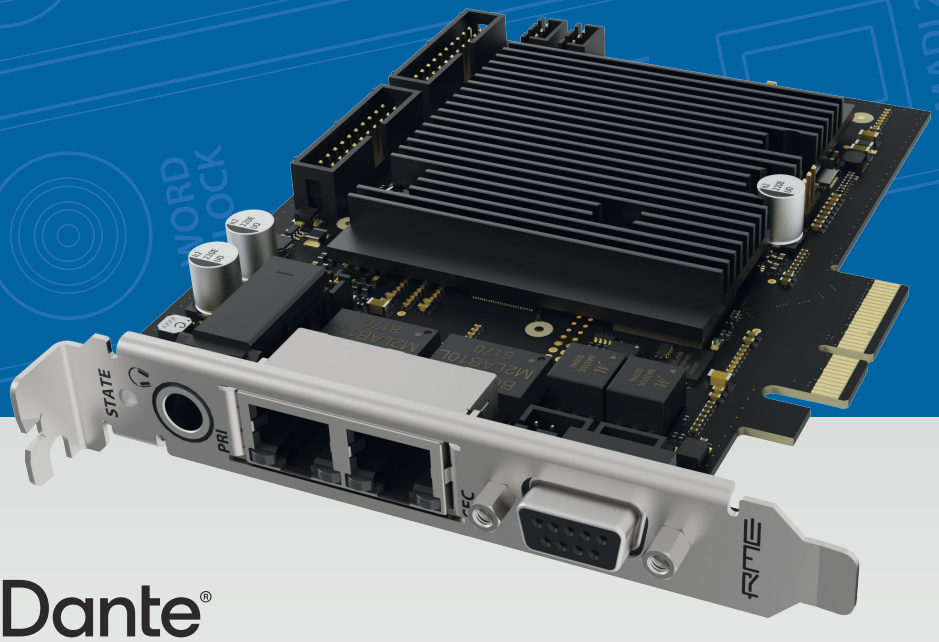
PCI Express **Card**

HDSPe AoX-D

DANTE

512-Channel PCI Express Card
with Dante®



Dante®

User's Guide

RME

RME HDSPe AoX-D User's Guide

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1. Introduction

Thank you for choosing the HDSPe AoX-D. This unique audio system is capable of transferring digital audio data directly into a computer, from any device transmitting Milan® audio streams, and vice versa. Installation is simple, even for the inexperienced user, thanks to the latest Plug and Play technology. The numerous unique features and well thought-out configuration dialogs put the HDSPe AoX-D at the very top of the range of digital audio interface cards. Drivers are available for Microsoft Windows™ and Apple macOS™.

Our high-performance philosophy guarantees maximum system performance by executing as many functions as possible not in the driver (i.e. the CPU), but directly on the HDSPe AoX-D.

1.1. Package Contents

The package of the HDSPe AoX-D contains the following items:

- HDSPe AoX-D card
- AES/MIDI breakout cable
- Internal Sync Cable (3-conductor)
- printed manual

If any item is missing from a factory-sealed package, please contact your support immediately.

Drivers must be downloaded from the internet:
https://rme-audio.de/downloads.html

1.2. System Requirements

- Windows 10 or up, macOS 14 Sonoma or up
- 1 free PCIe x4 slot, four lanes, version 1.1

1.3. Brief Description and Characteristics

- 512 channels 48 kHz/24 bit record/playback
- 256 channels 96 kHz/24 bit record/playback
- 128 channels 192 kHz/24 bit record/playback
- TotalMix 256 x 256 channel mixer with 46 bit internal resolution for latency-free submixes
- SyncAlign guarantees sample alignment and no channel swaps
- SyncCheck tests and reports the synchronization status of input signals
- 1 x MIDI I/O, 16 channels high-speed MIDI
- 1 x AES-3 I/O, 2 channels at up to 192 kHz
- DIGICheck DSP: Level meter in hardware, peak- and RMS calculation
- Optional expansion boards for MADI and Word Clock I/O

1.4. Hardware Installation

To simplify installation, it is recommended to first download and install the drivers (ref. Section 5.1.1, "Driver Installation" for Microsoft Windows™ and Section 6.1.1, "Driver Installation (Apple macOS™)"

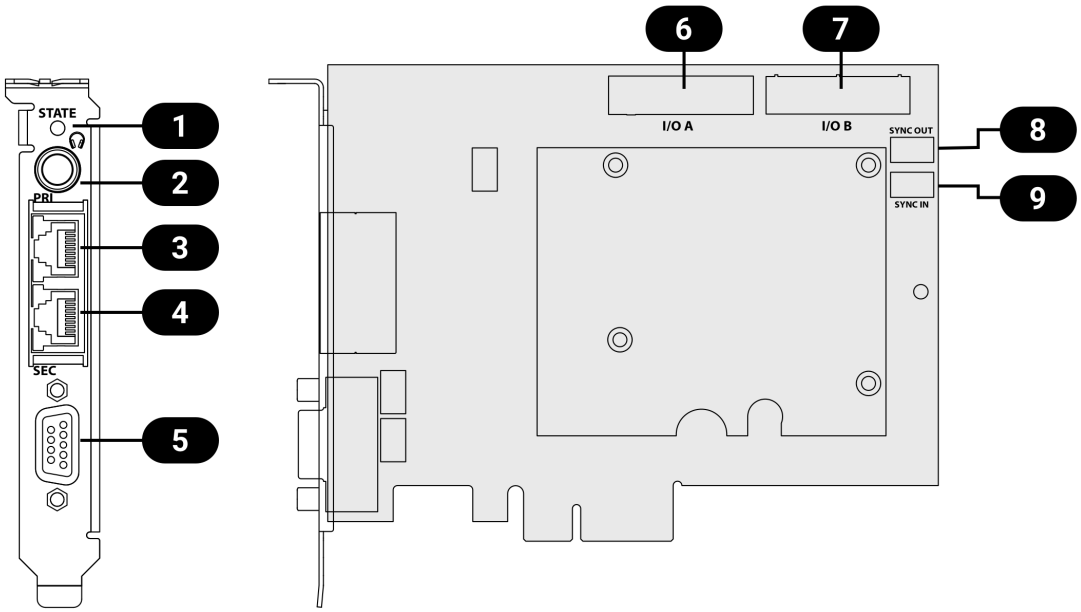
for Apple macOS™) before the unit is connected to the computer. But it will also work the other way round.

Before installing the PCI Express card, please make sure the computer is completely switched off (S5 State). Inserting or removing the card while the computer is in operation can cause irreparable damage to both motherboard and card!

Before removing the HDSPe AoX-D from its protective bag, discharge any static in your body by touching the metal chassis of the PC while it is connected to ground.

1. Disconnect the power cord and all other cables from the computer.
2. Open the computer's enclosure. Further information on how to do this can be obtained from your computer's instruction manual.
3. Insert the HDSPe AoX-D card firmly into a free PCI Express x4 slot and fasten the screw.
4. Close the computer's enclosure.
5. Reconnect all cables including the power cord.

1.5. Hardware Overview



1	Status LED
2	Headphone Output
3	Primary Network Port
4	Secondary Network Port
5	MIDI/AES-3 Breakout port
6	Expansion Port A
7	Expansion Port B
8	Sync Out
9	Sync In

The bracket of the board has two RJ45 network jacks, an analog stereo output via TRS jack (Phones)

and D-Sub connector for the breakout cable, which provides MIDI input and output via 5-pin DIN connectors, and one AES-3 (AES/EBU) input and output with corresponding XLR connectors.

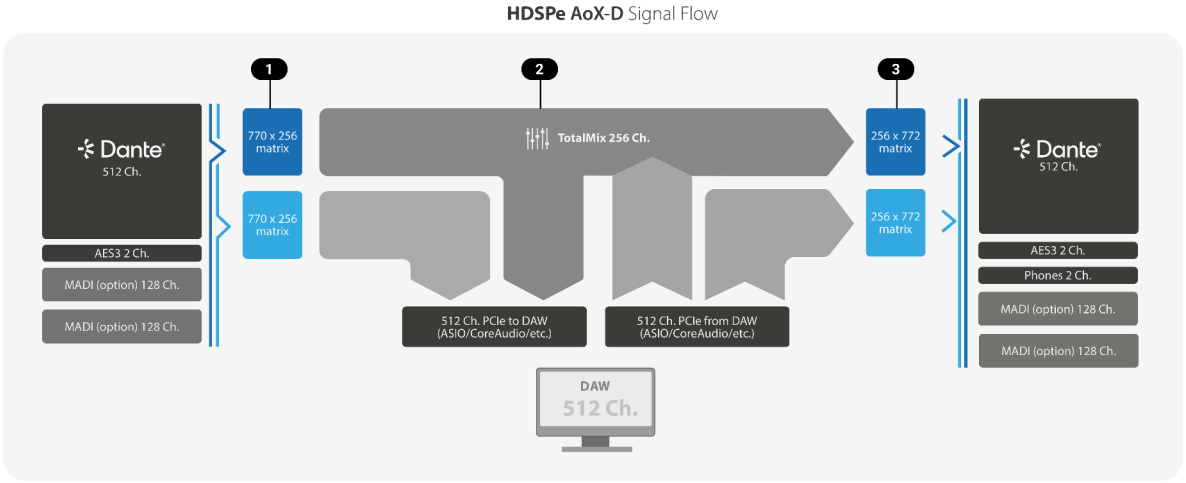
STATE LED by default lit in green to indicate that the network core has been initialized successfully. It flashes in various colors when using the "identify" command from MILAN Manager (helpful to identify a specific card on the network).

Expansion Ports A and B are used to connect optional dual MADI + Word Clock expansion boards.

The **Sync In** connector is used to synchronize to another card.

The **Sync Out** 3-pin connector carries an internal word clock signal.
It can be used to synchronize multiple cards with sample accuracy, and without the need for an external connection. The card where SYNC OUT is used is leader, the one with SYNC IN is follower. In the Settings dialog the slave has to be set to Sync In under **Clock Mode** › **Clock Source**.

1.6. Signal Flow Diagram



The diagram shows the basic signal flow of the HDSPe AoX-D at 48 kHz. The Dante channels are connected externally with a separate routing matrix. The Dante Controller sees this device as a 512 channel transmitter and as a 512 channel receiver, and allows creating connections to and from other Dante devices on the network.

Input matrix 1

Out of up to 770 possible input channels, an input matrix is used to pre-select channels and to define a channel order. In comparison to other HDSPe audio interface cards, this card does not map all available hardware I/O directly to the TotalMix mixing engine. Instead, the driver dialog provides input and output configuration to let the user decide which channels should reach the host computer driver in which order. The first 256 channels can be processed in TotalMix; additional 256 channels are passed directly to the driver.

TotalMix 2

Using a combination of any of the first 256 input channels configured above, up to 128 stereo submixes can be created on the card with ultra low latency and without causing any CPU load on the host computer. It is possible to record these submixes using the Loopback (Section 7.14.5,

"Recording a Submix - Loopback") feature on the DAW. TotalMix also provides numerous features to enhance monitoring (Section 7.6, "Control Room Strip") and can be remote controlled.

Output matrix 3

By default, audio signals played back from the host computer will be transmitted via Dante in the same sequence that the driver shows (Software Playback channel 1-512 are connected to Dante transmitting channels 1-512). However, this routing can be changed using the output matrix, which allows the 512 channels originating from the host computer (up to 256 Mono submixes and 256 additional software playback channels) to be changed in order and mirrored to the optional expansion modules.

At the time of writing, this card does not pass network traffic from its Ethernet ports via PCIe to the computer. To control the Dante connections and individual devices on the network, it is therefore necessary to add an additional network adapter to the host computer and connect it to the Dante network using a switch (or, in case the internal ports are in switch configuration, to one of its network ports).

2. Accessories

RME offers optional expansion modules for the HDSPe AoX-D:

Part Number	Description
AoX-MADI-EXT-BNC	Dual MADI Extension Board with two MADI BNC I/O and Word Clock
AoX-MADI-EXT-SFP	Dual MADI Extension Board with two Multimode LC modules and Word Clock

3. Warranty and Support

3.1. Warranty

Each individual HDSPe AoX-D undergoes comprehensive quality control and a complete test before shipping. The usage of high grade components should guarantee a long and trouble-free operation of the unit.

If you suspect that your product is faulty, please contact your local retailer. Do not disassemble the device by yourself as it may get damaged. It has been sealed with tamper-evident material, and your warranty is void if those seals have been damaged.

The distributor grants a limited manufacturer warranty of 6 months from the day of invoice showing the date of sale. The length of the warranty period is different depending where the product was purchased. Please contact your local distributor for extended warranty information and service. Note that each country may have regional specific warranty implications.

In any case warranty does not cover damage caused by improper installation or maltreatment - replacement or repair in such cases can only be carried out at the owner's expense.

No warranty service is provided when the product is not returned to the local distributor in the region where the product had been originally shipped.

The distributor does not accept claims for damages of any kind, especially consequential damage. Liability is limited to the value of the HDSPe AoX-D. The general terms of business drawn up by the distributor apply at all times.

3.2. Support

Please ensure that you are using the latest firmware before contacting support.

In many cases, the user forum at https://forum.rme-audio.de provides help with a simple search for relevant keywords.

If the problem cannot be solved by any of the aforementioned methods, please have your serial number at hand and contact and your local dealer or distributor. A complete list of distributors can be found on the RME website.

3.3. Support Contacts

Additionally, the following global service centers can provide support assistance:

Europe

Audio AG, Germany
support@rme-audio.de

Synthax U.K.
info@synthax.co.uk

Asia/Australia

RME Trading Ltd., Hong Kong
support@rme-trading.hk

Americas

Synthax Inc., U.S.A.
tech.support@synthax.com

Global

support@rme-audio.de

4. Annex

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Apple, iOS, iPad and macOS are registered trademarks of Apple Inc.
Dante is a registered trademark of Audinate Pty Ltd.
ASIO is a trademark of Steinberg Media Technologies GmbH.

Although the contents of this User's Guide have been thoroughly checked for errors, RME can not guarantee that it is correct throughout. RME does not accept responsibility for any misleading or incorrect information within this guide.

5. Usage under Windows

5.1. Driver and Firmware (Windows)

The HDSPe AoX-D requires a driver to be installed on the host computer. This driver ensures proper communication between the hardware and the software applications.

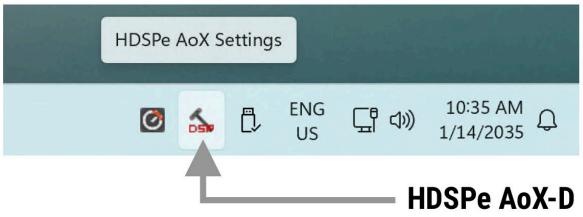
The driver can be downloaded from the official website. Please visit the following link to download the latest version of the driver:

https://rme.to/downloads

5.1.1. Driver Installation

To simplify installation, it is recommended to first install the drivers before the card is built into the computer. But it will also work the other way round.

After downloading the driver, run the installer included in the zip file and confirm each step in the installer. Once the installation is complete, shutdown the computer and install the card. After the HDSPe AoX-D has been installed correctly, and the computer has been switched on, Windows will detect the new hardware and install the drivers automatically.



After a reboot, the icons of TotalMix FX and the Settings dialog appear in the notification area. Depending on the Windows version and configuration, it may be necessary to change the task bar settings so that the tray icons are not hidden.

Driver Updates do not require removal of the existing driver. Simply install the new driver over the existing one.

5.1.2. Uninstalling the Drivers

Uninstalling the HDSPe driver files is generally unnecessary, as Windows does not inherently support driver removal. With full Plug & Play functionality, driver files will cease to load once the hardware is disconnected. If desired, these files can be manually deleted from the system.

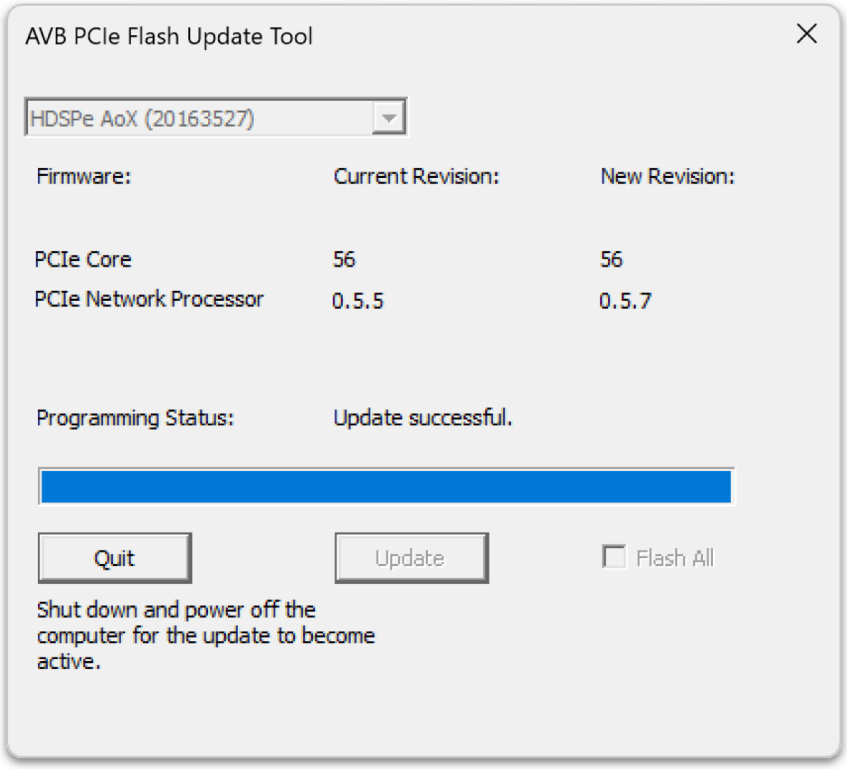
However, Windows Plug & Play does not automatically handle the removal of additional components such as TotalMix autorun entries, the Settings dialog, or the ASIO driver registration. These entries can be removed via the software uninstallation process. To do so, navigate to the Control Panel under Programs and Features (formerly "Software"), and select the entries labeled

- RME HDSPe AoX
- Windows Driver Package - RME HDSPe_AoX

to initiate the uninstallation process.

5.1.3. Updating the HDSPe AoX-D Firmware

The Flash Update Tool (FUT) updates the HDSPe AoX-D to the latest firmware version. It requires a previously installed driver so the card can be detected by the update tool.



To update the firmware with the Flash Update Tool

1. Download the latest Firmware Update Tool from the RME Website and unzip it.
2. Start the program executable file.
   The Flash Update Tool will display the current revision of the HDSPe AoX-D and indicate whether an update is needed. If an update is needed, press the Update button. A progress bar will show the update status. The bar moves slowly during the programming phase and faster during verification.
3. If more than one interface card is installed, switch to the next tab in the tool to update additional cards. Repeat the process for each card as necessary.
4. To load the new PCIe Core firmware, power off and then power on the computer.

   A computer restart is insufficient to reset the card on some computers because the PCIe slot will maintain its power supply. Therefore it is recommend to always power off the computer after a PCIe Core update.

5. The card will load a **PCIe Network Processor** firmware automatically. This process does not require a reboot.

If you want to update all parts of the firmware including the fallback firmware, select the `Flash All` option in the tool.
By default, the tool only updates parts of the firmware that have a newer version.

If the update fails (status: failure), perform a cold boot of the PC.
The card's secondary firmware will be used (Fallback), keeping the card fully functional. Try the flash process again on a different computer.

5.2. Configuring the HDSPe AoX-D

The HDSPe hardware offers a number of helpful, well thought-of practical functions and options which affect how the card operates - it can be configured to suit many different requirements.

The following items are shown in the 'Settings' dialog:

- Latency
- WDM Device Configuration
- Current sample rate
- Synchronization behavior
- Configuration of digital I/Os
- Input selection
- State of input and output

Any changes made in the Settings dialog are applied immediately - confirmation (e.g. by clicking on OK or exiting the dialog) is not required.

Settings should not be changed during playback or record if it can be avoided, as this can cause unwanted noises.

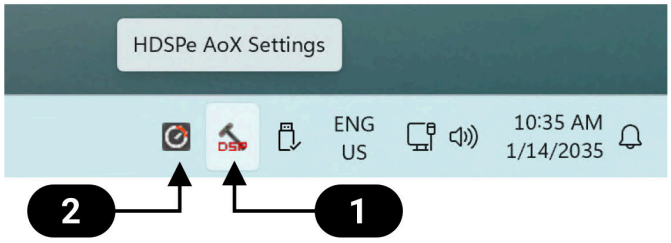
Also, please note that even in 'Stop' mode, several programs keep the recording and playback devices open, which means that any new settings might not be applied immediately.

The status displays at the bottom of the dialog box give the user precise information about the current status of the system, and the status of all digital signals.

The tab **About** provides information about the current driver version of the HDSPe AoX-D.

5.2.1. Revealing the Settings Dialog

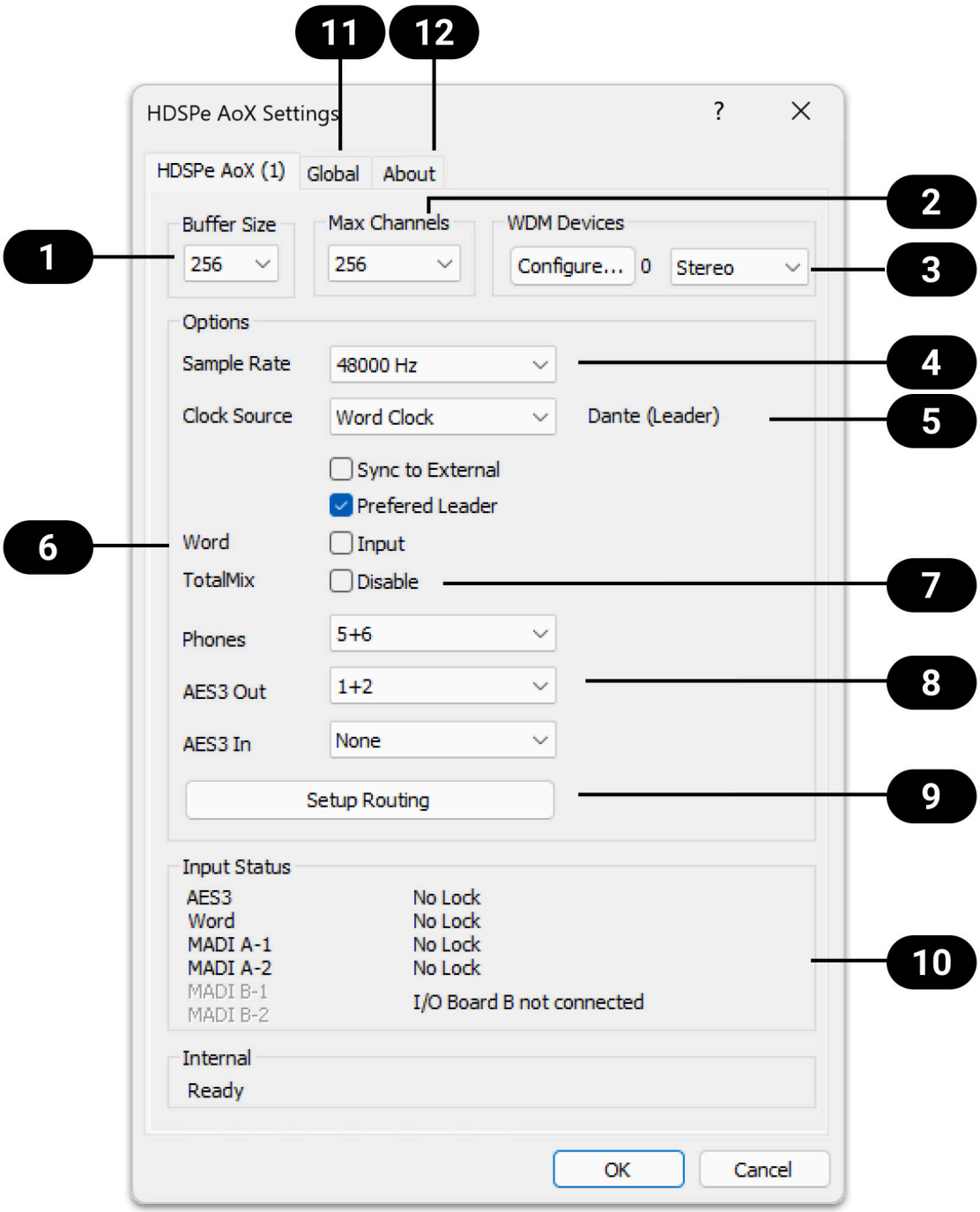
The HDSPe AoX-D is configured through its dedicated settings dialog.



The panel 'Settings' can be opened by clicking on the hammer symbol 1 in the task bar notification area.

The mixer of the interface, **TotalMix FX**, can be opened by clicking on the knob symbol 2 in the task bar notification area.

5.2.2. Settings Dialog Overview



1. Buffer Size
2. Max. channels
3. WDM Devices
4. Sample Rate
5. Clock Source
6. Word Clock A Jack
7. TotalMix Disable
8. Phones and AES3 Routing

9 Routing Setup

10 Input Status

11 'Global' Tab

12 'About' Tab

1 Buffer Size

The setting Buffer Size determines the latency between incoming and outgoing ASIO and WDM data, as well as affecting system stability (see chapter 13.1). While ASIO can use any offered buffer size, WDM is limited to 256 (XP) or 512 samples (Win 7/8). The driver handles this automatically, higher settings are only applied to ASIO while WDM will stay at 256/512 internally.

2 Max. Channels

Allows reducing the number of available channels of the driver. This can be useful if the driver is used in a system with limited resources, or if the user wants to reduce the number of channels to simplify the channel selection dialogs.

3 WDM Devices

Allows to freely set which I/Os are available as WDM devices, if these are stereo or multi-channel devices (up to 8 channels), and if one or multiple of the currently active WDM devices should have the Speaker property. More details are found in chapter Section 5.2.4, "Create and Modify WDM Devices".

Clock Mode

4 Sample Rate

Sets the currently used sample rate. Offers a central and comfortable way of configuring the sample rate of all WDM devices to the same value, as since Vista the audio software is no longer allowed to set the sample rate. However, an ASIO program can still set the sample rate by itself.

During record/playback the selection is greyed out, so no change is possible.

5 Clock Source

By default, Dante devices in a network are electing a PTP leader automatically. The unit can be configured to announce itself as the preferred leader, which would make the internal clock source the reference clock for the entire network unless there are other devices on the network with the same setting. When elected leader, it is also possible to choose one of the input signals (Dante, MADI, AES, Word Clock) as clock source. If the selected source isn't available (No Lock), the unit will attempt to lock to another available one (this behavior is called AutoSync). If none is available then the internal clock is used. The current clock source is displayed as Current.

6 Word Clock A Jack

The Word Clock BNC jacks on the optional MADI extension boards act as outputs by default. The checkbox 'input' can be used change the Word Clock BNC of the expansion module in slot A to act as an input instead. The incoming signal can then act as the clock source if 'Sync To External' is active and the HDSPe AoX-D is elected Leader in the Dante network.

7 TotalMix Disable

Disables TotalMix FX. This is useful if the driver is used in a system where TotalMix FX is not needed.

8 Phones and AES3 Routing

The source channels of the Phones and AES3 outputs can be set here. They can either be a submix created in TotalMix FX, or one of the additional software playback channels of the driver. If selecting channels for the AES3 input, they replace the currently selected Milan® or MADI input channels.

9 Routing Setup

The routing setup dialog is divided into Input and Output Routing. The input routing is used to replace blocks of 64 network input channels with signals from the MADI extension modules. The output routing is used to copy any block of 64 playback channels from the driver to the MADI extension modules.

10 Input Status

Displays the state of the current input signal:

- Clock state (No Lock, Lock, Sync)
- Sample rate (coarse)

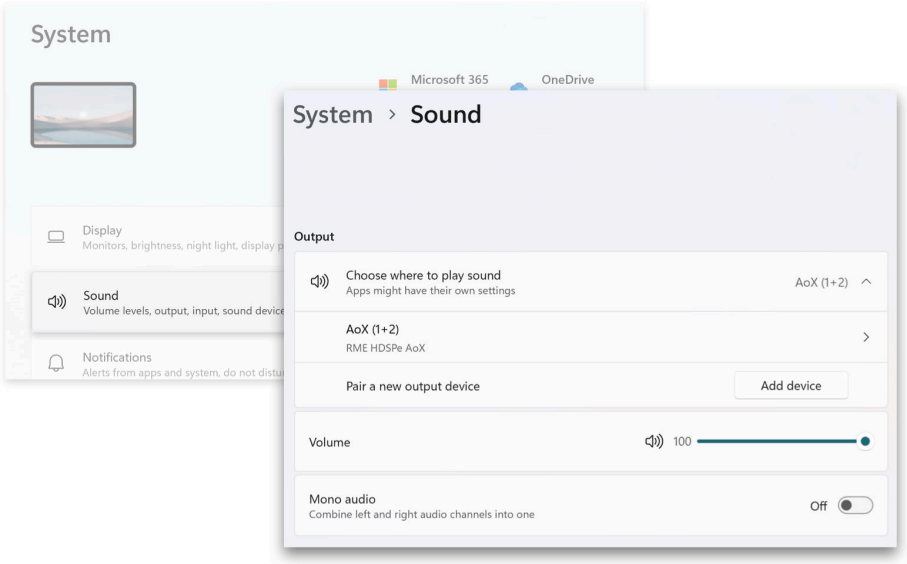
SyncCheck

RME's exclusive SyncCheck technology provides an easy to use indicator of the current clock status. The clock state column indicates whether no signal (No Lock), a valid signal (Lock) or a valid and synchronous signal (Sync) is present at each of the digital clock source inputs.

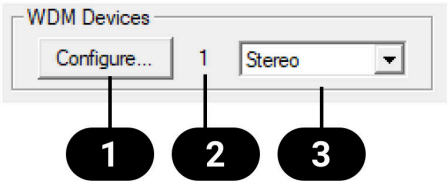
5.2.3. WDM Devices

The WDM (Windows Driver Model) driver provides a method for Windows to access the inputs and outputs of the HDSPe AoX-D. The driver therefore allows sound to be played back from the operating system itself (notification sounds etc.) and from a wide range of multimedia applications. It can be used in addition or as an alternative to the **ASIO** driver that provides better performance for multichannel applications. WDM supports advanced audio configurations, including complex speaker setups for surround sound and immersive audio playback.

Both the ASIO and WDM driver are present and active at the same time.



WDM devices typically consist of a few channels, for example to represent a pair of headphones or a set of speakers. The Settings Dialog is used to configure one or more separate WDM devices, which then appear for further configuration in Windows' Sound Settings.



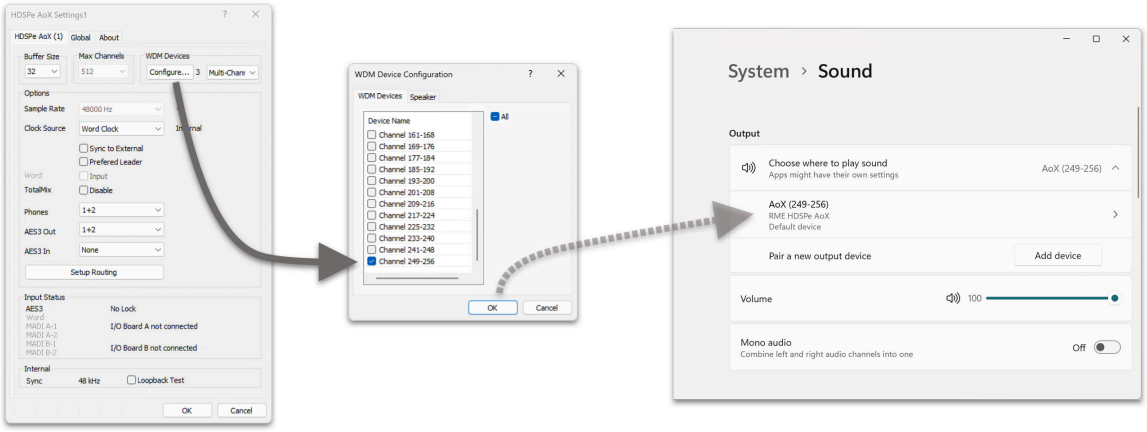
The **WDM Devices** section of the Settings Dialog has one button to enter the configuration dialog 1, a status display showing the number of currently enabled WDM devices 2, and a dropdown field 3 to select between Stereo or Multi-Channel devices.

The number represents both record and playback devices, so '1' means one input and one output device.

5.2.4. Create and Modify WDM Devices

To modify WDM devices:

1. Select 'Stereo' or 'Multi-Channel' from the drop down menu. This sets the following configuration dialog to display only multi-channel or stereo devices.
2. Open the configuration dialog by pressing Configure... in the settings panel.



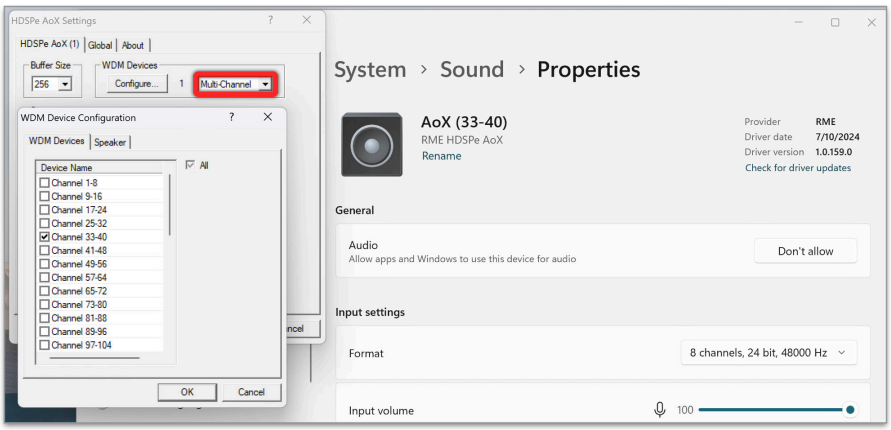
3. Activate any number of devices from the list.
4. Optionally, use the checkbox **All** to activate or deactivate all devices simultaneously.
5. Press OK to confirm changes and reload the WDM devices.

Activating all devices at once can freeze the operating system for a considerable amount of time. Activate only the devices you need.

Using a multi-channel WDM device allows for the use of multi-channel playback with specialized software as well as Surround sound from DVD or Blu-Ray player software.

To activate multi-channel WDM devices:

1. Select 'Multi-Channel' from the WDM Devices dropdown.

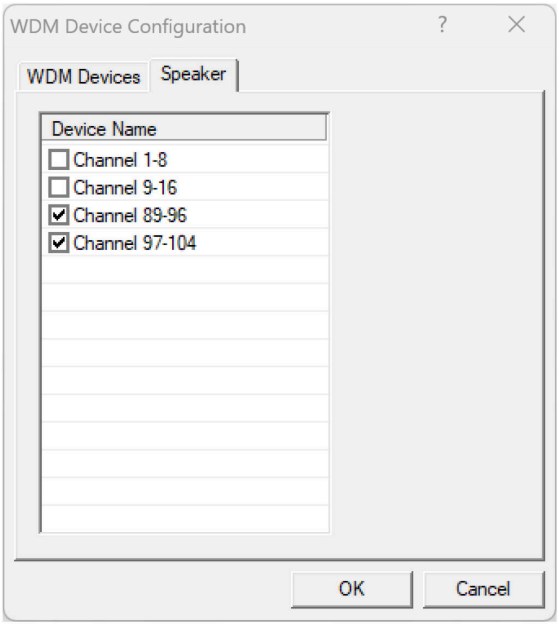


2. Press Configure...
3. Choose the desired multi-channel device. In the example shown, the device *Channel 33-40* is selected for multi-channel playback.

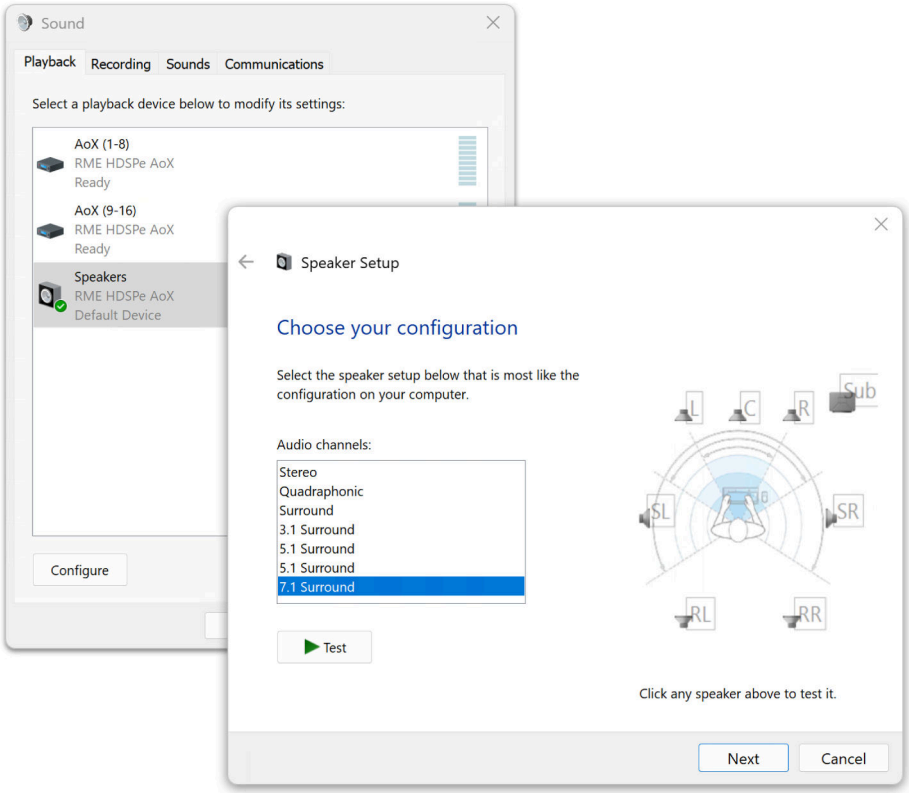
Configuring the multi-channel WDM device to a specific surround mode in the Windows *Sound* control panel requires the device to have the *Speaker* property. This can be set on the *Speaker* tab.

To assign the Speaker property to WDM devices:

1. While in the configuration dialog, switch to the *Speaker* tab. Active WDM devices listed as shown below:

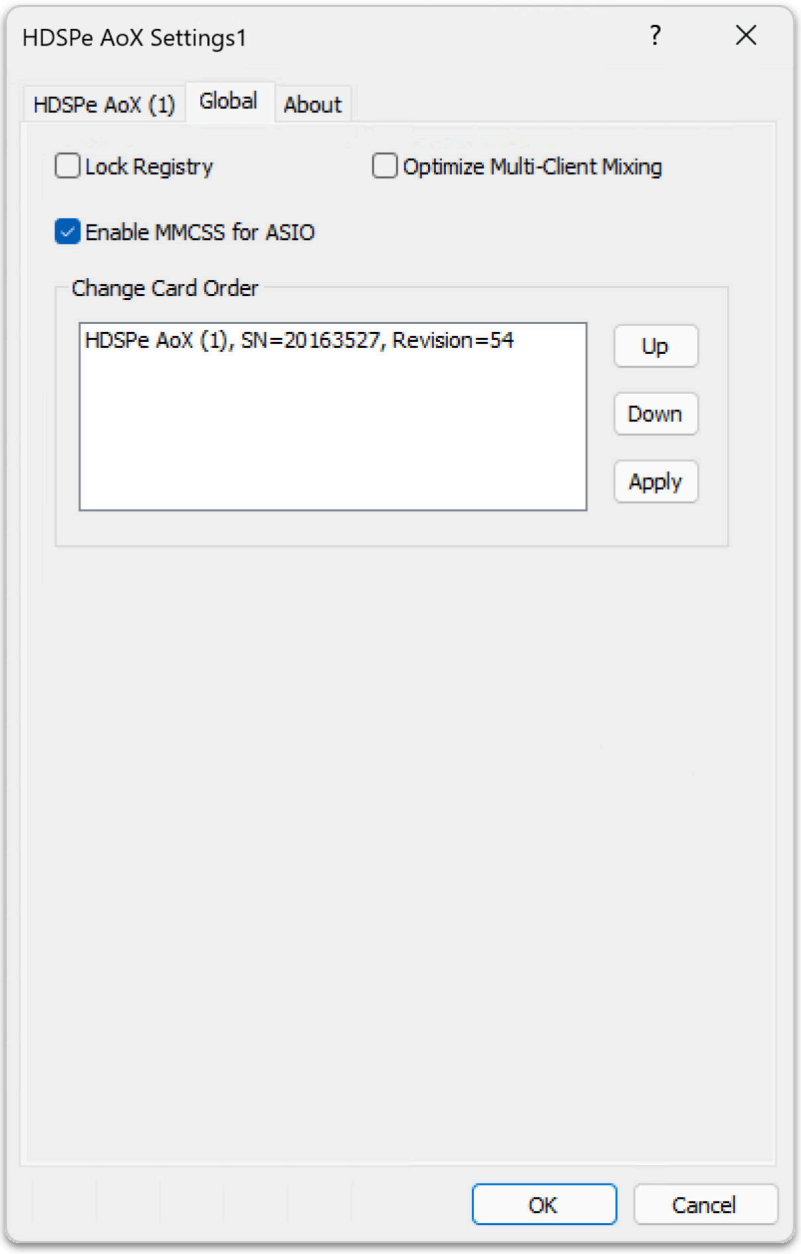


2. Select the devices to assign the *Speaker* property.
3. Optionally, use the checkbox **All** to assign or remove the *Speaker* property for all devices simultaneously.
4. Use the Windows configuration dialog to set the preferred surround setup.



Defining more than one device as Speaker usually makes no sense, as Windows does not number or rename speaker devices, making them indistinguishable.

5.2.5. Global Tab



This tab includes several options that work on all currently installed cards.

Lock Registry

Default: **off**. Checking this option brings up a dialog to enter a password. Changes in the Settings dialog are no longer written to the registry. As the settings are always loaded from the registry when starting the computer, this method provides an easy way to define an initial state of the HDSPe AoX-D.

Optimize Multi-Client Mixing

Default: **off**. Checking this option removes short noise bursts when multi-client playback starts but will also introduce some additional CPU load.

Enable MMCSS for ASIO

Enable MMCSS for ASIO activates support with higher priority for the ASIO driver (Default **Off**)

At this time, activating this option seems to be useful only with the latest Cubase/Nuendo at higher load. With other software this option can decrease performance. The change becomes active after an ASIO reset. Therefore, it is easy to quickly check which setting works better.

Change Card Order

This dialog lists all cards currently installed in the system and controlled by the driver. Their order can then be changed by selecting a card and using the up/down arrows. Confirm the operation with the Apply button. This feature comes in handy if different cards are installed and a specific one of them should always be the first in the ASIO channel list.

At the end of each card info line its current firmware version is shown (Revision).

5.2.6. Clock Synchronization

In digital systems, all devices must function as either a **Leader** (clock source) or **Follower** (clock receiver). If multiple devices are connected, there must always be one **Leader Clock**. A digital system can only have one **Leader** clock at any time.

In Dante networks, connected devices automatically elect a **Leader** among themselves if the configured sampling rate matches. When the clock mode on HDSPe AoX-D is set to **Preferred Leader**, all other devices will operate as **Followers** unless they have been configured to act as **Preferred Leader** themselves.

In audio network systems, a change of sampling rate is not instantaneous: all devices must be configured to use the new sampling rate explicitly. This is most conveniently done with dedicated network management software, such as Dante Controller.

The **SyncCheck** technology from RME allows users to easily monitor and verify the current clock status. The **Input Status** display shows whether there is a valid signal (**Lock** or **No Lock**) for each input (**Word**, **MADI**, **AES**, or **Sync In**). The display also indicates if the signal is valid and synchronized (**Sync**).

The **Clock Source** setting allows you to define a preferred input for synchronization. If a valid signal is present on the preferred input, it is used as the sync source. If no valid signal is detected, the system scans the other inputs in sequence. If no inputs have a valid signal, HDSPe AoX-D automatically switches to **Leader** clock mode.

When using **WDM**, the card sets the sample rate. If the sample rate of the digital signal and the system do not match, an error may occur. For example, if a 48 kHz signal is detected at the **Word Clock** input, but the card is set to 44.1 kHz, a red error message will appear, prompting the user to manually set the sample rate to 48 kHz.

When using **ASIO**, the audio software sets the sample rate, so such mismatches are rare. In follower mode, the external sample rate takes priority, and the system will not allow incompatible settings. For instance, feeding 44.1 kHz prevents the ASIO software from setting 48 kHz unless the clock mode is switched to **Leader/Internal**.

SyncCheck provides a simple way to verify whether all connected digital devices are properly configured. With **SyncCheck**, users can easily resolve one of the most common and complex issues in digital studio setups.

5.3. Operation and Usage

5.3.1. Playback

The HDSPe AoX-D can play back audio data in supported formats only.

In the audio application being used, HDSPe AoX-D must be selected as output device. This can often be found in the **Options**, **Preferences** or **Settings** menus under *Playback Device*, *Audio Devices*, *Audio I/O* etc.

To ensure that system sounds do not interfere with audio playback and recording, it is strongly recommended to switch off all system sounds or routing them to a different audio interface. Also, the HDSPe AoX-D should not be the Preferred Device for audio playback, as the operating system might attempt to play back audio at an incompatible sample rate and yield errors.

Consult the manual of your digital audio workstation for details on how to set up the correct driver.

Increasing the number and/or size of audio buffers may prevent the audio signal from breaking up, but also leads to an increase in latency (i.e. output signal is delayed).

The HDSPe AoX-D allows sample rates of up to 192 kHz. The number of available channels is reduced to half of the advertised channel count at double speed (DS, 88.2 kHz and 96 kHz), and one fourth of the advertised channel count at quad speed (QS, 172.4 kHz and 192 kHz).

The audio application cannot control the sample rate using the WDM or ASIO driver interface. Therefore, the driver of the HDSPe AoX-D includes a way to set the sample rate globally for all WDM devices within the Settings dialog, see Section 5.2.6, "Clock Synchronization".

5.3.2. Surround Sound (AC-3/DTS)

AC-3 / DTS Pass-through

When playing back files that include an encoded multichannel audio stream (for example using software like PowerDVD®), the audio can be passed through to any AC-3/DTS capable receiver via the HDSPe AoX-D's digital outputs transparently.

Encoded AC-3 or DTS signals sound like chopped noise at highest level. Ensure that the volume is turned down before starting playback to confirm that the signal is properly sent to a device that detects and decodes the signal.

For this to work, the playback software has to be configured accordingly so that it would not attempt to decode the signal by itself. Consult the software's manual for details on how to configure AC-3 pass-through.

Decoded Multi-channel audio

Some media players will automatically decode embedded surround sound signals. The HDSPe AoX-D must then be configured as the preferred audio device in the operating system sound settings.

Newer versions of Microsoft Windows™ have removed the corresponding Codec and it must be installed manually.

5.3.3. Multi-Client Operation

RME audio interfaces support multi-client operation. Several programs can access the HDSPe AoX-D at the same time. It is even possible to access the same channels with ASIO and WDM drivers at the same time. As ASIO does not use real-time sample rate conversion, all active ASIO software has to use the same sample rate.

However, a better overview is maintained by using the channels exclusively. This is no limitation at all, because TotalMix allows summing of several software playback channels by creating a submix.

Inputs can be received by an unlimited number of WDM and ASIO applications at the same time, as the driver simply sends the data to them simultaneously.

RME's sophisticated tool *DIGICheck* operates like an ASIO host, using a special technique to access playback channels directly. Therefore DIGICheck is able to analyse and display playback data from any software, no matter which format it uses.

5.4. Operation under ASIO

Start the ASIO application and select HDSPe AoX as the audio I/O device.

The driver supports ASIO Direct Monitoring (ADM).

The HDSPe AoX-D's MIDI I/O can be used with both MME MIDI and DirectMusic MIDI.

At a sample rate of 88.2 or 96 kHz (Double Speed mode), the amount of channels is halved. At a sample rate of 176.4 or 192 kHz (Quad Speed mode), the amount of channels is quartered.

When changing the sample rate range between Single, Double and Quad Speed the number of channels presented from the ASIO driver will change too. This may require a reset of the I/O list in the audio application.

5.4.1. Known Problems

Troubleshooting Audio Performance and Synchronization in the HDSPe System

CPU Performance and PCIe-Bus Transfer Rates

Insufficient CPU power or PCIe-bus transfer rates can result in dropouts, crackling, and noise.

To mitigate these issues:

- Increase the buffer size in the **Settings** dialog of the HDSPe system. This resolves most performance-related issues.
- Deactivate all plugins to ensure they are not contributing to these effects.
- Reduce the number of channels in the **Settings** dialog.
- Disable power saving mechanisms (such as Core Parking) by activating the **High Performance** power plan in Windows.
- Search the RME user forum on topics related to `DPC latency` to find suggestions on how to optimize your system.

Synchronization Issues

Proper synchronization is critical for error-free operation.

Note the following:

- The card does not provide sampling rate converters for asynchronous operation. Input and output signals, the sampling rate set in the settings dialog, and the audio application's project settings must match.

Use the **SyncCheck** *feature in the* **Settings** *dialog:*

- If it displays **Lock** instead of **Sync**, the devices are not properly configured.
- When using multiple HDSPe cards, ensure all cards are synchronized. Failing to do so will result in periodically repeated noise.

ASIO Direct Monitoring (ADM)

The HDSPe system supports **ASIO Direct Monitoring (ADM)**.

Note the following:

- Not all programs fully support ADM. The most commonly reported issue is incorrect stereo panning behavior.
- Avoid setting **TotalMix FX** hardware outputs (third row) to mono mode, as this can disrupt ADM compatibility.

Audio and MIDI Drift or Deviation

If you experience:

- A drift between audio and MIDI.
- A fixed deviation where MIDI notes are positioned slightly before or after their correct location.

Adjust the following settings in **Cubase/Nuendo***:*

- Enable the **Use System Timestamp** option (this setting was recommended at the time of documentation).
- The HDSPe system supports both **MME MIDI** and **DirectMusic MIDI**. Test both to determine which works better for your specific application.

By addressing these areas, you can ensure optimal performance and compatibility for your HDSPe system.

5.5. Using multiple HDSPe AoX-D cards

The current driver supports the operation of up to three HDSPe AoX-D cards. To ensure proper functionality, all cards must remain synchronized, either through a valid sync source via word clock or by using **Auto-Sync** with synchronized signals.

Synchronization Setup

To maintain precise synchronization between multiple cards, internal connectors are available. The cards should be synchronized to the leader card by connecting the corresponding **SYNC** headers on the card with the supplied cable. Ensure that the clock modes for all cards are configured correctly in their respective **Settings** dialogs.

- When all units are supplied with a synchronous clock signal (i.e., all units display **Sync** in their **Settings** dialogs), all channels across the cards can be utilized simultaneously. This setup is particularly streamlined under ASIO, as the ASIO driver combines all cards into a single interface.

TotalMix with multiple cards

TotalMix is integrated into the hardware of each HDSPe AoX-D, allowing for up to three independent mixers when using three cards. However, these mixers are separate and do not support data exchange between cards. As a result, a global mixer for all units is not available.

If required, submixes could be aggregated from different cards using the optional MADI ports.

5.6. DIGICheck Software Overview

DIGICheck is a unique utility developed for testing, measuring, and analyzing digital audio streams. While the software is intuitive and user-friendly, it includes comprehensive online help for detailed guidance. DIGICheck 5.81 functions as a multi-client ASIO host, enabling it to operate alongside any software, utilizing both inputs and outputs simultaneously. Below is a summary of its key features:

Key Features

- **Level Meter** High-precision 24-bit resolution with support for 2, 8, or 196 channels. Applications include:
- Peak and RMS level measurement.
- Over-detection and phase correlation measurement.
- Dynamic range and signal-to-noise ratio analysis.
- RMS to peak difference (loudness) and long-term peak measurement.
- Oversampling for levels exceeding 0 dBFS. Additional features:
- Vertical and horizontal modes.
- Slow RMS and RLB weighting filters.
- K-system visualization support.
- **Hardware Level Meter** Displays levels for input, playback, and output channels.
- Pre-calculated directly by HDSPe hardware for near-zero CPU load.
- **Spectral Analyzer** A unique display offering 10-, 20-, or 30-band analog bandpass-filter technology.
- Fully supports 192 kHz operation.
- **Vector Audio Scope** A groundbreaking Goniometer with oscilloscope-style afterglow visualization.
- Includes a correlation meter and level meter.
- **Totalyser** Combines the **Spectral Analyzer**, **Level Meter**, and **Vector Audio Scope** into a single window.
- **Surround Audio Scope** Professional-grade Surround Level Meter.
- Features extended correlation analysis, ITU weighting, and ITU summing meters.
- **ITU1770/EBU R128 Meter** Designed for standardized loudness measurements.
- **Bit Statistics & Noise Analyzer** Displays the true resolution of audio signals, including errors and DC offset.
- Includes signal-to-noise ratio measurements in dB and dBA, and DC measurement.
- **Channel Status Display** Provides a detailed analysis of SPDIF and AES/EBU channel status data.

- **Global Record** Allows long-term recording of all channels with minimal system load.
- **Multi-Client Operation** Supports multiple measurement windows across any channels, inputs, or outputs.

Installation

To install DIGICheck:

1. Download DIGICheck from https://rme.to/downloads (select 'Software')
2. Run the installer included in the downloaded zip file.
3. Follow the on-screen instructions.

Updates

DIGICheck is continually updated. Always download the latest version from the official RME website:

6. Usage under macOS

6.1. Driver and Firmware (macOS)

The HDSPe AoX-D requires a driver to be installed on the host computer. This driver ensures proper communication between the hardware and the software applications.

The driver can be downloaded from the official website. Please visit the following link to download the latest version of the driver:

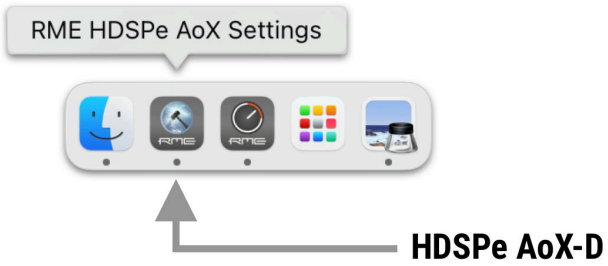
https://rme.to/downloads

6.1.1. Driver Installation (Apple macOS™)

First download the newest Apple macOS™ driver from the RME website or using the direct link to the download portal https://rme.to/downloads.

Unzip the downloaded archive and run the `.pkg` file that was extracted from the archive. Reboot the computer when installation is done.

During driver installation the programs HDSPe FX Settings and Totalmix (TotalMix FX) are copied to the Applications folder.



Driver updates do not require removal of the existing drivers. Simply install the new driver to replace the previous one.

6.1.2. Uninstalling the Driver

It is not required to uninstall drivers under normal circumstances. When the HDSPe AoX-D is removed from the system, the drivers will no longer be loaded. In case of problems the driver files can be deleted manually by dragging them to the trash bin (replace 'username' with the account user name):

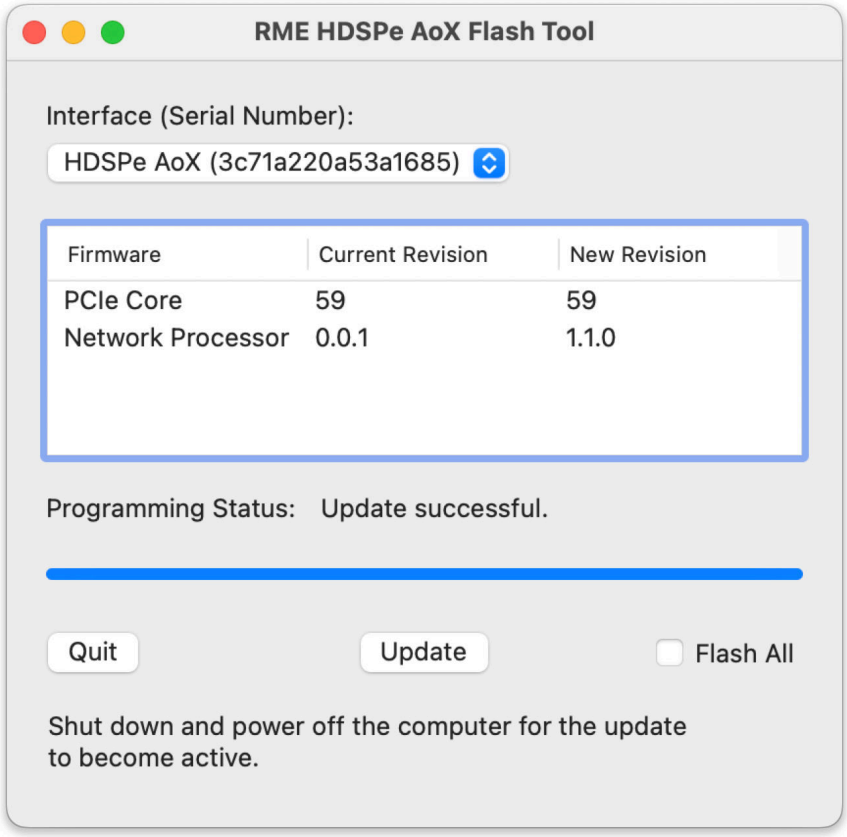
```
/Applications/Totalmix
/Applications/RME HDSPe AoX Settings
/Library/Audio/MIDI Drivers/HDSPe AoX MIDI.plugin
/Library/Audio/Plug-Ins/HAL/RMEAoXAsp.driver
/Users/username/Library/Application Support/RME TotalMix FX folder
/Users/username/Library/Preferences/de.rme-audio.dkaoxsettings.plist
/Users/username/Library/Preferences/de.rme-audio.TotalmixFX.plist
```

Under the latest Mac OS the `User/username/Library folder is not visible in the Finder. To reveal it start Finder, click on the menu item Go. Hold down the option (alt) key,

then click on Library.

6.1.3. Firmware Update

The Flash Update Tool (FUT) updates the HDSPe AoX-D to the latest firmware version. It requires a previously installed driver so the card can be detected by the update tool.



To update the firmware with the Flash Update Tool

1. Download the latest Firmware Update Tool from the RME Website and unzip it.
2. Start the program executable file.
   The Flash Update Tool will display the current revision of the HDSPe AoX-D and indicate whether an update is needed. If an update is needed, press the Update button. A progress bar will show the update status. The bar moves slowly during the programming phase and faster during verification.
3. If more than one interface card is installed, switch to the next tab in the tool to update additional cards. Repeat the process for each card as necessary.
4. To load the new PCIe Core firmware, power off and then power on the computer or expansion chassis.

   It is important to interrupt the power supply to the PCIe card (by powering off the computer or expansion chassis).

5. The card will load a **PCIe Network Processor** firmware automatically. This process does not require a reboot.

If you want to update all parts of the firmware including the fallback firmware, select the `Flash All` option in the tool.
By default, the tool only updates parts of the firmware that have a newer version.

If the update fails (status: failure), perform a cold boot of the PC.
The card's secondary firmware will be used (Fallback), keeping the card fully functional. Try the flash process again on a different computer.

6.2. Configuring the HDSPe AoX-D

The HDSPe hardware offers a number of helpful, well thought-of practical functions and options which affect how the card operates - it can be configured to suit many different requirements.

The following items are shown in the 'Settings' dialog:

- Current sample rate
- Synchronization behavior
- Configuration of digital I/Os
- Driver and Firmware version

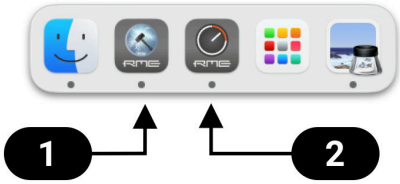
Any changes made in the Settings dialog are applied immediately - confirmation (e.g. by clicking on OK or exiting the dialog) is not required.

Settings should not be changed during playback or record if it can be avoided, as this can cause unwanted noises.

Also, please note that even in 'Stop' mode, several programs keep the recording and playback devices open, which means that any new settings might not be applied immediately.

6.2.1. Revealing the Settings Dialog

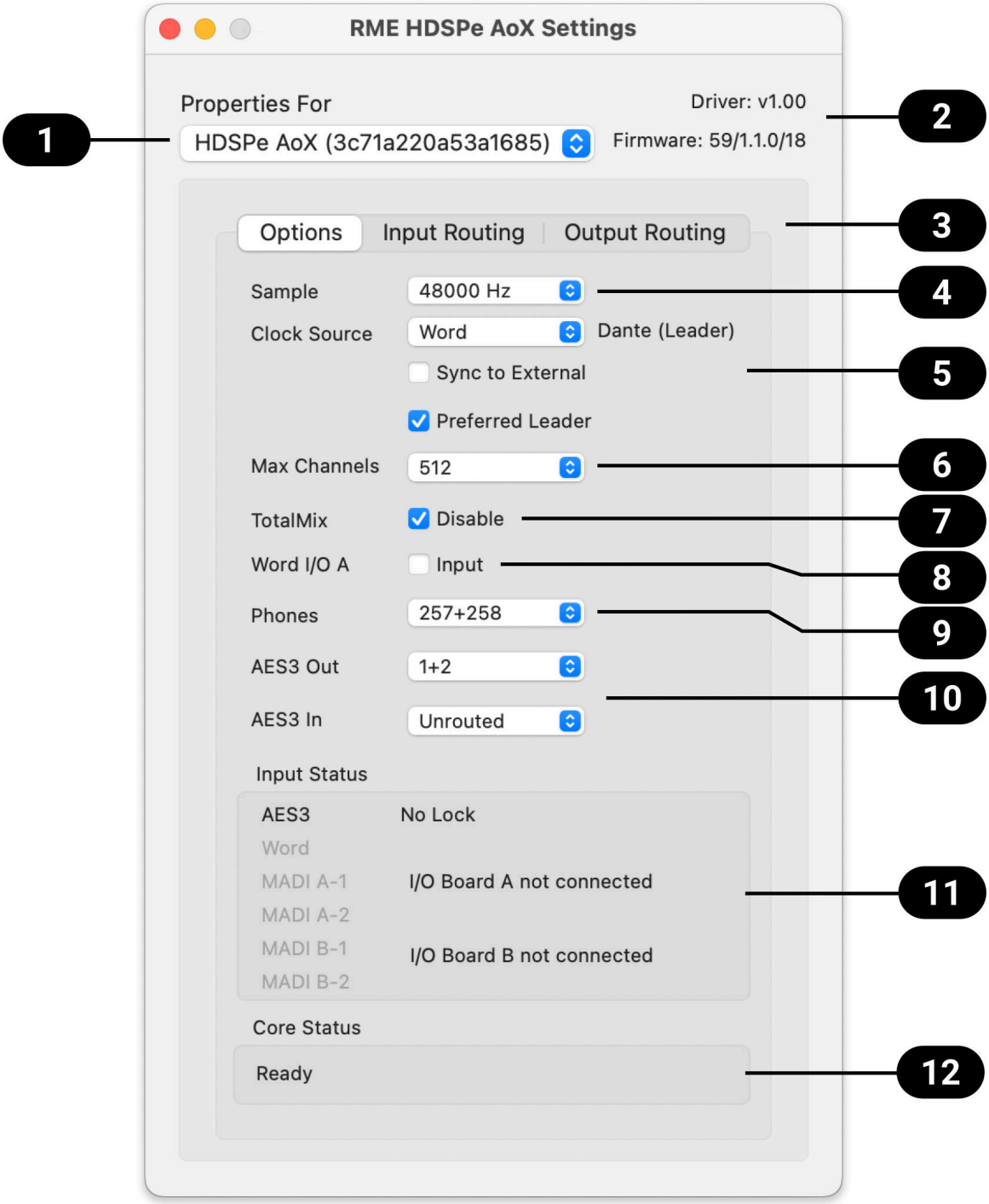
The HDSPe AoX-D is configured through its dedicated settings dialog.



The panel 'Settings' can be opened by clicking on the hammer symbol 1 in the task bar notification area.

The mixer of the interface, **TotalMix FX**, can be opened by clicking on the knob symbol 2 in the task bar notification area.

6.2.2. Settings Dialog Overview



1. Card selection
2. Driver and Firmware version
3. Input and Output routing
4. Sample Rate
5. Clock Source
6. Max. Channels
7. Disable TotalMix
8. Word Clock A Jack
9. Phones Routing

10 AES3 Routing

11 AES3/MADI input status

12 Core status

1 Card Selection

When using more than one HDSPe AoX card.

2 Driver Information

Shows the current firmware and driver version.

3 Routing Setup

The routing setup dialog is divided into Input and Output Routing. The input routing is used to replace blocks of 64 network input channels with signals from the MADI extension modules. The output routing is used to copy any block of 64 playback channels from the driver to the MADI extension modules.

Clock Mode

4 Sample Rate

Sets the currently used sample rate. Offers a central and comfortable way of configuring the sample rate of all WDM devices to the same value, as since Vista the audio software is no longer allowed to set the sample rate. However, an ASIO program can still set the sample rate by itself.

During record/playback the selection is greyed out, so no change is possible.

5 Clock Source

By default, Dante devices in a network are electing a PTP leader automatically. The unit can be configured to announce itself as the preferred leader, which would make the internal clock source the reference clock for the entire network unless there are other devices on the network with the same setting. When elected leader, it is also possible to choose one of the input signals (Dante, MADI, AES, Word Clock) as clock source. If the selected source isn't available (No Lock), the unit will attempt to lock to another available one (this behavior is called AutoSync). If none is available then the internal clock is used. The current clock source is displayed as Current.

6 Maximum Channel Selection.

Allows reducing the number of available channels of the driver. This can be useful if the driver is used in a system with limited resources, or if the user wants to reduce the number of channels to simplify the channel selection dialogs.

7 TotalMix Disable

Disables TotalMix FX. This is useful if the driver is used in a system where TotalMix FX is not needed.

9 Phones Routing

This drop down field sets the routing of a pair of software playback channels (or TotalMix outputs) to the headphone outputs.

10 AES3 Routing

The source channels of the AES3 output can be set here. It can either be a submix created in TotalMix FX, or one of the additional software playback channels of the driver. When selecting channels for the AES3 input, they replace the currently selected Milan® or MADI input channels configured in the input routing.

11 Input Status

Displays the state of the current input signal:

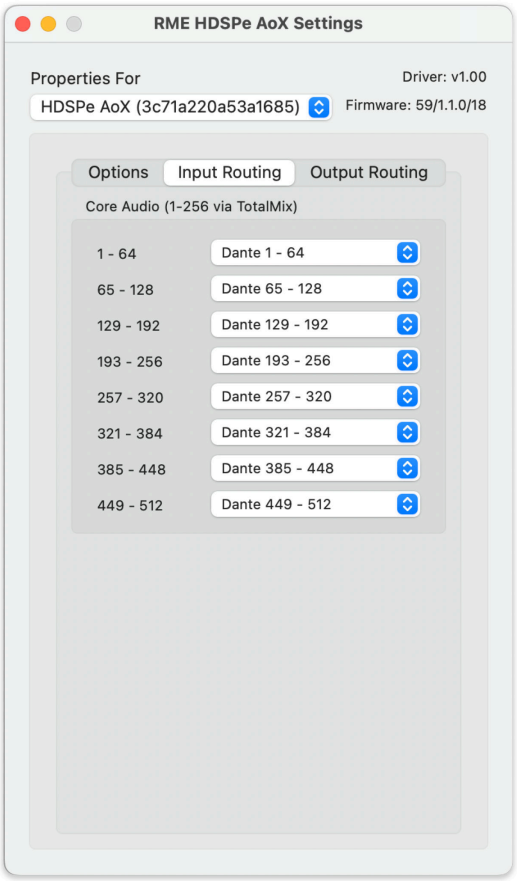
- Clock state (No Lock, Lock, Sync)
- Sample rate (coarse)

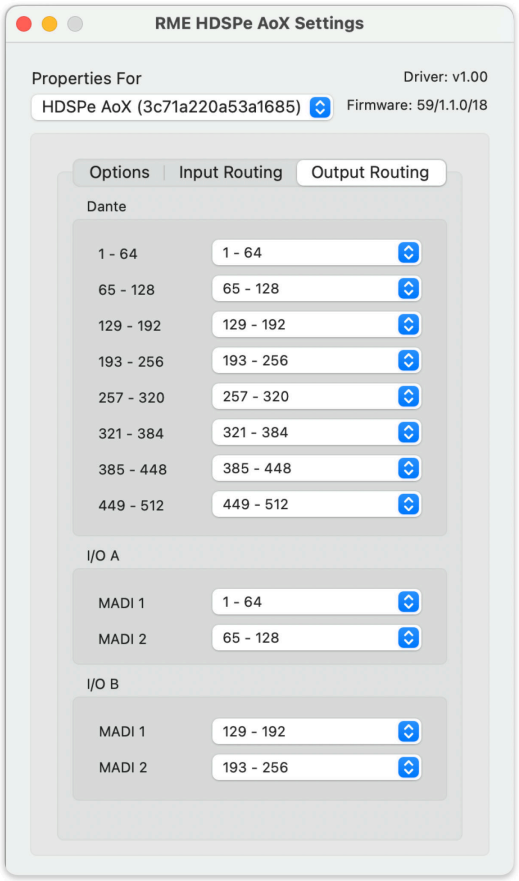
SyncCheck

RME's exclusive SyncCheck technology provides an easy to use indicator of the current clock status. The clock state column indicates whether no signal (No Lock), a valid signal (Lock) or a valid and synchronous signal (Sync) is present at each of the digital clock source inputs.

6.2.3. Input and Output Routing

The driver of the HDSPe AoX-D supports bi-directional transfer of up to 512 channels. As the total number of inputs and outputs can exceed this number, a pre-selection of channels can be made in the corresponding input and output dialog.

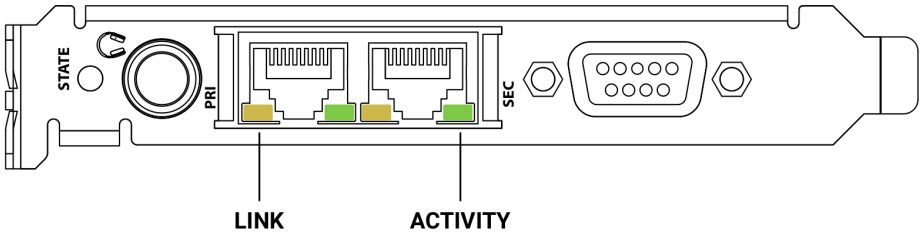




6.3. Connections

6.3.1. Network Ports

The slot bracket features two RJ45 connectors labeled **PRI** and **SEC**. The supported link speeds are **1 Gb/s** and **100 Mb/s**.



- A yellow LED (left, **LINK**) signals a successful link.
- A green LED (right, **ACT**) signals network traffic (blinking).

Both straight and crossover cables can be used (*Auto MDI-X*). Cable lengths of up to 100m are supported when using Cat 5e or higher classification.

The network ports are used to send and receive up to **512 audio channels** when connected to a Dante® network.

At the time of writing, the HDSPe AoX-D does not provide an ethernet interface to the host operating system. Therefore it is not possible to communicate with the network directly unless a separate network adapter is installed on the same computer and

connected to the Milan® network.

Combine ethernet ports (Switched mode)

The two ethernet ports can be configured with the MILAN Manager in *Device View* > *Network Config* > *Dante Redundancy*. If both ports are connected to the same network, for example to create a daisy-chain of several HDSPe AoX-D devices, then the setting must be changed to **Switched**. In the default mode, the device is configured so that each port connects to one of two separate networks (**Redundancy**).

If the unit has been configured to connect the primary and secondary port internally (switched mode), devices attached to the two ports can communicate both with each other and with the HDSPe AoX-D.

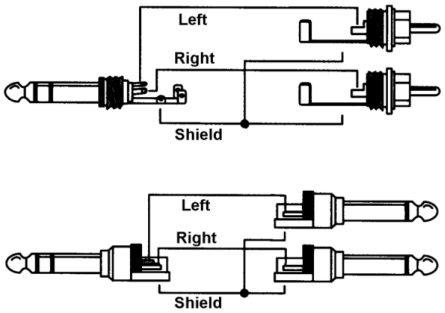
6.3.2. Line - Headphones

The HDSPe AoX-D offers a hi-quality analog monitor output. The short circuit protected stereo line output provides high output level, low impedance, and is available via a 6.3 mm (1/4") TRS jack. Therefore it is also suitable for a direct use with headphones.

The analog output receives its signal from any of the host computers 512 software playback channels or any TotalMix submix. The channel can be selected in the **Settings Dialog**.

The analog output does not include speaker protection. When switching the computer on and off, noise may occur at the analog outputs.

In case the output should operate as line out, an adapter TRS plug to RCA phono plugs, or TRS plug to TS plugs is required.



The pin assignment follows international standards. The left channel is connected to the tip, the right channel to the ring of the TRS jack/plug.

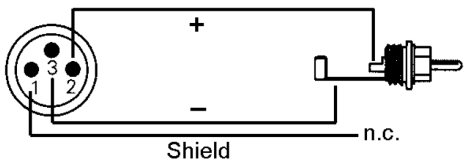
6.3.3. AES/EBU

The XLR AES/EBU input and output are transformer-balanced and ground-free. The incoming channel status is ignored. Connection is accomplished using balanced cables with XLR plugs.

AES/EBU (and SPDIF) can contain Emphasis information. Audio signals with Emphasis have a strong high frequency boost, requiring high frequency attenuation on playback.

An Emphasis indication gets lost as there exists no standardized interface on computers to handle this information!

Input



Thanks to a highly sensitive input stage, the SPDIF coaxial signal can also be received using a simple phono-to-XLR cable adapter. To accomplish this, pins 2 and 3 of a male XLR plug are each connected to the two pins of a phono (Cinch/RCA) plug. The cable shielding is connected only to pin 1 of the XLR plug and not to the phono plug.

Output

Using the cable adapter XLR/phono described above, devices with coaxial SPDIF interface can be connected to the AES output of the HDSPe AoX-D as well. Note that most consumer equipment with phono (SPDIF) inputs will only accept signals having a Channel Status 'Consumer' format. The Consumer status is activated in the Settings dialog. In Consumer mode the output voltage is reduced as well, as SPDIF calls for a lower voltage than AES/EBU.

The output signal coding of the HDSPe AoX-D has been implemented according to AES3-1992 Amendment 4:

1. 44.1 / 48 kHz, 88.2 / 96 kHz, 176.4 / 192 kHz depending on the current sample rate
2. Audio use
3. No Copyright, Copy permitted
4. Format Professional or Consumer
5. Category General, Generation not indicated
6. 2-Channel, No Emphasis

6.3.4. MIDI

The HDSPe AoX-D offers one MIDI I/O via 5-pin DIN connectors. The MIDI port is added to the system by the driver. Using MIDI capable software, the port can be accessed under the name MADI MIDI.

The MIDI port supports multi-client operation. A MIDI input signal can be received from several programs at the same time. Even the MIDI output can be used by multiple programs simultaneously. However, due to the limited bandwidth of MIDI, this kind of application will often show various problems.

6.3.5. D-Sub25 Connector Pinout

Table 1. Pin assignment of the 9-pin D-type connector, breakout cable MIDI / AES

Pin	Name	Pin	Name	Pin	Name
1	MIDI In (4)	4	AES Out	7	MIDI Out (5)
2	MIDI Out (4)	5	GND	8	AES In -
3	AES In	6	MIDI In (5)	9	AES Out -

7. Routing and Monitoring with TotalMix

The HDSPe AoX-D features a powerful real-time digital hardware mixer, the **Hammerfall DSP Mixer**, which leverages RME's unique, sample-rate independent **TotalMix** technology. This advanced mixer provides virtually unlimited mixing and routing capabilities, enabling all inputs and playback channels to be routed simultaneously to any hardware output.

7.1. Key Applications of TotalMix

- **Delay-Free Submixes (Headphone Mixes)**
  Create up to 128 fully independent stereo submixes. This is equivalent to having 256 Aux sends on an analog mixing desk!
- **Unlimited Routing**
  Route inputs and outputs freely, enabling flexible patchbay functionality.
- **Signal Distribution**
  Distribute signals to multiple outputs simultaneously.
- TotalMix includes advanced splitter and distributor features.
- **Simultaneous Playback of Multiple Programs**
  The ASIO multi-client driver allows several programs to use the same playback channels concurrently.
- TotalMix can mix and monitor these programs on a single stereo output, even when originating from different playback channels.
- **Mixing Input and Playback Signals**
  Combine input signals with playback signals for comprehensive **ASIO Direct Monitoring (ADM)**.
- RME pioneered ADM technology and offers the most complete implementation available.
- **Integration of External Devices** Use TotalMix to insert external effects devices into playback or recording paths.
- This functionality supports inserts or effects sends/returns, ideal for real-time monitoring with effects such as reverb on vocals.

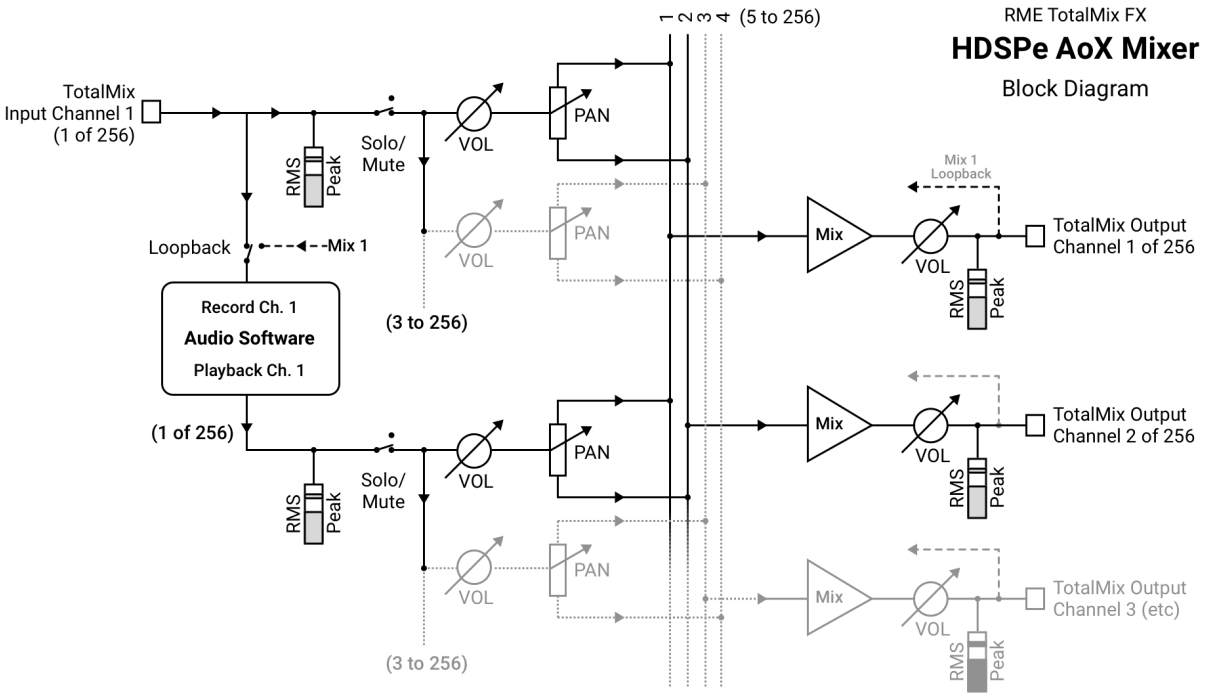
7.2. Features and Level Monitoring

Every input channel, playback channel, and hardware output includes a **Peak** and **RMS** level meter. These meters are calculated in hardware and are invaluable for verifying the presence of signals and their routing destinations.

7.3. Key Concepts for Understanding TotalMix

- **Recording Path**
  As illustrated in the block diagram below, the recording signal remains unaltered.
- TotalMix does not interfere with the record path or affect the recorded audio's level or data, except when using loopback mode.
- **Flexible Routing and Independent Levels**
  Hardware input signals can be routed to multiple destinations with independent levels.
- Unlike conventional mixing desks, where the channel fader controls all routing destinations simultaneously, TotalMix provides granular control.
- **Level Meter Placement**
  Input and playback channel level meters are **pre-fader**, allowing you to monitor signal presence at their sources. Hardware output level meters are **post-fader**, showing the actual output levels.

TotalMix offers unparalleled flexibility and precision, making it an indispensable tool for professional audio workflows.



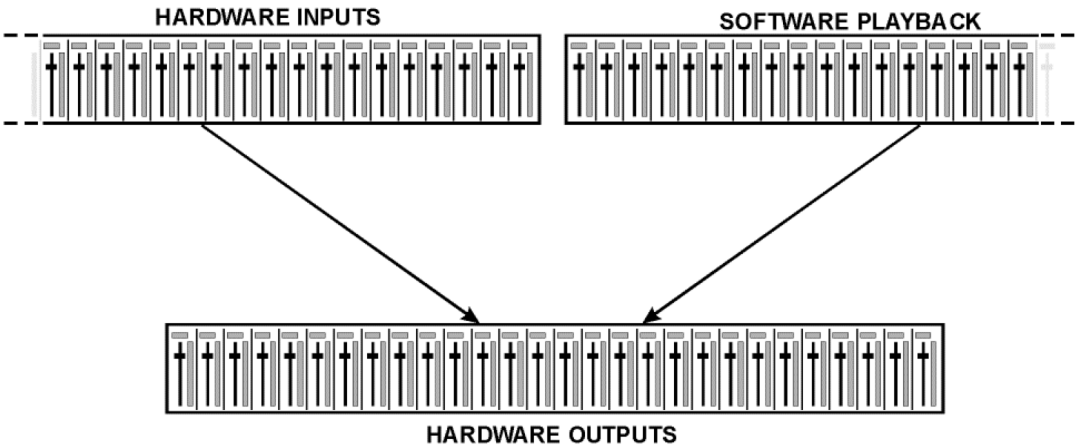
7.4. The User Interface

7.4.1. Visual Design and Channel Layout

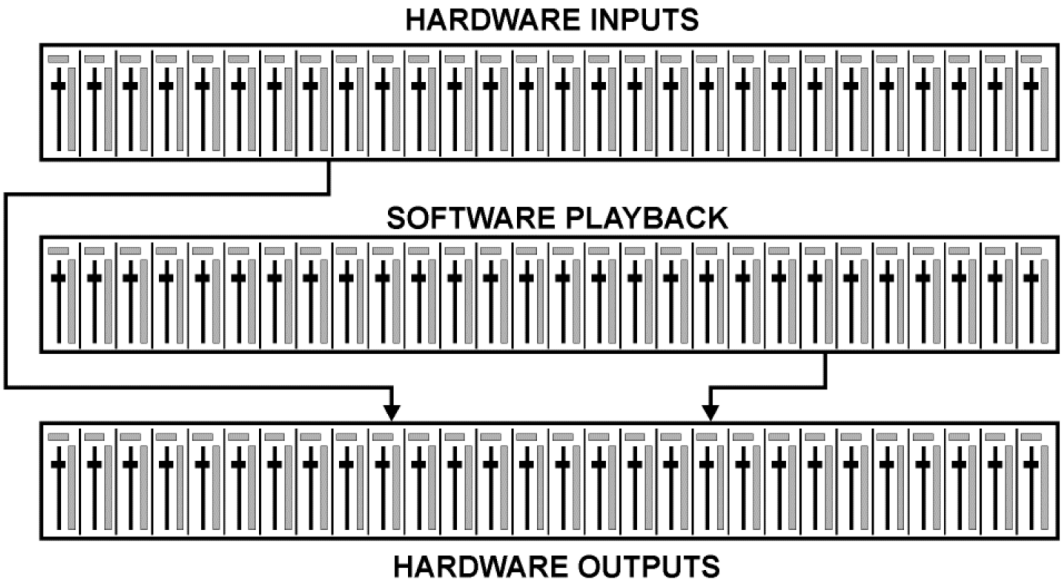
The TotalMix mixer interface is designed to fully leverage its capability to route hardware inputs and software playback channels to any of the first 256 hardware outputs. The HDSPe AoX-D provides TotalMix on the first 256 hardware input channels, 256 software playback channels and 256 hardware output channels. The remaining channels are not accessible via TotalMix.

TotalMix offers two primary viewing modes:

- **2-Row View:** A simplified, horizontal view for quick access.



- **3-Row Inline View (Default):** A vertical alignment resembling an Inline mixing desk, where software playback channels act as the **Tape Return** of a traditional mixer.



Channel Rows and Functions

Top Row: Hardware Inputs

- Displays the input signal level, independent of the fader position.
- Inputs can be routed and mixed to any hardware output (bottom row) using the faders and routing field.

Middle Row: Software Playback Channels

- Represents playback tracks from the audio software.
- Playback channels can be routed and mixed to any hardware output (bottom row) via the faders and routing menu.

Bottom Row (Third Row): Hardware Outputs

- Adjusts the total output level, such as for connected loudspeakers or reducing an overloaded submix.

7.4.2. Submix View (Default Mode)

In **Submix View**, *routing and mixing are simplified:*

1. Click on the hardware output channel where you want to send an audio signal.
   - This channel becomes brighter, indicating it is the active submix.
2. Adjust the faders for all input and playback channels you wish to include in the submix.
   - The selected output will receive audio from these sources at the levels you set.

7.4.3. Further Documentation

Subsequent chapters will provide a step-by-step explanation of all functions and controls in the TotalMix user interface, ensuring you can fully utilize its powerful routing and mixing capabilities.

7.5. The Channel Strip

A single channel can be switched between mono and stereo mode. The mode is set in the channel

settings.

Channel name. The name field is the preferred place to select a channel by a mouse click. A double click opens a dialog to assign a different name. The original name will be shown when activating the option Names in the View Options.

Panorama. Routes the input signal freely to the left and right routing destination (lower label, see below). The level reduction in center position is -3 dB.

Mute and Solo. Input channels and playback channels each have a mute and solo button.

Numerical level display. Shows the current RMS or Peak level, updated twice per second. OVR means overload. The setting Peak/RMS is changed in the View Options.

Level meter. The meter shows both peak values (zero attack, 1 sample is enough for a full-scale display) by means of a yellow line, and mathematically correct RMS values by means of a green bar. The RMS display has a relatively slow time constant, so that it shows the average loudness quite well. Overs are shown in red at the top of the bar. In the Preferences dialog (F2) the Peak Hold time, the over detection and the RMS reference can be set.

Fader. Determines the gain/level of the signal routed to the current routing destination (lower label). Please note that this fader is not the fader of the channel, but only the fader of the current routing. Compared to a standard mixing desk TotalMix does not have a channel fader, but only Aux Sends, as many as there are hardware outputs. Therefore, TotalMix can create as many different submixes as there are hardware outputs. This concept is understood best in the *Submix View*, but more on that later.

Below the fader the Gain is shown in a numerical display field, according to the current fader position. The fader can be:

- dragged with the left mouse button pressed
- moved by the mouse wheel
- set to 0 dB and −∞ by a double click. The same happens with a single click plus held down Ctrl key.
- adjusted in fine mode by mouse drag and mouse wheel when holding the Shift key down

A Shift-click on a fader adds the fader to the temporary fader group. All faders now marked yellow are ganged and move simultaneously in a relative way. The temporary fader group is deleted by a click on the **F** symbol in the upper right of the window.

The **arrow symbol** at the bottom minimizes the channel width to that of the level meters. Another click maximizes it again. A mouse click with held Ctrl key causes all channels to the right to enlarge and minimize at once.

The lowest field shows the current **routing target**. A mouse click opens the routing window to select a routing target. The list shows all activated routings of the current channel by arrows in front of the listed entries. The current one is shown in bold letters.

An arrow is only shown with an activated routing. A routing is seen as activated when audio data is sent. As long as the fader is set to −∞ the current routing will be shown in bold letters, but not have an arrow in the front.

Trim Gain. After a click on the T-button one channel's faders are all synchronized. Instead of changing only a single routing the fader affects all the channel's active routings. For a better overview the faders currently not visible are indicated by orange triangles beside the fader path. When moving the fader the triangles also move to a new position, equalling the faders new settings.

Note that the fader button is set to the highest routing gain of all routings so that best control is offered. The gain (fader knob position) of the currently active routing (the submix selected in the third row) is shown as white triangle.

Background: TotalMix has no fixed channel fader. In case of the HDSPe AoX-D there are 128 stereo Aux sends, shown alternately as single fader within the channel strip. The high number of Aux sends enables multiple and fully independent routings.

In some cases it is necessary to synchronize the gain changes of these routings. An example is the Post fader function, where a change of the singer's volume shall be performed identical to the volume change of the signal sent to the reverb device, so that the reverb level keeps its relation to the original signal. Another example is the signal of a guitar that is routed to different submixes, means hardware outputs, which gets much too loud during the solo part, and therefore needs to be reduced in volume on all outputs simultaneously. After a click on the Trim button this can be done easily and with a perfect overview.

As all channel's routings change simultaneously when Trim is active, this mode basically causes the same behavior as a trim pot within the input channel, affecting the signal already before the mixer. That's how this function got its name.

In the View Options / Show the function Trim Gains can be globally switched on and off for all channels. The global Trim mode is recommended when using TotalMix FX as live mixing desk.

The Context Menu. With a right click on the input, playback and output channels their context menus

provide advanced functionality (these menus are also available in the Matrix, but only directly on the channel labels). The entries are self-explanatory and automatically adjust to where the click is performed. The input channels offer Clear, Copy input, paste the input mix and paste its FX. On a playback channel Copy, Paste and Clear the playback mix are available. On an output channel **Copy and Mirror** functionality for the current submix and copying of the FX settings is offered.

7.5.1. Settings

A click on the tool symbol opens the channel's Settings panel. It includes these elements:

Stereo. Switches the channel to mono or stereo mode.

Width. Defines the stereo width. 1.00 equals full stereo, 0.00 mono, -1.00 swapped channels.

MS Proc. Activates M/S processing within the stereo channel. Monaural information is sent to the left channel, stereo information to the right.

Phase L. Inverts the phase of the left channel by 180°.

Phase R. Inverts the phase of the right channel by 180°.

Note: The functions Width, MS Proc, Phase L and Phase R affect all routings of the respective channel.

The **Hardware Outputs** have no width option, but two other options:

Talkback. Activates this channel as receiver and output of the Talkback signal. This way Talkback can be sent to any outputs, not only the Phones in the Control Room section. Another application could be to send a certain signal to specific outputs by the push of a button.

No Trim. Sometimes channels need to have a fixed routing and level, which should not be changed in any case. An example is the stereo mixdown for recording of a live show. With No Trim active, the routing to this output channel is excluded from the Trim Gains function, therefore is not changed unintentionally.

Loopback. Sends the output data to the driver as record data. The corresponding submix can be recorded then. This channel's hardware input sends its data only to TotalMix, no longer to the recording software.

Another difference to the input and playback channels is the **Cue** button instead of Solo. A click on Cue sends the respective Hardware Output's audio to the Main Out, or any of the Phones outputs (option Assign / Cue to in the Control Room section). With this any hardware output can be controlled and listened to through the monitoring output very conveniently.

7.6. Control Room Strip

In the section Control Room the menu Assign is used to define the **Main Out** which is used for listening in the studio. For this output the functions Dim, Recall, Mono, Talkback, External In and Mute FX are automatically applied.

Additionally the channel will be shifted from the Hardware Outputs into the Control Room section, and renamed Main. The same happens when assigning Main Out B or the Phones. The original name can be displayed by the function Names in the View Options - *Show* at any time.

Phones 1 to 4 will have Dim (set in Settings) and a special routing applied when Talkback is activated. Also putting them beside the Main Out increases the overview within the output section greatly.

Dim. The volume will be reduced by the amount set in the Settings dialog (F3).

Recall. Sets the gain value defined in the Settings dialog.

Speaker B. Switches playback from Main Out to Main Out B. The faders of the channels Main and Speaker B can be ganged via Link.

Mono. Mixes left and right channel. Useful to check for mono compatibility and phase problems.

Talkback. A click on this button will dim all signals on the Phones outputs by an amount set up in the Preferences dialog. At the same time the control room's microphone signal (source defined in Preferences) is sent to the Phones. The microphone level is adjusted with the channel's input fader.

External Input. Switches Main monitoring from the mix bus to the stereo input defined in the Settings dialog (F3). The relative volume of the stereo signal is adjusted there as well.

Assign. Allows to define the Main Out, Main Out B (Speaker B), and up to four Phones outs.

The output for the Cue signal, which is usually Main, can also be set to one of the four Phones outputs. This setting also controls the PFL monitoring.

7.7. Control Strip

The Control Strip on the right side combines different functions that are either required globally, or constantly used, and therefore should not be hidden in a menu. Still using the menu entry Window, Hide Control Strip, the Control Strip is shifted out of the visible area to gain more space for other elements.

Device selection. Select the unit to be controlled in case more than one is installed on the computer.

Undo / Redo. With the unlimited Undo and Redo changes of the mix can be undone and redone, at any time. Undo/Redo does not cover graphical changes (window size, position, channels wide/narrow etc.), and also no changes to the Presets. The accidental overwrite of an EQ Preset can not be made undone.

Undo/Redo also operates across Workspaces. Therefore a completely differently set up mixer view can be loaded via Workspace, and with a single click on Undo the previous internal mixer state is returned - but the new mixer view stays.

Global Mute Solo Fader.

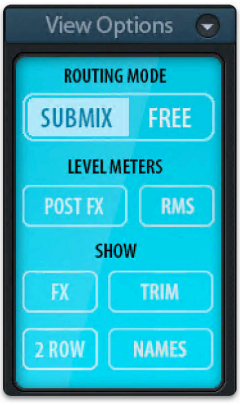
Mute. Global Mute operates in a pre fader style, muting all currently activated routings of the channel. As soon as any Mute button is pressed, the Mute Master button lights up in the Control Strip area. With this button all selected mutes can be switched off and on again. One can comfortably set up a mute group or activate and deactivate several mute buttons simultaneously.

Solo. As soon as any Solo button is pressed, the Solo Master button lights up in the Control Strip area. With this button all selected Solos are switched off and on again. Solo operates as Solo-in-Place, post fader style, as known from common mixing desks. A typical limitation for mixing desks, Solo working only globally and only for the Main Out, does not exist in TotalMix. Solo is always activated for the current submix only.

Fader. A Shift-click on a fader adds the fader to the temporary fader group. All faders now marked yellow are ganged, and move simultaneously in a relative way. The temporary fader group is deleted by a click on the F symbol.

7.7.1. View Options

View Options. This area combines different functions of routing, the level meters and the mixer view.



Routing Mode

- **Submix.** The Submix view (default) is the preferred view and delivers the quickest overview, operation and understanding of TotalMix. The click on one of the Hardware Output channels selects the respective submix, all other outputs are darkened. At the same time all routing fields are set to this channel. With Submix view, it is very easy to generate a submix for any output: select the output channel, then adjust the fader and pans of first and second row - finished.
- **Free.** The Free view is for advanced users. It is used to edit several submixes simultaneously, without the need to change between them. Here one works with the routings fields of the input and playback channels only, which then show different routing destinations.

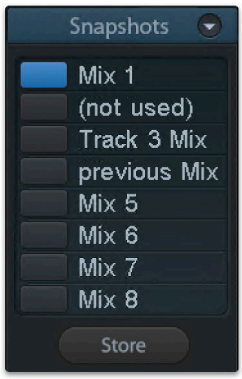
Level Meters

- **Post FX.** This device has no effects processor, therefore the level meters will show the same level regardless of this setting.
- **RMS.** The numerical level display in the channels displays peak or RMS.

Show

- **FX.** Opens the window to set up the effects Reverb and Echo.
- **Trim.** Activates all Trim buttons on all channels. TotalMix thus behaves like a conventional, simple mixing desk. Each fader affects all active routings of the channel simultaneously, as if the fader were a trim-pot in the hardware input.
- **2 Row.** Switches the mixer view to 2 rows. Hardware Inputs and Software Playbacks are placed side by side. This view saves a lot of space, especially in height.
- **Names.** Display of the original names of channels when they had been renamed by the user.

7.7.2. Snapshots

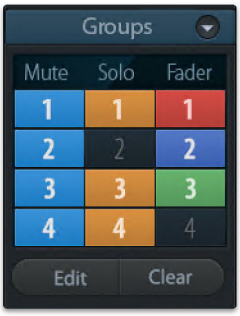


Snapshots include all mixer settings, but no graphical elements like window positions, window size, number of windows, visible EQs or Settings, scroll states, Presets etc. Only the state wide/narrow of the channels is registered. Moreover the Snapshot is only temporarily stored. Loading a Workspace causes the loss of all stored Snapshots, when these all had not been saved before in a Workspace, or separately via *File / Save Snapshot as*. Via *File / Load Snapshot* the mixer states can be loaded individually.

Eight different mixes can be stored under individual names in the Snapshot section. A click on any of the 8 buttons loads the corresponding Snapshot. A double click on the name field opens the dialog Input Name to edit the name. As soon as the mixer state is changed the button starts flashing. A click on Store lets all buttons flash, whereby the last loaded one, the base of the current state, flashes inversely. The storage finishes by clicking the desired button (means storage place). The storage process is exited by another click on the flashing Store button.

The area Snapshots can be minimized by a click on the arrow in the title bar.

7.7.3. Groups



The area **Groups** provides 4 storage places each for fader, mute and solo groups. The groups are valid per Workspace, being active and usable in all 8 Snapshots. But with this they are also lost when loading a new workspace, in case they have not been saved before in a different Workspace.

Note: The Undo function will help in case of an accidental overwrite or deletion of the groups.

TotalMix uses flashing signals to guide you through the group setup. After a click on Edit and click on the desired storage place all desired functions for this group have to be activated or selected. The storage process is finished by another click on Edit.

When setting up a fader group make sure to not add faders that are at the top or low position, except all faders of that group have this position.

The Mute groups operate - other than the global mute - exclusively for the current routing. This way you can not mute signals on all outputs unintentionally. Instead signals can be muted on specific submixes by the push of a button.

A solo group operates exactly like the global solo, signals outside the current routing are not affected.

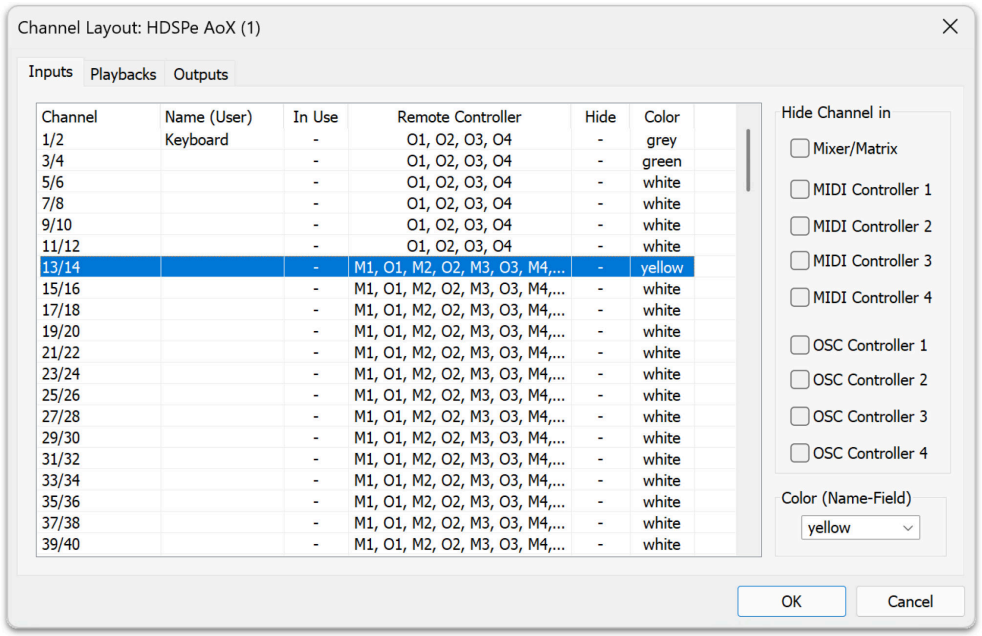
7.7.4. Layout Presets

To maintain overview within TotalMix FX channels can be hidden. Channels can also be excluded from being remote controlled. Under **Options / Channel Layout** a dialog lists all I/Os with their current state. Selecting one or several channels enables the options to the right:

- Hide Channel in Mixer/Matrix. The selected channels are no longer shown in TotalMix FX, nor are they available via MIDI or OSC remote control.
- Hide Channel in MIDI Remote 1-4. The selected channels are hidden for MIDI remote (CC and Mackie Protocol).
- Hide Channel in OSC Remote 1-4. The selected channels are hidden for OSC remote control.

Hidden channels in Mixer/Matrix are still fully functional. An existing routing/mixing/FX processing stays active. But as the channel is no longer visible it can not be edited anymore. At the same time the hidden channels are removed from the list of remote controllable channels, to prevent them from being edited unnoticed.

Hidden channels in MIDI Remote x are removed from the list of remote controllable channels. Within an 8-channel block of a Mackie compatible control they are skipped. The control therefore is no longer bound to consecutive orders. For example it will control channels 1, 2, and 6 to 11, when channels 3 to 5 are hidden.



The same can be done for OSC. With unnecessary channels made invisible for the OSC remote the more important channels are available as one block on the remote.

The dialog can be called directly from TotalMix by a right mouse click on any channel. The corresponding channel will then be preselected in the dialog.

Rows Inputs, Playbacks and Outputs are set up individually by the tabs at the top. In Use shows which channels are currently used in the mixing process.

In the above example the Phones playback channel has been made invisible. When the Phones output is not used this is an easy way to remove it from the mixer completely. A more complex setup would be to only show all channels of the drum section, the horn section or the violins.

After finishing those settings the whole state can be stored as Layout Preset. A click on Store and the desired memory slot makes the current channel layout recallable anytime. The button All makes all channels temporarily visible again.

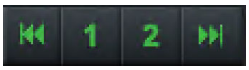
With a simple click on a button it will then be possible to easily switch views of only the channels involved with the mixing of the drum section, the horn section, the violins, or any other useful view. An optimized remote layout can be activated here as well, with or without visible changes. Double-click the default slot name to enter any other name.

Layout Presets are stored within the Workspace, so make sure to save the current state before loading a different Workspace!

The button Sub activates another useful special view. When in Submix view, Sub will cause all channels to disappear that are not part of the currently selected Submix/Hardware Output. Sub temporarily shows the mix based on all channels from Inputs and Playback row, independent from the current Layout Preset. That makes it very easy to see and to verify which channels are mixed/routed to the current output. Sub makes checking and verifying of mixes, but also the mix editing itself, a lot easier, and maintains perfect overview even with lots of channels.

7.7.5. Scroll Location Markers

Another feature to improve overview and working with TotalMix FX are scroll location markers (TotalMix view only). These are displayed automatically when the horizontal size of the TotalMix FX window is smaller than the channel display requires. Shown on the right side of the scrollbar of each row they have four elements:



1. Arrow to the left. A left mouse click let the channels scroll to the very first one, or most left.
2. Marker number 1. Scroll to the desired position and perform a right mouse click on 1. A dialog comes up with precise information. Once stored, a left mouse click will scroll the channels to the stored position.
3. Marker number 2. See above.
4. Arrow to the right. A left mouse click let the channels scroll the last one, or most right.

Scroll location markers are stored in the Workspace.

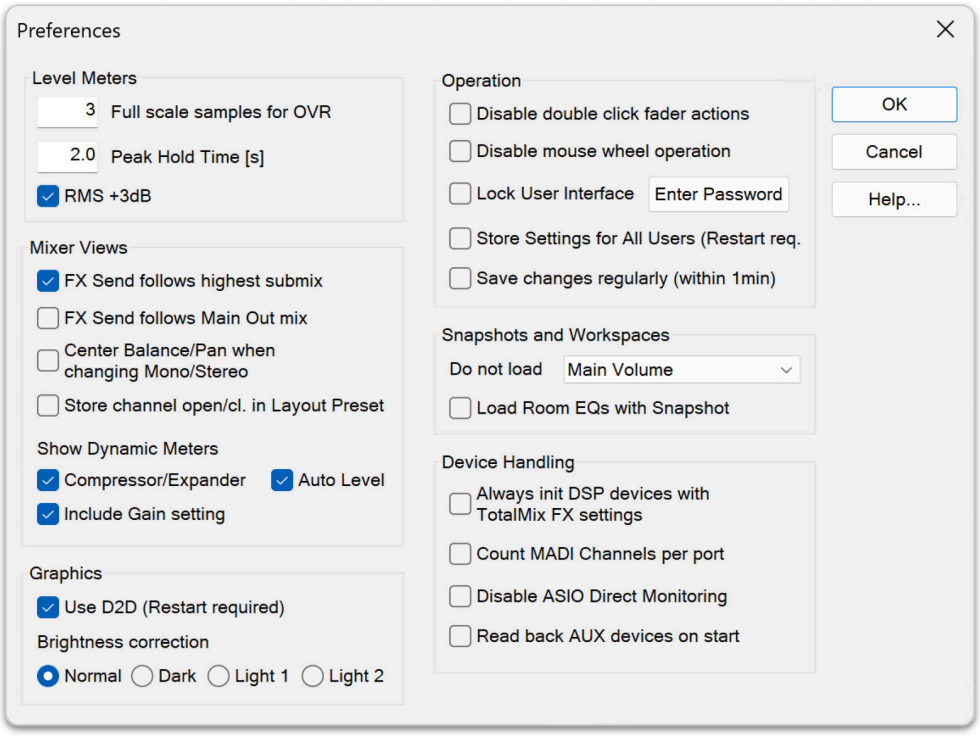
Application Examples

- When the TotalMix FX window is intentionally made small in width, so only a few channels are shown.
- When the available screenspace is not sufficient to show all channels.
- When some or all EQ or Dynamics panels are open. Then all relevant settings are always visible, but require a lot of space horizontally.

7.8. Preferences

The dialog Preferences can be opened via the Options menu or directly via F2.

TotalMix FX supports various RME audio interfaces. Not all preferences apply to the HDSPe AoX-D.



Level Meters

- Full scale samples for OVR. Number of consecutive samples to trigger an over detection (1 to 10).
- Peak Hold Time. Hold time of the peak value. Adjustable from 0.1 up to 9.9 s.
- RMS +3 dB. Shifts the RMS value by +3 dB, so that full scale level is identical for Peak and RMS at 0 dBFS.

Mixer Views

- FX Send follows highest Submix. *Not applicable for the HDSPe AoX-D.*
- FX Send follows Main Out mix. *Not applicable for the HDSPe AoX-D.*
- Center Balance/Pan when changing Mono/Stereo. When switching a stereo channel into two mono channels the pan-pots are set fully left and right. This option will set them to center instead.
- Disable double click fader action. Prevents unintentional gain settings, for example when using sensitive touchpads.

Dynamic Meters

- Compressor/Expander. *Not applicable for the HDSPe AoX-D.*
- Include Gain setting. *Not applicable for the HDSPe AoX-D.*
- Auto Level. *Not applicable for the HDSPe AoX-D.*

Snapshots

- Do not load Main volume/balance. The values stored in the Snapshot are not loaded for the Main Out, so the current setting is not changed.

Device Handling

- Always init DSP devices with TotalMix FX settings. Not supported by the hardware.
- Count MADI Channels per port. *Not applicable for the HDSPe AoX-D.*
- Disable ASIO Direct Monitoring. Disables ASIO Direct Monitoring (ADM) for the HDSPe AoX-D within TotalMix FX.

Graphics

- Use D2D (Change requires restart). Default on. Can be deactivated to use a compatible but CPU-taxing graphics mode, in case graphics problems show up.
- Brightness correction. Set TotalMix FX screen brightness to your taste, matching the monitor setting or the environment.

Store Setting for (Windows only)

- All Users (Restart required). See next chapter.

Special Options

- Lock User Interface. Default off. Can be activated to freeze the current mix state. Faders, buttons and knobs relating to the mix state can not be moved anymore.

7.8.1. Store for Current or All Users (Windows)

TotalMix FX stores all settings, workspaces and snapshots for the current user in:

`C:\Users\Username\AppData\Local\TotalMixFX`

Current User ensures that when workstations are used by several people they all find their own settings. In case the settings should be identical or given for any user, TotalMix FX can be changed to use the `All User` directory. An admin could even write protect the file `last.HDSPeAoX1.xml`,

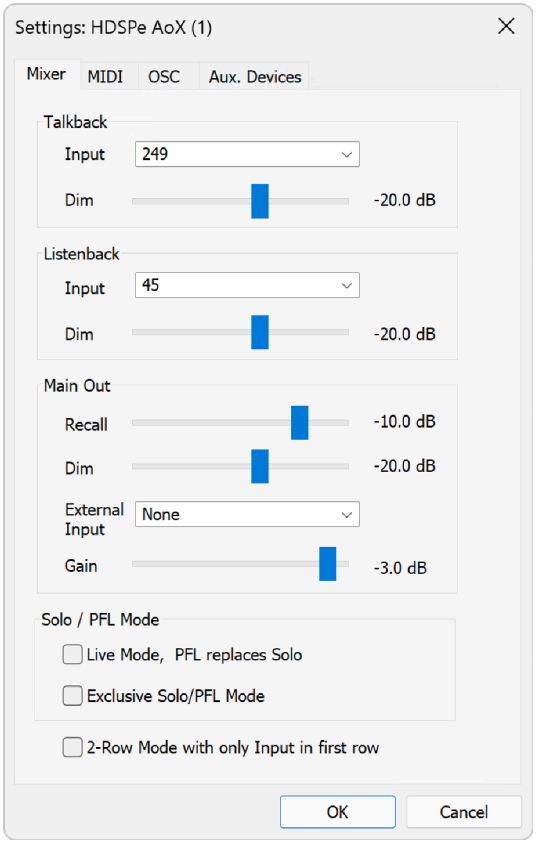
which results in a complete reset to that file's content whenever TotalMix FX is restarted. The xml-file is updated on exit, so simply set up TotalMix as desired and exit it (right mouse click on the symbol in the notification area).

7.9. Settings

The dialog Settings can be opened via the Options menu or directly via F3.

7.9.1. Mixer Tab

On the mixer page some typical settings for the mixer operation are set, like Talkback source, Dim amount when Talkback is active, the stored main volume or the input used for the External Input function.



Talkback

- Input. Selects the input channel of the Talkback signal (microphone in control room). Default: None.
- Dim. Amount of attenuation of the signals routed to the Phones in dB.

Listenback

- Input. Selects the input channel of the Listenback signal (microphone in recording room). Default: None.
- Dim. Amount of attenuation of the signals routed to the Main Out in dB.

Main Out

- Recall. User defined listening volume, activated by the Recall button at the unit or in TotalMix.
- Dim. Amount of attenuation for the Main Out in dB.
- External Input. Selects the stereo input that replaces the mix signal on the Main Out when

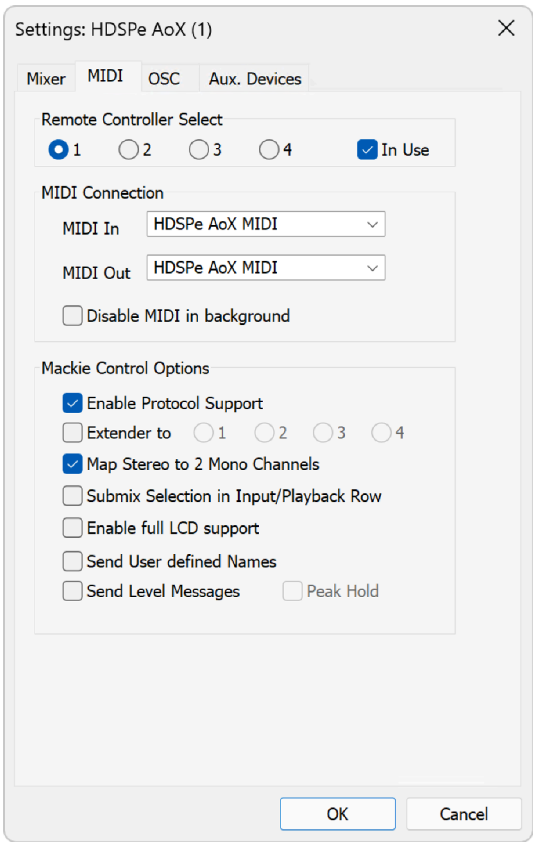
activated. The volume of the stereo signal is adjusted by the slider Gain.

PFL Mode

- Live Mode, PFL replaces Solo. PFL means Pre Fader Listening. This feature is very useful when operating TotalMix in a live environment, as it allows to quickly listen/monitor any of the inputs by hitting the Solo button. The monitoring happens on the output set for the Cue signal via the Assign dialog.

7.9.2. MIDI Tab

The MIDI page has four independent settings for up to four MIDI remote controls, using CC commands or the Mackie Control protocol.



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Select one of four settings pages and thus remote controls. Settings are remembered automatically. To activate or deactivate any of the four remote controls check or uncheck 'In Use'.

MIDI Remote Control

- **MIDI In.** Input where TotalMix receives MIDI Remote data.
- **MIDI Out.** Output where TotalMix sends MIDI Remote data.
- **Disable MIDI in background.** Deactivates MIDI Remote Control as soon as another application is in the focus, or when TotalMix has been minimized.

Mackie Control Options

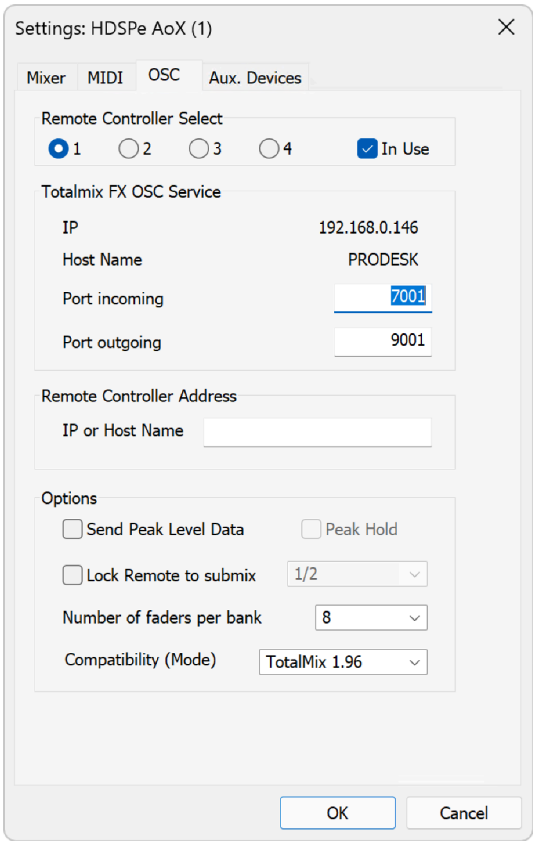
- **Enable Protocol Support.** When disabled TM FX will only react on the Control Change commands of chapter 28.5.
- **Extender to.** Sets the current remote to be an extender to the main remote. Both remotes will be shown as one block and navigate simultaneously.

- **Map Stereo to 2 Mono Channels.** One fader controls one (mono) channel. Should be disabled when stereo channels are used.
- **Submix Selection in Input/Playback Row.** Enables a selection of the submix when in first row, without having to change to the third row first. However, when using both mono and stereo channels, first and third row usually do not match anymore, so the selection often becomes unclear this way.
- **Enable full LCD support.** Activates full Mackie Control LCD support with eight channel names and eight volume/pan values.
- **Send User defined Names.** Channel names defined by the user will be sent to the remote device via MIDI and - if supported - shown in its display.
- **Send Level Messages.** Activates the transmission of the level meter data. Peak Hold activates the peak hold function as set up for the TotalMix level meters in the preferences.

When MIDI Out is set to NONE then TotalMix FX can still be controlled by Mackie Control MIDI commands, but the 8-channel block is not marked as remote target.

7.9.3. OSC Tab

The OSC page has four independent settings for up to four MIDI remote controls via Open Sound Control (OSC). This is a network based remote protocol that can be used for example by Apple's iPad with the app TouchOSC or Lemur to wirelessly remote control TotalMix FX running on a Mac or Windows computer.



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Select one of four settings pages and thus remote controls. Settings are remembered automatically. To activate or deactivate any of the four remote controls check or uncheck 'In Use'.

TotalMix FX OSC Service

- **IP.** Shows the network address of the computer running TotalMix FX (local host). This address

must be entered on the remote side.

- **Host Name.** Local computer name.
- **Port incoming.** Must match the remote entry 'Port outgoing'. Typical values are 7001 or 8000.
- **Port outgoing.** Must match the remote entry 'Port incoming'. Typical values are 9001 or 9000.

Remote Control

- **IP or Host name.** Enter the IP or host name of the remote control. Please note that the IP number usually works better than the host name.

Options

- **Send Peak Level.** Activates the transmission of the peak level meter data. Peak Hold activates the peak hold function as set up for the TotalMix level meters in the preferences.

7.9.4. AUX Devices

TotalMix FX can show additional remote control elements for the most important parameters of the following microphone preamplifiers:

- RME AVB Tool (four channels)
- RME Octamic XTC (eight channels)
- RME 12Mic (12 channels)
- RME 12Mic-D (12 channels)

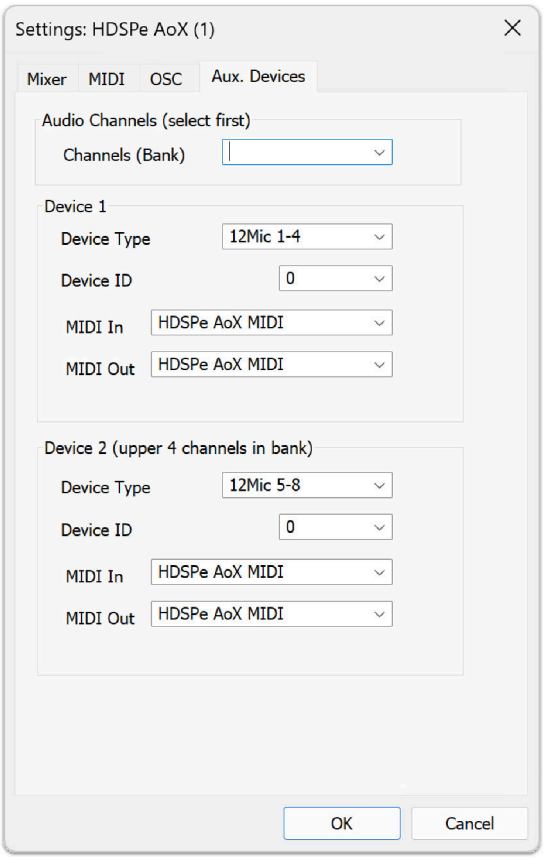
These devices must be connected via MIDI (DIN; Octamic XTC alternatively via USB); it is not possible to send the control data via network.

At the time of writing, the HDSPe AoX-D driver does not provide a `MIDI over MADI` interface for the four optional MADI ports. However, apart from the Octamic XTC, the preamps require that MIDI remote control information is embedded in a MADI signal because they do not have physical MIDI ports that could be connected to the HDSPe AoX-D directly. It is therefore necessary to either embed the MIDI signal into a MADI stream with a separate device (for example the Octamic XTC) in order to control those units over MIDI.

There are several applications that can control the above preamplifiers over MIDI. It is important to ensure that only one application uses the same MIDI port at a given time to ensure proper data transfer. It is not possible to use two applications to control the same device via MIDI at the same time.

Audio Channels (select first)

This selects a 'bank' of eight consecutive TotalMix input channels where the remote control features should be displayed. The bank either represents one Octamic XTC device or two four-channel blocks of any of the other devices.



- **Device 1,**
- **Device 2:**
  - **Device Type:** The model that should be controlled in the selected bank
  - **Device ID:** Used to distinguish several devices of the same type (to be configured on the device itself; default is `0`)
- **MIDI In.**
  Set the currently used MIDI port that receives the return signal from the controlled device.
- **MIDI Out.**
  Set the currently used MIDI port that connected to the controlled device.

The manuals of the controlled device contain details on how to setup MIDI remote control. Also the RME User Forum can be searched on this topic for further advice.

Mixer View Integration

1. Open TotalMix FX.
2. Navigate to **Options** > **Settings**.
3. In the **Aux Devices** tab, select the bank that currently receives the device's audio signals.

   There are three routing matrices that establish a signal flow of the corresponding audio channels from the device to TotalMix:

   - the output routing of the controlled device to Milan® or MADI,
   - the routing configured in the MILAN Manager or any MADI routers in between and
   - the *Input Routing* in the HDSPe AoX-D **Settings** dialog.
4. Assign the device's channels to the corresponding input channels in TotalMix FX.

Once configured, TotalMix FX will display controls for phantom power, Instrument/PAD/TRS, Gain, and AutoSet for the selected device. Control is bidirectional if TotalMix receives the responses of the device on the configured MIDI port:

- Adjusting parameters on the hardware will reflect in TotalMix FX.
- Changes made in TotalMix FX will update the hardware in real time.

Further information can be found on the RME User Forum (https://forum.rme-audio.de).

Configurations are stored within snapshots and can be recalled for several devices at once by recalling snapshots.

7.10. Hotkeys and Usage

TotalMix FX has many hotkeys and mouse/hotkey combinations to speed up and simplify the usage. The below description refers to Windows.

On Mac substitute Ctrl in the below list with the **Command key** ⌘.

The Shift key enables a fine-tuning of the gain with all faders and in the Matrix. On all knobs it will speed up the setting.

A click on a fader with held down Shift key adds the fader to the temporary fader group.

A click in the fader path with held down Ctrl key will let the fader jump to 0 dB, at the next click to −∞. Same function: Double click of the mouse.

Clicking on one of the **Panorama or Gain knobs** with held down Ctrl key lets the knob jump to center position. Same function: Double click of the mouse.

Clicking on the **Panorama knob** with held down Shift key lets the knob jump to fully left, with Shift-Ctrl to fully right.

Clicking on one of the channel settings buttons (slim/normal, Settings, EQ, Dynamics) with held down Ctrl key lets all channels to the right change their state. For example all panels can be opened/closed simultaneously.

A double click of the mouse on a knob or its numerical field opens the according Input Value dialog. The desired value can then be set by keyboard.

Dragging the mouse from a parameter field increases (move up) or decreases (move down) the value in the field.

Ctrl-N opens the dialog Function Select to open a new TotalMix window.

Ctrl-W opens the dialog **File Open** of the operating system to load a TotalMix Workspace file.

The key W starts the dialog Workspace Quick Select for a direct selection or storage of up to 30 Workspaces.

The key M switches the active window to **Mixer** view. The key X switches the active window to Matrix view. Ctrl-M opens a new Mixer window, Ctrl-X opens a new Matrix window. Another Ctrl-M or Ctrl-X closes the new window again.

F1 opens the online help. The Level Meter setup dialog can be opened with F2 (same as in DIGICheck). The dialog **Preferences** is opened with F3.

Alt - F4 closes the current window.

Alt and number keys 1 to 8 (not on the numeric keypad!) will load the corresponding Workspace from the Workspace Quick Select feature (hotkey W).

7.11. Menu 'Options'

Deactivate Screensaver: When active (checked) any activated Windows screensaver will be disabled temporarily.

Always on Top: When active (checked) the TotalMix window will always be on top of the Windows desktop.

This function may result in problems with windows containing help text, as the TotalMix window will even be on top of those windows, so the help text isn't readable.

Enable MIDI / OSC Control: Activates external MIDI or OSC control of the TotalMix mixer. In Mackie Protocol mode the channels which are currently under MIDI control are indicated by a color change of the name field. This setting also controls the MIDI remote function in stand-alone operation. The current state is kept when changing from online to offline. Additionally the current state is stored in the six Setups, the unit's own memory.

Submix linked to MIDI / OSC control (1-4). The 8-channel group follows the currently selected submix, means Hardware Output, when a different submix is chosen on the remote as well as when doing this in TotalMix. When using multiple windows it can be useful to deactivate this feature for specific windows. The view will not change then.

Preferences: Opens a dialog box to configure several functions of the level meters and the mixer. See Section 7.8, "Preferences"

Settings. Opens a dialog box to configure several functions like Talkback, Listenback, Main Out and the MIDI Remote Control. See Section 7.9, "Settings".

Channel Layout. Allows to hide channels visually and from remote. See Section 7.7.4, "Layout Presets".

Key Commands. Opens a dialog box to configure the computer's keyboard keys F4 to F8.

Reset Mix. Offers several options to reset the mixer state:

- **Straight playback with all to Main Out.** All Playback channels are routed 1:1 to the Hardware Outputs. Simultaneously all playbacks are mixed down to the Main Out. The faders in the third row are not changed.
- **Straight Playback.** All Playback channels are routed 1:1 to the Hardware outputs. The faders in the third row are not changed.
- **Clear all submixes.** Deletes all submixes.
- **Clear channel effects.** Switches off all EQs, Low Cuts, Reverb, Echo, Dynamics and Stereo Width and sets their knobs to default position.
- **Set output volumes.** All third row faders will be set to 0 dB, Main and Speaker B to -10 dB.
- **Reset channel names.** Removes all names assigned by the user.
- **Set all channels mono.** Reconfigures all TotalMix FX channels to mono mode.
- **Set all channels stereo.** Reconfigures all TotalMix FX channels to stereo mode.
- **Set inputs mono / outputs stereo (ADM).** Preferred setup for best ASIO Direct Monitoring compatibility. In most cases mono hardware outputs will break ADM. Mono inputs are in most cases compatible. If not wrong panning might occur.
- **Total Reset.** Playback routing 1:1 with mixdown to Main Out. Switches off all other functions.

Operational Mode. Defines TotalMix FX basic operational mode. Choices are Full Mode (default, mixer active, all routing options available), and Digital Audio Workstation Mode (straight playback routing, no input mix).

Offline Device Setup. Makes all devices supported by TotalMix FX available offline. This 'demo' mode can load and save workspaces, and thus also allows offline editing and visual inspection of workspaces and snapshots.

Setup: Select the desired devices and add them to the list of Configured Devices by clicking Add. Close the dialog by clicking OK.

Mixer and Matrix can now be opened even without a connected device. The device selection is done on the top right via the device selection field in the Control Strip.

Network Remote Settings. Settings to remote control TotalMix FX by TotalMix Remote via network.

7.12. Menu Window

Zoom Options 100%, 135%, 200%. Depending on the size of the monitor and the current resolution TotalMix FX might be much too small and the controls too tiny to easily operate them. Together with the 2 Row mode these options give a lot of different window sizes that suit all monitors and resolutions currently existing.

Hide Control Strip. Shifts the Control Strip out of the visible area to gain more space for other elements.

7.13. The Matrix

The mixer window of TotalMix looks and operates similar to mixing desks, as it is based on a conventional stereo design. The matrix display presents a different method of assigning and routing channels, based on a single channel or monaural design. The matrix view of the HDSPe AoX-D has the look and works like a conventional patchbay, adding functionality way beyond comparable hardware and software solutions. While most patchbays will allow you to connect inputs to outputs with just the original level (1:1, or 0 dB, as known from mechanical patchbays), TotalMix allows you to use a freely definable gain value per crosspoint.

Matrix and TotalMix are different ways of displaying the same processes. Because of this both views are always fully synchronized. Each change in one view is immediately reflected in the other view as well.

7.13.1. Elements of the Matrix View

The visual design of the Matrix is based on the architecture of the HDSPe AoX-D system:

- **Horizontal labels.** All hardware outputs
- **Vertical labels.** All hardware inputs. Below are all playback channels.
- **Green 0.0 dB field.** Standard 1:1 routing
- **Dark grey field with number.** Shows the current gain value as dB
- **Blue field.** This routing is muted
- **Red field.** Phase 180° (inverted)
- **Dark grey field.** No routing.

To maintain overview when the window size has been reduced, the labels are floating. They won't

leave the visible area when scrolling.

7.13.2. How to use the matrix

Using the Matrix is a breeze. It is very easy to identify the current crosspoint, because the outer labels light up in orange according to the mouse position.

- If input 1 is to be routed to output 1, use the mouse and click one time on crosspoint In 1 / Out 1 with held down Ctrl key. Two green 0.0 dB field pop in, another click removes them.
- To change the gain (equals the use of a different fader position, see simultaneous display of the mixer view), drag the mouse up or down, starting from the gain field. The value within the field changes accordingly. The corresponding fader in the mixer view is moving simultaneously, in case the currently modified routing is visible.
- On the right side is the Control Strip from the mixer window, adapted to the Matrix. The button for the temporary fader group is missing as well as all View options, as they do not make sense here. Instead the button Mono Mode lets you decide whether all the actions performed in the Matrix are valid for two channels or just one.

The Matrix not always replaces the mixer view, but it significantly enhances the routing capabilities and - more important - is a brilliant way to get a fast overview of all active routings. It shows you in a glance what is going on. And since the Matrix operates monaural, it is very easy to set up specific routings with specific gains.

7.14. ASIO Direct Monitoring (Windows)

Programs that support ADM (ASIO Direct Monitoring - Samplitude, Sequoia, Cubase, Nuendo etc.) send control commands to TotalMix. This is directly shown by TotalMix. When a fader is moved in the ASIO host the corresponding fader in TotalMix will move too. TotalMix reflects all ADM gain and pan changes in real-time.

But: the faders only move when the currently activated routing (the selected submix) corresponds to the routing in the ASIO host. The Matrix on the other hand will show any change, as it shows all possible routings in one view.

7.14.1. To Copy a Submix

TotalMix allows you to copy complete submixes to other outputs. In case a complex submix is need with only a few changes on a different output, the whole submix can be copied to that output.

1. Right click with the mouse on the original submix output, means Hardware Output.
2. In the context menu select **Copy Submix**.
3. Then right click on the new submix output, choose **Paste Submix** in the context menu.

Now fine tune the submix.

7.14.2. Doubling the Output Signal (Mirror)

If a mix should be sent out via two (or more) different hardware outputs simply mirror that mix to any number of other outputs.

1. A right click on the original output brings up the option to Copy/Mirror <name>.
2. Another right click on the new output, then selecting Mirror of Output <name> will paste the whole submix and then synchronize it automatically to any future changes.

The outputs now always send out the same signals, but their main volume (fader) and the EQ settings stay fully independent.

7.14.3. Delete a submix

The easiest and quickest way to delete complex routings is by selection of the according output channel in the mixer view by a right mouse click, and selection of the menu entry **Clear Submix**. As TotalMix FX includes an unlimited undo the delete process can be undone without any problem.

7.14.4. Copy and paste everywhere

The above three tips use functions found in the right click context menu available on all channels of the TotalMix FX mixer view. These menus are also available in the Matrix, but only directly on the channel labels. They are self-explanatory and automatically adjust to where the click is performed. The input channels offer Clear, Copy input, Paste the input mix and Paste its FX. On a playback channel Copy, Paste and Clear the playback mix are available. On an output channel Copy and Mirror functionality for the current submix and copying of the FX settings is offered.

These options are very advanced and mighty tools to quickly do the impossible. Still there is no need to fear breaking something, as a simple click (or several) on the Undo button will get you back to where you started!

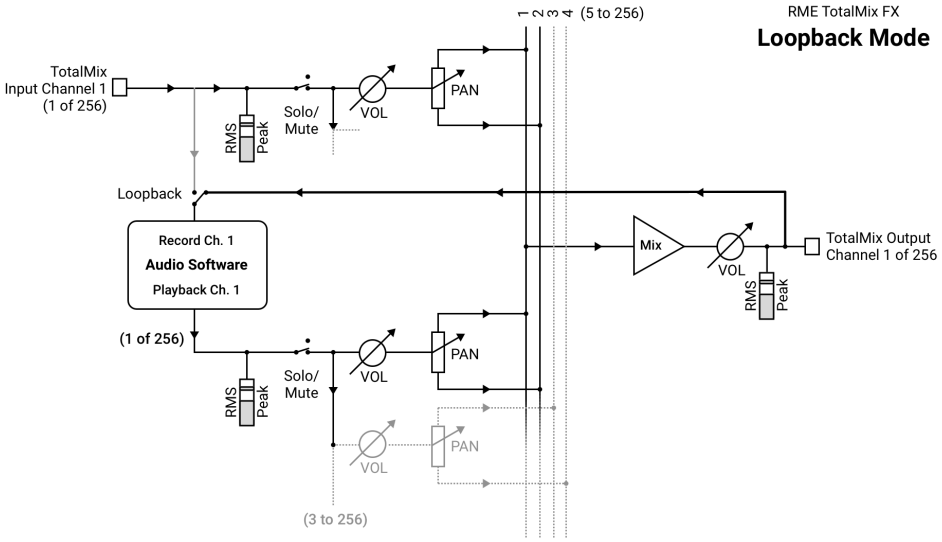
7.14.5. Recording a Submix - Loopback

TotalMix includes an internal loopback function, from the Hardware Outputs to the recording software. Instead of the signal at the hardware input, the signal at the hardware output is sent to the record software. This way, submixes can be recorded without an external loopback cable. Also the playback from a software can be recorded by another software.

The function is activated by the Loopback button in the Settings panel of the Hardware Outputs. In loopback mode, the signal at the hardware input of the corresponding channel is no longer sent to the recording software, but still passed through to TotalMix. Therefore TotalMix can be used to route this input signal to any hardware output. Using the subgroup recording, the input can still be recorded on a different channel.

As each of the 128 stereo hardware outputs can be routed to the record software, and none of these hardware inputs get lost, TotalMix offers an overall flexibility and performance not rivalled by any other solution.

The risk of feedbacks, a basic problem of loopback methods, is low, because the feedback can not happen within the mixer, only when the audio software is switched into monitoring mode.



The block diagram shows how the software's input signal is played back, and fed back from the Hardware Output to the software input.

Note: The phones output has no matching input, therefore does not support Loopback.

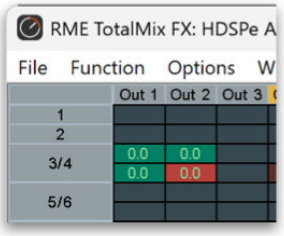
Recording a Software's playback In real world application, recording a software's output with another software will show the following problem: The record software tries to open the same playback channel as the playback software (already active), or the playback one has already opened the input channel which should be used by the record software.

This problem can easily be solved. First make sure that all rules for proper multi-client operation are met (not using the same record/playback channels in both programs). Then route the playback signal via TotalMix to a hardware output in the range of the record software, and activate Loopback for recording.

Mixing several input signals into one record channel In some cases it is useful to record several sources into only one track. For example when using two microphones recording instruments and loudspeakers, TotalMix' Loopback mode saves an external mixing desk. Simply route/mix the input signals to the same output (third row), then redefine this output into a record channel via Loopback. This way any number of input channels from different sources can be recorded into one single track.

7.14.6. MS Processing

The mid/side principle is a special positioning technique for microphones, which results in a mid signal on one channel and a side signal on the other channel. This information can be transformed back into a stereo signal quite easily. The process sends the monaural mid channel to left and right, the side channel too, but phase inverted (180°) to the right channel. For a better understanding: the mid channel represents the function L+R, while the side channel represents L-R.



During record the monitoring needs to be done in 'conventional' stereo. Therefore, TotalMix also offers the functionality of a M/S-decoder. Activation is done in the Settings panel of the Hardware Input and Software Playback channels via the MS Proc button.

The M/S-Processing automatically operates as M/S encoder or decoder, depending on the source signal format. When processing a usual stereo signal, all monaural information will be shifted into the left channel, all stereo information into the right channel. Thus, the stereo signal is M/S encoded.

This yields some interesting insights into the mono/stereo contents of modern music productions. Additionally, some very interesting methods of manipulating the stereo base and generating stereo effects come up, as it is then very easy to process the side channel with Low Cut, Expander, Compressor or Delay.

The most basic application is the manipulation of the stereo width: a change of the level of the side channel allows to manipulate the stereo width from mono to stereo up to extended.

7.15. MIDI Remote Overview

TotalMix can be remote controlled via MIDI. It is compatible to the widely spread Mackie Control protocol, so TotalMix can be controlled with all hardware controllers supporting this standard. Examples are the Mackie Control, Tascam US-2400 or Behringer BCF 2000.

Additionally, the stereo output faders (lowest row) which are set up as Main Out in the Control Room section can also be controlled by the standard **Control Change Volume** via **MIDI channel 1**. With this, the main volume of the MADI FX is controllable from nearly any MIDI equipped hardware device.

MIDI remote control always operates in View *Submix* mode, even when the View Option *Free* is currently selected in TotalMix FX.

7.15.1. MIDI Remote Mapping

TotalMix supports the following Mackie Control surface elements*:

Element:	**Meaning in TotalMix:**
Channel faders 1 - 8	volume
Master fader	Main Out channel fader
SEL(1-8) + DYNAMICS	Activate Trim mode
V-Pots 1 - 8	pan
pressing V-Pot knobs	pan = center
CHANNEL LEFT or REWIND	move one channel left
CHANNEL RIGHT or FAST FORWARD	move one channel right
BANK LEFT or ARROW LEFT	move eight channels left
BANK RIGHT or ARROW RIGHT	move eight channels right
ARROW UP or Assignable1/PAGE+	move one row up
ARROW DOWN or Assignable2/PAGE-	move one row down
EQ	Master Mute
PLUGINS/INSERT	Master Solo
STOP	Dim Main Out
PLAY	Talkback
PAN	Mono Main Out
FLIP	Speaker B

DYN	TrimGains
MUTE Ch. 1 - 8	Mute
SOLO Ch. 1 - 8	Solo
SELECT Ch. 1 - 8	Select
REC Ch. 1 - 8	select output bus (Submix)
RECORD	Recall
F1 - F8	load Snapshot 1 - 8
F9	select Main Out
F10 - F12	select Cue Phones 1 - 3

*Tested with Behringer BCF2000 Firmware v1.07 in Mackie Control emulation for Steinberg mode and with Mackie Control under Mac OS X.

7.15.2. Setup MIDI Control

To allow Remote Control via external MIDI messages:

1. Open the Preferences dialog (menu Options or F3). Select the MIDI Input and MIDI Output port where your controller is connected to.
2. When no feedback is needed select NONE as MIDI Output.
3. Check *Enable MIDI Control* in the Options menu.

7.15.3. Operation

The channels being under Mackie MIDI control are indicated by a color change of the name field, black turns to brown.

The 8-fader block can be moved horizontally and vertically, in steps of one or eight channels.

Faders can be selected to gang them.

In Submix View mode, the current routing destination (output bus) can be selected via REC Ch. 1 - 8. This equals the selection of a different output channel in the lowest row by a mouse click when in Submix View. In MIDI operation it is not necessary to jump to the lowest row to perform this selection. This way even the routing can be easily changed via MIDI.

Full LC Display Support: This option in Preferences (F3) activates complete Mackie Control LCD support with eight channel names and eight volume/pan values. When Full LC Display Support is turned off, only a brief information about the first fader of the block (channel and row) is sent. This brief information is also available on the LED display of the Behringer BCF2000.

Disable MIDI in Background (menu Options, Settings) disables the MIDI control as soon as another application is in the focus, or in case TotalMix has been minimized. This way the hardware controller will control the main DAW application only, except when TotalMix is in the foreground. Often the DAW application can be set to become inactive in background too, so that MIDI control is switched between TotalMix and the application automatically when switching between both applications.

TotalMix also supports the 9th fader of the Mackie Control. This fader (labelled Master) will control the stereo output faders (lowest row) which are set up as Main Out in the Control Room section.

7.15.4. MIDI Control

The hardware output which is set up as Main Out can be controlled by the standard Control Change Volume via MIDI channel 1. With this, the main volume of the HDSPe AoX-D is controllable from nearly any MIDI equipped hardware device.

Even if you don't want to control all faders and pans, some buttons are highly desired to be available in 'hardware'. These are mainly the Talkback and the Dim button, and the monitoring option Cue (listen to Phones submixes). Fortunately a Mackie Control compatible controller is not required to control these buttons, as they are steered by simple Note On/Off commands on MIDI channel 1.

The notes are (hex / decimal / keys):

Dim: 5D / 93 / A 6
Mono: 2A / 42 / #F 2
Talkback: 5E / 94 / #A 6
Recall: 5F / 95 / H 6
Speaker B: 32 / 50 / D3

Cue Main Out: 3E / 62 / D 4
Cue Phones 1: 3F / 63 / #D 4
Cue Phones 2: 40 / 64 / E 4
Cue Phones 3: 41 / 65 / F 4
Cue Phones 4: 42 / 66 / #F 4

Snapshot 1: 36 / 54 / #F 3
Snapshot 2: 37 / 55 / G 3
Snapshot 3: 38 / 56 / #G 3
Snapshot 4: 39 / 57 / A 3
Snapshot 5: 3A / 58 / #A 3
Snapshot 6: 3B / 59 / B 3
Snapshot 7: 3C / 60 / C 4
Snapshot 8: 3D / 61 / #C 4

Trim Gains: 2D / 45 / A 2
Master Mute: 2C / 44 / #G 2
Master Solo: 2B / 43 / G 2

Switching off Mackie Protocol support in Settings / Mackie Control Options will also disable the above simple MIDI note commands, as they are part of the Mackie protocol.

Furthermore, all faders of all three rows can be controlled via simple **Control Change** commands. The format for the Control Change commands is:

Bx yy zz

x = MIDI channel yy = control number zz = value

The first row in TotalMix is addressed by MIDI channels 1 up to 4, the middle row by channels 5 up to 8 and the bottom row by channels 9 up to 12.

16 Controller numbers are used: 102 up to 117 (= hex 66 to 75). With these 16 Controllers (= faders) and 4 MIDI channels each per row, up to 64 faders can be controlled per row.

Examples for sending MIDI strings:

- Set input 1 to 0 dB: `B0 66 68`
- Set input 17 to maximum attenuation: `B1 66 0`
- Set playback 1 to maximum: `B4 66 7F`
- Set Output 16 to 0 dB: `B8 75 68`

Note: Sending MIDI strings requires to use programmer's logic for the MIDI channel, starting with 0 for channel 1 and ending with 15 for channel 16.

Further functions:

- Trim Gains On: `BC 66 xx` (`BC` = MIDI channel 13, `xx` = any value)
- Trim Gains Off: `BC 66 xx` or select a submix

Select submix (fader) in third row:

- channel 1/2: `BC 68/69 xx`
- channel 3/4: `BC 6A/6B xx`
  etc.

7.15.5. Loopback Detection

The Mackie Control protocol requires feedback of the received commands, back to the hardware controller. So usually TotalMix will be set up with both a MIDI input and MIDI output. Unfortunately any small error in wiring and setup will cause a MIDI feedback loop here, which then completely blocks the computer (the CPU).

To prevent the computer from freezing, TotalMix sends a special MIDI note every 0.5 seconds to its MIDI output. As soon as it detects this special note at the input, the MIDI functionality is disabled. After fixing the loopback, check Enable MIDI Control under Options to reactivate the TotalMix MIDI.

7.15.6. OSC (Open Sound Control)

Besides simple MIDI notes, the Mackie Protocol and Control Change commands, TotalMix FX can also be controlled by the Open Sound Control, OSC. For details on setup and usage see Section 7.9.3, "OSC Tab".

An OSC implementation chart can be downloaded from the RME website:

http://www.rme-audio.de/download/osc_table_totalmix.zip

RME offers a free iPad™ template for the iOS™ app TouchOSC (by Hexler, available in the Apple App-Store):

http://www.rme-audio.de/download/tosc_tm_ipad_template.zip

The RME forum hosts further information, more templates (iPhone…) and lots of useful user feedback.