

## D.O.TEC® MA2CHBOX Manual



Version 1.5



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# About This Manual

## How to Use This Manual

This manual guides you through the installation and operation of the MA2CHBOX.

Use the Table of Contents at the beginning of the manual or Index Directory (see *page 49*) to locate help on a particular topic.

You can access more information and latest news by visiting on the DirectOut website at [www.directout.eu](http://www.directout.eu).

## Conventions

The following symbols are used to draw your attention to:

**Tips** – indicate useful tips and short cuts.



**Notes** – are used for important points of clarification or cross references.



## Warning

Warnings – alert you when an action should always be observed.



# Chapter 1: Overview

## Introduction

Welcome to the MA2CHBOX, D.O.TEC's headphone amplifier for monitoring MADI signals:



The MA2CHBOX can monitor any mono channel or any stereo pair of 64 audio channels from a MADI stream. The signal is fed to the headphone output. The MA2CHBOX provides the following interfaces:

- Standard MADI I/O (coaxial, BNC or optical, SC)
- two ExpressCards I/Os for use with RME MADI-face
- USB Port for transmission of RS 232 data (virtual serial port) and firmware updates.
- Headphone output (stereo)



## Applications

The MA2CHBOX can be used for monitoring one or two channels out of 192 channels (3x 64 channels). The MADI signal from the input is routed through the output for possible daisy chaining (normal mode).

Typical applications include:

- personal monitoring during a recording session with several musicians - each having his own monitor mix in the MADI signal.
- recording with redundant systems - the incoming MADI signal (main input) is mirrored to both ExpressCard outputs feeding two RME MADIfaces.
- playback from an ExpressCard to the MADI chain, thus allowing a virtual soundcheck (EC Mode).
- signal control of MADI signals within a signal chain; e.g. on stage for line check.

## How it works

The input is selected in the menu. By turning the encoder knob the desired channel pair is accessed or the volume adjustment is done. Two modes (normal mode / EC mode) allow different signal routing. The USB port for RS 232 data transmission is switchable. Thus allowing a transparent signalflow through the MA2CHBOX.

## Feature Summary

<b>MADI Ports:</b>	1 x MADI input and output (Coaxial BNC connection or optical SC port)
<b>ExpressCard Ports</b>	2 x IEEE 1394a connector, proprietary protocol (no Firewire), compatible with RME MADiface ExpressCard
<b>MADI Formats</b>	56/64 channel, 48k/96k Frame, S/MUX 2/4
<b>Sample Rates</b>	44.1, 48, 88.2, 96, 176.4, 192 kHz +/-12.5%
<b>Headphone Output</b>	6.3 mm TRS jack, stereo
<b>Serial Communication</b>	RS-232 via USB (virtual COM Port for Windows XP, Vista, 7)
<b>Power Supply</b>	Internal (safety class 2)

# Chapter 2: Installation

## Before Installing This Device

### Warning

---



Please read and observe **ALL** of the following notes before installing this product:

- Check the hardware device for transport damage.
- Any devices showing signs of mechanical damage or damage from the spillage of liquids **MUST NOT** be connected to the mains supply, or disconnected from the mains immediately by pulling out the power lead.
- All devices **MUST** be connected to the mains using the two-cord power leads supplied with the system. Only supply electrical interfaces with the voltages and signals described in these instructions.
- Do **NOT** use the device at extreme temperatures. Proper operation can only be guaranteed between temperatures of 5° C and 45° C and a maximum relative humidity of 80 %, non-condensing.
- The cabinet of the device will heat up. Do **NOT** place the device close to heat sources (e.g. heaters). Observe the environmental conditions.

## Defective Parts/Modules



### **Warning**

---

This device contains no user-serviceable parts. Therefore do NOT open the device.

In the event of a hardware defect, please send the device to your local service representative together with a detailed description of the fault.

We would like to remind you to please check carefully whether the failure is caused by erroneous configuration, operation or connection before sending parts in for repair. See Chapter 6 for assistance with troubleshooting.

## First Aid (in case of electric shock)

### Warning

---



- **DO NOT** touch the person or his/her clothing before power is turned off, otherwise you risk sustaining an electric shock yourself.
- Separate the person as quickly as possible from the electric power source as follows:
  - ✓ Switch off the equipment.
  - ✓ Unplug or disconnect the mains cable.
- Move the person away from the power source by using dry insulating material (such as wood or plastic).
- If the person is unconscious:
  - ✓ Check their pulse and reanimate if their respiration is poor.
  - ✓ Lay the body down and turn it to one side. Call for a doctor immediately.
- Having sustained an electric shock, **ALWAYS** consult a doctor.

## Contents

The contents of your MA2CHBOX package should include:

- 1 x MA2CHBOX
- 1 x power chord
- 1 x Manual

## Updates

D.O.TEC® products are continually under development, and therefore the information in this manual may be superseded by new releases. To access the latest documentation, please visit the DirectOut website: [www.directout.eu](http://www.directout.eu).

This guide refers to firmware version 1.7.

## Intended Operation

The **MA2CHBOX** is designed for monitoring MAD1 signals (AES 10) via headphones.

### Warning

No compensation can be claimed for damages caused by operation of this unit other than for the intended use described above. Consecutive damages are also excluded explicitly. The general terms and conditions of business of DirectOut GmbH are applied.



### Warning

The use of headphones at high volumes may damage your hearing.



## Conditions of Warranty

This unit has been designed and examined carefully by the manufacturer and complies with actual norms and directives.

Warranty is granted by DirectOut GmbH over the period of two years for all components that are essential for proper and intended operation of the device. The date of purchase is applied for this period.



### Warning

All claims of warranty will expire once the device has been opened or modified, or if instructions and warnings were ignored.

For warranty claims please contact the dealer where your device was acquired.



## Conformity & Certificates

### CE

This device complies with the basic requests of applicable EU guidelines. The appropriate procedure for approval has been carried out.

### RoHS

(Restriction of the use of certain Hazardous Substances)

This device was constructed fulfilling the directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment 2002/95/EC.

### WEEE

(Directive on Waste Electrical and Electronic Equipment)

Due to the directive 2002/96/EC for waste disposal this device must be recycled.

For correct recycling please dispatch the device to:

IMM Elektronik GmbH,  
Leipziger Strasse 32  
09648 Mittweida, Germany



Only stamped parcels will be accepted!

WEEE-Reg.-No. DE 93924963

## Contact

### Sales:

DirectOut GmbH, Leipziger Strasse 32,  
09648 Mittweida, Germany

Phone: +49 (0)3727 6205-333

Fax: +49 (0)3727 6205-56

[www.directout.eu](http://www.directout.eu)

### Manufacturer:

IMM Elektronik GmbH, Leipziger Strasse 32,  
09648 Mittweida, Germany

Phone: +49 (0)3727 6205-0

Fax: +49 (0)3727 6205-56

[www.imm-gruppe.de](http://www.imm-gruppe.de)

## Installing the Device

1. Open the packaging and check that the contents have been delivered complete and undamaged.
2. Place the device on a non-slip horizontal surface.

### Warning

Avoid damage from condensation by waiting for the device to adapt to the environmental temperature. Proper operation can only be guaranteed between temperatures of 5° C and 45° C and a maximum relative humidity of 80%, non-condensing.

Ensure that the unit has sufficient air circulation for cooling.

3. Using the power cord provided connect the device to a matching power supply:



### Warning

This device **MUST** be connected to the mains using the two-cord power leads supplied with the system. Only supply the voltages and signals indicated (84V – 264V).



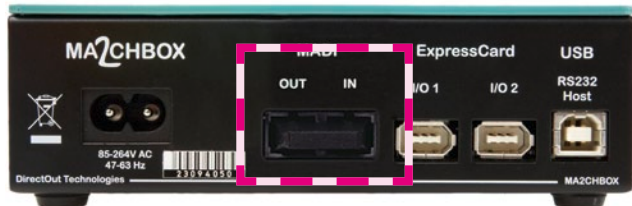
4. Turn on the power switch:



*The first seconds after switch on the actual firmware version of the device is displayed.*

**For the optical version only:**

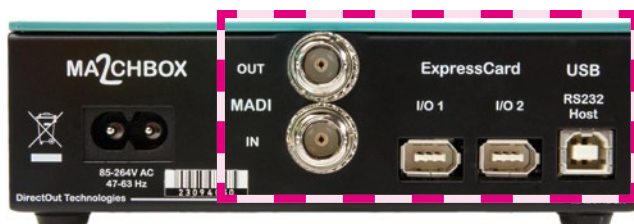
4a. Remove the protective cap from the optical MADI port if you wish to use it:



*Retain the protective cap if the optical port is unused. This will protect against soiling which can lead to malfunction.*

5. Connect the MADI and USB signals to the device:

- MADI IN/OUT – coaxial or optical connectors
- I/O 1 & I/O 2 – ExpressCard connectors
- optional: USB - USB connector (*needs D.O.TEC USB driver to be installed - see page 34*)



Keep any packaging in order to protect the device should it need to be dispatched for service.



# Chapter 3: Operation

## Introduction

This chapter describes the basic operation of the device.

Note that throughout this manual, the abbreviation FS refers to sample rate or sample frequency. So, when dealing with scaling factors, the following sample rates can be written as:

- 44.1 kHz = 1 FS; 88.2 kHz = 2 FS; 176.4 kHz = 4 FS

or

- 48 kHz = 1 FS; 96 kHz = 2 FS; 192 kHz = 4 FS

## Global Controls



<p><b>On/Off Switch</b></p>	<p>Press to turn the power supply on or off.</p>
<p><b>Encoder knob (Volume)</b></p>	<p>Press and turn for all operations (channel selection, volume, menu settings).          Press short to toggle between <b>volume</b> and <b>channel selection</b> (Vol/Ch) or to navigate through the <b>menu</b>.          Press for more than 2 seconds to toggle between <b>Vol/Ch</b> and the <b>menu</b>.          Press twice (“doubleclick”) to mute / unmute the headphone output.          Turning the encoder knob in <b>Volume mode</b> will also unmute the output.</p>

***Mute and Volume control** are applied to the headphones output only and do not affect the MADI signal.*



## Input / Sync / Operating Mode



The MA2CHBOX is synced to the input signal automatically. Sync priority: Main ⇨ EC1 ⇨ EC2  
 If no valid signal is present the next input is used.  
 If no input has a valid signal, all three LEDs will pulse.

<b>LED MADI IN</b>	<p><b>This LED indicates the use of the main input and its sync status.</b></p> <p>LED OFF = no signal</p> <p>LED flashing = signal present, asynchronous (LOCK)</p> <p>LED ON = signal present, synchronous (SYNC)</p>
<b>LED EC 1 IN</b>	<p><b>This LED indicates the use of the EC 1 input and its sync status.</b></p> <p>LED OFF = no signal</p> <p>LED flashing = signal present, asynchronous (LOCK)</p> <p>LED ON = signal present, synchronous (SYNC)</p>



<b>LED EC 2 IN</b>	<p><b>This LED indicates the use of the EC2 input and its sync status.</b></p> <p>LED OFF = no signal</p> <p>LED flashing = signal present, asynchronous (LOCK)</p> <p>LED ON = signal present, synchronous (SYNC)</p>
<b>LED EC MODE</b>	<p><b>This LED indicates operating mode.</b></p> <p>LED OFF = Normal mode active</p> <p>LED ON = EC mode active</p> <p>Press the <b>encoder knob</b> (for more than 2 seconds) to open the menu settings and change the mode there.</p>

## Display / Menu

The 7 segment display indicates the selected channel pair, adjusted volume, level, menu settings.



Display content	Meaning
<Number> + Decimalpoint(s)	<p><b>The selected channel (pair) is indicated.</b></p> <p>In <i>stereo mode</i> odd numbers are indicated only; e.g. 05. is selected = monitoring of MADI channels 05 (left) and 06 (right)</p> <p>In <i>mono mode</i> all channels are indicated.</p> <p>Blinking of left decimal point indicates: <b>Mute</b> active.</p> <p>Blinking numbers indicate: channel not available (at scaling factor 2 FS or 4 FS or in 56ch mode)</p>
<Number> only	<p><b>The adjusted volume level is indicated.</b></p> <p>The signal can be varied within a range of -96 dBFS to 0 dBFS in steps of 1 dB. An additional boost up to 9 dB can be applied.</p> <p>Blinking numbers indicate: <b>Mute</b> active.</p>

*The channel mode (56ch or 64ch) of the MADl signal is detected automatically and remains unchanged.*



Display content	Meaning
<b>A&lt;x&gt; (MENU)</b>	<p><b>Selected audio input for monitoring is indicated.</b></p> <p>Values: AM = Main / A1 = EC 1 / A2 = EC 2</p>
<b>E&lt;x&gt; (MENU)</b>	<p><b>Selected operating mode is indicated.</b></p> <p>Values: E0 = EC mode off / E1 = EC mode on</p>
<b>F&lt;x&gt; (MENU)</b>	<p><b>Selected input scaling factor is indicated.</b></p> <p>Values: 1 = 1 FS / 2 = 2 FS / 4 = 4 FS</p> <p><i>A 96k Frame signal will override the setting and force the scaling factor to 2 FS temporarily. The set value is restored once a 48k Frame signal is detected. Override is indicated by blinking display of 1 FS or 4 FS.</i></p>
<b>L&lt;x&gt; (MENU)</b>	<p><b>Level metering during idle mode.</b></p> <p>Values: 0 = off / 1 = on</p> <p>After a short period of time without using the encoder knob the idle mode is activated.</p> <p>The display then indicates the input level for the left and right channel individually. The three horizontal bars of the segment display mark the values -30 dBFS, -18 dBFS and -6 dBFS. At a level below -30 dBFS the display is dark. The decimal point indicates signal (LSB used); i.e. audio is present.</p>

Display content	Meaning
<b>U&lt;x&gt; (MENU)</b>	Mode and BAUD rate of USB serial Embedder/Deembedder is indicated. Values: 0 = off / 1 = 19.200 kbps / 2 = 38.400 kbps / 3 = 115.200 kbps
<b>C&lt;x&gt; (MENU)</b>	<b>Monitor mode is indicated.</b> Values: M = mono / S = stereo Monitoring of either a stereo pair or a single mono channel. Stereo => odd channels to left and even channels to right. Mono => left and right are identical. <i>This setting affects the indication of channels too (see &lt;Numbers&gt; + Decimalpoints).</i>



*Once the Embedder is switched off (0) all MADI streams are processed bittransparent. Embedded MIDI over MADI is processed bidirectional in EC Mode.*



*A scaling factor of 2 FS (4 FS) will reduce the number of channels to 32 (16) channels.*

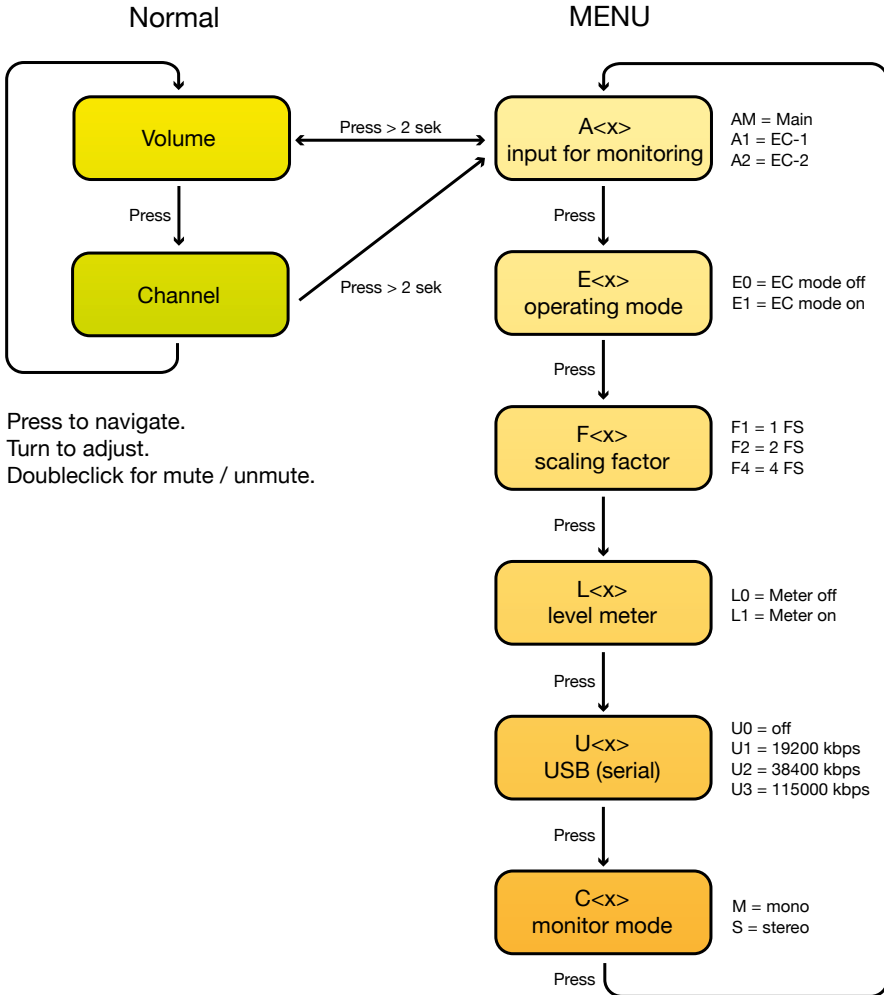


*Volume settings greater than 0 dB can cause distortions in the monitor signal for high signal levels.*

After a short period of time without using the encoder knob the **idle mode** becomes active; i.e. the menu is left automatically and the display switches back to **level metering** or **Vol/Ch** selection.

# Menu Map

## MA2CHBOX - Menu Map



## Output



### Phones

**6.3 mm TRS jack, stereo.**

Connect the headphones here for monitoring the selected channel pair.

## The Rear Panel (coaxial version)



<b>Power supply</b>	<b>C7 socket (“Euro connector”)</b> Connect the power supply here (84V - 264V).
<b>MADI OUT</b>	<b>Coaxial socket for Main output</b> Connect for MADI Main output signal here.
<b>MADI IN</b>	<b>Coaxial socket for Main input</b> Connect MADI Main input signal here.
<b>I/O 1</b>	<b>IEEE 1394a socket for EC 1 input</b> (proprietary protocol, no FireWire) Connect the RME MADiface ExpressCard here.
<b>I/O2</b>	<b>IEEE 1394a socket for EC 2 input</b> (proprietary protocol, no FireWire) Connect the RME MADiface ExpressCard here.
<b>USB (RS 232 Host)</b>	<b>USB 2.0 socket (Type B)</b> Connect here for RS 232 transmission and firmware updates.



## The Rear Panel (optical version)



<b>Power supply</b>	<b>C7 socket (“Euro connector”)</b> Connect the power supply here (84V - 264V).
<b>MADI OUT</b>	<b>Optical SC socket for Main output</b> Connect for MADI Main output signal here.
<b>MADI IN</b>	<b>Optical SC socket for Main input</b> Connect MADI Main input signal here.
<b>I/O 1</b>	<b>IEEE 1394a socket for EC 1 input</b> (proprietary protocol, no FireWire) Connect the RME MADiface ExpressCard here.
<b>I/O2</b>	<b>IEEE 1394a socket for EC 2 input</b> (proprietary protocol, no FireWire) Connect the RME MADiface ExpressCard here.
<b>USB (RS 232 Host)</b>	<b>USB 2.0 socket (Type B)</b> Connect here for RS 232 transmission and firmware updates.



*For USB control please read the guide “Installation USB control”. See: [www.directout.eu](http://www.directout.eu)*

# Chapter 4: Operating Modes

## Introduction

The MA2CHBOX provides two operating modes:

- Normal Mode
- EC Mode

In both modes the USB to serial embedder / deembedder can be activated to embed RS 232 data from the USB input. The position of the embedder / deembedder may be varied (see page 39).

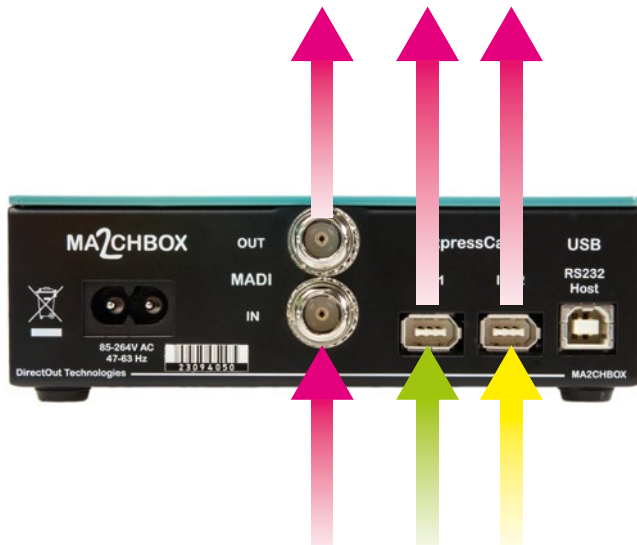
*The input signal source of the headphone output is selected in the menu and therefore independent from the operating mode.*



## Normal Mode

The input signal of the MADi input (main) is processed to all MADi outputs.

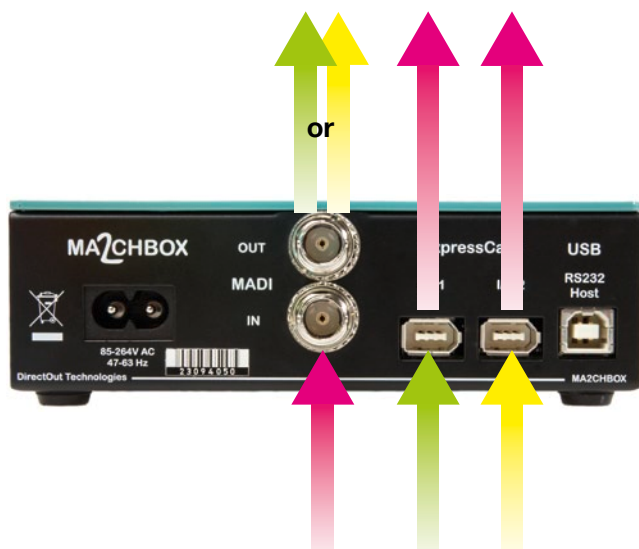
Output	gets signal from input
Main	Main + Serial data (if Embedder is active)
EC 1	Main
EC 2	Main



## EC Mode

The selected input signal (EC 1 or EC 2) is routed to the main output. The signal from the main input is still routed to the EC outputs.

Output	gets signal from input
Main	EC 1 or EC 2 EC 1 has priority
EC 1	Main
EC 2	Main

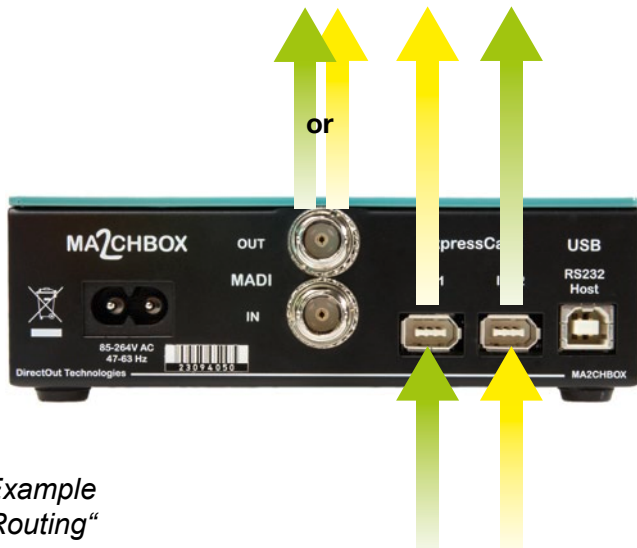


## Extended Routing

The MA2CHBOX can be used together with the interface box of the MADIface bundle.

For this application the signal routing is extended once there is **no signal present at the main input**:

Output	gets signal from input
Main	no signal (Normal Mode) or EC 1 or EC 2 (EC-Mode)
EC 1	EC 2
EC 2	EC 1



See also „Example 4: Extended Routing“ on page 44.

## Embedder / Deembedder

Serial data can be tunnelled within a MADI signal. The MA2CHBOX provides a virtual serial interface using a USB port.

Depending on the operating mode and input signal condition of the main input the position of the embedder / deembedder may vary as follows:

Mode	Input signal - main input	Embedder @ port
Normal	yes	Main
EC-Mode	yes	Main
Normal	no <sup>*)</sup>	EC 1
EC-Mode	no <sup>*)</sup>	EC 2

<sup>\*)</sup> = extended routing

The signal condition at the main input “moves” the embedder / deembedder between main port and the EC ports. The operating mode selects the used EC port.

*The order of the connected devices is significant as the sync source priority follows a fixed order: Main ⇔ EC 1 ⇔ EC 2*



# Chapter 5: Application Examples

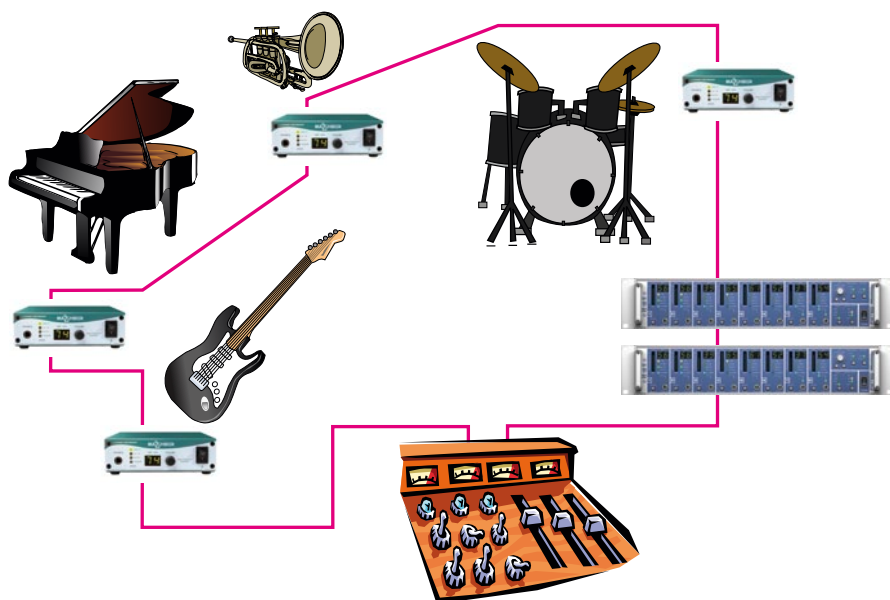
## Introduction

This chapter describes how the MA2CHBOX device can be used.



## Example 1: Monitoring

Recording and monitoring by using a MADI ring. Monitor mixes are routed to a MADI output of the console. Using the MA2CHBOX the musicians can pick their personal monitor mix out of the MADI stream. The MADI signal is daisy chained and can be used for recording and mixing in the console at the same time.

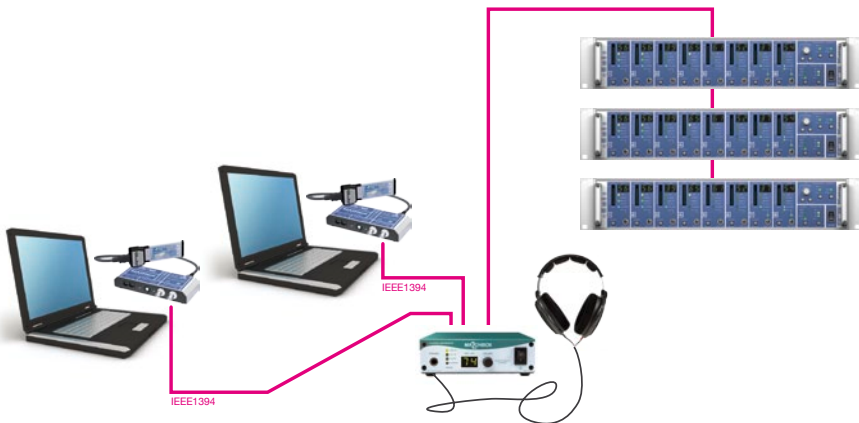


*The signal is refreshed within the MA2CHBOX thus allowing daisy chaining any number of devices.*



## Example 2: Mobile recording

The MA2CHBOX adds monitoring functionality to small mobile recording setups. While the box passes through the MADI data from stage to the recording DAWs the engineer can listen to the stage signal or the playback mix from his laptop.

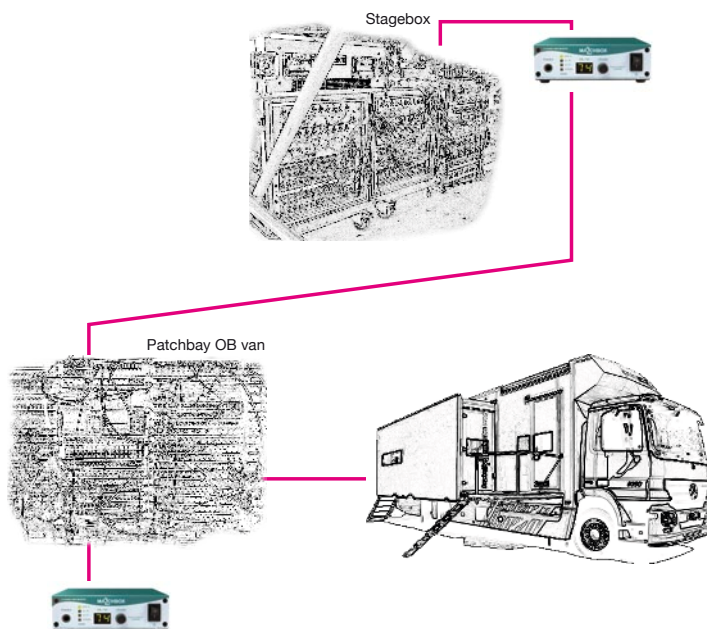


*Switching to EC mode feeds the recorded signal from the DAW to the MADI output; thus allowing playback for a virtual soundcheck.*

## Example 3: Monitor control

The signal from stage is fed through the MA2CHBOX to the OB van. The signal can be controlled on stage (e.g. for line check) and at the patch bay of the OB van (e.g. checking the patching). Signal control is possible anywhere in the MADi signal chain.

Alternatively the signal could be split on stage first - using the D.O.TEC® SPLIT.CONVERTER.



## Example 4: Extended Routing

The signal from stage (e.g. Micstasies) is connected to the optical port of the MADiface box. EC Port 1 of the MA2CHBOX is fed by the output of the MADiface box. Output EC 2 is attached to the ExpressCard in a laptop for recording. The coaxial ports of both boxes output the same signal, too (EC Mode required).

Signal conversion + 1 in 3 splitting.



**Condition for this routing is that there is *no signal present at the main input.***

# Chapter 6: Troubleshooting and Maintenance

## Troubleshooting

To identify a possible defect with the device please consult the following table. If the fault cannot be resolved using these instructions, please contact your local D.O.TEC® representative or visit [support.directout.eu](http://support.directout.eu).

Issue	Possible reason	Solution
Device doesn't work.	Power supply is broken.	Check that the power supply switch is on, that the device is connected to the power supply and that the socket is working. Defective fuses must be exchanged by qualified service personal only.
Optical port does not work.	Optic is dirty.	Use an air supply to carefully remove any dust. Never use objects for cleaning.
Output port does not transmit the desired signal.	Wrong operating mode active.	Check the operating mode (LED EC mode) and change the mode in the menu.
No signal at the output port.	Connections (input / output) are mixed up.	Check the connections and change the cables if necessary.
No signal at the output port.	Signal cable defective.	Exchange the signal cable.

Issue	Possible reason	Solution
MADI signal at the input is not stable.	Signal source is defective or bad signal condition (Jitter > 1 ns) - e.g. due to exceeded length or bad screening attenuation of signal cable.	Change the source or use appropriate cables (see „ <i>Technical Data</i> “ on page 47).
Clicks in the audiosignal.	Input source is not in sync with clock master of the box.	Check the status of input LED and check clock setting of the connected device.
Display blinking in VOL mode.	Channel is not available, due to scaling factor or 56 ch mode used.	Check the scaling factor in the menu or check the input signal.
Display is black.	No signal is present and level meter during idle mode is enabled.	Check input signal or switch off level meter (see page 27).

## Maintenance

To clean the device, use a soft, dry cloth. To protect the surface, avoid using cleaning agents.



*The device should be disconnected from the power supply during the cleaning process.*

# Technical Data

## Dimensions

- Width 140 mm
- Height 42 mm
- Depth 140 mm

## Weight

- 0,8 kg

## Power consumption

- 5 watts, standby power < 0,5 watts (efficiency level V)

## Power supply

- 84 V - 264 V AC / 47 Hz - 63 Hz / Safety class 2

## Environmental conditions

- Operating temperature +5°C up to +45°C
- Relative humidity: 10% - 80%, non condensing

## MADI Port - coaxial

- BNC connection (input/output)
- Impedance: 75  $\Omega$
- 0.3 V up to 0.6 V (peak to peak)
- Maximum Signal Jitter < 1 ns

## **MADI Port - optical**

- 1x SC socket FDDI (input/output)
- ISO/IEC 9314-3
- Wave length 1300 nm
- Multi-Mode 62.5/125 or 50/125

## **ExpressCard Ports**

- 2x IEEE 1394a connector (proprietary protocol, no FireWire)
- compatible with RME MADIface ExpressCard

## **Headphone Output**

- 6,3 mm TRS jack, stereo

## **Output Level**

- max. +12dBu
- SNR: 114dB RMS unweighted / 117dBA
- THD@0dBFS: -95dB / 600  $\Omega$

## **Serial Communication**

- RS-232 via USB (virtual COM-Port for Windows XP, Vista, 7)

## **Cable Specifications**

- coaxial cable - impedance 75  $\Omega$ , screening attenuation better than 85 dB



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## Symbole

96 kHz *see input scaling factor*

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