User's Guide

MADIface USB

Portable MADI via USB!

DVD
24 Bit / 192 kHz ✓ *ready*

TotalMix™

ASIO

SyncAlign™   **ZLM**™   **SyncCheck**™

SteadyClock™

USB 2.0 Digital I/O System
64 Channels MADI Interface
24 Bit / 192 kHz Digital Audio
128 x 128 Matrix Router
MIDI embedded in MADI
Stand-Alone Operation

▷ Stand-Alone Operation, Connections

▷ TotalMix FX

▷ Technical Reference

▷ Miscellaneous

MADIface USB

▷ **General**

1. Introduction

Thank you for choosing the MADIface USB. This unique audio interface is capable of transferring digital MADI audio to a Mac or PC. The latest Plug and Play technology guarantees a simple installation, even for the inexperienced user. The numerous unique features and well thought-out configuration dialog puts the MADIface USB at the very top of the range of computer-based audio interfaces.

The package contains drivers for Windows Vista / 7 / 8 and Mac OS X x86 (Intel).

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 within the audio hardware.

2. Package Contents

Please check that your MADIface USB package contains each of the following:

- MADIface USB
- Cable USB 2.0, 1.8 m (6 ft)
- RME Driver CD

3. System Requirements

- Windows Vista or up, Intel Mac OS X (10.6 or up)
- 1 USB 2.0 port
- Computer with at least Pentium Core 2 Duo CPU

4. Brief Description and Characteristics

- All settings can be changed in real-time
- Buffer sizes/latencies from 64 up to 8192 samples selectable
- 32 channels 96 kHz/24 bit record/playback
- 16 channels 192 kHz/24 bit record/playback
- Clock modes slave and master
- SteadyClock: Jitter-immune, super-stable digital clock
- DDS technology for free setting of the sample rate
- TotalMix for latency-free submixes and perfect ASIO Direct Monitoring
- TotalMix FX: 2048 channel mixer with 46 bit internal resolution
- SyncAlign guarantees sample aligned and never swapping channels
- SyncCheck tests and reports the synchronization status of input signals
- Virtual MIDI port embedded in MADI
- DIGICheck DSP: Level meter in hardware, peak- and RMS calculation
- Stand-alone mode with repeater and format converter functionality

5. First Usage – Quick Start

First install the drivers, see chapter 6/13 for details. After the driver installation connect the rear USB port of the MADIface to the computer's USB port with the included USB cable. Finally connect external MADI gear to coaxial or optical input and output of the MADIface.

Start the Settings dialog. Under Clock Mode the currently used input can be set as clock source (*Optical, Coaxial*). Alternatively the option *Internal* forces the MADIface USB to act as clock master, all connected equipment has to be in clock mode slave then and sync to the MADIface.

Two SYNC LEDs on the front help to set up the unit correctly. With no input signal they stay dark. With input signal they flash. With correct clock setup the LEDs will stay constantly lit.

For quickest and simple setup select *Disable TotalMix* under Options. This way the MADIface USB operates as straight 64 channel I/O interface. For more options in routing and monitoring with TotalMix FX select either *64 Channel Mix* or *128 Channel Mix*.

The MADIface USB can be used stand-alone, connected to standard USB 5V power supplies. It does not remember any setting but uses a fixed internal mode, see chapter 19 for details.

User's Guide MADIface USB © RME

User's Guide

MADIface USB

▷ **Installation and Operation - Windows**

6. Hardware, Driver and Firmware Installation

6.1 Hardware and Driver Installation

To simplify installation it is recommended to first install the drivers before the unit is connected to the computer. But it will also work the other way round.

Insert the RME Driver CD into your CD-ROM drive. The driver installer is located in the directory **\MADIface_USB**. Start *rmeinstaller.exe* and follow the instructions of the installer. After installation connect computer and MADIface using the supplied USB cable. Windows detects the new hardware as **MADIface USB** and installs the drivers automatically.

After a reboot, the icons of TotalMix FX and Settings dialog appear in the notification area.
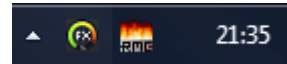
Driver Updates do not require to remove the existing drivers. Simply install the new driver over the existing one.

Possible reasons why a MADIface USB is not found after driver installation:

- The USB port is not active in the system (check the Device Manager)

- The USB cable is not, or not correctly inserted into the socket. Check that the LED beside the USB port is lit, it indicates power.

6.2 De-installing the Drivers

A de-installation of the driver files is not necessary – and not supported by Windows anyway. Thanks to full Plug & Play support, the driver files will not be loaded after the hardware has been removed. If desired these files can then be deleted manually.

Unfortunately Windows Plug & Play methods do not cover the additional autorun entries of TotalMix, the Settings dialog, and the registration of the ASIO driver. These entries can be removed from the registry by a software de-installation request. This request can be found (like all de-installation entries) in *Control Panel, Software*. Click on the entry 'RME MADIface USB'.

6.3 Firmware Update

The Flash Update Tool updates the firmware of the MADIface USB to the latest version. It requires an already installed driver.

Start the program **fut_mfusb.exe**. The Flash Update Tool displays the current revision of the MADIface USB's firmware and whether it needs an update or not. If so, then simply press the 'Update' button. A progress bar will indicate when the flash process is finished (Verify Ok).

After the update the unit needs to be reset. This is done by unplugging the MADIface USB for a few seconds. A reboot of the computer is not necessary.

When the update fails (status: failure), the unit's Safety BIOS will be used from the next boot on, the unit stays fully functional. The flash process should then be tried again.

7. Configuring the MADIface USB

7.1 Settings Dialog - General

Configuration of the MADIface USB is done via its own settings dialog. The panel *Settings* can be opened:

- by clicking on the fire symbol in the Task Bar's notification area

The mixer of the MADIface USB, TotalMix FX, can be opened:
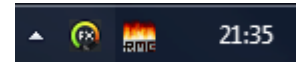
- by clicking on the mixer icon in the Task Bar's notification area

The hardware of the MADIface USB offers a number of helpful, well thought-of practical functions and options which affect how the unit operates - it can be configured to suit many different requirements. The following is available in the Settings dialog:

- Latency
- Configuration of digital I/Os
- Current sample rate
- Synchronization behaviour
- 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.

However, 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 display at the bottom of the dialog box gives precise information about the current status of the system, and the status of all digital signals.
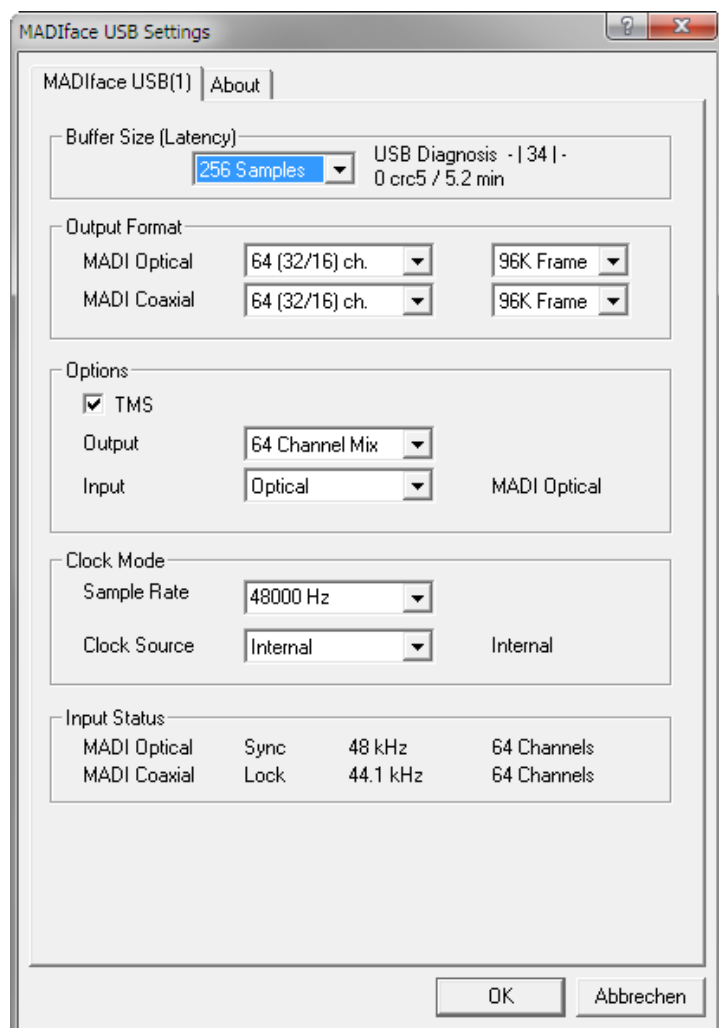
Buffer Size
The setting *Buffer Size* determines the latency between incoming and outgoing ASIO and WDM data, as well as affecting system stability (see chapter 8/9).

USB Diagnosis shows specific USB transmission errors (CRC5, usually 0) and general errors. If the unit detects a record or playback error the number shown will no longer be 0. An audio reset is performed automatically. The counter is reset on start of playback/record. More information can be found in chapter 26.4.

Output Format
Defines the format of the MADI output signal. MADI can be a 56 or 64 channel signal. Sample rates in Double Speed range (64/88.2/96 kHz) can be transmitted by the normal 48K Frame, or using a native 96K Frame.

Options
TMS activates the transmission of Channel Status data and Track Marker information from the MADI input signal. DIGICheck allows to read out those information from the MADI stream.

Output offers three options: 64 Channel Mix, 128 Channel Mix, Disable TotalMix. In *64 Channel Mix* mode TotalMix FX shows 64 input, playback and output channels. All settings in TotalMix use the data from one MADI input port, and send identical data to both MADI output ports. In *128 Channel Mix* mode record and playback is still limited to 64 channels, with the current input selected in the Settings dialog. But the other input is also active for TotalMix, and the output signal is not mirrored, but separated, with TotalMix having 128 output channels. D*isable TotalMix* completely disables TotalMix FX. All input and output data is going straight to record/coming from playback, with no mixing or routing involved. In this mode the outputs are mirrored, carrying the same signal.

Input defines the currently used main input, Optical or Coaxial. AutoSelect activates an automatic input selection. Using both inputs at the same time, AutoSelect puts the device into *Seamless Redundancy mode*. The MADIface USB will switch to the other input in real-time if the current one fails.

Clock Mode
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 this is no longer supported to be done by the audio program. However, an ASIO program can still set the sample rate by itself.

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

Clock Source
The unit can be configured to use its own clock (Internal = master), or one of the input signals. If the selected source isn't available, the unit will change to the next available one (AutoSync). If none is available then the internal clock is used. The current clock source is displayed to the right.

Input Status
Indicates for each input whether there is a valid signal (Lock, No Lock), or if there is a valid *and* synchronous signal (Sync). The second row shows the sample frequency measured by the hardware. The third row shows the input's channel format (64 or 56 channels).

The **About** tab includes information about the current driver version as well as the current firmware version of the MADIface USB plus two more options:

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 MADIface.

Enable MMCSS for ASIO activates support with higher priority for the ASIO driver. Note: 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.

8. Operation and Usage

8.1 Playback

In the audio application being used, MADIface must be selected as output device. This can often be found in the *Options, Preferences* or *Settings* menus as *Playback Device, Audio Devices, Audio* etc.

We recommend switching all system sounds off (via >*Control Panel /Sound*<). Also MADIface should not be the *Preferred Device* for playback, as this could cause loss of synchronization and unwanted noises. If you feel you cannot do without system sounds, you should consider using the on-board sound device or buying a cheap Blaster clone and select this as *Preferred Device* in >*Control Panel /Multimedia /Audio*< or >*Control Panel /Sound /Playback*<.

The screenshot shows a typical configuration dialog. After selecting a device, audio data is sent to the specified channels of the MADI port, depending on which has been selected as playback device.
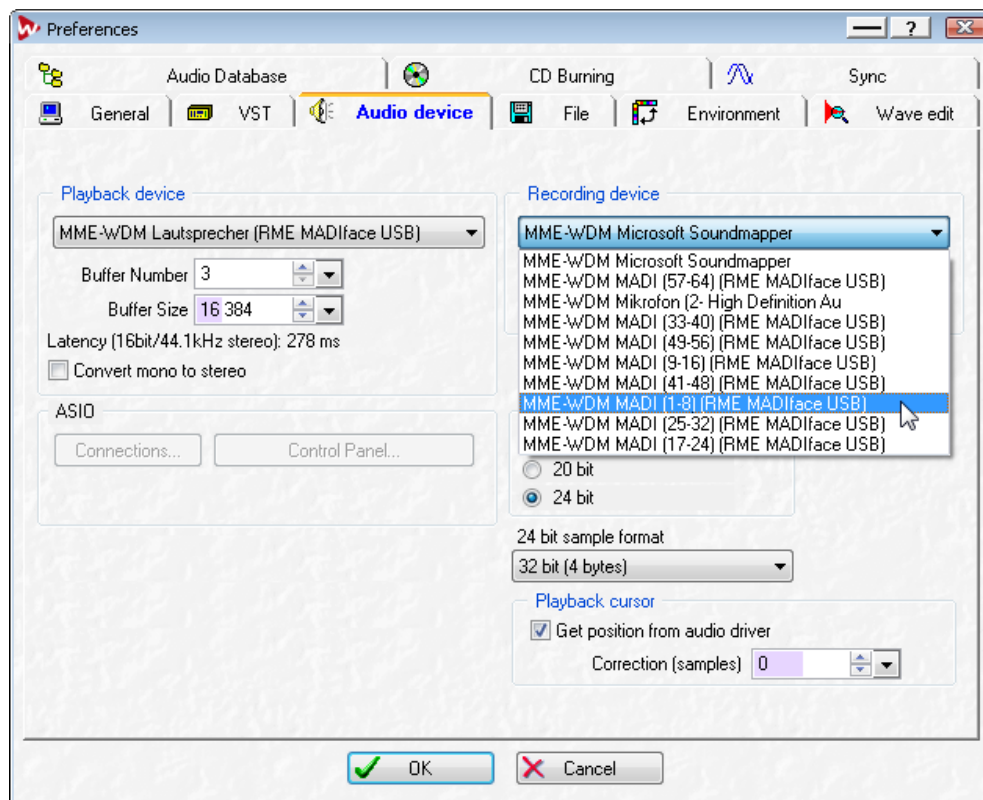
Increasing the number and/or size of audio buffers may prevent the audio signal from breaking up, but also increases latency i.e. output is delayed. For synchronized playback of audio and MIDI (or similar), be sure to activate the checkbox 'Get position from audio driver'.

Note on Windows Vista/7/8:
Since Vista the audio application can no longer control the sample rate under WDM. Instead the user has to work himself through numerous settings, and to set the sample rate to the same value per stereo device.

Therefore the driver of the MADIface USB includes a workaround: the sample rate can be set globally for all WDM devices within the Settings dialog, see chapter 7.1.

8.2 DVD-Playback (AC-3/DTS)

AC-3 / DTS
When using popular DVD software players like *WinDVD* and *PowerDVD*, their audio data stream can be sent to any AC-3/DTS capable receiver via the MADIface. For this to work, an output wave device has to be selected in >*Control Panel/ Sounds and Multimedia/ Audio*< or >*Control Panel/ Sound/Playback*<. Also check 'use preferred device only'.

The DVD software's audio properties now show the options 'SPDIF Out' or similar. When selecting it, the software will transfer the non-decoded digital multichannel data stream to the MADIface. Naturally a successful decoding also requires a MADI to AES converter like the **RME ADI-642**, converting the playback signals to stereo AES3 or SPDIF.

Note: This 'SPDIF' signal sounds like chopped noise at highest level. The first 2 MADI channels (Loudspeaker) do not support digital AC-3/DTS playback.

Multichannel
PowerDVD and WinDVD can also operate as software decoder, sending a DVD's multichannel data stream directly to the digital output of the MADIface. For this to work select the WDM playback device 'MADIface 1-8' of the MADIface in

Vista/7/8: >*Control Panel/ Sound/ Playback* < as 'Standard'. Additionally the loudspeaker setup, found under >*Configuration*<, has to be changed from *Stereo* to *5.1 Surround*.

PowerDVD's and WinDVD's audio properties now list several multichannel modes. If one of these is selected, the software sends the decoded analog multichannel data to the MADIface. TotalMix can then be used to play back via any desired output channels.

The typical channel assignment for surround playback is:

1 - Left
2 - Right
3 - Center
4 - LFE (Low Frequency Effects)
5 - SL (Surround Left)
6 - SR (Surround Right)

Note 1: Selecting the MADIface to be used as system playback device is no good idea, as professional interfaces should not be disturbed by system events. Make sure to re-assign the selection after usage or to disable any system sounds (tab Sounds, scheme 'No audio').

Note 2: The DVD player will be synced backwards from the MADIface. This means when using AutoSync and/or Pitch, the playback speed and pitch follows the incoming clock signal.

8.3 Notes on WDM

The driver offers eight 8-channel devices WDM streaming devices, like **RME MADIface 17-24**. WDM Streaming is Microsoft's current driver and audio system, directly embedded into the operating system. WDM Streaming is hardly usable for professional music purposes, as all data is processed by the so called Kernel Mixer, causing a latency of at least 30 ms. Additionally, WDM can perform sample rate conversions unnoticed, cause offsets between record and playback data, block channels unintentionally and much more.

Several programs do not offer any direct device selection. Instead they use the *playback device* selected in Windows under

Vista/7: *<Control Panel/ Sound/ Playback>*

The MADIface uses 8-channel interleaved devices exclusively. When recording with WDM or WDM KS based programs the input choice might be limited to stereo or left/right, so channels 3 to 8 of each block are not available. This problem does usually not exist on the playback side, and never under ASIO.

Multi-Channel using WDM
The WDM Streaming device *Loudspeaker* (MADIface 1-8) of the RME driver can operate as usual stereo device, or as up to 8-channel device.

An 8-channel playback using the Windows Media Player requires the speaker setup 7.*1 Surround.* Configure as follows:

Vista/7/8: *>Control Panel /Sound /Playback /Loudspeaker /Configure <*

8.4 Channel Count under WDM

The MADIface allows the use of sample rates up to 192 kHz via the MADI interface. For this to work single-channel data is spread to two or four channels using the *Sample Multiplexing* technique. Therefore the number of channels is reduced to 32 or 16 respectively.

Whenever the MADIface changes into Double Speed (88.2/96 kHz) or Quad Speed mode (176.4/192 kHz) all devices no longer available vanish automatically.

WDM	Double Speed	Quad Speed
MADI (1 to 16)	MADI (1 to 16)	MADI (1 to 16)
MADI (17 to 32)	MADI (17 to 32)	MADI (17 to 32)
MADI (33 to 64)	MADI (33 to 64)	MADI (33 to 64)

Note: Under Vista/7/8 the outputs 1-8 show up as *Loudspeaker*.

8.5 Multi-client Operation

RME audio interfaces support multi-client operation. Several programs can be used at the same time. The formats ASIO and WDM can even be used on the same playback channels simultaneously. As WDM uses a real-time sample rate conversion (ASIO does not), 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 for any output routing, and therefore a playback of multiple software on the same hardware outputs.

Inputs can be used from an unlimited number of WDM and ASIO software at the same time, as the driver simply sends the data to all applications simultaneously.

RME's sophisticated tool *DIGICheck* is an exception to this rule. It 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.

8.6 Clock Modes - Synchronization

In the digital world, all devices must be either Master (clock source) or Slave (clock receiver). Whenever several devices are linked, there must always be a single master clock.

☞ *A digital system can only have one master! If the MADIface's clock mode is set to 'Internal', all other devices must be set to 'Slave'.*

The MADIface USB utilizes a very user-friendly, intelligent clock control, called **AutoSync**. In AutoSync mode, the system constantly scans both inputs for a valid signal. If any valid signal is found, the MADIface switches from the internal quartz (*Clock Mode* – Current Internal) to a clock extracted from the input signal (*Clock Mode* – Current Optical or Coaxial). The difference to a usual slave mode is that whenever the clock reference fails, the system will automatically use its internal clock and operate in master mode again.

The MADIface USB inputs can be used simultaneously. In that case the MADIface USB has to be told which one of the signals is the sync reference - a digital device can only be clocked from a single source. The Clock Source selection is used to define a preferred input for the automatic clock selection. This input will stay active as long as a valid signal is found.

RME's exclusive **SyncCheck** technology (first implemented in the Hammerfall) enables an easy to use check and display of the current clock status. *Input Status* indicates whether there is a valid signal (Lock, No Lock) for each input, or if there is a valid *and* synchronous signal (Sync). In the field *Clock Mode* the clock reference is shown (Current…). See chapter 26.2.

Under WDM the MADIface has to set the sample rate. Therefore the error shown to the right can occur. A stable signal with a sample rate of 44.1 kHz is detected at the Coaxial input (Sync), but Windows audio had been set to 48000 Hz before. The red color of the text label signals the error condition, and prompts the user to set 44100 Hz manually as sample rate. Under ASIO the audio software sets the sample rate, so that such an error can not happen. If the input sample rate is different then there will be no *Sync* indication.

With RME's AutoSync and SyncCheck, finally anyone can master this common source of error, previously one of the most complex issues in the digital studio world.

9. Operation under ASIO

9.1 General

Start the ASIO software and select **ASIO MADIface USB** as the audio I/O device or the audio driver.

MADIface USB supports *ASIO Direct Monitoring* (ADM).

The MADIface USB supports both MME MIDI and DirectMusic MIDI.
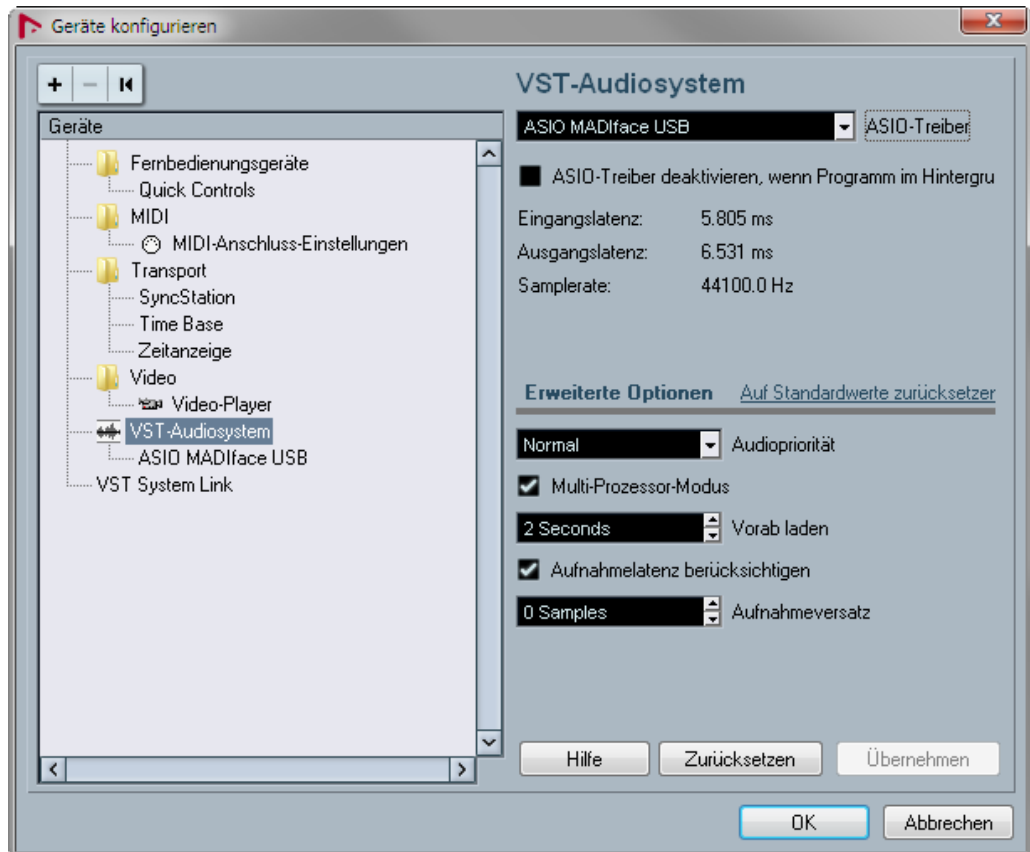
9.2 Channel Count under ASIO

The MADIface allows the use of sample rates up to 192 kHz via the MADI interface. For this to work single-channel data is spread to two or four channels using the *Sample Multiplexing* technique. Therefore the number of channels is reduced to 32 or 16 respectively.

Please note that 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 software, and will require a reassignment of the channels within the project.

Mono channels	Double Speed	Quad Speed
MADI (1 to 16)	MADI (1 to 16)	MADI (1 to 16)
MADI (17 to 32)	MADI (17 to 32)	MADI (17 to 32)
MADI (33 to 64)	MADI (33 to 64)	MADI (33 to 64)

9.3 Known Problems

If a computer does not provide sufficient CPU-power and/or sufficient USB-bus transfer rates, then drop outs, crackling and noise will appear. Such effects can often be avoided by using a higher buffer setting/latency in the Settings dialog of the MADIface USB. Furthermore PlugIns should be deactivated temporarily to make sure they do not cause these problems. More information can be found in chapter 26.4.

Another common source of trouble is incorrect synchronization. ASIO does not support asynchronous operation, which means that the input and output signals not only have to use the same sample frequency, but also have to be in sync. All devices connected to the MADIface USB must be properly configured for Full Duplex operation. As long as SyncCheck (in the Settings dialog) only displays *Lock* instead of *Sync*, the devices have not been set up properly!

The same applies when using more than one MADIface USB. They all have to be in sync. Else a periodically repeated noise will be heard.

MADIface USB supports *ASIO Direct Monitoring* (ADM). Please note that not every program supports ADM completely or error-free. The most often reported problem is the wrong behaviour of panorama in a stereo channel.

In case of a drift between audio and MIDI, or in case of a fixed deviation (MIDI notes placed close before or behind the correct position), the settings in Cubase/Nuendo have to be changed. At the time of print the option 'Use System Timestamp' should be activated. The MADIface USB supports both MME MIDI and DirectMusic MIDI. It depends on the used application which one will work better.

10. Using more than one MADIface

The current driver supports up to three MADIface USB. All units have to be in sync, i.e. have to receive valid sync information (by feeding synchronized signals).

- If one of the MADIfaces is set to clock mode Internal, all others have to be set to clock mode slave, and have to be synced from the master. The clock modes of all units have to be set up correctly in the MADIface Settings dialog.

- If all units are fed with synchronous signals, i.e. all units show *Sync* in their Settings dialog, all channels can be used at once. This is especially easy to handle under ASIO, as the ASIO driver presents all units as one.

The driver takes care of the numbering of all MADIfaces, so that it doesn't change. The unit with the lowest serial number is always 'MADIface (1)'. Please note:

- If the MADIface (1) is switched off, MADIface (2) logically turns to the first and only MADIface. If MADIface (1) is switched on later, the numbering changes and the unit becomes MADIface (2) immediately.

- The driver has no control on the numbering of the WDM devices. Therefore it might happen that the WDM devices (2) are mapped to unit (1), especially when switching on more MADIfaces during a Windows session. A reboot with all MADIfaces already operational should solve this problem.

Note: TotalMix is part of the hardware of each MADIface. Up to three mixers are available, but these are separated and can't interchange data. Therefore a global mixer for all units is not possible.

Using more than one MADIface the USB bus will be overloaded. To prevent this connect all units to different USB busses. This should be possible without further hardware as many popular USB 2.0 interfaces come as twins, which can be checked in the Device Manager as follows:

- Connect the MADIface USB to a USB port
- Start the Device Manager, View set to 'Devices by Connection'
- Expand ACPI x86-based PC, Microsoft ACPI compatible System, PCI bus

Here you usually find two entries of a *USB2 Enhanced Host Controller*. All USB devices are connected via a *Root Hub*, the MADIface USB will show up here too. By a simple reconnection to other ports this view lets you check to which one of the two controllers the MADIface is connected to. And with two units, if they use the same controller or not.

This information can also be used to make sure that an external USB hard drive will not interfere with the MADIface USB, by ensuring its connection to a different bus (controller).

Especially with laptops it can be seen that all internal devices and all sockets are connected to the same controller, and that the second controller is not used at all. Then all units operate on the same bus and fight against each other for bandwidth.

11. DIGICheck Windows

The DIGICheck software is a unique utility developed for testing, measuring and analysing digital audio streams. Although this Windows software is fairly self-explanatory, it still includes a comprehensive online help. DIGICheck 5.60 operates as multi-client ASIO host, therefore can be used in parallel to any software, with both inputs and outputs (!). The following is a short summary of the currently available functions:

- **Level Meter**. High precision 24-bit resolution, 2/8/64 channels. Application examples: Peak level measurement, RMS level measurement, over-detection, phase correlation measurement, dynamic range and signal-to-noise ratios, RMS to peak difference (loudness), long term peak measurement, input check. Oversampling mode for levels higher than 0 dBFS. Vertical and horizontal mode. Slow RMS and RLB weighting filter. Supports visualization according to the K-System.
- **Hardware Level Meter** for **Input**, **Playback** and **Output**. Reference Level Meter freely configurable, causing near zero CPU load, because calculated from the MADIface hardware.
- **Vector Audio Scope**. World wide unique Goniometer showing the typical afterglow of a oscilloscope-tube. Includes Correlation meter and level meter.
- analysis, ITU weighting and ITU summing meter.
- **Spectral Analyser.** World wide unique 10-, 20- or 30-band display in analog bandpass filter technology. 192 kHz-capable!
- **Totalyser**. Spectral Analyser, Level Meter and Vector Audio Scope in a single window.
- **Surround Audio Scope.** Professional Surround Level Meter with extended correlation
- **ITU1770/EBU R128 Meter**. For standardized loudness measurements.
- **Bit Statistics & Noise**. Shows the true resolution of audio signals as well as errors and DC offset. Includes Signal to Noise measurement in dB and dBA, plus DC measurement.
- **Channel Status Display**. Detailed analysis and display of Channel Status data within the MADI stream.
- **Global Record.** Long-term recording of all channels at lowest system load.
- **Completely multi-client.** Open as many measurement windows as you like, on any channels and inputs or outputs!

To install DIGICheck, go to the **\DIGICheck** directory on the RME Driver CD and run *setup.exe*. Follow the instructions prompted on the screen.

DIGICheck is constantly updated. The latest version is always available on our website **www.rme-audio.com**, section **Downloads / DIGICheck**.

12. Hotline – Troubleshooting

The newest information can always be found on our website www.rme-audio.com, section FAQ, Latest Additions.

The input signal cannot be monitored in real-time

- ASIO Direct Monitoring has not been enabled within the DAW, and/or monitoring has been disabled globally (TotalMix Options).

Playback works, but record doesn't

- Check that there is a valid signal at the input. If so, the current sample frequency is displayed in the Settings dialog.
- Check whether the MADIface USB has been selected as recording device in the audio application.
- Check whether the sample frequency set in the audio application ('Recording properties' or similar) matches the input signal.
- Check that cables/devices have not been connected in a closed loop. If so, set the system's clock mode to 'Internal'.

Crackle during record or playback

- Increase the number and size of buffers in the 'Settings' dialog or in the application.
- Try different cables (coaxial or optical) to rule out any defects here.
- Check that cables/devices have not been connected in a closed loop. If so, set the system's clock mode to 'Master'.
- Check the Settings dialog for displayed Errors.

Driver installation and Settings dialog/TotalMix work, but a playback or record is not possible

- While recognition and control of the device are low bandwidth applications, playback/record needs the full USB transmission performance. Therefore, defective USB cables with limited transmission bandwidth can cause such errors.

User's Guide

MADIface USB

▷ **Mac OS X – Installation and Operation**

13. Hardware, Driver and Firmware Installation

13.1 Hardware and Driver Installation

Connect computer and MADIface using the supplied USB cable. Mac OS X detects the new hardware as **MADIface USB (serial number)**. Install the drivers from the RME Driver CD. The driver files are located in the folder **Fireface_USB**. Installation works automatically by a double-click on the file **Fireface USB.pkg**.

RME recommends downloading the latest driver from the RME website. If done, the procedure is as follows: A double-click onto **driver_usb_mac_xxx.zip** expands the archive file to **Fireface USB.pkg**. Installation works automatically by a double-click on this file.

During driver installation the programs **Fireface USB Settings** and **Totalmix** (TotalMix FX) are copied to the Applications folder. They will automatically start into the dock if a MADIface USB is connected. A reboot of the computer is not required.

Driver Updates do not require to remove the existing drivers. Simply install the new driver over the existing one.

Possible reasons why a MADIface USB is not found after driver installation:

- The USB port is not active in the system (check in System Report, USB)

- The USB cable is not or not correctly inserted into the socket

13.2 De-installing the Drivers

In case of problems the driver files can be deleted manually by dragging them to the trash bin:

/Applications/Fireface USB Settings
/Applications/Totalmix
/System/Library/Extensions/FirefaceUSB.kext
/Users/username/Library/Preferences/de.rme-audio.TotalmixFX.plist
/Users/username/Library/Preferences/de.rme-audio.Fireface_USB_Settings.plist
/Library/LaunchAgents/de.rme-audio.firefaceUSBAgent.plist

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

13.3 Firmware Update

The program **RME USB Series Flash Tool** updates the firmware of the MADIface USB to the latest version. It requires an already installed driver.

After its start the program displays the current revision of the MADIface USB firmware, and whether it needs an update or not. If so, simply press the 'Update' button. A progress bar will indicate when the flash process is finished (Verify Ok).

After the update the unit needs to be reset. This is done by unplugging the MADIface USB for a few seconds. A reboot of the computer is not necessary.

To reduce the time needed for the flash process the tool updates only the parts of the firmware that are present in a newer version. The option *Flash All* forces the tool to update all parts.

When the update fails (status: failure), the unit's Safety BIOS will be used from the next boot on, the unit stays fully functional. The flash process can then be tried again on a different computer.

14. Configuring the MADIface USB

14.1 Settings Dialog

Configuring the MADIface USB is done via its own *Settings* dialog. Start the program **Fireface USB Settings**. The mixer of the MADIface USB can be configured by starting the program **TotalMix FX**.

The MADIface 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 is available in the *Settings* dialog:

- Configuration of digital I/Os
- Synchronization behaviour
- Current sample rate
- State of input and output

Any changes performed in the Settings dialog are applied immediately - confirmation (e.g. by exiting the dialog) is not required.

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

Use the drop down menu **Properties For** to select the unit to be configured.

On the right of it the current firmware and driver version is shown.
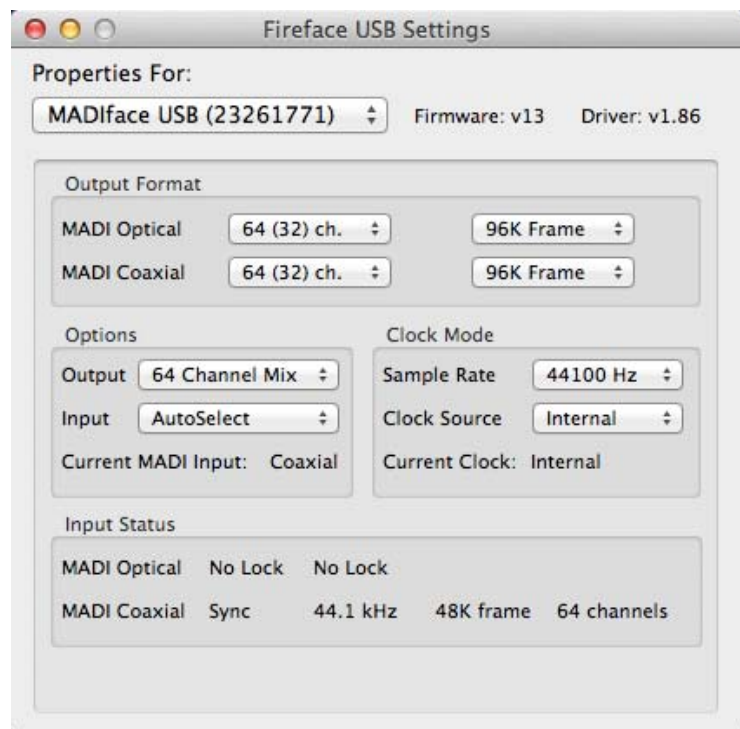
Output Format
Defines the format of the MADI output signal. MADI can be a 56 or 64 channel signal. Sample rates in Double Speed range (64/88.2/96 kHz) can be transmitted by the normal 48K Frame, or using a native 96K Frame.

Options
Output offers three options: 64 Channel Mix, 128 Channel Mix, Disable TotalMix. In *64 Channel Mix* mode TotalMix FX shows 64 input, playback and output channels. All settings in TotalMix use the data from one MADI input port, and send identical data to both MADI output ports. In *128 Channel Mix* mode record and playback is still limited to 64 channels, with the current input selected in the Settings dialog. But the other input is also active for TotalMix, and the output signal is not mirrored, but separated, with TotalMix having 128 output channels. D*isable TotalMix* completely disables TotalMix FX. All input and output data is going straight to record/coming from playback, with no mixing or routing involved. In this mode the outputs are mirrored, carrying the same signal.

Input defines the currently used main input, Optical or Coaxial. AutoSelect activates an automatic input selection, dependent on the currently connected input. Using both inputs at the same time, AutoSelect puts the device into *Seamless Redundancy mode*. The MADIface USB will switch to the other input in real-time if the current one fails. The currently used input for recording is shown below as *Current MADI Input*.

Clock Mode
Sample Rate
Used to set the current sample rate. This is the same setting as in the Audio MIDI Setup, just added here for your convenience.

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

Clock Source
The unit can be configured to use its own clock (Internal = master), or one of the input signals. If the selected source isn't available, the unit will change to the next available one (AutoSync). If none is available then the internal clock is used. The current clock source is displayed below.

Input Status
Indicates for each input whether there is a valid signal (Lock, No Lock), or if there is a valid *and* synchronous signal (Sync). The second row shows the sample frequency measured by the hardware. The third and fourth row shows the input's channel format (48k/96k Frame, 64 or 56 channels).

14.2 Clock Modes - Synchronization

In the digital world, all devices must be either Master (clock source) or Slave (clock receiver). Whenever several devices are linked there must always be a single master clock.

☞ *A digital system can only have one master! If the MADIface's clock mode is set to 'Internal', all other devices must be set to 'Slave'.*

The MADIface USB utilizes a very user-friendly, intelligent clock control, called **AutoSync**. In AutoSync mode, the system constantly scans all digital inputs for a valid signal. If any valid signal is found, the MADIface switches from the internal quartz (*Clock Mode* – Current Internal) to a clock extracted from the input signal (*Clock Mode* – Current Optical or Coaxial). The difference to a usual slave mode is that whenever the clock reference fails, the system will automatically use its internal clock and operate in Master mode.

The MADIface USB inputs operate simultaneously. Because there is no input selector in some modes, the MADIface USB has to be told which one of the signals is the sync reference - a digital device can only be clocked from a *single* source. The Clock Source selection is used to define a preferred input for the automatic clock system. This input will stay active as long as a valid signal is found.

To cope with some situations which may arise in studio practice, defining a sync reference is essential. RME's exclusive **SyncCheck** technology (first implemented in the Hammerfall) enables an easy to use check and display of the current clock status. *Input Status* indicates whether there is a valid signal (Lock, No Lock) for each input, or if there is a valid *and* synchronous signal (Sync). In the field *Clock Mode* the clock reference is shown (Current…). See chapter 26.2.

Input Status				
MADI Optical	Lock	44.1 kHz	48K frame	64 channels
MADI Coaxial	Sync	44.1 kHz	48K frame	64 channels

In practice, SyncCheck provides the user with an easy way of checking whether all digital devices connected to the system are properly configured. With SyncCheck, finally anyone can master this common source of error, previously one of the most complex issues in the digital studio world.

15. Mac OS X FAQ

15.1 MIDI doesn't work

In some cases the applications do not show the MIDI port. The reason for this is usually visible within the **Audio MIDI Setup – MIDI Window**. It displays no RME MIDI device, or the device is greyed out and therefore inactive. Mostly, removing the greyed out device and searching for MIDI devices again will solve the problem.

The MADIface USB MIDI is class compliant. Therefore it comes without a driver. OS X recognizes it as MIDI device and will be using it with the driver included in the operating system.

15.2 Repairing Disk Permissions

Repairing permission can solve problems with the installation process - plus many others. To do this, launch **Disk Utility** located in **Utilities**. Select your system drive in the drive/volume list to the left. The **First Aid** tab to the right now allows you to check and repair disk permissions.

15.3 Supported Sample Rates

RME's Mac OS X driver supports all sampling frequencies provided by the hardware. This includes **32 kHz** and **64 kHz**, and even **128 kHz, 176.4 kHz** and **192 kHz**.

But not any software will support all the hardware's sample rates. The hardware's capabilities can easily be verified in the **Audio MIDI Setup – Audio Window**. Select the MADIface USB. A click on **Format** will show the full list of supported sample rates.

15.4 Channel Count under Core Audio

The MADIface allows the use of sample rates up to 192 kHz via the MADI interface. For this to work single-channel data is spread to two or four channels using the *Sample Multiplexing* technique. Therefore the number of channels is reduced to 32 or 16 respectively.

It is not possible to change the number of Core Audio devices without a reboot of the computer. So when the MADIface changes to Double Speed (88.2/96 kHz) or Quad Speed mode (176.4/192 kHz) all channels stay present, but are partly inactive.

Core Audio	Double Speed	Quad Speed
MADI (1 to 16)	MADI (1 to 16)	MADI (1 to 16)
MADI (17 to 32)	MADI (17 to 32)	MADI (17 to 32)
MADI (33 to 64)	MADI (33 to 64)	MADI (33 to 64)

15.5 Various Information

The driver of the MADIface USB requires at least Mac OS 10.6.

Programs that don't support card or channel selection will use the device chosen as **Input** and **Output** in the **System Preferences – Sound** panel.

Via **Launchpad – Other – Audio MIDI Setup** the MADIface can be configured for the system wide usage in more detail.

Programs that don't support channel selection will always use channels 1/2, the first stereo pair. To access other inputs, use the following workaround with TotalMix: route the desired input signal to output channels 1/2. In the channel settings of outputs 1/2 activate *Loopback*. Result: the desired input signal is now available at input channel 1/2, without further delay/latency.

Use **Configure Speakers** to freely configure the stereo or multichannel playback to any available channels.

16. Using more than one MADIface USB

OS X supports the usage of more than one audio device within the audio software. This is done via the Core Audio function **Aggregate Devices**, which allows to combine several devices into one. This function is found in the **Audio MIDI Setup – Audio Window**. Clock the **+** sign in the lower left.

The current driver supports up to three MADIface USB. All units have to be in sync, i.e. have to receive valid sync information (by feeding synchronized signals).

- If one of the MADIfaces is set to clock mode Master (Internal), all others have to be set to clock mode Slave, and have to be synced from the master. The clock modes of all units have to be set up correctly in the MADIface Settings dialog.

- If all units are fed with a synchronous clock, i.e. all units show *Sync* in their Settings dialog, all channels can be used at once.

When using more than one MADIface USB the USB bus might get overloaded. To prevent this connect all units to different USB busses.

Note: TotalMix is part of the hardware of each MADIface. Up to three mixers are available, but these are separated and can't interchange data. Therefore a global mixer for all units is not possible.

17. DIGICheck Mac

The DIGICheck software is a unique utility developed for testing, measuring and analysing digital audio streams. Although this Windows software is fairly self-explanatory, it still includes a comprehensive online help. DIGICheck 0.670 operates in parallel to any software, showing all input data. The following is a short summary of the currently available functions:

- **Level Meter**. High precision 24-bit resolution, 2/8/64 channels. Application examples: Peak level measurement, RMS level measurement, over-detection, phase correlation measurement, dynamic range and signal-to-noise ratios, RMS to peak difference (loudness), long term peak measurement, input check. Oversampling mode for levels higher than 0 dBFS. Vertical and horizontal mode. Slow RMS and RLB weighting filter. Supports visualization according to the K-System.
- **Hardware Level Meter** for **Input**, **Playback** and **Output**. Reference Level Meter freely configurable, causing near zero CPU load, because calculated from the MADIface hardware.
- **Vector Audio Scope**. World wide unique Goniometer showing the typical afterglow of a oscilloscope-tube. Includes Correlation meter and level meter.
- **Spectral Analyser.** World wide unique 10-, 20- or 30-band display in analog bandpass filter technology. 192 kHz-capable!
- **Totalyser**. Spectral Analyser, Level Meter and Vector Audio Scope in a single window.
- **Surround Audio Scope.** Professional Surround Level Meter with extended correlation analysis, ITU weighting and ITU summing meter.
- **ITU1770/EBU R128 Meter**. For standardized loudness measurements.
- **Bit Statistics & Noise**. Shows the true resolution of audio signals as well as errors and DC offset. Includes Signal to Noise measurement in dB and dBA, plus DC measurement.
- **Completely multiclient.** Open as many measurement windows as you like, on any channels and inputs or outputs!

To install DIGICheck, go to the **\DIGICheck** directory on the RME Driver CD and run *setup.exe*. Follow the instructions prompted on the screen.

DIGICheck is constantly updated. The latest version is always available on our website **www.rme-audio.com**, section **Downloads / DIGICheck**.

18. Hotline – Troubleshooting

The newest information can always be found on our website www.rme-audio.com, section FAQ, latest Additions.

The unit and drivers have been installed correctly, but playback does not work:

- Is MADIface USB listed in the System Report, USB?
- Has MADIface been selected as current playback device in the audio application?

Playback works, but record doesn't:

- Check that there is a valid signal at the input. If so, the current sample frequency is displayed in the Settings dialog.
- Check whether the MADIface USB has been selected as recording device in the audio application.
- Check whether the sample frequency set in the audio application ('Recording properties' or similar) matches the input signal.
- Check that cables/devices have not been connected in a closed loop. If so, set the system's clock mode to 'Master'.

Crackle during record or playback:

- Increase the number and size of buffers in the application.
- Try different cables (coaxial or optical) to rule out any defects here.
- Check that cables/devices have not been connected in a closed loop. If so, set the system's clock mode to 'Master'.

Possible causes for a MADIface not working

- The USB cable is not, or not correctly inserted into the socket

Driver installation and Settings dialog/TotalMix work, but a playback or record is not possible

- While recognition and control of the device are low bandwidth applications, playback/record needs the full USB transmission performance. Therefore, defective USB cables with limited transmission bandwidth can cause such an error scheme.

User's Guide

MADIface USB

▷ **Stand-Alone Operation and Connections**

19. Stand-alone Operation

19.1 General

The MADIface USB can be powered by any USB power wall wart or USB battery, like those for mobile phones and MP3 players. Without a computer host the device enters a pre-configured operation mode which is part of its firmware, thus cannot be modified by the user.

Using one input the MADIface USB is clock slave, using the sample rate found at the input. AutoSelect is active, so either input can be used. The input's audio data is transferred to the outputs unchanged. The output format follows the input format (56/64 channel mode, 48k/96k Frame). Using two inputs Double Processing Mode becomes active, for two independent paths, including two SteadyClocks. The internal routing changes from parallel output to cross-coupled.

19.2 Digital Format Converter

Both modes can be used for format conversion. With only one input connected the outputs carry the same signal, the unit can be used as either coaxial to optical or optical to coaxial format converter, with the added function to send the signal to two different devices simultaneously. With two inputs connected the unit works bi-directional, converting coaxial to optical and vice versa simultaneously. This is even possible when the connected device uses sample rate con-verters for independent clocking - the sample rate can be different in both paths. Thanks to a completely newly generated signal, jitter suppression by SteadyClock, and reclocking of the MADI output, the MADIface USB provides not simple but sophisticated format conversion.

19.3 Active Repeater

Both modes, *one in to two outs* and *one in to one out cross*ed, enable the use as active re-peater. In stand-alone mode the MADI input signal is completely decoded and rebuild, its clock base is rebuild by SteadyClock's active jitter suppression. The specified length of BNC and optical cables is multiplied by the number of MADIface USB inserted, as each device re-sends the MADI signal as a rebuild original one. The newly generated output signal is highly compati-ble. Units normally not talking to each other will do with a MADIface USB in-between.

20. Connections

20.1 MADI I/Os

The BNC input's ground-free design is built according to AES10-1991. The input impedance is 75 Ohm. It will operate error-free from about 180 mVpp on.

The optical input and output uses a FDDI (ISO/IEC 9413-3) compatible optical module, accord-ing to AES10-1991. More information can be found in chapter 26.1, MADI Basics.

The currently active input is indicated by a lit LED.

The BNC output is built according to AES10-1991. The output's impedance is 75 Ohm. The output voltage will be 600 mVpp when terminated with 75 Ohm.

20.2 MIDI over MADI

The MADIface has a virtual MIDI port. MADI MIDI In (1) and MADI MIDI Out (1) receive and transmit MIDI data via MADI. This allows for a direct communication between systems with HDSP(e) MADI cards or MADIfaces. Additionally MIDI data can be transmitted from/to other RME devices with MADI ports, and both can be MIDI remote controlled without any additional line or cabling between computer (MADIface) and unit.

User's Guide

MADIface USB

▷ **TotalMix FX**

21. TotalMix: Routing and Monitoring

21.1 Overview

The MADIface USB includes a powerful digital real-time mixer, *TotalMix FX,* based on RME's unique, sample-rate independent TotalMix technology. It allows for practically unlimited mixing and routing operations, with all inputs and playback channels simultaneously, to any hardware outputs. The MADIface does not have a DSP, so there are no FX available.

Here are some typical applications for TotalMix:

* Setting up delay-free submixes (headphone mixes). The MADIface allows for up to 32 fully independent stereo submixes. On an analog mixing desk, this would equal 64 Aux sends.

* Unlimited routing of inputs and outputs (free utilisation, patchbay functionality).

* Distributing signals to several outputs at a time. TotalMix offers state-of-the-art splitter and distributor functions.

* Simultaneous playback of different programs via a single stereo output. The ASIO multi-client driver supports the usage of several programs at the same time. When done on different playback channels TotalMix provides the means to mix and monitor these on a single stereo output.

* Mixing of the input signal to the playback signal (complete ASIO Direct Monitoring). RME not only is *the* pioneer of ADM, but also offers the most complete implementation of the ADM functions.

* Integration of external devices. Use TotalMix to insert external effects devices, be it in the playback or in the record path. Depending on the current application, the functionality equals insert or effects send and effects return, for example as used during real-time monitoring when adding some reverb to the vocals.

Every single input channel, playback channel and hardware output features a Peak and RMS level meter, calculated in hardware. These level displays are very useful to determine the presence and routing destinations of the audio signals.

For a better understanding of the TotalMix mixer you should know the following:

* As shown in the block diagram (next page), the record signal usually stays unaltered. TotalMix does not reside within the record path, and does not change the record level or the audio data to be recorded (exception: loopback mode).

* The hardware input signal can be passed on as often as desired, even with different levels. This is a big difference to conventional mixing desks, where the channel fader always controls the level for all routing destinations simultaneously.

* The level meter of inputs and playback channels are connected pre-fader, to be able to visually monitor where a signal is currently present. The level meters of the hardware outputs are connected post-fader, thus displaying the actual output level.

RME TotalMix
MADIface USB Mixer
Block Diagram, 08/2013
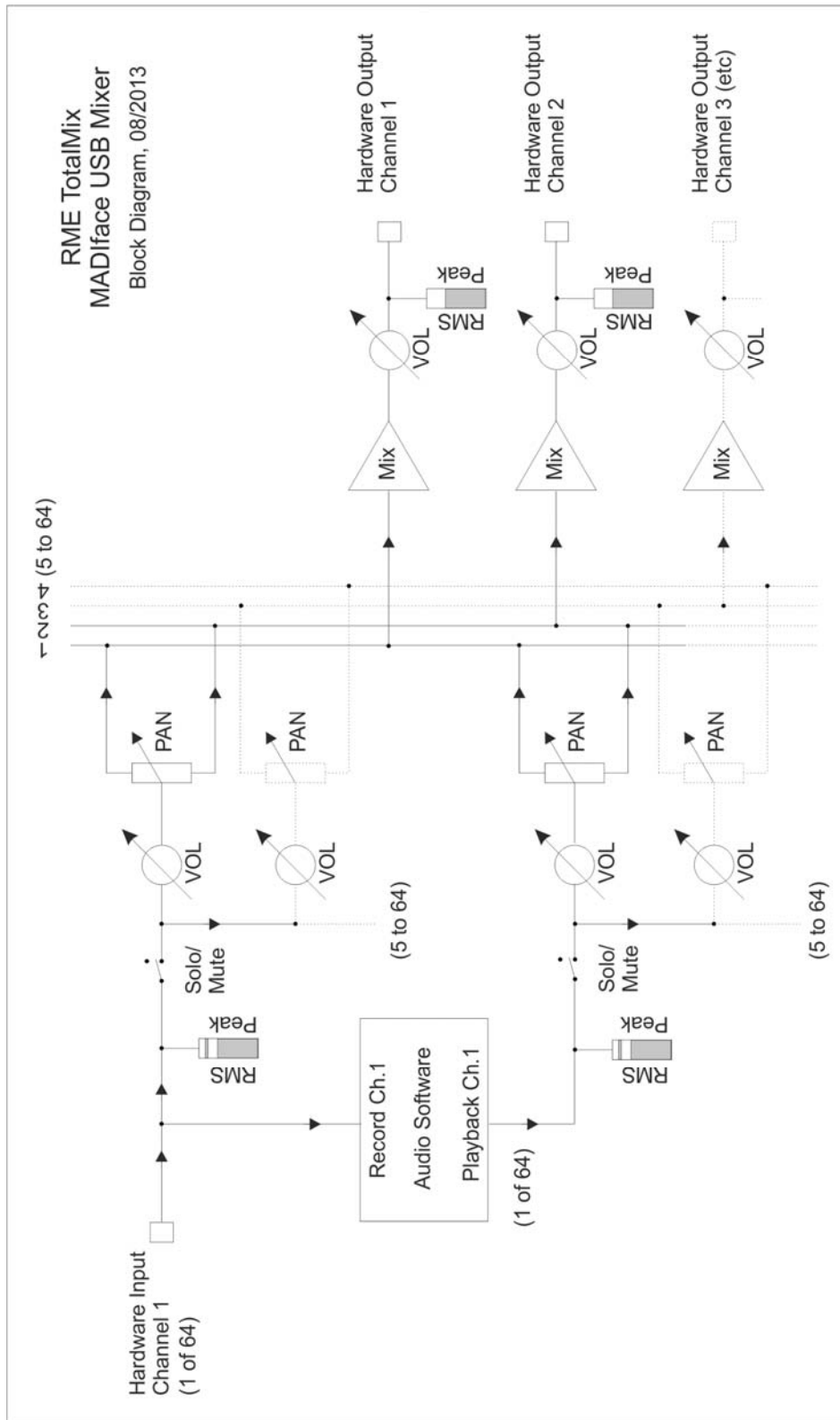
21.2 The User Interface

The visual design of the TotalMix mixer is a result of its capability to route hardware inputs and software playback channels to any hardware output. The MADIface USB provides 64 input channels, 64 software playback channels, and 64 hardware output channels:

HARDWARE INPUTS   **SOFTWARE PLAYBACK**

HARDWARE OUTPUTS
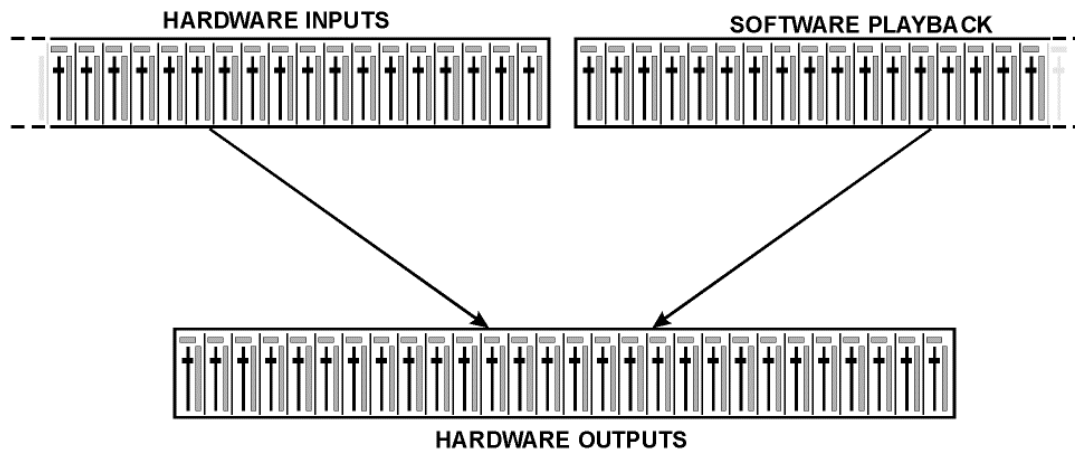
TotalMix can be used in the above view (View Options **2 Rows**). However, the default is a vertical alignment in three rows as known from an Inline desk, so that the row *Software Playback* equals the *Tape Return* of a real mixing desk:

HARDWARE INPUTS

SOFTWARE PLAYBACK
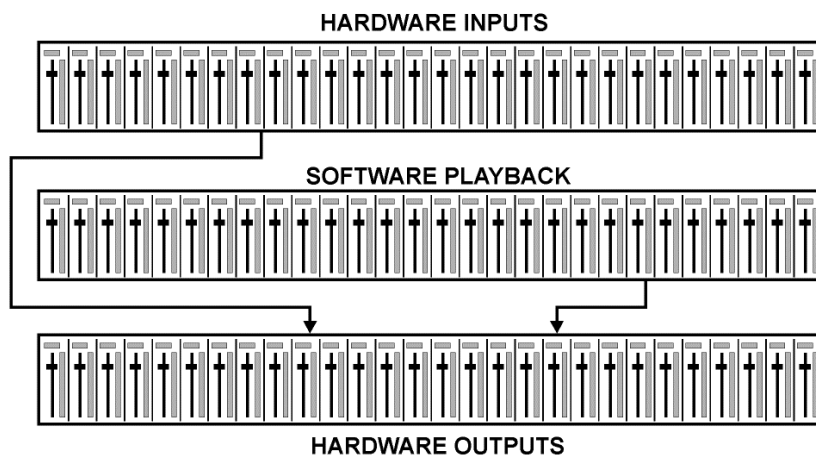
HARDWARE OUTPUTS

- Top row: Hardware inputs. The level shown is that of the input signal, i. e. fader independent. Via fader and routing field, any input channel can be routed and mixed to any hardware output (bottom row).

- Middle row: Playback channels (playback tracks of the audio software). Via fader and routing field, any playback channel can be routed and mixed to any hardware output (third row).

- Bottom row (third row): Hardware outputs. Here, the total level of the output can be adjusted. This may be the level of connected loudspeakers, or the necessity to reduce the level of an overloaded submix.

Usage in mode Submix View (Default): simply click on the hardware output channel where you want to have an audio signal. This channel turns brighter, means it is selected as current submix. Now move the faders up from all sources - input and playback channels - that you want to hear at the submix output.

The following chapters explain step by step all functions of the user interface.

21.3 The Channels

A single channel can be switched between mono and stereo mode. The mode is set in the channel settings panel (tool symbol).

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 O-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 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** symbol 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 MADIface USB there are 32 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 behaviour as a trim pot within the input channel, affecting the signal already before the mixer. That's how this function got its name.

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

21.3.1 Settings

A click on the tool symbol opens the channel's **Settings** panel with differing elements.

Stereo. Switches the channel to mono or stereo mode.

Width. Setting 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.

Besides Stereo/Mono, Phase L und Phase R the settings of the Hardware Outputs have three more 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. With this any hardware output can be controlled and listened to through the monitoring output very conveniently. Using the option *Assign / Cue to* in the Control Room section, Cue can also be used with any of the Phones outputs.

21.4 Section Control Room

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 and Talkback 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. Can also be set at the unit by holding the key Recall down for two seconds.

Speak. 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, and up to four Phones outs. The choice is limited to 1 to 16, as at 192 kHz the other channels are not available anymore.

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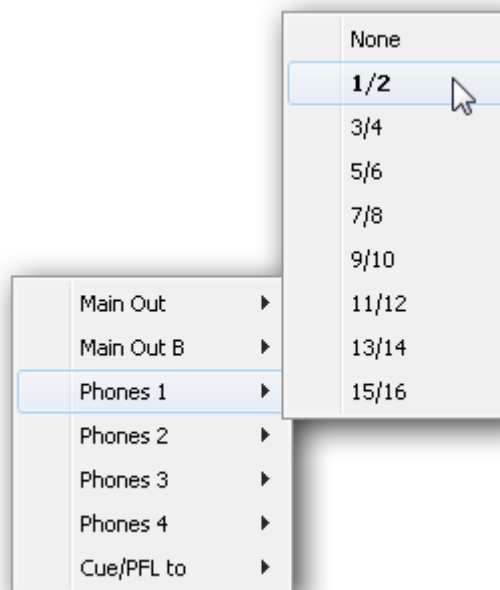
21.5 The Control Strip

The Control Strip on the right side is a fixed element. It combines different functions that are either required globally, or constantly used, and therefore should not be hidden in a menu.

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

FX. Not functional with the MADIface USB.

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.

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.

21.5.1 View Options

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

Routing

➢ **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, 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.** Not functional with the MADIface USB.

➢ **RMS Level.** The numerical level display in the channels displays peak or RMS.

Show

➢ **FX.** Not functional with the MADIface USB.

➢ **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.

21.5.2 Snapshots - Groups

Snapshots. Snapshots include all mixer settings, but no graphical elements like window positions, window size, number of windows, visible settings, scroll states 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 eight 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.

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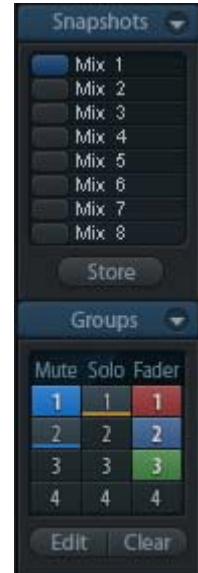
TotalMix uses flashing signals to guide you through the group setup. After a click on Edit and click on the desired storage place all desired functions for this group have to be activated or selected. The storage process is finished by another click on Edit.

When setting up a fader group, make sure to not add faders that are at the most top or lowest 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.

21.5.3 Channel Layout - Layout Presets

To maintain overview within TotalMix FX channels can be hidden. Channels can also be excluded from being remoted. 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 for remote control x. 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.
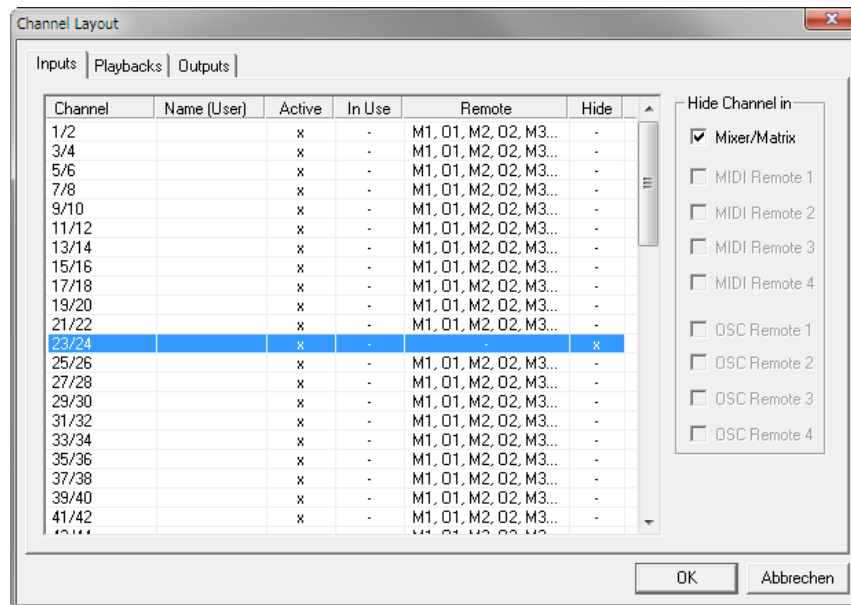
The dialog can be called directly from TotalMix by a right mouse click on any channel. The corresponding channel will then be preselected in the dialog.

Rows Inputs, Playbacks and Outputs are set up individually by the tabs at the top. *Active* indicates currently available channels. At higher sample rates many channels are no longer active. *In Use* shows which channels are currently used in the mixing process.

In the above example channel 23/24 have been made invisible. If these are not used this is an easy way to remove them 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.

21.5.4 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:

> **Arrow to the left.** A left mouse click let the channels scroll to the very first one, or most left.
> **1.** 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.
> **2.** Marker number 2. See 1 for details.
> **Arrow to the right.** A left mouse click let the channels scroll the last one, or most right.

Location markers are stored in the Workspace.

Application Examples

While originally added to improve navigation in the HDSPe MADI FX (having 196 channels that never fit on any screen), the scroll location markers are also helpful with units having less channels:

- When the TotalMix FX window is intentionally made small in width, so only a few channels are shown.
- When some or all Settings panels are open. Then all settings are always visible, but require a lot of space horizontally.

21.6 Preferences

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

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 supported by the MADIface USB (no FX).
➢ **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 touch-pads.

Dynamic Meters
Not supported by the MADIface USB, as these settings refer to Compressor and Expander from other RME devices.

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.** For the MADIface USB: always on, as the unit does not store any. When connecting to a computer TotalMix FX will immediately load its settings into the MADIface.
➢ **Count MADI Channels per port.** In *128 Channel mode* the channels shown in TotalMix are counted 1 to 64 two times.
➢ **Disable ASIO Direct Monitoring.** Disables ASIO Direct Monitoring (ADM) for the MADIface USB 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.

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.
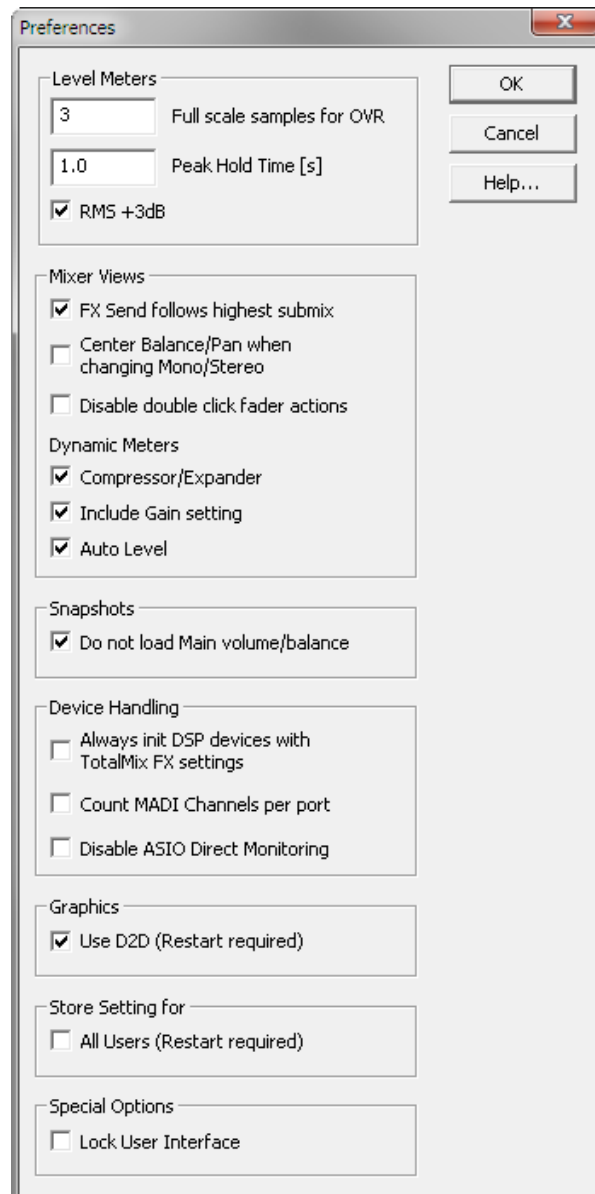
21.6.1 Store for Current or All Users (Windows)

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

XP: C:\Documents and Settings\ Username\Local Settings\ Application Data\TotalMixFX

Vista/7/8: 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 **lastMADI-faceUSB1.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).

21.7 Settings

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

21.7.1 Mixer Page

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.
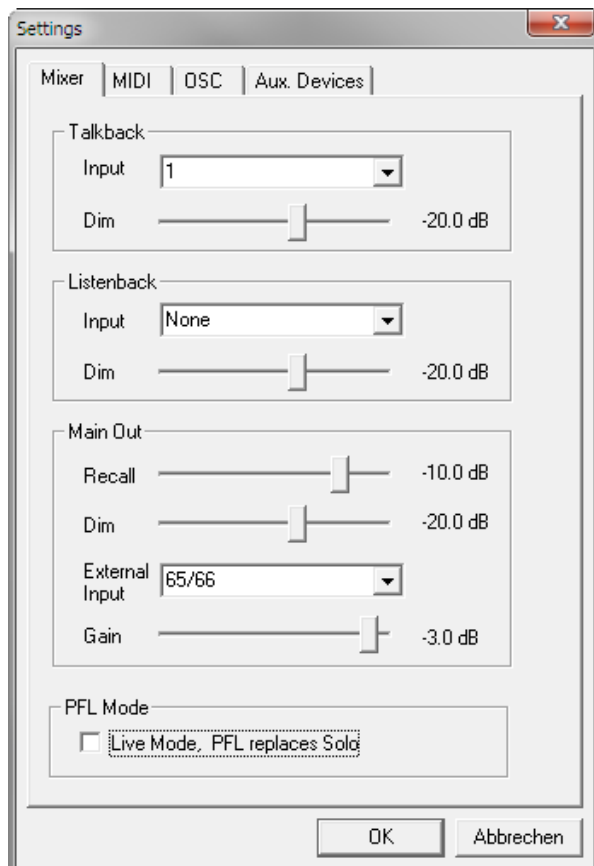
21.7.2 MIDI Page

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

Index
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 Connection
- ➢ **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 24.5.
- ➢ **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.

<u>Note</u>: 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.

21.7.3 OSC Page

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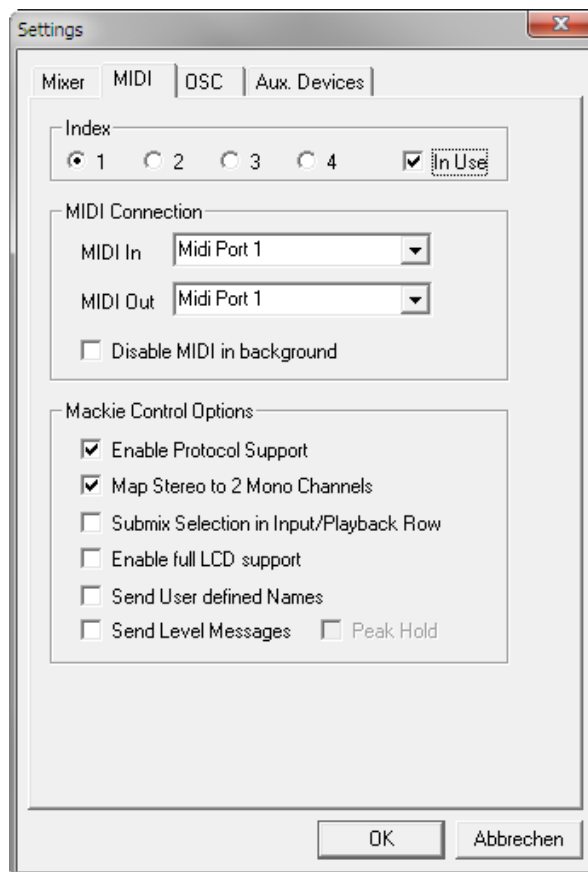
Index
Select one of four settings pages and thus remote controls. Settings are remembered automatically. To activate or deactivate any of the four remote controls check or uncheck 'In Use'.

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.
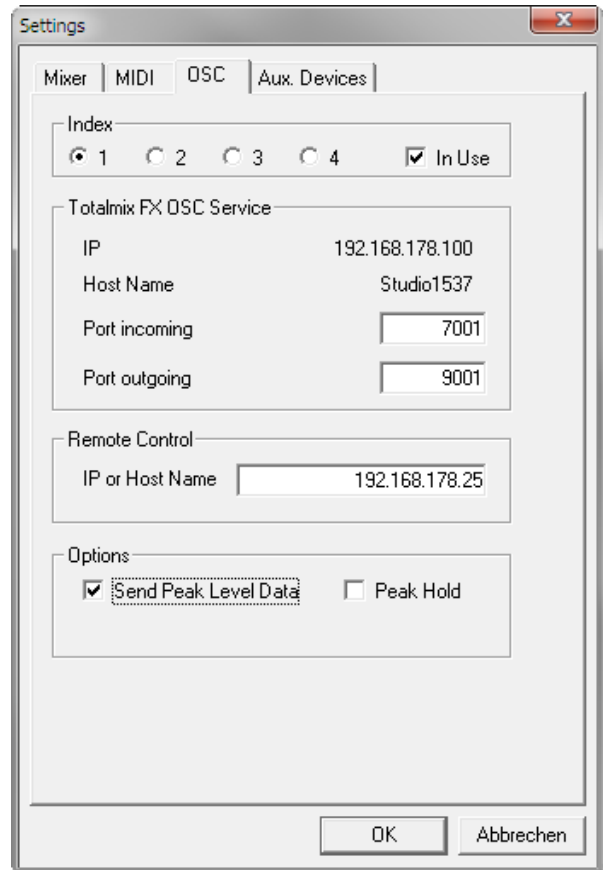
21.7.4 Aux Devices

The RME OctaMic XTC is a highly flexible hi-quality 8-channel microphone, line and instrument preamp with integrated AD-conversion to ADAT, AES/EBU and MADI, plus 4 channels of DA-conversion for monitoring. It can be used as universal front-end for the MADIface USB and other interfaces.

To simplify operation the most important parameters of the XTC (gain, 48V, phase, mute, AutoSet) can be controlled directly from the TotalMix FX input channels. This special remote control uses MIDI of any format (DIN, USB, MIDI over MADI).

TotalMix FX version 0.99 or higher will show the panel *Aux Devices* which has all the settings to activate remote functionality.

Device Settings
➢ **Digital Channels.** Select where the OctaMic XTC sends its 8 analog channels to. With the MADIface USB this will be one of the 8-channel blocks of MADI.
➢ **Device.** At this time only the OctaMic XTC is supported and can be chosen.

MIDI Settings
➢ **MIDI In.** Set the currently used MIDI connection to OctaMic XTC.
➢ **MIDI Out.** Set the currently used MIDI connection to OctaMic XTC.
➢ **Device ID.** Default 0. This setting relates to the current choice in Digital Channels.
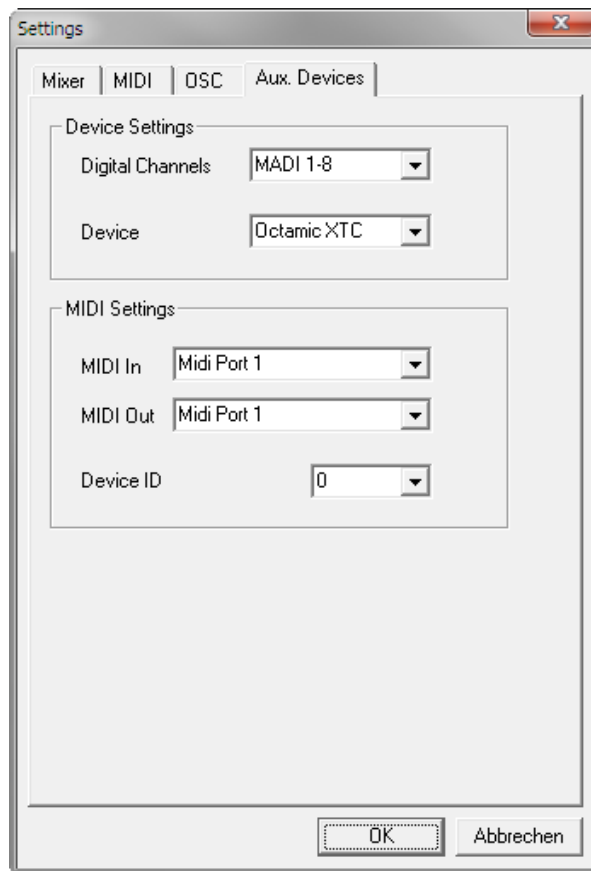
When using more than one OctaMic XTC these must have different Device IDs (configuration is done at the OctaMic XTC). *Aux Devices* supports to set different Device IDs to the 8-channel blocks as well. Storing the setting is done automatically when selecting a Device ID. To check the current assignments select all 8-channel blocks sequentially.

The screenshot to the right shows what happens as soon as the above settings have been confirmed with OK. The chosen MADI channels show new elements for phantom power, Inst/PAD, Gain and AutoSet. Control operates bidirectional, so changing the gain at the unit will be mirrored in the TotalMix channels. Changing the gain in TotalMix FX will set the gain in the unit, which is also shown on the unit's display.

For the remote to work the XTC's currently used MIDI I/Os have to be set to *Control*. More details are found in the manual of the OctaMic XTC.

21.8 Hotkeys and Usage

TotalMix FX has many hotkeys and mouse/hotkey combinations to speed up and simplify the usage.

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 tp 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) with held down **Shift** key lets all channels to the right change their state. For example all settings 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** 1 to 8 (not on the numeric keypad!) will load the corresponding Snapshot.

The right mouse button selects a Hardware Output. At the same time a context menu is displayed having these options:

Clear Submix. Deletes the whole submix of the selected output. All inputs and playbacks of this routing will be set to −∞.

Copy Submix. Copies the whole submix of the selected output into memory. All input and playback faders from that routing will be included.

Paste Submix. Writes the previously copied submix on to the now selected output.

21.9 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.
Note: 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 control of the TotalMix mixer. In Mackie Protocol mode the channels which are currently under MIDI control are indicated by a colour change of the name field.

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. The function can be activated separately for any of the 4/4 possible remotes. 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 chapter 21.6.

Settings. Opens a dialog box to configure several functions like Talkback, Listenback, Main Out and the MIDI Remote Control. See chapter 21.7.

Channel Layout. Hide channels visually and exclude them from remote. See chapter 27.5.3.

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.** Not valid for the MADIface USB.

➤ **Reset output volumes.** All faders of the third row will be set to 0 dB, Main and Speaker B to -10 dB.

➤ **Reset channel names.** Removes all names assigned by the user.

➤ **Total Reset.** Playback routing 1:1 with mixdown to Main Out. Switches off all other functions.

22. The Matrix

22.1 Overview

The mixer window of TotalMix looks and operates similar to mixing desks, as it is based on a conventional fader 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 MADIface USB 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.

22.2 Elements of the Matrix View

The visual design of the TotalMix Matrix is mainly determined by the architecture of the MADI-face USB:

- ➢ **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.

22.3 Operation

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 **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 don't 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's going on. And since the Matrix operates monaural if desired, it is very easy to set up specific routings with specific gains.

23. Tips and Tricks

23.1 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.

23.2 Copy a Submix

TotalMix allows you to copy complete submixes to other outputs. In case a complex submix is needed with only a few changes on a different output, the whole submix can be copied to that output. Right click with the mouse on the original submix output, means Hardware Output. In the context menu select Copy Submix. Then right click on the new submix output, choose Paste Submix in the context menu. Now fine tune the submix.

23.3 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.

23.4 Doubling the Output Signal

If a mix should be sent out via two different hardware outputs, the most elegant way is to use a permanently activated *Cue*. Set up the mixdown on the routing to the Main Out, use Copy Submix to copy the final mix to the other output, then activate Cue on this other output. The output signal, and with this the complete mixdown, will then be played back from two stereo outputs simultaneously – the Main Out and the other Hardware Output. Even better: the faders of both outputs are still active, so the signal level can be adjusted individually.

23.5 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, complete 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 9 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.
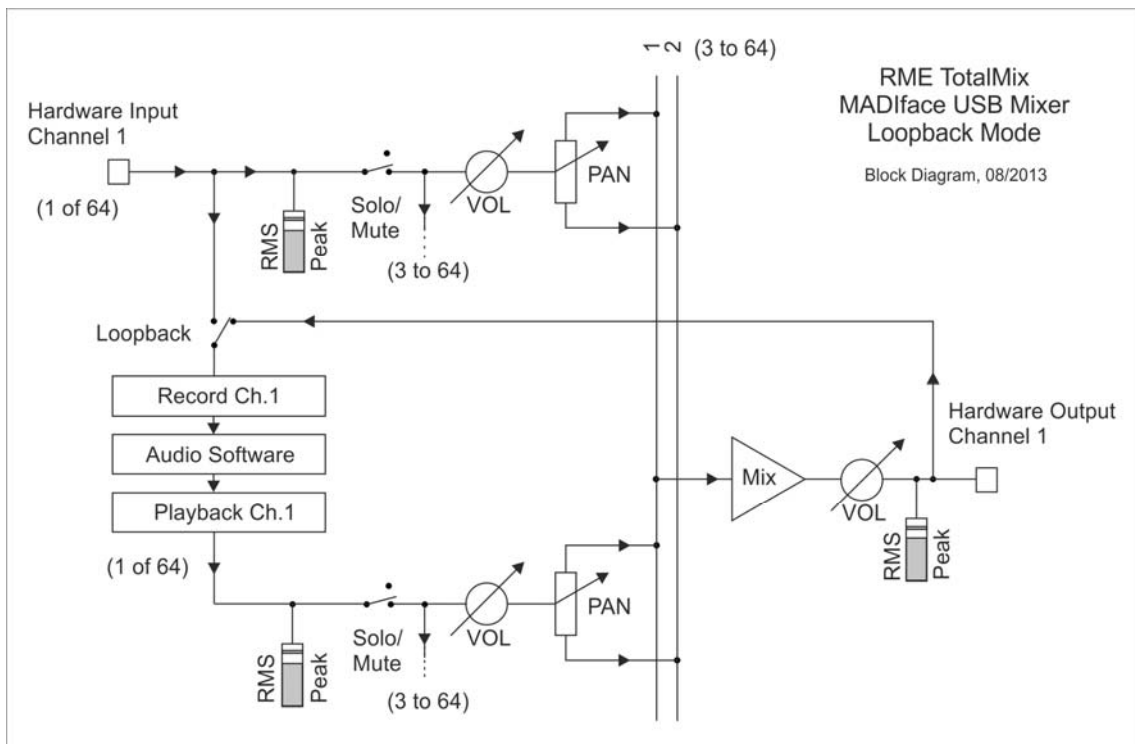
The block diagram shows how the software's input signal is played back, and fed back from the hardware output to the software input.

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.
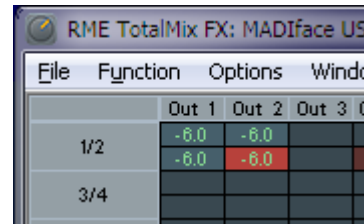
Mixing several input signals into one record channel

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.

23.6 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.

These 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.

24. MIDI Remote Control

24.1 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 MADIface USB 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.

24.2 Mapping

TotalMix supports the following Mackie Control surface elements*:

Element:	Meaning in TotalMix:
Channel faders 1 – 8	volume
Master fader	Main Monitor channel's faders
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.

24.3 Setup

Open the Preferences dialog (menu Options or F3). Select the MIDI Input and MIDI Output port where your controller is connected to.

When no feedback is needed select NONE as MIDI Output.

Check *Enable MIDI Control* in the Options menu.

24.4 Operation

The channels being under Mackie MIDI control are indicated by a colour 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.

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, 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 fader (lowest row) which is set up as *Main Out* in the Control Room section.

24.5 MIDI Control

The hardware output 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 MADIface USB 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 desirable to be available in 'hardware'. These are mainly the *Talkback* and the *Dim* button, and the monitoring options (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 / **#G2**
Master Solo: 2B / 43 / **G2**

Note: 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 5 to maximum attenuation: B1 6A 0
- Set playback 1 to maximum: B4 66 7F
- Set Output 3 to 0 dB: B8 68 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.

24.6 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.

24.7 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 chapter 21.7.3.

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

A template for Lemur is available from liine.net, the makers of Lemur.

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

User's Guide

MADIface USB

▷ **Technical Reference**

25. Technical Specifications

25.1 Inputs

MADI
- Coaxial via BNC, 75 Ohm, according to AES10-1991
- High-sensitivity input stage (< 0.2 Vpp)
- Optical via FDDI duplex SC connector
- 62.5/125 and 50/125 compatible
- Accepts 56 channel and 64 channel mode, plus 96k Frame
- Standard: up to 64 channels 24 bit 48 kHz
- S/MUX: up to 32 channels 24 bit 96 kHz
- S/MUX4: up to 16 channels 24 bit 192 kHz
- Lock range: 25 kHz – 54 kHz
- Jitter when synced to input signal: < 1 ns

25.2 Outputs

MADI
- Coaxial via BNC, 75 Ohm, according to AES10-1991
- Output voltage 600 mVpp
- Cable length: up to 100 m
- Optical via FDDI duplex SC connector
- 62.5/125 and 50/125 compatible
- Cable length: up to 2000 m
- Generates 56 channel and 64 channel mode, plus 96k Frame
- Standard: up to 64 channels 24 bit 48 kHz
- S/MUX / 96k Frame: up to 32 channels 24 bit 96 kHz
- S/MUX4: up to 16 channels 24 bit 192 kHz

25.3 Digital

- Clocks: Internal, MADI In
- Low jitter design: < 1 ns in PLL mode, all inputs
- Internal clock: 800 ps jitter, random spread spectrum
- Jitter suppression of external clocks: about 30 dB (2.4 kHz)
- Input PLL ensures zero dropout, even at more than 100 ns jitter
- Supported sample rates: 28 kHz up to 200 kHz

25.4 General

- Power supply: USB bus power
- Typical power consumption: 2 Watts
- Dimensions (WxHxD): 112 x 27 x 83 mm (4.4" x 1.1" x 3.3")
- Weight: 273 g (0.6 lbs)
- Temperature range: +5° up to +50° Celsius (41° F up to 122°F)
- Relative humidity: < 75%, non condensing

26. Technical Background

26.1 MADI Basics

MADI, the serial **M**ultichannel **A**udio **D**igital **I**nterface, has been defined already in 1989 as an extension of the existing AES3 standard following several manufacturers' wish. The format also known as AES/EBU, a balanced bi-phase signal, is limited to two channels. Simply put, MADI contains 28 of those AES/EBU signals in serial, i. e. after one another, and the sample rate can still even vary by +/-12.5%. The limit which cannot be exceeded is a data rate of 100 Mbit/s.

Because an exact sampling frequency is used in most cases, the 64 channel mode was introduced officially in 2001. It allows for a maximum sample rate of 48 kHz + ca. 1%, corresponding to 32 channels at 96 kHz, without exceeding the maximum data rate of 100 Mbit/s. The effective data rate of the port is 125 Mbit/s due to additional coding.

Older devices understand and generate only the 56 channel format. Newer devices often work in the 64 channel format, but offer still no more than 56 audio channels. The rest is being eaten up by control commands for mixer settings etc. RME's devices of the MADI series show that this can be done in a much better way, with an invisible transmission of 16 MIDI channels and the MADI signal still being 100% compatible.

For the transmission of the MADI signal, proved methods known from network technology were applied. Most people know unbalanced (coaxial) cables with 75 Ohms BNC plugs, they are not expensive and easy to get. The optical interface is much more interesting due to its complete galvanic separation, but for many users it is a mystery, because very few have ever dealt with huge cabinets full of professional network technology. Therefore here are some explanations regarding 'MADI optical'.

- The cables used are standard in computer network technology. They are thus not at all expensive, but unfortunately not available in every computer store.

- The cables have an internal fibre of only 50 or 62.5 µm diameter and a coating of 125 µm. They are called network cables 62.5/125 or 50/125, the former mostly being blue and the latter mostly being orange. Although in many cases not clearly labelled, these are always (!) glass fibre cables. Plastic fibre cables (POF, plastic optical fibre) can not be manufactured in such small diameters.

- The plugs used are also an industry standard and called SC. Please don't mix them up with ST connectors, which look similar to BNC connectors and are being screwed. Plugs used in the past (MIC/R) were unnecessarily big and are not being used any longer.

- The cables are available as a duplex variant (2 cables being glued together) or as a simplex variant (1 cable). The MADIface's opto module supports both variants.

- The transmission uses the multimode technique which supports cable lengths of up to almost 2 km. Single mode allows for much longer distances, but it uses a completely different fibre (8 µm). By the way, due to the wave-length of the light being used (1300 nm), the optical signal is invisible to the human eye.

26.2 Lock and SyncCheck

Digital signals consist of a carrier and the data. If a digital signal is applied to an input, the receiver has to synchronize to the carrier clock in order to read the data correctly. To achieve this, the receiver uses a PLL (Phase Locked Loop). As soon as the receiver meets the exact frequency of the incoming signal, it is locked. This **Lock** state remains even with small changes of the frequency, because the PLL tracks the receiver's frequency.

If a MADI signal is applied to the MADIface, the unit indicates LOCK, i. e. a valid input signal. This information is presented in the Settings dialog. In the status display the state of all clocks is decoded and shown as simple text (No Lock, Lock, Sync).

Unfortunately, LOCK does not necessarily mean that the received signal is correct with respect to the clock which processes the read out of the embedded data. Example: The MADIface is set to 44.1 kHz internally (clock mode Master), and a mixing desk with MADI output is connected to the unit's MADI input. The status display will show LOCK immediately, but usually the mixing desk's sample rate is generated internally (it is Master too), and thus slightly higher or lower than the MADIface internal sample rate. Result: When reading out the data, there will frequently be read errors that cause clicks and drop outs.

The above described problem can be solved elegantly by setting the MADIface from Master to AutoSync (its internal clock will then be the clock delivered by the mixing desk).

In order to display those problems, the MADIface includes **SyncCheck**. It checks all clocks used for *synchronicity*. If they are not synchronous to each other, the status display will show LOCK. If they are synchronous to each other (i.e. absolutely identical), the status display will change to SYNC. In the example above it would have been obvious immediately that the entry LOCK is shown instead of SYNC, right after connecting the mixing desk. For proper operation both MADI inputs must display SYNC if both are connected.

In practice, SyncCheck allows for a quick overview of the correct configuration of all digital devices. So one of the most difficult and error-prone topics of the digital studio world finally becomes easy to handle.

26.3 Latency and Monitoring

The term **Zero Latency Monitoring** has been introduced by RME in 1998 for the DIGI96 series of audio cards. It stands for the ability to pass-through the computer's input signal at the interface directly to the output. Since then, the idea behind has become one of the most important features of modern hard disk recording. In the year 2000, RME published two ground-breaking Tech Infos on the topics *Low Latency Background*, which are still up-to-date: *Monitoring, ZLM and ASIO*, and *Buffer and Latency Jitter*, both found on the RME website.

How much Zero is Zero?
From a technical view there is no zero. Even the analog pass-through is subject to phase errors, equalling a delay between input and output. However, delays below certain values can subjectively be claimed to be a zero-latency. This applies to analog routing and mixing, and in our opinion also to RME's Zero Latency Monitoring. The term describes the digital path of the audio data from the input of the interface to its output. The digital receiver of the MADIface USB can't operate un-buffered, and together with TotalMix and the output via the transmitter, it causes a typical delay of 3 samples. At 44.1 kHz this equals about 68 µs (0.000068 s), at 192 kHz only 15 µs. The delay is valid for ADAT and SPDIF in the same way.

Oversampling
While the delays of digital interfaces can be disregarded altogether, the analog inputs and outputs do cause a significant delay. Modern converter chips operate with 64 or 128 times oversampling plus digital filtering, in order to move the error-prone analog filters away from the audible frequency range as far as possible. This typically generates a delay of one millisecond. A playback and re-record of the same signal via DA and AD (loopback) then causes an offset of the newly recorded track of about 2 ms.

Buffer Size (Latency)
Windows: This option found in the Settings dialog defines the size of the buffers for the audio data used in ASIO and WDM (see chapter 8/9).

Mac OS X: The buffer size is defined within the application. Only some do not offer any setting. For example iTunes is fixed to 512 samples.

General: A setting of 64 samples at 44.1 kHz causes a latency of 1.5 ms, for record and playback each. But when performing a digital loopback test no latency/offset can be detected. The reason is that the software naturally knows the size of the buffers, therefore is able to position the newly recorded data at a place equalling a latency-free system.

AD/DA Offset under ASIO and OS X: ASIO (Windows) and Core Audio (Mac OS X) allow for the signalling of an offset value to correct buffer independent delays, like AD- and DA-conversion or the Safety Buffer described below. An analog loopback test will then show no offset, because the application shifts the recorded data accordingly.

Because the MADIface is a completely digital interface, and the delays introduced by external AD/DA-converters or other digital interfaces are unknown to unit and driver, the drivers include the digital offset values (3 / 6 / 12 samples). Therefore the delays caused by external converters have to be taken care off in the record software, which usually means that the user has to enter specific offset values manually.

Note: Cubase and Nuendo display the latency values signalled from the driver separately for record and playback. The current driver includes a safety offset of 32 samples for the playback side only, which will be included in the shown value.

Safety Buffer
An additional small Safety Buffer on the playback side only has proven to be very efficient and useful. The MADIface USB uses a fixed additional buffer of 32 samples, which is added to the current buffer size. The main advantage is the ability to use lowest latency at highest CPU loads. Furthermore, the fixed buffer does not add to the latency jitter (see Tech Info), the subjective timing is extraordinary.

Core Audio's Safety Offset
Under OS X, every audio interface has to use a so called *Safety Offset*, otherwise Core Audio won't operate click-free. The MADIface USB uses a safety offset of 16 samples. This offset is signalled to the system, and the software can calculate and display the total latency of buffer size plus AD/DA offset plus 2 x Safety Offset plus Safety Buffer for the current sample rate.
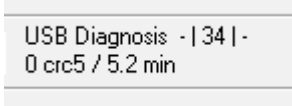
26.4 USB Audio

USB audio is in several ways different from PCI based audio interfaces. The MADIface USB even more, as it tries to use the USB standard's full potential. Transmitting 64 channels simultaneously in both directions therefore requires modern hardware. While the MADIface USB will work on older computers with for example a Core 2 Duo CPU and ICH 9 as USB hub, the CPU load is noticeable and DPC is raised from the underlying USB driver of the operating system. Newer computers, especially those already having USB 3 ports, usually show no such issues, as their raw performance handles the USB load with ease.

Low CPU load and click-free operation even at 64 samples buffer size are indeed possible on current computers. However, using older computers a simple stereo playback will already cause a CPU load of more than 30%.

A computer blocked for a short time – no matter if ASIO or WDM – will loose one or more data packets. Such problems can only be solved by increasing the buffer size (and with this the latency).

The MADIface USB features a unique data checking, detecting errors during transmission via USB and displaying them in the Settings dialog. Additionally the MADIface provides a special mechanism to continue recording and playback in spite of drop-outs, and to correct the sample position in real-time.

USB Diagnosis - | 34 | -
0 crc5 / 5.2 min

Like any audio interface the MADIface USB should have a data transmission to the computer as undisturbed as possible. The easiest way to guarantee this is to connect it to its own bus, which should be no big problem as most USB 2.0 interfaces are a double bus design. A check in the Device Manager can be done as follows:

➢ Connect the MADIface USB to a USB port
➢ Start the Device Manager, choose View Devices by Connection
➢ Select ACPI x86-based PC, Microsoft ACPI-Compliant System, expand PCI Bus

This branch normally includes two entries of a USB2 Enhanced Host Controller. A USB Root Hub can be seen, which then connects all USB devices, including the MADIface USB. By reconnecting to a different port this view now allows for a check at which of the two controllers the MADIface is connected. With multiple devices it can also be checked if they are connected to the same controller.

Furthermore this information can be used to operate an external USB drive without disturbing the MADIface USB, by simply connecting the drive to the other controller.

Especially with notebooks it can happen that all internal devices and all the sockets/ports are connected to the same controller, with the second controller not used at all. In that case all devices have to use the same bus and interfere with each other.

26.5 DS - Double Speed

When activating the *Double Speed* mode the MADIface operates at double sample rate. The internal clock 44.1 kHz turns to 88.2 kHz, 48 kHz to 96 kHz. The internal resolution is still 24 bit.

Sample rates above 48 kHz were not always taken for granted, and are still not widely used because of the CD format (44.1 kHz) dominating everything. Before 1998 there were no receiver/transmitter circuits available that could receive or transmit more than 48 kHz. Therefore a work-around was used: instead of two channels, one AES line only carries one channel, whose odd and even samples are being distributed to the former left and right channels. By this, you get the double amount of data, i. e. also double sample rate. Of course in order to transmit a stereo signal two AES/EBU ports are necessary then.

This transmission mode is called *Double Wire* in the professional studio world, and is also known as *S/MUX* (abbreviation for *Sample Multiplexing*) in connection with the multichannel ADAT format. The AES3 specification uses the uncommon term *Single channel double sampling frequency mode*.

Not before February 1998, Crystal shipped the first 'single wire' receiver/transmitters that could also work with double sample rate. It was then possible to transmit two channels of 96 kHz data via one AES/EBU port.

But *Double Wire* is still far from being dead. On one hand, there are still many devices which can't handle more than 48 kHz, e. g. digital tape recorders. But also other common interfaces like ADAT or TDIF are still using this technique.

With MADI, sample multiplexing is often used as well to offer sample rates higher than 48 kHz. The MADIface supports all formats. 96 kHz can be received and transmitted both as 48K Frame (using S/MUX) and as native 96K Frame. In 48K Frame Double Speed mode, the MADIface distributes the data of one channel to two consecutive MADI channels. This reduces the available channel count from 64 to 32.

As the transmission of double rate signals with 48K Frame is done at standard sample rate (Single Speed), the MADI ports still operate at 44.1 kHz or 48 kHz.

26.6 QS – Quad Speed

Due to the small number of available devices that use sample rates up to 192 kHz, but even more due to a missing real world application (CD...), Quad Speed has had no broad success so far. An implementation of the ADAT format as double S/MUX (S/MUX4) results in only two channels per optical output. Devices using this method are few.

In earlier times the transmission of 192 kHz had not been possible via Single Wire, so once again sample multiplexing was used: instead of two channels, one AES line transmits only one half of a channel. A transmission of one channel requires two AES/EBU lines, stereo requires even four. This transmission mode is being called *Quad Wire* in the professional studio world. The AES3 specification does not mention Quad Wire.

With MADI, sample multiplexing is used as well to offer sample rates higher than 96 kHz. In fact, technical reasons require to use this method beyond 96 kHz. A 192K or 384K Frame format would not be fully compatible to the MADI standard. Therefore 192 kHz is supported as S/MUX4 only. So in 48K Frame Quad Speed mode, a MADI device distributes the data of one channel to four consecutive MADI channels. This reduces the available channel count from 64 to 16.

As the transmission of quad rate signals with 48K Frame is done at standard sample rate (Single Speed), the MADI ports still operate at 44.1 kHz or 48 kHz.

26.7 SteadyClock

RME's SteadyClock technology guarantees an excellent performance in all clock modes. Its highly efficient jitter suppression refreshes and cleans up any clock signal, and provides it as reference clock at the output.

Usually a clock section consists of an analog PLL for external synchronization and several quartz oscillators for internal synchronisation. SteadyClock requires only one quartz, using a frequency not equalling digital audio. Latest circuit designs like hi-speed digital synthesizer, digital PLL, 100 MHz sample rate and analog filtering allow RME to realize a completely newly developed clock technology, right within the FPGA at lowest costs. The clock's performance exceeds even professional expectations. Despite its remarkable features, SteadyClock reacts quite fast compared to other techniques. It locks in fractions of a second to the input signal, follows even extreme varipitch changes with phase accuracy, and locks directly within a range of 25 kHz up to 200 kHz.

SteadyClock has originally been developed to gain a stable and clean clock from the heavily jittery MADI data signal. The embedded MADI clock suffers from about 80 ns jitter, caused by the time resolution of 125 MHz within the format. Common jitter values for other devices are 5 ns, while a very good clock will have less than 2 ns.

The picture to the right shows the MADI input signal with 80 ns of jitter (top graph, yellow). Thanks to SteadyClock this signal turns into a clock with less than 2 ns jitter (lower graph, blue).
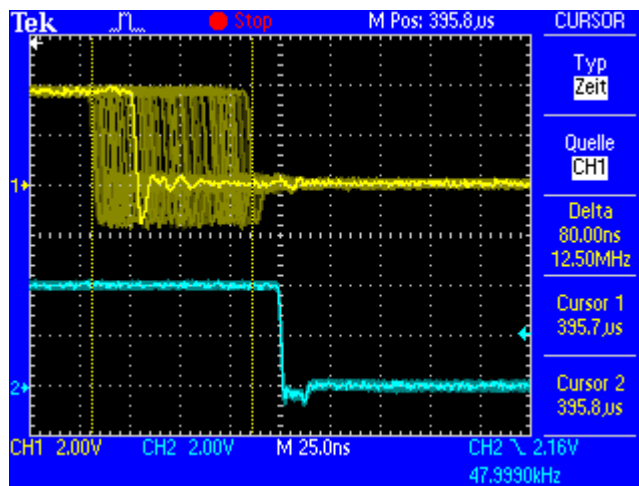
26.8 Terminology

Single Speed
Sample rate range originally used in Digital Audio. Typical applications are 32 kHz (digital radio broadcast), 44.1 kHz (CD), and 48 kHz (DAT).

Double Speed
Doubles the original sample rate range, in order to achieve higher audio quality and improved audio processing. 64 kHz is practically never used, 88.2 kHz is quite rare in spite of certain advantages. 96 kHz is a common format. Sometimes called **Double Fast**.

Quad Speed
Controversially discussed way of ensuring hi-end audio quality and processing by quadrupling the sample frequency. 128 kHz is non-existent, 176.4 kHz is rare, if at all then 192 kHz is used, e.g. for DVD Audio.

Single Wire
Standard audio data transfer, where the audio signal's sample rate is equal to the rate of the digital signal. Used from 32 to 192 kHz. Sometimes called **Single Wide**.

Double Wire
Before 1998 there were no receiver/transmitter circuits available that could receive or transmit more than 48 kHz. Higher sample rates were transferred by splitting odd and even bits across the L/R channels of a single AES connection. This provides for twice the data rate, and hence twice the sample rate. A stereo signal subsequently requires two AES/EBU ports.

The Double Wire method is an industry standard today, however it has a number of different names, like **Dual AES**, **Double Wide**, **Dual Line** and **Wide Wire**. The AES3 specification uses the uncommon term *Single channel double sampling frequency mode*. When used with the ADAT format, the term S/MUX is commonly used.

Double Wire not only works with Single Speed signals, but also with Double Speed. As an example, Pro Tools HD, whose AES receiver/transmitter only work up to 96 kHz, uses Double Wire to transmit 192 kHz. Four channels of 96 kHz turn into two channels of 192 kHz.

Quad Wire
Similar to Double Wire, with samples of one channel spread across four channels. This way single speed devices can transmit up to 192 kHz, but need two AES/EBU ports to transmit one channel. Also called **Quad AES**.

S/MUX
Since the ADAT hardware interface is limited to Single Speed, the Double Wire method is used for sample rates up to 96 kHz, but usually referred to as S/MUX (Sample Multiplexing). An ADAT port supports four channels this way. With MADI S/MUX is used as well, to transmit up to 96kHz although the 48K Frame format is used.

S/MUX4
The Quad Wire method allows to transmit two channels at up to 192 kHz via ADAT. The method is referred to as S/MUX4. With MADI S/MUX4 is used as well, to transmit up to 192 kHz although the 48K Frame format is used.

Note: All conversions of the above described methods are lossless. The existing samples are just spread or re-united between the channels.

48K Frame
Most often used MADI format. Supports up to 64 channels at up to 48 kHz.

96K Frame
Frame format for up to 32 channels at up to 96 kHz. The advantage of this format against 48K Frame using S/MUX: the receiver can detect the real (double) sample rate on its own and immediately. With 48K Frame and S/MUX, the user has to set up the correct sample rate in all involved devices manually.

User's Guide MADIface USB   © RME

User's Guide

MADIface USB

▷ **Miscellaneous**

27. Accessories

RME offers several optional components for the MADIface USB:

Part Number   **Description**

Optical MADI cables:

Part Number	Description
OK0100PRO	Optical cable, TOSLINK, 1 m (3.3 ft)
OK0200PRO	Optical cable, TOSLINK, 2 m (6.6 ft)
OK0300PRO	Optical cable, TOSLINK, 3 m (9.9 ft)
OK0500PRO	Optical cable, TOSLINK, 5 m (16.4 ft)
OK1000PRO	Optical cable, TOSLINK, 10 m (33 ft)
MADI0.5S	MADI Optical Cable, Simplex, 0.5 m (1.6 ft)
MADI1S	MADI Optical Cable, Simplex, 1 m (3.3 ft)
MADI3D	MADI Optical Cable, Duplex, 3 m (9.9 ft)
MADI6D	MADI Optical Cable, Duplex, 6 m (20 ft)
MADI10D	MADI Optical Cable, Duplex, 10 m (33 ft)
MADI20D	MADI Optical Cable, Duplex, 20 m (66 ft)
MADI50D	MADI Optical Cable, Duplex, 50 m (165 ft)
MCD100	MADI Optical multicore on drum, 100 m
MCD150	MADI Optical multicore on drum, 150 m
MCD300	MADI Optical multicore on drum, 300 m

28. Warranty

Each individual MADIface USB undergoes comprehensive quality control and a complete test at IMM 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.

Audio AG 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 per country. 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.

Audio AG does not accept claims for damages of any kind, especially consequential damage. Liability is limited to the value of the MADIface USB. The general terms of business drawn up by Audio AG apply at all times.

29. Appendix

RME news, driver updates and further product information are available on our website:

http://www.rme-audio.com

Distributor: Audio AG, Am Pfanderling 60, D-85778 Haimhausen, Tel.: +49 (0)8133 / 918170

Manufacturer:
IMM Elektronik GmbH, Leipziger Strasse 32, D-09648 Mittweida

Trademarks

All trademarks, registered or otherwise, are the property of their respective owners. RME, DIGICheck and Hammerfall are registered trademarks of RME Intelligent Audio Solutions. SyncCheck, ZLM, DIGI96, SyncAlign, TMS, TotalMix, SteadyClock, MADIface and Fireface are trademarks of RME Intelligent Audio Solutions. Microsoft, Windows Vista / 7 / 8 are registered trademarks or trademarks of Microsoft Corp. Steinberg, Cubase and VST are registered trademarks of Steinberg Media Technologies GmbH. ASIO is a trademark of Steinberg Media Technologies GmbH.

Copyright © Matthias Carstens, 09/2013. Version 1.4
Current driver version: W: 0.9360, Mac OS X: 1.86, Firmware 18

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. Lending or copying any part of the guide or the RME Driver CD, or any commercial exploitation of these media without express written permission from RME Intelligent Audio Solutions is prohibited. RME reserves the right to change specifications at any time without notice.

30. Declaration of Conformity

CE
This device has been tested and found to comply with the limits of the European Council Directive on the approximation of the laws of the member states relating to electromagnetic compatibility according to RL2004/108/EG, and European Low Voltage Directive RL2006/95/EG.

FCC
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

RoHS
This product has been soldered lead-free and fulfils the requirements of the RoHS directive.

ISO 9001
This product has been manufactured under ISO 9001 quality management. The manufacturer, IMM Elektronik GmbH, is also certified for ISO 14001 (Environment) and ISO 13485 (medical devices).

Note on Disposal

According to the guide line RL2002/96/EG (WEEE – Directive on Waste Electrical and Electronic Equipment), valid for all european countries, this product has to be recycled at the end of its lifetime.

In case a disposal of electronic waste is not possible, the recycling can also be done by IMM Elektronik GmbH, the manufacturer of the MADIface USB.

For this the device has to be sent **free to the door** to:

    IMM Elektronik GmbH
    Leipziger Straße 32
    D-09648 Mittweida
    Germany

Shipments not prepaid will be rejected and returned on the original sender's costs.