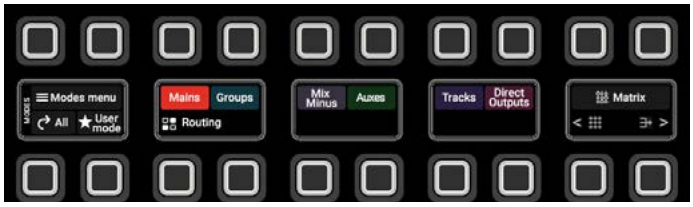
The Mode Row Sets below show the 4 main modes in button control cells 5 thru 8 & their associated function pages for reference.

- The Processing row applies signal processing to the selected path.
- The Routing row selects where the selected path source is sent to as a destination.
- The Buses row selects the various Main, Group Auxiliary and Track bus which may or may not be have been assigned to a fader on the surface, for the purpose of controlling the output level of the chosen bus.
- The Monitoring row selects the required monitoring output, controls its level, cut and dim settings and selects which signal path will be monitored based on the width of the monitoring system.

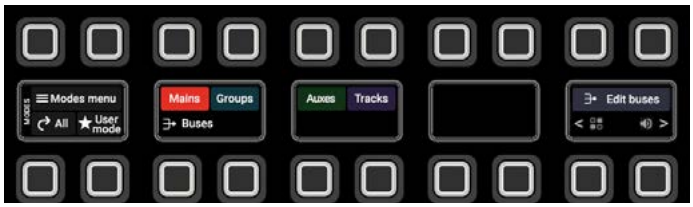
PROCESSING MODE ROW



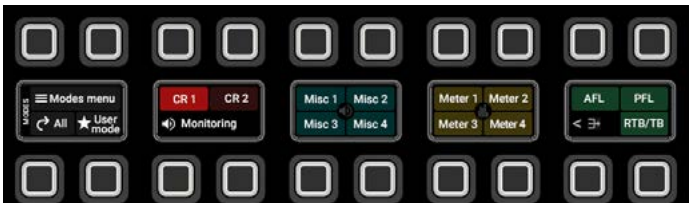
ROUTING MODE ROW



BUSES MODE ROW



MONITORING MODE ROW

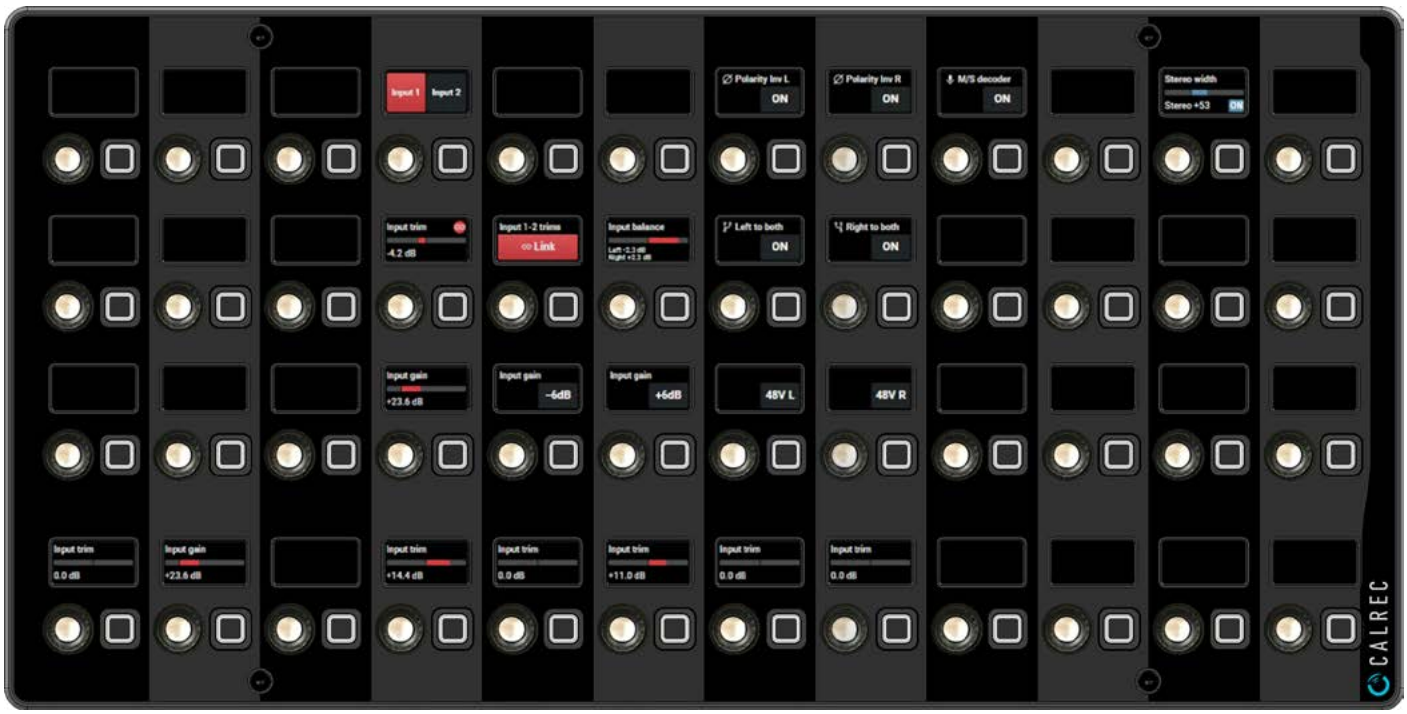


The image below shows the Wild Assign panel in **Processing>Input** mode.
The layout of the controls approximately mimics the layout of the TFT touchscreen and changes according to the type of path and the mode that has been selected.

Here we are looking at the Input controls for a stereo path on Fader 2A which are laid out across the top 3 rows of the panel, which provides up to 36 rotary and button controls cells with an associated TFT display for each parameter displayed.

The bottom row of 12 control cells are used here to display individual Input gain or Input trim levels of each fader strip where valid. This row of controls can be custom defined to display whatever control is required to be at hand from **Show setup>Customise panels.**

CA6575 WILD ASSIGN PANEL DETAIL



Other Argo Panels

MY6574 Monitor panels these provide the Argo S/Argo Q full control of the various monitoring outputs of the console. Generally one of these panels is fitted per console, although more than one can be fitted for multi- user/monitor operation. The 20 x 4 button cells across the top provides fast monitor source selection and the large rotary control and buttons in the centre of the panel is used to provide control for the Main control room monitors. To its left & right are 12 rotary encoders which can be configured to control and display various other monitor outputs and a XLR talkback mic connector is provided.

IU6577 Short Fader panels these provide additional fader control interfaces which can be fitted in the same space as a Wild Assign panel, for the Argo S, one row of this panel type can be fitted and for the larger Argo Q, two rows of this panel type can be fitted to make up the required console layout. These increase the number of available access paths without increasing the width of the surface and can also be used to provide dedicated spill control for Surround or Immersive paths.

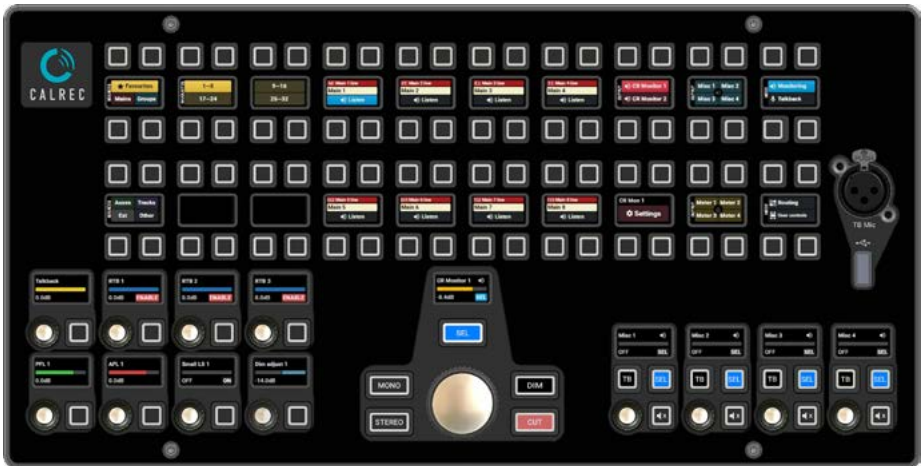
Basic System Tests

A very basic test, can be applied using a Tone source from the internal oscillator, which is applied to the input channel in place of an audio input signal, routing it to an output bus and adjusting the input and output levels whilst listening to the resultant levels. The user should setup a simple monitoring output to speakers or headphones, using the IO patching function to connect the monitor outputs to the audio outputs in an I/O box where the resultant audio should appear.

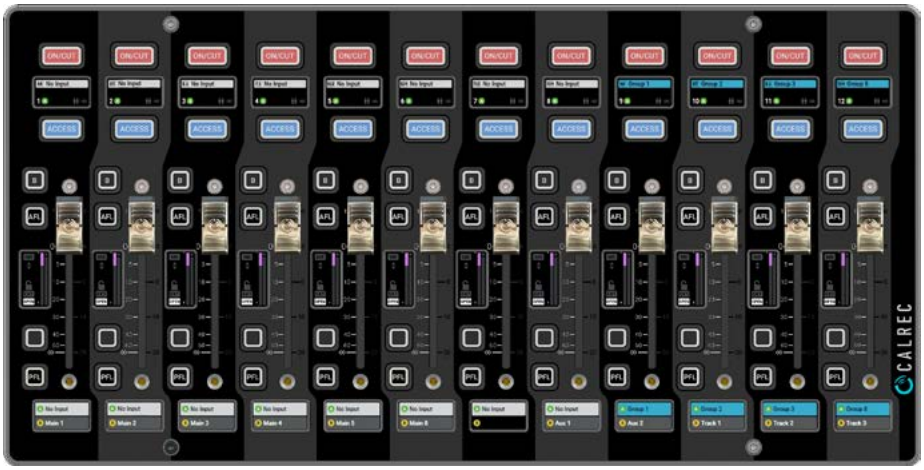
The basic end to end system test is where the user applies an audio signal to an Input port on an I/O box, which is then converted into a digital signal and connected to a Transmitter being sent from the I/O box into a Receiver in the Impulse core using the **Connect** application which is used to configure Transmitters & Receivers to and from the Impulse core and the I/O box audio ports.

In order to control the various parameters of that received input signal, it needs to be placed on to a path on the console.

MY6574 MONITOR PANEL



IU6577 SHORT 12 FADER PANEL



Paths of various signal widths are created in the Fader layout function and using the IO patching function, the received audio is patched from the Impulse Receiver to the input of the created channel path.

The channel path is accessed from the Console surface or Assist application and the input applied is adjusted and made available for signal conditioning in the Processing mode using Input gain control, equalisation, dynamics delay etc. ready to be routed into an output Bus.

The Routing mode allows the user to route the currently accessed path to the desired output bus to be mixed together with other input signals ready to be output.

The overall output levels of the mixed input signals are adjusted in the Buses mode and are then available to be sent out of the system.

The resultant output signals are sent via a Transmitter from the Impulse core into a Receiver in the I/O box, using the IO patching function. The links to the I/O box audio ports from TX & RX having already been made in the **Connect** application.

The Monitor mode allows the user to listen to what is being sent out of the various monitor outputs in multiple listen modes to quality check the bus outputs and by using PFL & AFL, to listen to the signal at various intermediate points in the signal flow from input to output.

Once the user has completed these basic tests then they should refer to the **'Further Reading'** section at the back of this guide for more information on the operation of the system. See **"Further Reading - Impulse" on page 44**.

DSP PACK COMPARISON

The digital signal processing element of the Impulse core allows a combination of different 'Console Pack' sizes.

DSP Pack Sizes for Argo S & Argo Q

The Impulse Core has a number of DSP Packs available for Argo S & Argo Q which can be installed in the DSP Module. The table below shows each pack size which can be used in conjunction with any Argo S or Argo Q console. The console will have been provided with the DSP Pack under licence ordered at the time of purchase and other DSP pack licences may be purchased to provide more processing facilities as required.

SIGNAL PROCESSING AND PACK SIZES AT 48KHZ

DSP Pack Licence Name	Argo S/Argo Q Pack 8	Argo S/Argo Q Pack 7 & Pack 7B	Argo S/Argo Q Pack 6 & Pack 6B	Argo S/Argo Q Pack 5 & Pack 5B/5C
Input Channels	2048	1792	1536	1122 OR 1024 Pack 5C
Main Output Buses	Up to 16 buses from 192 mono legs Mains & Groups pool	Up to 16 buses from 192 mono legs Mains & Groups pool	Up to 16 buses from 192 mono legs Mains & Groups pool	Up to 16 buses from 192 mono legs Mains & Groups pool
Audio Group Buses	Up to 48 buses from 192 mono legs Mains & Groups pool	Up to 48 buses from 192 mono legs Mains & Groups pool	Up to 48 buses from 192 mono legs Mains & Groups pool	Up to 48 buses from 192 mono legs Mains & Groups pool
Track/IFB Output Buses	Up to 96 buses from 96 mono legs pool	Up to 96 buses from 96 mono legs pool	Up to 96 buses from 96 mono legs pool	Up to 96 buses from 96 mono legs pool
Track/IFB Sends in Path	4	4	4	4
Aux Output Buses	Up to 48 buses from 48 mono legs pool	Up to 48 buses from 48 mono legs pool	Up to 48 buses from 48 mono legs pool	Up to 48 buses from 48 mono legs pool
Direct/Mix-Outputs per Channel-Group	Up to 4 outputs from 1024 mono legs pool	Up to 4 outputs from 1024 mono legs pool OR 768 mono legs pool on Pack 7B	Up to 4 outputs from 768 mono legs pool OR 512 mono legs pool on Pack 6B	Up to 4 outputs from 768 mono legs pool OR 512 mono legs pool on Pack 5B & Pack 5C
Insert Send & Returns	2 x Inserts/path from 1024 mono legs pool	2 x Inserts/path from 1024 mono legs pool OR 896 mono legs pool on Pack 7B	2 x Inserts/path from 384 mono legs pool	2 x Inserts/path from 384 mono legs pool
EQ on Channels Groups, Mains, Auxes & Tracks	6 band parametric EQ 6/12 dB8v shelves and 6/12/18 db8v filters on Bands 1 & 6	6 band parametric EQ 6/12 dB8v shelves and 6/12/18 db8v filters on Bands 1 & 6	6 band parametric EQ 6/12 dB8v shelves and 6/12/18 db8v filters on Bands 1 & 6	6 band parametric EQ 6/12 dB8v shelves and 6/12/18 db8v filters on Bands 1 & 6
Dynamics	2 x compress/limiters 1 x expander/gate/ducker with sidechain source selection per Channel & Group 2-band sidechain EQ per Channel 1-band sidechain EQ per Group & Main. 2 x compress/limiters per Aux & Track	2 x compress/limiters 1 x expander/gate/ducker with sidechain source selection per Channel & Group 2-band sidechain EQ per Channel 1-band sidechain EQ per Group & Main 2 x compress/limiters per Aux & Track	2 x compress/limiters 1 x expander/gate/ducker with sidechain source selection per Channel & Group 2-band sidechain EQ per Channel 1-band sidechain EQ per Group & Main 2 x compress/limiters per Aux & Track	2 x compress/limiters 1 x expander/gate/ducker with sidechain source selection per Channel & Group 2-band sidechain EQ per Channel 1-band sidechain EQ per Group & Main 2 x compress/limiters per Aux & Track
Input Delay	Up to 5.4s/input from 256 mono legs pool	Up to 5.4s/input from 256 mono legs pool	Up to 5.4s/input from 256 mono legs pool	Up to 5.4s/input from 256 mono legs pool
Path Delay	Up to 5.4s/path	Up to 5.4s/path	Up to 5.4s/path	Up to 5.4s/path
Output Delay	Up to 5.4s/output from 256 mono legs pool	Up to 5.4s/output from 256 mono legs pool	Up to 5.4s/output from 256 mono legs pool	Up to 5.4s/output from 256 mono legs pool

Multiple Consoles & DSP Packs

The DSP carrier module can be loaded with up to 4 Mezzanine modules which allows up to 4 Argo consoles to operate simultaneously. These are arranged in pairs (first pair provides mixers A & B, second pair provides mixers C & D)

These Impulse DSP Pairing options for multiple console use are shown on page 40.

Note: in some console pairing combinations, the number of Direct Outputs are reduced ,these DSP packs are known as **PACK 5B, 6B & 7B** also note that in one case there is also a reduction in the number of channels in **PACK 5C** from 1122 to 1024.

DSP Pack Licence Name	Argo S/Argo Q Pack 4	Argo S/Argo Q Pack 3	Argo S/Argo Q Pack 2	Argo S/Argo Q Pack 1
Input Channels	768	512	384	256
Main Output Buses	Up to 16 buses from 192 mono legs Mains & Groups pool	Up to 16 buses from 192 mono legs Mains & Groups pool	Up to 16 buses from 192 mono legs Mains & Groups pool	Up to 16 buses from 96 mono legs Mains & Groups pool
Audio Group Buses	Up to 48 buses from 192 mono legs Mains & Groups pool	Up to 48 buses from 192 mono legs Mains & Groups pool	Up to 48 buses from 192 mono legs Mains & Groups pool	Up to 48 buses from 96 mono legs Mains & Groups pool
Track/IFB Output Buses	Up to 64 buses from 64 mono legs pool	Up to 64 buses from 64 mono legs pool	Up to 64 buses from 64 mono legs pool	Up to 48 buses from 48 mono legs pool
Track/IFB Sends in Path	4	4	4	4
Aux Output Buses	Up to 32 buses from 32 mono legs pool	Up to 32 buses from 32 mono legs pool	Up to 32 buses from 32 mono legs pool	Up to 32 buses from 32 mono legs pool
Direct/Mix-Outputs per Channel-Group	Up to 4 outputs from 512 mono legs pool	Up to 4 outputs from 512 mono legs pool	Up to 4 outputs from 512 mono legs pool	Up to 4 outputs from 256 mono legs pool
Insert Send & Returns	2 x Inserts/path from 256 mono legs pool	2 x Inserts/path from 256 mono legs pool	2 x Inserts/path from 256 mono legs pool	2 x Inserts/path from 128 mono legs pool
EQ on Channels Groups, Mains, Auxes & Tracks	6 band parametric EQ 6/12 dB8v shelves and 6/12/18 db8v filters on Bands 1 & 6	6 band parametric EQ 6/12 dB8v shelves and 6/12/18 db8v filters on Bands 1 & 6	6 band parametric EQ 6/12 dB8v shelves and 6/12/18 db8v filters on Bands 1 & 6	6 band parametric EQ 6/12 dB8v shelves and 6/12/18 db8v filters on Bands 1 & 6
Dynamics	2 x compress/limiters 1 x expander/gate/ducker with sidechain source selection per Channel & Group 2-band sidechain EQ per Channel 1-band sidechain EQ per Group & Main. 2 x compress/limiters per Aux and Track	2 x compress/limiters 1 x expander/gate/ducker with sidechain source selection per Channel & Group 2-band sidechain EQ per Channel 1-band sidechain EQ per Group & Main. 2 x compress/limiters per Aux and Track	2 x compress/limiters 1 x expander/gate/ducker with sidechain source selection per Channel & Group 2-band sidechain EQ per Channel 1-band sidechain EQ per Group & Main. 2 x compress/limiters per Aux and Track	2 x compress/limiters 1 x expander/gate/ducker with sidechain source selection per Channel & Group 2-band sidechain EQ per Channel 1-band sidechain EQ per Group & Main. 2 x compress/limiters per Aux and Track
Input Delay	Up to 5.4s/input from 256 mono legs pool	Up to 5.4s/input from 128 mono legs pool	Up to 5.4s/input from 128 mono legs pool	Up to 5.4s/input from 128 mono legs pool
Path Delay	Up to 5.4s/path	Up to 5.4s/path	Up to 5.4s/path	Up to 5.4s/path
Output Delay	Up to 5.4s/output from 256 mono legs pool	Up to 5.4s/output from 128 mono legs pool	Up to 5.4s/output from 128 mono legs pool	Up to 5.4s/output from 128 mono legs pool

DSP PACKS & MULTIPLE MIXERS

In addition to the 8 basic single console DSP Pack arrangements which are described in detail on the next 2 pages, the digital signal processing element of the Impulse core allows a combination of different 'Console Packs' across multiple mixing consoles. Up to 4 DSP mezzanine cards can be fitted to the DSP module which has been designed to be flexible & provide sufficient processing for up to 4 different consoles connected to an Impulse core arranged to run on the 2 pairs of Mezzanine modules. The DSP Pairing Options table is shown below.

DSP MIXER PAIRING OPTIONS

DSP Pack Licence Name	Argo S/Argo Q Mixer A	Argo S/Argo Q Mixer B	Argo S/Argo Q Mixer C	Argo S/Argo Q Mixer D
Base Pack 1	Pack 1 Pack 1	None Pack 1	Pack 1 Pack 1	None Pack 1
Base Pack 2	Pack 2 Pack 2 Pack 2	None Pack 1 Pack 2	Pack 2 Pack 2 Pack 2	None Pack 2 Pack 2
Base Pack 3	Pack 3 Pack 3 Pack 3 Pack 3	None Pack 1 Pack 2 Pack 3	Pack 3 Pack 3 Pack 3 Pack 3	None Pack 1 Pack 2 Pack 3
Base Pack 4	Pack 4 Pack 4 Pack 4 Pack 4 Pack 4	None Pack 1 Pack 2 Pack 3 Pack 4	Pack 4 Pack 4 Pack 4 Pack 4 Pack 4	None Pack 1 Pack 2 Pack 3 Pack 4
Base Pack 5	Pack 5 Pack 5 Pack 5B Pack 5B Pack 5B Pack 5C	None Pack 1 Pack 2 Pack 3 Pack 4 Pack 5C	Pack 5 Pack 5 Pack 5B Pack 5B Pack 5B Pack 5C	None Pack 1 Pack 2 Pack 3 Pack 4 Pack 5C
Base Pack 6	Pack 6 Pack 6 Pack 6B Pack 6B	None Pack 1 Pack 2 Pack 3	Pack 6 Pack 6 Pack 6B Pack 6B	None Pack 1 Pack 2 Pack 3
Base Pack 7	Pack 7 Pack 7B	None Pack 1	Pack 7 Pack 7B	None Pack 1
Base Pack 8	Pack 8	None	Pack 8	None

Notes: Mixers A & B reside on the first pair of Mezzanine cards slots 0 & 2 and Mixers C & D reside on the second pair of Mezzanine cards slots 1 & 3 on the DSP carrier module, and the mapping of the Mixer packs to the actual surfaces can be swapped around as required.

PRIMARY CORE – ROUTER INTERFACES – SUGGESTED SETTINGS

The suggested default settings for the Primary Impulse Core Router Interfaces are shown below. Use the tables below to configure your AoIP Router ports and to record the serial number and label details of each router port for later reference. After configuring the AoIP Router interfaces, you may want to attach labels to them. A blank label sheet is provided with the Impulse core for this purpose. A printer template for this Label sheet is available to distributors on the Calrec Website.

Primary Core Router I/F Number	Primary Core Router Port Label	Primary Core Router Module Serial number	Primary interface IP Address	Subnet mask*	Secondary interface IP Address	Subnet mask**
1	Router #1-1A/1B		192.168.30.111	/24	192.168.31.111	/24
2	Router #1-2A/2B		192.168.30.112	/24	192.168.31.112	/24
3	Router #1-3A/3B		192.168.30.113	/24	192.168.31.113	/24
4	Router #1-4A/4B		192.168.30.114	/24	192.168.31.114	/24
5	Router #2-1A/1B		192.168.30.121	/24	192.168.31.121	/24
6	Router #2-2A/2B		192.168.30.122	/24	192.168.31.122	/24
7	Router #2-3A/3B		192.168.30.123	/24	192.168.31.123	/24
8	Router #2-4A/4B		192.168.30.124	/24	192.168.31.124	/24
9	Router #3-1A/1B		192.168.30.131	/24	192.168.31.131	/24
10	Router #3-2A/2B		192.168.30.132	/24	192.168.31.132	/24
11	Router #3-3A/3B		192.168.30.133	/24	192.168.31.133	/24
12	Router #3-4A/4B		192.168.30.134	/24	192.168.31.134	/24
13	Router #4-1A/1B		192.168.30.141	/24	192.168.31.141	/24
14	Router #4-2A/2B		192.168.30.142	/24	192.168.31.142	/24
15	Router #4-3A/3B		192.168.30.143	/24	192.168.31.143	/24
16	Router #4-4A/4B		192.168.30.144	/24	192.168.31.144	/24

**Subnet masks are displayed in CIDR notation

The entries in GREEN are the defaults for a Redundant Impulse System with the minimum of 1 Router Module Installed

SECONDARY CORE – ROUTER INTERFACES – SUGGESTED SETTINGS

The suggested default settings for the Secondary Impulse Core Router Interfaces are shown below. Use the tables below to configure your AoIP Router ports and to record the serial number and label details of each router port for later reference. After configuring the AoIP Router interfaces, you may want to attach labels to them. A blank label sheet is provided with the Impulse core for this purpose. A printer template for this Label sheet is available to distributors on the Calrec Website.

Secondary Core Router Interface Number	Secondary Core Router Port Label	Secondary Core Router Module Serial number	Primary interface IP Address	Subnet mask*	Secondary interface IP Address	Subnet mask**
1	Router #1-1A/1B		192.168.30.211	/24	192.168.31.211	/24
2	Router #1-2A/2B		192.168.30.212	/24	192.168.31.212	/24
3	Router #1-3A/3B		192.168.30.213	/24	192.168.31.213	/24
4	Router #1-4A/4B		192.168.30.214	/24	192.168.31.214	/24
5	Router #2-1A/1B		192.168.30.221	/24	192.168.31.221	/24
6	Router #2-2A/2B		192.168.30.222	/24	192.168.31.222	/24
7	Router #2-3A/3B		192.168.30.223	/24	192.168.31.223	/24
8	Router #2-4A/4B		192.168.30.224	/24	192.168.31.224	/24
9	Router #3-1A/1B		192.168.30.231	/24	192.168.31.231	/24
10	Router #3-2A/2B		192.168.30.232	/24	192.168.31.232	/24
11	Router #3-3A/3B		192.168.30.233	/24	192.168.31.233	/24
12	Router #3-4A/4B		192.168.30.234	/24	192.168.31.234	/24
13	Router #4-1A/1B		192.168.30.241	/24	192.168.31.241	/24
14	Router #4-2A/2B		192.168.30.242	/24	192.168.31.242	/24
15	Router #4-3A/3B		192.168.30.243	/24	192.168.31.243	/24
16	Router #4-4A/4B		192.168.30.244	/24	192.168.31.244	/24

**Subnet masks are displayed in CIDR notation

The entries in GREEN are the defaults for a Redundant Impulse System with the minimum of 1 Router Module Installed

AOIP DEVICES – NETWORK INTERFACES – SUGGESTED SETTINGS

The suggested default settings for the first 20 AoIP devices attached to a given Impulse system are shown below. Use the tables below to configure your AoIP devices and to record the serial number and label details of each device for later reference. Note that MOD I/O boxes can have 2 AoIP network interface connections and would take up 2 box entries. After configuring the AoIP network interfaces, you may want to attach labels to them. A blank label sheet is provided with the Impulse core for this purpose. A printer template for this Label sheet is available to distributors on the Calrec Website.

Box No	IO box label	Serial number	Primary interface IP Address	Subnet mask*	Secondary interface IP Address	Subnet mask**
1	Mod I/O #1-1A/1B		192.168.30.11	/24	192.168.31.11	/24
2	Mod I/O #1 2A/2B		192.168.30.12	/24	192.168.31.12	/24
3	Mod I/O #2-1A/1B		192.168.30.13	/24	192.168.31.13	/24
4	AoIP Box Label		192.168.30.14	/24	192.168.31.14	/24
5	Mod I/O #3-1A/1B		192.168.30.15	/24	192.168.31.15	/24
6	AoIP Box Label		192.168.30.16	/24	192.168.31.16	/24
7	AoIP Box Label		192.168.30.17	/24	192.168.31.17	/24
8	AoIP Box Label		192.168.30.18	/24	192.168.31.18	/24
9	AoIP Box Label		192.168.30.19	/24	192.168.31.19	/24
10	AoIP Box Label		192.168.30.20	/24	192.168.31.20	/24
11	AoIP Box Label		192.168.30.21	/24	192.168.31.21	/24
12	AoIP Box Label		192.168.30.22	/24	192.168.31.22	/24
13	AoIP Box Label		192.168.30.23	/24	192.168.31.23	/24
14	AoIP Box Label		192.168.30.24	/24	192.168.31.24	/24
15	AoIP Box Label		192.168.30.25	/24	192.168.31.25	/24
16	AoIP Box Label		192.168.30.26	/24	192.168.31.26	/24
17	AoIP Box Label		192.168.30.27	/24	192.168.31.27	/24
18	AoIP Box Label		192.168.30.28	/24	192.168.31.28	/24
19	AoIP Box Label		192.168.30.29	/24	192.168.31.29	/24
20	AoIP Box Label		192.168.30.30	/24	192.168.31.30	/24

**Subnet masks are displayed in CIDR notation

The Mod I/O entries above are examples from the Argo S+ Impulse System with 3 Mod I/O AoIP boxes from Section 12.

FURTHER READING – IMPULSE

Impulse has a number of Manuals associated with it. This is the Impulse - Argo Start Up Guide:-

1. Impulse - Argo Product Info Sheet (926-320)
This information sheet shows how to collect information on Impulse - Argo

2. Impulse - Argo Start Up Guide (926-321)
This guide shows how to Power Up and Access/Configure the Impulse core, Configure the Argo Surface IP connections, Connect the Argo Surface to the Impulse Cores, Power Up the Argo Surface & Create a New Show, Configure Network Switches & Devices, Access the Configure/Connect/Software Updater/Assist* applications, Update the Core Software to the latest version (optional), Configure AoIP Router & AoIP Device IP addresses, Connect Audio Switches & AoIP Devices to the Core and Examine an example system.

3. Impulse Installation Manual (926-288) * Updated for Argo S & Argo Q
This contains a number of chapters including an overview of the Impulse system, Defining the system elements of an Impulse core, Core DSP pack options, Synchronisation, Surface Connections, AoIP network connections, Redundancy, AoIP network examples, External Control connections and Technical specifications.

4. Impulse Configure Application Guide (926-290) * Updated for Argo S & Argo Q
This defines how Impulse system Core(s) can be configured and partitioned into different mixing surfaces with varying amounts of DSP processing channels available in different 'Pack' sizes under licence. It provides guidance on updating the system software, backing up and restoring user data, setting the sample rate, controlling the application containers that run the system and provide maintenance logs. It's also used to configure the IP addresses of the Network Interface Controllers for the application containers, manage the Remote Network interfaces such as the RP1, AoIP interfaces for the Audio Routers, PTP interfaces for synchronisation, setting up Argo Control Surface layouts, synchronisation sources, Core I/O Virtual Patchbays and Users, Roles & Permissions.

5. Connect Guide (926-292)
This defines how the Impulse/Type R Core IP Input and Output streams are connected to AoIP based interfaces and how the AoIP streams are managed including GPIO devices. These can be connections to and from either Calrec AoIP Devices or other 3rd party AoIP streams.

6. 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.

7. Argo Installation Manual (926-312)
This contains information about the installation and setup of the Argo surface for use with Impulse systems.

8. Argo Operator Manual (926-313)
This defines how an installed Argo console is configured and controlled via its surface. 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 settings sections provide configuration tools for both show and system configuration.

9. Argo Assist Manual (926-317)
This defines how an Argo with or without a physical console is setup and controlled via Calrec Assist, which is Calrec's web-based user operation tool.

USER NOTES

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