

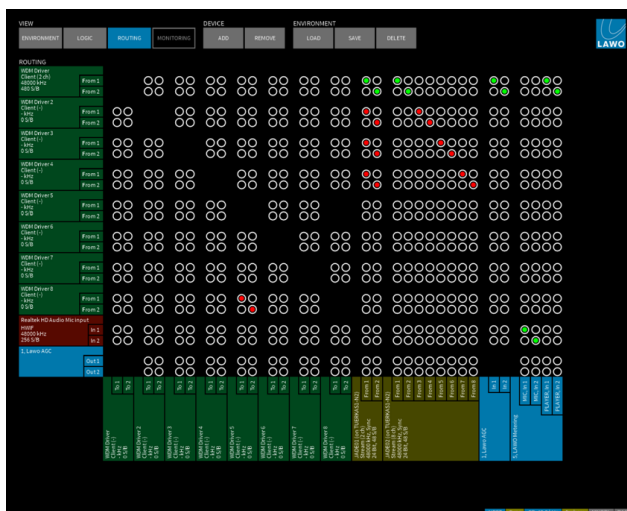
# RELAY

## VPB Virtual Patch Bay

### User Guide

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To obtain the latest documentation and software downloads, please visit:

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

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# 1. Introduction

---

Welcome to **RELAY VPB**.

## About this Manual

This document describes how to install, configure and operate the system.

Look out for the following which indicate:

**Notes** - points of clarification.

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

**Attention:** Alert you when an action should *always* be observed.

## Software Updates

The latest User Guides and software are available from the **Downloads** area at [www.lawo.com](http://www.lawo.com) (after **Login**).

## Lawo User Registration

For access to the **Downloads** area and to receive regular product updates, please register at:

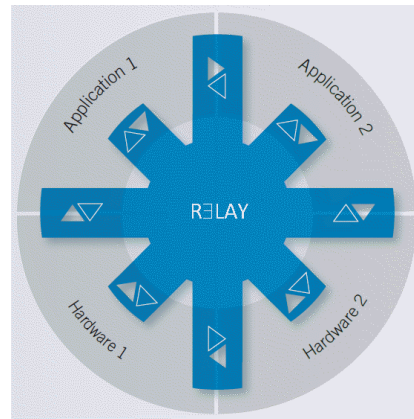
[www.lawo.com/registration](http://www.lawo.com/registration).

## 2. Product Overview

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### 2.1 Introducing R3LAY VPB

**R3LAY Virtual PatchBay** is a software application which manages all the audio streams on a Windows® computer. It can "see" all audio hardware interfaces and active software clients, and acts as a central routing hub to interconnect different audio streams and reset parameters:



One of the main benefits is that users can work with different hardware interfaces and software applications simultaneously. For example, a journalist may record their own USB microphone and an interviewee, connected via their chat software, at the same time. Normally this isn't possible in Windows® applications, as only one audio input/output device may be specified at a time. By defining **R3LAY VPB** as the audio input/output device, multiple audio streams may be summed and routed to an application.

In addition, **R3LAY VPB**'s environments can be used to reset parameters. By preparing different matrix routing and saving environments, end-users can recall complex audio configurations at the touch of a button.

**R3LAY VPB** operates with all non-proprietary audio interface drivers (ASIO, WDM, WASAPI and MME), meaning that all hardware and software devices on a single computer can pass through **R3LAY VPB**. In addition, **R3LAY VPB** provides a native implementation of the RAVENNA streaming technology (Audio over IP) enabling you to send and receive audio streams across your IP network.

## 2.2 The Four 'Views'

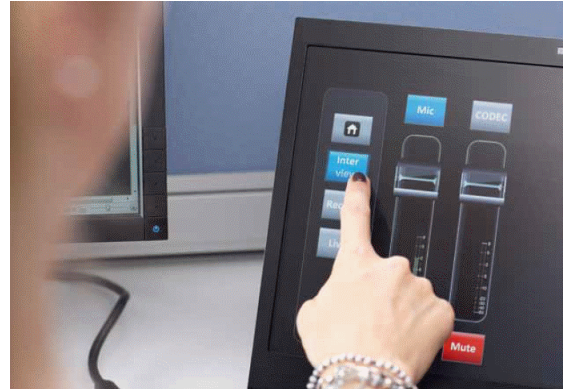
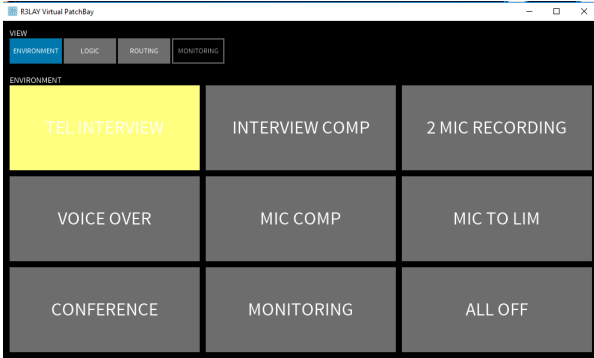
**RELAY VPB** includes four 'Views' to configure the routing matrix, load environments and monitor signals:

- **Routing** View defines the audio hardware interfaces and software applications which may be connected and reset by **RELAY VPB**. You can add input and output devices, prepare matrix connections, adjust input, output and summation levels, and meter signals. **Routing** View is also used to save and configure environments.
- **Environments** View is designed for the end-user, and loads environments. Each environment can store devices, connections, and processing parameters. In addition, it may reset external matrix connections (via Remote MNOPL) and/or include SOAP scripts to perform actions outside of **RELAY VPB**.
- **Logic** View is also designed for the end-user, and offers a simplified view of the routing matrix. Each logical device can be named and colour-coded, and represent single or multiple channels from a real audio interface.
- **Monitoring** View allows you to monitor and meter any audio signal on your computer. It is useful for line checking or fault finding different audio streams.

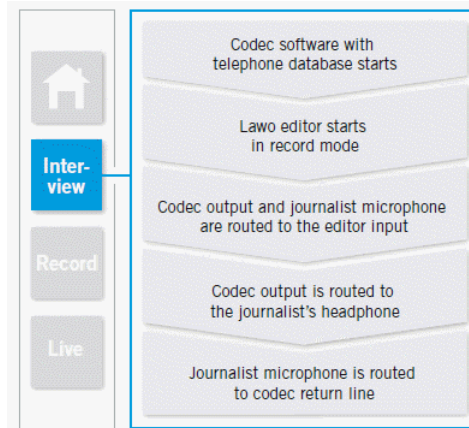
Routing View Example

### 2.3 End-User Operation

Usually environments are prepared in advance, so that the audio path can be reset for different tasks or situations. Environments may be recalled from **RELAY VPB**'s own graphical user interface (via the **Environment** view, below left), from a keyboard shortcut or, remotely, from an external device or application (via RAS Control or Ember+, below right):



In addition to resetting connections and parameters, environments may control functions outside of **RELAY VPB** - for example, to reset external matrix connections (via Remote MNOPL) or execute macro functionality (via SOAP script commands). In the example opposite, a single environment prepares the audio path for a telephone interview, starts the recording software and places the software into record ready mode:



Once installed, **RELAY VPB** can start either as an application (with full GUI control) or as a service (where prepared audio paths and RAVENNA streams run in the background). The latter is ideal for Playout Servers or remote-controlled **RELAY** devices where you wish to restrict the user access. The starting and stopping of different applications and services is managed by the **RELAY Service Manager**.

## 3. Installation

This chapter describes how to install the software, assign the virtual audio drivers and activate the license.

### 3.1 Preparation

**R3LAY VPB** is delivered as a software download only. You will need a customer login to download the installer, and a valid software license to activate the product.

To host the software, you will need a Windows PC which is not supplied.

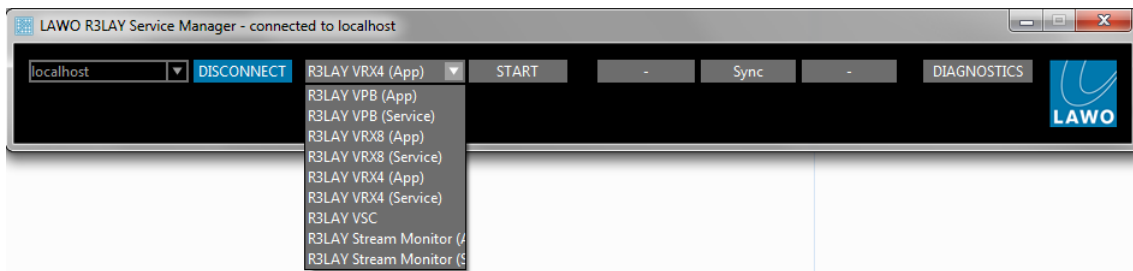
To get your system operational, please complete each of the following steps:

1. Check that your host PC meets the [system requirements](#).
2. Run the **R3LAY VPB** [installer](#).
3. Assign the [virtual audio drivers](#) for each software application you wish to connect.
4. [Activate](#) your software license.

#### 3.1.1 Installing Multiple R3LAY Products on a Single PC

The **R3LAY** product family comprises several independent products: **VRX<sup>4</sup>** and **VRX<sup>8</sup> (Virtual Radio Mixers)**, **VSC (Virtual Sound Card)** and **VPB (Virtual PatchBay)**. In addition, the **VoIP Stream Monitor** provides a tool for monitoring RAVENNA streaming connections. **VRX**, **VPB** and **Stream Monitor** can run either as an application (with full GUI control) or as a service (in the background) whenever you start the PC.

You can install multiple products on the same PC, but they cannot run at the same time. If more than one flavour of **R3LAY** is installed, you can choose to stop and then start a different service or application from the **R3LAY Service Manager**:



#### 3.1.2 Controlling R3LAY Services on a Remote PC

If multiple **R3LAY** PCs are connected to the network, then you can use the **R3LAY Service Manager** to connect to a remote PC, and then start or stop a **R3LAY** application or service running on the remote host. See [Connecting to a Local Host or Remote PC](#).

All settings are stored locally on the connected PC. If you wish to start **R3LAY VRX**, **VPB** or **Stream Monitor** as an application, then a user must be logged in on the remote PC (in order to open the application GUI).

## 3.2 System Requirements

RELAY Virtual Radio Mixer applications are processor-intensive, and can be very demanding on a computer's resources, especially the CPU.

While it is virtually impossible to keep track of the ever-changing list of CPUs available, we do have some guidelines that can assist you in making your selection. These have been selected to help ensure that your RELAY software operates properly using any combination of included features.

### Look for CPUs and PCs with the following characteristics:

- A multicore processor specified for desktop or server applications.
- Processor should have a CPU benchmark score of 8,000 points, minimum.
- System must have 8GB minimum RAM.
- Operating system should be Windows 7, 8, 8.1,10 (32 and 64 Bit), Server2012 R2 or Server2016.
- Dedicated graphics card recommended for improved performance.
- Gigabit Ethernet LAN connection. Better results are more likely to be achieved by using separate NICs for "normal" traffic and streaming.

To help you determine the best CPU for your RELAY system, we recommend PassMark's excellent website. You may be familiar with their benchmarking software; they also maintain a large list of CPUs with performance scores at [https://www.cpubenchmark.net/cpu\\_list.php](https://www.cpubenchmark.net/cpu_list.php).

In general, you must select a CPU with 8,000 points or higher for optimal results. A score lower than 8,000 will likely result in performance problems. The more programs and tasks required to run while using RELAY, and the more streams the computer has to work with, the higher the CPU benchmark should be.

### Warning Notices

Operating systems not listed above have not been thoroughly tested by Lawo. Although you may be able to run RELAY on these untested operating systems, we cannot support such installations; neither can we support RELAY on any computers using pre-release or beta OS versions.

Although RELAY may run on computers with CPUs which do not meet the benchmark requirements stated here, we cannot ensure that all software features will operate correctly unless that power requirement is met, and cannot support RELAY on any computers which do not meet the minimum hardware requirements.

### Additional Notes

As some audio devices and network interface cards behave in a different and unpredictable manner after recovering from a power-saving sleep state, it is recommended NOT to allow your computer to enter a sleep state while using such devices with RELAY. You can configure your power plan in Windows®, by selecting the "Control Panel -> Power Options" - choose a plan which does not put the computer to sleep.

### 3.2.1 Running RELAY in a Virtual Machine

Lawo is a VMWare Partner, and so to run RELAY in a Virtual Machine we recommend VMWare Server 6.5 and VSphere.

To familiarize yourself with the VMWare environment, please read the following Technical White Papers (from VMWare):

- [Deploying Extremely Latency-Sensitive Applications in VMware vSphere 5.5](#)
- [Best Practices for Performance Tuning of Telco and NFV Workloads in VSphere](#)

When configuring VMWare for use with RELAY, it is essential to use the latency sensitivity settings (mentioned in the white papers), and to follow the “100% reservation rule” for CPU and memory.

In addition to VMWare’s recommendations, it is essential to configure a separate, standalone network for streaming, with additional NICs and an additional VSwitch.



### 3.3 Installing the Software

The latest **LawoR3LAYVirtualPatchBaySetup** installer can be downloaded from [www.r3lay.com/pages/manuals-downloads](http://www.r3lay.com/pages/manuals-downloads).

1. Copy the installer onto your computer and double-click on its icon to start the setup wizard.

If an earlier version of **R3LAY VPB**, or another **R3LAY** flavour, is running on the computer, then it is best to [stop](#) and [disconnect](#) the current service, and then [close](#) the Service Manager GUI before continuing.

2. Select **Next** and follow the Wizard's instructions accepting the default options provided.

When the "Select Additional Tasks" screen appears, you may choose the following options. Note that the installer will detect which Virtual audio and RAVENNA Network drivers are currently installed; if there is a newer version, then the option is selected; if you already have the latest version, then the option is not ticked. If in doubt, leave the default options selected.

#### ➤ Virtual audio drivers

These options determine which audio drivers will be installed:

- **ASIO** - installs a DLL which is loaded by devices using an ASIO driver. Most professional interfaces and applications use ASIO drivers (for lower latency).
- **WDM-Drivers** - installs up to 32 instances of the standard WDM driver. These are used by software applications such as chat software or media players.

#### ➤ RAVENNA

- **Network Driver** - installs the RAVENNA network driver. The driver optimises network packet transmission for RAVENNA streaming.
- **Add firewall rules** - adds pre-determined firewall rules which may be required by the **Network Driver**.
- **Activate HPET (High Precision Event Timer)** - appears if you are running an OS prior to Windows 10. In this instance, HPET should be activated for proper RAVENNA timing.

Note that Windows 10 uses an improved internal clocking mechanism named "TSC\_INVARIANT", which by default is active. Therefore, when running Windows 10, you will not see the **Activate HPET** option.

➤ **Licensing** - tick this option to install the **CodeMeter Runtime** software required for [licensing](#). If the software is already installed, then selecting this option will update the CodeMeter release and configure a new Cm container.

➤ **Additional icons** - tick this option to create a desktop icon for the application.

4. Select **Next** followed by **Install** to proceed with the installation.

If an existing **R3LAY** service is running, then the install may fail and an error dialog box will appear. Select the option to "automatically close the application(s)", **Abort** the install and then re-run the installer from step 1. Once the active **R3LAY** service or application has been closed, the installer should run successfully.

5. After the **R3LAY** installation, the **CodeMeter Runtime** Wizard appears (if **Licensing** has been selected during step 3). Select **Next** to install the licensing software. Or, **Cancel** to quit this part of the installation - for example, if the PC is already running the latest **CodeMeter Runtime** release.

6. After a successful install, a confirmation window appears - you will be prompted to restart the computer (if any of the "requires new start" options were selected during step 3). Select **Yes** (or **No**) and then click on **Finish**.

After the restart, you should see the **R3LAY Service Manager** icon in the taskbar:



If you have any problems with the software installation, please contact your local Lawo representative or email [support@lawo.com](mailto:support@lawo.com).

## 3.4 Uninstall & Updates

The software can be uninstalled in the usual Windows manner:

1. First, [stop](#) and [disconnect](#) the current application or service, and then [close](#) the Service Manager GUI.
2. Then open the "Uninstall or change a program" Control Panel, select the **RELAY VPB** program and click **Uninstall**.

To update to a new version, follow the installation procedure described [earlier](#). There is no need to remove older versions of the application. The latest configuration is stored locally and is loaded automatically after the update, see [Saving the Configuration](#).

## 3.5 Assigning the Virtual Audio Drivers

**RELAY VPB** supports 32 WDM drivers (stereo) plus an ASIO client (up to 256 channels). To use both driver types, they must have been selected during installation using the [Virtual Audio Driver](#) options.

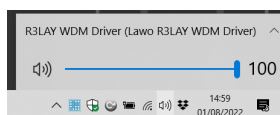
The driver you choose depends on the software client and whether you wish to make connections independently:

- For the lowest latency, best audio performance or multi-channel operation, use **ASIO** (if supported by your software client).
- If ASIO is not supported, or to connect to applications independently, assign a different **WDM Driver** instance to each software client.

Note that not all software clients support the option to assign an audio driver, and may use only the [Default Windows Sound Device](#).

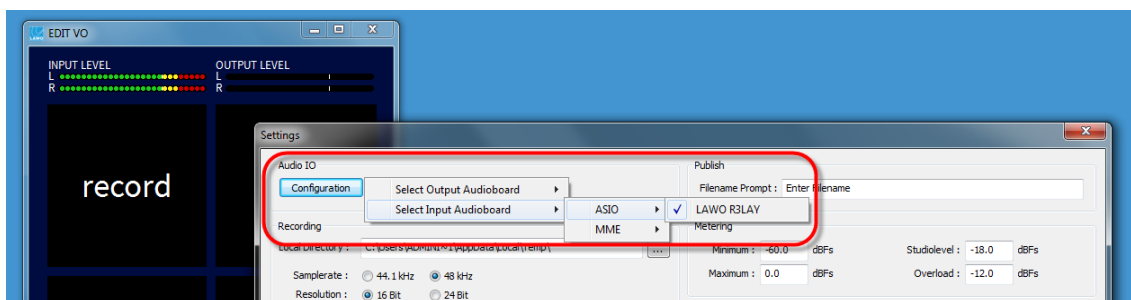
If a single driver is used more than once, then audio to and from these software clients is presented to **RELAY** as a single audio stream.

Optionally, you can activate the Windows mixer volume for all **WDM driver** instances. This allows you to use the Windows volume control (shown below) to adjust the level to **RELAY**. By default, this option is turned off. It can be enabled by editing the advanced options (described [later](#)).

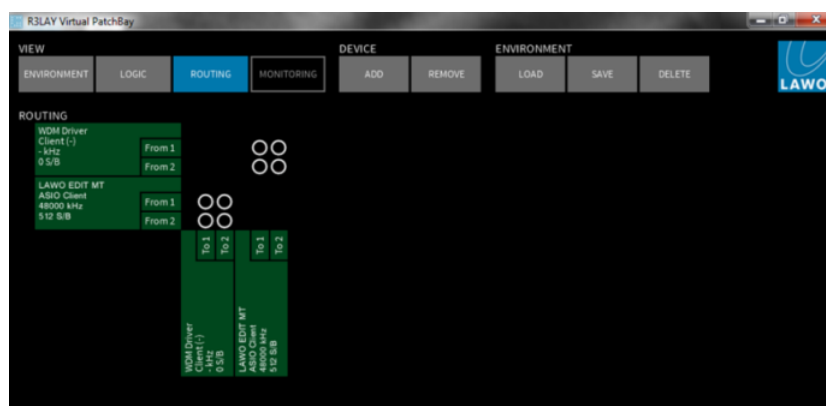


### 3.5.1 ASIO Software Clients

Most professional audio applications support ASIO. In order to connect audio to and from these clients using **RELAY VPB**, you will need to assign **RELAY** as the audio input and/or output device within the software application. The exact procedure depends on the application; an example using Lawo's **Edit VO** is shown below:



If you now open the **RELAY VPB** GUI, the application is automatically added to the 'Routing' View as a device:



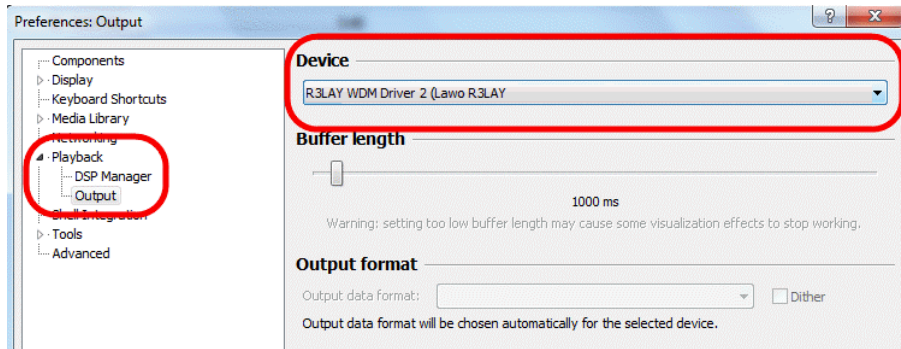
You may configure and run multiple ASIO applications simultaneously.

Sample rate conversion is automatically applied to audio to and from ASIO clients. For example, if a 48kHz audio hardware interface or RAVENNA stream is connected to a 44.1kHz ASIO software client, sample rate conversion will be applied.

### 3.5.2 WDM Software Clients

Applications such as chat software or media players do not usually support ASIO, and therefore you should assign one of the **R3LAY** WDM Driver instances. By assigning a different driver to each software client, you can connect RAVENNA streams to and from each program independently.

The exact procedure depends on the program. Below is an example of a common media player where the **Playback Output Device** has been assigned to the **R3LAY WDM Driver 2**:

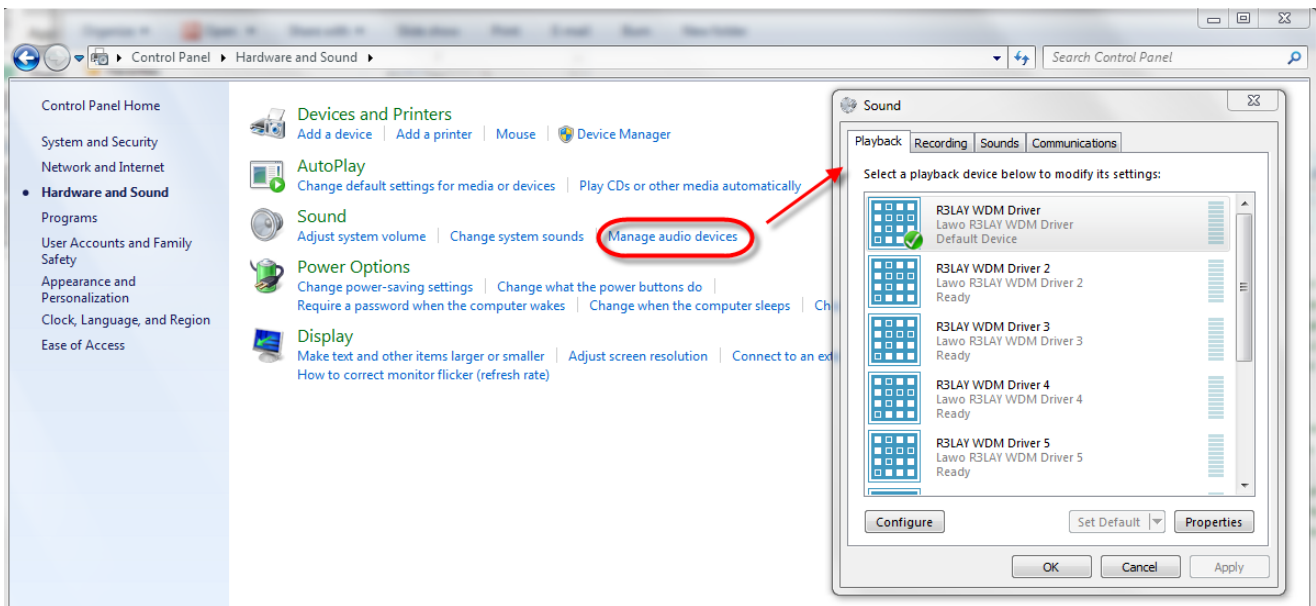


### 3.5.3 The Windows Default Sound Device

Some applications may not support the option to assign an audio driver and, instead, use only the default Windows Sound device. In order to connect audio to and from these clients using **R3LAY VPB** you will need to assign one of the **R3LAY** WDM Driver instances as the default Windows Sound device:

1. In Windows®, select **Control Panel -> Hardware and Sound -> Manage audio devices**, and assign one of the **R3LAY WDM Driver** instances as the default **Recording** and **Playback** device:

*Windows OS: Default Playback Device*



If more than one software client uses the default Windows Sound device, then audio to and from these applications will be presented to **R3LAY** as a single audio stream.

### 3.6 Licensing

Once the software has been started, the system checks periodically for an active software license. This can be installed into a local container (on your PC), a remote container (on a networked server), or onto a USB dongle (for portability). If you wish to use a dongle, then this must be ordered separately.

The license is activated and managed by the CodeMeter Runtime licensing system from [WIBU systems](http://www.wibu.com). The license code can be found on the delivery note supplied with the software.

#### 3.6.1 Checking the License Status

The current status of the license is indicated in the status bar at the bottom of the GUI. If no license is found, then the software operates in demo mode, with all features enabled, for 15 minutes - during this time, the **Demo** field turns yellow and shows the 15 minute countdown:



After 15 minutes, a five second burst of white noise (at a level of -30dBFS) is inserted every minute. This is indicated by the red **Demo** field:



Once an active license is successfully located, the noise burst is removed and the field updates to **Licensed**:



If the license is later removed, after being found at startup, there is a 12 hour grace period before the noise burst resumes. This is indicated by a yellow **Demo** license field (with a 12-hour countdown). If the license is not reinstated at the end of the countdown, then the **Demo** field turns red to indicate that the noise burst is active.

#### 3.6.2 Using a Dongle

All dongles are specially-configured USB memory sticks which can be purchased from either [Lawo](http://www.lawo.com) or [WIBU systems](http://www.wibu.com). The dongles supplied for software and hardware products ship with different file systems, so please take care not to mix up the different types. If you have purchased a dongle for **RELAY VPB**, then this will have a metal "LAWO logo" tag attached as shown below. Multiple **RELAY** products and other Lawo software can be licensed from a single dongle.

USB Dongle (for Lawo software)



### 3.6.3 Preparing for Activation

To activate a license, you will need:

- A PC with an internet connection (and USB port if using a dongle). If your PC does not have an internet connection, then the offline activation method can be used.
- The WIBU systems USB memory stick (if using a dongle).
- The license code. This can be found on the delivery note shipped with the system. It takes the form of a 25-digit ticket number such as the one shown below.

*License Code Example*

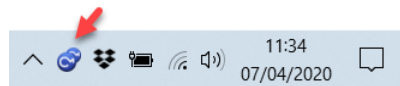
<b>Ticket:</b>
7MAMJ-8HZ95-N9VW5-3MKX6-LWUYM

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

### 3.6.4 Installing CodeMeter Runtime

To activate a license, your PC must be installed with **CodeMeter Runtime** (from WIBU systems). The correct version is installed automatically with the setup software for your product.

You can check the installation by looking in the Windows taskbar where you should see the following icon.

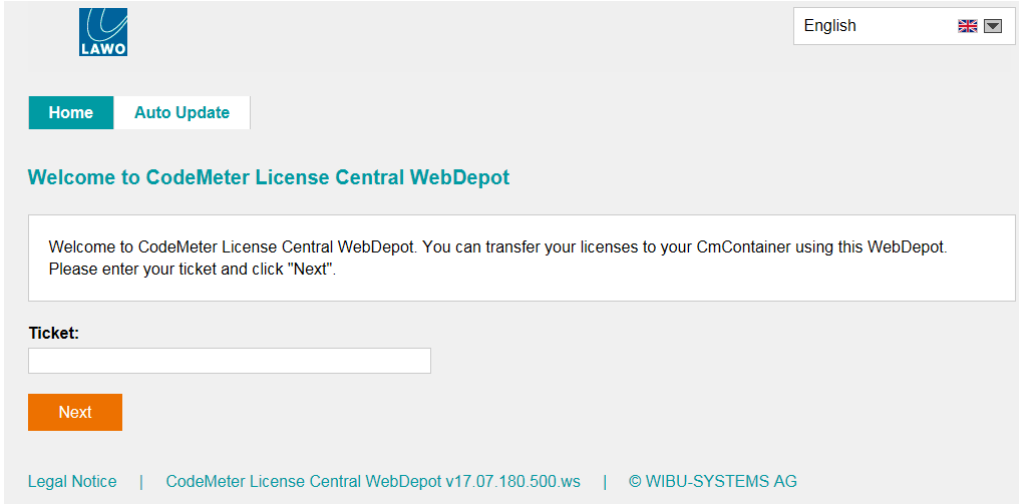


This shows that a Cm container (for local license storage) has been installed.

### 3.6.5 Activating a License Online

To use this method, your PC must have an internet connection. If installing onto a dongle, then this should be connected to the PC's USB port.

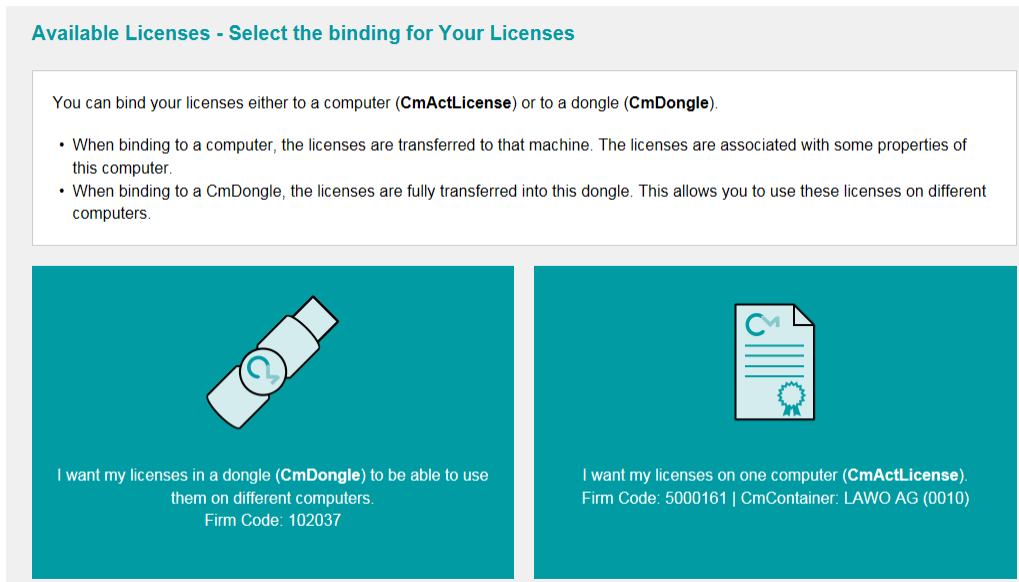
1. Open the Lawo licensing web page by copying the following URL into your web browser:  
<https://licenseportal.lawo.com>



If necessary you can choose a different language using the drop-down menu at the top right of the page.

2. Copy your license ticket number - this is the 25-digit number code - into the **Ticket** field and select **Next**.
3. The WebDepot searches for and displays your licenses - select **Activate Licenses** to continue.
4. At the next page, select the storage method for your license - note that this cannot be altered later.

Choose either **CmDongle** (to create a USB dongle) or **CmActLicense** (to bind the license to the local computer).



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

#### Available Licenses

**To activate your licenses:**

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

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

**Select CmContainer**

128-2311304 (LAWO AG) ↻

Activate Selected Licenses Now Offline license transfer

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

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

6. Click on **Activate Selected Licenses Now** and wait for a few seconds - a confirmation pop-up appears once the activation is successful:

#### Online License Transfer

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

Starting license transfer.  
Creating license request.

#### Online License Transfer

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

✔ License transfer completed successfully!

OK

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

Home
My Licenses
Auto Update

#### My Licenses

Name	Activated On	CmContainer	Status
*Product Name* <small>(License Quantity: 1)</small>	2018-07-05 18:33:51	128-2311304	Available: 0 (1)

Re-Host Licenses

8. You can now close the browser and return to your Lawo software application or install the USB dongle. For information on re-hosting a license, offline activation, backup/restore and using a license server, please see the [Advanced Licensing Features](#) appendix.



## 4. Operating Principles

This chapter describes the operating principles of **R3LAY VPB**.

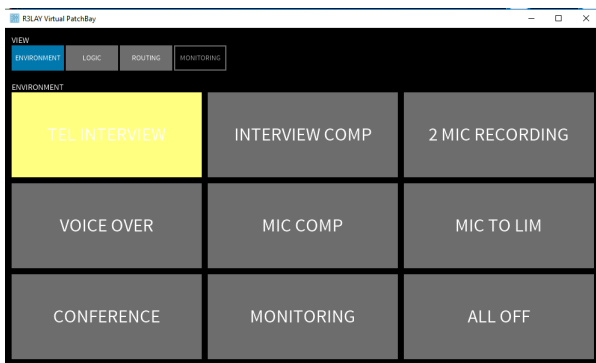
### 4.1 Starting the Application

The simplest way to start **R3LAY VPB** is by double-clicking on its desktop icon or selecting the program from the Windows START menu. **R3LAY VPB** can also be started from the [Service Manager GUI](#).

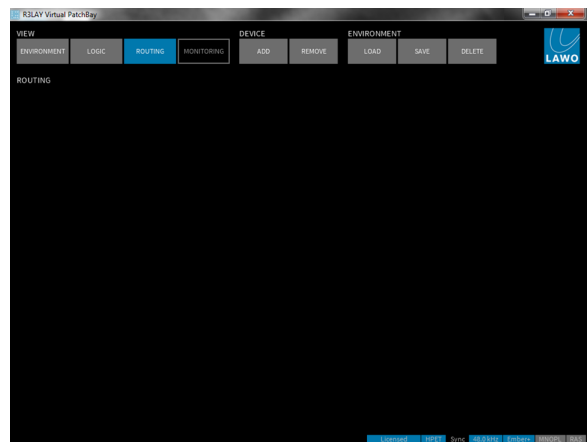
Only one instance of **R3LAY** may be running at a time, and so if you see the message "This program is already started...", then check your taskbar icons and [close](#) the application, or use the **Service Manager** to [stop](#) the active service.

The application starts and you will see either an active configuration (if the software has been setup previously) or an empty operating window:

*Active Configuration: Environment View*



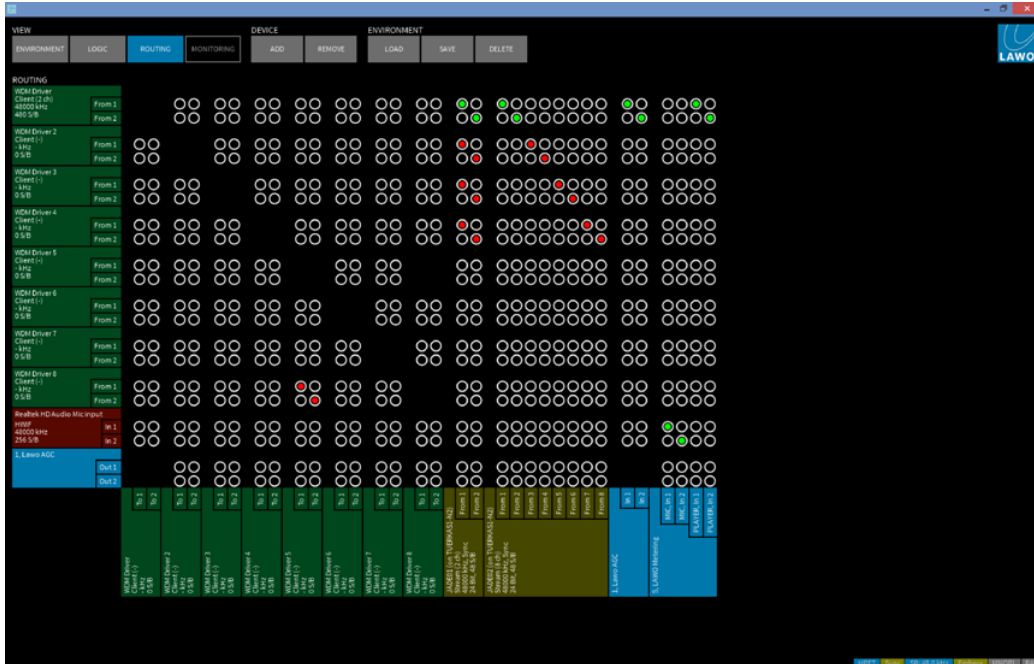
*Empty Configuration: Routing View*



The application can load an empty configuration, the latest active configuration or a specific Environment. In addition, one of the 'Views' may be set to appear. These options are defined in the **Settings** dialog box, under [Settings -> Host -> Startup](#).

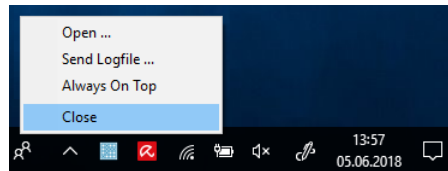
## 4.2 Opening & Closing the Operating Window

1. Click on the red cross (top right) to close the operating window:



Note that this closes the window, but **RELAY VPB** continues to run in the background (as indicated by the notification icon in your taskbar).

2. To reopen the operating window, left-click on the **RELAY** taskbar icon.
3. Right-click on the taskbar icon to reveal the following options:

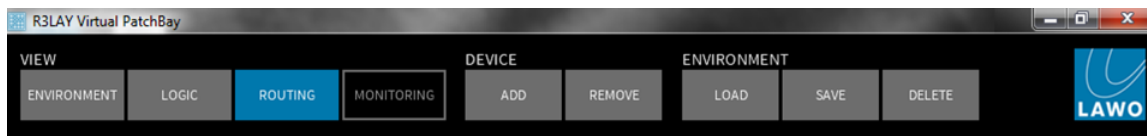


- **Open...** re-opens the **RELAY VPB** operating window.
- **Send Logfile...** when [logging](#) is active, you can send a log file using this option.
- **Always on Top** - when ticked, the **RELAY VPB** operating window will always appear on top of any other open application windows.
- **Close** - select this option to [close](#) **RELAY VPB**. (Or, press **ALT + F4** on your computer keyboard.)

## 4. Operating Principles

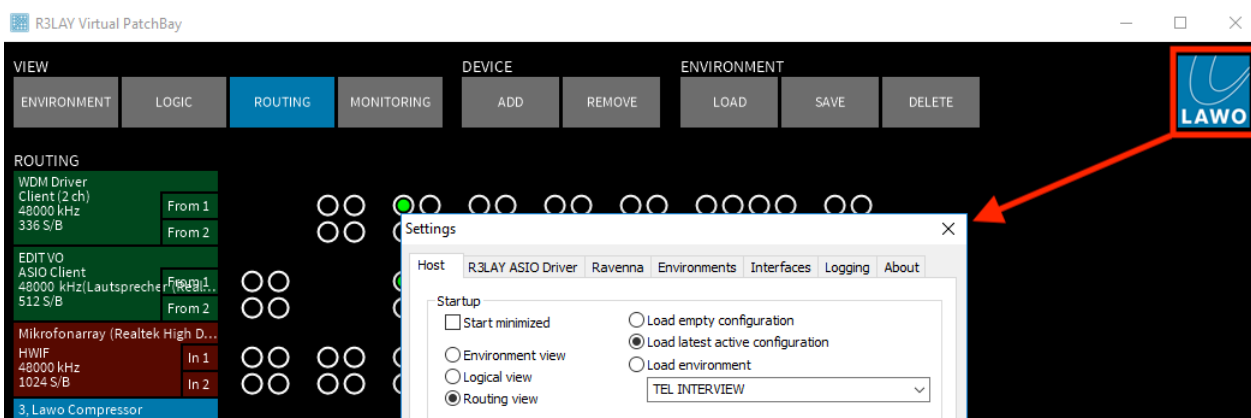
### 4.3 Views and Settings

1. Use the four 'View' buttons, at the top left of the operating window, to switch between the different views:



If the 'View' buttons are not visible, then they may have been [hidden](#) (for end-user operation).

2. The 'Device' and 'Environment' buttons appear within the **Routing** and **Logic** views, and are used to [add](#) or [remove](#) devices and [configure environments](#).
3. Click on the Lawo logo (top right in 'Routing' View) to access all of the program's [settings](#):



### 4.4 The Status Bar

The status bar appears at the bottom right of the operating window, in all views. The background colours indicate:

- Grey or Black = disabled.
- Blue = enabled, with valid connection.



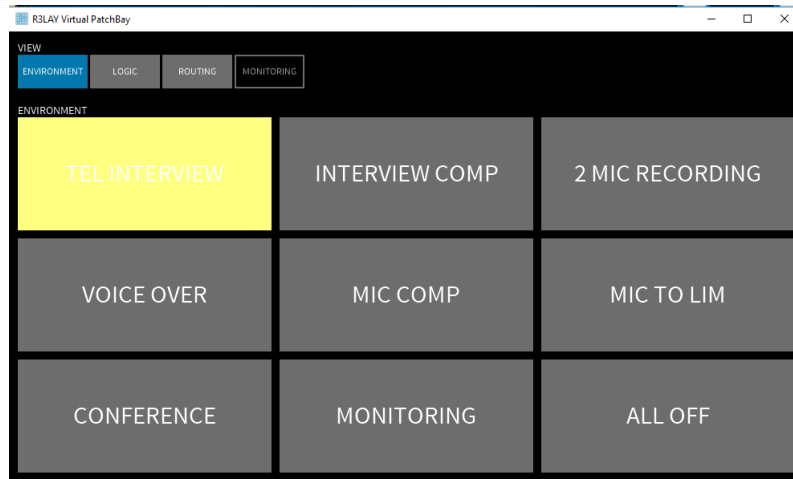
The fields show:

- **Licensed** - the status of the [software license](#). (Note that a red **Demo** field indicates that the two-second noise-burst is active.)
- **TSC** (Windows 10) or **HPET** (OS prior to Windows 10). Both are [internal clocking](#) mechanisms provided by your PC. Blue = active.
- **Sync** - the status of the [sync source](#) required for [RAVENNA](#) streaming. (Blue = valid sync source active. Yellow flashing = **R3LAY VPB** is syncing. This is normal at startup and may take a few seconds.)
- **48.0kHz** - this is the sample rate defined in the program's [Settings](#). (This field is always blue.)
- **Ember+** - the status of the [Ember+ Control](#) interface, enabled from the program's [Settings](#). (Yellow = enabled, but no valid connection. Blue = valid connection.)
- **MNOPL** - the status of the [Remote MNOPL](#) interface, enabled from the program's [Settings](#). (Yellow = enabled, but no valid connection. Blue = valid connection.)
- **RAS** - the status of the [Radio Automation System](#) interface, enabled from the program's [Settings](#). (Yellow = enabled, but no valid connection. Blue = valid connection.)

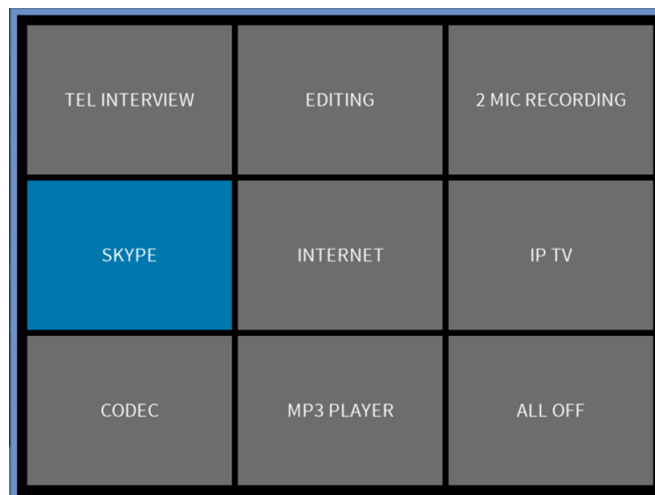
## 4.5 Show/Hide the 'View' Buttons & Status Bar

The four ['View' buttons](#) at the top of the operating window, and [status bar](#) at the bottom can be hidden in order to simplify the **Environment 'View'** for end-user operation:

1. Select **Environment 'View'** and press and hold **SHIFT + ESC**:



The window resizes to show only the available environments:

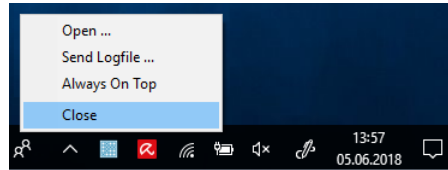


2. Click and drag on the blue surround to resize the window.
3. Click on the grey outline bar to reposition the window.
4. To return to the full **Environment 'View'**, with 'View' select buttons and status bar, press and hold **SHIFT + ESC**.

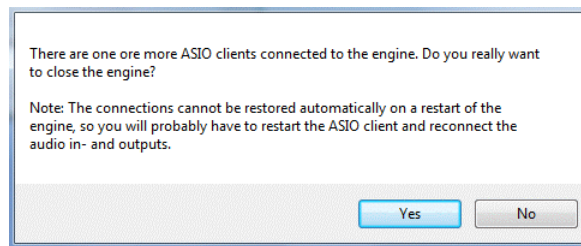
## 4.6 Closing the Application

To close **RELAY VPB**:

1. Right-click on the notification icon in the taskbar and select **Close**:



If you attempt to close **RELAY VPB** while one or more ASIO clients are running, then the following message appears:



If you select **Yes** and then restart **RELAY VPB**, you may need to restart the ASIO software application, and reconnect its [audio input and output devices](#).

Closing **RELAY VPB** stops all audio passing through the application.

If **RELAY VPB** is closed while the 'View' buttons are [hidden](#), then this is how the GUI opens when the application is next [started](#).

## 4.7 Starting RELAY VirtualPatchBay as a Service

**RELAY VPB** can also be started as a service, so that all of the configured audio paths and RAVENNA streams can run in the background. See [The Service Manager](#) for more details.

## 5. Operation (for end-users)

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This chapter covers the most common operations intended for daily use.

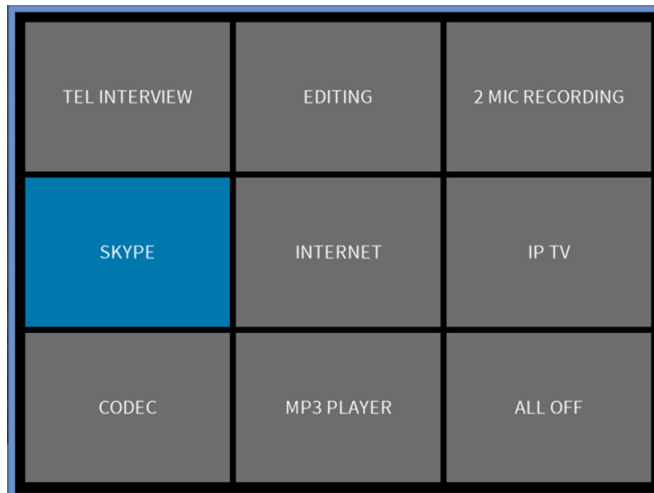
### 5.1 Loading an Environment (in Environment View)

If **RELAY VPB** has already been configured on your computer, then it will open with an active configuration and provide access to environments.

1. Select **Environment** 'View' to access the environments within your configuration.

Note that the 'View' select buttons and status bar may be [hidden](#).

2. Touch or click on a button to load the environment. (Or, press the keyboard shortcut if [configured](#)):

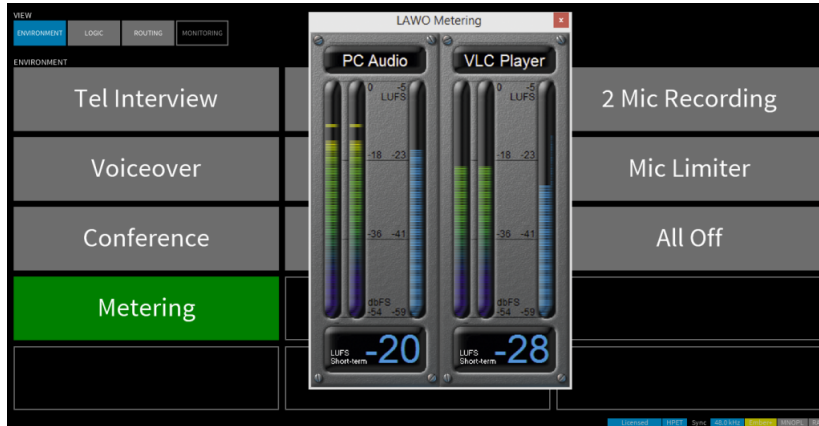


Environments reset the routing matrix and parameters, and may perform actions outside the application, such as starting your recording software. The exact operation depends on the environment configuration. For more details, see [Environment Configuration](#).

## 5.2 Processing Parameters

Loading an environment may open a floating window to control one of the processing devices - for example, to view metering or control an internal effect:

LAWO Metering



LAWO Compressor

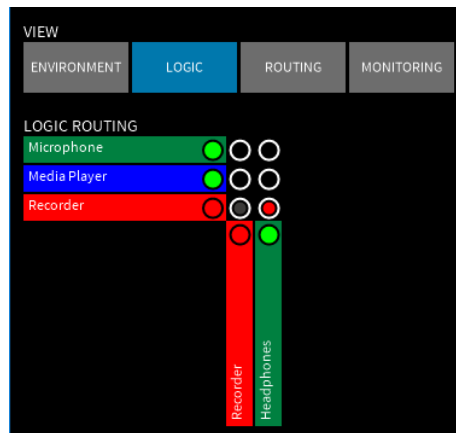


See:

- [LAWO Loudness Metering](#)
- [LAWO Metering Operation](#)
- [LAWO Processing Operation](#)

### 5.3 Operating the Logic View Matrix

If logical devices have been configured in **RELAY VPB**, then select **Logic** View to control the matrix. This is a simplified version of the **Routing** View which can be used to provide access to common tasks:



1. Left-click on a crosspoint to connect the devices.

The color of the crosspoint circles indicate the connection status:

- **Green** = connect is set and audio is ok.
- **Red** = connect is set but there is no signal present.
- **Yellow** = connect is set and audio is active, but there are drop-outs in the audio stream. The color changes to yellow each time a sample is dropped.
- **Black** = no connect set.

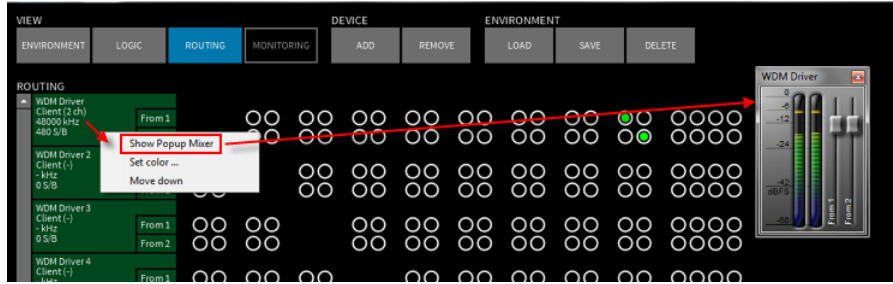
Please see [Matrix Control in Logic View](#) for more details.

If no logical devices have been configured, then the View will be empty. For more details, see [Logic View](#).

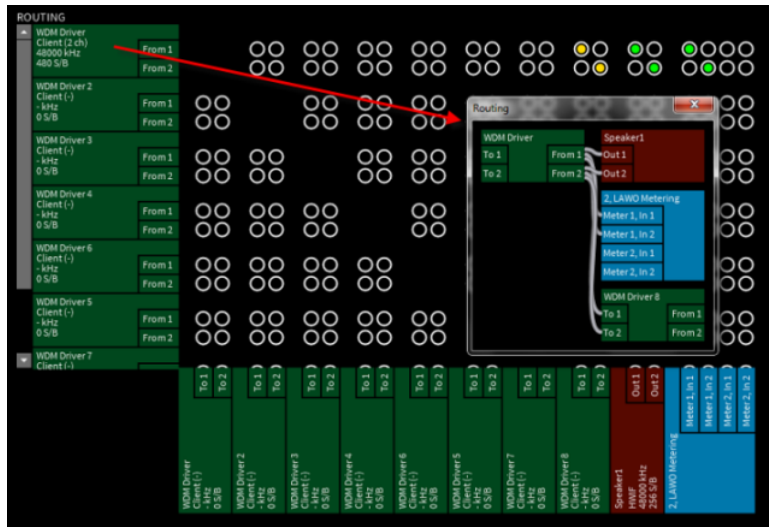




- Right-click (or double-click) on a device to access its Context menu - for example, to show the Popup Mixer:



- Press **SHIFT + CTRL + ALT**, and left-click on a device to interrogate its signal flow:



### 6.2 Add Devices

The first step is to add some input and output devices to routing matrix.

Each device may be a hardware interface (**HWIF**), software application (**Client**), internal processing or RAVENNA stream (**Stream**).

Some devices act both as inputs and outputs (e.g. editing software or internal plug-ins). While others may be input-only or output-only (e.g. microphones and speakers).

A single device may support multiple channels; the number of channels is determined by the device driver. Or, for ASIO applications, you can set the maximum number of channels in the **Settings** dialog box, under [Settings -> RELAY ASIO Driver -> Channels](#).

All hardware devices must operate at the sample rate defined in the software [Settings](#). If you attempt to add a device operating at a different sample rate, then you will receive an error message. Note that sample rate conversion is automatically applied for [ASIO clients](#).

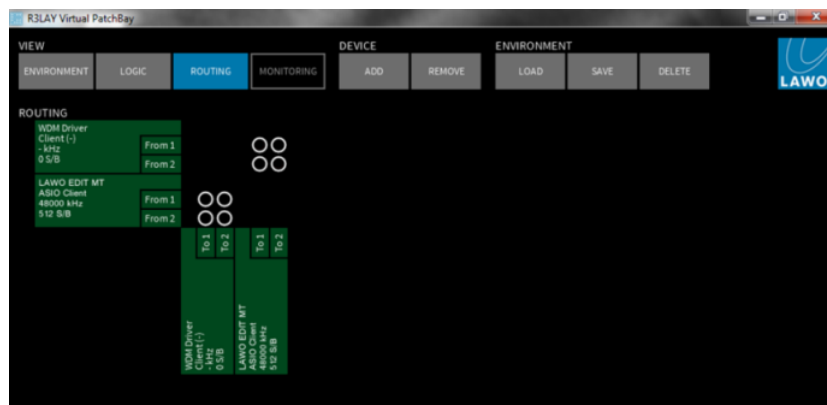
Devices are added to the matrix in one of three ways:

- in Windows® by assigning **RELAY** as the [default sound device](#).
- in an external software application by assigning **RELAY** as the [audio i/o device](#) (ASIO client).
- from the **Routing** View using [Add 'Device'](#) - this method can add any hardware interface connected to your computer, internal processing such as plug-ins, or RAVENNA streams on your network.

It is a good idea to configure the Windows® [default sound device](#) and [ASIO clients](#) before starting **RELAY VPB**. These devices will then appear automatically in the **Routing** View when you start the external application.

#### 6.2.1 ASIO Client Connections

Once your ASIO client software is running, you will see its audio channels in the 'Routing' View when you open **RELAY VPB**:



In our example, the **LAWO EDIT MT** supports two audio input and output channels. However, depending on the application and [Settings -> RELAY ASIO Driver -> Channels](#) option, many more channels may appear.

Your ASIO client software must be running and have **RELAY** assigned as its audio i/o device, in order to see the client in the 'Routing' View devices list.

You may configure and run multiple ASIO applications simultaneously.

Sample rate conversion is automatically applied to audio to and from ASIO clients. For example, if a 48kHz audio hardware interface or RAVENNA stream is connected to a 44.1kHz ASIO software client, sample rate conversion will be applied.

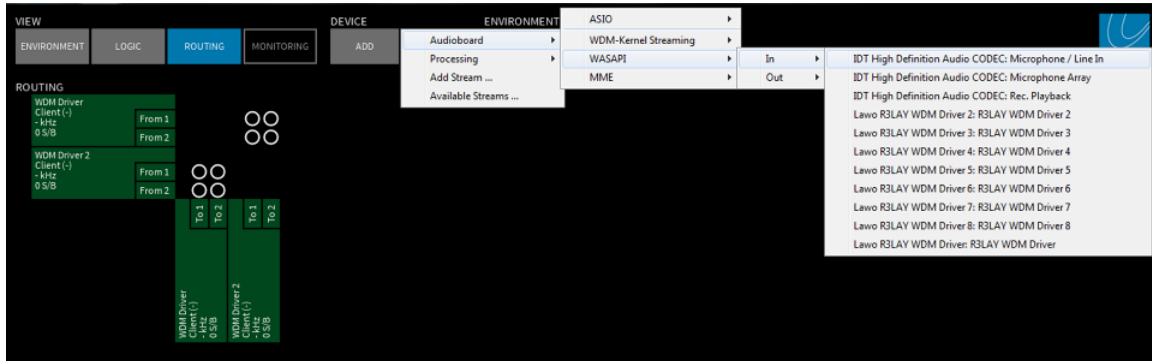
## 6.2.2 Routing View: Add Device

This method is used to add:

- **Audioboard** - hardware audio interfaces connected to your computer (see below).
- **Processing** - internal processing such as metering, routing points and plug-ins, see [Processing](#).
- **Add Stream / Available Streams** - RAVENNA streams to/from the IP network, see [RAVENNA](#).

➤ **To add a hardware interface:**

1. Click on **Add 'Device'** and select **Audioboard**.
2. Then select your device from the drop-down options:



**Audioboard** devices are divided into four driver categories (**ASIO**, **WDM-Kernel Streaming**, **WASAPI** and/or **MME**). The available categories are determined by the **Settings** dialog box, under [Settings -> Host -> Audioboard Types](#). This allows you to restrict **RELAY VPB** to certain driver types; from a default install, you will see only **ASIO** and **WDM-Kernel Streaming**.

Within each category, the available options depend on what interfaces are installed and connected to your computer, and what version of Windows® you are running.

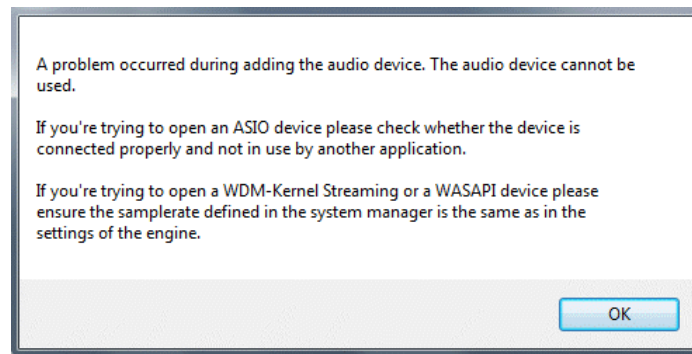
If your interface appears more than once, then it supports more than one driver type. Choose the highest available option, so look under **ASIO** first, then **WDM-Kernel Streaming**, then **WASAPI** and finally **MME**. This ensures the best performance for the device. See [Choosing the Best Driver](#).

## 6. Routing View

The selected device is added to the matrix - in our example, the **Realtek HD Audio Mic** is a 2-channel input-only device:



If the following dialog box appears, then the device cannot be added:



- For **ASIO** devices - check the connections and close any applications which may be using the device (or change the audio input and output device in the application).
  - For **WDM** or **WASAPI** devices, check that the [sample rate](#) of **RELAY VPB** matches those of your devices - set by the Windows® System Manager.
- 3.** Repeat to add another hardware interface. Or select:
- **Add 'Device' -> Processing** - to add internal processing such as metering, routing points and plug-ins, see [Processing](#).
  - **Add 'Device' -> Add Stream or Available Streams** - to add RAVENNA streams to or from the IP network, see [RAVENNA](#).

### 6.2.3 Choosing the Best Driver

Some hardware interfaces support multiple drivers, and may appear more than once in the **Audioboard** options list. There are two factors to consider when deciding which driver to choose: latency and independence. Both are determined by the driver and Windows®, and are beyond the control of **RELAY VPB**.

#### ➤ Latency

The driver type affects the audio buffer size and, therefore, the latency of the audio. The smaller the audio buffer size, the lower the latency but, depending on system performance, the more susceptible to drop-outs. You can view the audio buffer size in samples per buffer (S/B) by looking at the [device information](#). As an example, a value of 256 S/B at an input means that **RELAY VPB** receives an audio data packet every 256 samples - this equates to every 5.3ms at a sample rate of 48kHz.

It is not recommended that you add a device to the matrix more than once. If you do, then audio may be received at slightly different times causing phasing problems if you attempt to listen to the streams simultaneously.

For ASIO clients, you can adjust the preferred audio buffer size from the **Settings** dialog box, under [Settings -> RELAY ASIO Driver -> Buffersize](#). Use a third-party software application, such as the Latency Monitor from [www.resplendence.com](http://www.resplendence.com), to analyse the performance of your system, and thereby optimise the audio buffer size parameters.

#### ➤ Independence

Clients, which use the **RELAY ASIO** driver, are presented to **RELAY VPB** independently as separate devices. The audio stream will be directly transferred from the client to **RELAY**, and vice versa, and will be bit-transparent.

However, clients which use the same **RELAY WDM** Driver are presented to **RELAY VPB** as a single mixed audio stream and pass through the Windows® audio mixer. This mixer can apply sample rate conversion or bit depth changes, and so these audio streams will not be bit-transparent.

You should bear this in mind when [assigning](#) the **RELAY WDM** Drivers to your third-party software.

#### ➤ Choosing a Driver

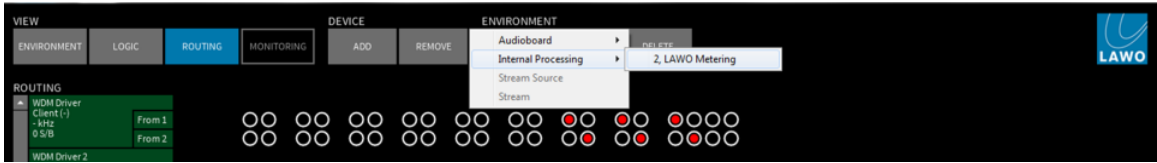
The driver you choose depends on what is supported by each interface, the intended application and your computer's specification. As a guide:

- For the lowest latency, best audio performance and independence, use **ASIO**.
- If **ASIO** is not available, choose one of the other drivers (recommended in the order below). Note that the choice of drivers, and whether single or multiple instances are supported, varies depending on the interface manufacturer:
  - **WDM-Kernel Streaming** - the audio streams are sent directly to/from the hardware at a low latency. The Windows® audio mixer is bypassed.
  - **WASAPI** - also uses smaller audio buffer sizes, resulting in lower latency, but is only supported from Windows® Vista onwards.
  - **MME** - uses larger audio buffer sizes (longer latency but less susceptible to drop-outs in an underpowered system). The Windows® audio mixer accesses the audio stream and will apply sample rate conversion, bit depth changes or channel conversions.

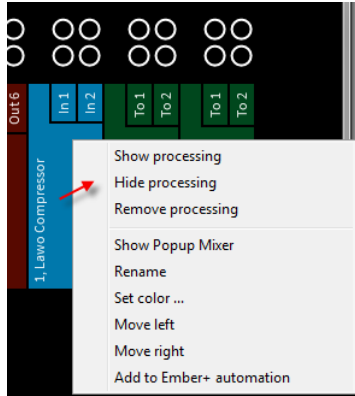
## 6.3 Remove Devices

To remove a device from the matrix:

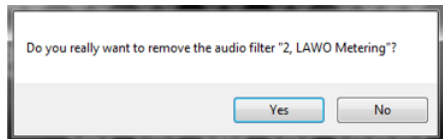
1. Click on **Remove** 'Device' and select the device:



Or right-click (or double-click) on the device to open its [context menu](#), and select **Remove**:



2. Confirm by selecting **Yes**:



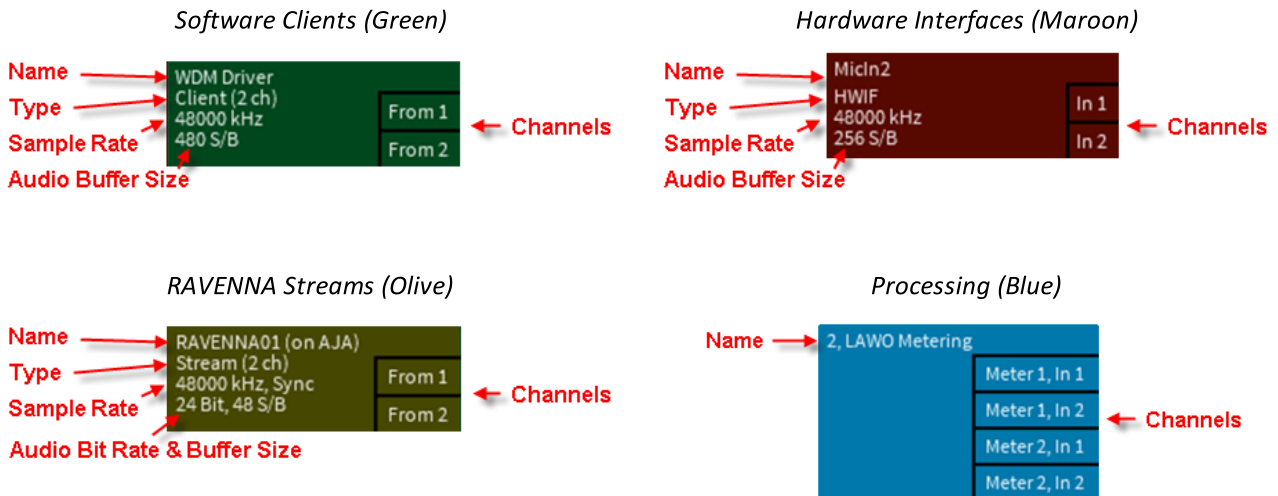
The device is removed from the matrix.

If audio was passing to or from the device, then the audio stream is disconnected from **RELAY VPB**. You cannot remove the **WDM Driver** or **ASIO** devices in this manner. To remove an **ASIO** device, close the ASIO application or deassign **RELAY** as the software's audio i/o device.



## 6.4 Device Information

When devices are [added](#) to the matrix, they are named, identified by type and assigned a default colour:



### ➤ Type & Colour

There are four different device types, which can be quickly identified by their default colour:

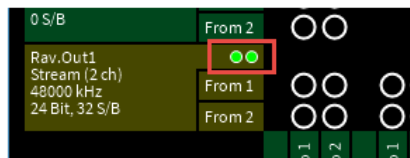
- **Client** (Green) = software applications.
- **HWIF** (Maroon) = hardware interfaces
- **Stream** (Olive) = RAVENNA streams
- **Processing** (Blue) = internal processing

You can change the colour of any device, to customise your matrix, from the [context menu](#).

### ➤ Name

- Hardware interfaces and software clients are named by the device driver, and cannot be renamed by **RELAY VPB**.
- **RAVENNA** streams are named when you add the device. They cannot be renamed later, as the name identifies the stream to other network users.
- **Processing** devices, such as metering, routing points and plug-ins, are named when you add the device. They can be renamed, at any time, from the [context menu](#).

Note that if you are receiving a SMPTE 2022-7 compatible stream, and SMPTE 2022-7 streaming is enabled via the [Advanced Options](#), then the state of each receiver is also shown beside the stream name. This indicates the validity of the data arriving via NIC 1 and NIC 2: green = stream is OK; red = stream is in error.



### ➤ Sample Rate and Audio Buffer Size

Other information, includes the sample rate and audio buffer size of each device.

For **WDM Driver** clients, you will only see these figures once audio is active - for example, start your media player to see the sample rate and buffer size update.

### ➤ Channels

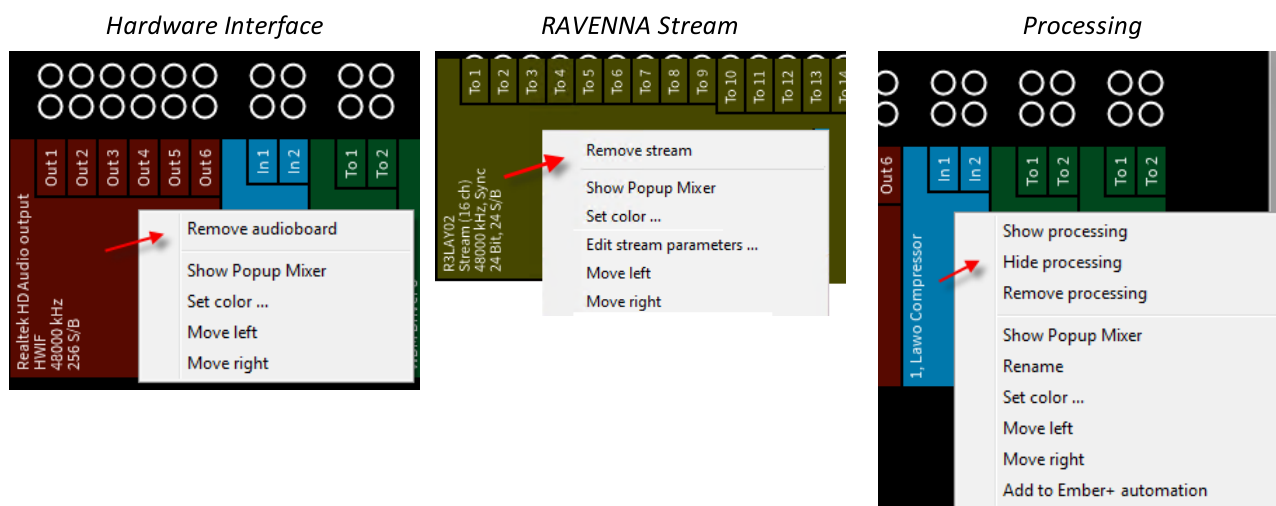
The number of available channels (**In 1**, **In 2**) are defined by the device driver. For ASIO software clients, you can set the maximum number of channels in the **Settings** dialog box, under [Settings -> RELAY ASIO Driver -> Channels](#). For any device type, you can rename individual channels from their [context menu](#).



### 6.5 The Context Menu

A range of options are accessed from the context menu - either right-click, or double-click, on a device to open the menu.

The options vary slightly depending on the device type, whether it is an input or output, and whether you click on the device or on an individual channel. Below are the device options. See also the [Device Channel Context Menu](#).



Common to all device types are:

- **Remove...** - [removes](#) the device.
- **Show Popup Mixer** - opens the [popup mixer](#) to control input or output levels.
- **Set color..** - opens the [colour pallet](#) to assign a new device colour.
- **Move left/right** or **Move up/down** - moves the position of the selected device.

Available for RAVENNA streams only:

- **Edit stream parameters** - opens the RAVENNA [Add Stream Source](#) dialog box.
- **Copy RTSP Link** (optional\*) - copies the stream's RTSP link to the clipboard.
- **Copy SDP** (optional\*) - copies the stream's SDP information to the clipboard.

\*These two options can be revealed by editing the advanced options (described [later](#)).

Available for processing devices only:

- **Show** or **Hide processing** - opens or closes the floating operating window for the [processor](#).
- **Rename** - allows you to [rename](#) an internal processing device.
- **Add to Ember+ automation** - [publishes](#) the processing device parameters to the network via Ember+.

Any changes you make to the appearance of a device, such as its name and colour, are saved when you [save an environment](#).

#### ➤ To change the colour of a device:

Right-click (or double-click) on the device, and select **Set Color...** Then choose a new colour from the colour pallet and click **OK**.

#### ➤ To move the position of a device:

Right-click (or double-click) on the device, and select **Move up/down** or **Move left/right**.

#### ➤ To rename a processing device:

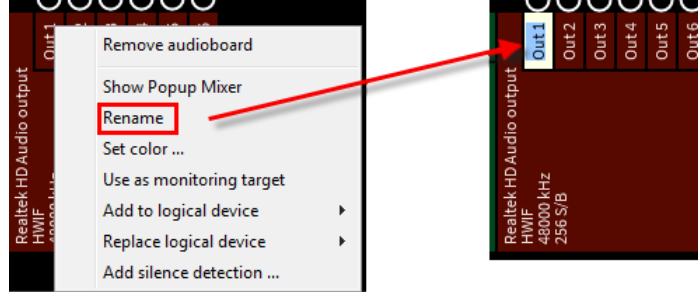
Right-click (or double-click) on the processor, and select **Rename**. Type in the new name and press Enter.

## 6.6 Device Channel Context Menu

Right-click (or double-click) on a device channel, to access some additional functions:

### ➤ Rename

Allows you to rename the channel of any device:



### ➤ Use as monitoring target (Hardware Interfaces only)

Defines the output channel as the [monitoring target](#).

### ➤ Set ASIO Direct Monitor channel type (ASIO devices only)

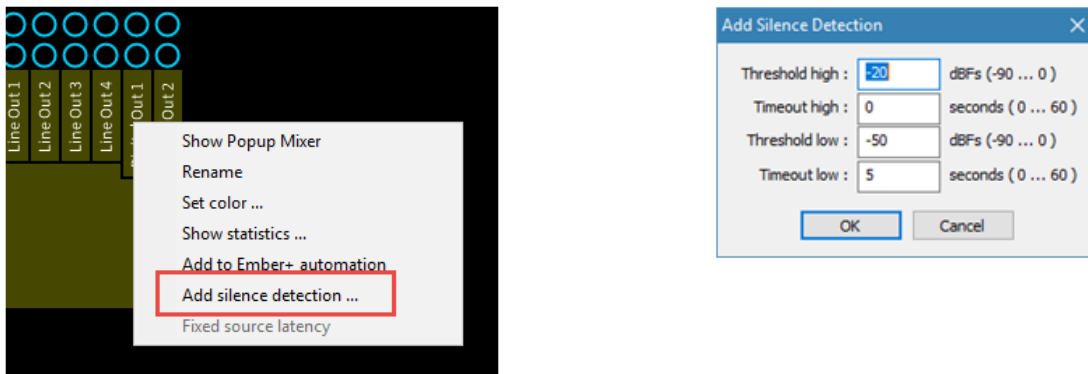
Defines mono or stereo output channels for [ASIO Direct Monitoring](#).

### ➤ Add to logical device/Replace logical device

Assigns the channel to a [logical device](#). Note that this option will only appear once at least one logical device has been configured.

### ➤ Add silence detection

Opens a dialog box where you can define the silence detection parameters for the channel:



The silence detection **Active** state is published to the network via Ember+ (if the Ember+ interface is [enabled](#)). From here it can be used by an Ember+ consuming device.

*R3LAY VirtualPatchBay Ember+ Tree*



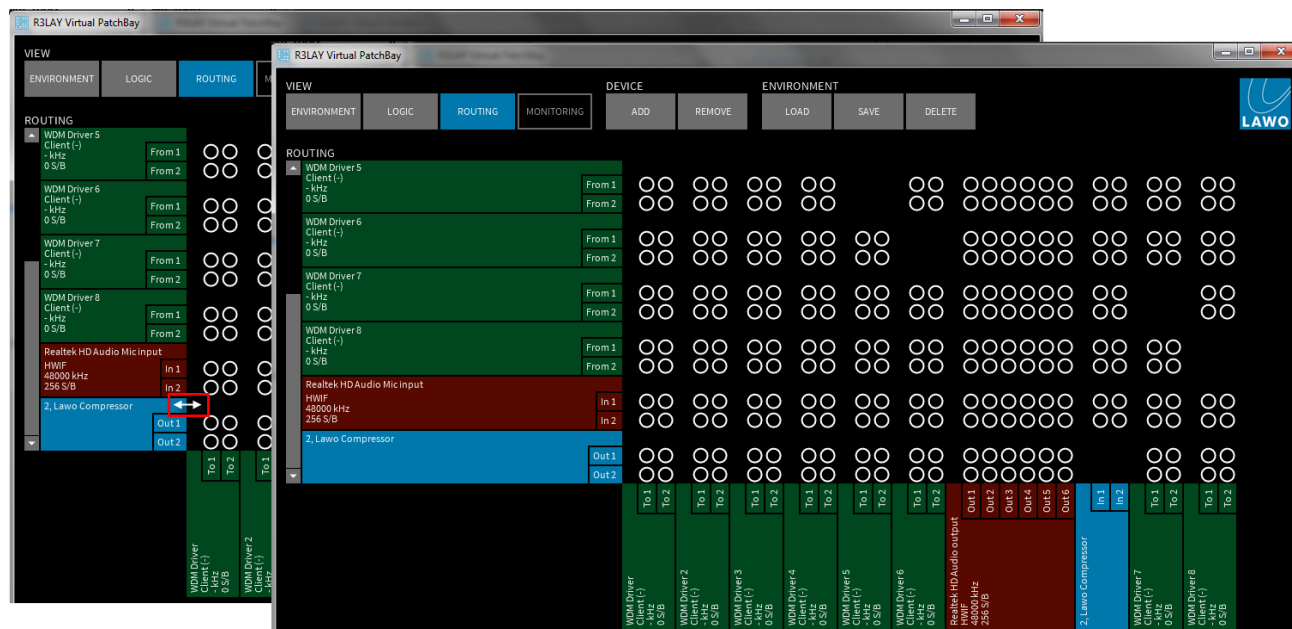
### ➤ Show statistics (RAVENNA Streams only)

Opens a dialog box showing detailed information about the stream - e.g. the recognized packet jitter and SDP.

### 6.7 Scrolling & Resize

Scroll bars appear if there are too many input or output devices/channels for the operating window; click and drag on the scroll bar (or click below/to the side of the bar) to scroll up/down or left/right.

To resize input or output devices, left-click and drag as shown below:



### 6.8 Online/Offline Device Status

For hardware audio devices using ASIO or MME drivers, RAVENNA streams and software clients using the **R3LAY** ASIO driver, **R3LAY VPB** monitors their online/offline status.

If a device is offline, then its entry in the matrix will be "greyed out". This allows you to prepare connections even if the device is offline.

All ASIO Clients (software applications), some ASIO hardware interfaces, and all RAVENNA streams can be monitored in this manner.

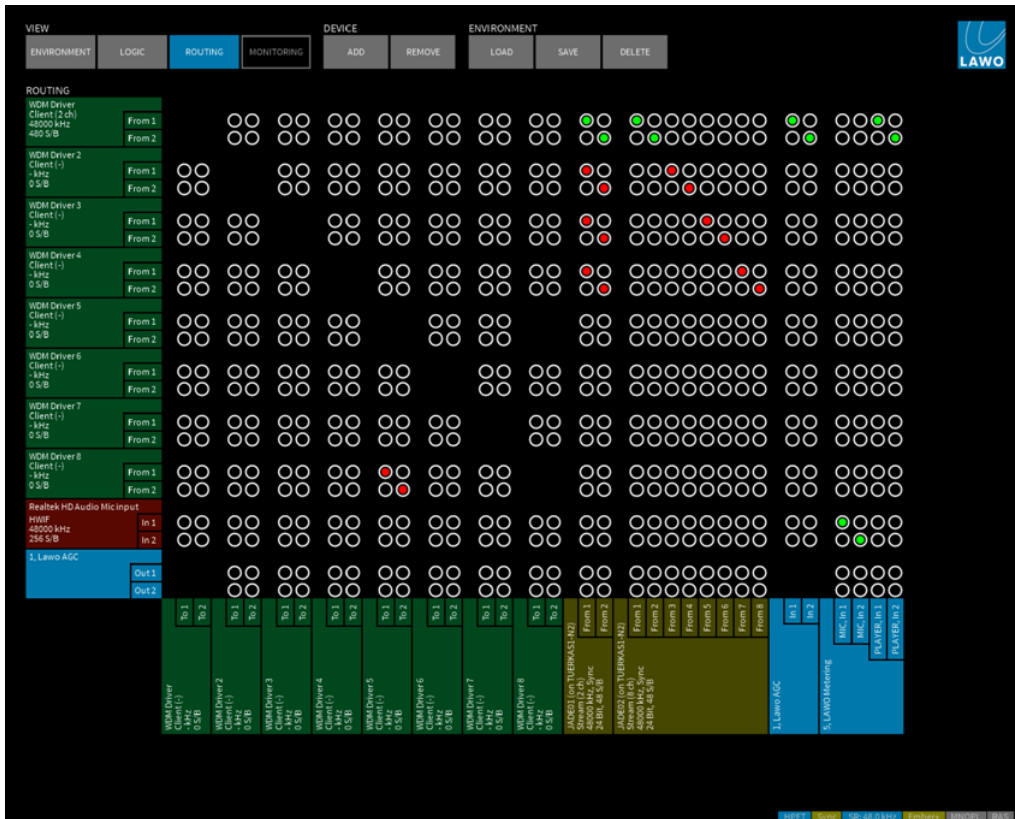
Other driver types do not permit online/offline status monitoring.

## 6.9 Matrix Control

Each row and column, within the **Routing** View, represents the individual audio channels to and from each device.

To make, or unmake, a connection:

- Left-click on a crosspoint - the colour of each crosspoint indicates different states:
  - Green** = connect set and audio is ok.
  - Red** = connect set but there is no signal present.
  - Yellow** = connect set and audio is active, but there are drop-outs in the audio stream. The color changes to yellow each time a sample is dropped.
  - Blue** = an ASIO Direct Monitoring connect is set and audio is active.
  - Black** = no connect set.



In our example, the red connections are coming from the **WDM Driver**. As soon as our media player, or another software client using this driver, is put into play, then the connect colour changes to green to indicate that audio is now active.

If a yellow connect indicator is permanently lit, or flashing a frequent intervals, then you should check your device connections and the [audio buffer size](#) (for ASIO applications).

A blue connect indicator distinguishes direct connections (within an ASIO interface) from green connections (routed via the **RELAY VPB** computer). See [ASIO Direct Monitoring](#).

Note also that crosspoints may disappear as you make connections, to prevent you from routing a device back to itself!

You can connect a single input channel to multiple outputs. Or, connect a single output from multiple inputs. By using the [input and output levels](#), or [summing levels](#), you have complete control of how signals are mixed inside **RELAY VPB**.

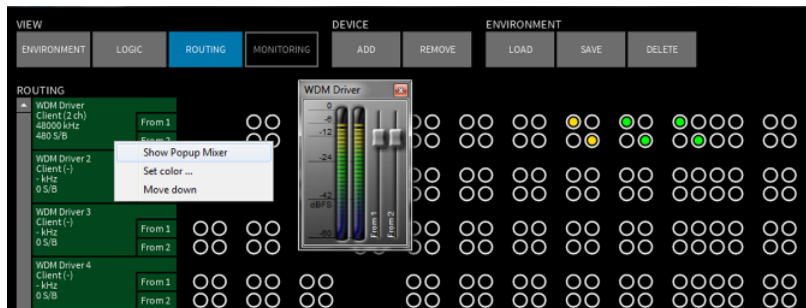
## 6. Routing View

### 6.10 Input & Output Levels

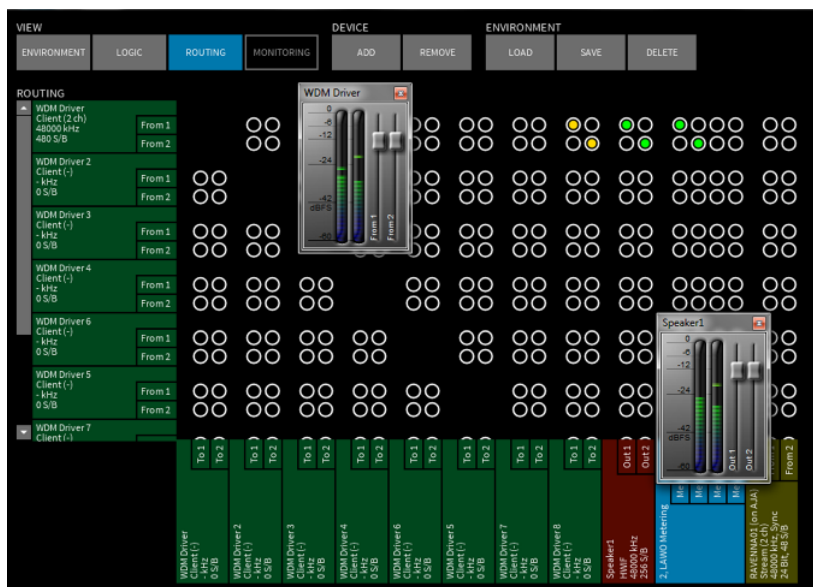
You can adjust the individual channel levels, to or from a device, using its **Popup mixer**.

1. Right-click (or double-click) on a device to open its [context menu](#), and select **Show Popup Mixer**.

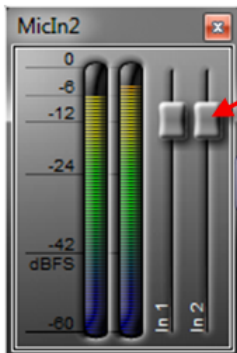
If audio is running, you will see level on the meters (in dBFS):



You can open several **Popup Mixers** - click and drag on their title bar to position each popup:

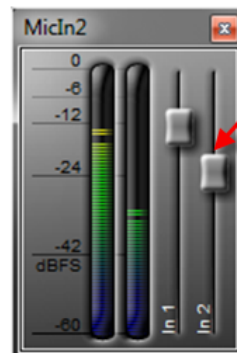


2. Hover your mouse over a fader to view the channel levels as text.
3. Left-click and drag any fader to adjust all levels in parallel. Or, use your mouse wheel, if available.
4. Right-click and drag to adjust a single fader.



Left-click and drag to adjust all faders in parallel.

Hover mouse above faders to see the channel levels.



Right-click and drag to adjust single fader.

Double left-click on a fader to reset all levels to 0dBFS. Double right-click on a fader to reset an individual channel.

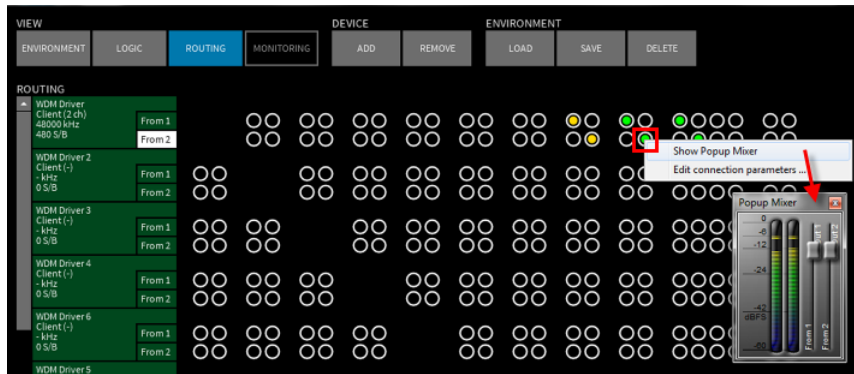
5. Click on the red cross to close the **Popup Mixer**.

### 6.11 Summing Point Levels

In addition to controlling the level of each input and output channel, you can also adjust the summing level for each matrix crosspoint.

This is particularly useful if an input channel is routed to multiple destinations, as you can use the summing level to adjust only the level to a single output (rather than changing the input level which would affect all connected outputs).

1. Right-click on a connected crosspoint (red, yellow or green), and select **Show Popup Mixer**, to view the individual summing levels:



You cannot open a **Popup Mixer** if no connection is set!

You can open several **Popup Mixers** if you wish, but they will appear with the same name. Therefore, it's best not to open too many popups at the same time!

If audio is running, you will see level on the meters (in dBFS).

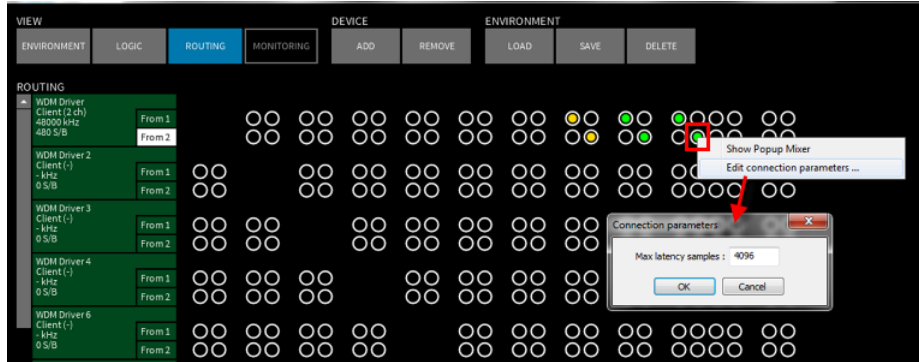
2. Levels are adjusted in an identical manner to inputs and outputs, see [Input & Output Levels](#).
3. Click on the red cross to close the **Popup Mixer**.



## 6.12 Summing Point Latency

The maximum [latency](#) for each matrix crosspoint is set automatically by **RELAY VPB** to minimize the risk of dropouts. If needed, the value can be changed manually as follows:

1. Right-click on a connected crosspoint (red, yellow or green), and select **Edit connection parameters** - a pop-up appears showing the maximum latency value:



2. Enter a number (in samples) and select **OK** to adjust the value. For example, increase the value to reduce the risk of dropouts.

### What is the Summing Point Latency?

Because **RELAY VPB** allows you to connect devices with different internal audio buffers, connection buffers are required to ensure a secure audio transport. By default, a maximum latency for each connection is set. This is derived automatically from the buffer sizes of the source and destination as follows:

- The maximum connection buffer size is calculated by taking the source or destination buffer size (whichever is highest) and multiplying by 8. The minimum value is 128 samples. For example, if the source buffer is 48 samples and the destination buffer is 64 samples, then the maximum connection buffer size is  $64 \times 8 = 512$  samples.
- The connection latency (in seconds) is calculated by dividing this value by the sample rate. For our example above, the connection latency at 48kHz =  $512 / 48000 = 0.0106$  seconds = 11 milliseconds.

This describes the maximum latency per connection. Each connection starts with half of this latency, and then selects an appropriate value depending on the quality of the connection. If the maximum value is too small to achieve a proper connection (e.g. the source jitter is too high), then you can manually change the value, as described above, and override the automatic selection.

Note that all connection points between any pair of individual devices use the same connection latency value.

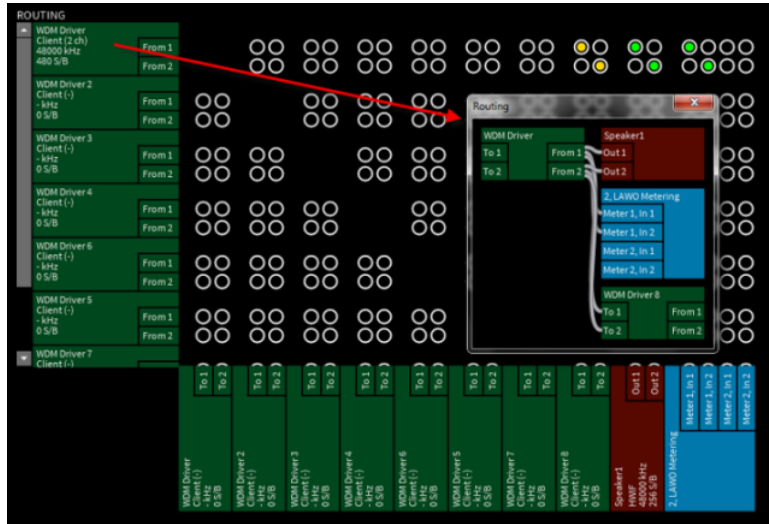


## 6.13 Audio Path Interrogation

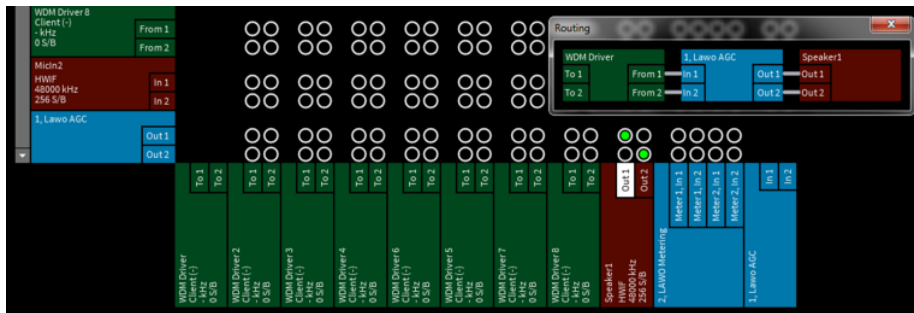
To interrogate the audio signal flow to or from a device:

1. Press and hold **SHIFT + CTRL + ALT**, and left-click on the device - the result is displayed as a line diagram:

*Interrogate Input Device:*



*Interrogate Output Device:*



You must close each dialog box, by clicking on the red cross, before you can perform another operation.

If you interrogate a [processing](#) device, such as a plug-in, then there may be several connection stages, and the complete signal flow can look complicated!

## 6.14 ASIO Direct Monitoring

In the [Settings -> Host -> Audioboard Types](#) options, tick the **Use ASIO Direct Monitoring** option if you wish enable ASIO Direct Monitoring on supporting ASIO hardware interfaces. (These are usually interfaces which include a hardware audio mixer or DSP engine.)

Once enabled, you can connect ASIO inputs to outputs directly within the same interface, thus bypassing the **RELAY VPB** computer and reducing the latency of the audio path. This feature is ideal for artist monitoring applications where software-based latency is unacceptable.

ASIO Direct Monitoring is a feature of the ASIO driver and, therefore, is *only* supported by certain hardware interfaces. Please consult your third-party documentation for details.

1. Direct ASIO connections are made in the [usual manner](#), but appear as blue circles within the Routing 'View'. This distinguishes direct connections (within an ASIO interface) from green connections (routed via the **RELAY VPB** computer).
2. You may adjust the [level](#) of the connection and store all routing and level parameters within [environments](#) in the usual manner.
3. As the ASIO driver specification uses different volume adjustments for mono and stereo channels, but the hardware configuration is not transmitted via ASIO, you will need to tell **RELAY VPB** which type of channel is used by your interface. (Note that this is a requirement of the ASIO driver specification, and not **RELAY VPB**). To do this:
  - Right-click on the first output channel of the device to open its [context menu](#).
  - Select **Stereo** from the **Set ASIO Direct Monitor channel type** options.

## 7. Processing

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This chapter covers the internal processing which can add metering, routing points or effects to the matrix.

### 7.1 Processing Options

The available options are:

- [LAWO Loudness Metering](#) - opens a LAWO Loudness Metering window.
- [LAWO Metering](#) - opens a metering window with multiple VU (and loudness) bargraphs.
- [Routing Point](#) - adds connection points to the matrix, each with its own input, output and summing level.
- [LAWO Processing](#) - adds Lawo's native plug-ins, from the mc<sup>2</sup> console series, to the matrix (this feature is license-dependent).
- [VST Effect](#) - adds third-party VST plug-ins to the matrix (this feature is license-dependent).

All processing parameters are stored when you [save](#) an environment.

Environments can also open metering or effects floating windows so that they may be operated from the **Environment** 'View'.

## 7.2 LAWO Loudness Metering

The **LAWO Loudness Metering** appears in a separate floating window and measures the integrated loudness, over time, of audio patched via the matrix.

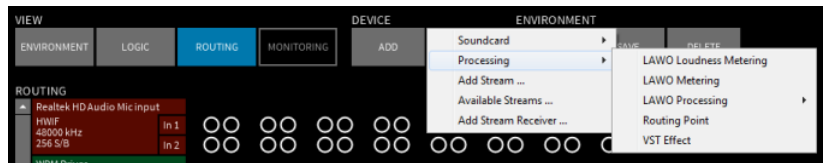
The loudness meter operates in stereo and is ideal for analysing output signals such as final mixes, playout streams, etc.

To meter lots of signals, such as individual input channels, choose the [LAWO Metering](#) option.

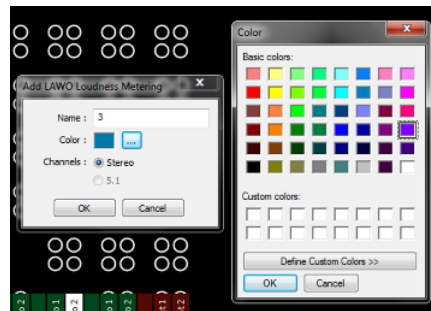
Multiple LAWO Loudness Meters can be added to the matrix if you wish.

➤ **To add a loudness meter to the matrix:**

1. Select **Routing View**.
2. Click on **Add 'Device', Processing** and select **LAWO Loudness Metering**:



A dialog box appears:

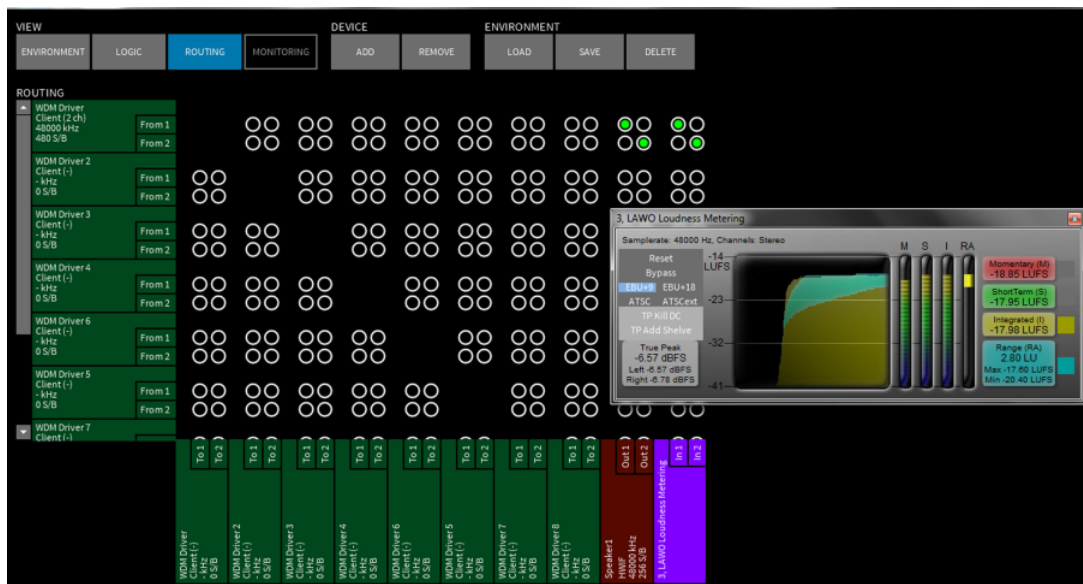


3. Configure the options as follows:
  - **Name** - names the device. This name appears in the meter's title bar and in the routing matrix.
  - **Color** - click to assign a colour from the colour palette. This will help quickly identify the meter in the matrix.
  - **Channels** - set to **Stereo**.

## 7. Processing

4. Once you have made your selections, click on **OK** - the meter is added to the routing matrix, and its operating window can be dragged to any position.
5. Left-click on a crosspoint to connect signals to the meter.

Once audio is running, the matrix crosspoints turn green and the loudness meter starts to measure the connected audio signal(s):



The open/closed status of the floating window, and its position, are saved when you [save an environment](#). Use this to make the operating window appear when [loading environments](#) from the **Environment View**.

6. Click on the red cross to close the Loudness Meter window.
7. Right-click (or double-click) on the device name to open its [context menu](#). From here you can rename, colour-code or move the device, and open its operating window or popup mixer.

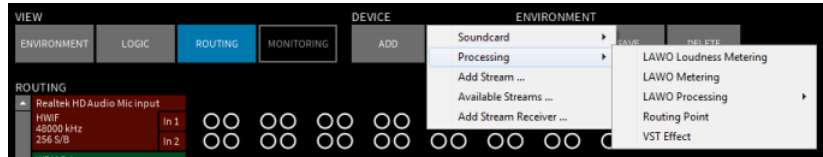
### 7.3 LAW0 Metering

This option contains multiple stereo VU meters (plus loudness bargraph and LUFS measurement) in a separate floating window. The meters measure audio channels patched via the matrix, and are ideal for metering lots of signals simultaneously. You can specify the number of meters per row and column when you add the device.

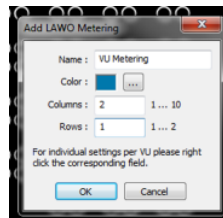
To view the integrated loudness over time, use a [LAW0 Loudness Metering](#) device.

➤ To add bargraph metering to the matrix:

1. Select **Routing View**.
2. Click on **Add 'Device', Processing** and select **LAW0 Metering**:



A dialog box appears:



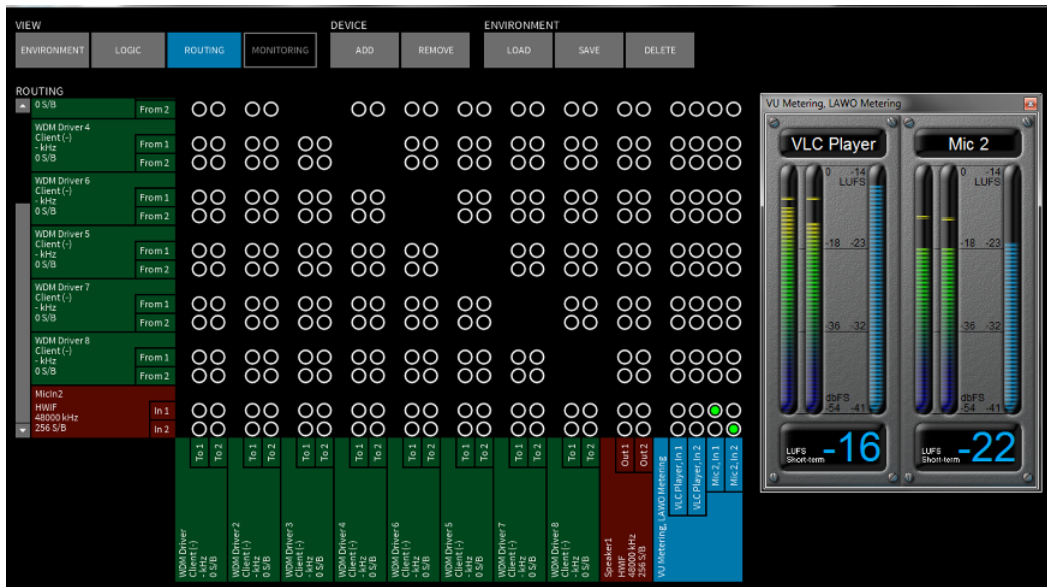
3. Configure the options as follows:
  - **Name** - names the device. This name appears in the meter's title bar and in the routing matrix.
  - **Color** - click to assign a colour from the colour palette. This will help quickly identify the meter device in the matrix.
  - **Columns** - sets the number of columns of meters (up to 10)
  - **Rows** - sets the number of rows of meters (up to 2).

In our example, we have entered 1 row and 2 columns, producing a total of 2 stereo meters.

4. Once you have made your selections, click on **OK** - the device is added to the routing matrix, and the metering window can be dragged to any position.

## 7. Processing

- Left-click on a crosspoint to connect signals to each of the meters - if signal is present, the crosspoints turn green and the bargraph meters are active:



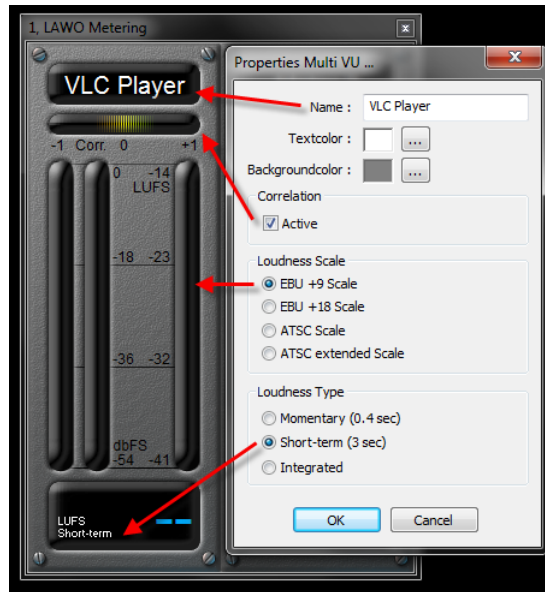
The open/closed status of the floating window, and its position, are saved when you [save an environment](#). Use this to make the window appear when [loading environments](#) from the **Environment** View.

- Click on the red cross to close the LAWO metering window.
- Right-click (or double-click) on the device name to open its [context menu](#). From here you can rename, colour-code or move the device, and open its operating window or popup mixer.

### 7.3.1 LAWO Metering Operation

Each meter provides two peak level bargraphs (in dBFS) with an optional stereo correlation meter, plus a loudness bargraph and measurement indicator (in LUFS).

1. Right-click on a meter and select **Properties** to open the 'Properties' dialog box:



- **Name** - names the meter.
  - **Textcolor** - assigns a colour for the Name text.
  - **Backgroundcolor** - assigns a colour for the meter's background.
  - **Correlation** - select **Active** to enable the stereo correlation meter.
  - **Loudness Scale** - set the loudness bargraph to either:
    - **EBU+9** (standard scale) or **EBU+18** (extended scale) - for EBU R128 compliance.
    - **ATSC** (standard scale) or **ATSCext** (extended scale) - for ATSC A/85 compliance.
  - **Loudness Type** - select **Momentary**, **Short-term** or **Integrated**. This changes the type of loudness measurement, shown in LUFS, on the bargraph and text readout. Only one loudness measurement can be displayed at a time.
2. Right-click on a meter and select **Reset integrated loudness** to reset the integrated loudness measurement.

The loudness metering conforms to the ITU-R BS1770, and either the **EBU R128** or **ATSC A/85** implementation standards. For more details, see [Loudness Metering](#).

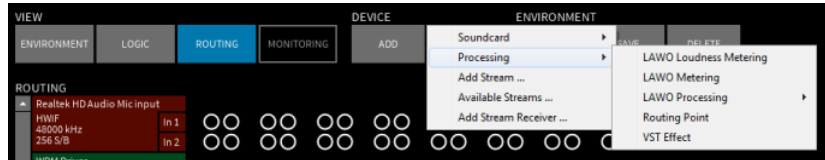


## 7.4 Routing Point

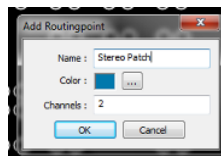
This option adds connection points to the matrix, each with its own input, output and summing level. There are many applications, but in our example, we will add a stereo routing point in order to sum three stereo signals together and then apply a stereo compressor. Each Routing Point can support up to 32 mono channels.

➤ **To add a routing point to the matrix:**

1. Select **Routing View**.
2. Click on **Add 'Device', Processing** and select **Routing Point**:



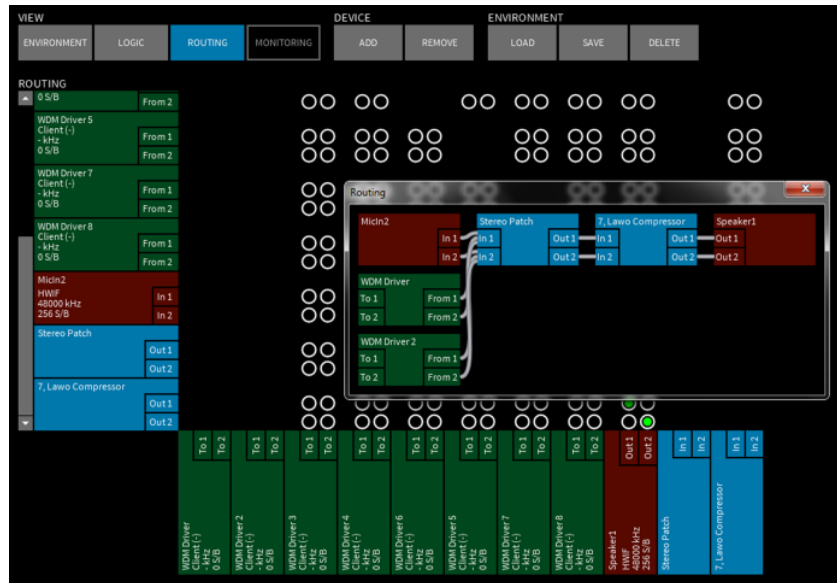
A dialog box appears:



3. Configure the options as follows:
  - **Name** - names the device. This name appears in the routing matrix.
  - **Color** - click to assign a colour from the colour palette. This will help quickly identify the routing points in the matrix.
  - **Channels** - enter the number of mono channels you wish to add (up to 32).

4. Once you have made your selections, click on **OK** - the crosspoints are added to the routing matrix as both input and output devices.
5. Left-click on a crosspoint to connect signals to the routing point channels.

In our example, we have connected the stereo output channels from three devices to the left and right channels of the Routing Point; the Routing Point inputs then connect to a Lawo internal effect (compressor); and then onto the stereo Speakers:



Press **SHIFT + CTRL + ALT** and left-click on the **Stereo Patch Point** device to open the ['Routing'](#) pop-up window shown above.

Use the [input and output levels](#), or [summing level](#), to control levels for each Routing Point channel.

## 7.5 LAWO Processing

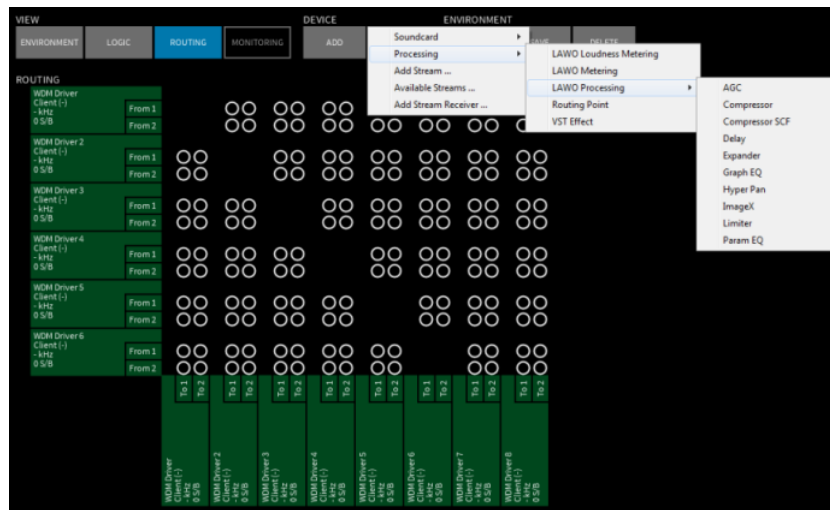
This option adds Lawo's native plug-ins, from the mc<sup>2</sup> console series, to the matrix.

This feature is license-dependent. Please see the [comparison chart](#) on the Lawo website for details.

The plug-in suite includes Automatic Gain Control, Compressor, Compressor with Sidechain Filters, Delay, Expander, Graphic EQ, Hyper Pan, Image Control, Limiter and 4-band Parametric EQ. Once configured, each device is controlled from a floating window. You can add multiple plug-in devices if you wish.

➤ **To add a Lawo native plug-in to the matrix:**

1. Select **Routing View**.
2. Click on **Add 'Device', Processing, LAWO Processing** and select a plug-in from the drop-down list:

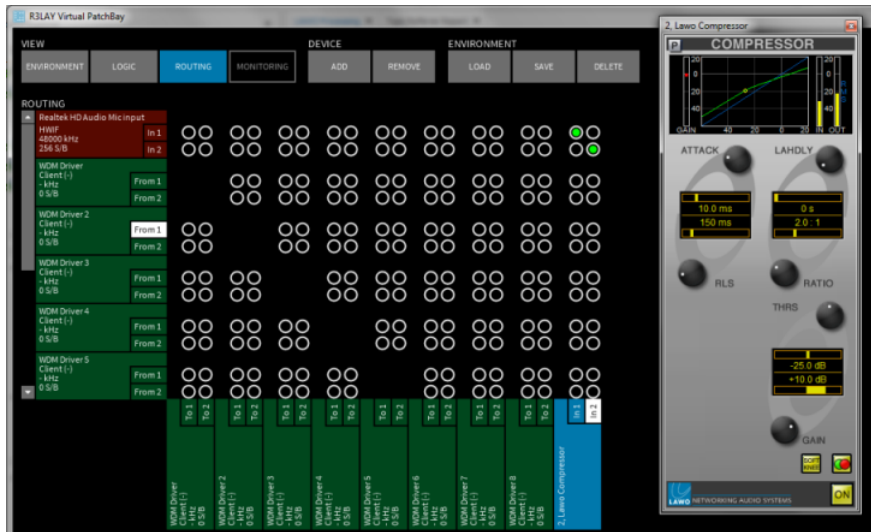


If the "No License found" window appears, then you do not have a valid software licence. Please purchase and activate the software licence in the usual manner.

The device is added to the matrix and given a default name and colour. Its operating window can be dragged to any position.

- Left-click on a crosspoint to connect signals to and from the effect.

In our example, we have connected the microphone to the compressor - the crosspoints are green and so the compressor meter is active indicating that there is signal present:



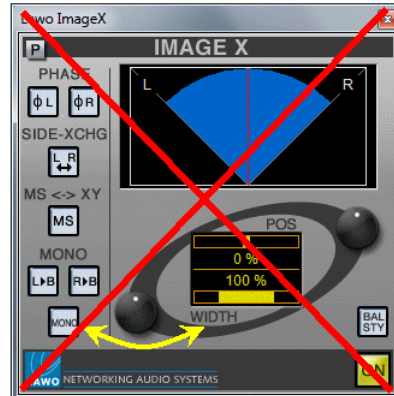
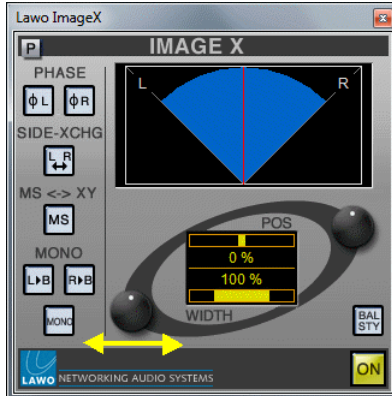
The open/closed status of the floating window, and its position, are saved when you [save an environment](#). Use this to make the window appear when [loading environments](#) from the **Environment** View. Use the [input and output levels](#) or the [summing level](#) to control levels to and from the device.

- Click on the red cross to close the Compressor window.
- Right-click (or double-click) on the device name to open its [context menu](#). From here you can rename, colour-code or move the device, and open its operating window or popup mixer.

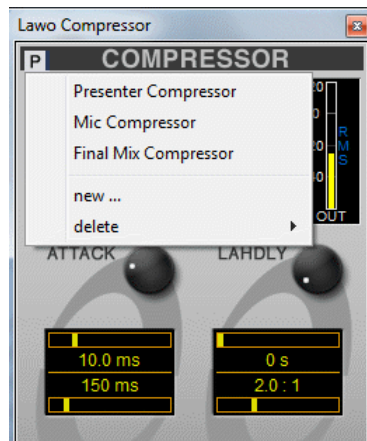
## 7.5.1 LAWO Processing Operation

Each plug-in effect is controlled from its on-screen operating window.

1. Click on the on-screen buttons to turn parameters on or off.
2. Click and drag from left to right, or right to left, to adjust rotary controls. Don't try and turn the control as you would in real life!



3. Click on the **P** button to access the plug-in's presets:



- Select an option from the drop-down list - e.g. **Final Mix Compressor** - to load a preset.
- Select **new..** to store the current settings as a preset - you will be asked to enter a filename.
- Select **delete** to delete an existing preset.

For more detailed information, please refer to the [LAWO Processing Collection](#).

## 7.6 VST Effect

This option adds third-party VST plug-ins to the matrix.

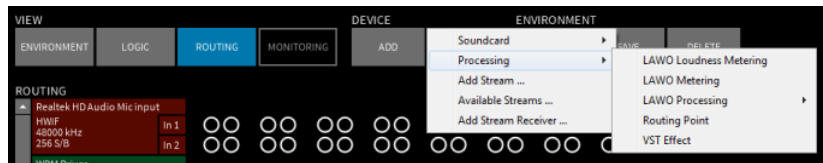
This feature is license-dependent. Please see the [comparison chart](#) on the Lawo website for details.

Once configured, each device is controlled from a floating window. You can add multiple VST plug-in devices if you wish.

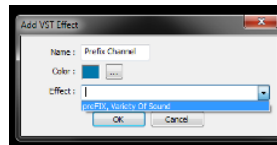
All the VST plug-ins you wish to use in **RELAY VPB** must be installed within a single folder on your computer. The folder location is specified in the **Settings** dialog box, under [Settings -> Host -> VST Effects](#).

### ➤ To add a VST plug-in to the matrix:

1. Select **Routing View**.
2. Click on **Add 'Device', Processing** and select **VST Effect**:



A dialog box appears:



If the "No License found" window appears, then you do not have a valid software licence. Please purchase and activate the software licence in the usual manner.

3. Configure the options as follows:
  - **Name** - names the device. This name appears in the plug-in's title bar and in the routing matrix.
  - **Color** - click to assign a colour from the colour palette. This will help quickly identify the routing points in the matrix.
  - **Effect** - select a plug-in from the drop-down list. This option scans the folder (specified under [Settings -> Host -> VST Effects](#)) and offers a list of all available VST effects. If the list is empty, then check that the VST plug-ins are installed in the correct folder.

## 7. Processing

- Once you have made your selections, click on **OK** - the device is added to the matrix. Its operating window can be dragged to any position:



- Left-click on a crosspoint to connect signals to and from the effect.

The open/closed status of the floating window, and its position, are saved when you [save an environment](#). Use this to make the window appear when [loading environments](#) from the **Environment** View. Use the [input and output levels](#) or the [summing level](#) to control levels to and from the device.

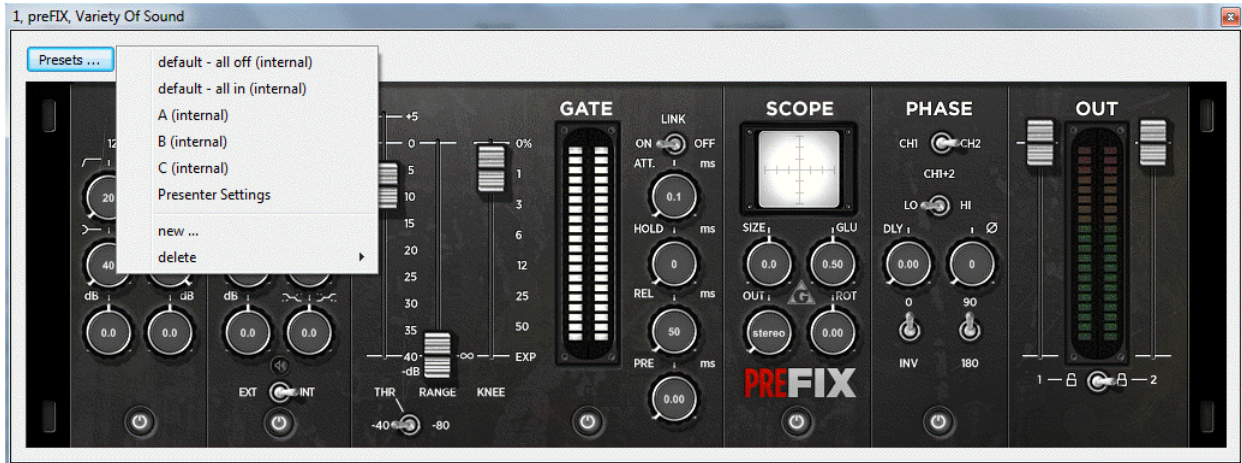
- Click on the red cross to close the operating window.
- Right-click (or double-click) on the device name to open its [context menu](#). From here you can rename, colour-code or move the device, and open its operating window or popup mixer.



### 7.6.1 VST Effect Operation

Each VST effect is controlled from its on-screen operating window.

1. Click on the on-screen buttons to turn parameters on or off.
2. Click and drag from left to right, or right to left, to adjust rotary controls. Don't try and turn the control as you would in real life!
3. Click on the **Presets** button to access the plug-in's presets:



- Select an option from the drop-down list - e.g. **default - all in** - to load a preset.
- Select **new..** to store the current settings as a preset - you will be asked to enter a filename.
- Select **delete** to delete an existing preset. Note that you may only delete presets stored from **RELAY VPB**, and not those included with the plug-in.

For more detailed information, please refer to your VST plug-in documentation.



## 8. Environments

This chapter deals with saving and loading settings into environments.

### 8.1 Operating Principles

The 'Environment' **Load**, **Save** and **Delete** buttons appear in both the **Routing** and **Logic** Views creating two separate sets of environments. Both are saved and managed in a similar manner, but store different settings.

Environments from either View can be loaded by the end-user from the [Environment](#) View.

#### What is Saved in an Environment?

**Routing** View environments store all devices (including their appearance); matrix connections; input, output and summing levels; processing parameters; and the open/closed status of any LAWO Loudness Metering, LAWO Metering, LAWO Processing plug-in and VST Effect operating windows. No logical devices are saved.

**Logic** View environments store all of the above plus logical devices, channel assignments and their parameters.

Environments do *NOT* save the software's [Settings](#), the open/closed status of '[Popup Mixer](#)' or '[Routing](#)' windows or the [Monitoring](#) target.

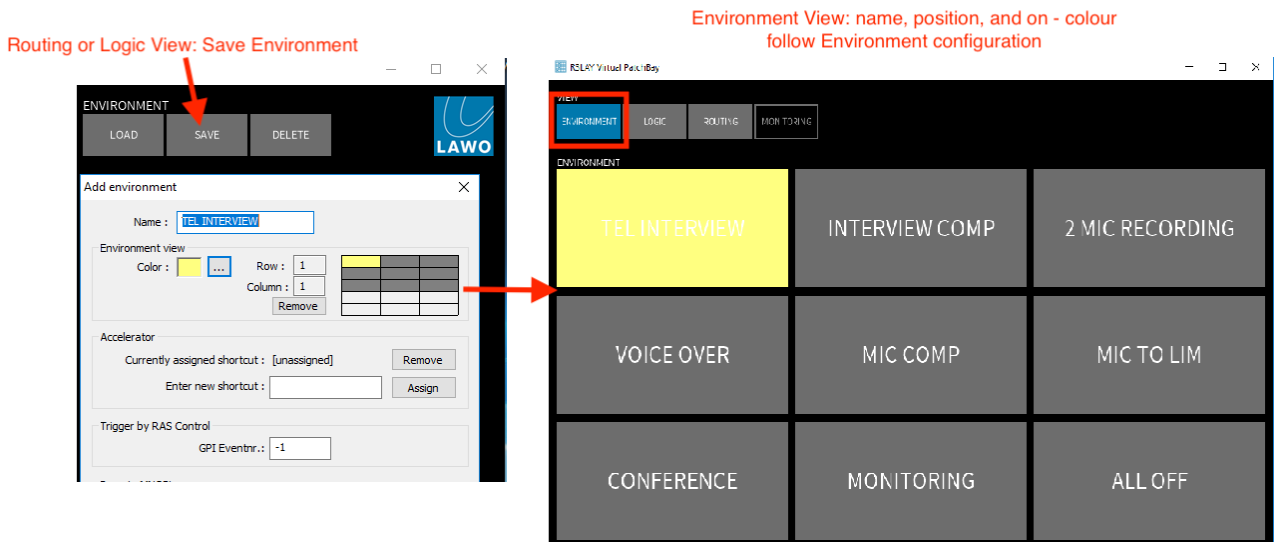
#### Environment Configuration Options

In addition to storing and recalling parameters inside **RELAY VPB**, environments may reset external matrix connections (via Remote MNOPL) and/or include SOAP scripts to perform actions outside of **RELAY VPB**.

You can also decide how end-users load their environments by customising the **Environment** View or configuring RAS Control interface triggers.

The complete configuration, including all environments, is stored in a single XML file each time you close **RELAY VPB**. See [Saving the Configuration](#).

You may also [import and export](#) environments, as individual XML files, so that they may be transferred between **RELAY VPB** computers.

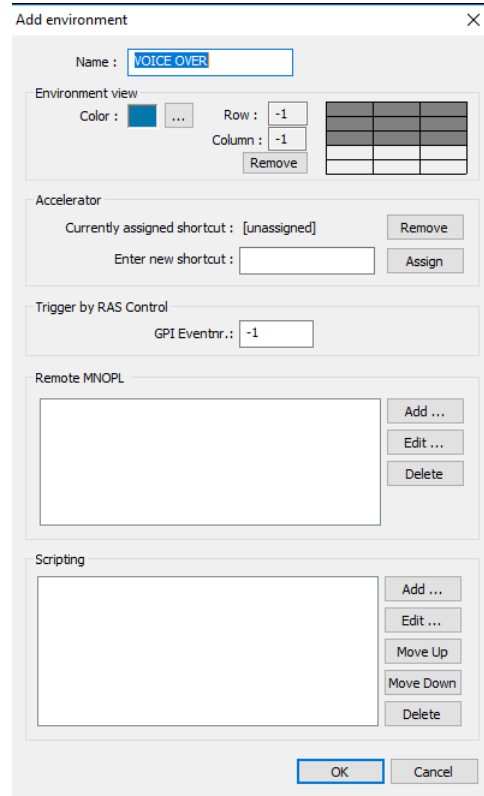
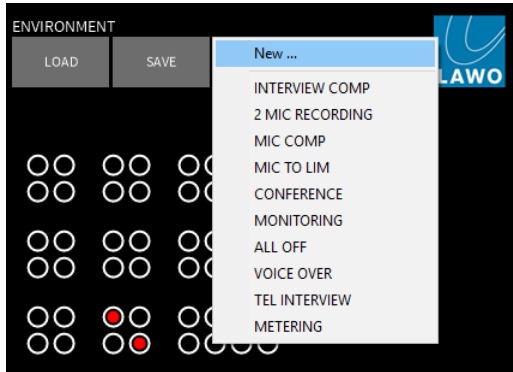


## 8.2 Save -> New

To store all of the internal parameters in a new environment:

1. Click on 'Environment' **Save** and select **New...**

The 'Add environment' dialog box appears:



2. Complete the [fields](#) in order to **Name** the environment, assign a button position in the **Environment View**, etc.

All fields are optional and can be [updated](#) later. For now, enter a **Name** (it must be unique).

3. Select **OK**.

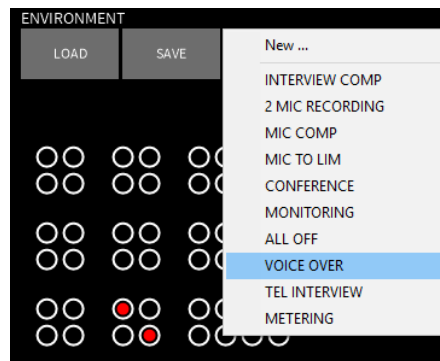
All of the settings are stored and the environment is added to the configuration.

## 8.3 Load & Delete

### ➤ Environment Load

This option loads any environment stored in the configuration, regardless of whether it is assigned to a button in [Environment](#) View. You can use it to load environments in either the **Routing** or **Logic** View:

1. Click on 'Environment' **Load** - all environments (relevant to the current View) appear in list form - click on a name to load the environment:



If you cannot see the environment you are looking for, have you selected the correct View? **Routing** View environments appear only in **Routing** View, and **Logic** View environments only in **Logic** View.

### ➤ Environment Delete

This button deletes an environment permanently from the configuration.

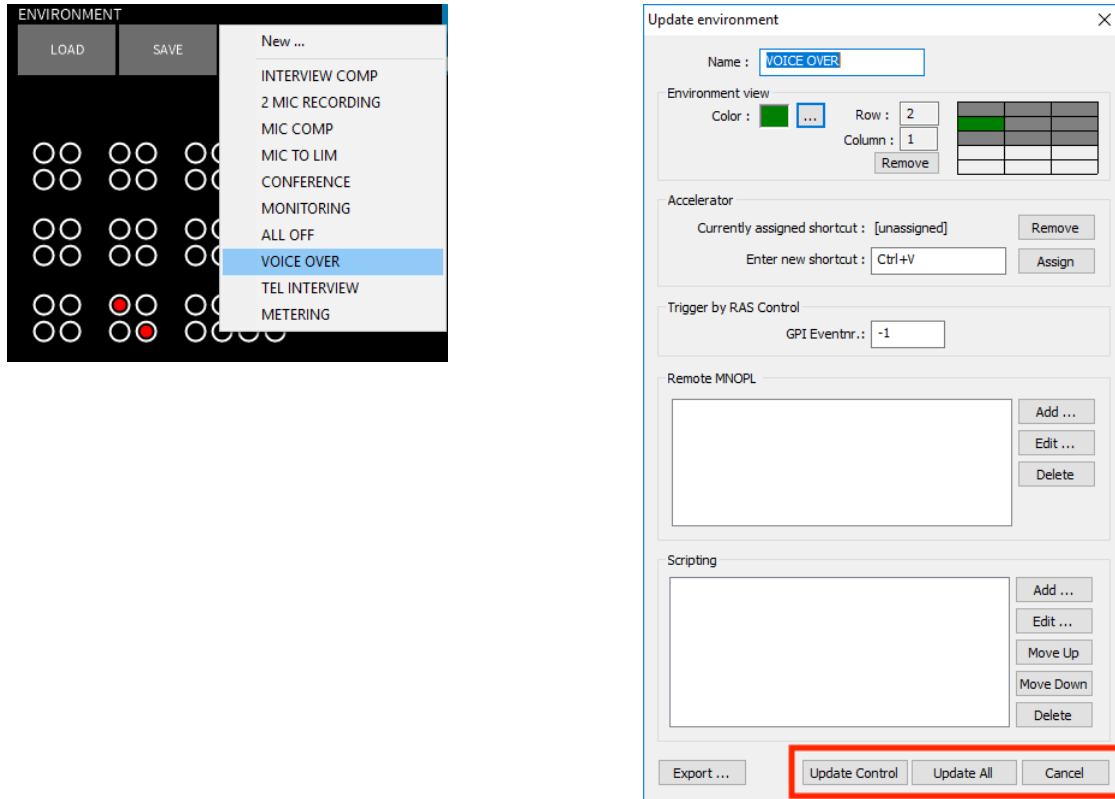
1. Click on 'Environment' **Delete** and select an entry.
2. Select **Yes** to confirm the delete.

## 8.4 Update

To update the parameters in an existing environment and edit its control [fields](#):

1. Click on 'Environment' **Save** and select an existing environment from the drop-down list - for example, **VOICE OVER**.

The 'Update environment' dialog box appears:



This box contains the same control fields as when you first [saved](#) the environment.

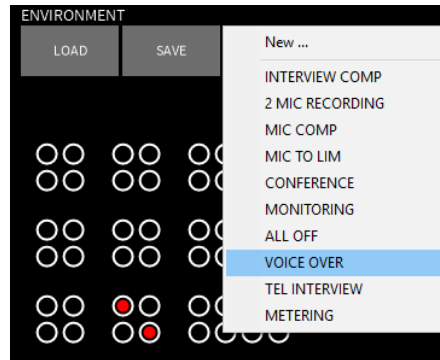
2. Use the [fields](#) to assign a button position in the **Environment** View, assign a keyboard shortcut (**Accelerator**), and so on.
3. Then select one of the following options to exit the dialog box:
  - **Update Control** - updates the environment with changes to the control [fields](#) only. (Other settings - devices, connections and parameters - are NOT altered).
  - **Update All** - updates the environment with all settings (both parameters and control).
  - **Cancel** - exits the dialog box without saving.

## 8.5 Import & Export

These options may be used to save environments, as individual XML files, so that they may be transferred between **RELAY VPB** computers.

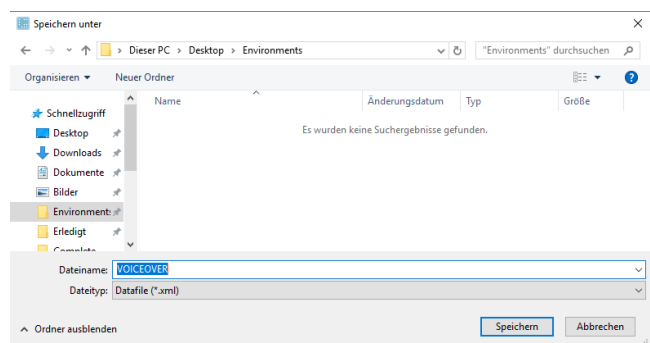
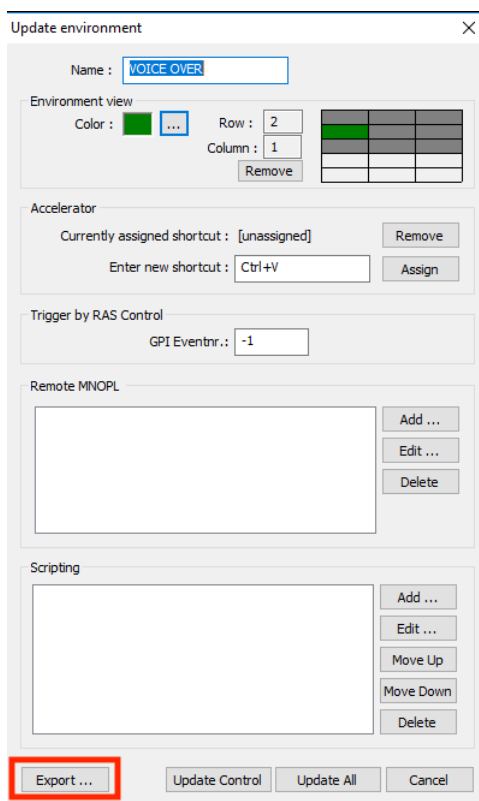
### ➤ To export an environment:

1. Click on 'Environment' **Save** and select the environment from the drop-down list - for example, **VOICE OVER**:



The 'Update environment' dialog box appears.

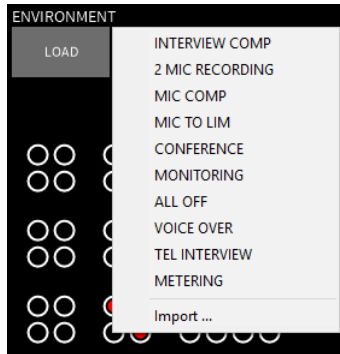
2. Click on **Export...** and, using Windows Explorer, select a folder location and filename:



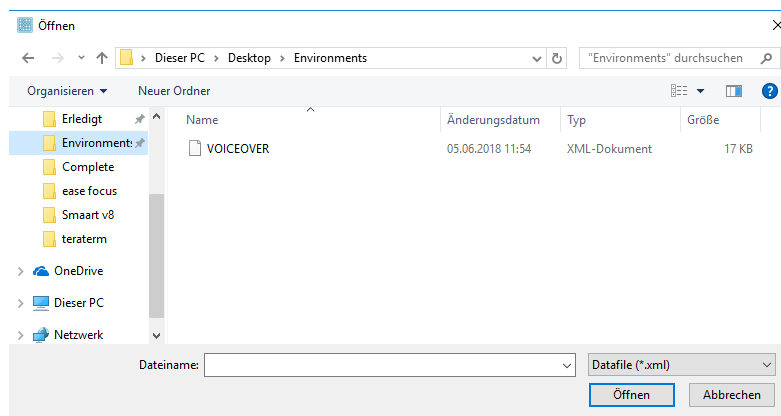
3. Click on **Save** to export the environment as a **.xml** file.
4. Transfer the file to another **RELAY VPB** computer.

➤ **To import an environment:**

1. Click on 'Environment' **Load** and select **Import...**:



2. Using Windows Explorer, select the environment **.xml** file you wish to import, and click on **Open**:



If [RAVENNA](#) Stream Sources or Destinations are stored in the environment, and the **.xml** file was exported from a computer using a different network interface, then two dialog boxes appear asking you to select the network interface to be used for streaming (one for Sources and one for Destinations).

3. The environment may now be [loaded](#) in the usual manner.

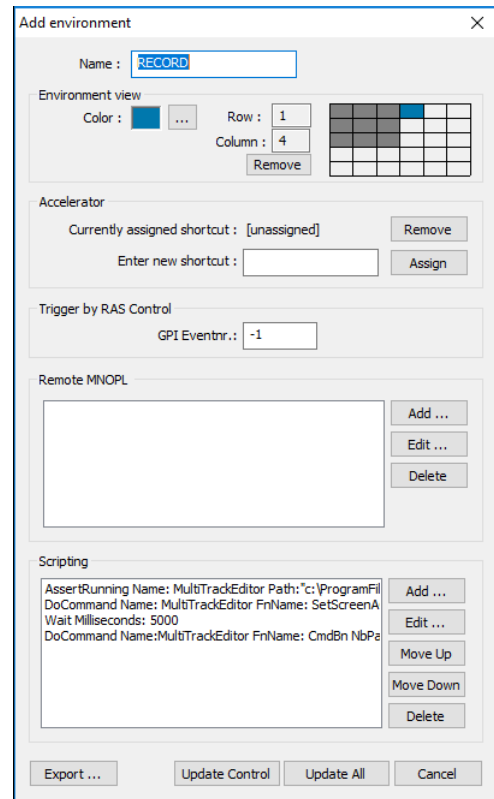
If an environment of the same name already exists, then the system creates a copy.

## 8.6 Control Fields

The 'Add/Update environment' dialog box appears whenever you save a [new](#) environment or [update](#) an existing one.

The fields are optional and are used as follows (please follow the links for details):

- [Name](#) - names the environment.
- [Environment View](#) - assigns a button to load the environment.
- [Accelerator](#) - assigns a keyboard shortcut to load the environment.
- [Trigger by RAS Control](#) - assigns a control trigger so that the environment can be loaded from a remote device, such as a Radio Automation System or external mixing console.
- [Remote MNOPL](#) - adds a list of external matrix connects which will be reset (via Remote MNOPL) when the environment loads. You can use this to reset connections in an external router.
- [Scripting](#) - adds a list of SOAP commands which will perform functions outside of **RELAY VPB** when the environment loads. For example, to start your recording software and place it into record ready mode.

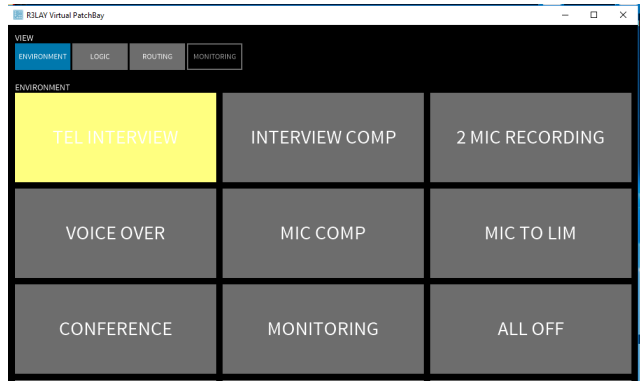
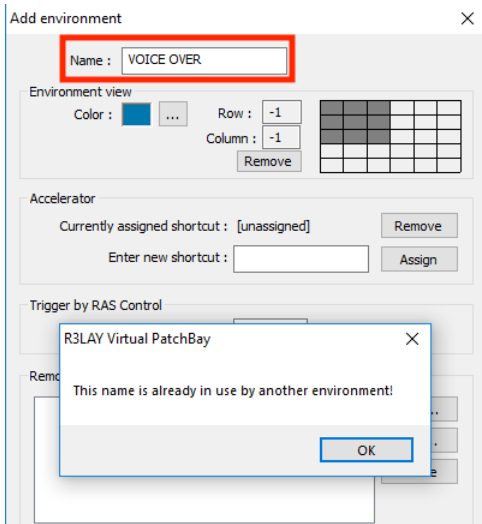


### 8.6.1 Name

This field names the environment. Each environment must have a unique name.

If you enter a duplicate name and select **OK** or **Update**, then the following message appears.

Names can be any length, but bear in mind that the names are used to label each button in the **Environment View**.





## 8.6.2 Environment View

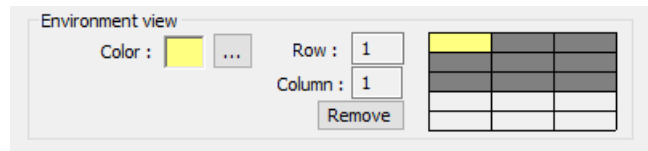
This area assigns an **Environment View** button to load the environment:



The number of available buttons is defined in the **Settings** dialog box, under [Settings -> Environments](#).

The grid shows the button locations:

- **Grey** = used by another environment.
- **Colour (e.g. Yellow)** = the current assignment.
- **White** = available.



The **Row** and **Column** entries also display the current assignment - e.g. **Row 1, Column 1**.

1. Click on a white box to assign the environment to a new button location - the grid and **Row/Column** update accordingly.

You cannot overwrite a used environment button location. So, if you wish to reorder the layout of the **Environment View**, open each environment and [update](#) its position.

2. Click on **Remove** to remove the environment from the grid.

This removes the environment from **Environment View**, but does not delete the environment. The environment is still stored in the configuration and can be loaded from the [Load](#) button. To delete an environment, use [Delete](#).

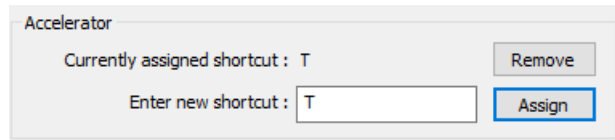
3. Click on the ... box to assign a colour. This colour is used to light the environment button when it is [loaded](#) in **Environment View**.

It is a good idea to colour-code **Routing View** and **Logic View** environments so that they can be distinguished in the **Environment View**. For example, use yellow for **Logic View**, and green for **Routing View** environments.

### 8.6.3 Accerator (Keyboard Shortcut)

This field assigns a keyboard shortcut (**Accelerator**) to load the environment.

1. To enter a new keyboard shortcut, click in the **Enter new shortcut field**, and then press the key or keys you wish to use - for example, **T**.
2. Then click on **Assign** to make the assignment:



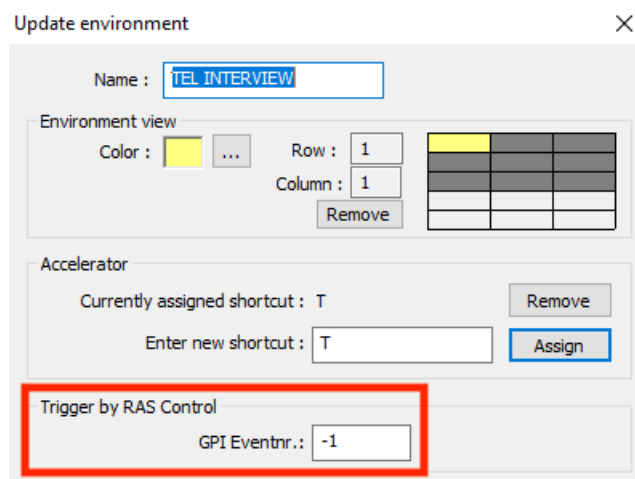
3. To remove an assignment, click on **Remove**.

### 8.6.4 Trigger by RAS Control

This field assigns a GPI event number so that the environment can be loaded from a remote device via RAS Control.

Any device which supports the RAS Control interface can be used - for example, a Radio Automation System or external mixing console.

The **RAS Control** network connection and **Active** state must be defined in [Settings -> Interfaces](#) before the trigger becomes active. The **RAS** flag on the [status bar](#) indicates whether you have a valid connection.

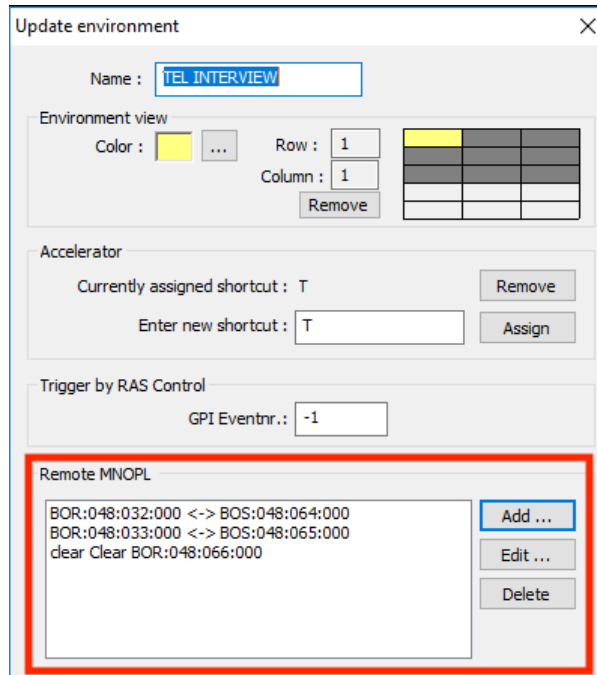


Enter the GPI event number, from your RAS Control system, which will trigger the environment load (-1 = trigger off).

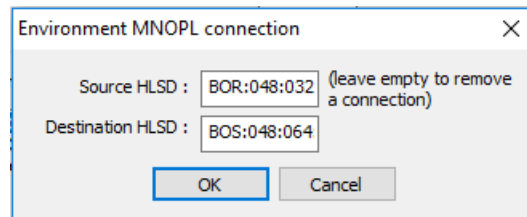
### 8.6.5 Remote MNOPL

This field can be used to enter a list of external matrix connections which will be actioned when the environment loads. Typically, it is used to reset connections within a Lawo routing system, such as the Nova73.

The **Remote MNOPL** network connection and **Active** state must be defined in [Settings -> Interfaces](#) before the connections can be loaded. The **MNOPL** flag on the [status bar](#) indicates whether you have a valid connection.



1. Click on **Add..** to open a dialog box where you can enter the **Source** and **Destination HLSD** for each connection you want to set:



The High Level Signal Definition is a unique system address for the signal. The address syntax can be found by opening the **AdminHD configuration** for the Nova73 system - please refer to the "Nova73 Technical Manual".

To disconnect a **Destination HLSD**, leave the **Source HLSD** field empty.

2. Select **OK** to add the connection to the **Remote MNOPL** list.
3. Repeat to add as many connections as you wish.
4. Select an entry and click on **Edit..** to edit the address.
5. Select an entry and click on **Delete** to remove a connection from the list.

When the **RELAY VPB** environment is loaded, all connections in the list will be reset.

### 8.6.6 Scripting

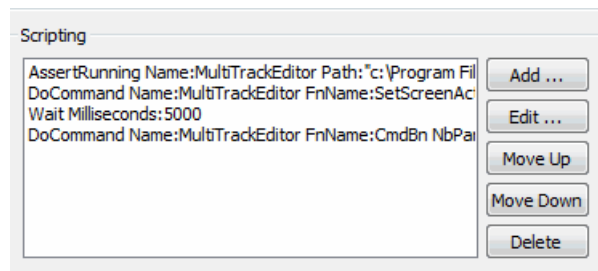
This field can be used to enter a list of commands which will be actioned when the environment loads. For example, to perform actions outside of **RELAY VPB** such as starting and configuring your recording software.

Any application which supports SOAP commands can be controlled. (SOAP is a non-proprietary protocol for XML information exchange.) The amount of integration depends on the level of SOAP support in your external software. The **Lawo MutliTrack Editor** supports SOAP.

Generally it is possible to open a batch file, for example to open an application, via the following command:

```
CallBatch Path:"C:\Temp\CopyTest.bat."
```

Below is an example with 4 commands which opens the **Lawo MutliTrack Editor** software and places it into record ready mode:



The syntax for each line is as follows:

**Line 1:**

```
AssertRunning Name:MultiTrackEditor Path:"C:\Program Files (x86)\Lawo\Editor\MultiTrackV5.exe"
```

This line checks if the **MultiTrack Editor** application is running (the location is set by the file path). If it is not running, the application is started.

**Line 2:**

```
DoCommand Name:MultiTrackEditor FnName:SetScreenActive NbPars:1 Parl:xxxx (where xxxx = MultiTrack, S
```

This line triggers an internal SOAP command within the **MultiTrack Editor** to switch the software to a different page.

**Line 3:**

```
Wait Milliseconds:5000
```

Here, we wait for 5 seconds in order to let **RELAY VPB** set its crosspoints correctly. This ensures that everything happens in the correct order.

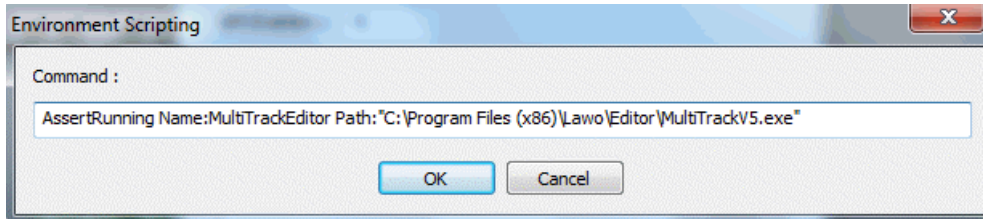
**Line 4:**

```
DoCommand Name:MultiTrackEditor FnName:CmdBn NbPars:1 Parl:xxxx (where xxxx = Record, Play or Stop)
```

This line enables the **Record Enable**, **Play** or **Stop** buttons in the transport control.

To enter the **Scripting** commands:

1. Click on **Add..** to open a dialog box where you can enter each command:



2. Repeat to add as many commands as you wish.
3. Select an entry and click on **Edit..** to edit a command.
4. Select an entry and click on **Move Up** or **Move Down** to move its position in the list.
5. Select an entry and click on **Delete** to remove a command.

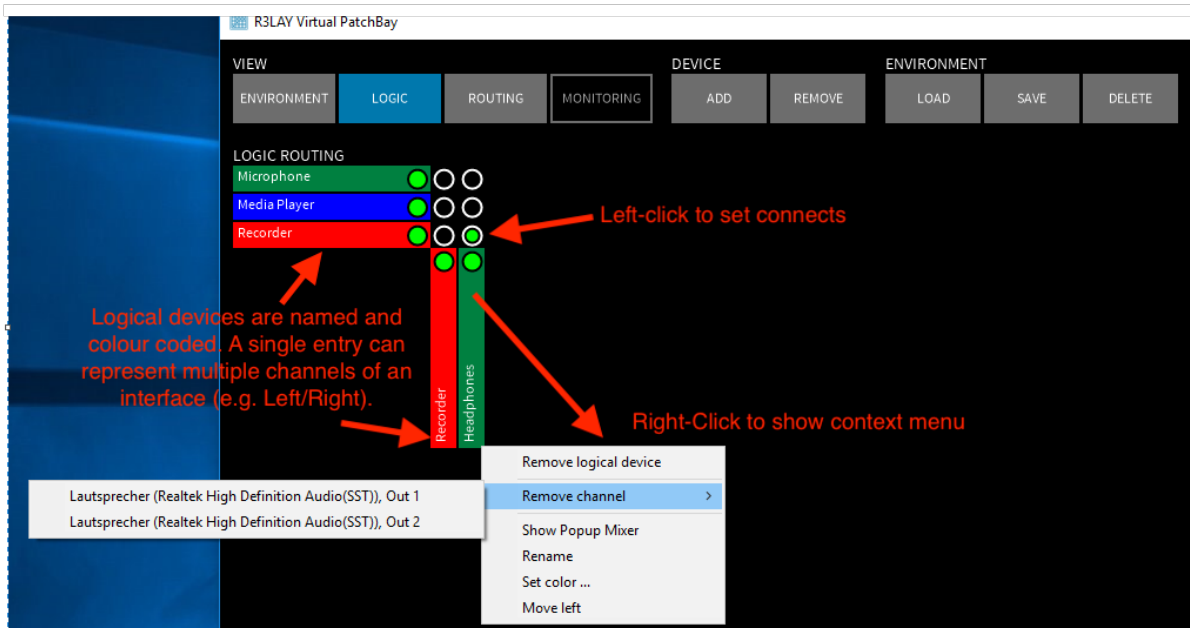
When the **RELAY VPB** environment is loaded, all commands are actioned from top to bottom in a stepwise fashion.

## 9. Logic View

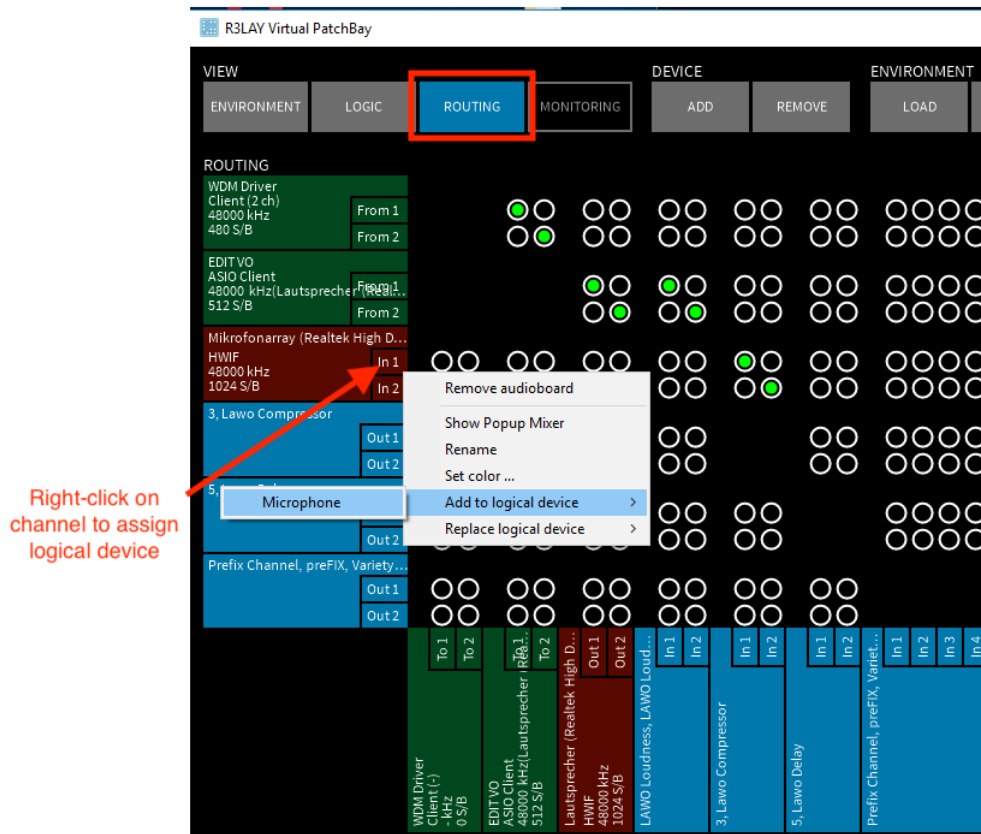
**Logic View** provides a signal-based view of the audio setup which is independent from the software and hardware.

Each logical device can be named and colour-coded, and may represent single or multiple channels from a real audio interface. This allows you to configure a simple routing matrix for common tasks. You can also save logical devices and their parameters in [environments](#).

*Logic View offers a simplified version of the matrix*



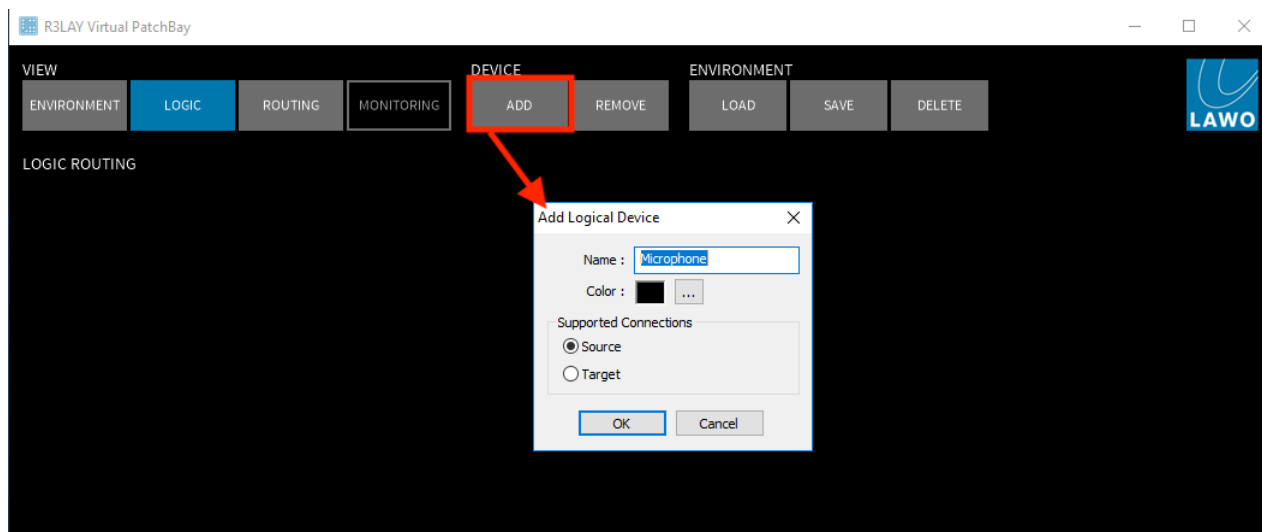
*Routing View assigns channels to each logical device*



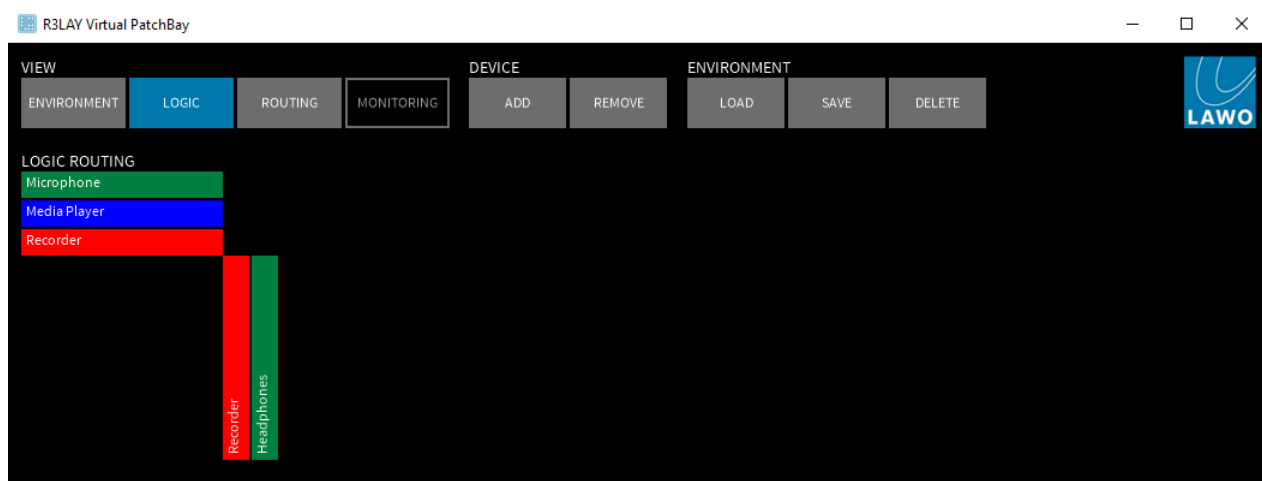
## 9.1 Add Logical Devices

The first step is to add some logical input and output devices:

1. Select **Logic View** and click on **Add 'Device'** to open the 'Add Logical Device' dialog box:



2. Configure the options as follows:
  - **Name** - names the logical device.
  - **Color** - click to assign a colour from the colour palette. This will help quickly identify the device in the **Logic View** matrix.
  - **Supported Connections** - select the **Source** or **Target** options to define whether this is an input or output device.
3. Once you have made your selections, click on **OK** - the logical device is added to the routing matrix.
4. Repeat to add all your logical devices - for example:

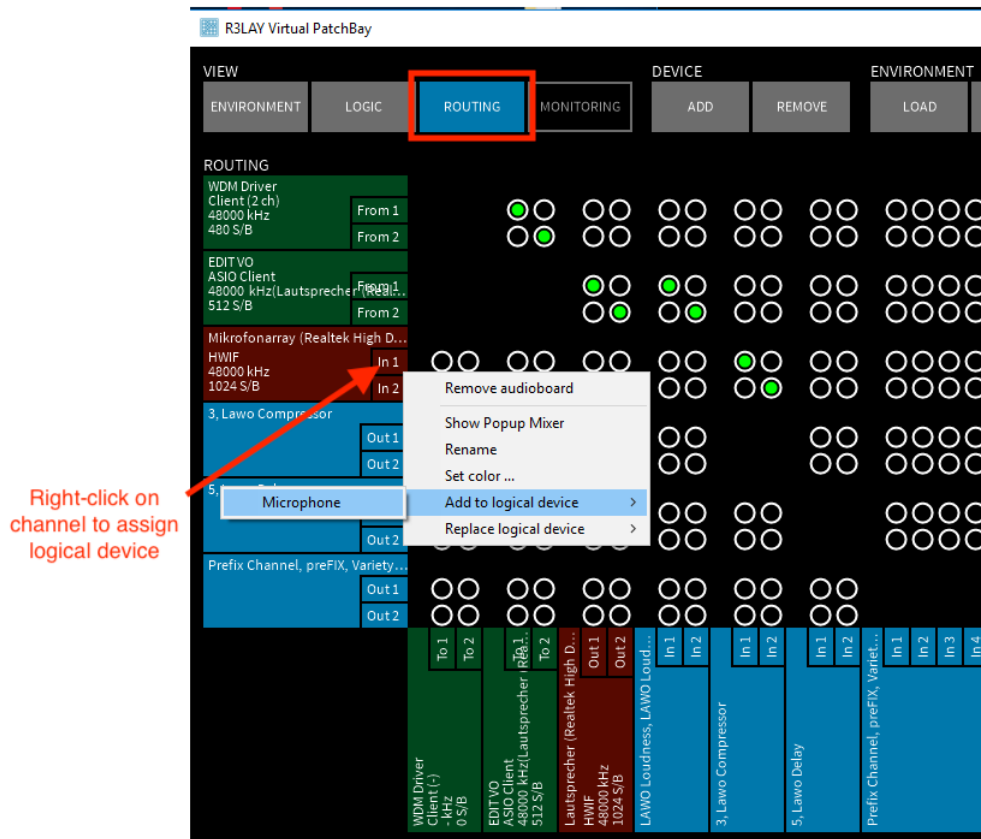


## 9.2 Assign Audio Channels

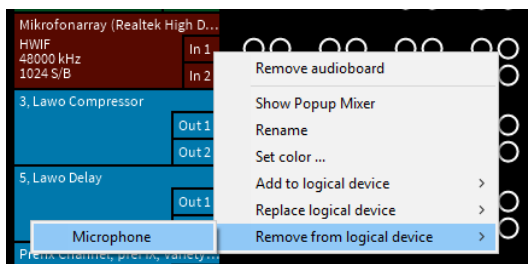
The next step is to assign some real audio channels to each input and output device.

You can assign multiple audio channels from the same interface if you wish. For example, assign **Out 1** and **Out 2** from the **Speakers interface** to the **Headphones** logical device. This will allow to connect both the left and right outputs of the **Headphones** from one logical crosspoint, see [Matrix Control](#).

1. Select **Routing View**.
2. Right-click (or double-click) on the channel to access its [context menu](#) - in our example, **In 1** from our **Microphone Realtek interface**.
3. Select **Add to logical device**, and choose a device from the drop-down menu - the list shows all the logical devices [added](#) earlier:



4. Repeat to assign audio channels to each input and output logical device.
5. Right-click and select **Replace logical device** to replace an existing assignment with the selected channel.
6. If you select a channel which is already assigned to a device, then you can use **Remove from logical device** to remove the channel:

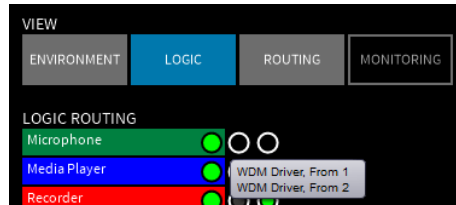


7. When you have finished all your assignments, switch back to **Logic View** to see your matrix.



## 9.3 Matrix Control

The **Logic** View shows all logical devices and matrix crosspoints. Hover your mouse over a logical device, to reveal the actual audio channel assignments:



The coloured points beside each logical device indicate its status:

- **Green** = audio running.
- **Red** = no signal present (e.g. playback or recording may be in Stop).
- **Black** = device unavailable (e.g. the software application is not open, or the device has been [removed](#)).
- No coloured point = no audio channel has been assigned to the device.

### ➤ Making Connections

1. Left-click on a crosspoint to connect (or disconnect) the corresponding devices - the colour of each crosspoint indicates the different connection states as described [earlier](#).

Connecting logical devices connects the corresponding audio channels in the **Routing** View - you can see this if you make a connection in **Logic** View and then switch back to **Routing** View to reveal the audio channels.

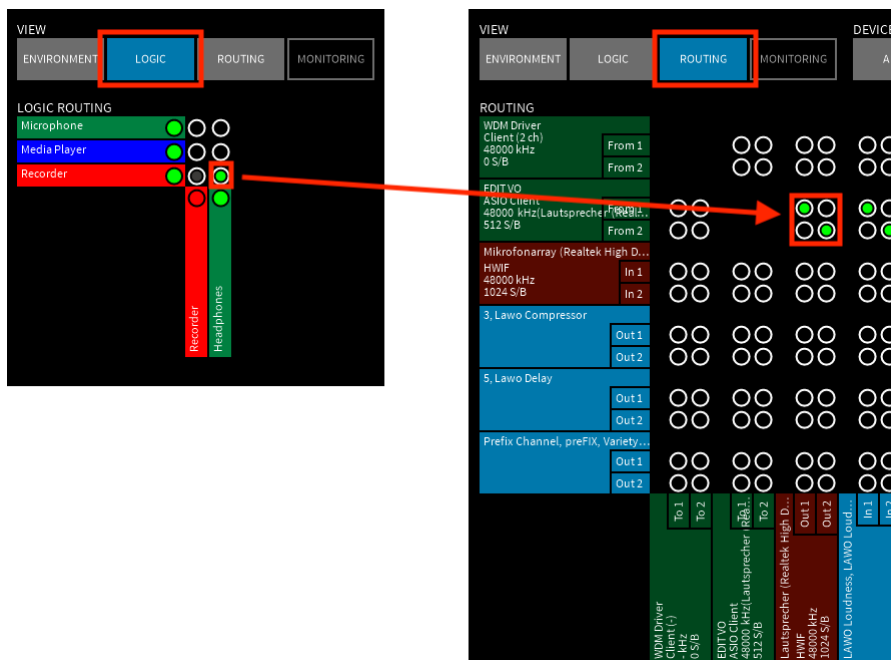
Note that if you make connections in **Routing** View, they will not be displayed in **Logic** View!

Connecting a single-channel to a multi-channel logical device, routes the single input to all output channels.

Connecting a multi-channel to a single-channel logical device, routes all inputs to the single output channel.

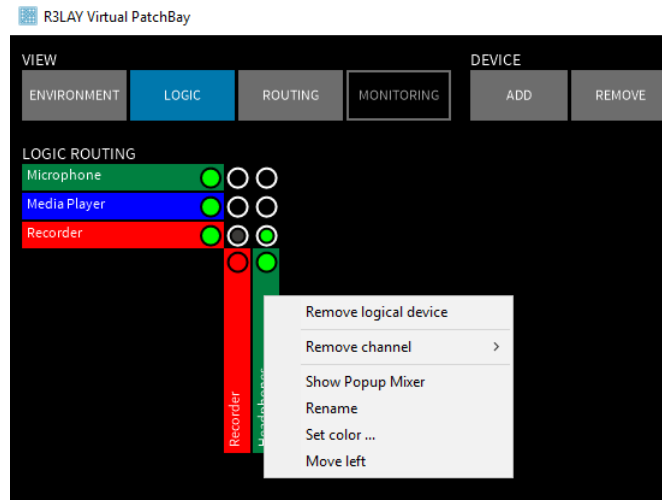
Connecting multi-channel logical devices, routes input 1 to output 1, input 2 to output 2 and so on. If the number of channels vary, then the pattern is repeated.

For example, connecting our **Recorder** (a two-channel input device) to **Headphones** (a two-channel output device) routes input 1 to output 1, and input 2 to output 2:

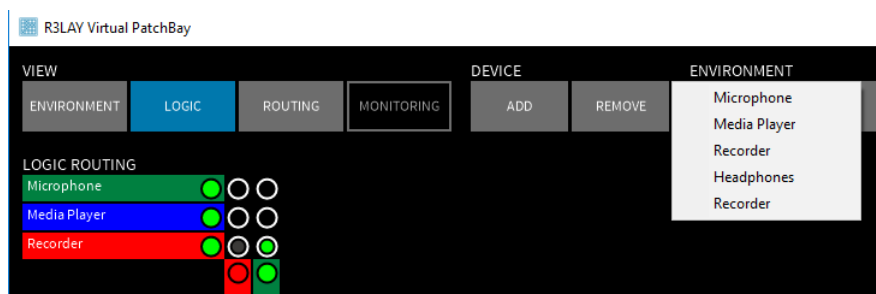


## 9.4 Other Operations

1. Right-click (or double-click) on a logical device to reveal its context menu:



- **Remove logical device** - removes the logical device. A confirmation dialog asks you to confirm the operation. Note that if audio connections are set, then they will remain set (in **Routing View**) after the logical device has been removed.
  - **Remove channel** - this option lists all the audio channels assigned to the logical device. Click on an audio channel to remove it from the logical device. As above, if a connection was set, it will remain after the channel is removed.
  - **Show Popup Mixer** - opens a pop-up mixer where you can meter and adjust the input or output levels of the logical device channels. This works in a similar manner to **Routing View**, see [Input & Output levels](#).
  - **Rename** - allows you to rename the logical device.
  - **Set color..** - opens the colour pallet to assign a new device colour.
  - **Move left/right** or **Move up/down** - moves the position of the selected device.
2. You can also select 'Device' **Remove** to remove a logical device:

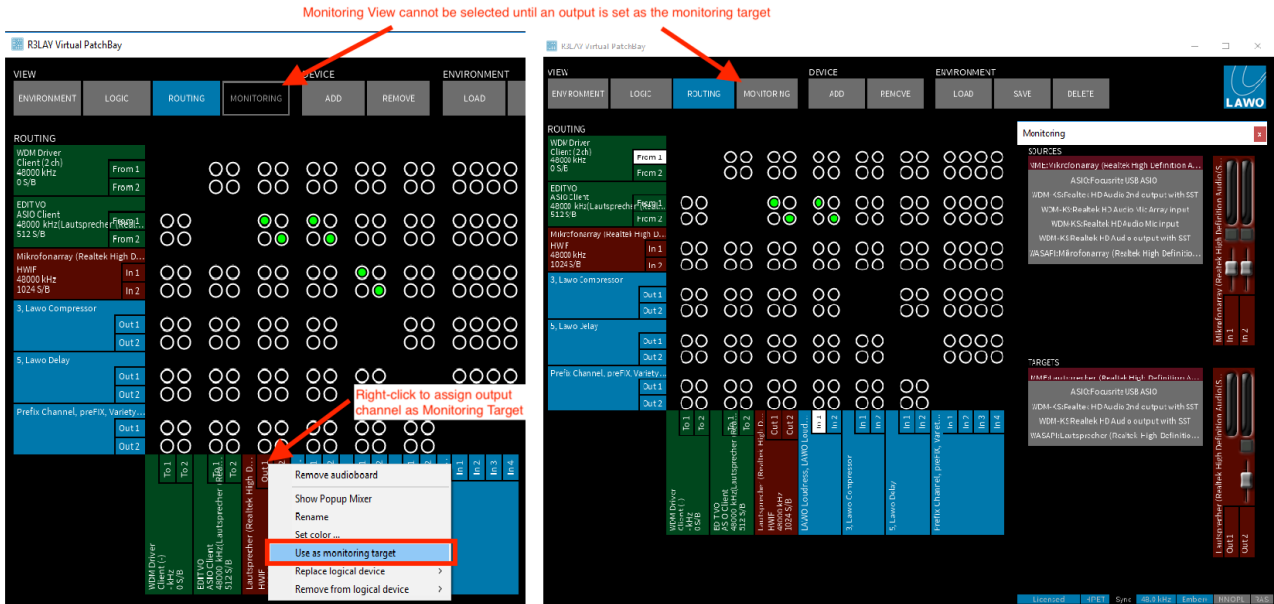


3. Use the 'Environment' **Load**, **Save** and **Delete** buttons to save and manage environments. These work in an identical manner to the **Routing View**, with the exception that saving an environment saves all logical devices, connections and channel parameters. See [Environment Configuration](#) for details.

# 10. Monitoring View

**Monitoring View** is used to monitor and meter any audio stream.

It is useful for line checking or fault finding the audio streams available on your computer. Once open, the 'Monitoring' window shows all Sources and Targets. Click on a device name to reveal its metering and monitoring options:

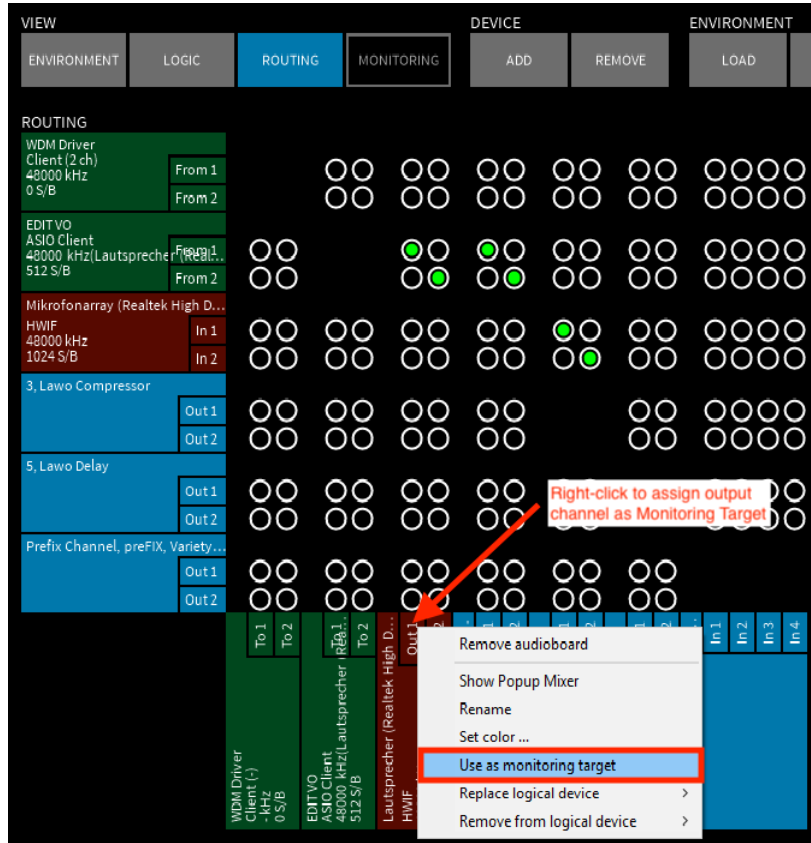


## 10.1 Defining the Monitoring Target

The first step is to define an output device as the monitoring target.

**Monitoring** View cannot be selected until a target is set - the button is greyed out.

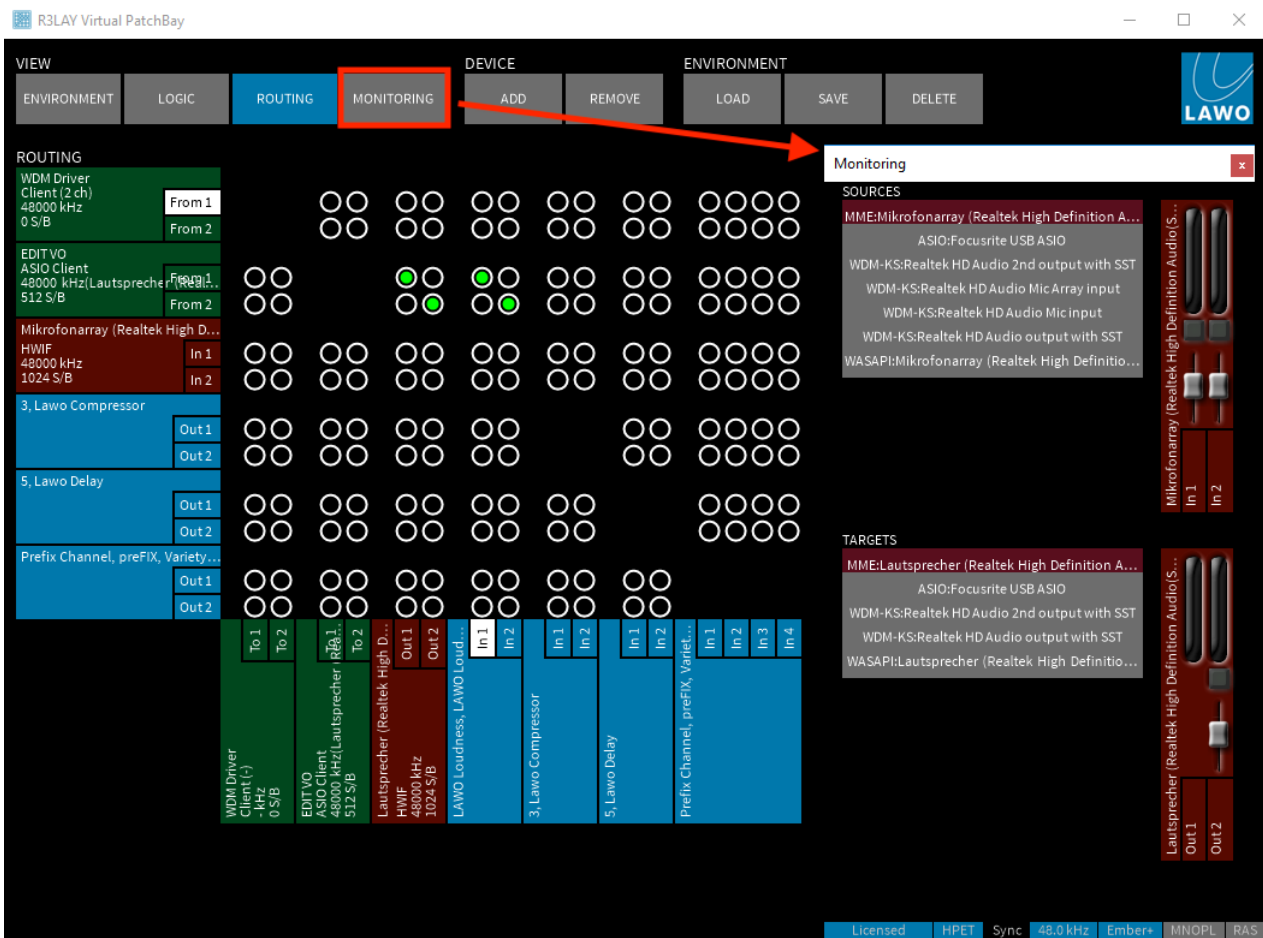
1. Select **Routing** View.
2. Right-click on an output channel (e.g. **Speaker Out 1**) and select **Use as monitoring target**:



To monitor signals in stereo, repeat the operation to select two output channels.

## 10.2 Monitoring Signals

- Once you have [defined a target](#), you can click on **Monitoring** View to open the 'Monitoring' pop-up window:



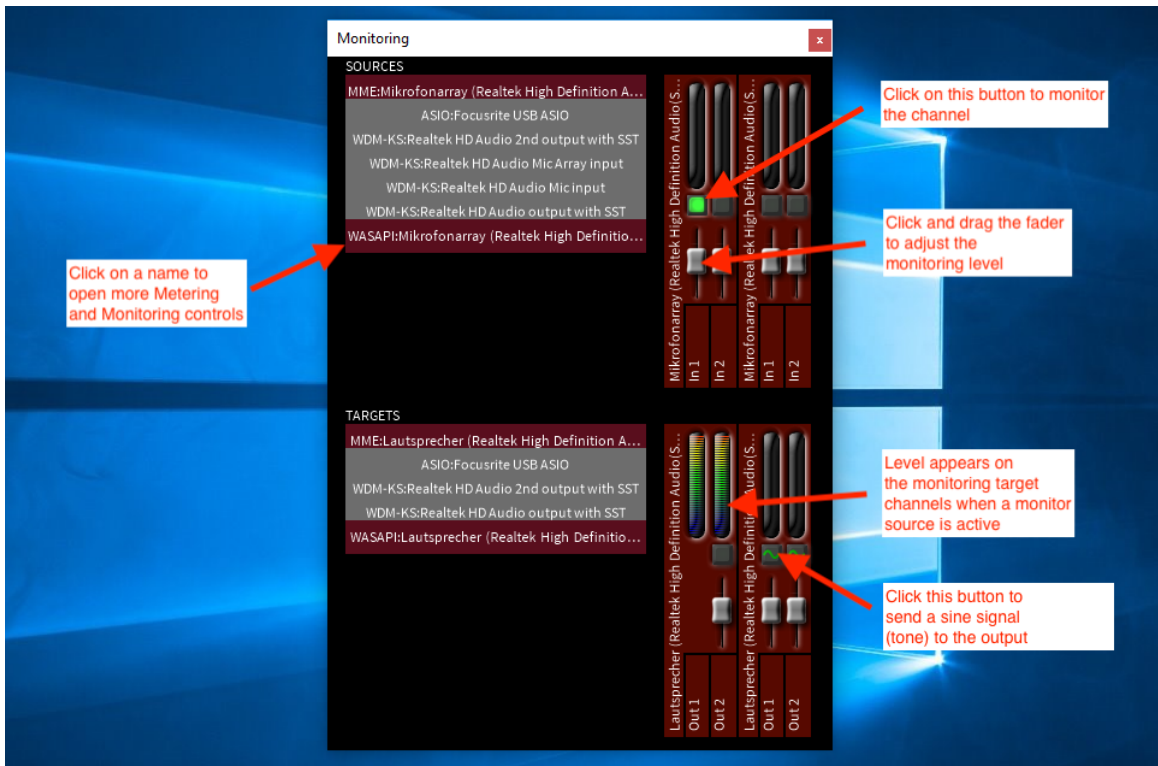
The window shows all 'Sources' and 'Targets' which can be "seen" by **R3LAY VPB** - in other words, all hardware interfaces and software applications on your computer which support ASIO, MME, WASAPI and WDM drivers. Note that devices appear multiple times if they support more than one driver type.

The devices which have been added to the routing matrix are automatically selected, and you will see metering and monitoring controls for their channels. You will also see metering for your monitor target - in our example, the **Speakers Out 1 and Out 2**.

- To open more metering and monitoring controls, click on a Source or Target name - if the device is already selected (with a different driver type), then an error may appear.
- To monitor a Source or Target, click on its monitor button - you will see level on your monitoring target channels, and should be able to hear the audio signal (providing your monitoring target interface is connected!).

Click quickly to latch the monitor button(s) on/off. You can monitor multiple Sources and Targets if you wish. Click and hold (for > 200ms), and the monitor button is momentary.

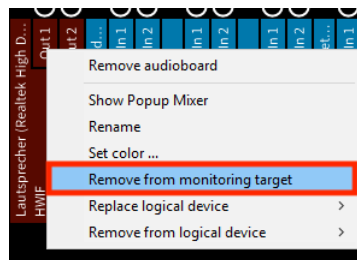
- Click and drag on the faders below the monitor buttons to adjust the monitoring level. Note that this level is for monitoring only, and does not affect the [Input and Output levels](#) of your device.
- Click on a green sine button to send tone to the corresponding output. These buttons appear on monitoring targets which have been added to the **Monitoring View** but are not yet part of the **Routing grid**, can help you find a connected speaker or headphone.



- Deselect the monitor buttons to turn off the monitoring signal.
- Click on the red cross to close the 'Monitoring' window. You must close the window before you can continue with further operations.

You can leave your monitoring target selected - the assignment is [saved](#) with the configuration.

- Or, right-click on the monitoring device channel to remove it from the monitoring target:

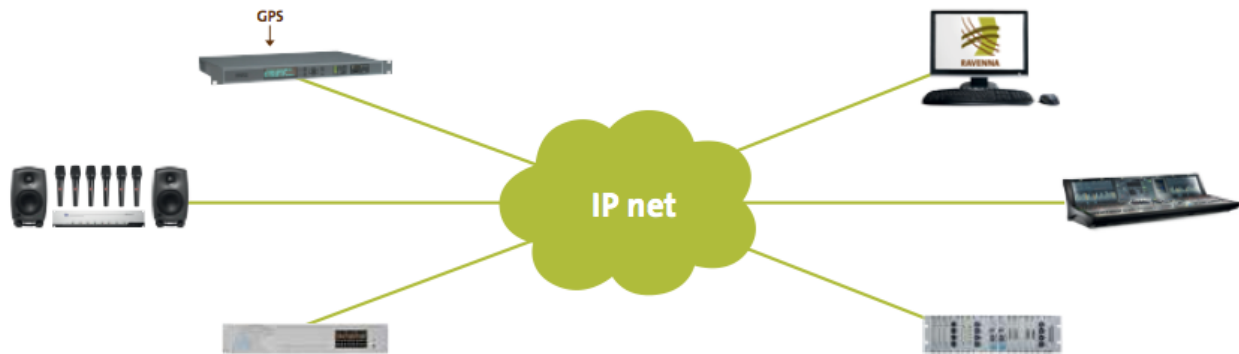


## 11. RAVENNA

This chapter describes the setup of RAVENNA streams for transferring audio-over-IP.

### 11.1 About RAVENNA

RAVENNA is an open technology which uses standardized networking protocols to stream audio, and other media content, across an IP network:



Each "node" on the network can be any RAVENNA compatible device (Lawo or third-party). RAVENNA nodes *MUST* be connected via a qualifying IP network - i.e. one that meets certain data network requirements. Audio streams can be published from each node to the network - for example, from a **RELAY** PC. Other nodes may then choose to start receiving the stream - for example, to play out the audio through one of the mixing consoles. Multiple streams can be published from a single node. In a multicast network, a published stream can be used by multiple receivers simultaneously. A major advantage of RAVENNA is that the network infrastructure can grow to meet the installation's requirements.

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

#### 11.1.1 RAVENNA & RELAY VirtualPatchBay

**RELAY VPB** supports a native implementation of RAVENNA.

RAVENNA streams are added to the routing matrix, just like any other device. Each stream can be either stereo or 8-channel.

Typical applications include receiving audio streams from a network playout server or other **RELAY** users, and publishing final mixes from your **RELAY VPB** computer onto the network.

All RAVENNA device parameters are stored when you [save](#) an environment. This allows you to recall RAVENNA devices and matrix routing from the **Environment** 'View'.

The maximum number of RAVENNA channels, used by any combination of streams, is 64 channels (sending) + 64 channels (receiving).

#### 11.1.2 AoIP Stream Monitor

**AoIP Stream Monitor** can be used to check the status of RAVENNA streams on the network. It provides a useful diagnostics tool for master control and service technicians. It is available as a separate application (or service) and is described in the separate "AoIP Stream Monitor User Guide".

## 11.2 Configuring the Network Interface Card (TCP/IP Settings)

**RELAY VPB** connects to the RAVENNA network via the host PC's Network Interface Card (NIC). If the PC supports more than one NIC, then you can choose which interface will be used from the "Settings -> [RAVENNA](#)" menu.

To establish communication, you must first configure the TCP/IP settings of the NIC as follows. The exact steps vary depending on your OS version.

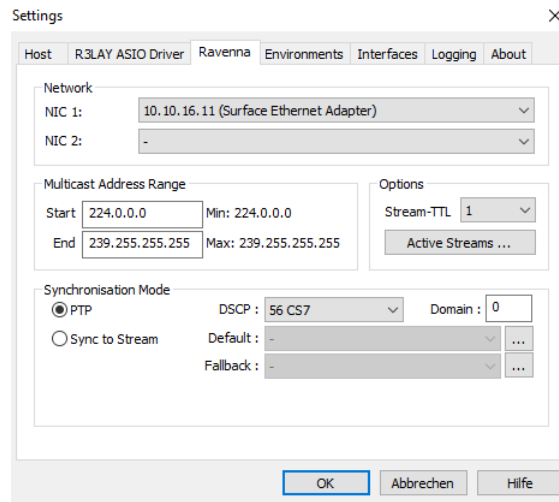
- **IP Address** - this must be unique and lie within the same IP address range as the other streaming nodes connected to the network.
- **Netmask** - this must match the subnet mask of the other streaming nodes.
- **Gateway** - this setting is required if data packets are to be redirected. For example, if the streaming nodes are connected via a network switch with Layer 3 routing capability. Please contact your network administrator if this is the case.

**RELAY VPB** supports both DHCP and static IP addresses. If you are using **RELAY VPB** with other Lawo RAVENNA hardware devices, then static IPs are recommended.



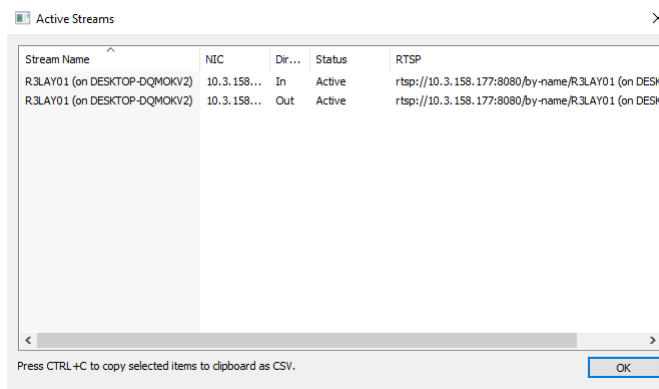
### 11.3 Defining the RAVENNA Settings

1. Open the [Settings](#) dialog box by clicking on the Lawo logo at the top right of the GUI.
2. Select the **Ravenna** tab:



The RAVENNA settings configure the global streaming options used by **R3LAY VPB**:

- **Network** - selects the two Network Interface Cards (**NICs**) to be used for RAVENNA streaming. The drop-down menus list all available network interface cards fitted to your computer; up to two NICs can be assigned. Either NIC can be assigned to an outgoing RAVENNA stream. Or, if SMPTE 2022-7 compatible streaming is enabled via the [advanced options](#), it will be possible to transmit and receive streams to/from both NICs. The output stream assignments are made from the [Add Stream](#) dialog box.
- **Multicast Address Range** - these values define the multicast address range used for outgoing RAVENNA streams. Enter a valid IP address into the **Start** and **End** fields if you wish to edit the range.
- **Options: Stream-TTL** - defines the Time To Live for outgoing RAVENNA streams. TTL is used within computer networks to limit the lifespan of data packets so that they do not circulate indefinitely. For RAVENNA streaming, you may need to increase the TTL value if you wish to cross several subnets within your network - click in the **Stream-TTL** field and increase the value to something like **4**.
- **Options: Active Streams** - click on this button to open a further dialog box. Here you will see information about all the streams which **R3LAY VPB** is sending and receiving:



You can copy and paste the details relating to any active stream - select a stream (or streams) from the list and press **CTRL + C** to copy the data to the clipboard. Then open a text editor and press **CTRL + V** to paste - the data appears in a .csv (comma separated values) format.

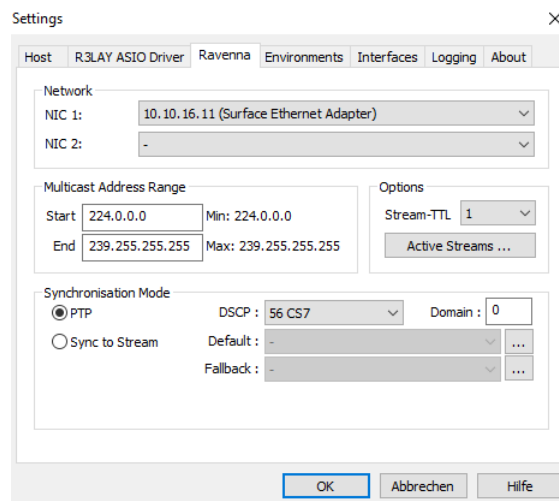
- **Synchronisation Mode**: see [Synchronisation](#).

## 11.4 Synchronisation

RAVENNA streaming relies on accurate timing information and a valid sync source must be specified. This can be either PTP (Precision Time Protocol) from the network or an incoming RAVENNA stream.

### 11.4.1 Defining the Sync Mode

1. Open the [Settings](#) dialog box by clicking on the Lawo logo at the top right of the GUI.
2. Select the **Ravenna** tab, and under 'Synchronisation Mode' select either **PTP** (Precision Time Protocol) or **Sync to Stream**:



#### ➤ PTP

The default mode is PTP (recommended for larger networks/multiple device streaming).

Note that **R3LAY VPB** acts only as a PTP slave and, therefore, a master PTP clock generator must be installed somewhere within the network. The PTP clock source should arrive via the Network Interface Card (specified in either the **NIC 1** or **NIC 2** field); the **Sync** status [field](#) flashes while synchronising, and lights once a valid PTP source is detected; this can take a few seconds.

The **DSCP** field can be used to assign a differentiated services code point, or quality class, to PTP sync requests. This can improve the timing of the system. 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. If in doubt, please check the DSCP implementation with your network administrator.

#### ➤ Sync to Stream

If your network has no PTP master, then **R3LAY VPB** can sync to an incoming RAVENNA stream. This can be useful in a small network with say a single sending device. **R3LAY VPB** will generate RAVENNA compatible streams locked to the incoming stream, allowing any outgoing streams to be received (by the sending device) without clock drift.

Select the **Sync to Stream** box, and then assign a **Default** (and **Fallback**) stream from the drop-down menus; the **Sync** status [field](#) flashes while synchronising, and lights once a valid PTP source is detected; this can take a few seconds. If the **Default** stream disappears, then the **Fallback** stream is used.

Note that the drop-down menus list all RAVENNA streams announced to the network. Alternatively, you can select a stream which has *not* been announced by clicking on the ... buttons - this opens a further dialog box where you can enter the URL of the stream manually.

3. Following a change, you will need to [restart](#) the **R3LAY VPB** service before the changes take affect.

### 11.4.2 Checking the Sync Status

The sync status is indicated in the status bar at the bottom of the GUI - the **Sync** field is blue if **RELAY VPB** is receiving a valid sync source:



The field will flash yellow if the clock is synchronising - for example, after the **RELAY VPB** service is [started](#). It is normal for the synchronisation process to take a few seconds.

The field has a black background if there is no valid sync signal detected.

## 11.5 Checking the Internal Clock (TSC or HPET)

For RAVENNA compatible operation, your PC must also have an active internal clocking mechanism. Depending on your Windows Operating System, there are two possibilities: **TSC** (for Windows 10) or **HPET** (for OS prior to Windows 10).

In both cases, the status is shown in the [status bar](#); lit = the TSC (or HPET) is active.

*HPET active (for OS prior to Windows 10)*



### HPET (High Precision Event Timer)

HPET is a high precision clock provided by your PC when running an OS prior to Windows 10.

By default, **HPET** should be activated during the software installation. If not, then re-run the [installer](#) and select the **Activate HPET** check box from the 'Additional Tasks' dialog box.

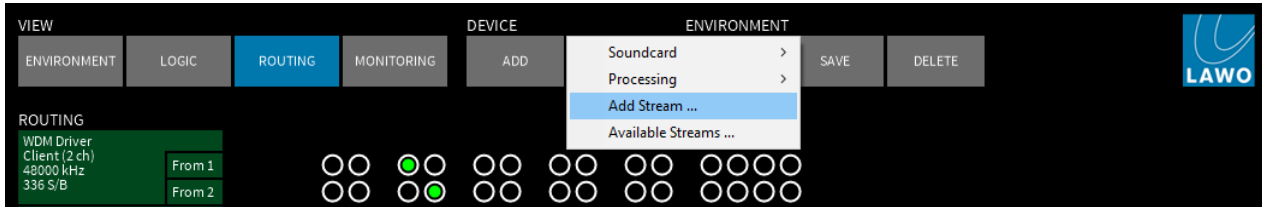
### TSC

Windows 10 uses an improved internal clocking mechanism known as "TSC\_INVARIANT". By default, TSC will be active.

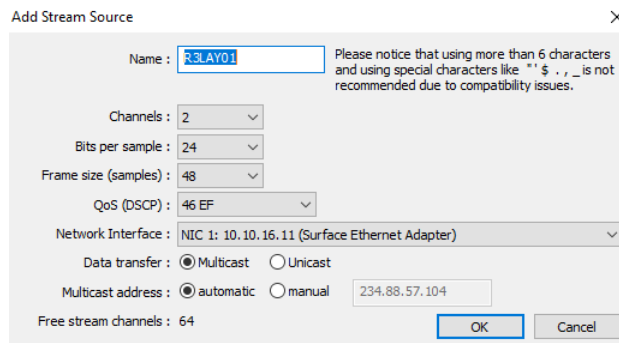
## 11.6 Publishing Audio to the Network (Add Stream)

To publish audio from your computer to the network, you must add a **Stream** device:

1. Select **Routing View**.
2. Click on **Add 'Device'** and select **Add Stream ...**:



A dialog box appears with settings to configure the stream:



The 'Add Stream Source' dialog box contains the following fields and options:

- Name:** RELAY01 (with a warning: "Please notice that using more than 6 characters and using special characters like \* \* \$ . , \_ is not recommended due to compatibility issues.")
- Channels:** 2
- Bits per sample:** 24
- Frame size (samples):** 48
- QoS (DSCP):** 46 EF
- Network Interface:** NIC 1: 10.10.16.11 (Surface Ethernet Adapter)
- Data transfer:**  Multicast  Unicast
- Multicast address:**  automatic  manual (234.88.57.104)
- Free stream channels:** 64

- **Name** - names the stream. This name appears in the routing matrix, and also identifies the stream to other network users. Therefore, the name cannot be edited later. Please follow the on-screen guidance relating to the length and use of characters in the name.
- **Channels** - enter the number of channels for the audio stream (2 or 8)\*. The channel count forms part of the stream, and therefore cannot be edited later. The number of available channels is indicated by the **Free stream channels** counter - the total number of RAVENNA channels (used by sending + receiving streams) cannot exceed the [maximum](#) permitted by your license.
- **Bits per sample** - enter the bit depth (16 or 24-bit).
- **Frame size (samples)** - enter the frame size (32, 48, 64 or 128)\*. The default setting is 48; the smaller the frame size, the lower the latency but, depending on system performance, the more susceptible to drop-outs.

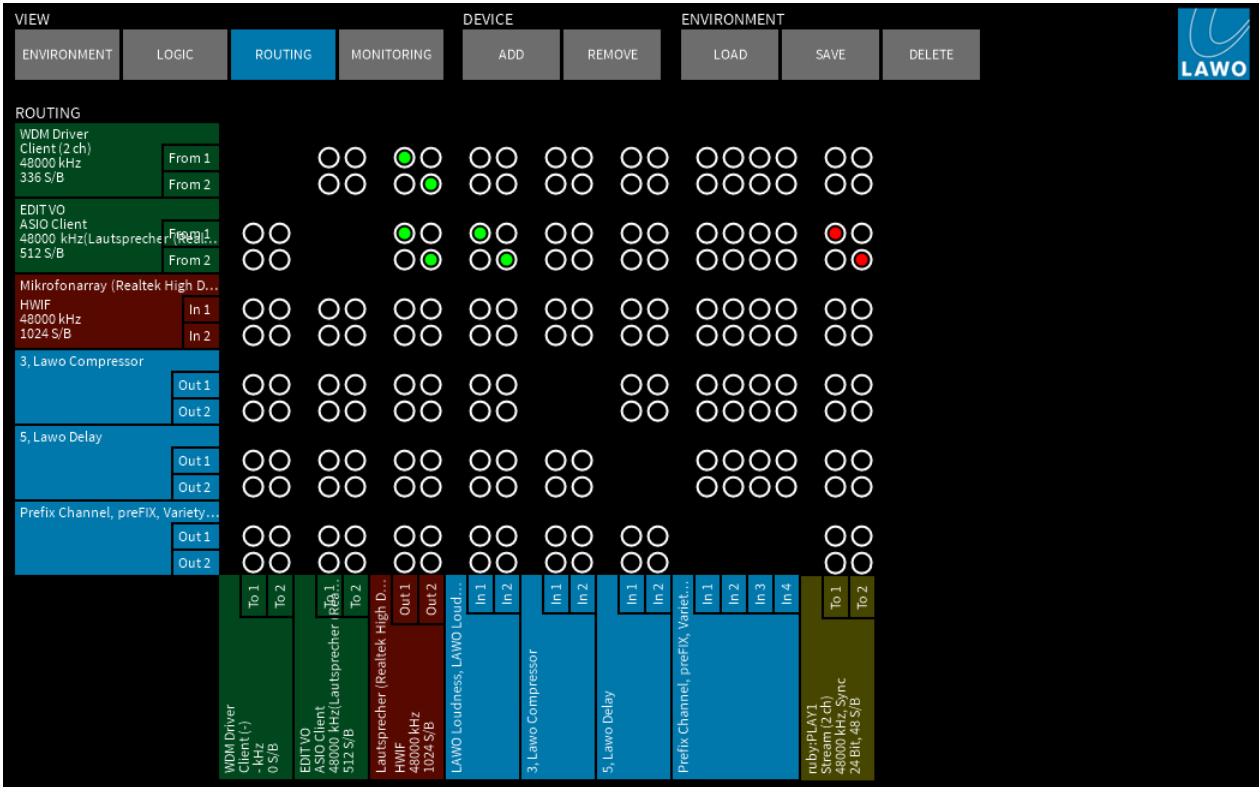
\*The values that appear in the **Channels** and **Frame size** drop-down menus can be expanded by editing the [advanced options](#).

**RELAY VPB** will automatically adjust the frame size so that data always remains within the maximum packet size for a RAVENNA audio stream. For example, if you enter 2 channels, at 24-bit with a frame size of 128, then the audio buffer size can be 128. However, if you enter 8 channels, at 24-bit, then **RELAY VPB** automatically adjusts the buffer size accordingly.

- **QoS (DSCP)** - assigns a DSCP (differentiated services code point) or quality class to the audio stream. 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 values for streams is 46 (=EF); and for PTP is 56 (=CS7). You can find more details on QoS in the separate "AV Networking Guide".
- **Network Interface** - use the drop-down menu to assign a network interface to the audio stream. You can choose either of the two NICs defined in the [Settings -> RAVENNA](#) dialog box. If you are working within a PTP network, then the correct network interface (containing the PTP clock information) is automatically selected. If SPS is enabled via the [advanced options](#), then it is possible to choose both NICs.

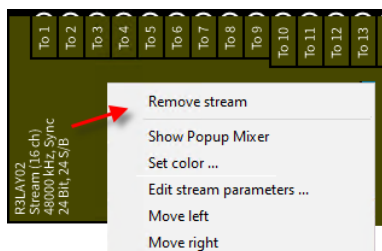
- **Data Transfer** - sets the transfer mode to either **Multicast** or **Unicast**.
- **Multicast address** - if **Multicast** is selected, then this field sets the multicast address to either **automatic** or **manual**. Choose **manual** and enter the IP address if your network supports a limited IP range. The multicast address range is defined in the [Settings -> RAVENNA](#) dialog box. If SPS is enabled via the [advanced options](#), then it is possible to set a second multicast address.

4. Once you have made your selections, click on **OK** - the stream is added to the routing matrix as an output device:



It is now available to other network users (and within **RELAY VPB**) as an [Available Stream](#).

5. Left-click on a crosspoint to connect signals to the audio stream - in our example, the output from the **Lawo MultiTrack Editor**.
6. Right-click (or double-click) on the device name to open its [context menu](#). From here you can colour-code or move the device, and open its popup mixer or parameter window:



7. Select **Edit stream parameters..** to edit parameters for an existing RAVENNA stream. Note that cannot edit the **Name** or the number of **Channels**.
8. Two additional content menu entries can be revealed by editing the [advanced options](#) file: **Copy RTSP Link** and **Copy SDP**.

These options copy the stream's RTSP Link or SDP information to the clipboard, so that it can be used to set up a new stream. For example, via the [Add Stream URL](#) or [Add Stream SDP](#) window.

### 11.6.1 AES-67 Compliance

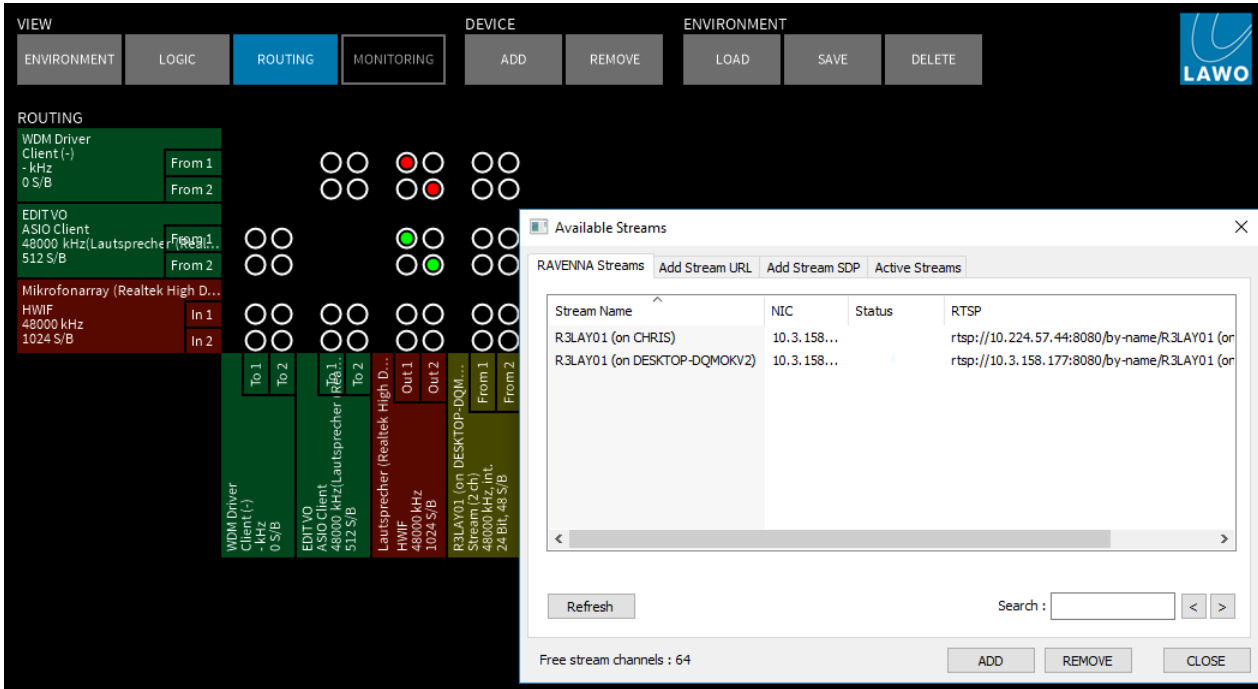
When a RAVENNA stream is published from **RELAY VPB**, the user can specify the stream name and number of channels. To ensure that all streams are AES-67 compliant, the remaining payload parameters should be defined as follows:

- **Bits per sample** = 24
- **Frame size** = 48 (for 2-channel and 8-channel streams).
- **Frame size** = 6 (for 64-channel streams).
- **QoS (DSCP)** = 46 (EF).

## 11.7 Using Audio from the Network (Available Streams)

To use audio from a stream on the network, you must add an **Available Streams** device to the Routing matrix:

1. Select **Routing View**.
2. Click on **Add 'Device' and Available Streams ...** - the 'Available Streams' dialog box appears:



From here you can add a stream by name, URL or SDP, and also view all active streams.

### 11.7.1 RAVENNA Streams

1. Select the **RAVENNA Streams** tab to see all of the streams announced by Bonjour to the network.

The list will include incoming streams from other devices plus local streams published from this device.

2. Select a stream and then click on **ADD** - the stream is added to the routing matrix as an input device, and its Status updates to **Added**.

Repeat to add more streams as you wish.

Click on **Refresh** to update the list.

You can search the Stream Names by entering a text string into the **Search** field and clicking on **Refresh**. Use the arrow keys to select the next or previous occurrence.

The number of available channels is indicated by the **Free stream channels** counter - the total number of RAVENNA channels (used by sending + receiving streams) cannot exceed the [maximum](#) permitted by your license.

3. To remove a stream, select an **Added** stream from the list followed by **REMOVE**.
4. To close the dialog box, click on **CLOSE**.

Once a stream is added as a device, left-click on a crosspoint to connect the audio channels to another device. Or, right/double-click on the device name to open its [context menu](#).

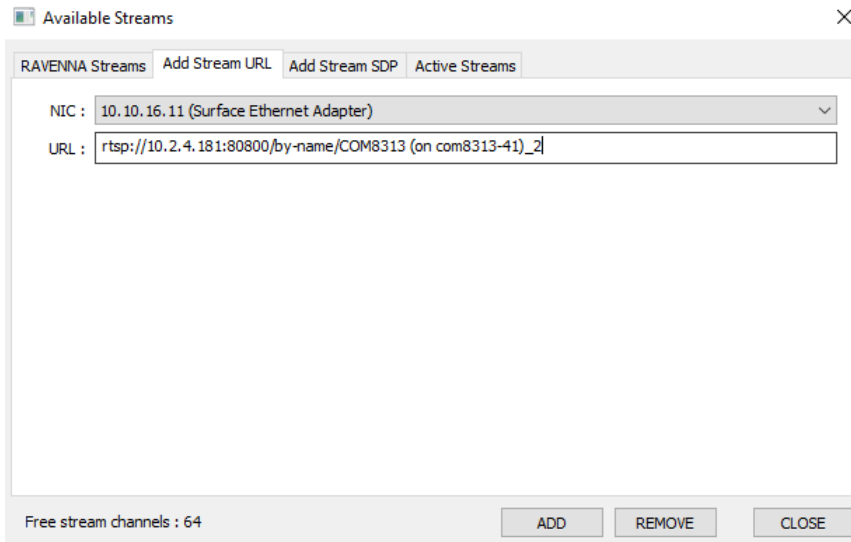
The remaining tabs in the "Available Streams" dialog box work in a similar manner and are described over the next few pages.



### 11.7.2 Add Stream URL

Select this tab to add a RAVENNA stream with a specific URL - for example, if your network uses rtsp addresses.

1. Select the Network Interface Card (NIC) which is receiving the stream from the drop-down menu.
2. Enter the URL - the maximum length of an accepted URL is 200 characters.

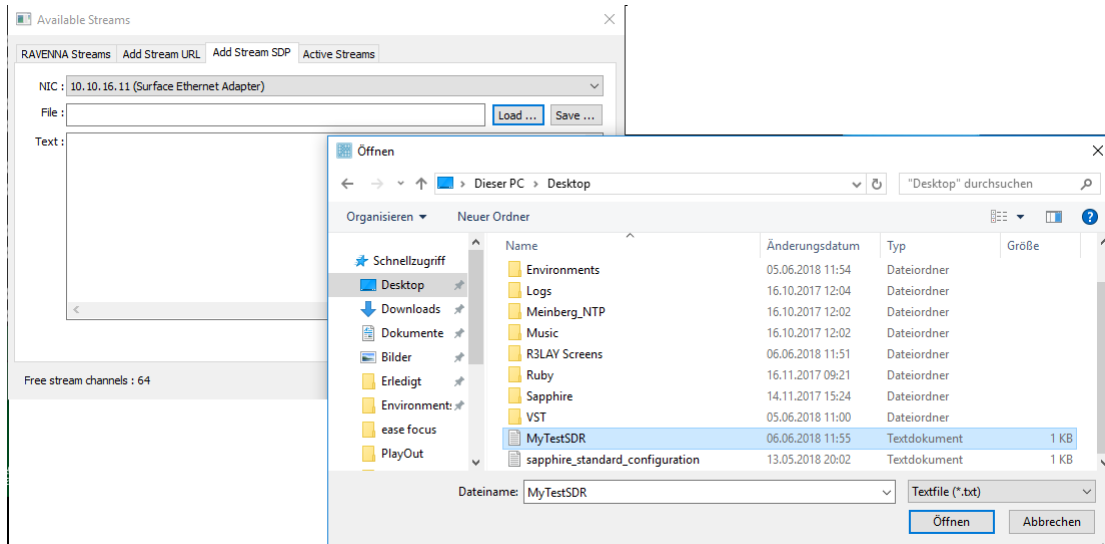


3. Click on **ADD** to add the stream as an input device.

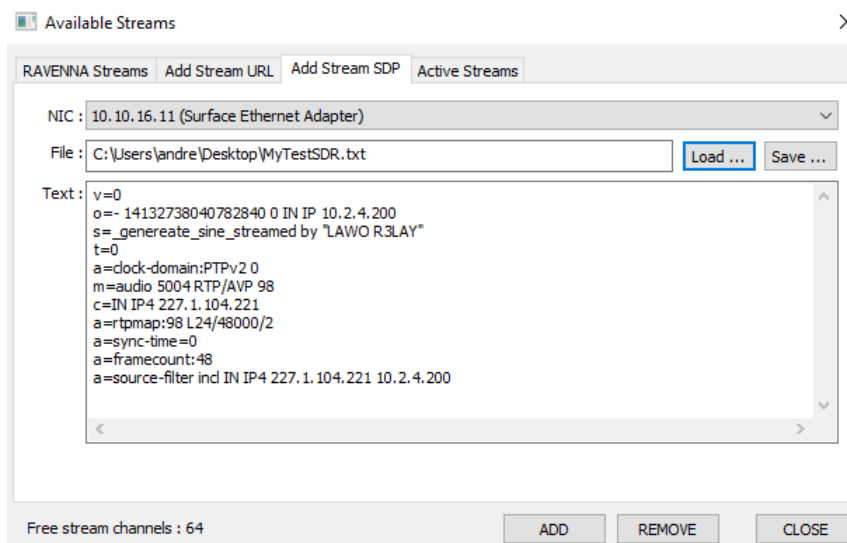
### 11.7.3 Add Stream SDP

Select this tab to add a RAVENNA stream identified by a stream description (SDP). The SDP can either be loaded (from a file) or entered manually (by typing in the text, or using copy/paste to paste the information from another location).

1. Select the Network Interface Card (NIC) which is receiving the stream from the drop-down menu.
2. To load an SDP, click on File **Load..** to select the file location:



Then select **Open** - the file contents are displayed in the Text area:



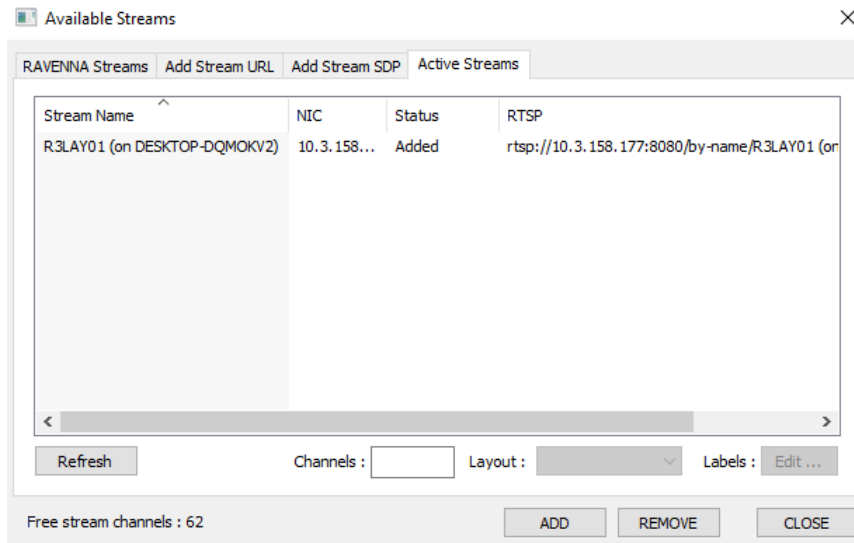
3. Alternatively, type in the SDP information into the Text area (or use copy/paste to paste text from another location).

The **Save..** button can be used to save the SDP Text content (under a new filename).

4. Click on **ADD** to add the stream as an input device.

### 11.7.4 Active Streams

Select this tab to display all active streams (those already added to **RELAY VPB**):



Click **Refresh** to update the list.

Note that the **Channels**, **Layout** and **Labels** fields are reserved for future implementation.

## 12. Ember+

This chapter describes the Ember+ implementation.

### 12.1 About Ember+

Ember+ is a non-proprietary TCP/IP control protocol which allows devices to remotely control parameters within **R3LAY**, or **R3LAY** to control parameters within an external device. It is supported by a wide range of products and manufacturers. More details about the Ember+ protocol can be found at <https://github.com/Lawo/ember-plus/wiki>.

An Ember+ provider "publishes" parameters so that they may be controlled, or responded to, by an external consuming device. Parameters can include global functions such as GPIOs, or channel parameters such as fader and DSP functionality. An Ember+ consumer can then control, or respond to, parameters published by an Ember+ providing device. For example, to activate a red light on another console and illuminate its status.

All devices should be connected to the Lawo control network in the usual manner. You will need to know the hostname or TCP/IP Address and Port Number of each Ember+ device on the network.

An Ember+ Tree Viewer can be used to check the status of Ember+ parameters and/or switch a parameter manually. This can be useful when configuring and testing an Ember+ controlled device.

#### 12.1.1 Ember+ & R3LAY VirtualPatchBay

**R3LAY Virtual PatchBay** can operate as an Ember+ provider (but not a consumer). Thus, it can supply elements to other Ember+ consumers on the network. Note that this does not govern the direction of the control, as parameters defined for ReadWrite operation can be adjusted from both sides. The amount of integration depends on the level of Ember+ support in the consumer. To configure the control, the Ember+ interface must be [enabled](#) and the required parameters [published](#). The following parameters can be made available:

- Loading Environments
- Channel Parameters:
  - Fader control (popup mixer levels)
  - Metering data (popup mixer meters)
  - Matrix Crosspoints
  - Silence Detection (from V4.0.0)
- Processing Parameters (for LAWO processing and VST effects)

### 12.2 Enabling the Ember+ Interface

Ember+ is enabled, or disabled, from the **Settings** dialog box:

1. Select [Settings -> Interfaces -> Ember](#), and tick the **Active** checkbox and define the **Listen Port**.
2. Then [close](#) and [re-open R3LAY VPB](#).

The **Ember+** field on the [status bar](#) indicates the status of the connection:



- **Blue** background = a valid Ember+ connection.
- **Yellow** background = Ember+ enabled, but no connection.
- **Black** background = Ember+ disabled.

Once the Ember+ interface is enabled, all published parameters are made available to the network (for use by a consuming device).

## 12.3 Publishing Channel Parameters

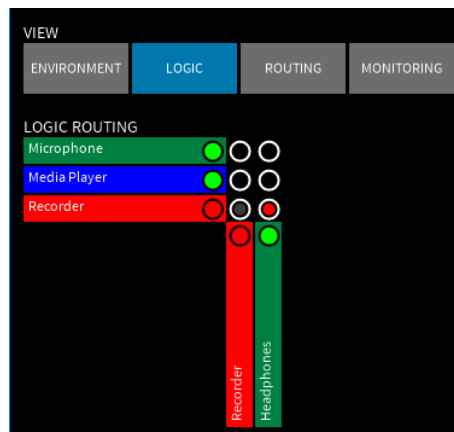
Channel parameters include fader control (popup mixer levels), metering data (popup mixer meters) and matrix crosspoints.

They are published to Ember+ by adding logical devices and refreshing the Ember+ connection:

1. Select **Logic** View, and [add](#) some logical devices.
2. Select **Routing** View, and [assign](#) audio channels to each logical device.
3. Refresh the Ember+ connection by [saving](#) and [loading](#) an environment, or [restarting](#) **R3LAY VPB**.

Providing the Ember+ interface is [enabled](#), the channel parameters for each logical device are now available for remote control.

Channels are identified using their logical device names. So, in our example, Ember+ can access the **Microphone**, **Media Player**, **Recorder** and **Headphones** channels.



If no logical devices are configured, then no channel parameters are published to Ember+.

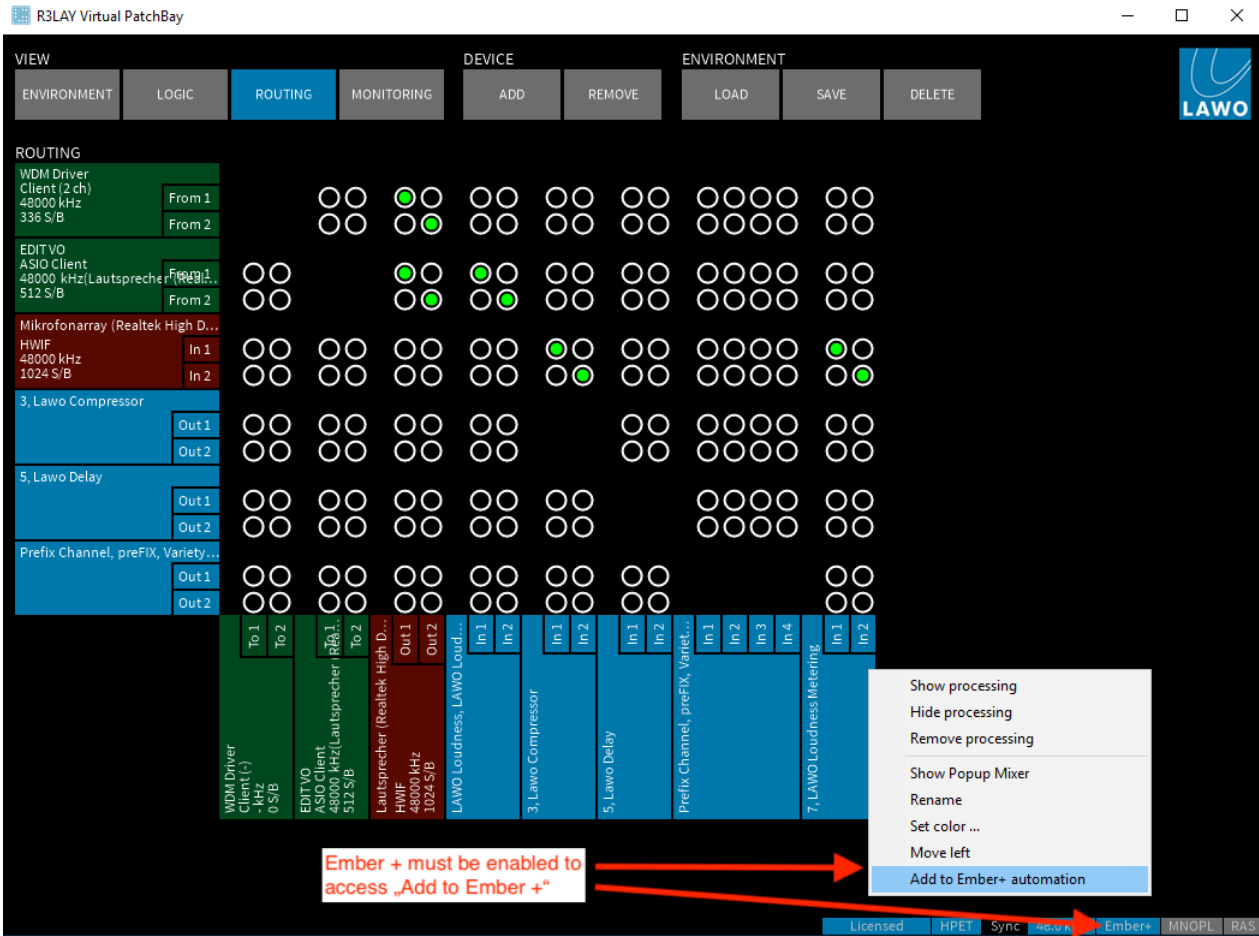
4. You can confirm exactly which channels have been published by switching to **Routing** View and pressing **CTRL + E** on your keyboard.

## 12.4 Publishing Processing Parameters

Processing parameters are parameters for any [LAWO processor](#) or [VST effect](#) device, and include anything within the operating window that can be controlled from the mouse.

Processing devices are published via their context menu, once the Ember+ interface is enabled:

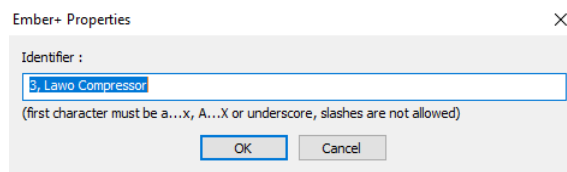
1. [Enable](#) the Ember+ interface.
2. Select **Routing** View, and right-click (or double-click) on the processing device to open its context menu.
3. Select **Add to Ember+ automation** to publish the processing device:



If the Ember+ interface is *NOT* enabled, then you will not see **Add to Ember+ automation** in the context menu.

This option is *ONLY* available for [LAWO processing](#) or [VST Effect](#) devices.

4. Enter an identifier (the name used to identify the processing device within Ember+) - and select **OK**:

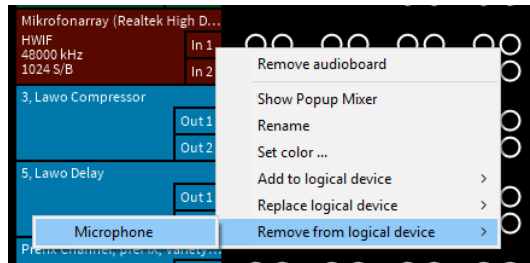


5. Refresh the Ember+ connection by [saving](#) and [loading](#) an environment, or [restarting R3LAY VPB](#).

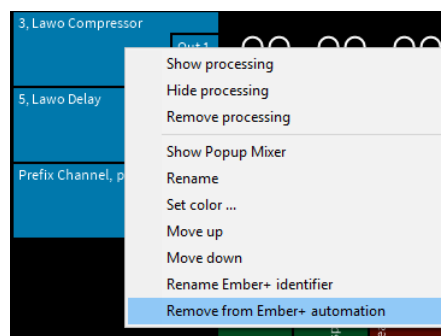
Providing the Ember+ interface is enabled, the processing device parameters are now available for remote control.

## 12.5 Removing Parameters from Ember+

1. Select **Routing** View.
2. To "unpublish" [channel parameters](#), de-assign the audio channel from the logical device (right-click on the channel and select **Remove from logical device**):



3. To "unpublish" [processing parameters](#), right-click on the processing device (e.g. **Lawo Compressor**) and select **Remove from Ember+ automation**:



4. After any changes, refresh the Ember+ connection by [saving](#) and [loading](#) an environment, or [restarting RELAY VPB](#).

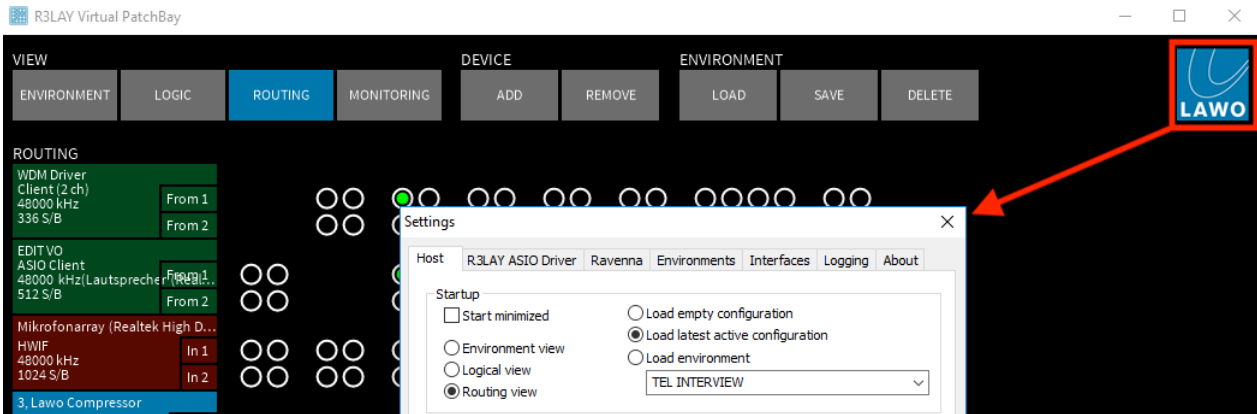
## 12.6 Defining the Functionality

Once the Ember+ interface is [enabled](#) and the required parameters [published](#), the rest of the functionality should be configured within the consuming device.

## 13. Settings

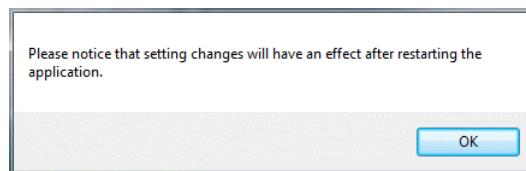
This chapter describes the program's global settings.

1. Open the "Settings" dialog box by clicking on the Lawo logo (top right):



2. Select a tab and edit the settings.
3. Select **OK** to save any changes and close the dialog box.

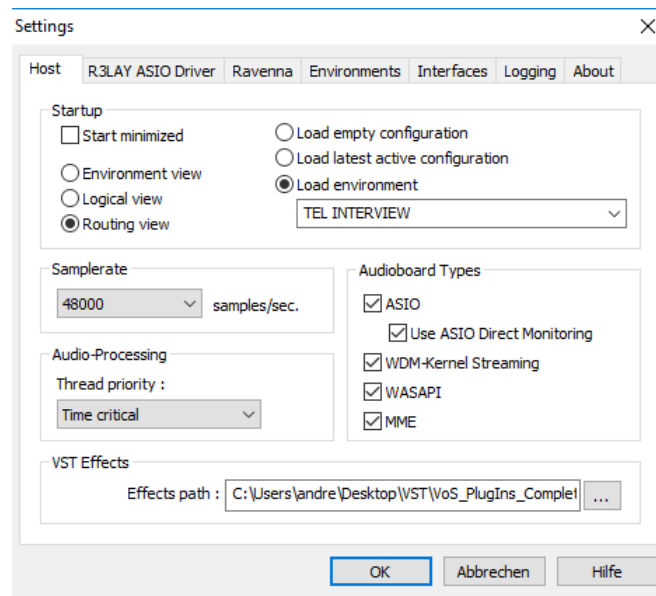
If the following message appears, you will need to close and restart the application (as described [earlier](#)).



All Settings are stored with the rest of the configuration, see [Saving the Configuration](#).  
Settings are NOT stored in Environments.

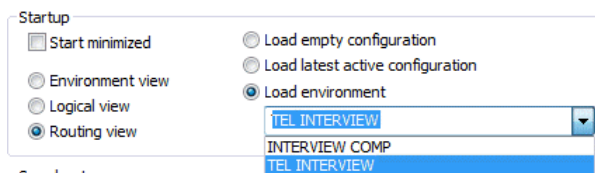


## 13.1 Host



This tab configures options for the local host:

### 13.1.1 Startup



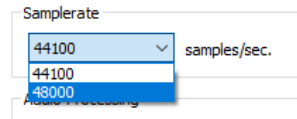
Use these options to define what happens when **R3LAY VPB** starts up:

- **Start minimized** - the application GUI is hidden from view (to restrict end-user access).
- **Environment view / Logical view / Routing view** - the selected view appears.
- **Load empty configuration / Load latest active configuration / Load environment** - the selected configuration or environment is loaded. For **Load environment**, choose an environment from the drop-down menu.

For example, to run **R3LAY VPB** as a background service on startup, you would select **Start minimized** and **Load latest active configuration**. Any audio paths and streams stored in the active configuration will be reinstated at startup, providing that the relevant hardware interfaces, client drivers and RAVENNA streams are available. In this mode, the end-user cannot see the GUI and therefore cannot adjust the configuration. This mode is ideal for Playout Servers, or **R3LAY** PCs which are remotely controlled.

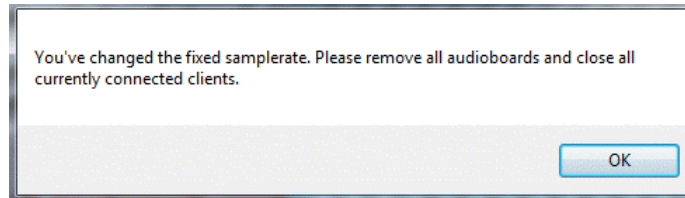
Alternatively, you may wish **R3LAY VPB** to startup with the [Environment](#) view so that end-users can quickly access the prepared environments. To configure this mode, select **Environment view** and **Load latest active configuration**. Then make sure that all the environments are saved in the latest configuration.

### 13.1.2 Sample Rate



Use this option to set the sample rate of **RELAY VPB**:

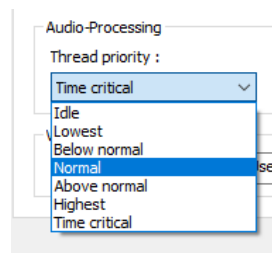
1. Select the sample rate from the drop-down menu; the available options are shown above.
2. Select **OK** to confirm the sample rate change - the following window appears:



3. Disconnect all hardware interfaces and close any open software clients (as instructed above).
4. Reconnect your hardware and restart any software applications to run at the new sample rate.

All hardware devices must operate at the sample rate defined in the software [Settings](#). If you attempt to add a device operating at a different sample rate, then you will receive an error message. Note that sample rate conversion is automatically applied for [ASIO clients](#).

### 13.1.3 Audio Processing

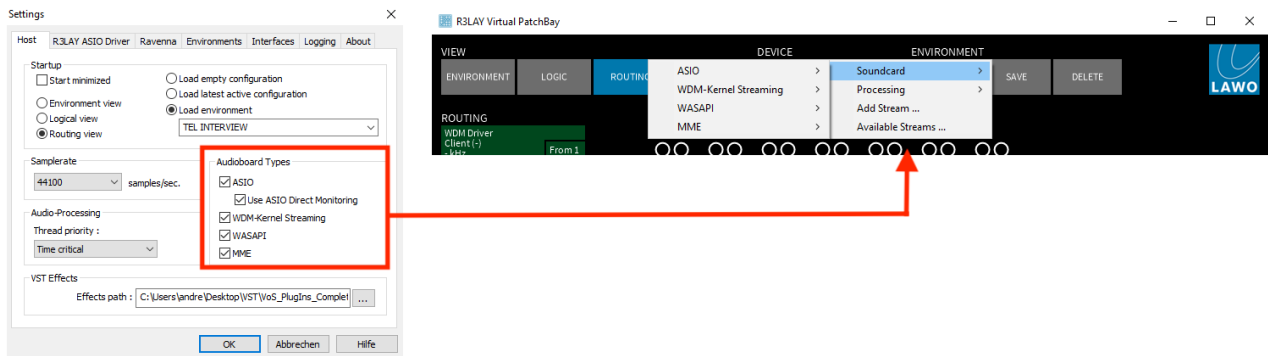


This option sets the priority of **RELAY VPB**'s audio processing in relation to other applications running on your computer:

- **Idle** allocates more CPU time to other applications
- **Time critical** allocates more CPU time to **RELAY VPB**.

If you assign a higher priority to **RELAY VPB**, then you can achieve fewer dropouts at a lower latency, but other applications may not respond as quickly as you would like them to. The most appropriate setting depends on your system - i.e. what other applications you are running and their priority. If you are already running **RELAY VPB** at a high priority, and are experiencing dropouts, then you should check your Windows® Control Panel System settings to optimise the performance of background processes.

### 13.1.4 Audioboard Types



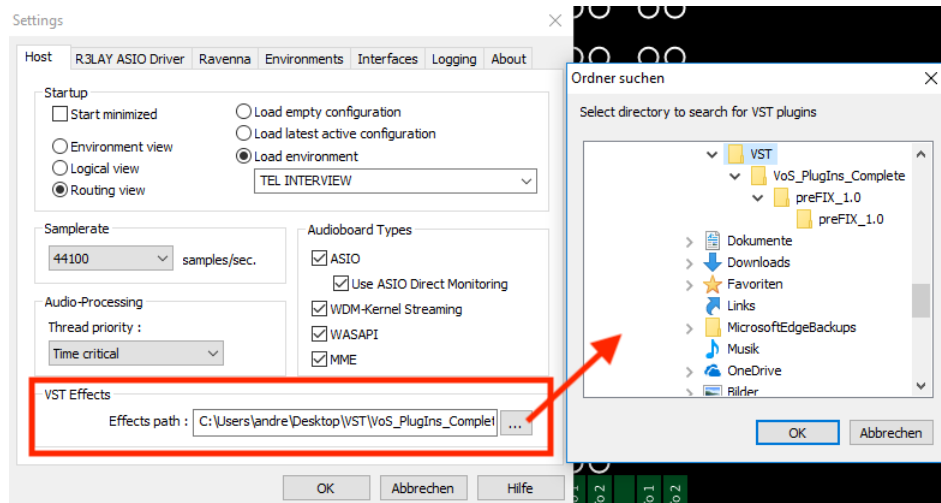
The **ASIO**, **WDM-Kernel Streaming**, **WASAPI** and **MME** checkboxes define what hardware interfaces appear when you [add](#) an **Audioboard** device.

The default settings provide access to all **ASIO** and **WDM** devices. To access **WASAPI** and/or **MME** devices, tick the relevant check boxes.

The relevant driver(s) *MUST* have been installed during the [software installation](#). If not, then the **Audioboard** category will be empty.

Check the **Use ASIO Direct Monitoring** option if you wish enable ASIO Direct Monitoring on supporting ASIO hardware interfaces. See [ASIO Direct Monitoring](#) for details

### 13.1.5 VST Effects



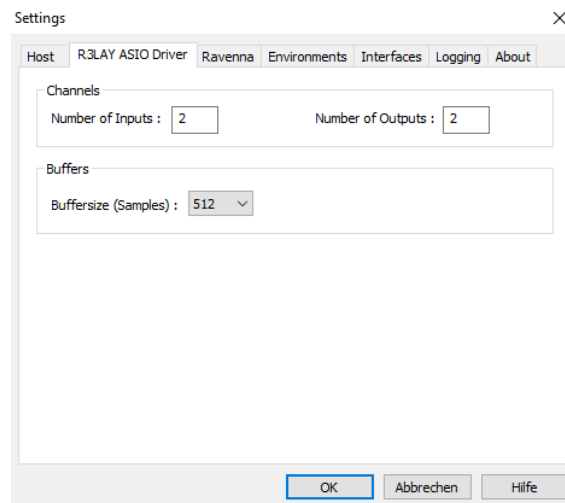
This option defines the file path for [VST Effects](#):

1. Click on the folder button, and use Windows Explorer to select the folder containing your VST plug-ins (.dll files).

Once selected, the file path appears in the **VST Effects** box.

This is the folder which is scanned when adding a VST Effect.

## 13.2 R3LAY ASIO Driver



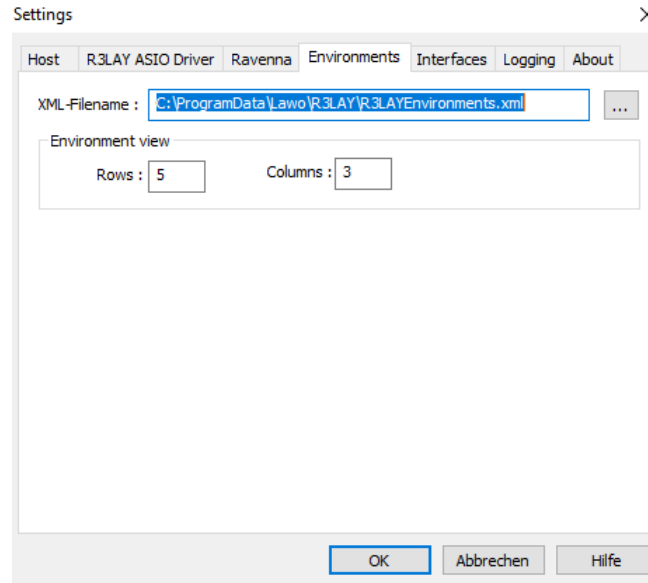
This tab defines settings which relate to **R3LAY** clients (software applications using the ASIO driver):

- **Channels** - this option sets the number of channels to and from an ASIO client.
- **Buffersize (Samples)** - this value adjusts the preferred audio buffer size for ASIO clients. Please see [Choosing the Correct Driver](#) for more details on how buffer sizes affect latency and drop-out performance.

## 13.3 RAVENNA

These settings configure the global streaming options described [earlier](#) in the RAVENNA chapter.

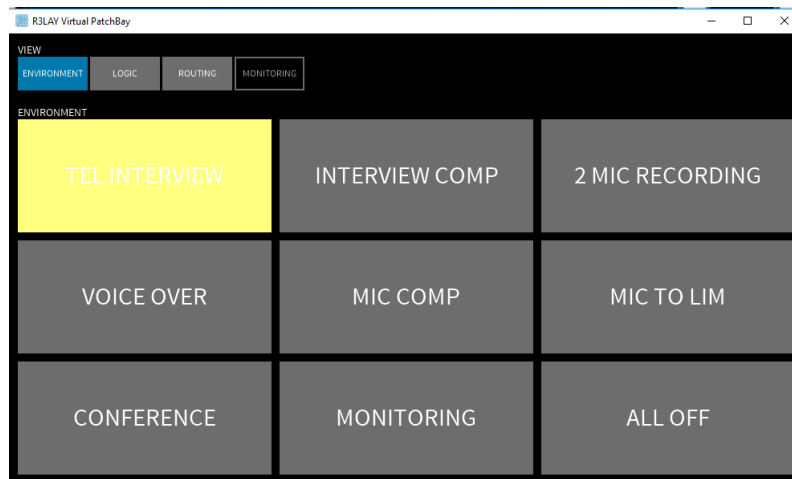
## 13.4 Environments



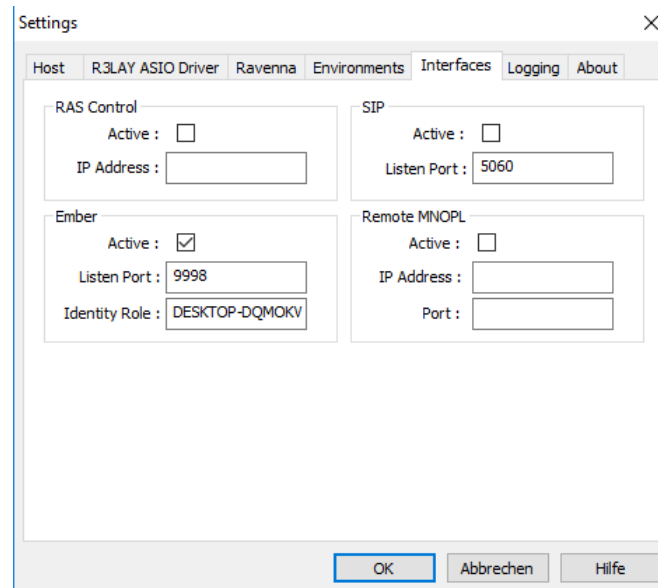
Use these options to define where the configuration data is stored, and how the **Environment View** appears:

- **XML-Filename** - use Windows Explorer to select a file path for the **Environments.xml** file. This is where the complete configuration, including all environments and Views, is stored. See [Saving the Configuration](#) for details.
- **Environment view** - use the **Rows** and **Columns** entries to change the appearance of the **Environment View**. You can display a single column (or single row) of buttons by entering **0** Rows (or **0** Columns).

*3 x 3 Environment Buttons:*



## 13.5 Interfaces

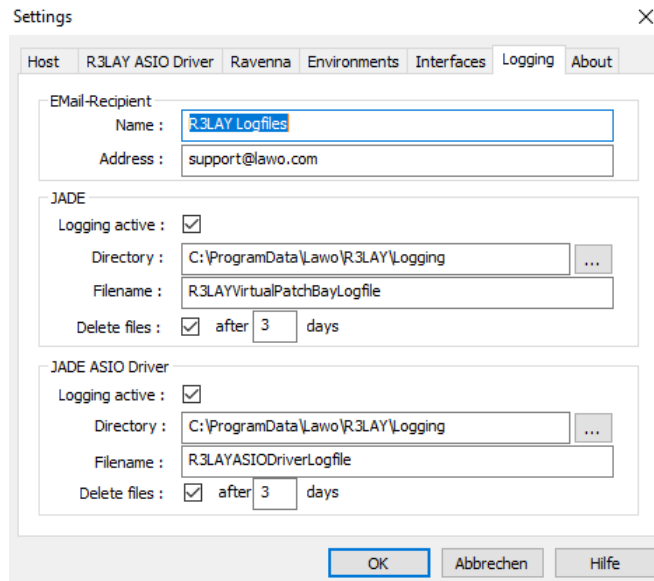


These options configure and activate each of **R3LAY VPB**'s external interfaces. In each case, tick the **Active** check box to enable the interface:

- **RAS Control** - an environment may be loaded from a remote device, see [Trigger by RAS Control](#). Enter the TCP/IP address of the remote device in the **IP Address** field.
- **Ember** - many parameters within **R3LAY VPB** are accessible via the Ember+ protocol, see [Ember+ Control](#). These options define the **Listen Port** which will be used to send out any Ember+ parameters; the default port (**9998**) is automatically entered. If this port is used by another application on your computer, then use the next available port with a high number (e.g. **9999**). The **Identity Role** field will identify **R3LAY** parameters to the external device.
- **Remote MNOPL** - an environment may reset matrix connections within an external Lawo routing system such as the Nova73, see [Remote MNOPL](#). Enter the TCP/IP address of the remote device in the **IP Address** field and **Port** number.

The **Ember+**, **MNOPL** and **RAS** flags on the [status bar](#) indicate whether you have a valid connection.

## 13.6 Logging

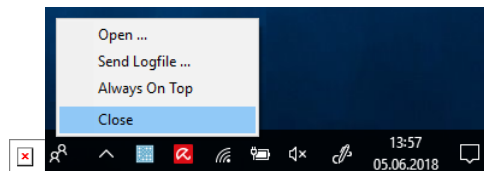


**R3LAY VPB** produces a very detailed log of many events and statistics. These options define:

- **Email-Recipient** - enter the **Name** and **Address** of your chosen recipient - e.g. [support@lawo.com](mailto:support@lawo.com).
- **Logging active** - saves a log file whenever there is a problem with the software.
- **Directory** and **Filename** - sets the filename and location for the log file(s) - each file is automatically suffixed with a different number to make it unique.
- **Delete Files** - select this option to delete the log files after **x** days.

Note that the same settings can be defined for the main **R3LAY VPB** application and its ASIO Driver.

Once logging is active, you can send a log file by right-clicking on the **R3LAY VPB** icon in the task bar, and selecting **Send Logfile**:



**R3LAY VPB** will then pack all the logfiles created today into a single zip-file, open your standard email client and attach the file to a new message. Please add a description of what was happening when the problem occurred, and email the message to [support@lawo.com](mailto:support@lawo.com).

## 13.7 About

This page provides information about the **R3LAY VPB** release and its drivers.

You can also display information about the third-party modules and/or Open Source libraries by selecting **Show Modules and Libs...**

The **Activate License** button opens the 'Lawo License' web browser page. If the button is greyed out, then a full license is already active.

## 14. The Service Manager

This chapter describes the **R3LAY Service Manager** which is included with **R3LAY VPB**. It can be used to start and stop a **R3LAY** service or application (running on either the local or remote host).

### 14.1 Architecture

Once **R3LAY VPB** is installed, the user sees only the GUI. However, there are three executables:

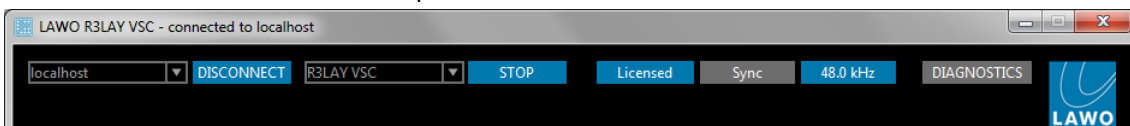
- **R3LAY VirtualPatchBay** - this is the program which deals with all audio handling and RAVENNA streaming configuration. It can run either as an application (with full GUI control) or as a service (in the background) whenever you start the PC. The default file path is: "C:\Program Files (x86)\LAWO\R3LAYVirtualPatchBay\R3LAYVirtualPatchBay.exe".
- **R3LAY Service Manager** - this service is required to start and stop the application or service (described above). It runs automatically in the background whenever you start the PC. The default file path is: "C:\Program Files (x86)\LAWO\R3LAYServiceManager\R3LAYServiceManager.exe".
- **R3LAY Service Manager GUI** - this is the GUI application which controls the Service Manager, which in turn starts and stops the **R3LAY** application or service. The GUI can connect to either the local host or a remote PC, and can start and stop any flavour of **R3LAY**. The default file path is: "C:\Program Files (x86)\LAWO\R3LAYServiceManager\R3LAYServiceManagerGUI.exe".



### 14.2 Opening the Service Manager GUI

1. To open the **R3LAY Service Manager** GUI, either click on the taskbar icon or select the application from the Windows START menu.

The GUI opens with an automatic connection to the local host's active **R3LAY** service - in our example, **R3LAY VSC**. This is indicated by the 'LAWO **R3LAY VSC** - connected to localhost' text in the title bar, and the **localhost** and **R3LAY VSC** fields at the top of the GUI:

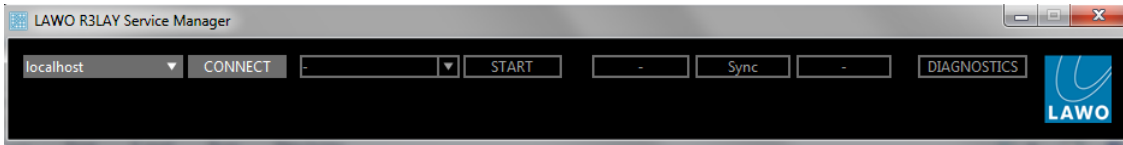


Only one **R3LAY** application or service may be running at a time. To switch to another application or service, you will need to stop the current service and [start](#) a new one.



### 14.3 Connecting to a Local or Remote Host

If you see the following window, then the host has been disconnected:



The connection status is also indicated by the taskbar icon - a green dot appears when the service is connected:



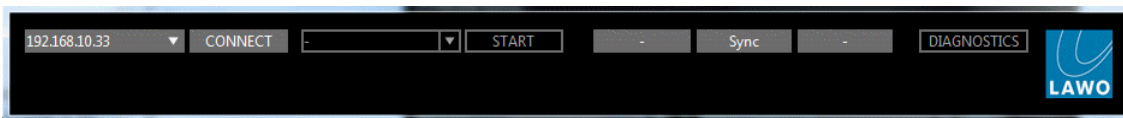
#### ➤ To connect to a Local Host:

1. Select **localhost** from the drop-down menu (top left).
2. Click **CONNECT** - the GUI connects to the active **R3LAY** service running locally on this computer, in our example to **R3LAY VSC**:



#### ➤ To connect to a Remote Host:

1. Select **DISCONNECT** - to disconnect the local host.
2. Type either the IP address or network name of the remote PC's Network Interface Card into the 'connected host' field - for example:



3. Click **CONNECT** - the GUI connects to the active **R3LAY** service running on the remote PC.

#### The Standard Port Number

The standard port used for a **R3LAY** connection = 9997. If you are not using the standard port, then you will need to add this number (after a colon) to the IP address or network name - for example, type "localhost:9997", "192.163.10.33:9997" or "MyPCName:9997" and then select **CONNECT**.

If you wish to use a different port number (other than 9997), then edit the number in the "C:\ProgramData\Lawo\R3LAY\R3LAYServiceManager.ini" file on the PC running the **R3LAY** service. The line to edit is "EmberPort=9997".

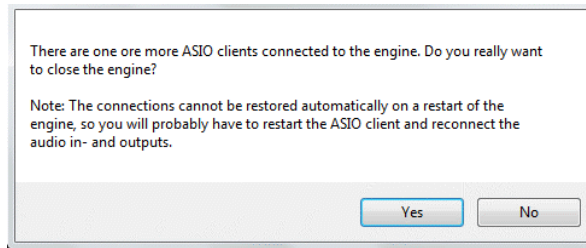
## 14.4 Starting and Stopping the Service

Only one **R3LAY** application or service may be running at a time. Therefore, if you have installed **R3LAY VRX**, **VPB** or **Stream Monitor** (which can run as either an application or service), or have multiple flavours of **R3LAY** installed on the same PC, you will need to stop the current service before starting a new one:

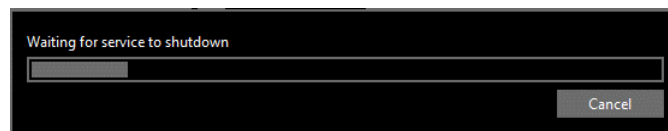
1. Select **STOP** to stop the active service:



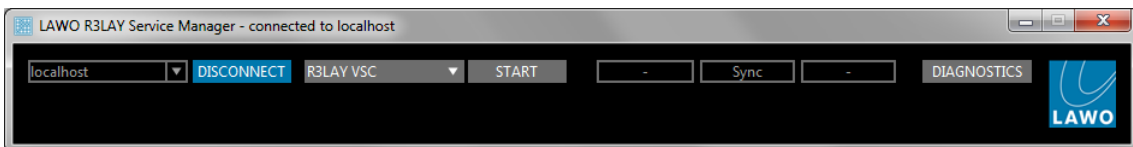
If an ASIO client is running, then you will be asked for confirmation:



Select **Yes** to continue - the software [saves](#) the current configuration and stops the service. This may take a few seconds:



When the shutdown is complete, you will see a reduced GUI:



2. Select the new application or service from the drop-down service field - note that you will only see the options installed on the connected host:



3. Select **START** - a pop-up appears showing the progress; it may take a few seconds to start a new service. At the end of the start-up, the software loads the latest configuration file:
  - For **R3LAY VRX**, **VPB** or **Stream Monitor** applications, the application GUI opens in a separate window.
  - For **R3LAY VRX**, **VPB** or **Stream Monitor** services, you will see a reduced Service Manager GUI (as shown above) - the service is now running in the background.
  - For **R3LAY VSC**, the Service Manager expands to reveal the full VSC GUI.

You need to restart your ASIO clients and [reconnect](#) their audio input/output devices following a service restart.

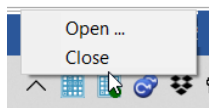
If the connection is to a remote PC, and you start a **R3LAY VRX**, **VPB** or **Stream Monitor** application, then a user must be logged in on the remote PC (in order to open the application GUI). To start **R3LAY** services on a remote PC, no user login is required.

## 14.5 Closing the GUI

The **RELAY Service Manager** GUI can be minimised or closed in the usual windows manner (from the top right of the window):



Alternatively, right-click on the taskbar icon and select **Close**:



Note that closing the GUI only closes the Service Manager GUI - all **RELAY** services continue to run in the background, meaning that any audio connections and RAVENNA streams remain active. If you wish to stop the active service, then use the **STOP** button. See [Starting and Stopping the Service](#).

To reopen the GUI, click on the taskbar icon.

## 15. Saving the Configuration

---

The **R3LAY VPB** configuration is stored locally on the connected host, each time you [stop](#) the **R3LAY VPB** service or shut down the **R3LAY VPB** PC.

### What is Saved?

The complete configuration is saved, including the current 'View' and all [Environments](#). The data is stored in an ".xml" file; the location of this file is defined in the **Settings** dialog box, under [Settings -> Environments -> XML-Filename](#). To share a single configuration file, choose a file path which can be accessed by all users. Or, to give users of the same PC access to different configurations - for example, to access a different set of environments - then copy a different ".xml" file into each user's Home directory. It is important that Windows Administrator rights grant full access to the ".xml" file for every user.

### Restarting

**R3LAY VPB** may be started either as an application (with full GUI control) or as a service (where a prepared configuration runs in the background). The latter is ideal for Playout Servers or remote-controlled **R3LAYs**, where you wish to restrict the user access.

To start **R3LAY VPB** as an application, either click directly on its [icon](#) (from the desktop or Windows START menu), or start the application from the [Service Manager](#) by selecting the **R3LAY VPB (App)** option. The operating window appears.

To start **R3LAY VPB** as a service, [close](#) the application (if open), and then start the service from the [Service Manager](#) by selecting the **R3LAY VPB (Service)** option. In this mode, the operating window is not visible and the service runs automatically in the background.

In both instances, the software loads the latest active configuration at startup. Note that, in **R3LAY VPB**, you can decide whether this is the last active configuration, an empty configuration or a specific environment (using the [Settings -> Host -> Startup](#) options). This means that any audio paths and RAVENNA streams stored in the configuration will be reinstated after a restart. Note that connections can only be re-instated if the same hardware interfaces, client drivers and RAVENNA streams are available. For RAVENNA streams, you must also have a valid sync signal.

When the PC next restarts, the operating mode (application or service) is reinstated. This allows you to start **R3LAY VPB** as an application to edit the configuration. Then, stop and restart **R3LAY VPB** as a service. From then on, PC will start up with **R3LAY VPB** running as a service (i.e. with the active configuration running in the background).

## 16. Appendices

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This chapter includes further information which you may find useful.

### 16.1 Third-Party Modules & Open-Source Libraries

**RELAY VPB** uses the following third-party modules and/or Open Source libraries. Please click on the links below for more information about the code and license.

---

#### Live555

<http://www.live555.com/liveMedia>

<http://www.live555.com/liveMedia/#license>

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#### Portaudio V19

<http://www.portaudio.com/>

<http://www.portaudio.com/license.html>

---

#### Rapidxml

<http://rapidxml.sourceforge.net/>

<http://rapidxml.sourceforge.net/license.txt>

---

#### reSIProcate

<https://www.resiprocate.org/>

<https://www.resiprocate.org/License>

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#### Steinberg ASIO & VST

<https://www.steinberg.net/de/company/developer.html>

This program uses ASIO Technology by Steinberg Media Technologies GmbH. VST is a trademark of Steinberg Media Technologies GmbH.

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#### Info-Zip

<ftp://ftp.info-zip.org/pub/infozip/license.html>

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## 16.2 Advanced Options

**RELAY** supports a number of options which can be enabled (or disabled) by editing the "RELAYxxx.ini" file, where xxx is the application name: VSC, VRX4, VRX8, VirtualPatchBay or StreamMonitor.

The file can be found in the "C:\ProgramData\Lawo\R3LAY\" folder on the PC running the **RELAY** service. If more than one **RELAY** product is installed, then you will see a separate ".ini" file for each application.

In each case, use the following steps to update the file:

1. Using a plain text editor, add the correct syntax to the ".ini" file.
2. Save the file, taking care to retain the same file name and folder location.
3. [Stop](#) and then [restart](#) the **RELAY** application - the software will read the ".ini" file contents and update its feature set accordingly.

An ".ini" file [template](#) can be used to distribute parameters across several workstations or **RELAY** applications.

The next few topics describe the most common options. A list of all possible options is included [later](#).

### 16.2.1 Setup SPS Connections

This option supports SMPTE ST2022-7 compatible streaming, otherwise known as Seamless Protection Switching (SPS) or Hitless Merge. Once enabled, you will be able to transmit and receive streams using both of your computer's NICs. Thus, supporting the two separate network paths required for SPS.

To achieve real redundancy, it is recommended to use different subnets or even a different network infrastructure (switches, etc.) to achieve the two separate paths. This will ensure that twice the load is not placed on the same network.  
Using different subnets is also better for stream detection via mDNS.

#### Syntax

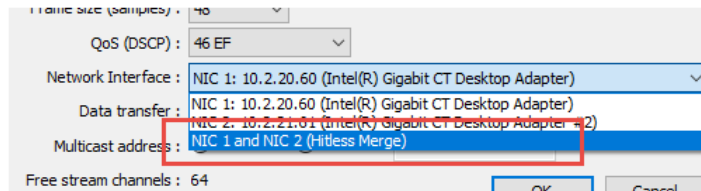
To enable SPS, add the following syntax to the "R3LAYVirtualPatchBay.ini" file:

```
[Debug]
StreamingUseHitlessMerge=1
```

The value can be set to either 0 (disabled) or 1 (enabled).

#### Functionality for TX Streams

The output stream assignments are made from the [Add Stream](#) dialog box. Once the "Hitless Merge" option is enabled, you will be able to select both NICs in the **Network Interface** field.

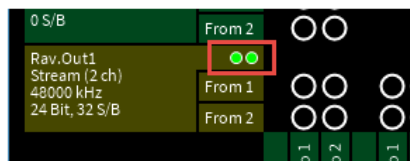


Thus, the stream will be transmitted to the network via both NIC 1 and NIC 2.

Note that NIC 1 and NIC 2 must be defined in the Settings -> [RAVENNA](#) tab. If a second NIC is not defined, then you will not see the options shown above.

#### Functionality for RX Streams

When receiving a SMPTE ST2022-7 compatible stream, the state of each receiver is shown in the [Routing](#) matrix. This indicates the validity of the data arriving via NIC 1 and NIC 2: green = stream is OK; red = stream is in error.



## 16.2.2 Setup mDNS Announcement Rings

This option allows you to define up to four separate mDNS announcement rings. The system will then listen on all of the defined rings for stream announcements, and allow you to select an individual ring or rings whenever you [add](#) a stream.

### Syntax

To enable the announcement rings, add the following syntax to the "R3LAYVirtualPatchBay.ini" file:

```
[Debug]

UseBonjour=INT

UseBonjourAddress1=224.0.0.251

UseBonjourPort1=5353

UseBonjourAddressName1=Ring 1

UseBonjourAddress2=224.0.0.252

UseBonjourPort2=5353

UseBonjourAddressName2=Ring 2

UseBonjourAddress3=224.0.0.253

UseBonjourPort3=5353

UseBonjourAddressName3=Ring 3

UseBonjourAddress4=224.0.0.254

UseBonjourPort4=5353

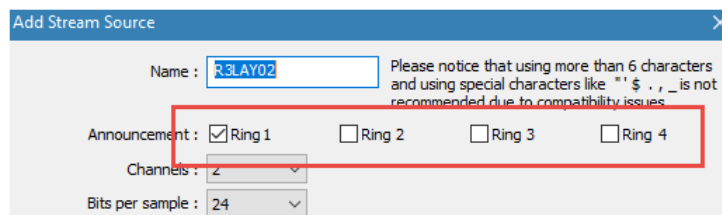
UseBonjourAddressName4=Ring 4
```

You can define any number of rings up to the maximum of 4.

The "UseBonjourAddressName" syntax appears in the stream source setup (shown below). So, in our example, the rings appear as "Ring 1", "Ring 2", "Ring 3" and "Ring 4".

### Functionality for TX Streams

Once defined, you will be able to select an individual ring or rings whenever you [add](#) a stream source.



### Functionality for RX Streams

When receiving streams, the system listens on all of the defined rings in the "R3LAYVirtualPatchBay.ini" file.



### 16.2.3 Setup SAP Support

If this option is enabled, then the software will listen for SAP announcements, and announce streams to the network via SAP. This provides an alternative method of stream detection to the usual mDNS/Bonjour. Up to four SAP announcement rings can be specified.

#### Syntax

To enable SAP announcements and configure the rings, add the following syntax to the "R3LAYVirtualPatchBay.ini" file:

```
[Debug]

UseSAP=1

UseSAPDoSDPSort=1

UseSAPAddress1=239.255.255.255

UseSAPPort1=9875

UseSAPAddress2=

UseSAPPort2=9875

UseSAPAddress3=

UseSAPPort3=9875

UseSAPAddress4=

UseSAPPort4=9875
```

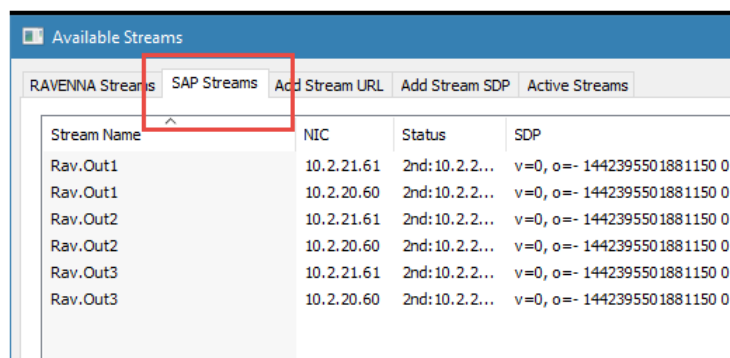
The "UseSAP" value acts as the "on/off" switch for SAP and can be set to either 0 or 1. It must be set to 1 before you can do anything further with SAP.

#### Functionality for TX Streams

Once enabled, all streams will be announced to the network via SAP.

#### Functionality for RX Streams

Once enabled, an additional tab appears in the "[Available Streams](#)" dialog box - select **SAP Streams** to view all of the streams announced by the SAP rings:



Then click on **ADD** to add a stream as an input device in the [usual](#) manner.

### 16.2.4 Define Stream Name

If this option is enabled, then the computer name is added to all stream names, resulting in names like "stream01 (on xxx)". This makes it easy to identify streams on the network.

#### Syntax

To enable the computer name suffix, add the following syntax to the "R3LAYVirtualPatchBay.ini" file:

```
[Debug]
StreamNameAddComputerName=1
```

The value can be set to either 0 (disabled) or 1 (enabled).

### 16.2.5 Setup Automatic Multicast Address Generator

This option allows you to set your own default pattern for the multicast address generator.

#### Syntax

Add the following syntax to the "R3LAYVirtualPatchBay.ini" file:

```
[Streaming]
MulticastIPv4Pattern=239.NIC3.NIC4.n
```

The value is an IPv4 pattern, where:

- the number is a fixed value in the range 0 to 255.
- **NIC3 / NIC 4** is the corresponding number of the NIC sending the stream (NIC1 to NIC4 are permitted).
- **n** is an increasing number in the range 0 to 255.
- **x** is a random number in the range 0 to 255.

### 16.2.6 Define Offset for Second Multicast Address

When sending Hitless Merge streams, you can add an offset to the mulitcast address for the second stream.

#### Syntax

Add the following syntax to the "R3LAYVirtualPatchBay.ini" file:

```
[Streaming]
SecondMulticastIPv4Offset=0.0.0.1
```

where the "IPv4Offset" value defines the offset for each digit of the address.

### 16.2.7 Setup AlarmLog and Matrix Server Connections

This option supports connections to a DSA Alarmlog PC and/or Matrix Server.

#### Syntax

To enable a connection, add the following syntax to the "R3LAYVirtualPatchBay.ini" file:

```
[Interfaces]
AlarmLogActive=1
AlarmLogNIC1=
AlarmLogIPAddress1=alarmlog.stream
AlarmLogPort1=18200
AlarmLogNIC2=
AlarmLogIPAddress2=alarmlog2.stream
AlarmLogPort2=18200
AlarmLogMatrixServerActive=1
AlarmLogMatrixServerIDOffset=0
```

The "AlarmLogActive" and "AlarmLogMatrixServerActive" values can be set to either 0 or 1. The "AlarmLogMatrixServerIDOffset" sets a general offset for all IDs from 0 to 65535.

### 16.2.8 Setup Stream Switching via Ember+

This option allows stream parameters to be read and controlled via [Ember+](#). For example, to switch streams to and from R3LAY. To switch streams into R3LAY, a prerequisite is that the "[Matrix Server](#)" connection must be enabled.

#### Syntax

To enable the Ember+ access, add the following syntax to the "R3LAYVirtualPatchBay.ini" file:

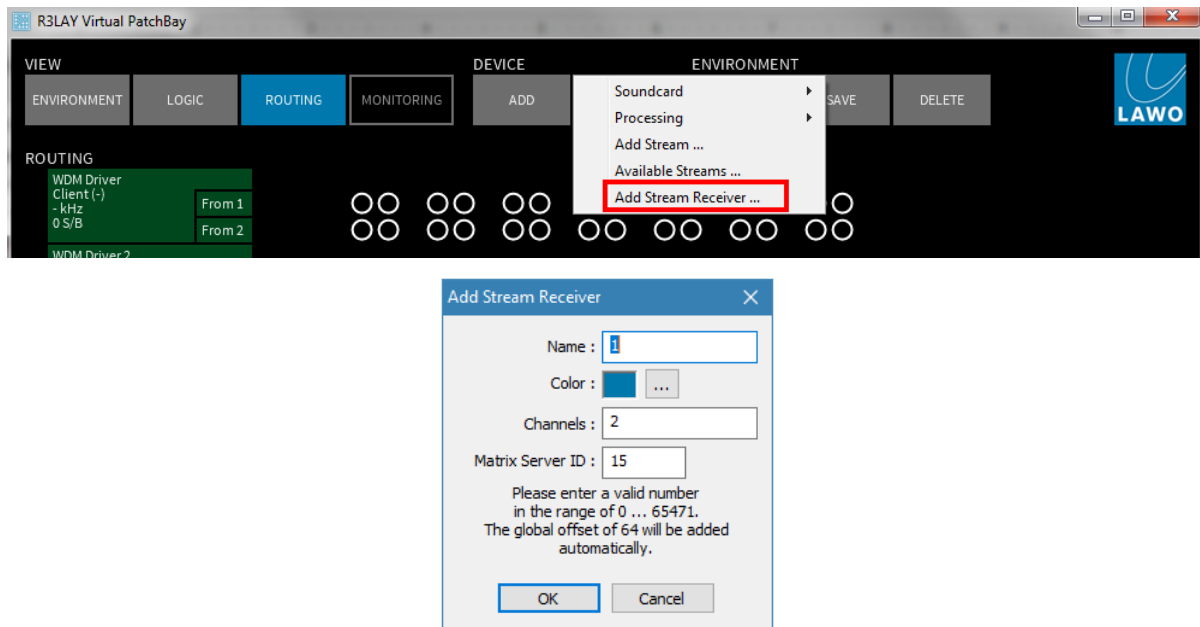
```
[Streaming]
UseEmber=1
```

The value can be set to either 0 (disabled) or 1 (enabled).

#### Functionality

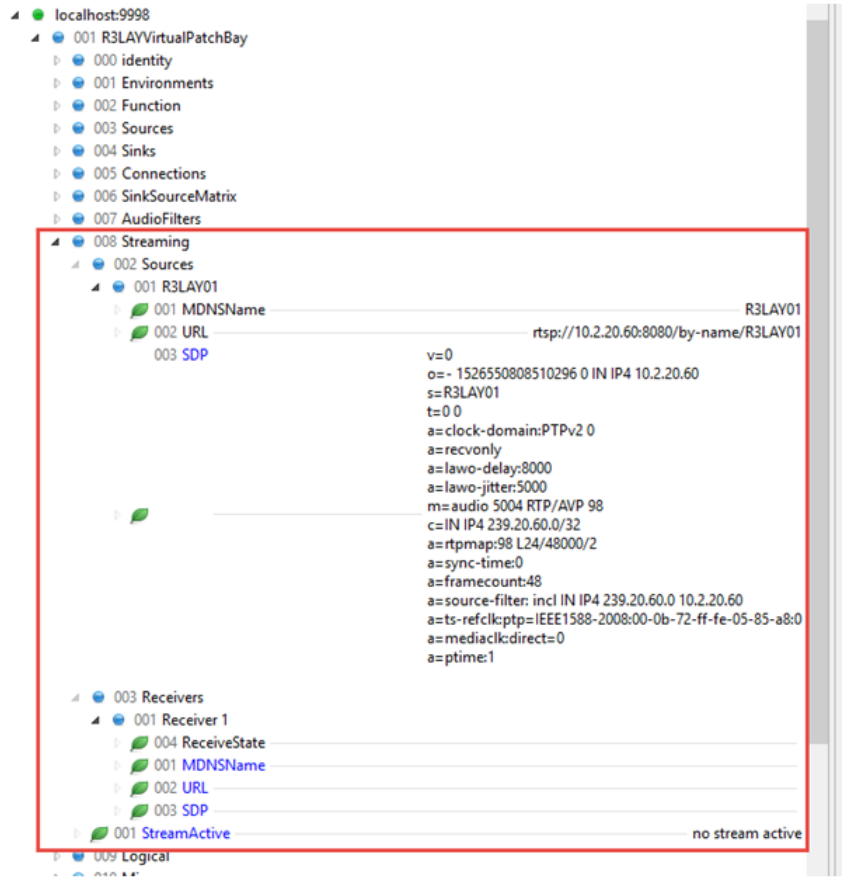
Once enabled, all configured stream parameters will be published to the network via Ember+ (if the Ember+ interface is [enabled](#)). From here they can be used by an Ember+ consuming device

To switch streams into R3LAY you must first add a **Stream Receiver** (from the [Device -> Add](#) context menu) and define its settings:



Then copy the SDP, or RTSP URL, to the corresponding receiver in the Ember+ node.

*R3LAY Ember+ Tree*



```

001 R3LAY01
├── 001 MDNSName R3LAY01
├── 002 URL rtsp://10.2.20.60:8080/by-name/R3LAY01
└── 003 SDP
        v=0
        o=- 1526550808510296 0 IN IP4 10.2.20.60
        s=R3LAY01
        t=0 0
        a=clock-domain:PTPv2 0
        a=recvonly
        a=lawo-delay:8000
        a=lawo-jitter:5000
        m=audio 5004 RTP/AVP 98
        c=IN IP4 239.20.60.0/32
        a=rtpmap:98 L24/48000/2
        a=sync-time:0
        a=framecount:48
        a=source-filter: incl IN IP4 239.20.60.0 10.2.20.60
        a=ts-refclk:ptp=IEEE1588-2008:00-0b-72-ff-fe-05-85-a8:0
        a=mediaclk:direct=0
        a=ptime:1
    
```

003 Receivers

- 001 Receiver 1
  - 004 ReceiveState
  - 001 MDNSName
  - 002 URL
  - 003 SDP
  - 001 StreamActive no stream active

## 16.2.9 Setup Alert Manager

This option activates the Alert Manager to monitor events that are not obvious to the user. Once enabled, a dialog box will appear if an alert is detected. The Alert Manager detects the following situations:

- NICs using more than one IP address.
- Suddenly missing UDP stream packets.
- Duplicated multicast addresses.

### Syntax

To enable the Alert Manager, add the following syntax to the "R3LAYVirtualPatchBay.ini" file:

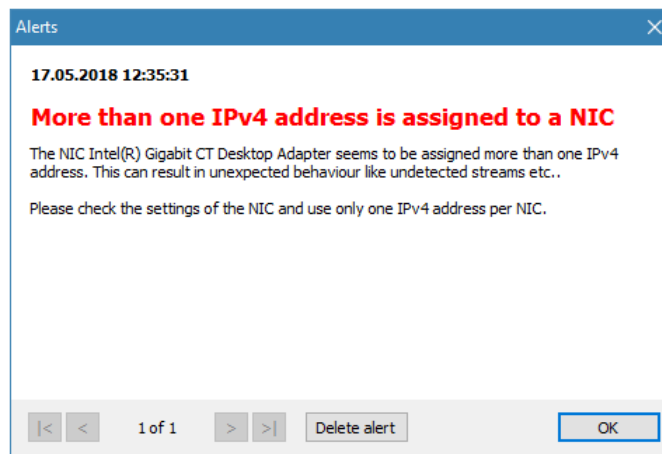
```
[Debug]
```

```
UseAlertManager=1
```

The value can be set to either 0 (disabled) or 1 (enabled).

### Functionality

If a problem is detected, then an error message is presented to the user when they click on the Settings button. For example:



### 16.2.10 Using an ".ini" File Template

A separate \*.ini" file can be used to distribute parameters across several workstations or **RELAY** applications. The template can be stored locally or on a centralized file server.

This feature works as follows. On start up, **RELAY** always reads its local "RELAYxxx.ini" file. If a template is specified using the syntax given below, then the template is also read and its entries appended or overwritten to the local file.

#### Syntax

To enable this feature, add the following syntax to the local "RELAYxxx.ini" files:

```
[IniTemplates]
PathLocalTemplate=\\fileserver\Lawo\R3lay\R3layTemplate.ini
```

The file name used can be any, providing it matches the name and path defined above.

#### Implementation

Then edit the template "\*.ini" file and move it to the specified folder location.

When you next [stop](#) and [start](#) the **RELAY** application on each workstation, the software will update the local ".ini" file contents as described above.

The examples below demonstrate some of the ways you can use this feature.

#### Example 1: Adding Workstation Names to Stream Names

If the following syntax is added to the "R3layTemplate.ini" file, then the result will be that Bonjour is switched off, and the workstation name will be automatically added to the stream names on all connected workstations:

```
[Debug]
UseBonjour=0
StreamNameAddComputerName=0
```

#### Example 2: Automatic Editing of Stream Parameters

Similarly, you can use variables to define certain stream parameters. So, if the following syntax is added to the "R3layTemplate.ini" file, the first stream can have a different Name and Multicast Address:

```
[R3layVRX8\RTSPSource\0]
Instance=1
Name=R3LAY%REGISTRY:HKEY_LOCAL_MACHINE\SOFTWARE\DSA\VisTool:StationID:String%_sla
MulticastAddr=230.155.139. %REGISTRY:HKEY_LOCAL_MACHINE\SOFTWARE\Lawo\R3layVRX8:MulticastStream0:DWORD%
```

#### Example 3: Using Different Templates for Different Workstations and Users

It is also possible to use variables within the template name. Thus you can specify a different template for each workstation or user.

For example, if the following syntax is added to the local "RELAYxxx.ini" files, then each workstation will read its own "\*.ini" template from a centralized server:

```
[IniTemplates]
PathLocalTemplate=\\fileserver\Lawo\R3lay\R3layTemplate%REGISTRY:HKEY_LOCAL_MACHINE\SOFTWARE\DSA\VisTool:StationID:String%.ini
```

Similarly, the variable can be based on the environment variable username:

```
[IniTemplates]
PathLocalTemplate=\\fileserver\Lawo\R3lay\R3layTemplate%USERNAME%.ini
```

## 16.2.11 ".ini" File Options

### Stream Setup

Name	Syntax & Description	Values
<b>Setup SPS Connections</b>	[Debug] StreamingUseHitlessMerge=0 This option enables SMPTE ST2022-7 compatible streaming, otherwise known as Seamless Protection Switching (SPS) or Hitless Merge. Once enabled, you can transmit and receive streams using two NICs: default (NIC 1) and alternate (NIC 2). Note that SPS is NOT supported by RELAY VSC.	0 or 1, default is 0
<b>Setup Automatic Multicast Address Generator</b>	[Streaming] MulticastIPv4Pattern=239.NIC3.NIC4.n This option allows you to set your own default pattern for the multicast address generator. The value is an IPv4 pattern, where: <ul style="list-style-type: none"> <li>the number is a fixed value in the range 0 to 255.</li> <li>NIC3 / NIC 4 is the corresponding number of the NIC sending the stream (NIC1 to NIC4 are permitted).</li> <li>n is an increasing number in the range 0 to 255.</li> <li>x is a random number in the range 0 to 255.</li> </ul>	as per description
<b>Define Offset for Second Multicast Address</b>	[Streaming] SecondMulticastIPv4Offset=0.0.0.1 When sending Hitless Merge streams, you can add an offset to the multicast address for the second stream. The value is an IPv4 pattern which defines the offset for each digit.	as per description
<b>Add Support for Source Specific Multicast (SSM)</b>	[Streaming] UseStreamSinkSSM=0 This option adds support for Source Specific Multicast (SSM) to the network driver. The driver version must be >= 1.4.0.11 For SSM to work, the value must be set to 1 on all IGMPv3 members. SSM is a method of delivering multicast packets in which the only packets delivered to a receiver originate from a specific source address. Thus, SSM reduces demands on the network and improves security.	0 or 1, default is 0
<b>Define Default RTP Media Payload</b>	[Ravenna] StreamPayloadType= This option defines the default RTP media payload type if it is not specified elsewhere (i.e. via Ember+).	leave empty or enter value (95 to 255), default is empty
<b>Direct Audio Switching</b>	[Debug] UseStreamReceiverDirectConnection=0 This option activates direct audio routing for streams switched to stream receivers. Once enabled, the connections from the receiver itself are used as a template for how to connect the stream.	0 or 1, default is 0
<b>Define WAN Connections (in addition to LAN Connections)</b>	[Debug] WanNICDefault= WanNICAlternate= This option supports two additional WAN NICs to support stream translations between LAN and WAN. In this instance, you may have up to two NICs for WAN and two NICs for LAN.	leave empty or enter NIC name
<b>Setup Additional Values</b>	[Debug] DialogAddStreamSourceNbChannels=1,2,4,8,12,16,24,32,48,64 DialogAddStreamSourceSamplesPerFrame=4,8,12,16,24,32,48,64,96,128,192,240,256,480,512 DialogSettingsHostSamplerates=32000,44100,48000,88200,96000 This option defines the values that appear in the drop-down menus when you <a href="#">add</a> a stream: Channels, Frame Size (samples per packet) and Sample Rate. Any value is permitted, so please take care to enter only reasonable values. For the number of channels, any value can be added from 1 to 64. For sample rates, note that WDM drivers support only 44.1kHz and 48kHz, while ASIO clients and streaming support other options. A typical example is shown above.	as per description
<b>Define New Stream Delay Time</b>	[Debug] NewStreamInfoDelayMilliSec=5000 This option defines the time (in ms) between the arrival of a stream announcement and the stream being made available inside RELAY.	enter value in ms (0 to 30000), default is 5000



## Stream Announcement

Name	Syntax & Description	Values
<b>Setup Bonjour</b>	<pre>[Debug] UseBonjour=INT</pre> <p>This option defines the type of Bonjour implementation or deactivates Bonjour. The default value (INT) uses the internal C++ flavour. All other values result in Apple's mDNSResponder. (From Version 3.0.0.181, the value DSA is not supported.)</p>	0, 1, TRUE, APPLE or INT, default is INT
<b>Define Node Names</b>	<pre>[Debug] BonjourNodeNameDefault= BonjourNodeNameAlternate=</pre> <p>This option defines the node names published to the network via Bonjour for your computer's NICs. The alternate name applies if SPS / Hitless Merge is enabled.</p>	leave empty or enter node name
<b>Define Stream Name</b>	<pre>[Debug] StreamNameAddComputerName=1</pre> <p>This option adds the computer name to all stream names, resulting in names like "stream01 (on xxxx)". This makes it easy to identify streams on the network.</p>	0 or 1, default is 1
<b>Setup mDNS Announcement Rings</b>	<pre>[Debug] UseBonjour=INT UseBonjourAddress1=224.0.0.251 UseBonjourPort1=5353 UseBonjourAddressName1=Ring 1 UseBonjourAddress2=224.0.0.252 UseBonjourPort2=5353 UseBonjourAddressName2=Ring 2 UseBonjourAddress3=224.0.0.253 UseBonjourPort3=5353 UseBonjourAddressName3=Ring 3 UseBonjourAddress4=224.0.0.254 UseBonjourPort4=5353 UseBonjourAddressName4=Ring 4</pre> <p>This option allows you to define up to four separate mDNS announcement rings. The system listens on all of the defined rings for stream announcements, and allows you to select an individual ring or rings when you add a stream.</p> <p>The "UseBonjourAddressName" values name the rings in the GUI.</p>	leave empty or set (as shown)
<b>Setup SAP Support</b>	<pre>[Debug] UseSAP=1 (default 0) UseSAPDoSDPSort=1 (default 1) UseSAPAddress1=239.255.255.255 UseSAPPort1=9875 UseSAPAddress2= UseSAPPort2=9875 UseSAPAddress3= UseSAPPort3=9875 UseSAPAddress4= UseSAPPort4=9875</pre> <p>If this option is enabled, the software listens for SAP announcements, and announce streams to the network via SAP. This provides an alternative method of stream detection to the usual mDNS/Bonjour. Up to four SAP announcement rings can be specified.</p> <p>The "UseSAPDoSDPSort" value affects the ordering of SDP lines within the SAP message.</p>	0 or 1, default is 0
<b>Define TTL for mDNS Packets</b>	<pre>[Debug] UseBonjourTTL=0</pre> <p>This option defines a TTL for outgoing mDNS UDP packets.</p>	0 to 255, default is 0 (which results in OS default TTL=1)
<b>Define TTL for SAP Packets</b>	<pre>[Debug] UseSAPTTL=0</pre> <p>This option defines a TTL for outgoing SAP UDP packets.</p>	0 to 255, default is 0 (which results in OS default TTL=1)
<b>Setup UniCast without RTSP</b>	<pre>[Debug] StreamingUseDirectUnicast=0</pre> <p>This option can be used to do unicast without RTSP communication. When the option is enabled, you can enter stream destination IPs which are not multicast. Any IP address can be entered in the Multicast Address field, and there will be no test to check if the value is a valid multicast address.</p>	0 or 1, default is 0

Name	Syntax & Description	Values
<b>Define Send Multicast Join/Leave</b>	[Debug] StreamSenderJoinMulticast=0 When this option is enabled, the stream senders issue a multicast join/leave. This can be used to avoid UDP packet flooding on certain types of network switch.	0 or 1, default is 0
<b>Send Stream SDPs as mDNS Packet</b>	[Debug] UseBonjourSDPExtension=0 This option supports an mDNS extension to send stream SDPs directly in a mDNS packet.	0 or 1, default is 0
<b>Define the Media Index inside SDP</b>	[Ravenna] NICDefaultSDPMediaSelection=MediaIndex:0 NICDefaultSDPMediaSelection=MediaID:primary This option is needed only in routed networks, such as a Nevon network. It defines the part of the SDP which should be used for the default NIC. The syntax is shown below. For the MediaIndex, enter either an index number (starting from 0) or id (defined in the SDP line "a=mid:...").	as per description
<b>Support Static SDP Stream List</b>	[SDPStreams] NbStreams=1 [SDPStream_1] Interface=Default Name="Rav.Out8" SDP="v=0\r\no=- 06904238260008 0 IN IP4 10.2.20.90\r\ns=Rav.Out8\r\nt=0 0\r\na=clock-domain\:PTPv2 0\r\na=ts-refclk\:ptp=IEEE1588-2008\:00-0B-72-FF-FE-05-85-A8\:0\r\na=mediaclk\:direct=0\r\nm=audio 5004 RTP/AVP 98\r\nnc=IN IP4 239.20.90.8/5\r\na=source-filter\: incl IN IP4 239.20.90.8 10.2.20.90\r\na=rtpmap\:98 L24/48000/2\r\na=framecount\:32\r\na=recvonly\r\na=ptime\:0.66 6\r\na=sync-ime\:0\r\na=mediaclk\:direct=0\r\n"           This option supports a static SDP stream list. A typical example is shown above. Please note the SDP escapement.	as per description
<b>Setup Search Text</b>	[Debug] DialogAddStreamSinkUseSearchAsFilter=0 When this option is enabled, the "Search" field in the <a href="#">'Available Streams'</a> dialog box can be used to filter the list of streams. Enter your filter text into the "Search" field and press <b>Refresh</b> - all streams which match the filter are shown. Clear the "Search" field and press <b>Refresh</b> again to see the complete list. Note that the search text is case sensitive.	0 or 1, default is 0

## Synchronization

Name	Syntax & Description	Values
<b>Set WDM Clock to PTP</b>	[Debug] UsePTPtoWDMClockSyncFactor=0 This option sets the WDM clock to PTP by transmitting the PTP clock factor from the application to the WDM driver. This options requires a WDM driver version >= 1.6. You can check the WDM driver version from the <a href="#">About</a> menu (click on the Lawo logo and then select "About").	0 or 1, default is 0
<b>Setup PTP Delay Request</b>	[Debug] PTPUseSyncOnly=1 This option deactivates PTP Delay Request messages. This can slightly improve the precision of PTP. Under normal circumstances, it is not needed.	0 or 1, default is 1
<b>Define PTP "Not Valid" Delay Message</b>	[Debug] PTPMaxValidMessageTimeoutMilliSec=5000 This option defines the time in milliseconds without receiving PTP before the software reports the sync signal as lost.	enter value in ms (1000 to 300000), default is 5000
<b>Define Minimum Number of Valid PTP Sync Signals</b>	[Debug] PTPMinSyncs=50 This option defines the minimum number of valid PTP syncs received before the software switches the sync to active. <b>ATTENTION!</b> It is recommended to leave this option unchanged, as setting the value too low can result in sync issues.	enter value (5 to 100), default is 50

Name	Syntax & Description	Values
<b>Define Valid Number of PTP Delay Requests</b>	[Debug] PTPMinDelayRequests=5 This option defines the minimum number of valid PTP delay request responses received before the software switches the sync to active.	enter value (1 to 20), default is 5
<b>Setup Seamless PTP Switching</b>	[Debug] UseSeamlessPTPSwitching=1 When this option is enabled and the PTP master is lost, the software uses the latest computed values until a new valid PTP master is available. Thus, the system switches seamlessly between PTP masters.	0 or 1, default is 1
<b>Setup Internal Streams without PTP</b>	[Debug] UseInternalSyncedStreams=0 This option adds an additional sync mode to send streams based on the internal clock. The option must be enabled in both the sender and receiver. In the receiver, the streams are called "R3lay" streams and are displayed in a separate tab from the Ravenna tab.	0 or 1, default is 0
<b>Define Internal Streams without PTP as Ravenna Streams</b>	[Debug] AnnounceNonPTPStreamsAsRavenna=0 This option announces the internal streams as Ravenna streams even though they are not synchronized to PTP.	0 or 1, default is 0

## RTSP

Name	Syntax & Description	Values
<b>Define RTSP URL Escape Characters</b>	[Debug] RtspUrlEscapeCharacters=":/?#[ ]@!\$%&'()*+,-;= % " This option defines the list of characters to be used for RTSP URL escapement. Please include the reserved characters like ":" and "?". If the list is left empty, then the internal escape characters are used.	leave empty or set (as shown)
<b>Define First RTSP Server Port</b>	[Streaming] InitialRTSPSourcePort=8000 This option defines the port number of the first RTSP server.	enter port number
<b>Setup RTSP Ping Timeout</b>	[Streaming] RTSPPingTimeoutSecs=0 This option defines the RTSP behaviour if the ICMP ping to Unicast receiver fails. The value sets the number of seconds after which the stream is stopped. If the value is 0, then no ICMP ping check is done.	0 to 14400, default is 0
<b>Define RTSP Behaviour for 0 Bytes</b>	[Streaming] RTSPCloseSessionOnEmptyNewBytes=0 This option defines the RTSP behaviour if a remote socket dies and a 0 bytes reading is reported. In this instance, the unicast stream is stopped.	0 or 1, default is 0
<b>Setup RTSP Timeout for 0 Bytes</b>	[Streaming] RTSPLivenessTimeoutSecs=0 This option defines the RTSP behaviour if the connection breaks and there is no further RTSP communication. The value sets the number of seconds after which the unicast stream is stopped. Note that the receiver must send periodic dummy RTSP commands to use this feature.	0 to 14400, default is 0

## Network Compensation

Name	Syntax & Description	Values
<b>Setup Wait Time Before Processing Buffer</b>	[Debug] SampleDataBufferTimeout=15 This option sets the wait timeout in milliseconds for data buffers before the buffer is processed.	1 to 1000, default is 15
<b>Setup Wait Time Before Processing Connection</b>	[Debug] SampleDataConnectionTimeout=15 This option sets the wait timeout in milliseconds for data buffers before a connection is processed.	1 to 1000, default is 15

Name	Syntax & Description	Values
<b>Setup Wait Time Before Processing WDM Driver</b>	[Debug] WMDriverTimeout=5 This option sets the wait timeout in milliseconds for WDM drivers before the buffer is processed.	1 to 50, default is 5
<b>Setup Window Resend Size if Packets are too late</b>	[Debug] StreamDiscardPacketsTooLateMilliSecs=0 Packets which are too late by this amount of time are discarded and not sent. The option can be used to avoid heavy packet bursts. A value of 0 means no discarding of packets even if they are late. The time is set in milliseconds.	1 to 100000, default is 15
<b>Define What To Do in Case Of Drifting Streams</b>	[Debug] ClockDriftCompensation=NONE This option defines what happens if a connection needs to be corrected due to under or overruns (caused by drifting clocks or performance jitter). The possible values are "NONE", "CROSSFADE", "CHECKPHASE" or "CHECKCLOCK". The default is "NONE". <ul style="list-style-type: none"> <li>• CROSSFADE - a small crossfade is added to smooth the audio correction.</li> <li>• CROSSFADE CHECKPHASE - the software performs a phase check to find an appropriate sample position and then adds a small crossfade.</li> <li>• CHECKCLOCK - the software attempts to compensate for the different sample clocks by adding or dropping random samples.</li> </ul>	as per description
<b>Setup Cross Fade Behaviour in Case of Drifting Streams</b>	[Debug] DropoutCrossfadeSamples=64 In the case where a crossfade is applied, this option sets the crossfade duration (in samples).	0 to 512, default is 64
<b>Define Search Area for Phase Auto Correction in Case Of Drifting Streams</b>	[Debug] DropoutPhaseSearchSamples=0 In the case where a phase check is performed, this option defines the range of samples searched to find the best match for the audio correction.	0 to 512, default is 0
<b>Define Audio Buffer Size</b>	[Debug] SampleDataBufferSizeMilliSec=-1 This option sets the buffer size for each audio object inside RELAY. Defining a large buffer size can be used to compensate for high jitter values in the incoming or outgoing audio signals.	500 to 30000, or -1 for default

### Ember+

Name	Description	Values
<b>Setup Stream Switching via Ember+</b>	[Streaming] UseEmber=0 This option allows stream parameters to be read and controlled via <a href="#">Ember+</a> . For example, to switch streams to and from RELAY.	0 or 1, default is 0
<b>Define EMBER+ Stream Interval</b>	[Interfaces] EmberStreamInterval=50 This option sets the number of milliseconds until a new value is sent for Ember+ streams (i.e. peakmeter values).	10 to 5000, default is 50
<b>Improved Performance for Large Matrix</b>	[Debug] UseSinkSourceEmberMatrix=0 This option switches the SourceToSink matrix to an Ember+ matrix for each streaming connection. It can be used to improve the performance of a large matrix.	0 or 1, default is 0
<b>VRX: Setup Extended EMBER+ Tree for GUI</b>	[Debug] UseJadeStudioFullEmber=0 This option applies to RELAY VRX4 and VRX8. When enabled, the Ember+ tree is extended to allow control of the complete GUI.	0 or 1, default is 0
<b>VPB: Define Additional EMBER+ Matrix View</b>	[GUI] EmberMenuCommands=0 This option applies to RELAY VirtualPatchBay. It allows you to add individual inputs, outputs and summing points to the Ember+ tree (via the context menu in the VPB routing matrix).	0 or 1, default is 0

## Diagnostics

Name	Syntax & Description	Values
<b>Setup Alert Manager</b>	<pre>[Debug] UseAlertManager=0</pre> <p>This option activates the Alert Manager to monitor events that are not obvious to the user. Once enabled, a dialog box appears if an alert is detected. The Alert Manager detects the following situations:</p> <ul style="list-style-type: none"> <li>• NICs using more than one IP address.</li> <li>• Suddenly missing UDP stream packets.</li> <li>• Duplicated multicast addresses.</li> </ul>	0 or 1, default is 0
<b>Setup AlarmLog and Matrix Server Connections</b>	<pre>[Interfaces] AlarmLogActive=1 AlarmLogNIC1= AlarmLogIPAddress1=x.y.z.t AlarmLogPort1=18200 AlarmLogNIC2= AlarmLogIPAddress2=x.y.z.t AlarmLogPort2=18200 AlarmLogMatrixServerActive=0 AlarmLogMatrixServerIDOffset=0</pre> <p>This option supports connections to a DSA Alarmlog PC and/or Matrix Server.</p> <p>The "AlarmLogActive" and "AlarmLogMatrixServerActive" values can be set to either 0 or 1, the default is 0.</p> <p>The "AlarmLogIPAddress1" and "AlarmLogIPAddress2" values define the IP address of the main and redundant Alarmlog PC. In each case, enter either an IP address or name.</p> <p>The "AlarmLogMatrixServerIDOffset" sets a general offset for all IDs from 0 to 65535.</p>	as per description
<b>Setup Latency Measuring</b>	<pre>[Debug] UseLatencyMeasuring=0</pre> <p>This option should only be used by an administrator in the case of latency issues. It can be used to measure and define the total latency of samples received in a stream and sent to a stream.</p>	0 or 1, default is 0

## SysLog

Name	Syntax & Description	Values
<b>Setup SysLog</b>	<pre>[Interfaces] SysLogActive=0</pre> <p>Activates the sending of some syslog messages.</p>	0 or 1, default is 0
<b>Define SysLog IP</b>	<pre>[Interfaces] SysLogIPAddress=127.0.0.1</pre> <p>Defines the IPv4 address of the syslog server.</p>	enter IP address
<b>Define SysLog Port</b>	<pre>[Interfaces] SysLogPort=514</pre> <p>Defines the port number of the syslog server.</p>	enter port number

## Virtual Machine (VM)

Name	Syntax & Description	Values
<b>Setup VM Mode</b>	<pre>[Debug] UseVMWareAPI=0</pre> <p>When this option is enabled, the software tries to load a vmware dll to detect whether it is running on a Virtual Machine and improve migration.</p>	0 or 1, default is 0
<b>Fallback Monitor Rate in VM</b>	<pre>[Debug] UseMonitorRefreshRateFallback=0</pre> <p>This option may be needed if the software is running on a Virtual Machine and the monitor refresh rate cannot be detected. If the VM shows an error message such as "The monitor refresh rate could not be detected...", then the option should be set to 1.</p>	0 or 1, default is 0

## General

Name	Syntax & Description	Values
<b>Setup Defaults for Silence Detection</b>	[Debug] SilenceDetectionThresholdHigh=-20 SilenceDetectionTimeoutHigh=0 SilenceDetectionThresholdLow=-50 SilenceDetectionTimeoutLow=5 This option sets the default values for silence detection. This feature can be used to indicate when the signal on a channel falls below a certain level. The silence detection Active state is published to the network via Ember+ (if Ember+ is <a href="#">enabled</a> ), and be used by an Ember+ consuming device.	enter threshold in dBFs (-90 to 0), enter timeouts in seconds (0 to 60), default values are as shown.
<b>Setup Audio Plug-in</b>	[Debug] UseAudioFilterFileSource=0 Adds the possibility to add a plug-in that can playback linear PCM wave files and be controlled via Ember+ (if Ember+ is <a href="#">enabled</a> ).	0 or 1, default is 0
<b>Setup Double Touch Event Delay</b>	[GUI] SuppressDoubleTouchMilliSecs=100 This option determines what happens when the user presses the same button in quick succession. If the time between presses is less than, or equal to, the value, then the software responds only to the first press. If the time between presses is greater than the value, then the software responds to the second press and actions another event. The time is set in milliseconds.	50 to 2000, default is 100
<b>Setup Process Priority</b>	[Host] ProcessPriority=REALTIME This option defines the processing priority of RELAY. You can use this to increase the CPU resources allocated to RELAY compared to other PC tasks. The possible values are "NORMAL", "ABOVENORMAL", "HIGH", "REALTIME". The default is "REALTIME".	as per description
<b>Define SRC for ASIO (CPU Load)</b>	[Debug] ASIOClientsSRC=BEST_QUALITY This option defines the quality of Sample Rate Conversion (SRC) for ASIO clients running at a different sample rate. Note that a higher quality results in a higher CPU load. The possible values are "BEST_QUALITY", "MEDIUM_QUALITY", "FASTEST", "ZERO_ORDER_HOLD" and "LINEAR". The default is "BEST_QUALITY".	as per description
<b>Setup WLAN NICs</b>	[Debug] UseNIC=ALL Enables the use of WLAN NICs. <b>ATTENTION!</b> Only for testing purposes as Admin.	leave empty or set (as shown)
<b>Setup Custom AutoMix Parameters</b>	[Debug] AutoMixAttackMilliSecs=5 AutoMixReleaseMilliSecs=250 AutoMixFloorDb=-45 This option can be used to define custom parameters for the AutoMix function: <ul style="list-style-type: none"> <li>• Attack Time in ms, from 1 to 1000 (default is 5)</li> <li>• Release Time in ms, from 1 to 2000 (default is 250)</li> <li>• Floor Level in dB, from -100 to 0 (default is -45)</li> </ul> Note that AutoMix is NOT supported by RELAY VSC.	as per description
<b>Activate Windows Mixer Volume</b>	[Debug] WDMDriverUseMixerVolume=0 This option activates the Windows mixer volume for all WDM driver instances. It allows you to use the Windows volume control to adjust the level to RELAY. The WDM driver version must be 1.8.0.5 or later.	0 or 1, default is 0

## R3LAY VSC

Name	Syntax & Description	Values
<b>Maximum Connection Latency</b>	<p>[VSC]            MaxConnectionLatencyWDMToStream=1024            MaxConnectionLatencyASIOToStream=1024            MaxConnectionLatencyStreamToWDM=1024            MaxConnectionLatencyStreamToASIO=1024</p> <p>This option applies to R3LAY VSC. It defines the maximum latency for each type of connection. If a value is entered, then this overrides the settings-defined value: "short", "medium" or "long".</p>	leave empty or enter value (64 to 16384), default is empty
<b>Define Fixed RTSP Ports</b>	<p>[Streaming]            VSCUseFixedRTSPPortPerSlot=0</p> <p>This option applies to R3LAY VSC. It assigns a fixed RTSP port for each connection slot.</p>	0 or 1, default is 0

## R3LAY VRX

Name	Syntax & Description	Values
<b>Define Preset Workflow with Open Faders</b>	<p>[Debug]            MuteChannelOnPresetSwitch=0</p> <p>This option applies to R3LAY VRX. When enabled, a channel with an open fader mutes when the user changes the signal processing preset.</p>	0 or 1, default is 0
<b>Define User Keys for Stream Connects</b>	<p>[Debug]            UseJadeStudioStreamReceiveConnect=0</p> <p>This option applies to R3LAY VRX. When enabled, VRX user keys can be defined to connect an incoming stream to a stream receiver.</p>	0 or 1, default is 0
<b>Define User Keys to Open Sources</b>	<p>[Debug]            UseJadeStudioOpenSource=0</p> <p>This option applies to R3LAY VRX. When enabled, VRX user keys can be defined to open and close source channels. On opening, the fader returns to its last known position.</p>	0 or 1, default is 0
<b>Define User Keys to Talk</b>	<p>[Debug]            UseJadeStudioTalkDirect=0</p> <p>This option applies to R3LAY VRX. When enabled, VRX user keys can be defined to talk to the direct out.</p>	0 or 1, default is 0
<b>Define PPM</b>	<p>[Debug]            PeakmeterType=PPM10</p> <p>This option applies to R3LAY VRX and affects the PPM metering in the Taskbar. It sets the peak meter characteristics to match those used in Lawo's mc<sup>2</sup> Audio Production Consoles. The possible values are "PPM0", "PPM1", "PPM10" and "VU". The default is "PPM10".</p>	as per description
<b>Setup PPM Level for Red Marker</b>	<p>[Debug]            StudioRedLevel=-6</p> <p>This option applies to R3LAY VRX and affects the PPM metering in the Taskbar. It sets the level at which the meter color turns red. The value is set in dBFS from -32 to 0. In VRX8, the default is -6. In VRX4, the default is -3.</p>	as per description
<b>Define Range for Pop-up Arrows</b>	<p>[R3LAYVRX8\Settings\Global\GUI]            ButtonUnfoldHeightPercent=50</p> <p>This option applies to R3LAY VRX. It applies to the four User Keys in the headline of the GUI which support a second function via the pop-up arrow. It defines how much of the button is used for the arrow and how much is left for the main function. When the value is set to 50%, the button is split equally. i.e. users must click on the upper half of the button to action the User Key function, and click on the lower half to open the drop-down menu. If you wish to make it easier to operate the User Key functions, then reduce the value to make the arrows smaller.</p>	enter value (10 to 90), default is 50
<b>Enable switching Fullscreen / WindowMode</b>	<p>[Debug]            R3LAYVRXnUseWindow=0 (n = 4 or 8)</p> <p>This option applies to R3LAY VRX. It is a special option which prevents the application switching into full screen view. To activate, click on the TASKBAR icon while pressing left SHIFT + CTRL + ALT.</p>	0 or 1, default is 0



Name	Syntax & Description	Values
<b>Setup Extended EmBER+ Tree for GUI</b>	[Debug] UseJadeStudioFullEmber=0 This option applies to R3LAY VRX. When enabled, the Ember+ tree is extended to allow control of the complete GUI.	0 or 1, default is 0
<b>VRX4: Define Default Support Channel in Taskbar</b>	[R3LAYVRX4\Settings\Global\General] StartupAppBarChannel=PHONES This option applies to R3LAY VRX4. It defines the default channel assigned to the "Channel Selection" box in Taskbar View.	"Phones", "Speaker" or leave empty, default is empty
<b>VRX8: Setup Processing for PGM and REC Bus</b>	[Debug] UseVRX8OutputProcessing=0 This option applies to R3LAY VRX8. It allows you to assign signal processing presets to the PGM and Record busses (in Admin Mode).	0 or 1, default is 0
<b>VRX8: Show Options: Copy RTSP Link &amp; Copy SDP</b>	[Debug] UseStreamClipboardCopy=0 This option applies to R3LAY VRX8 and VPB. By default, the option is disabled. When enabled, it reveals two additional buttons when you <a href="#">add streams</a> to VRX8: Copy RTSP Link and Copy SDP. These options copy the selected information to the clipboard, so that it can be used to setup a new stream. For example, via the <a href="#">Add Stream URL</a> or <a href="#">Add Stream SDP</a> windows in R3LAY VRX8.	0 or 1, default is 0
<b>VRX8: Setup Additional Values for Number of Channels to/from ASIO Client</b>	[Debug] DialogSettingsNbAsioChannels=1, 2, 4, 8, 12, 16, 24, 32, 48, 64 This option applies to R3LAY VRX8. It defines the values that appear in the Number of Inputs and Number of Outputs menus for the R3LAY ASIO Driver (in the Global Settings -> Audio tab). Any value from 1 to 256 is permitted, so please take care to enter only reasonable values. A typical example is shown above.	as per description

## R3LAY VPB

Name	Syntax & Description	Values
<b>Define Loop Visibility</b>	[GUI] PreventClientLoops=1 This option applies to R3LAY VPB. When enabled, any connections in the routing matrix that could result in loops are hidden from view.	0 or 1, default is 1
<b>Setup AutoMix Context Menu</b>	[Debug] UseAutoMix=0 This option applies to R3LAY VPB. It adds the AutoMix function to the context menu for summing points, in the routing matrix, so that users can apply automatic level adjustment.	0 or 1, default is 0
<b>Setup Stream Statistics</b>	[Debug] UseShowStatisticsInContextMenu=0 This option applies to R3LAY VPB. It activates a context menu option to open a stream statistics window for the selected stream. To open the statistics window, right-click on a stream and select "Show Statistics...".	0 or 1, default is 0
<b>Show Options: Copy RTSP Link &amp; Copy SDP</b>	[Debug] UseStreamClipboardCopy=0 This option applies to R3LAY VRX8 and VPB. By default, the option is disabled. When enabled, it reveals two additional <a href="#">context menu</a> options in the VPB "Routing" view when you right-click on a stream: Copy RTSP Link and Copy SDP. These options copy the selected information to the clipboard, so that it can be used to setup a new stream. For example, via the <a href="#">Add Stream URL</a> or <a href="#">Add Stream SDP</a> windows in R3LAY VPB.	0 or 1, default is 0

## R3LAY Stream Monitor

Name	Syntax & Description	Values
<b>Open App as Window</b>	[Debug] R3LAYStreamMonitorUseWindow=0 This option applies to R3LAY Stream Monitor. When enabled, the application opens as a window that can be resized, minimized, etc. By default the option is disabled so that the application opens in full screen.	0 or 1, default is 0



Name	Syntax & Description	Values
<b>Disable Loudness Measurement</b>	<pre>[Debug] UseStreamMonitorLUFS=1</pre> <p>This option applies to R3LAY Stream Monitor. It can be used to switch off the loudness measurement to reduce the demand on the computer's CPU. In this instance, the stream monitoring window shows only the peak level metering (in dBFS). By default, the loudness measurement is turned on and so both dBFS and LUFS are shown.</p>	0 or 1, default is 1

## OnAir4

Name	Syntax & Description	Values
<b>Setup OnAir4</b>	<pre>[Interfaces] OnAir4Active=0 OnAir4UseFixedIPAddress=1 OnAir4FixedIPAddress=a.b.c.d</pre> <p>This option activates the connection to an OnAir4 (supported by R3LAY VRX4, VRX8 and VPB).</p>	0 or 1, default is 1
<b>VRX8: Setup All Headphones for OnAir4</b>	<pre>[Interfaces] OnAir4UseMultiHeadphone=1</pre> <p>This option applies to R3LAY VRX8. It activates all four headphone outputs on the OnAir4 with independent level control from the GUI, and via Ember, for each output.</p>	0 or 1, default is 0 for existing and 1 for new installations
<b>Setup Image Check on OnAir4</b>	<pre>[Interfaces] OnAir4CheckImageVersion=1</pre> <p>This option suppresses the image check of the OnAir4 (when the value = 0). <b>ATTENTION!</b> Only for testing purposes as Admin.</p>	0 or 1, default is 1

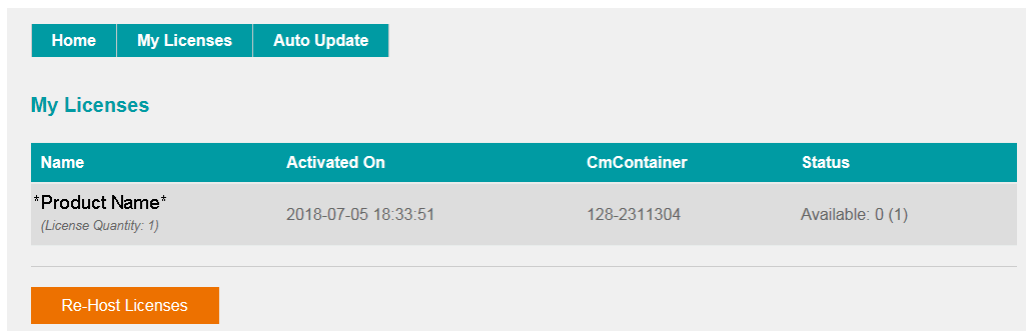
## 16.3 Advanced Licensing Features

This appendix describes the more advanced features of the CodeMeter Runtime licensing system.

### 16.3.1 Re-Hosting a License

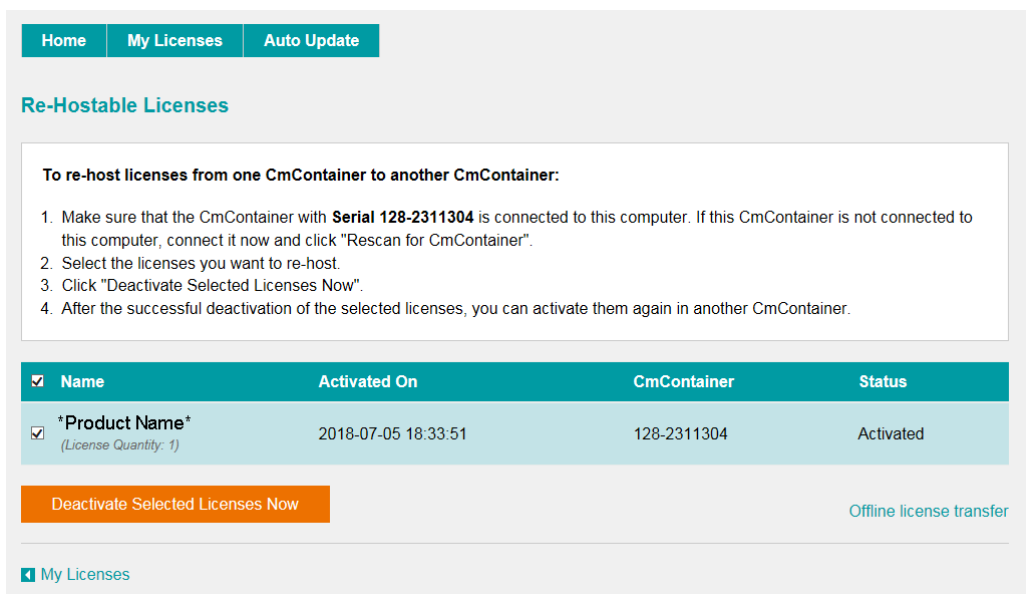
To move a license from one Cm container to another, you will need to re-host the license as follows. This requires you to first de-activate the license from its existing Cm container, and then choose the new storage container.

1. Follow the first two steps from the [online activation](#) method:
  - Open the 'Lawo License' web browser page at <https://licenseportal.lawo.com>.
  - Copy your license ticket number - this is the 25 number code - into the **Ticket** field and select **Next**.
2. At the "My Licenses" summary window, select **Re-Host Licenses**:



Name	Activated On	CmContainer	Status
*Product Name* <small>(License Quantity: 1)</small>	2018-07-05 18:33:51	128-2311304	Available: 0 (1)

3. Make sure that the Cm container is connected to the computer, select the licenses you wish to re-host and select **Deactivate Selected Licenses Now**.



**To re-host licenses from one CmContainer to another CmContainer:**

1. Make sure that the CmContainer with **Serial 128-2311304** is connected to this computer. If this CmContainer is not connected to this computer, connect it now and click "Rescan for CmContainer".
2. Select the licenses you want to re-host.
3. Click "Deactivate Selected Licenses Now".
4. After the successful deactivation of the selected licenses, you can activate them again in another CmContainer.

<input checked="" type="checkbox"/>	Name	Activated On	CmContainer	Status
<input checked="" type="checkbox"/>	*Product Name* <small>(License Quantity: 1)</small>	2018-07-05 18:33:51	128-2311304	Activated

Wait for a few seconds - a confirmation pop-up appears once the de-activation is successful.

You can follow steps 3 to 7 from the [online](#) activation method, or perform an [offline](#) license transfer, to activate the license using a new storage container.

### 16.3.2 Activating a License Offline

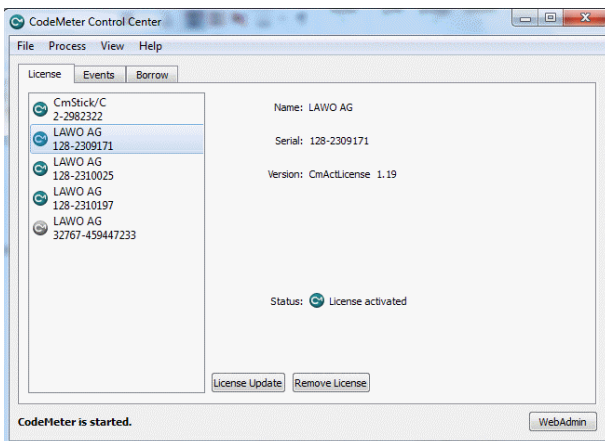
If your PC has no internet access, then you can activate a software license offline. This method involves three stages:

- **Create a license request file** - for the Cm storage container. Then copy the file onto a computer with internet access.
- **Activate the license** - using the 'Lawo License' web portal, copy the license update file back to the original computer.
- **Import the license update file** - to the Cm storage container.

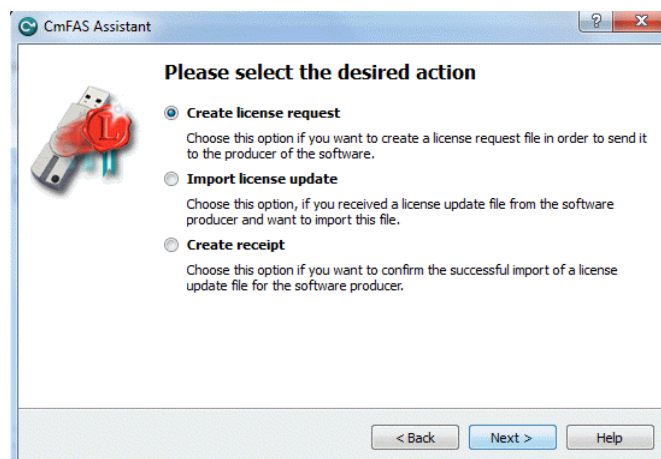
#### Creating the License Request File

On the computer you wish to license:

1. Open the '[CodeMeter Control Center](#)' (by clicking on the Cm taskbar icon), and select the container you wish to use for the license storage.
2. If the container is empty, select **Activate License**. Or, if the container already holds an active license, select **License Update**. This starts the 'CodeMeter Field Activation Service (CmFAS) assistant':

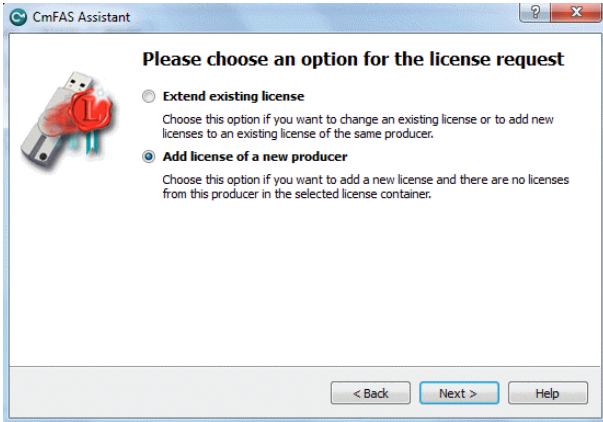


3. Select **Next:** and then **Create license request:**



At this stage, there are two additional steps (to add the correct firmcode) if you have selected a **CmStick** container. Enter the following Lawo FirmCode to create the license request file:

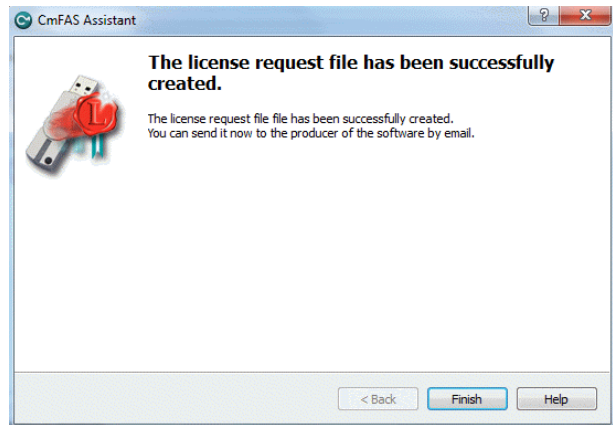
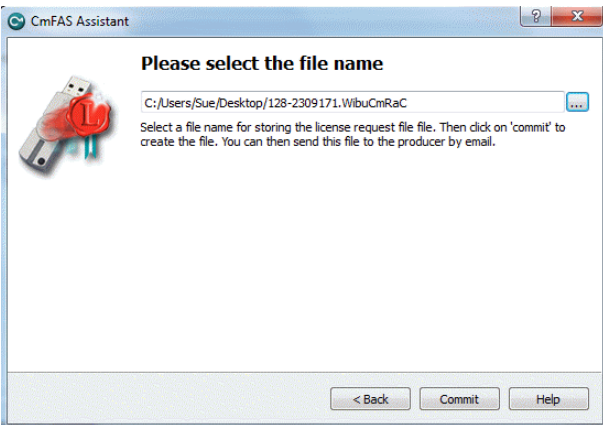
Select Add license of a new producer



Enter the Lawo FirmCode = 102037



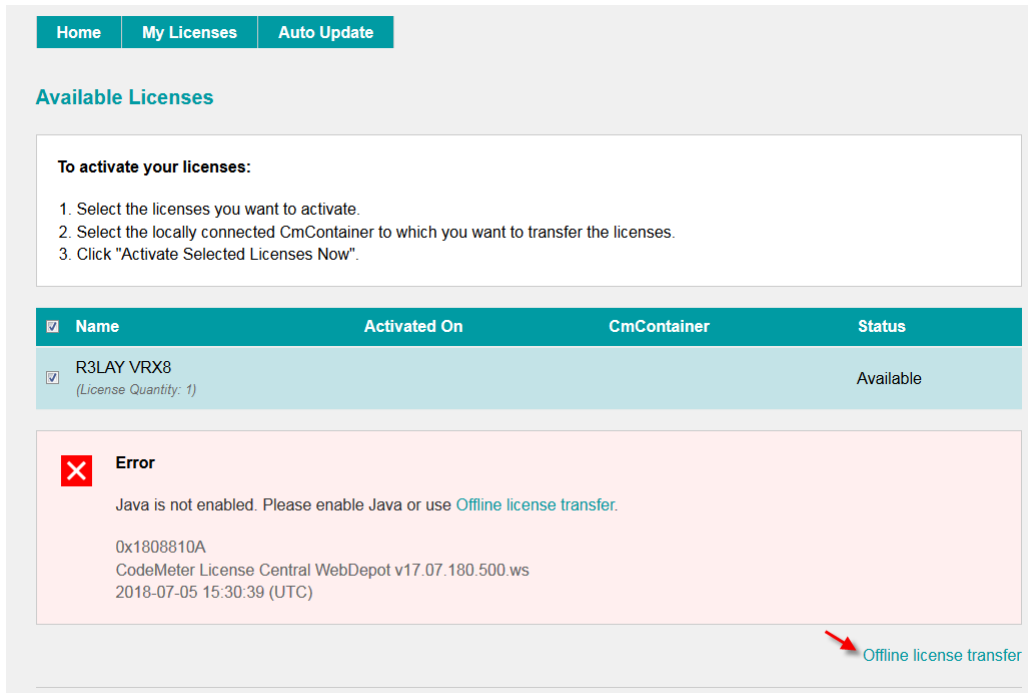
4. Select **Next**, and using Windows Explorer, enter a file path for the license request file. Choose somewhere easy to find, such as the Desktop. Then select **Commit** to create the request file:



5. Select **Finish** and copy the request file onto a computer with internet access. You will need both the license request file and the 25-digit ticket number (received with your license purchase).

## Activating the License

1. On a computer with internet access, follow the first four steps from the [online activation](#) method:
  - Open the 'Lawo License' web browser page at <https://licenseportal.lawo.com>.
  - Copy your license ticket number - this is the 25 number code - into the **Ticket** field and select **Next**.
  - When your license is displayed, select **Activate Licenses** to continue.
  - Select the storage method for your license - either USB dongle or single computer.
2. At the **Available Licenses** page, select **Offline license transfer** to continue:



Home My Licenses Auto Update

### Available Licenses

**To activate your licenses:**

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

<input checked="" type="checkbox"/>	Name	Activated On	CmContainer	Status
<input checked="" type="checkbox"/>	R3LAY VRX8 <small>(License Quantity: 1)</small>			Available

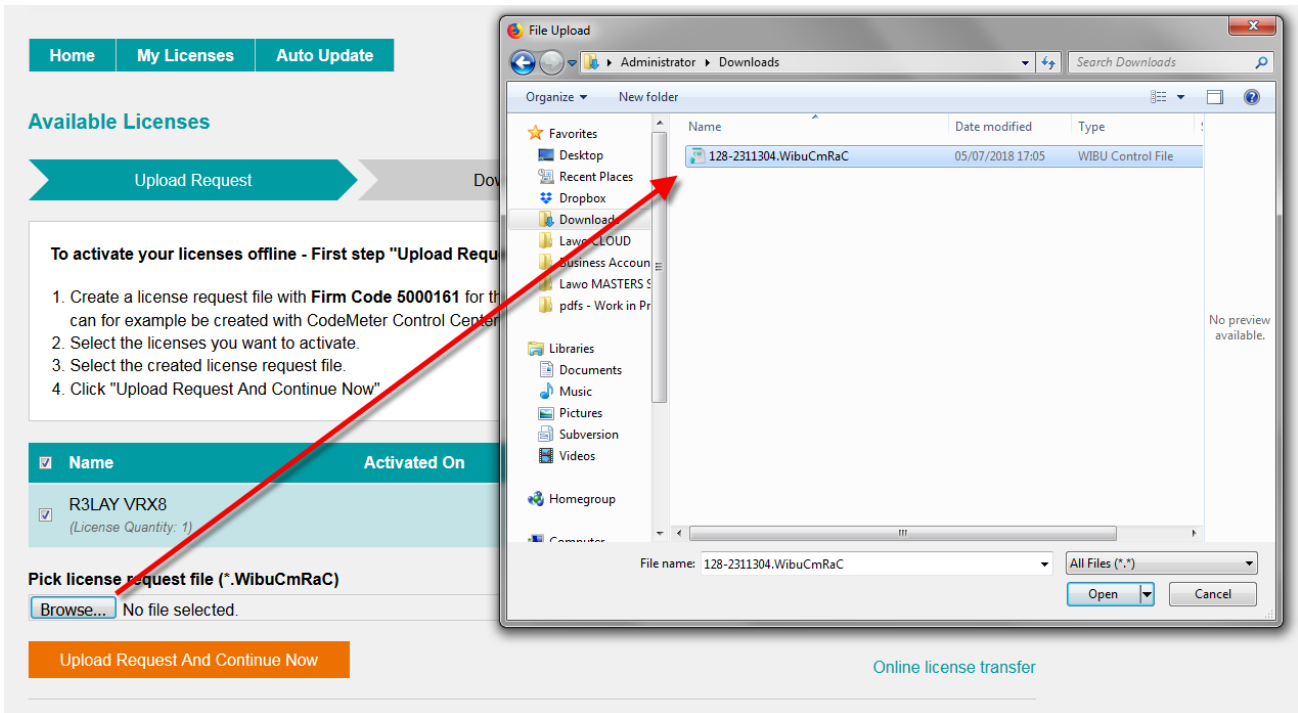
**Error**

Java is not enabled. Please enable Java or use [Offline license transfer](#).

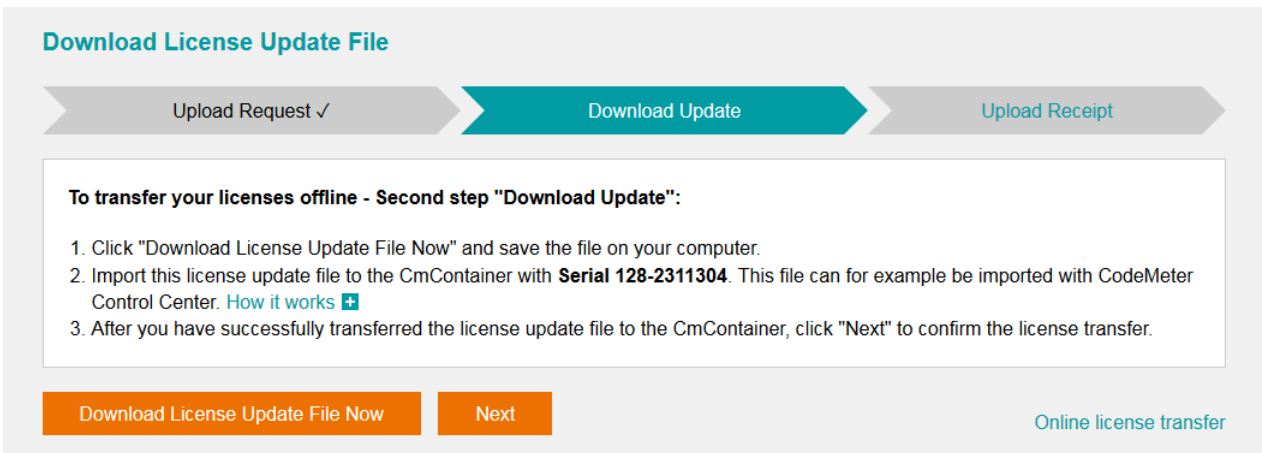
0x1808810A  
CodeMeter License Central WebDepot v17.07.180.500.ws  
2018-07-05 15:30:39 (UTC)

[Offline license transfer](#)

3. On the next page, select the license(s) you wish to activate, select **Browse...** and, using Windows Explorer, choose the request file (created earlier):



4. Then select **Upload Request And Continue Now** - the license request is processed and, if successful, you will have the option to Download the update:

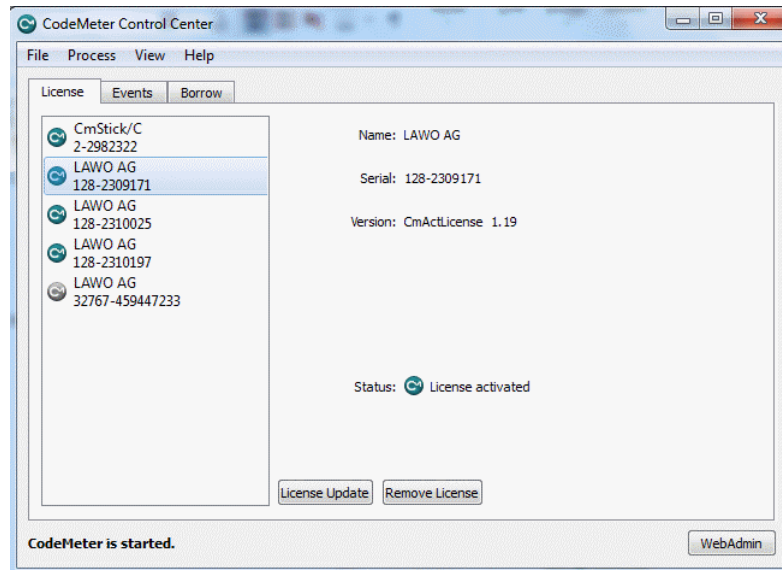


5. Select **Download License Update File Now** and, when prompted, choose the **Save** file option - the file is downloaded.

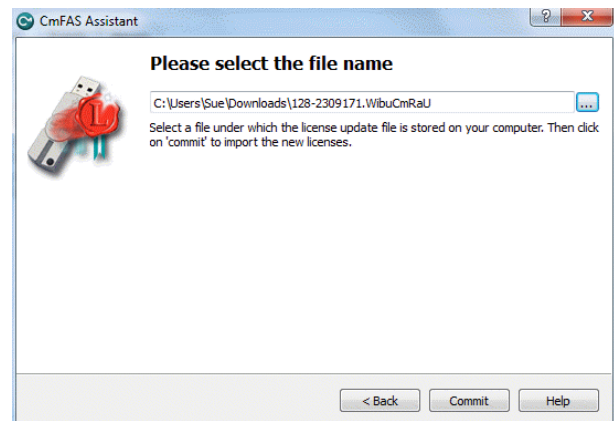
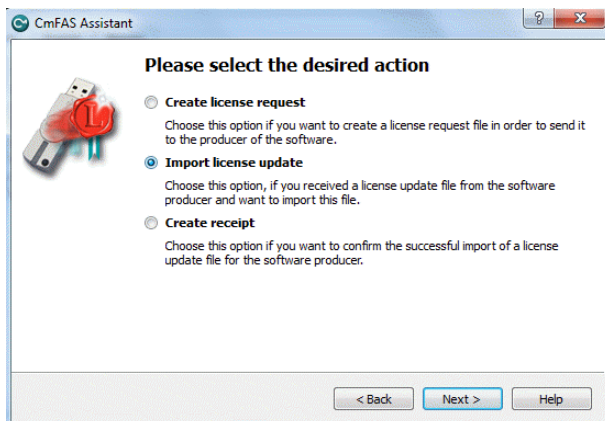
6. Copy the License Update file back to the original PC.

## Importing the License Update

1. On the original computer re-open the 'CodeMeter Control Center' and select the Cm container for the license update. Note that this must be the same container as the one selected earlier (during the License Request).



2. Select **License Update** and follow the instructions given by the 'CmFAS Assistant' - when prompted, select Import License update and choose the update file (downloaded from the License portal):



3. Select **Commit** to action the update - the license is activated and you can close the 'CodeMeter Control Center'.
4. You can now return to your Lawo application or install your USB license dongle - all licensed features should be available.



### 16.3.3 The CodeMeter Control Center

The 'CodeMeter Control Center' is used to manage the license containers and perform a backup or restore.

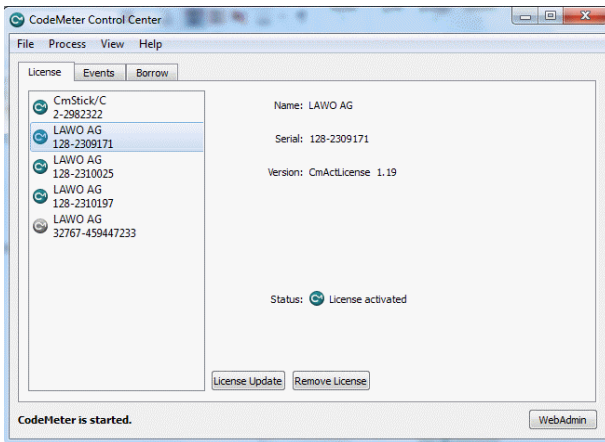
1. Click on the Windows taskbar Cm icon to open the 'CodeMeter Control Center' - the icon may be hidden from view or vary in color (depending on your taskbar configuration).



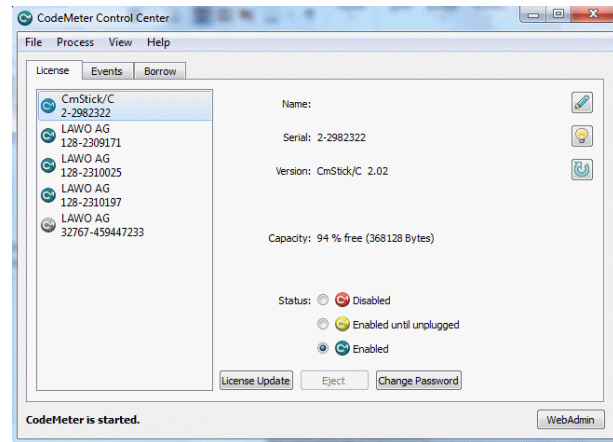
The 'CodeMeter Control Center' shows all the Cm containers which can be used for license storage.

A new local computer container is created each time you run the **CodeMeter Runtime** install wizard. Therefore, if you have installed multiple Lawo products or software versions, you will see several **LAWO AG** containers. If a USB dongle is connected, you will see a container labelled **CmStick**.

Local Computer Container (LAWO AG)



USB Dongle Container (CmStick)

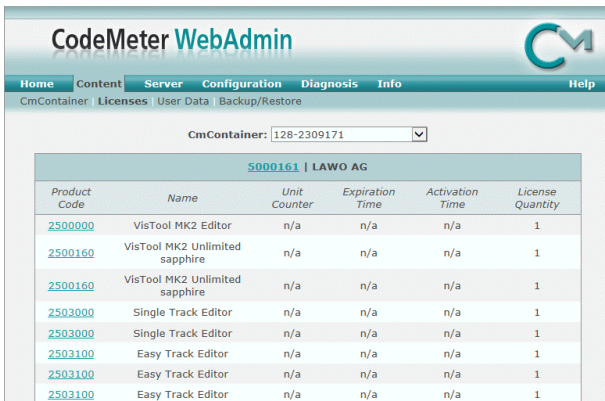


The **Serial** numbers identify each container. The icon colours indicate: green = license activated; grey = container is empty; red = license deactivated.

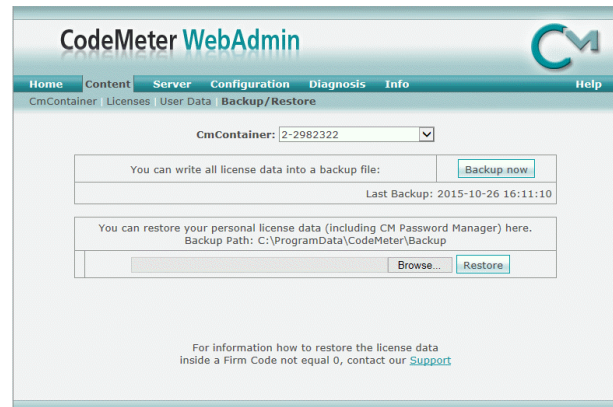
A single Cm container can contain multiple licenses - simply select the same container during the [activation](#) process.

2. Select **WebAdmin** (bottom right) to open the WebAdmin portal in your default browser. The portal has many functions including license interrogation, and backup/restore functions for licenses stored on a **CmStick** (USB Dongle):

WebAdmin Content Cm Container



WebAdmin Backup/Restore

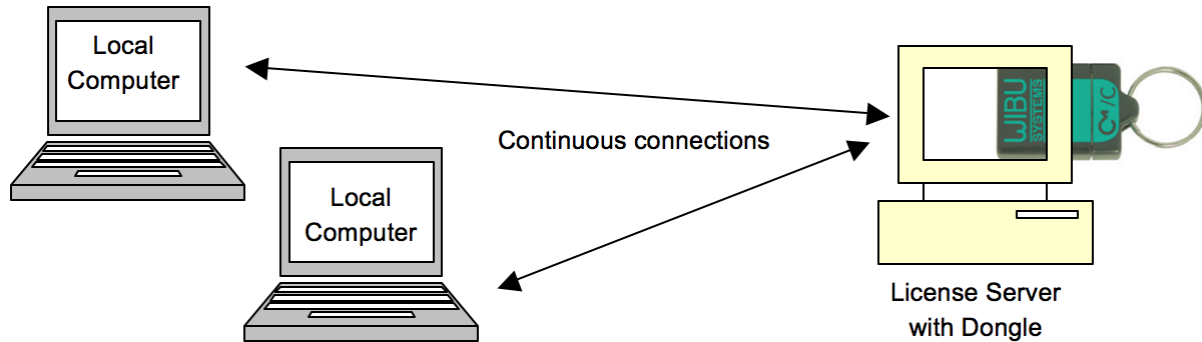


For further information, please refer to the **CodeMeter Runtime** documentation at [wibu.com](http://wibu.com).



### 16.3.4 License Configuration via a Server

This license storage method can be used to administrate licenses centrally within a local network. For example, when starting a Lawo application such as **VisTool**, the local computer asks the server to borrow the relevant license. The license is then used by the **VisTool** client until the application is closed. On closing, the license is handed back to the server where it may then be used by a different **VisTool** client.



#### Preparing the Server

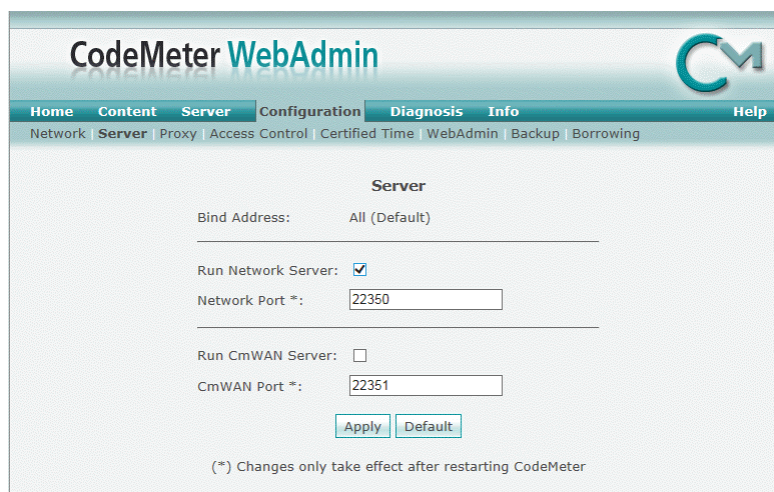
1. First, install the **Codemeter Runtime** software (Version 5.10 or above) on the central server. (Or, on a virtual machine on the server).

The latest release of CodeMeter Runtime can be downloaded from WIBU systems at [wibu.com](http://wibu.com).

2. Activate all licenses in the usual manner.

If a virtual machine is being used, set up a connection between the virtual machine and USB dongle.

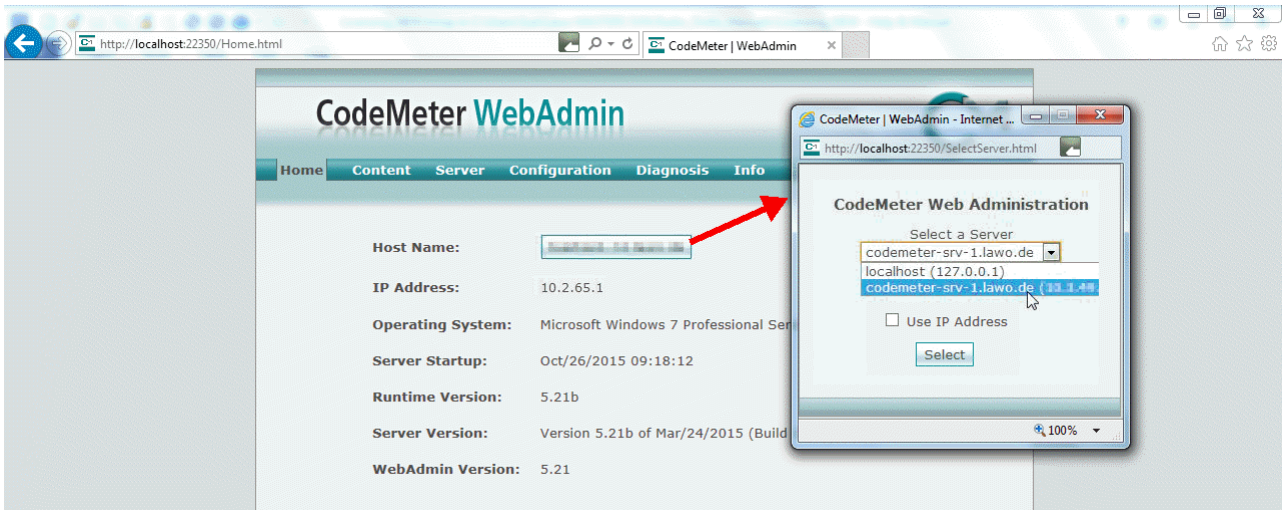
3. Open the [CodeMeter Control Center](#) and select **WebAdmin**.
4. Under **Configuration -> Server**, select the **Run Network Server** checkbox:



5. Click **Apply** and restart the **CodeMeter Runtime** software.

### Preparing the Clients

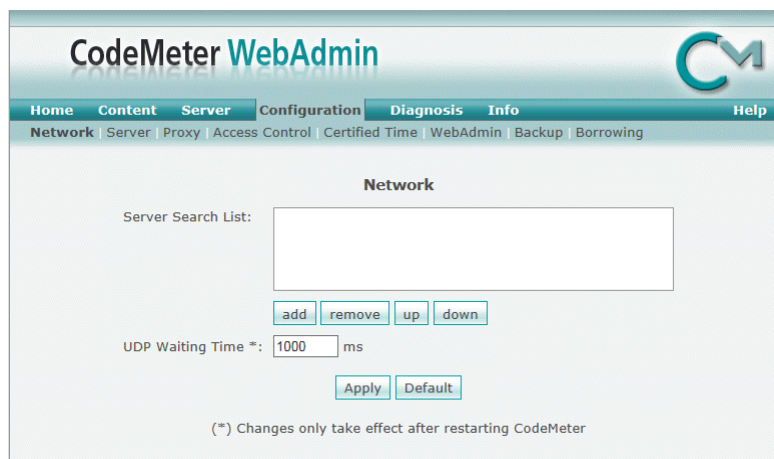
1. Install the **Codemeter Runtime** software (Version 5.10 or above) on each of the client computers.
2. Connect the clients (and server) to the network - on startup, the **CodeMeter Runtime** software sends a broadcast message across the network to find all license servers.
3. On each client computer, open the [Codemeter Control Center](#) and select **WebAdmin**.
4. From the **Home** page, select the name of the computer - a dialogue box should appear listing all the available license servers:



5. Choose the correct server from the drop-down list and click on **Select**.

If the license server is not found, then your firewall or network policy may not allow messages to be broadcast. In this case, you will need to add the server's IP settings to the search list, manually, as follows:

Under **Configuration** -> **Network**, add the correct IP settings into the **Server Search** list:



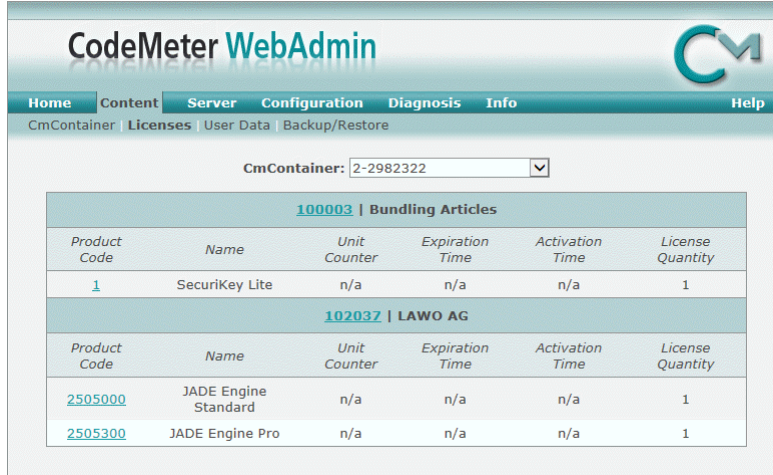
Click **Apply** and restart the **CodeMeter Runtime** software.

Note that once the **Server Search list** has an entry, all other license servers (announced automatically to the network) will be ignored.

### Choosing a License

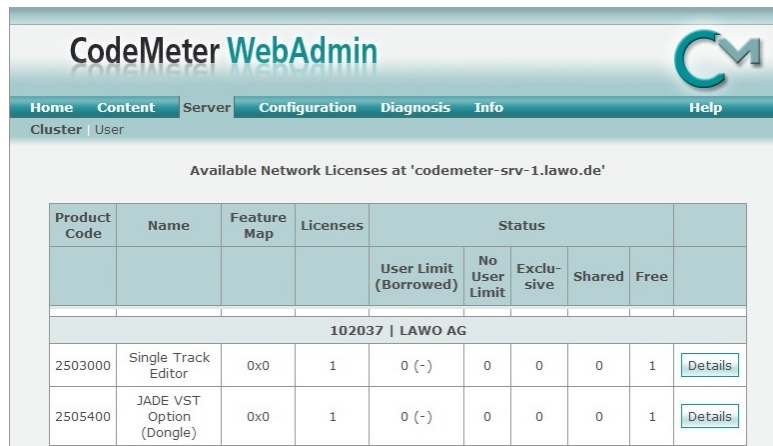
Once a connection to the license server is established, you can borrow one of the server licenses as follows:

1. On the client computer, open the [Codemeter Control Center](#) and select **WebAdmin**.
2. Under **Content** -> **Licenses**, choose the **CmContainer** (holding the server licenses) and select the desired license file:



If the licenses is in use, then a warning message appears.

You can check which licenses are available (free) by selecting **Server** and **Cluster**:



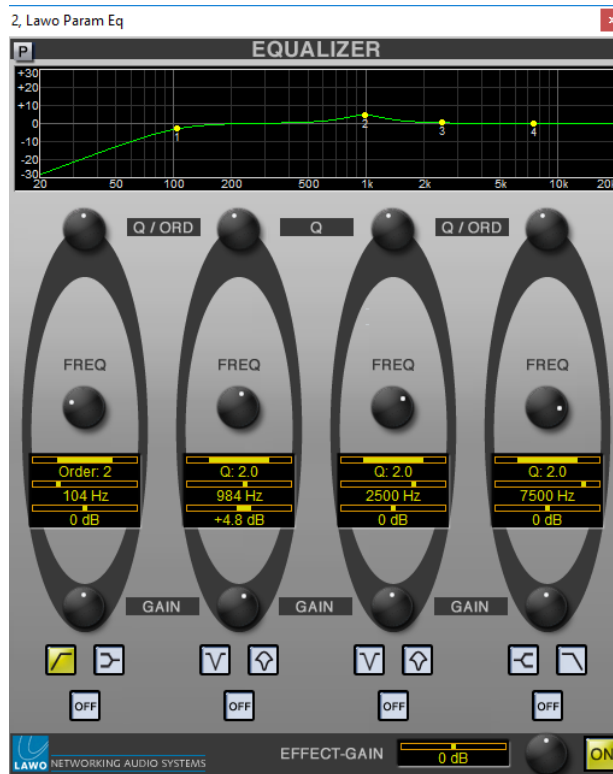
## 16.4 The LAWO Processing Collection

This appendix covers the operation of the LAWO Processing collection, which can be added to the routing matrix as processing devices, see [LAWO Processing](#).

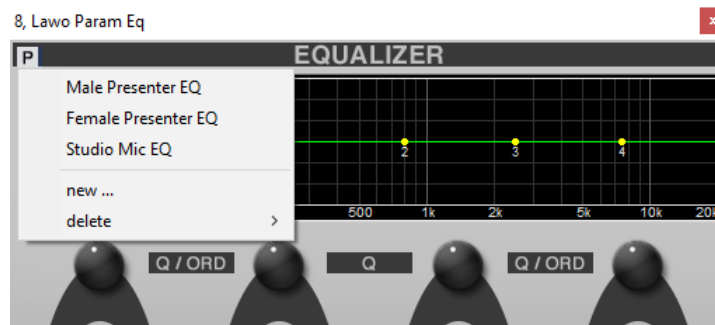
This feature is license-dependent. Please see the [comparison chart](#) on the Lawo website for details.

Each signal processor is controlled from its on-screen operating window.

1. Click on the on-screen buttons to turn parameters on or off.
2. Click and drag from left to right, or right to left, to adjust rotary controls. Don't try and turn the control as you would in real life!



3. Click on the **P** button to access the processor's presets:




- Select an option from the drop-down list to load a preset.
- Select **new..** to store the current settings as a preset - you will be asked to enter a filename.
- Select **delete** to delete an existing preset.

### 16.4.1 AGC (Automatic Gain Control)

This plug-in combines an expander and compressor with maximum and minimum gain controls and sidechain filter section. It is ideal for 'leveling' signals with a wide dynamic range.

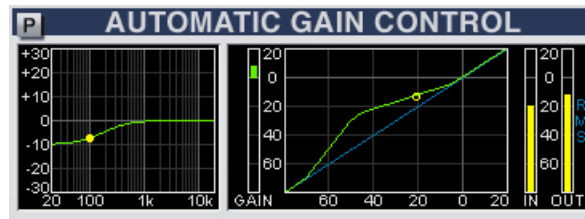
#### Parameters

<b>ATTACK</b>	Attack time from 100µs to 250ms.
<b>RLS</b>	Release time from 1ms to 60s.
<b>LAHDLY</b>	Look Ahead Delay from 0 to 10ms.
<b>MAX-GAIN</b>	Maximum gain from 0dB to +30dB.
<b>MIN-GAIN</b>	Minimum gain from -30dB to 0dB.
<b>SCF-FREQ</b>	Sidechain Filter frequency from 20Hz to 20kHz.
<b>SCF-GAIN</b>	Sidechain Filter gain from -24dB to +24dB
<b>SCF-Type</b>	These buttons select the sidechain type: <ul style="list-style-type: none"> <li>• High Pass Filter</li> <li>• High Shelving Filter</li> <li>• Low Shelving Filter</li> <li>• Low Pass Filter</li> </ul>
<b>SCF ON</b>	Switches the sidechain EQ on or off.
<b>SCF LSN</b>	Click this button to listen to the sidechain.
<b>E-RATIO</b>	Expander ratio from 0.10:1 to 1:1.
<b>E-THRS</b>	Expander threshold from -70dB to 0dB.
<b>C-RATIO</b>	Compressor ratio from 1:1 to 10:1.
<b>C-ROT.P</b>	Compressor rotation point from -20dB to +20dB.
	Mono or stereo operation.
<b>ON</b>	Switches the plug-in on or off.



## Operation

This plug-in combines several processes in order to achieve automatic gain control of an incoming signal. You will see an overview of the processing of the top of the plug-in window:



- **Sidechain EQ** – an overview of any sidechain filtering.
- **GAIN** - the amount of GAIN reduction applied.
- **Graph** – a graphical overview of the expander, compressor and maximum/minimum gain settings.
- **IN** and **OUT** – the input and output signal levels to and from the AGC plug-in (the power-sum of left and right channels).

As you adjust your settings, the yellow bouncing ball on the graph shows input level versus gain.

To use this plug-in to 'level' a signal with a wide dynamic range:

1. Select the **ON** button (yellow) so that the AGC is on.
  2. Set the Compressor Rotation point (**C-ROT.P**) and the Compressor Ratio (**C-RATIO**) – the default settings of -5dB and 2:1 are a good starting point for most signals.
  3. Now adjust the Maximum Gain and Minimum Gain. Note that the Compressor Rotation point (**C-ROT.P**) defines where the Maximum and Minimum Gain will be applied:
    - Maximum Gain – is applied to signal levels below the Compressor Rotation point.
    - Minimum Gain – is applied to signal levels above the Compressor Rotation point.
- So to squash your signal harder, apply lots of Maximum Gain (e.g. +30dB) and reduce the Minimum Gain (e.g. -30dB).
4. Now set an Expander so that low signal levels (e.g. noise) will not be increased by the compressor:
    - Levels below the Expander Threshold (**E-THRES**) remain at 1:1.
    - Adjust the slope using the **E-RATIO** control.


As with the other dynamics processing plug-ins, you can use the Look Ahead Delay (LAHD) and Sidechain Filter to optimise the signal processing, see [Compressor SCF](#).



### 16.4.2 Compressor

This plug-in faithfully reproduces the signal processing of Lawo's mc<sup>2</sup> Compressor section: a great sounding compressor featuring hard or soft knee behaviour.

#### Parameters

<b>ATTACK</b>	Attack time from 100µs to 250ms.
<b>RLS</b>	Release time from 1ms to 10s.
<b>LAHDLY</b>	Look Ahead Delay from 0 to 10ms.
<b>RATIO</b>	Ratio from 1:1 to 10:1.
<b>THRS</b>	Threshold from -70dB to +20dB.
<b>GAIN</b>	Make-up gain from -20dB to +20dB
<b>SOFT KNEE</b>	Hard or soft knee operation.
	Mono or stereo operation.
<b>ON</b>	Switches the plug-in on or off.



#### Operation

The action of the compressor is best described by looking at the top of the plug-in window:

- **GAIN** - the amount of GAIN reduction applied by the compressor.
- **Graph** – a graphical overview of the compressor settings.
- **IN** and **OUT** – the input and output signal levels to and from the compressor plug-in (the power-sum of left and right channels).

As you adjust your settings, the yellow bouncing ball on the graph shows momentary input level versus gain.

Use the Look Ahead Delay (LAHDLY) to delay the main signal path relative to the sidechain. This will result in pleasant dynamics processing even for widely varying dynamic signals.

The **GAIN** reduction metering follows the attack and release settings. So, if you have a very fast attack, the metering will reflect this.

### 16.4.3 Compressor SCF

This plug-in is identical to the [Compressor](#) but adds two bands of parametric EQ enabling you to equalize or filter the compressor sidechain.



#### Parameters

Parameters on the right are identical to the [Compressor](#) plug-in. The sidechain EQ parameters, on the left, are adjusted as follows.

For each band of EQ:

<b>Q / ORD</b>	Quality from 0.1 to 80 (parametric EQ) Or, when operating as a shelving or high/low pass filter, this control sets the order: <ul style="list-style-type: none"> <li>• Order 1 = 6dB per octave.</li> <li>• Order 2 = 12dB per octave</li> <li>• Order 3 = 18dB per octave</li> </ul>
<b>FREQ</b>	Frequency from 20Hz to 20kHz.
<b>GAIN</b>	Gain from -24dB to +24dB
<b>EQ Type</b>	These buttons select the EQ type: <ul style="list-style-type: none"> <li>• Parametric EQ</li> <li>• Shelving EQ</li> <li>• High or Low pass Filter</li> </ul>
<b>OFF</b>	Switches the band of EQ on or off. Use this button to switch an individual band out of circuit.

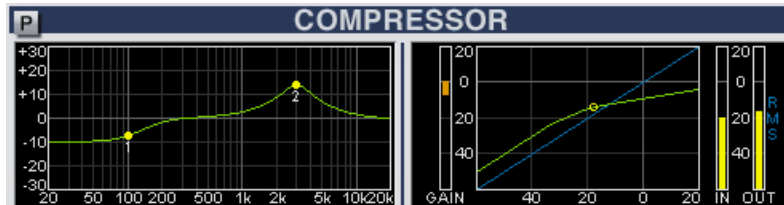


For the complete EQ section:

<b>SCF ON</b>	Switches the sidechain equalisation (both EQ bands) on or off.
<b>SCF LSN</b>	Click this button to listen to the sidechain.

### Operation

You will see an overview of the sidechain EQ at the top left of the plug-in window:



To equalize the compressor sidechain:

1. Set up your compressor as described [earlier](#).
2. Select the **SCF ON** button (yellow) so that the sidechain EQ is in circuit.

The sidechain EQ graph turns green as shown above. If the **SCF ON** button is off, then the graph is coloured yellow.

3. Make sure that the **OFF** buttons are deselected so that each band of EQ is in operation.
4. Select the EQ type for each of the two bands.
5. Adjust your GAIN, FREQ and Q or ORDER parameters.

You are now listening to the results of the compressor with an equalized sidechain.

6. Deselect the **SCF ON** button to listen to the compressor without sidechain EQ.
7. Or, select **SCF LSN** to audition the sidechain.

You are now listening to the compressor sidechain. Use this mode to adjust your EQ settings accordingly.

8. Deselect **SCF LSN** to return to the output of the compressor.

For a smoother compressor, set -10dB gain for an Order 1 low shelving filter at around 125Hz to prevent unwanted pumping caused by low frequencies.

The **GAIN** reduction metering follows the attack and release settings. So, if you have a very fast attack, the metering will reflect this.

### 16.4.4 Delay

This plug-in provides up to 1.8 seconds of delay and may be used as an effect, or to delay a signal by a specific value.



**Parameters**

<b>FEEDBK</b>	The amount of feedback applied to the delayed signal from 0% (no feedback) to 99%.
<b>MIX</b>	The mix of dry to wet (delayed) signal. This control can be set from 0% to 100% where: <ul style="list-style-type: none"> <li>• 0% = dry signal only (no delay).</li> <li>• 50% = equal levels of dry to wet.</li> <li>• 100% = wet (delayed signal only).</li> </ul>
<b>DELAY</b>	Delay time which can be set in: <ul style="list-style-type: none"> <li>• ms, up to 1800 milliseconds (1.8 sec)</li> <li>• Spls, up to 79380 samples</li> <li>• Meters, up to 612 meters</li> <li>• BPM, up to 33.3 beats per minute</li> <li>• FR, frames:           <ul style="list-style-type: none"> <li>○ up to 43.16 frames (23.98 fps)</li> <li>○ up to 43.30 frames (24 fps)</li> <li>○ up to 45.00 frames (25 fps)</li> <li>○ up to 53.95 frames (29.97 fps)</li> <li>○ up to 54.00 frames (30 fps)</li> </ul> </li> </ul>
<b>MOD</b>	Steps through the delay time modes above.
<b>TAP</b>	Click this button repeatedly to enter the delay time automatically.
<b>ON</b>	Switches the plug-in on or off

## Operation

To delay a signal by a specific value (for example, to delay an audio signal to match picture delayed by 12 frames):

1. Select the **ON** button (yellow) so that the Delay section is in circuit.
2. Set the MIX control to 100% so that only delayed signal is output from the plug-in.
3. Make sure that the FEEDBK control is set to 0% so that there are no feedback loops.
4. Now enter the delay time using the DELAY control.

You can change the entry mode to frames by clicking on the **MOD** button to cycle through to the desired frame option:

- **FR23.98** = 23.98 frames per second
- **FR24** = 24 frames per second (film)
- **FR25** = 25 frames per second (PAL or SECAM TV)
- **FR29.97** = 29.97 frames per second (drop frame NTSC)
- **FR 30** = 30 frames per second (non-drop frame)

You can also access these options by right-clicking on the delay time.

Alternatively, to use the delay as an effect (for example, to add delay to a vocal channel):

1. Select the **ON** button (yellow) so that the Delay section is in circuit.
2. Set the MIX control to 25% so that you have a mix of dry and wet signal.
3. Enter the delay time using the DELAY control.

For our example, it might be nice to tap in the tempo, so click on the **TAP** button repeatedly in time to the music. The delay time is automatically calculated.


You can see the tempo entered in beats per minute by pressing the **MOD** button until you reach the BPM option shown opposite.



### 16.4.5 Expander

This plug-in reproduces the signal processing of Lawo's mc<sup>2</sup> Expander section.

#### Parameters

<b>ATTACK</b>	Attack time from 100µs to 250ms.
<b>RLS</b>	Release time from 1ms to 10s.
<b>LAHDLY</b>	Look Ahead Delay from 0 to 10ms.
<b>RATIO</b>	Ratio from 0.10:1 to 1:1.
<b>THRS</b>	Threshold from -80dB to 0dB.
<b>FLOOR</b>	Floor level from -40dB to 0dB
	Mono or stereo operation.
<b>ON</b>	Switches the plug-in on or off.



#### Operation

The action of the expander is best described by looking at the top of the plug-in window:

- **GAIN** - the amount of GAIN applied by the expander.
- **Graph** – a graphical overview of the expander settings.
- **IN** and **OUT** – the input and output signal levels to and from the expander plug-in (the power-sum of left and right channels).


As you adjust your settings, the yellow bouncing ball on the graph shows momentary input level versus gain.

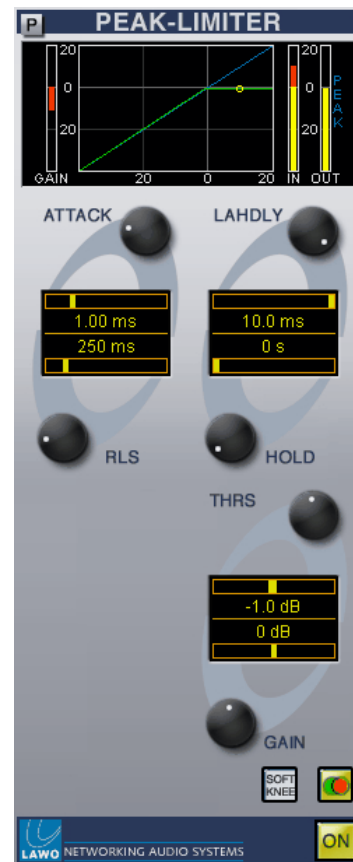
The **GAIN** reduction metering follows the attack and release settings. So, if you have a very fast attack, the metering will reflect this.

### 16.4.6 Limiter

This plug-in reproduces the signal processing of Lawo's mc2 Limiter section: an excellent peak limiter with look ahead delay.

#### Parameters

<b>ATTACK</b>	Attack time from 100µs to 20ms.
<b>RLS</b>	Release time from 10ms to 10s.
<b>LAHDLY</b>	Look Ahead Delay from 0 to 10ms.
<b>HOLD</b>	Hold time from 0 to 500ms.
<b>THRS</b>	Threshold from -20dB to +20dB.
<b>GAIN</b>	Make-up gain from -20dB to +20dB
<b>SOFT KNEE</b>	Hard or soft knee operation.
	Mono or stereo operation.
<b>ON</b>	Switches the plug-in on or off.



#### Operation

The action of the limiter is best described by looking at the top of the plug-in window:

- **GAIN** - the amount of GAIN reduction applied by the limiter.
- **Graph** – a graphical overview of the limiter settings.
- **IN** and **OUT** – the input and output signal levels to and from the limiter plug-in (the maximum peak level of left or right channels).

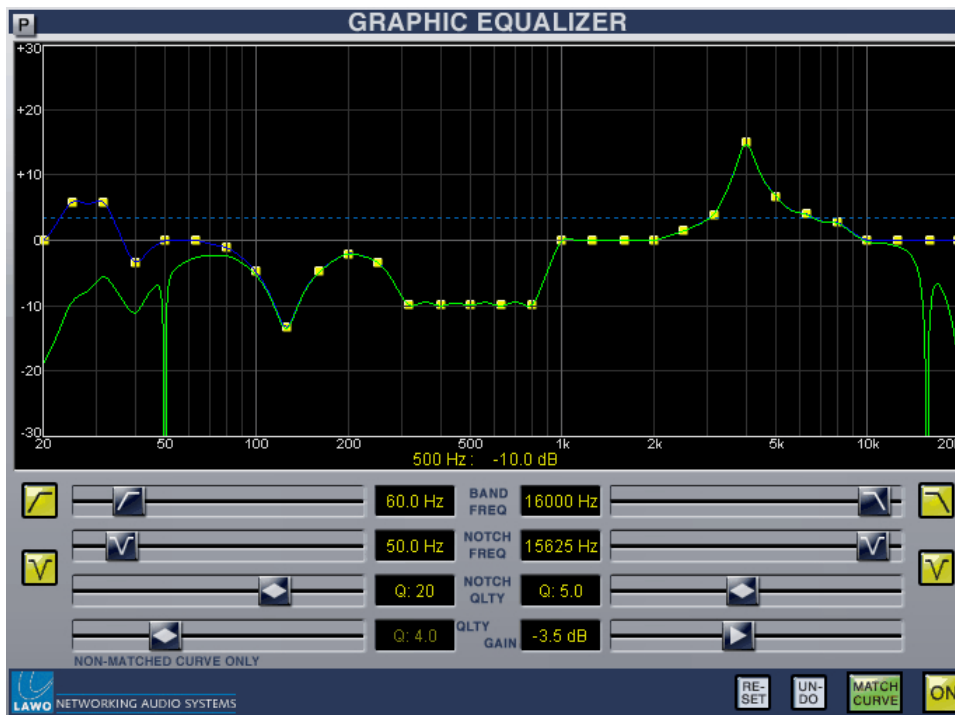
As you adjust your settings, the yellow bouncing ball on the graph shows momentary input level versus gain.

For best results you should give the limiter the chance to 'see' signal peaks in advance by setting a look ahead delay (LAHDLY) of around 5ms.

The **GAIN** reduction metering follows the attack and release settings. So, if you have a very fast attack, the metering will reflect this.

### 16.4.7 Graphic Equaliser

This plug-in is a fully adjustable 31-band graphic equaliser ideal for controlling feedback or room tones. It includes additional filters for high-pass, low-pass and double notch filter operation.



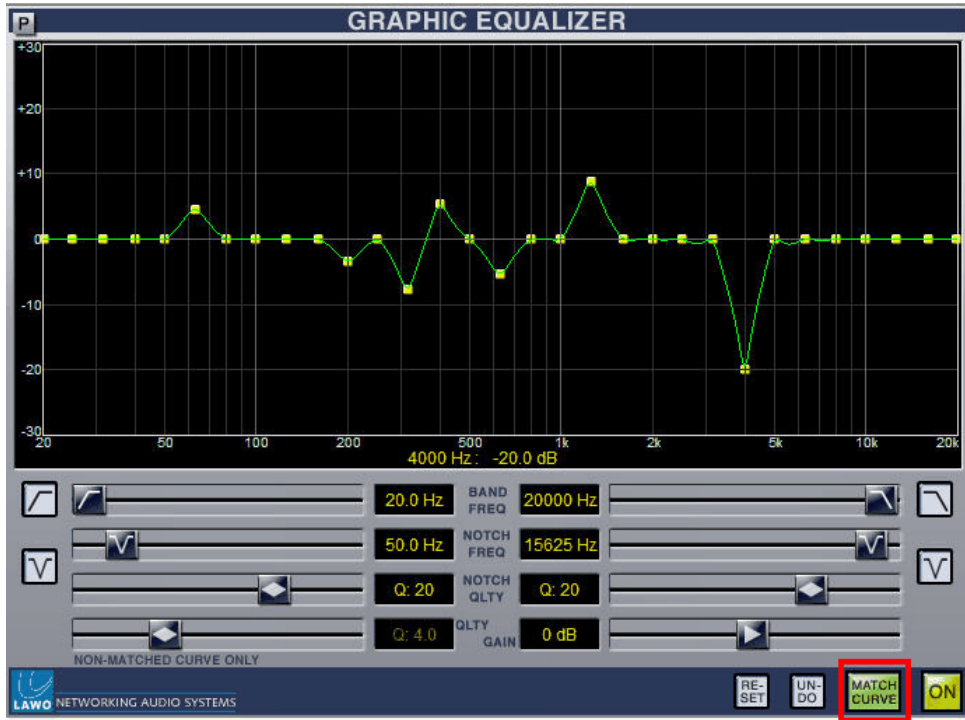
#### Graphic EQ: Basic Operation

This plug-in provides 31 fixed frequency bands spaced one third of an octave apart from 20Hz to 20kHz. You may adjust the gain of each band individually, and/or use the quick-buttons to action an additional filter function – high pass, low pass and two notch filter bands.

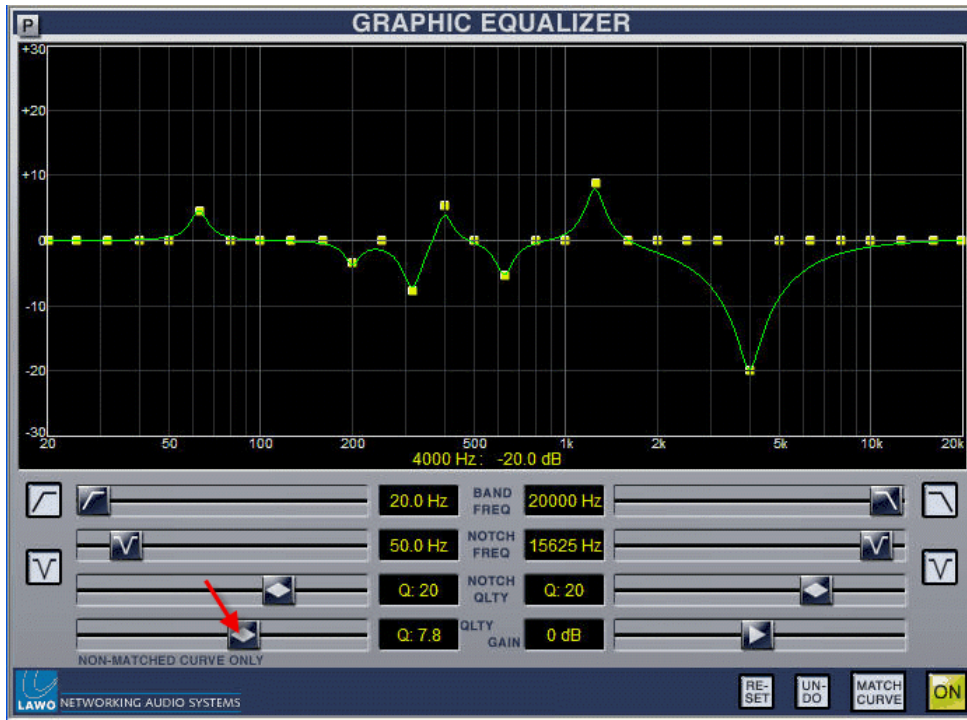
1. Select the **ON** button (yellow) so that the EQ is in circuit.
2. Click and drag on the yellow frequency nodes within the graph area to adjust the gain at a specific frequency.

Gain may be adjusted from -20dB to +20dB for each band.

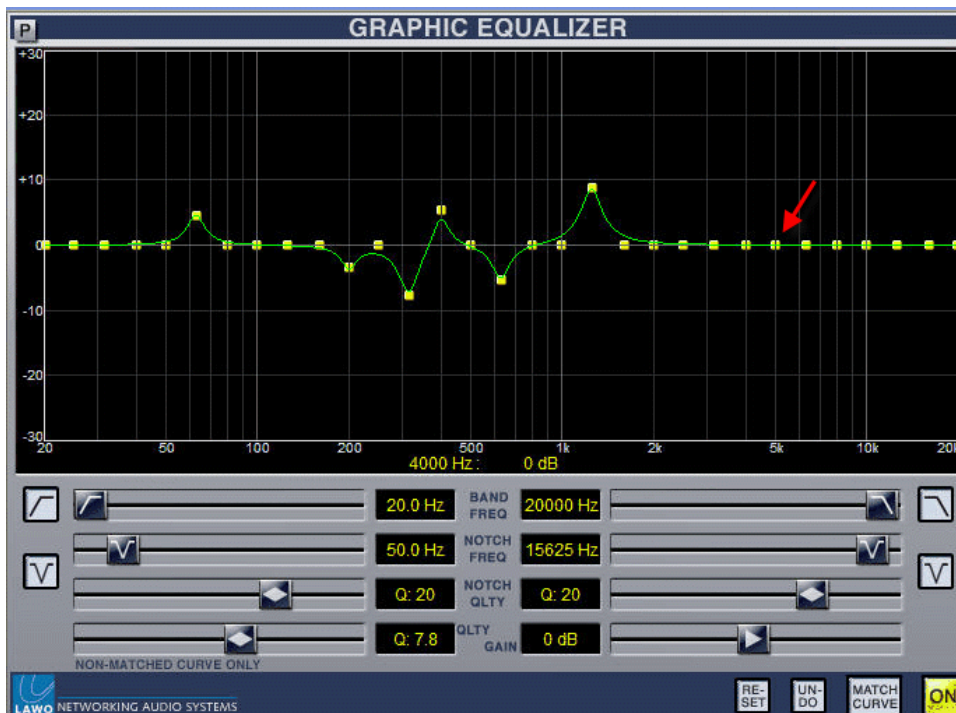
3. If you want the curve to follow your frequency nodes precisely, then select the **MATCH CURVE** button (green):



4. Alternatively, you can create a smoother curve by turning MATCH CURVE off and adjusting the QLTY slider to adjust the quality (Q) of all frequency bands:



5. To reset an individual frequency band to 0dB, press and hold [CTRL] and click on a yellow node:

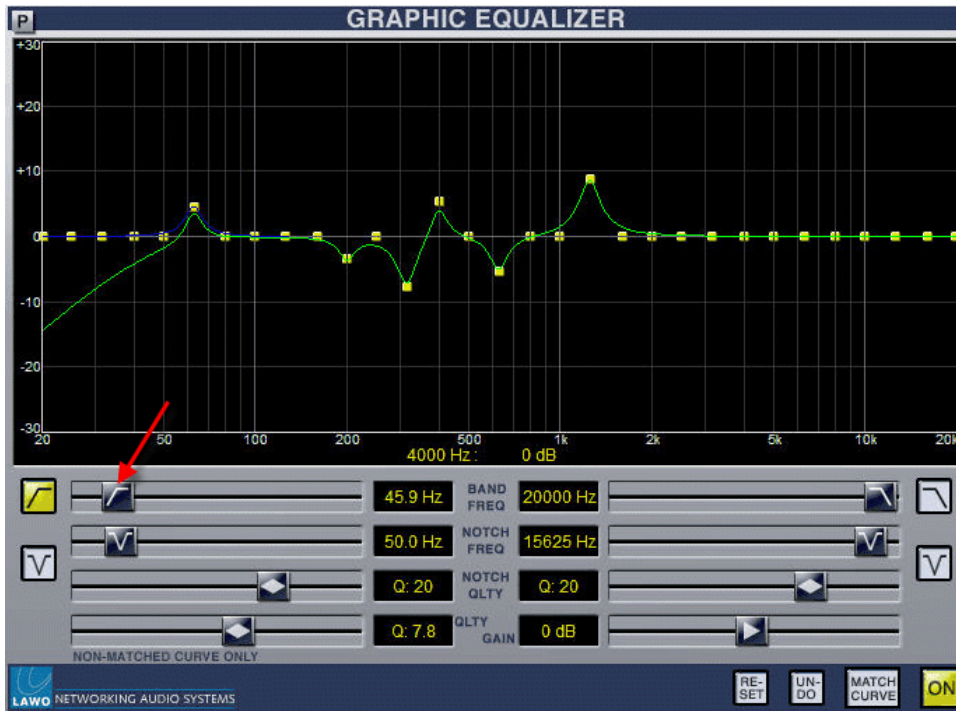


### Graphic EQ: Using the Additional Filters

To achieve a high-pass, low-pass or notch filter quickly, there are a number of quick buttons in the lower part of the plug-in window:

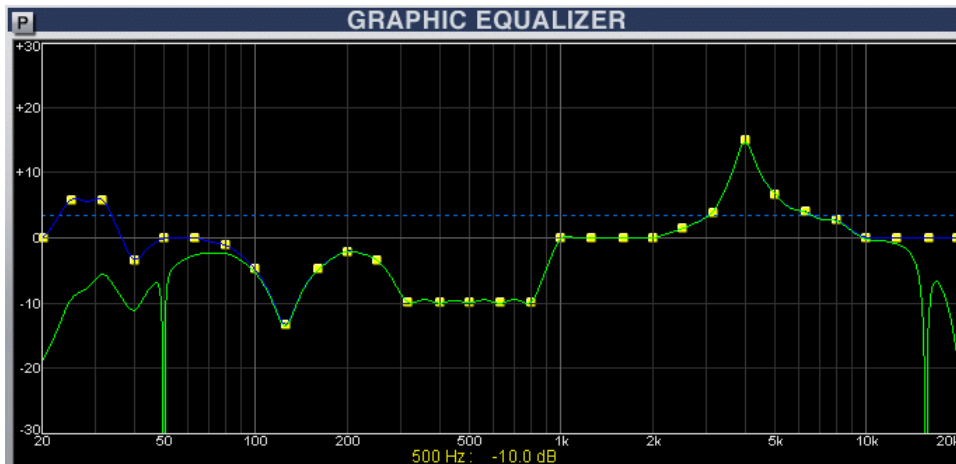
1. To add a high-pass filter, select the appropriate quick button and adjust the BAND FREQ slider to set the roll-off frequency:



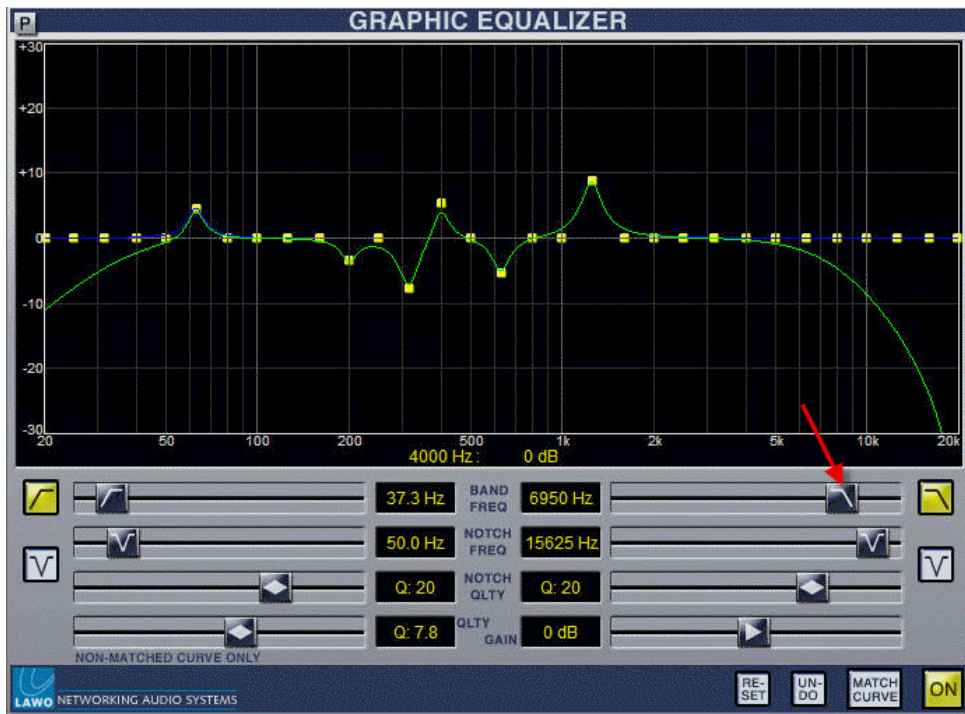


Note that your filter settings are superimposed over the existing 31-band graphic EQ curve; you can still adjust individual frequency bands by clicking and dragging on the yellow nodes.

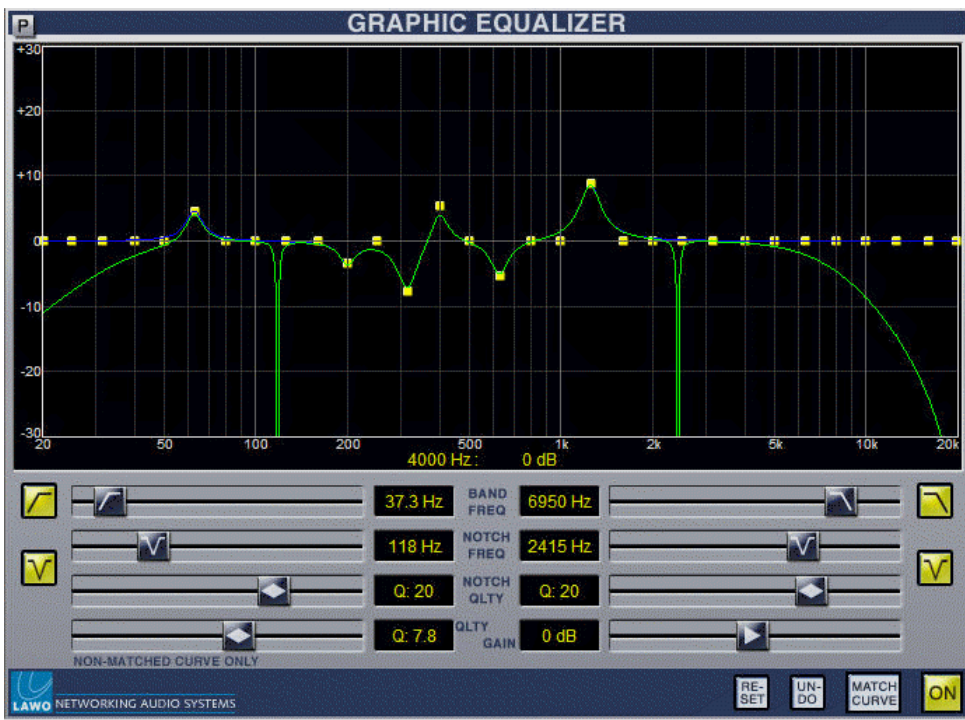
The 31-band Graphic EQ settings are indicated by the blue line; the combined EQ curve is the green line:



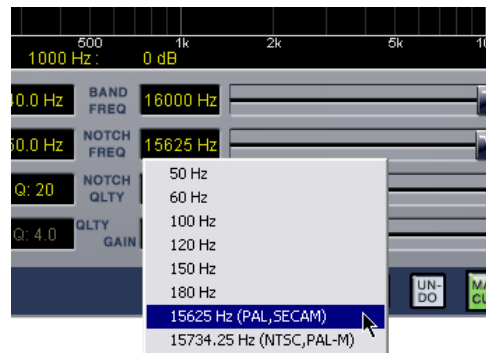
- To add a high-pass filter, select the High Pass quick-button and adjust its BAND FREQ slider:



- You can also add up to two notch filters and adjust the NOTCH FREQ and NOTCH QLTY for each:

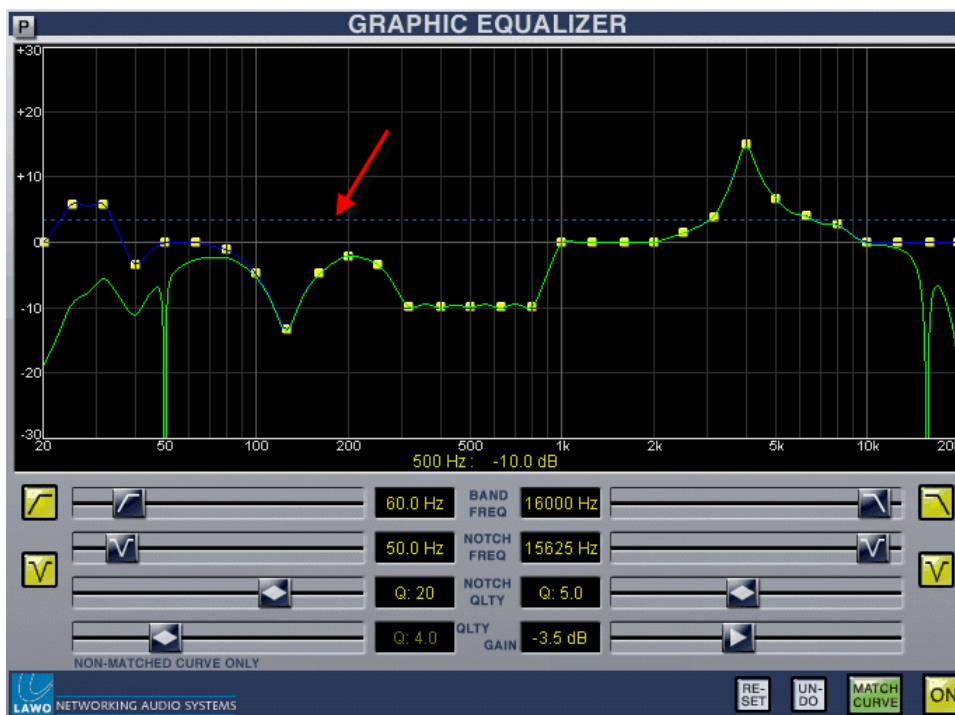


Right-click on the NOTCH FREQ value (e.g. 15625Hz) to select a specific frequency from the drop-down menu:



### Graphic EQ: Other Controls

1. Use the GAIN slider to boost or cut the output level from the Graphic EQ plug-in. If the GAIN is adjusted (not 0dB), then this is represented by a dotted blue line:



2. Select the **RE-SET** button to reset all frequency bands to 0dB.

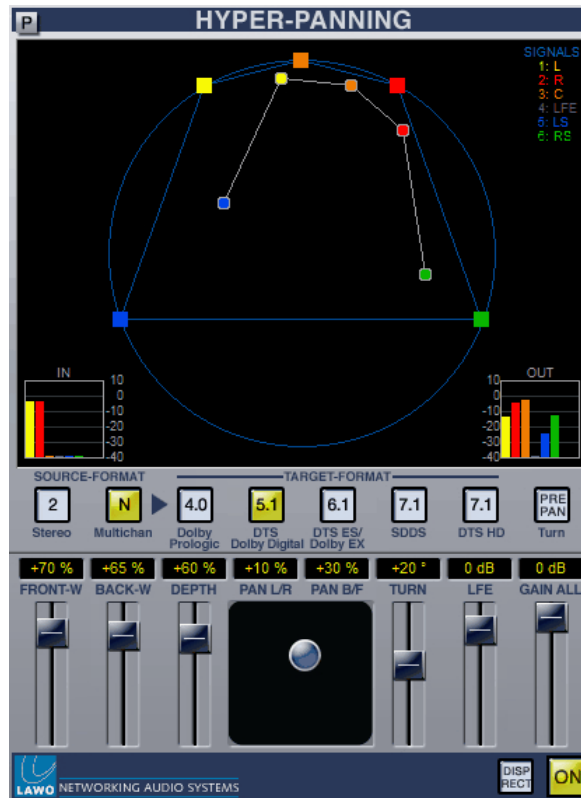
Note that this button only resets the frequency bands, and does not deselect any high-pass, low-pass or notch filter quick-buttons.

3. If you select **RE-SET** by accident, select **UN-DO** to undo the reset!

### 16.4.8 Hyper Pan

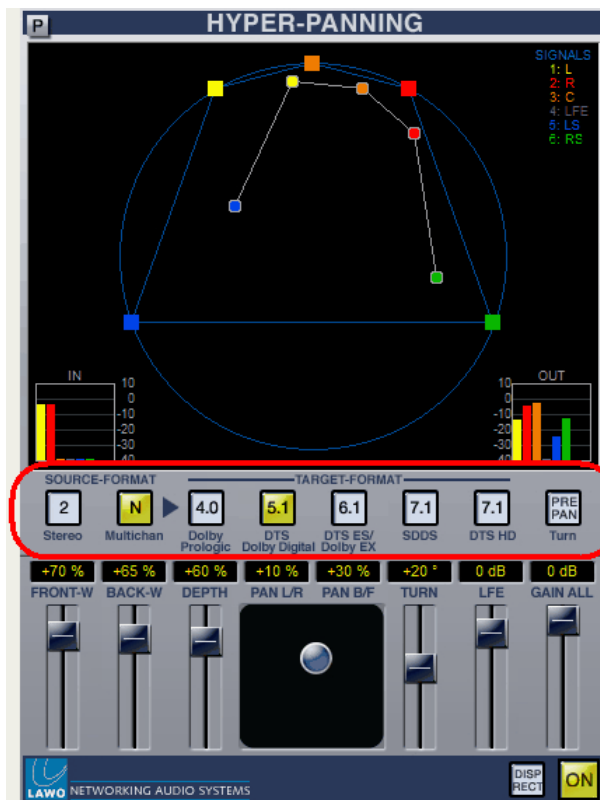
This plug-in faithfully reproduces the Hyper Pan controls found on Lawo's mc<sup>2</sup> mixing consoles, and is a unique tool for controlling source positioning within a surround field.

The tool has many applications, for example, you may have to deal with a surround microphone where the left and right inputs are out of phase, or maybe you wish to rotate the surround source around the sweet spot axis.



### Hyper Pan: Sources & Targets

Hyper Pan can take any mono, stereo or surround input, and control its pan position to a surround output. The choice of input and output formats is made using the SOURCE-FORMAT and TARGET-FORMAT buttons:



You may select:

- SOURCE-FORMAT – stereo (2) or multichannel (N).

- TARGET-FORMAT – any one of:
  - 4.0 Dolby ProLogic
  - 5.1 Dolby Digital and DTS
  - 6.1 Dolby EX and DTS ES
  - 7.1 SDDS
  - 7.1 DTS HD

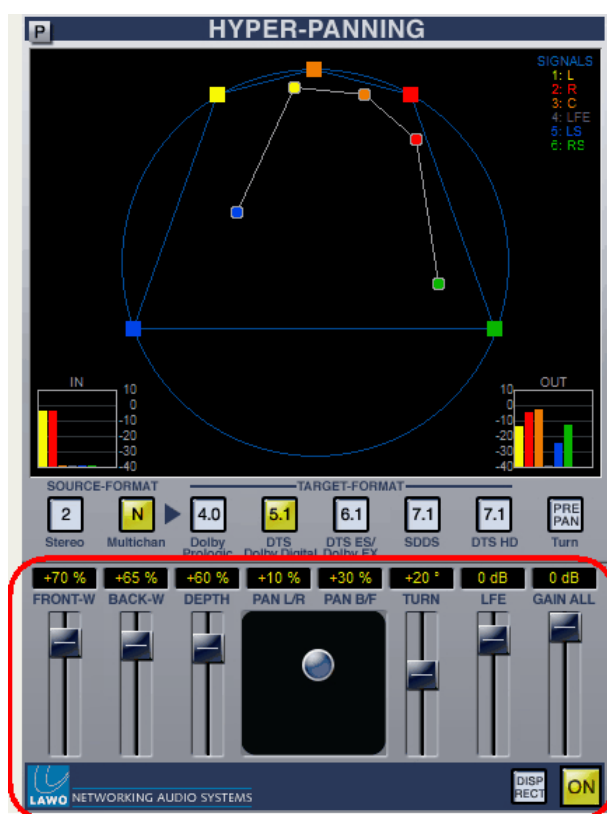
Note that this plug-in utilises 8 inputs and 8 outputs. Therefore, after selecting your SOURCE and TARGET formats, make sure that the inputs and outputs to the plug-in are assigned correctly within your host DAW application. Please consult your host application documentation for details.

In our example, we are operating with a 5.1 TARGET format and therefore should assign output 1 to Left, output 2 to Right, output 3 to Centre, and so on. The correct assignments for your chosen TARGET format are always displayed under the **SIGNALS** list at the top right of the plug-in window.

This list also acts as a key to the colour coded nodes within the surround field – in our example, Left is yellow, Right is red, Centre is orange and so on.

### Hyper Pan: Parameters

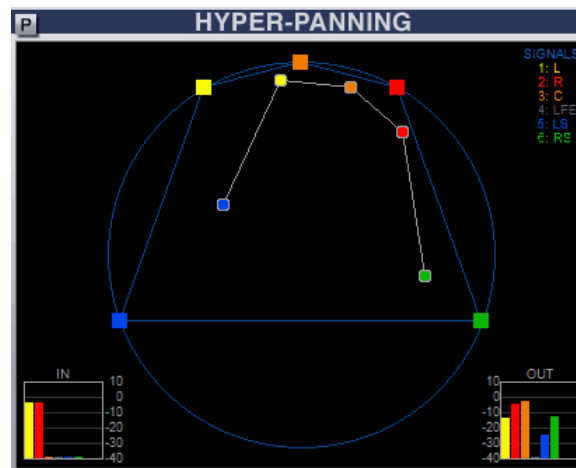
Having selected a [source and target](#) format, you can then use the sliders and on-screen joystick to adjust the following parameters:



<b>FRONT-W</b>	Front Width from +100% to -100%
<b>BACK-W</b>	Back Width from +100% to -100%
<b>DEPTH</b>	Depth from +100% to -100%
<b>PAN L/R</b>	Left to Right pan position (X).
<b>PAN B/F</b>	Front to Back pan position (Y).
<b>TURN</b>	Use this parameter to turn the source from +180° to -180°.
<b>LFE</b>	Low Frequency Effect (Subwoofer) Level from off to +15dB.

<b>GAIN ALL</b>	Reduces the gain of all output channels from 0dB to -20dB.
<b>PRE PAN</b>	When selected, TURN operates pre pan (i.e. relative to the sweet spot and not the current XY pan position).
<b>DISP RECT</b>	Changes the graphical view of the surround field from a circle to a rectangle.
<b>ON</b>	Switches the plug-in on or off.

The action of Hyper Pan is best described by looking at the top of the plug-in window:



- **IN** and **OUT** – the input and output signal levels to and from the plug-in (up to 8 inputs and 8 outputs).
- **SIGNALS** – shows the input and output order as selected by your TARGET-FORMAT. In our example, we have selected **5.1**.
- **Surround field** – shows the position of each input (L, C, R, etc.) in relation to the output format. Each node is colour coded. In our example, the colours are:
  - Yellow = Front Left
  - Orange = Front Centre
  - Red = Front Right
  - Blue = Surround Left
  - Green = Surround Right

To fully explain each Hyper Pan parameter, it is best to use some examples...

### Hyper Pan: on a Surround Source

This example controls the positioning of a 5.1 source to a 5.1 output.

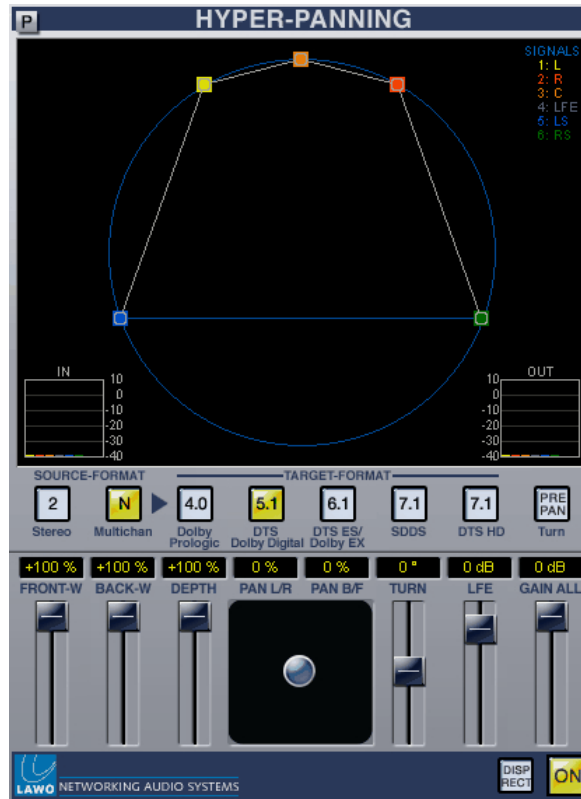
1. Make sure the **ON** button is selected (yellow) so that the plug-in is active.
2. Select **N** as the SOURCE-FORMAT and check the assignment of your 6 input channels (Left, Right, Centre, etc.) to the Hyper Pan plug-in.
3. Select **5.1** as the TARGET-FORMAT and check the output assignments from the plug-in.

Each host DAW application has its own method for assigning inputs and outputs to plug-ins. Therefore, please consult your DAW documentation for details.

We will assume that you are starting from the default settings.

4. To reset the parameters, press and hold **[CTRL]** and then click on a slider or on the joystick control to reset each individual parameter.

Your Hyper Pan window should look as follows:



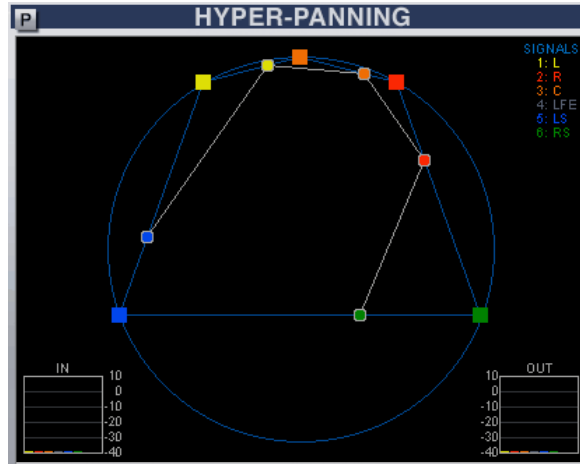
Note that Hyper Pan is affected by the current joystick (X/Y) pan position. The default starting point is the sweet spot (X = 0 and Y = 0).



The following examples look at the affect of each Hyper Pan control. In each case, the control is reset before adjusting the next to show the affect of each parameter. However, you may combine parameters as you wish.

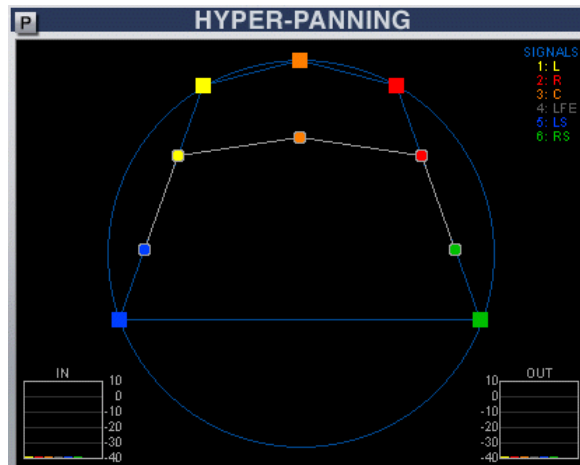
➤ **TURN**

This parameter rotates the surround source within the surround field. It can be adjusted from 0 degrees to +180 or -180 degrees. Our example shows a turn of +30°:



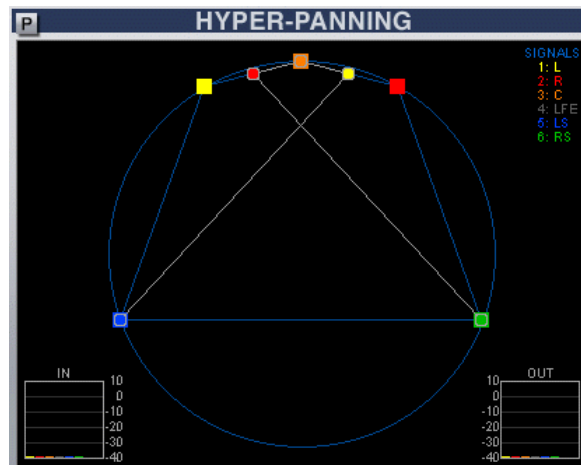
➤ **DEPTH**

This parameter reduces the depth of the surround source with respect to the sweet spot. It can be adjusted from +100% through 0% (all nodes are aligned at the sweet spot) to -100% (front and rear nodes are reversed). Our example shows the depth reduced to +40%:



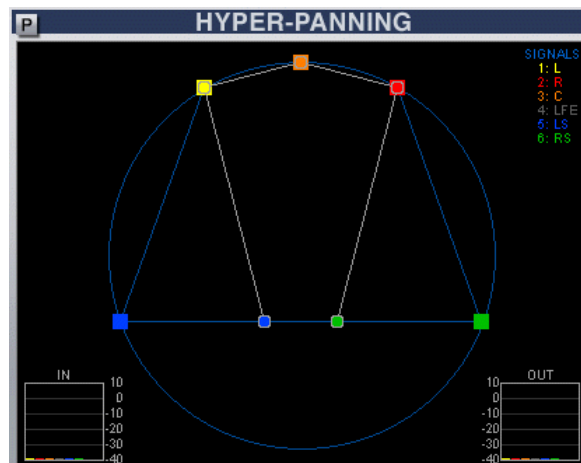
➤ **FWIDTH (Front Width)**

This parameter adjusts the width of the front channels. It can be adjusted from +100% (full width) through 0% (all channels centered) to -100% (left and right channels are reversed). Our example shows a Front Width of -50%:



➤ **BWIDTH (Back Width)**

This parameter adjusts the width of the rear channels. It can be adjusted from +100% (full width) through 0% (all channels centered) to -100% (left and right channels are reversed). Our example shows Back Width set to +20%:



➤ **Adjusting the Sweet Spot and Combining Parameters**

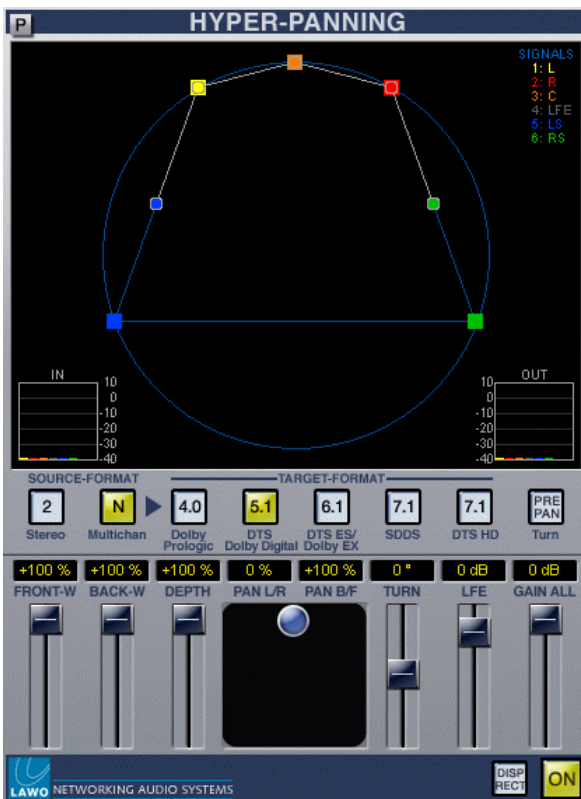
You may use the joystick to reposition the sweet spot – the example below (left) shows all parameters set to their defaults, but with the joystick position set forward, effectively bringing the surround channels closer to the front field.

If you now adjust the **TURN** control, you will find that the surround source rotates around front centre (the current joystick position).

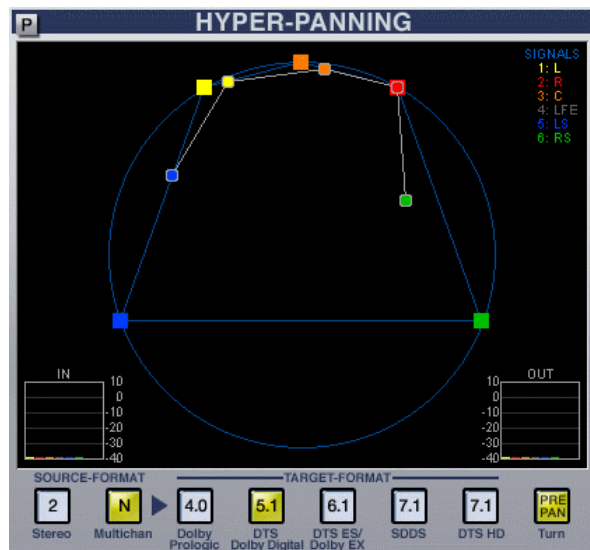
When the X/Y pan position moves away from the central sweet spot, then **TURN** is dependent on the **PRE PAN** button:

- **PRE PAN** off – the surround source rotates around front centre (the current joystick position) as above.
- **PRE PAN** on – allows you to turn to surround source relative to the central sweet spot, and then position the rotated source:

*Parameters Reset + Joystick Forward*



*TURN (PRE PAN on)*



**Hyper Pan: on a Mono Source**

You can also use Hyper Pan to control the positioning of an individual channel within the surround field. Select **N** as your SOURCE-FORMAT but assign your mono source to the Centre input (e.g. input 3).

The position of the Centre channel now reflects the position of your mono source within the surround field.

**Hyper Pan: on a Stereo Source**

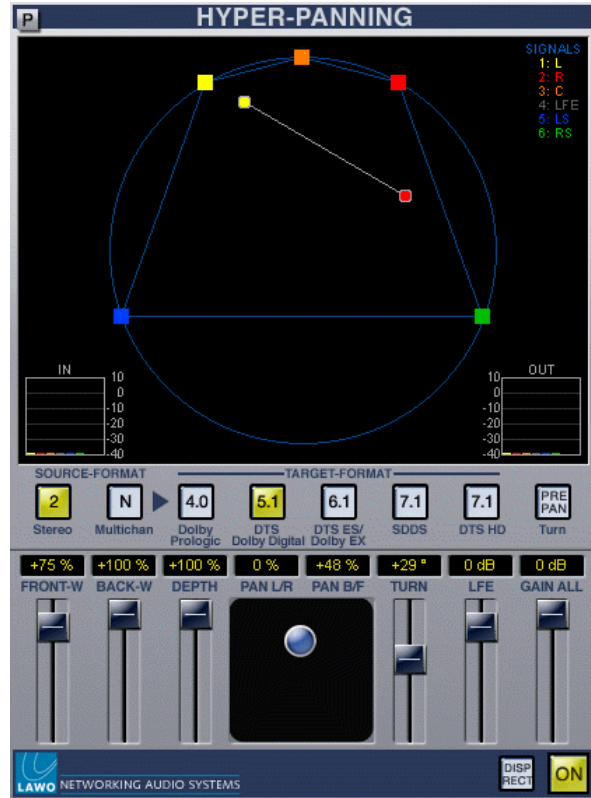
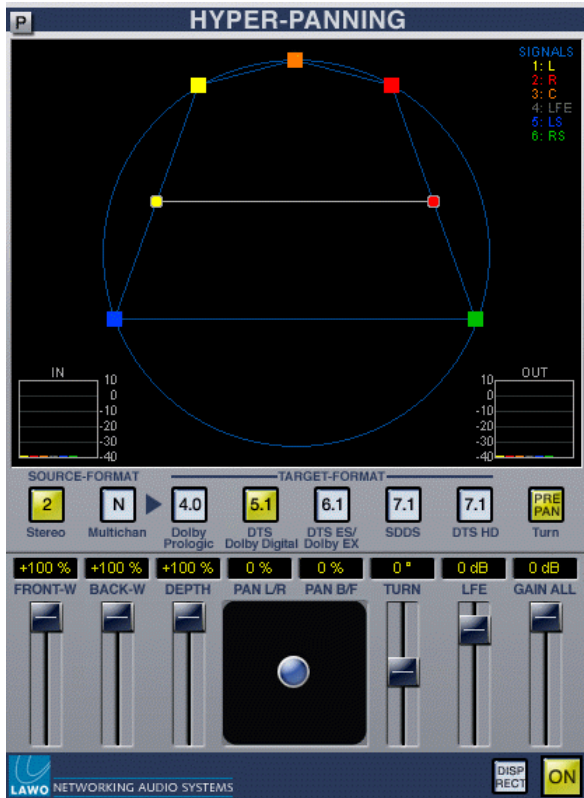
To use Hyper Pan on stereo channels, select the **2** (stereo) SOURCE-TARGET button.

The example below shows the starting position of a stereo source with all parameters reset.

Use the **TURN** control to rotate the stereo source around the joystick position, and **FRONT-W** to adjust the stereo width:

*Parameters Reset*

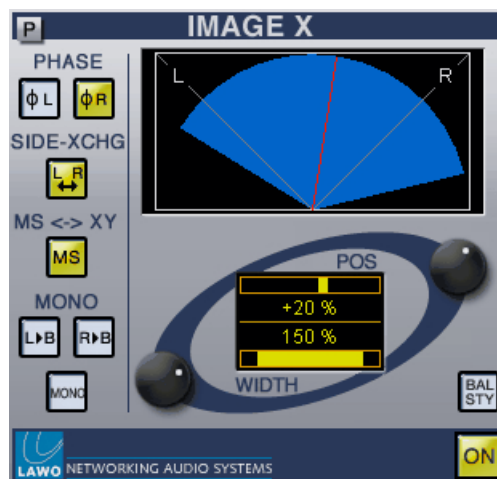
*TURN & FRONT-W*



### 16.4.9 Image Control

This plug-in is based on a combination of Lawo's mc<sup>2</sup> Image and Input Mixer sections, and is specifically designed for stereo signals.

The Image controls on the right are a great tool for controlling stereo width and image. The Input mixer buttons on the left provide phase reverse, left/right reverse, MS encoding/decoding and mono compatibility functions.




#### Input Mixer

The Input mixer controls on the left of the plug-in window can be used as follows. Remember to select the **ON** button (yellow) so that the plug-in is active.

##### ➤ Phase Reverse

Select the  $\emptyset$  L or  $\emptyset$  R buttons to reverse the phase of either the left or right channel.

➤ **Left/Right Reverse**

Select the  button to reverse the left and right inputs of the stereo channel.

➤ **MS Encoding/Decoding**

Select **MS** to encode or decode sources using sum and difference coding (Sum to Left, Difference to Right).

➤ **Mono Compatibility**

Use the MONO buttons to deal with problem stereo sources which are not stereo:

1. Select either **L>B** or **R>B** to route either the left or right source to both sides of the plug-in channel. You can use the buttons to deal with situations where either the left or right source signal has disappeared.
2. Select the **MONO** button to sum the Left and Right inputs.

### Image Control

The Image controls adjust the position and width of the stereo channel, and operate in one of two styles:

- **BAL STY** off – the width of the stereo image is retained while the **POS** control offsets the position within the stereo field.
- **BAL STY** on – the **POS** control collapses the width of the stereo image towards the left or right.

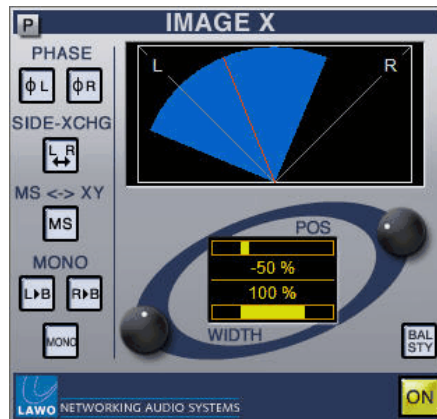
To adjust the stereo width and positioning:

1. Select the **ON** button (yellow) so that the plug-in is active.
2. Make sure **BAL STY** off.
3. Use the **WIDTH** control to widen or narrow the stereo image.

The graph updates to show your changes by narrowing or widening the blue image area.

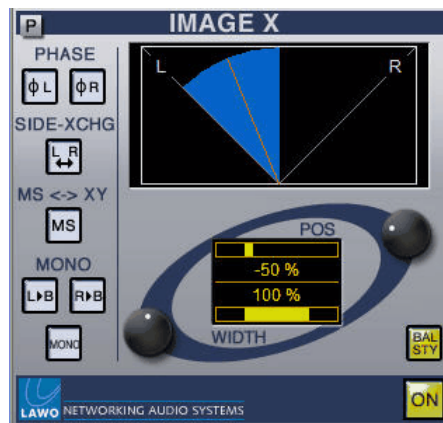
4. Now adjust the **POS** control to move the narrowed or widened image within the stereo field.

Note how the image width is retained, and the red line on the Image graph moves as you adjust this control to represent the direction of the image control:



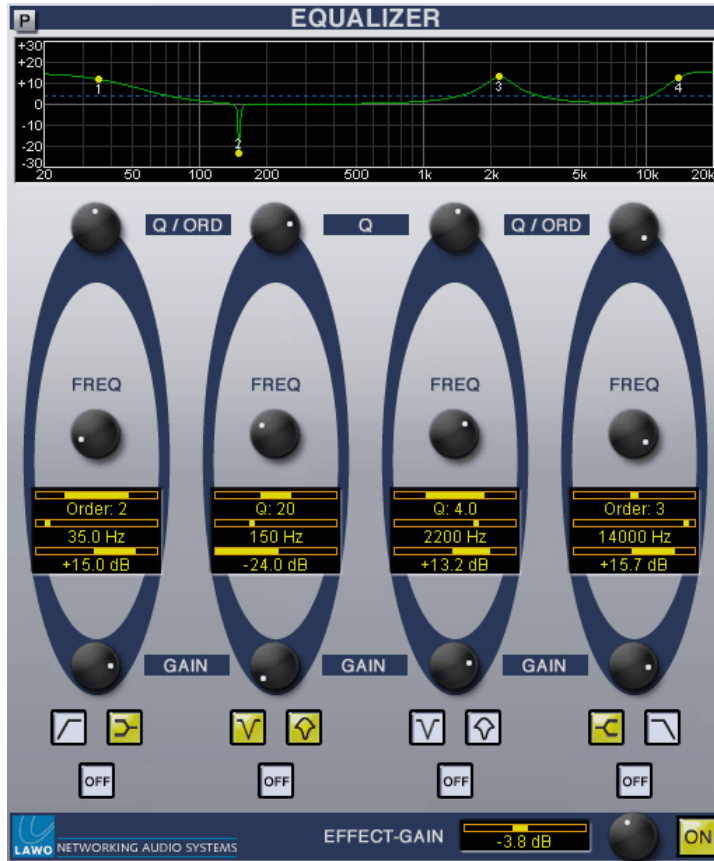
5. Now turn on the **BAL STY** button and adjust the **POS** control.

This time the stereo width collapses as indicated by the narrowing blue area on the graph:



### 16.4.10 Parametric Equaliser

This plug-in faithfully reproduces the signal processing of Lawo's mc<sup>2</sup> EQ section: a 4-band parametric equaliser featuring bell, constant Q, notch, shelving and pass band filter types.



#### Parameters

For each band of EQ:

<b>Q / ORD</b>	Quality from 0.1 to 80 (parametric EQ) Or, when operating as a shelving or high/low pass filter, this control sets the order: <ul style="list-style-type: none"> <li>• Order 1 = 6dB per octave.</li> <li>• Order 2 = 12dB per octave</li> <li>• Order 3 = 18dB per octave</li> </ul>
<b>FREQ</b>	Frequency from 20Hz to 20kHz.
<b>GAIN</b>	Gain from -24dB to +24dB
<b>EQ Type</b>	The two outer bands may operate as: <ul style="list-style-type: none"> <li>• Constant Q (all buttons off)</li> <li>• Shelving EQ (shown opposite)</li> <li>• High or Low pass Filter</li> </ul> The two inner bands may operate as: <ul style="list-style-type: none"> <li>• Constant Q (shown opposite)</li> <li>• Notch</li> <li>• Bell</li> </ul>
<b>OFF</b>	Switches the band of EQ on or off. Use this button to switch an individual band out of circuit.

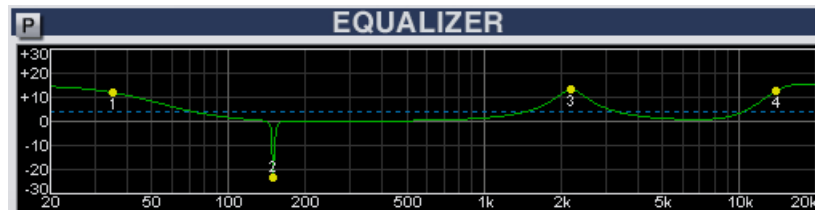
For the complete EQ section:

<b>EFFECT-GAIN</b>	Gain (boosts the output gain of the EQ section) from -24dB to +24dB.
<b>ON</b>	Switches the plug-in on or off.

### Operation

All 4-bands of EQ operate across the full frequency range (20Hz to 20kHz), and offer a variety of different EQ types.

The centre, or corner, frequencies for each band (1 to 4) are displayed within the EQ graph at the top of the plug-in window:



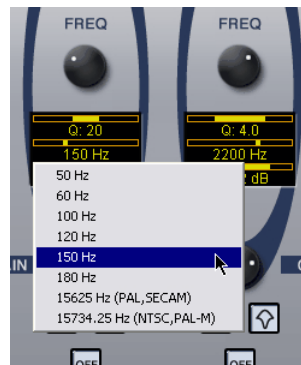
To apply EQ to a signal:

1. Select the **ON** button (yellow) so that the EQ section is in circuit.
2. Make sure that the **OFF** buttons are deselected so that each band of EQ is in operation.
3. Select the EQ type for each band.
4. Adjust your GAIN, FREQ and Q or ORDER parameters.

Note that the ORDER control offers three positions:

- **Order 1** = 6dB per octave.
- **Order 2** = 12dB per octave.
- **Order 3** = 18dB per octave.

Right-click on a frequency value (e.g. **150Hz**) to select from the drop-down menu – this is great for selecting specific frequencies for a notch filter:



5. Use the **OFF** buttons to switch an individual band on/off.
6. Press and hold **[CTRL]** and then click on a rotary control to reset an individual parameter.
7. Use the EFFECT-GAIN control to adjust the output level from the EQ plug-in.



## 17. Glossary

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<b>48kHz or 44.1kHz</b>	See Sample Rate.
<b>ASIO</b>	Audio Stream Input/Output A computer sound card driver protocol for digital audio. Most professional interfaces and applications use ASIO drivers to achieve low latency.
<b>Audio 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>Bargraph</b>	An optical display instrument in the shape of a LED bar for displaying signal level.
<b>dB</b>	deciBel A unit of transmission giving the ratio of two powers. The number of bels is the logarithm to the base 10 of the ratio of the two powers. One decibel equals one tenth of a bel.
<b>dBu</b>	dBu is used to describe levels within the analogue domain, and is a measure of absolute voltage level based on 0dBu = 0.775 Volts (RMS). dBu is often used to indicate nominal broadcast operating levels. For example, in the EBU normal broadcasting level = +6dBu.
<b>dBFS</b>	dB Full Scale dBFS is used to describe levels within the digital domain. 0dBFS describes the system's internal clipping point; this is the maximum level which may be handled by the system without signal distortion. For example, your system may be set for +18dBu = 0dBFS. If your normal broadcast level is +6dBu then this leaves an operating headroom of 12dB.
<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.
<b>DLL</b>	Dynamic Link Library An alternative file type to .exe, used in computing to run installer applications in Windows®. In <b>R3LAY</b> , DLLs are used to support the ASIO and MME driver types.
<b>Ember+</b>	A non-proprietary TCP/IP interface protocol. In <b>R3LAY</b> , parameters can be "published" in Ember+, enabling control from a remote device such as a mixing console.
<b>Fader</b>	A potentiometer used to adjust the gain of a signal.
<b>Gain</b>	Adjusting the gain of a signal results in a change in the perceived level or amplitude. An increase in gain (positive values) results in amplification and a reduction in gain (negative values) in attenuation.
<b>GPI</b>	General Purpose Interface (IEEE488) is a standardised platform independent short-range digital interface, to allow switching connections between broadcast equipment from different manufacturers.
<b>Headroom</b>	The amount of operating level which is in reserve between normal operating level and 0dBFS.
<b>HPET</b>	High Precision Event Timer A high precision clock reference provided by your PC.
<b>HTTP</b>	Hypertext Transfer Protocol A networking protocol/URL address, commonly used to exchange or transfer web pages, email, etc.
<b>Insert Point</b>	A connection point which interrupts the signal flow and routes signal to and from the inserted device.

<b>Latency</b>	The amount of time delay between an audio signal entering and emerging from a system.
<b>MME-Interface</b>	Multimedia Extensions Interface (also known as WaveIn/WaveOut) A Windows® driver for digital audio.
<b>Monitor</b>	Term used to describe the outputs and functionality of feeds to loudspeakers or headphones for the purpose of listening to a mix.
<b>ms</b>	milliseconds Unit of time measurement.
<b>NIC</b>	Network Interface Card A computer interface that connects to external network devices.
<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>Overload</b>	Occurs when the signal level is too large for the system, resulting in signal distortion.
<b>PTP</b>	Precision Time Protocol. An ultra-precise, synchronisation method used in data networks. The protocol can be used as the sync reference for all RAVENNA devices in a network.
<b>QoS</b>	Quality of Service The QoS defines the overall performance of a computer network. Several factors are considered: error rates, bandwidth, throughput, transmission delay, availability, jitter, etc.
<b>RAS</b>	Radio Automation System control protocol is Lawo's universal protocol for communication between a mixing console (MIXER) and a radio automation system (RAS).
<b>RAVENNA</b>	A real-time, network-synchronised Audio over IP protocol. RAVENNA offers real-time distribution of audio and other media content within IP-based network environments.
<b>Remote MNOPL</b>	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.
<b>Routing</b>	Signal Routing Term used to describe the connection made between an input and output.
<b>RTSP</b>	Real Time Streaming Protocol A networking protocol/URL address, commonly used in establishing point-to-point media sessions.
<b>Sample Rate</b>	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.
<b>SDP</b>	Session Description Protocol A format for describing streaming media communications parameters.
<b>SIP</b>	Session Initiation Protocol A networking protocol/URL address, commonly used within Voice-over-IP systems.
<b>SOAP</b>	Simple Object Access Protocol. A non-proprietary protocol for XML information exchange. <b>RELAY</b> environments use SOAP scripts to trigger external actions.
<b>TCP</b>	Transmission Control Protocol 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.

<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 an IO to DSP card, or vice versa.
<b>TTL</b>	Time to Live 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>WDM</b>	Windows Driver Model The standard Windows® driver for digital audio. Devices using this driver are presented to <b>RELAY</b> as a single mixed audio stream and pass through the Windows® audio mixer.
<b>WASAPI</b>	Windows Audio Session API (Application Programming Interface) A Windows® driver for digital audio, introduced in Windows Vista.