

# A\_\_mic8 / A\_\_digital8

## User Guide

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# 1. Introduction

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## About this Manual

This document describes how to install and configure the **A\_\_mic8** and **A\_\_digital8**. The specification is valid for Image Version 10.0.2.x.

Other useful resources include the:

- **A\_\_line Data Sheets** - a full technical specification for each device.
- [Lawo IP Networking Guide](#) - more about the data network requirements and suitable components for AoIP.

All Lawo manuals are available from the **Downloads** area at [www.lawo.com](http://www.lawo.com) (after **Login**).

Look out for the following which indicate:

**Notes** - points of clarification.

**Tips** - useful tips and short cuts.

**Attention:** Alert you when an action should *a/ways* be observed!

## Utility Software

Each device is configured via a series of HTML pages. No specific software is required other than a suitable web browser.

## Lawo User Registration

For access to the **Download-Center** and to receive regular product updates, please register at:

[www.lawo.com/user-registration](http://www.lawo.com/user-registration).

## 2. Important Safety Instructions

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Please observe all of the instructions provided in the "General Safety Information for Lawo Equipment" booklet delivered with your devices. Double-click [here](#) to open the same information (as a pdf).

## 3. Overview



The **A\_mic8** and **A\_digital8** are members of Lawo's A\_line series. Each 1RU, 19-inch unit provides a range of local inputs and outputs, plus two dual-redundant streaming ports for Audio over IP (AoIP). By networking multiple nodes, signals can be easily distributed between different device locations.

### Local IO

<b>A_mic8 (985/01)</b>	<b>A_digital8 (985/02)</b>
8 x mic/line in	8 x AES3 in
4 x line out	4 x AES3 out
8 x GPI	8 x GPI
8 x GPO	8 x GPO

### Network Interfaces

The rear panel provides two female RJ45, Gigabit Ethernet interfaces to stream the unit's local IO signals to and from the IP network. The interfaces support the SMPTE ST2110-30/31, AES67 and RAVENNA standards. By connecting and configuring both ports to discrete network paths, the unit can support redundant streaming via SMPTE 2022-7 Seamless Protection Switching. Using a standard CAT5 cable, the device can be located up to 80m from the network switch. To extend the cable length, an optional Coax converter must be fitted.

### Wordclock IN & OUT

The **A\_mic8** and **A\_digital8** come with Wordclock IN and OUT to expand the unit's synchronization options.

### Power

The interfaces have no fans or internal power supply. They can be powered using either Power over Ethernet (PoE), or an external 12V DC power supply which is optional. Power redundancy is achieved by connecting both; in this instance, PoE takes priority.

### Control

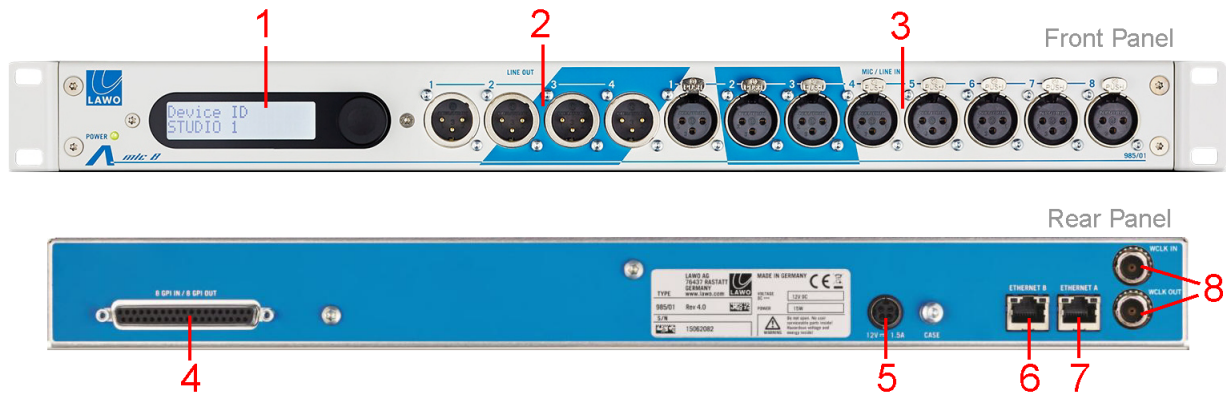
The front panel display and rotary control provides access to basic parameters such as the IP address of each streaming port. All other parameters are accessed via a series of HTML pages. These can be remotely controlled from a computer connected to the streaming network by opening a web browser connection to either Ethernet port. The device's Landing page provides access to all HTML resources. These include the Device Parameters and GPIO pages (for local parameter control), and the RAVENNA Web UI (used to select the sync source, set the sample rate and manage all streaming connections).

Once configured, all parameters are accessible via Ember+. From Image Version 10.0.0, this includes the internal Routing Matrix which maps the device's local IO signals to and from the RAVENNA streams.

Parameters can also be controlled from an mc<sup>2</sup> mixing console if the mc<sup>2</sup> system and A\_line device are correctly configured. For more about this application, please refer to the separate "RAVENNA for mc<sup>2</sup>/Nova User Guide".

# 4. Controls, Connectors & Indicators

## 4.1 A\_mic8



### 1 Status Display & Menu Control

From here you can view and edit basic parameters such as the IP address of each streaming port. The **POWER** LED illuminates as soon as power is applied.

### 2 4 x LINE OUT

Four line level outputs (XLR) for connection to local devices (balanced; floating; suitable for unbalanced use; maximum output level +24dBu).

### 3 8 x MIC/LINE IN

Eight mic/line inputs (XLR) for connection to microphones and other local devices (balanced; galvanic separated; suitable for unbalanced use; click-free gain adjustment; gain range 118dB<sub>A</sub>; +48V phantom power; -20dB PAD; maximum input level +24dBu).

### 4 8 x GPI IN / 8 x GPI OUT

Eight General Purpose Inputs and Outputs (D-Sub) for local signaling and switched functions:

- GPI: 8 x optocouplers (3-36 VDC / 8mA @ 36V).
- GPO: 8 x silent CMOS relays (50V AD/DC / 0.5A AC; 1.0A DC).

### 5 12V DC Input

This is the connection to the external 12V DC power supply. The power supply is optional and must be used if Power over Ethernet (PoE) is not available, or if power redundancy is required. The **CASE** grounding screw should be used to ground the frame.

### 6 & 7 ETHERNET A & ETHERNET B

These are the two streaming ports which connect the unit to the AoIP network (RJ45, Gigabit Ethernet: 100/1000 Base-T). If only one port is connected, then the device supports non-redundant streaming. Connect both ports to configure redundant streaming via SMPTE 2022-7 (SPS). Both ports provide access to the HTML pages. ETHERNET A supports Power over Ethernet (PoE).

### 8 WCLK IN & WCLK OUT

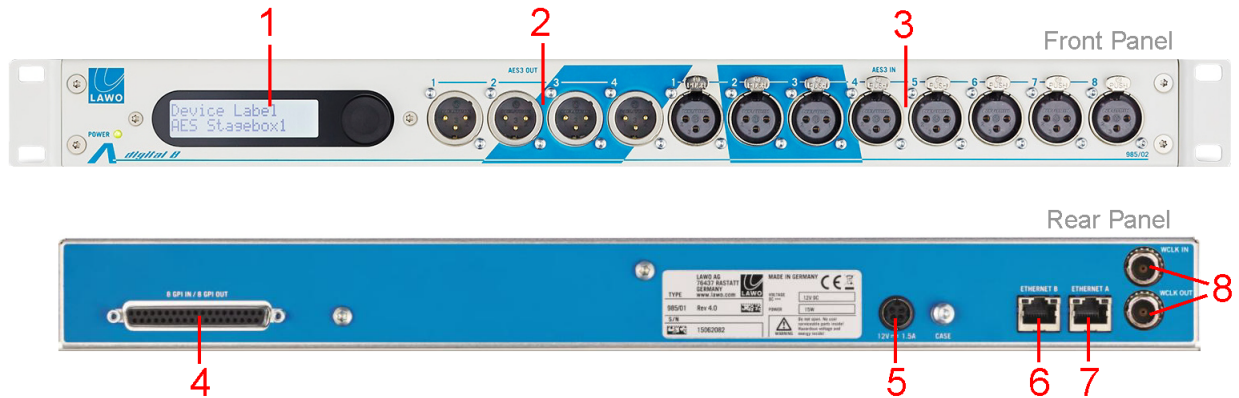
A\_mic8 features Wordclock connectivity on the rear of the device. The two standard BNC connectors provide:

- **WCLK IN** - to connect an external Wordclock reference signal to sync the device.
- **WCLK OUT** - to output the active sync source (PTP, Wordclock or Internal) of the device.

The Wordclock input signal can be used to generate a corresponding PTP reference, so that other nodes can sync via the IP network. Please note: if you are using a mixture of PTP and WCLK references within your installation, then it is mandatory to derive them from the same master reference (e.g. GPS). Otherwise sync offset issues will result in audible audio artifacts.

The Wordclock output can be used to distribute the active sync source to other units via BNC.

### 4.2 A\_\_digital8



The **A\_\_digital8** is identical to the **A\_\_mic8** except for:

#### 2 4 x AES3 OUT

Four stereo AES3 outputs (XLR) for connection to local devices (balanced; floating; galvanic isolated; 110 output impedance).

#### 3 8 x AES3 IN

Eight stereo AES3 inputs (XLR) for connection to local devices (balanced; floating; galvanic isolated; 110 input impedance). Input 1 can be used to connect a clocking signal.



# 5. The Streaming Ports

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The two streaming ports (**ETHERNET A** & **ETHERNET B**) conform to the following specifications.

## 5.1 RAVENNA Net

All RAVENNA Net interfaces provide:

- SMPTE 2110-30/31 AES67/RAVENNA: multi-channel digital audio-over-IP.
- Per port: up to 128 bi-directional channels at 48kHz AND 96kHz.
- Per port: up to 128 TX and 128 RX streams.

RAVENNA Net connections *must* be made via the streaming network (i.e. to and from a RAVENNA-compatible network switch). This ensures that the network's PTP clock signal is available to all streaming ports.

RAVENNA streaming requires proper configuration and management of the data network. The network *must* use a suitable 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 RAVENNA interfaces using an unqualifying IP network, as correct streaming operation cannot be guaranteed.

You can find more details about the data network requirements in the [Lawo IP Networking Guide](#).

## 5.2 Network Cables & Connectors

### Copper Connections

Choose an Ethernet cable that meets the following specification:

- CAT 5 or better (CAT 5e/6/7); straight (1:1) or crossed Ethernet cable.
- Connector Type: RJ45.
- 1000, 100 or 10 Base-TX LAN; **1000 Base-TX** (Gigabit Ethernet) is recommended.
- Cable Length: up to 80m.

### Optical Fibre Connections

To support optical fibre, an optional Coax converter must be fitted.

## 5.3 SMPTE 2022-7, Seamless Protection Switching (SPS)

SMPTE 2022-7 is a method of recovering lost data packets when streaming data over an IP network. The technology is also known as Seamless Protection Switching (SPS). Within a RAVENNA installation, it can be used to provide main and redundant paths for audio/video streams and PTP synchronization.

### Compatible Devices

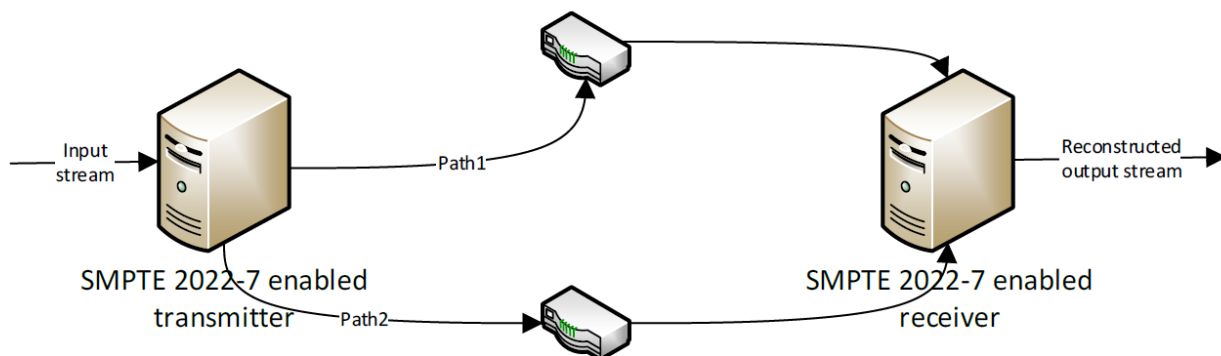
Lawo devices that support SMPTE 2022-7 are:

- 981/61 RAVENNA IO module - fitted to the Nova73, Nova37, mc<sup>2</sup>36 and mc<sup>2</sup> Micro Core.
- mc<sup>2</sup>56 MKIII and mc<sup>2</sup>96 Local IO.
- A\_\_line devices: A\_\_mic8, A\_\_digital8, A\_\_madi4, A\_\_stage48, A\_\_stage64, A\_\_stage80.
- Power Core<sup>RP</sup> (for mc<sup>2</sup>/Nova Remote Production).
- Radio consoles: ruby / Power Core, crystal / Compact Engine.
- Virtual radio applications: R3LAY VRX<sup>4</sup>, R3LAY VRX<sup>8</sup> and R3LAY VPB.

SMPTE 2022-7 is supported from mc<sup>2</sup>/Nova Version 5.14.0 and Image Version 10.0.0.x onwards.

### Concept

The diagram below illustrates the concept in a standard data network:



A SMPTE 2022-7-enabled transmitter duplicates the input stream and sends it via two different paths to the destination receiver. The receiver (also SMPTE 2022-7 enabled) combines the streams from both paths and reconstructs the original stream. If a packet was lost on path 1, the packet is taken from path 2. If path 1 is lost completely, then the entire stream is taken from path 2, and vice versa. The result is that the receiver can switch from one path to the other without impacting upon the stream content.

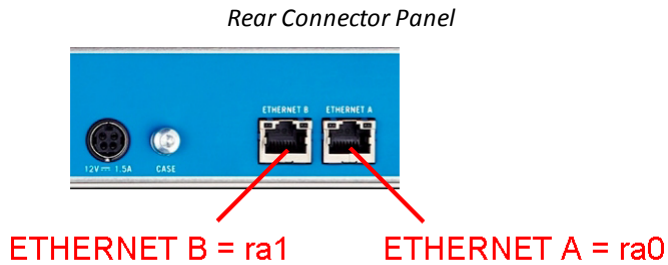
### Configuration

To configure SMPTE 2022-7 within a RAVENNA streaming network, will need to create the two separate paths for each data stream. This means doubling the network's infrastructure and then connecting each sending and receiving device to both paths. Within Lawo systems, the two paths are usually known as the primary (red) and secondary (blue) networks.

For the A\_\_mic8 / A\_\_digital8, the two streaming paths can be created by connecting both of the **ETHERNET A** and **ETHERNET B** ports to the network, and using the RAVENNA Web UI to configure main and redundant streams.

### 5.4 Port Labeling

On the rear connector panel, the two streaming ports are labeled as **ETHERNET A** and **ETHERNET B**. However, on the front panel display and within the RAVENNA Web UI, they appear as **ra0** and **ra1**. This is important to know when editing settings from the front panel or using the Web UI:



*Network Interfaces (in the Web UI)*

#### ≡ Network

strm0

ra0      **Address** 10.3.192.120

ra1      **Address** 10.3.192.121

Other network settings ...

### Creating SMPTE 2022-7 Compatible Streams

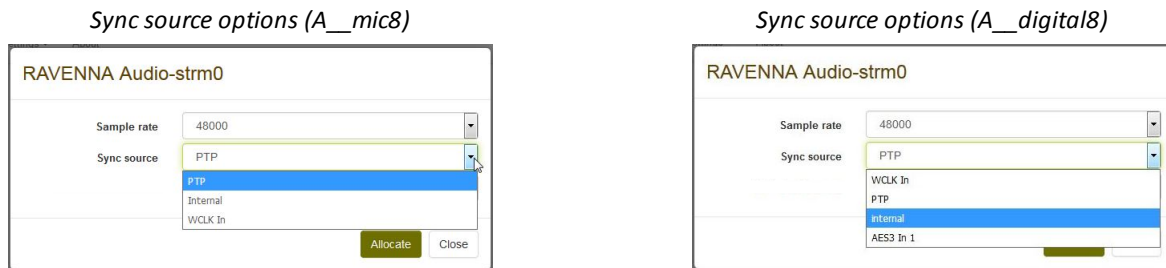
To create the two network paths required for SMPTE 2022-7 (SPS), the ports are paired as indicated in the RAVENNA Web UI:

- **strm0** (ra0 + ra1) = (ETHERNET A + ETHERNET B)

## 6. Synchronization

### 6.1 Sync Reference Options

The active sync source for the A\_\_mic8 / A\_\_digital8 is selected using the RAVENNA Web UI:



For the **A\_\_mic8**, you can choose one of three options:

- **PTP** – arriving from/sending to the RAVENNA streaming network (via ETHERNET A or ETHERNET B).
- **Internal** – the device's own internal sync generator.
- **WCLK In** – external wordclock connected to the WCLK IN.

For the **A\_\_digital8**, there is a fourth option:

- **AES3 In 1** – external AES3 connected to IN 1.

To sync to an external reference, the clocking signal *MUST* match the internal sample rate of the device.

### 6.2 Using PTP


For correct synchronization via PTP, the RAVENNA streaming network requires a PTP master clock source. This can be achieved by using a RAVENNA node or installing a separate grandmaster device. A PTP master should be capable of taking an incoming sync signal and generating PTP clock. Please note:

- PTP uses a master-slave approach in which all master-capable devices elect the best master, called the grandmaster, according to a common algorithm known as the “Best Master Clock Algorithm”.
- At any moment in time, there can be only one PTP master operating on the network.
- For a master-capable device, the RAVENNA Web UI defines the [PTP mode](#): Slave only or master-slave. In master-slave mode, the device will operate as either a master or slave depending on the PTP priorities set within the device itself and all other streaming nodes.

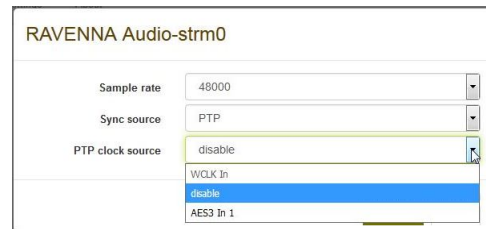
### A\_\_mic8 / A\_\_digital8 as PTP Master

When operating as a PTP master, the A\_\_line device transmits PTP *to* the streaming network via both of its interfaces: ETHERNET A and ETHERNET B. The reference clock for the PTP signal can be selected using the RAVENNA Web UI. For the A\_\_mic8, you can choose either Internal or WCLK IN. For the A\_\_digital8, you can choose Internal, WCLK IN or AES3 In 1.

PTP clock source options (A\_\_mic8)



PTP clock source options (A\_\_digital8)



To generate PTP from an external reference, the clocking signal *MUST* match the internal sample rate of the device.

### A\_\_mic8 / A\_\_digital8 as PTP Slave

When operating as a PTP slave, the A\_\_line device locks to PTP received *from* the streaming network via either of its interfaces: ETHERNET A and ETHERNET B. The device's sync source must be set to PTP using the RAVENNA Web UI (as described [earlier](#)).

### Installing a Grandmaster Device

If you wish to install a third-party PTP master device, then Lawo recommends Meinberg clock generators.

Alternatively, for networks utilizing SMPTE 2022-7, you could install a Lawo A\_\_madi4. This brings a number of advantages:

- A\_\_madi4 can transmit PTP to the network via both of its interfaces. Thus supporting the two separate network paths required for SPS.
- A\_\_madi4 provides two independent bridges. Thus it can provide redundancy for the PTP clock source.

To implement this solution, the A\_\_madi4 *must* be clocked to a reliable Wordclock signal. Lawo recommends Rosendahl Wordclock generators.

### Checking the PTP Sync Status

Once all of the streaming devices are connected and configured, the PTP sync status can be checked from the "[Sync](#)" area of the RAVENNA Web UI Home page.

## 6.3 Non-PTP Installations

If PTP is not available and all devices support synchronised streaming, then you can use external Wordclock as the sync reference for all streaming nodes.

To support this option, you must have ordered the Wordclock version of the A\_\_mic8 / A\_\_digital8 and have a reliable Wordclock signal that can be distributed to all nodes on the network.

Please note:

- For correct synchronization without PTP, the same sync source *must* be selected at all streaming nodes!
- All nodes *must* support synchronised streaming. This is true for all Lawo RAVENNA interfaces, but must be checked for third-party devices.

## 7. Installing the Unit

### 7.1 Checklist

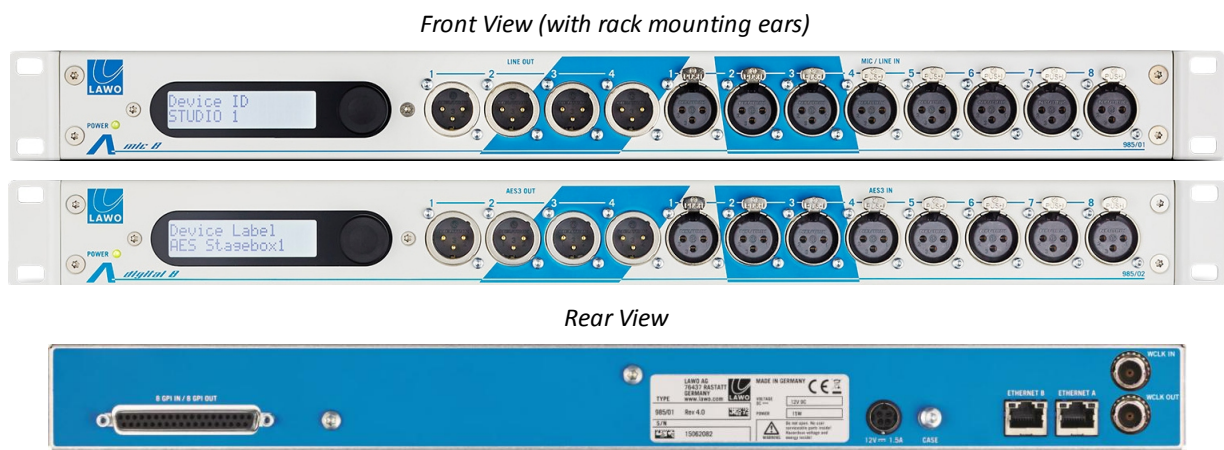
To install the device, please complete each of the following steps:

1. Unpack and check the contents of the shipping box. You should find:
  - 1 x **A\_\_mic8 / A\_\_digital8**
  - 1 x External 12V DC Power Supply (optional)
  - 1 x CAT5 to Coax Converter (optional)
  - 19" rack-mounting kit (optional)

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

2. Install the frame.

The unit is delivered with rack-mounting ears fitted to the sides of the frame - this is ideal for mounting the unit in a 19" housing:



3. Connect your local audio, GPIO and, if applicable, external sync signals. See [Controls, Connectors & Indicators](#).

At this stage, do NOT connect the **ETHERNET** ports to the network, as first you must configure their IP settings.

**A\_\_mic8 / A\_\_digital8** is a fanless unit and relies on convection cooling. Please do NOT obstruct the ventilation holes when connecting your cabling.

4. Apply power, either by using Power over Ethernet or the external 12V DC power supply.

To use Power over Ethernet, a suitable powering device should be connected to the **ETHERNET A** port - for example, a powering network switch or **V\_\_line** device.

To use the external power supply, connect its power cable to the **12V DC IN** port. The port uses a locking 4-pin DIN connector. So, to fully insert or remove the power cable, you must pull back its collar away from the socket.

If both PoE and the external supply are connected, then the unit benefits from power redundancy. In this instance, PoE takes priority.

The unit has no on/off switch and starts automatically as soon as power is applied - the **POWER** LED on the front panel illuminates. The front panel display shows "**initializing...**" while the unit is booting. When the boot process is complete, you will see "**Device ID**" - the unit is now ready for configuration.

## 7.2 Getting Operational

Once the unit has booted the next steps are:

1. Check and edit the network settings using the front panel [display](#).

**IMPORTANT:** Each streaming port must be given a unique IP address before it is connected to the network (to avoid IP conflicts).

2. Connect the device to the network using **ETHERNET A** and/or **ETHERNET B**. If you wish to configure SMPTE 2022-7 compatible streams, then both ports must be connected.
3. Open the device's [Landing Page](#) to check the network communication.
4. Open the [RAVENNA Web UI](#) to check and update the device firmware. Then define the device's sync settings, sample rate and streaming connections.
5. Open the [Device Parameters](#) and [GPIO](#) pages to adjust the local parameters.
6. **Optional:** open the [Ember+ Tree Viewer](#) to check the status of Ember+ parameters or switch a parameter manually.

## 8. Front Panel Parameters

The front panel display and rotary control provide access to local device parameters:



Turn the control to scroll through the available menus. Then push down to access the next level or edit the value. In each case, you can confirm all changes by pressing down on the **o** (ok) symbol. Alternatively, to exit without accepting the changes, press down on the **x** (exit). A step-by-step example is described below.

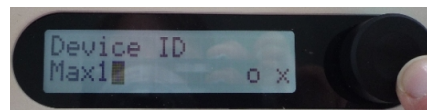
### 8.1 Editing Parameters from the Front Panel

The steps below show how to edit the **Device ID**. All other parameters can be edited in a similar manner.

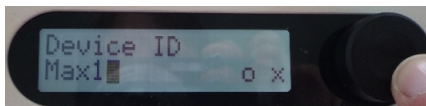
1. Turn the rotary control until you see the parameter you wish to edit - the current value is displayed. Then push down on the control to edit the ID - a cursor appears below the first field:



2. Turn the rotary control again to select a character, and press down to edit the selected field - the field flashes with a "filled" background:



3. Turn to select a new value, and press down to confirm the change.



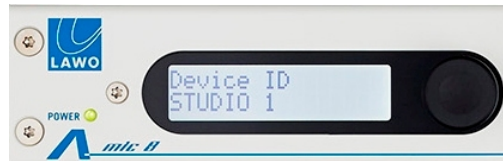
4. Repeat steps 2 and 3 to edit the other character fields as required.
5. Finally, turn the control to select the **o** (ok) symbol, and press down to confirm the **Device ID** change - the changes are accepted:



Alternatively, to exit without accepting any of the character field changes, press down on the **x** (exit) symbol.



### 8.2 Network Settings



#### Device ID

The Device ID must be a unique ID which identifies the unit within the IP network. Short, descriptive names are recommended. Use only normal characters, numbers and "\_" or "-" without spaces. Up to 31 characters are permitted. The default ID is blank.

#### Device Label

The Label is optional, but can be useful in a networked installation with multiple devices. The default Label is blank.

#### Network Settings

The Network Settings menu defines four parameters (**Network Mode**, **IP Address**, **Netmask** and **Gateway**) for each streaming port (**ra0** and **ra1**). The port labeling corresponds to the rear connectors as follows:

- ra0 = ETHERNET A
- ra1 = ETHERNET B

Note that you edit several parameters in one visit and then select **Apply changes** to confirm.

#### Network Mode

The **Network Mode** can be set to one of the following options:

- **Static** - select this mode to enter the IP Address, Netmask and Gateway manually, as described below.
- **DHCP** - select this mode to receive an IP Address automatically from the network's DHCP server.
- **Auto** - in this mode, the unit will automatically assign its own IP address.

In the current RAVENNA release, the Configuration *must* be set to **Static** (so that a static IP address can be allocated to each streaming port). The **DHCP** and **Auto** modes are not supported.

#### IP Address, Netmask and Gateway

The **IP address** *must* be unique, and lie within the same IP address range as all other RAVENNA streaming nodes (i.e. the first three fields must match). The default IP addresses are:

- ra0 (ETHERNET A) = **192.168.101.250**
- ra1 (ETHERNET B) = **192.168.101.251**

The **Netmask** *must* match the Subnet Mask of all other RAVENNA streaming nodes. The default Netmask = **255.255.255.0**

A **Gateway** is required if data packets are to be redirected. For example, if the streaming port is connected via a network switch with Layer 3 routing capability. If redirection is not required, then the Gateway can be left at its default = **0.0.0.0**

Check the IP settings of all streaming ports carefully. If there is an IP conflict, then the network will not operate correctly.

## 8.3 System Menu

The **System** menu provides access to the following options:

### Reboot

Press down and then confirm to reboot the device. Once the reboot is complete, the latest settings will be restored.

### Factory Defaults

Press down and then confirm to reset the device to the factory default settings.

This operation will overwrite all existing settings and, therefore, should be used with caution!

## 9. Connecting a Service Computer

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To open the Landing Page, and other HTML resources, you will need a computer with a LAN connection. There are no special requirements other than a suitable web browser, but it is a good idea to check that the computer meets the RAVENNA Web UI [Prerequisites](#).

1. Connect the computer to the streaming network.
2. Then configure the TCP/IP settings of the computer's Network Interface Card.

### TCP/IP Settings

#### ➤ IP Address

The IP address must be unique, and lie within the same IP address range as that of the port you are connecting to (i.e. the first three fields must match).

For example, if the ETHERNET A port has an IP address of **192.168.101.250**, then set your computer's IP address to **192.168.101.255** (providing **.255** is not already in use).

You can check the IP address of each streaming port from the device's front panel [display](#).

#### ➤ Subnet Mask

The Subnet Mask must match that of the port you are connecting to. In all Lawo systems, the default Subnet Mask = **255.255.255.0**.

#### ➤ Default Gateway

A Default Gateway setting is required if data packets are to be redirected. For example, if the PC is connected via a network switch with Layer 3 routing capability. If redirection is not required, then the Default Gateway can be left blank.

Check the IP settings carefully. If there is an IP conflict, then the network will not operate correctly.

### Testing the Connection

The simplest way to check the connection is to [open](#) the Landing page.

If you are having problems with the network communication, then check your physical connections. Then check both the [Network Settings](#) of the device and the TCP/IP settings of your computer's network interface card. You can also try running a [PING test](#) and/or disabling your computer's firewall (if active).

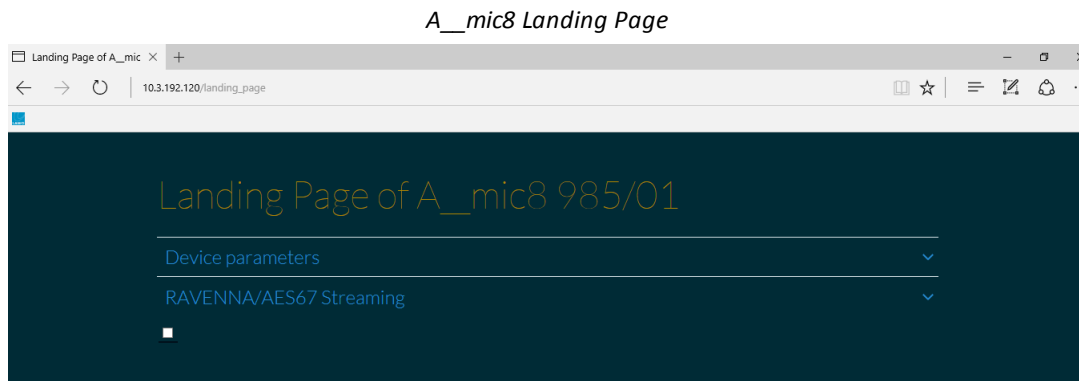
## 10. The Landing Page

The Landing Page provides access to all of resources required to configure the system. Note that the page does not adjust any settings directly, but provides a gateway to the HTML resources.

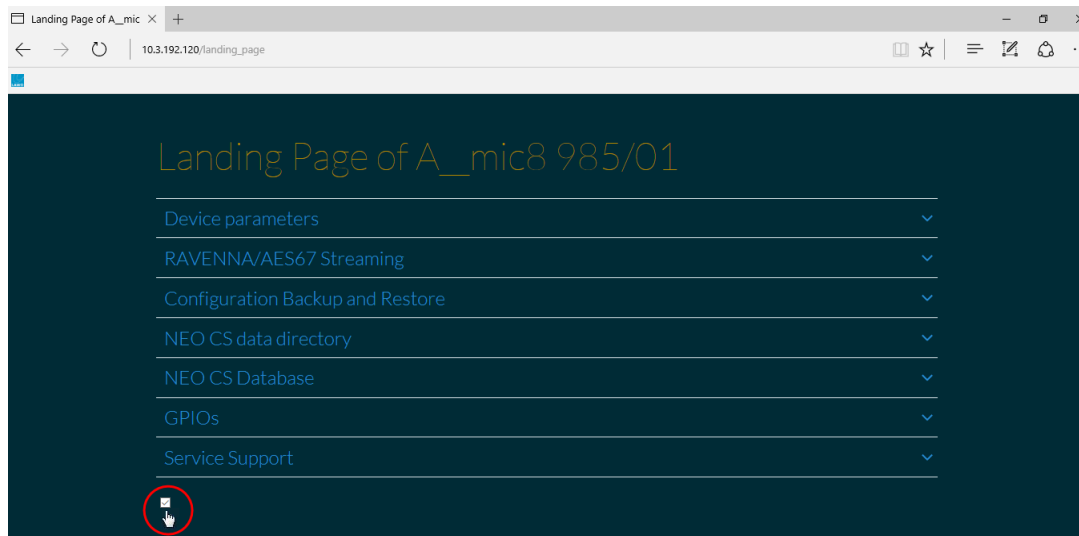
### 10.1 Opening the Landing Page

1. Open your browser software, and enter the IP address of the device's **ETHERNET** port into the URL field. You can check the IP address of each streaming port from the device's front panel [display](#). Either address can be used providing both ports are connected to the network.
2. Press Enter - the browser connects and the landing page appears.

The text headlines show the resources:



3. Tick the small white checkbox to enter "service mode" - the page updates to reveal more resources:



## 10.2 Landing Page Resources

For the **A\_\_mic8** and **A\_\_digital8**, the landing page provides access to:

- **Device parameters** - local audio parameter control.
- **RAVENNA/AES67 Streaming** - the RAVENNA Web UI.

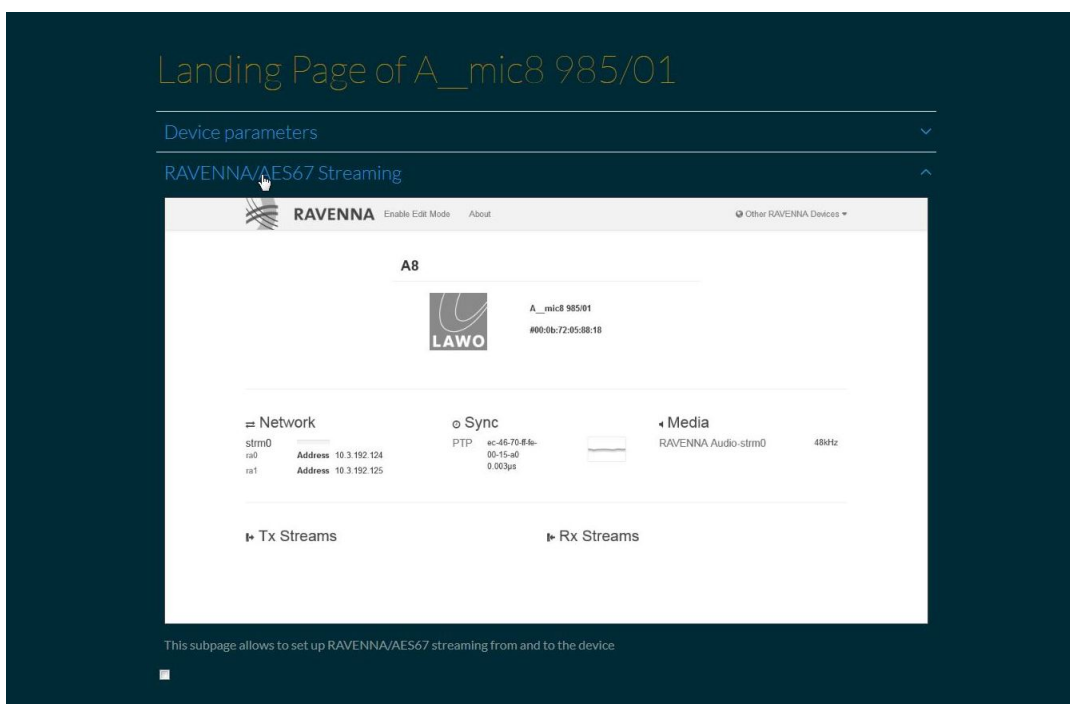
And, in service mode:

- **Configuration Backup and Restore** - backup and restore options (for use when exchanging a unit).
- **NEO CS data directory & Database** - pages useful for Lawo support.
- **GPIOs** - local GPIO control.
- **Service Support** - can be used to download a snapshot of the settings (useful for Lawo support if there is a problem with the device).

## 10.3 Opening a HTML Resource

In each case:

1. Click on the headline to show (or hide) a preview:



2. Then click on the image to open the resource in a new browser window.

In our example, this will open the RAVENNA Web UI [Home](#) page.

Note that the previews shown in step 1 use static library images. Therefore, do not expect them to update in real time or represent the actual settings on the connected device!

## 11. The RAVENNA Web UI

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This chapter describes the RAVENNA Web UI, otherwise known as the "Butler" interface.

### 11.1 Applications

For A\_\_mic8 or A\_\_digital8 devices, the RAVENNA Web UI is used for three main tasks:

- To check and, if necessary, update the device firmware.
- To edit the device's sync source and sample rate.
- To create and manage the TX and RX streams, including SMPTE 2022-7 compatible streams.

Note that the latest settings are stored locally on the device, and are re-instated following a power cycle or reboot.

Any settings changed from the RAVENNA Web UI can be backed up (and restored) using the [Backup & Restore Config](#) tool. This is ideal if you need to exchange a device.

### 11.2 Prerequisites

To run the RAVENNA Web UI, your computer *MUST* meet or exceed the following requirements:

- **Processor:** Pentium 166 or higher
- **RAM:** 64 MB
- **Network Interface Card:** operating at 100 or 1000 Base-T
- **Screen Resolution:**  $\geq 1024 \times 786$
- **Web Browser:** Microsoft Internet Explorer, Mozilla Firefox, Apple Safari or Google Chrome. Please install the latest version of the browser for best performance.

### 11.3 Opening the Home page

To open a RAVENNA Web UI connection:

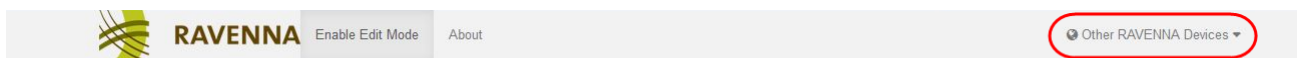
1. Connect a service computer and configure its TCP/IP settings as described [earlier](#).
2. Open the [Landing page](#), select **RAVENNA/AES67** and then click on the graphical preview.

The RAVENNA [Home](#) page should appear.

## 11.4 Navigating to Other RAVENNA Devices

Once the [Home](#) page is open, you can navigate to any other discovered device on the network.

1. Click on **Other RAVENNA Devices** at the top right of the Home page:

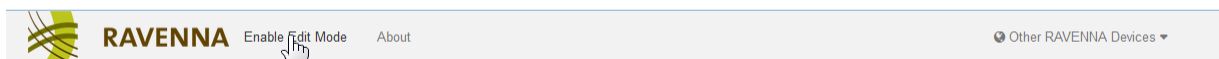


2. Choose an option from the drop-down list of devices - its [Home](#) page will open.

## 11.5 Enabling Expert Mode

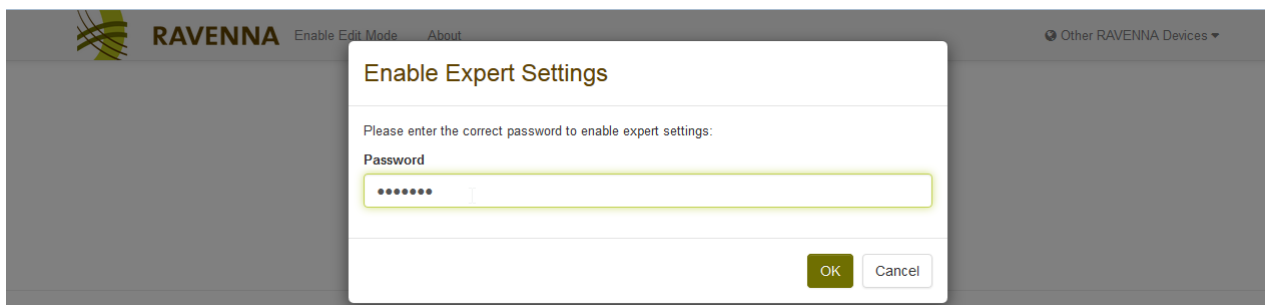
Many operations are hidden from view unless you are running in expert mode. To enable expert mode:

1. Select **Enable Edit Mode** from the headline at the top of the Home page:



A pop-up window appears.

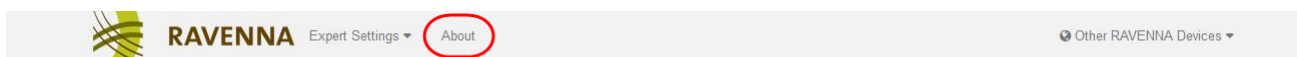
2. Type in the Password - **ravenna** - and click **OK**



The [Home](#) page updates to show all of the locked functions, and **Enable Edit Mode** updates to **Expert Settings** (to access to the [Expert Settings](#) menu).

## 11.6 Checking the Firmware Version

To check the firmware version, select **About** from the headline at the top of the Home page:



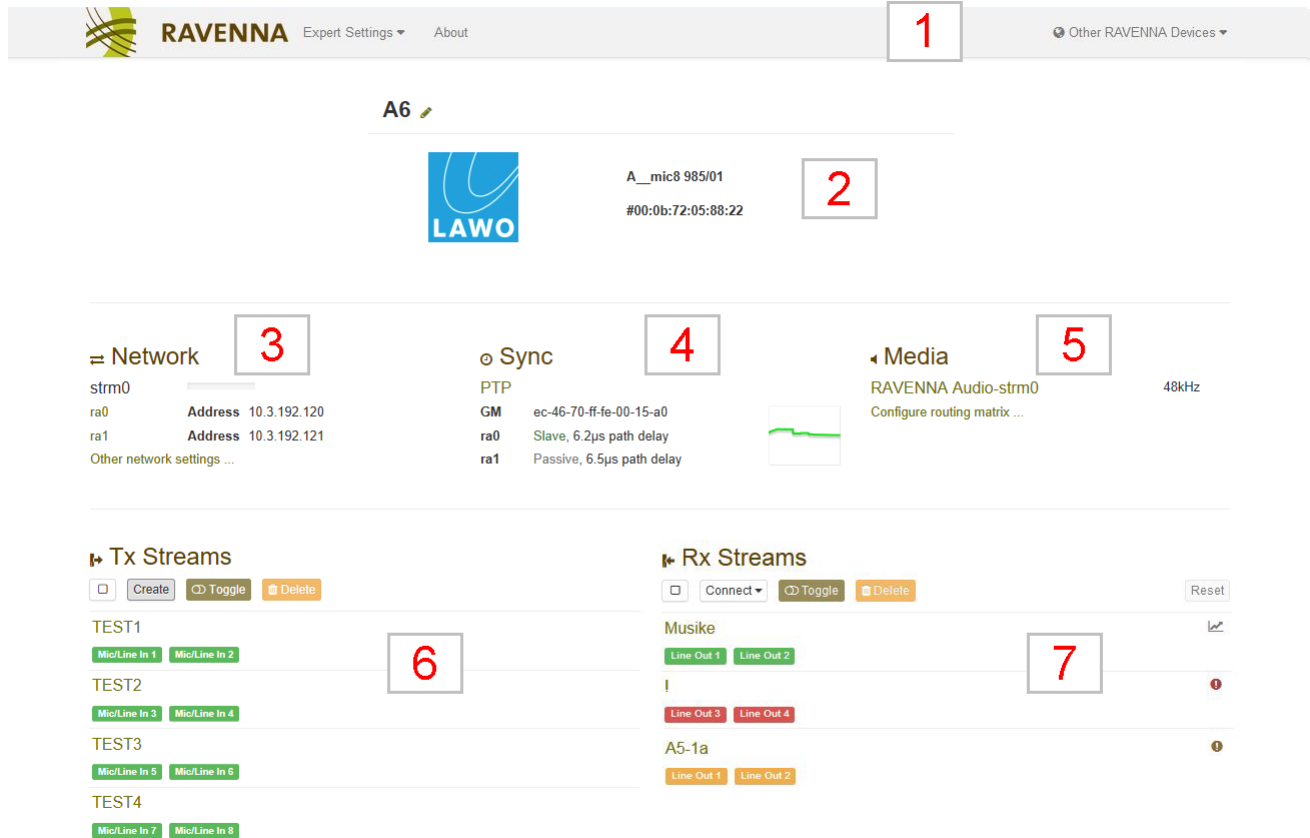
The 'About' dialog box opens. The **Image version** describes the RAVENNA release installed on the device. It is important that all nodes on the network are running compatible Image versions, so if the number is not correct, you will need to update the device.

To do this, use the **Expert Settings** -> [Firmware update](#) tool.

## 11.7 The Home Page

The Home page for each RAVENNA IO device is divided into the following areas. Note that some functions only become available once [expert mode](#) has been enabled.

A\_\_line RAVENNA Web UI Home Page



### 1 **Headline**

- Click on **Enable Edit Mode** (or **Expert Settings**) to [enable](#) expert mode (or open the [Expert Settings](#) menu).
- Click on **About** to view more [information](#) about the RAVENNA release.
- Click on **Other RAVENNA Devices** to [navigate](#) to another device's Home page.

### 2 **Device ID (and other details)**

This area defines the Device ID.

For the A\_\_mic8 / A\_\_digital8, the Device ID can be edited either from the front panel display or by clicking on the pencil icon and entering a name. The Device ID must be a unique ID which identifies the unit within the IP network. Short, descriptive names are recommended. Use only normal characters, numbers and "\_" or "-" without spaces. Up to 31 characters are permitted.

To the right of the Lawo logo, you will also see a description of the device and the MAC address of the **ra0** interface. These fields are for information only and cannot be edited.



## 3 Network

This area defines the network settings of the streaming ports.

If the device supports SMPTE 2022-7 (streaming redundancy), then the ports are grouped into their SPS pairs. For example: strm0 = ra0 + ra1. Note that the group and port names are fixed and cannot be changed.

For the A\_\_mic8 / A\_\_digital8, the IP Address, Network Mask and Gateway can be edited using the Web UI. Note that the IP Address and Network Mask can also be edited from the front panel display.

The horizontal bar beside the group name is the Link Load indicator. Once streams are active, this indicates the amount of streaming traffic. The indicator will change from green to orange and then to red.

- Click on an interface (e.g. **ra0**) to view or edit its individual [network settings](#).
- Click on **Other network settings** to view or edit the [general settings](#) applied to all ports.

## 4 Sync

This area shows the status of the PTP clock source. What you see will vary slightly depending on the device's [PTP mode](#): master-slave or slave only:

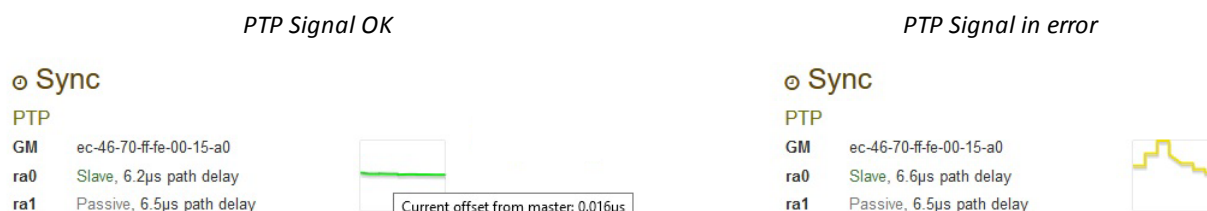
Master-Slave (device running as PTP Master):

- Beside **ID** you will see the MAC address of the device. Hover your mouse over the MAC address to reveal its IP address.
- The text "**Master**" indicates the interface(s) which are transmitting PTP to the network.

Slave only:

- Beside **GM** you will see the MAC address of the current grandmaster device. Hover your mouse over the MAC address to reveal its IP address.
- Beside each streaming interface, you will see **passive** if the interface is inactive, or **Slave** if the interface is active and operating in Slave only mode.
- You will also see the amount of **path delay**, otherwise known as the differential delay. This is the delay caused by the time it takes the packets to travel between the PTP master and slave device.

The graphical area monitors the PTP clock source over time:



The graph should be green if the device is receiving or transmitting a valid PTP signal. The graph will change to orange or red if there is a problem with the PTP signal. Hover your mouse over the graph to reveal further information.

- Click on **PTP** to view or edit the [PTP Properties](#) for the device.

## 5 Media

This area lists all of the media which can be used for streaming. If the device supports more than one network interface, then each media is grouped into pairs: e.g. Audio-strm 0 = ra0 + ra1; Audio-strm 1 = ra2 + ra3. Note that this configuration is fixed; you cannot change the network interface allocations to a media.

Any settings adjusted from here affect the complete media (i.e. both ra0 and ra1). The current sample rate is shown beside the media name.

- Click on a media to define its sample rate, sync source and PTP clock source. See [Defining the Media](#).
- Click on **Configure routing matrix** to control the mapping of the device's local audio signals to and from the media (and hence the audio streams). See [The Routing Matrix](#).

## 6 TX Streams

This area defines the sending streams, which are used to publish audio from the device to the network.

In each case, you will see the TX stream name and the RAVENNA media channels which are being used.

For TX streams, the media channels are color-coded as follows: green = the stream is active; grey = the stream is inactive.

The buttons at the top of the area provide the following functions. These are described in more detail [later](#).

- Click on **Create** to create a new TX stream.
- Click on an existing stream name to interrogate or edit its configuration.
- Click on **SEL ALL** to select all TX streams. Or, click on an individual entry to select or deselect it - the complete line is highlighted whenever a stream is selected.
- Click on **Toggle** to active or deactivate all selected TX streams.
- Click on **Delete** to delete all selected TX streams.

## 7 RX Streams

This area defines the receiving streams, which are required to use audio from the network.

As for TX streams, you will see the stream name and the RAVENNA media channels which are being used.

For RX streams, the media channels are color-coded as follows: green = correct operation; red = there is either no connection or no data; orange = the stream is being received but there are drop-outs in the data; grey = the stream is inactive.

You will also see an icon on the right of each RX stream which reflects the health statuses:

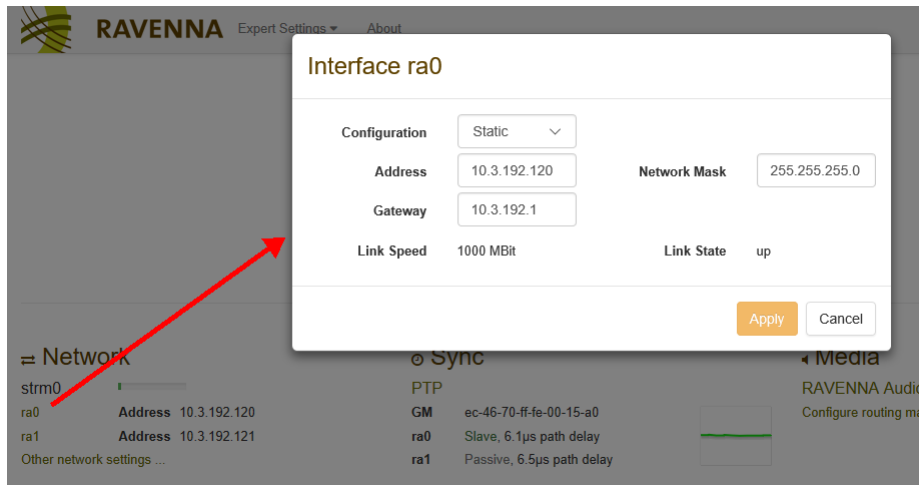
- Click on the icon to open the [statistics](#) window for further information.
- To reset all of the error flags for the RX streams, click on the **Reset** button.

The buttons at the top of the area provide the following functions. These are described in more detail [later](#).

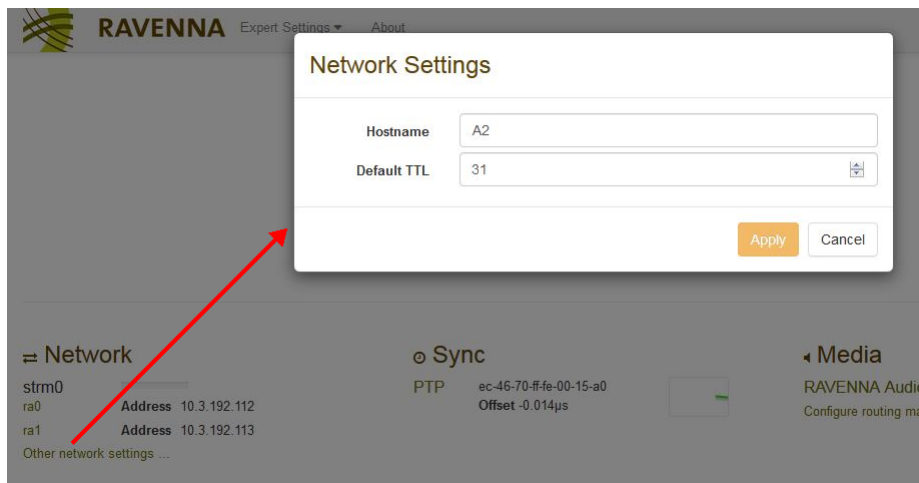
- Click on **Connect** to create a new RX stream.
- Click on an existing stream name to interrogate or edit its configuration.
- Use the **SEL ALL**, **Toggle** and **Delete** buttons to manage the RX streams.

## 11.8 Defining the Network Interfaces

1. From the **Network** area, click on an interface (e.g. **ra0**) to view its individual settings:



2. Or, click on **Other network settings** to view the general settings applied to all ports:



2. Use the fields to type in a value or select a menu option.
3. If you make a change, select **Apply** to confirm (or **Cancel**).
4. The device must be rebooted before the new settings take affect, which means that you will lose your browser connection.
5. Once the reboot is complete, [re-open](#) the RAVENNA Web UI to check the changes.

## 11.8.1 Network Interface Settings

### ➤ Configuration

The **Configuration** defines the network mode. The options are:

- **Static** - select this mode to enter the IP Address, Network Mask and Gateway manually.
- **DHCP** - select this mode to receive an IP Address automatically from the network's DHCP server.
- **Zeroconf** - in this mode, the unit will automatically assign its own IP address. On an A\_\_line device, this is the same as the front panel "Auto" mode.

In the current RAVENNA release, the Configuration *must* be set to **Static** (so that a static IP address can be allocated to each streaming port). The DHCP and Zerconf modes are not supported.

### ➤ Address, Network Mask and Gateway

The **IP Address** *must* be unique, and lie within the same IP address range as all other RAVENNA streaming nodes (i.e. the first three fields must match). For the A\_\_mic8 / A\_\_digital8, the default IP Addresses are:

- ra0 (ETHERNET A) = **192.168.101.250**
- ra1 (ETHERNET B) = **192.168.101.251**

The **Network Mask** *must* match the Subnet Mask of all other RAVENNA streaming nodes. For the A\_\_mic8 / A\_\_digital8, the default Netmask = **255.255.255.0**

A **Gateway** is required if data packets are to be redirected. For example, if the streaming port is connected via a network switch with Layer 3 routing capability. If redirection is not required, then the Gateway can be left at its default = **0.0.0.0**

Check the IP settings of all streaming ports carefully. If there is an IP conflict, then the network will not operate correctly.

### ➤ Link Speed & Link State

The **Link Speed** shows the speed of the interface. This must be 1000 MBit (GB Ethernet) or higher; RAVENNA streaming is not supported at 100 MBit (Fast Ethernet).

The **Link State** should be: **up** = correct operation; **down** = the Ethernet link is not connected or invalid.

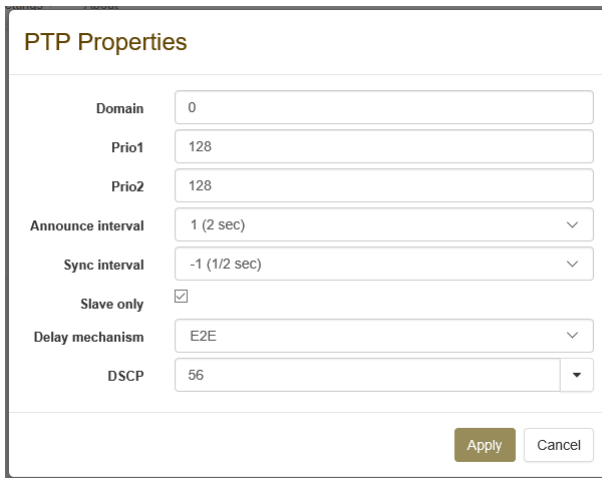
## 11.8.2 Other Network Settings

The **Hostname** is a unique name which identifies the device to the network. By default it will be the set to the Device ID.

The **Default TTL** sets the default Time To Leave. It can be used to prevent data packets from circulating indefinitely. The default value = **31**.

## 11.9 Defining the PTP Properties

1. From the **Sync** area, click on **PTP** to open the 'PTP Properties' window:



Field	Value
Domain	0
Prio1	128
Prio2	128
Announce interval	1 (2 sec)
Sync interval	-1 (1/2 sec)
Slave only	<input checked="" type="checkbox"/>
Delay mechanism	E2E
DSCP	56

2. Use the fields to type in a value or select a menu option.
3. If you make a change, select **Apply** to confirm (or **Cancel**).

Please refer to the [Lawo IP Networking Guide](#) for a more detailed explanation of PTP and how it should be implemented. Here we will provide a general description of the parameter fields.

### ➤ Slave only

The **Slave only** option determines whether the device will run in Slave only or master-slave mode.

If **Slave only** is enabled, then the device is forced to operate as a PTP slave at all times. The screenshot above shows the default parameter values associated with this mode.

If **Slave only** is disabled, then the device will operate in PTP master-slave mode. In this mode, the PTP priorities set within the device itself and all other streaming nodes determine the current PTP master.

### ➤ Prio1 and Prio2

PTP uses a master-slave approach in which all master-capable devices elect the best master, called the grandmaster, according to a common algorithm known as the "Best Master Clock Algorithm". The algorithm compares the following parameters in turn:

- **Prio1** - the lower the number, the higher the priority of the device.
- **Clock Class**
- **Prio 2** - as for Prio 1.
- **MAC Address**

For example, if there is no **Prio1** available, then all devices on the network look at the **Clock Class**, then **Prio2** and finally the **MAC address**.

Note that only the **Prio1** and **Prio2** values can be adjusted from the RAVENNA Web UI. The **Clock Class** is not available but may be used by a third-party grandmaster if one is installed.

### ➤ DSCP

The **DSCP** field assigns a DSCP (differentiated services code point) or quality class to the PTP clock stream. The default setting is **56**.

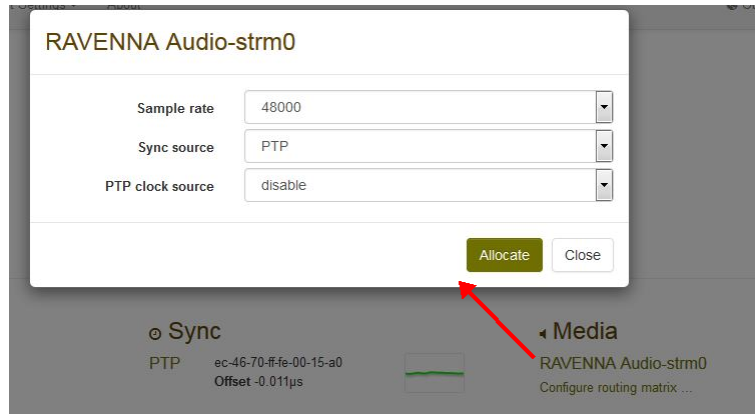
### ➤ Other Properties

The values within the remaining fields - **Domain**, **Announce Interval**, **Sync Interval** and **Delay Mechanism** - vary depending on the PTP profile in use. See the [Lawo IP Networking Guide](#) for more details.

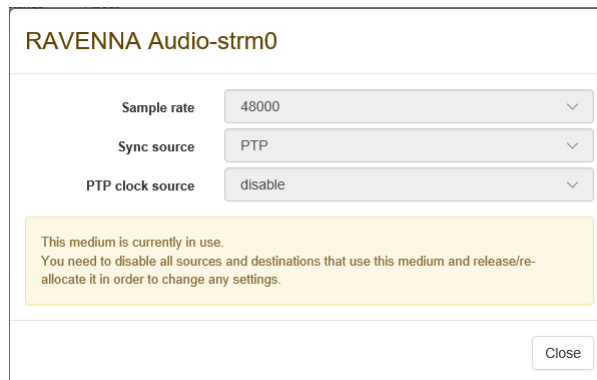
## 11.10 Defining the Media

1. From the **Media** area, click to view or edit the media's settings - options include the sample rate, sync source and PTP clock source.

Note that these parameters will be applied to all of the media's sending (TX) streams.



If the media has already been assigned to an active TX or RX stream, then it will be locked as shown below:



2. To unlock a media, first close the window and use the [Toggle](#) function to stop all active TX and RX streams.
3. Once released, you can re-open the media to select a new option.
4. Then select **Allocate** to apply all changes (or **Close** to cancel).
5. Now use the [Toggle](#) function to re-activate any previously-configured TX and RX streams.

### 11.10.1 Media Settings

#### ➤ Sample rate

The **Sample rate** sets the sample rate of the RAVENNA media. For an A\_\_line device, you can choose any of the available options. However, note that to sync to an external reference, the clocking signal *MUST* match the sample rate of the device.

#### ➤ Sync source

The **Sync source** sets the sync reference used by the RAVENNA media.

For the A\_\_mic8, you can choose one of three options:

- **PTP** – arriving from/sending to the RAVENNA streaming network (via ETHERNET A or ETHERNET B).
- **Internal** – the device's own internal sync generator.
- **WCLK In** – external wordclock connected to the WCLK IN.

For the A\_\_digital8, there is a fourth option:

- **AES3 In 1** – external AES3 connected to IN 1.

#### ➤ PTP clock source

If the device is running as a PTP master, then this option selects the reference clock for the PTP signal.

For the A\_\_mic8, you can choose either Internal (**disable**) or **WCLK In**.

For the A\_\_digital8, you can choose Internal (**disable**), **WCLK In** or **AES3 In 1**.

To generate PTP from an external reference, the clocking signal *MUST* match the internal sample rate of the device.

## 11.11 TX Streams

### 11.11.1 Creating a TX Stream

To publish audio from the device to the network, you will need to create a TX stream.

1. Click on the **Create** button to open the TX stream properties:

The screenshot shows the RAVENNA Web UI interface. In the background, the 'Network' section lists 'strm0' and two audio streams: 'ra0' with address 10.3.192.110 and 'ra1' with address 10.3.192.111. Below this is the 'Tx Streams' section with 'Create', 'Toggle', and 'Delete' buttons. A red arrow points from the 'Create' button to the 'Tx Stream Properties' dialog box. The dialog box contains the following settings:

- Stream Settings:**
  - Name: TEST
  - Payload: RAVENNA Stereo Stream
  - ra0: auto
  - ra1: (disabled)
- Media Settings:**
  - Medium: RAVENNA Audio-strm0
- Consecutive tracks:**
- Recording tracks:** Mic/Line In 1, Mic/Line In 2
- Configuration result:** Your configuration results in 384 data bytes/packet.
- Batch Create:** Enable

Buttons at the bottom right: Apply, Cancel.

2. Use the fields to edit the properties.
3. Once you have completed all of the settings, check the network packet size shown in the box that starts "Your configuration results in ...".

The network packet size cannot exceed the the Maximum Transmission Unit (MTU) defined by the Ethernet standard which is 1460 bytes. If the size exceeds the MTU, a warning appears and you *MUST* re-adjust the [payload parameters](#).

4. Click **Apply** to create the stream (or **Cancel**).

The stream is published to the network and appears at the bottom of the **TX stream** list on the [Home](#) page.



## 11.11.2 TX Stream Properties

### Stream Settings

#### ➤ Name

The **Name** will identify the stream to other network users and, therefore, cannot be edited later. It is recommended to use 6 characters or less with no special characters or spaces.

#### ➤ Payload

From the drop-down menu, either choose a preset or select **Custom** to [edit](#) the payload parameters manually. Note that the payload will determine the stream's network packet size which, in turn, will affect the latency and network bandwidth.

#### ➤ ra0 & ra1

These fields determine which interface, or interfaces, will be used to transmit the stream to the network. In each case, if a multicast IP address is defined, then the interface will be active. To create SMPTE 2022-7 compatible streams, you should choose either **auto** or **manual** to activate both interfaces. If redundant streaming is not required, then one interface can be disabled (as shown above). For each interface, there are three possible options:

- **disabled** = the interface will not be used for this stream.
- **auto** = the interface is active and the stream will be allocated an automatic multicast IP address. You can find out the address later by [interrogating](#) the TX stream.
- **manual** = the interface is active, and you will need to enter your own multicast IP address. Choose this option if your network supports a limited IP range. To configure this option, simply type the multicast IP address into the field.

### Media Settings

#### ➤ Medium

This field defines the RAVENNA media which will be used to publish the stream. On some devices, only one media is available and, therefore, there is nothing to select. If your device supports more than one media, then choose an option from the drop-down menu. For example, for a 981/61 IO module, you can choose either **RAVENNA Audio-strm0** (ra0 + ra1) or **RAVENNA Audio-strm1** (ra2 + ra3).

#### ➤ Consecutive tracks

Tick this check box to assign consecutive **Recording tracks**.

#### ➤ Recording tracks

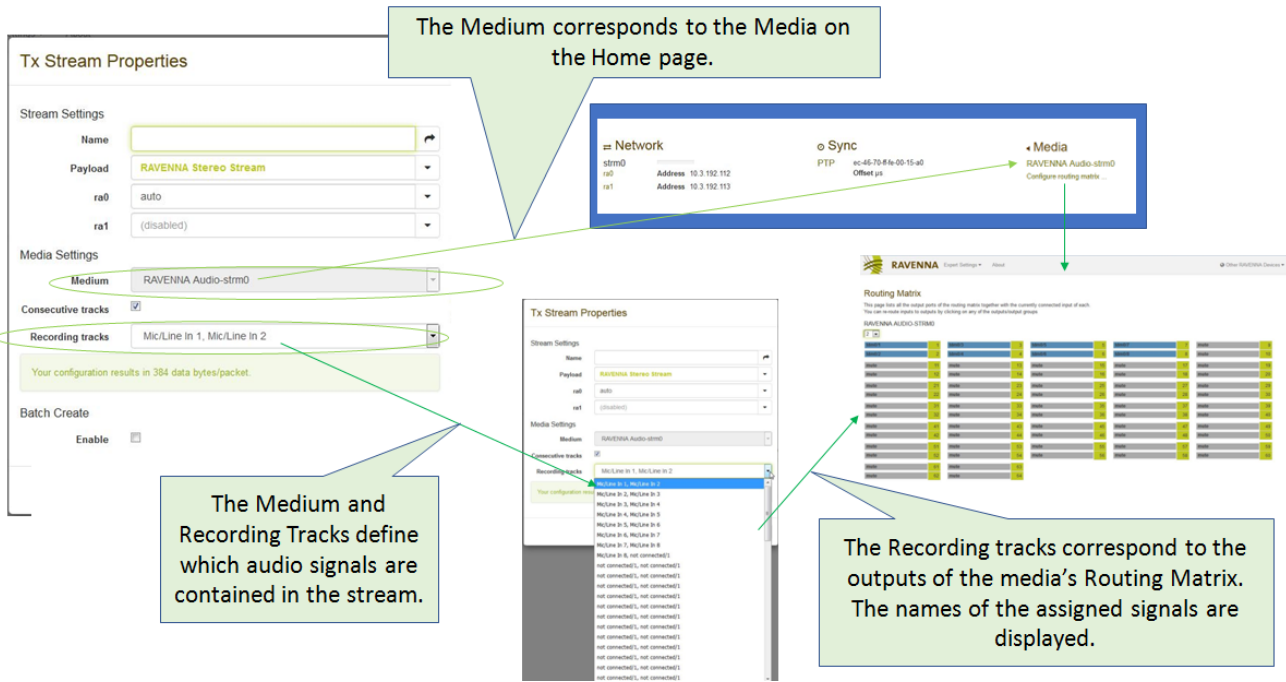
Use this drop-down menu to assign the sending channels for the audio stream.

On an A\_\_line device, the sending channels correspond to the RAVENNA media outputs of the internal [routing matrix](#). So, by assigning the Recording tracks, and then routing local audio to the RAVENNA media outputs via the matrix, you will define the audio contained in the TX stream. For convenience, the names displayed in the drop-down menu show the assigned source signals (e.g. Mic/Line In 1, etc). 64 channels are available.

### Batch Create

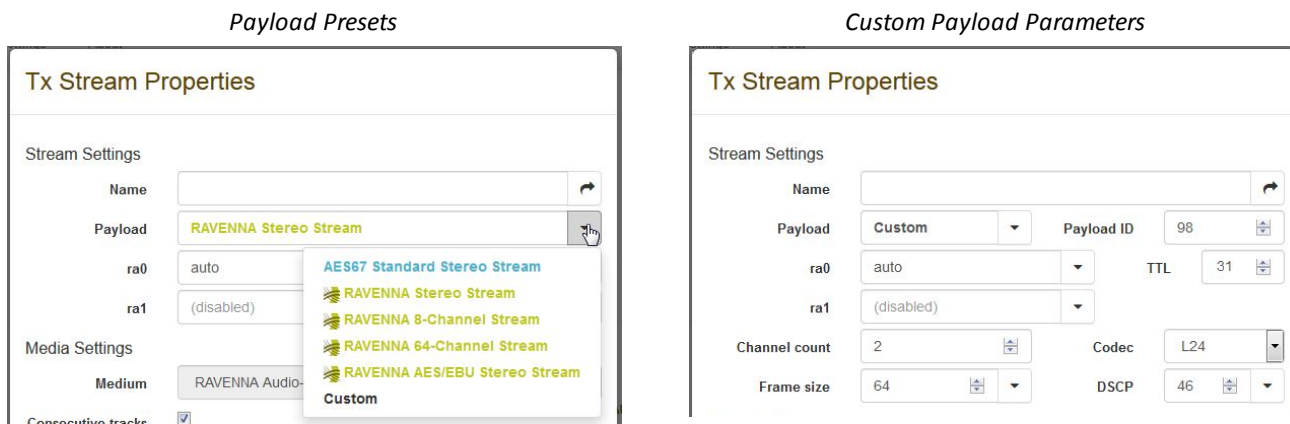
You can use this function to quickly create a series of similarly-configured TX streams. See [Batch Create](#).

The diagram below illustrates how the TX stream properties relate to other parts of the configuration:



### 11.11.3 Editing the Payload Parameters

To define the payload, either choose a preset from the drop-down menu, or select **Custom** to edit the parameters manually:



When editing the parameters manually, the payload is determined by three parameters:

- **Frame Size** = the number of samples per channel per network packet. The smaller the frame size, the more often the sender transmits packets. This results in a lower sending latency, but also a higher demand on the network's bandwidth. In Lawo devices, the Frame Size limits the number of TX streams which can be created by each device.
- **Codec** = the encoding method used for the digital audio. For example: **L16** = 16-bit Linear PCM; **L24** = 24-bit Linear PCM; **AM824** = 24-bit Linear PCM + 8-bit metadata, a non-standard format commonly used in AES/EBU.
- **Channel count** = the number of channels to be encoded: mono, stereo, 8-channel, etc.

It is the **Payload** which forms the bulk of the RAVENNA network packet size. In short, the more channels per stream, the bigger the payload.

The other **Custom** parameter fields are:

- **DSCP** - assigns a DSCP (differentiated services code point) or quality class to the stream. The default value = **46**.
- **Payload ID** - describes the format of the transported content. The default value = **98**.
- **TTL** (Time To Leave) - can be used to prevent data packets from circulating indefinitely. The default value = **31**.

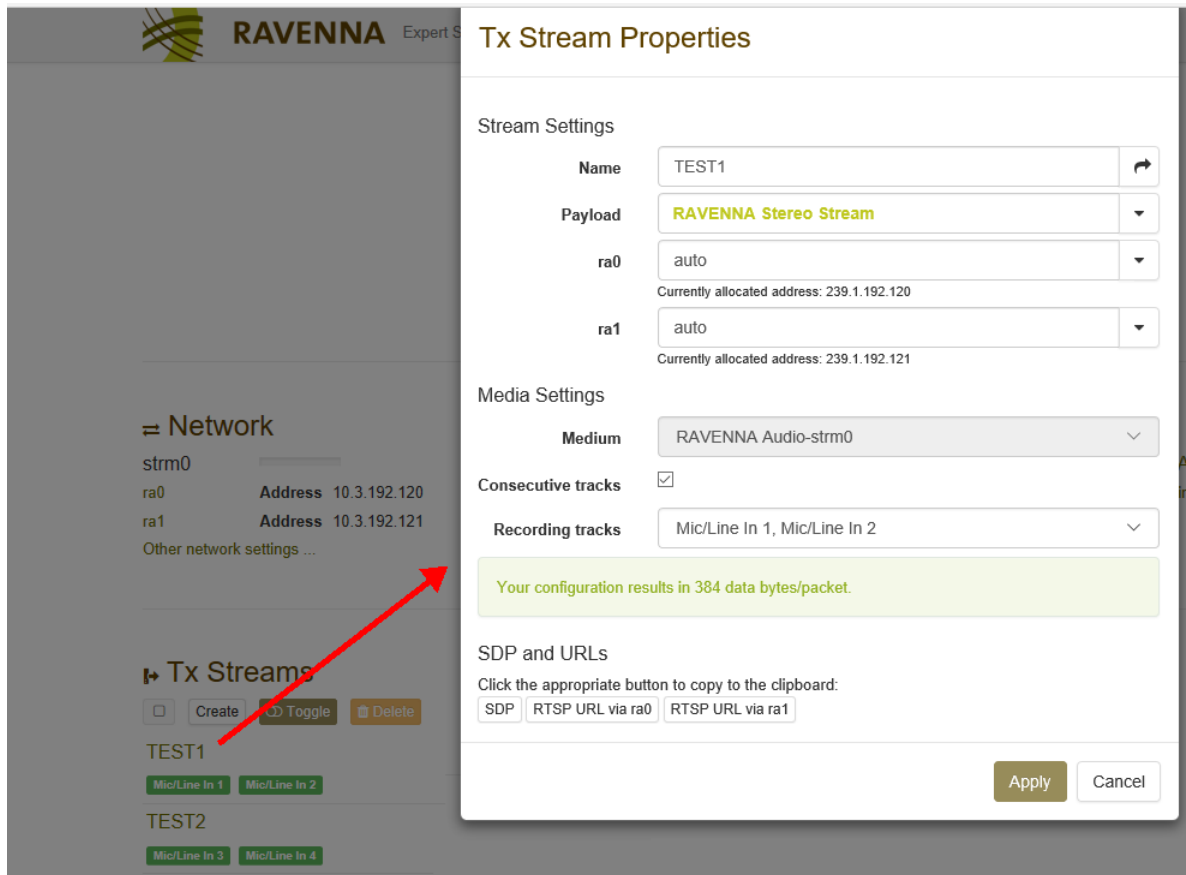
#### AES67 Compliance

An AES67-compliant stream requires the following parameters:

- **Bits per sample** = 24
- **Frame size** = 48
- **QoS (DSCP)** = 46 (=EF).

The simplest way to create an AES67-compliant stream is to choose the **AES67** preset.

### 11.11.4 Interrogating & Editing TX Streams



**RAVENNA Expert S**

#### Tx Stream Properties

**Stream Settings**

**Name** TEST1

**Payload** RAVENNA Stereo Stream

**ra0** auto  
Currently allocated address: 239.1.192.120

**ra1** auto  
Currently allocated address: 239.1.192.121

**Media Settings**

**Medium** RAVENNA Audio-strm0

**Consecutive tracks**

**Recording tracks** Mic/Line In 1, Mic/Line In 2

Your configuration results in 384 data bytes/packet.

**SDP and URLs**  
Click the appropriate button to copy to the clipboard:  
SDP RTSP URL via ra0 RTSP URL via ra1

Apply Cancel

**Network**

strm0

ra0 Address 10.3.192.120

ra1 Address 10.3.192.121

Other network settings ...

**Tx Streams**

Create Toggle Delete

TEST1  
Mic/Line In 1 Mic/Line In 2

TEST2  
Mic/Line In 3 Mic/Line In 4

If you click on existing TX stream, then the fields can be edited as described [earlier](#), apart from the following exceptions:

#### Stream Settings

- **Name** - the name cannot be edited once a stream has been published to the network.
- **ra0** and **ra1** - if you selected **auto** for either of the RAVENNA interfaces, then you will now see the multicast IP address which has been allocated.

#### SDP and URLs

These buttons copy the TX Stream's SDP or RTSP URL information to the clipboard.

They are very useful if you need to configure a RX stream on another networked device, as you can open the "RX Stream Properties" and paste in the relevant information. See [Copying & Pasting URLs](#) for details.

## 11.12 RX Streams

### 11.12.1 Creating a RX Stream

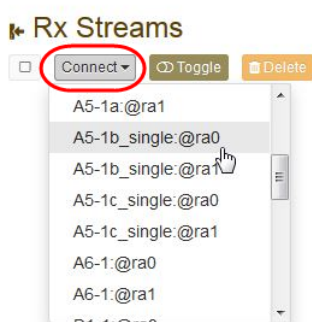
To use audio from the network, you will need to create a RX stream.

1. Click on the **Connect** button and choose a stream name from the drop-down menu - the 'RX Stream Properties' window appears.

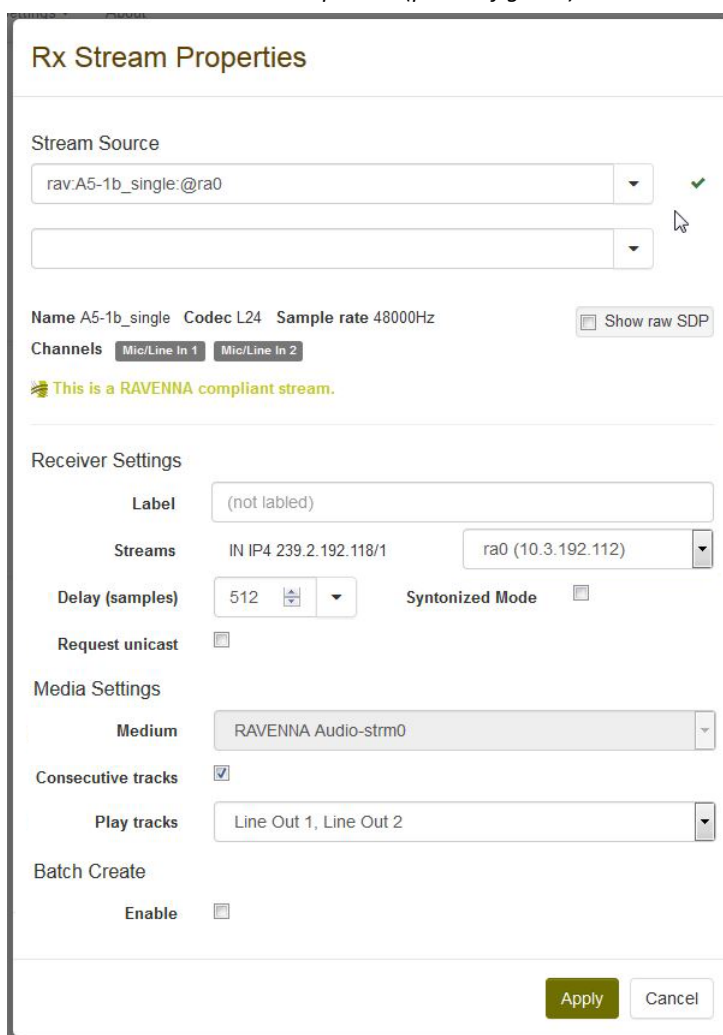
In this instance, the **Stream Source** is completed automatically (from the stream's SDP information), and the **Receiver Settings** are also pre-configured (according to the default settings).

Note that the streams listed in the **Connect** menu are dependent on the TX streams being announced to the network via their SDP information. As this is not always supported by all devices, you can open an empty 'RX Stream Properties' window by selecting the **Using a Custom URL...** option. This method is described [later](#). The **@ra#** suffix indicates on which RAVENNA interface the stream can be received.

Connect Menu



'RX Stream Properties' (pre-configured)



The image shows the 'Rx Stream Properties' configuration window. It has the following sections and fields:

- Stream Source:** A dropdown menu showing 'rav:A5-1b\_single:@ra0' with a green checkmark to its right.
- Name:** 'A5-1b\_single', **Codec:** 'L24', **Sample rate:** '48000Hz'. There is a 'Show raw SDP' checkbox.
- Channels:** Two buttons labeled 'Mic/Line In 1' and 'Mic/Line In 2'.
- Receiver Settings:**
  - Label:** '(not labled)'
  - Streams:** 'IN IP4 239.2.192.118/1' and 'ra0 (10.3.192.112)'
  - Delay (samples):** '512' with a dropdown arrow.
  - Synchronized Mode:** A checkbox.
  - Request unicast:** A checkbox.
- Media Settings:**
  - Medium:** 'RAVENNA Audio-strm0' with a dropdown arrow.
  - Consecutive tracks:** A checked checkbox.
  - Play tracks:** 'Line Out 1, Line Out 2' with a dropdown arrow.
- Batch Create:** An 'Enable' checkbox.

At the bottom right, there are 'Apply' and 'Cancel' buttons.

2. Use the fields to check and, if necessary, edit the properties.
3. Once you have completed all of the settings, click **Apply** to create the stream (or **Cancel**).

The stream becomes active and appears at the bottom of the **RX stream** list on the [Home](#) page.

## 11.12.2 RX Stream Properties

### Stream Source

This area defines the origin of the stream using its SDP information.

For a non-redundant stream, the SDP should be entered into the upper field with the lower field left blank. For SMPTE 2022-7 compatible streams, it may be necessary to use both fields (as described [later](#)). In both cases, providing you have selected a stream from the **Connect** menu, the SDP will be entered automatically. If this is not possible, then see [Using a Custom URL](#).

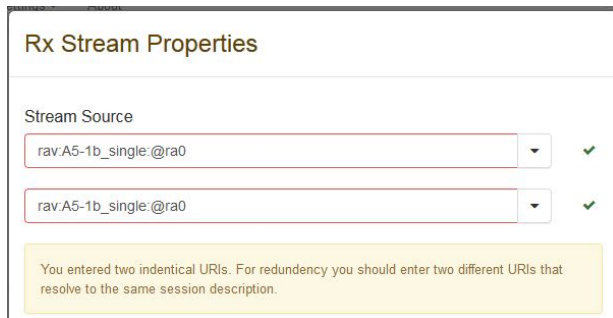
The green tick beside the field indicates that the SDP information is being received correctly. Note that the SDP information can be received via ra0 or ra1. Or, for a 981/61 IO module, ra2 or ra3.

Below the two entry fields is a description of the stream. This comes from the SDP information. Click on **Show raw SDP** to view the SDP data - this can be useful for diagnostics.

Below this you will see any errors or information about the Stream Source configuration. In the example above, there are no errors and we can see that "This is a RAVENNA compliant stream".

Note that it is **NOT** permitted to assign the same SDP or two non-redundant SDPs. In these instances, an error message will appear, and will need to remove the assignment to the second Stream Source field to continue:

*Incorrect Configuration: Duplicated SDPs*



**Rx Stream Properties**

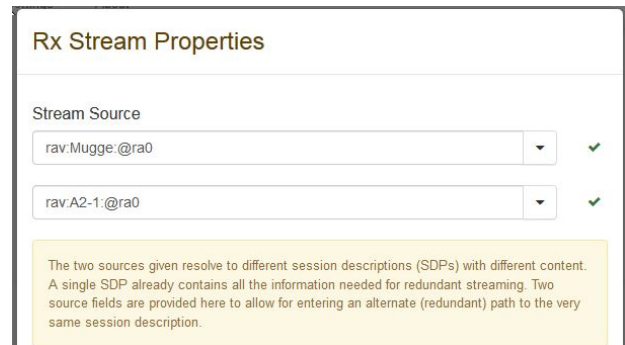
Stream Source

rav:A5-1b\_single:@ra0 ✓

rav:A5-1b\_single:@ra0 ✓

You entered two identical URIs. For redundancy you should enter two different URIs that resolve to the same session description.

*Incorrect Configuration: 2 x Non-redundant SDPs*



**Rx Stream Properties**

Stream Source

rav.Mugge:@ra0 ✓

rav.A2-1:@ra0 ✓

The two sources given resolve to different session descriptions (SDPs) with different content. A single SDP already contains all the information needed for redundant streaming. Two source fields are provided here to allow for entering an alternate (redundant) path to the very same session description.

For more information on configuring redundant streams, see [Creating SMPTE 2022-7 Compatible Streams](#).

### Receiver Settings

#### ➤ Label

This is a local label which is optional. If defined, it is used to label the RX stream on the [Home](#) page

#### ➤ Streams

Here you will see the IP address of the stream's source, followed by a menu where you can choose the receiver's RAVENNA interface. By default, the first interface is always pre-configured (e.g. **ra0**). Click to change the interface or unsubscribe from the stream:



**Receiver Settings**

Label: (not labled)

Streams: IN IP4 239.2.192.118/1

Delay (samples): 512

Request unicast:

Dropdown menu options: ra0 (10.3.192.124), (not subscribed), ra0 (10.3.192.124), ra1 (10.3.192.125)

If the SDP entered in the Stream Source field contains two SMPTE 2022-7 compatible streams, then a second line for the redundant stream's IP address and receiving interface are displayed. In this instance, assign a different interface to each stream, OR switch one of the interfaces to **not subscribed** to receive the stream without redundancy.

On all Lawo devices, you can use either interface of a streaming pair to receive single streams from the network.

### ➤ Delay

This value adjusts the amount of delay applied, in samples, before audio is played out. In other words, it defines the size of the receiving buffer. It should be large enough to deal with delays in the network such as sending latency and jitter. The **Delay** should always be larger than the [frame size](#) specified by the sender. As a general rule, set the **Delay** to 2 x the sender's **Frame Size**. If you experience drop-outs during playback, then increase the **Delay** time.

### ➤ Syntonized Mode

By default this option is disabled, which means that the receiver is running in synchronized mode. Tick the option to enable syntonized mode, which means that the stream will be free running.

Syntonized mode should be enabled if the clock signal is missing from the SDP information, or if you have a different clock source selected at the sender and receiver.

Syntonized mode should always be enabled for connections between Lawo audio and V\_\_line devices.

Syntonized mode should be disabled for AES67 or SMPTE 2110-30 compliance.

Any receiving devices which do not support syntonised streaming must connect to the same 981/61 RAVENNA IO module that is transmitting the PTP signal.

### ➤ Request unicast

In the current release, this option should be left disabled as RAVENNA streaming supports multicast addressing only, and not unicast.

## Media Settings

### ➤ Medium

This field defines the RAVENNA media which will be used to receive the stream. On some devices, only one media is available and, therefore, there is nothing to select. If your device supports more than one media, then choose an option from the drop-down menu. For example, for a 981/61 IO module, you can choose either **RAVENNA Audio-strm0** (ra0 + ra1) or **RAVENNA Audio-strm1** (ra2 + ra3).

### ➤ Consecutive tracks

Tick this check box to assign consecutive **Play tracks**.

### ➤ Play tracks

Use this drop-down menu to assign the receiving channels for the audio stream.

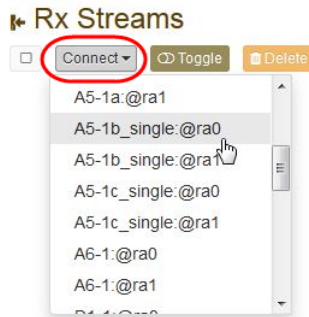
On an A\_\_line device, the receiving channels correspond to the RAVENNA media inputs in the internal [routing matrix](#). So, by assigning the Play tracks, and then assigning the RAVENNA media inputs to local TDM (or MADI) outputs via the matrix, you can play out the audio contained in the RX stream. For convenience, the names displayed in the drop-down menu show the assigned destinations (e.g. Line Out 1, etc). 64 channels are available.

## Batch Create

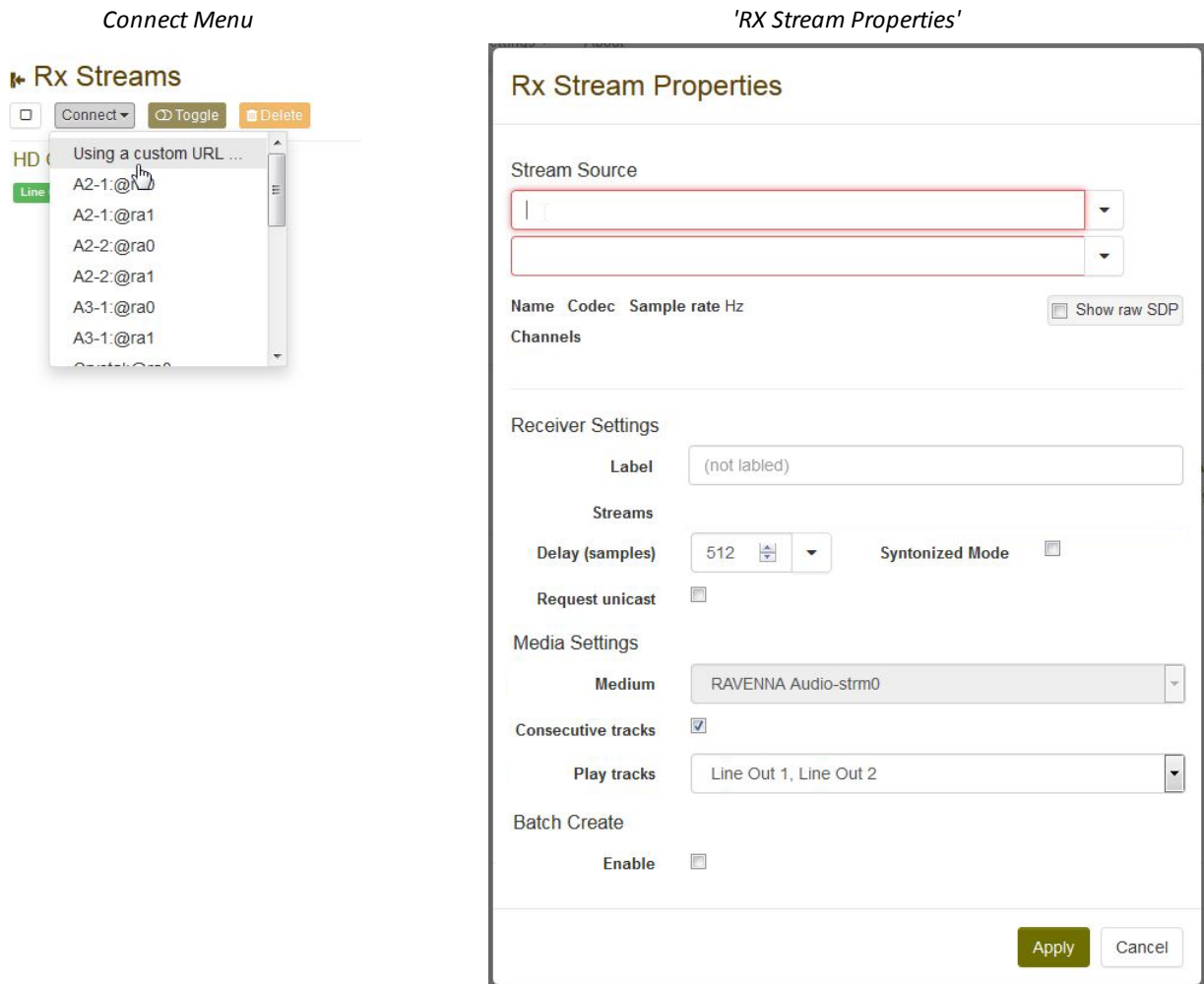
You can use this function to quickly create a series of similarly-configured RX streams. See [Batch Create](#).

### 11.12.3 Using a Custom URL

Whenever a TX stream is created, its SDP (Session Description Protocol) information is announced to the rest of the network using RTSP / mDNS protocols. This means that providing the receiving device uses mDNS to collect SDP information AND can "see" the sending node, the stream will automatically be displayed in the RX Stream **Connect** menu:



If the receiving device does not use mDNS or cannot "see" the sending device, then the automatic listing of the stream will not happen. In this instance, click on the **Connect** button and choose **Using a Custom URL...** from the drop-down menu - an empty 'RX Stream Properties' window appears:



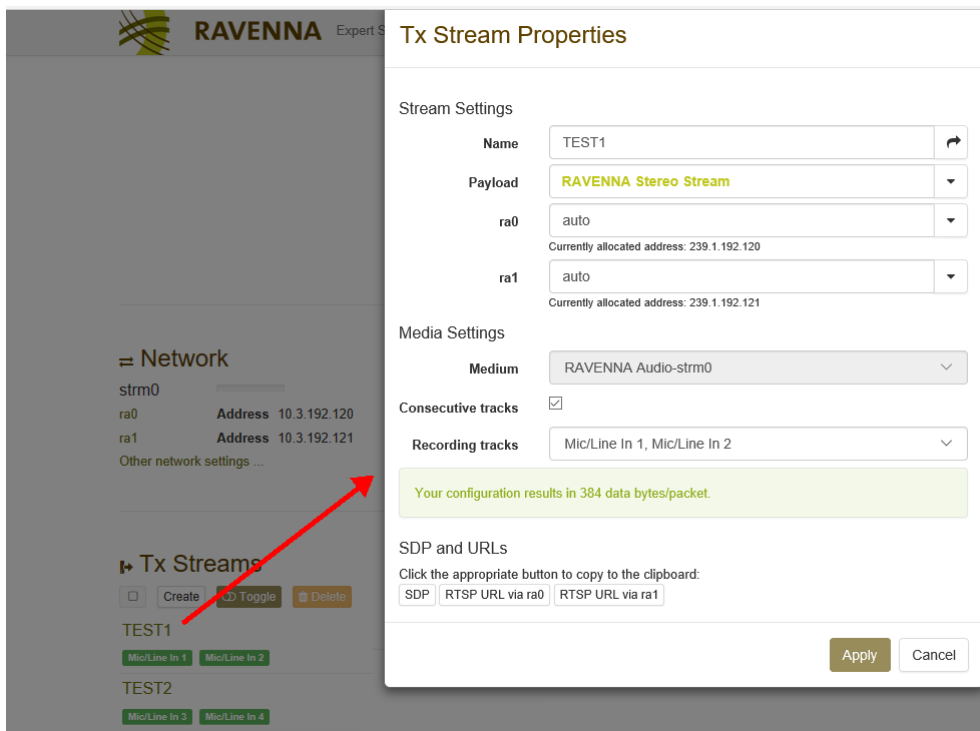
The simplest way to enter the SDP information is to copy and paste the SDP or RTSP URLs from the sending device's Web UI.



## 11.12.4 Copying & Pasting SDP / RTSP URLs

To copy and paste the SDP information from a sending device:

1. Open a Web UI connection to the sending device, and click on the TX stream:

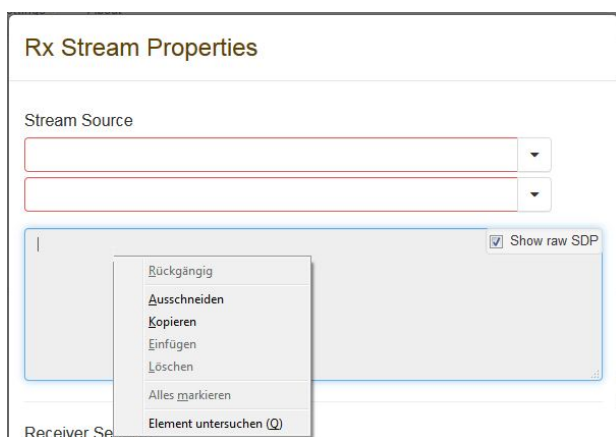


2. At the bottom of the window, click on the **SDP** button to copy the stream's SDP information to the clipboard.

If the stream is redundant, then information about both of the paths is contained in the same SDP.

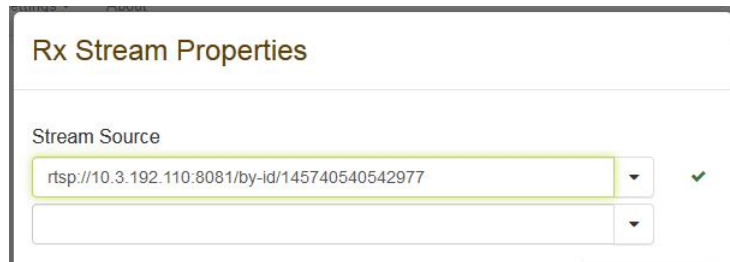
3. Now open a Web UI connection to the receiving device, and click on the RX stream to open its properties.
4. Select **Show raw SDP** and then right-click anywhere inside the SDP area to paste the contents of the clipboard (or press CTRL + V).

The **Stream Source** fields update according to the SDP information:



A similar method can be used to copy and paste the RTSP URLs:

1. On the sending device, use the **RTSP URL** buttons in the 'TX Stream Properties' window to copy the address for the sending interface.
2. Then on the receiving device, paste the clipboard contents into the **Stream Source** field:



The screenshot shows a web interface titled "Rx Stream Properties". Under the heading "Stream Source", there are two input fields. The top field contains the RTSP URL "rtsp://10.3.192.110:8081/by-id/145740540542977" and has a green checkmark to its right. The bottom field is empty. Both fields have a dropdown arrow on the right side.

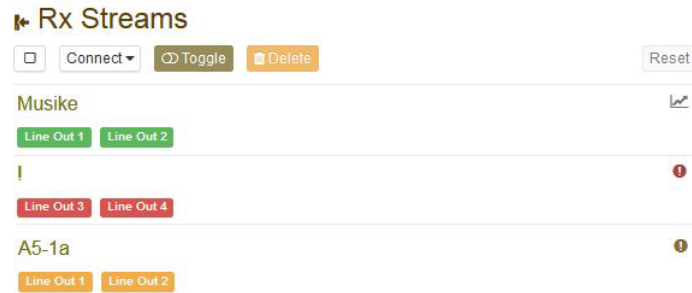
If the TX stream is redundant, copy and paste the URL for the each of the sending interfaces separately - enter the ra0 URL into the upper field and the ra1 URL into the lower field.

The receiving device will now use the RTSP URLs to request the SDP information from the sender.

In both cases, once the 'Stream Source' is defined, the 'Receiver Settings' and 'Media Settings' can be completed in the [usual](#) manner.

## 11.12.5 The Statistics Window

On the [Home](#) page, each RX stream name is color-coded to indicate the health of the stream:



- **Green** = correct operation.
- **Red** = there is either no connection or no data.
- **Orange** = the stream is being received but there are drop-outs in the data.

You will also see an icon on the right of each RX stream which reflects the same statuses.

1. Click on the icon to open the Statistics window - this provides more information about the stream.

*Healthy RX Stream (green)*

**Musike**

This receiver is configured for synchronized mode:  
Received audio samples are put into the receive buffer based on absolute time using the timestamps of the samples and the configured delay (currently set to 512 samples).

**Network interface ra0**  
Absolute minimum buffer offset (in samples): 463 (last report: 463)  
Absolute maximum buffer offset (in samples): 510 (last report: 510)  
The current median interarrival jitter is 0 samples.  
Show Graphs ▲

**Network interface ra1**  
Absolute minimum buffer offset (in samples): 463 (last report: 463)  
Absolute maximum buffer offset (in samples): 510 (last report: 510)  
The current median interarrival jitter is 0 samples.  
Show Graphs ▲

*Unhealthy RX Stream (orange)*

**A5-1a**

This receiver is configured for synchronized mode:  
Received audio samples are put into the receive buffer based on absolute time using the timestamps of the samples and the configured delay (currently set to 512 samples).

**Network interface ra0**  
Absolute minimum buffer offset (in samples): 447 (last report: 447)  
Absolute maximum buffer offset (in samples): 510 (last report: 510)  

A total of 163 lost packet(s) has been detected.

  
The current median interarrival jitter is 0 samples.  
Show Graphs ▲

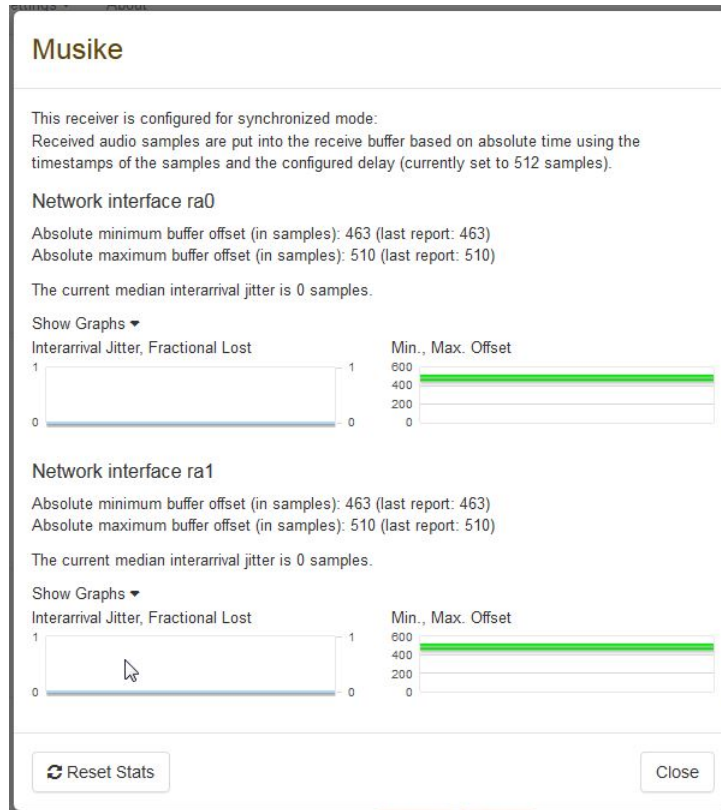
**Network interface ra1**  
Absolute minimum buffer offset (in samples): 447 (last report: 447)  
Absolute maximum buffer offset (in samples): 510 (last report: 510)  

A total of 84 lost packet(s) has been detected.

  
The current median interarrival jitter is 0 samples.  
Show Graphs ▲

- For a healthy stream (green) or one experiencing drop-outs (orange) you can click on **Show Graphs** for further details:

### Healthy RX Stream (Show Graphs)



- **Fractional Lost Packets** - the number of lost packets over the last few seconds.
- **Min & Max Offset** - information about the receive buffer in samples: on the left is the current value realized every few seconds; on the right is the peak value reached since the last reset.

Note that the **Min Offset** should never reach zero, as this would mean that the buffer was empty. Typically the **Min Offset** should be close to the configured [Delay](#) value. The **Max Offset** is dependent on more parameters; critical is the possible maximum buffer - this is 1023 for the 981/61, and 4095 for the 947/21 or 947/22 (DALLIS Master Board).

- Click on **Reset Stats** to clear the statistics history for the selected stream.
- Return to the Home page and click on the **Reset** button to clear the statistics history for all RX streams.

### 11.13 Creating SMPTE 2022-7 Compatible Streams

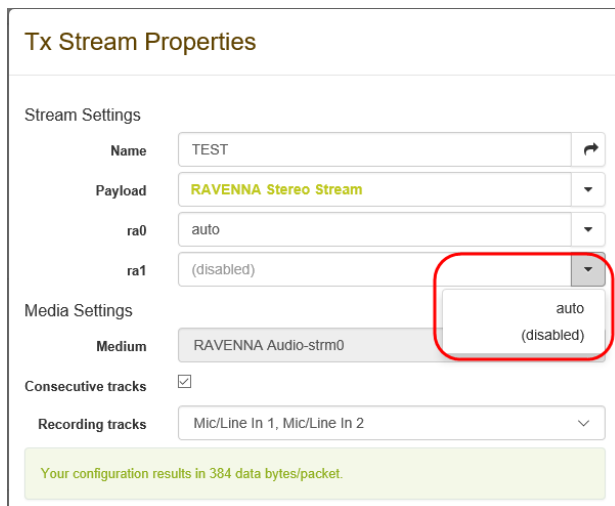
To support [SMPTE 2022-7](#) (streaming redundancy), a stream must be transmitted and received via two separate network paths.

For an A\_\_line device, the TX or RX interfaces are ETHERNET A (ra0) + ETHERNET B (ra1).

#### TX Stream Properties

First, open a RAVENNA Web UI connection to the sending device and make sure that the 'TX Stream Properties' are configured to use both RAVENNA interfaces. This means assigning a multicast IP address to both of the **ra0** and **ra1** fields:

*ra1 - define multicast IP address*



**Tx Stream Properties**

Stream Settings

Name: TEST

Payload: RAVENNA Stereo Stream

ra0: auto

ra1: (disabled)

Media Settings

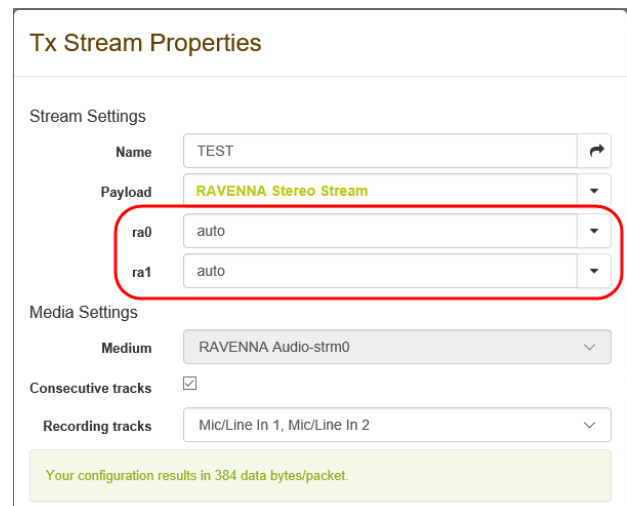
Medium: RAVENNA Audio-strm0

Consecutive tracks:

Recording tracks: Mic/Line In 1, Mic/Line In 2

Your configuration results in 384 data bytes/packet.

*Both ra0 and ra1 should be set to auto*



**Tx Stream Properties**

Stream Settings

Name: TEST

Payload: RAVENNA Stereo Stream

ra0: auto

ra1: auto

Media Settings

Medium: RAVENNA Audio-strm0

Consecutive tracks:

Recording tracks: Mic/Line In 1, Mic/Line In 2

Your configuration results in 384 data bytes/packet.

All other properties should be configured as for a non-redundant stream, see [TX Stream Properties](#).

Once you click **Apply**, the TX stream will be duplicated and published separately via both interfaces. Note that information about both streams (main and redundant) is contained in the same SDP information.

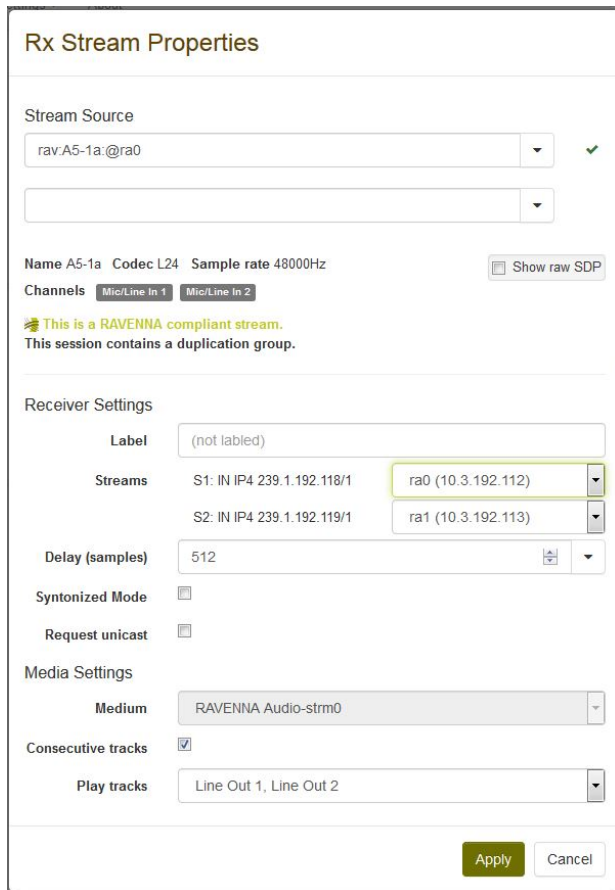
## RX Stream Properties: Pre-configured

Now open a RAVENNA Web UI connection to the receiving device and, if possible, select the TX stream from the **Connect** menu - the 'RX Stream Properties' window opens.

The **Stream Source** will be completed automatically from the stream's SDP information, and the **Receiver Settings** will be pre-configured according to the default settings.

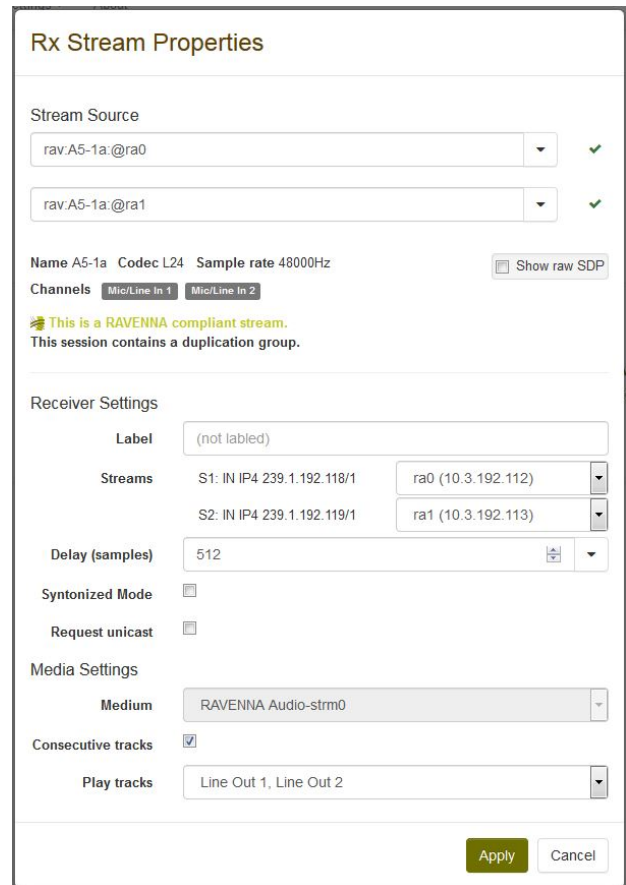
If you need to define two separate paths for the SDP information, then you can enter the redundant stream's SDP path into the lower Stream Source field.

*'RX Stream Properties' (single SDP)*



The screenshot shows the 'Rx Stream Properties' window for a single SDP configuration. The 'Stream Source' field is set to 'rav.A5-1a:@ra0'. Below it, there is a second empty 'Stream Source' field. The 'Name' is 'A5-1a', 'Codec' is 'L24', and 'Sample rate' is '48000Hz'. There are two channel buttons: 'Mic/Line In 1' and 'Mic/Line In 2'. A message states: 'This is a RAVENNA compliant stream. This session contains a duplication group.' Under 'Receiver Settings', the 'Label' is '(not labeled)'. The 'Streams' section has two entries: 'S1: IN IP4 239.1.192.118/1' with a dropdown set to 'ra0 (10.3.192.112)', and 'S2: IN IP4 239.1.192.119/1' with a dropdown set to 'ra1 (10.3.192.113)'. The 'Delay (samples)' is 512. 'Synchronized Mode' and 'Request unicast' are unchecked. Under 'Media Settings', the 'Medium' is 'RAVENNA Audio-strm0', 'Consecutive tracks' is checked, and 'Play tracks' is 'Line Out 1, Line Out 2'. 'Apply' and 'Cancel' buttons are at the bottom.

*'RX Stream Properties' (main & redundant SDP)*



The screenshot shows the 'Rx Stream Properties' window for a main and redundant SDP configuration. The 'Stream Source' field is set to 'rav.A5-1a:@ra0'. Below it, the second 'Stream Source' field is set to 'rav.A5-1a:@ra1'. The 'Name', 'Codec', and 'Sample rate' are the same as in the single SDP version. The 'Streams' section has two entries: 'S1: IN IP4 239.1.192.118/1' with a dropdown set to 'ra0 (10.3.192.112)', and 'S2: IN IP4 239.1.192.119/1' with a dropdown set to 'ra1 (10.3.192.113)'. The 'Delay (samples)' is 512. 'Synchronized Mode' and 'Request unicast' are unchecked. Under 'Media Settings', the 'Medium' is 'RAVENNA Audio-strm0', 'Consecutive tracks' is checked, and 'Play tracks' is 'Line Out 1, Line Out 2'. 'Apply' and 'Cancel' buttons are at the bottom.

The only other difference from a non-redundant stream is that the **Streams** entry, under 'Receiver Settings', shows two lines - one for the main and one for the redundant source. By default, these are assigned to the media's two RAVENNA interfaces (ra0 and ra1), and so there is nothing further to do. If you wish to receive the stream without redundancy, then switch one of the interfaces to **not subscribed**.

All other properties should be configured as for a non-redundant stream, see [RX Stream Properties](#).

When a RX stream is configured for redundancy, you will see the following message in the information area: "This session contains a duplication group".

Once you click **Apply**, the RX stream becomes active and appears at the bottom of the **RX stream** list on the [Home](#) page.

The receiver will now combine the data arriving at both of the interfaces to reconstruct the original stream.

## RX Stream Properties: Using a Custom URL

If the TX stream does not appear in the **Connect** menu, then you will need to select [Using a Custom URL](#) and define the **Stream Source** fields manually. As before, the simplest way to do this is to [copy and paste](#) the SDP or RTSP URLs from the sending device.

Note that the same SDP will announce both streams. If you need to use RTSP URLs, then take care to copy and paste each one separately - enter the ra0 URL into the upper field and the ra1 URL into the lower field.

If you make a mistake, then an error message will appear:

*Incorrect Configuration: Duplicated SDPs*

### Rx Stream Properties

Stream Source

✓

✓

You entered two indetical URIs. For redundancy you should enter two different URIs that resolve to the same session description.

*Incorrect Configuration: 2 x Non-redundant SDPs*

### Rx Stream Properties

Stream Source

✓

✓

The two sources given resolve to different session descriptions (SDPs) with different content. A single SDP already contains all the information needed for redundant streaming. Two source fields are provided here to allow for entering an alternate (redundant) path to the very same session description.

Once the SDP is entered, the 'Receiver Settings' can be edited as described on the previous page.

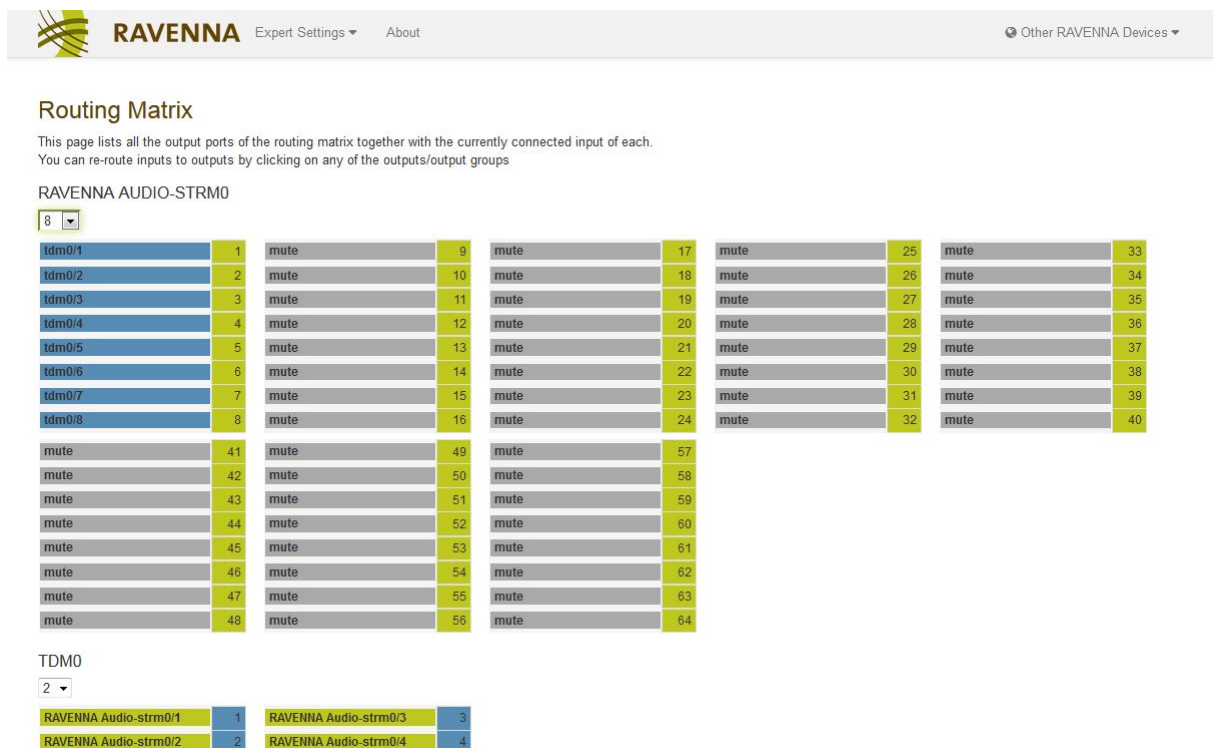
## 11.14 The Routing Matrix

The Routing Matrix maps the device's local audio signals to and from the RAVENNA media. Together with the [Recording track](#) assignments (for TX streams) and [Play track](#) assignments (for RX streams), this determines the audio path to and from the network.

The matrix is organised into separate sections for each RAVENNA media and local signals (TDM). In each case, the drop-down menus set the multi-channel view. The boxes then represent the output(s), while the color and text inside the box represents their source: blue = TDM (local signals); grey = silence (mute); green = RAVENNA media channels.

For each RAVENNA media, there are always 64 inputs and 64 outputs. The number of TDM inputs and outputs varies depending on the A\_\_line device. The screenshot below is taken from an A\_\_mic8 which has 8 mic/line inputs and 4 line outputs, and so there are 8 TDM inputs and 4 TDM outputs.

In the example below, the first eight **RAVENNA AUDIO-STRM0** outputs are fed from TDM inputs 1 to 8, while the remaining outputs are set to silence (mute); the four **TDM0** outputs are fed from RAVENNA Audio-strm0 media inputs 1 to 4:



**RAVENNA AUDIO-STRM0**

8

ldm0/1	1	mute	9	mute	17	mute	25	mute	33
ldm0/2	2	mute	10	mute	18	mute	26	mute	34
ldm0/3	3	mute	11	mute	19	mute	27	mute	35
ldm0/4	4	mute	12	mute	20	mute	28	mute	36
ldm0/5	5	mute	13	mute	21	mute	29	mute	37
ldm0/6	6	mute	14	mute	22	mute	30	mute	38
ldm0/7	7	mute	15	mute	23	mute	31	mute	39
ldm0/8	8	mute	16	mute	24	mute	32	mute	40
mute	41	mute	49	mute	57				
mute	42	mute	50	mute	58				
mute	43	mute	51	mute	59				
mute	44	mute	52	mute	60				
mute	45	mute	53	mute	61				
mute	46	mute	54	mute	62				
mute	47	mute	55	mute	63				
mute	48	mute	56	mute	64				

**TDM0**

2

RAVENNA Audio-strm0/1	1	RAVENNA Audio-strm0/3	3
RAVENNA Audio-strm0/2	2	RAVENNA Audio-strm0/4	4

To change the matrix allocations:

1. First, click in the drop-down menu to select the multi-channel view.

For example, when assigning the TDM outputs, **2** is a good view to use so that the outputs can be assigned in stereo pairs.

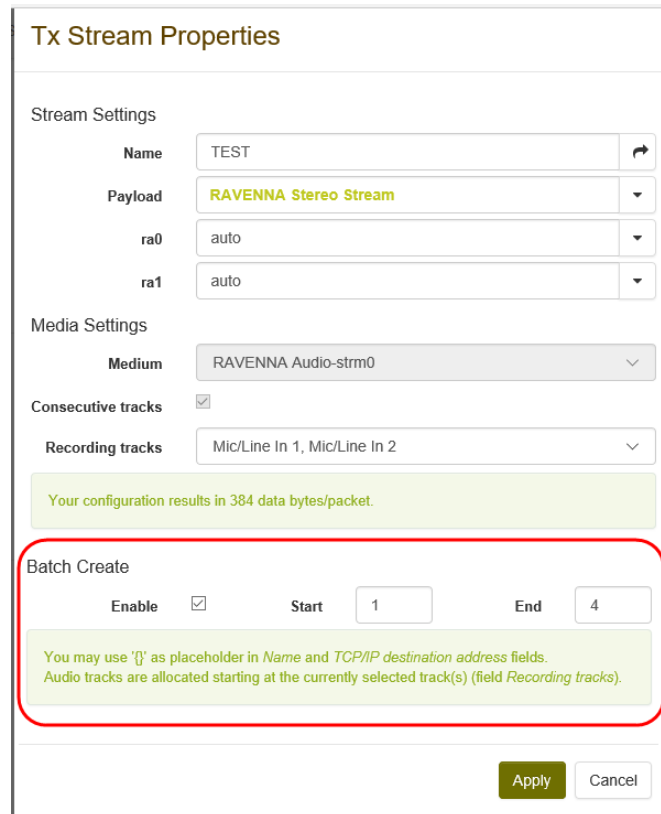
2. Then click on the output block you wish to assign (e.g. on outputs 1 & 2) - the available inputs appear.
3. Select one of the Input options (e.g. a different pair of RAVENNA media channels) - the inputs are assigned to the output block, and the output block's color-coding and text updates accordingly.
4. Return to the [Home](#) page by clicking on the RAVENNA icon.



## 11.15 Batch Create

The **Batch Create** function can be used to quickly create a series of similarly-configured TX or RX streams. For example:

1. Use the [Create](#) button to open the 'TX Stream Properties' window and enter the parameters required for the first stream.
2. Under 'Batch Create' tick the **Enable** box.
3. Enter a **Start** and **End** suffix to apply to the stream **Name**.



**Tx Stream Properties**

Stream Settings

Name: TEST

Payload: RAVENNA Stereo Stream

ra0: auto

ra1: auto

Media Settings

Medium: RAVENNA Audio-strm0

Consecutive tracks:

Recording tracks: Mic/Line In 1, Mic/Line In 2

Your configuration results in 384 data bytes/packet.

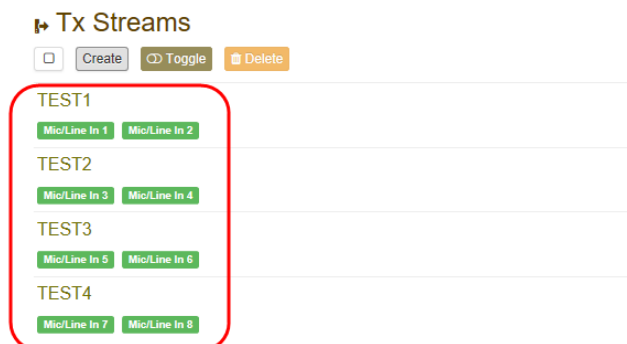
**Batch Create**

Enable:  Start: 1 End: 4

You may use '[' as placeholder in Name and TCP/IP destination address fields.  
Audio tracks are allocated starting at the currently selected track(s) (field Recording tracks).

Apply Cancel

4. Click **Apply** - a batch of TX streams are added to the Home page:



**Tx Streams**

Create Toggle Delete

TEST1  
Mic/Line In 1 Mic/Line In 2

TEST2  
Mic/Line In 3 Mic/Line In 4

TEST3  
Mic/Line In 5 Mic/Line In 6

TEST4  
Mic/Line In 7 Mic/Line In 8

All properties are applied identically apart from the **Name** which takes the Start and End suffix, and the **Recording tracks** which increment automatically across the batch of streams.

The example above shows the set up for four identical RAVENNA Stereo Streams named "TEST1" to "TEST4", where TEST1 uses Mic/Line In 1&2; TEST2 uses Mic/Line In 3&4; and so on.

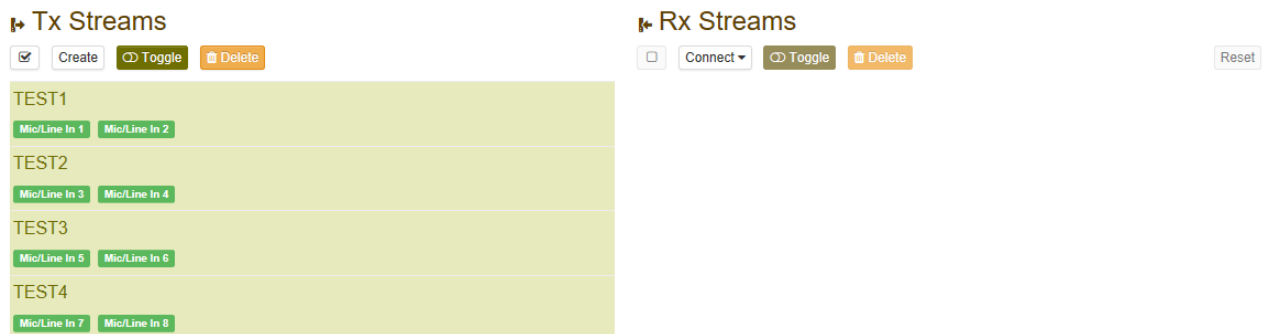
The same principles can be applied to [RX streams](#), but this time it is the stream **Label** which takes the **Start** and **End** suffix, and the **Play tracks** which are incrementally assigned.

## 11.16 Selecting Streams

You will need to select a stream to delete it or make it active or inactive via the [Toggle](#) button. In each case, the following methods can be applied to either TX or RX streams:

1. Click on an individual entry to select (or deselect) the stream - the complete line is highlighted whenever a stream is selected.
2. Press and hold SHIFT to select a consecutive range of streams.
3. Press and hold CTRL to select non-consecutive streams.
4. Click on the "Select All" icon to select (or deselect) all streams.

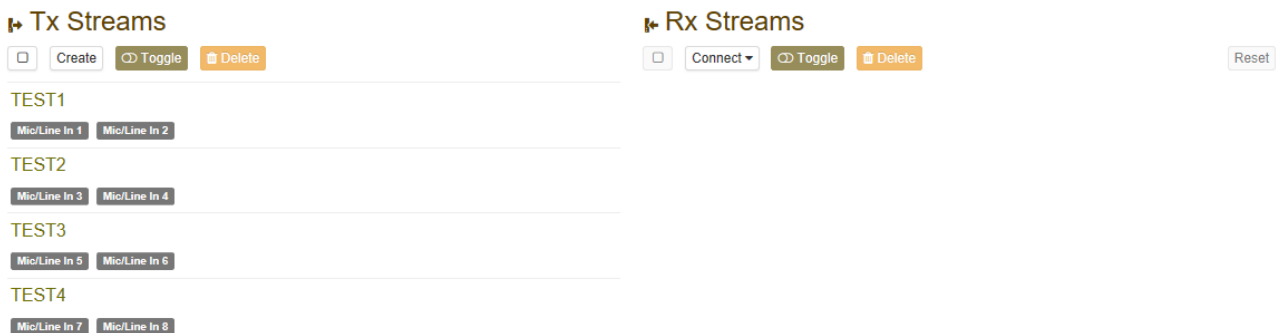
*TX Streams - Select All active*



## 11.17 Using the Toggle Function

The **Toggle** button can be used to make TX or RX streams active or inactive. First, [select](#) the streams you wish to toggle, and then click on **Toggle** to apply the change.

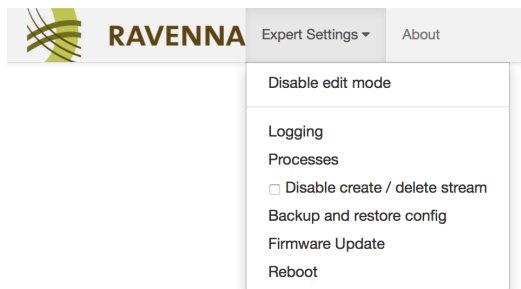
For TX Streams, the names will change from green (active) to grey (inactive):



For RX Streams, the names will change from green, orange or red (active) to grey (inactive). The green, orange and red colors indicate the [health](#) of the stream.

## 11.18 Expert Settings Menu

Once [expert](#) mode is enabled, you can click on **Expert Settings** to reveal the following options:



### ➤ Disable edit mode

Returns to the normal mode of operation. This is ideal if you wish to interrogate the configuration but do not need to edit any settings.

### ➤ Logging

Select this option to download the RAVENNA log file for the device. The log file can be used for diagnostic purposes.

### ➤ Processes

Select this option to download the RAVENNA process statuses, which can also be useful for diagnostics.

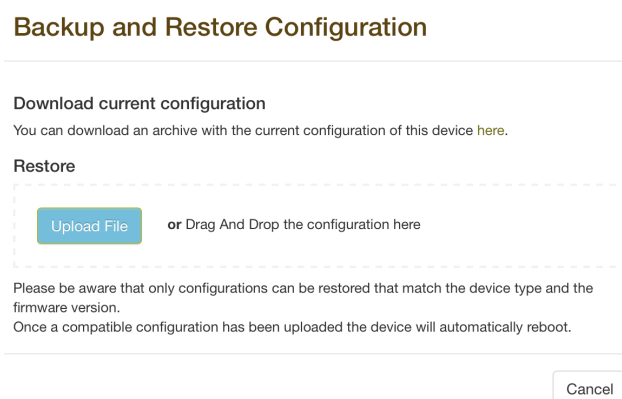
### ➤ Disable create/delete streams

Enable this option if you wish to edit the configuration in [expert](#) mode, but prevent the creation or deletion of TX or RX streams. This is recommended if you are using an external control system, such as VSM, to control the streaming connections.

### ➤ Backup and restore config

This tool will backup and restore the complete RAVENNA configuration. It is ideal if you need to exchange the device.

1. Select **Backup and restore config** from the **Expert Settings** menu - the following window appears:



2. Click on the link to download the current configuration as a "config-backup.tar.gz" file.
3. Or, click on **Upload File** and follow the on-screen instructions to perform a restore. Once the upload is complete, the device will automatically reboot (which means that you will lose your browser connection).
4. Once the reboot is complete, [re-open](#) the RAVENNA Web UI to check the new settings.

When you restore a configuration, you will override all of the device's RAVENNA settings. Therefore, make sure that you are connected to the correct unit before performing a restore!

## ➤ Firmware Update

This tool can be used to upgrade or downgrade the [Image version](#) installed on the device.

To check the **Image version**, select **About** from the headline at the top of the Home page to open the ['About'](#) dialog box. To perform an update:

1. Download the update file onto your computer. All releases are available from the **Downloads** area at [www.lawo.com](http://www.lawo.com) (after **Login**).

Please check that the downloaded file ends with **.tar.gz**

Some browsers, such as Safari, tend to unzip the file automatically after download which makes the file invalid. If this is the case, choose "Download as..." in your browser to bypass the automatic unzip function.

2. Read the release notes supplied with the update file.

If settings will be lost as a result of an update, it is strongly recommended that you export your configuration and/or take screenshots so that the current settings can be re-instated once the upgrade/downgrade is complete. Details of which settings will be affected are included in the release notes.

3. Select **Expert Settings -> Firmware update**.
4. Select the update file (**.tar.gz**) and then **Start Update**.

After a successful update, the device will automatically reboot (which means that you will lose your browser connection).

5. Once the reboot is complete, [re-open](#) the RAVENNA Web UI to check the new **Image version**.

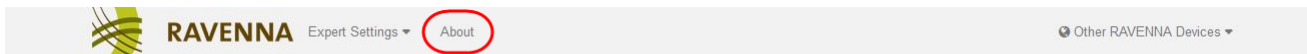
## ➤ Reboot

Select this option to reboot the RAVENNA IO device.

All streaming will cease during the reboot. Once the reboot is complete, all streaming connections will be re-instated according to the RAVENNA configuration stored locally on the device.

## 11.19 About

Select **About** from the headline at the top of the Home page:



The 'About' dialog box opens.

Under **Version**, the **Image version** describes the RAVENNA release installed on the device. It is important that all nodes on the network are running compatible Image versions, so if the number is not correct, you will need to [update](#) the device.

The other version fields describe the:

- **Image type** - the type of RAVENNA interface.
- **RAVENNA version** - the RAVENNA Web UI (Butler) release, which is a subset of the **Image version** release.

Select **Close** to close the information window and return to the Home page.

## 12. Adjusting Local Parameters

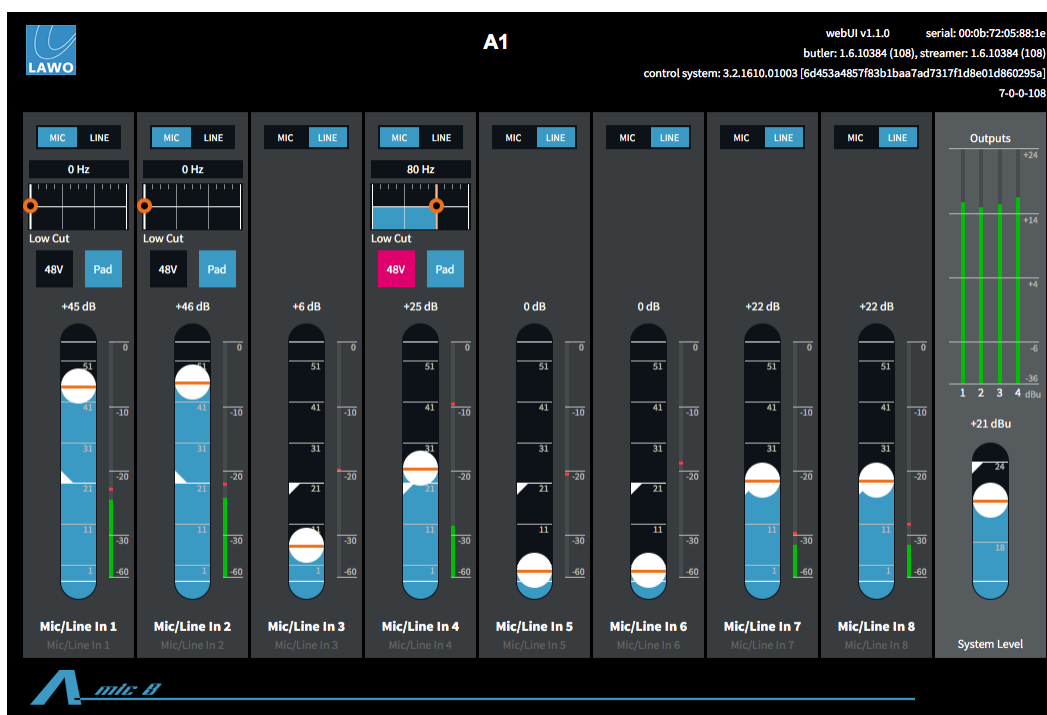
The **Device Parameters** and **GPIO** pages allow you to remotely control the audio and GPIO parameters from your service computer. Note that the latest values are stored locally on the device, and are re-instated following a power cycle or reboot.

### 12.1 Using the Control Pages

1. Open the [Landing page](#), select either **Device Parameters** or **GPIOs**, and then click on the graphical preview.

Note that you must enter service mode to access the **GPIOs**!

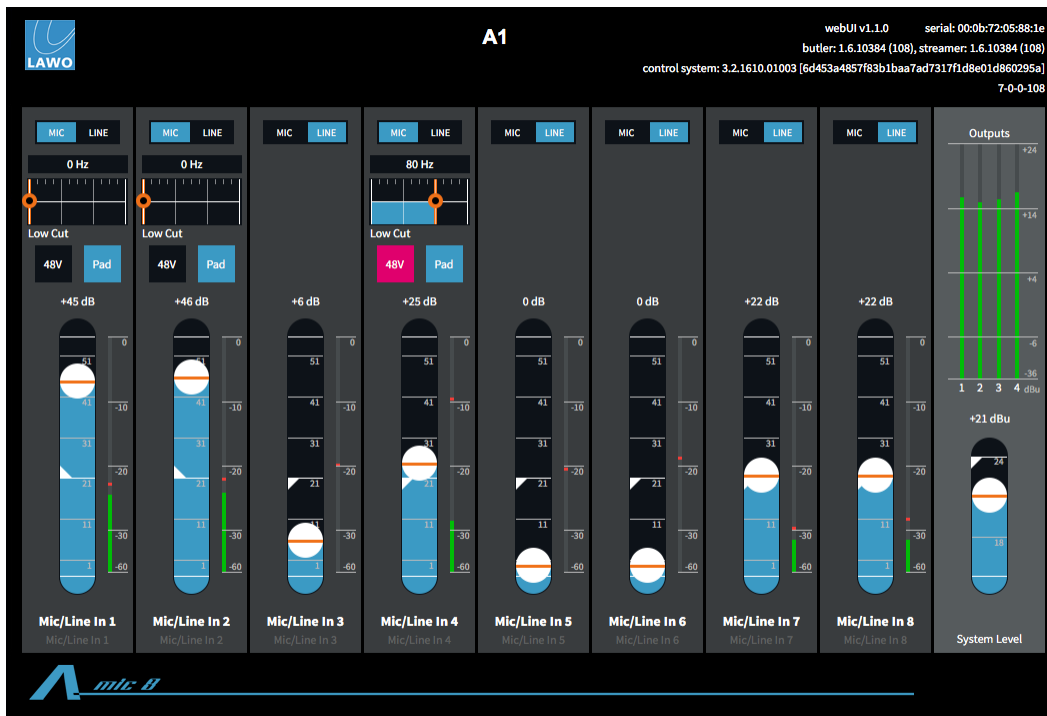
The control page opens in a new browser tab - in our example, the **Device Parameters** for an **A\_\_mic8**:



At the top of the page you will see the device's Network Name (e.g. **A1**), and information including the web UI version, serial number of the device and its firmware versions (top right). In the main area are the audio parameters and metering.

2. Touch and drag the sliders to adjust variable parameters.
3. Touch the on-screen buttons to enable or disable switched functions.

## 12.2 Device Parameters: A\_\_mic8



On the left of the page, each **Mic/Line In (1 to 8)** is represented by a vertical channel strip, with **MIC / LINE** input selection.

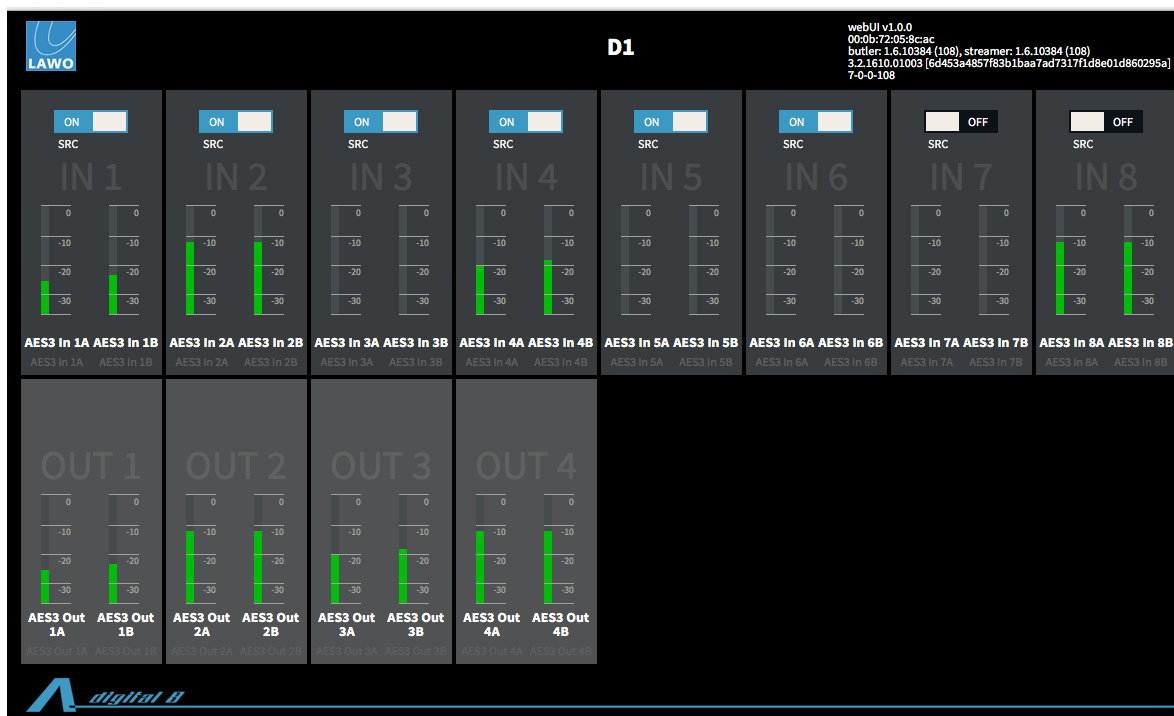
When switched to **MIC**, each input provides:

- **Low Cut** filtering, with a choice of roll-off frequencies: 0Hz, 40Hz, 80Hz or 140Hz.
- **48V** phantom power (on/off)
- **-20 dB Pad** (on/off)
- **Mic input gain** - with a typical range of 79dB (this may vary and shift depending on the given reference level and headroom).
- **Input meter**, with dBFS levels and a peak hold indicator (in red) - click on the meter to reset the peak hold value.

When switched to **LINE**, there is no Low Cut filter, 48V or 20dB Pad. So, for line inputs you can control input gain (with a typical range of 59dB) and input metering only.

On the right of the page, you will see output metering for the four Line Out (1 to 4), and a slider which adjusts the **System Level**. Note that the **System Level** sets the analogue reference level relative to 0dBFS and, therefore, should be adjusted with care.

## 12.3 Device Parameters: A\_\_digital8



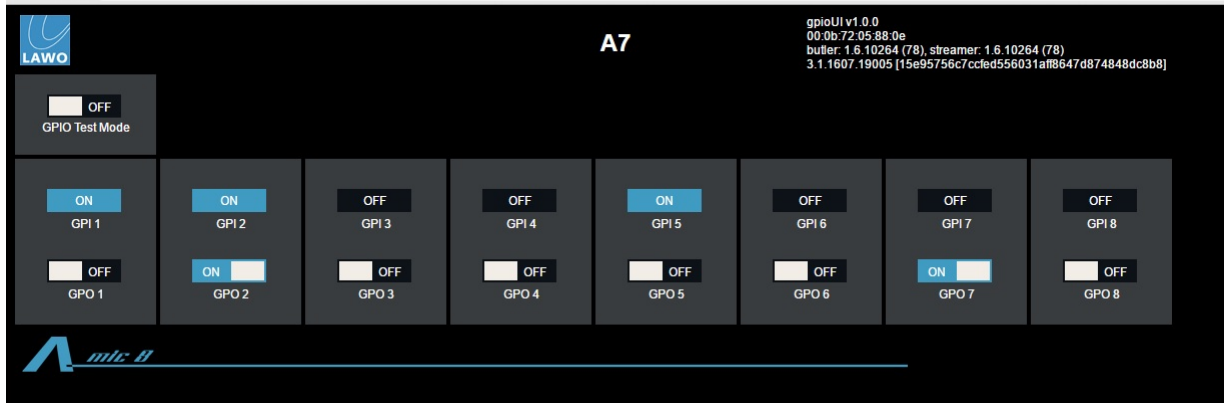
Across the top of the page, each **AES3 In (1 to 8)** is represented by a stereo channel with **SRC ON / OFF** to enable or disable the sample rate conversion, and input metering (in dBFS) for the left and right sides of the AES3 input.

Across the bottom of the page, you will see output metering for each **AES3 Out (1 to 4)**.

Note that the **A\_\_digital8** does not support the **A\_\_mic8**'s peak hold feature.

## 12.4 GPIOs

This page is identical for both the **A\_\_mic8** and **A\_\_digital8**.



At the top left, enable the **GPIO Test Mode** to loop all inputs to outputs. This can be useful for testing purposes. For normal operation, the Test Mode should be **OFF**.

The two lower rows represent each individual input and output:

- For each input (GPI 1 to 8), the **ON** button lights in blue if the input state is high (GPI active).
- For each output (GPO 1 to 8), use the **ON / OFF** button to switch the output high or low.



## 13. Software Tools & Diagnostics

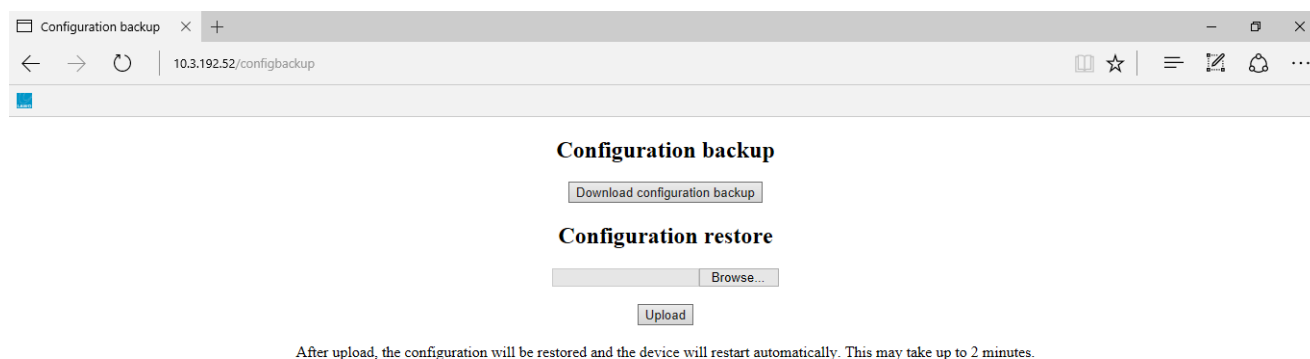
### 13.1 Configuration Backup & Restore

This tool will backup and restore the complete RAVENNA configuration. It is ideal if you need to exchange a device. Note that this function is identical to the **Backup and restore config** function available from the [Expert Settings](#) menu of the RAVENNA Web UI.

➤ **To create a backup:**

1. Open the [Landing page](#) in service mode, select **Configuration Backup & Restore** and then click on the graphical preview.

The Configuration backup & restore page opens in a new browser tab:



2. Select **Download configuration backup** - you are asked what to do with the "config-backup.tar.gz" file.
3. Select either **Save** or **Save As** to save the file locally onto your computer.

Once the download is complete, a confirmation message appears.

You can now replace the existing unit.

➤ **To restore a configuration file:**

1. Open the Configuration backup & restore home page as before, but this time on the replacement unit.

When you restore a configuration, you will override all of the device's RAVENNA settings. Therefore, make sure that you are connected to the correct unit before performing a restore!

2. Click on the **Browse** button, select the backup file and then click on **Open**.



### Configuration backup

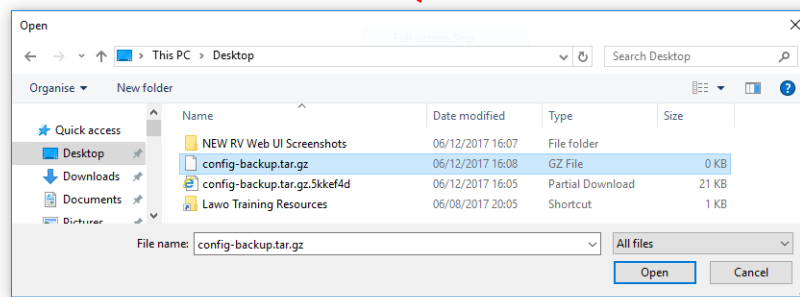
Download configuration backup

### Configuration restore

Browse...

Upload

After upload, the configuration will be restored and the device will restart automatically. This may take up to 2 minutes.



The selected file appears in the **Configuration restore** file selection field.

3. Select **Upload** to begin the restore.

Once the upload is complete, the device will automatically restart.

4. Re-open the Landing page to check the restored settings.

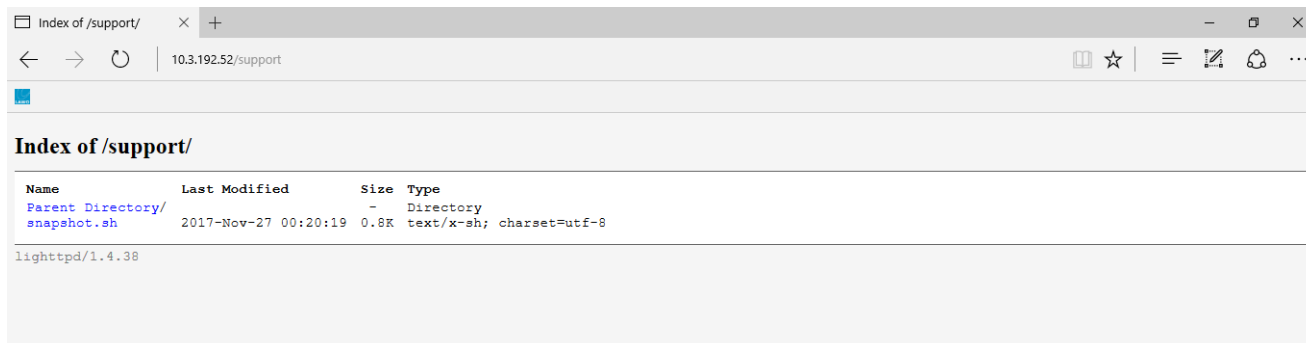
## 13.2 Service Support

This tool will download a current snapshot of the device settings into a "snapshot.sh" file. The file can be useful for Lawo support when diagnosing a problem.

➤ **To download the snapshot file:**

1. Open the [Landing page](#) in service mode, select **Service Support** and then click on the graphical preview.

The Service Support page opens in a new browser tab:



2. Click on the **snapshot.sh** link - you are asked what to do with the file.
3. Select either **Save** or **Save As** to save the file locally onto your computer.

Once the download is complete, a confirmation message appears.

You can now send the file to [support@lawo.com](mailto:support@lawo.com) along with a short description of the problem.

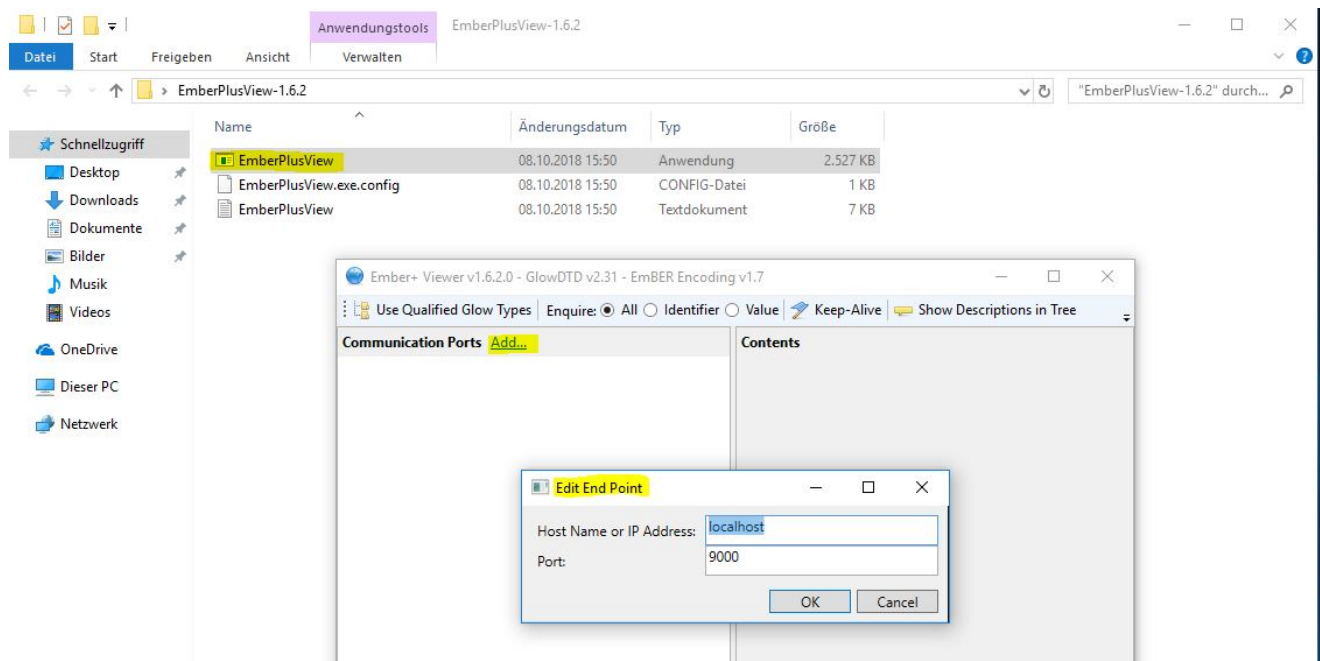
### 13.3 Ember+ Tree Viewer

All parameters within the A\_\_mic8 / A\_\_digital8 are accessible via Ember+. This allows an external control system, such as a Lawo console or VSM, to remotely control or respond to parameter changes within the device. From Image Version 10.0.0, this includes the internal Routing Matrix which maps the device's local IO signals to and from the RAVENNA streams.

Ember+ is a non-proprietary TCP/IP protocol supported by a wide range of Lawo products. More details about the Ember+ protocol can be found at <https://github.com/Lawo/ember-plus/wiki>.

The Ember+ Tree Viewer can be used to check the status of Ember+ parameters and/or switch a parameter manually within the A\_\_mic8 / A\_\_digital8. This can be useful when configuring and testing an Ember+ controlled device. To use the application:

1. Download the ".bz2" or ".xz" archive from the location <https://github.com/Lawo/ember-plus/releases> and unzip it.
2. Navigate to the folder "tools" and unzip the file "EmberPlusView-XXX.zip"
3. Double-click on the file "EmberPlusView.exe" to start the Ember+ Tree Viewer.
4. Once the application is open, click on "Add.." to add a new communication port:



5. Enter the IP Address and Port number of your device.

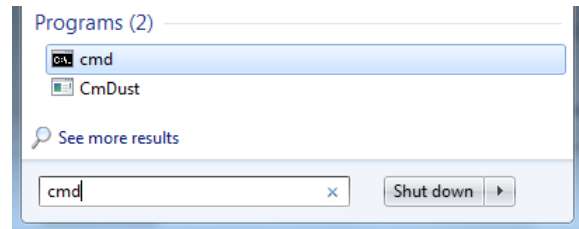
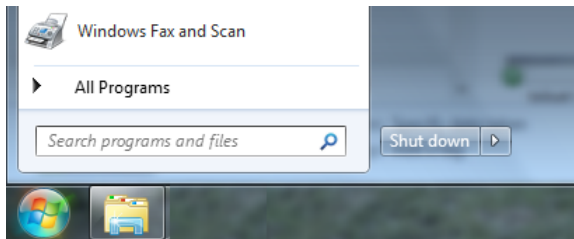
You can use the IP address of any streaming port. So, for example, on an A\_\_mic8 / A\_\_digital8, this can be the IP address of either ETHERNET A (ra0) or ETHERNET B (ra1).

6. Select **OK** to add the device to the Ember+ Viewer - the virtual status LED will turn green once the tree has been fully read.
7. You can now open the branches of the tree and select a parameter to interrogate or alter its status.

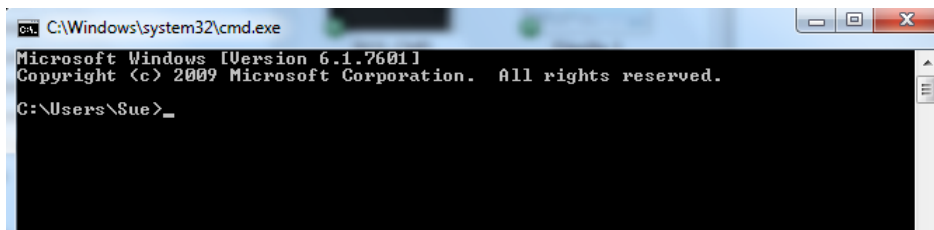
## 13.4 Running a PING Test

The PING command is a built-in Windows and Mac function, that allows you to test whether you have a valid network connection to and from any networked device.

1. Make sure that your computer is connected to the correct network port, and that you have configured the TCP/IP settings of your computer's network interface card.
2. On a Windows 7 PC, type **cmd** into the "Search programs and files" field under the **Start** menu and press Enter.



This opens the DOS command prompt window:



Alternatively, on a Mac, open the **Terminal** program (found in the **Applications -> Utilities** folder).

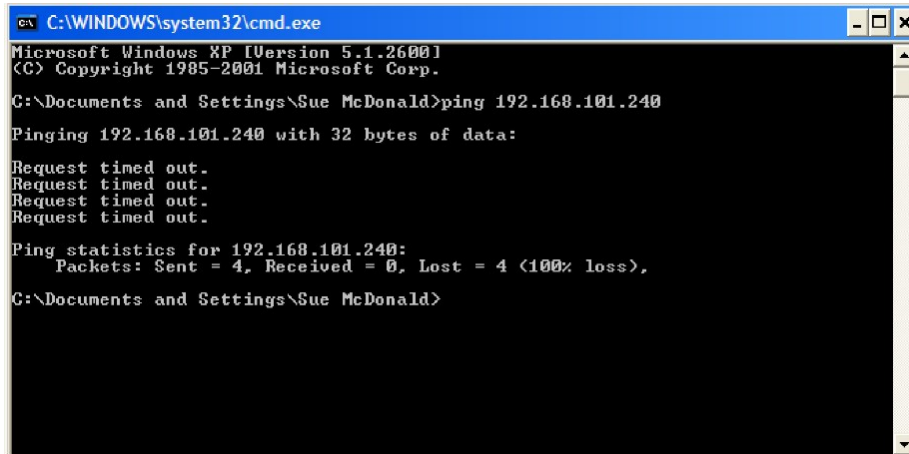
3. On both platforms, perform the ping test as follows:

Type **ping xxx.xxx.xxx.xx** (where **xx..** is the IP address of the device you are trying to connect to) and press Enter.

Your computer will now try to establish communication...

### ➤ Ping Test Fail

If the ping test fails, then the request will time out, and you will not receive any successful packets:



```
ex C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Sue McDonald>ping 192.168.101.240

Pinging 192.168.101.240 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

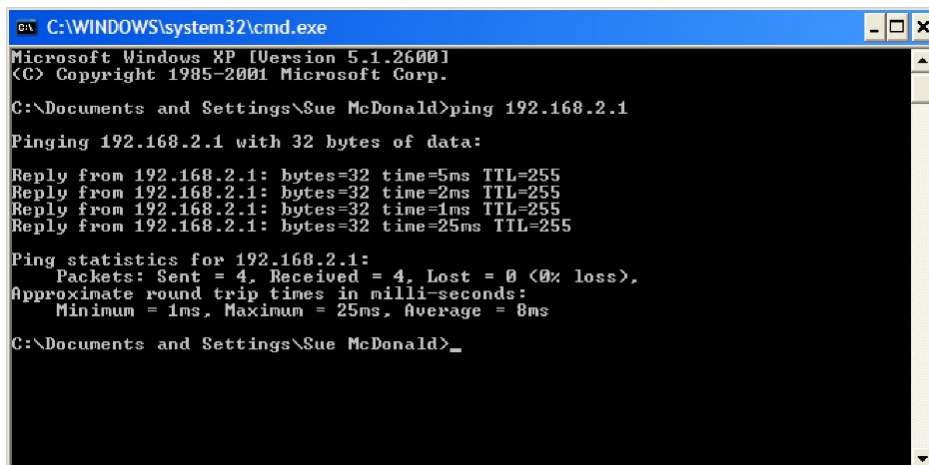
Ping statistics for 192.168.101.240:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\Documents and Settings\Sue McDonald>
```

There is something wrong with your network configuration, so check the network connections, and TCP/IP settings again. Or contact your network administrator.

### ➤ Ping Test Success

If the ping test is successful, then the result will show that the Sent packets have been successfully Received:



```
ex C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Sue McDonald>ping 192.168.2.1

Pinging 192.168.2.1 with 32 bytes of data:

Reply from 192.168.2.1: bytes=32 time=5ms TTL=255
Reply from 192.168.2.1: bytes=32 time=2ms TTL=255
Reply from 192.168.2.1: bytes=32 time=1ms TTL=255
Reply from 192.168.2.1: bytes=32 time=25ms TTL=255

Ping statistics for 192.168.2.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 25ms, Average = 8ms

C:\Documents and Settings\Sue McDonald>_
```

This confirms that the network communication is working. If you still cannot connect, then something on your computer is blocking the network connection. Try disabling any firewall and/or antivirus software.

## 14. Glossary

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<b>1000 Base-T</b>	Used in data networks to describe the Ethernet standard. The standard defines the network speed, cable type and length.
<b>1000 Base-SX</b>	
<b>1000 Base-LX</b>	For example, 1000 Base-T is a standard for Gigabit Ethernet over copper wiring. The 1000 refers to the network speed (1000 Mbit/s), while the Base-T refers to the cable type and length of connection (e.g. twisted pair CAT5, CAT5e, CAT6, CAT7, up to 100m).  Other common Ethernet standards include 100 Base-TX (Fast Ethernet, twisted pair CAT 5, up to 100m), 1000 Base-SX (Gigabit Ethernet, multi-mode fibre, 220-550 metres), 1000 Base-LX10 (Gigabit Ethernet, single-mode fibre, up to 10km), etc.
<b>AoIP</b>	Audio-over-IP
<b>Buffer Size</b>	The buffer size sets the amount of data stored (in memory) before each data packet is transmitted or played out. In an audio system, the smaller the buffer size, the lower the latency, but the more susceptible to drop-outs.
<b>COMi.MX</b>	The name of Lawo's RAVENNA processing hardware device. The COMi.MX forms a sub component of most of Lawo's RAVENNA IO cards.
<b>DALLIS</b>	Digital and Line Level Interface System.  The name of Lawo's configurable IO device. Each DALLIS frame can be fitted with a combination of plug-in IO cards.
<b>DHCP</b>	Dynamic Host Configuration Protocol  Commonly used in data networks to dynamically allocate IP addresses from a central server.
<b>DSCP</b>	Differentiated Services Code Point  DSCP values are used within computer networks to classify and manage different types of network traffic. For example, to provide low-latency for critical network traffic such as media streaming, while providing best-effort services to non-critical services such as web traffic or file transfers. The default DSCP value for RAVENNA streams is 46 (=EF); and for PTP is 56 (=CS7).
<b>Ember+</b>	A non-proprietary TCP/IP interface protocol. An Ember+ provider can "publish" parameters which may then be used by an Ember+ consumer. For example, to display information or enable control from a remote device.
<b>Fast Leave</b>	An option often supported by IGMP network switches, which allows the switch to determine when an output port has left a Multicast group. If this option is not enabled, then Multicast traffic can flood the output port continuously. See IGMP.
<b>HPET</b>	High Precision Event Timer  A high precision clock reference provided by your PC. It is required for proper RAVENNA timing.
<b>HTTP</b>	Hypertext Transfer Protocol  A networking protocol/URL address, commonly used to exchange or transfer web pages, email, etc.

<b>IGMP</b>	<p>Internet Group Management Protocol</p> <p>A communications protocol used by adjacent switches/routers on a network to establish Multicast group memberships.</p> <p>IGMP Querying/Snooping is a technique used by network switches to control the forwarding of Multicast data packets. A switch with IGMP Querying/Snooping will forward Multicast data packets only to the ports that are members of the Multicast group. Whereas, a switch without IGMP Querying/Snooping will broadcast Multicast data to all of its output ports. As a result, the volume of Multicast traffic will be significantly reduced if a network switch supports IGMP Querying/Snooping.</p>
<b>IP Address</b>	<p>Internet Protocol address.</p> <p>All devices connected to a data network must have a unique IP address. In IPv4, a 32-bit number is used and a typical address looks like this: <b>192.168.101.240</b>. In IPv6, a 128-bit number is used.</p> <p>In IPv4, subnets are used to divide the IP address range. For example, a subnet mask of <b>255.255.255.0</b> effectively filters the first three fields of the address. So, providing the subnet masks match, a device with an IP address = <b>192.168.101.xxx</b> can communicate with another device using an IP address = <b>192.168.101.xxx</b> (where <b>xxx</b> is a unique number between <b>1</b> and <b>254</b>) without any further configuration or routing. A Class C IPv4 address range runs from <b>0</b> to <b>255</b>. However, <b>.0</b> is usually reserved for use as a gateway and <b>.255</b> as a broadcast address (by network switches). Therefore, this type of network supports 254 clients/nodes. If communication is required outside of the broadcast domain - for example, to a device with an IP address = <b>192.168.102.xxx</b> - then the data packets must be redirected using a network switch with Layer 3 routing capability.</p>
<b>IPv4</b>	Internet Protocol Version 4 - see IP Address.
<b>IPv6</b>	Internet Protocol Version 6 - see IP Address.
<b>LAN</b>	<p>Local Area Network</p> <p>A data network that interconnects devices within a small geographic area (e.g. a home, school or office building). LANs differ from WANs (Wide Area Networks) in that they do not require leased telecommunications lines (i.e. there is no need for an external service provider).</p>
<b>Latency</b>	The amount of time delay between an audio signal entering and emerging from a system.
<b>Layer 2/3</b>	See Network Switch.
<b>Multicast</b>	In a multicast data network, data is copied and distributed by the network switch/router. This means that packets sent from a single device can be received by multiple nodes at the same time (i.e. one to many). This differs from a unicast data network where data packets are addressed to a single receiving node (i.e. one to one).
<b>Network Router</b>	See Network Switch.
<b>Network Switch</b>	A device used in data networks to interconnect multiple nodes. A Layer 2 network switch conforms to the OSI Layer 2 model, meaning that they can handle the physical and data link layers (i.e. cabling and basic packet transmission). This differs from a Layer 3 network router which also handles the network layer (i.e. it can redirect network packets).
<b>NIC</b>	<p>Network Interface Card</p> <p>A computer interface that connects to external network devices.</p>
<b>Nova73</b>	A stand alone routing matrix with networking capabilities; this is a large matrix related to the mc <sup>2</sup> series of Lawo consoles.



<b>PTP</b>	<p>Precision Time Protocol.</p> <p>An ultra-precise, Synchronization method used in data networks. The PTPv2 protocol can be used as the sync reference for all RAVENNA devices in a network.</p>
<b>QoS</b>	<p>Quality of Service</p> <p>The QoS defines the overall performance of a computer network. Several factors are considered: error rates, bandwidth, throughput, transmission delay, availability, jitter, etc. See also DSCP.</p>
<b>RAVENNA</b>	<p>A real-time, network-synchronised Audio over IP protocol.</p> <p>RAVENNA offers real-time distribution of audio and other media content within IP-based network environments.</p>
<b>Remote MNOPL</b>	<p>The remote control protocol RemoteMNOPL is a LAN based client-server network byte order protocol to enable third party systems to control Lawo's digital mixing consoles or standalone routers.</p>
<b>RTP</b>	<p>Real-time Transport Protocol</p> <p>A networking protocol that defines a standard packet format for delivering audio and video over data networks.</p>
<b>RTCP</b>	<p>Real-time Transport Control Protocol</p> <p>Works in conjunction with RTP. While RTP carries the media streams (audio and video), RTCP is used to monitor the transmission statistics and Quality of Service (QoS).</p>
<b>RTSP</b>	<p>Real-time Transport Streaming Protocol</p> <p>A networking protocol/URL address, commonly used in establishing point-to-point media sessions.</p>
<b>Sample Rate</b>	<p>The speed at which the Processing of the system takes samples respective to values from a continuous, analogue audio signal to make a discrete, digital one. For example, when running at 48kHz, incoming analogue audio is sampled at a rate of 48000 values per second.</p>
<b>SDP</b>	<p>Session Description Protocol</p> <p>A format for describing streaming media communications parameters.</p>
<b>SFP</b>	<p>Small Form-factor Pluggable transceiver.</p> <p>A hot-pluggable device which can be used to offer a choice of connection methods - e.g. multi-mode fibre, single-mode fibre, etc.</p>
<b>SIP</b>	<p>Session Initiation Protocol</p> <p>A networking protocol/URL address, commonly used within Voice-over-IP systems.</p>
<b>SMPTE 2022-7</b>	<p>SMPTE 2022 is a standard from the Society of Motion Picture and Television Engineers (SMPTE) that describes how to send digital video over an IP network. The standard is published in seven parts. The seventh part (SMPTE 2022-7) describes the Seamless Protection Switching of SMPTE ST 2022 IP datagrams. Within a RAVENNA streaming network, the technology is used to provide redundant streaming between two nodes.</p>
<b>SPS</b>	<p>Seamless Protection Switching. See SMPTE 2022-7.</p>
<b>Subnet</b>	<p>See IP Address.</p>
<b>TCP</b>	<p>Transmission Control Protocol</p> <p>A protocol that provides reliable, ordered, and error-checked delivery of a stream of octets (bytes) between applications running on hosts communicating via an IP network.</p>

<b>TCP/IP</b>	The Internet protocol suite - Transmission Control Protocol (TCP) and the Internet Protocol (IP) - provides end-to-end data communication specifying how data should be packetized, addressed, transmitted, routed, and received.
<b>TDM</b>	Time-Division Multiplexing A common method of transporting signals via a point-to-point connection. In Lawo devices, TDM is used internally to transport audio along the backplane - e.g. from a IO or DSP card to the routing matrix, and vice versa.
<b>TTL</b>	Time to Leave A mechanism that limits the lifespan of data within a computer network, in order to prevent data packets from circulating indefinitely.
<b>UDP</b>	User Datagram Protocol A simple connection-less networking protocol which is often used in real-time applications due to its low latency. UDP is suitable for purposes where error checking and correction are either not necessary or performed in the application.
<b>URL</b>	Uniform Resource Locator A networking term for specifying the location of a resource on a computer network. URL types include http, rtsp and sip.
<b>vLAN</b>	virtual Local Area Network A tool supported by some network switches/routers to separate network traffic "virtually" when connected to the same physical LAN.
<b>WAN</b>	Wide Area Network A data network that covers a broad area (e.g. linking regional, national or international boundaries) using leased telecommunications lines (i.e. supported by a service contract from an external provider).