



# Power Core<sup>RP</sup> v2

## User Manual

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**Power Core<sup>RP v2</sup>** is a remote production solution for Lawo's mc<sup>2</sup> mixing consoles.

The device works with the following products:

- mc<sup>2</sup>36 MKII and xp.
- mc<sup>2</sup>56 MKIII.
- mc<sup>2</sup>96 (all variants).

This manual describes how to install, setup and operate the device.



# 1 Power Core RP v2- General Information

Before you start working with Power Core RP v2, please read the following information.

- [Power Core RP v2- About this Documentation](#)
- [Power Core RP v2 - Important Safety Instructions](#)
- [Power Core RP v2 - Important Cleaning Instructions](#)


## 1.1 Power Core RP v2- About this Documentation

This documentation represents the latest state of information. Subject to availability, manuals covering former versions are provided via the [Lawo Download-Center](#) (after login).


### General Safety & Important Notes

When working with our hardware components, it is important to read and observe all of the instructions provided in the "[General Safety Information for Lawo Equipment](#)" booklet delivered with your devices.

The same symbols are used in the product documentation so please look out for them as follows. The letter in brackets before the signal word denotes the language version: e.g. (E) = English.


 **(E) WARNING** - warnings or mandatory actions.


These instructions **must always be observed** to ensure the personal safety of the user, and to protect your system and the work environment from potential damage.


 **(E) IMPORTANT NOTE** - important information for proper functioning.


### Other Informational Icons

When reading about our software or the general operation, you may also see the following icons.

 General information and points of clarification. Please take note.

 Useful tips and shortcuts. Feel free to follow if you like.

 Notes. To avoid getting stuck, make sure you follow.

 Important actions. To keep the system operational, you should always follow.

### Further Information

Mechanical drawings and data sheets (including weights and dimensions) are available from the [Lawo Download-Center](#) (after login). We also recommend that you carefully observe the release notes for your product/system.

### Lawo User Registration

For access to the [Lawo Download-Center](#), and to receive regular product updates, please register at: [www.lawo.com/registration](http://www.lawo.com/registration).

### Contact Details

If you need further assistance, the Lawo Support Department can be contacted by email at [support@lawo.com](mailto:support@lawo.com), or by telephone during normal working hours - please visit the [Support](#) area of the Lawo website for the most up-to-date contact details.



## 1.2 Power Core RP v2 - Important Safety Instructions

When working with our hardware components, please read and observe all of the instructions provided in the "General Safety Information for Lawo Equipment" booklet delivered with your devices.

Click on the link below to read or download the booklet as a pdf.

[Lawo\\_Safety.pdf](#)

## 1.3 Power Core RP v2 - Important Cleaning Instructions

Before cleaning your Lawo devices, please read and observe all of the following instructions.

### (E) ATTENTION

DO NOT spill liquids into any system components!

DO NOT clean the front panels or operational surfaces with sharp instruments.

### (F) ATTENTION

NE PAS renverser de liquides dans les composants du système!

NE PAS nettoyer les panneaux avant ou les surfaces opérationnelles avec des instruments pointus.

### (E) IMPORTANT NOTE

#### General Cleaning / Disinfecting Requirements

Lawo hardware products are made from a variety of different materials, and each material might have specific cleaning requirements. Therefore, a general allowance for the disinfection of product surfaces with disinfectants containing alcohol cannot be given.

Our front panels and operational surfaces are not entirely approved for treatment with chemical cleaning agents and disinfectants. Component surfaces, buttons and electronics can be permanently damaged by treatment with such agents and the lifespan can be dramatically shortened. Please note that some substances can lead to discoloration of surfaces.

Lawo is not responsible for damage caused by the unauthorized use of disinfectants on our products and surfaces. Damages caused by unspecified treatment of modules and components are not covered by regular or extended warranties or SLA regulations.

This is a general instruction and recommendation for cleaning that applies to all Lawo products:

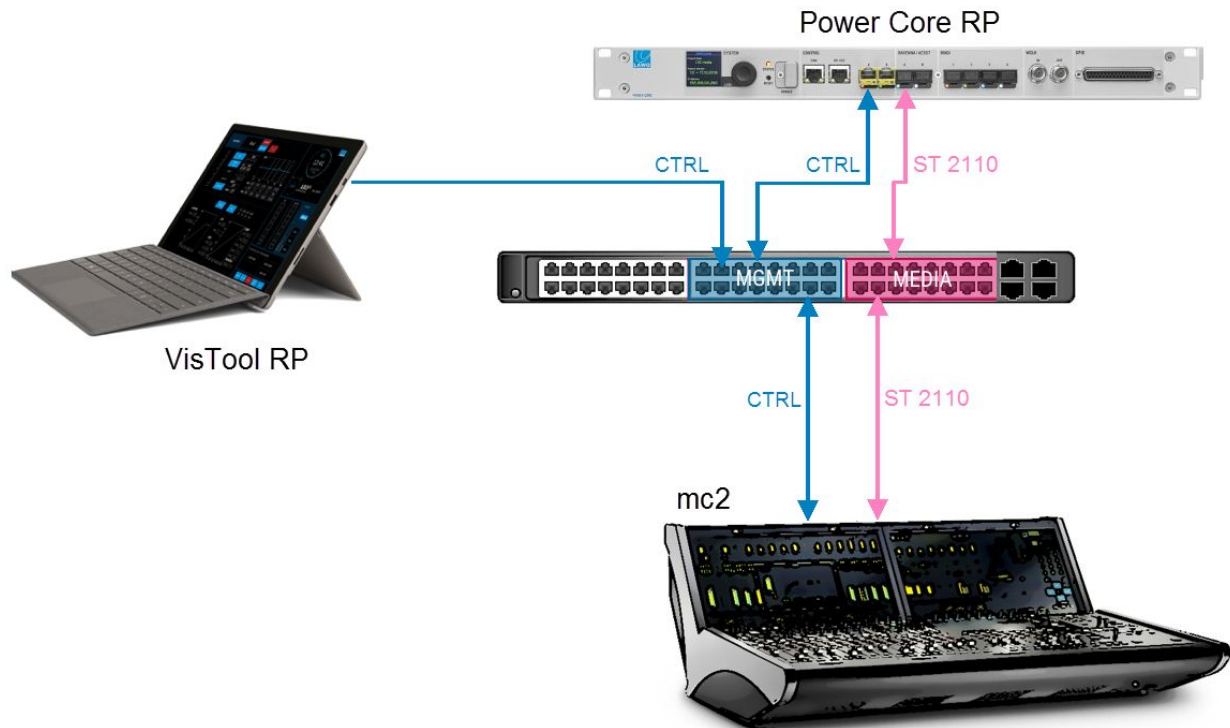
- Before cleaning the device, unplug all external power sources.
- Clean the device with a soft cloth, dipped lightly in warm to hot soapy water.
- Do not use any liquid cleaning agents or spray cleaners that may contain flammable materials.
- Do not get moisture into any openings.
- Do not use aerosol sprays, bleaches, or abrasives.
- Do not spray cleaners directly onto the item.

The above information and our technical application advice are given to the best of our knowledge.

## 2 Power Core RP v2 - Product Overview

**Power Core RP v2** is a remote production solution for Lawo's mc<sup>2</sup> audio consoles. It provides integrated modular IO, DSP and IP streaming capabilities, and is typically used to create low-latency mixes locally at the production venue (e.g. for monitors or IFBs).

The diagram below shows a typical installation with a single Power Core RP v2 device.



Up to four Power Core RP v2 devices can be controlled from one mc<sup>2</sup> console. Each Power Core RP v2 connects to the media network to transfer audio over IP, and to the management network to transfer control data.

- The MEDIA connection streams audio to and from the mc<sup>2</sup> system (for matrix assignment and console monitoring).
- The MGMT connection allows the console to remotely control DSP within Power Core via RPx (Remote Production) channels.

In addition to the console integration, Power Core RP v2 can be controlled from VisTool RP, a screen-based graphical user interface running on a networked PC.

### 2.1 Power Core RP v2 Local Resources

Each 1RU, 19-inch unit comes with a fixed DSP configuration of 64 mono input channels and 16 stereo auxes, plus two discrete stereo monitoring buses including AFL & PFL capabilities.

Additionally, a 16x12 mono matrix summing mixer (the "Co-Mixer"), 8 Talkback Inputs, and 4 stereo down-mixers are available.

The local I/O is flexible, via plug-in expansion I/O cards on the rear panel. All I/O cards are supported, including MADI, MADI SRC, and Dante cards.

Signals from the local I/O cards, as well as the front panel MADI & Ravenna ports can be freely assigned to any of the 64 mono input channels.



## 2.2 Remote Control from VisTool RP

From the GUI's "Mixer" page, you can adjust the fader levels and DSP parameters for the 64 input channels and 16 auxes. Other pages include:

- Meters (Meters for all Inputs & DSP Outputs)
- I/O Routing
- Talkback (for controlling the talkback system)
- Co-Mixer (for controlling co-mixer summing assignments)
- Mic Pre (for controlling local or A\_Mic8 preamps)
- Web (an embedded web browser with 10 programmable bookmarks)

## 2.3 Remote Control from the Console

By assigning RPx input and aux channels to the console's fader strips, you can remotely adjust the Power Core RP v2 DSP resources from the console's fader strips or Central Control Section.



## 3 Power Core RP v2 - Getting Started

This chapter describes the local operation of the device.

- [Power Core RP v2 - Controls, Connectors and Indicators](#)
- [Power Core RP v2 - Powering On](#)
- [Power Core RP v2 - SYSTEM Display](#)



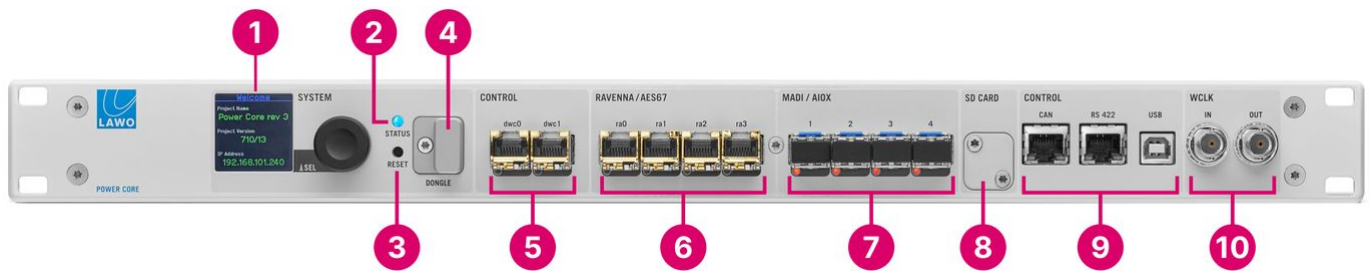
### 3.1 Power Core RP v2 - Controls, Connectors and Indicators

The descriptions below provide a quick guide to the controls, connectors and indicators. For more information about how to connect the device, see [Power Core RP v2 - Wiring](#).

This topic covers both of the current hardware revisions. Note that the front panel controls differ slightly, while the rear panel is the same for both revisions.

- [Front View, Revision 3](#)
- [Front View, Revision 2](#)
- [Rear View \(all revisions\)](#)
- [Comparison of Revisions](#)

#### Front View, Revision 3



#### 1. SYSTEM Display & Menu Control

The [front panel display](#) can be used to edit local device parameters such as the IP address.

#### 2. STATUS LED

The **STATUS** LED indicates the health of the device and sync status.

- If the LED is blinking at regular intervals, then the device is working properly and the LED color indicates the sync source/status.
- If the LED is lit and static, then either the device is booting or there is an internal problem.


The table below describes all possible meanings.

Blinking STATUS LED	Meaning
Blue ↔ Off	Synchronized to PTP master
Yellow ↔ Off	Trying to sync to PTP master
Red ↔ Off	Synchronized to internal clock
Green ↔ Off	Synchronized via Wordclock
Magenta ↔ Off	Synchronized via MADI
Red ↔ white	Device is PTP Master, sync source = internal
Green ↔ white	Device is PTP Master, sync source = Wordclock
Magenta ↔ white	Device is PTP Master, sync source = MADI

Static STATUS LED	Meaning
Off	System powered off
White	System starting
Color (not white)	System failure

### 3. RESET button

The **RESET** button can be used to reboot the device and load the warm start data. The button is recessed to prevent accidental operation.

 This operation should NOT be performed while the device is live on-air!

### 4. DONGLE

The **DONGLE** port should be used to connect the USB memory stick containing your system's [WIBU license\(s\)](#). A safety cap is available to prevent accidental removal of the dongle. If fitted, you will need a T10 star tool to remove the cap.

### 5. CONTROL Network Ports

The **dwc0** and **dwc1** network ports provide a connection to the device's control system.

It is possible to configure **dwc0** and **dwc1** as redundant interfaces using either a LACP bond or generic failover mode using the Power Core web UI.

The control network must be separate from the streaming network connected to the RAVENNA/AES67 ports (6).

### 6. RAVENNA/AES67 Network Ports

The **ra0**, **ra1**, **ra2** and **ra3** interfaces can be used to stream audio to and from the IP network. The first pair of interfaces are enabled as standard. The second pair of interfaces can be enabled by purchasing the optional [AddOnRAV+](#) license.

The Ravenna interfaces can be used to connect the Power Core to the media network (to stream audio to and from the mc<sup>2</sup> console). The RP offers 3 default configurations:

- 32x 8ch Streams
- 16x 16ch Streams
- 4x 64ch Streams

Using the AddOn RAV+ license doubles the stream count. The streams are fully compatible with SMPTE ST2110-30/31, AES67 and RAVENNA. To achieve redundant streaming, compatible with SMPTE ST2022-7, you must use both interfaces: ra0/ra1 or ra2/ra3.

The streaming network must be properly managed and configured.

### 7. MADI/AIOX Ports

The four MADI/AIOX ports may be configured in one of three modes:

- Mode 1: Front Port 1, 2, 3, 4 are configured independently (4x64ch)
- Mode 2 : Front Port 1 and 2 are a redundant pair, Front Port 3 and 4 are independent (1x64ch + 2x 64ch)
- Mode 3 : Front Port 1 and 2 are a redundant pair, as well as Front Port 3 and 4 (2x 64ch)

### 8. SD Card

The SD card stores all of the system software and configuration data. It can be accessed by removing the safety cover (included).



It can be quickly inserted into a replacement device (if you are exchanging the hardware). Or, removed and copied (to create a backup of the system data).

## 9. Other CONTROL Ports

Power Core revision 3 supports three other control data ports.

**CAN** - this port is not used by mc<sup>2</sup> systems. It should be left unconnected.

**RS-422** - this port is not used by mc<sup>2</sup> systems. It should be left unconnected.

**USB** - the USB port can be used for debugging.

## 10. WCLK IN & OUT

The two WCLK connectors can be used for external synchronization.

If Ravenna streams are being used, the Power Core RP v2 must be synchronized to PTP arriving from the streaming network OR must be configured as a PTP Master. If the Power Core RP v2 is a PTP Slave:


**WCLK IN** will not be used.

**WCLK OUT** provides an output of the current system reference. It can be used to distribute a wordclock signal to non-PTP devices.

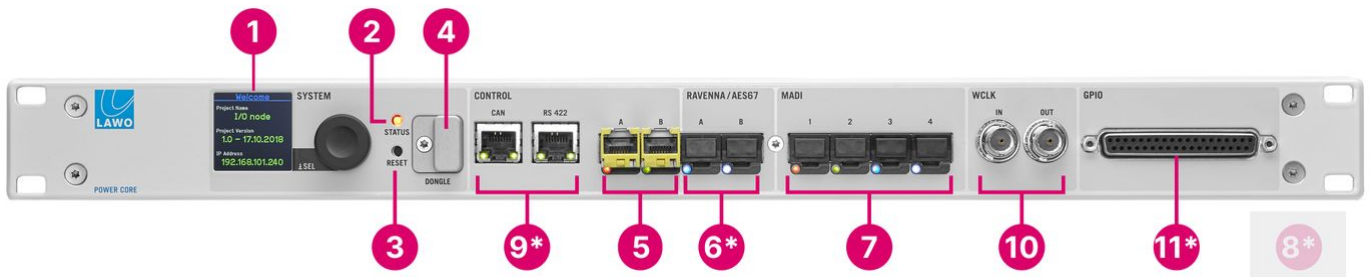
If the Power Power Core RP v2 is a PTP master

**WCLK IN** can be connected to provide an external sync reference

**WCLK OUT** provides an output of the current system reference. It can be used to distribute a wordclock signal to non-PTP devices.

 The **WCLK OUT** will not function while the Power Core is being rebooted.

## Front View, Revision 2



The asterisks (\*) indicate a difference in functionality from a revision 3 frame: fewer RAVENNA/AES67 ports (6); no access to SD card (8); no USB port (9); GPIOs are included (11). All other controls work in an identical manner, with some variations in the connector labelling.

### 1. SYSTEM Display & Menu Control

The front panel display can be used to edit local device parameters such as the IP address.

### 2. STATUS LED

The **STATUS** LED indicates the health of the device and sync status.

If the LED is blinking at regular intervals, then the device is working properly and the LED color indicates the sync source/status.

If the LED is lit and static, then either the device is booting or there is an internal problem.

The table below describes all possible meanings.

Blinking STATUS LED	Meaning
Blue ↔ Off	Synchronized to PTP master
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Red ↔ Off	Synchronized to internal clock
Green ↔ Off	Synchronized via Wordclock
Magenta ↔ Off	Synchronized via MADI
Red ↔ white	Device is PTP Master, sync source = internal
Green ↔ white	Device is PTP Master, sync source = Wordclock
Magenta ↔ white	Device is PTP Master, sync source = MADI

Static STATUS LED	Meaning
Off	System powered off
White	System starting
Color (not white)	System failure

### 3. RESET button

The **RESET** button can be used to reboot the device and load the warm start data. The button is recessed to prevent accidental operation.

**i** This operation should NOT be performed while the device is live on-air!

### 4. DONGLE

The **DONGLE** port should be used to connect the USB memory stick containing your system's [WIBU license\(s\)](#). A safety cap is available to prevent accidental removal of the dongle. If fitted, you will need a T10 star tool to remove the cap.

### 5. CONTROL Network Ports

The CONTROL **A** and **B** network ports provide a connection to the device's control system.

It is possible to configure CONTROL **A** and **B** as redundant interfaces using either a LACP bond or generic failover mode using the Power Core web UI. It connects the device to the management network (for administration and control).

The control network must be separate from the streaming network connected to the RAVENNA/AES67 ports (6).

### 6. RAVENNA/AES67 Network Ports

The RAVENNA/AES67 **A** and **B** interfaces can be used to stream audio to and from the IP network.

In an mc<sup>2</sup> installation, the ports connect the device to the media network (to stream audio to and from the mc<sup>2</sup> console). The streams must be configured by HOME (as part of the system setup).

The streams are fully compatible with SMPTE ST2110-30/31, AES67 and RAVENNA. To achieve redundant streaming, compatible with SMPTE ST2022-7, you must use both interfaces: ra0/ra1 or ra2/ra3.

The streaming network must be properly managed and configured.

### 7. MADI/AIOX Ports

The four MADI/AIOX ports may be configured in one of three modes:

- Mode 1: Front Port 1, 2, 3, 4 are configured independently (4x64ch)
- Mode 2 : Front Port 1 and 2 are a redundant pair, Front Port 3 and 4 are independent (1x64ch + 2x 64ch)
- Mode 3 : Front Port 1 and 2 are a redundant pair, as well as Front Port 3 and 4 (2x 64ch)

### 9. Other CONTROL Ports

Power Core revision 2 supports two other control data ports.

**CAN** - this port is not used by mc<sup>2</sup> systems. It should be left unconnected.

**RS-422** - this port is not used by mc<sup>2</sup> systems. It should be left unconnected.

### 10. WCLK IN & OUT

The two WCLK connectors can be used for external synchronization.

If Ravenna streams are being used, the Power Core RP v2 must be synchronized to PTP arriving from the streaming network OR must be configured as a PTP Master. If the Power Core RP v2 is a PTP Slave:

**WCLK IN** will not be used.


**WCLK OUT** provides an output of the current system reference. It can be used to distribute a wordclock signal to non-PTP devices.

If the Power Core RP v2 is a PTP master

**WCLK IN** can be connected to provide an external sync reference



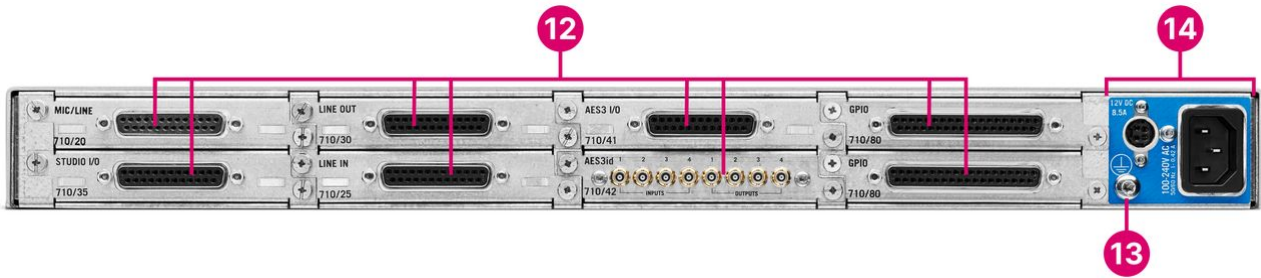
**WCLK OUT** provides an output of the current system reference. It can be used to distribute a wordclock signal to non-PTP devices.

 The **WCLK OUT** will not function while the Power Core is being rebooted.

## 11. GPIO

The front panel GPIO connector provides 8 x GPI (optocouplers) and 8 x GPO (silent and self-healing relays) for local signaling and switched functions. These GPIOs are available in HOME.

## Rear View (all revisions)



### 12. Expansion I/O Cards

Up to 8 expansion I/O cards can be fitted to the slots at the rear of the frame. All cards are hot-pluggable. Options include: Mic/Line In, Line Out, Studio I/O, AES3 I/O, Dante, MADI, MADI SRC, and GPIO.

### 13. CASE Grounding Screw

The **CASE** screw is used to ground the frame. Please see Power Core RP v2 - Grounding.

### 14. Power Inputs: AC & DC

Power Core comes with dual power feeds: AC and DC. To use the DC input, you will need the external DC power supply which must be ordered separately. If both inputs are connected, then the two feeds provide main and redundant power.

Please see Power Core RP v2 - Power Supplies.

## Comparison of Revisions

The table below compares the current hardware revisions; all differences are highlighted in **bold**.

		Revision 3	Revision 2	Notes
1.	SYSTEM Display & Menu Control	yes	yes	
2.	STATUS LED	yes	yes	
3.	RESET button	yes	yes	
4.	DONGLE port	yes	yes	
5.	CONTROL Network Ports	2	2	dwc0 = CONTROL A; dwc1 = CONTROL B
6.	<b>RAVENNA/AES67 Network Ports</b>	<b>4</b>	<b>2</b>	ra0 = RAVENNA A; ra1 = RAVENNA B
7.	MADI/AIOX Ports	4	4	
8.	<b>Front panel access to SD card</b>	<b>yes</b>	<b>no, access is internal</b>	
9.	<b>USB service port</b>	<b>yes</b>	<b>no, use RS-422 port</b>	
10.	WCLK IN & OUT	yes	yes	
11.	<b>Front panel GPIO</b>	<b>no</b>	<b>yes</b>	GPIO can be added via the rear expansion I/O cards

## 3.2 Power Core RP v2 - Powering On

Power Core RP v2 has no on/off switch and starts automatically when power is applied. The system can also be restarted remotely using a Web UI or Telnet connection, see [Power Core RP v2 - System Restart](#).

The boot-up progress is shown on the front panel:

1. First, the SYSTEM display and **STATUS** LED are black and unlit.
2. Then, the Lawo logo appears and the **STATUS** LED lights in white.
3. As soon as boot-up is complete, the **Welcome** page appears and the **STATUS** LED starts to blink; its color reflects the [sync status](#).



If the **STATUS** LED does not start to blink, then the device has an internal problem. Please reboot the device (using the RESET button) as a first step.

At the end of the boot-up, Power Core loads the latest settings (stored at shut-down). This is known as the warm start data, and it means that the system returns to whatever the settings were at the last power off.

There are two exceptions: PTP parameters that have been edited using the Web UI and output stream parameters that are changed during runtime via Ember+. In this instance, the changes are not warm start persistent and the parameters reset to the values stored in the configuration.

### Please note:

- If you perform a cold start, then the system ignores the warm start data and resets all settings to the default values stored in the configuration.
- If this is the first time you have powered the device "out of the box", then the system loads a very basic configuration that allows Power Core to boot. To get the system operational, you will need to upload the standard configuration or a custom configuration using the ON-AIR Designer.

### Powering Off / Shutdown

There is no special shutdown procedure for the hardware. So, to power down, turn off the mains power.



### 3.3 Power Core RP v2 - SYSTEM Display

The front panel display and rotary encoder can be used to view or edit device parameters. The same parameters can be accessed via the [Power Core Web UI](#).



There are four navigation levels: page select, parameter select, parameter edit and character edit. In each case, turn the rotary encoder to scroll through the available options and push down to select.

#### 1. Page Select.

Turn the encoder to scroll through the available pages. Push down to select the highlighted page.

#### 2. Parameter Select.

Turn the encoder to scroll through the available parameters. Push down to select the highlighted parameter, or return to the previous level (if nothing is highlighted).

#### 3. Parameter Edit.

Turn the encoder to scroll through the parameter fields/characters. Push down to edit the highlighted character, or return to the previous level (if nothing is highlighted).

#### 4. Character Edit.

Once a character is highlighted, turn the encoder to change its value. Push down to accept the change.

Once all characters have been edited, push down and hold to save the changes. Alternatively, push down (when no character is highlighted) to cancel and return to the previous level.

You can use the following commands to insert, delete or clear all characters:

- Select the up arrow to insert a new character.
- Select the down arrow to delete the selected character.
- Select "α" to clear all.

If you push down and hold the encoder during boot-up, the device will reset to a default firmware image and empty configuration.

### Identifying a Power Core

The "Identify" function can be used to send a message to the front panel display so that a Power Core can be easily identified. The message can be sent in one of three ways:

- via Ember+ - using Provider 1: / PowerCore/ System / Identify (1.29.20)
- via the Web UI - select "Identify" on the [System](#) → [Control](#) tab.
- via the console command: `sys_id \[y | n\]`
- via the HOME Web UI - using the [Identify Hardware](#) function.

Once activated, the display shows "HELLO I AM \[dwc0 IP Address\]". The message disappears once you de-activate "Identify" or push down on the encoder.



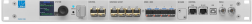


## 4 Power Core RP v2 - Hardware

This chapter describes the Power Core RP v2 frame and its hardware components.

- [Power Core RP v2 - Hardware Revisions](#)
- [Power Core RP v2 - Frame Description](#)
- [Power Core RP v2 - Power Supplies](#)
- [Power Core RP v2 - Grounding](#)
- [Power Core RP v2 - Expansion I/O Cards](#)
- [Power Core RP v2 - SFP Transceivers](#)
- [Power Core RP v2 - Audio I/O Extender](#)

## 4.1 Power Core RP v2 - Hardware Revisions

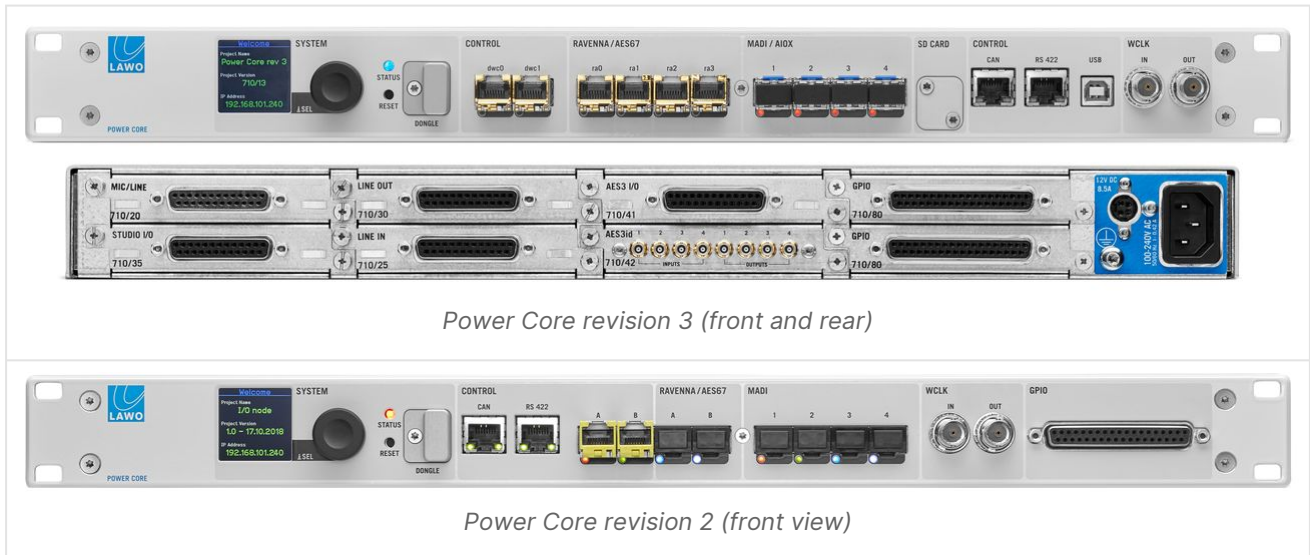
There have been three revisions of Power Core since its first introduction. The table below summarizes the main differences. Power Core RP v2 can be ordered in either of the current revisions (2 and 3).

Power Core Frame	Type Number	Summary of differences
<b>Revision 3, Current</b> 	710/13	Changes from revision 2: <ul style="list-style-type: none"> <li>• Added 2 x RAVENNA/AES67 interfaces (ra2, ra3). This doubles the maximum number of streams/AoIP channels.</li> <li>• Easy access to SD card (from front) for data backup/exchange.</li> <li>• New USB type B server port (at front) for diagnostics.</li> <li>• Removed GPIO (from front) to make way for new features. GPIOs can be added via rear expansion I/O cards.</li> </ul>
<b>Revision 2, Current</b> 	710/11	Changes from revision 1: <ul style="list-style-type: none"> <li>• All network interfaces changed from RJ45 to SFPs, to support a range of cable types and connectors.</li> <li>• Added 1 x network control interface (dwc1).</li> </ul>
<b>Revision 1, Discontinued</b> 	710/10	First release. <ul style="list-style-type: none"> <li>• 1 x network control interface (dwc0).</li> <li>• 2 x RAVENNA/AES67 interfaces (ra0, ra1).</li> <li>• All network interfaces available via RJ45.</li> <li>• GPIO included (at front).</li> </ul>

## 4.2 Power Core RP v2 - Frame Description

Power Core RP v2 comes with a number of standard components (at the front) and eight expansion I/O slots (at the rear). The images below show the front and rear of a fully populated frame.

This topic covers both of the current hardware revisions. Note that the front panel controls differ slightly, while the rear panel is the same for both revisions.



### Key Facts

- Frame size = 19" / 1RU. The frame is designed for indoor use and rack mounting.
- Dual-power feeds are included: 1 x AC and 1 x DC. To use the DC input, you will need to order the external DC power supply (optional).
- Temperature-controlled cooling fans.
- To integrate with an mc<sup>2</sup> system, the device must be installed with the "**AP IO Node**" license. This is installed onto a USB memory stick connected to the DONGLE port.
- The DSP resources provide:
  - 64 mono input channels for external sources.
  - 16 stereo auxes.
  - Two discrete stereo AFL, PFL and Listen buses for monitoring.
  - 16x12 mono matrix summing mixer (the "Co-Mixer")
  - 8 talkback inputs
  - 8 flexible direct outs
  - 4 stereo down-mixers
- The local I/O configuration is flexible and specified via plug-in expansion I/O cards on the rear panel. Options include Mic/Line In, Line In (only), Line Out (only), AES3 In/Out, Dante, MADI, or MADI SRC.
- Signals from the local I/O cards, as well as the front panel MADI & Ravenna ports can be freely assigned to any of the 64 mono input channels.
- The resources can be remotely controlled in one of two ways:
  - from the console's fader strips (using RPx input and aux channels).
  - from VisTool RP, a screen-based graphical user interface running on a networked PC.

### Power Core RP v2 vs Power Core

Power Core RP v2 is identical to Power Core (as an I/O node) apart from the following:

- The DSP resources come in a fixed configuration defined by the "AP I/O Node" license.

## Components

Each frame has the following user-serviceable components:

- Expansion I/O cards (fitted to the rear).
- USB dongle (fitted to the front).
- SD Card, revision 3 only (fitted to the front).
- Other internal components can be replaced by removing the top cover.

### (E) WARNING

- For safety reasons, and to ensure efficient cooling, Power Core RP v2 must not operate without a fully-closed frame. i.e. any spare expansion I/O slots must be closed with cover plates (at the rear).
- You must disconnect the unit from its power source before removing the top cover of the frame.

## Ordering Information

To specify a new system, please follow these steps:

1. Order the Power Core frame using the following part number: 710/13 (revision 3) or 710/11 (revision 2).
2. Optional: add an external DC power supply for the frame(s). See [Power Core RP v2 - Power Supplies](#).
3. Optional: add the [AddOnRAV+](#) license
4. Add the required number of [expansion I/O cards](#) - to populate the frame(s).
5. Don't forget the [SFP modules](#) for the network CONTROL and RAVENNA/AES67 port(s).

## Further Information

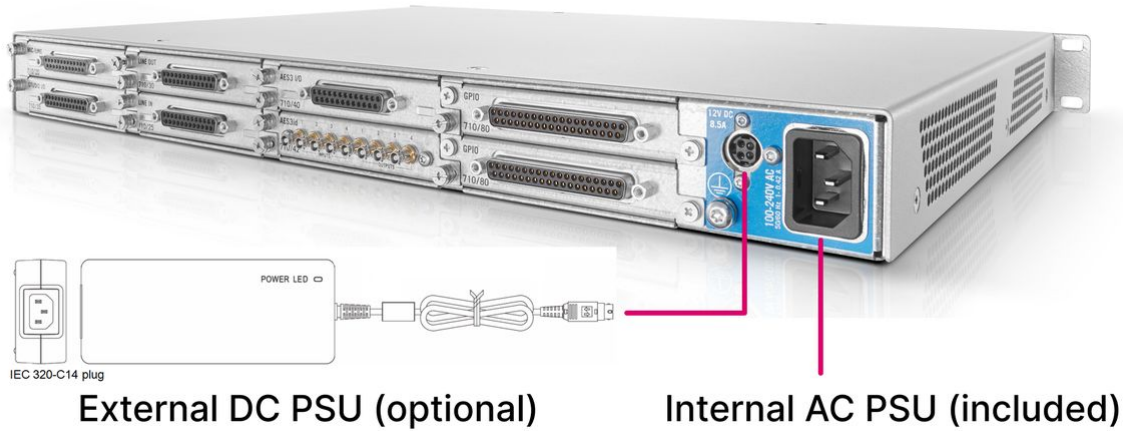
For dimensions, weight, power, etc. see [Power Core RP v2 - Technical Specification](#).

For installation information, see [Power Core RP v2 - Installation](#).

Additional information can be found in the data sheet for the Power Core frame and for each of the expansion I/O cards. All data sheets are available from [Lawo Download-Center](#) (after login).

### 4.3 Power Core RP v2 - Power Supplies

Power Core RP v2 comes with dual power feeds: AC and DC. If both inputs are connected, then the two feeds provide main and redundant power. The image below shows the connectors (at the rear of the frame).



#### Power Supply Options

The frame includes an integrated wide-ranging AC power supply. To use the DC input, you will need the external DC power supply (shown above). This is optional and must be ordered separately.

Permitted DC Power Supplies:

- 1 x **955/50-80** - external DC power supply.

Permitted AC Power Supplies:

- 1 x **436-9917-000** - internal AC power supply.

#### Electrical Specification

For input voltages and power consumption, see [Power Core RP v2 - Technical Specification](#).

#### IEC Power Cables

The frame is delivered with 1 x IEC power cable to connect mains power to the AC input. If the external DC supply is ordered, then this is delivered with its own IEC power cable. The IEC power cables are country-specific. The table below describes all permitted options.

Name	Part Number	Description
IEC Lock Schuko	436-7206-000	Power Cord with European connector for e.g. D, AU, F, Benelux.
IEC Lock Open Ends	436-7207-000	Power Cord with open wire ends.
IEC Lock US	436-7208-000	Power Cord with connector for USA.
IEC Lock UK	436-7209-000	Power Cord with connector for United Kingdom.
IEC Lock AUS	436-7218-000	Power Cord with connector for Australia.
IEC Lock JPN	436-7219-000	Power Cord with connector for Japan.

## Using the Power Supplies

Before connecting power to the frame, please read and observe all of the instructions in the "[General Safety Information for Lawo Equipment](#)" booklet delivered with your devices.

### (E) WARNING

The AC input(s) MUST be connected to the mains using the power cable(s) supplied with the system.

Disconnect all power sources to completely disconnect power from the system. e.g. before you open the unit for maintenance and service.

Take care that the protective earth (PE) connection of each PSU is individually connected to the PE connection of the building installation (e.g. wall socket). It is forbidden to use IEC Y-cables, or connect both PSUs to the same multiple-socket outlet. This measure guarantees that there is no shared PE connection (whose failure would lead to a summation of the leakage current from both PSUs to the housing).

### (F) AVERTISSEMENT

La ou les entrées CA DOIVENT être connectées au secteur à l'aide du ou des câbles d'alimentation fournis avec le système.

Déconnectez toutes les sources d'alimentation pour couper complètement l'alimentation du système, par exemple avant d'ouvrir l'unité pour la maintenance et l'entretien.

Veillez à ce que la connexion de terre de protection (PE) de chaque PSU soit connectée individuellement à la connexion PE de l'installation du bâtiment (par exemple, une prise murale). Il est interdit d'utiliser des câbles en Y IEC, ou de connecter les deux PSU à la même prise multiple. Cette mesure garantit qu'il n'y a pas de connexion PE partagée (dont la défaillance entraînerait une sommation du courant de fuite des deux PSU vers le boîtier).

## Connecting the AC Input

1. Using the IEC cable provided, connect your mains supply to the AC input on the rear panel.

## Connecting the DC Input

1. Start by connecting the external power supply to the DC input on the rear panel.
2. Then, using the IEC cable provided, connect your mains supply to the external PSU.
3. The PSU has an LED that lights (green) when mains power is detected.

## Powering On

Power Core has no on/off switch and starts automatically when power is applied. What happens next is described later. See [Power Core RP v2 - Powering On](#).

## Status LEDs

The **STATUS** LED (at the front of the frame) lights once power is applied. The color-coding of the LED is described later. See [Power Core RP v2 - Controls, Connectors and Indicators](#).

## 4.4 Power Core RP v2 - Grounding

The Power Core frame must be grounded for EMC reasons.

### Grounding Instructions

A grounding screw is provided beside the power connectors (at the rear of the frame).



Grounding Screw (M4x8, Torx20)

To ground the frame, please read and observe all of the instructions in the "[General Safety Information for Lawo Equipment](#)" booklet delivered with your devices.

#### (E) CAUTION

Each frame must be on the same potential as all other system devices.

ALWAYS use a grounded mains connection, to prevent the device from being grounded through Ethernet or other signal connections.

The device must be connected to an additional fixed protective ground if it is conductively connected with more than 20 other devices. i.e. more than 20 copper I/O connections. For more information, please refer to the "General Safety Information for Lawo Equipment" booklet delivered with your devices.

Use the M4x8 screw to fasten the grounding cable to the housing. You should use a Torx T20 driver for this purpose.



## 4.5 Power Core RP v2 - Expansion I/O Cards

Each Power Core RP v2 frame can be fitted with up to eight expansion I/O cards to provide audio inputs, audio outputs and GPIOs that are local to the frame.

- ✔ The I/O cards are hot-pluggable and so it is possible to add or replace a card while the frame is powered. See [Replacing an I/O Card](#) for instructions.

### Expansion Slots & Conditions

The image below shows how the expansion slots are numbered (when viewed from the rear).



Before ordering or fitting an I/O card, it is important to observe the following slot conditions:



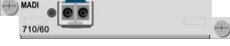


- Due to heat emissions, **a maximum of four MIC/LINE IN cards are permitted**. These must be fitted to even numbered slots only (i.e. the top row).
- In addition, **a maximum of two GPIO cards are permitted**. These must be fitted to slots 7 and 8 only (right-hand side, viewed from rear).

### Ordering Information

All I/O cards are optional and must be ordered separately from the frame (using their type number). The table below describes all available options.

**Please note:** To connect a [Power Core AIOX](#) device to a rear MAD I/AIOX port, you must fit a MAD I/O card (710/50). The MAD I SRC I/O (710/60) cannot be used for AIOX.

Expansion I/O Card	Type No.	Description	Connector	Max. per Frame
	710/20	8 x mono Mic/Line inputs	1 x DB-25*	4 (even slots only)
	710/25	8 x mono or 4 x stereo Line inputs	1 x DB-25*	8
	710/30	8 x mono or 4 x stereo Line outputs	1 x DB-25*	8
	710/35	2 x mono Mic/Line inputs 1 x stereo Line output 2 x stereo Headphone outputs	1 x DB-25*	8
	710/41	4 x stereo AES3 inputs with SRC 4 x stereo AES3 outputs Bit-transparent	1 x DB-25*	8
	710/40	as for 710/41 but not bit transparent. This card is discontinued; existing cards can be replaced with the 710/41.		

Expansion I/O Card	Type No.	Description	Connector	Max. per Frame
<b>AES3id I/O</b> 	710/42	as for 710/41 but with HD-BNCs	8 x HD-BNC	8
<b>MADI I/O</b> 	710/50	2 x MADI ports (64 I/O channels per port), supports AIOX	depends on <u>SFP</u>	8
<b>MADI SRC I/O</b> 	710/60	1 x MADI port (64 I/O channels with SRC)	depends on <u>SFP</u>	8
<b>DANTE I/O</b> 	710/55	2 x DANTE ports (dual-redundant, 64 I/O channels in total with SRC)	2 x RJ45	8
<b>GPIO</b> 	710/80	8 x GPI (optocouplers) 8 x GPO (silent and self-healing relays) 2 x VCA (voltage-controlled inputs)	1 x DB-37	2 (slots 7 & 8 only)

**\*All DB-25 connectors are wired according to the AES59 (TASCAM) standard, except for the Headphone outputs on the STUDIO I/O card.**

For wiring information, see [Power Core RP v2 - Connector Pin-Outs](#).

Additional information can be found in the data sheet for each I/O card. All data sheets are available from the [Lawo Download-Center](#) (after login).

## 4.6 Power Core RP v2 - SFP Transceivers

To use the network ports, you must fit the correct SFP transceivers. These must be Lawo-certified and ordered separately from the frame.

### Available Interfaces (via SFP)

You will need:

- 1 x Network Interface SFP - for the first CONTROL port (dwc0).
- 1 x Network Interface SFP - for each RAVENNA/AES67 port (ra0 to ra3).

The image below shows an example with all of the front SFP cages populated.



### Ordering Information

All SFP modules must be ordered separately from the frame (using their type number). The tables below describe all available options.

#### **(E) WARNING**

- If a device has SFP slots, the UL approval of the device is valid only if the used SFP modules are UL-certified and comply with the category NWGQ, NWGQ2, AZOT, or AZOT2. The classification of SFPs must be FDA 21 CFR 1010 or CFR 1040 for products with laser class 1 (I) or IEC 60825-2 for products with LED class 1.
- For all other approvals of the device (e.g. CE), the SFP used must have the classification according to IEC 60825-2 for LED class 1 products.

#### **(F) ATTENTION**

- Si un appareil possède des emplacements SFP, l'homologation UL de l'appareil n'est valable que si les modules SFP utilisés sont certifiés UL et conformes à la catégorie NWGQ, NWGQ2, AZOT ou AZOT2. La classification des SFP doit être conforme à la norme FDA 21 CFR 1010 ou CFR 1040 pour les produits avec laser de classe 1 (I) ou IEC 60825-2 pour les produits avec LED de classe 1.
- Pour toutes les autres homologations de l'appareil (par exemple CE), le SFP utilisé doit avoir la classification selon IEC 60825-2 pour les produits à LED de classe 1.



### Network Interface SFPs

Please order 1 x SFP for each network port you wish to use: CONTROL or RAVENNA/AES67.

Type Number	Cable	Max. Distance	Standard
981/60-10	Multi-mode fiber: 850nm, -7dBm	550m	1000 Base-SX
981/60-20	Single-mode fiber: 1310nm, -3dBm	10km	1000 Base-LX
981/60-30	Single-mode fiber: 1550nm, 0dBm	80km	1000 Base-ZX
981/60-61	Copper, RJ45	100m	100/1000 Base-T
981/60-60 (Discontinued)	Copper, RJ45	100m	1000 Base-T

### MADI Interface SFPs

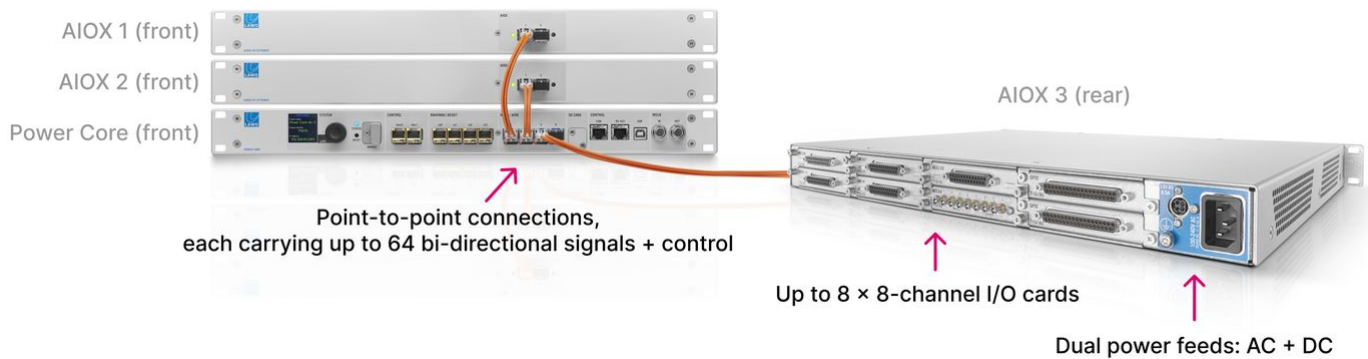
The four MADI ports are not supported by the mc<sup>2</sup> integration, and so these ports should be left with the dust caps fitted.

## 4.7 Power Core RP v2 - Audio I/O Extender

The audio (and GPIO) capabilities of Power Core RP v2 can be expanded further by adding one or more Audio I/O Extenders.

Each Audio I/O Extender (AIOX) is a separate 1RU device that delivers up to 64 channels of I/O. Each device connects to the main frame using any available MAD I/AIOX port (front or rear). Up to 20 AIOX devices can connect to a single Power Core, expanding its I/O capability to up to 1,280 audio inputs, outputs and GPIO.

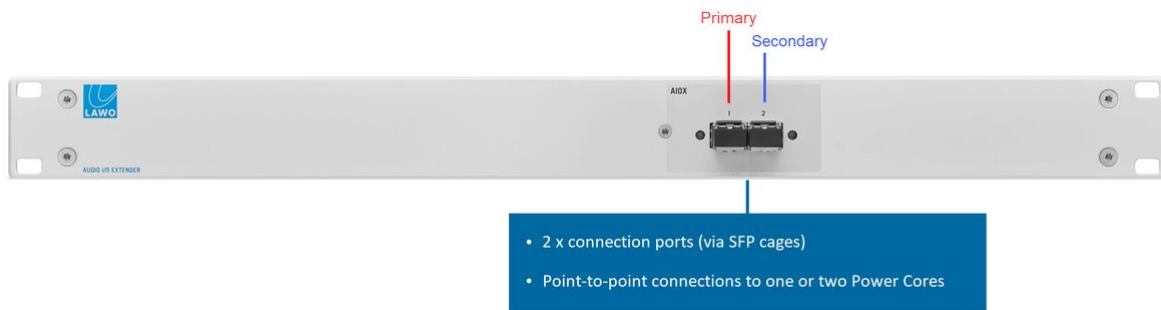
The image below shows an example with three AIOX devices.



**i** Adding an AIOX unit to Power Core RP v2 requires a configuration change. Please contact your Lawo Project Engineer for assistance.

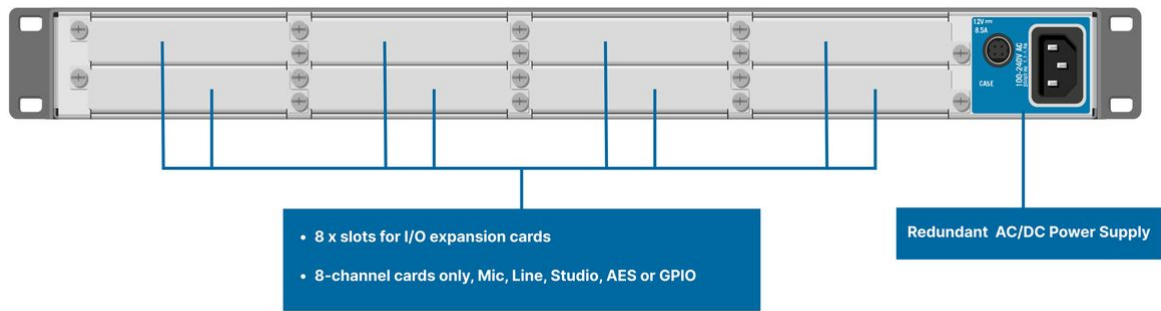
### AIOX Frame

Each AIOX device uses the same frame/housing as a standard Power Core and comes with 2 x AIOX ports (at the front).



### I/O Cards

The rear of the frame can be fitted with up to 8 x 8-channel expansion I/O cards. These are identical to the expansion I/O cards described earlier. Options include Mic/Line In, Line Out, Studio I/O, AES3 I/O and GPIO. Note that the MAD I and DANTE I/O cards are not supported (as the maximum capacity of the AIOX connection is 64 channels).



## Power

The AIOX frame is powered in the same manner as the main frame (as described [earlier](#)). If both AC and DC inputs are connected, then the two feeds provide main and redundant power.

## Connecting the Main Frame

The connection to the main frame is always point-to-point, and is made using a proprietary high-speed, low-delay audio and control protocol. You will need 1 x MADI port for each connection. This can be any of the four MADI/AIOX ports on the front panel, or a MADI port on a rear expansion I/O card (if available). The port(s) must be configured for AIOX operation (by editing the system configuration using ON-AIR Designer).

To configure redundancy, you must connect both ports from the AIOX device.

The type of connection, and its maximum length, is determined by the SFP module fitted to the frame. SFPs for coax, copper or single- and multi-mode fiber connections are available. For more information, see [Power Core RP v2 - SFP Transceivers](#).

## Ordering Information

To specify the AIOX option, please follow these steps:

1. Order the required number of AIOX frame(s) using the following part number: Power Core AIOX (970/12).
2. Optional: add an external DC power supply for the AIOX frame(s). See [Power Core RP v2 - Power Supplies](#).
3. Add the required number of [expansion I/O cards](#) - to populate the AIOX frame(s). All 8-channel card options are supported.
4. Don't forget the [SFP modules](#) for the MADI/AIOX port(s) in the main frame and AIOX device.

**Please note:** To connect a Power Core AIOX device to a rear MADI/AIOX port on the main frame, you must use a MADI I/O card (710/50). The MADI SRC I/O (710/60) cannot be used for AIOX.

## Backwards Compatibility

Power Core AIOX can be added to any revision of the Power Core main frame: 710/13, 710/11 or 710/10.

## Further Information

Additional information can be found in the data sheet for the AIOX device (710/12). This is available from the [LAWO Download-Center](#) (after login).



## 5 Power Core RP v2 - Installation

This chapter describes how to install the Power Core RP v2 hardware.

- [Power Core RP v2 - Installation Instructions](#)
- [Power Core RP v2 - Unpacking](#)
- [Power Core RP v2 - Frame Installation](#)
- [Power Core RP v2 - SFP Installation](#)
- [Power Core RP v2 - Wiring](#)
- [Power Core RP v2 - Synchronization](#)

## 5.1 Power Core RP v2 - Installation Instructions

We recommend that you read all of this chapter in full before starting the installation.

Mechanical drawings and data sheets (including weights and dimensions) are available from the [LAWO Download-Center](#) (after login).

### (E) WARNING

Please read and observe ALL of the [LAWO - Important Safety Instructions](#) BEFORE installing or servicing any component.

### (F) AVERTISSEMENT

Veillez lire et respecter TOUTES [les consignes de sécurité importantes](#) AVANT d'installer ou d'entretenir un composant.

Once you are ready to begin, it is recommended to complete the tasks in the following order.

- [Unpack](#)
- [Fit the Expansion I/O Cards](#)
- [Install the Frame](#)
- [Fit the SFP Modules](#)
- [Cable the system](#)
- [Check the synchronization](#)

The rest of this chapter describes each task in more detail.

If you need further assistance, the Lawo Support Department can be contacted by email at [support@lawo.com](mailto:support@lawo.com), or by telephone during normal working hours - please visit the [Support](#) area of the Lawo website for the most up-to-date contact details.



## 5.2 Power Core RP v2 - Unpacking

Each Power Core RP v2 frame is delivered in its own box with all included accessories. If you have ordered any expansion I/O cards or the DC power supply, then these are packaged separately, along with the optical transceivers.

The license codes for all software licenses can be found on the delivery note (included with the shipment).

A list of serial numbers for the hardware components is also included. Please keep this list for your records.

Please check the contents of the shipping boxes, and in the event of any transport damage, contact your local Lawo representative or email [support@lawo.com](mailto:support@lawo.com).

### Packing List

The contents of the shipment will vary depending on the component(s) ordered.

### Included

The following items are included with each Power Core RP v2 frame:

- 1 x 2m IEC power cable (country-specific) - to connect AC mains to the frame.
- 1 x USB license dongle (250-5998-000).
- Dust caps for the Network Interface and MADi SFP cages - these will be mounted in the frame.
- 1 x USB memory card - containing the latest software and configuration files.

If you have ordered a revision 2 frame, then you will also find 1 x serial cable (485-0700-000) - to connect to the RS 422 port (for diagnostics).

Note that the license codes (for the Power Core RP v2 USB dongle and VisTool RP) can be found on the delivery note.

### Optional

The following items are optional and must be ordered separately:

- Up to 8 x rear expansion I/O cards - for audio and GPI/O interfacing.
- 1 x external DC power supply (955/50-80) with 2m IEC power cable (country-specific) - to connect DC power to the frame.
- 1 x USB license dongle safety cap.
- Optical transceivers - for the network interface ports.

As a first step, any expansion I/O cards should be fitted into the frame. See [Fitting an I/O Card](#) for instructions.

### Not Included

The following items are required and must be provided by the customer or installer:

- Ethernet cable(s), optical and/or copper - to connect the media and management ports to the network.
- Windows 64-bit host PC - to run the Lawo VisTool RP application.
- Ethernet cable(s) - to connect the host PC to the network.



The following document contains more information about the host PC requirements: [Vistool PC Config.pdf](#).

### 5.3 Power Core RP v2 - Frame Installation

Power Core RP v2 is designed for indoor use in a dust-free environment. The frame should be mounted, horizontally, in a 19-inch equipment rack (as described below).

Please install supporting slide bars to hold the weight of the unit, and use the locking devices provided. For recessed rack-mounting, use standard, third-party, 1RU recessed rack adapters such as the ones shown below.



Recessed Rack Adaptors

When fitting the rack adapters and slide bars, you must make sure that there is sufficient airflow around the device for cooling.

Connectors are located at the front and rear of the unit. Therefore, when using 19-inch racks with doors please leave enough room for the cables.

#### Installing the I/O Cards

As standard, the frame is delivered with metal cover plates to close the rear slots. Therefore, before mounting the frame, you must fit the rear I/O cards.

How to do this is described later. See [Fitting an I/O Card](#) for instructions.

#### Dimensions and Weight

Mechanical data can be found in the data sheet for the Power Core frame, available from [Lawo Download-Center](#) (after login).

The table below describes a Power Core revision 3 frame without expansion I/O cards.

<b>Width</b>	483 mm (19")
<b>Height</b>	> 44.0 mm (1 RU)
<b>Depth (inc locking devices)</b>	385 mm
<b>Weight (without expansion IO cards)</b>	4.5 kg



## Airflow Requirements

Power Core RP v2 is cooled by temperature-controlled fans for minimum noise emission.

Ventilation holes are provided on the left and right. You must make sure that there is sufficient airflow around the frame for cooling.

The current temperature of the device's internal components can be checked on the [front panel display](#) and [Web UI](#). The recommended tolerances can be found in the data sheet for the Power Core main frame. In particular, the temperature of the FPGA chip must NOT exceed 85° C.

### (E) ATTENTION

- DO NOT obstruct the ventilation holes as to do so will prevent efficient cooling.

### (F) ATTENTION

- N'obstruez PAS les trous de ventilation, car cela empêcherait un refroidissement efficace.

## Power Consumption and Electrical Voltage

See [Power Core RP v2 - Power Supplies](#).

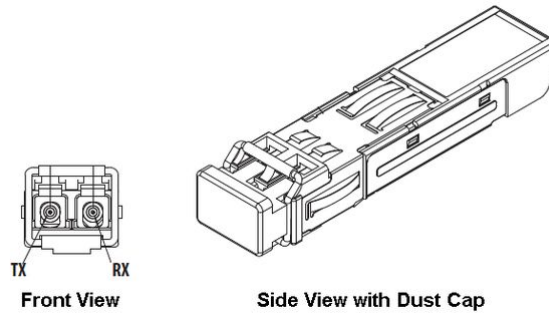
## 5.4 Power Core RP v2 - SFP Installation

In order to connect the CONTROL and RAVENNA/AES67 ports, they must be fitted with the correct SFP transceivers. These must be Lawo-certified (as described [earlier](#)).

### Overview

The SFPs are hot-pluggable, so they can be fitted or exchanged while the device is powered.

The image below shows an example of an optical transceiver.



### SFP Installation

Before fitting or removing a transceiver, please read and observe the following important safety information.

#### (E) CAUTION

This equipment may use Class 1 Laser products. It emits invisible laser radiation that may lead to eye injury.

- Never look directly into optical components or optical fibre cables.
- Keep optical components closed by protection plugs when unused.
- For your safety connect all fibre cables first before turning on the equipment.

#### (F) ATTENTION

Cet équipement peut utiliser des produits laser de classe 1. Il émet un rayonnement laser invisible qui peut entraîner des lésions oculaires.

- Ne regardez jamais directement dans les composants optiques ou les câbles à fibres optiques.
- Gardez les composants optiques fermés par des bouchons de protection lorsqu'ils ne sont pas utilisés.
- Pour votre sécurité, connectez d'abord tous les câbles à fibres optiques avant d'allumer l'équipement.

#### (E) IMPORTANT NOTE

- Before removal, please unlock the transceiver to avoid mechanical damage to the slots.
- If a transceiver is removed, please refit the device's dust cap to protect the internal components.
- When fitting an optical transceiver, you must use the correct fiber type for your remote device. Using the wrong fiber type, or exceeding the maximum optical input power, can result in a malfunction of, or damage to, the device.

### Instructions (for insertion)

SFP modules must only be inserted when there is no cable connected.



1. Disconnect the cable from the SFP module or remove its dust cap (as applicable).

We recommend that you label the cable before it is disconnected (for easy reconnection to the correct port at a later time).

Please watch out for locks on the cable connector, and unlock these to release the cable. In some cases, this must be done while pulling the cable out of the SFP.

You must take care to prevent electrostatic discharge to the SFP module. This can be done by grounding yourself and taking ESD measures. Do not touch the contacts of the SFP.

When disconnecting the cable from an optical transceiver, take care to cover the unplugged optical cable with a dust cap.

2. Remove the dust cap from the SFP cage on the device.

Any spare dust caps should be stored carefully so that they can be replaced if a module is removed.

3. Before inserting the SFP, flip the extraction lever (at the front) up to its rest position.
4. Slide the SFP gently into the slot.

**Please note:** if the SFP is upside down, then it will not glide in easily.

The SFP module must slide in smoothly without force. When done correctly, the contacts of the SFP glide into the contacts of the device. At this moment, press firmly until the module locks into position (you will hear a click).

5. Check that the SFP is locked by pulling on it without lifting the extraction lever.

- If the module cannot be removed, it is installed correctly.
- If the module can be removed, then check its orientation: perhaps the SFP is inserted upside down.
- Repeat step 4 until the module is securely latched into the SFP cage.

6. After inserting an optical transceiver, take care to immediately connect the optical cable or fit a dust cap.

When connecting a cable, make sure that the cable connector locks into position correctly (you will hear a click).

### **Instructions (for removal)**

SFP modules must only be removed when there is no cable connected.

1. Disconnect the cable from the SFP module.

We recommend that you label the cable before it is disconnected (for easy reconnection to the correct port at a later time).

As before, watch out for locks on the cable connector, and unlock these to release the cable. In some cases, this must be done while pulling the cable out of the SFP.

You must take care to prevent electrostatic discharge to the SFP module. This can be done by grounding yourself and taking ESD measures. Do not touch the contacts of the SFP.

When disconnecting the cable from an optical transceiver, take care to cover the unplugged optical cable with a dust cap.

2. Before removing the SFP, flip the extraction lever (at the front) down. Then use the lever to pull out the SFP.
3. Pull firmly until the contacts of the SFP glide out of the contacts of the device.

From this point onwards, the SFP must slide out smoothly without force.

4. After removing the SFP module, take care to refit a dust cap immediately to the device's SFP cage (to protect the internal components) and to the SFP module (if the transceiver is optical).

## 5.5 Power Core RP v2 - Wiring

Once the frame is populated and mounted, you are ready to cable the device.

This topic covers both of the current hardware revisions. Note that the front panel connectors differ slightly, while the rear panel is the same for both revisions.

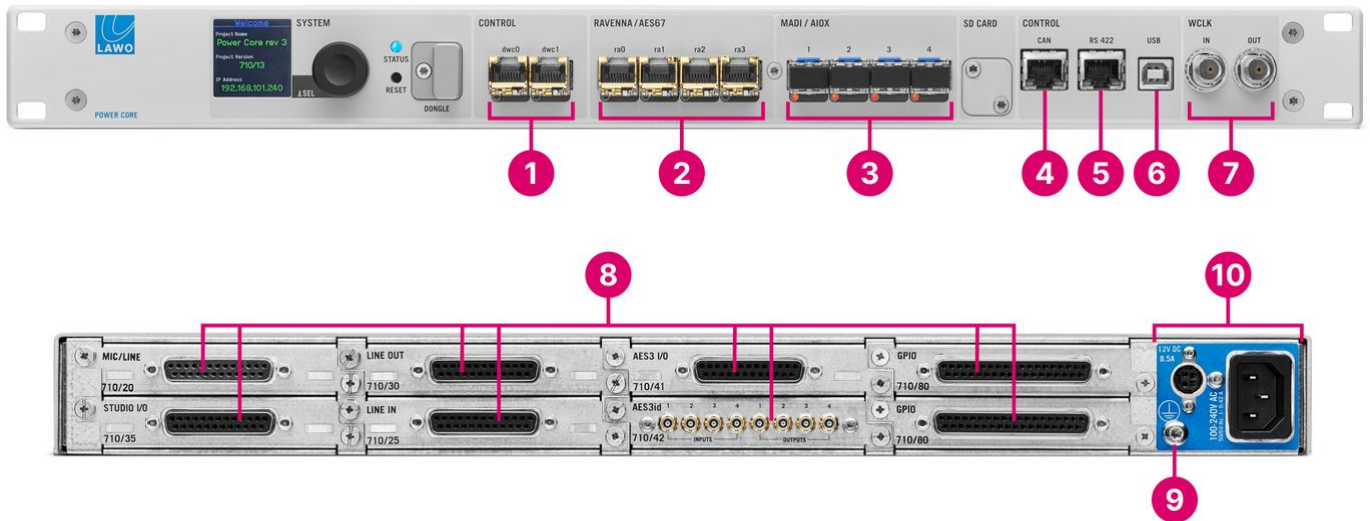
- [Connector Summary, Revision 3](#)
- [Connector Summary, Revision 2](#)

To configure the system, only power (10) and control (1) are required.

To get the system operational, the following connections are required: control (1), streaming (2), expansion I/O (8), grounding (9) and power (10).

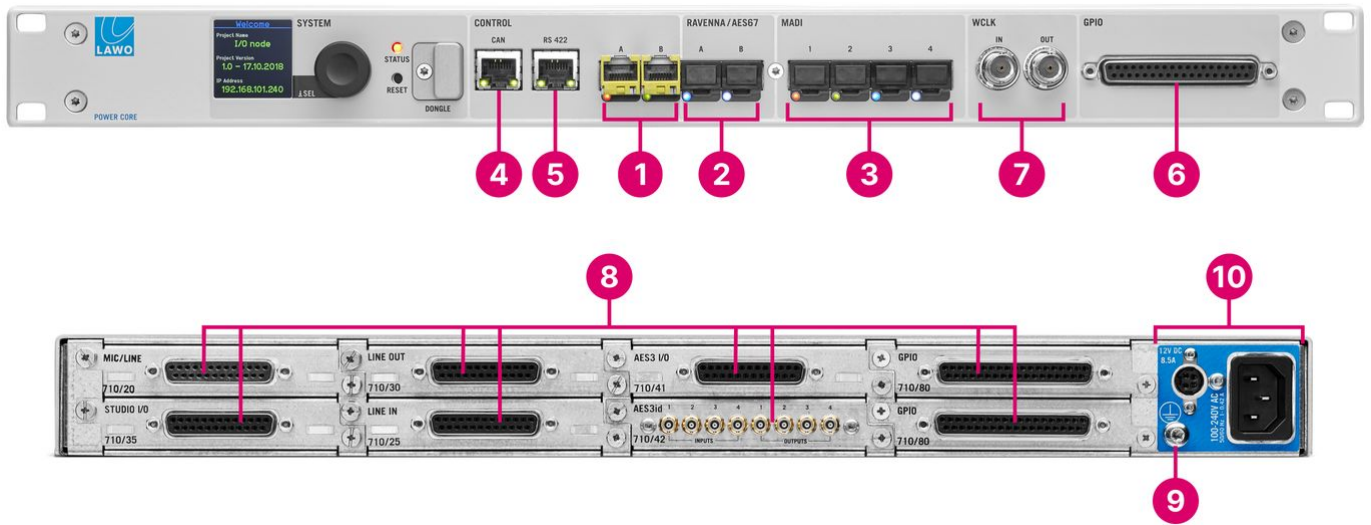
In an mc<sup>2</sup> installation, the following connections are unused: CAN (4) and RS-422 (5).

### Connector Summary, Revision 3



- 1. CONTROL:** 2 x 1GbE control ports (via SFP) - used to connect Power Core to the control network/surface via IP. One connection is essential to configure the device.
- 2. RAVENNA/AES67:** 4 x 1GbE streaming ports (via SFP) - used to stream audio and GPIO signals to and from the media network.
- 3. MADI/AIOX:** 4 x MADI or AIOX ports (via SFP) - used to connect local MADI or Audio I/O Extenders (optional).
- 4. CAN:** 1 x 500Kb/s CAN port (CAT5e, RJ45) - unused.
- 5. RS-422:** 1 x serial port (RJ45) - unused.
- 6. USB** (revision 3 only): 1 x USB port - used for debugging (optional). On a revision 2 frame, the RS-422 serial port may be used for debugging.
- 7. WCLK:** IN & OUT (BNC) - used to connect the system's sync reference to other devices (optional).
- 8. Expansion I/O** (various) - used to connect local audio and GPIO signals.
- 9. Grounding Screw** (M4x8) - used to ground the frame (essential).
- 10. Power Inputs:** AC & DC (IEC & Kycon) - used to connect power to the frame. One connection is essential; the other provides redundancy.

## Connector Summary, Revision 2



As above, except for:

**2. RAVENNA/AES67:** 2 x 1GbE streaming ports (via SFP). On a revision 2 frame, there are two RAVENNA/AES67 ports.

**6. GPIO:** 8 x GPI and 8 x GPO (DB-37). On a revision 2 frame, GPIOs are always included.

On a revision 2 frame, there is no USB connector for debugging; the RS-422 serial port (5) can be used for this purpose.

The rest of this topic describes the connections. For pinning information, see [Connector Pin-Outs](#).

- [CONTROL Ports](#)
- [RAVENNA/AES67 Ports](#)
- [MADI/AIOX Ports](#)
- [CAN Bus Port](#)
- [RS-422 Serial Port](#)
- [USB Service Port](#) (revision 3 only)
- [Wordclock IN & OUT](#)
- [GPIO](#)
- [Expansion I/O](#)
- [CASE Grounding Screw](#)
- [Power Inputs: AC & DC](#)



### CONTROL Ports: dwc0 & dwc1

The two network CONTROL ports (dwc0 & dwc1) are used for administration and control. They can be used to remotely control Power Core via TCP/IP; to network Power Core to other devices; and to update the system firmware and configuration.

In an mc<sup>2</sup> installation, the control ports are initially used to set up the device and then connect it to the same management network as the mc<sup>2</sup> control system.

On a Power Core revision 2 frame, the ports provide the same functionality but are labelled differently: CONTROL A = dwc0 and CONTROL B = dwc1.

At least one port must be connected initially to configure the device's network settings. The port(s) can then be used to connect Power Core to a dedicated control network (for out-of-band control). Usually, only the first port (dwc0) is connected. If both ports are used, then redundancy can be implemented via LACP or a generic link failover mode.

**dwc0 & dwc1** – always active: 2 x 1GbE\* (via SFP).

The connection(s) can be made either directly or via a network switch.

When connecting via a network, then this can be shared with other devices, such as in the regular "house network" of a typical broadcast facility. Routers are permitted as long as the minimum requirements of the network interfaces are met. By using routers, or similar devices, the latency of the communication will increase.

\*The control network interfaces can operate at 1000, 100 or 10 BASE-T, depending on the SFP. The network switch/router port(s) MUST meet the following requirements:


- **Speed** = 1Gb/s, 100Mb/s or 10Mb/s; **1Gb/s is recommended**
- **Duplex mode** = **Full Duplex**

When connecting via a network, then this can be shared with other devices, such as in the regular "house network" of a typical broadcast facility. Routers are permitted as long as the minimum requirements of the network interfaces are met. By using routers, or similar devices, the latency of the communication will increase.

\*

The control network interfaces can operate at 1000, 100 or 10 BASE-T, depending on the SFP. The network switch/router port(s) MUST meet the following requirements:

- **Speed** = 1Gb/s, 100Mb/s or 10Mb/s; **1Gb/s is recommended**
- **Duplex mode** = **Full Duplex**

 It is important to keep the control network separate from the streaming network connected to the RAVENNA/AES67 ports (2).

To use the control network ports, you must fit the correct SFP modules. These must be Lawo-certified (as described [earlier](#)). The SFP determines the cable type, maximum distance and connector.

Each port has an LED which indicates the following information.

CONTROL Port LED	Meaning
Off	link down
Green	link up, speed = 100 Mb/s
Blue	link up, speed = 1000 Mb/s



### RAVENNA/AES67 Ports: ra0, ra1, ra2, ra3

The four RAVENNA/AES67 ports stream audio to and from an IP network. In an mc<sup>2</sup> installation, they are used to stream audio signals to and from the mc<sup>2</sup> system via the media network.

The first pair of interfaces are enabled as standard: **ra0** & **ra1**. The second pair of interfaces can be enabled by purchasing the optional [AddOnRAV+](#) license: **ra2** & **ra3**.

On a Power Core revision 2 frame, there are two streaming interfaces: ra0 & ra1. They provide the same functionality but are labelled differently: RAVENNA A = ra0 and RAVENNA B = ra1.


The streams are fully compatible with SMPTE ST2110-30/31, AES67 and RAVENNA. To achieve redundant streaming, compatible with SMPTE ST2022-7, you must use both interfaces: **ra0/ra1** (or **ra2/ra3** on revision 3).

Using the first pair of interfaces only, the total Audio over IP capacity is up to 256 I/O channels. The Power Core RP v2 can be configured with 32x8 channel streams, 16x16 channel streams, or 4x64 channel streams. Using the VisTool RP application it is possible to enable or disable individual stream transmitters. By default, all streams are configured to use both interfaces.

If the second pair of interfaces are enabled (on revision 3), then the total Audio over IP capacity doubles: up to 512 I/O channels, with either 64x8 channels streams, 32x16 channel streams, or 8x64 channel streams.

- **ra0** & **ra1** – always active: 2 x 1GbE (via SFP).
- **ra2** & **ra3** (revision 3 only) – requires the [AddOnRAV+](#) license: 2 x 1GbE (via SFP).

The connection(s) must be made via a network switch and not directly to another streaming port. You can find more details about the data network requirements and suitable components in the [Lawo IP Networking Guide](#).

 The media network must be properly managed and configured. i.e. it must use a suitable network architecture; all components must support multicast (as opposed to unicast); a proper Quality of Service (QoS) must be configured; and so on. Please DO NOT attempt to connect the streaming ports using an unqualifying IP network, as correct operation cannot be guaranteed.

The senders and receivers are pre-defined in the configuration file. The configuration of the senders and receivers can be modified using ON-AIR Designer.

To use the streaming network ports, you must fit the correct SFP modules. These must be Lawo-certified (as described [earlier](#)). The SFP determines the cable type, maximum distance and connector.

Each port has an LED which indicates the following information.

RAVENNA/AES67 Port LED	Meaning
Off	link down
Green	link up, speed = 100 Mb/s
Blue	link up, speed = 1000 Mb/s



### MADI/AIOX Ports: 1, 2, 3, 4

Each of the four MADI/AIOX ports has two possible modes of operation: either MADI (conforming to AES10) or AIOX (a proprietary protocol).

In **MADI mode**, the ports can be used to connect multi-channel digital audio to Power Core.

- Each port conforms to AES10 and carries up to 64 bi-directional channels (at 48kHz).
- Ports 1&2 and 3&4 can be dual-redundant.
- Dual-redundancy is defined in the ON-AIR Designer.

In **AIOX mode**, the ports can be used to connect a Power Core Audio I/O Extender (described [earlier](#)).

- The AIOX protocol carries both audio and control to the external device.
- Ports 1&2 and 3&4 can be dual-redundant.
- Dual-redundancy is defined in ON-AIR Designer.

It is possible to mix and match the two modes. For example, to use ports 1 & 2 for a dual-redundant MADI connection and ports 3 & 4 for two non-redundant connections to two audio I/O extenders. The mode of operation is defined by the ON-AIR Designer (via the "Frame → System Core" configuration).

- **1, 2, 3, 4** – always active: 4 x MADI or AIOX (via SFP).

All MADI and AIOX connections must be point-to-point.

To use a MADI or AIOX port, you must fit the correct SFP module. These must be Lawo-certified (as described [earlier](#)). The SFP determines the cable type, maximum distance and connector.

Each port has an LED which indicates the following information.

MADI/AIOX Port LED	Meaning
Off	not configured
Red	signal not present
Green	signal present
Blue	signal present & active
Light Blue	signal present & not active

### CAN Bus Port

In an mc<sup>2</sup> installation, the CAN port is not used. It should be left unconnected.

### RS-422 Serial Port

In an mc<sup>2</sup> installation, the RS-422 serial port on revision 2 frames can be used for debugging. On revision 3 frames, it is not used and should be left unconnected.

### USB Service Port

The USB (type B) port is included on revision 3 frames only. It can be used to connect a service computer for debugging.



The port supports plug and play operation so, after connecting your computer, the device should be assigned a Com port number automatically. Enter this into your terminal emulation software tool to establish a connection. For step-by-step instructions, please see [Power Core RP v2 - USB Service Port](#).

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### **Wordclock IN & OUT**

The two WCLK connectors can be used for external synchronization. If Ravenna streams are being used, the Power Core RP v2 must be synchronized to PTP arriving from the streaming network OR must be configured as a PTP Master. If the Power Core RP v2 is a PTP Slave:

**WCLK IN** will not be used.

**WCLK OUT** provides an output of the current system reference. It can be used to distribute a wordclock signal to non-PTP devices.

If the Power Core RP v2 is a PTP master

**WCLK IN** can be connected to provide an external sync reference

**WCLK OUT** provides an output of the current system reference. It can be used to distribute a wordclock signal to non-PTP devices.

The connections are made using standard 75 ohm BNC connectors. The maximum cable length depends on the equipment you are connecting to.

See [Power Core RP v2 - Synchronization](#) for more information.

---

### **GPIO**

The front panel GPIO connector is included on revision 2 frames only. It provides 8 x GPI (optocouplers) and 8 x GPO (silent and self-healing relays).

On a Revision 3 frame, GPIOs can be added by fitting up to two rear expansion GPIO cards (described [below](#)). Note that rear expansion GPIO cards can also be added to revision 2 frames (to expand the number of GPIOs).

---



## Expansion I/O Cards

Power Core RP v2 supports up to 8 expansion I/O cards (as described [earlier](#)).

All rear panel I/O cards, except the Dante, GPIO, MADI, and MADI SRC cards break out on DB-25 connectors that are wired according to the AES59 (TASCAM) standard.

## MIC/LINE IN

All MIC/LINE IN connections are electronically balanced and floating (suitable for balanced or unbalanced use). They feature a discrete class-A preamplifier with superb performance at both low (mic) and high (line) levels. In addition to variable microphone pre-amp gain, each input comes with switchable 48V phantom power, a high-pass filter and 20dB PAD. The pre-amp gain can be automatically adjusted using the AutoGain feature. The maximum analog input level (with the PAD enabled) is +24dBu.

## LINE IN & LINE OUT

All LINE IN and LINE OUT connections are electronically balanced and floating (suitable for balanced or unbalanced use). For LINE OUTs, the maximum analog level can be adjusted to +12, +15, +18, +21 or +24 dBu relative to digital full scale (dBFS). This is a factory-configured setting; +24dBu is recommended.

## AES3

All AES3 connections conform to the stereo AES3 standard. The inputs have sample rate conversion (SRC).

## MADI

The two ports on a MADI I/O card (710/50) meet the same specification as the front panel MADI/AIOX ports. This allows them to use for either MADI or an Audio I/O Extender. See [MADI/AIOX](#).

The single port on a MADI SRC I/O card (710/60) provides 64 bi-directional channels with SRC on the inputs. Note that this card does not support AIOX and so it cannot be used for an Audio I/O Extender.

## DANTE

The DANTE card provides 1 x DANTE Brooklyn III module with 1 main + 1 redundant port.

Each port supports up to 64 bi-directional channels (at 48kHz).

The connector and cable type is RJ45, CAT 5 or better (CAT 5e/6/7); straight or crossed Ethernet cable. The supported standard is Gigabit Ethernet (1000 Base-Tx). The maximum cable length is up to 80m.

The configuration of the DANTE Brooklyn modules depends on their firmware version. Please refer to your Lawo software release notes for the latest information.

For more information about DANTE networking, please refer to the manufacturer's website at: <https://www.audinate.com/>

## GPIO

The GPIO card provides 8 x GPI (optocouplers) and 8 x GPO (silent and self-healing relays) for local signaling and switched functions, plus two VCA inputs to remotely control variable parameters.

- GPI = 8 x optocouplers (3-36V DC / 8mA @ 36V)
- GPO = 8 x Opto-MOS relays (50V AC / 120mA @ 50V)
- 2 x voltage-controlled inputs.

The connector is a 37-pin D-type (DB-37), female.



## **CASE Grounding Screw**

The M4x8 grounding screw must be used to ground the frame for EMC reasons.

See [Power Core RP v2 - Grounding](#).

---

## **Power Inputs: AC & DC**

Power Core comes with dual power feeds: AC and DC. To use the DC input, you will need the external DC power supply which must be ordered separately. If both inputs are connected, then the two feeds provide main and redundant power.

- **12V In** (Kycon) – DC input
- **100-240V In** (IEC) - AC input

Before connecting power to the device, please read and observe all of the important safety information in the [Power Core RP v2 - Power Supplies](#) topic.

## 5.6 Power Core RP v2 - Synchronization

Power Core RP v2 can be synced to PTP, Wordclock, MADI, or the internal clock. However, if the RAVENNA/AES67 ports are used, Power Core RP v2 must either be synchronized to PTP arriving from the streaming network (via the front panel RAVENNA/AES67 ports) or Power Core RP v2 must be configured as a PTP master.

By default, Power Core RP v2 is configured to sync to PTP on Domain 127. This configuration can be modified temporarily using the Web UI, or permanently using ON-AIR Designer.

**i** The following sync reference options are possible:

- **PTP** - arriving from the streaming network (via the front panel RAVENNA/AES67 ports).
- **Wordclock** – connected to WCLK IN on the front panel.
- **MADI** – incoming MADI from front panel port 1 (or port 2 if redundancy is configured and port 2 is active). Note that other MADI ports cannot be used for synchronization.
- **Internal Clock** – set to 48kHz or 44.1kHz.

**⚠ Please note:** if Power Core has been synchronized once to a PTP master, then it will NOT automatically switch to another sync source but try to re-establish its connection to the external PTP master. While doing this, it becomes PTP master itself, and uses the pre-aligned internal clock as the reference.

### Checking the Sync Status

The sync status can be checked either from the device (using the STATUS LED) or from the Power Core Web UI.

### Using the STATUS LED

The **STATUS** LED (on the front panel) indicates the health of the device and sync status. If the LED is blinking at regular intervals, then the device is working properly and the LED color indicates the sync status.



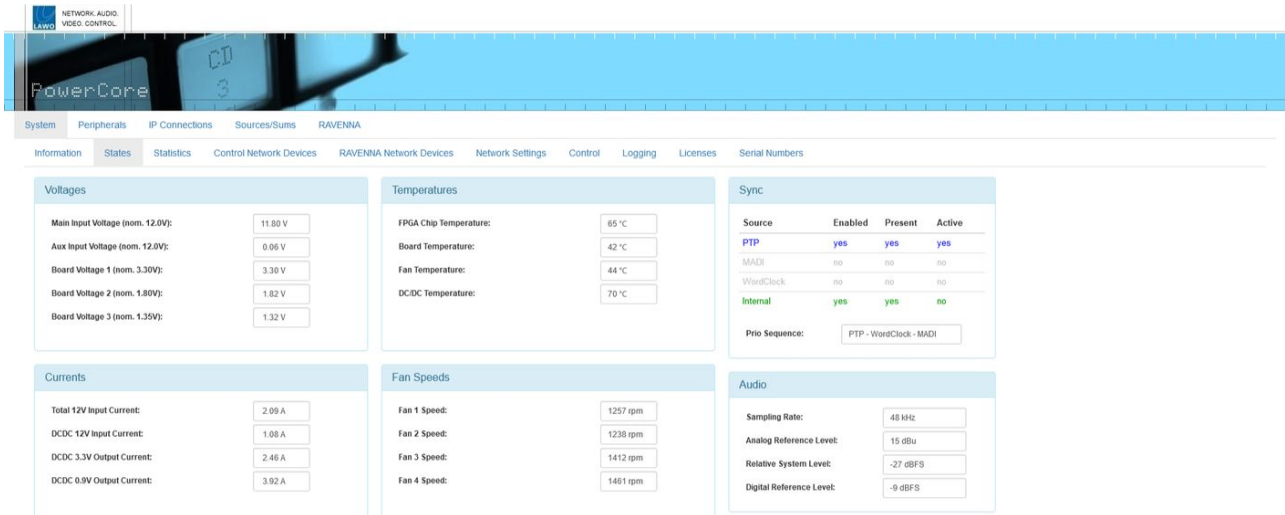
### STATUS LED meanings

Blinking STATUS LED	Meaning
Blue ↔ Off	Synchronized to PTP master
Yellow ↔ Off	Trying to sync to PTP master
Red ↔ Off	Synchronized to internal clock
Green ↔ Off	Synchronized via Wordclock
Magenta ↔ Off	Synchronized via MADI
Red ↔ white	Device is PTP Master, sync source = internal

Blinking STATUS LED	Meaning
Green ↔ white	Device is PTP Master, sync source = Wordclock
Magenta ↔ white	Device is PTP Master, sync source = MADI

### Using the Web UI

On the right of the "System → States" page (in the Web UI), you will see information about each of the **Sync** sources.



The columns show whether the sync source is **Enabled** (in the configuration), **Present** (a valid signal has been detected), and **Active**.

The color coding indicates:

- **Blue** = sync source is enabled, present and active.
- **Green** = sync source is enabled and present, but not currently active.
- **Red** = sync source is enabled but not present.
- **Light Grey** = sync source is disabled in the configuration.

The **Prio Sequence** box shows the priority of the external sync sources as defined by the configuration - in our example, PTP, Wordclock and then MADI.

### Using the Sync Output

The WCLK OUT connector on the front panel provides an output of the system reference. e.g. to provide a wordclock signal to other non-PTP devices.



## 6 Power Core RP v2 - System Setup

This chapter describes how to set up Power Core RP v2 for use with an mc<sup>2</sup> system and VisTool RP.


- [Power Core RP v2 - Setup Quick Start](#)
- [Power Core RP v2 - Control Network Requirements](#)
- [Power Core RP v2 - Web UI Sessions](#)
- [Power Core RP v2 - Network Settings](#)
- [Power Core RP v2 - System Date and Time](#)
- [Power Core RP v2 - Network Security](#)
- [Power Core RP - mc<sup>2</sup> Configuration](#)





## 6.1 Power Core RP v2 - Setup Quick Start

This topic describes the recommended workflow to configure a system from scratch.

 The **VisTool RP Admin** tool will be available later this year.

### Overview

Power Core RP v2 is supplied with a VisTool RP installer which includes two components: **VisTool RP** and **VisTool RP Admin**. VisTool RP is used to control Power Core RP v2 from a networked PC (via a GUI). VisTool RP Admin is used to update the device firmware, load different RP configuration files, and configure the VisToolRP application. To launch VisTool RP for remote operation, you must activate the "VisTool RP" license.

Power Core RP v2 ships from the factory with the default RP DSP configuration, but you can use VisTool RP Admin to load a configuration with a different streaming configuration, or you can manually load a configuration file if you require additional customization. To unlock the DSP resources, you must activate the "AP IO Node" license onto the USB dongle (supplied). After inserting the dongle, Power Core will automatically reboot and load the default configuration file. You will then need to open a Web UI connection to the CONTROL port (dwc0) to configure the correct network settings and then use VisTool RP Admin to update the device firmware.

To control Power Core RP v2 from a mc<sup>2</sup> console, you must specify the device using a custom function.

### Instructions

The instructions below describe how to install a single Power Core RP v2 device into an existing mc<sup>2</sup> network.

To set up the system you will need a PC that is installed with a suitable web browser and the VisTool RP software. How to prepare the configuration PC is described [here](#).

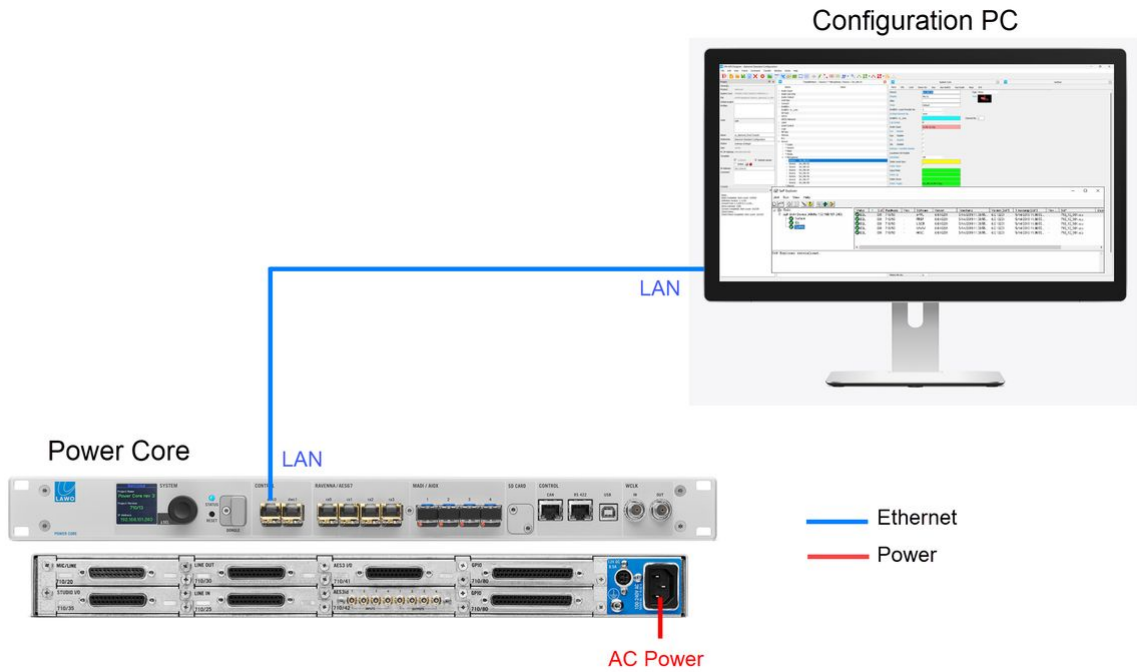
1. To boot and configure the system, the device must be powered.

Once power is applied, Power Core boots in a few seconds. The boot-up progress is shown on the front panel display.

2. Start the configuration by connecting your PC's LAN port directly to Power Core RP v2 (as shown below).

It is recommended to use the first control port: **dwc0** (so that you can use its default IP address **192.168.101.240**).

For the cabling and network requirements, see [Power Core RP - Wiring: CONTROL](#).



### 3. Configure the network settings of the first control port.

This step is necessary if you wish to fit Power Core into an existing network OR install more than one Power Core device (to avoid IP conflicts).

The settings are edited by opening a Web UI connection to Power Core and adjusting the "Device dwc0" parameters (in the "System → Control Network Devices" tab).

- The Web UI can be reached by entering the current IP address: 192.168.101.240
- Log in as either Supervisor or Administrator. The default passwords are *orion* for Supervisor and *hydra* for Administrator.
- Open the "System → Control Network Devices" tab and enter the required network settings.

**Device dwc0** defines the first control port. If you are using the second control port, then edit the parameters for **Device dwc1**.

The following fields can be edited: **IP Address**, **Network Mask** and **Gateway**. Type in the new value(s) and select **Apply** to save the changes.

The screenshot below shows an example.

The screenshot displays the PowerCore web interface with the following configuration details:

Device	Host Name	MAC Address	IP Address	Network Mask	Gateway	Link Speed	Link State	AutoNegotiation	Link Flags	SFP Type	SFP Vendor Name	SFP Vendor PN	Switch Name	Switch MAC Address	Switch Mgmt. Addr.	Switch Port Intf. Name	Switch Port Descr.	VLAN
Device dwc0	PoCo-aiiox02-MGMT01	08:00:27:00:00:00	192.168.101.240 (*)	255.255.255.0 (*)		1Gbit/s	up	disabled	SGMII	SGMII via RJ45	AWAGO	ABCU-5731ARZ		08:00:27:00:00:00	192.168.101.240	eth0	eth0	
Device dwc1	PoCo-aiiox2-MGMT02	08:00:27:00:00:00	192.168.102.240 (*)	255.255.255.0 (*)			down	disabled										

Below the device configurations, the LACP settings for the lagg0 interface are shown:

LACP dwc0/dwc1 (Device lagg0)	Status
	disabled (*)

Footnote: (\*) Modifications need system restart to take effect

For more information, see [Power Core RP v2 - Network Settings](#).

At this stage, you can reconnect your devices via the control network.

It is recommended to check the network connection to your configuration PC by re-opening the Power Core Web UI.

4. Add a summary of the remaining steps.



## Next Steps

Once you have completed the steps above, the system is ready for operation.

If you haven't done so already, connect and check your [sync reference](#). Optionally, you may wish to set the [system date and time](#) or configure the [network security](#).

Then go to [Power Core RP v2 - Getting Started](#) to learn more about the functionality of the device.



## 6.2 Power Core RP v2 - Control Network Requirements

To configure or control Power Core via TCP/IP Ethernet, you will need to make a connection to the control port (dwc0 or dwc1). This connection can be made either directly (point-to-point) or via a network (LAN or WAN).

When connecting via a network, then this can be shared with other devices, such as in the regular "house network" of a typical broadcast facility. Routers are permitted as long as the minimum requirements of the network interfaces are met. By using routers, or similar devices, the latency of the communication will increase.

The control network interfaces can operate at 1000, 100 or 10 BASE-T, depending on the SFP. The network switch/router port(s) MUST meet the following requirements:

- **Speed** = 1Gb/s, 100Mb/s or 10Mb/s; **1Gb/s is recommended**
- **Duplex mode** = **Full Duplex**

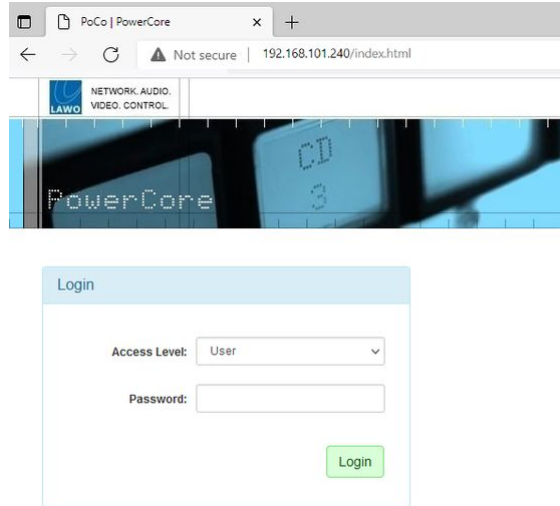
## 6.3 Power Core RP v2 - Web UI Sessions

This topic describes how to open a Web UI connection and log in.

1. Open a web browser application and enter the system's IP address into the URL field.

For example, enter **192.168.101.240** (for the default IP address).

Following a successful connection, the "Login" screen appears.



2. Select an Access Level and enter the Password.

There are three possible Access Levels.

- **User** (no password required, leave blank).

Information is displayed as "read-only" with no editable fields.

- **Supervisor** (default password = *orion*).

Allows pertinent fields to be edited, such as the IP settings in the "System → Network Devices" tab.

- **Administrator** (default password = *hydra*).

As for Supervisor, but with access to Supervisor and Administrator passwords in the "System → Control" tab.

For security reasons, it is recommended to change the Administrator and Supervisor passwords from the defaults after the device is set up.

3. Click on the green **Login** button.

Following a successful login, the current information is loaded from the device, and the "System → Information" tab appears.

Power Core has many system parameters and so it will take a few seconds for the information to load. Some of the information is displayed as a "snapshot" of the current data, so it is only as current as the latest refresh.



## 6.4 Power Core RP v2 - Network Settings

This topic describes how to configure the network settings for Power Core.

### Active Network Ports

Power Core (revision 3) is equipped with six network interfaces: two control and four streaming ports.

- The two control ports (dwc0 and dw1) and first pair of streaming ports (ra0 and ra1) are always active.
- The second pair of streaming ports (ra2 and ra3) can be enabled if there is a valid [RAV+ add-on license](#).

Power Core (revision 2) is equipped with four network interfaces that are always active: two control ports (dwc0 and dwc1) and two streaming ports (ra0 and ra1).

### Default Network Settings

By default, the network interfaces are assigned the following IP addresses. Note that Power Core can handle static IP addresses only; DHCP is not supported.

Network Port	IP Address	Subnet Mask	Gateway
Power Core - dwc0	Static only 192.168.101.240	255.255.255.0	0.0.0.0
Power Core - dwc1	Static only 192.168.102.240	255.255.255.0	0.0.0.0
Power Core - ra0	Static only 192.168.99.240	255.255.255.0	0.0.0.0
Power Core - ra1	Static only 192.168.98.240	255.255.255.0	0.0.0.0
Power Core - ra2	Static only 192.168.199.240	255.255.255.0	0.0.0.0
Power Core - ra3	Static only 192.168.198.240	255.255.255.0	0.0.0.0

### Current Network Settings

The network settings for the first control port (**dwc0**) are shown on the [front panel display](#).

### Editing the Network Settings

The network settings for the control and streaming ports can be edited by opening a Web UI connection to Power Core. You will need to do this if you are installing more than one device (to avoid any IP conflicts).

1. For the initial setup, best practice is to connect your configuration PC directly to the first control port: **dwc0**.
2. The Web UI can be reached by entering the IP address of the connected port.
  - For Power Core (dwc0), the default IP = 192.168.101.240

Log in as either Supervisor or Administrator. The default passwords are *orion* for Supervisor and *hydra* for Administrator.

3. Select either "System → Control Network Devices" or "System → RAVENNA Network Devices".

The first page shows the settings for the control network interfaces: **Device dwc0** and **Device dwc1**.

The screenshot displays the 'RAVENNA Network Devices' configuration page. It features two main configuration panels for 'Device dwc0' and 'Device dwc1'. Each panel includes fields for Host Name, MAC Address, IP Address, Network Mask, Gateway, Link Speed, Link State, AutoNegotiation, Link Flags, SFP Type, SFP Vendor Name, SFP Vendor PN, Switch Name, Switch MAC Address, Switch Mgmt. Addr., Switch Port Intf. Name, Switch Port Descr., and VLAN. Below these panels is a 'LACP dwc0/dwc1 (Device lagg0)' section with a 'Status' dropdown menu. A note at the bottom states: '(\*\*) Modifications need system restart to take effect'.

The second page shows the settings for the streaming network interfaces: **Device ra0** and **Device ra1** (plus **Device ra2** and **Device ra3** if these ports are enabled/available).

This screenshot shows the 'RAVENNA Network Devices' configuration page for streaming interfaces. It contains four configuration panels for 'Device ra0', 'Device ra1', 'Device ra2', and 'Device ra3'. Each panel includes fields for Public Name, MAC Address, IP Address, Network Mask, Gateway, Link Speed, Link State, AutoNegotiation, Link Flags, SFP Type, SFP Vendor Name, SFP Vendor PN, Switch Name, Switch MAC Address, Switch Mgmt. Addr., Switch Port Intf. Name, Switch Port Descr., VLAN, RX Bandwidth Usage, and TX Bandwidth Usage. Below the panels are 'LACP ra0/ra1 (Device lagg1)' and 'LACP ra2/ra3 (Device lagg2)' sections with 'Status' dropdown menus. A note at the bottom states: '(\*\*) Modifications need system restart to take effect' and '(\*\*\*) Modifications need RAVENNA restart to take effect for RAVENNA'.

**Important:** After updating the system to a new version, it is recommended to clear the cache of the web browser (to avoid old information being displayed).






The editable fields are marked with an asterisk (\*) and include the IP Address, Network Mask and Gateway.

4. Type in the new value(s) and select **Apply** to save the changes.

For the control ports (dwc0 and dwc1), IP address changes are made immediately, and so you will lose your browser connection once settings are applied. It is recommended to check the communication by re-opening the Web UI using the new IP address.

For the streaming ports (ra0, ra1, ra2 and ra3), IP address changes require a restart, and so you will need to reboot the device after settings are applied. This can be done using the **Reboot (Warmstart)** button in the "System → Control" tab.

 A Domain Name Server, NTP Server or Syslog Server can be entered via the "System → Network Settings" tab.

5. Once the correct settings are in place, you can connect Power Core to the control network.

6. To continue with the setup, enter the new IP address into your browser and log in again (as described above).

### Backup and Restore

It is possible to make a backup of the current network settings by copying the **parm.xml** file from the SD card (via ftp). This can then be copied back to the system if a restore is required.

The **parm.xml** file can be found in the following location on the SD card: **/media/mmc0-0-0/parm**

After replacing the file, you will need to reboot Power Core using a cold start. This can be done using the **Reboot (Coldstart)** button in the "System → Control" tab.

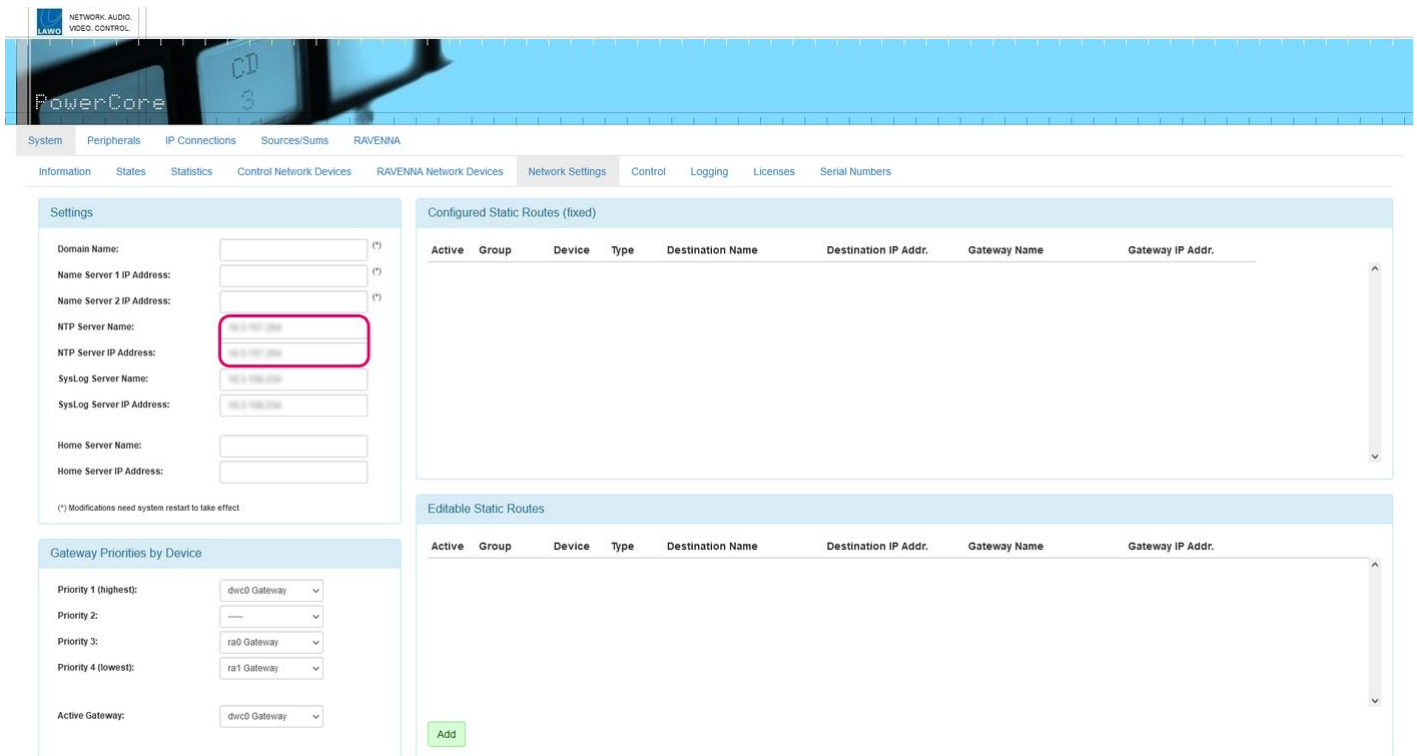
## 6.5 Power Core RP v2 - System Date and Time

The system date and time is provided by your network's NTP server (if present), or by the device's internal Real Time Clock (RTC). In both cases, a different time zone can be applied. This topic describes how to define the NTP server, reset the date/time manually and change the time zone.

### Defining an NTP Server

The network's NTP server can be defined in the "System → Network Settings" page of the Power Core Web UI. Once present, the system uses the NTP server to provide the system date and time.

1. Open a Web UI session for Power Core (as described [earlier](#)).
2. Log in as either Supervisor or Administrator. The default passwords are *orion* for Supervisor and *hydra* for Administrator.
3. Select the "System → Network Settings" page.



4. Use the **NTP Server Name** or **NTP Server IP Address** fields to define the server.

If you type "ntp.internal" in the Server Name box, then the IP Address is automatically filled.


### Setting the Date/Time Using SoP Explorer

SoP Explorer can be used to transfer the date and time from your configuration PC to the Lawo device. The transfer is done as a one-shot snapshot, so start by checking the current settings on your PC before you begin.

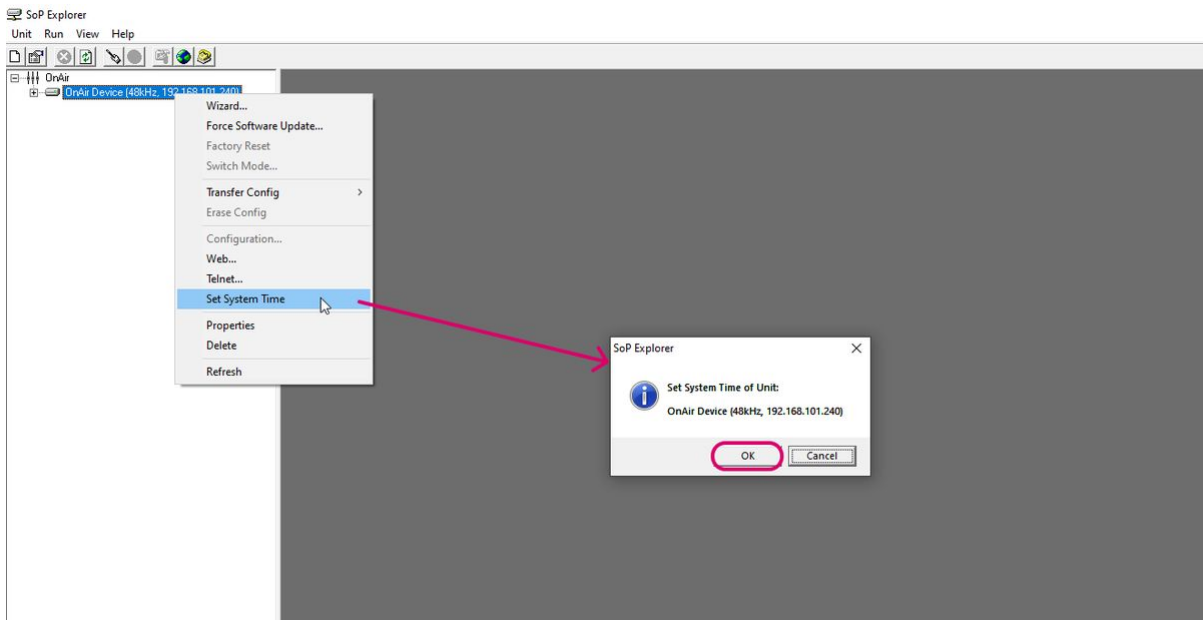
1. If SoP Explorer is not already open, start the application from either its desktop icon or Windows START menu.

All units that have been previously defined appear in the system tree (on the left).

If the unit you wish to configure is not listed, then select **Unit → New...** (from the main menus), enter the **IP** address of the Core and select **OK** - the unit is added to the "OnAir" device group in the system tree. SoP Explorer connects to the device and analyses the current firmware revisions.

If a white cross on a red background  appears beside the unit name, then SoP Explorer cannot connect to the device. Check that the IP address (entered in the "Unit Properties") matches that of the remote device. Then check the IP settings of the configuration PC and the network cabling.

2. Right-click on the unit and select **Set System Time**. Confirm by selecting **OK**.

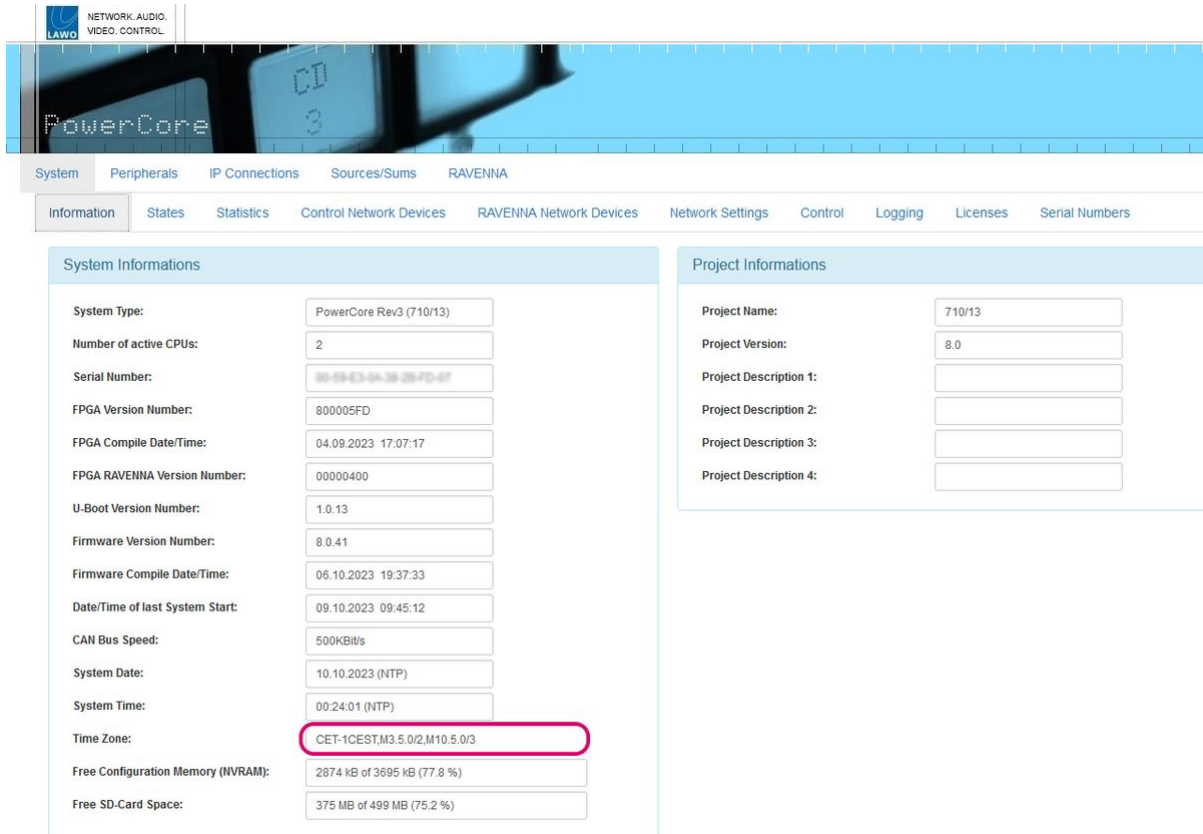


The software now sets the system date and time to match that of the configuration PC. The success (or failure) of the reset is shown in the SoP Explorer status bar area.

## Changing the Time Zone

The time zone can be edited by opening a Web UI connection to the device.

1. Open a Web UI session for Power Core (as described [earlier](#)).
2. Log in as either Supervisor or Administrator. The default passwords are *orion* for Supervisor and *hydra* for Administrator.
3. Select the "System → Information" page.
4. Click to edit the **Time Zone** value - any change takes immediate effect and so a restart is not required.



The time zone should be specified relative to Central European Time (CET).

For example, "CET+5CEST,M3.2.0/2:00,M11.1.0/2:00" is suitable for US East Coast, where CET is 5 hours ahead.

The second part of the syntax specifies the start and end of Central European Summer Time (CEST). e.g. from month 3, week 2, day 0, time 2am (the second Sunday in March) until month 11, week 1, day 0, time 2am (the first Sunday in November).

## 6.6 Power Core RP v2 - Network Security

To make the system more secure, the following features are supported.

### User Login for the Web UI

To open the Web UI, you must login as a User, Supervisor or Administrator. In User mode, all fields are visible but cannot be edited. Thus, settings can only be changed by entering Supervisor or Administrator mode. For security reasons, it is recommended to change the Administrator and Supervisor passwords from the defaults once the device is set up. This can be done from the [System -> Control](#) tab once you are logged in as Administrator.

### "https" for the Web UI (optional)

This option allows you to use a secure connection for the Web UI. It can be achieved by storing the required SSL certificates on the Power Core device. The steps required to prepare the device are described [later](#). Once the certificates are in place, the Web UI can be opened using a "https" connection. Apart from the connection method, there is no difference in the functionality.

### Ember+ Provider Clients Whitelist (optional)


This option can be used to make sure that only devices with a defined IP can access the Ember+ providers. The option is enabled, in the ON-AIR Designer configuration, by entering at least one IP address in the Ember+ Provider Clients Whitelist. If the list is empty, then the feature is disabled and access is permitted from consumers with any IP address. For testing purposes, the whitelist can be temporarily disabled from the Web UI (via the [System -> Control](#) tab).

### Network Port Restrictions (optional)

This option can be used to restrict the network ports used for the different protocols: Telnet, WebUI, Netcom, DMS, MNOPL and EmBER+. The option is set from the Web UI (via the [System -> Control](#) tab). In each case, you can choose either **any** (to allow access via any control network port) or **dwc0** (to restrict access to the first control port). Note that if you choose **dwc0**, then the restriction also applies to the local host and so access is not permitted via 127.0.0.1. By default, all protocols are available on all interfaces.

### Ember+ Denial-of-service Attack Blocker

This feature is always implemented, and protects the Ember+ provider from unwanted service requests. If there are more than 10 "GetDir" requests from the same node in quick succession, then the connection to the consumer is terminated. The connection can then be re-established by the consumer.

 **Please note:** encryption adds calculation time and so some parameters are updated more slowly than without encryption. A difference will be noticed if the stream destinations are monitored with and without SSL (as Packet Increase is updated more frequently without SSL).

## 6.7 Power Core RP - mc<sup>2</sup> Configuration

This topic describes how to enable the Power Core RP v2 integration on the Lawo mc<sup>2</sup> console.

### Introduction

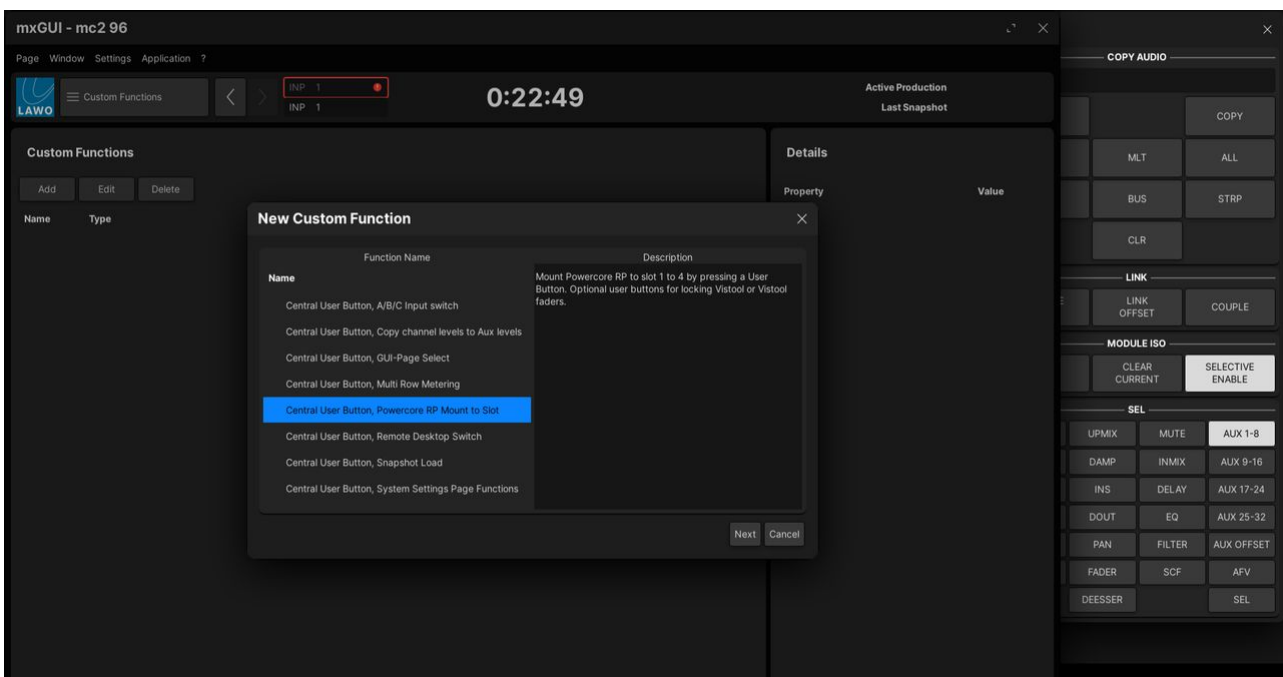
On Lawo's mc<sup>2</sup> consoles, a custom function must be used to define each Power Core RP v2 that can be connected.

Each mc<sup>2</sup> console can mount up to four Power Core RP v2 units simultaneously, but it is possible to define more connections.

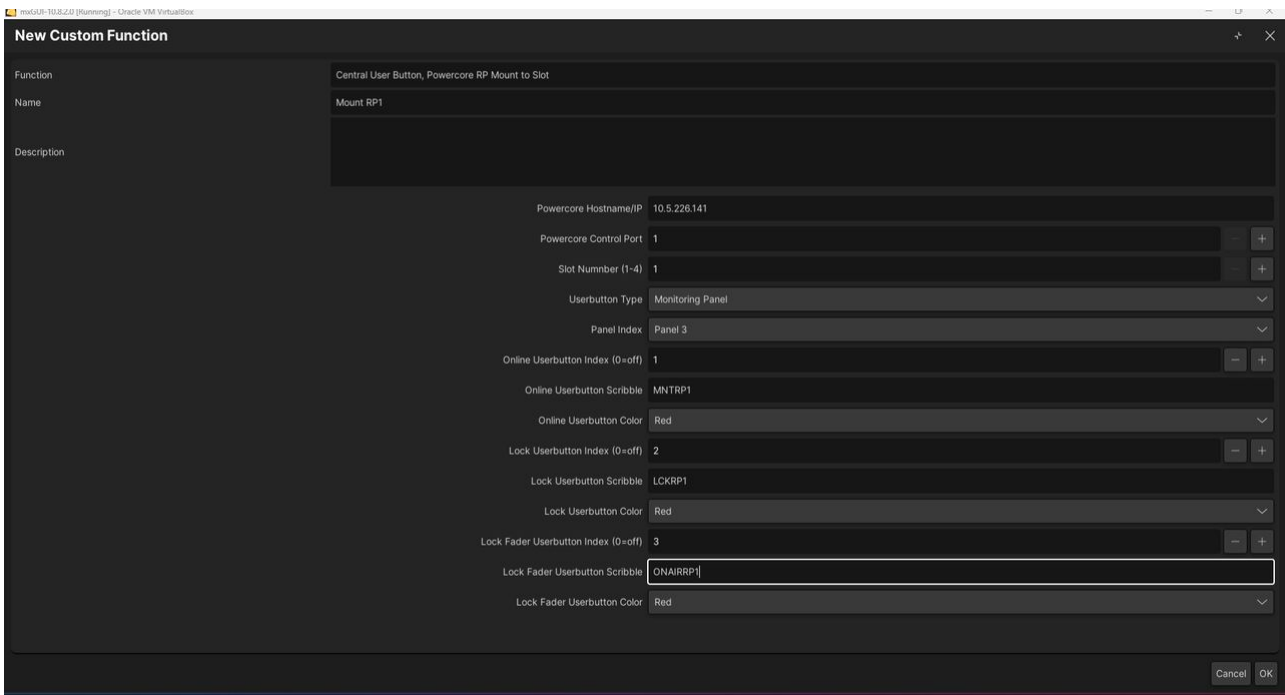
More information about custom functions can be found in [mc<sup>2</sup>56 - Custom Functions](#).

### Configuring a Custom Function to mount the Power Core RP v2

1. Open the **Custom Functions** display on the Central GUI. Select the **Central User Button, Powercore RP Mount to Slot** function and click **Next**.



2. Set the name of the Custom Function and provide a description if desired.
3. The **Powercore Hostname/IP** should be set to the control IP address of the Power Core RP v2.
4. Set the **Powercore Control Port** to **9001**.
5. Select a **Slot Number** to mount the Power Core RP v2 into.
6. Select a **Userbutton type** and **Panel Index** to use for the RP Mount and Control keys. For more information about the Userbutton panel types and indexes, see [Programming User Buttons](#).
7. Select a **Userbutton Index** for the **Online**, **Lock**, and **Lock Fader** user buttons. Set the Scribble strip label for each button, as well as the color the button will turn when the function is active.

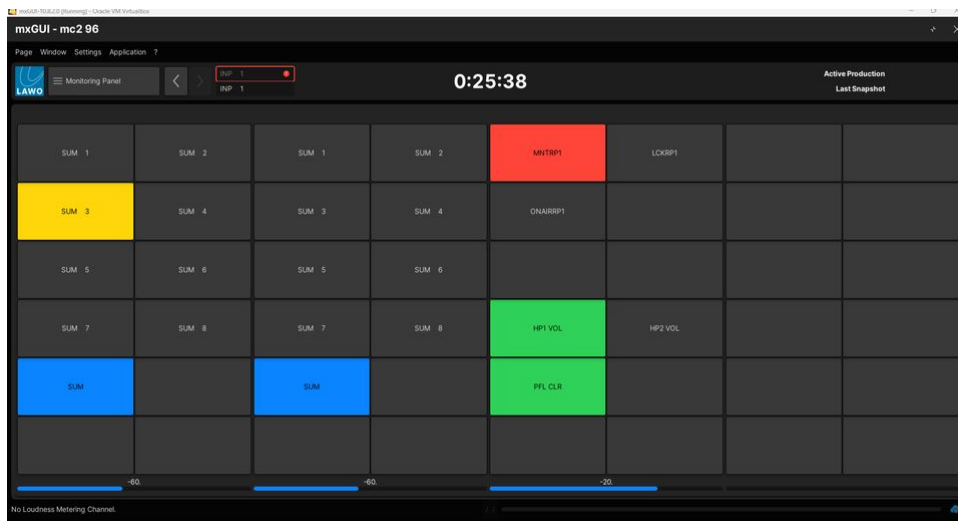


8. Click **OK** to create the custom function.

### Mounting the Power Core RP v2

To mount to Power Core RP v2, press the Userbutton defined in the custom function associated with the Power Core RP v2 that you wish to mount. If the connection is successful, the Userbutton lamp will illuminate.

Once a Power Core RP v2 is mounted, the channels and auxes can be assigned to fader strips using the [normal workflow](#).



### Next Steps

Once you have completed the steps above, the system is now ready to use. Go to [VisTool RP - Getting Started](#) to learn more about the VisTool RP GUI, or go to [Power Core RP v2 - Remote Operation from the Console](#) to learn how to control the Power Core RP v2 from the mc<sup>2</sup> console.

If you haven't done so already, connect and check your [sync reference](#). Optionally, you may wish to set the [system date and time](#) or configure the [network security](#).

## 7 Power Core RP v2 - Manual Install

This chapter describes the recommended workflow to manually configure a system from scratch.

### 7.1 Overview

For customers who purchase Power Core RP v2 with an unlocked configuration, or customers using Beta releases they may choose to configure the Power Core RP v2 manually.

Your Lawo Project Engineer will provide you with a zipped release file that will contain the correct version of ON-AIR Designer, VisTool, as well as the Power Core and VisTool configuration files.

It is recommended that customers have some previous familiarity with using ON-AIR Designer and VisTool.

### 7.2 Release File Structure

Each release file will contain the following files:

- **docs/readme.txt** - If there are any special instructions for this release, they will be contained in this file
- **docs/releaseNotes.txt** - Release Notes for the current version detailing any changes, fixes, or new features, as well as known issues
- **software/onair-designer-8.x.x.x.exe** - The current version of ON-AIR Designer that should be used with this release.
- **software/vistoolmk2-8.x.x.x-x64.exe** - The current version of VisTool MK2 that should be used with this release.
- **templateFiles/Emberdefault.ini** - A sample file that can be used to set the Bookmark URLs
- **templateFiles/Emberhosts.ini** - A sample file that is used to define the EmBER+ connections from VisTool
- **templateFiles/RPv2\_default\_labels.xml** - A sample file with a default set of user labels for all Inputs and Buses
- **RPv2.db3** - The ON-AIR Designer database file for customers using a Power Core Rev3 WITH the Ravenna Plus addOn license
- **RPv2-rev3.db3** - The ON-AIR Designer database for customers using a Power Core Rev3 without the Ravenna Ravenna Plus addOn license
- **RPv2-rev2.db3** - The ON-AIR Designer database for customers using a Power Core Rev1 or Power Core Rev2 unit
- **RPv2-Local.vistool** - The VisTool file that should be used for a local user (located with the MC<sup>2</sup> console)
- **RPv2-Remote.vistool** - The VisTool file that should be used for a remote user (located on-site with the Power Core)

The files in the release folder should be extracted to a common directory, such as C:\Lawo\Configurations\RPv2. This way, there is no need to update the VisTool Session configurations each time a new release is available.

### 7.3 Install Process

- [Power Core RP v2 - Installing VisTool](#)
- [Power Core RP v2 - License Activation](#)
- [Power Core RP v2 - Installing ON-AIR Designer](#)
- [Power Core RP v2 - Firmware Updates](#)
- [Power Core RP v2 - Loading the Configuration](#)



## 7.4 Power Core RP v2 - Installing VisTool

This topic describes how to install VisTool and configure the RP Sessions.

### User Access In Windows

If you wish VisTool to be available to any Windows User, then you should make sure that all files and applications are accessible to all users:

1. With the PC's main monitor connected, make sure that you are logged into Windows as an Administrator.
2. Prepare a "projects" folder that can be seen by all users of the PC.

Later you will use this folder to store all of the relevant project files required to run the VisTool RP application. We recommend using the following file path:

```
C:\users\public\Lawo
```

In Windows, set up the Users so they have access to this folder and its contents.

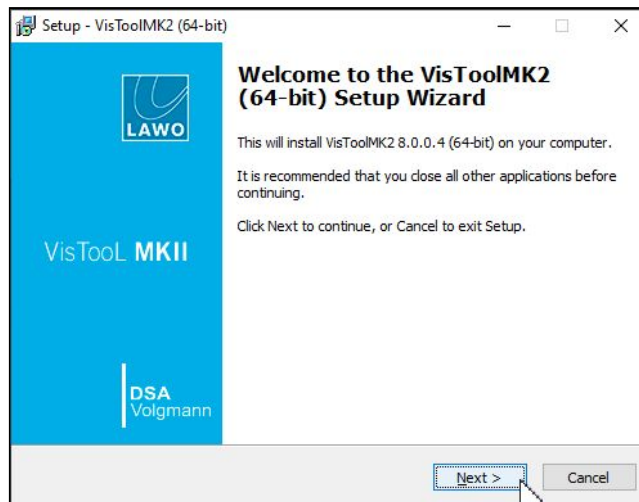
3. When you run the VisTool MK2 installer, make sure that you run the ".exe" file as an Administrator.

### Installing the Software

The **VisToolMK2.exe** installer performs an automatic install of all VisTool components and Codemeter Runtime (the software license manager).

1. The VisTool installer will be included in the Software folder of the Release zip file provided by your Lawo Project Engineer.
2. Double click on the installer icon, or right-click and run the **VisToolMK2.exe** as an Administrator.

The latter is recommended if you wish VisTool to be accessible to all users of the PC. Both operations start the 'VisToolMK2 Setup Wizard'. Select the language to be used for the installation, either English or German, and the following window appears.



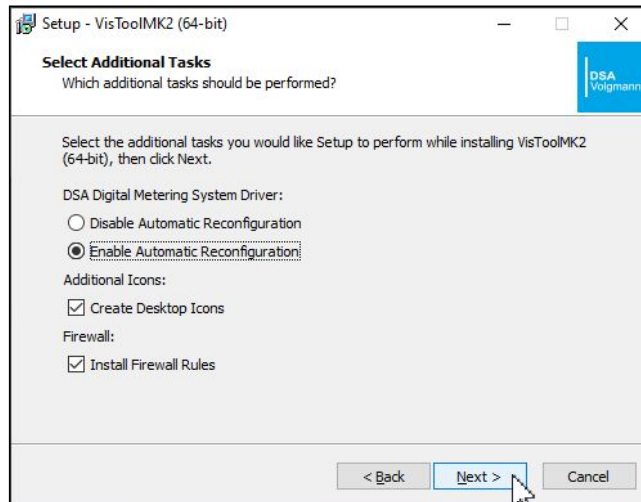
3. Follow the Wizard's instructions accepting the default options provided.

At the 'Select Components' window, all of the components should be ticked.

**Note** that the **CodeMeter** software is necessary for licensing. If an existing License Container is already installed, then this option can be deselected.

Leave the option ticked to update the CodeMeter release and create a new container.

At the 'Additional Tasks' window, make sure that the **Create Desktop Icons** and **Install Firewall Rules** options are selected:

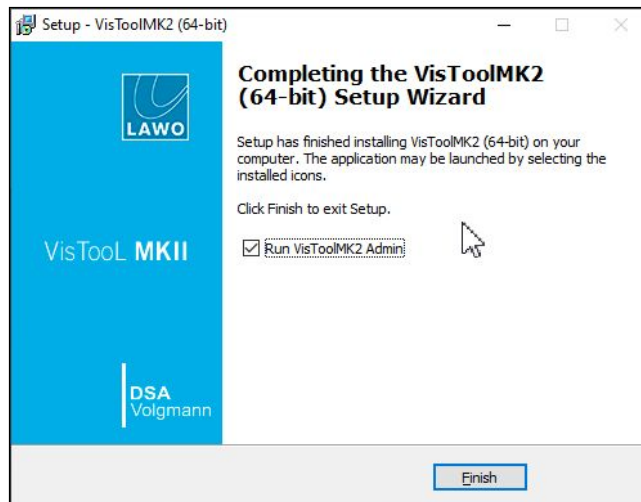


**i** By default, the installer will add firewall rules to ensure the smooth operation of VisTool during runtime.

4. When you reach the 'Summary' window, check the options and click **Install** - the software will be installed onto your computer; this may take a few minutes.

By default, files are installed in the location: 'C:\Program Files\VisToolMK2'.

5. When the installation is complete, the following window will appear:



Leave the default "Run" options selected and click on **Finish**. You can now use **VisToolMK2 Admin** to configure the connection from VisTool to the Power Core.

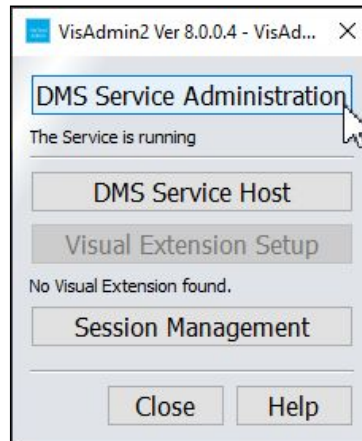
### Configuring VisAdmin

VisAdmin is used to configure the DMS connections from VisTool to the Power Core. **DMS** (Digital Metering Service) is a Lawo control protocol supported by the Power Core.

It is used by the VisTool RP application to control functions within the Power Core and provides metering data from the Power Core to the VisTool UI.

1. **VisAdmin** starts automatically at the end of the VisTool installation procedure.

Alternatively, it can be started by clicking on the **VisToolMK2 Admin** desktop icon, or by selecting the program from the Windows "Start" menu. On startup, the **VisAdmin** home page appears:

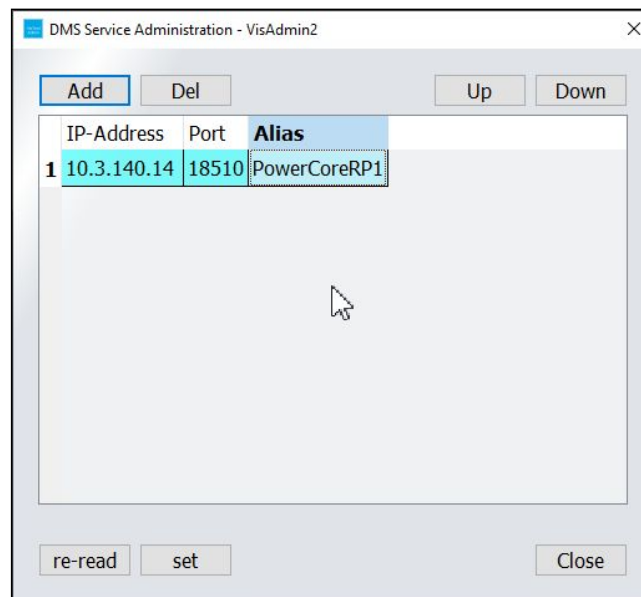


2. Click on the **DMS Service Administration** option. This window defines all of the DMS endpoints supported by the VisTool PC. It is possible to configure up to 4 DMS connections to different Power Cores.

3. Select **Add** to add a new device and then double-click in each field to define the connection.

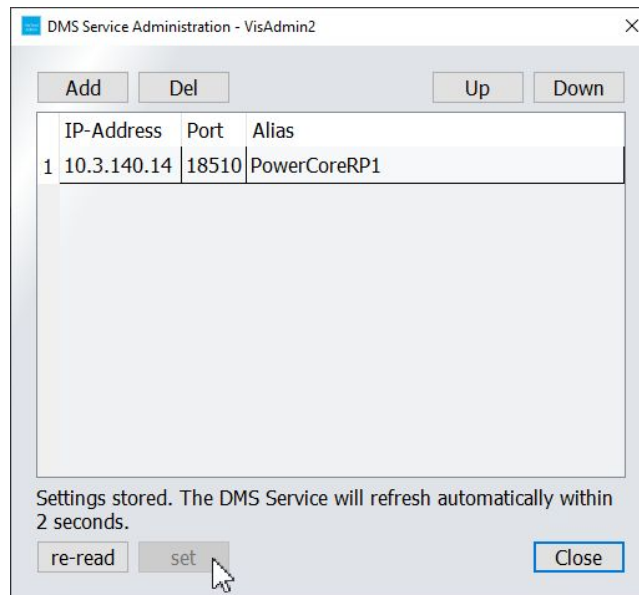
The **IP-Address** and **Port** fields must be completed; the **Alias** field is optional.

- **IP-Address** - this must match the IP address of the Power Core RP you wish to control.
- **Port** - this should be set to 18510 (the default port number)
- **Alias** - this field is used in the Session Management window. It can be useful to enter an alias name to help identify the device such as *RP1-Paris*. Spaces are not supported in the Alias.



4. Repeat step 2 for each Power Core RP v2 you wish to control from the PC.

5. Once all fields are complete, select **set** to store the settings and refresh the DMS service - the list updates and the **set** button will become greyed out:



**i** Note that you must use **set** to confirm your changes. If the **set** button is not greyed out, then the settings are still in edit mode and will not be saved if you **Close** the window.

6. Once the settings have been stored, select **Close** to close the window and return to the VisAdmin home page.

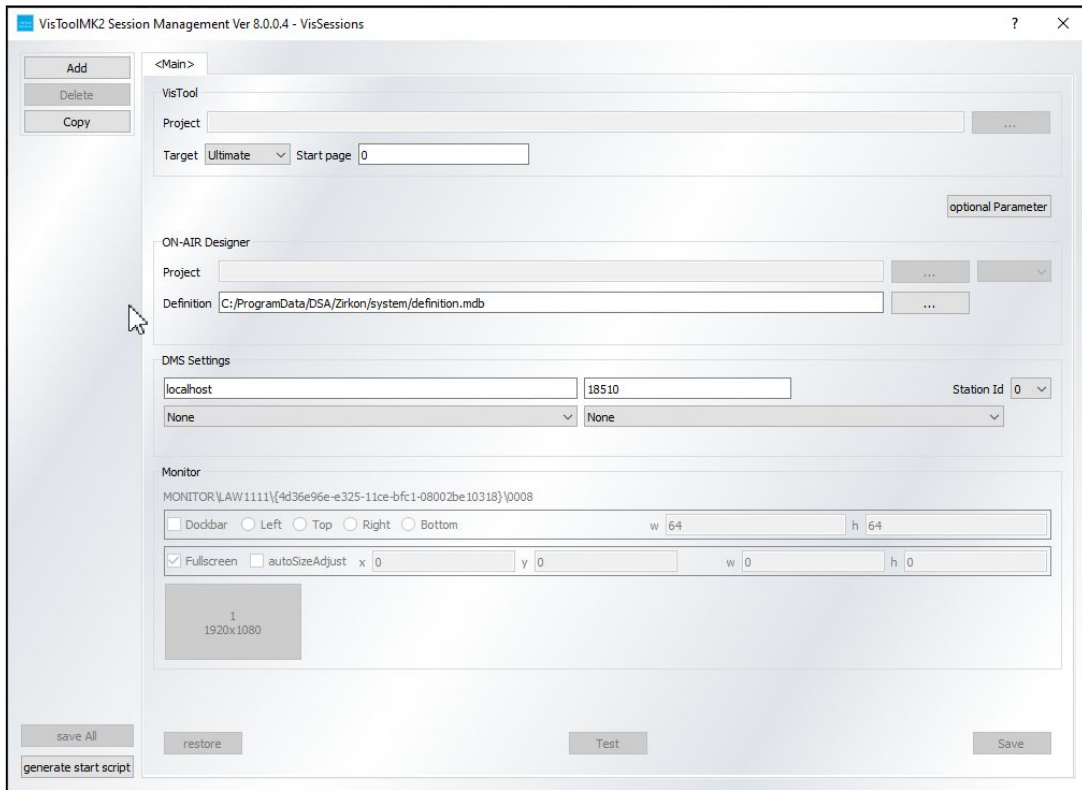
### Configuring VisTool RP Sessions

**VisTool Sessions** are used to configure how the VisTool RP application will appear on your PC's monitor(s) and to generate a start script that can launch the application.

Sessions are used to associate a VisTool file (for either the Local or Remote users) with a Power Core and define some default settings.

1. **VisToolMK2 Sessions** can be launched by clicking on the **Session Management** button in **VisAdmin** or by clicking on the **VisToolMK2 Sessions** desktop icon, or selecting the program from the Windows "Start" menu.

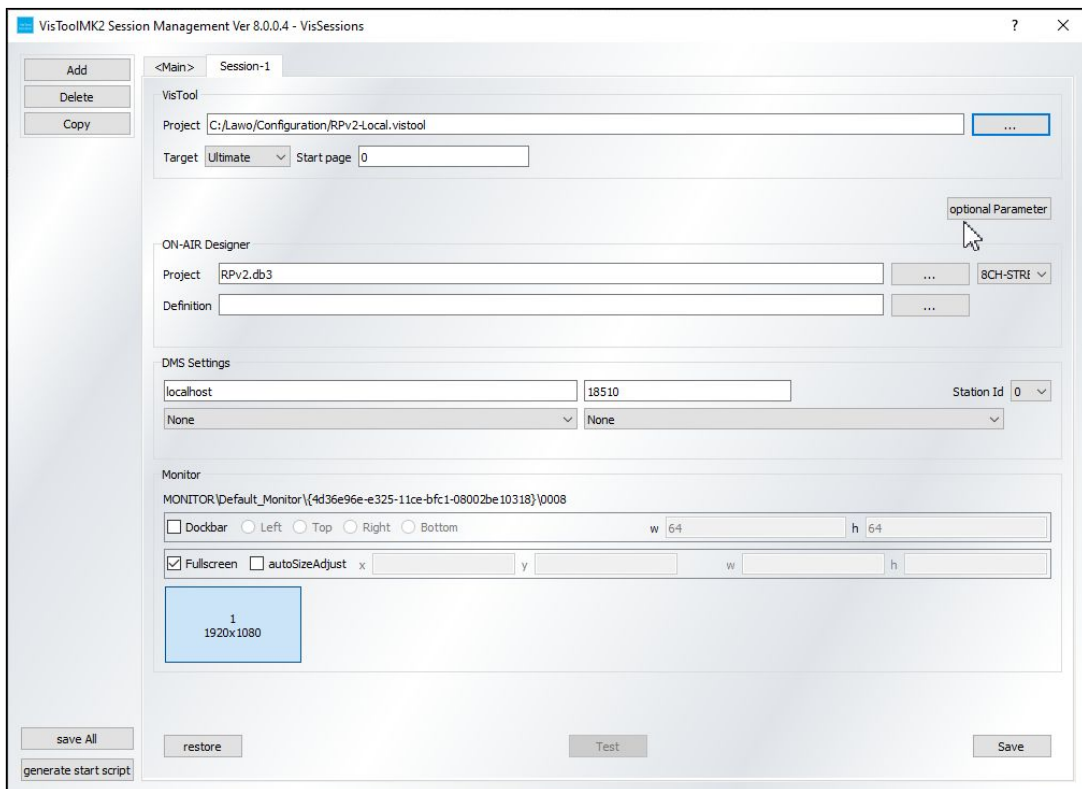
On startup, the **Session Management** page appears:



2. Click **Add** to create a new session.

3. Click the ... button in the VisTool section to select the VisTool project file.

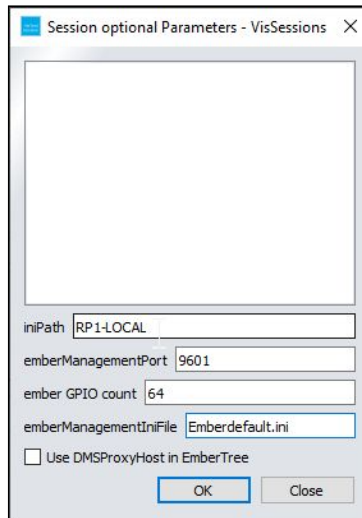
Select the **RPv2-Local.vistool** file if you are configuring the PC for the **Local** user (located with the MC<sup>2</sup> console) or the **RPv2-Remote.vistool** file if you are configuring the PC for the **Remote** user (located on-site with the Power Core RP).



4. Click the **optional parameter** button

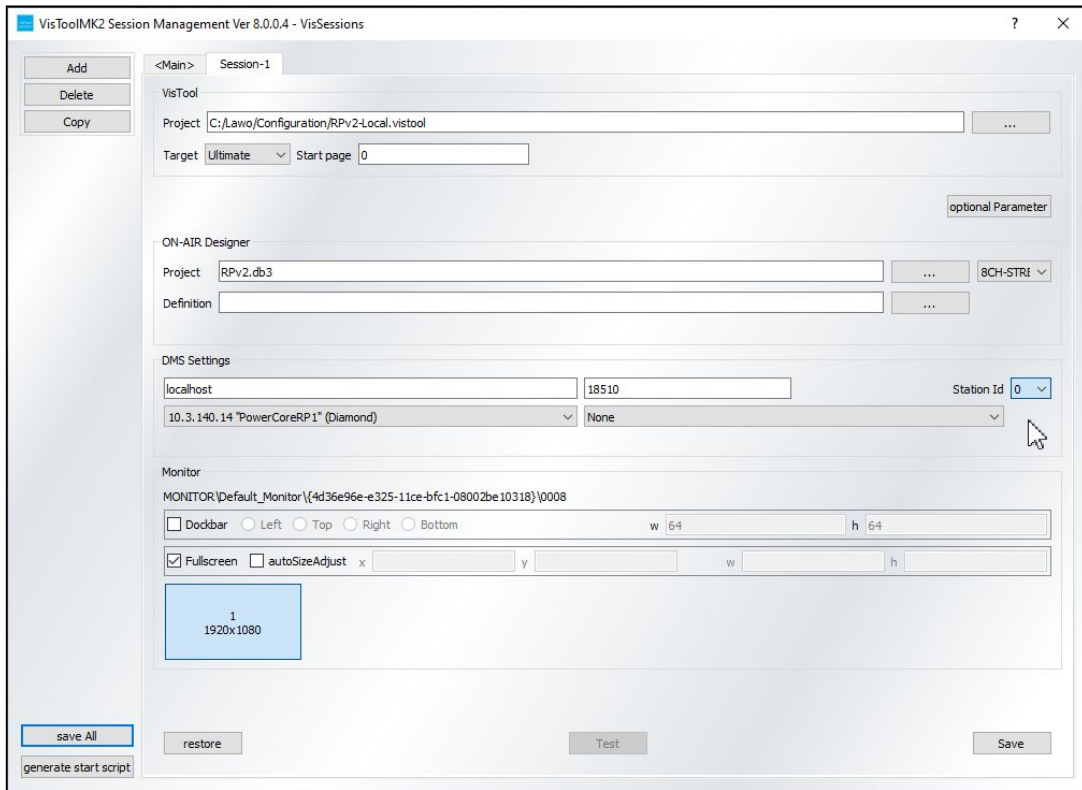
- **iniPath** - This is used to define the folder where the **Emberhosts.ini** and **Emberdefault.ini** files will be located. These files are used to define the devices that VisTool will connect to using the EmBER+ protocol and set some default settings for the VisTool RP instance. Setting this option allows the settings to be unique for each VisTool session.
- **emberManagementPort** - Each VisTool RP instance acts as an EmBER+ provider. This option is used to set the TCP port used by the VisTool RP instance. This value should be unique for each session.
- **ember GPIO count** - This should be set to **64**.
- **emberManagementIniFile** - This is the name of the file used to configure the bookmarks for the VisTool RP instance. This should be set to **Emberdefault.ini**.

Click **OK** to set the optional parameters.

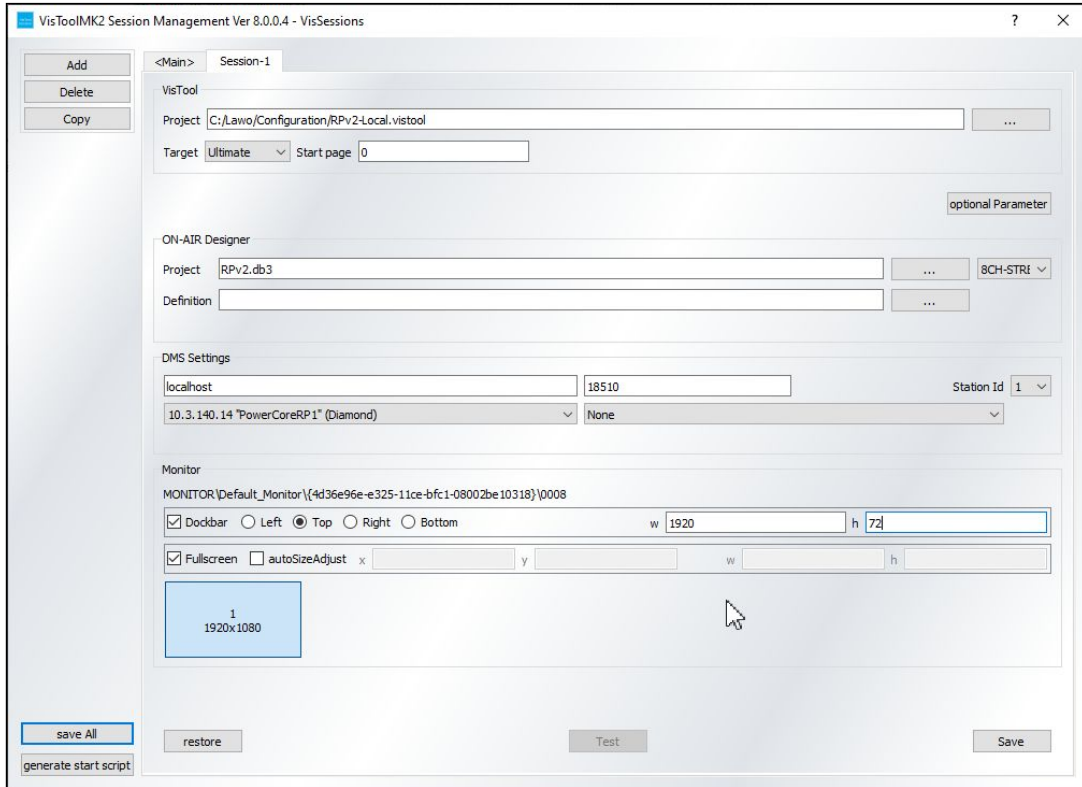


**i** If you will only be running one VisTool RP instance on the computer, you can leave the **iniPath** field blank and copy the **Emberhosts.ini** and **Emberdefault.ini** files to `C:\ProgramData\DSA`

5. Click the left dropdown under **DMS Settings** and change the device from **None** to the Power Core RP v2 device the VisTool should connect to.



6. Set the Station ID to **1** if you are configuring the session for a local user. Set the Station ID to **2** if you are configuring the session for a remote user.
7. Tick the **Dockbar** check box and select the **Top** radio button. Set the **Width** to 1920 and the **Height** to 72.



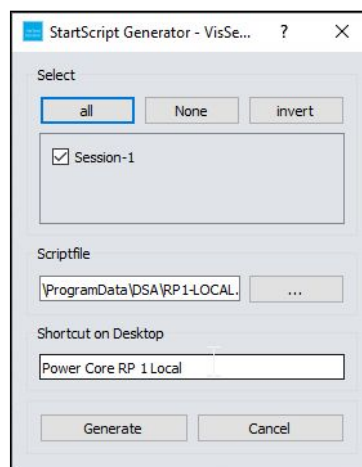
ⓘ VisTool RP was designed to run on a screen with a resolution of 1920x1080. If you are running VisTool RP on a smaller or larger screen, you may need to adjust the Dockbar Width and Height values based on your screen resolution and Windows Display scaling factor.

For example, on a computer with a 4K screen (3840x2160) with a 100% scaling factor, the Dockbar Width should be set to 3840 and the Dockbar height should be set to 288.

8. Connected monitors will be displayed at the bottom of the screen. Click on a monitor to set VisTool to launch on that monitor. The monitor will be highlighted in blue once it has been selected.

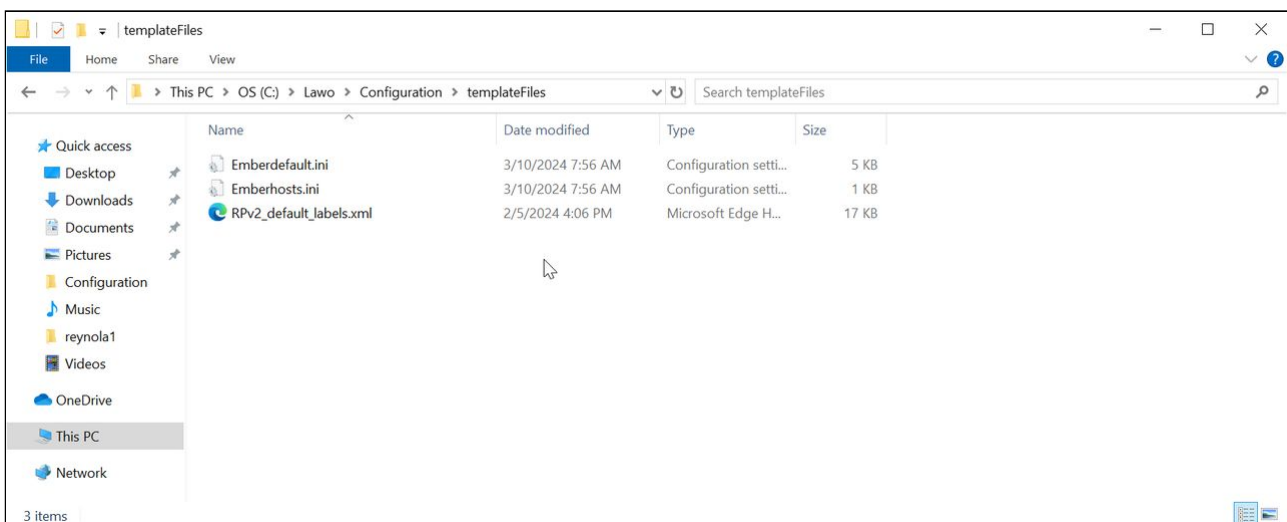
9. Click **Save** to save the session configuration. The **Save** button will become greyed out.

10. Click on **generate start script**. This will create a script file and a shortcut on the desktop that can be used to launch the VisTool RP instance. The scriptfile will have a default file name of `vistoolsession.cmd`. If you intend to run more than one VisTool session per computer, you should set the script file name to a unique value, such as `RPx-Local.cmd`. The name of the Desktop Shortcut can also be set. Click **Generate** and the shortcut will be created on the local desktop.



## Installing the Ember Ini files

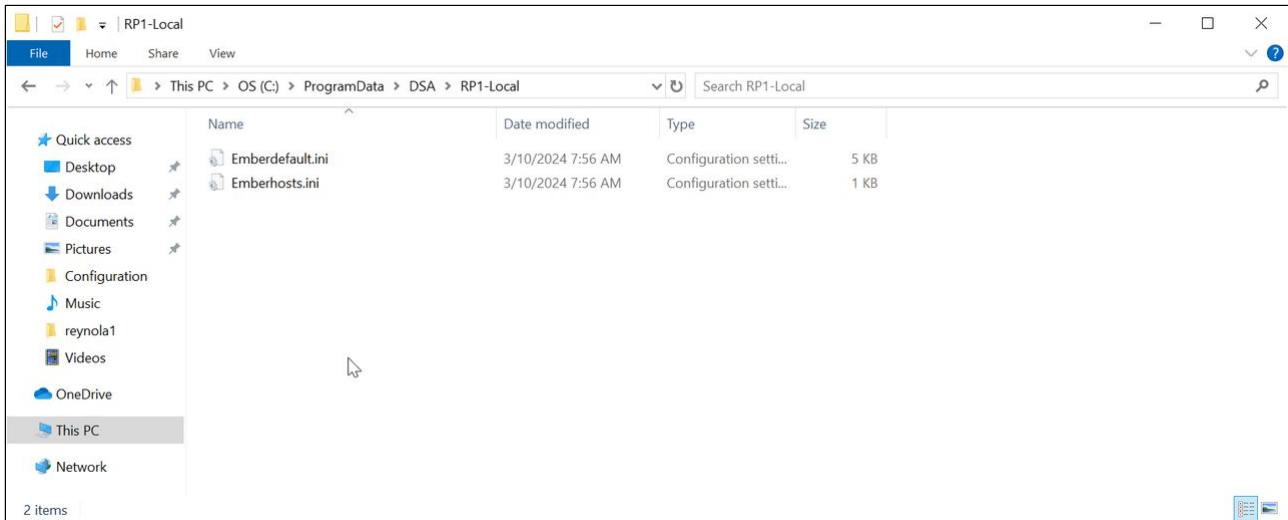
In each release.zip file provided by your Lawo Project Engineer, there will be a folder called templateFiles. Inside this folder are the **Emberhosts.ini** file and **Emberdefault.ini** files.



The **Emberhosts.ini** file is used to define EmBER+ connections from VisTool. In order for the VisTool RP application to run properly, VisTool **must** be able to connect to the Power Core RP v2 EmBER+ API. Optionally, the VisTool RP application can also connect to two Lawo A\_Mic8 units to provide microphone preamp control from within the VisTool RP application.



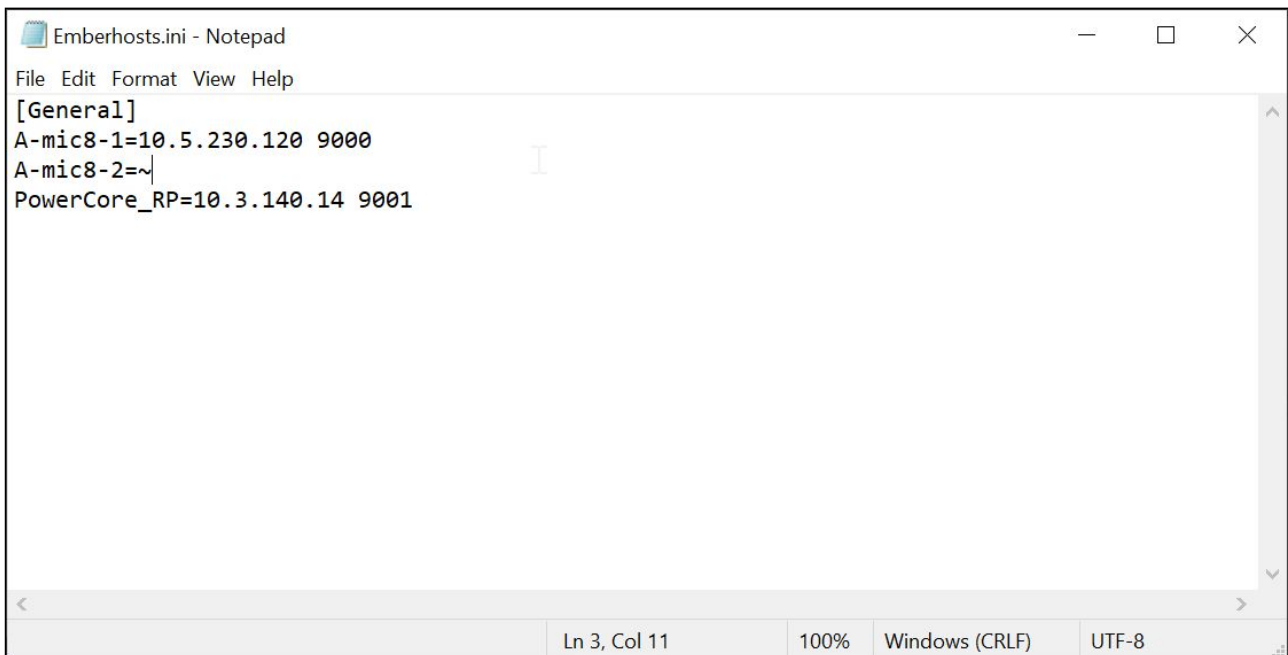
1. Copy the **Emberhosts.ini** and **Emberdefault.ini** files to `C:\ProgramData\DSA\` or `C:\ProgramData\DSA\RP1-Local` (if you configured a custom **iniPath** for the VisTool RP session in step 4 in the section above).



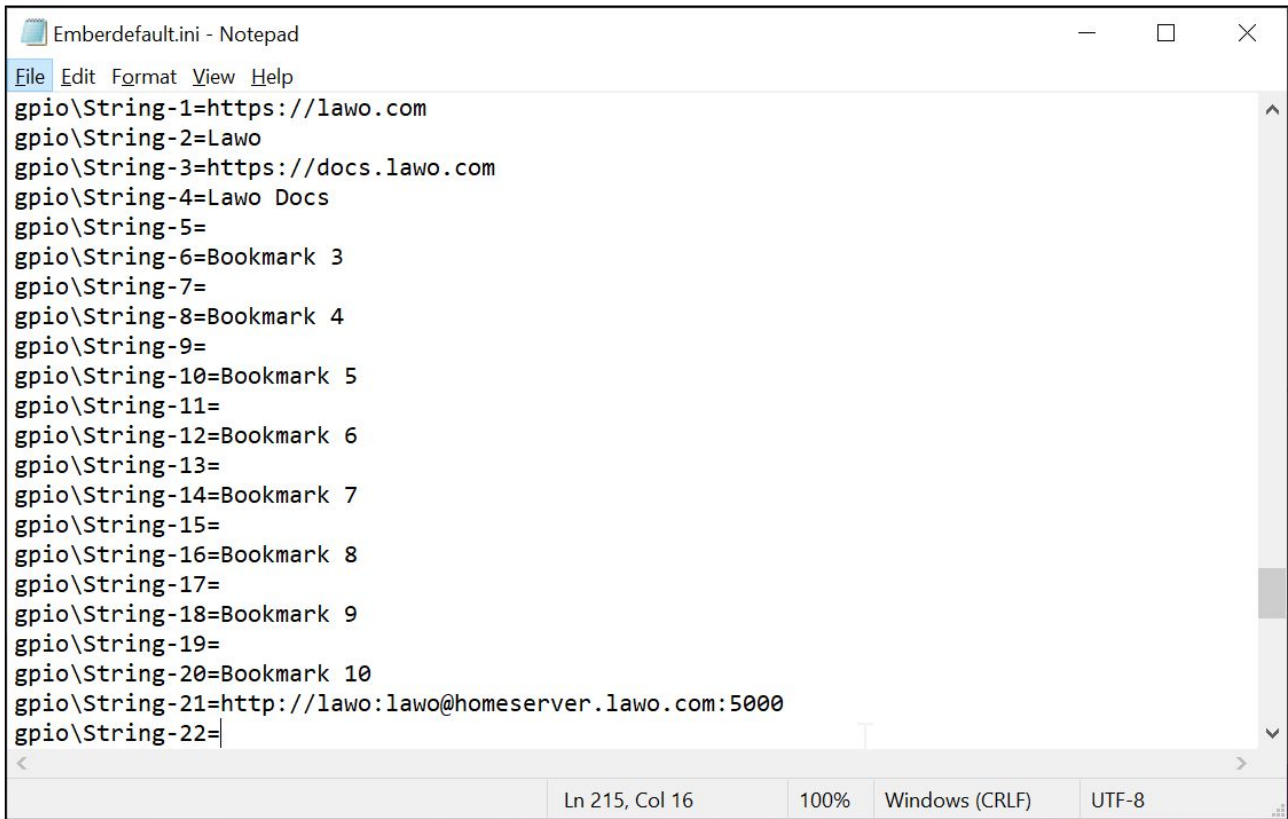
2. Use a suitable text editor to edit the **Emberhosts.ini** file.

Each line in the **General** section consists of a device alias, an IP address for the device, and the port number the EmBER+ API is listening. For Lawo A\_Mic8s, the EmBER+ port is 9000. For the Power Core RP v2, this port is set to 9001 by default.

In the below example, only one A\_Mic8 is in use, so the second A\_Mic8 connection has been disabled by setting the value to ~.



3. Use a suitable text editor to edit the **Emberdefault.ini** file. This file is used to set the values for the bookmark URLs and Labels in the VisTool RP application.



```
Emberdefault.ini - Notepad
File Edit Format View Help
gpio\String-1=https://lawo.com
gpio\String-2=Lawo
gpio\String-3=https://docs.lawo.com
gpio\String-4=Lawo Docs
gpio\String-5=
gpio\String-6=Bookmark 3
gpio\String-7=
gpio\String-8=Bookmark 4
gpio\String-9=
gpio\String-10=Bookmark 5
gpio\String-11=
gpio\String-12=Bookmark 6
gpio\String-13=
gpio\String-14=Bookmark 7
gpio\String-15=
gpio\String-16=Bookmark 8
gpio\String-17=
gpio\String-18=Bookmark 9
gpio\String-19=
gpio\String-20=Bookmark 10
gpio\String-21=http://lawo:lawo@homeserver.lawo.com:5000
gpio\String-22=|
Ln 215, Col 16 100% Windows (CRLF) UTF-8
```

The table below describes the EmBER+ parameters.

### Emberdefault.ini String Parameters

The following parameters can be used to define the 'Web Page' bookmark URLs and labels.

Name	Description	Default	Additional Information
gpio/String 1	Bookmark 01 URL	-	-
gpio/String 2	Bookmark 01 Label	Bookmark 1	-
gpio/String 3	Bookmark 02 URL	-	-
gpio/String 4	Bookmark 02 Label	Bookmark 2	-
gpio/String 5	Bookmark 03 URL	-	-
gpio/String 6	Bookmark 03 Label	Bookmark 3	-
gpio/String 7	Bookmark 04 URL	-	-
gpio/String 8	Bookmark 04 Label	Bookmark 4	-
gpio/String 9	Bookmark 05 URL	-	-
gpio/String 10	Bookmark 05 Label	Bookmark 5	-
gpio/String 11	Bookmark 06 URL	-	-
gpio/String 12	Bookmark 06 Label	Bookmark 6	-
gpio/String 13	Bookmark 07 URL	-	-
gpio/String 14	Bookmark 07 Label	Bookmark 7	-
gpio/String 15	Bookmark 08 URL	-	-
gpio/String 16	Bookmark 08 Label	Bookmark 8	-
gpio/String 17	Bookmark 09 URL	-	-
gpio/String 18	Bookmark 09 Label	Bookmark 9	-
gpio/String 19	Bookmark 10 URL	-	-
gpio/String 20	Bookmark 10 Label	Bookmark 10	-
gpio/String 27	Top Bar Label Line 1	Power Core	
gpio/String 28	Top Bar Label Line 2	RP Local	
gpio/String 64	HOME Server URL	http:// lawo:lawo@hom eserver.lawo.co m:5000	



## **Next Steps**

Once you have completed the steps above, proceed to the instructions on [activating a VisTool license](#).

## 7.5 Power Core RP v2 - License Activation

This topic describes how to install and activate the software license(s).

### Overview

The system requires two licenses: one for VisTool and one for Power Core.

The "VisTool RP" license (VISRP) can be installed into a local container (on your host PC), a remote container (on a networked server), or onto a USB dongle (for portability). If you wish to use a dongle, then this must be ordered separately.

**i** For customers using beta versions of VisTool RP or VisTool RP with an open configuration, you will need the **VisTool MK2 Sapphire Unlimited** license and the **VisTool MK2 AddOn Ember+/Logic** add-on license.

For Power Core RP v2, the "AP IO Node" license (APION) must be installed onto a USB memory stick that is connected to the front panel DONGLE port. A specially-configured USB memory stick is supplied for this purpose.

In both cases, the licenses are activated using the **CodeMeter Runtime** licensing system from [WIBU systems](#). The license codes can be found on the delivery note shipped with the system.

### About the Dongles

All dongles are specially-configured USB memory sticks that must be purchased from either [Lawo](#) or [WIBU systems](#).

The dongles supplied for software and hardware products ship with different file systems, so **it is important not to mix up the dongle types**.

If you have purchased a dongle for a Lawo software application such as VisTool, then this will have a metal "LAWO logo" tag attached as shown below. Multiple software products can be licensed from a single dongle.



The dongle supplied for hardware products such as Power Core are stand-alone (with no metal tag).

### Preparing for Activation

To activate a license, you will need:

- A PC with an internet connection (and USB port if using a dongle). If your PC does not have an internet connection, then the [offline activation](#) method can be used. The PC must be installed with **CodeMeter Runtime** (as described below).
- The WIBU systems USB memory stick (if using a dongle).
- The license code. This can be found on the delivery note shipped with the system.

## Installing CodeMeter Runtime

To activate a license, your PC must be installed with **CodeMeter Runtime** (from WIBU systems). The correct version is installed automatically with the setup software for your product. You can check the installation by looking in the Windows taskbar where you should see the following icon.



This shows that a Cm container (for local license storage) has been installed.

## Activating a License Online

To use this method, your PC must have an internet connection. If this is not possible, then the offline activation method can be used.

When installing onto a dongle, the dongle must be connected to the PC's USB port.

1. Open the Lawo licensing web page at <https://licenseportal.lawo.com>



**TIP:** You can change the language using the drop-down menu at the top right of the page.

2. Copy your license ticket number into the 'Ticket' field and select **Next**.

The license code can be found on the delivery note shipped with the system. It takes the form of a 25-digit ticket number such as the one shown below.

**Ticket:**  
7MAMJ-8HZ95-N9VW5-3MKX6-LWUYM

3. The WebDepot searches for and displays your licenses. Select **Activate Licenses** to continue.
4. At the next page, select the storage method for your license.


There are two possibilities:

- **CmDongle** - to create a USB dongle.
- **CmActLicense** - to bind the license to the local computer.


### Available Licenses - Select the binding for Your Licenses

You can bind your licenses either to a computer (**CmActLicense**) or to a dongle (**CmDongle**).

- When binding to a computer, the licenses are transferred to that machine. The licenses are associated with some properties of this computer.
- When binding to a CmDongle, the licenses are fully transferred into this dongle. This allows you to use these licenses on different computers.



I want my licenses in a dongle (**CmDongle**) to be able to use them on different computers.  
Firm Code: 102037



I want my licenses on one computer (**CmActLicense**).  
Firm Code: 5000161 | CmContainer: LAWO AG (0010)

5. At the next page, select the licenses you wish to activate and the CmContainer to be used for the license storage.

### Available Licenses

**To activate your licenses:**

1. Select the licenses you want to activate.
2. Select the locally connected CmContainer to which you want to transfer the licenses.
3. Click "Activate Selected Licenses Now".

<input checked="" type="checkbox"/>	Name	Activated On	CmContainer	Status
<input checked="" type="checkbox"/>	*Product Name* <small>(License Quantity: 1)</small>			Available

Select CmContainer  
128-2311304 (LAWO AG)

**Activate Selected Licenses Now** Offline license transfer

[Select binding](#)  
[My Licenses](#)

You can store multiple licenses in the same container. If no Cm containers are available, then you will see an option to "Get CmContainer automatically".

6. Click on **Activate Selected Licenses Now** and wait for a few seconds.

A confirmation message appears once the activation is successful.

#### Online License Transfer

**!** **Please wait!** The selected licenses are transferred. **This process may take several minutes to complete.** Please do not remove the CmContainer during this process and do not reload this page.

Starting license transfer.  
Creating license request.

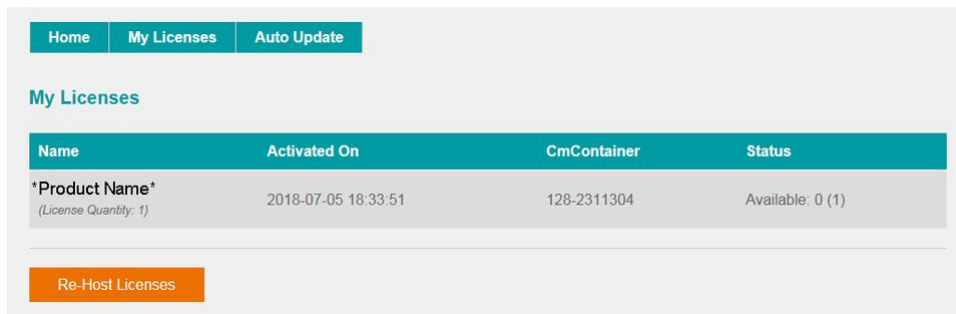
#### Online License Transfer

Starting license transfer.  
Creating license request.  
Downloading license update.  
Importing license update to CmContainer.  
Creating receipt.  
Uploading receipt.

License transfer completed successfully!

**OK**

7. After selecting **OK**, a summary appears.



8. You can now close the browser and return to your Lawo software application or install the USB dongle.

**⚠** Once activated, it is **strongly recommended** that you backup your licenses (using the [CodeMeter Web Admin](#) portal). This will allow you to restore a license if the original is lost or damaged.

### Installing the License Dongle

Once the Power Core RP v2 license(s) are activated, it is time to connect the USB memory stick to the DONGLE port. This is located on the front panel (next to the **STATUS** LED).



If the optional safety cap is fitted, you will need a T10 star tool to remove and replace the cap.

After inserting the license dongle, the device automatically reboots and loads the appropriate settings.

### Further Information

The licensing system supports a number of other features including re-hosting a license, offline activation, backup/restore and using a license server. These are described in the "Licensing" documentation, see [License Activation](#).

### Next Steps

Once you have completed the steps above, the system is ready to [install ON-AIR Designer](#).



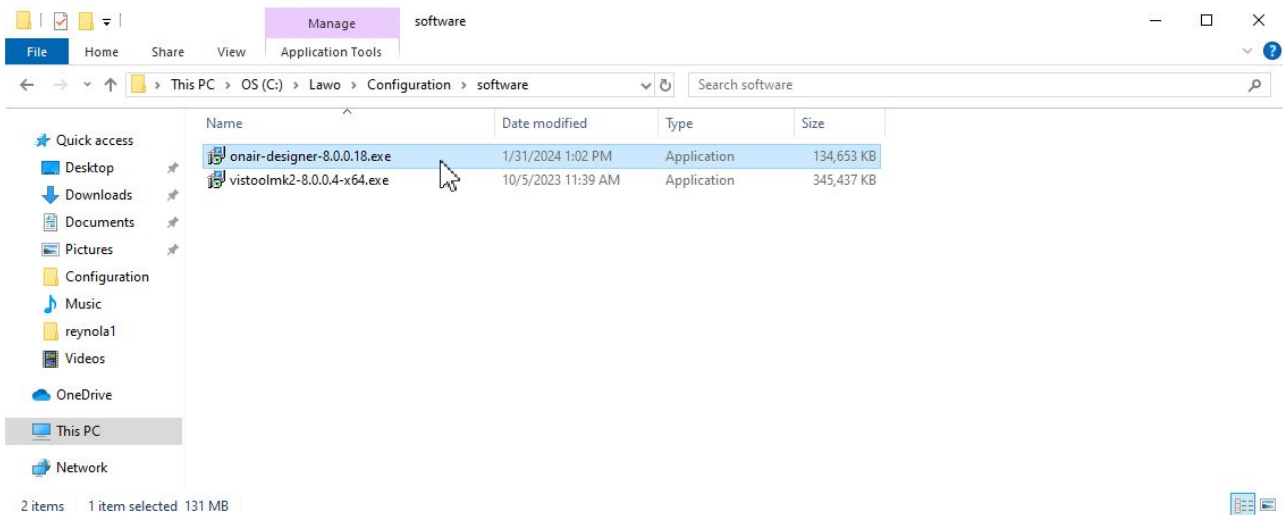
## 7.6 Power Core RP v2 - Installing ON-AIR Designer

This topic describes how to install ON-AIR Designer.

### Installing the Software

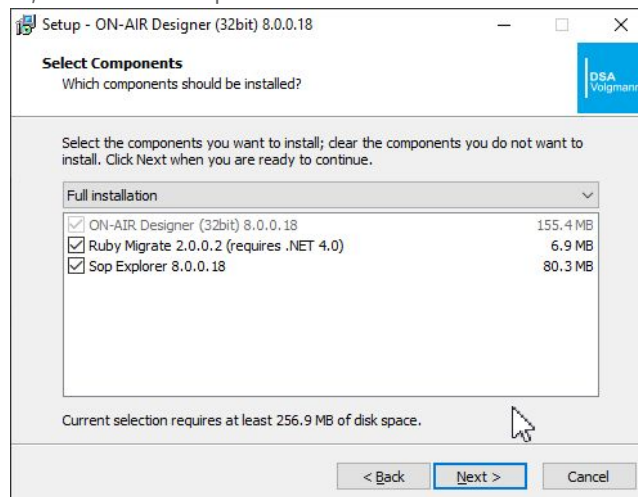
The **onair-designer-8.x.x.x.exe** installer performs an automatic install of ON-AIR Designer and SoP Explorer (the firmware update manager).

1. The ON-AIR Designer installer will be included in the Software folder of the Release zip file provided by your Lawo Project Engineer.

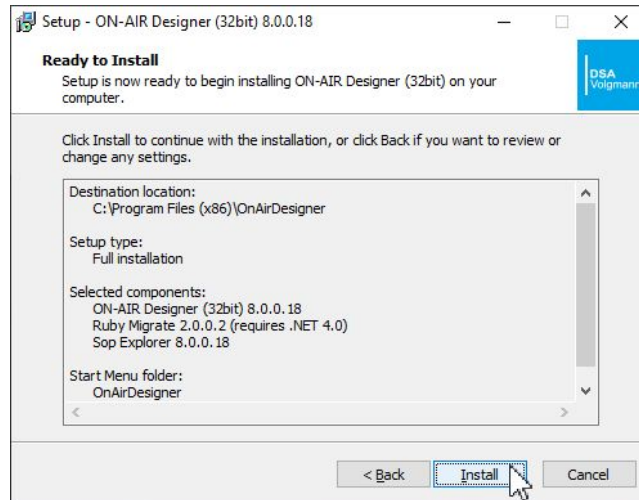


2. Double click on the installer icon, or right-click and run the **onair-designer-8.x.x.x.exe** file as an Administrator.
3. Follow the Wizard's instructions accepting the default options provided.

At the 'Select Components' window, make sure all options are checked.

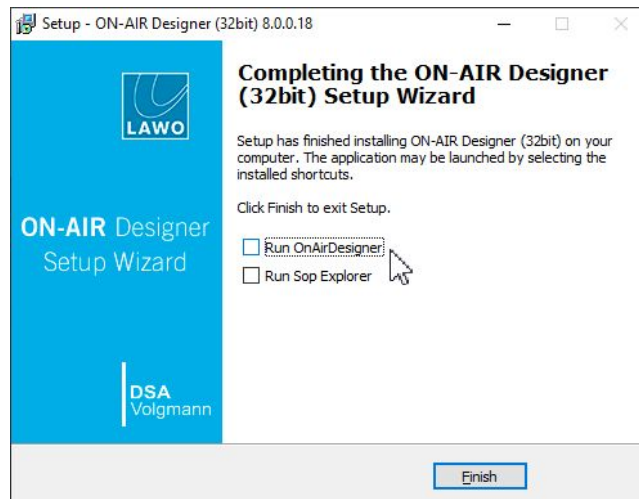


4. When you reach the 'Summary' window, check the options and click **Install** - the software is installed onto your computer; this may take a few minutes.



**i** By default, files are installed in `C:\Program Files\OnAirDesigner`

5. When the installation is complete, the following window will appear:



You can now use **SoP Explorer** to check the firmware revisions of the system, and **ON-AIR Designer** to transfer a configuration.

### Next Steps

Once you have completed the steps above, proceed to the instructions on updating the Power Core RP firmware.

## 7.7 Power Core RP v2 - Firmware Updates

This topic describes how to check and update the system firmware using SoP Explorer.

### Overview

SoP Explorer is the firmware update tool for Lawo on-air systems. It can be used to check and update the firmware versions on the Core, expansion I/O cards and, where applicable, the control surface and key panels.

You will need to run SoP Explorer whenever you update to a new version of software. The latest firmware files are copied onto the PC by the software installer. When SoP Explorer connects to the Lawo system, it compares the versions. If updates are required, data is transferred firstly to the Core, and then onto the other components.

**Important:** You should never update system while it is operational! The hardware will reset several times during the update process, causing interruption to the operation and audio.

### Prerequisites

SoP Explorer must be installed onto the configuration PC using the **onair-designer.exe** installer (as described [earlier](#)). Both the configuration PC and Power Core must be connected to the control network.

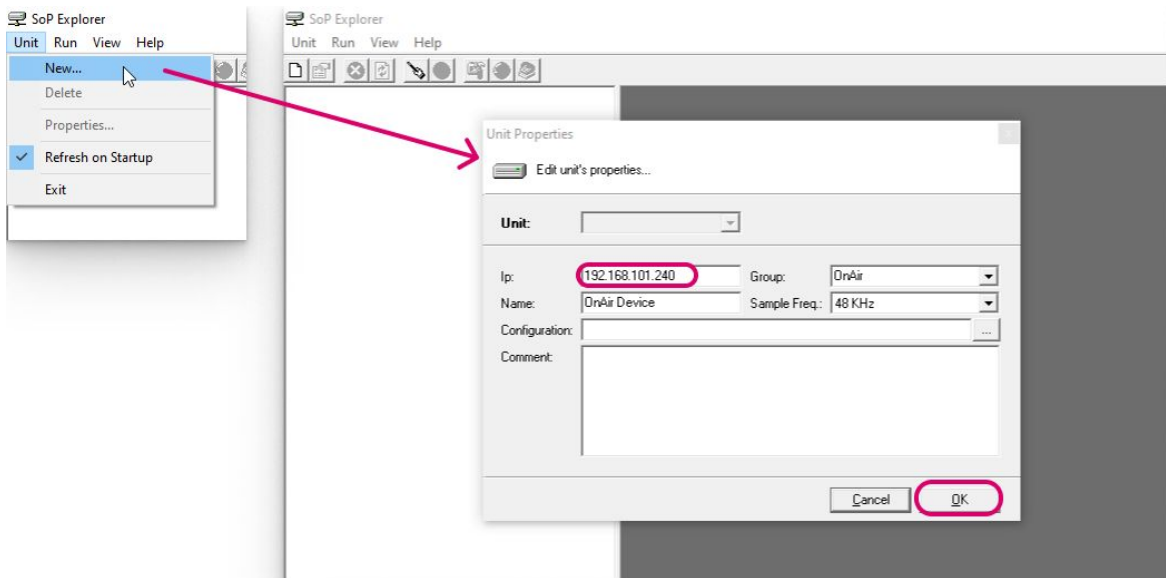
### First Steps

Before you begin, check that the expansion I/O cards are installed and that any surface components, including key panels, are connected.

1. Start the software.

SoP Explorer starts automatically at the end of the ON-AIR Designer software installation procedure. It can also be started from the desktop icon or Windows START menu.


If this is the first time you have launched SoP Explorer, then the "Unit Properties" window opens automatically. Alternatively, select **Unit → New...** (from the main menus).



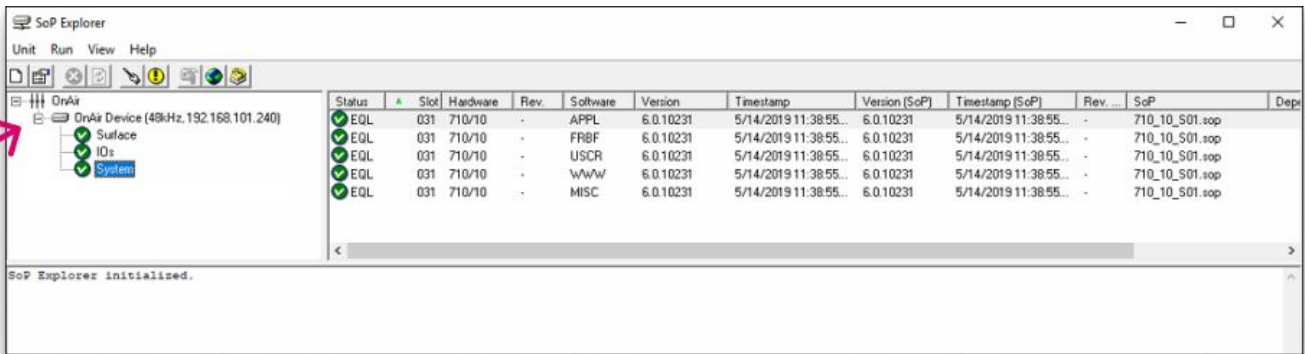
2. Edit the 'Unit Properties' to define the system you wish to connect to.

Usually it is enough to enter the **IP** address of the Core and leave the other fields at their default values. In a larger network with multiple devices, it can be useful to edit the **Name** field (to help identify the device in the system tree).

Select **OK** - the unit is added to the **OnAir** device group in the system tree. SoP Explorer connects to the device and analyses the current firmware revisions.


If a white cross on a red background  appears beside the unit name, then SoP Explorer cannot connect to the device. Check that the IP address (entered in the "Unit Properties") matches that of the remote device. Then check the IP settings of the configuration PC and the network cabling.

3. Once a connection is established, you can use the **+** and **-** signs (in the system tree) to reveal the components.




For a Power Core system, you will see up to three components: **System** (for internal components), **IOs** (for expansion I/O cards) and **Surface** (for control surface modules and/or key panels). If the **Surface** branch is missing, then the surface components are not connected.

### Editing the 'Unit Properties'

Once a unit is defined, you can re-open the 'Unit Properties' by selecting **Unit → Properties...** (from the main menus) or clicking on the  button (from the toolbar).

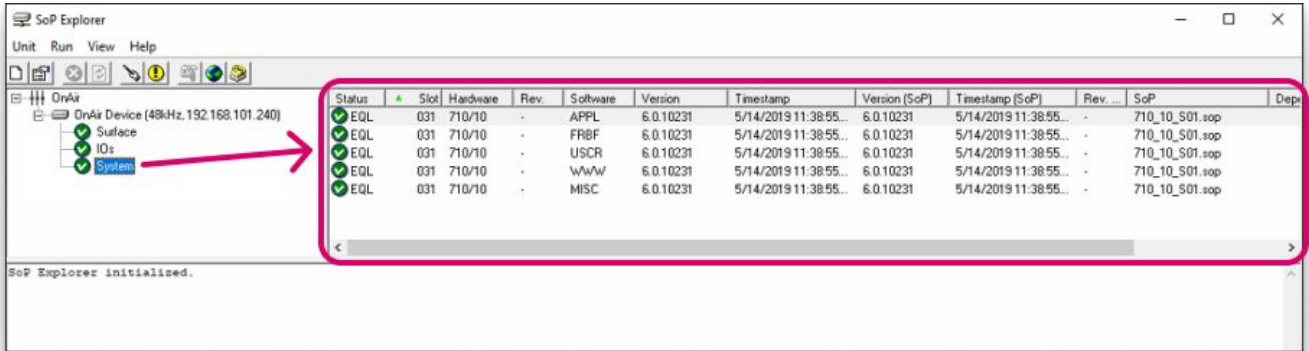
If more than one device has been added to SoP Explorer, then you can use the **Unit** drop-down menu to select a different system.

The remaining fields can be edited as follows.

- **Ip** - defines the IP address of the Lawo control system. This must be entered correctly, otherwise network communication cannot be established.
- **Name** - identifies the system within SoP Explorer. A default name of **OnAir Device** is given to each new unit. It is a good idea to edit the name so that systems can be easily identified.
- **Group** - is reserved for future implementation; the default group is always **OnAir**.
- **Sample Freq** - this field is used to select the sample frequency for **sapphire** or **Nova17**. It has no function for other systems.
- **Configuration** - this field is optional. It can be used to enter the file path for the system configuration. You do not have to enter a configuration, but if you do, you will be able to open the ON-AIR Designer configuration by selecting **Run → Configuration** (from the main menus) or clicking on the  button (from the toolbar).
- **Comment** - this field is optional. It can be used to enter notes about the system.

### Checking the Current Revisions

Once the unit is defined, select a component (e.g. **System**) to interrogate its software modules.



Several columns of information are provided: "Status", "Slot", "Hardware", etc. These are described in more detail [later](#).

For now, use the "Status" column to check the firmware revisions. The table below describes all possible states.

Status	Meaning	Actions
EQ	Software is up to date.	No action required.
UPD	Software requires an update.	Update the module using one of the update methods.
NEW	Software is newer than the SoP Explorer release.	SoP Explorer cannot be used to downgrade the software. Please contact the <a href="#">Lawo Support Department</a> for assistance.
FIX	Software cannot be updated by the SoP Explorer release.	Please contact the <a href="#">Lawo Support Department</a> for assistance.
OLD	Software cannot be identified. This may occur if you have not updated the system for a while.	Please update the module and then refresh the connection.

Repeat to interrogate each component as applicable: **System**, **IOs** and **Surface**.

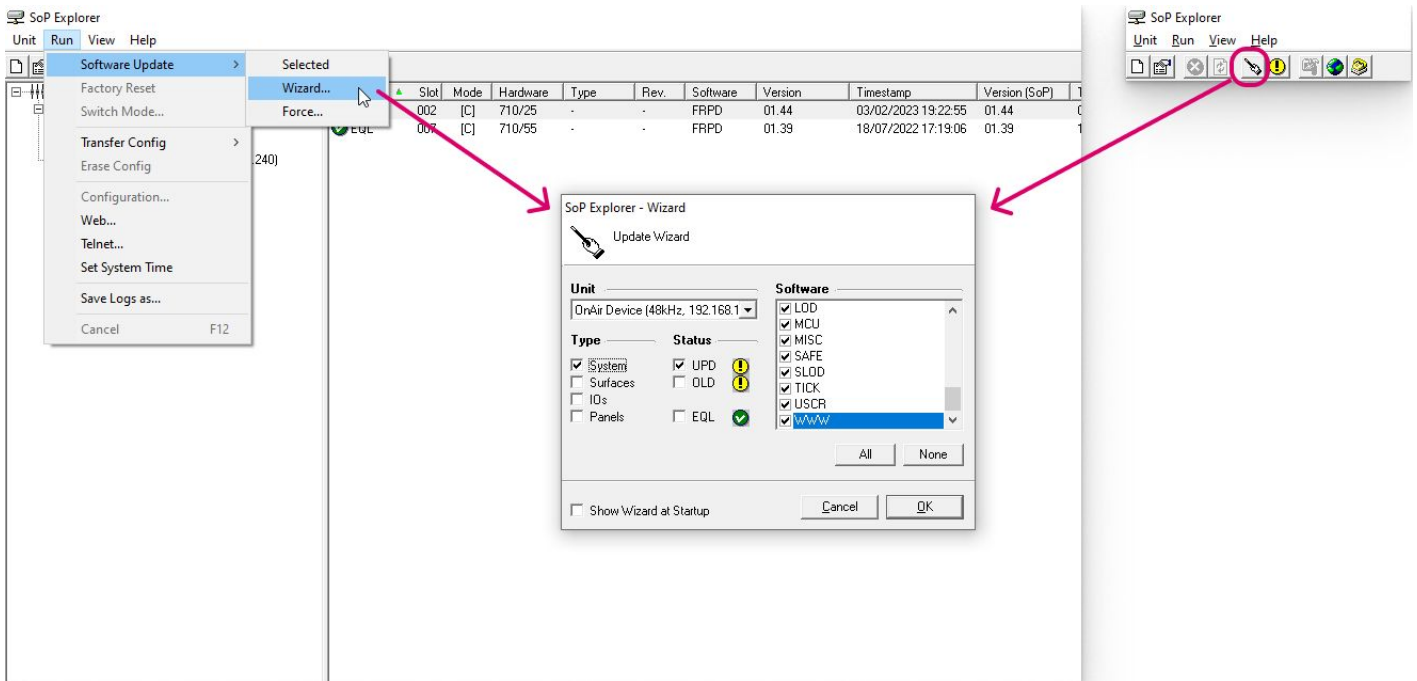
If all modules on all components are up to date, then you can close SoP Explorer. Alternatively, use the 'Software Update Wizard' to update the components.

## Using the Software Update Wizard

SoP Explorer support three software update methods: Selected, Wizard and Force. Unless otherwise advised, it is recommended to use the 'Update Wizard'.

**⚠ Important:** While it is possible to update all components at once, it is strongly recommended that you update the components individually in the following order: **System, IOs** and then **Surface**.

1. Start by opening the 'Software Update Wizard', either from the main menus (**Run → Software Update → Wizard...**) or toolbar.




2. Check that the correct unit is selected (in the drop-down **Unit** menu).
3. Then use the **Type, Status** and **Software** options to prepare the update as follows.

Start by selecting **System** (in the Type column) + **UPD** (in the Status column) + **All** (in the **Software** modules list).

4. Select **OK** - a confirmation window appears.
5. Select **Continue** to start the update.

Software updates can take several minutes. The progress is shown in the status bar at the bottom of the SoP Explorer window. Once the update is complete, the system cold starts.

6. Wait for the system to reboot and then click on the refresh button on the toolbar .
7. Now check the status of the **System** modules.

All modules should be equalized  indicating that their software is up to date.

8. Repeat the process but this time select **IOs** (in the Type column) to update the expansion I/O cards fitted to the Core.
9. If a control surface is connected, repeat the process again but this time select **Surfaces** (in the Type column).

Once all software modules on all components are equalized, the firmware updates are complete and you can close SoP Explorer.



In the unlikely event that the 'Software Update Wizard' fails, you can try one of the [alternative update methods](#).

### **Next Steps**

Once you have completed the steps above, the system is ready to [load the Power Core RP configuration](#).


## 7.8 Power Core RP v2 - Loading the Configuration

This topic describes how to load the Power Core RP v2 configuration onto a Power Core.

### Opening the configuration

The release package provided by your Lawo Project Engineer will include three ON-AIR Designer database files.

- **RPv2.db3** - This file should be used for Revision 3 Power Core RP v2 units that have also purchased the Ravenna Plus addon license.
- **RPv2-rev3.db3** - This file should be used for Revision 3 Power Core RP v2 units that have **not** purchased the Ravenna Plus addon license.
- **RPv2-rev2.db3** - This file should be used for Revision 1 or Revision 2 Power Core RP v2 units.

 The Power Core hardware revisions are described [here](#).

1. Launch ON-AIR Designer, select File>Open, and select the appropriate ON-AIR Designer configuration file.
2. Once the configuration file has loaded, use the **Unit Selector** in the **Project** window to select the desired streaming configuration. Power Core RP v2 comes with three default configurations:
  - **8CH-STREAMS** - This unit comes with 32 8 channel RAVENNA senders and receivers. If the **RPv2.db3** has been selected, there will be 64 8 channel RAVENNA senders and receivers.
  - **16CH-STREAM** - This unit comes with 16 16 channel RAVENNA senders and receivers. If the **RPv2.db3** has been selected, there will be 32 16 channel RAVENNA senders and receivers.
  - **64CH-STREAM** - This unit comes with 4 64 channel RAVENNA senders and receivers. If the **RPv2.db3** has been selected, there will be 8 64 channel RAVENNA senders and receivers.
3. Select **Transfer > Create Config** in the top menu bar. This will create the binary configuration file that must be loaded onto the Power Core RP v2 unit.
3. Once the binary configuration file has been generated, a folder will be created in the project directory with the same name as the selected unit. In this example, we created a configuration for a unit with 8 channel streams, so the folder is called **8CH-STREAMS**.
4. Select the \*.cfg file in the folder. The name will be the same as the ON-AIR Designer database file used to generate the configuration file. In this example, the configuration file is called **RPv2-rev2.cfg**.
5. Rename the binary configuration file to **io\_node.cfg**.
6. Using a FTP client, transfer the **io\_node.cfg** to the `/media/mmcSD-0-0/configs` folder on the Power Core RP v2 unit.
7. Login to the Web UI of the Power Core as an Administrator, and go to the **Control** page in the **System** tab.
8. Click the **Reboot (Coldstart)** button to coldstart the Power Core<sup>RP</sup> and load the new configuration file.

### Next Steps

Once you have completed the steps above, proceed to the instructions on [configuring the mc<sup>2</sup> console](#).





## 8 Power Core RP v2 - Remote Operation from VisTool

This chapter describes how to remotely control Power Core RP v2 from VisTool RP.

- [VisTool RP - Getting Started](#)
- [VisTool RP - Dock Mode](#)
- [VisTool RP - Mixer](#)
- [VisTool RP - Metering](#)
- [VisTool RP - IO Routing](#)
- [VisTool RP - Talkback](#)
- [VisTool RP - Co-Mixer](#)
- [VisTool RP - Mic Pre](#)
- [VisTool RP - Web Interface](#)
- [VisTool RP - Settings](#)
- [VisTool RP - Edit User Labels](#)
- [VisTool RP - Snapshots](#)

## 8.1 VisTool RP - Getting Started

This topic describes how to start and close VisTool RP, and its basic operating principles.

### Prerequisites

VisTool RP runs on a Windows 64-bit PC that must be supplied by the customer. A license to run VisTool RP is included with the Power Core RP v2 shipment.

It is expected that the customer has prepared the host PC (as described [earlier](#)), and connected the host PC and Power Core<sup>RP</sup> to the same management network as the mc<sup>2</sup> control system.

### Starting the Software

VisTool RP is started by double-clicking on the "VisTool RP" desktop icon. The session loads and connects to the hardware. The **Mixer Page** is always the first page to appear.



Providing there are no error messages, the GUI is ready for operation.

### Troubleshooting

If a valid software license is not found when you start VisTool RP, then an error message appears. Follow the [activation procedure](#) to activate your license. If the VisTool RP license is installed onto a USB dongle, then check that the dongle is connected to the PC!

If a valid Power Core RP v2 license is not found, then the system will not operate as expected. In this instance, check that the license has been activated and that the USB dongle is correctly installed.

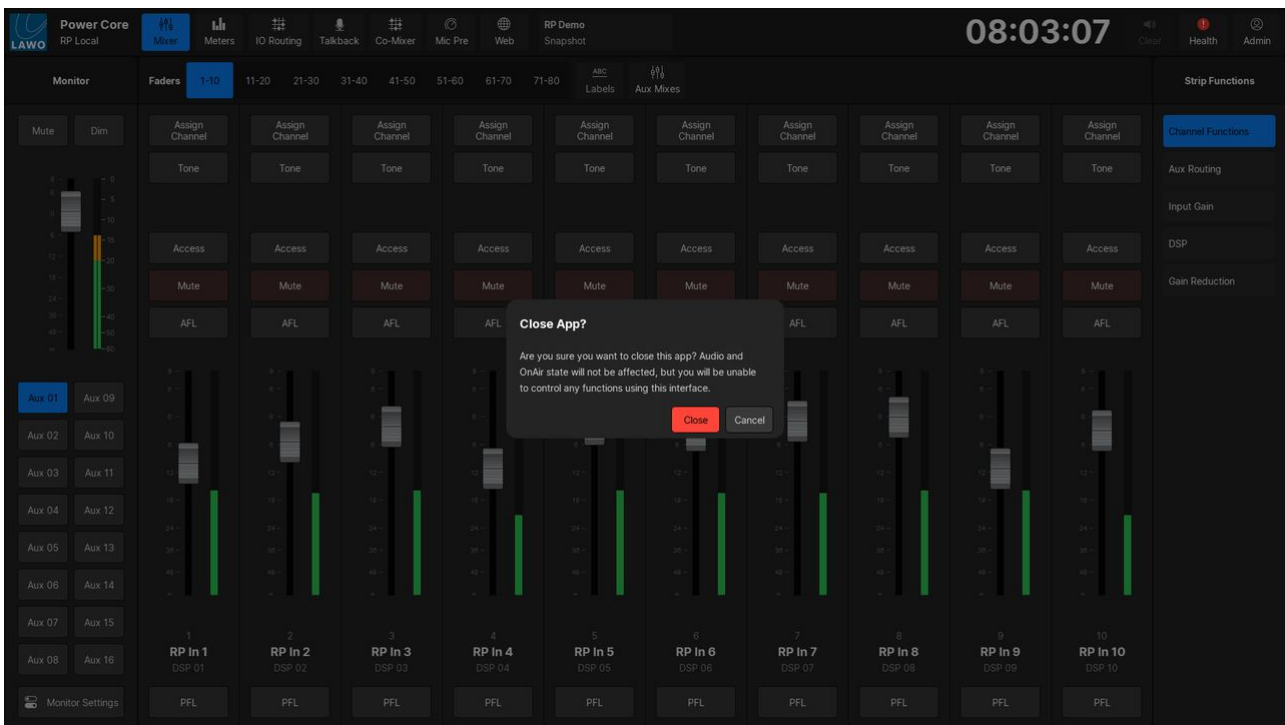
If VisTool RP opens but there is a problem with the network connection to Power Core RP v2 or the two A\_Mic8 units then the following window appears:

Alias	Protocol	Status
1 localhost18510	DMS	NOT connected
2 Powercore	Ember+	NOT Connected

In this instance, check the network cabling and IP settings of the host PC, and then the network settings of the Power Core control port. If the A\_Mic8 units are listed as **NOT Connected** and they are not present, you can disable the associated EmBER+ connections using the Emberhosts.ini file as described in [Power Core RP v2 - Installing VisTool](#).

### Closing the Software

To close VisTool RP, click the **User** button in the top right corner of the screen and select **Close App**.



**i** Note that this closes the VisTool session only. Power Core RP v2 continues to operate with the current settings, and parameters can be remotely controlled from the mc<sup>2</sup> console.

### Operating Principles

The VisTool RP user interface is divided into two sections: the dock bar and selected page.

#### Dock Bar (Headline)

The dock bar is always visible at the top of every page and is used to navigate between pages.



From left to right, it contains the following elements:

- **LAWO logo** and product name (**Power Core RP v2**) - for information only. Touch the logo to see contact information for Lawo Support.
- Mixer - on-screen control of the Power Core<sup>RP</sup> DSP channels
- Meters - metering for all local inputs, as well as all DSP buses and outputs

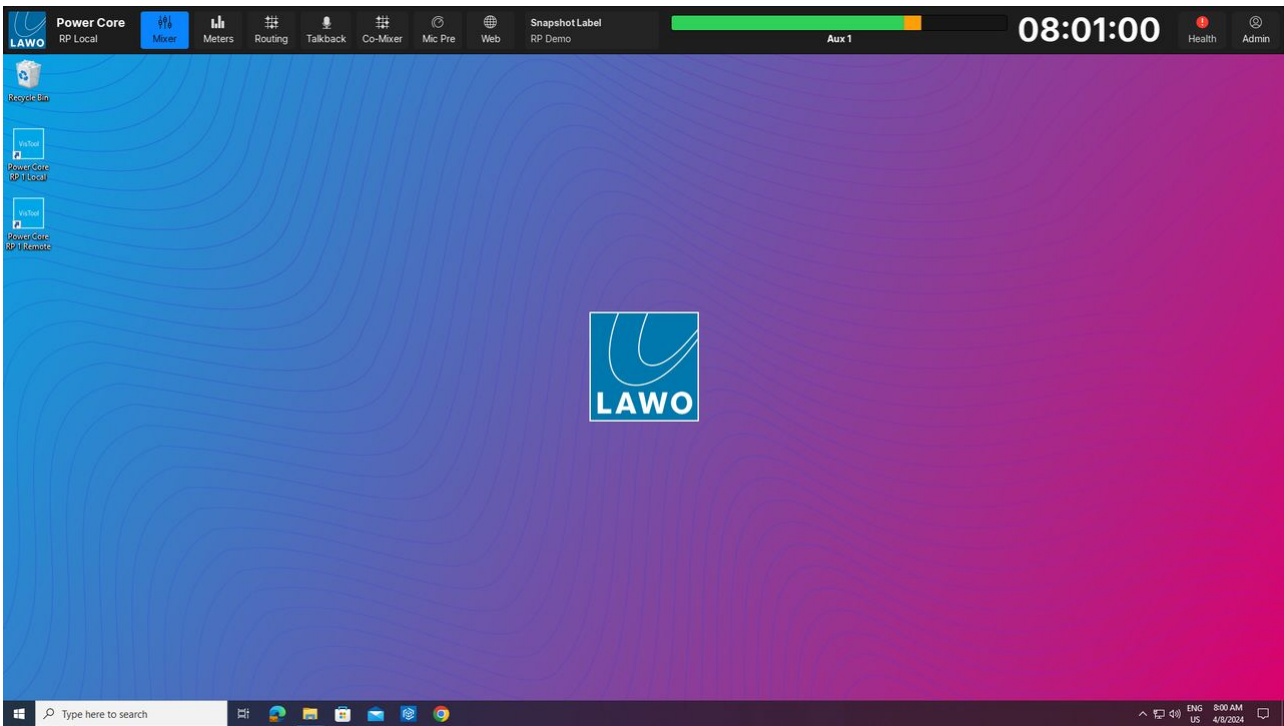


- Routing- configure audio routing for all local IO and DSP
- Talkback - configure talkback insertion
- Co-Mixer - on-screen control of a 16x12 mono summing matrix mixer
- Mic Pre - configure any locally installed microphone preamps or (optionally) up to two Lawo A\_Mic8 units
- Web - opens a generic web browser (within VisTool RP)
- **Snapshot Label** - shows the name of the last VisTool snapshot saved or loaded
- **Dock Bar Meter** - a PPM meter for the Aux 1 bus
- **System Clock** - for information only. The system clock shows the time and date running on the host PC. This can be transferred to Power Core using SoP Explorer (as described later).
- **Health Menu** - shows the health of the system. A white tick shows that everything is ok. If there is a problem, then an exclamation mark appears. In each case, touch the indicator to view more information.
- User Name - Touch the user name to open the user menu. From here you can sign in (or sign out), switch to dock mode, load, save, or delete snapshots, lock the screen, adjust system settings, or close the VisTool RP App.



## 8.2 VisTool RP - Dock Mode

VisTool RP can be switched into a Dock mode, which allows VisTool to occupy the top section of the screen, while other applications can be maximized into the remaining space.



Dock bar mode can be activated by clicking the **Dock Top Bar** key in the User menu.

Clicking on the Dock bar while in dock mode will switch the application back to the previously selected page (highlighted in blue) and back to full screen mode.

### 8.3 VisTool RP - Mixer

The **Mixer** page provides on-screen control of the Power Core RP v2 DSP channels.

#### Structure

The Mixer page is divided into four sections:

- **Mixer Functions Top Bar** - Used to switch between fader banks, edit user labels, or enter Aux Mixes mode
- **Monitor Side Bar** - Used to control the local monitor bus
- **Strip Functions Side Bar** - Used to switch the mini-displays at the top of each fader strip
- **Fader Strips** - 10 Fader strips



#### Mixer Functions Top Bar

The Power Core RP contains 80 faders, to which each of the 64 DSP Inputs and 16 Aux Buses can be mapped. The faders are arranged in banks of 10, and both the Local and Remote user can switch between fader banks independently of each other.

#### Monitor Side Bar

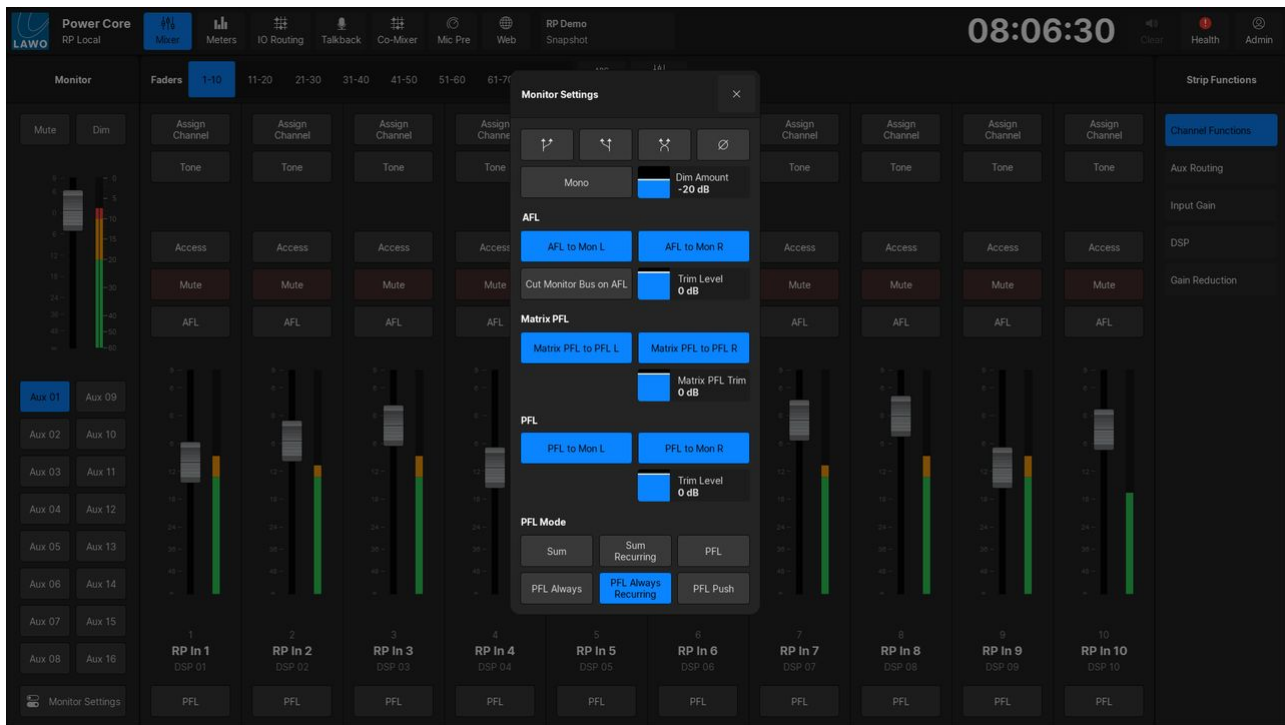
The **Monitor Side Bar** provides control over the users (Local or Remote depending on the session configuration) monitor bus.

The **Mute** and **Dim** keys can be used to mute or dim the monitor output.

The fader can be used to control the overall level of the monitor bus (a pre-level control Monitor Bus output is also available). The PPM Meter will show the pre-level control signal level of the monitor bus, after any AFL/PFL inserts.

Press one of the **AUX xx** buttons to monitor one of the 16 stereo Aux buses. If a user label has been set for an Aux Bus, line 1 of the user label will be displayed instead of **AUX xx**.

Press the **Monitor Settings** button to adjust settings such as AFL/PFL insertion behavior, as well as dim levels, PFL modes, and output controls.



## Strip Functions Side Bar

The **Strip Functions Side Bar** is used to switch between mini-displays in the **Fader Strips** area.

The following functions are available:

- **Channel Functions** - the default view. Displays the **Assign Channel**, **Tone**, **AFL**, and **PFL** buttons. For Aux Buses, a **Talkback** key will also be displayed.
- **Aux Routing** - displays an overview of the bus routing state for the 16 Aux buses.
- **Input Gain** - provides a digital gain level control.
- **DSP** - shows the on/off status of each DSP module: unlit = off, lit = on.
- **Gain Reduction** - shows meters for the gain reduction applied by the three DSP blocks (Dynamics, Limiter, De-Esser)

## Fader Strips

On each fader strip, the following controls are always available:

- **Gain** - source gain.
- **Aux send on/off** - for 4 auxes. Use the **AUX** button (below **LAYERS**) to page through all 16 aux sends, 4 at a time.
- **Access**- channel select. Touch to select a channel and open the **Access** page (described below).
- **Fader** - channel level.
- **Input Meter** - channel metering.
- **Channel Label** - shows the system name (e.g. DSP 01) and the user label (e.g. RP IN 1). The user labels can be edited by clicking the **Labels** key in the Mixer Functions Top Bar, or from the MC<sup>2</sup> console.
- **MUTE** - channel mute.

If **Channel Functions** are selected in the **Strip Functions Side Bar** the following controls are also available:

- **Assign**- input assign. Touch to assign a processing channel or Aux bus to an on-screen fader. You can choose any of the 64 input channels or 16 Aux buses.
- **Tone** - inserts a tone generator signal into the Input or Aux Bus. While active the input signal or Aux bus content will be replaced.
- **Talkback** - (only available on Aux Buses) inserts either the Talkback 1 or Talkback 2 signal into the Aux Bus. Talkback 1 is used for the Local User VisTool session, Talkback 2 is used for the Remote VisTool session.
- **AFL** - channel AFL (after-fade listen).



- **PFL** - channel PFL (pre-fade listen).

⚠ If Tone is inserted into an Input channel, this will not be reflected on the MC<sup>2</sup> RP Input meters!

## DSP Access

The **DSP Access** page appears whenever you press a fader strip **Access** button. It shows all of the available DSP parameters for the selected Power Core<sup>RP</sup> DSP channel.



To adjust a switched parameter, such as EQ on/off, touch the button to change its state: unlit = off; lit = on.

For variable parameters, touch and drag anywhere inside the parameter box: dragging to the left will decrease the value, dragging to the right will increase the value.

- ✓ The Limiter and Dynamics graphs include a red ball which represents the output level. For the Dynamics, this is for the complete Dynamics section: Compressor, Expander and Gate. The ball changes dynamically as the signal level varies, and so is extremely helpful when adjusting parameters.

For convenience, the following RP operations can be accessed from the top of every page:

- **Assign Source** - press to open the 'Assign Source' dialog box. From here you can assign a different source to the selected fader strip.
- **Copy** - press to copy settings from the source in access to the clipboard.
- **Paste** - press to paste settings from the clipboard to the source in access.
- **Save** - press to open the 'Save Snapshot' dialog box.
- **Load** - press to open the 'Load Snapshot' dialog box.
- **Reset** - press to open the 'DSP Reset' menu, which can be used to reset either all DSP settings, or only the settings for individual modules.



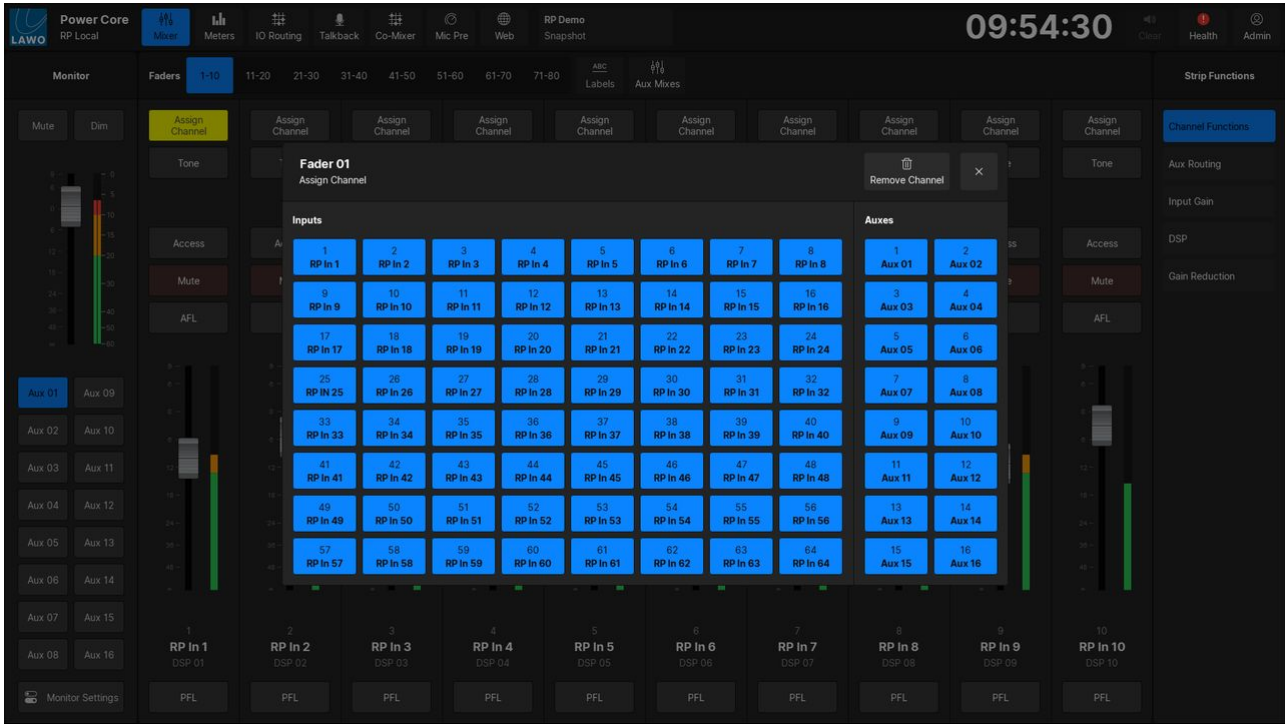


## Assign

Any fader strip can control a DSP channel or an Aux Bus. Fader strip assignments are saved and loaded in snapshots.

To assign a channel to a fader, select **Channel Functions** in the Strip Functions Side Bar then touch the **Assign** button on the fader strip you wish to assign a channel to. This will open the Assign page.

DSP Channels are displayed on the left half, Aux Buses are displayed on the right half.



## Aux Mixes

By pressing the **Aux Mixes** button in the Mixer Function Top Bar, the Aux Mix mode will be activated, and the contribution level to each Aux Bus can be adjusted.





To switch to a different Aux Bus, select the desired Aux Bus in the right hand menu. The selected Aux Bus will be highlighted in green, and the name will be displayed in the Aux Mix Mode Top Bar.

For each Aux Bus, the Top Bar provides the following controls:

- **Contributors** - This will open the contributors page, which allows user to control reverse aux bus assigns.
- **Aux Output Level** - This will display the current level of the Aux Master. The level can be adjusted by dragging up or down from within the box.
- **Access** - This will open the DSP Access page.
- **Tone** - This will replace the Aux Bus content with the internal tone generator signal.
- **Talkback** - This will insert either Talkback Input 1 (if the VisTool is configured for the Local user) or Talkback Input 2 (if the VisTool is configured for the Remote user)
- **PFL** - channel PFL (pre-fader listen)
- **AFL** - channel AFL (after-fader listen)
- **Mute** - Mutes the selected Aux Bus
- **Route all** - Routes all 64 DSP inputs to the selected Aux Bus after fader.
- **Unroute all** - Unroutes all 64 DSP inputs from the selected Aux Bus.

When Aux Mix mode is activated the Fader Strip Controls will be replaced with a toggle button that can be used to change the bus assign state.

If Aux Panning has been enabled for the selected Aux Bus, then a Pan control will be displayed.



### 8.4 VisTool RP - Metering

The **Meters** page provides access to PPM meters for all inputs, DSP Buses, and DSP Outputs. It can be used to check any of the stereo aux mixes and/or talk to the aux outputs while setting up the local mixes.



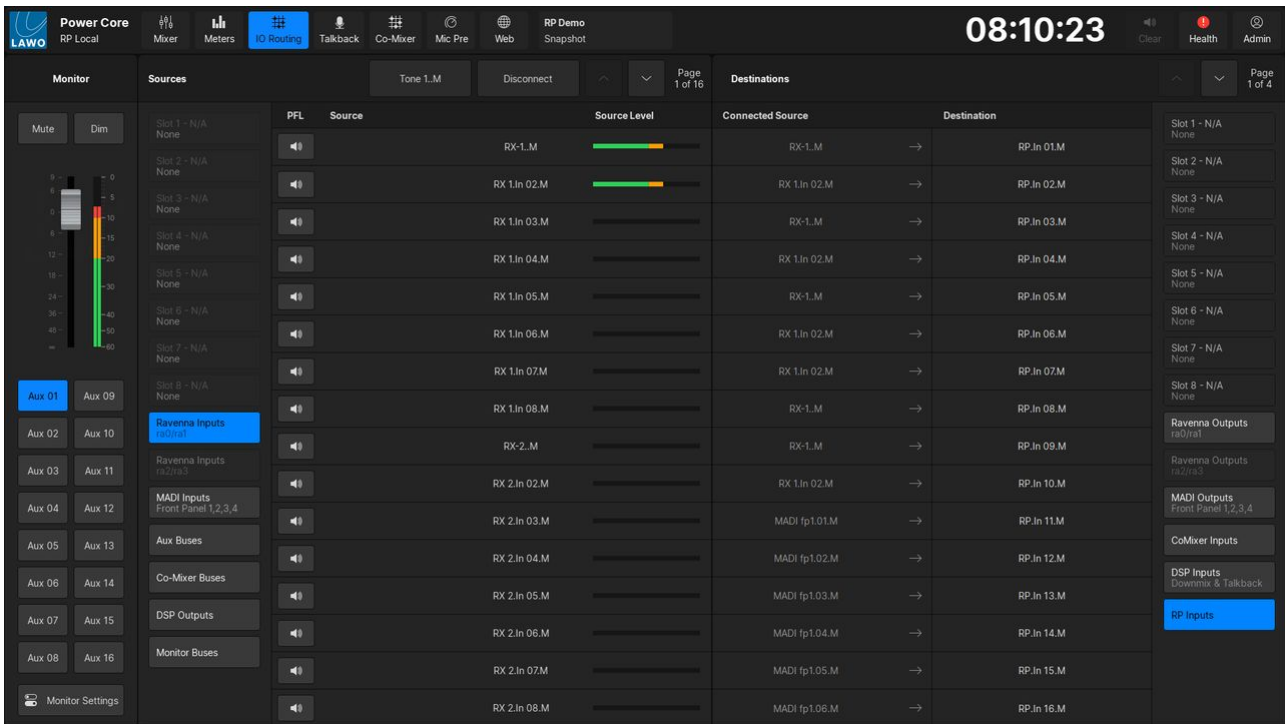
Input slots can be selected on the left side of the page and will dynamically update based on the presence of IO cards, the MADI Redundancy mode configuration, and the presence of the Ravenna Plus Addon license.

For slots with more than 16 inputs, the **Page Up** and **Page Down** keys in the top right can be used to navigate between the input banks.



## 8.5 VisTool RP - IO Routing

Power Core RP v2 supports full mono routing for all inputs and outputs. IO Routing can be controlled from within VisTool RP using the **IO Routing** page, as well as in HOME.

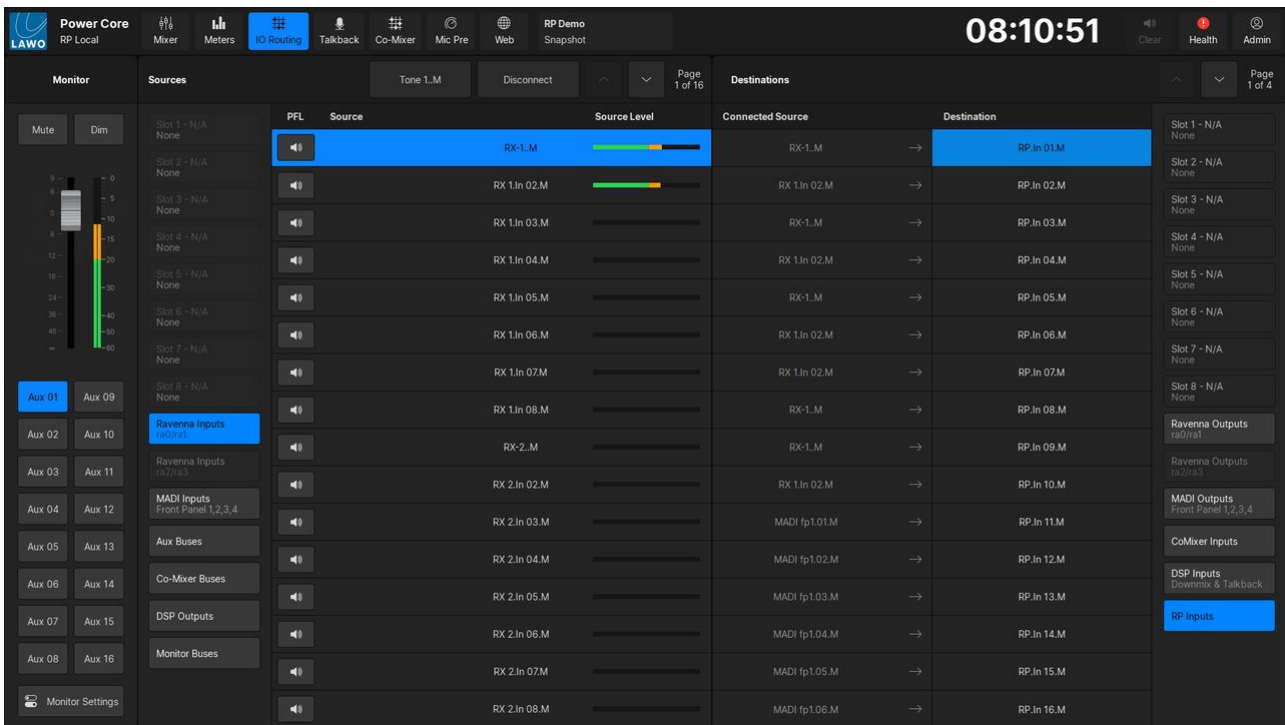


### IO Routing

The **IO Routing** page is used to connect audio from physical or virtual audio inputs to physical or virtual audio outputs in the device. The routing page is divided into two halves: **Sources** on the left and **Destinations** on the right.

Audio signals are grouped into **Slots**, with slots for each physical IO card, as well as the MADI, RAVENNA, and DSP signals.

To make a connection, select a source and then select a destination. The connection will be made as soon as you touch the destination.

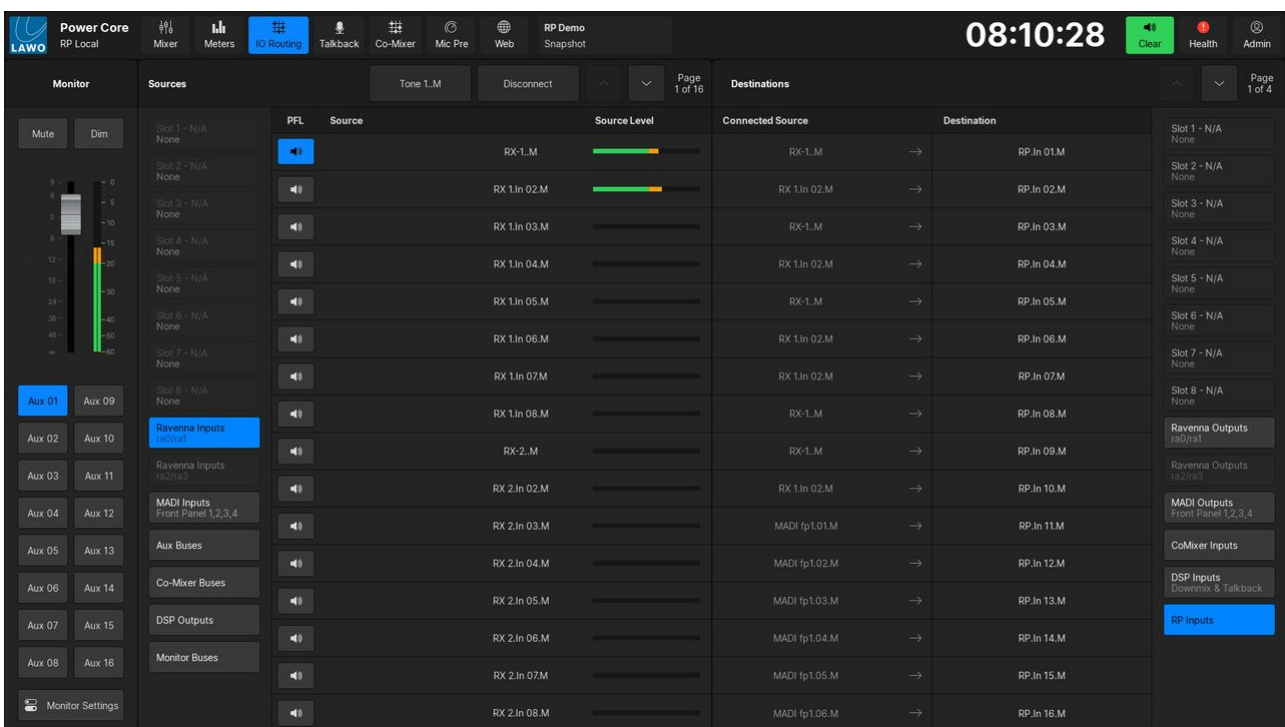


If a destination is connected, the label of the connected source will be displayed to the left of the destination.

To disconnect an output, click the **Disconnect** then click on the destination you wish to disconnect.

For slots with more than 16 signals, **Page Up** and **Page Down** keys can be used to navigate through the signal list.

Each source signal has a PPM meter and a PFL key that can be used to preview that audio output. The IO Routing page has a dedicated PFL output called **MTX PFL**. This PFL bus is unique for both the Local and Remote users and can be routed directly to an output or summed into the users monitor bus.

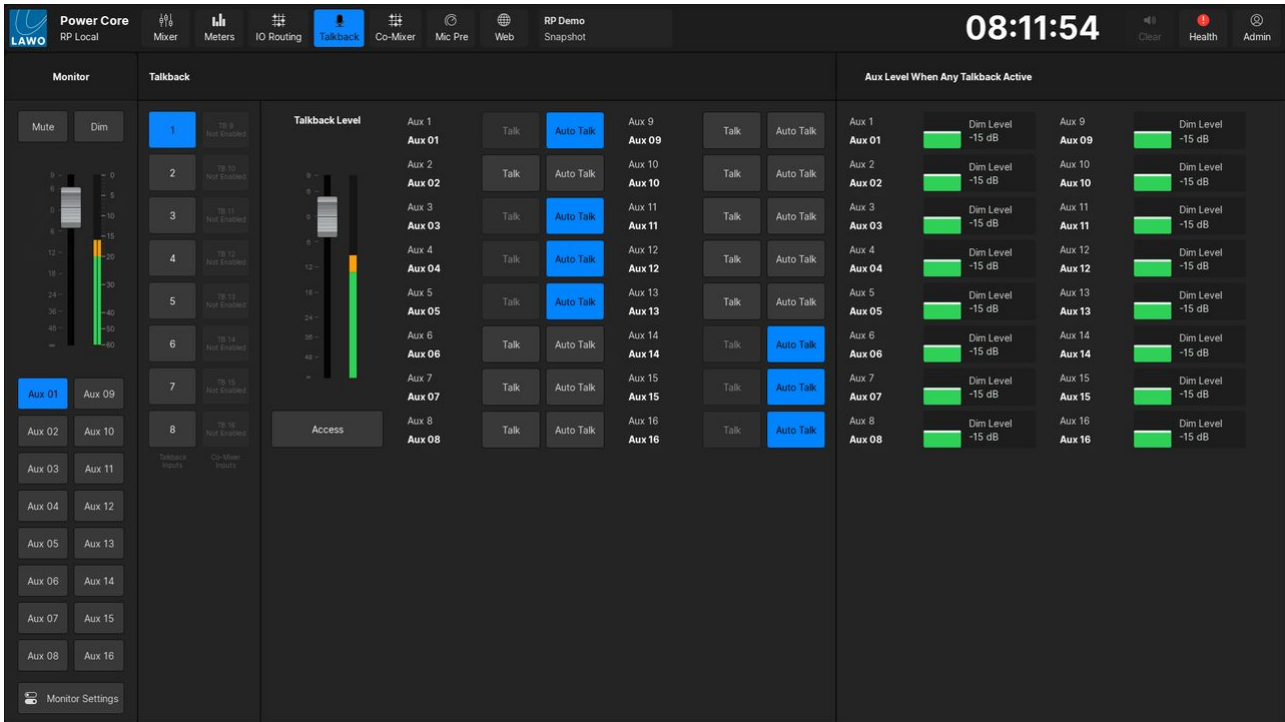


✔ To momentarily PFL a signal (as opposed to toggling the PFL on or off), press and hold the PFL key for one second.

## 8.6 VisTool RP - Talkback

The **Talkback** page provides access to control the talkback system. The Power Core RP provides 8 fully-featured local talkback inputs, and users can choose to convert Co-Mixer Inputs 1-8 to be an additional talkback input.

The Talkback page is divided into two halves; the left half is used to select a talkback input, adjust the DSP parameters of that input, and set the Aux Bus assigns. The right half is used to set the level each Aux Bus will be dimmed by when **any** talkback input is active to that Aux Bus.



### Operation from the Talkback Page

Selecting a talkback input displays a PPM input meter for the signal, as well as a fader to control the overall level of the talkback input.

Pressing the **Access** key will open the **DSP Access** window, where DSP parameters (EQ, Dynamics, Limiter) can be adjusted.

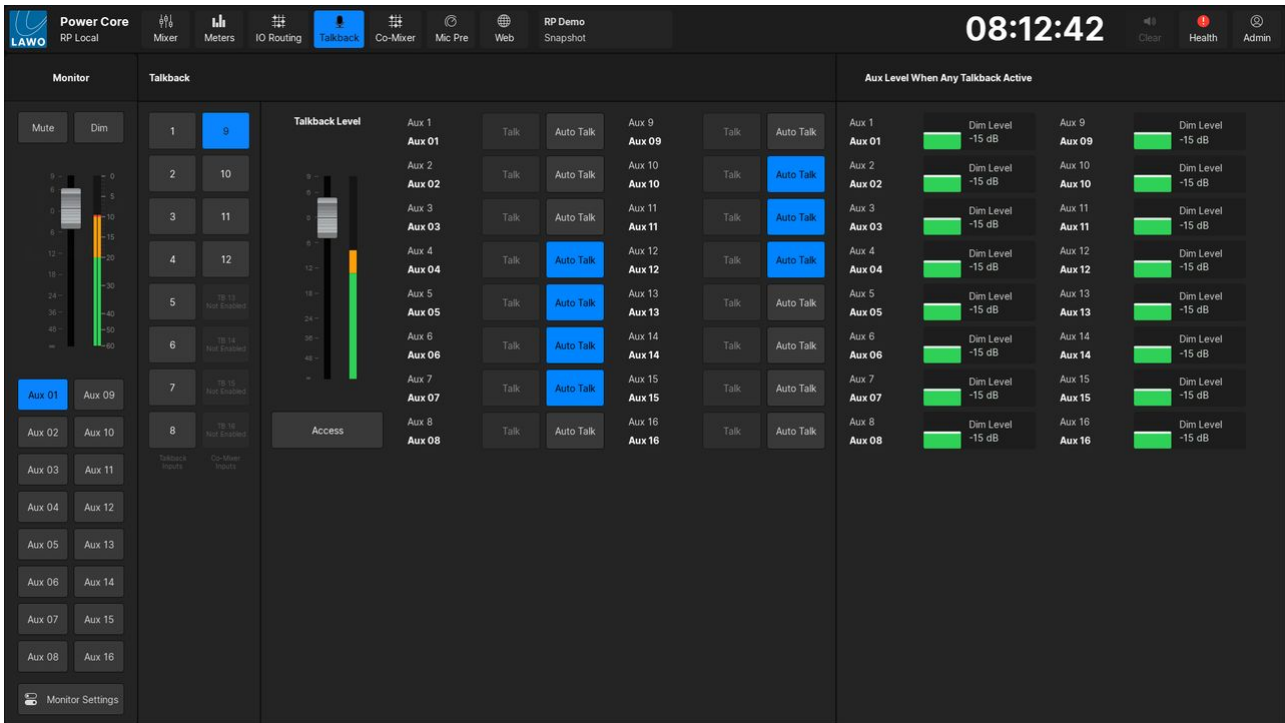
For the eight local talkback inputs, each input can be manually or automatically inserted into the 16 Aux Buses.

Pressing the **Talk** key will insert the talkback input into the corresponding Aux Bus for as long as the key is pressed.

Pressing the **Auto Talk** key will insert the talkback input into the corresponding Aux Bus whenever level is detected on the talkback input. When **Auto Talk** is enabled, the **Talk** key will be disabled.

For the eight Co-Mixer Talkback inputs, only **Auto Talk** is supported.





### Operation from the Mixer Page

Talkbacks can also be triggered from the **Mixer** page. When an Aux bus is assigned to a fader, and **Channel Functions** are selected in the **Strip Functions** side bar, a **Talkback** key will be present for each Aux Bus.

Pressing the **Talkback** button will insert talkback input 1 if pressed by the **Local** user, or talkback input 2 if pressed by the **Remote** user.

### Enabling the Co-Mixer Talkback Inputs

The eight Co-Mixer Talkback inputs can be enabled from the **Settings** page.

Switching a Co-Mixer input to be a Talkback input will remove any Co-Mixer bus assigns, and disable the input in the Co-Mixer.

Switching a Co-Mixer input back to a co-mixer input will reset any talkback bus assigns and disable the input in the Talkback system.



**Power Core**  
RP Local

Mixer Meters IO Routing Talkback Co-Mixer Mic Pre Web RP Demo Snapshot

08:17:15 Clear Health Admin

**Mixer Settings**

Network Info - Control

Network Info - Ravenna

Monitor

Receivers

Senders

System Info

**Aux Panning**  
Enable discrete Aux Pan controls. This will ignore the global input pan settings.

Aux 1  Aux 9

Aux 2  Aux 10

Aux 3  Aux 11

Aux 4  Aux 12

Aux 5  Aux 13

Aux 6  Aux 14

Aux 7  Aux 15

Aux 8  Aux 16

**Mixer Controls**  
Enable Aux Send mutes to be pre-fader.

Mute Pre Fader

**MCX Controls**  
Block incoming MCX connections, reset a MCX Fader Lock, or enable syncing from MCX.

Block New MCX Connections

Reset MCX Fader Lock

Sync From MCX

**Enable Additional Talkback Inputs**  
Co-Mixer Inputs 1-8 can be enabled as additional talkback inputs.

Co-Mixer Input 1

Co-Mixer Input 2

Co-Mixer Input 3

Co-Mixer Input 4

Co-Mixer Input 5

Co-Mixer Input 6

Co-Mixer Input 7

Co-Mixer Input 8

**Tone 1 (Mixer)** **Tone 2**

63 Hz 400 Hz 1 kHz 12.5 kHz 63 Hz 400 Hz 1 kHz 12.5 kHz

Level -20 dB Level -20 dB



## 8.7 VisTool RP - Co-Mixer

The **Co-Mixer** page provides access to control the Co-Mixer system. The Co-Mixer is a 16x12 mono matrix summing mixer.

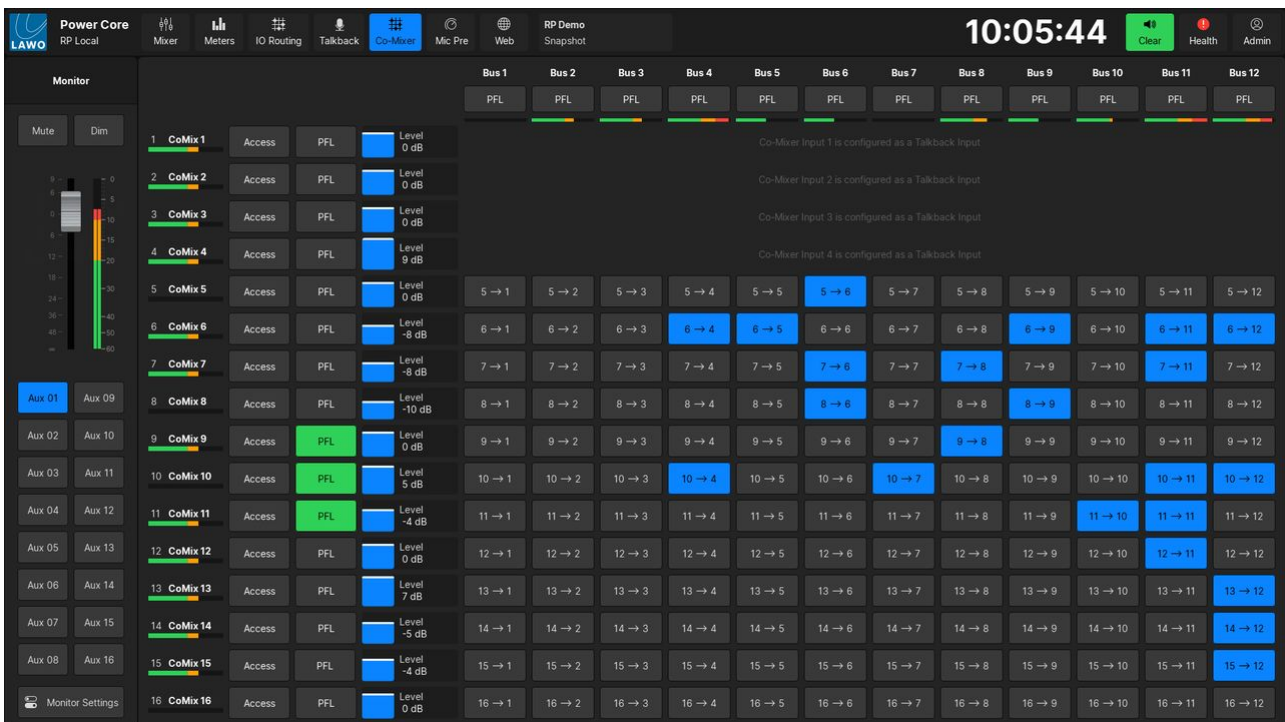


To assign a Co-Mixer input to a Co-Mixer bus touch the crosspoint button that corresponds to the assignment you wish to make.

Each Co-Mixer input has a level control which affects all bus send levels.

Co-Mixer Inputs and Bus can also be placed into the PFL bus and will use the normal PFL bus.

If a Co-Mixer input has been switched to being an additional Talkback input, any active Co-Mixer bus assigns will be disabled, and the Co-Mixer input will no longer be usable in the Co-Mixer.



## AutoMix

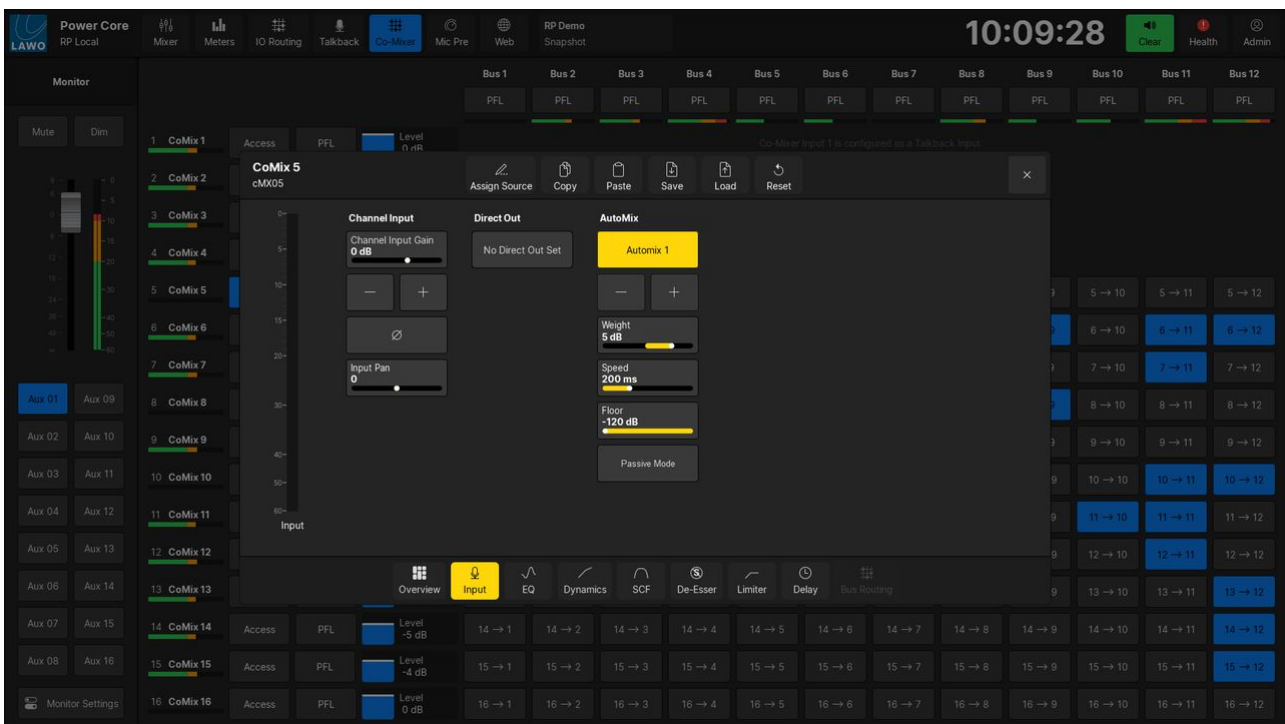
Automix can be enabled for any of the 16 Co-Mixer inputs. Once enabled, an internal algorithm monitors the signal power of each channel, and then automatically adjusts the mix levels accordingly. For example, if there are three guests and a host, the algorithm automatically mutes the guest sources while the host is speaking. The feature is ideal for balancing active and inactive microphones, such as in a panel discussion, or creating an automated voice-over.

For each source, there are four parameters:

- **Group** - assigns the source to an automix group (from 1 to 8).
- **AMix** - enables (or disables) the automix function. When disabled, the mix level is adjusted manually from the source fader.
- **Weight** - sets the weighting factor of the source, from +9 to -9 with a default midpoint = 0.
- **Speed** - sets the "smoothness" of the automixing, in milliseconds (ms).
- **Floor** - defines the minimum level that the signal volume can be set to by the AutoMix.
- **Passive Mode** - prevents the channel from affecting other signals in the same AutoMix group. The channel itself will still be controlled by the AutoMix.

Sources with a higher weight value get priority in the mix; those with the same weight are mixed equally; those with a lower value get reduced priority. For example, in a panel discussion, you might want to give the host leading the discussion a higher weight value than that of the guests. Or, to create an automated voice-over, adjust the weight of the playout material to a much lower value than that of the voice.

The speed defines how quickly a signal returns to its normal mix level after its gain has been suppressed. A short speed fades signals in and out quickly but could result in "pumping" if several guests are talking in parallel. A longer speed will be smoother but may generate audible fades in and out. The ideal value depends on the material.





## 8.8 VisTool RP - Mic Pre

Power Core RP v2 provides mic preamp control from a dedicated page in VisTool RP.


### Mic/Line Card Control

If a Mic/Line or Studio IO card is installed in the Power CoreRP, the slot containing the card will be activated and the channel preamps can be controlled.

Touch on a slot to select that IO card. Selecting a slot will allow you to adjust the Mic Gain, Pad, Phantom Power, and High Pass Filter.

The PPM meter to the right of each channel can be used to monitor the input signal level.

To preview the audio signal, press the PFL button to the right of the meter.

 The Mic Pre page PFL bus uses the Matrix PFL output.

### A\_Mic8 Preamp Control

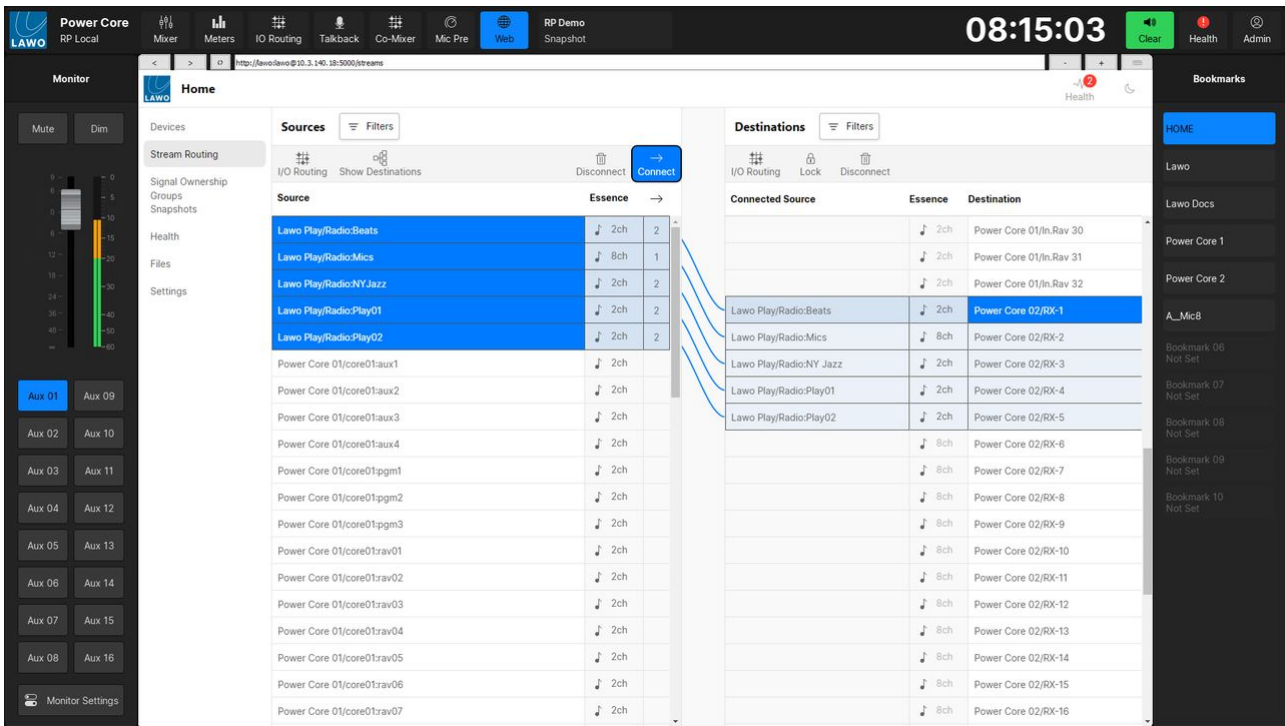
If an A\_Mic8 connection has been enabled (using the Emberhosts.ini file), and the A\_Mic8 is online, the slots will be enabled and the mic preamp channels can be controlled.

A\_Mic8 units do not have PPM meters or PFL capabilities.



## 8.9 VisTool RP - Web Interface

The **Web** page opens a generic web browser where you can open any web page. The operation is controlled using two elements: the navigation bar (at the top) and bookmarks (on the right).



### Navigation Bar

Working from left to right, the navigation bar provides the following functions:

- < and > buttons - navigate forward or backward to the next or previous page.
- **Refresh** button - reloads the current page.
- **Address Bar** - displays the web address (URL) of the page. A new address can be entered from the keyboard. For touch-screen operation (with no physical keyboard), open the on-screen keyboard to enter an address.
- + and - buttons - zoom in or out on the current page.
- **Show Keyboard**- select this icon to open the on-screen keyboard.

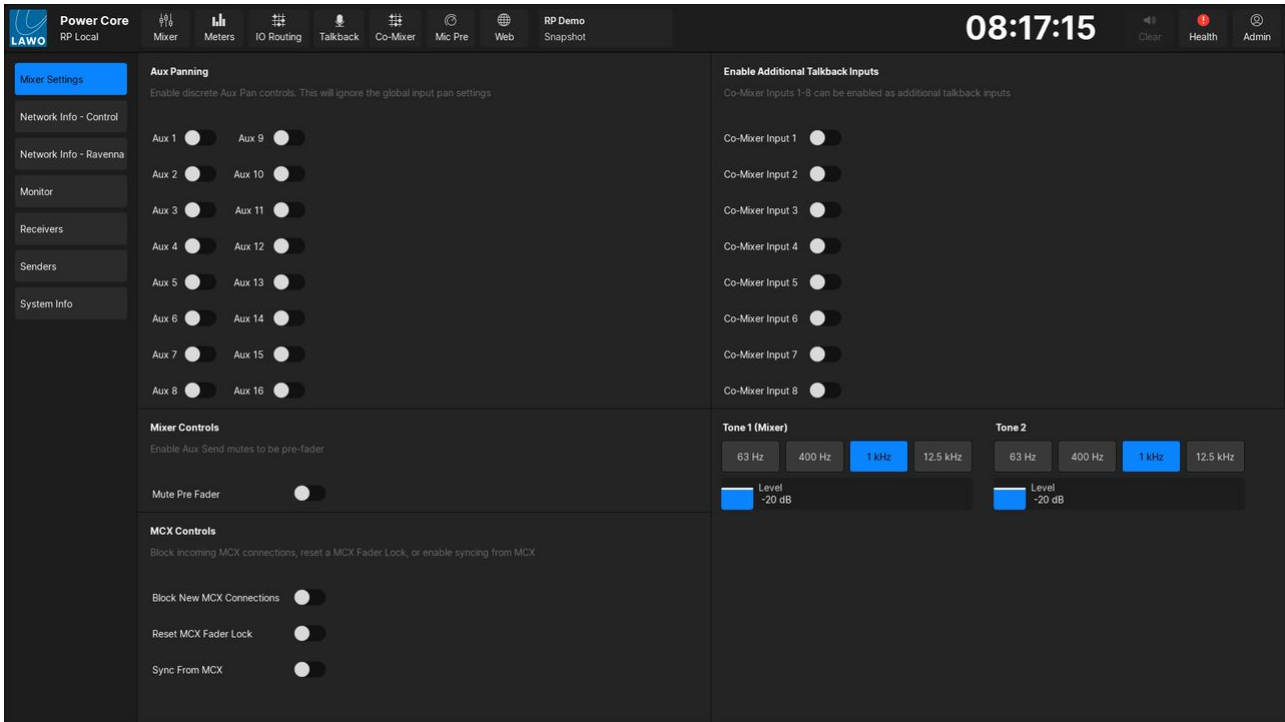
### Bookmarks

The ten bookmarks (on the right) provide fast access to a pre-configured page. Select a bookmark to load the page. An additional bookmark is provided for quick access to the HOME web UI.

The web address and label for each bookmark are defined in the "Emberdefault.ini" file. If a bookmark URL is not defined, the bookmark key will be disabled.

## 8.10 VisTool RP - Settings

The **Settings** page can be used to customize the operation of the Power Core RP v2.



To open the Settings page, touch the user icon and select **Settings** (from the user menu).

### Mixer Settings

This tab is used to customize audio related functions, including:

- **Aux Panning** - Enable discrete aux pan controls for each aux bus. This will ignore the global input pan setting.
- **Mixer Controls** - Configure the channel mute to apply to pre-fader sends. By default, mutes only affect after fader sends.
- **MCX Controls** - Control the connection parameters to the MCX system
- **Enable Additional Talkback Inputs** - Switch Co-Mixer Inputs 1-8 to be an additional talkback input
- **Tone** - Set the level and frequency for the two internal tone generators

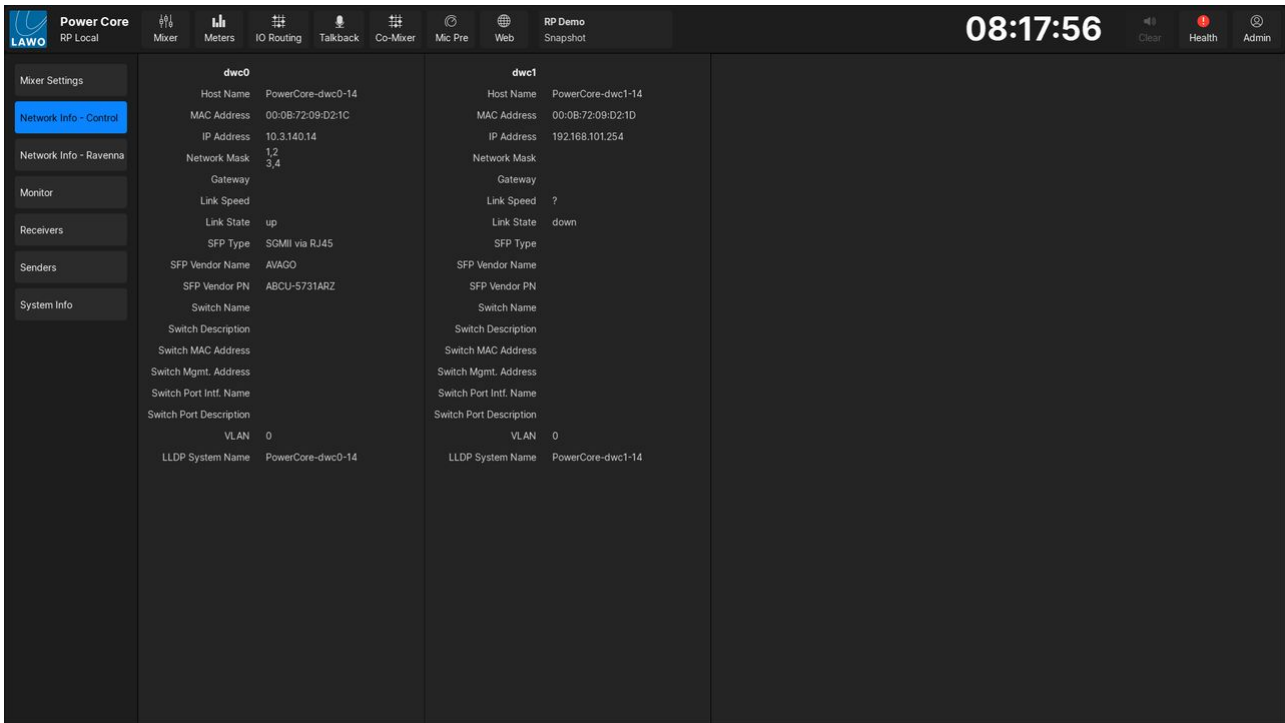
### MCX Controls

Three options are available to define the behavior of the MCX connection:

- **Block New Connections From MCX** - Setting this option will prevent a MCX instance from mounting the Power Core RP v2. This is useful when a production is live on-air to prevent other consoles from affecting the on-air mix.
- **Reset Fader Lock** - If fader control has been locked by the MCX user, it is possible to reset the fader lock (for example if the control connection is lost)
- **Sync From MCX** - If this option is set, then MCX will push settings to the Power Core RP v2 when the device is first mounted.

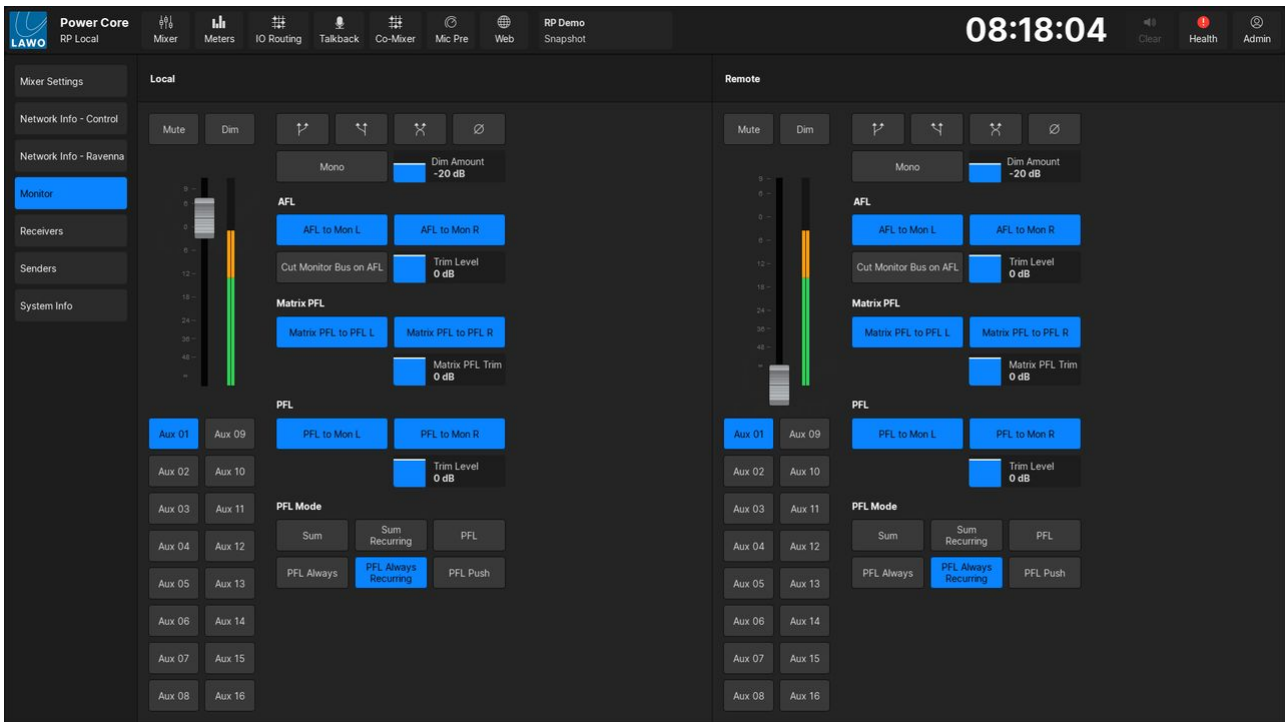
### Network Info

These tabs display the information for each of the Control and RAVENNA interfaces on the Power Core. It displays the same information as the Network Information page in the Power Core web UI.



## Monitor

This tab provides control over the monitor settings for both the Local and Remote user monitor buses.



## Receivers

This tab provides a view of the configured RAVENNA receivers, and displays the connected stream, the current time offset for each stream, and the status of each stream.

If a stream is unstable the stream name will be highlighted in red.





**Receivers Legend:**

- I Init
- S Scheduled
- W Waiting
- F Fixed Time Offset
- T Tuning
- U Unstable
- O Mute
- L Local Stream
- D Default Stream
- Connected
- A Assigned Stream
- Connected
- M Multi-Assign

Receiver ID	Name	Flags	Time Offset (s)
1	RadioBeats@192.168.98.15-239.98.15.3	-----A-	144
2	RadioMics@192.168.98.15-239.98.15.2	-----A-	144
3	RadioNY Jazz@192.168.98.15-239.98.15.4	-----A-	144
4	RadioPlay01@192.168.98.15-239.98.15.0	-----A-	144
5	RadioPlay02@192.168.98.15-239.98.15.1	-----A-	144
6		Flags: ----0----	0
7		Flags: ----0----	0
8		Flags: ----0----	0
9		Flags: ----0----	0
10		Flags: ----0----	0
11		Flags: ----0----	0
12		Flags: ----0----	0
13		Flags: ----0----	0
14		Flags: ----0----	0
15		Flags: ----0----	0
16		Flags: ----0----	0
17		Flags: ----0----	0
18		Flags: ----0----	0
19		Flags: ----0----	0
20		Flags: ----0----	0
21		Flags: ----0----	0
22		Flags: ----0----	0
23		Flags: ----0----	0
24		Flags: ----0----	0
25		Flags: ----0----	0
26		Flags: ----0----	0
27		Flags: ----0----	0
28		Flags: ----0----	0
29		Flags: ----0----	0
30		Flags: ----0----	0
31		Flags: ----0----	0
32		Flags: ----0----	0

### Senders

This tab provides a view of the configured RAVENNA transmitters and displays the primary and secondary multicast address for each stream.

Streams can be enabled or disabled by touching the toggle button to the left of the stream.

On a coldstart or after loading a configuration onto the Power Core, all stream senders will be disabled.

The state of the stream senders will be saved in snapshots.

Sender ID	Name	P: (Primary)	S: (Secondary)	State
1	TX-1	239.98.14.1	239.99.14.1	Off
2	TX-2	239.98.14.2	239.99.14.2	Off
3	TX-3	239.98.14.3	239.99.14.3	Off
4	TX-4	239.98.14.4	239.99.14.4	Off
5	TX-5	239.98.14.5	239.99.14.5	On
6	TX-6	239.98.14.6	239.99.14.6	On
7	TX-7	239.98.14.7	239.99.14.7	On
8	TX-8	239.98.14.8	239.99.14.8	On
9	TX-9	239.98.14.9	239.99.14.9	On
10	TX-10	239.98.14.10	239.99.14.10	On
11	TX-11	239.98.14.11	239.99.14.11	On
12	TX-12	239.98.14.12	239.99.14.12	On
13	TX-13	239.98.14.13	239.99.14.13	On
14	TX-14	239.98.14.14	239.99.14.14	On
15	TX-15	239.98.14.15	239.99.14.15	On
16	TX-16	239.98.14.16	239.99.14.16	On
17	TX-17	239.98.14.17	239.99.14.17	On
18	TX-18	239.98.14.18	239.99.14.18	On
19	TX-19	239.98.14.19	239.99.14.19	On
20	TX-20	239.98.14.20	239.99.14.20	On
21	TX-21	239.98.14.21	239.99.14.21	On
22	TX-22	239.98.14.22	239.99.14.22	On
23	TX-23	239.98.14.23	239.99.14.23	On
24	TX-24	239.98.14.24	239.99.14.24	On
25	TX-25	239.98.14.25	239.99.14.25	On
26	TX-26	239.98.14.26	239.99.14.26	On
27	TX-27	239.98.14.27	239.99.14.27	On
28	TX-28	239.98.14.28	239.99.14.28	On
29	TX-29	239.98.14.29	239.99.14.29	On
30	TX-30	239.98.14.30	239.99.14.30	On
31	TX-31	239.98.14.31	239.99.14.31	On
32	TX-32	239.98.14.32	239.99.14.32	On



## System Info

This tab displays general system settings, including reference levels, PTP settings, and version information.

The screenshot shows the 'System Info' tab in a dark-themed web interface. The top navigation bar includes the 'Power Core RP Local' logo, a menu of icons (Mixer, Meters, IO Routing, Talkback, Co-Mixer, Mic Pre, Web), 'RP Demo Snapshot', a digital clock showing '08:18:20', and status icons for 'Clear', 'Health', and 'Admin'. The main content area is divided into three columns: 'General', 'PTP', and 'System'. The 'General' column lists 'Analog Reference Level' (18), 'Relative System Level' (-28), 'Working Level' (-10), and 'Sync Source' (PTP). The 'PTP' column lists 'Domain' (0), 'Priority 1' (128), 'Priority 2' (128), 'PTP Mode' (Slave), 'Announce Interval' (1 (2s)), 'Sync Interval' (-2 (1/4s)), 'Own Clock ID' (00-08-72-FF-FE-09-D2-E2), and 'Status' (Active). The 'System' column lists 'Firmware Version' (8.2.93), 'System Start Date' (07.04.2024 18:28:55), 'Serial Number' (00-59-E3-08-10-82-07-1D), 'Product Name' (PowerCore Rev2 (710/11)), 'Project Name' (PowerCore Rpv2), 'Project Version' (2.0.0), and 'Project Note 1' (Rev3 + RA Max). A left sidebar contains a menu with 'System info' highlighted in blue.

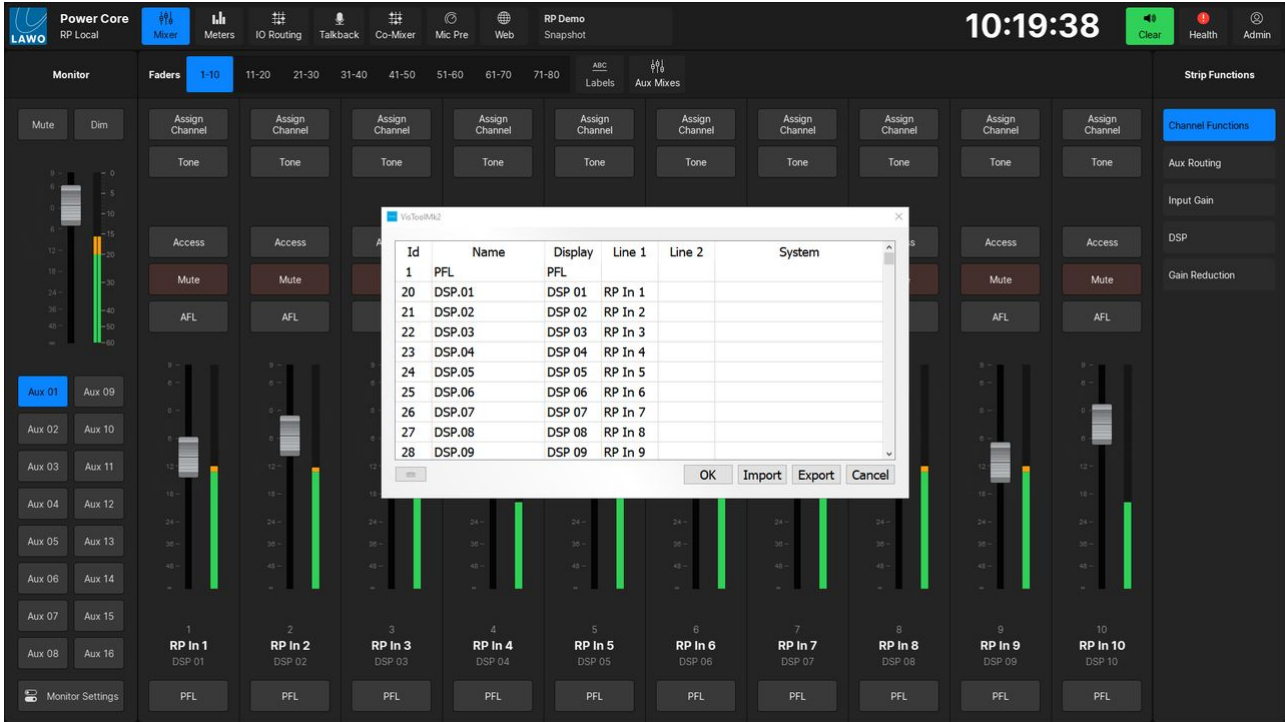
Category	Parameter	Value
General	Analog Reference Level	18
	Relative System Level	-28
	Working Level	-10
	Sync Source	PTP
PTP	Domain	0
	Priority 1	128
	Priority 2	128
	PTP Mode	Slave
	Announce Interval	1 (2s)
	Sync Interval	-2 (1/4s)
	Own Clock ID	00-08-72-FF-FE-09-D2-E2
	Status	Active
System	Firmware Version	8.2.93
	System Start Date	07.04.2024 18:28:55
	Serial Number	00-59-E3-08-10-82-07-1D
	Product Name	PowerCore Rev2 (710/11)
	Project Name	PowerCore Rpv2
	Project Version	2.0.0
Project Note 1	Rev3 + RA Max	



## 8.11 VisTool RP - Edit User Labels

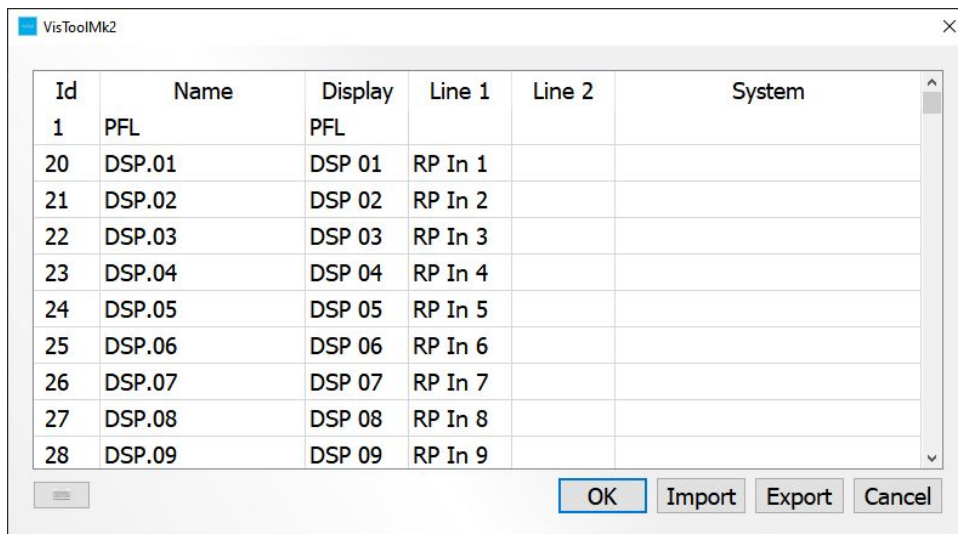
The user labels editor can be used to edit the system name and user labels for the Power Core RP v2 input and aux channels. This allows you to prepare the labels before connecting the mc<sup>2</sup> console.

1. Press the **LABELS** button (on the [Mixer page](#)) to open the label editor.
2. The screenshot below shows the label editor.



Once the network connection is made, the contents of "Line 1" sync to the RPx user labels (displayed on the console fader strips and in the Main display). The direction of sync is determined by the **Sync From MCX** option (described [earlier](#)). Once sync is established, the "Line 1" labels can be edited from the mc<sup>2</sup> (in the same way as for other control channels such as VCAs).

The **Export** button can be used to save all labels into an .xml file. This allows you to copy the file to another VisTool PC and then select **Import** to import the labels. When using import, the labels are applied to sources with an identical source **Name** field.



## 8.12 VisTool RP - Snapshots

Snapshots can be used to reset the Power Core RP v2 by storing and recalling settings.

There is no limit on the number of snapshots that VisTool can save and two types are supported: full snapshots (to save all settings) and source snapshots (to save settings for the source in access). The operation is determined by the configuration. Optionally, the [User Access Rights](#) system can be used to manage the snapshot access for different users.

The **Load**, **Save**, and **Delete** snapshot buttons are located in the user menu (for full snapshots) and in the **DSP Access** window (for source snapshots); users must be logged in to save or delete full snapshots.

### What is stored in a snapshot?


The following settings are saved in all snapshots:

- **Fader Strip Assignments** – the assignment of sources and buses to all fader strips.
- **User Labels** – the two user label text lines for all sources and buses.
- **Input Parameters** – input gain, pan, etc. for all sources.
- **DSP Parameters** – EQ, Dynamics, etc. for all sources and buses.
- **Fader Levels** – the fader levels for all sources and buses.
- **Bus Assignments** – the assignment of sources to summing buses and their send levels, including the Co-Mixer and Talkback assigns
- **Talkback Dim Levels** - the level by which an Aux Bus will be dimmed when any talkback input is active to that Aux Bus
- **Tone Generator Level** - the level of the two internal tone generators
- **Direct Out Assignments** – the assignment of insert devices.
- **Monitor Settings** - AFL, PFL, and Matrix PFL insert to monitors assignments for both the Local and Remote users
- **Monitor Bus Selections** - the selected monitor bus for the Local and Remote users
- **Monitor PFL Mode** - the selected PFL mode for the Local and Remote users
- **Aux Pan Settings** - Aux Pan enables for each Aux Bus
- **Mute Pre-Fader** - whether channel mutes apply to pre-fader sends
- **IO Routing** – the state all internal audio connections
- **RAVENNA Stream State** - the state of the RAVENNA stream senders

### Saving a Full Snapshot

Snapshots can be loaded at any time without being logged in, but you must be logged in to save or delete full snapshots.

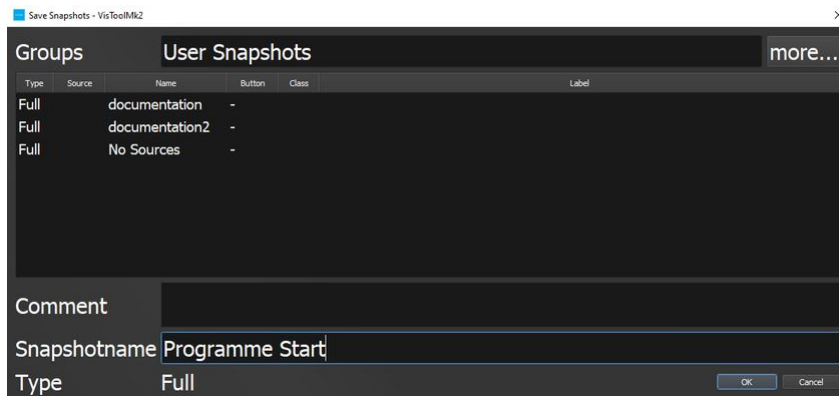
1. Select **Sign In** (from the user menu) and login in the usual manner.

 The default username is **Admin** and the default password is **default**.

Following a successful login, the **Delete Snapshot** and **Save Snapshot** will become active.



2. Choose **Save Snapshot** to open the 'Save Snapshots' dialog box.



3. Enter a snapshot name and, optionally, a comment. Then select **OK**.

The dialog box closes and the settings are saved.

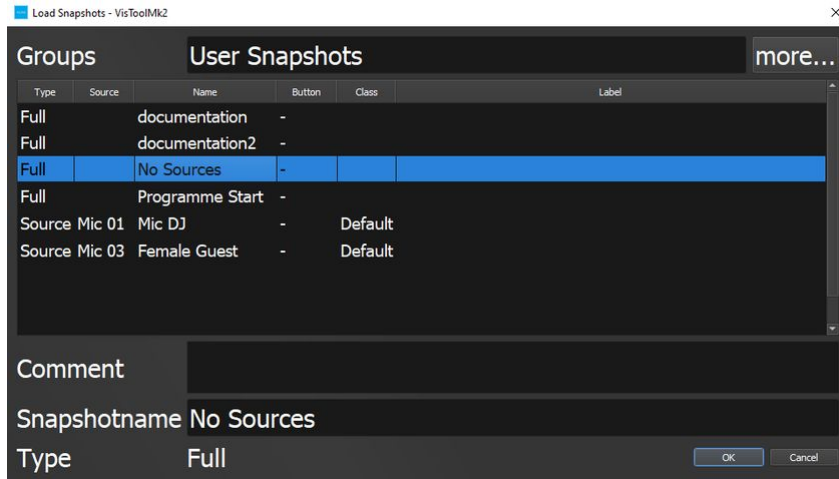
If you enter the same name as an existing snapshot, then a confirmation box appears - select **Yes** to overwrite or **No** to cancel.

By default, all snapshots are saved into the "User Snapshots" group. If other groups are available, then these can be selected via the **more...** button (top right). If this button is greyed out, then it is not available to the current user.

The access to snapshot groups is determined by the [User Access Rights](#) system (described in the VisTool MK2 documentation).

### Loading a Full Snapshot

1. Select **Load Snapshot** (from the user menu) to open the 'Load Snapshots' dialog box.



Here you will see all of the snapshots stored in the "User Snapshots" group. If your system supports other snapshot groups, then these can be selected via the **more...** button (top right).

The 'Type' column shows the type of snapshot, either **Full** or **Source**.

2. Select a full snapshot and select **OK**.

The dialog box closes and the console resets to the settings saved in the snapshot.

If you load a source snapshot when no source is in access, then its settings are loaded to the original source (shown in the 'Source' column). For example, loading the snapshot named "Mic DJ" will reset the Mic 01 source.

When the snapshot has finished loading, the label of the active snapshot will be displayed in the top bar.

**i** Full Snapshots can contain thousands of parameters and can take several seconds to load. Snapshots should never be loaded while live!

### Saving a Source Snapshot

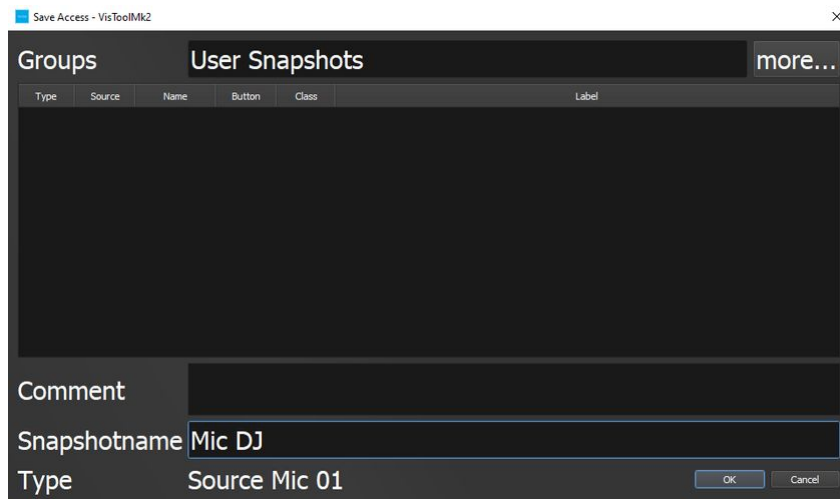
In the standard configuration, source snapshots are saved from the 'Source Parameter' dialog box. This opens automatically when a source is in access.

1. On the surface, press a fader strip **Access** key to select the source you wish to save.

The DSP Access dialog box opens on the GUI.



2. Select **Save** (from the top row of buttons) to open the 'Save Access' dialog box.



3. Enter a snapshot name and, optionally, a comment. Then select **OK**.

The dialog box closes and the settings are saved.

If you enter the same name as an existing snapshot, then a confirmation box appears - select **Yes** to overwrite or **No** to cancel.

As before, the snapshot is saved into the "User Snapshots" group. If other groups are available, then these can be selected via the **more...** button (top right).

### Loading a Source Snapshot

Source snapshots can be loaded either to the source in access or to the original source. The first option is particularly useful if you have saved a library of source snapshots, or wish to copy and paste settings between sources.

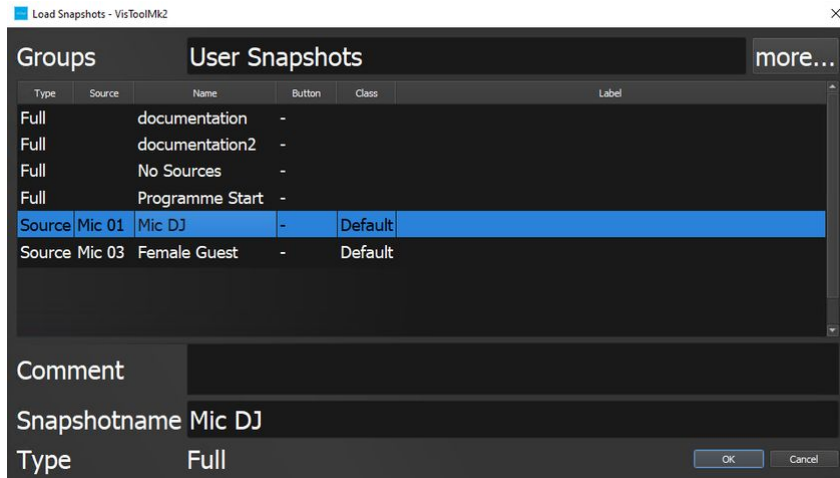
### Loading Settings to the Source in Access

1. On the surface, press a fader strip **Access** key to select the source you wish to reset.

The DSP Access dialog box opens on the GUI.



2. Select **Load** (from the top row of buttons) to open the 'Load Snapshots' dialog box.



3. Select a source snapshot and select **OK**.

The dialog box closes and the source in access resets according to the snapshot recall options (described [earlier](#)).

4. Turn off the fader strip **Access** key to close the 'Source Parameter' dialog box and return the surface controls to their default functions.

### Loading Settings to the Original Source

1. Select **Load Snapshot** (from the user menu) to open the 'Load Snapshots' dialog box.

2. Select a source snapshot and select **OK**.

In this instance, there is no source in access and so the snapshot settings are loaded to the original source (shown in the 'Source' column). For example, loading the snapshot named "Mic DJ" will reset the Mic 01 source.



## VisTool Snapshot Database

By default, VisTool snapshots are stored in the `C:\ProgramData\DSA\VisToolMK2\database\Visconfigurations.mdb` file. Usually, this is located on the host PC so that there is one set of GUI snapshots for each VisTool instance.

If you wish to allow different VisTools to access the same snapshots, then a centralized database can be specified, or the `visConfigurations.mdb` file can be placed on a network file share that both the Local and Remote VisTool RP instances can access.



## 9 Power Core RP v2 - Remote Operation from the Console

This chapter describes how to remotely control Power Core RP v2 from the mc<sup>2</sup> console.

- [Power Core RP v2 - Console Control, First Steps](#)
- [Power Core RP v2 - Console Control, Operations](#)



## 9.1 Power Core RP v2 - Console Control, First Steps

This topic describes how to prepare the RPx channels and connect the audio and GPIO signals.

### Prerequisites

It is expected that the customer has prepared the mc<sup>2</sup> configuration (as described [earlier](#)) and connected the Power Core RP v2 to the same management network as the mc<sup>2</sup> control system.

### Mount the Remote Mixing Engine

Start by mounting the Power Core RP v2 device you wish to use by enabling the **RPx Mnt** user button (defined [earlier](#)).

Up to four Power Core RP v2 devices can be controlled from one mc<sup>2</sup> console. Once a device is mounted, the RPx channels (**RPx INP** and **RPx AUX**) can [assigned](#) to the console's fader strips.

### RPx Lock

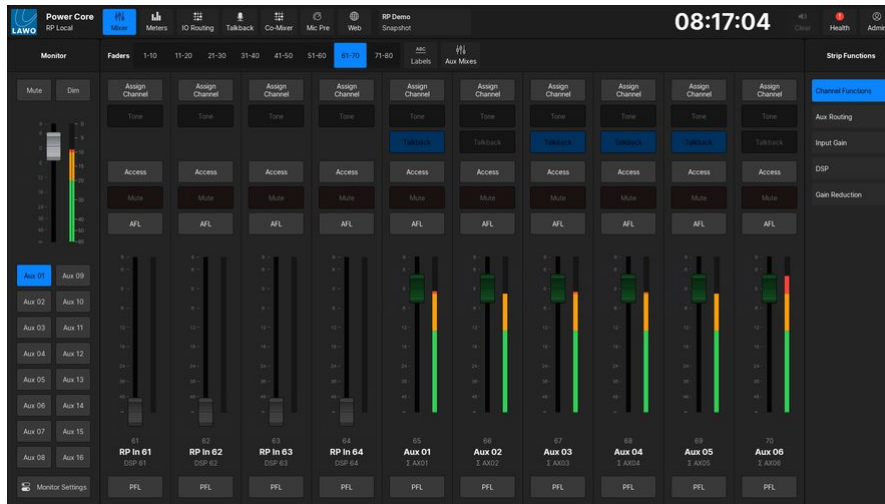
A screen lock can be triggered on the remote VisTool RP instance. To enable or disable this option, use the **RPx Lock** user button (defined [earlier](#)). The Remote VisTool RP user can override this lock if necessary.



### RPx Fader Lock

The fader lock prevents operation of the Power Core RP v2 from both the local and remote VisTool RP. The following controls will be disabled in the VisTool RP instances:

- Fader Level
- Mute
- Tone Insert
- Talkback (Aux Buses only)



It is possible for the VisTool RP user to reset the fader lock in the Settings menu if they are logged in.

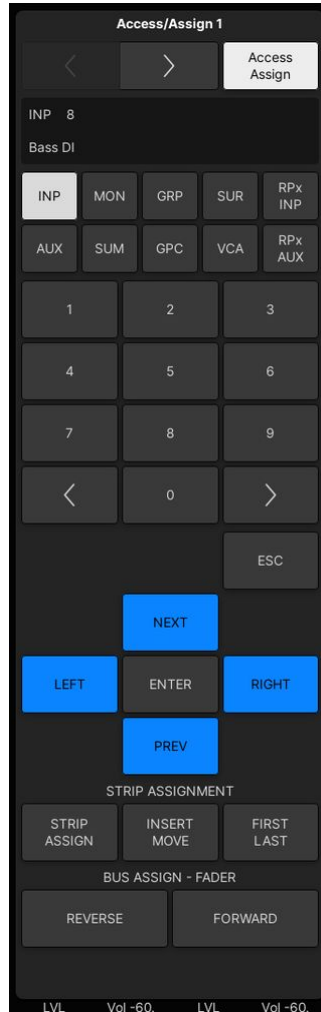
## 9.2 Power Core RP v2 - Console Control, Operations

RPx (Remote Production channels) are control channels which can be assigned to any fader strip. They can be used to remotely control the DSP within a Power Core RP v2 without any transfer of audio or usage of mc<sup>2</sup> DSP resources.

### Fader Strip Assignment

Once the correct configuration is in place, RPx channels can be assigned to any channel or main fader strip in the usual manner.

1. Start by selecting the channel you wish to assign (from the **Access/Assign** panel).



Select **RPx INP** to assign a remote production input channel, or **RPx AUX** to assign a remote production aux master.

Each Power CoreRP provides 64 mono input channels and 16 stereo auxes. Therefore, if more than one device is configured, the channels are numbered as follows:

- RPx INP 1-64 + RPx AUX 1-16 = Power CoreRP1
- RPx INP 65-128 + RPx AUX 17-32 = Power CoreRP2
- RPx INP 129-192 + RPx AUX 33-48 = Power CoreRP3
- RPx INP 193-256 + RPx AUX 49-64 = Power CoreRP4

2. Use the **ASSIGN** or **FIRST LAST** buttons (under STRIP ASSIGNMENT in the centre section) to assign the RPx channel(s) in the usual manner.

## Source Assignment

Any audio input in the Power Core RP v2 can be freely assigned to the 64 DSP processing channels using the [IO Routing](#) page in VisTool RP or the [Device I/O Routing](#) page in HOME.

## I/O Parameters

If a mic/line or Studio IO card is installed in the Power Core RP v2, the mic preamp settings (mic gain, phantom power, pad, and high pass filter) can be controlled from the [Mic Pre](#) page. To control a mic preamp from the mc2 console, the mic signal must be routed to a mc2 DSP input.

## DSP Parameters

Once the RPx channels are assigned to the fader strips, you can use any of the usual methods to adjust the channel levels and signal processing parameters: EQ, Dynamics, Delay, etc.

**Please note:** RPx channels feature the same control objects as a normal DSP channel – EQ, Delay, Compressor, Limiter, etc. However, the ranges and resolutions used in the Power Core DSP differ to those used in the mc<sup>2</sup> console.

In these instances, a best effort is applied. For example, the EQ GAIN range in mc<sup>2</sup> is +/- 24dB, while in Power Core it is +/- 15dB. This means that if you turn an EQ GAIN control on the console surface beyond +15dB, there will be no further increase in the Power Core EQ GAIN value. Similarly, if a DSP parameter is not supported (e.g. Look Ahead Delay), then the mc<sup>2</sup> console control will have no function.

The best way to see the available DSP within Power Core RP v2 is to open a VisTool GUI instance, select the [MIXER](#) page and then press **Access** to put a channel into access. In the example below, DSP 01 is in access (on VisTool RP):



The DSP sections are similar to those in the mc<sup>2</sup> with the following exceptions and additions:

- Power Core RP v2 input channels feature 5 bands of EQ (instead of 4). This means that band 5 can only be adjusted from the VisTool GUI.
- Power Core RP v2 input channels feature left/right stereo panning only. There is no surround capability. If discrete Aux Bus Panning is enabled for an Aux Bus in the VisTool RP GUI, the input pan will not be taken into account.
- Power Core RP v2 input channels have a Side Chain Filter and De-Esser. These are not mapped to the mc2 and can only be controlled from the VisTool RP GUI.




For convenient operation, RPx channels support features such as LINK, COUPLE, VCA grouping and AFV.

You can make bus assignments from RPx inputs to RPx auxes in the any of the usual ways: e.g. touch an Aux bus on the **Channel Display** or use the **Bus Assign** displays on the Central GUI.

### Metering

To enable the correct control, all RPx channels are mono (even though aux masters in Power Core RP v2 are stereo). Thus, on RPx AUX channels, the "mono" meter shows the RMS value for the Power Core RP v2 stereo aux DSP channel: L+R.

 If the tone insert has been activated for an RPx Input channel in the VisTool RP GUI, the tone insert will **NOT** be reflected in the mc2 meter.

### Saving and Loading Settings

The settings for RPx channels are stored in snapshots and productions in exactly the same way as normal DSP channels. This means that you can use **SNAP ISO** to isolate an individual RPx from snapshot recall or protect all RPx channels using the Global Snapshot ISO **DSP** option.

Note that mc<sup>2</sup> snapshots and productions will always reset RPx channels (that are not in ISO), regardless of the VisTool RP DSP Sync at Start up option.



## 10 Power Core RP v2 - Software Tools and Diagnostics

This chapter describes the tools available for fault finding and diagnostics.

- [Power Core RP v2 - System Restart](#)
- [Power Core RP v2 - Web UI](#)
  - [Power Core RP v2 - System Menu](#)
  - [Power Core RP v2 - Peripherals Menu](#)
  - [Power Core RP v2 - IP Connections Menu](#)
  - [Power Core RP v2 - Sources/Sums Menu](#)
  - [Power Core RP v2 - RAVENNA Menu](#)
  - [Power Core RP v2 - Preparing a Secure Connection \(for https\)](#)
- [Power Core RP v2 - Stream Tuning](#)
- [Power Core RP v2 - USB Service Port](#)
- [Power Core RP v2 - RS-422 Serial Port](#)
- [Power Core RP v2 - Telnet Sessions](#)
- [Power Core RP v2 - File Transfer via FTP](#)

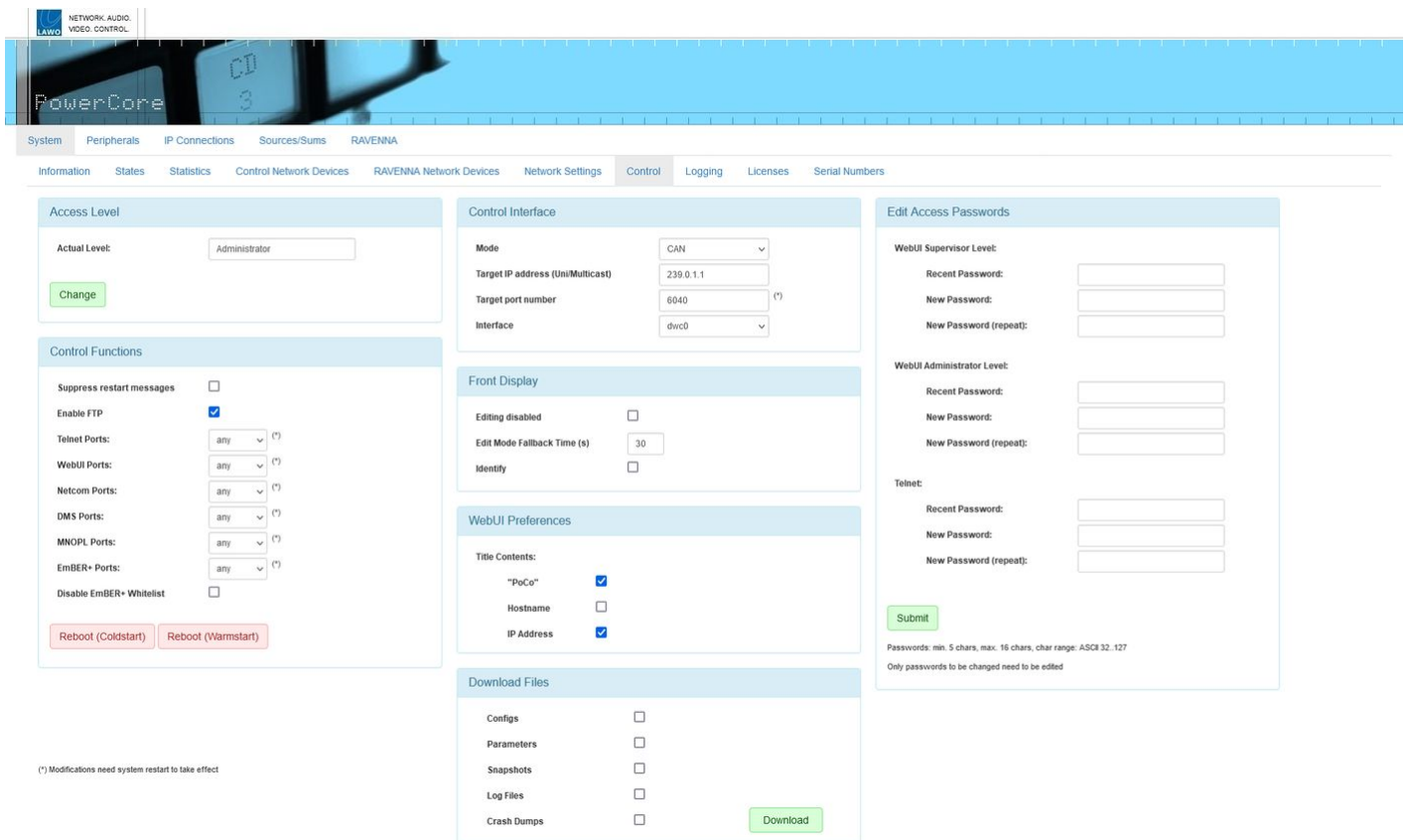
## 10.1 Power Core RP v2 - System Restart

This topic describes how to restart the system.

### How to Restart Power Core

Power Core has no on/off switch and starts automatically when power is applied. The system can also be restarted remotely using the Web UI (described below) or a Telnet session (described [later](#)).

1. Open a Web UI connection to the Power Core control port.
2. Log in as either Supervisor or Administrator. The default passwords are *orion* for Supervisor and *hydra* for Administrator.
3. Select the **System** → **Control** tab and look for the **Reboot (Coldstart)** and **Reboot (Warmstart)** buttons (at the bottom of the "Control Functions" area).



### Reboot (Warm Start)

By default, the system performs a warm start whenever you apply power, press the recessed **RESET** button (on the front panel), choose **Reboot (Warmstart)** from the Web UI or type "sys\_rb" into a Telnet session.

The boot-up progress is shown on the front panel:

1. First, the SYSTEM display and **STATUS** LED are black and unlit.
2. Then, the Lawo logo appears and the **STATUS** LED lights in white.
3. As soon as boot-up is complete, the **Welcome** page appears and the **STATUS** LED starts to blink; its color reflects the [sync status](#).



If the **STATUS** LED does not start to blink, then the device has an internal problem. Please reboot the device (using the RESET button) as a first step.

At the end of the boot-up, Power Core loads the latest settings (stored at shut-down). This is known as the warm start data, and it means that the system returns to whatever the settings were at the last power off.

There are two exceptions: PTP parameters that have been edited using the Web UI and output stream parameters that are changed during runtime via Ember+. In this instance, the changes are not warm start persistent and the parameters reset to the values stored in the configuration.

**Please note:**

- If you perform a cold start, then the system ignores the warm start data and resets all settings to the default values stored in the configuration.
- If this is the first time you have powered the device "out of the box", then the system loads a very basic configuration that allows Power Core to boot. To get the system operational, you will need to upload the standard configuration or a custom configuration using the ON-AIR Designer.

**Reboot (Cold Start)**

As explained above, a cold start ignores the warm start data, and resets all internal logic states and audio parameters to the default values stored in the configuration.

A cold start happens automatically whenever you transfer a new configuration to Power Core (using ON-AIR Designer) or update its firmware (using SoP Explorer). It can also be triggered manually using the **Reboot (Coldstart)** button on the Web UI.

**Reboot (Default Mode)**

If Power Core boots in default mode, then it loads a very basic configuration stored on the SD card. This can be useful if the customer's configuration is stopping the system from booting (e.g. there is a loop in the ON-AIR Designer configuration and you need to exit out of the loop).

To activate default mode:

1. Press and hold the encoder on the front panel and, while holding, press the RESET button.
2. Once the Lawo logo appears, you can release the encoder - the device now boots up in default mode.
3. Once boot-up is complete, you can use SoP Explorer to reload all system firmware and ON-AIR Designer to transfer a different configuration.





## 10.2 Power Core RP v2 - Web UI

The Power Core Web UI can be used to provide status information about the system and perform a number of administrative and diagnostic tasks.

It can be reached by entering the IP address or hostname of Power Core into a web browser (e.g. **192.168.101.240** if the default IP is in use). In User mode (no password). The computer you use must be connected to the same control network as Power Core. For more information, see [\\_Power Core RP v2- Configuration Tools](#) and [Opening a Web UI Session](#).

In User mode, information is displayed as "read-only" with no editable fields. If you wish to edit or access the permitted options, then you must login as either Supervisor or Administrator. The default passwords are *orion* for Supervisor and *hydra* for Administrator.

Once you have opened a connection and logged in, you will see the available pages/tabs.

**i** Optionally, the Web UI can be opened using a secure connection. The steps required to prepare the device are described [later](#). Once the SSL certificates are in place, the Web UI can be opened using a "https" connection. Apart from the connection method, there is no difference in the functionality.

In the current release, there are five main menus each containing several sub pages/tabs. The rest of this section describes all available pages plus how to prepare a secure connection. Alternatively, use the [quick links](#) (below) to learn more about a particular function.

- [Power Core RP v2 - System Menu](#)
- [Power Core RP v2 - Peripherals Menu](#)
- [Power Core RP v2 - IP Connections Menu](#)
- [Power Core RP v2 - Sources/Sums Menu](#)
- [Power Core RP v2 - RAVENNA Menu](#)
- [Power Core RP v2 - Preparing a Secure Connection \(for https\)](#)

### Quick Links

The table below provides quick links to some of the most useful functions.

How to...	
Change the time zone	Edit the <b>Time Zone</b> field in " <a href="#">System → Information</a> ".
Check the sync status	Look at the <b>Sync</b> area in " <a href="#">System → States</a> ".
Check the status of the hardware components	Look at the " <a href="#">System → States</a> " page (for the main frame) and " <a href="#">Peripherals</a> " pages (for other components: MADI ports, I/O cards, AIOX devices, control surface and key panels).
Change the IP address of the control and streaming ports	Edit the <b>IP Address</b> fields in the " <a href="#">System → Control Network Interfaces</a> " and <a href="#">System → RAVENNA Network Interfaces</a> tabs.
Identify the Power Core device	Press the <b>Identify</b> button in " <a href="#">System → Control</a> ".
Reboot the device	Press the <b>Reboot (Warmstart)</b> button in " <a href="#">System → Control</a> ".
Change the passwords (for Supervisor and Administrator)	Use the <b>Edit Access Passwords</b> area in " <a href="#">System → Control</a> ".

## Power Core RP v2 - System Menu

In the System menu, there are ten pages/tabs. They provide status information about the main unit and its peripherals. Most of the information is for diagnostic purposes only. Values which can be modified are noted for each tab.

- [System → Information](#)
- [System → States](#)
- [System → Statistics](#)
- [System → Control Network Devices](#)
- [System → RAVENNA Network Devices](#)
- [System → Network Settings](#)
- [System → Control](#)
- [System → Logging](#)
- [System → Licenses](#)
- [System → Serial Numbers](#)

### System → Information

The **System → Information** tab is the first tab to be shown following a successful login.

On the left, you will see basic information about the device such as the serial number, software / firmware version numbers and system date and time. The system date and time is provided by your network's NTP server (if present), or by the device's internal Real Time Clock (RTC). In User mode, all fields are non-editable. In Supervisor or Administrator mode, you can edit the time zone (as described below).

On the right, the "Project Information" area shows the project name, version and description defined by the ON-AIR Designer configuration.

### Setting the Time Zone

In Supervisor or Administrator mode you can edit the current **Time Zone** value. Type in a new value - any change takes immediate effect and so a restart is not required.

The time zone should be specified relative to Central European Time (CET).

For example, "CET+5CEST,M3.2.0/2:00,M11.1.0/2:00" is suitable for US East Coast, where CET is 5 hours ahead.



The second part of the syntax specifies the start and end of Central European Summer Time (CEST). e.g. from month 3, week 2, day 0, time 2am (the second Sunday in March) until month 11, week 1, day 0, time 2am (the first Sunday in November).

## System → States

The screenshot shows the 'System → States' tab in the PowerCore RP v2 web interface. The interface is divided into several sections:

- Voltages:**
  - Main Input Voltage (nom. 12.0V): 11.80 V
  - Aux Input Voltage (nom. 12.0V): 0.06 V
  - Board Voltage 1 (nom. 3.30V): 3.30 V
  - Board Voltage 2 (nom. 1.80V): 1.82 V
  - Board Voltage 3 (nom. 1.35V): 1.32 V
- Temperatures:**
  - FPGA Chip Temperature: 65 °C
  - Board Temperature: 42 °C
  - Fan Temperature: 44 °C
  - DC/DC Temperature: 70 °C
- Currents:**
  - Total 12V Input Current: 2.09 A
  - DCDC 12V Input Current: 1.08 A
  - DCDC 3.3V Output Current: 2.46 A
  - DCDC 0.9V Output Current: 3.92 A
- Fan Speeds:**
  - Fan 1 Speed: 1257 rpm
  - Fan 2 Speed: 1230 rpm
  - Fan 3 Speed: 1412 rpm
  - Fan 4 Speed: 1461 rpm
- Sync:**

Source	Enabled	Present	Active
PTP	yes	yes	yes
MADI	no	no	no
WordClock	no	no	no
Internal	yes	yes	no

Prio Sequence: PTP - WordClock - MADI
- Audio:**
  - Sampling Rate: 48 kHz
  - Analog Reference Level: 15 dBu
  - Relative System Level: -27 dBFS
  - Digital Reference Level: -9 dBFS

The **System → States** tab shows information about the physical state of the Power Core hardware. It is for diagnostic use only; there are no editable fields.

In the "Sync" area (on the right), you will see information about each of the sync sources defined in the ON-AIR Designer configuration. The color-coding indicates:

- **Blue** = sync source is enabled, present and active.
- **Green** = sync source is enabled and present, but not currently active.
- **Red** = sync source is enabled but not present.
- **Light Grey** = sync source is disabled in the configuration.

## System → Statistics

The screenshot shows the PowerCore web interface. At the top left, there is a logo for 'LAWO NETWORK AUDIO VIDEO CONTROL'. Below it, the text 'PowerCore' is visible. The main navigation bar includes 'System', 'Peripherals', 'IP Connections', 'Sources/Sums', and 'RAVENNA'. A secondary navigation bar contains 'Information', 'States', 'Statistics', 'Control Network Devices', 'RAVENNA Network Devices', 'Network Settings', 'Control', 'Logging', 'Licenses', and 'Serial Numbers'. The 'Statistics' tab is active, and the 'CAN' section is expanded. The CAN statistics are as follows:

Parameter	Value
Bus Speed:	500 kBits/s
TX Messages:	1
RX Messages:	1
TX Errors:	0
RX Errors:	0
TEC:	0
REC:	0
ErrFlags:	0x00
StatusFlags:	0x00

A green 'Reset' button is located at the bottom left of the CAN statistics panel.

The **System → Statistics** tab shows information about the CAN bus. It can be used to analyse the number of messages sent and received, and if there are any TX or RX problems.

To reset all of the message/error/flag counters to zero, click on the **Reset** button at the bottom of the page.

## System → Control Network Devices

The screenshot shows the 'Control Network Devices' tab in the PowerCore web interface. It features two columns for 'Device dwc0' and 'Device dwc1'. Each column contains a form with various network configuration fields such as Host Name, MAC Address, IP Address, Network Mask, Gateway, Link Speed, Link State, AutoNegotiation, Link Flags, SFP Type, SFP Vendor Name, SFP Vendor PN, Switch Name, Switch MAC Address, Switch Mgmt. Addr., Switch Port Intf. Name, Switch Port Descr., and VLAN. Below the forms is a 'LACP dwc0/dwc1 (Device lagg0)' section with a 'Status' dropdown menu. A note at the bottom states: '(\*\*) Modifications need system restart to take effect'. The interface includes a navigation menu at the top with options like System, Peripherals, IP Connections, Sources/Sums, RAVENNA, Information, States, Statistics, Control Network Devices, RAVENNA Network Devices, Network Settings, Control, Logging, Licenses, and Serial Numbers.

This tab provides access to the settings for the two control ports: **Device dwc0** and **Device dwc1**.

Each "Device" section displays the port's Host Name (defined by the ON-AIR Designer configuration) and MAC address, plus the network IP Address, Network Mask and Gateway (if used). The Link Speed and State show the speed of the connection and its current status (up or down). You will also see information about the SFP module fitted to the port and the network switch connection (if a switch is in use).

In User mode, all fields are non-editable. In Supervisor or Administrator mode, you can enter a new IP Address, Network Mask and/or Gateway. If any settings are changed, you must click **Apply** to save the changes. IP Address changes are made immediately and so you will lose your browser connection once the settings are applied. To continue with the system administration, enter the device's new IP address into your browser and login again (from the Login screen).

### Using LACP

LACP *MUST* be configured in the network switch as well as in Power Core. Otherwise, you will not be able to reach Power Core via its CONTROL ports.

## System → RAVENNA Network Devices

The screenshot displays the configuration page for RAVENNA Network Devices. It features a navigation bar at the top with tabs for System, Peripherals, IP Connections, Sources/Sums, and RAVENNA. Below this is a sub-menu with Information, States, Statistics, Control Network Devices, RAVENNA Network Devices, Network Settings, Control, Logging, Licenses, and Serial Numbers. The main content area is divided into four columns, each representing a different network device: Device ra0, Device ra1, Device ra2, and Device ra3. Each column contains a form with various configuration fields. Device ra0 and ra2 have their Link States set to 'up', while Device ra1 and ra3 are set to 'down'. All devices have their AutoNegotiation set to 'disabled'. At the bottom of each device's settings, there is a green 'Apply (\*)' button. Below the device settings, there are two LACP configuration sections: LACP ra0/ra1 (Device lagg1) and LACP ra2/ra3 (Device lagg2), both with their Status set to 'disabled'. A note at the bottom right states: '(\*) Modifications need system restart to take effect' and '(\*\*\*) Modifications need RAVENNA restart to take effect for RAVENNA'.

This tab contains similar settings for the streaming ports. The first two network interfaces (**Device ra0** and **Device ra1**) are always available. The second pair of interfaces (**Device ra2** and **Device ra3**) are supported by Power Core revision 3 with a valid RAVENNA Plus license/configuration.

As above, in Supervisor or Administrator mode, it is possible to change the IP Address, Network Mask and Gateway, plus the Public Name (a friendly name displayed during network searches). Remember to click **Apply** to save any changes. For the streaming ports (ra0, ra1, ra2 and ra3), IP address changes require a restart, and so you will need to reboot the device after settings are applied. This can be done using the **Reboot (Warmstart)** button in the "System → Control" tab.

## System → Network Settings

This tab provides access to Power Core's control network settings. It can be used to define a Domain Name Server, NTP Server or Syslog Server, the gateway priorities (should the primary control link fail) and any static network routes.

### Settings

Using the fields in this area, you can enter the Domain Name of your network and DNS Name Server IP Addresses. In addition, you can configure settings for a NTP, SysLog and Home server.

- Your NTP server can be configured either by entering its name in the Server Name box, or its IP Address in the Address box. If you type "ntp.internal" in the Server Name box, the IP Address will be automatically filled.
- Your Syslog and Home server can be configured in a similar manner. Type "syslog.internal" or "home.internal" into the Server Name box to complete the IP address automatically.

### Gateway Priorities By Device

These options allow you to determine which of Power Core's network ports will be used as the control port should the primary link be interrupted. Priority 1 is generally assigned to the "dwc0" port; use the remaining Priority fields to prioritize fallback ports.

### Configured Static Routes (fixed)

This area shows any static routes which have been configured for your network (via the "Logic -> Static Network Route" element in the ON-AIR Designer configuration).

### Editable Static Routes

Here you can add an editable static route by clicking **Add** and completing the dialog box.

If a Home server is defined, then the following information is made available (via MQTT heartbeat): system\_type; project\_name; project\_version; serial\_number; ember\_target; timestamp; and timestamp\_utc. The ember\_target is always





Provider 1. Therefore, it is mandatory to configure the Ember+ Local Provider (in "System -> Definition -> Parameter = Control Settings" and anything else used by Home) to Provider 1.

## System → Control

The screenshot shows the 'System → Control' web interface. At the top, there's a navigation bar with tabs: System, Peripherals, IP Connections, Sources/Sums, RAVENNA, Information, States, Statistics, Control Network Devices, RAVENNA Network Devices, Network Settings, Control, Logging, Licenses, and Serial Numbers. The 'Control' tab is active.

**Access Level:** Shows 'Actual Level' as 'Administrator' with a 'Change' button.

**Control Functions:** Includes checkboxes for 'Suppress restart messages' and 'Disable EmBER+ Whitelist'. It also has 'Enable FTP' checked and dropdown menus for 'Telnet Ports', 'WebUI Ports', 'Netcom Ports', 'DMS Ports', 'MNOPL Ports', and 'EmBER+ Ports', all set to 'any'. There are 'Reboot (Coldstart)' and 'Reboot (Warmstart)' buttons.

**Control Interface:** Includes 'Mode' (CAN), 'Target IP address (Uni/Multicast)' (239.0.1.1), 'Target port number' (6040), and 'Interface' (dwc0).

**Front Display:** Includes 'Editing disabled' (unchecked), 'Edit Mode Fallback Time (s)' (30), and 'Identify' (unchecked).

**WebUI Preferences:** Includes 'Title Contents' with 'PoCo' checked, 'Hostname' unchecked, and 'IP Address' checked.

**Download Files:** Includes checkboxes for 'Configs', 'Parameters', 'Snapshots', 'Log Files', and 'Crash Dumps', with a 'Download' button.

**Edit Access Passwords:** Includes password fields for 'WebUI Supervisor Level', 'WebUI Administrator Level', and 'Telnet', each with 'Recent Password', 'New Password', and 'New Password (repeat)' fields. A 'Submit' button is at the bottom.

Footnote: (\*) Modifications need system restart to take effect

The **System → Control** tab can be used to configure the device's external control options. For example, to permit access via FTP, etc., reboot the device, define the control surface connection, permit editing or identify the device from the front panel display, and/or edit the passwords for the various user modes.

The options shown are determined by the current "Access Level". In User mode, this is the only section visible. In Supervisor mode, you will also see "Control Functions". In Administrator mode, there are more options in the "Control Functions" plus sections for the "Control Interface", "Front Display", "WebUI Preferences", "Download Files" and "Edit Access Passwords".

### Access Level

The current user mode is displayed in the **Actual Level** field.

To change the current access level, click on **Change** - this opens the Login screen. Select a different **Access Level** and enter the **Password**:

- **User** (no password required).
- **Supervisor** (default password = *orion*).
- **Administrator** (default password = *hydra*).

Now re-select the **System → Control** tab to return to this page.

### Control Functions

In Supervisor and Administrator modes, the "Control Functions" section becomes visible. Note that the following options are only visible in Administrator mode: **Enable FTP**, **Telnet Ports** and **WebUI Ports**.

- **Suppress restart messages** - by default, an on-screen message appears whenever the system restarts. You can turn the messages off by selecting this option.



- **Enable FTP** - by default, this option is turned on to allow file transfers to Power Core via FTP. Turn this option off to prevent FTP access.
- **Telnet Ports, WebUI Ports, Netcom Ports**, etc. - these options define which network port(s) can be used for Telnet, the Web UI, Netcom, DMS, MNOPL and EmBER+ communication. In each case, you can choose either **any** (to allow access via any network port) or **dwc0** (to restrict access to CONTROL A only). Note that if you choose **dwc0**, then the restriction also applies to the local host and so access is not permitted via 127.0.0.1. The default setting for all protocols is **any**.
- **Disable EmBER+ Whitelist** - the Ember Whitelist+ (configured in ON-AIR Designer) can be used to restrict the access to the Ember+ providers so that only devices with a defined IP can talk to Power Core (via Ember+). For convenience, you can temporarily deactivate the whitelist by selecting this option. This will allow access from consumers with any IP address.

The two red buttons at the bottom of the area can be used to restart the system as follows:

- **Reboot (Coldstart)** - reboots the unit and loads the base configuration parameters (as defined by the ON-AIR Designer). This will clear any temporary changes made from the Web UI.
- **Reboot (Warmstart)** - reboots the unit keeping temporary changes intact.

## Control Interface

In Administrator mode, the "Control Interface" section becomes visible. These parameters define the IP connection to the control surface (if applicable). Please refer to the documentation for your control surface. e.g. [diamond - Control Interface Settings](#).

## Front Display

In Administrator mode, the "Front Display" section becomes visible. These options affect the [SYSTEM display](#) on the device's front panel.

- **Editing disabled** - by default, this option is turned on. It can be turned off to permit editing of the unit's IP Address and other settings from the front panel. Lawo recommends keeping the option selected.
- **Edit Mode Fallback Time (s)** - when using the front panel controls, inactivity causes the display to return to its normal status. You can set a timeout period for this action by entering a value, in seconds, in this field.
- **Identity** - you can use this box to send a message to the front panel display so that a Power Core can be easily identified. Once activated, the display shows "HELLO I AM \[dwc0 IP Address\]". The message disappears once you deactivate "Identify" or push down on the encoder.

## Web UI Preferences

In Administrator mode, the "Web UI Preferences" section becomes visible. These options adjust what is shown in the browser's "title" for the Web UI session. If nothing is selected, then the page address (URL) is shown. Any changes take affect after a refresh of the browser page.

## Download Files

In Administrator mode, the "Download Files" section becomes visible. You can use these options to download files from Power Core to your computer. To proceed, first select the tick boxes and then click on the green **Download** button.

## Edit Access Passwords

In Administrator mode, the "Edit Access Passwords" section becomes visible.

This area can be used to edit the passwords for the Supervisor and Administrator modes in the Web UI, and/or the device's Telnet login. In each case:

- Enter the current password into the "Recent Password" field, followed by the new password into the two "New Password" fields.



- The new password must meet the following requirements: minimum of 5 characters; maximum of 16 characters; permitted character range: ASCII 32..127.
- Click on **Submit** to apply the changes - an on-screen message appears to confirm (or deny) the operation.

## System → Logging

Message Type	Console	Telnet	Syslog	Logfile
Init	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Desk	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IO Cards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Panels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HV RAM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Parameters	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ZMS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Audio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
NetCom	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MNOPL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DMS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DMS PC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KPF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Snapshots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Web Cnds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Logging Ctrl	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alarmlog	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Message Type	Console	Telnet	Syslog	Logfile
System	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Error	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Warning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Traffic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Manager	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Consumer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Parameter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Report	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Subscript	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Matrix	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Message Type	Console	Telnet	Syslog	Logfile
System	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Error	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Warning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Core	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mDNS Level 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mDNS Level 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mDNS Level 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SAP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RTSP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SDP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Streams	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RTCP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sequencer/Scheduler	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Routing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Matrix Server	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FPGA	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Message Type	Console	Telnet	Syslog	Logfile
System	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Error	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Warning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The options here are used for diagnostics. Please keep all options at their default values unless instructed otherwise by Lawo support.

Log files can be obtained from the system by connecting your PC to the debugging port. How to do this is described later in [Power Core RP v2 - USB Service Port](#).

## System → Licenses

NETWORK AUDIO  
VIDEO CONTROL

PowerCore

System Peripherals IP Connections Sources/Sums RAVENNA

Information States Statistics Control Network Devices RAVENNA Network Devices Network Settings Control Logging Licenses Serial Numbers

**Configuration**

Configured License: Power Core MAX

Configured Sub Licenses: RA+ GPIO

**Dongle**

Dongle Name:

CmContainer ID: 2-2252410

License: Power Core MAX

Sub Licenses: LB N-1 MM AP CA RA+ GPIO

**Foreign Copyrights & Licenses**





Download

This tab displays two sets of licensing information describing what is configured (by ON-AIR Designer) and what is detected (on the USB dongle). In each case, the **License** field describes the main license, while the **Sub Licenses** list any active add-ons.

The **Download** button can be used to download a copy of the copyright and license information.



## System → Serial Numbers

Slot	Card ID	Barcode
0	710/13	 71013 009E23A3E28F0C7
2	710/25	 71025 009E22010D0FFB4
7	710/55	 71055 009E201184E201C
8	710/80	 71080 009E2231028E4D4

[Print](#)

This tab shows the barcodes and serial numbers of the Power Core frame and expansion I/O cards. The **Print** button can be used to print a copy for your system documentation.

## Power Core RP v2 - Peripherals Menu

In the **Peripherals** menu, there are five pages/tabs. They provide status information about the device's peripherals. All pages are for diagnostic use only; there are no editable fields.

- [Peripherals → MAD I](#)
- [Peripherals → I/O Cards](#)
- [Peripherals → AIOX Cores](#)
- [Peripherals → Surface](#)
- [Peripherals → KS Panels](#)

### Peripherals → MAD I

Port No.	Port configured	Port detected	Port Location	SFP present	Signal present	AIOX	Tx64	TxCopy	XOver	Temperature
1	yes	yes	Front	yes	yes	yes	yes	no	no	29°C
2	yes	yes	Front	yes	yes	yes	yes			43°C
3	no	yes	Front	no	no	no				
4	no	yes	Front	no	no	no				

The **Peripherals → MAD I** tab shows information about all available MAD I/AIOX ports. The rows are color-coded to indicate the present state of the connection.

- Green = the port is configured and a valid signal is present. (no redundancy configured).
- Blue = the port is configured and a valid signal is present AND active. (redundancy configured).
- Light Blue = the port is configured and is a valid is present but not active. (redundancy configured).
- Red = the port is configured but a valid signal is NOT present. e.g. an SFP is not fitted or there is no connection.
- Grey = the port is not configured (by the ON-AIR Designer configuration).

The columns show the following information.

- **Port No.:** shows the port number.
- **Port configured:** shows whether the port is configured (in ON-AIR Designer): yes or no.
- **Port detected:** shows whether the port is detected by the hardware: yes or no.
- **Port Location:** indicates the physical location of the port: Front or Rear.
- **SFP Present:** shows whether an SFP module is installed: yes or no.
- **Signal present:** confirms port signal activity: yes or no.
- **AIOX:** shows whether AIOX mode is active: yes or no.
- **Tx64:** shows whether Tx64 mode is active: yes or no. If "no", then Tx56 mode is in use.
- **TxCopy & XOver:** shows whether the port is mirrored with another port for signal redundancy. This setting is selected using the ON-AIR Designer.
- **Temperature:** if an SFP is installed, this field displays the current temperature of the SFP.



## Peripherals → I/O Cards

Slot	Slot Description	Configured Card ID	Configured Card Designation	Detected Card ID	Detected Card Designation	Hardware Revision	Firmware Version	Firmware Compile Date	Temperature	Board State	RSU State	Test Mode	Sync State	Serial Number	GPIOs 8..1	GPOs 8..1
2	Core Slot 2	710/25	Line In	710/25	Line In	0	1.44	03.02.2023 20:22:55	35 °C	0x02	0x80	0xA0	0x80	80-98-02-20-10-D6-FF-B4		
7	Core Slot 7	710/55	DANTE SRC I/O	710/55	DANTE SRC I/O	0	1.39	18.07.2022 19:19:06	45 °C	0x02	0x80	0x00	0x91	80-98-02-61-18-AE-38-1C		
8	Core Slot 8	710/80	GPIO	710/80	GPIO	1	1.44	03.02.2023 18:38:44	39 °C	0x02	0x80	0x00	0x00	80-98-22-31-02-6E-A4-D4	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
9	AIOX Core 1	710/12	AIOX Core	710/12	AIOX Core	1	1.55	15.06.2023 14:44:44	32 °C	0x02	0xA0	0x00	0x00	80-98-02-10-12-8E-D8-D0		
10	AIOX Core 2	710/12	AIOX Core	710/12	AIOX Core	1	1.55	15.06.2023 14:44:44	31 °C	0x02	0xA0	0x00	0x00	80-98-02-10-12-8E-18-D0		
45	AIOX 1 Slot 1	710/40	AES3 SRC In/Out	710/40	AES3 SRC In/Out	0	1.44	03.02.2023 19:49:43	34 °C	0x02	0x80	0x00	0x00	80-98-C2-09-00-4E-AF-38		
46	AIOX 1 Slot 2	710/40	AES3 SRC In/Out	710/40	AES3 SRC In/Out	0	1.44	03.02.2023 19:49:43	32 °C	0x02	0x80	0x00	0x00	80-98-C2-09-00-4E-0F-44		
54	AIOX 2 Slot 2	710/20	MicLine	710/60	MADI SRC	0	1.40	05.08.2022 16:33:13	39 °C	0x83	0x80	0x00	0x00	80-98-02-20-10-8E-38-E8		

The **Peripherals → I/O Cards** tab shows information about the expansion I/O cards and, on Power Core revision 2, the internal GPIOs.

### List of I/O Cards

This area shows information about the expansion I/O cards. Slots 1 to 8 refer to the I/O cards fitted to the rear panel. Slots 9 upwards refer to any AIOX Cores, connected to Power Core, and their I/O cards.

For the I/O cards, the rows are color-coded to indicate the present state of the card.

- Green = the I/O card is configured and active.
- Red = the I/O card is configured but NOT active. e.g. no card fitted or different card detected (ID mismatch).

The columns show information about the I/O card such as its slot number, hardware revision, firmware version, temperature, serial number, etc. Most important are the configured and detected card IDs as these must match for correct operation. If they differ, then you will need to change the I/O card (fitted) or modify the configuration (using ON-AIR Designer).

For a GPIO card, you can check the present state of all 8 GPIOs and 8 GPOs: 1 = high; 0 = low.

For the AIOX Cores, the rows are color-coded to indicate the present state of the connection.

- Blue = the AIOX Core is configured and present.
- Red = the AIOX Core is configured but NOT detected.

In this instance, the columns show information about the AIOX frame such as its hardware revision, firmware version, temperature, serial number, etc. Further information can be viewed using the **Peripherals → AIOX Core** tab (described below).

### Expansion I/O Slot (numbering)

Slot #	I/O Card or Device
1 - 8	Power Core I/O Cards (rear slots 01 to 08)
9 - 12	AIOX Core 1 to 4 (connected via front MADI/AIOX ports 1 to 4)
13 - 28	AIOX Core 5 to 20 (connected via rear MADI/AIOX ports in slots 01 to 08)
45 - 52	AIOX 1 I/O Cards (rear slots 01 to 08)

Slot #	I/O Card or Device
53 - 60	AIOX 2 I/O Cards (rear slots 01 to 08)
61 - 68	AIOX 3 I/O Cards (rear slots 01 to 08)
69 - 76	AIOX 4 I/O Cards (rear slots 01 to 08)
77 - 84	AIOX 5 I/O Cards (rear slots 01 to 08)
85 - 92	AIOX 6 I/O Cards (rear slots 01 to 08)
93 - 100	AIOX 7 I/O Cards (rear slots 01 to 08)
101 - 108	AIOX 8 I/O Cards (rear slots 01 to 08)
109 - 116	AIOX 9 I/O Cards (rear slots 01 to 08)
117 - 124	AIOX 10 I/O Cards (rear slots 01 to 08)
125 - 132	AIOX1 11 I/O Cards (rear slots 01 to 08)
133 - 140	AIOX 12 I/O Cards (rear slots 01 to 08)
141 - 148	AIOX 13 I/O Cards (rear slots 01 to 08)
149 - 156	AIOX 14 I/O Cards (rear slots 01 to 08)
157 - 164	AIOX 15 I/O Cards (rear slots 01 to 08)
165 - 172	AIOX 16 I/O Cards (rear slots 01 to 08)
173 - 180	AIOX 17 I/O Cards (rear slots 01 to 08)
181 - 188	AIOX 18 I/O Cards (rear slots 01 to 08)
189 - 196	AIOX 19 I/O Cards (rear slots 01 to 08)
197 - 204	AIOX 20 I/O Cards (rear slots 01 to 08)

### Internal GPIO Card

Internal GPIO Card

	I/O 8	I/O 7	I/O 6	I/O 5	I/O 4	I/O 3	I/O 2	I/O 1
Inputs:	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Outputs:	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>

This area appears for Power Core revision 1 and 2 systems only. It shows the present state of the internal GPIO closures that break out on the front panel GPIO connector. There are two possible states for each input and output: 1 = high; 0 = low.

## Peripherals → AIOX Cores

AIOX Core No.	Core Voltage 1 (2.5V)	Core Voltage 2 (3.3V)	Core Voltage 3 (12V Main)	Core Voltage 4 (12V Aux)	Core Current 1 (@12V)	Core Current 2 (@3.3V)	Core Temperature	Core Fan 1 Speed	Core Fan 2 Speed	I/O Cards Temperature	I/O Cards Fan 1 Speed	I/O Cards Fan 2 Speed
1	2.52 V	3.29 V	11.6 V	0.0 V	0.34 A	0.86 A	31.6 °C	1047 rpm	1051 rpm	33.5 °C	1050 rpm	1050 rpm
2	2.54 V	3.27 V	11.7 V	0.0 V	0.38 A	0.87 A	31.0 °C	1099 rpm	1094 rpm	38.2 °C	1096 rpm	1077 rpm

The **Peripherals → AIOX Cores** tab shows information about any Audio I/O Extenders connected to Power Core. The columns show information about the present state of the device such as its internal temperature and fan speed.

## Peripherals → Surface

Slot	Configured Module ID	Configured Module Designation	Detected Module ID	Detected Module Designation	Firmware Version	Firmware Date
1	711/10	FADER A				
2	711/10	FADER A				
16	711/20	CENTRAL				

The **Peripherals → Surface** tab shows information about any control surface modules which are defined in the configuration. The rows are color-coded to indicate the present state of the module.

- Green = the control surface module is configured and active.
- Red = the control surface module is configured but not active. e.g. the module is not fitted to the frame OR there is a problem with its connection.

The columns show information such as the module's slot ID and firmware version. Most important are the configured and detected module IDs as these must match for correct operation. If they differ, then you will need to change the module (fitted) or its slot ID (to match the ON-AIR Designer configuration). If you need to change a slot ID, then please refer to the documentation for your surface. e.g. [diamond - Slot IDs](#).

## Peripherals → KS Panels

Slot	Configured Panel ID	Configured Panel Designation	Detected Panel ID	Detected Panel Designation	Firmware Version	Firmware Date	GPIs 32..25	GPIs 24..17	GPIs 16..9	GPIs 8..1	GPOs 32..25	GPOs 24..17	GPOs 16..9	GPOs 8..1
------	---------------------	------------------------------	-------------------	----------------------------	------------------	---------------	-------------	-------------	------------	-----------	-------------	-------------	------------	-----------

The **Peripherals → KS Panels** tab shows information about any external key panels which are defined in the configuration. The rows are color-coded to indicate the present state of the panel.

- Green = the key panel is configured and active.
- Red = the key panel is configured but not active. e.g. there is a problem with its connection.

## Power Core RP v2 - IP Connections Menu

In the **IP Connections** menu, there are six pages/tabs. They provide status information about the network connections to Power Core. All pages are for diagnostic use only; there are no editable fields.

- [IP Connections → Netcom](#)
- [IP Connections → DMS](#)
- [IP Connections → MNOPL](#)
- [IP Connections → Ember+](#)
- [IP Connections → GPIO Net TCP & UDP](#)

### IP Connections → Netcom

The screenshot shows the 'IP Connections → Netcom' web interface. The navigation menu includes 'System', 'Peripherals', 'IP Connections', 'Sources/Sums', and 'RAVENNA'. Under 'IP Connections', there are sub-tabs for 'Netcom', 'DMS', 'MNOPL', 'EmBER+', 'GPIO Net TCP', and 'GPIO Net UDP'. The 'Netcom' tab is active, displaying three tables:

- List of configured Netcom Local Clients:** A table with columns: ID, Remote IP Address, Remote Hostname, Context.
- List of Netcom Local Client to Remote Server Connections:** A table with columns: ID, Remote IP Address, Remote Hostname, Remote Port, Local Port, Context, Socket, Send Task, Rcv Task, TTL.
- List of Netcom Remote Client to Local Server Connections:** A table with columns: ID, Remote IP Address, Remote Hostname, Remote Port, Local Port, Context, Socket, Rcv Task, Send Task, TTL.

The data in the 'List of Netcom Remote Client to Local Server Connections' table is as follows:

ID	Remote IP Address	Remote Hostname	Remote Port	Local Port	Context	Socket	Rcv Task	Send Task	TTL
2	192.168.1.100		20975	18500	ETH_GETH1	0x18B	NPR1	NPT1	50
3	192.168.1.101		55538	18500	---	0x194	NPR2	NPT2	50

The **IP Connections → Netcom** tab displays a list of all configured Netcom systems and their connections. For example, another Power Core that is configured for GNET (GPIO over network) communication.

## IP Connections → DMS

The screenshot shows the 'IP Connections → DMS' tab in a software interface. At the top, there are navigation tabs: System, Peripherals, IP Connections (selected), Sources/Sums, and RAVENNA. Below these are sub-tabs: Netcom, DMS (selected), MNOPL, EmBER+, GPIO Net TCP, and GPIO Net UDP. The main content area is titled 'List of DMS Remote Client to Local Server Connections' and contains a table with the following data:

ID	Remote IP Address	Remote Hostname	Remote Port	Local Port	Context	Socket	Rcve Task	Send Task	TTL
1	192.168.1.100		54132	18510	CAN	0x07C	DPR0	DPTQ	49
2	192.168.1.100		52834	18510	CAN	0xF2B	DPR1	DPTQ	49
3	192.168.1.100		55540	18510	CAN	0x18D	DPR2	DPTQ	50

The **IP Connections → DMS** tab displays a list of all systems connected via DMS. For example, a VisTool host PC.

## IP Connections → MNOPL

System Peripherals IP Connections Sources/Sums RAVENNA

Netcom DMS MNOPL EmBER+ GPIO Net TCP GPIO Net UDP

List of MNOPL Local Client to Remote Server Connections

ID	Remote IP Address	Remote Hostname	Remote Port	Socket Task	TTL	Card State
----	-------------------	-----------------	-------------	-------------	-----	------------

List of MNOPL Remote Client to Local Server Connections

Remote IP Address	Remote Hostname	Remote Port	Local Port	Context	Socket Rcv Task	Send Task	TTL
-------------------	-----------------	-------------	------------	---------	-----------------	-----------	-----

The **IP Connections → MNOPL** tab displays a list of all systems connected via MNOPL. For example, Lawo's Nova series of routers.



## IP Connections → Ember+

The screenshot shows the PowerCore web interface with the following components:

- Navigation Menu:** System, Peripherals, IP Connections, Sources/Sums, RAVENNA, Netcom, DMS, MNOPL, **EmBER+**, GPIO Net TCP, GPIO Net UDP.
- List of configured Ember+ Local Providers:**

ID	Mgr Task	Server Task	Local Port
1	EPM1	EPS1	9001
- List of configured Ember+ Local Consumers:**

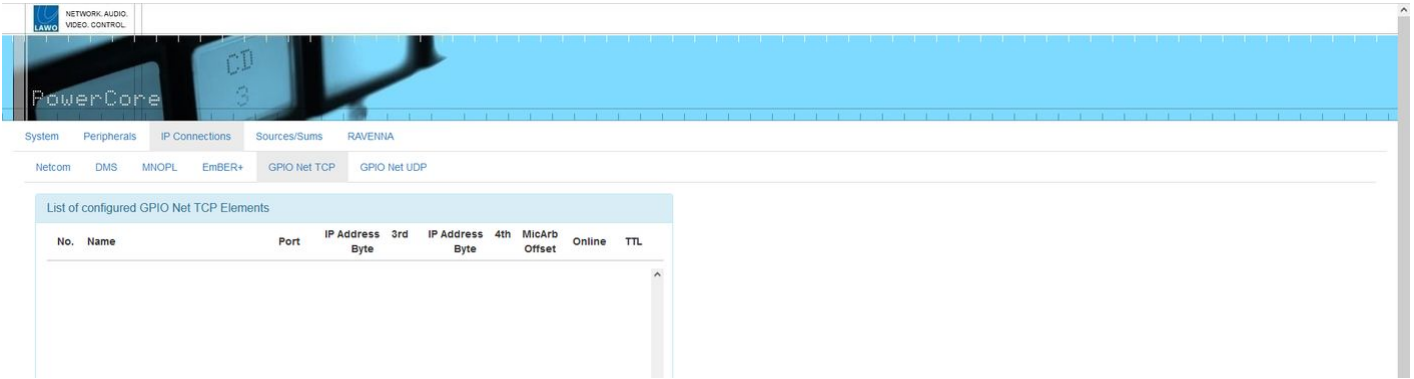
ID	Remote IP Address	Remote Hostname	Remote Port	Mgr Task	Used by
- List of Ember+ Remote Consumer to Local Provider connections:**

ID	Client	Remote IP Address	Remote Hostname	Remote Port	Local Port	Socket	Recv Task	Send Task
1	1	192.168.1.100		38156	9001	0x199	ER11	EPT1
1	2	192.168.1.100		54532	9001	0x1A2	ER12	EPT1
1	3	192.168.1.100		50696	9001	0x1A3	ER13	EPT1
- List of Ember+ Local Consumer to Remote Provider connections:**

ID	Remote IP Address	Remote Hostname	Remote Port	Local Port	Socket	Send Task	Recv Task

The **IP Connections → Ember+** tab displays a list of all configured Ember+ systems and their connections. For example, a VSM control system.

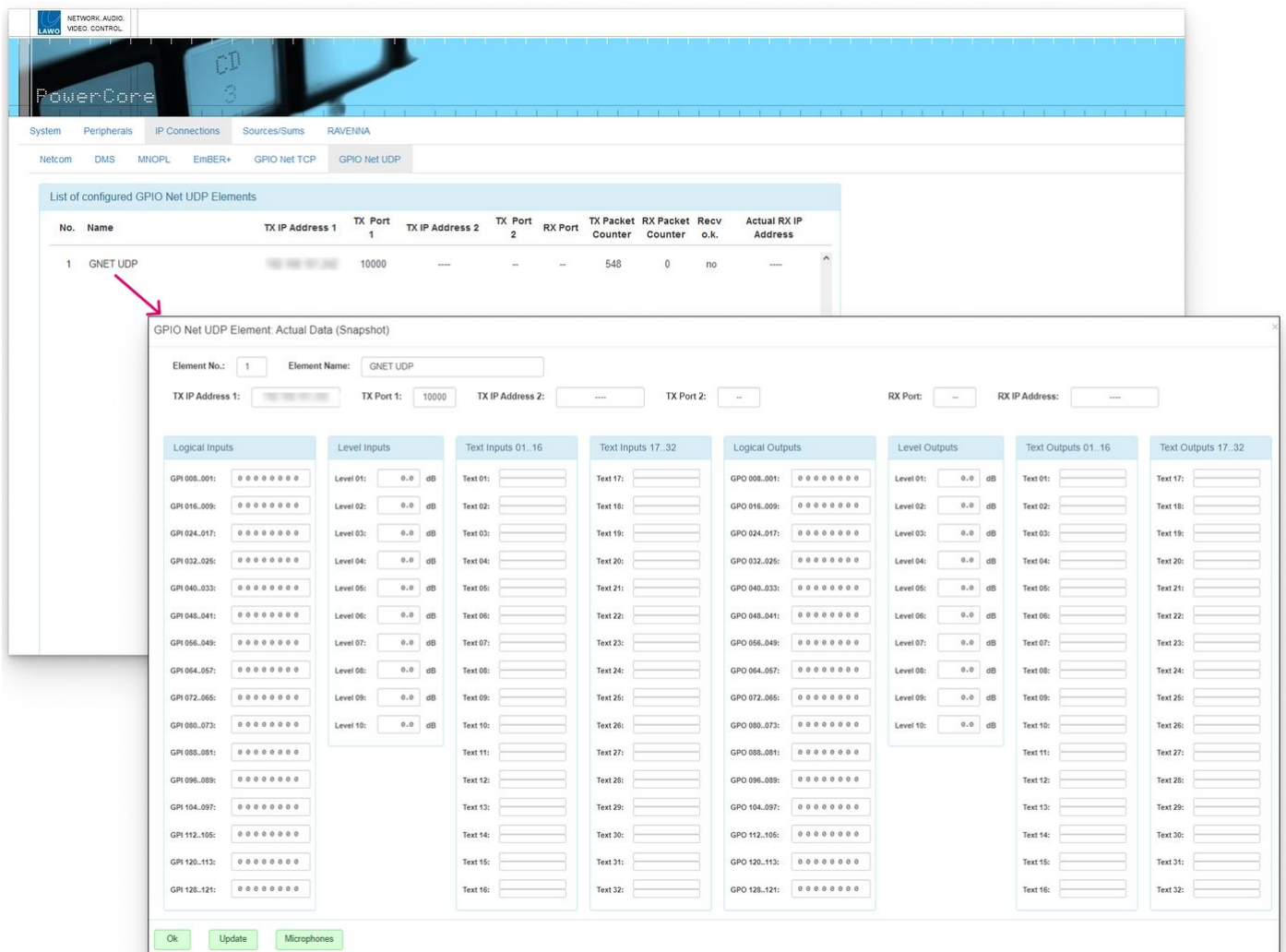
## IP Connections → GPIO Net TCP & UDP



The last two tabs in the **IP Connections** menu display a list of all configured **GPIO Net TCP** (and **GPIO Net UDP**) elements. They can be used to monitor the status of any GNET elements (that are used to exchange GPIO signals over the control network).

Power Core supports GNET via both TCP and UDP. This means that it can communicate with other Power Cores (usually via UDP) and legacy systems (that support TCP only).

From the **GPIO Net UDP** tab (shown below), you can click on the element's name field to open a more detailed view. This can be used to check the present state of the logical I/Os and text inputs/outputs.



## Power Core RP v2 - Sources/Sums Menu

In the **Sources/Sums** menu, there are three pages/tabs that provide information about the DSP resources. All pages are for diagnostic use only; there are no editable fields.

- [Sources/Sums → Sources & Sums](#)
- [Sources/Sums → Sum Inputs](#)

### Sources/Sums → Sources & Sums

Sys No.	Name	Type	Display Name	Alias Name	List Enabled	Access Enables	Access Group	Access States	Fader No.	Sum No.	EQ No.	DYN No.	DSS No.	LIM No.	DEL No.	INS No.	EQ En.	DYN En.	DSS En.	LIM En.	DEL En.	EmBER+ Provider No.	RAVENNA Pool No.
2	src_ra0in1	stereo	Ra0in1		N	1---	1	----	1	1	33	33	33	33	33	--	Y	Y	Y	Y	Y	--	--
3	src_ra0in2	stereo	Ra0in2		N	1---	1	----	2	3	35	35	35	35	35	--	Y	Y	Y	Y	Y	--	--
4	src_ra2in1	stereo	Ra2in1		N	1---	1	----	9	9	41	41	41	41	41	--	Y	Y	Y	Y	Y	--	--
5	src_ra2in4	stereo	Ra2in4		N	1---	1	----	12	15	47	47	47	47	47	--	Y	Y	Y	Y	Y	--	--
6	src_ra2in3	stereo	Ra2in3		N	1---	1	----	11	13	45	45	45	45	45	--	Y	Y	Y	Y	Y	--	--
7	src_ra2in2	stereo	Ra2in2		N	1---	1	----	10	11	43	43	43	43	43	--	Y	Y	Y	Y	Y	--	--
8	src_ra0in4	stereo	Ra0in4		N	1---	1	----	4	7	39	39	39	39	39	--	Y	Y	Y	Y	Y	--	--
9	src_ra0in3	stereo	Ra0in3		N	1---	1	----	3	5	37	37	37	37	37	--	Y	Y	Y	Y	Y	--	--

The first two tabs provide a comprehensive listing of Power Core's input sources and summing buses.

The **Sources** tab shows all of the configured sources (defined by the ON-AIR Designer). Here you check information such as the source's names, format and Access Group; which fader number the source is assigned to; and whether DSP is configured and enabled.

The **Sums** tab shows similar information for all of the configured summing buses.

The lists can be sorted by **Sys No**, **Name**, etc. by clicking on a column header. Click again to reverse the sorting order.

To make changes to the sources or buses, you must edit and save the configuration offline (using ON-AIR Designer) and then upload the edited version to the Core. How to do this is described in [Power Core RP - mc<sup>2</sup> Configuration](#).

## Sources/Sums → Sum Inputs

NETWORK AUDIO  
VIDEO CONTROL

PowerCore

3

System
Peripherals
IP Connections
Sources/Sums
RAVENNA

Sources
Sums
Sum Inputs

List of Sum Inputs 01..16				List of Sum Inputs 17..32				List of Sum Inputs 33..48				List of Sum Inputs 49..64				List of Sum Inputs 65..80				List of Sum Inputs 81..96			
Inp. No.	Sys. No.	Source Name	Fader No.	Inp. No.	Sys. No.	Source Name	Fader No.	Inp. No.	Sys. No.	Source Name	Fader No.	Inp. No.	Sys. No.	Source Name	Fader No.	Inp. No.	Sys. No.	Source Name	Fader No.	Inp. No.	Sys. No.	Source Name	Fader No.
1	2	Ra0In1	1	17	-	---	-	33	-	---	-	49	-	---	-	65	-	---	-	81	-	---	-
2	2	Ra0In1	1	18	-	---	-	34	-	---	-	50	-	---	-	66	-	---	-	82	-	---	-
3	3	Ra0In2	2	19	-	---	-	35	-	---	-	51	-	---	-	67	-	---	-	83	-	---	-
4	3	Ra0In2	2	20	-	---	-	36	-	---	-	52	-	---	-	68	-	---	-	84	-	---	-
5	9	Ra0In3	3	21	-	---	-	37	-	---	-	53	-	---	-	69	-	---	-	85	-	---	-
6	9	Ra0In3	3	22	-	---	-	38	-	---	-	54	-	---	-	70	-	---	-	86	-	---	-
7	8	Ra0In4	4	23	-	---	-	39	-	---	-	55	-	---	-	71	-	---	-	87	-	---	-
8	8	Ra0In4	4	24	-	---	-	40	-	---	-	56	-	---	-	72	-	---	-	88	-	---	-
9	4	Ra2In1	9	25	-	---	-	41	-	---	-	57	-	---	-	73	-	---	-	89	-	---	-
10	4	Ra2In1	9	26	-	---	-	42	-	---	-	58	-	---	-	74	-	---	-	90	-	---	-
11	7	Ra2In2	10	27	-	---	-	43	-	---	-	59	-	---	-	75	-	---	-	91	-	---	-
12	7	Ra2In2	10	28	-	---	-	44	-	---	-	60	-	---	-	76	-	---	-	92	-	---	-
13	6	Ra2In3	11	29	-	---	-	45	-	---	-	61	-	---	-	77	-	---	-	93	-	---	-
14	6	Ra2In3	11	30	-	---	-	46	-	---	-	62	-	---	-	78	-	---	-	94	-	---	-
15	5	Ra2In4	12	31	-	---	-	47	-	---	-	63	-	---	-	79	-	---	-	95	-	---	-
16	5	Ra2In4	12	32	-	---	-	48	-	---	-	64	-	---	-	80	-	---	-	96	-	---	-

Allocated Sum Inputs Count: 
 Maximum:

The **Sources/Sums → Sum Inputs** tab lists the available summing points and shows how they are utilised.

Note that the **Maximum** number of parallel mix inputs is determined by the main license (described in the [Power Core - License Chart](#)).

## Power Core RP v2 - RAVENNA Menu

In the **RAVENNA** menu, there are seven pages/tabs. They can be used to check and troubleshoot the Audio-over-IP streams. Most of the information is for diagnostic purposes only. Values which can be modified are noted for each tab.

- [RAVENNA → Global](#)
- [RAVENNA → PTP](#)
- [RAVENNA → Inputs](#)
- [RAVENNA → Outputs](#)
- [RAVENNA → Stream Destinations](#)
- [RAVENNA → Nodes](#)
- [RAVENNA → Streams](#)

### RAVENNA → Global

The screenshot displays the RAVENNA Global configuration page. It features a navigation bar with tabs for System, Peripherals, IP Connections, Sources/Sums, and RAVENNA. Under RAVENNA, there are sub-tabs for Global, PTP, Inputs (Core -> Device), Outputs (Device -> Core), Stream Destinations, Nodes, and Streams. The main content area is divided into four sections: mDNS Channels, SAP Channels, Streams, and Control. Each section contains configuration parameters for its respective category.

The **RAVENNA → Global** tab displays Power Core's global RAVENNA settings. The parameters are configured by the ON-AIR Designer; there are no editable fields.

### mDNS & SAP Channels

The first two areas define the mDNS and SAP channels used for stream announcement:

- **mDNS Channels** use the multicast Domain Name System defined in IETF RFC 6762.
- **SAP Channels** use the Session Announcement Protocol defined in IETC RFC 2974.

For each channel, you will see the "Multicast IP Address", "Port" number and "TTL" value (in seconds). The "enabled" checkbox shows if the channel is enabled or disabled.

### Streams

This area shows the global options for streams.

### Control

Here you will see the status of the RAVENNA service and the global options for control.

## RAVENNA → PTP

The **RAVENNA → PTP** tab shows statistics and options for the system's PTP clocking.

For convenience, you may enter new temporary PTP settings (as described below). However, to make permanent changes, it is recommended to edit the values defined in the configuration (using the ON-AIR Designer). This ensures that the changes remain in place after a cold start.

### Configuration / Control

This area defines the PTP mode and its associated parameters. Power Core supports two possible PTP modes: slave only and master-slave. If **Slave only** is enabled, then Power Core is forced to operate as a PTP slave at all times. If **Slave only** is disabled, then Power Core will operate in PTP master-slave mode, whereby the PTP priorities set within the device itself and all other streaming nodes determine the current PTP master.

To make a temporary change, either choose a different option from the drop-down menus or type in a new value into the permitted fields. Any changes require a PTP restart to take effect, so press **PTP Stop** and then **PTP Start**. Any changes will remain in place until the next cold start.

### Slave-Only Engine

The two graphs in this area monitor PTP jitter across the system. This is useful for system analysis and debugging. As a rule of thumb, the "Clock Connection Value" display should be stable with little variance over time as an indication of good system health. High activity in the "Time Difference" display is normal and to be expected.

**i** For Power Core to sync correctly to PTP, PTP 2-step must be used (as opposed to PTP 1-step). In PTP 2-step, the time stamp message is sent separately after the sync message. This allows devices such as Power Core to calculate the network delay of the route.



### **Global Data**

This area shows the system's PTP mode, the active clock ID and address, and the grandmaster clock ID. These IDs may differ if your system uses a boundary clock.

### **Grandmaster Data**

This area shows information about the grandmaster clock.

### **Master-Slave Engine**

This area shows whether the master-slave engine is active, and displays the clock ID (used if master-slave is enabled).



## RAVENNA → Inputs

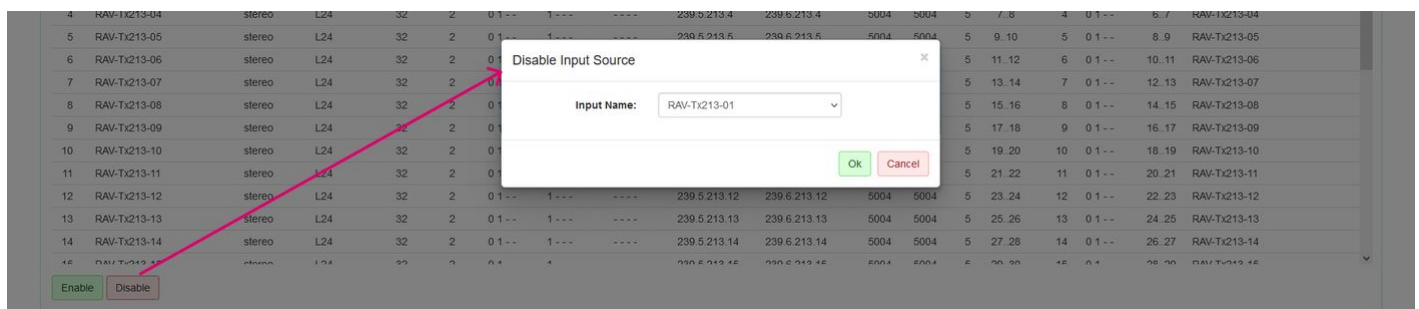
No.	Name	Type	Codec	Samples per Frame	#Channels	Device IDs	mDNS Channels	SAP Channels	MCast IP Address 0	MCast IP Address 1	UDP Port 0	UDP Port 1	TTL	Conf'd Input Slots	Source No.	Streaming	FPGA Tracks	Stream Name
1	RAV-Tx213-01	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.1	239.6.213.1	5004	5004	5	1.2	1	0 1 --	0.1	RAV-Tx213-01
2	RAV-Tx213-02	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.2	239.6.213.2	5004	5004	5	3.4	2	0 1 --	2.3	RAV-Tx213-02
3	RAV-Tx213-03	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.3	239.6.213.3	5004	5004	5	5.6	3	0 1 --	4.5	RAV-Tx213-03
4	RAV-Tx213-04	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.4	239.6.213.4	5004	5004	5	7.8	4	0 1 --	6.7	RAV-Tx213-04
5	RAV-Tx213-05	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.5	239.6.213.5	5004	5004	5	9.10	5	0 1 --	8.9	RAV-Tx213-05
6	RAV-Tx213-06	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.6	239.6.213.6	5004	5004	5	11.12	6	0 1 --	10.11	RAV-Tx213-06
7	RAV-Tx213-07	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.7	239.6.213.7	5004	5004	5	13.14	7	0 1 --	12.13	RAV-Tx213-07
8	RAV-Tx213-08	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.8	239.6.213.8	5004	5004	5	15.16	8	0 1 --	14.15	RAV-Tx213-08
9	RAV-Tx213-09	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.9	239.6.213.9	5004	5004	5	17.18	9	0 1 --	16.17	RAV-Tx213-09
10	RAV-Tx213-10	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.10	239.6.213.10	5004	5004	5	19.20	10	0 1 --	18.19	RAV-Tx213-10
11	RAV-Tx213-11	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.11	239.6.213.11	5004	5004	5	21.22	11	0 1 --	20.21	RAV-Tx213-11
12	RAV-Tx213-12	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.12	239.6.213.12	5004	5004	5	23.24	12	0 1 --	22.23	RAV-Tx213-12
13	RAV-Tx213-13	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.13	239.6.213.13	5004	5004	5	25.26	13	0 1 --	24.25	RAV-Tx213-13
14	RAV-Tx213-14	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.14	239.6.213.14	5004	5004	5	27.28	14	0 1 --	26.27	RAV-Tx213-14
15	RAV-Tx213-15	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.15	239.6.213.15	5004	5004	5	29.30	15	0 1 --	28.29	RAV-Tx213-15
16	RAV-Tx213-16	stereo	L24	32	2	0 1 --	1 ---	----	239.5.213.16	239.6.213.16	5004	5004	5	31.32	16	0 1 --	30.31	RAV-Tx213-16

The **RAVENNA → Inputs** tab lists all of the RAVENNA senders (i.e. the streams supplied by Power Core to the network). The parameters are configured by the ON-AIR Designer; there are no editable fields.

The information includes the name, type, codec, audio sample rate, RAVENNA announcement protocol used, multicast stream address, UDP port number, stream TTL value (in seconds), the input slots of the RAVENNA device, and the tracks they use.

The "Streaming" column shows whether streams are in fact actually being transmitted from Power Core's RAVENNA interfaces. The four positions correspond to the front panel ports: ra0, ra1, ra2, ra3. A value indicates that the port is active: "0" for primary and "1" for secondary ports. If both "0" and "1" are present, then the stream is configured for redundancy (sending from both primary and secondary ports).

At the bottom of the page, the **Enable** and **Disable** buttons can be used to manually start and stop the sending of a stream. They should be used for troubleshooting only, and not for controlling senders during operation. In each case, the button opens a pop-up window where you can select the stream you wish to enable or disable. If the "Input Name" field is empty, then all of the senders are in the opposite state.





## RAVENNA → Outputs

No.	Name	Type	Flags	UDP Port	Default Stream Name	Assigned Stream Name	Scheduled Stream Name	Scheduled Time	#Channels	FPGA Tracks	Destination No.	Conf'd Output Slots	Matrix Number
1	RAV-Rx213-01	stereo	-----A-		RAV-Tx221-01	ACDC			2	0 1	1	1.2	---
2	RAV-Rx213-02	stereo	-----D-		RAV-Tx221-02	RAV-Tx221-02			2	2 3	2	3.4	---
3	RAV-Rx213-03	stereo	-----D-		RAV-Tx221-03	RAV-Tx221-03			2	4 5	3	5.6	---
4	RAV-Rx213-04	stereo	-----D-		RAV-Tx221-04	RAV-Tx221-04			2	6 7	4	7.8	---
5	RAV-Rx213-05	stereo	-----D-		RAV-Tx221-05	RAV-Tx221-05			2	8 9	5	9.10	---
6	RAV-Rx213-06	stereo	-----D-		RAV-Tx221-06	RAV-Tx221-06			2	10 11	6	11.12	---
7	RAV-Rx213-07	stereo	-----D-		RAV-Tx221-07	RAV-Tx221-07			2	12 13	7	13.14	---
8	RAV-Rx213-08	stereo	-----D-		RAV-Tx221-08	RAV-Tx221-08			2	14 15	8	15.16	---
9	RAV-Rx213-09	stereo	-----D-		RAV-Tx221-09	RAV-Tx221-09			2	16 17	9	17.18	---
10	RAV-Rx213-10	stereo	-----D-		RAV-Tx221-10	RAV-Tx221-10			2	18 19	10	19.20	---
11	RAV-Rx213-11	stereo	-----D-		RAV-Tx221-11	RAV-Tx221-11			2	20 21	11	21.22	---
12	RAV-Rx213-12	stereo	-----D-		RAV-Tx221-12	RAV-Tx221-12			2	22 23	12	23.24	---
13	RAV-Rx213-13	stereo	-----D-		RAV-Tx221-13	RAV-Tx221-13			2	24 25	13	25.26	---

Flags: I=Init S=Scheduled W=Waiting F=Fixed time offset T=Tuning U=Unstable O=Mute L=Local stream D=Default stream connected A=Assigned stream connected M=Multi-assign

Connect

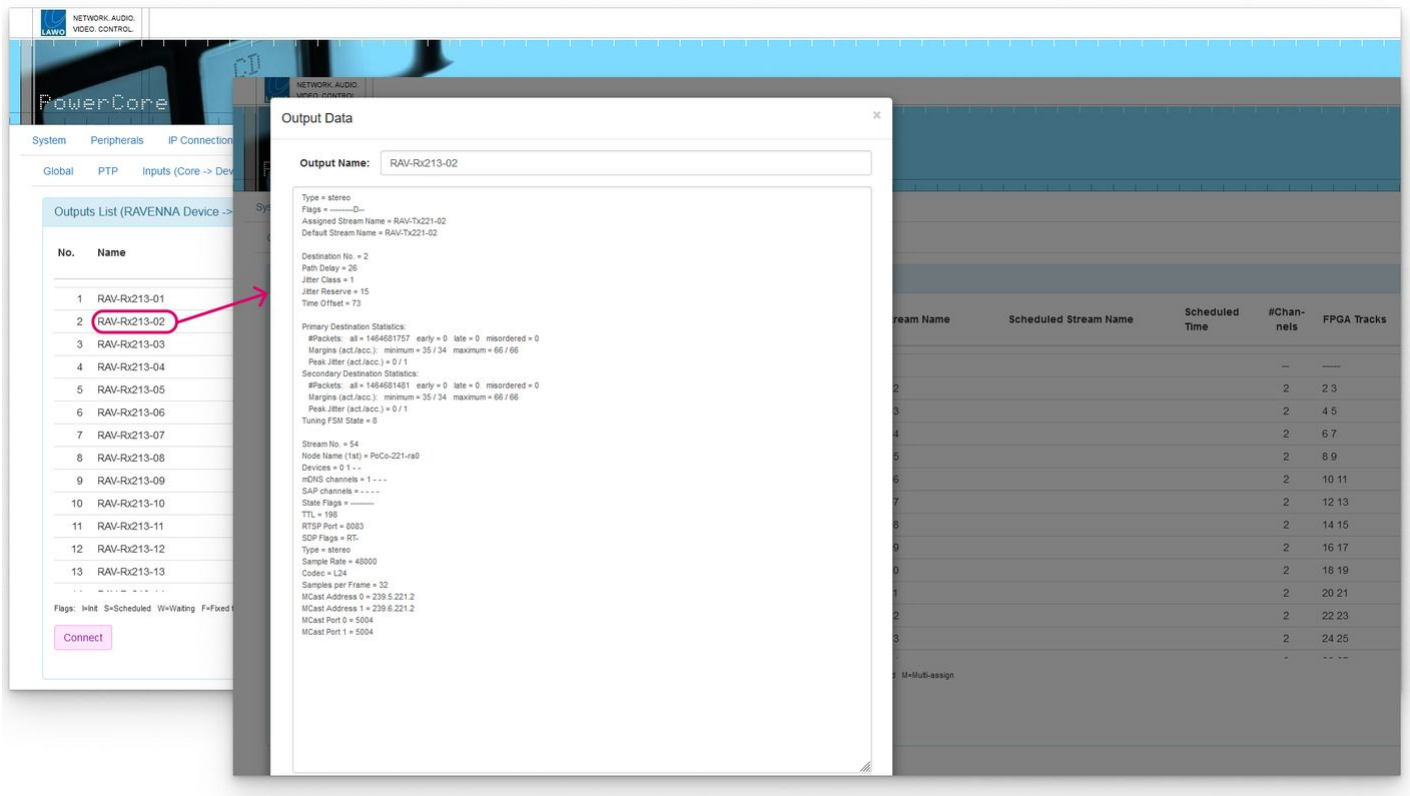
The **RAVENNA → Outputs** tab lists all of the RAVENNA receivers (that can consume streams from the network). As above, the parameters are configured by the ON-AIR Designer; there are no editable fields.

Of particular note are:

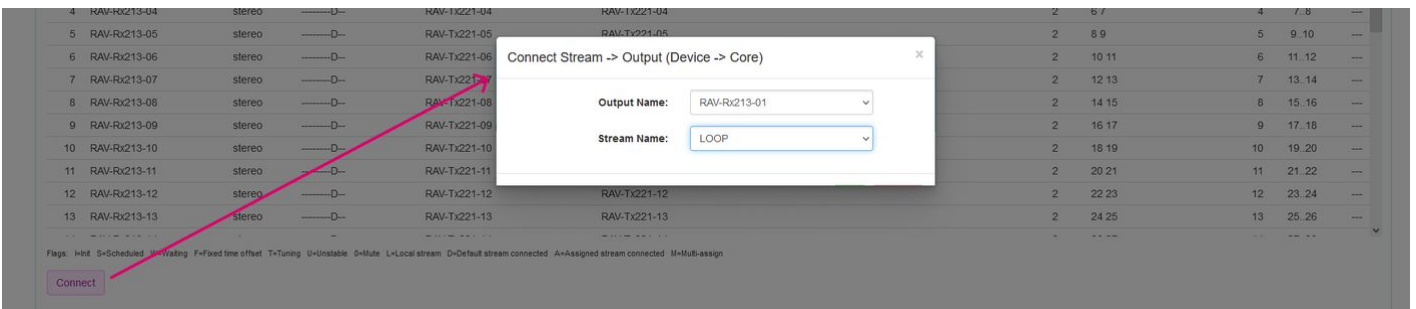
- **Name & Type** show the name and format of the receiver.
- **Flags** show information about the receiver (e.g. **D** = the default stream is connected). There is a key at the bottom of the page which explains the meaning of each flag.
- **Default Stream Name** shows the name of the stream that the receiver should subscribe to.
- **Assigned Stream Name** shows the name of the assigned stream following a successful subscription.
- **Scheduled Stream Name** shows the name of the scheduled stream (if make-before-break is enabled for the receiver).
- **UDP Port** shows the port number used by the receiver.
- **#Channels** and **FPGA Tracks** show the number of channels connected from the incoming stream and which tracks they use.

The "Default Stream Name" is optional (in the configuration) and can be used to permanently link the receiver to a stream. If a matching stream name is found, the receiver will automatically subscribe to it. In this instance, you will see the same name in both columns. If a Default Stream Name is not entered, then a stream subscription must be established using a different method. For example, by selecting a pool source on the console surface; using internal logic or external control via Ember+; or by manually connecting a stream via the **Connect** button (described below).

Clicking on a name in the "Name" column opens a pop-up window containing output data (information about the receiver and its connected stream).



At the bottom of the page, the **Connect** button can be used to connect an incoming stream to one of the configured receivers. It should be used for troubleshooting only, and not as an operational tool. The button opens a pop-up window where you can select a receiver (in the "Output Name" field), and then the "Stream Name" you wish to subscribe to. The list of available streams is determined by the mDNS or SAP channel announcement.



## RAVENNA → Stream Destinations

The screenshot displays the 'Stream Destinations List' and 'Stream Destinations Statistics' sections of the software interface.

**Stream Destinations List**

No.	Name	Type	Codec	Samples per Frame	Device IDs	Path Delay [S]	Path Delay Class	Jitter Class	Jitter Reserve [S]	Time Offset [S]	Connected Outputs Count	Remote Stream No.	Remote Stream Name	FPGA Bk. No.	FPGA Dst. No.	FPGA Bk. Tracks
1	Dst01	stereo	L24	48	0 1 --	84	3	5	430	562	0	48	ACDC	1	1	0 1
2	Dst02	stereo	L24	32	0 1 --	26	2	1	15	73	1	54	RAV-Tx221-02	1	2	2 3
3	Dst03	stereo	L24	32	0 1 --	26	2	1	15	73	1	55	RAV-Tx221-03	1	3	4 5
4	Dst04	stereo	L24	32	0 1 --	26	2	1	15	73	1	56	RAV-Tx221-04	1	4	6 7
5	Dst05	stereo	L24	32	0 1 --	26	2	1	15	73	1	57	RAV-Tx221-05	1	5	8 9
6	Dst06	stereo	L24	32	0 1 --	26	2	1	15	73	1	58	RAV-Tx221-06	1	6	10 11

**Stream Destinations Statistics (actual / accumulated)**

No.	Remote Stream Name	Primary Port									Secondary Port									Timeouts Count	FSM
		Packet Counts					-- Buffer Margins --		Peak Jitter[S]	Packet Counts					-- Buffer Margins --		Peak Jitter[S]				
		all	per s	early	late	misordered	Min.[S]	Max.[S]		all	per s	early	late	misordered	Min.[S]	Min.[S]					
1	ACDC	10939820	1000	0 / 0	0 / 0	0 / 0	427 / 397	538 / 567	49 / 84	10939816	1000	0 / 0	0 / 0	0 / 0	440 / 401	539 / 568	50 / 78	0 / 0	8		
2	RAV-Tx221-02	1345891692	1500	0 / 0	0 / 0	0 / 0	35 / 34	66 / 66	0 / 1	1345891416	1500	0 / 0	0 / 0	0 / 0	35 / 34	66 / 66	0 / 1	0 / 0	8		
3	RAV-Tx221-03	1345891692	1500	0 / 0	0 / 0	0 / 0	35 / 34	66 / 66	0 / 1	1345891416	1500	0 / 0	0 / 0	0 / 0	35 / 34	66 / 66	0 / 1	0 / 0	8		
4	RAV-Tx221-04	1345891692	1500	0 / 0	0 / 0	0 / 0	35 / 34	66 / 66	0 / 1	1345891416	1500	0 / 0	0 / 0	0 / 0	35 / 34	66 / 66	0 / 1	0 / 0	8		
5	RAV-Tx221-05	1345891692	1500	0 / 0	0 / 0	0 / 0	35 / 34	66 / 66	0 / 1	1345891409	1500	0 / 0	0 / 0	0 / 0	35 / 34	66 / 66	0 / 1	0 / 0	8		
6	RAV-Tx221-06	1345891692	1500	0 / 0	0 / 0	0 / 0	35 / 34	66 / 66	0 / 1	1345891409	1500	0 / 0	0 / 0	0 / 0	35 / 34	66 / 66	0 / 1	0 / 0	8		

The **RAVENNA → Stream Destinations** tab shows the statistics for all of the stream destinations which are in use (i.e. all subscribed streams). It can be used to view information about stream latency and stability, and to "retune" streams which are not performing properly.

### Stream Destinations List

This section shows information pertaining to individual RAVENNA streams. Data includes the number of audio channels, codec used, sample rate, number of subscribers listening to the stream, the Remote Stream name and number, and the numerical designations for the audio channels supplied. Streams with blank Remote Stream Name values are inactive or unavailable.

Of particular note are the Jitter Class, Path Delay Class and Time Offset values which are applied during stream tuning.

The Time Offsets for all streams can be cleared by clicking on the **Clear Time Offsets Table** button.

The **Set Time Offset**, **Retune** and **Retune All** buttons can be used to manually retune streams (as described later).

### Stream Destinations Statistics

This section provides statistics that report on the health of the received Primary and Secondary streams. Data includes the Packet Counts for Early, Late and Misordered Packets, Buffer Margins and Peak Jitter.

Of particular importance are the Primary Port Early and Late Packets Counts. If large numbers are seen in these columns, along with degraded audio performance, the stream should be retuned to fix the problem. The FSM column indicates the status of the retuning process.

The stream statistics can be cleared by clicking on the **Reset Statistics** button.

## RAVENNA → Nodes

The screenshot shows the 'Nodes List' interface. At the top, there are navigation tabs: System, Peripherals, IP Connections, Sources/Sums, RAVENNA, Global, PTP, Inputs (Core → Device), Outputs (Device → Core), Stream Destinations, Nodes, and Streams. The 'Nodes List' table contains 14 rows of data. Below the table, there is an 'Update' dropdown menu set to 'Data only', a '#Nodes:' counter showing '34', and a 'Request Service Info' button. A legend at the bottom left explains the state and service flags.

No.	Name	Device IDs	mDNS Ch.	SAP Ch.	State Flags	TTL	IP Address	Service Flags	HTTP Port	Ember+ Port
1	PwrCore-191be8	0 1 --	1 - - -	- - - -	- - - -	234	192.168.1.100	- - -	- - -	- - -
2	PwrCore-191c1c	0 1 --	1 - - -	- - - -	- - - -	269	192.168.1.101	- - -	- - -	- - -
3	RUBY-209-RA0	0 - - -	1 - - -	- - - -	- - - -	260	192.168.1.102	H E -	80	9000
4	RUBY-190-RA0	0 - - -	1 - - -	- - - -	- - - -	197	192.168.1.103	H E -	80	- - -
5	RUBY-193-RA0	0 - - -	1 - - -	- - - -	- - - -	214	192.168.1.104	H E -	80	9001
6	ruby-195-ra0	0 - - -	1 - - -	- - - -	- - - -	193	192.168.1.105	H E -	80	9001
7	PoCo-221-ra0	0 - - -	1 - - -	- - - -	- - - -	194	192.168.1.106	H E -	80	9001
8	RUBY-204-RA0	0 - - -	1 - - -	- - - -	- - - -	197	192.168.1.107	H E -	80	9021
9	PoCo-221-ra2	0 - - -	1 - - -	- - - -	- - - -	197	192.168.1.108	H E -	80	9001
10	A-OnAir4-3	0 - - -	1 - - -	- - - -	- - - -	236	192.168.1.109	H E -	8050	9000
11	A-OnAir4-2	0 - - -	1 - - -	- - - -	- - - -	231	192.168.1.110	H E -	8050	9000
12	A-OnAir4-3-avahi	0 - - -	1 - - -	- - - -	- - - -	245	192.168.1.111	H E -	8081	9009
13	Node-02	0 1 --	1 - - -	- - - -	- - - -	271	192.168.1.112	H - -	80	- - -
14	A-OnAir4-2-avahi	0 - - -	1 - - -	- - - -	- - - -	225	192.168.1.113	H E -	8081	9009

Update:  #Nodes:

State Flags: P=Properties missing S=Static E=via Ember+ I=Invalid D=Dead  
Service Flags: H=HTTP E=Ember+ S=SDP via mDNS

The **RAVENNA → Nodes** tab lists all available network nodes, showing their Device ID, announcement method (mDNS or SAP), TTL (in seconds), and IP address. Note that if static streams have been created using Ember+, then these are included in the list.

Pay particular attention to the "State Flags" as these show the condition of the network node. There is a key at the bottom of the page which explains the meaning of each flag.

Clicking on a name in the "Name" column opens the device's Web UI. You can use this to access further information in the usual manner.

At the bottom of the page is the **Update** selector. This can be set to one of two possibilities: **Data only** (the default) or **Data + TTL**. This defines what happens when the transmitter's MDNS / SAP announcement for a stream is made. If **Data + TTL** is selected, then the TTLs will be reset to the "Nodes List TTLs" value defined in ON-AIR Designer. Once the TTL count-down has expired, the node will remove the associated stream. This is generally needed only for diagnostic purposes.

## RAVENNA → Streams

Stream No.	Stream Name	Node Numbers	Node Name (1st)	Device IDs	mDNS Ch.	SAP Ch.	State Flags	TTL	RTSP Port	SDP Flags	Type	Sample Rate/Hz	Samples per Frm.	Codec	Stream IP Address 0	Stream IP Address 1	UDP Port 0	UDP Port 1	Local Dst. No.
1	RAV-Tx213-01	--	(local)	0 1 --	1 ---	----	-L-----	227	8083	---	stereo	48000	32	L24	239.5.213.1	239.6.213.1	5004	5004	--
2	RAV-Tx213-02	--	(local)	0 1 --	1 ---	----	-L-----	227	8083	---	stereo	48000	32	L24	239.5.213.2	239.6.213.2	5004	5004	--
3	RAV-Tx213-03	--	(local)	0 1 --	1 ---	----	-L-----	227	8083	---	stereo	48000	32	L24	239.5.213.3	239.6.213.3	5004	5004	--
4	RAV-Tx213-04	--	(local)	0 1 --	1 ---	----	-L-----	227	8083	---	stereo	48000	32	L24	239.5.213.4	239.6.213.4	5004	5004	--
5	RAV-Tx213-05	--	(local)	0 1 --	1 ---	----	-L-----	227	8083	---	stereo	48000	32	L24	239.5.213.5	239.6.213.5	5004	5004	--
6	RAV-Tx213-06	--	(local)	0 1 --	1 ---	----	-L-----	227	8083	---	stereo	48000	32	L24	239.5.213.6	239.6.213.6	5004	5004	--
7	RAV-Tx213-07	--	(local)	0 1 --	1 ---	----	-L-----	227	8083	---	stereo	48000	32	L24	239.5.213.7	239.6.213.7	5004	5004	--
8	RAV-Tx213-08	--	(local)	0 1 --	1 ---	----	-L-----	227	8083	---	stereo	48000	32	L24	239.5.213.8	239.6.213.8	5004	5004	--
9	RAV-Tx213-09	--	(local)	0 1 --	1 ---	----	-L-----	227	8083	---	stereo	48000	32	L24	239.5.213.9	239.6.213.9	5004	5004	--
10	RAV-Tx213-10	--	(local)	0 1 --	1 ---	----	-L-----	227	8083	---	stereo	48000	32	L24	239.5.213.10	239.6.213.10	5004	5004	--
11	RAV-Tx213-11	--	(local)	0 1 --	1 ---	----	-L-----	227	8083	---	stereo	48000	32	L24	239.5.213.11	239.6.213.11	5004	5004	--
12	RAV-Tx213-12	--	(local)	0 1 --	1 ---	----	-L-----	227	8083	---	stereo	48000	32	L24	239.5.213.12	239.6.213.12	5004	5004	--
13	RAV-Tx213-13	--	(local)	0 1 --	1 ---	----	-L-----	227	8083	---	stereo	48000	32	L24	239.5.213.13	239.6.213.13	5004	5004	--
14	RAV-Tx213-14	--	(local)	0 1 --	1 ---	----	-L-----	227	8083	---	stereo	48000	32	L24	239.5.213.14	239.6.213.14	5004	5004	--

The **RAVENNA → Streams** tab lists all available network streams which have been announced to Power Core.

Pay particular attention to the stream "State Flags" which show the condition of the stream. There is a key at the bottom of the page which explains the meaning of each flag.

Clicking on a name in the "Stream Name" column opens a pop-up window where you can view and copy the stream's SDP (using **Copy to Clipboard**).

**Stream SDP Data**

Stream Name: RAV-Tx213-01

```
v=0
o=- 09424069190001 0 IN IP4 10.5.5.213
s=RAV-Tx213-01
t=0
a=clock-domain PTPv2 0
a=ts-refclk:ptp=IEEE1588-2008.00-0B-72-FF-FE-05-C4-5E:0
a=mediacik:direct=0
a=group DUP ra0 ra1
m=audio 5004 RTP/AVP 98
c=IN IP4 239.5.213.1/5
a=source-filter: incl IN IP4 239.5.213.1 10.5.5.213
a=rtptime 98 L24/48000/2
a=md ra0
a=framecount 32
a=recvonly
a=ptime 0.666
a=sync-time 0
a=mediacik:direct=0
m=audio 5004 RTP/AVP 98
c=IN IP4 239.6.213.1/5
a=source-filter: incl IN IP4 239.6.213.1 10.5.6.213
a=rtptime 98 L24/48000/2
a=md ra1
a=framecount 32
a=recvonly
a=ptime 0.666
a=sync-time 0
a=mediacik:direct=0
```

Copy to Clipboard OK



At the bottom of the page is the **Update** selector. This can be set to one of two possibilities: **Data only** (the default) or **Data + TTL**. This works in a similar manner to the **Update** function in the Nodes tab, but the TTLs are reset to the "Streams List TTLs" value (defined in ON-AIR Designer).

## Power Core RP v2 - Preparing a Secure Connection (for https)

The Web UI can be opened with a secure connection (SSL) if the required certificates are stored on the Power Core device. This topic describes how to prepare the device. Once the SSL certificates are in place, the Web UI can be opened using a "https" connection. Apart from the connection method, there is no difference in the functionality.

You can find more information about OpenSSL at the following website: <https://www.freebsd.org/cgi/man.cgi?query=openssl>

### What you will need

The setup requires you to create the keys, requests and, if required, a self-signed certificate (using OpenSSL). The commands can be entered using a PC connected to Power Core either via telnet or the USB\* port. You will also need to a suitable FTP client in order to perform the file transfers.

For more information, see [Power Core RP v2 - Telnet Sessions](#), [Power Core RP v2 - USB Service Port](#) and [Power Core RP v2 - File Transfer via FTP](#).

\*For Power Core revision 1 and 2 systems, you can use the [RS-422 serial port](#) for the command line instructions.

### Overview

In summary, the steps are:

- Create or adapt a config file, and copy this to Power Core using a suitable FTP client.
- Create the necessary keys, requests and, if required, a self-signed certificate (using OpenSSL). To enter the commands, you can either:
  - Connect your PC to the control network and open a telnet session.
  - Connect your PC directly to the RS 422 port and open a serial connection.
- Let an external CA sign the certificate - by downloading, signing and uploading the certificate.
- Clean up the files.
- Cold start the device.

**Important:** it is recommended not to use keys larger than 1024 bit, as to do so may affect the system performance.

### Instructions

The instructions below provide more detail.

1. Create or adapt a config file (.conf), and copy this to Power Core using your FTP client.

The file should be created on, or copied to, the root directory. The screenshot below shows the Power Core root directory. In this example, the config file is named "request.conf".

Filename	Filesize	Filetype	Last modified	Permissions	Owner/Group
..					
dev		File folder	7/12/2020 1:03:...	drwxr-xr-x	0 0
etc		File folder	7/12/2020 1:03:...	drwxr-xr-x	0 0
media		File folder	7/12/2020 1:03:...	drwxr-xr-x	0 0
request.conf	503	CONF File	7/15/2020 10:4:...	-rw-r--r--	0 0



A sample configuration is as follows.

```
[req]
distinguished_name=req_distinguished_name
req_extensions=req_ext
prompt=no

[req_distinguished_name]
C=DE
ST=Nordrhein-Westfalen
L=Troisdorf-Spich
O=DSA-Volkmann
OU=Development
CN=POWERCORE-DSA-DWC0-240.internal

[req_ext]
extendedKeyUsage = clientAuth,serverAuth
subjectAltName = @alt_names

[alt_names]
DNS.1 = POWERCORE-DSA-DWC0-240.internal
#DNS.2 = [fqdn2]
#DNS.3 = [fqdn3]
#DNS.4 = [fqdn4]
IP.1=192.168.101.240
#IP.2=192.168.101.242
#IP.3=192.168.101.243
#IP.4=192.168.101.244
```

2. Now open a connection to the Power Core control system either using telnet or the USB service port.
3. Once login is complete, type the following command to create a RSA key with openssl genrsa.

```
openssl genrsa -out webs.key.pem 1024
```

Press ENTER. The confirmation message "Generating RSA private key..." appears.

4. Type the following command to create a request with openssl.

```
openssl req -batch -new -key webs.key.pem -out webs.csr -config request.conf
```

Press ENTER. There is no message following this command.

5. Type the following command to create a self-signed certificate with openssl.

```
openssl x509 -req -days 1825 -in webs.csr -signkey webs.key.pem -out webs.pem -extfile
request.conf -extensions req_ext
```

Press ENTER. The confirmation message "Signature ok..." appears.

The screenshot below shows the complete telnet session.



```

Telnet 192.168.101.240
Welcome to rtems-5.0.0 (ARM/ARMv4/arria10_devkit)
COPYRIGHT (c) 1989-2008.
On-Line Applications Research Corporation (OAR).

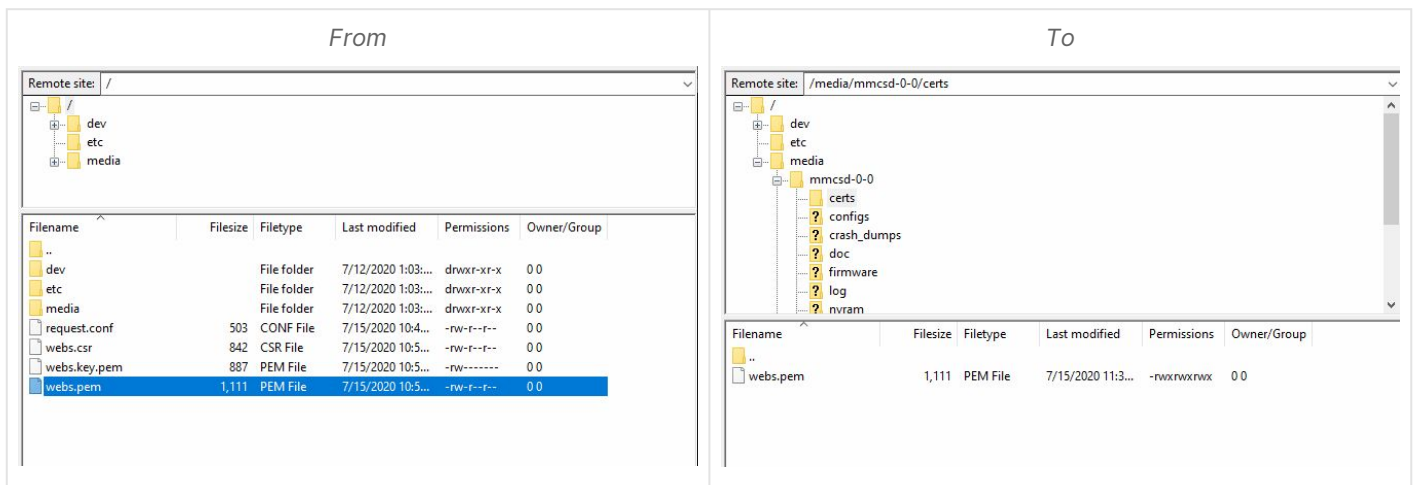
running on (ARM/ARMv4)
/dev/pty4 login: root
Password:

RTEMS Shell on /dev/pty4. Use 'help' to list commands.
TLNT [/] # openssl genrsa -out webs.key.pem 1024
Generating RSA private key, 1024 bit long modulus (2 primes)
.....+++++
.....+++++
e is 65537 (0x010001)
TLNT [/] # openssl req -batch -new -key webs.key.pem -out webs.csr -config request.conf
TLNT [/] # openssl x509 -req -days 1825 -in webs.csr -signkey webs.key.pem -out webs.pem -extfile request.conf -extension req_ext
Signature ok
subject=C = DE, ST = Nordrhein-Westfalen, L = Troisdorf-Spich, O = DSA-Volkmann, OU = Development, CN = RUBY-DSA-DWC0-24.0.internal
Getting Private key
TLNT [/] #

```

6. Using your FTP client, copy the resulting certificate "webs.pem" (in the root directory) to "/media/mmcscd-0-0/certs".
  - You will need to create the "certs" directory (via a right-click), and refresh the FTP client connection to see the new files.
  - To copy a file, download it to your computer (via a right-click); navigate to the new location on Power Core; then upload the file (via a right-click).

The screenshots below show the file/directory locations.

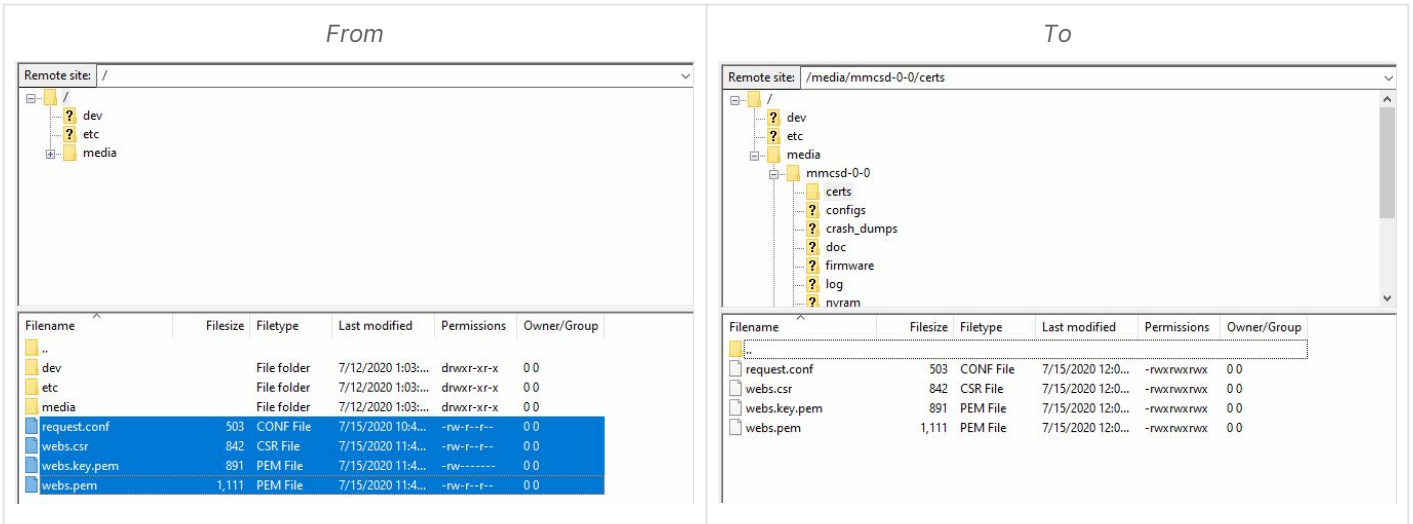


7. Now let an external CA sign the certificate as follows.
  - Using your FTP client, download the file "request.csr"
  - Let it sign from CA
  - Upload the certificate "webs.pem" to "/media/mmcscd-0-0/certs"

8. Using your FTP client, clean up the files.

Copy all of the files "webs.pem", "webs.key.pem", "webs.csr" and "request.conf" to "/media/mmcscd-0-0/certs", and delete the originals.

The screenshots below show the file/directory locations.



9. Cold start the Power Core control system by typing the following commands.

- Type `sys_cs` (press ENTER).
- Then type `YES` (and ENTER) to confirm.

If you are connected via telnet, you will lose your connection as soon as the device reboots.

If you are connected to the serial port, then you will see the following confirmation messages.

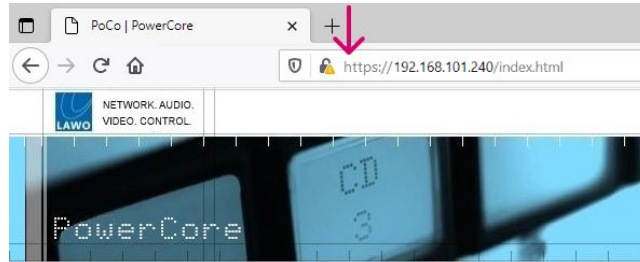
```

DSK system: init: ----- Starting Webserver -----
DSK system: init: Web Server started, result = 0
DSK system: init: Starting Webserver completed
WEBS system: init: Webserver bind https (certificate found)
    
```



10. Test the connection by opening a Web UI session and logging in.

The padlock icon and "https" prefix indicates that the connection is secure.



Login

Access Level:

Password:

### 10.3 Power Core RP v2 - Stream Tuning

This topic describes what happens when a RAVENNA stream is connected to a receiver and how to adjust the stream tuning.

It may help to open the **RAVENNA → Stream Destinations** tab in the [Power Core Web UI](#) and the "System -> Definition → RAVENNA" parameters in the [ON-AIR Designer](#). The Web UI page is shown below.

The screenshot displays the 'Stream Destinations' tab in the Power Core Web UI. It features two main tables: 'Stream Destinations List' and 'Stream Destinations Statistics (actual / accumulated)'. The 'Stream Destinations List' table includes columns for No., Name, Type, Codec, Samples per Frame, Device IDs, Path Delay [S], Path Delay Class, Jitter Class, Jitter Reserve [S], Time Offset [S], Connected Outputs Count, Remote Stream No., Remote Stream Name, FPGA Bk. No., Dst. No., and FPGA Bk. Tracks. The 'Stream Destinations Statistics' table is divided into 'Primary Port' and 'Secondary Port' sections, with columns for No., Remote Stream Name, Packet Counts (all, per s, early, late, misordered), Buffer Margins (Min.[S], Max.[S]), Peak Jitter[S], Timeouts Count, and FSM.

#### Overview

Each time a stream connects it goes through an automatic "tuning" process whereby a Time Offset is applied to compensate for network latency and jitter.

The **Time Offset** is calculated as follows:

$$\text{Time Offset} = \text{Samples per Frame (packet size)} + \text{Path Delay} + \text{Jitter Reserve}$$

where the **Jitter Reserve** is determined by the following ON-AIR Designer parameters:

$$\text{Jitter Reserve} = \text{Time-Offset Base Margin} + \text{Time Offset Addition (for the Jitter Class)} + \text{Time Offset Addition (for the Path Delay Class)}$$

Power Core supports five jitter classes, where Class 1 is for low-jitter devices (such as a Power Core), and Class 5 is for high-jitter devices (such as a R3LAY PC with a RAVENNA virtual sound card).

Similarly, there are five path delay classes, where Class 1 is for close network nodes (connected to the same switch), and Class 5 is for distant network nodes (passing through several switches or routers). The class allocation is dependent on the Jitter and Path Delay values measured by the receiver (and shown in the **Stream Destinations Statistics** area in the Web UI).

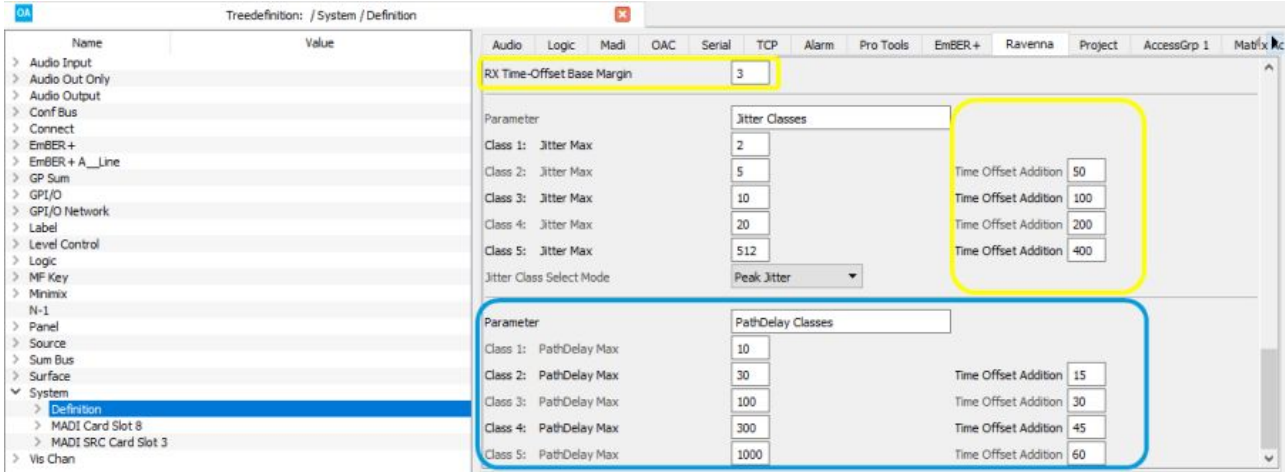
The resultant Jitter Class, Path Delay Class, Jitter Reserve and Time Offset values are all shown in the **Stream Destinations List** (in the Web UI).

### Time Offset Example

The screenshots below illustrate the following example:

$$\text{Time Offset (57)} = \text{Samples per Frame (48)} + \text{Path Delay (6)} + \text{Jitter Reserve (3)}$$

The parameters are defined using the "System → Definition" (RAVENNA tab) in the ON-AIR Designer.



The resultant values in the **Stream Destinations List** look like this.

Stream Destinations List													
No.	Name	Type	Codec	Samples per Frame	Path Delay	Path Delay Class	Jitter Class	Jitter Reserve	Time Offset	Connected Outputs Count	Remote Stream No.	Remote Stream Name	Tracks
1	Dst01	stereo	L24	48	6	1	1	3	57	1	1527	SRV1 PTG.var	0 1
2	Dst02	stereo	L24	48	6	1	1	3	57	1	1449	SRV2 PTG.var	2 3

High **Time Offset** values mean high latency which may affect stream performance.

## Retuning Streams


If changes are made to the network infrastructure after the initial tuning process, then the Jitter Class, Path Delay Class and Time Offset values may no longer be correct. In this instance, audio from the RAVENNA streams may be degraded or inaudible, and you should manually retune the streams. This can be done using the buttons on the right of the **RAVENNA → Stream Destinations** page:

- **Retune** - select this button to individually retune a stream.
- **Retune All** - select this button to retune all streams.
- **Set Time Offset** - this button allows manual entry of a Time Offset for a single selected stream. This is an advanced function which should only be used when instructed by Lawo Support personnel. Values entered using this button are cleared after every reboot.

The retuning process goes through three phases which are displayed on-screen (via the FSM column in the **Stream Destinations Statistics** area). The full sequence is described in the table below.

If audio on a selected stream was not previously present, it should be restored immediately. Once a value of 8 has been reached, retuning is complete and the stream's new Time Offset value is shown in the **Stream Destinations List**.

FSM value	Meaning
0	RAV_RTCP_TUNE_INIT = 0
1	RAV_RTCP_TUNE_WAIT
2	RAV_RTCP_TUNE_COARSE
3	RAV_RTCP_TUNE_FINE
4	RAV_RTCP_TUNE_CHECK_1, -> check results stage 1
5	RAV_RTCP_TUNE_STATS_ACQ -> acquire
6	RAV_RTCP_TUNE_STATS_EVAL, -> evaluate
7	RAV_RTCP_TUNE_CHECK_2, -> check results stage 2
8	RAV_RTCP_TUNE_FINISHED -> tuning value stored / finished

 If Power Core is NOT set to slave only in the PTP engine, then streams are retuned on every reconnect

## Stream Tuning Options

The following options are supported by the ON-AIR Designer: defining a fixed Time Offset and defining Jitter in the SDP.

### Defining a Fixed Time Offset

By configuring a "Logic → RAVENNA Static Stream" element, it is possible to define a fixed Time Offset using the **Fixed Jitter Reserve** field.

Once a non-zero value is entered, a fixed Time Offset is applied (instead of automatic or manual tuning). The value entered must include the path delay and desired minimum buffer margin as follows:

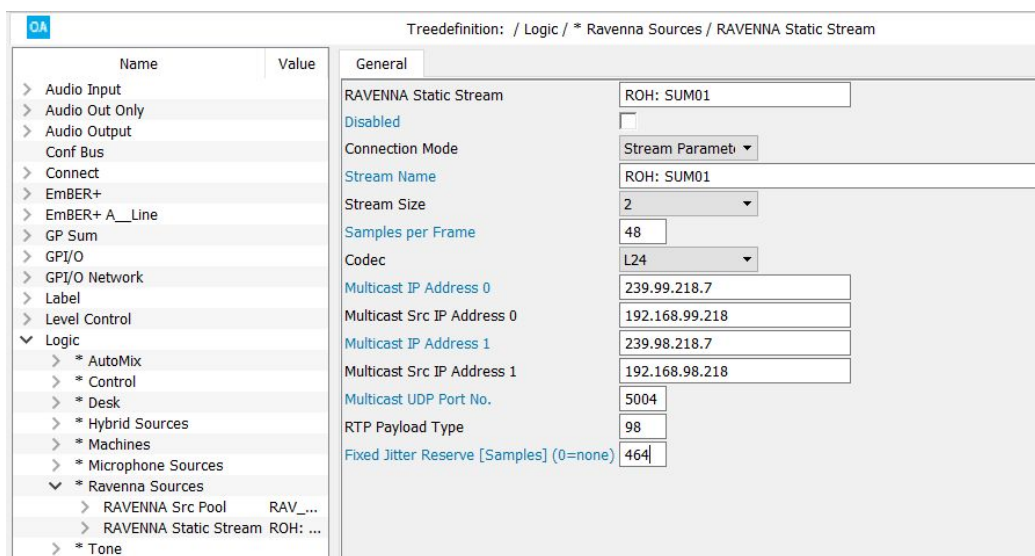
$$\text{Fixed Jitter Reserve} = \text{Path Delay} + \text{minimum Buffer Margin.}$$

The resulting Time Offset is then calculated from the configured value and the packet size of the incoming stream:

$$\text{Time Offset} = \text{Samples per Frame (packet size)} + \text{Fixed Jitter Reserve}$$

If you want to define a fixed playout time, you have to subtract the packet size from the fixed jitter reserve.

The screenshot below shows an example.



In the **Stream Destinations List** (in the Web UI), the Path Delay is displayed as 0 (as there is no measurement) and is included in the displayed Jitter Reserve.

Stream Destinations List													
No.	Name	Type	Codec	Samples per Frame	Path Delay	Path Class	Jitter Class	Jitter Reserve	Time Offset	Connected Outputs Count	Remote Stream No.	Remote Stream Name	Tracks
13	Dst13	stereo	L24	48	103	0	5	400	551	1	116	H3LAY-A2:toobar	24 25
14	Dst14	stereo	L24	48	0	0	0	464	512	1	83	ROH:SUM01	26 27

You can tell whether a fixed Time Offset has been defined by the configuration or Web UI by looking at the Path Delay and Jitter Reserve fields.

- Path Delay = 0 and Jitter Reserve > 0 indicates that the ON-AIR Designer **Fixed Jitter Reserve** field is active (> 0).
- Path Delay = 0 and Jitter Reserve = 0 indicates that the Web UI **Set Time Offset** button has been used to set the offset.

If the Time Offset of a stream with a Fixed Jitter Reserve is changed via the Web UI, then it will be reset to the configured value (instead of automatic tuning) if late packets arrive repeatedly at the receiver.



### Defining Jitter in the SDP Information

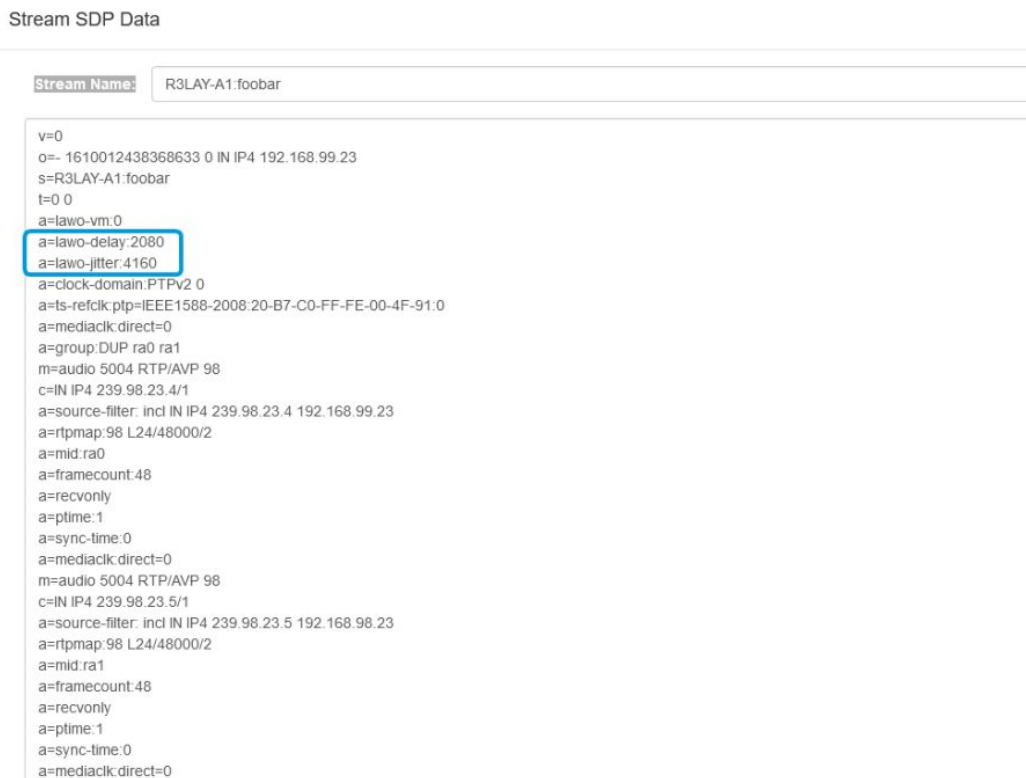
If the parameters "lawo-delay" and "lawo-jitter" are contained in a stream's SDP information, then Power Core measures only the Path Delay and not the Jitter. This allows you to keep the Time Offset Addition values low (for the Jitter Classes), while still connecting computer-based stream sources (such as R3LAY).

Start by measuring the jitter on the sending device (using a third-party tool), and enter the following parameters into the stream's SDP information:

a = lawo-delay: 2080

a = lawo-jitter: 4160

The SDP parameters must be defined in microseconds. The screenshot below shows an example.



In R3LAY the values can be configured using the ".ini" file as follows.

[DEBUG]

StreamLawoDelayMicrosecs = 2080

StreamLawoJitterMicrosecs = 4160

If Power Core receives a stream containing this SDP information, then only the Path Delay is measured and the Jitter Class is set to 0. This results in a single Time Offset Addition (for the Path Delay Class). In this instance, the Jitter Reserve is calculated as follows:

$$\text{Jitter Reserve} = \text{lawo-delay (from SDP)} + \text{lawo-jitter (from SDP)} + \text{Time Offset Addition (for Path Delay Class)}$$

The Time Offset is then calculated in the usual manner:

$$\text{Time Offset} = \text{Samples per Frame (packet size)} + \text{Path Delay} + \text{Jitter Reserve}$$





Streams that have been tuned using the new parameters are marked with a Jitter Class of 0 in the **Stream Destinations List** (in the Web UI).

Stream Destinations List													
No.	Name	Type	Codec	Samples per Frame	Path Delay	Path Delay Class	Jitter Class	Jitter Reserve	Time Offset	Connected Outputs Count	Remote Stream No.	Remote Stream Name	Tracks
1	Dst01	stereo	L24	48	6	1	1	3	57	1	1527	SRV1 PTG:var	0 1
2	Dst02	stereo	L24	48	6	1	1	3	57	1	1449	SRV2 PTG:var	2 3
3	Dst03	stereo	L24	48	5	1	1	3	56	1	911	R204.Sum02	4 5
4	Dst04	stereo	L24	48	71	3	0	330	449	1	106	R3LAY-A1.foobar	6 7

## 10.4 Power Core RP v2 - USB Service Port

This topic describes how to use the USB service port (on Power Core revision 3 systems).

### Overview

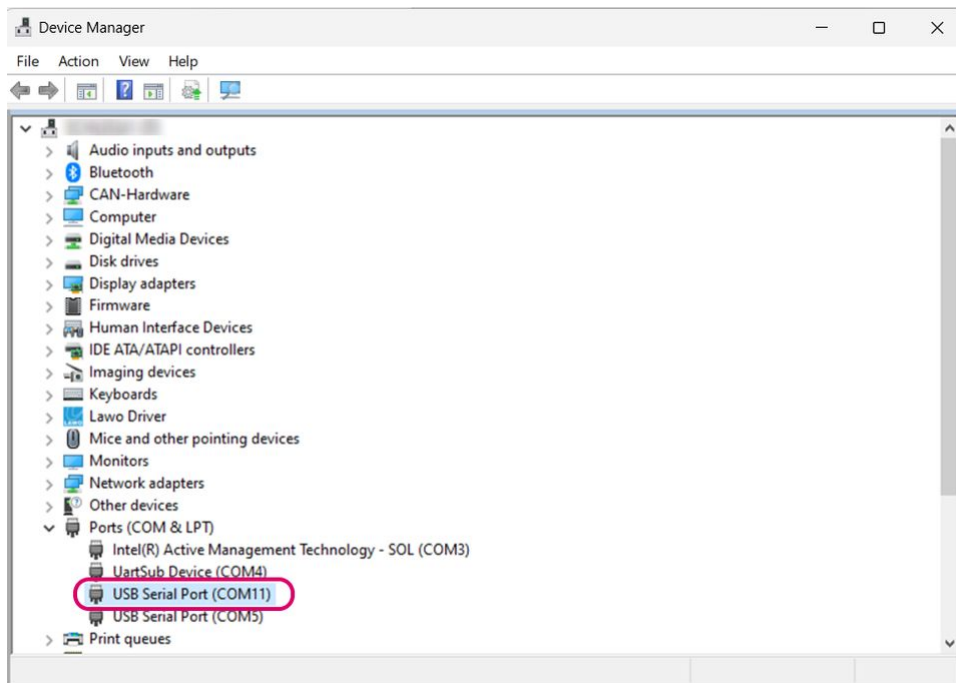
The USB port, on Power Core revision 3, can be used for debugging and/or downloading log files. Note that, on Power Core revision 1 or 2 systems, you must use the [RS-422 port](#) for this purpose.

### Opening a Connection to the System

The instructions below describe how to set up a connection to Power Core revision 3 for debugging.

1. Using a USB cable, connect your PC to the USB port on the Power Core front panel.

The required drivers are installed automatically. Once this is done, you will see a message (from Windows), that the COM port is ready to use. It is recommended to open the **Device Manager** (in Windows) and check that you can see the newly installed COM port.



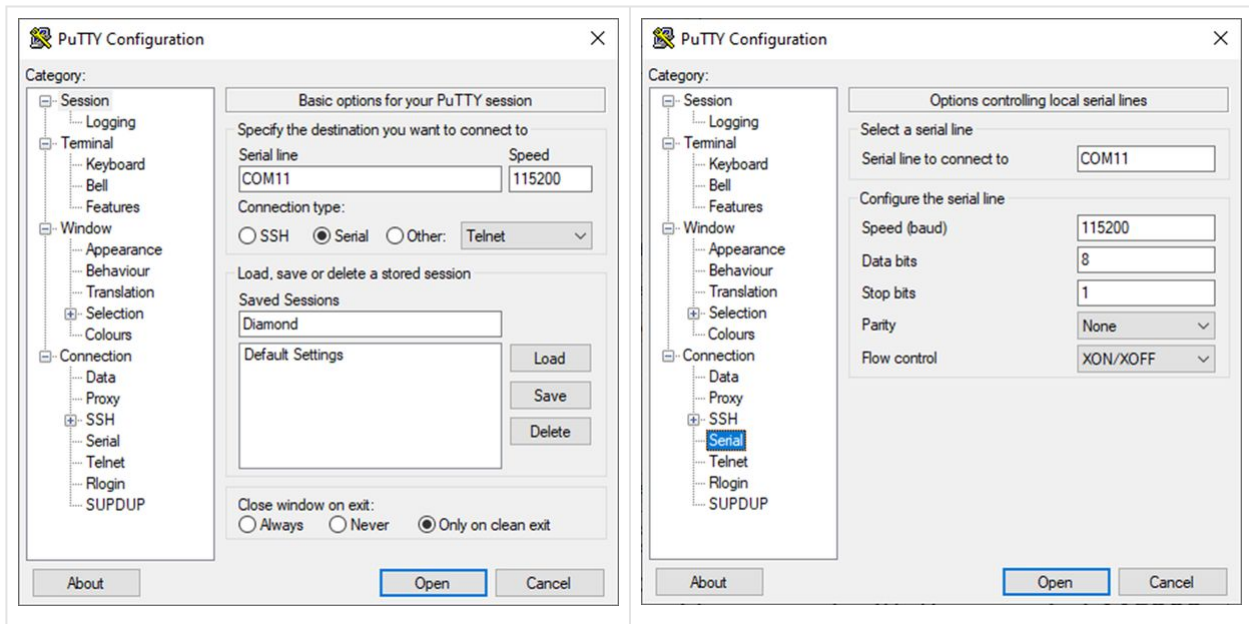
2. On your computer, open a suitable ssh/telnet application.

We recommend using **PUTTY**, a free ssh/telnet client for Windows. The latest version can be downloaded from the internet.

3. Set up the serial connection for the COM port using the following credentials.

- Speed (baud): **115200**
- Data bits: **8**
- Stop bits: **1**
- Parity: **XON/XOFF**

The correct settings for PUTTY are shown below.



4. Once the software connects to the system, you will see a new window.



5. Press ENTER and you will see the syntax: "SHLL [/] #".

You can now follow the instructions for the task you wish to perform.

## 10.5 Power Core RP v2 - RS-422 Serial Port

This topic describes how to set up a connection to the RS-422 serial port.

### Overview

The RS-422 port, on Power Core revision 3, can be used for remote control (e.g. of a playout system) or MACKIE HUI interfacing to a Digital Audio Workstation.

Note that, on Power Core revision 1 or 2 systems, the RS-422 port is also used for debugging and to download logging files. On Power Core revision 3, you must use the [USB port](#) for this purpose.

### What you will need

A special serial cable, article number **485-0700-000**, is required to connect the RS-422 port. Please contact the [LAWO Support Department](#) to obtain one.

The cable comes with a RJ45 connector (for Power Core) and a D-type connector (for the PC). If your PC does not support a D-type connector, then you will need to provide a serial to USB converter such as the one shown below.

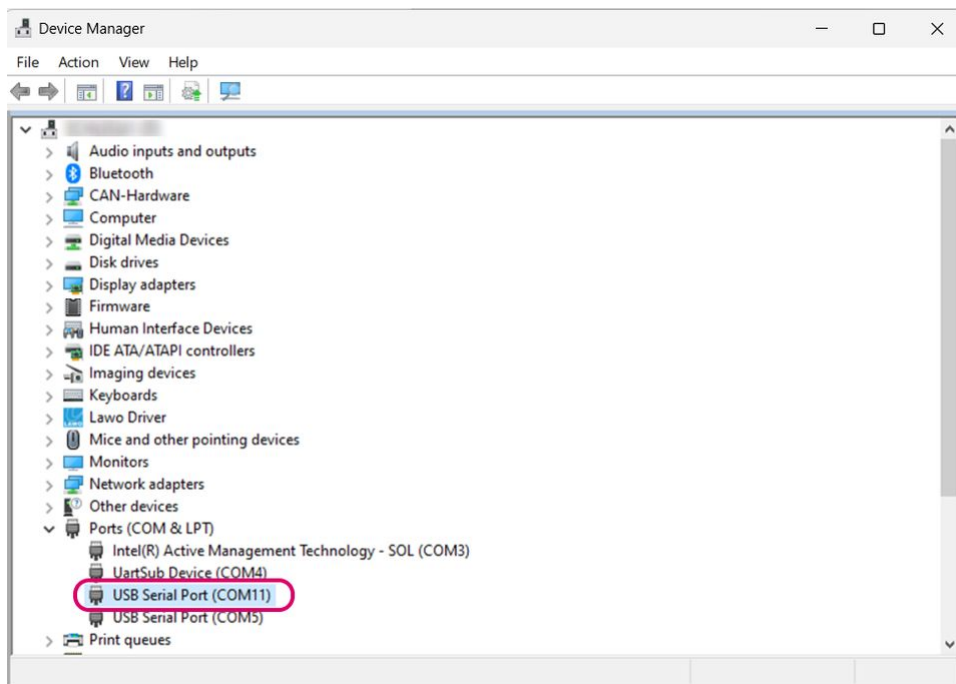


### Opening a Connection to the System

The instructions below describe how to set up a connection to Power Core revision 1 or 2 for debugging.

1. Using the serial cable (described above), connect your PC to the RS 422 port on the Power Core front panel.

The required drivers are installed automatically. Once this is done, you will see a message (from Windows), that the COM port is ready to use. It is recommended to open the **Device Manager** (in Windows) and check that you can see the newly installed COM port.



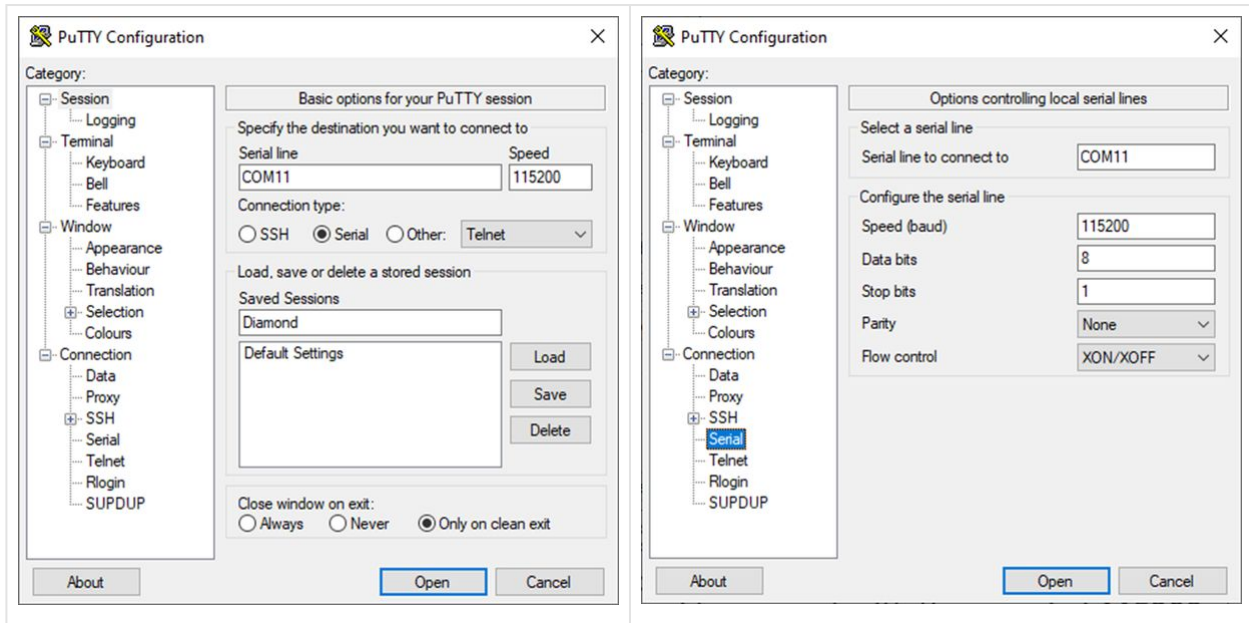
2. On your computer, open a suitable ssh/telnet application.

We recommend using **PUTTY**, a free ssh/telnet client for Windows. The latest version can be downloaded from the internet.

3. Set up the serial connection for the COM port using the following credentials.

- Speed (baud): **115200**
- Data bits: **8**
- Stop bits: **1**
- Parity: **XON/XOFF**

The correct settings for PUTTY are shown below.



4. Once the software connects to the system, you will see a new window.



5. Press ENTER and you will see the syntax: "SHLL [/] #".

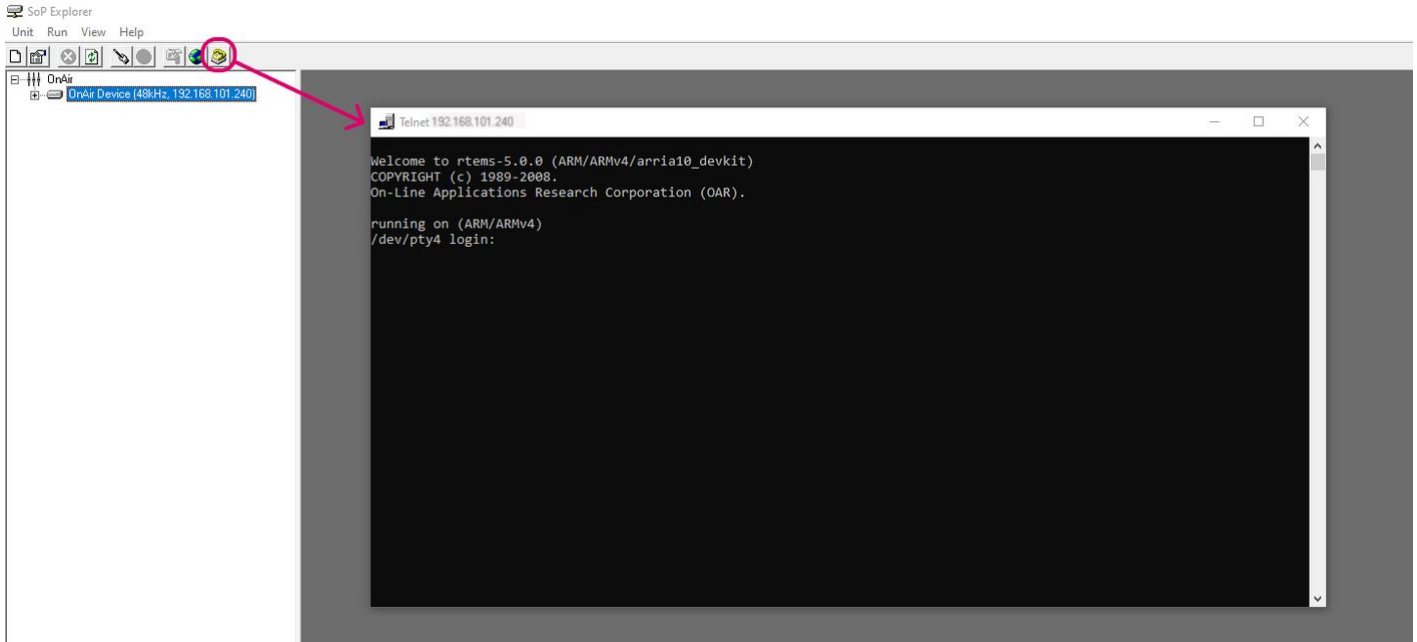
You can now follow the instructions for the task you wish to perform.

## 10.6 Power Core RP v2 - Telnet Sessions

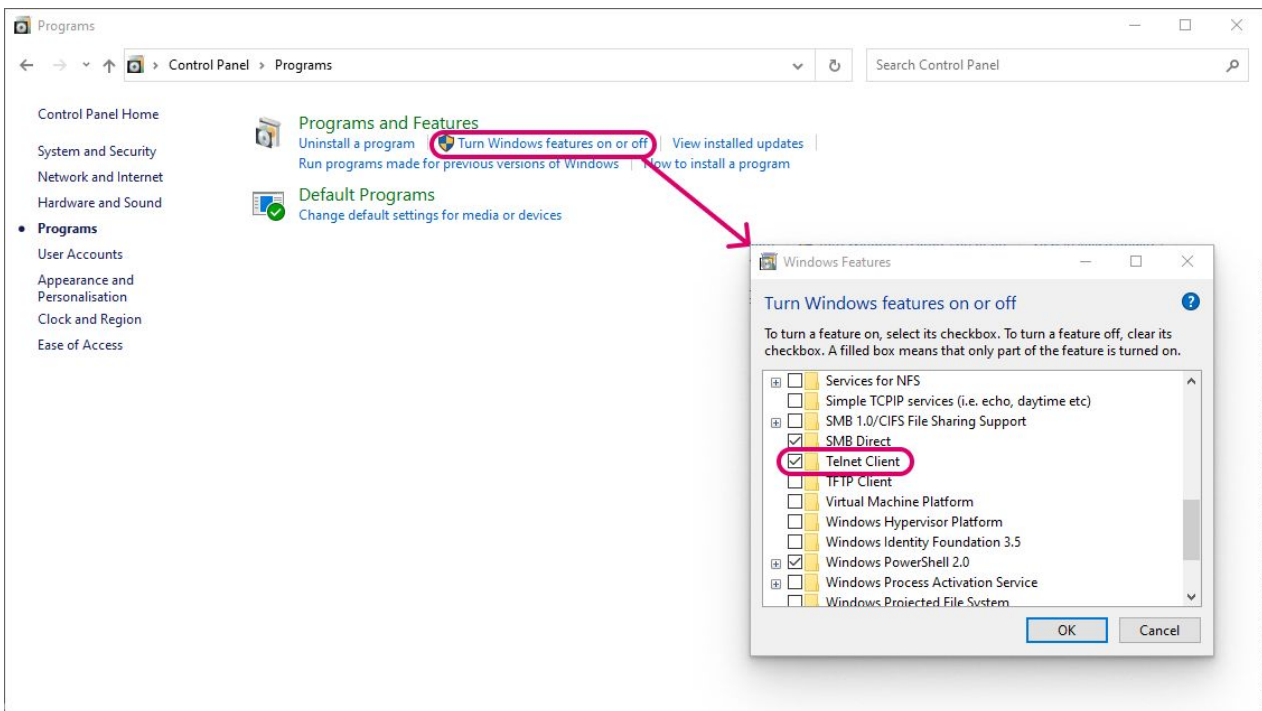
To adjust certain parameters on Power Core, you may need to open a telnet session to the control system.

### Opening a Connection to the System

1. The simplest way is to open SoP Explorer (as described [earlier](#)) and click on the "run telnet application" icon in the Toolbar.



If the telnet window does not appear, then the "Telnet Client" option may be disabled in Windows. This can be remedied by turning on the Telnet Client option in your Windows Control Panel.



If the Telnet Client option is activated and a Telnet session still does not appear, then try disabling any Anti-virus or Firewall applications running on the PC.



2. When prompted, enter the login name: "root" (press ENTER), and password "tomtom" (press ENTER).

Note that the telnet password can be changed from the Power Core Web UI (via the [System -> Control](#) tab) in Administrator mode.

The session opens, and you will see the command prompt for the control system.

### **Useful Commands**

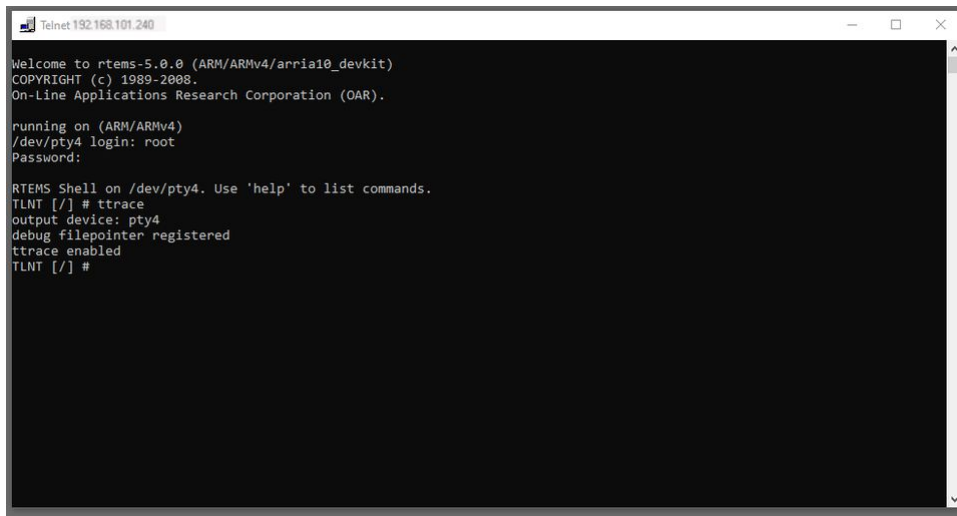
Once you see the command prompt, the following commands can be entered. In each case, type in the syntax and press ENTER.

- "sys\_rb" - reboots the system (warm start).
- "ttrace" - enables/disables logging messages (as described below).

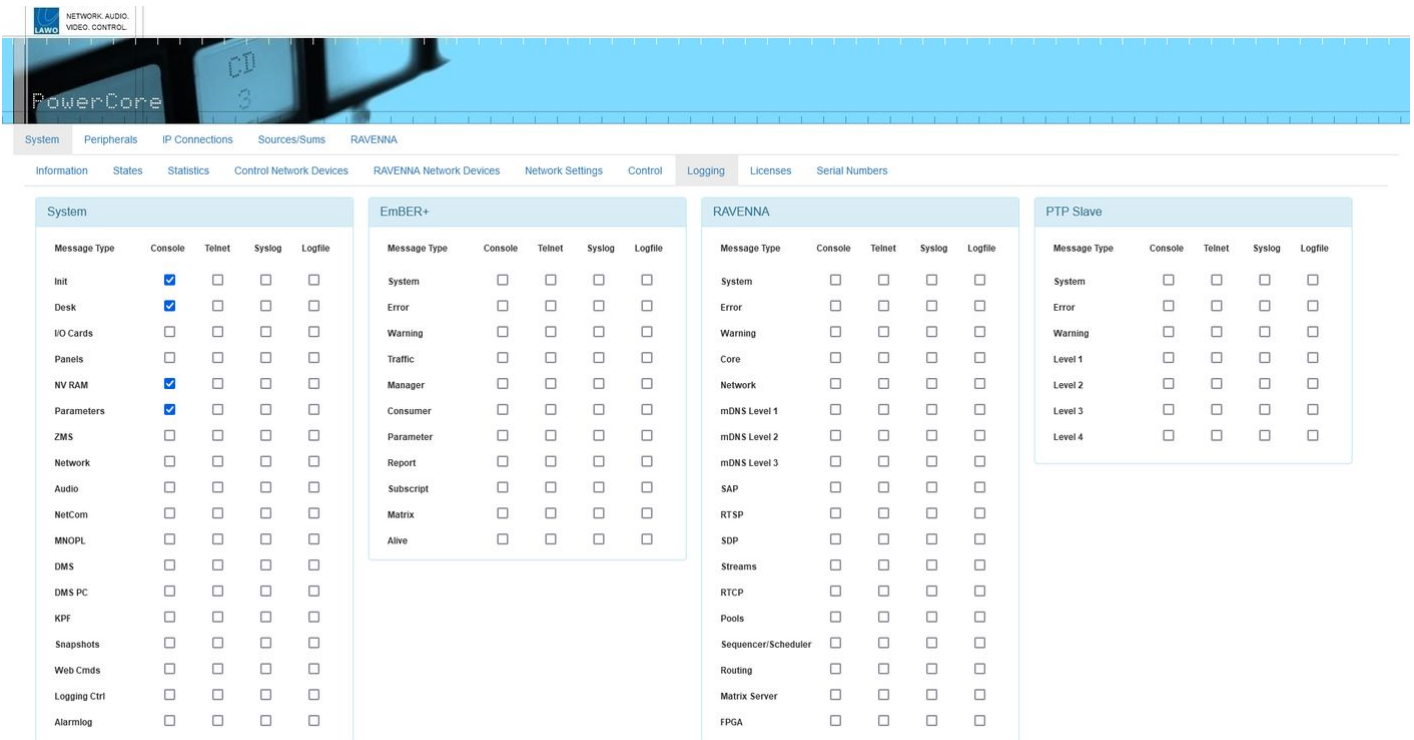
## Displaying Logging Messages via Telnet

The "ttrace" command can be used to display logging messages in the Telnet window.

1. Type "ttrace" after the command prompt.



2. Open the [System](#) → [Logging](#) tab in the Web UI, and select the messages you wish to view (using the Telnet tick boxes).



3. To turn off the display of logging messages, type the same syntax "ttrace".



## 10.7 Power Core RP v2 - File Transfer via FTP

All files stored on the Power Core control system can be accessed by a suitable FTP client. This topic describes how to perform a file transfer.

1. Install a suitable FTP client on your computer.

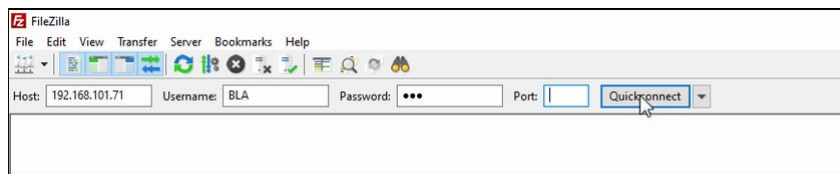
We recommend using **Filezilla**, a free FTP client for all platforms, which can be downloaded from [www.filezilla-project.org](http://www.filezilla-project.org)

2. Connect your configuration PC to Power Core via the control network (as described [earlier](#)).

3. Open the Filezilla FTP client, and enter the following information:

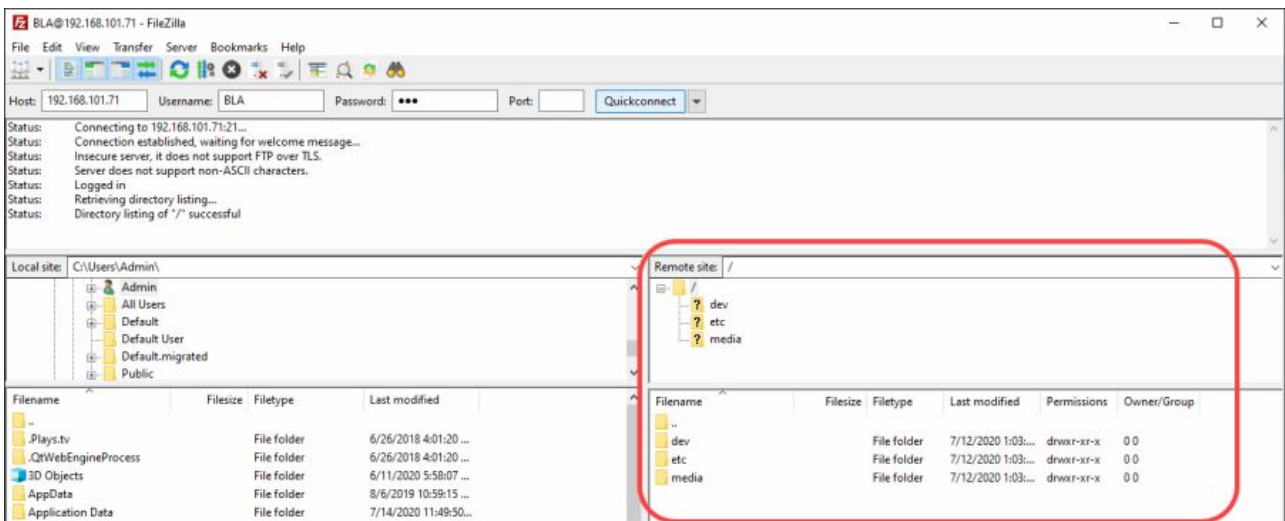
- Host = the IP address of your control system
- Username = **BLA**
- Password = **BLU**

If you leave the **Port** field blank, then the default port number of 21 will be used.

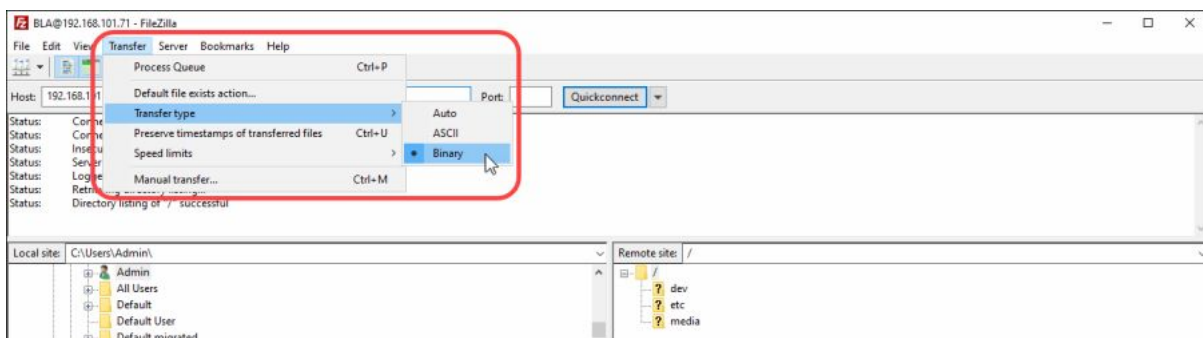


4. Click on **Quickconnect** to make the connection.

The session opens, and you will see the filing system of Power Core on the right (under **Remote Site**).



5. BEFORE transferring files, check that the **Transfer Type** is set to **Binary**.



**Important:** it is important that file transfers use "Binary" mode, and not "ASCII".



6. You can now transfer files from Power Core (the **Remote site**) to your computer (the **Local site**), or vice versa:
- Use the upper areas to navigate through the filing structure - the contents of the selected folder are displayed beneath (under **Filename**).
  - Right-click on a filename and select **Upload** or **Download** - the file is transferred to/from the selected folder.



## 11 Power Core RP v2 - Service Procedures

This chapter describes the service procedures available for the Power Core RP v2 hardware.

- [Power Core RP v2 - Using the Service Procedures](#)
- [Power Core RP v2 - Replace an I/O Card](#)

## 11.1 Power Core RP v2 - Using the Service Procedures

This topic describes how to use the service procedures.

We recommend that you read each topic in full before starting a procedure.

### (E) WARNING

Please read and observe ALL of the [Lawo - Important Safety Instructions](#) BEFORE installing or servicing any component.

### (F) AVERTISSEMENT

Veillez lire et respecter TOUTES [les consignes de sécurité importantes](#) AVANT d'installer ou d'entretenir un composant.

Mechanical drawings and data sheets (including weights and dimensions) are available from the [Lawo Download-Center](#) (after login).

The following procedures are covered in this chapter.

- [Replacing an I/O Card](#)

If you need further assistance, the Lawo Support Department can be contacted by email at [support@lawo.com](mailto:support@lawo.com), or by telephone during normal working hours - please visit the [Support](#) area of the Lawo website for the most up-to-date contact details.

## 11.2 Power Core RP v2 - Replace an I/O Card

The following procedure can be used to fit or exchange an expansion I/O card.

### Overview

Each Power Core frame can be fitted with up to 8 x expansion I/O cards (fitted to the rear).

The I/O cards are hot-pluggable and so it is possible to add or replace a card while the frame is powered.

Cards can be installed in any slot position as long as the frame meets the requirements stated earlier (i.e. a maximum of 4 MIC/LINE cards per frame, fitted to even slots only; GPIOs, slots 7&8 only; slots 2&4, inputs only; slots 5&7; outputs only).

### What you will need

To remove and replace the screws you will need a small flat-blade screwdriver (not supplied).

### Instructions

Please read the following important safety information and then follow the step-by-step instructions.

#### (E) WARNING

Please read and observe ALL of the [Lawo - Important Safety Instructions](#) BEFORE installing or servicing any component.

#### (F) AVERTISSEMENT

Veillez lire et respecter TOUTES [les consignes de sécurité importantes](#) AVANT d'installer ou d'entretenir un composant.

#### (E) CAUTION

If a frame is not fully populated, then any spare slots must be closed with cover plates. For safety reasons and to ensure efficient cooling, the frame must not be operated with an empty slot.

#### (F) ATTENTION

Si un cadre n'est pas entièrement rempli, les emplacements libres doivent être fermés par des panneaux d'obturation. Pour des raisons de sécurité et pour assurer un refroidissement efficace, le cadre ne doit pas être utilisé avec un emplacement vide.

1. Remove the existing I/O card (or cover plate).

- Disconnect and remove all of the I/O card cables.
- Using a Phillips PH1 screwdriver, unfasten the two diagonally opposite screws which hold the card, or cover plate, in place.

Note that there are two types of card/plate: one where the screws can be removed (and reused), and one where the screws remain attached to the card/plate. When removing the first type of card/plate, take care to store the screws safely.

- Carefully, pull out the card from the frame (or remove the cover plate).
- Store any cover plates safely (as they may be required in the future to close the frame).



2. Fit the new I/O card (or cover plate).

- Take the I/O card out of its packaging and slide it carefully into the guide rails (at the rear of the frame). Make sure that the card glides in smoothly and sits flush with the rear panel casing.
- If you are hot-plugging a card, then after a few seconds, the card will boot. You can check the status of the new card using the Power Core Web UI (via the "System → States" page).
- Secure by tightening the two screws to fix the card in place.
- A cover plate can be fitted in a similar manner.



3. The installation is now complete, and you can reconnect the cables and test the operation.


Once all cards are installed, check that they are all screwed into the frame and that any empty slots are closed with metal cover plates.



## 12 Power Core RP v2 - Configuration Options

The Power Core RP v2 offers a number of parameters that can be customized using ON-AIR Designer.

Documentation for changing these settings is provided below.

 Changing settings that are not documented here may break functionality in the Power Core RP v2, VisTool RP, or mc<sup>2</sup> console integration and is not supported!

- [Power Core RP v2 - Audio I/O Configuration](#)
- [Power Core RP v2 - GPIO Configuration](#)
- [Power Core RP v2 - Signal Processing](#)
- [Power Core RP v2 - System Settings](#)

## 12.1 Power Core RP v2 - Audio I/O Configuration

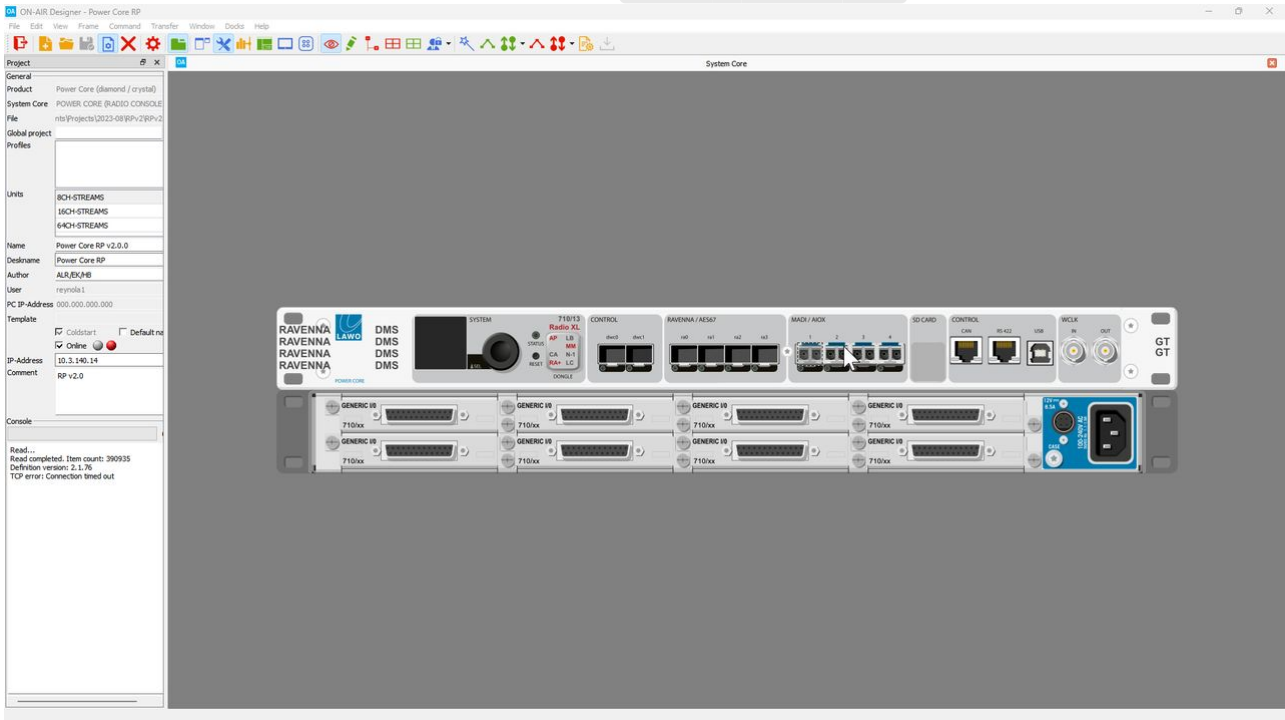
### Adding an Audio IO Extender

The audio (and GPIO) capabilities of Power Core RP v2 can be expanded further by adding one or more Audio I/O Extenders.

For more information about the Audio IO Extender, see [Power Core RP v2 - Audio I/O Extender](#).

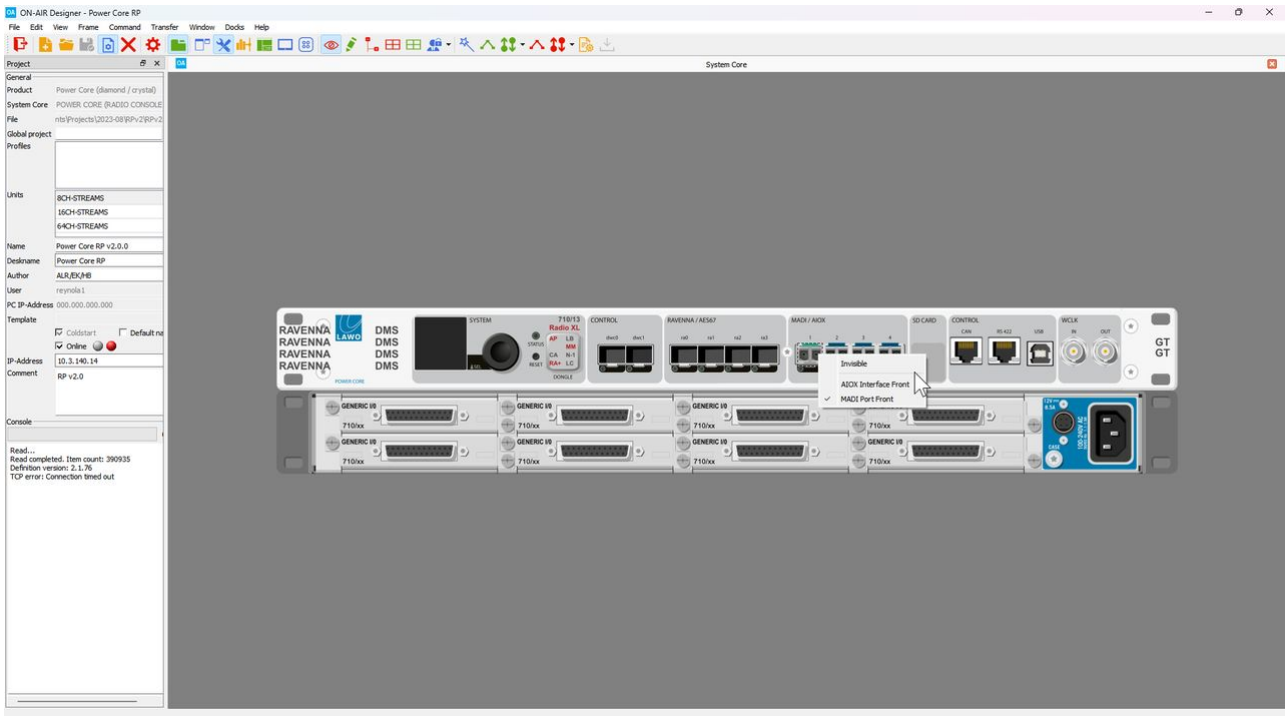
To add an AIOX unit to the Power Core RPv2, the MADi port the AIOX will be connected to must be changed to an AIOX port.

1. Navigate to the System Core page in ON-AIR Designer. ( **Frame > System Core** in the top menu bar).

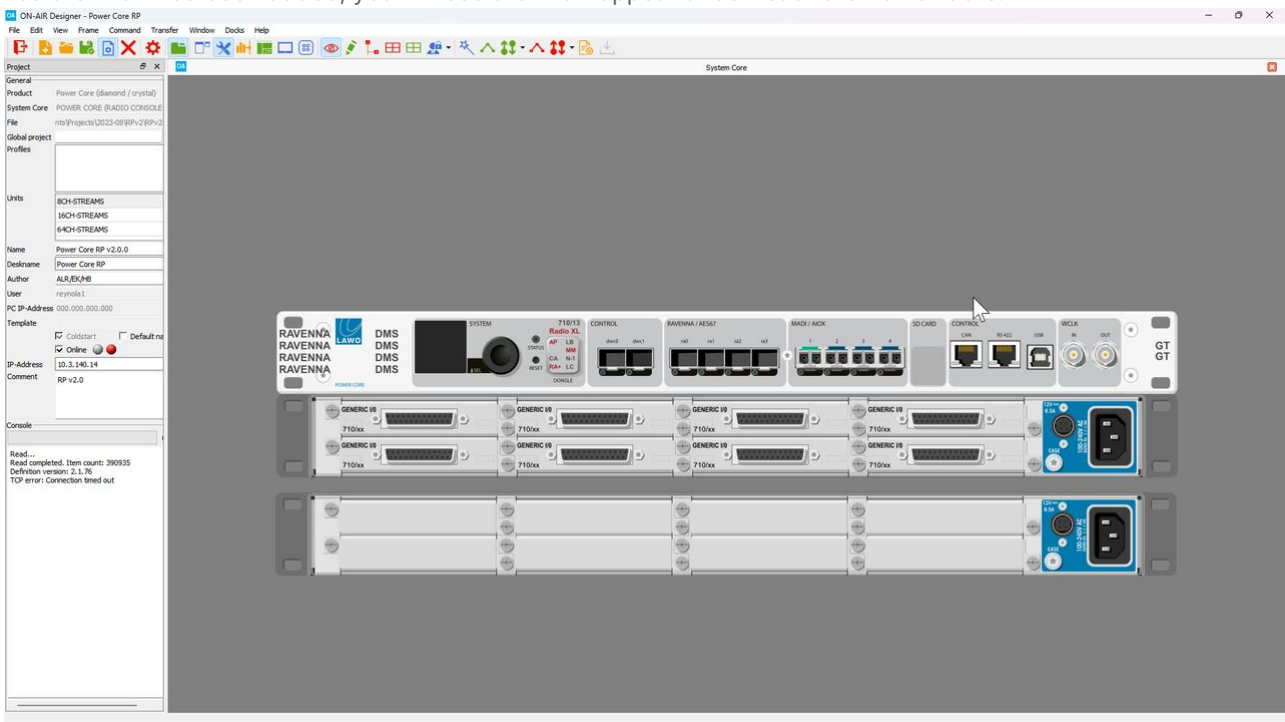


2. Right click on the MADi port that will be used to connect the AIOX and select **AIOX Interface Port**. ON-AIR Designer will make a series of database changes, this may take a few seconds.

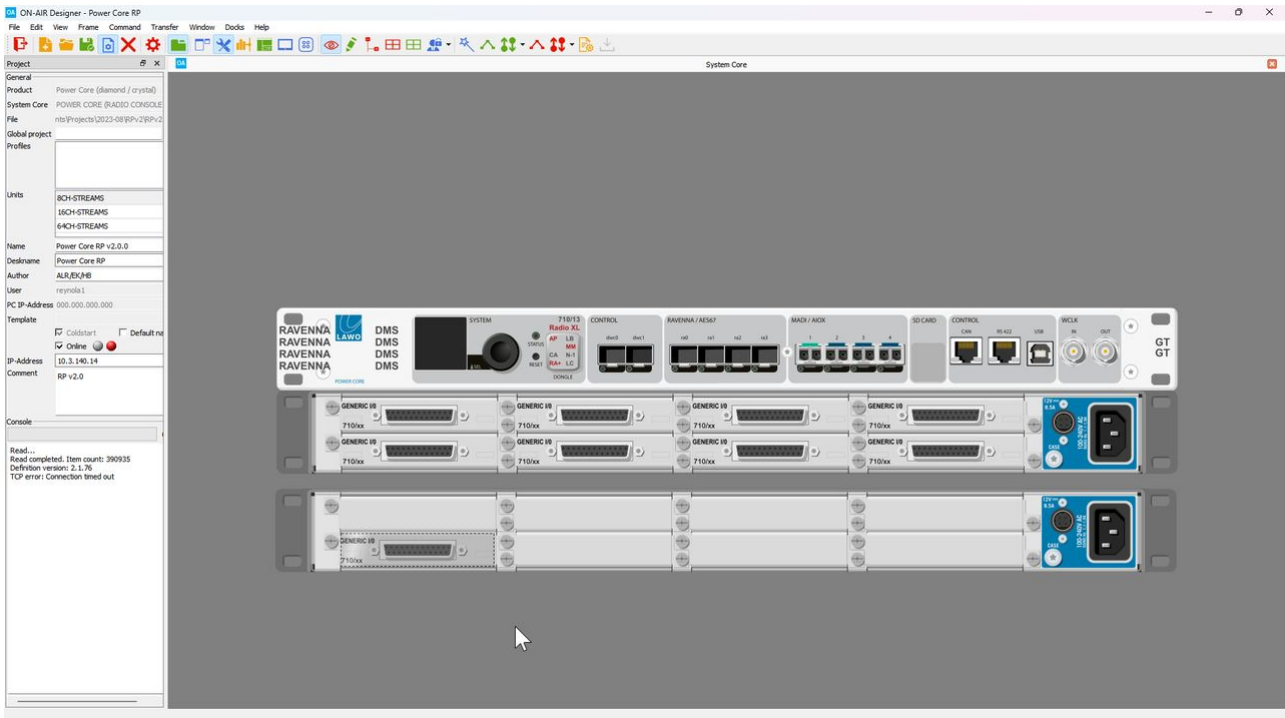




3. Once the AIOX has been added, you will see the AIOX appear underneath the Power Core.



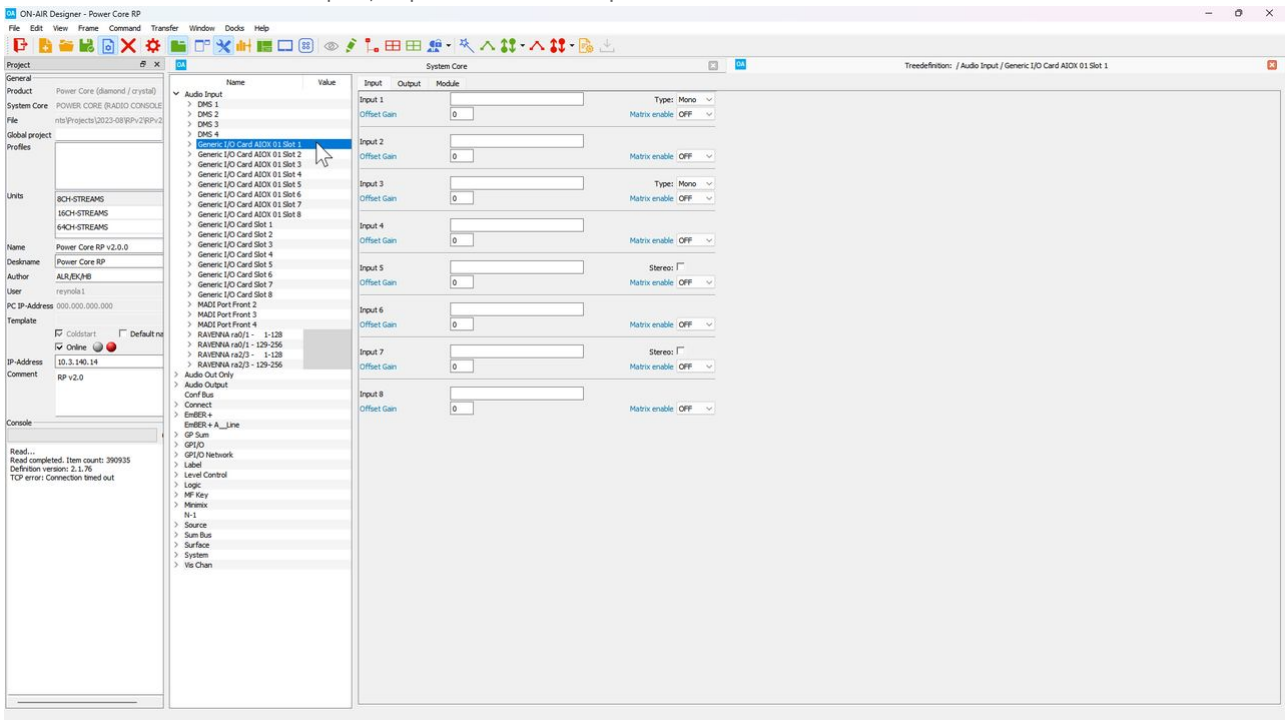
4. Right click on each of the IO card slots in the AIOX and select **Generic I/O Card**. By using the Generic I/O card, any type of card can be physically installed and hot-swapped.



5. If you wish to configure a redundant connection to the AIOX, repeat Steps 2-4, this time choosing the next available AIOX/MADI port. For example, if the AIOX is connected to MADI Front Port 1, the redundant connection will use MADI Front Port 2.

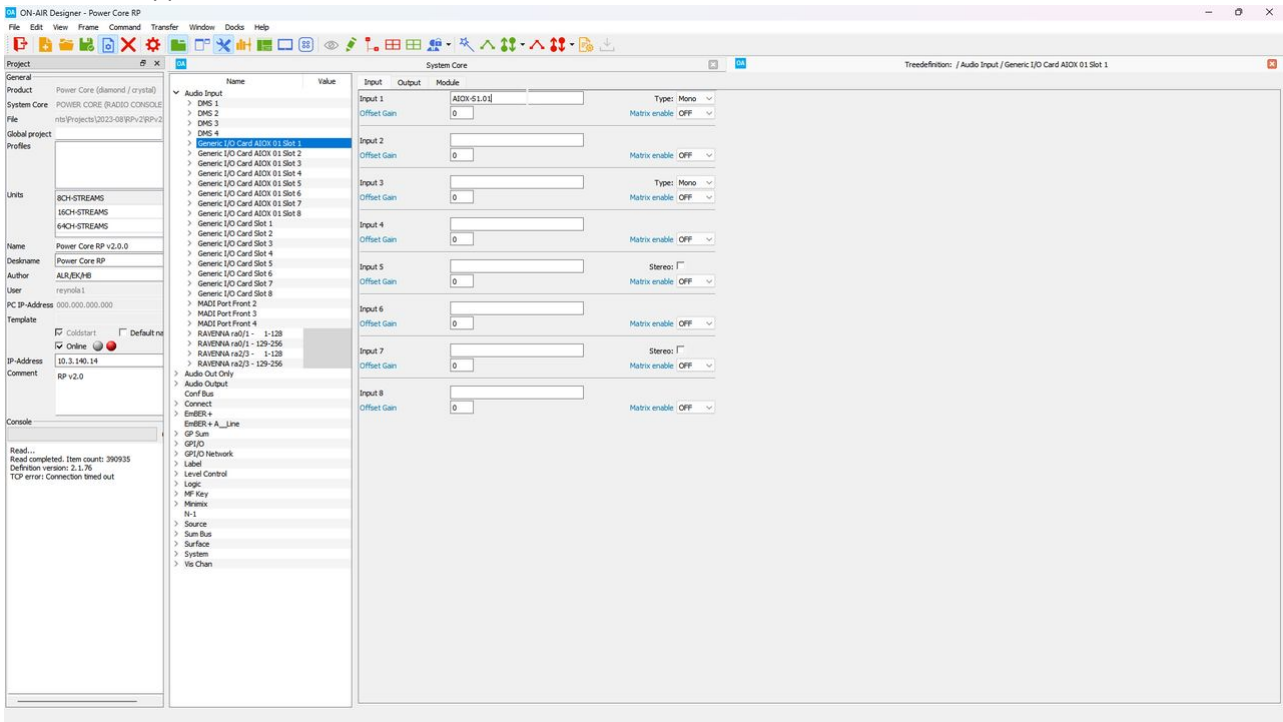
6. Once all I/O cards have been added, signal names must be defined for the I/O channels. To do this, open the **Tree Definition** window ( **Command > Treedefinition** in the top menu bar).

With the Tree Definition window open, expand the Audio Input folder and select the first Generic I/O Card in the AIOX.



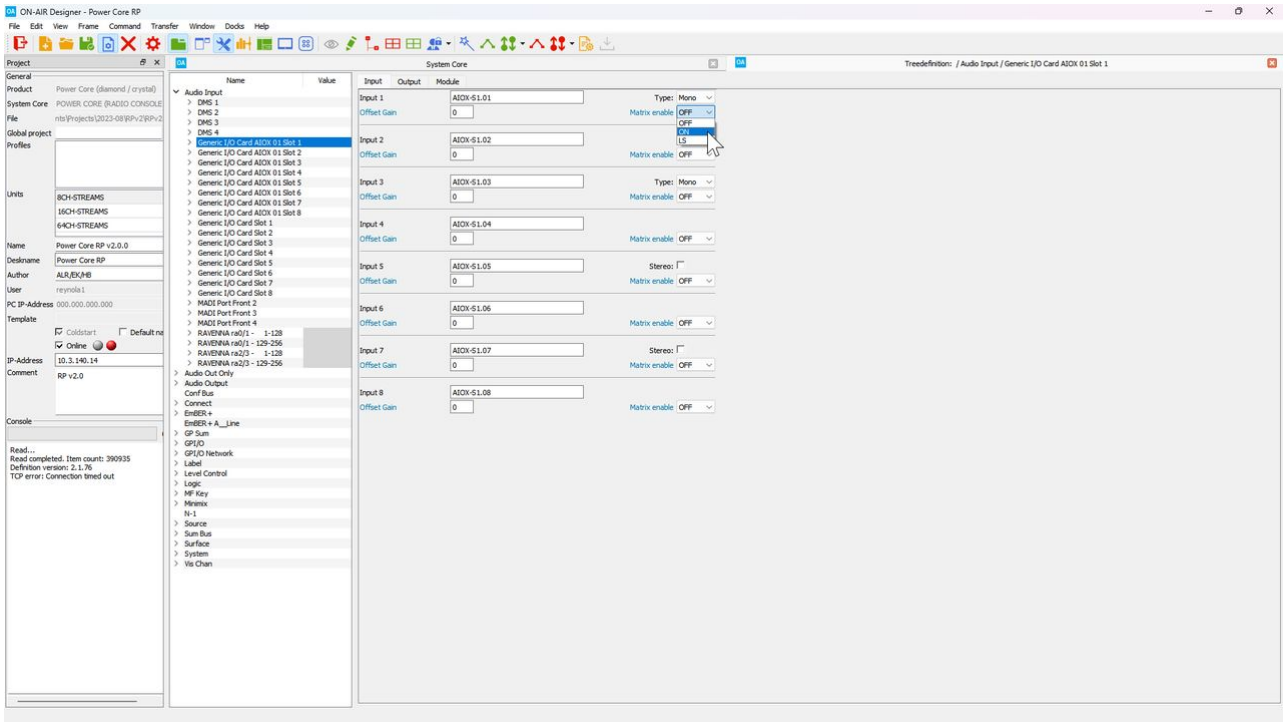
7. Each Input signal must have a label defined. Labels should follow the form GROUP.NAME where the Group and Name labels are both 8 characters or less.

Names should not start with a number and should only include alphanumeric characters (A-Za-z0-9). Underscores and dashes are also supported.

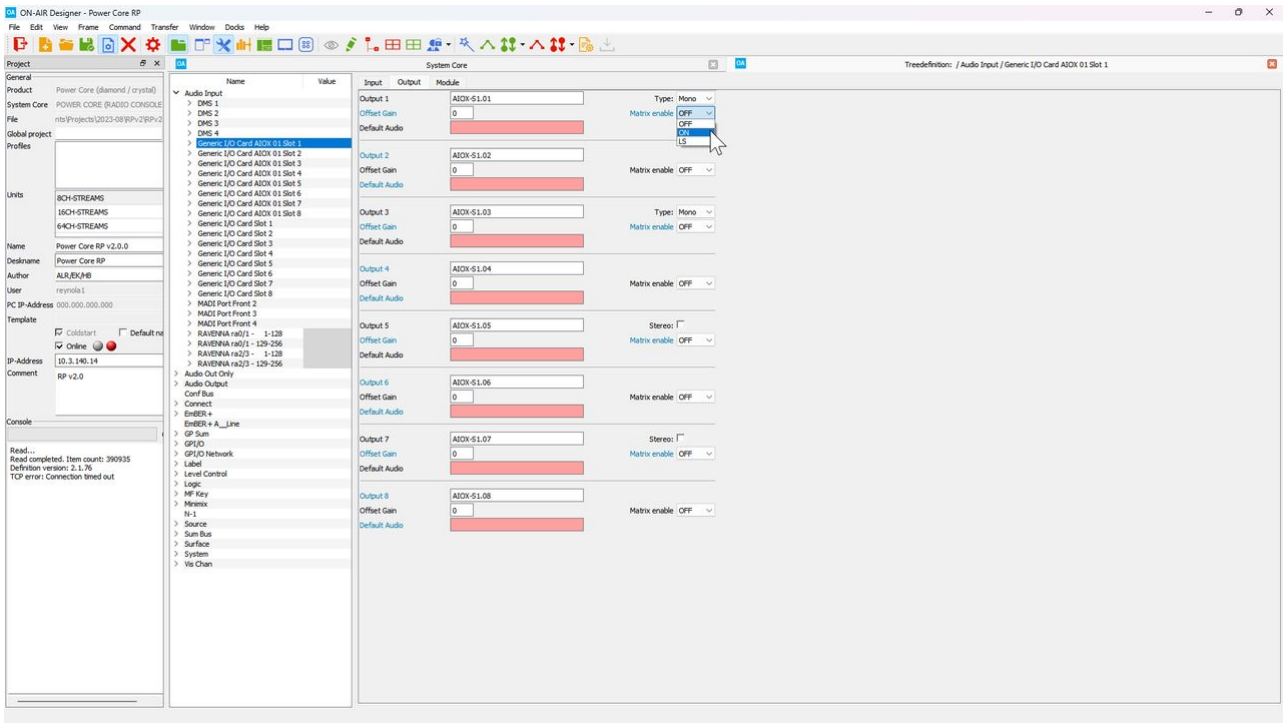


**i** Lawo recommends using AIOX signal names in the form **AIOX-xxSy.zz**, where xx is the AIOX number (1-20), y is the slot number (1-8), and zz is the zero padded channel number (01-08).

8. Once the Input signals have been labeled, they must be **Matrix Enabled** so that they can be used in the routing system. Click the **Matrix enable** drop down box and select **ON**.



9. Click on the **Output** tab and repeat the process for the output signals.



10. Repeat Steps 7-9 for each of the new Generic I/O cards.

**i** Remember that IO signal names will only be reflected in the VisTool RP GUI. HOME will automatically generate signal labels for physical IO.

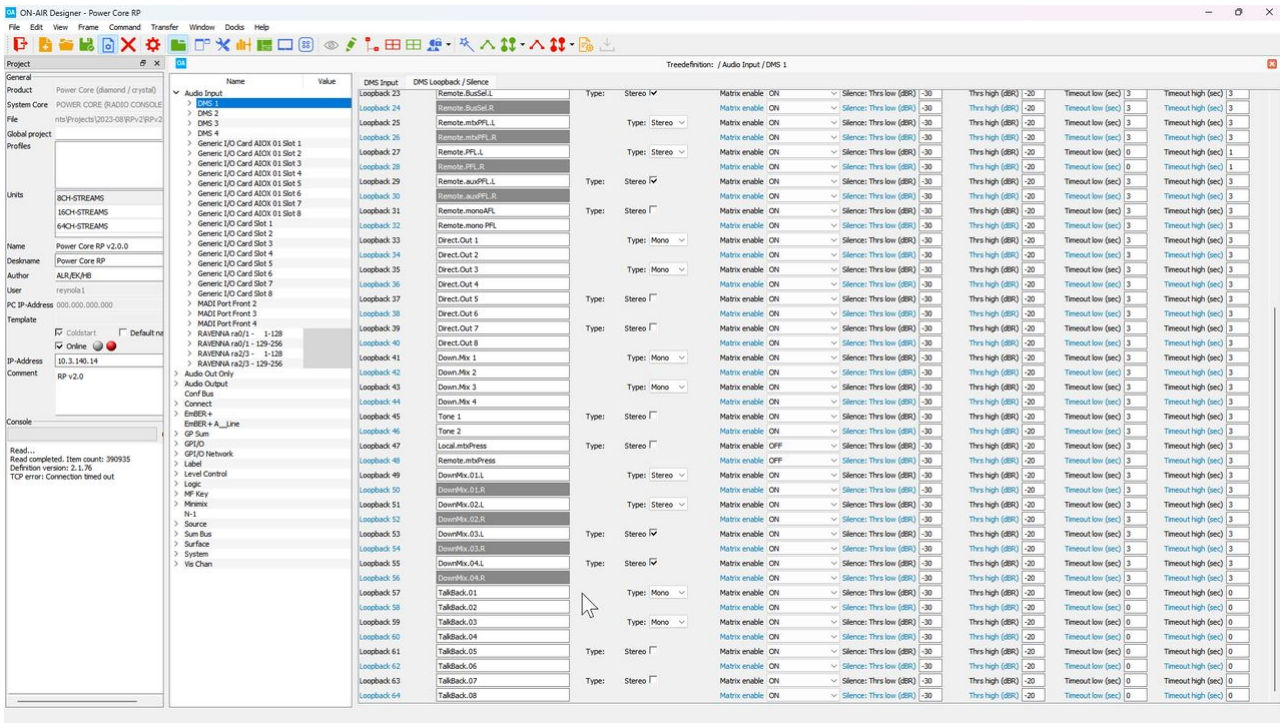
11. Save the updated configuration and follow the steps to [load the updated configuration](#).

### Adjusting the Talkback Input Level Detection Thresholds

Each of the Talkback inputs can detect when level is present on the input. This is used to trigger the insertion of the Talkback input into any selected Aux Buses, and also dim the program content of the selected Aux Bus.

The level at which a signal is considered to have audio present can be configured in ON-AIR Designer, as well as well as the length of time for which audio has to be present or silent to trigger the insertion.

1. Navigate to the **Tree Definition** window in ON-AIR Designer ( **Command** > **Treedefinition** in the top menu bar) and open the **Audio Input** folder. Select the **DMS 1** folder to open the DMS 1 signal configuration window.



2. The Talkback inputs are configured to use Loopbacks 57-64. To the right of each Talkback loopback signal are the **Silence: Thrs low (dBr)** and **Thrs high (dBr)** property boxes. The **Thrs low** property sets the value at which the signal will be considered silent. The **Thrs high** property sets the value at which the signal will be considered present. The default value for silence is **-30dBr** and the default value for level present is **-20dBr**.

**i** To convert from relative decibels (dBr) to decibels Full Scale (dBFS), add the Relative System Level to the dBr value, then add 18dB. For example, with a Relative System Level of **-38**:

$$-30\text{dBr} = -30\text{dBr} + -38\text{dB} + 18\text{dB} = -50\text{dBFS}$$

For more information about the relative decibels see [Power Core RP v2 - System Reference Levels](#).

3. The **Timeout Low** and **Timeout High** values can be adjusted to govern the behavior of the talkback insertion. In order for Talkback to be inserted, the signal level must exceed the value defined in the **Threshold High** property for the time defined in the **Timeout High** property. The Talkback input will remain active until the signal level is below the value defined in the **Threshold Low** property for the time defined in the **Timeout Low** property.

4. Co-Mixer Inputs 1-8 can also be used in the Talkback system. These signals are located in the **DMS 2** folder and use Loopbacks 33-40.

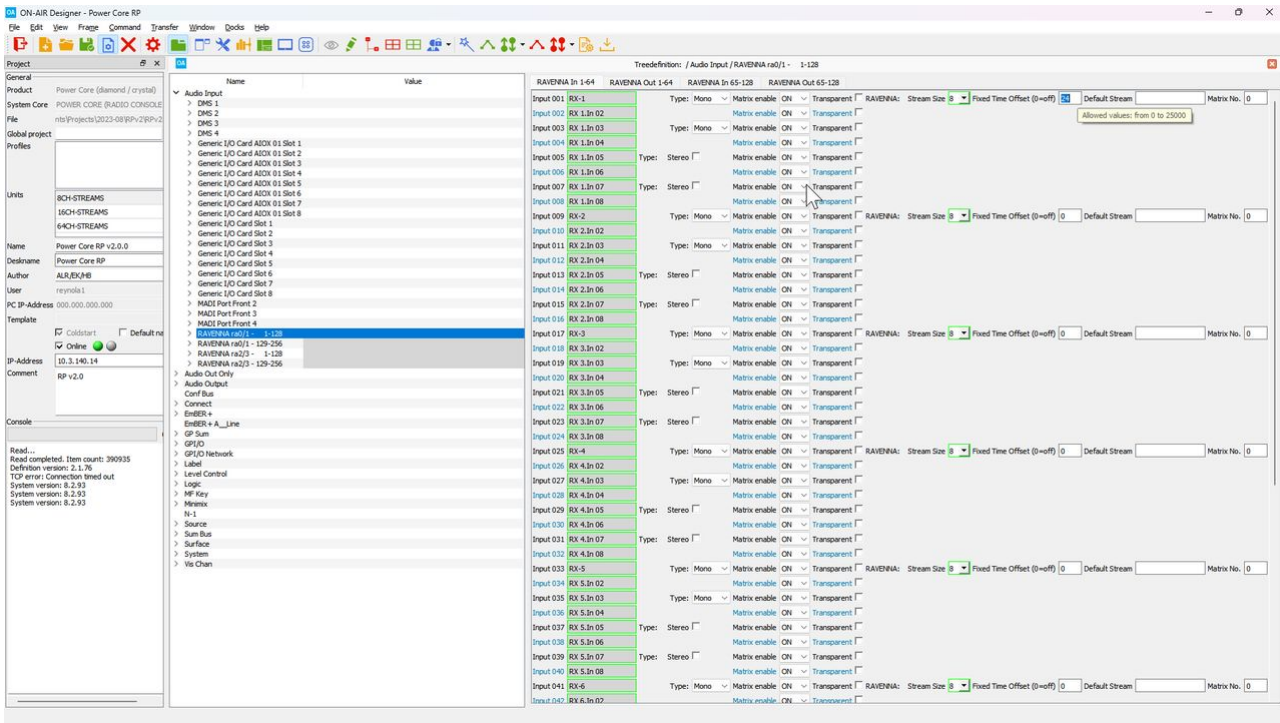
### Configuring RAVENNA stream receiver time offsets

By default, the Power Core RP v2 will use the dynamic stream tuning process described in [Power Core RP v2 - Stream Tuning](#). However, it is also possible to configure either a fixed time offset per receiver, or maximum time offset value for each device group.

1. To configure a fixed time offset for a specific receiver navigate to the **Tree Definition** window in ON-AIR Designer (**Command > Treedefinition** in the top menu bar) and select the RAVENNA stream group that contains the receiver you wish to edit.

2. Each stream receiver has a **Fixed Time Offset** property. The default value is **0**, which means the receiver will use the dynamic tuning process. To set a fixed time offset enter the desired time offset in samples.

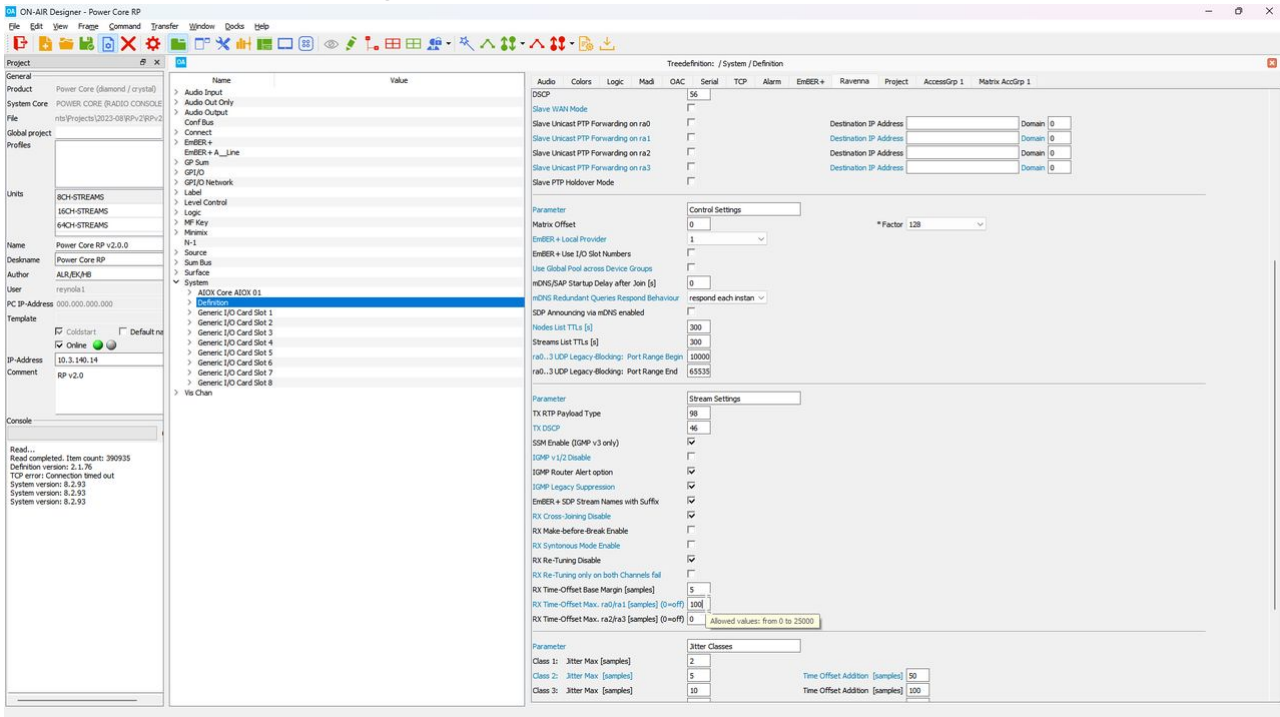




1. To configure a maximum time offset navigate to the **Tree Definition** window in ON-AIR Designer ( **Command > Treedefinition** in the top menu bar). Expand the **System** folder, select the **Definition** sub-folder and then select the **Ravenna** tab.

2. Scroll down to the **Stream Settings** section of the Ravenna tab. Set the **RX Time-Offset Max** property in samples for the ra0/1 device group.

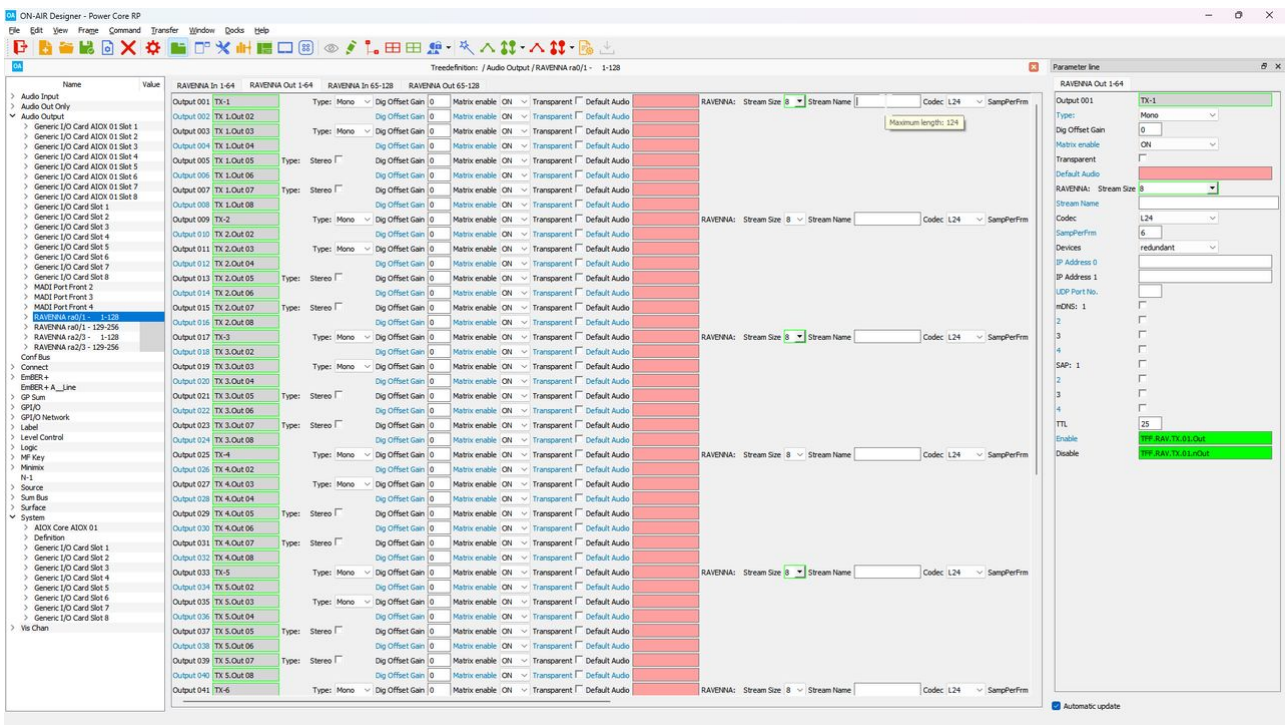
For a Revision 3 Power Core it is also possible to define separate maximum time offsets for the ra0/1 and ra2/3 device groups—this is useful when one device group is used on a WAN link.



## Configuring RAVENNA stream sender parameters

The RAVENNA stream senders in Power Core RP v2 can be configured to use specific multicast addresses, stream names, codecs, UDP ports or samples per frame.

- To configure a fixed time offset for a specific receiver navigate to the **Tree Definition** window in ON-AIR Designer (Command > Treedefinition in the top menu bar) and select the RAVENNA stream group that contains the sender you wish to edit.
- For each sender editing the following properties is supported:
  - Stream Name** - This is the descriptive name of the stream that will be used to identify the stream. This name will also be used for mDNS and SAP advertisements (if enabled).
  - Codec** - 16 bit PCM (L16), 24 bit PCM (L24), 32 bit PCM (L32), and AM824 codecs are supported.
  - SampPerFrm** - The number of samples per frame. Values from 1 to 64 are supported, but make sure to not select a value that will cause the frame payload to be larger than 1400 bytes.
  - Devices** - Select the device(s) to use when sending the stream.
  - IP Address 0|1** - Set a multicast IP address for the stream or the destination unicast IP address.
  - UDP Port No.** - Set the UDP port number to be used by the RTP stream.
  - mDNS 1-4** - Enable mDNS stream advertisements on mDNS rings 1 - 4. mDNS rings are defined in System>Definition>Stream Announcement.
  - SAP 1-4** - Enable SAP stream advertisements on SAP rings 1 - 4. SAP rings are defined in System>Definition>Stream Announcement.
  - TTL** - Define how many hops the stream supports in the network path.



**⚠** Changing the stream widths for RAVENNA senders or receivers is not supported! Check with your Lawo Project Engineer before changing any settings not documented in this guide.

## 12.2 Power Core RP v2 - GPIO Configuration

### Adding a GPIO Card

The GPIO capabilities of Power Core RP v2 can be expanded further by configuring a GPIO card.

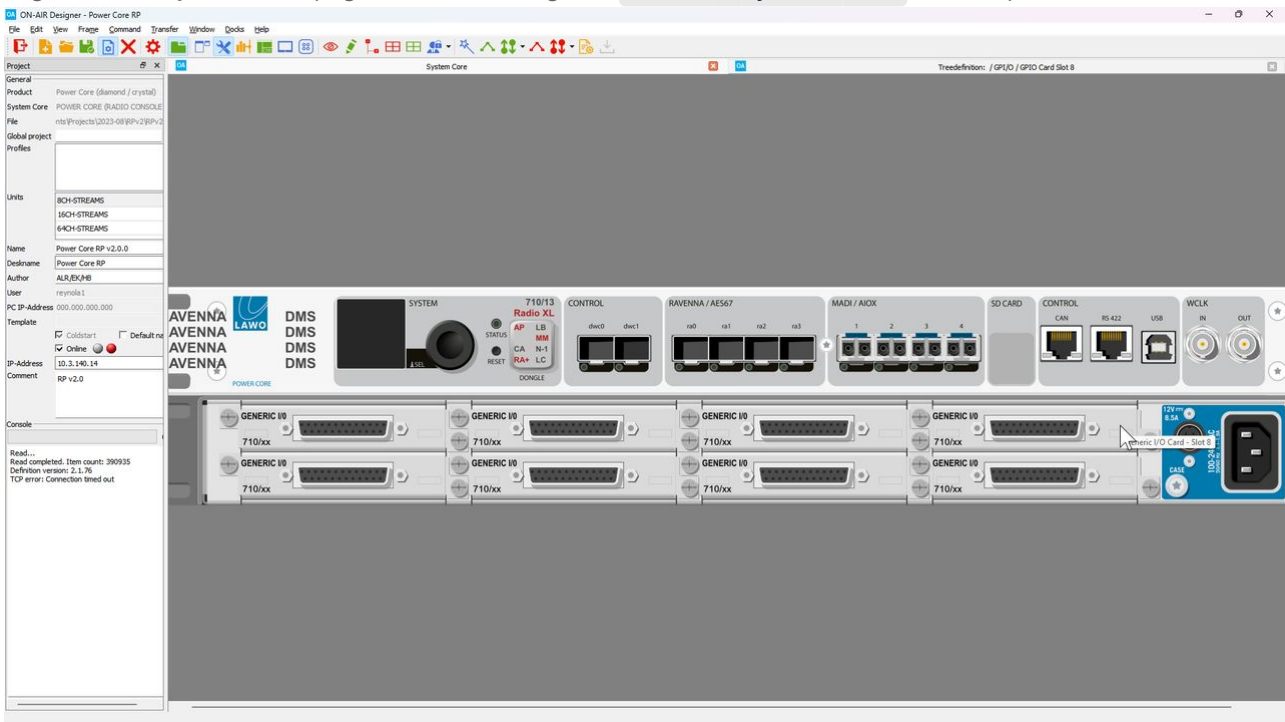
For Revision 1 or Revision 2 Power Cores that will use the front panel GPIOs with HOME, no configuration is required.

However, if it is necessary to use the GPIO cards in conjunction with internal logic in Power Core RP v2 (for example to trigger a Talkback input) it is necessary to add the GPIO card to the system configuration.

Revision 1 and 2 Power Cores have a built in GPIO port on the front panel. Revision 3 Power Cores do not have a built in GPIO port, and therefore a GPIO card must be added.

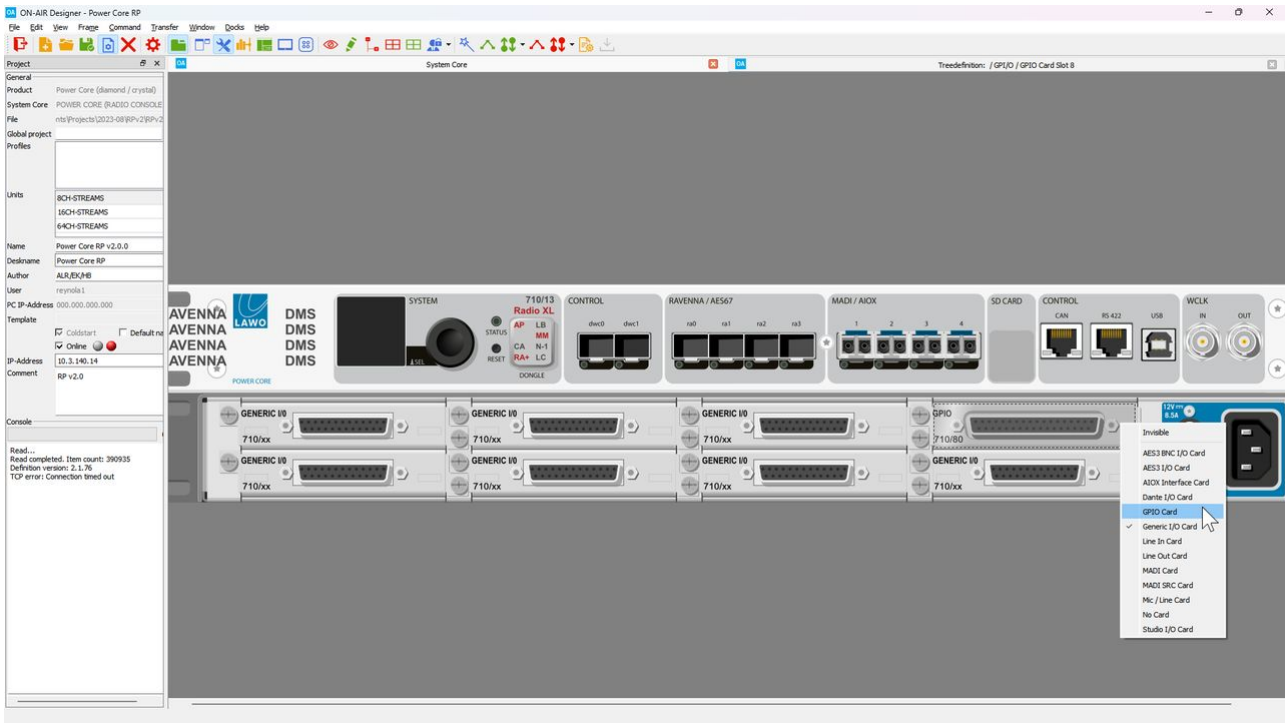
All Power Cores support a maximum of 2 GPIO cards, which can be installed in Slots 7 or 8. The same limitations apply to the Audio IO Extender.

1. Navigate to the System Core page in ON-AIR Designer. ( `Frame > System Core` in the top menu bar).



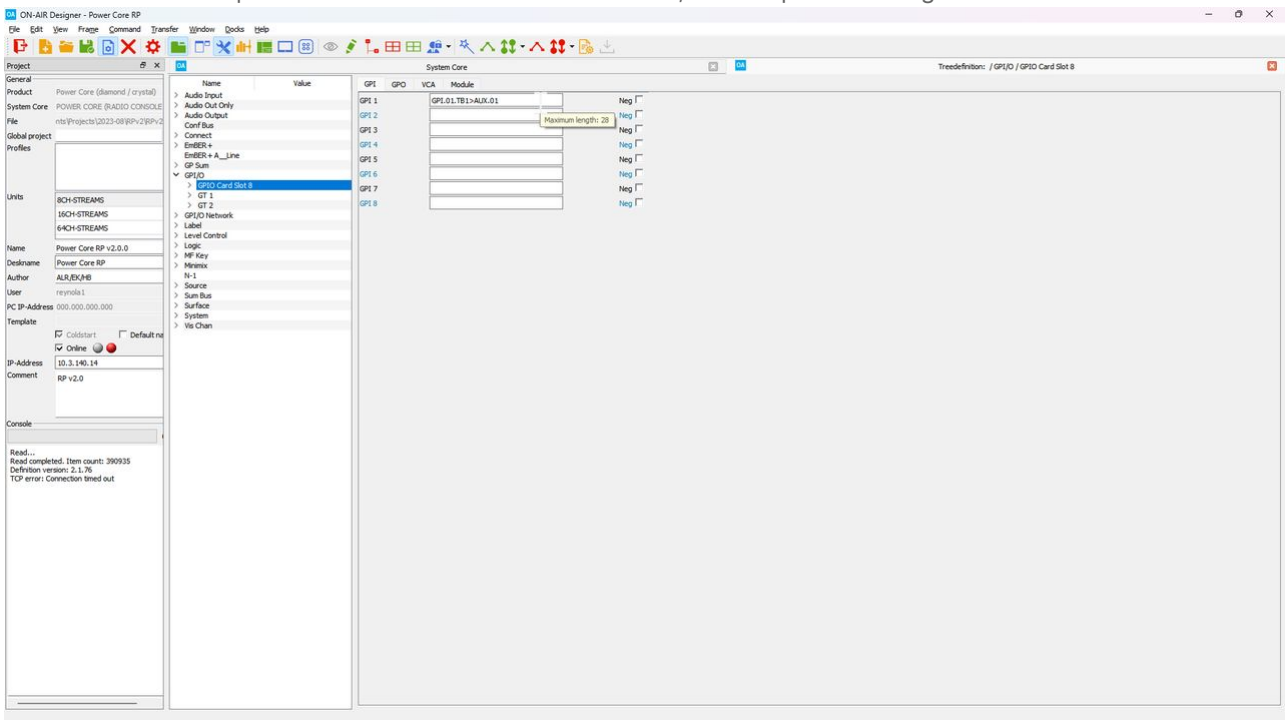
2. Right click on either Slot 7 or Slot 8 and select **GPIO Card**. ON-AIR Designer will make a series of database changes to replace the Generic IO card with a GPIO card, this may take a few seconds.



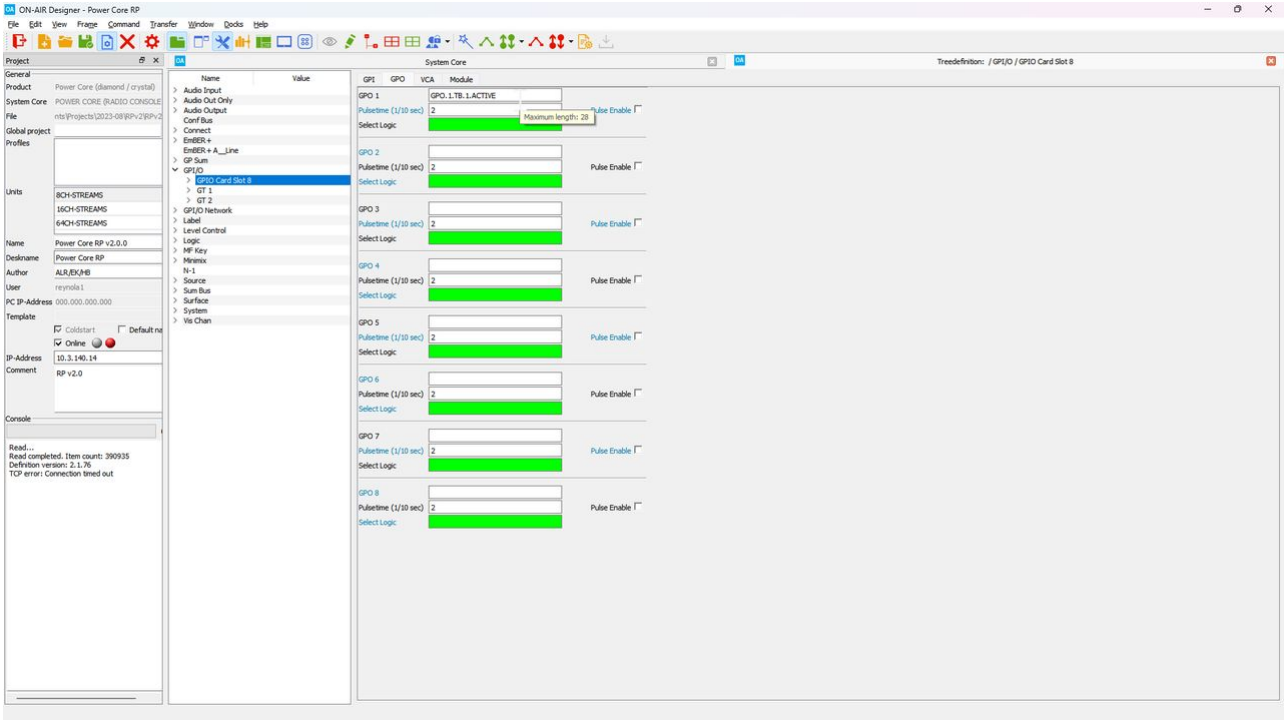


3. Once the GPIO card has been added the card can be configured in the **Tree Definition** window ( **Command** > **Treedefinition** in the top menu bar).

With the Tree Definition window open, expand the **GPIO** folder and select the GPIO card you wish to configure. There are tabs for the **GPI** and **GPO** pins. To use a GPI in Power Core RP v2, the GPI pin must be given a name.



4. GPO pins can be used by setting a name and then mapping a logical condition to trigger the GPO.



**i** Power Core RP v2 contains thousands of logical triggers. Contact your Lawo Project Engineer if you need assistance in selecting the appropriate logical trigger.

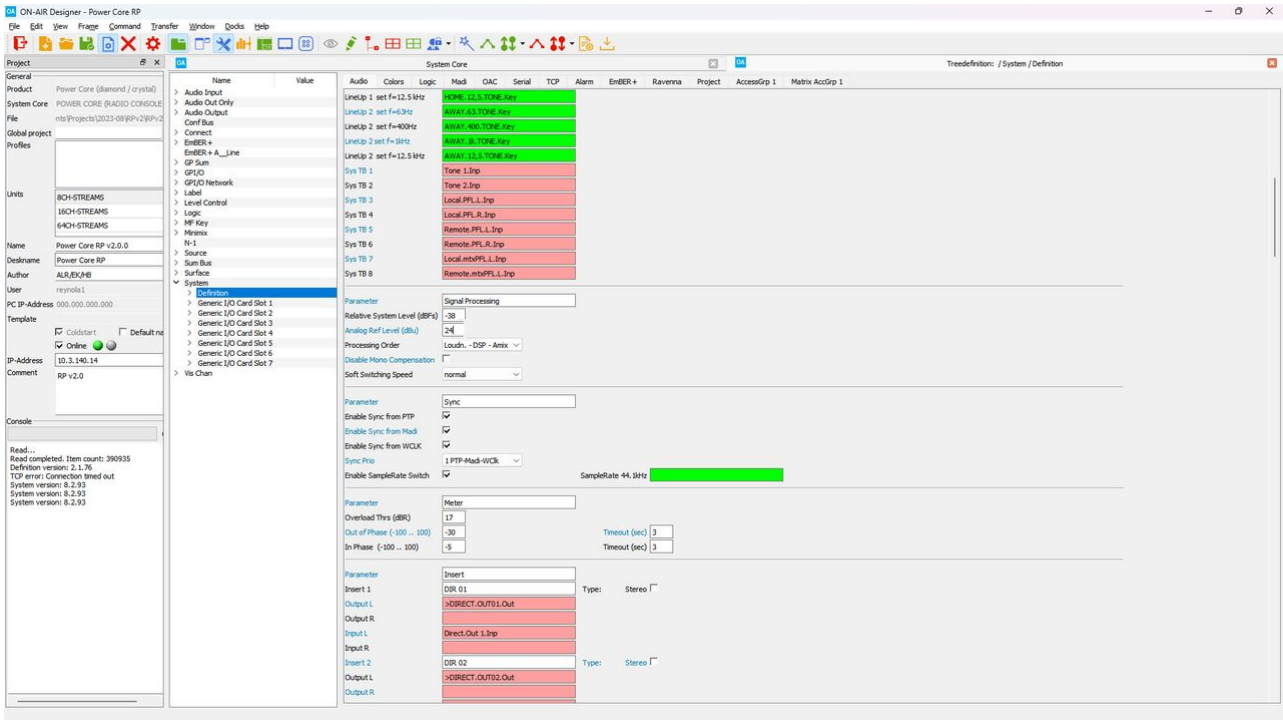
## 12.3 Power Core RP v2 - Signal Processing

The **Signal Processing** options define the system's reference level, headroom, and delay units.

### Reference Levels

Navigate to the **Tree Definition** window in ON-AIR Designer ( **Command > Treedefinition** in the top menu bar). Expand the **System** folder, select the **Definition** sub-folder, then select the **Audio** tab.

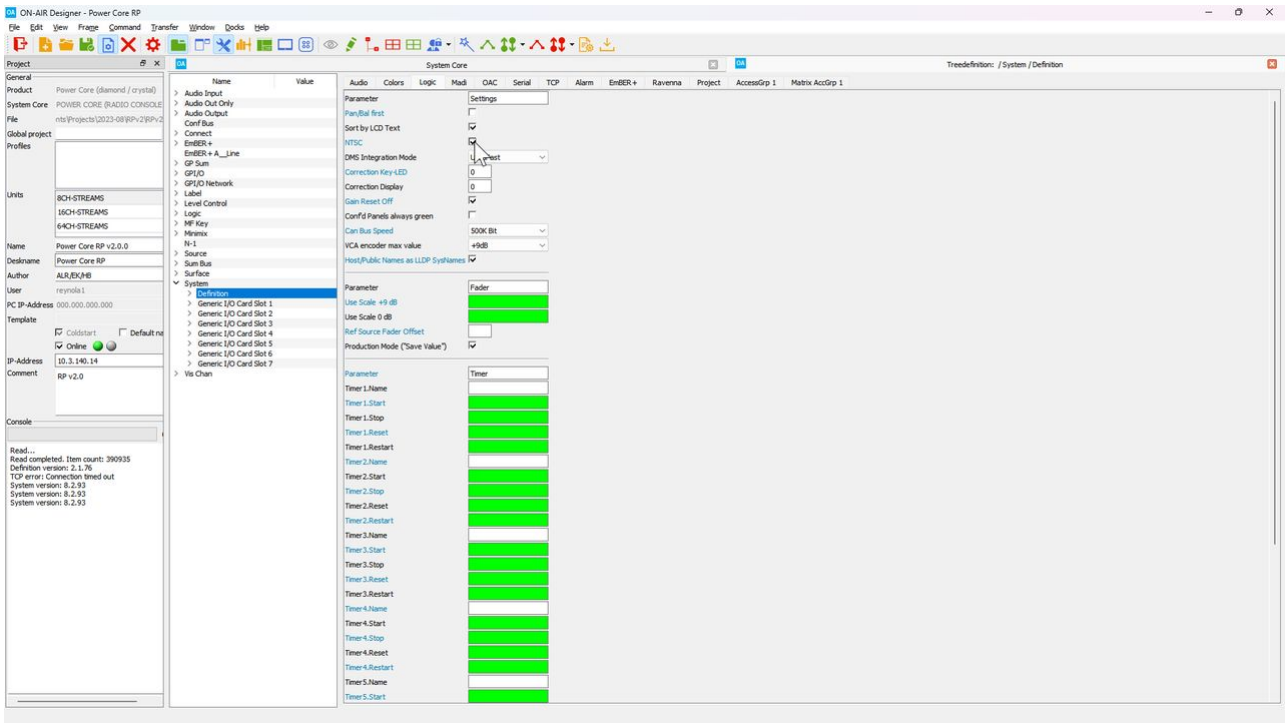
Scroll down to the **Signal Processing** section. The **Analog Reference Level** and **Relative System Level** may be defined here. See [Power Core RP v2 - System Reference Levels](#) for more information about these settings.



### Delay Units

Navigate to the **Tree Definition** window in ON-AIR Designer ( **Command > Treedefinition** in the top menu bar). Expand the **System** folder, select the **Definition** sub-folder, then select the **Logic** tab.

By default, Power Core RP v2 uses PAL frames for the delay units. Check the **NTSC** box to use NTSC frames for the delay units.



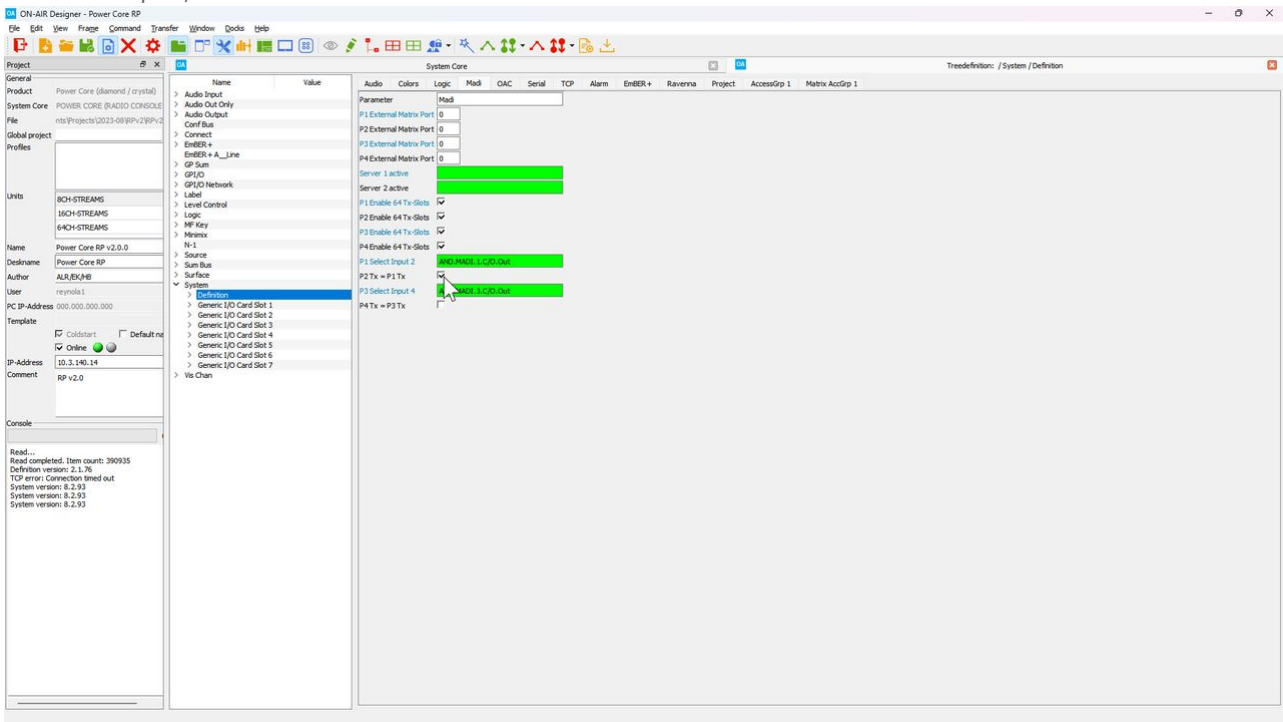
## 12.4 Power Core RP v2 - System Settings

### MADI Mode Configuration

The front panel MADI Ports in Power Core RP v2 can be configured independently or can act as a redundant pair.

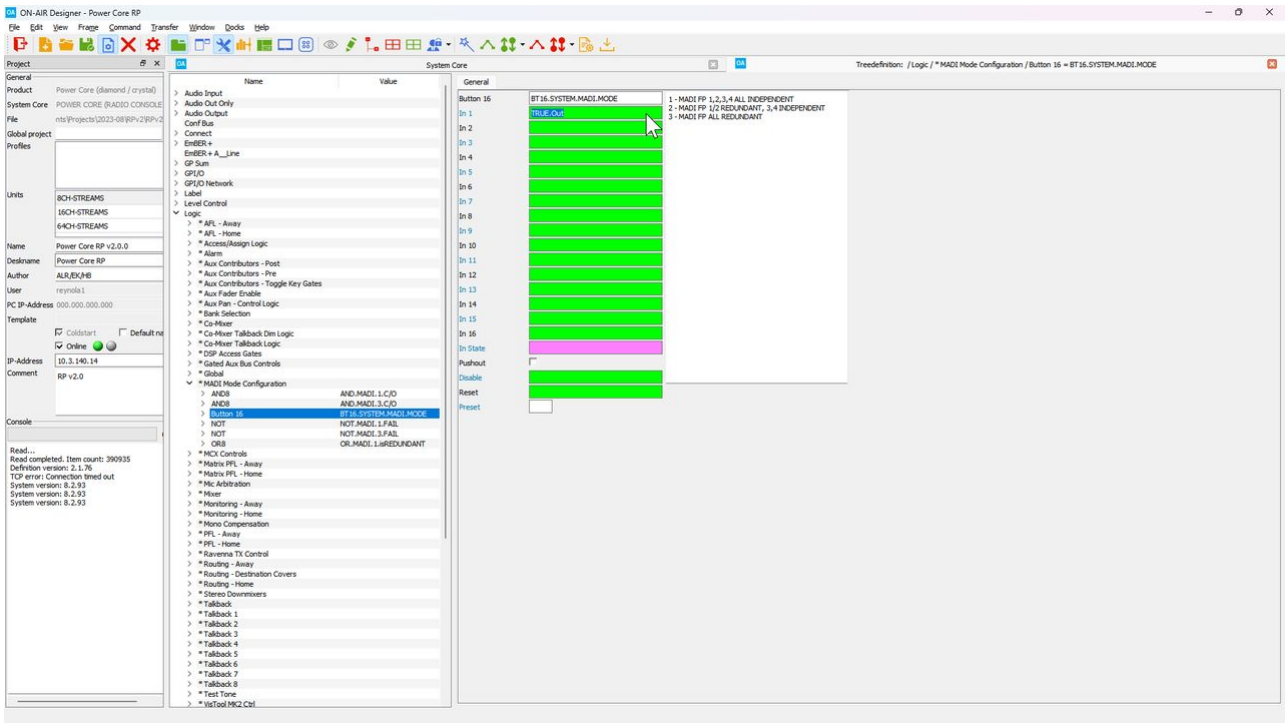
1. Navigate to the **Tree Definition** window in ON-AIR Designer ( **Command** > **Treedefinition** in the top menu bar). Expand the **System** folder, select the **Definition** sub-folder, then select the **MADI** tab.

To configure MADI Front Port 1 and 2 as a redundant pair, check the **P2 Tx = P1 Tx** box. To configure MADI Front Port 3 and 4 as a redundant pair, check the **P4 Tx = P3 Tx** box.



**i** If only one redundant MADI pair will be configured MADI Front Port 1 and 2 must be used.

2. In the **Tree Definition** window expand the **Logic** folder, then select the **Button 16** element named **BT16.SYSTEM.MADI.MODE** in the **MADI Mode Configuration** sub-folder.

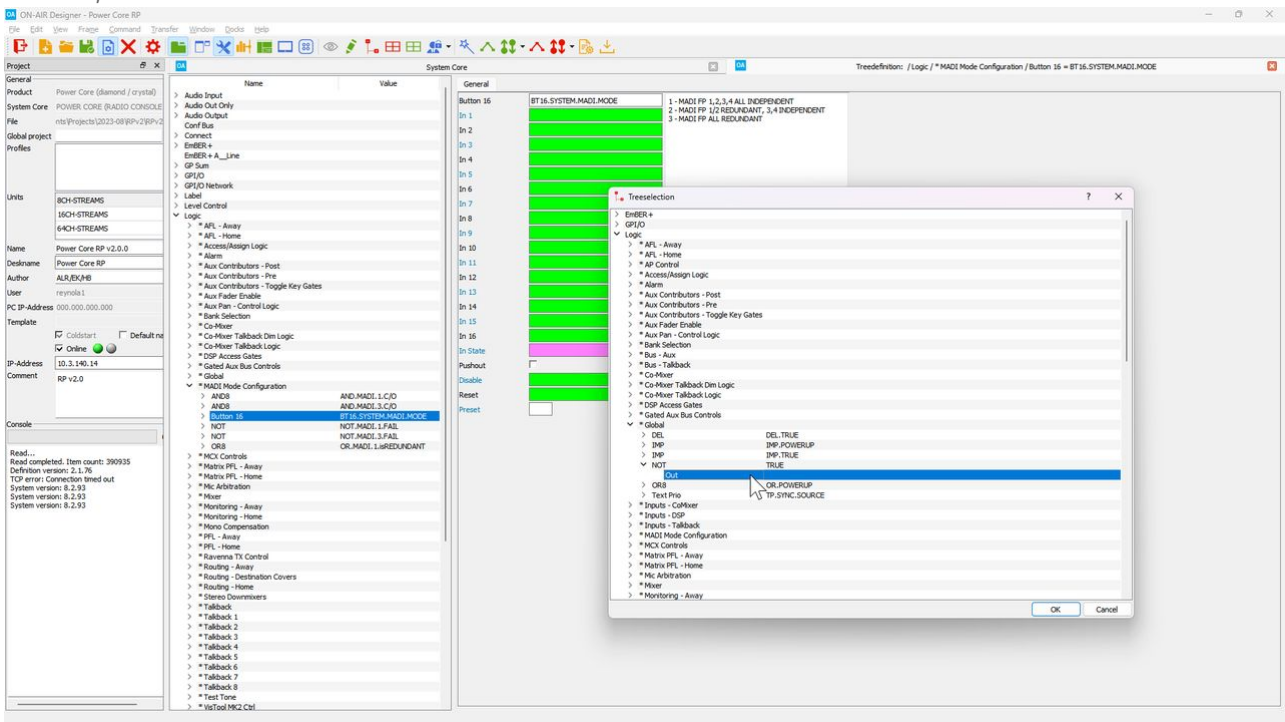


The MADI redundancy mode is set by changing the input to the Button 16 element. By default, a **True** logical input is assigned to Input 1, which indicates that all four MADI Front Ports are independent.

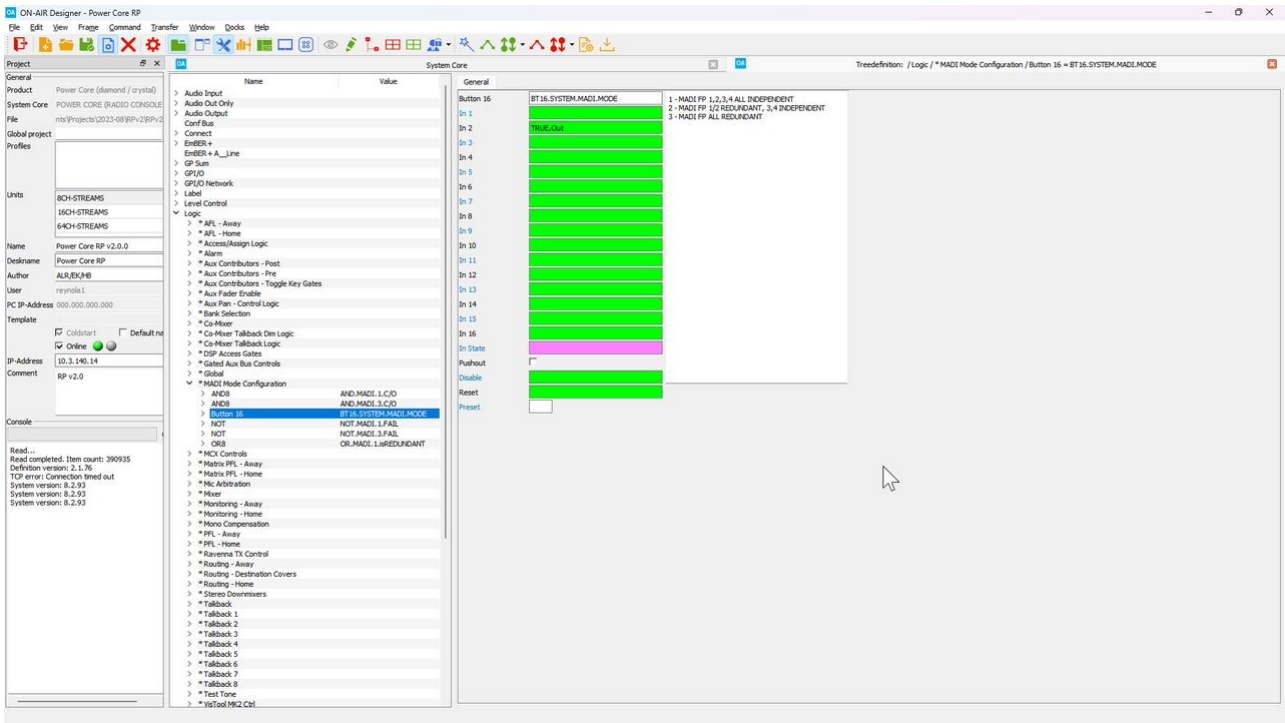
Move the **True** logical input to Input 2 to configure MADI Front Port 1 and 2 as a redundant pair, with MADI Front Port 3 and 4 as independent ports.

Move the **True** logical input to Input 3 to configure MADI Front Port 1 and 2 as a redundant pair, with MADI Front Port 3 and 4 as a second redundant pair.

3. To change the logical trigger for a Button 16 input, double click on the green field corresponding with the Input you wish to trigger. This will open the **Tree Selection** window. Navigate the tree to the **Global** folder, expand the **NOT** element labeled **TRUE**, and select the **TRUE.Out** element.



To delete a logical trigger from a Button 16 input, click on the green field containing the trigger and press the **DELETE** key.



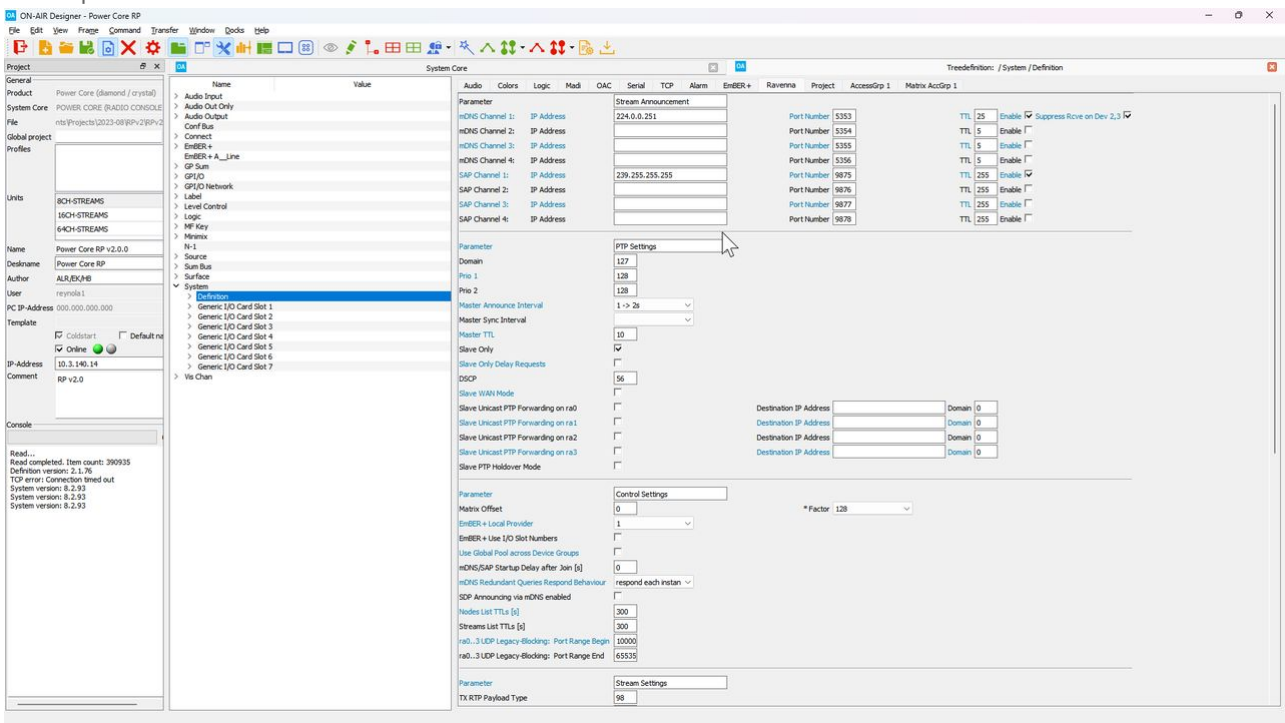
### PTP Settings

It is often necessary to change the PTP domain used by the Power Core RP v2, or to configure the system as a PTP master.

New PTP settings may be entered in the Web UI, however changes made in the Web UI are only temporary and will be reset after the next coldstart.

To permanently change the Power Core RP v2 PTP Settings the ON-AIR Designer configuration file must be edited.

Navigate to the **Tree Definition** window in ON-AIR Designer ( **Command > Treedefinition** in the top menu bar). Expand the **System** folder, select the **Definition** sub-folder, then select the **RAVENNA** tab. The **PTP Settings** section contains all PTP related parameters.





## Network and RAVENNA Settings

Global network and RAVENNA settings can be configured in ON-AIR Designer.

Navigate to the **Tree Definition** window in ON-AIR Designer ( **Command** > **Treedefinition** in the top menu bar). Expand the **System** folder, select the **Definition** sub-folder, then select the **RAVENNA** tab.

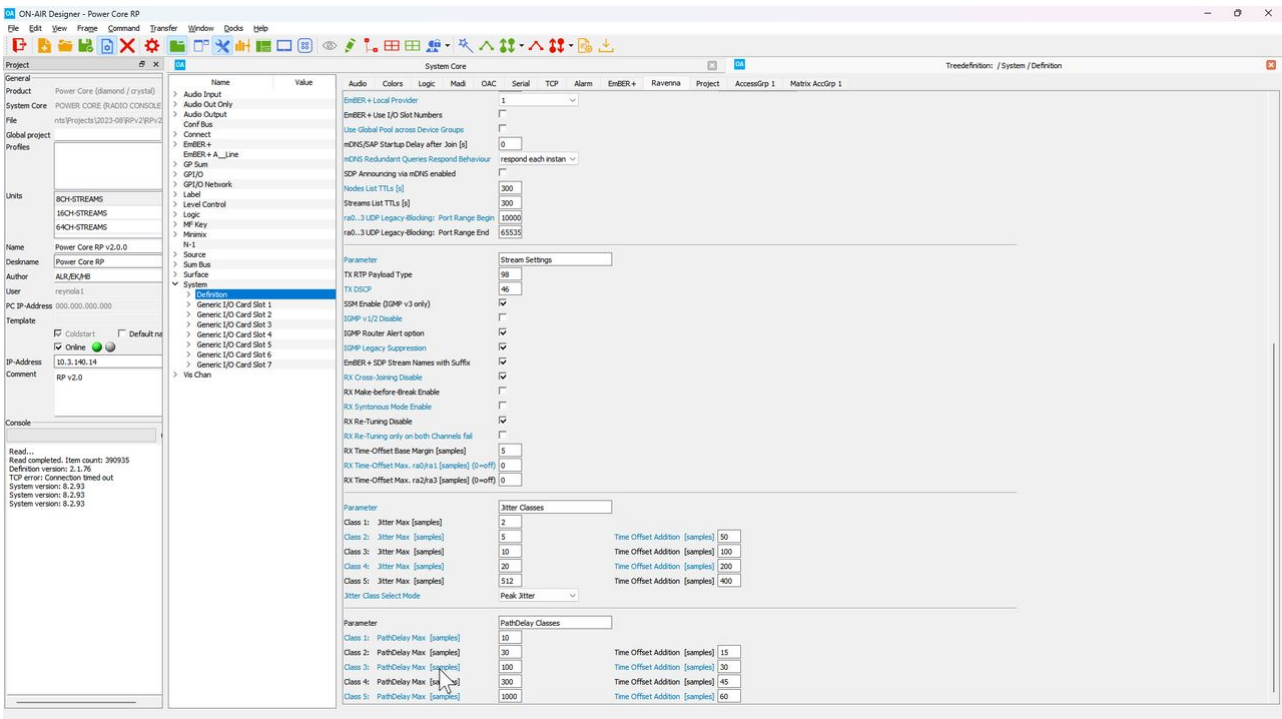
In the **Stream Announcement** section, the following parameters may be configured:

- **mDNS Channel 1-4** - Set the multicast IP address to be used by mDNS advertisements. The default address is 224.0.0.251, however it is possible to use a custom multicast address in situations when routed mDNS advertisements are necessary.
- **SAP Channel 1-4** - Set the multicast IP address to be used by SAP advertisements. The default address is 239.255.255.255.

**i** Custom multicast addresses for mDNS and SAP advertisements are not standardized and may not be supported by other vendors.

In the **Stream Settings** section, the following parameters may be configured:

- **TX RTP Payload Type** - Set the RTP payload type for all streams generated by Power Core RP v2.
- **TX DSCP** - Set the DSCP value for all streams generated by Power Core RP v2.
- **SSM Enable (IGMP v3 only)** - Set this for environments with a IGMPv3 querier or when only source specific multicast joins should be sent.
- **RX Syntonous Mode Enable** - Set this to enable syntonous mode for all stream receivers
- **RX Time-Offset Base Margin** - The minimum time offset to be used for all stream receivers. Useful to ensure a minimum time offset when operating in Syntonous mode.
- **RX Time-Offset Max. ra0|1/2|3** - The maximum time offset that may be set for any stream received on the corresponding device group.







## 13 Power Core RP v2 - Data and Specifications

This chapter contains data to work with such as specifications, drawings and schematics.

- [Power Core RP v2 - Part Numbers](#)
- [Power Core RP v2 - System Reference Levels](#)
- [Power Core RP v2 - Connector Pin-Outs](#)
- [Power Core RP v2 - Matrix Numbers](#)
- [Power Core RP v2 - Ember+ Tree](#)
- [Power Core RP v2 - Technical Specification](#)

Mechanical drawings and data sheets (including weights and dimensions) are available from the [LAWO Download-Center](#) (after login).

Please use the [Power Core RP v2 - Part Numbers](#) to locate the correct information.

## 13.1 Power Core RP v2 - Part Numbers

This topic lists the part numbers for Power Core RP v2.

Power Core		Part Number	Description
Frames	Main frame (revision 3)	710/13	See <a href="#">Power Core RP v2 - Hardware Revisions</a> .
	Main frame (revision 2)	710/11	See <a href="#">Power Core RP v2 - Hardware Revisions</a> .
I/O Cards	MIC / LINE IN	710/20	8 x mono mic/line in
	LINE IN	710/25	4 x stereo line in
	LINE OUT	710/30	4 x stereo line out
	STUDIO I/O	710/35	2 x mono mic/line in 1 x stereo line out 2 x stereo headphones out
	AES3 I/O	710/41	4 x stereo AES3 inputs with SRC 4 x stereo AES3 outputs Bit-transparent
		710/40	as for 710/41 but without bit transparency. This card is discontinued; existing cards can be replaced with the 710/41.
	AES3id I/O	710/42	as for 710/41 but with HD-BNCs
	MADI I/O	710/50	2 x MADI ports (64 I/O channels per port); can be configured for dual-redundant operation.
	MADI SRC I/O	710/60	1 x MADI port (64 I/O channels with SRC)
	DANTE I/O	710/55	2 x DANTE ports, dual-redundant (64 I/O with SRC)
	GPIO	710/80	8 x GPI (optocouplers) 8 x GPO (silent and self-healing relays) 2 x VCA (voltage-controlled inputs)
Software Licenses	RAVENNA Plus (RAV+) Add-on License	250-7130-000	See <a href="#">Power Core RP v2 - License Activation</a> .
Accessories	SFP modules	981/60-xx	See <a href="#">Power Core RP v2 - SFP Transceivers</a> .
	DC power supply	955/50-80	See <a href="#">Power Core RP v2 - Power Supplies</a> .
Spare Parts	USB dongle	250-5998-000	1 x LAWO USB dongle for Power Core.
	Replacement screws for I/O card	271A0106-000	2 x screws for new type I/O card/cover plate. See <a href="#">Power Core RP v2 - Replace an I/O Card</a> .

## 13.2 Power Core RP v2 - System Reference Levels

The **Relative System Level** and **Analog Reference Level** are options that are defined in the configuration. They combine to set the operating levels (analog and digital) for the system.

### Overview

The dynamics elements, as well as various other DSP modules in Power Core RP v2 use relative decibels, or dBr, as opposed to dBFS. For example, when using the dynamics elements (compressor, expander, gate, limiter, de-esser), the threshold values for those elements are in dBr, not dBFS.

How dBr is referenced to dBFS is dependent on the value you choose for the Relative System Level (RSL) in ON-AIR Designer. This value is calculated using the following formula:

- $RSL = \text{working point} - 18\text{dBFS}$

The working point (or reference level, or alignment level), is a level that represents a normal audio level. In the US, the SMPTE RP155-2004 standard specifies that the working point should be -20dBFS. In Europe, EBU R68-2000 specifies the working point should be -18dBFS, and in Germany the working point is -9dBFS.

The -18dBFS offset exists because the Power Core has an additional 18dB/3bits of digital headroom in the DSP section. This allows the user to compensate for very dynamic input signals that require low gain to avoid clipping the microphone pre-amp. It is very important that the level of the signal is reduced below 0dBFS before being connected to an audio output.

### RSL Values

The default Relative System Level is set to -27, which corresponds to a working point of -9dBFS, which is valid for German broadcasters.

For the US, if you want to adhere to the SMPTE RP-155-2004 standard, you should choose an RSL of -38dBFS. This will ensure that your working point, or 0dBr, is at -20dBFS. This will also ensure that the level of the internal tone generator is set to 0dBr/-20dBFS.

For Europe, if you wish to adhere to EBU68-2000, you should choose an RSL of -36dBFS.

The table below shows the values required to comply with the DIN, EBU, and SMPTE metering standards.

	DIN	EBU	SMPTE
ON-AIR Designer: Relative System Level (dBFS)	-27	-36	-38
ON-AIR Designer: Analog Ref Level (dBu)	15	24	24
Operating Level: Analog	+6 dBu	0 dBu	+ 4 dBu
Operating Level: Digital	-9 dBFS	-18 dBFS	-20 dBFS

### What this means in practice

As a practical example, if you set the threshold of the limiter to -10dBr on a source using the internal tone generator, you have a pre-limiter level of -20dBFS, and post-limiter level of -30dBFS.

If the RSL is set to -38dBFS, then the dynamics processors have a maximum threshold of +38dBr/+18dBFS; this is because of the additional 18dB of headroom available within the DSP processor.

The de-esser uses a fixed threshold of 0dBr. This means it will activate anytime a signal reaches 0dBr/-20dBFS or greater.



The compressor in Power Core RP v2 operates slightly differently to traditional compressors. In a traditional compressor, the output gain of the signal will be reduced anytime the input signal level is above the desired threshold. This reduces the dynamic range of the signal, but also means that the overall level of the signal is lower, and therefore you must apply makeup gain to compensate.

Power Core RP v2 also reduces the output gain of a signal anytime the input level is above the specified threshold. However, if the threshold is set below the working point of the system, the Power Core RP v2 compressor automatically increases the output gain anytime the input level is below the working point of the system (in correlation with the ratio). Practically speaking, this allows a user to very quickly and easily compress a signal without dramatically changing the on-air sound. Additionally, it ensures that the output signal level will always be automatically compressed around the defined working point of the system.

### 13.3 Power Core RP v2 - Connector Pin-Outs

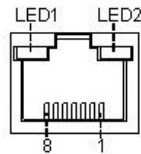
This topic describes the pinning information for each of the main frame connectors and expansion I/O cards.

- Main Frame Connectors
  - CAN
  - RS-422
  - DC Power IN
  - GPIO on front panel (revision 2 frames only)
- Expansion I/O Cards
  - MIC/LINE IN (710/20), LINE IN (710/25), LINE OUT (710/30)
  - STUDIO I/O (710/35)
  - AES3 I/O (710/41, 710/40)
  - AES3id I/O (710/42)
  - MADI I/O (710/50)
  - MADI I/O SRC (710/60)
  - DANTE I/O (710/55)
  - GPIO (710/80)

#### Main Frame Connectors

##### CAN

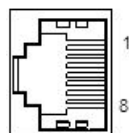
8-pin RJ45 connector, female.



PIN No:	FUNCTION
1	BUS high
2	BUS low
3	GND
4	n.c.
5	n.c.
6	n.c.
7	n.c.
8	n.c.
LED1	CAN Rx
LED2	CAN Tx

##### RS-422

8-pin RJ45 connector, female.

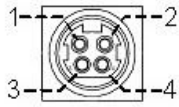


#### SERIAL RS422

PIN No.	RAS/NTP.(1)	DEBUG
1	n.a.	Tx +
2	n.a.	Tx -
3	n.a.	Rx +
4	Tx +	n.a.
5	Tx -	n.a.
6	n.a.	Rx -
7	Rx +	n.a.
8	Rx -	n.a.

### DC Power IN

4-pin Kycon connector, female.

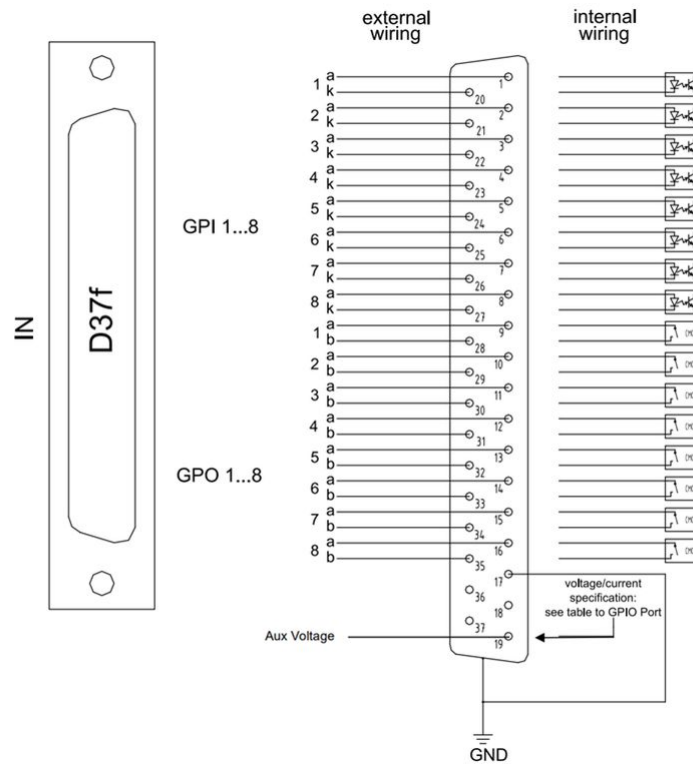


PIN No:	FUNCTION
1	+ 12 VDC
3	+ 12 VDC
2	GND
4	GND

### GPIO on front panel (revision 2 frames only)

37-pin D-type connector, female.

For voltage/current specifications, please refer to the data sheet for the Power Core frame (710/11).

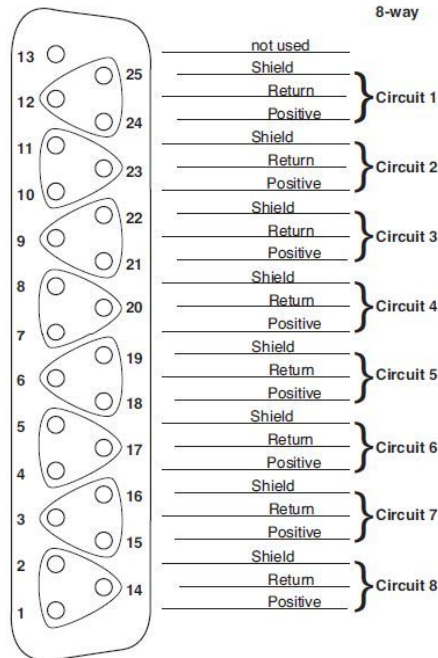


## Expansion I/O Cards

### MIC/LINE IN (710/20), LINE IN (710/25), LINE OUT (710/30)

25-pin D-type connector (DB25), female.

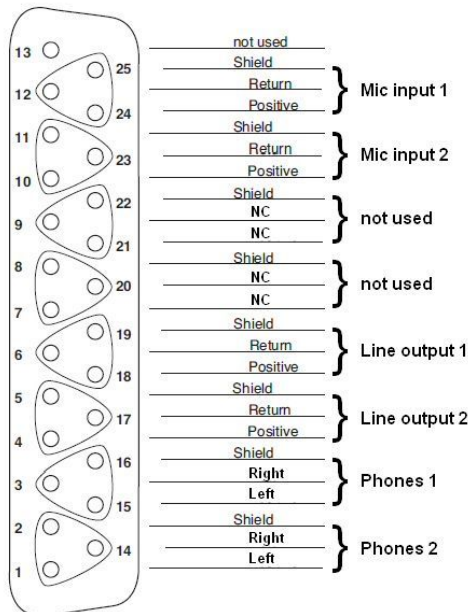
Pinning and gender according to AES59 (TASCAM) standard. All shields are internally connected to system ground.



### STUDIO I/O (710/35)

25-pin D-type connector (DB25), female.

Pinning and gender according to AES59 (TASCAM) standard, except for Phones. All shields are internally connected to system ground.

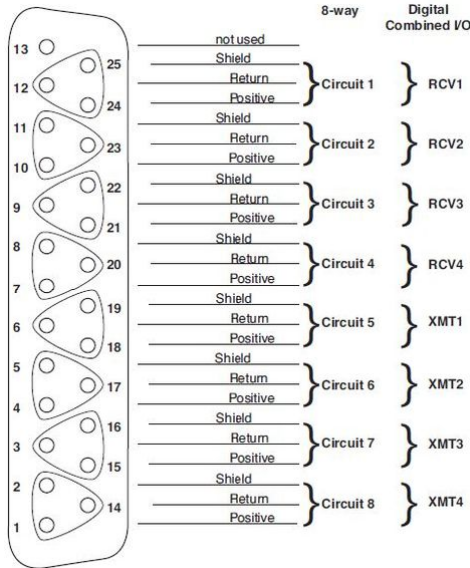


### AES3 I/O (710/41, 710/40)

25-pin D-type connector (DB25), female.

AES3 inputs 1..4 (RCV1..4), AES3 outputs 1..4 (XMT1..4).

Pinning and gender according to AES59 (TASCAM) standard. All shields are internally connected to system ground.



### AES3id I/O (710/42)

8 x HD-BNC, 75 ohm.

AES3 inputs 1..4, AES3 outputs 1..4.

### MADI I/O (710/50)

2 x MADI optical (via SFP).

Connector and fiber types depend on the [SFP module](#).

### MADI I/O SRC (710/60)

1 x MADI optical (via SFP).

Connector and fiber types depend on the [SFP module](#).

### DANTE I/O (710/55)

2 x DANTE (dual-redundant ports).

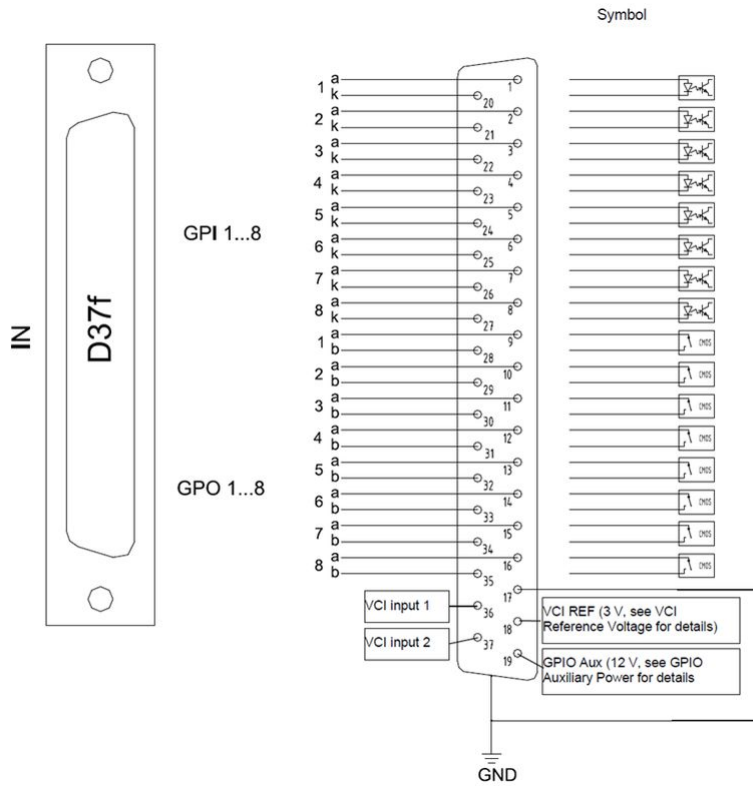
RJ45 connector, standard pinning for CAT5 cabling.



### GPIO (710/80)

37-pin D-type connector, female.

For voltage/current specifications, please refer to the data sheet for the I/O card (710/80).





## 13.4 Power Core RP v2 - Matrix Numbers

When using matrix functions, the inputs and outputs within the Lawo system are addressed using the numbers described in the table below. Note that there are some additional numbers for Power Core (revision 3) to address the two optional RAVENNA ports: ra2 and ra3.

The matrix address is the same as the **ID** number shown in the 'Command -> Inputs/Outputs' lists (in the ON-AIR Designer). Hence, this can be a useful way to determine the address for an individual signal. To control crosspoints within an external matrix, please contact the manufacturer for details on their matrix addressing system.

Matrix Address	Power Core (revision 3)	Power Core (revisions 1 & 2)
1	IO CARDS	IO CARDS
65		
129	MADI 1	MADI 1
193	MADI 2	MADI 2
257	MADI 3	MADI 3
321	MADI 4	MADI 4
385	MADI SLOT 1	MADI SLOT 1
449		
513	MADI SLOT 2	MADI SLOT 2
577		
641	MADI SLOT 3	MADI SLOT 3
705		
769	MADI SLOT 4	MADI SLOT 4
833		
897	MADI SLOT 5	MADI SLOT 5
961		
1025	MADI SLOT 6	MADI SLOT 6
1089		
1153	MADI SLOT 7	MADI SLOT 7
1217		
1281	MADI SLOT 8	MADI SLOT 8



<b>Matrix Address</b>	<b>Power Core (revision 3)</b>	<b>Power Core (revisions 1 &amp; 2)</b>
1345		
1409	RAVENNA (ra0, ra1)	RAVENNA (ra0. ra1)
1473		
1537		
1601		
1665	LOOPBACKS	LOOPBACKS
1729		
1793		
1857		
1921	GT	GT
1985		
2049	UDP	UDP
2113	RAVENNA (ra2, ra3)	not applicable
2368		

## 13.5 Power Core RP v2 - Technical Specification

This topic provides technical data for Power Core

- [Power Core Frame \(revision 3\)](#)
  - [Dimensions](#)
  - [Weight](#)
  - [Power: AC PSU \(included\)](#)
  - [Power: DC PSU \(optional\)](#)
  - [Environmental Specifications](#)

### Power Core Frame (revision 3)

#### Dimensions

- Height x Width x Depth: 44,0 mm (1RU) x 483 mm (19") x 385 mm (15,2")
- Depth measured includes locking devices.

#### Weight

- Frame without rear expansion I/O cards: 4.5kg (9.9lb)

#### Power: AC PSU (included)

- Connector: 1x IEC
- Input Voltage: nominal 1x 100-120V AC / 1x 200-240V AC, +/- 10%, 50/60Hz
- Max consumption: < 90W

#### Power: DC PSU (optional)

External DC power supply, 955/50-80:

- Height x Width x Depth: 72 mm (2,8") x 35 mm (1,38") x 175 mm (6,9")
- Weight: 0.67kg (1.5lb)
- Connector: see [Power Core - Power Supplies](#).
- Cable length, without plug: 1200 mm (47,2")
- Input Voltage: nominal 1x 12V DC
- Indicators: 1 x status LED (power)
- Max consumption: < 90W

#### Environmental Specifications

- Operating temperature: 0°C to +30°C (+32°F to + 86°F)
- Storage temperature: -20°C to +70°C (-4°F to +158°F)
- Relative humidity: < 85% non-condensing
- Ventilation/Airflow: from right to left cooling in frame