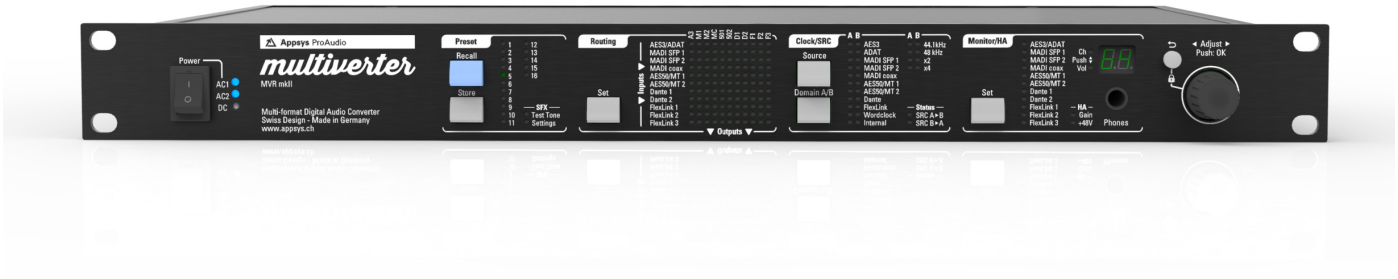
Appsys ProAudio

multiverter



Multiverter

Digital Format Converter
MVR mkII

User's Manual

(en)

Table of Contents

1. GENERAL

1.1. Conventions used in this manual

- A button on the front of the device is shown like this: **Set**
- A particular LED on the front of the device is shown like this: ☼ **WCLK**
- Text indicated on the seven-segment display is shown as 02
- Operations in a particular control method are indicated by a diamond:
  ◆ **Front panel,** ◆ **Web** or ◆ **Command line**

A section marked with a warning sign mark tells you that the information is particularly important to avoid damage or malfunction.

Filled circles with an exclamation mark indicates an action that must be performed (“Required”)

A section marked with a prohibited sign tells you that the action indicated is prohibited (“Prohibited”)

A section marked with a “information” icon indicates a useful tip.

1.2. Safety precautions

This device is intended to be used in a professional environment with restricted access only.

1.3. Foreword

Thank you for purchasing one of the most innovative digital audio converters on the market. The multiverter was designed with true vendor independence and interoperability in mind, with the idea to make all your gear interact seamlessly.

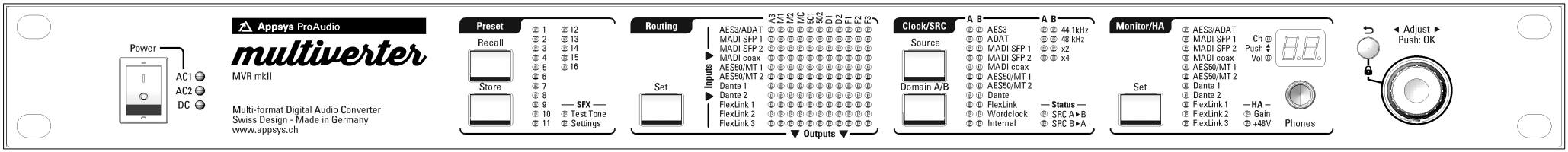
Please don't hesitate to tell us your feedback, thoughts and ideas, we try hard to make the multiverter your most valuable tool!

1.4. Box Contents

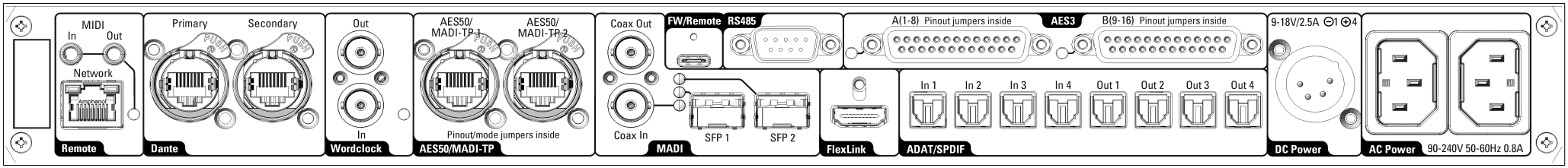
- MVR mkII multiverter device, with (1) MADI SFP installed (Multimode 1310nm)
- AC power cord (country specific)
- This manual

2. INTRODUCTION

2.1. Front view



2.2. Rear view



2.3. Overview

The multiverter is a unique device which allows you to convert digital audio data in any direction between the most popular formats. Built in are **AES3, ADAT, SPDIF, MADI SFP (optical), MADI coaxial, MADI-TP, AES50, Dante and AES67**. Other formats or additional ports can be added by connecting external breakout boxes.

All inputs can be routed channel-wise to all of the outputs, with an arbitrary number of splits and merges supported at the same time.
Channel-wise routing between different interfaces is supported via the **remote control via integrated web server** over Ethernet or USB, or via **command line.**

The routing matrix supports **704x704 channels** (11x11 interfaces with 64ch each) at single speed modes, 352x352 channels at double-speed and 176x176 channels at quad-speed modes.

Using the optional SRC-64 Samplerate Converter Module, highest quality **sample rate conversion** on 128 unidirectional or 64x64 bi-directional channels is supported.

The multiverter is also able to **remote-control Behringer and MIDAS stageboxes** over AES50, which makes it possible to use these as remote analog front-end without the need for an additional mixing console.

Troubleshooting is made simple by an integrated **headphones amplifier** and a test tone generator. Three power inlets allow operation from either AC or DC (battery pack) with full redundancy.

2.4. User interface

The device has been designed for fast and simple operation, with a no-frills everything-at-a glance concept. The unit can be operated either

- ◆ **directly on the front panel** for routing in 64ch blocks
- ◆ **via the integrated web server** for channel-wise routing (over Ethernet or USB)
- ◆ **via command line** (telnet or USB-serial terminal)
- ◆ **via MIDI** (Preset recall only)

In this manual, the required steps for each operation mode are indicated by ◆ **Front panel,** ◆ **Web** and ◆ **Command line** headers.

All operation modes can be used simultaneously, and any status change is immediately reflected on all interfaces. For example, it's possible to make some routing connections on the front panel, and later change them via the web interface or the command line.

◆ Front panel

Most settings are directly accessible without the need to walk through lengthy menus:

- To change a setting, first push the appropriate rectangular button (e.g. **Set**). This enters “Menu” mode, indicated by a yellow blinking cursor.
- Move the cursor by turning the encoder (rotary knob) left or right to move it to the desired setting.
- When the cursor is at the beginning or end of the column or line, continue turning to make it wrap around.
- Push the encoder knob (or push the appropriate menu button again) to confirm your changes. To return to the previous state without making any changes, push the **Back** button.

When the device is normal operation (i.e. not within a menu), turning the encoder knob changes “Volume” or “Channel” of the monitor headphones, while pushing the encoder toggles between “Volume” and “Channel” mode.

Note: Channel-wise routing is **not** available from the front panel due to the lack of controls.

◆ Web

The multiverter can be remotely operated from any browser. This is completely self-contained, platform independent and does not need any additional software.

Web control is the recommended method because it offers channel-wise routing and provides the most convenient graphical interface.

- You can run up to four sessions at the same time (i.e. have the page open on four different computers). Any change or status update will propagate within a few seconds to all connected devices.
- Web control has been carefully designed to transfer data only when a change occurred (and even then only a few bytes) so it generates virtually no additional load on the Dante network.

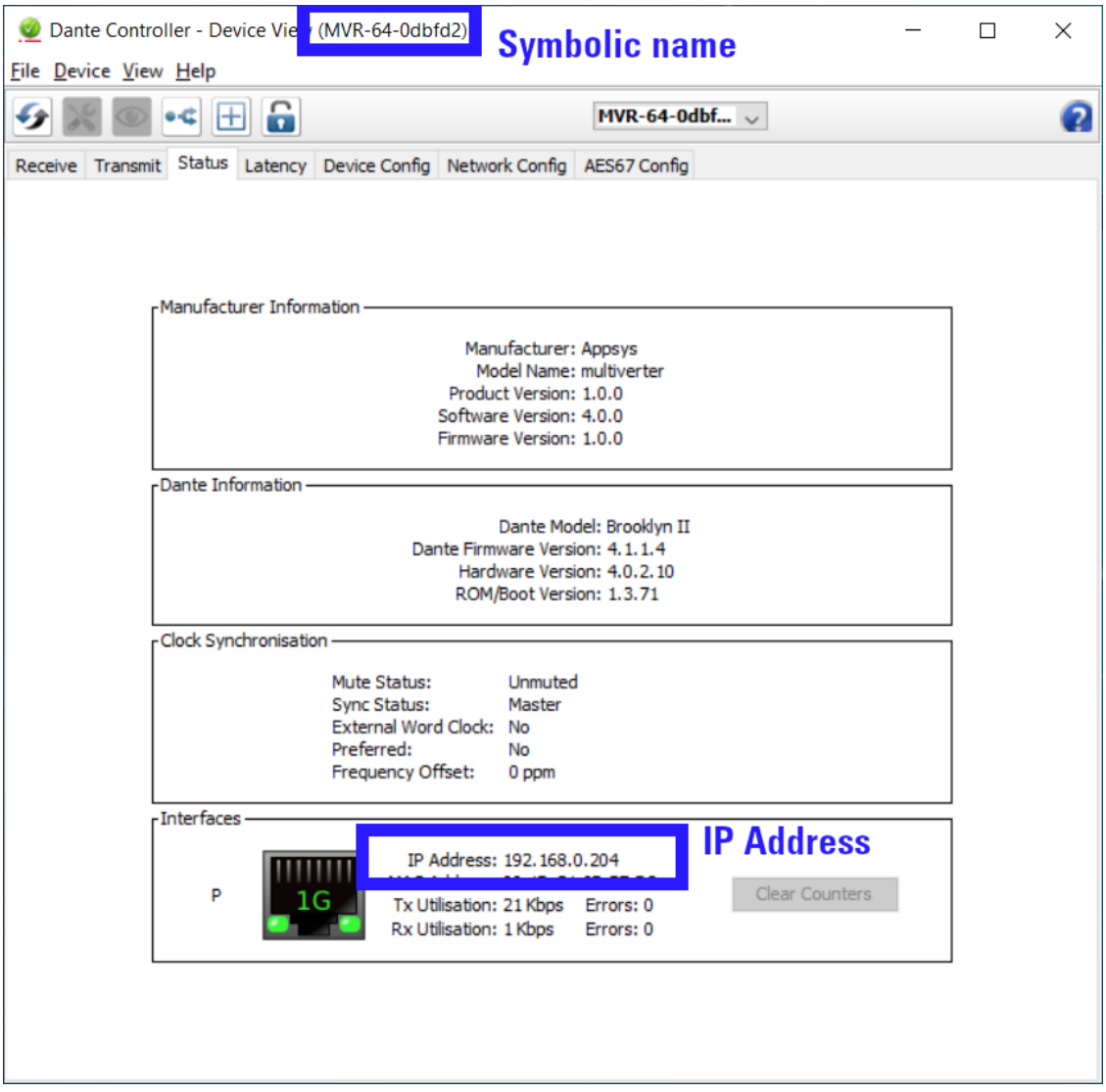
There are two methods for accessing the web server:

◆ Web via Dante network

This uses the web server running on the built-in Dante module, and can be accessed on the **same IP address** as the Dante module[1] or its **host name**. You can find both out using the Dante controller, see below.

- To access the multiverter using its host name, go to
  `http://MVR-xxxxxx.local`
  e.g. `http://MVR-0b21f9a.local`

- To access the multiverter using its IP address, go to
  `http://xxx.xxx.xxx.xxx`
  e.g. `http://192.168.0.204`



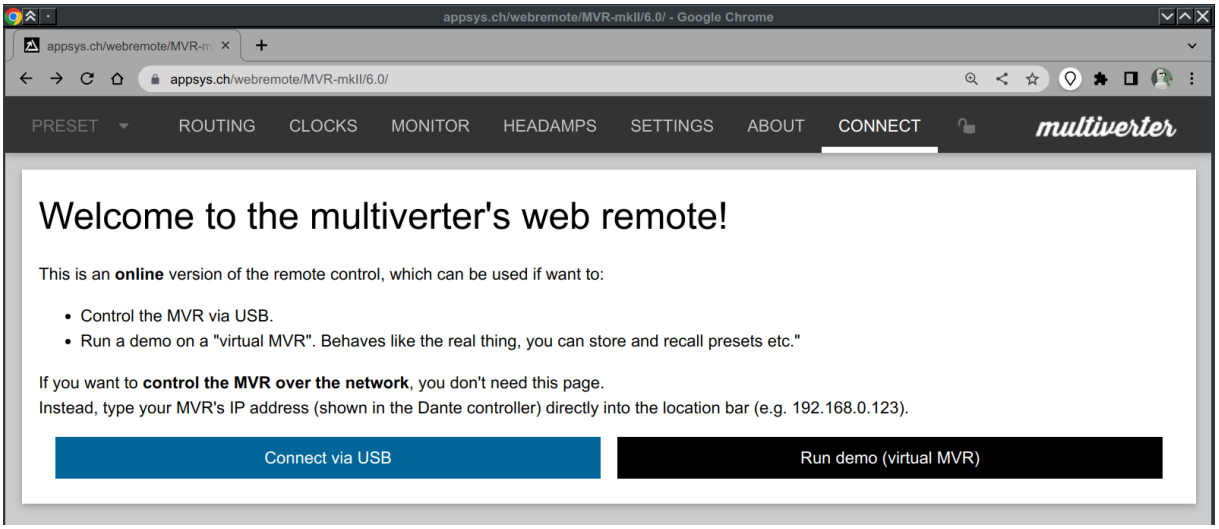
1 Remote control can also be configured run on a different network than audio.
See 10.8 Remote control on a Network separate from Dante Audio

◆ Web control via USB

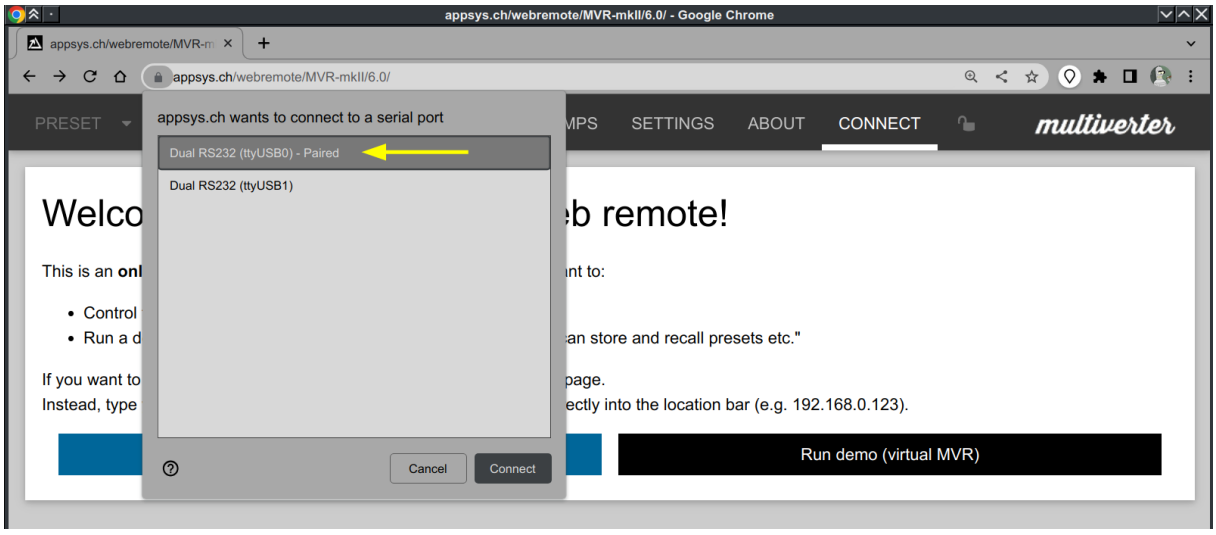
This works **ONLY** with **Chrome, Edge and Opera**.
Firefox, Safari and others do not support the required "Web Serial API".

- Connect the multiverter's USB port to your PC.
- Go to
  http://appsys.ch/webremote/MVR-mkII/6.0

  Note: your firmware version might be different than 6.0 so make sure you're using the right link.
- Click "Connect via USB", select the first port in the list and click OK:



- Select the first port in the list, then click "Connect":



◆ Command line

Command line control is available via standard telnet, and also on USB UART (COM port). It provides access to all multiverter functions and routings, and is perfectly suited for automated tasks or in headless operation.

- The telnet server listens on the Dante network, on port 2300. Use a telnet client to connect to it:

  `telnet MVR-xxxxxx.local 2300`

  Alternatively, you may use the IP address of the Dante module, either on the audio network on a separate control network (see Web Control).

- When connected via USB, the multiverter shows up as COM port. Communication can be done with a standard serial terminal (i.e. PuTTY or minicom). Communication parameters are 115200,8N1.
- To obtain a list of all commands, type **`help`** at the **`MVR>`** command prompt and press enter.
- To exit a command line session, type **`exit`** end press enter.

◆ MIDI

The only command supported via MIDI is "Preset Recall".
See 4.1. Preset Recall for details.

Besides this command, the MIDI port may be used to receive and transmit MIDI data in order to embed/de-embed it to any MADI stream. See 8. Headamp control / Control data forwarding for details.

3. CONNECTIONS OVERVIEW

This chapter gives you an overview of all connections on the back of the device. Please refer to 13. Specifications for full characteristics of each port.

3.1. AC Power

Mains AC inlet, 90-240VAC, 0.75A max.
Together with the DC power port, the inputs are fully redundant. If any of the inputs fail, the other takes immediately over. During the switch-over process, full operational state is maintained (i.e. no interruptions in the audio flow).

3.2. DC Power

Battery / DC inlet, nominal 9-18V, tolerates up to 30V.
Maximum current 2.5A, typical operating current < 1A, standby current ca. 10mA.

Use this port

- to operate independently from AC power,
  e.g. from a camera battery pack in the field
- as battery backup if the AC input(s) fail. To prevent the backup battery from draining while AC power is present, keep the DC voltage below 16 volts.

3.3. AES3

16x16 channels of balanced AES3 I/O are available, on two DB25 connectors.
All inputs and outputs are fully transformer isolated.

The pinout of the DB25 connectors can be set via internal jumper blocks (see 10.1 Pinout jumpers). The current setting is displayed on LEDs beside the ports when nothing is connected.

White: **Tascam**/Avid/Digidesign/Universal/RME
Blue: **Yamaha**/Apogee/Mackie/Lynx/SSL

The AES3 interface is shared with the ADAT/SPDIF interface (ch 1-16: AES3, ch 17-48: ADAT)

3.4. ADAT/SPDIF optical

Four optical input/output ports are available. Each input and output port can be run in different modes:

- ADAT with up to 8 channels per port
- SPDIF with up to 2 channels per port
- AES3 optical with up to 2 channels per port

For the inputs, the mode is detected automatically. For the outputs, the desired mode can be set individually via the Web UI on the SETTINGS page (see 10.3 Configuration settings).

The AES3 interface is shared with the ADAT/SPDIF interface (ch 1-16: AES3, ch 17-48: ADAT).

3.5. MADI SFP 1/2

These ports carry MADI data, according to the “optical” transmission method specified in AES10. The SFP modules use a small LC plug, when connecting to conventional non-SFP ports an LC-SC adapter cable is required.

The supplied SFP module is designed for up to 2km of multi-mode fiber (1310nm wavelength), but can easily be swapped with any other SFP to meet all possible environments. No vendor lock on the SFP is employed (Appsys policy) to provide best compatibility and user experience.

You can use **coaxial SFPs** (e.g. available from Ferrofish) to obtain more MADI BNC connections.

Control data (e.g. for preamp control) can be forwarded over these ports. See 8, Headamp control / Control data forwarding for details.

3.6. MADI BNC

This port carries MADI data according to the “coaxial” transmission method specified in AES10.

Control data (e.g. for preamp control) can be forwarded over this port. See 8, Headamp control / Control data forwarding for details.

3.7. AES50/MADI-TP 1/2

These ports can be configured to act either as AES50 or MADI-TP port. The desired operating mode can be configured by software, and the connector pinout can be jumpered internally (see 10.1 Pinout jumpers)

The pinout of the AES50/MADI-TP connectors can be set via internal jumper blocks. The current setting is displayed on the ports when nothing is connected.

White: AES50
Blue: MADI-TP according to AES-X-213

◆ **AES50 mode:**

Behringer/MIDAS SuperMAC™ compatible, supports 48ch@ 48kHz or 24ch@96kHz per port. AUX data for preamp control is supported for forwarding or generation (see 8. Headamp control / Control data forwarding)

The LEDs indicate the current status:

- Yellow: Link detected
- Green: Input data valid and system clock valid

◆ **MADI-TP mode:**

MADI data, according to the "MADI over Twisted Pair cabling" method specified in the draft standard AES-X-213. **Note: this is currently only implemented in RME™ and Optocore™ devices.**

To interface to the **DiGiCo or Soundcraft/Studer/Harman** variants of MADI-TP, an external MTA-64 adapter is required. See 14.1 MTA-64 Adapter for MADI-TP.

The LEDs indicates the current status:

- Yellow: Link detected
- Green: Input data valid and system clock valid

Control data (e.g. for preamp control) can be forwarded over this port (see 8, Headamp control / Control data forwarding for details).

3.8. Dante

The Dante interface supports up to 64x64ch@48k, 32x32ch@96k and 16x16ch@192k. This is currently[2] a limitation of the Brooklyn III module.

The Dante interface can be configured using the Dante Controller software, available from Audinate.

The multiverter is prepared for up to 128ch@48k / 64x64ch @96k on Dante, indicated by a second 64ch-block **Dante 2.**

Dante 2 is currently disabled and will be enabled later when a Brooklyn III firmware supporting extra channels becomes available from Audinate.

The “Primary” and “Secondary” ports are standard gigabit Ethernet ports, designed to connect to Dante Digital Audio Network. AES67 mode is alternative to Dante mode and can be set in the Dante Controller Software.

The port LEDs on "Primary" and "Secondary" indicates the current status:

- Yellow blinking: data transfer active
- Green: 1Gbit/s connection, off: 100MBit/s

By default, the ports are configured to act as switch (which allows daisy chaining), but can be changed using the Dante Controller Software as redundant ports for parallel connection.

3.9. FlexLink

This port is designed to connect break-out boxes to support other, non-built-in protocols and standards (e.g. AVB), or to connect additional ports for system extension. The FlexLink port supports three bi-directional lanes with 64channels each (total 192x192ch@48k) and is also able to supply power to the extension boxes.

Currently supported (as of 2023-07):

Product	Purpose
FLX-AES3	External break-out box with 16x16ch of AES3. Can additionally be equipped with an AUX card for more protocols or channels.

2 As of 2023-07

FLX-AES50	External break-out box with two AES50 ports (total 96ch@48k). Can additionally be equipped with an AUX card for more protocols or channels.
FLX-DANTE	External break-out box with two DANTE ports (total 64ch@48k). Can additionally be equipped with an AUX card for more protocols or channels.
FLX-MADI	External break-out box with one MADI SFP port and one MADI coaxial port (total 128ch@48k). Can additionally be equipped with an AUX card for more protocols or channels.
MTA-64	Adapter for DiGiCo/Soundcraft/Studer/Harman MADI-TP variant Note: The MTA-64 uses the Extension port only for power, not for audio. The port is fed through on the MTA-64 and remains available for other extension boxes.

Two multiverters can be connected together via the extension port with super-low-latency, high-bandwidth when a larger number of different ports is required.

Note: Although this port makes use of a standard HDMI connector, it is NOT compatible with HDMI devices. **Don't connect HDMI equipment!** The HDMI connector was chosen because cables are ubiquitous and can easily be replaced.

3.10. Wordclock

The **input** accepts a square wave signal in the frequency of the sample rate. x2 and x4 modes are automatically detected when the square wave has x2/x4 frequency, and can be manually set when the square wave has x1 frequency.
A 75 ohms termination resistor can electronically switched (OFF by default).

The **output** is a square wave signal (50% duty cycle) and is able to drive up to two 75 ohm resistors in parallel. Its frequency is either identical to the sample rate or always x1 (see 10.3 Configuration settings).

3.11. Network

The "Network" control port is a 100MBit/s network port designed for remote control. It is internally connected to the Dante module and accessible under the same IP address.

The LEDs indicate the current status:

- Yellow blinking: data transfer active
- Green: 100MBit/s connection, off: 10MBit/s

3.12. MIDI

The only command supported via the MIDI port is "Preset Recall".
See 4.1 Preset Recall.

The LED near the port flashes when incoming MIDI data is detected. **All incoming data is forwarded to the MIDI OUT port**, to allow daisy-chaining of devices.

Control data (e.g. for preamp control) can be forwarded over this port. See 8, Headamp control / Control data forwarding for details.

3.13. USB

The USB port is used for

- Firmware update
- Remote control via Web browser. See Web control via USB on page 10.
- Remote control via command line (serial terminal, 115200, 8N1)
  See Command line on page 11 for details.

The USB port does NOT carry audio data!

To interface the audio system of the multiverter to a computer, connect is using Ethernet to the Dante port and use the Dante Virtual Soundcard software.

3.14. RS485

The RS485 port can be used to tunnel RS485/RS422 over MADI, in a method compatible to DirectOut™ boxes.

4. PRESETS

All settings can be individually stored in one of the 16 preset locations, and may be recalled at any time later. The settings are stored in non-volatile memory and are retained for years even if the device is switched off or the power cable is unplugged. Additionally, the settings can be downloaded via the Web UI, and restored on the same or a different device.

4.1. Preset Recall

◆ Front panel

To recall a preset:

- Push the **Recall** button from the “Preset” menu.
- Select the desired storage location ☼ **1** to ☼ **16** by turning the encoder left or right.
- Note: The items “Test tone” and “Settings” are also accessed through the preset menu and have special purposes. See 10. Advanced Topics.
- Confirm the selected location by pushing the encoder, or push the ⮌ **Back** button to cancel the operation.

◆ Web

From the "PRESET ▼" menu, choose the desired preset number. An asterisk next to the number indicates that modifications to the recalled preset have been done. To save the modifications, choose "PRESET / Store".
Note: You can also upload presets from a file to the MVR. This is useful when transferring setups between different multiverters.

◆ Command line

```
preset recall <num>
```

◆ MIDI

Preset recall is done via "Program Change" messages
(program 00 = Preset 1 ... program 15 = Preset 16).

The MIDI channel is set to 1 by default but can be altered using function "07".
(Note: The channel is a per-preset setting, if you need to change it you will need to do so in all 16 presets).

4.2. Preset Store

◆ Front panel

To store a preset:

- Push the **Store** button in the “Preset” menu.
- Select the desired storage location ☼ **1** to ☼ **16** by turning the encoder left or right.
- Confirm the selected location by pushing the encoder, or push the ⮌ **Back** button to cancel the operation.

◆ Web

Select "PRESET ▼ / Store" menu to store the preset as current preset number, or select "PRESET ▼ / Store as..." to choose a different number.

Note: You can also download presets to a file. This is useful when transferring setups between different multiverters.

◆ Command line

`preset store [<num>]`

4.3. Changed presets

◆ Front panel

When a preset is recalled, the corresponding location ☼ **1** to ☼ **16** is lit **green**. If any setting is changed afterwards (except for headphones level), the LED turns **red** to indicate that the current setting differs from the recalled preset. If you want your changes to be reflected also in the stored preset, just store the preset again. Otherwise, the changes are overwritten the next time a preset is recalled.

◆ Web

A changed preset is indicated by an asterisk (*) next to the preset number.
Use "PRESET ▼ / Store" to permanently store changes into that preset.

◆ Command line

A changed preset is indicated by "modified: true"
The current preset can be queried by calling **`preset`** without parameters.

4.4. Auto-Store

In addition to the presets stored in locations 1-16, the multiverter remembers **always** the current setting, even when power cycled or left unpowered for a long time. This means that you can always reset the multiverter and have the settings fully restored by switching it off and on.

5. ROUTING

The front panel allows only interface-wise routing (blocks of 64 channels). To use channel-wise routing (merging of different input streams), use either the **web interface** or the **command line**.

◆ Front panel

The routing matrix indicates the interfaces between conversions are currently active.

- A **green** LED means that a conversion is currently in progress
- A **red** LED means that a conversion is set but inactive because the input or clock signals are missing
- A **white** LED means that a connection is currently in progress, and that sample rate conversion is applied between input and output[3]

Routing is easy if you think this way:
"*I want this input mapped to this output*"

To make or break a connection in the Routing Matrix:

- Push the **Set** button in the "Routing" menu
- A yellow blinking cursor indicates the current position within the matrix. Move it by turning the encoder to the desired point where you want to make or break a connection.
- At the beginning or end of the line, continue to turn to the right to make the cursor wrap around to the previous or next line.
- Push the encoder or press the **Set** button to make/break a connection. When the cursor blinks yellow/red or yellow/green, the connection has been made; when the cursor blinks yellow/dark, the connection was broken.
- To exit the routing matrix, push the **Back** button.

3 Requires SRC converter module installed.

Web (Matrix)

The Matrix allows fine-grained routing control in different levels (whole interfaces, channel groups or single channels). Routes can be entered via either *Matrix* or *List* view (both can be used interchangeably, and routings established in one view show immediately up also in the other):

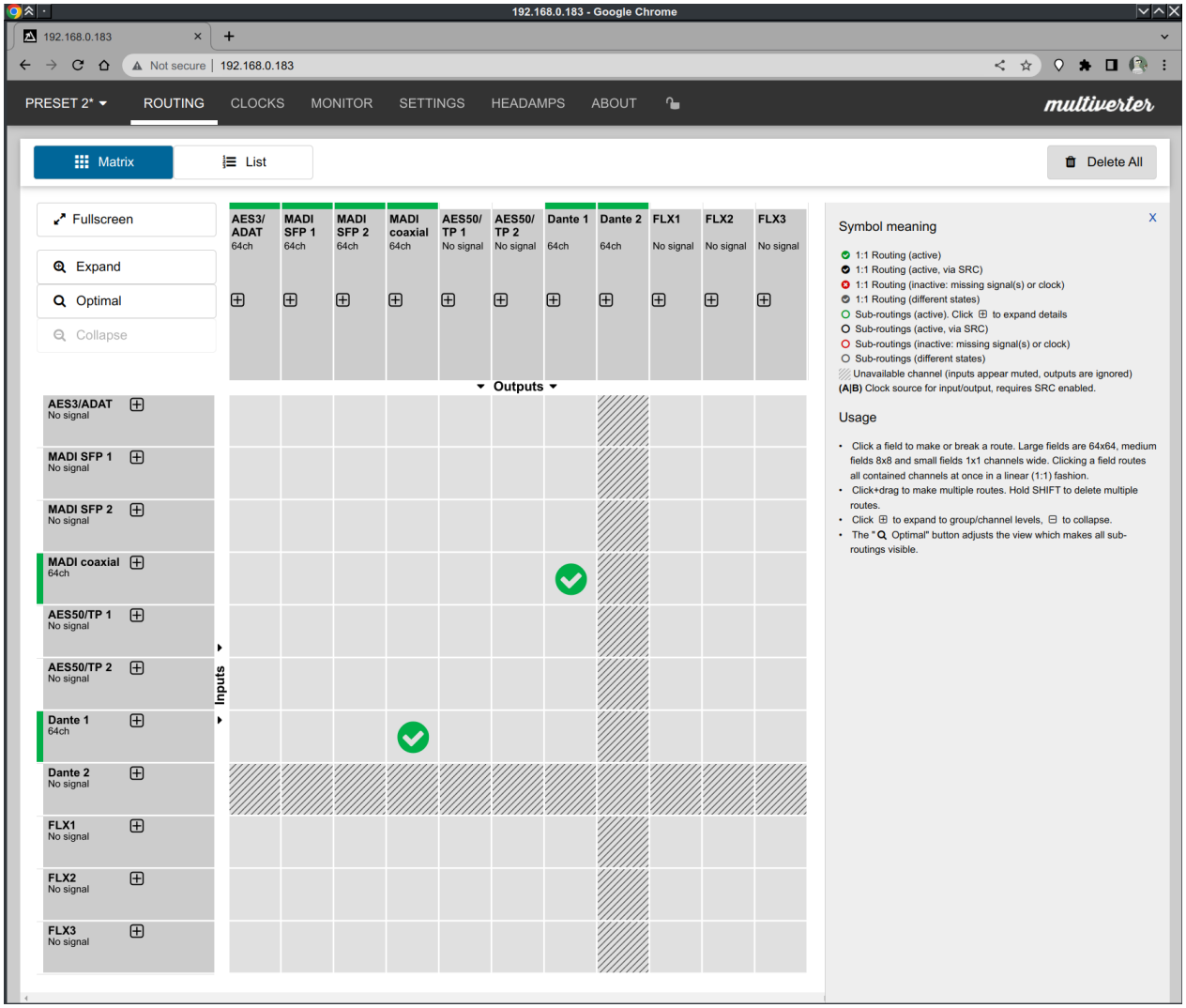


Figure 1: Everything at a glance.
The arrangement is the same as on the front panel.

- Click anywhere in the matrix to make or break a connection. Multiple connections can be made by click-and-drag, broken by holding SHIFT.
- Current status of a connection is indicated by the large colored icon on the connection; current status of each input / output is indicated smaller on the header.
- To clear all routings, click "Delete All".

The matrix can be expanded to group- and channel-wise views via + and - buttons on rows (inputs), columns (outputs) or intersections (connections).

- The "Expand" and "Collapse" buttons zoom the entire matrix. Use the "Optimal" button to expand to all sub-routings.

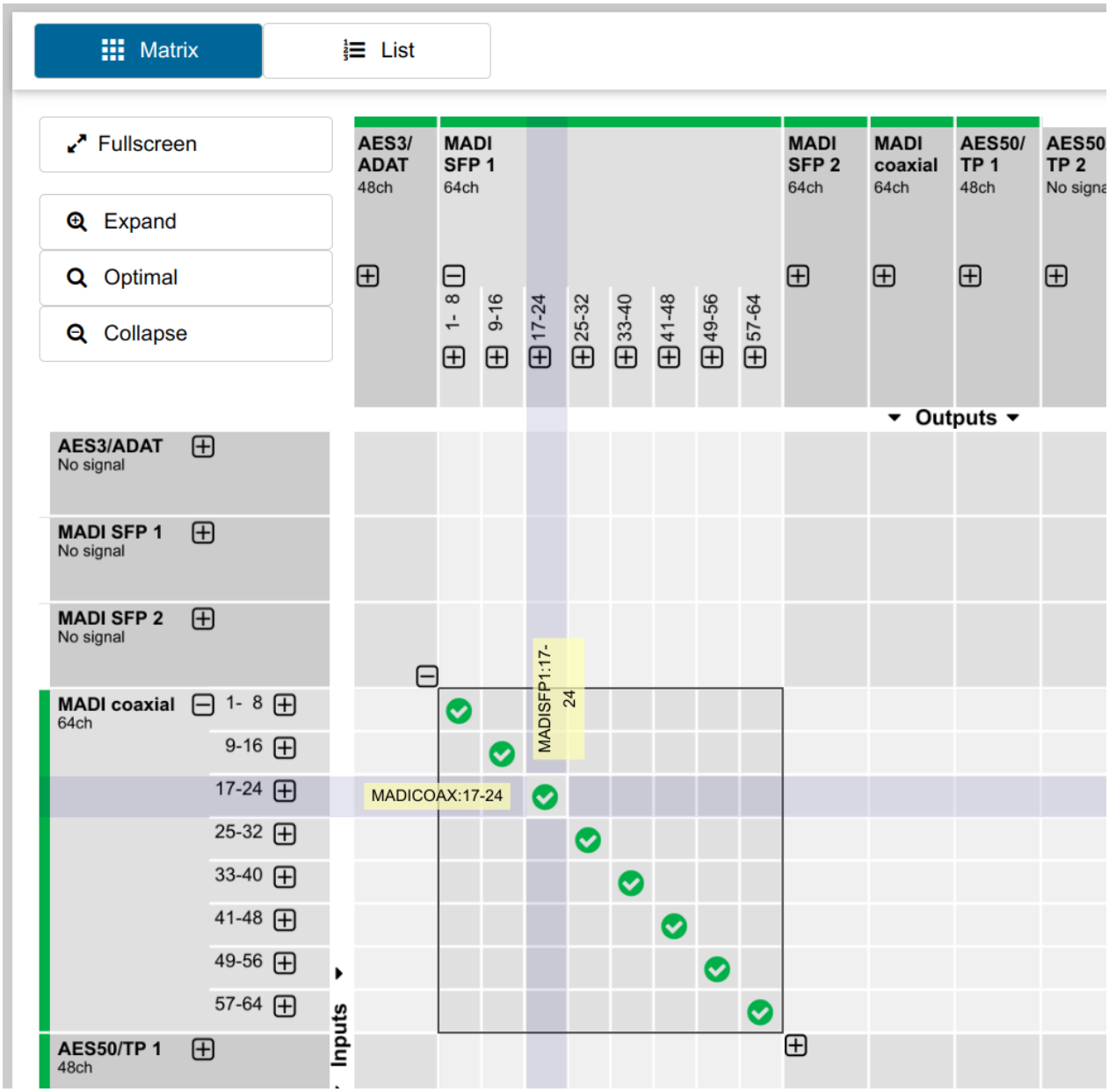


Figure 2: Matrix expanded to 8x8 channel blocks

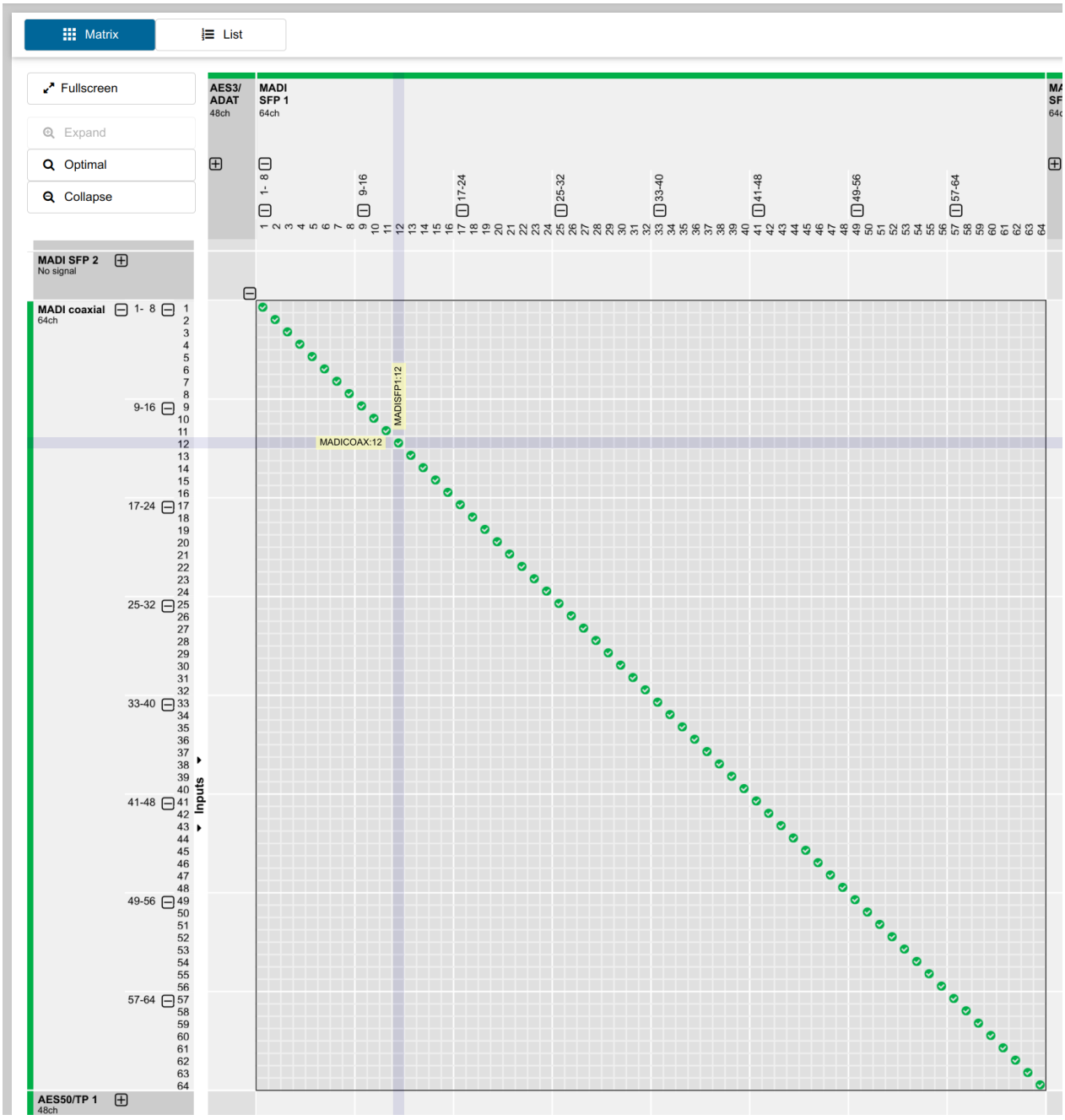


Figure 3: Matrix expanded to 64x64ch single-channel routing

Web (List view)

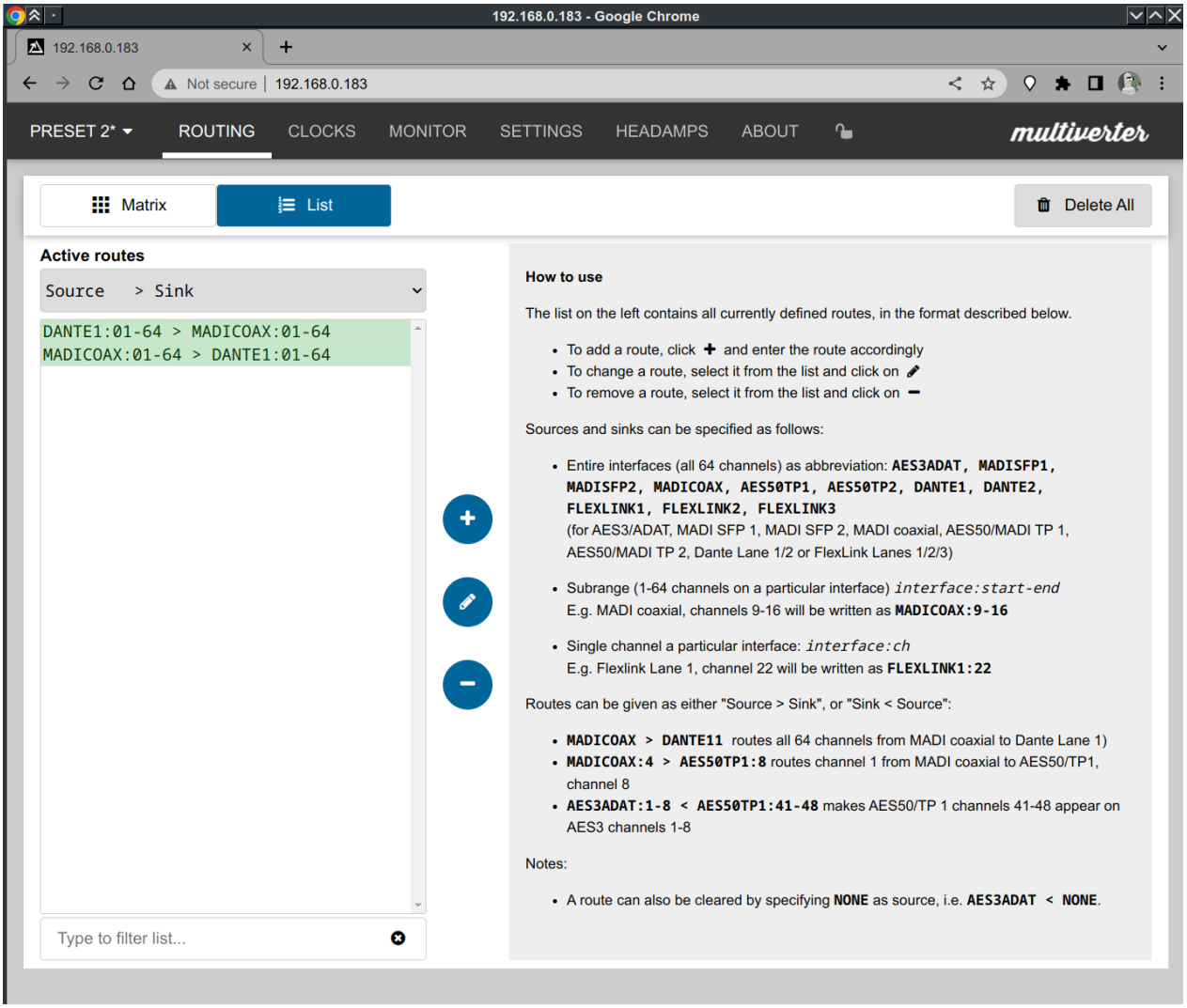


Figure 4: List view: quick way to specify complex routings

- Each routing can be entered as text line, in the form "**Source > Sink**" or alternatively "**Sink < Source**" (both produce identical results).
- "Sink" and "Source" can be entire interfaces, channel ranges or single channels. Entire interfaces are be specified as symbolic names (i.e. "**MADIOPTO**" for MADI optical)
- Channel ranges can be specified by appending a colon, followed by the start and end channels.. For example, Dante 1 channel 9 to 16 would read "**DANTE1:9-16**"
- Single channels are specified by appending a single the channel number to an interface, separated by a colon. For example, AES50 Port 1 channel 24 would read "**AES50TP1:24**"

- Example 1: to route all channels from AES50 Port 1 to MADI coaxial, enter "**AES50TP1 > MADICOAX**" (or alternatively, "**MADICOAX < AES50TP1**")
- Example 2: to route channels Dante 56-64 to AES3/ADAT channels 1-8, enter "**DANTE1:56-64 > AES3ADAT:1-8"** (or alternatively, "**AES3ADAT:1-8 < DANTE1:56-64**")
- Example 3: to route MADI SFP 2 channel 2 to FlexLink Lane 1, channel 1 "**MADISFP2:2 > FLEXLINK1:1**" (or alternatively, "**FLEXLINK1:1 < MADISFP2:2**")

◆ **Command line**

route [<destination> [<source>]]

with **<destination>** and **<source>** indicating channel ranges as described in the "List view" section above.

- If **<source>** is omitted, the current source for **<destination>** is printed.
- If both **<destination>** and **<source>** are omitted, all current routings are printed.

6. CLOCKING

All components within a digital audio system must reference to the same master clock to ensure that they run synchronously. The multiverter can use any of the incoming interfaces as clock source, or alternatively it can act as clock master using its internal, high-quality clock synthesizer.

If a common clock is not possible (e.g. when incoming data has a different sample rate), the optional **SRC module** can be used to sample rate convert audio data between different clock domains.

See the SRC-64 manual for details.

6.1. ClockShield

The multiverter's unique **ClockShield** feature allows the device to run up to one second (!) without a master clock signal. This makes the multiverter very robust against disturbances, glitches and dropouts in the clocking system.

How it works:

- When the clock signal is lost, the multiverter's clock continues to run for up to one second, at the frequency which it has been locked to when the clock was valid. During that period, audio processing continues as before.

- When the clock signal is re-applied, re-synchronization takes place to ensure perfect bit-wise alignment of data and clock. To avoid pops and clicks, all audio signals are soft-muted before the re-sync happens, and are soft unmuted directly after re-sync. The whole process takes only a few milliseconds and produces only minimal artifacts, often not even audible.

ClockShield is supported on all interfaces, but works best when the multiverter is clocked from the BNC wordclock input.

6.2. Clock source selection

Without sample rate conversion, interfaces in the multiverter must run at the same clock (i.e. share the same master clock). This clock is called "**Clock A**".

With the optional SRC-64 Samplerate Converter Module installed, interfaces can be set to run at an alternative clock "**Clock B**". **Whenever a translation between clock domains A and B is needed, audio is automatically sample-rate converted** by routing it through the SRC module. This process happens transparently in the background.

◆ Front panel

To set the clock sources for **Clock A** and optionally[4] **Clock B:**

- In the "Clock/SRC" menu, push the **Source** button.
- Move the cursor to the desired clock source under the respective "A" or "B" column.
- Push the encoder or press the **Source** button to select the clock source, or press **Back** to cancel.
- Depending on the selection, you will be asked to provide additional information:
- When the clock source is set to internal **INT**, you will be asked for the sample frequency where the internal clock should run at. Choose **44.1 kHz** / **48 kHz** and optionally **x2** / **x4**, or press **Back** to return to the clock source selection.
- When any MADI is chosen you need to set whether the multiverter should run in x1 (44.1/48kHz), in x2 (88.2/96kHz) or in x4 (176.4/192kHz). Choose the desired mode and push the encoder to confirm, or press return to the clock source selection.

  Note: When the clock source is set to MADI, the multiverter will always run in x2 mode when 96k frames are received.

To **assign** which **inputs and outputs** should **use Clock B:**

- In the "Clock/SRC" menu, push the **Domain A/B** button.
- Move the blinking bar to the desired input (horizontal) or output (vertical) and push the encoder to set "Clock B" for the selection; indicated by a white bar and SRC Status LEDs "A > B"/"B > A" lighting up in white.
- Repeat above step until all your assignments have been done. Then press **Back** to exit the menu.

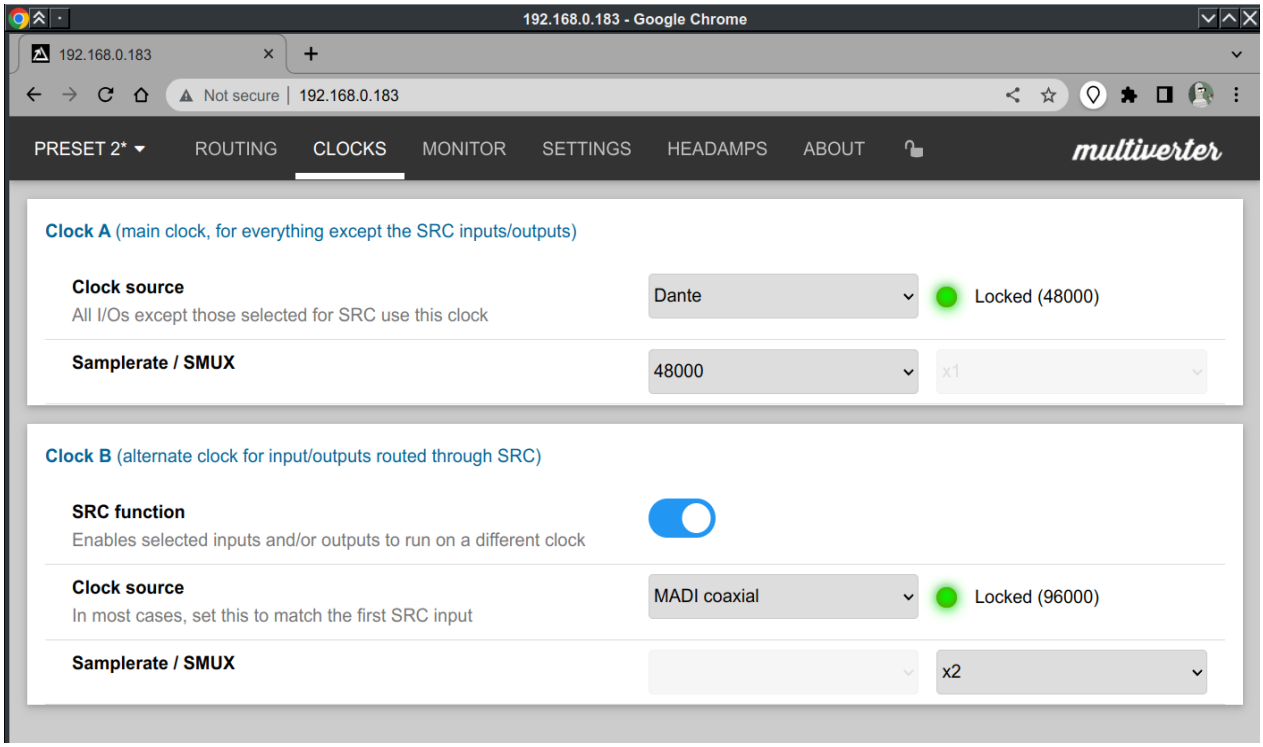
4 SRC module required

Only AES3, ADAT, and MADI support different sample rates for input and output. For these interfaces, you can choose clock domains for input and output independently.

For AES50, Dante and FlexLink, the input and output clock domains are coupled together.

Web

The settings for the clock sources can be found under the "CLOCKS" tab:



When the SRC module is installed and enabled, its behavior can be selected in the SRC section on the bottom. The settings above show a typical configuration for converting MADI 96k to Dante 48k.

The assignment of clock sources (A or B) to the respective inputs and outputs are done in the matrix view using the A/B switches:

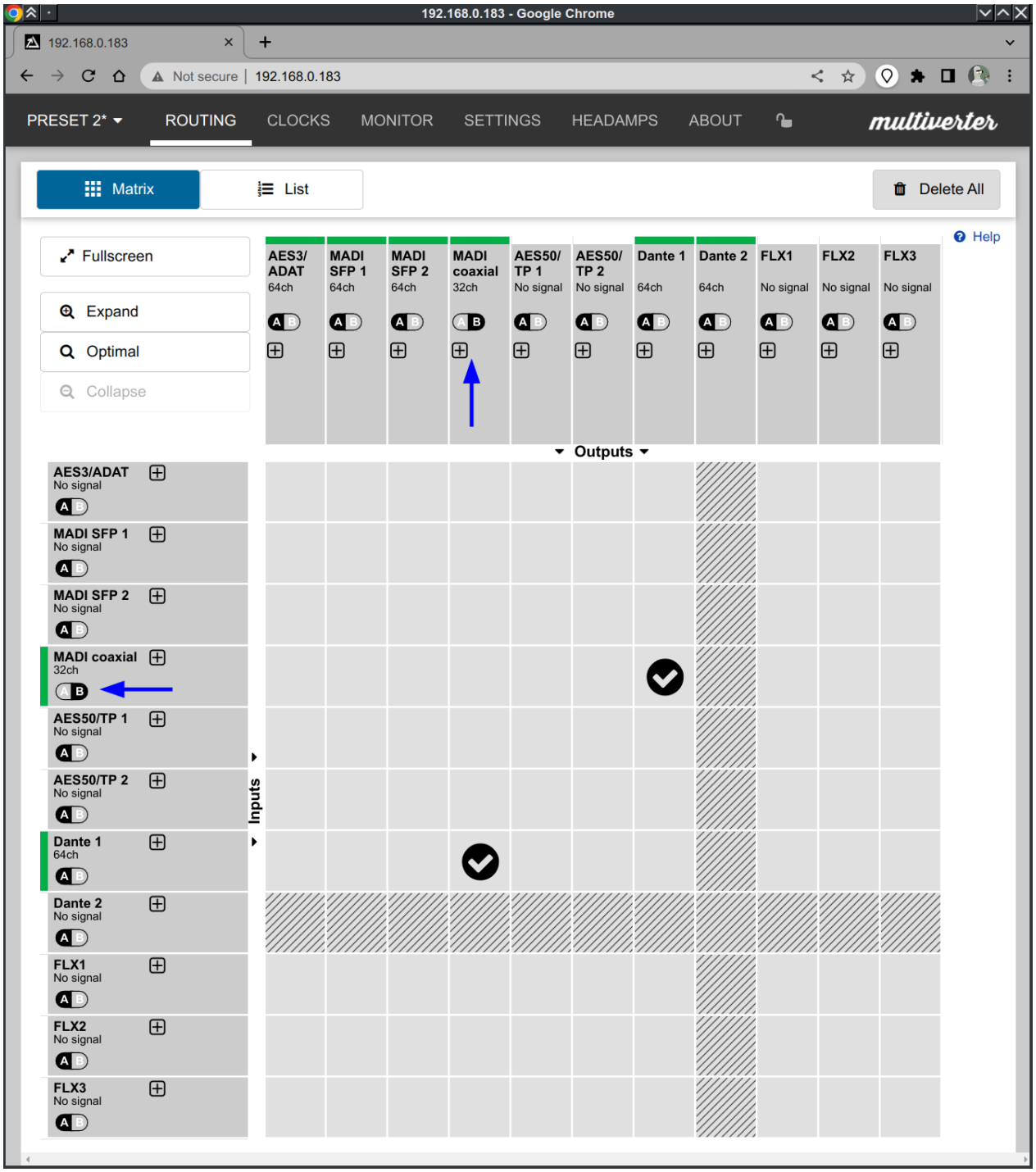


Figure 5: Typical routings for MADI 96k <> Dante 48k. Note that the clock source for MADI coaxial inputs and outputs set to clock "B". The black check marks indicate that the conversion is active with SRC involved (=white LEDs on the front panel).

◆ **Command line**

Clock source selection:

clock A|B [<source> [<srate>|<smux>]]

- Available Sources: **AES3,ADAT,MADISFP1,MADISFP2,MADICOAX,DANTE,FLEXLINK**
- Samplerate (only required for **DANTE** or **INTERNAL**): **44100,48000,88200,96000,176400,192000**
- SMUX (only required for **AES3,ADAT,MADI*,AES50TP* in TP mode,WCLK**): **1,2,4**

SRC configuration / Clock assignment:

asrc enable|disable [<in> <out>]: Configures the ASRC.

disable	Turn off ASRC
enable	Turn on ASRC, using previously set parameters or those specified below:
<in> <out>	Turn on ASRC, using previously set parameters or those specified below:Interfaces which should run on the alternate clock B. Possible Values: **AES3ADAT,MADISFP1,MADISFP2,MADICOAX, AES50TP1,AES50TP2,DANTE1,DANTE2, FLEXLINK1,FLEXLINK2,FLEXLINK3** Multiple values may be combined with comma, e.g. '**MADISFP1,MADISFP2**' If '**NONE**' is specified, the ASRC is turned off for the respective direction. If both <in> and <out> are set to '**NONE**' the ASRC is turned off. Alternatively, **<in>** and **<out>** can be specified as combined hex bit-mask, e.g. (**0x0001=AES3ADAT** ... **0x0400=FLEXLINK3**)

7. MONITOR

The “Monitor” section controls the headphone amplifier which allows you to listen to any channel received on the inputs.

◆ Front panel

Monitor control is enabled when the source and ch/vol LEDs in the "Monitor/HA" section are **blue** (or red for missing inputs). If they indicate white, you're in headamp control mode. To switch back to monitor mode, **long-press** the **Set** button (at least than 1 second)

To select a particular input to listen to:

- Press the **Set** button in the “Monitor” menu.
- Move the yellow blinking cursor to the desired interface.
- Push the encoder or press the **Set** button to select the interface, or press ⮌ **Back** to cancel.

To select a channel:

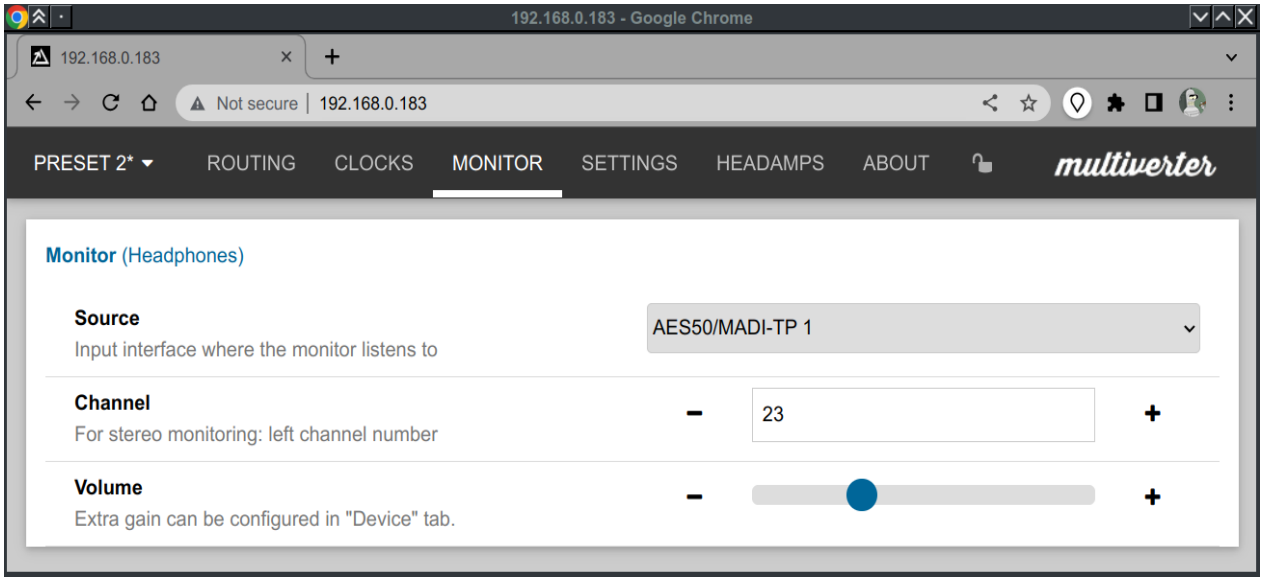
- Make sure that ☼ **Ch** is selected. If not, push the encoder once.
- Rotate the encoder left to decrease the channel, or right to increase the channel. In stereo mode, the selected channel is output on "L" whereas the subsequent channel is output on "R".

To change the volume:

- Make sure that ☼ **Vol** mode is selected. If not, push the encoder once.
- Rotate the encoder left to decrease the volume, or right to increase the volume.

You can adjust if mono (same channel on both ears) or stereo signals are output on the headphones. Also, extra gain (+6/+12/+24dB) can be added for the headphones output to ease monitoring of silent signals (but may cause clipping at larger levels).
To adjust these settings, see 9.2. Configuration settings

Web



The "MONITOR" page allows to set the source interface, channel and volume for the headphones. More settings (stereo/mono mode, gain) can be found on the "SETTINGS" page.

Command line

`monitor [<source>:<channel>]`

Sets the source interface and channel. If stereo monitoring is selected, <channel> corresponds to the "L" channel, the subsequent channel is output as "R" signal.

`volume [<vol>|+|-]`

Sets the volume of the monitor output, either as <vol> from 0-99, or "+" to increment / "-" to decrement the volume by 1.

8. HEADAMP CONTROL / CONTROL DATA FORWARDING

8.1. Control Data Forwarding

The multiverter can pass control data (e.g. for headamp control) through AES50, MADI and from and to MIDI.

- For AES50 (Behringer/MIDAS systems) the embedded control data can be transparently forwarded between both AES50 ports to enable the MVR to access to all audio data (merge/split/extract/inject) while maintaining control between console and stageboxes.
- For MADI, control data can be passed transparently through the multiverter, and can alternatively be injected/extracted through the MIDI ports (MIDI-over-MADI). Transparent forwarding includes all extra AES3 bits (V)alid, (U)ser data and (C)hannel status, which makes it compatible to all vendor-specific remoting protocols. To enable remoting via MADI, the channels containing the control data must be routed 1:1 (i.e. linearly), depending on the vendor protocol.

Vendor	**Control method**
Behringer, MIDAS	Control data is embedded into the AUX stream of the AES50 data. It is transparently forwarded between both AES50 ports, when "AES50 AUX channel" is set to "01: Forward". It is NOT required to establish any audio routings for this to work.
DiGiCo (MADI)	Control data is contained in all bits (audio+user) of channel 57. To enable forwarding between different MADI ports, • Set MADI transmit mode of the involved MADI ports to 57ch (see 10.3 Configuration settings) • Route ch 57 to ch 57 both ways
Soundcraft (MADI)	Control data is contained in the "U" bit of channels 1..10. • To enable forwarding between different MADI ports, route ch 1..10 to ch 1..10 both ways
RME, FerroFish, DirectOut (MIDI over MADI)	Control data is contained in the "U" bit of channel 56 (ch28 in 96k mode) • To enable forwarding between different MADI ports, route ch 56 to ch 56 both ways. • To enable forwarding from/to the MIDI ports on the rear to/from a particular MADI port, set "[08] MIDI forwarding" to the desired MADI port (see 10.3 Configuration settings)

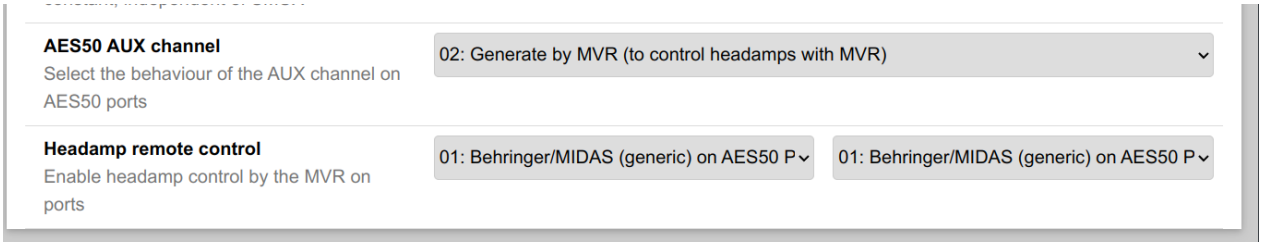
Table 1: Control data forwarding method

8.2. Headamp control

Headamps can be directly controlled by the multiverter (gain/phantom power), which means they can be used standalone (without console). At the time of writing (Firmware 6.0) this works for Behringer and MIDAS preamps via AES50. A total number of 96 headamp channels (48 on each AES50 port) can be controlled

To enable headamp control, go to the "SETTINGS" page:

- Set "AES50 AUX channel" to "02: Generate by MVR"
- Set "Headamp remote control" to the "01: Behringer/MIDAS" on the desired port(s):



◆ Front panel

To enter headamp control mode:

- In the "Monitor/HA" menu, **long-press** the **Set** button (at least than 1 second) The LEDs turn now white and the "HA" LED lights up, indicating that the controls are now in "HA" mode and can be used to control the headamps.
- Move the yellow blinking cursor to the desired interface. Push the encoder or press the **Set** button to select the interface, or press **Back** to cancel.

To select a channel:

- Make sure that **Ch** is selected. If not, push the encoder once.
- Rotate the encoder left to decrease the channel, or right to increase the channel.

To change the gain:

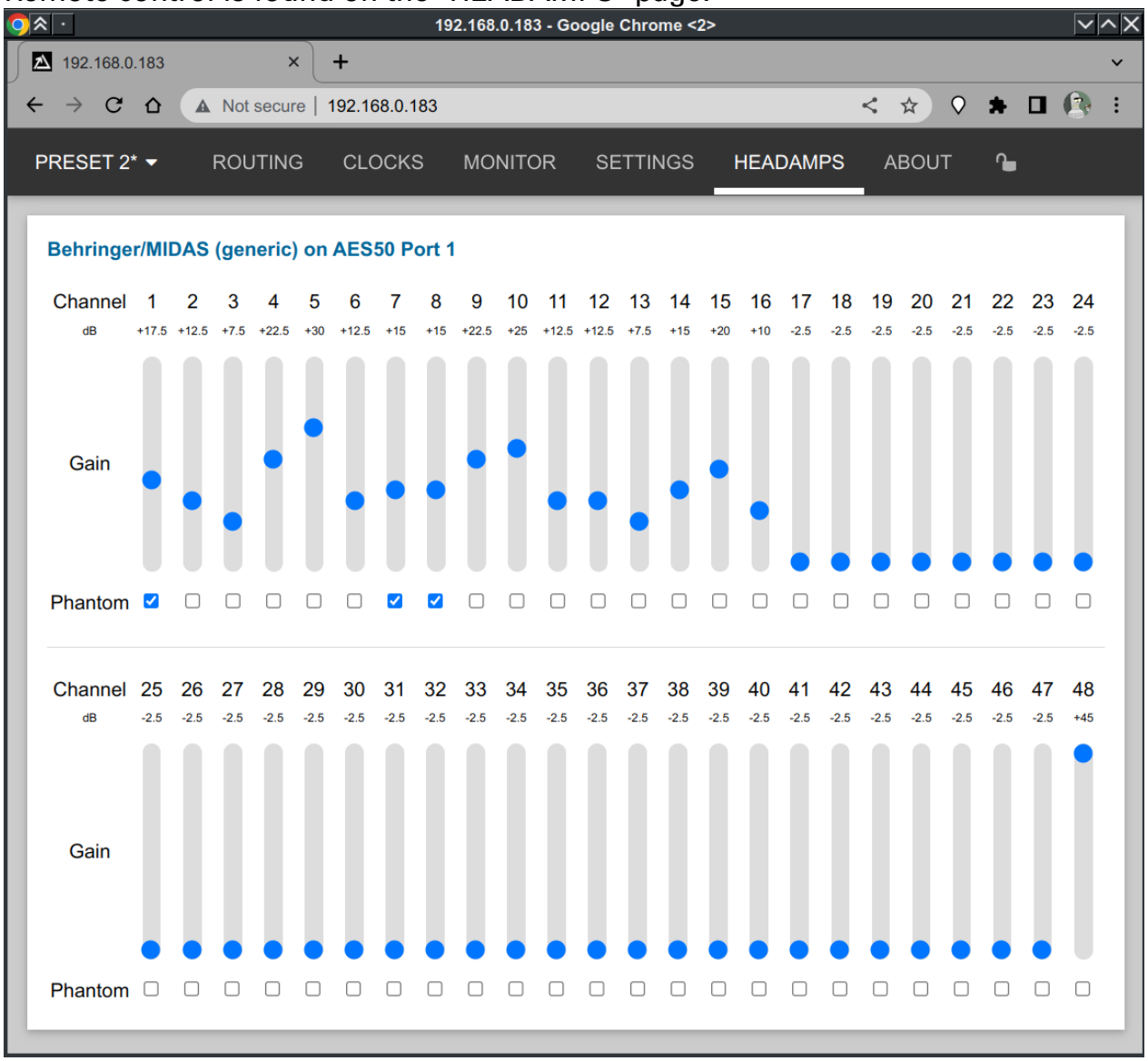
- Make sure that **Vol** mode is selected. If not, push the encoder once.
- Rotate the encoder left to decrease the gain, or right to increase it.
  NOTE: The seven-segment displays does not show dB values, but "gain steps" instead (1..20). On an S16 stagebox, they correspond to gain levels -2.5dB...+45.0 dB.

To switch phantom power:

- Make sure that **Ch** is selected. If not, push the encoder once.
- Rotate the encoder left to decrease the channel, or right to increase the channel.
- **Long-push the encoder** (at least than 1 second) to toggle phantom power. Active phantom power for the selected channel is shown by the "+48V" LED lighting red.

Web

Remote control is found on the "HEADAMPS" page:



The headamp settings (gain, phantom) are stored together with the current preset, and can be saved or recalled at any time.

Command line

`headamp <stagebox> <channel> [<gainstep>|<phantom>]`

Sets gain and/or phantom power on the selected stagebox and channel.

`<stagebox>`	Stagebox number (1 or 2)
`<channel>`	Channel number (1..64)
`<gainstep>`	Gainstep to set (1..20). The actual dB value depends on the preamp.
`<phantom>`	Phantom power, values: 'on' or 'off'

9. PANEL LOCK

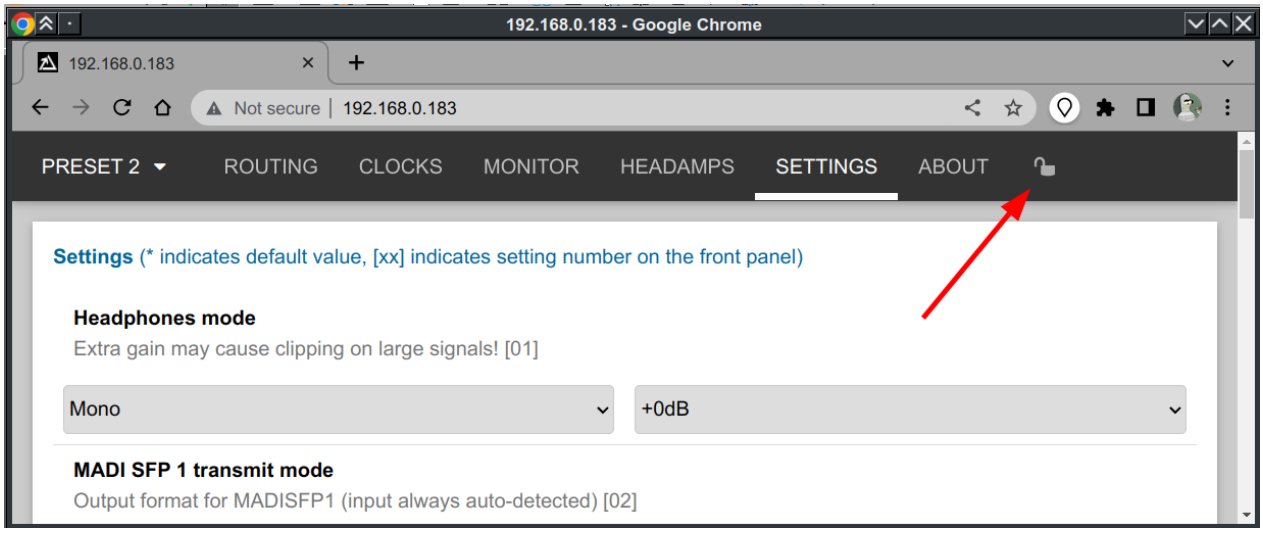
◆ Front panel

The panel lock feature can be used to disable all buttons on the front panel. This can be used to protect the multiverter against undesired or accidental parameter changes. The panel lock feature is available from firmware version 1.4 and higher.

- To lock the panel, hold down the **Back** button while pushing the encoder. The seven-segment display will blink to indicate the now locked panel. All buttons on the front panel are now disabled.
- If a button is pressed while the panel is locked, the seven-segment display will blink to indicate the locked panel.
- To unlock the panel, hold down the **Back** button while pushing the encoder.

◆ Web

The front panel can be locked/unlocked by clicking on the "Lock" icon in the title bar.



◆ Command line

- `key [l|u]`

  Lock the panel ("`key l`") or unlocks it ("`key u`")

10. ADVANCED TOPICS

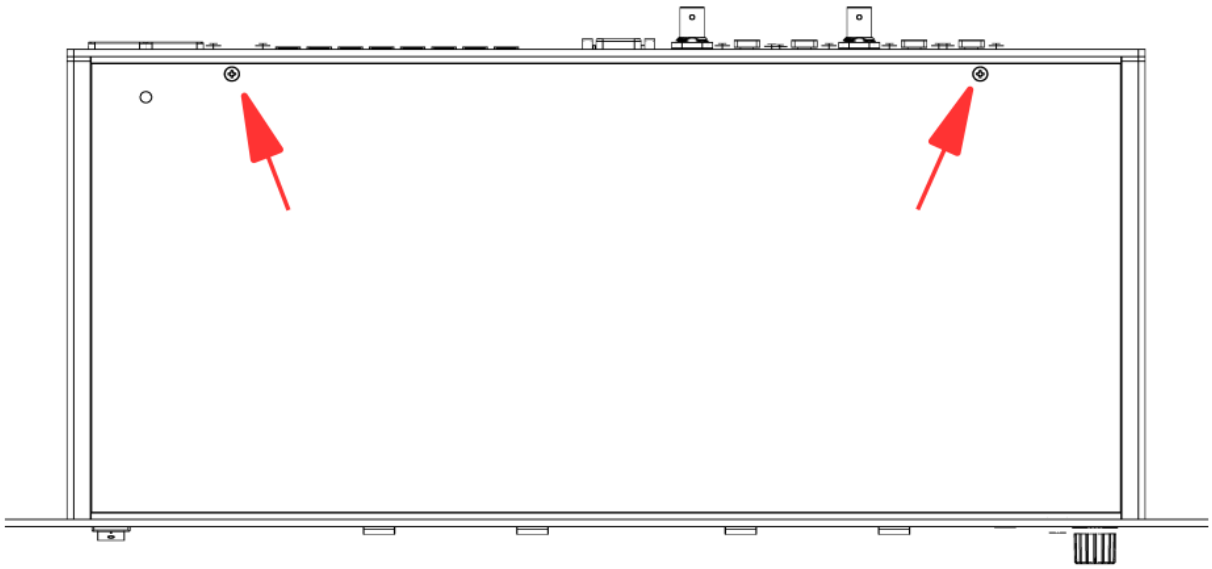
10.1. Pinout jumpers

The AES3 and AES50/TP connectors can be internally jumpered to different pinouts, to eliminate the need for adapter cables. To access these jumpers, open the device top cover.

CAUTION: To prevent electric shock, remove all mains power plugs from the multiverter before opening!

ATTENTION: Static Sensitive Device
Observe Precautions for Handling!

- Remove the two screws at the rear of the multiverter's top cover (Torx T10):



- Flip the multiverter to detach the top cover. Disconnect the cover's ground connection at the base.

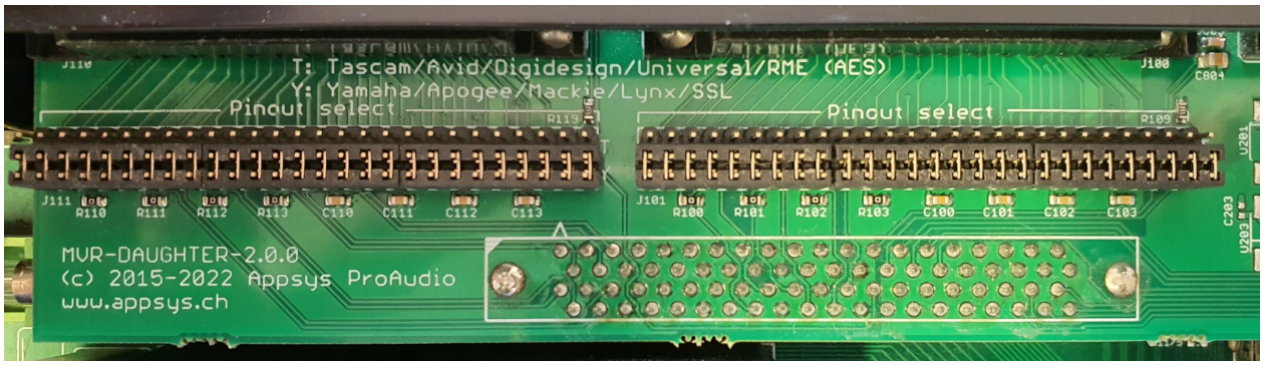


Figure 6: Pinout select jumpers for AES ports

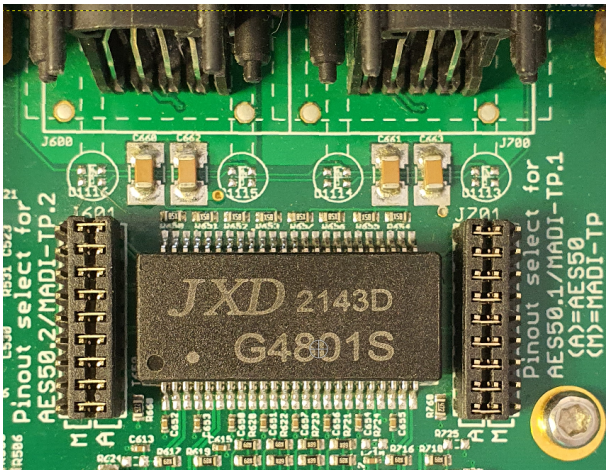


Figure 7: Pinout jumpers for AES50/MADI-TP ports

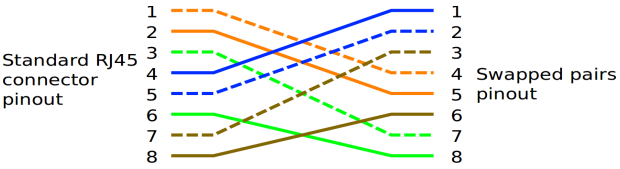


Figure 8: AES50/MADI-TP pinswap cable (use if you do not want to alter jumper settings)

- Locate the jumper blocks and move them to the desired position. The pinout setting (AES3: "T"=Tascam, "Y"=Yamaha, AES50/MADI-TP: "A"=AES50, "M"=MADI-TP) is indicated next to the jumper block.
- CAUTION: Take care when remove the jumper blocks, pulling both sides of each block equally gently upwards. You might use a knife or a screwdriver to push the blocks slowly upwards. **Make sure not to bend any pins!**
- Reconnect the cover's ground connection, reseat the cover and fasten the screws.

For AES50/MADI-TP ports, the pinout jumpers work independent from the actual firmware setting. This allows to switch between both modes only per software, however you need a special pinswap cable (Figure 8) for the "alien" mode.

10.2. Test tone mode

◆ Front panel only

For diagnostic purposes, the multiverter is able to play a test tone (1kHz, -20dB sine wave) on all outputs which are currently active. This feature is especially helpful to determine problems in your signal flow, as it does not rely on any external sources (except for the clock).

To enter test tone mode:

- Push the blue **Recall** button
- Move the cursor to ☼ **Test tone** by turning the encoder left or right
- Confirm your selection by pushing the encoder, or push ⮌ **Back** to cancel the operation.
- The test tone mode is now active. All outputs which are active in the Routing matrix are replaced by the test tone signal (indicated by yellow lit LEDs in the Routing area).

To exit test tone mode:

- Push the blue **Recall** button
- Move the cursor to “Test tone” by turning the encoder left or right
- De-select Test tone mode by pushing the encoder, or push ⮌ **Back** to cancel the operation.

10.3. Configuration settings

The multiverter offers fine-tuning of various parameters and seldom used settings via the “Settings” item in the Preset menu, or via the web interface. The “setting number” indicates the parameter to change, while the corresponding “value“ reflects its current setting. A complete list of “setting/value” pairs can be found in 10.4 **List of configuration settings.**

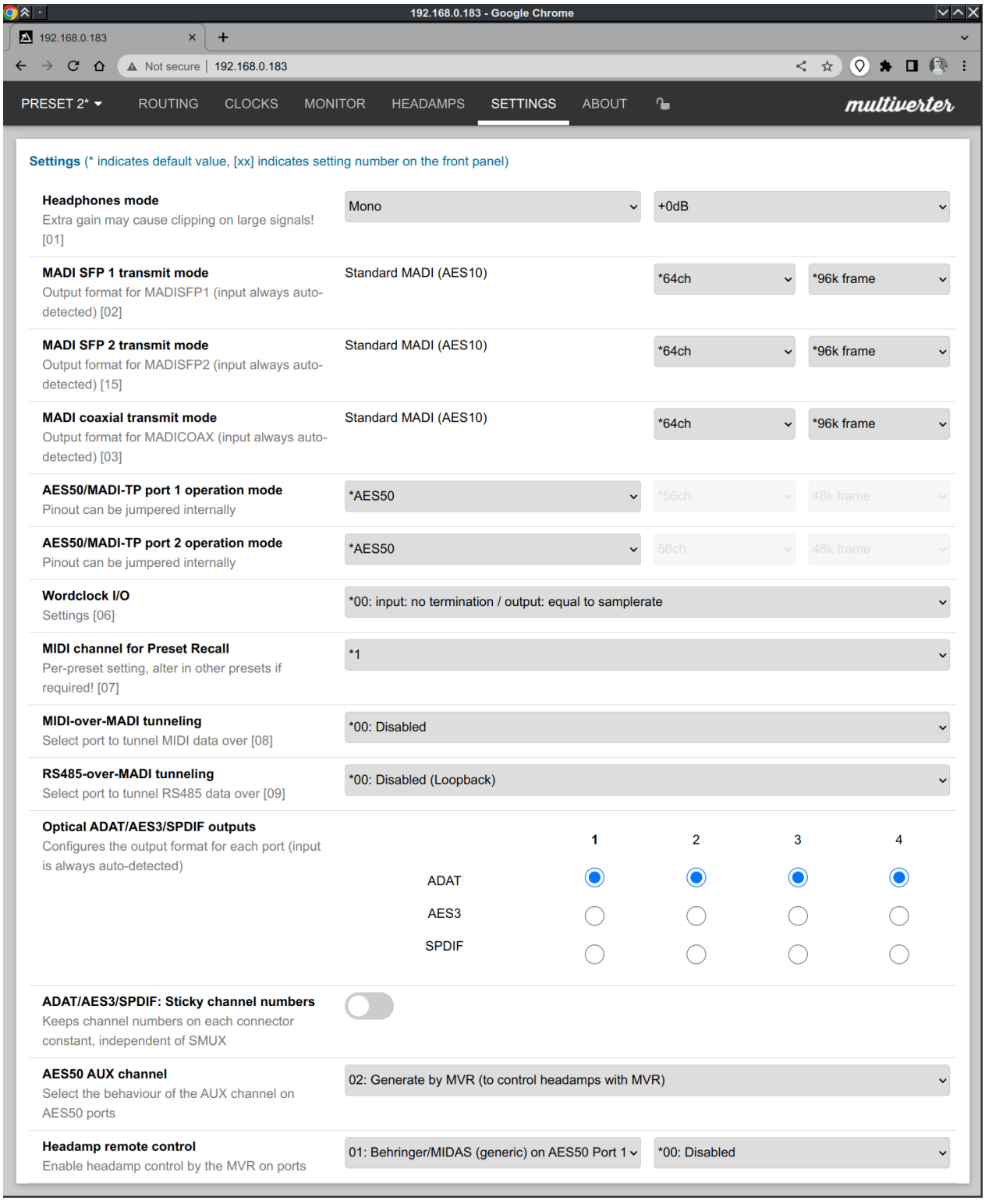
◆ Front panel

The “function index” is indicated by ☼ **1** to ☼ **16** in the “Preset” menu, while the corresponding “value” is displayed in the 7-segment display.
To adjust a particular setting:

- Push the blue **Recall** button
- Move the cursor to ☼ **Function** by turning the encoder left or right

- Confirm by pushing the encoder (or push ⮌ **Back** to cancel the operation).
- The ☼ **Function** LED should now be lit.
- Move the cursor to the desired index ☼ **1** to ☼ **16**
- Confirm by pushing the encoder (or push ⮌ **Back** to cancel the operation)
- The current value is displayed in the 7-segment display. Rotate the encoder to change the value, and push it to confirm.

◆ Web



*An asterisk * indicates the default setting*

◆ Command line

`setting [<number> [<value>]]`

10.4. List of configuration settings

<table>
<tr><th>Index</th><th>Purpose</th><th colspan="6">Values (bold: default setting)</th></tr>
<tr><td rowspan="11">[01]</td><td rowspan="11">Headphones mode</td><td colspan="2">Value</td><td colspan="2">Mode</td><td colspan="2">Extra Gain</td></tr>
<tr><td colspan="2">*01</td><td colspan="2">Mono</td><td colspan="2" rowspan="2">+0dB (none)</td></tr>
<tr><td colspan="2">02</td><td colspan="2">Stereo</td></tr>
<tr><td colspan="2">03</td><td colspan="2">Mono</td><td colspan="2" rowspan="2">+6dB</td></tr>
<tr><td colspan="2">04</td><td colspan="2">Stereo</td></tr>
<tr><td colspan="2">05</td><td colspan="2">Mono</td><td colspan="2" rowspan="2">+12dB</td></tr>
<tr><td colspan="2">06</td><td colspan="2">Stereo</td></tr>
<tr><td colspan="2">07</td><td colspan="2">Mono</td><td colspan="2" rowspan="2">+24dB</td></tr>
<tr><td colspan="2">08</td><td colspan="2">Stereo</td></tr>
<tr><td colspan="6">Mono: Both L and R speakers of the headphones play the same monitor channel,. The channel indication ranges from 1 to 64 and changes in steps of 1.

Stereo: Odd channels are played on the L speaker and the subsequent channel is played on the R speaker. The channel indication ranges from 1 to 63 and changes in steps of 2

Extra gain may cause clipping on large signals.</td></tr>
<tr><td rowspan="6">[02]

[03]</td><td rowspan="6">MADI SFP1 transmit mode[1] (for SFP2 see setting [15])

MADI coaxial transmit mode[1]</td><td colspan="2">Value</td><td colspan="2">Number of channels</td><td colspan="2">96k frame format</td></tr>
<tr><td colspan="2">00</td><td colspan="2" rowspan="2">56</td><td colspan="2">48k</td></tr>
<tr><td colspan="2">01</td><td colspan="2">96k</td></tr>
<tr><td colspan="2">02</td><td colspan="2" rowspan="2">64</td><td colspan="2">48k</td></tr>
<tr><td colspan="2">*03</td><td colspan="2">96k</td></tr>
<tr><td colspan="2">32</td><td colspan="2" rowspan="2">57</td><td colspan="2">48k</td></tr>
<tr><td colspan="2">33</td><td colspan="2">96k</td></tr>
<tr><td rowspan="13">[04]

[05]</td><td rowspan="13">AES50/TP1 port operation mode

AES50/TP2 port operation mode

NOTE: The pinout for the respective setting must also be jumpered internally!</td><td>Value</td><td>Mode</td><td>Num. Ch</td><td>96k frame format</td><td>Pinout mode</td><td>Remarks</td></tr>
<tr><td>00</td><td rowspan="4">AES-X213</td><td rowspan="2">56</td><td>48k</td><td rowspan="5">Auto</td><td rowspan="5"></td></tr>
<tr><td>01</td><td>96k</td></tr>
<tr><td>02</td><td rowspan="2">64</td><td>48k</td></tr>
<tr><td>03</td><td>96k</td></tr>
<tr><td>04</td><td>AES50</td><td>48</td><td>-</td></tr>
<tr><td>08 ‡</td><td rowspan="4">DiGiCo</td><td rowspan="2">56</td><td>48k</td><td rowspan="4">Straight</td><td rowspan="4">MTA-64 required</td></tr>
<tr><td>09 ‡</td><td>96k</td></tr>
<tr><td>10 ‡</td><td rowspan="2">64</td><td>48k</td></tr>
<tr><td>11 ‡</td><td>96k</td></tr>
</table>

1 Setting applies only to transmit function. Receive data format is automatically detected depending on the clock settings.

Index	Purpose	Values (bold: default setting)					
		12 ‡	Soundcraft/ Studer	56	48k		
		13 ‡			96k		
		14 ‡		64	48k		
		15 ‡			96k		
		24 ‡	DiGiCo	56	48k	MDIX (Crossover)	
		25 ‡			96k		
		26 ‡		64	48k		
		27 ‡			96k		
		28 ‡	Soundcraft/ Studer	56	48k		
		29 ‡			96k		
		30 ‡		64	48k		
		31 ‡			96k		
		32	AES-X213	57	48k	Auto	
		33			96k		
		40 ‡	DiGiCo	57	48k	Straight	MTA-64 required
		41 ‡			96k		
		44 ‡	Soundcraft/ Studer	57	48k		
		45 ‡			96k		
		56 ‡	DiGiCo	57	48k	MDIX (Crossover)	
		57 ‡			96k		
		60 ‡	Soundcraft/ Studer	57	48k		
		61 ‡			96k		
		‡: MTA-64 adapter required					
[06]	Wordclock	***00 = input: termination off / output: equal to samplerate** 01 = input: termination off / output: single speed 02 = input: 75 ohms termination / output: equal to samplerate 03 = input: 75 ohms termination / output: single speed					
[07]	MIDI channel	01...16. **Default: 01.** NOTE: This is a per-preset setting: remember to change on all presets!					
[08]	MIDI-over-MADI tunneling	Configures from/to which MADI interface the data on the MIDI jacks is routed. ***00 = Disabled** 01 = MIDI over MADI SFP 1 02 = MADI coaxial 03 = MIDI over MADI-TP 1 04 = MIDI over MADI-TP 2					
[09]	RS485-over-MADI tunneling	Configures from/to which MADI interface the RS485 port is routed, along with its baud rate: *00: Disabled (Loopback) 01: 9600 bps over MADI SFP 1 02: 9600 bps over MADI coaxial 03: 9600 bps over MADI-TP 1					

Index	Purpose	Values (bold: default setting)
		04: 9600 bps over MADI-TP 2 17: 19200 bps over MADI SFP 1 18: 19200 bps over MADI coaxial 19: 19200 bps over MADI-TP 1 20: 19200 bps over MADI-TP 2 33: 38400 bps over MADI SFP 1 34: 38400 bps over MADI coaxial 35: 38400 bps over MADI-TP 1 36: 38400 bps over MADI-TP 2 49: 57600 bps over MADI SFP 1 50: 57600 bps over MADI coaxial 51: 57600 bps over MADI-TP 1 52: 57600 bps over MADI-TP 2 65: 115200 bps over MADI SFP 1 66: 115200 bps over MADI coaxial 67: 115200 bps over MADI-TP 1 68: 115200 bps over MADI-TP 2
[10]	Reserved	
[11]	Service menu	01 = Self-test (external cabling required, see 9.5. Audio Interface self-test) 02 = LED and button test. See 9.6. LED and button test 03 = ASRC self-test. See 9.7 ASRC self-test 99 = Reset to Factory Defaults
[12]	Version info	**Note:** The firmware consists of several different parts. To check the overall firmware version number, use the web interface. Turn the encoder left or right to display the different version numbers in the 7-segment display: ☼**AES3/ADAT** FPGA Firmware Major version ☼**MADI SFP 1** FPGA Firmware Major version ☼**MADI SFP2** Control Firmware Major version ☼**MADI coax** Control Firmware Minor version ☼**AES50/TP 1** Hardware version Mainboard ☼**AES50/TP 2** Hardware version Front panel ☼**Dante 1** SRC Firmware Major version ("--" if not installed) ☼**Dante 2** SRC Firmware Minor version ("--" if not installed) ☼**FlexLink 1** Hardware version ASRC ("--" if not installed) Press ⮌ **Back** to exit the version display mode.
[13]*	ADAT transmit modes	Sets the output mode for each ADAT port. Possible values: ADAT: 8 channels ADAT format SPDIF: 2 channels (stereo), header in consumer format AES3: 2 channels (stereo), header in professional format
[14]*	ADAT sticky channel numbers	00 = ADAT channel numbers are always consecutive (no gaps) 01 = ADAT channel numbers stay constant but may introduce gaps when SMUX changes

* Not available on the front panel. Use web or command line to configure it.

Index	Purpose	Values (bold: default setting)		
[15]	MADI SFP2 transmit mode	**Value**	Number of channels	96k frame format
		00	56	48k
		01		96k
		02	64	48k
		*03		96k
		32	57	48k
		33		96k
[16]*	AES50 AUX channel	*00 = Disabled. Do not pass or generate AUX data 01 = Pass AUX data transparently between AES50 Port 1 and AES50 Port 2 02 = Generate by MVR (to control headamps with MVR)		
[17]*	Stagebox 1 type	*00 = Disabled 01 = Behringer/MIDAS (generic) on AES50 Port 1		
[18]*	Stagebox 2 type	*00 = Disabled 01 = Behringer/MIDAS (generic) on AES50 Port 2		

Table 2: Configuration settings

10.5. Audio Interface self-test

The multiverter can check itself for correct operation. This is done by sending a special signal out on every interface through an external loop back and monitor the received data for correctness. When the received data is correct, the respective LED on the front panel turns green.

To perform the self-test:

- Connect the **output** interface you want to test to its corresponding **input** (loopback).

  For AES3, use a loopback plug wired according to the current jumper setting.
  For ADAT, use four loopback cables.
  For DANTE, there is no loopback cable, but both ports must be connected to a gigabit network.

- Enter self-test mode by pushing **Recall**, move to ☼ **Function**, confirm with **OK**, move to ☼ **11**, push **OK**, turn encoder until display shows 01 and confirm with **OK**.

- On the headphones output, a 1kHz sine wave is played on both channels.

- During the self-test, 5t is shown in the seven-segment display. To return to normal operation, press ⮌ **Back** .

* Not available on the front panel. Use web or command line to configure it.

10.6. LED and button test

To verify correct operation of all LEDs and buttons:

- Enter LED/button test mode by pushing **Recall**, move to ☼ **Function**, confirm with **OK**, move to ☼ **11**, push **OK**, turn encoder until display shows 02 and confirm with **OK**
- During the test, all front and back panel LEDs (except for the Dante LEDs) show the same color. Each button press cycles the color, and ⮌ **Back** exits the test.

10.7. SRC-64 self-test

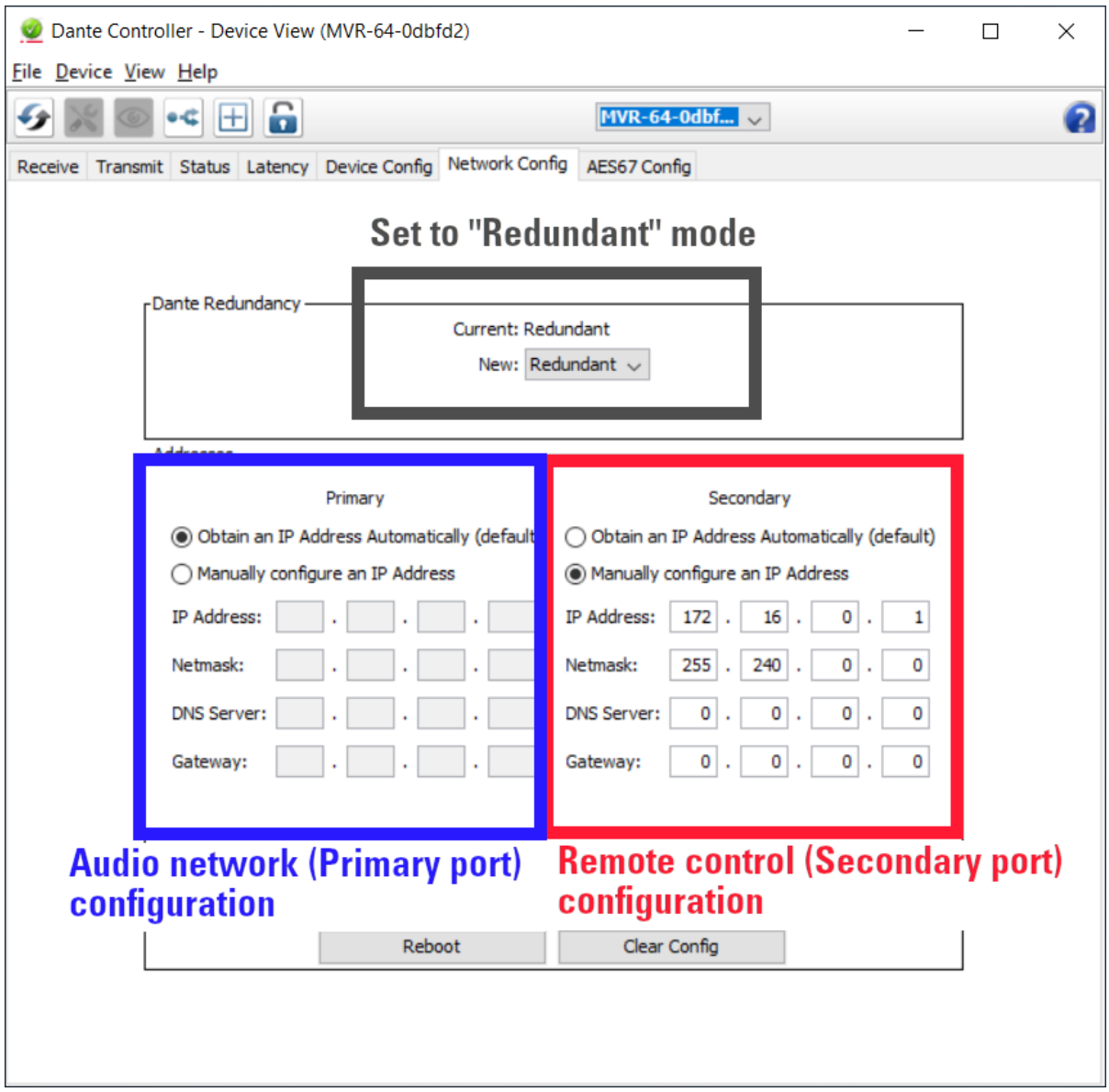
The SRC-64 sample rate converter can be self-tested for correct operation. A 1kHz, 96k sine wave is passed through all channels of the ASRC (down-sampled to 88.2k), and looped back (up-sampled to 96k again).
The result can be listened to on the headphones (and is also present on MADI optical (ch 1-32) and MADI coaxial (ch 33-64).

- Enter ASRC self-test mode by pushing **Recall**, move to ☼ **Function**, confirm with **OK**, move to ☼ **11**, push **OK**, turn encoder until display shows 03 and confirm with **OK**
- Plug in headphones. Turn the encoder and listen carefully to channels 1 to 64, one after another.
  On all channels a clean 1kHz tone should be audible.
- Press ⮌ **Back** to exit the test.

10.8. Remote control on a Network separate from Dante Audio

Dante's VLAN mode can be used to logically separate the control network from the audio network.

- In the Dante Controller, under "Network Config", set Dante Redundancy to "Redundant".
- Connect the Audio network to the "Primary" port only and configure it as desired.
- Connect the Control network to the "Secondary" port and configure it as desired.



-

11. FIRMWARE

11.1. Version check

We recommend to check the firmware via the Web interface ("ABOUT" tab). Only there is the overall version number (= package version, same as in the file name of the firmware ZIP-file) visible. Else you will see only component sub-versions.

◆ Frontpanel

Push **Recall**, move to ☼ **Function**, confirm with **OK**, move to ☼ **12**, push **OK**
The different versions are shown in the 7-segment display according to Table 2: Configuration settings, index 12.
NOTE: This lists only the component sub-versions and not the overall firmware version.

◆ Web

Click the "ABOUT" tab. The firmware package version number is displayed as "Firmware package: X.Y".

◆ Command line

`Version`
NOTE: This lists only the component sub-versions and not the overall firmware version.

11.2. Upgrade

Firmware upgrade involves **two** operations which must be **both** carried out (order doesn't matter):
1) FPGA/Control (via USB and command line tool)
2) Dante upgrade (via Dante network connection)

11.3. FPGA/Control Firmware

The first part (FPGA and Control firmware) is updated via the USB port. Connect the multiverter via USB to your PC and run

```
MVR-mkII-Updater.bat
```

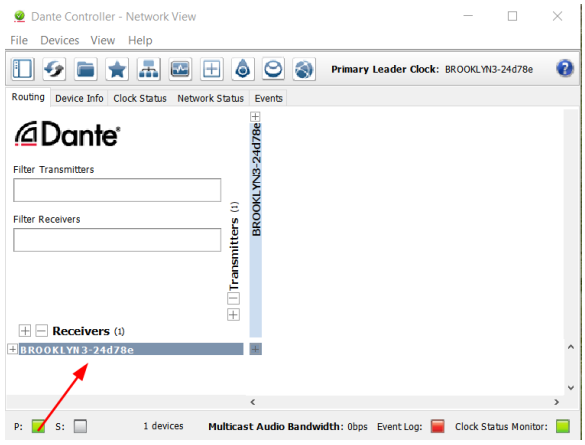
and follow the instructions on the screen.

Mac users: The updater runs also in a bootcamp Windows session, when both COM ports are mapped to windows.

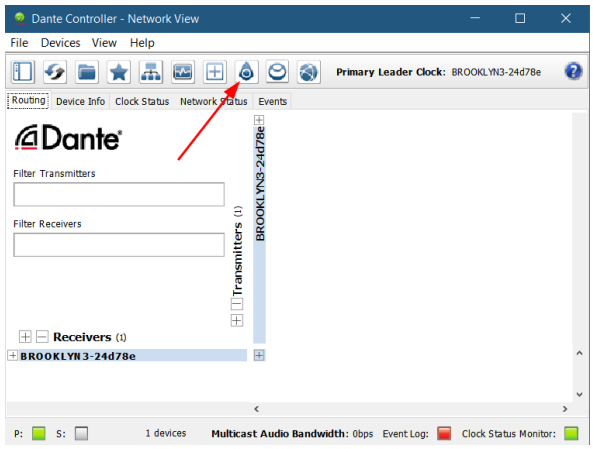
11.4. Dante Firmware

The second part (Dante firmware) is updated using the Dante Controller (available for Windows and Mac). The multiverter must be connected to the Dante network.

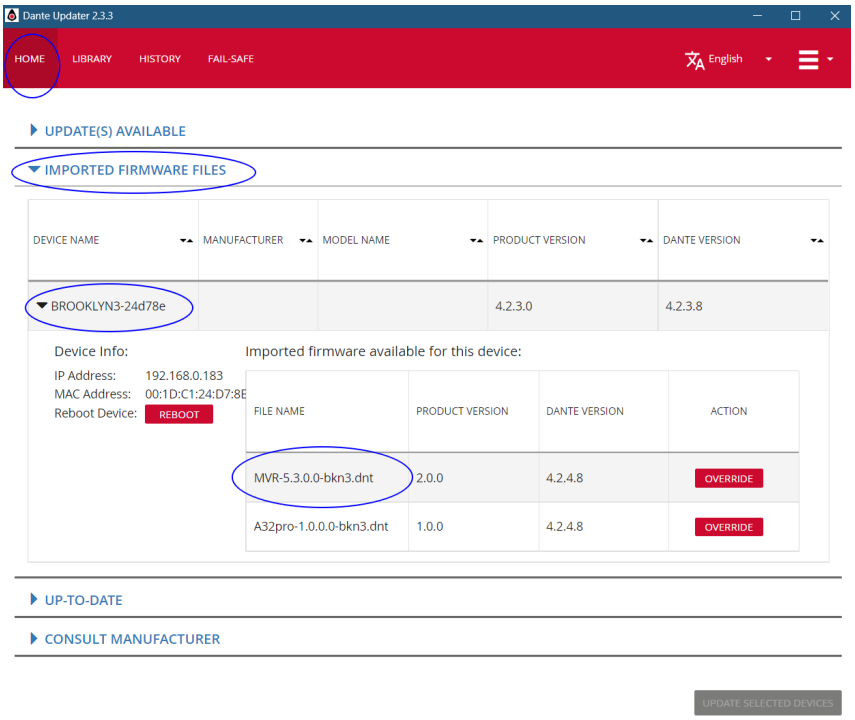
You will need the **`MVR-x.x.x.x-bkn3.dnt`** file from the firmware package (contained in the "firmware" folder).



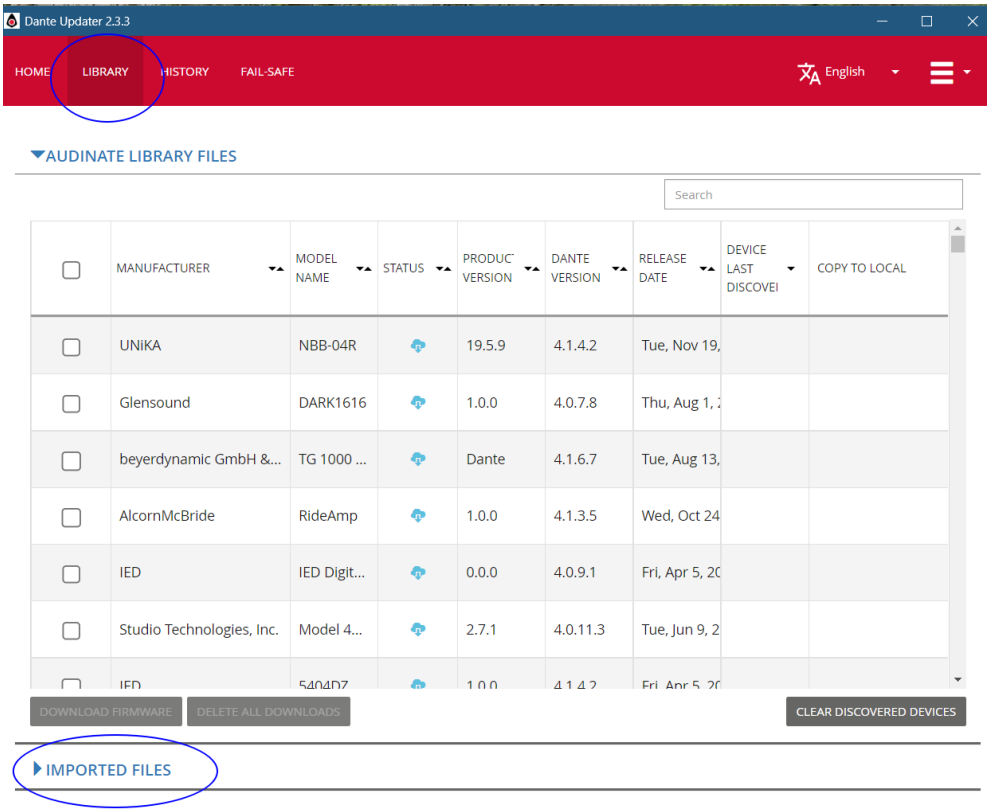
1. Start “Dante Controller".



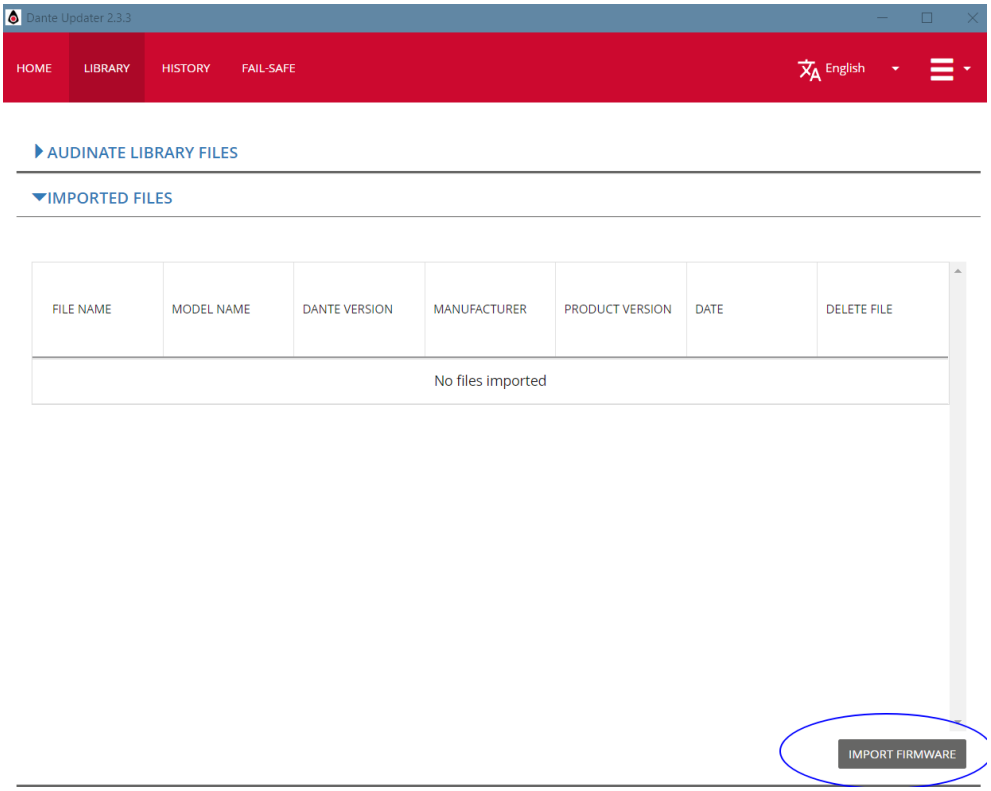
2. Start "Dante Updater



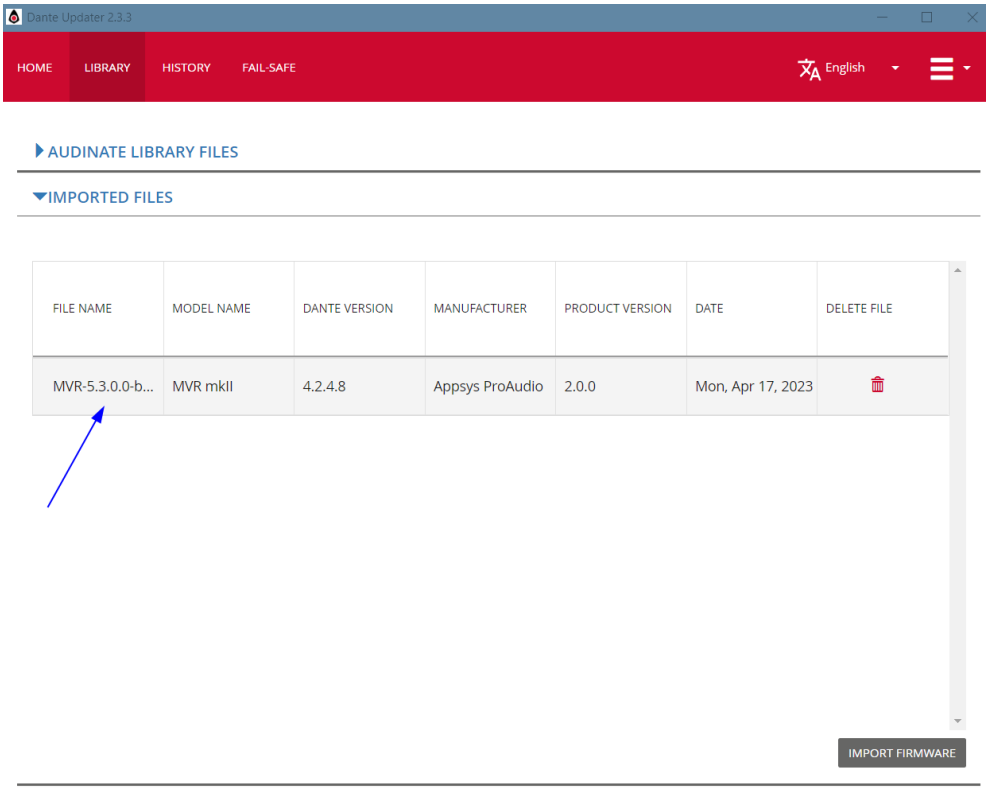
3. Check "HOME / IMPORTED FIRMWARE FILES" if the current MVR firmware version is already installed. **If this is the case, proceed to Step 6.**



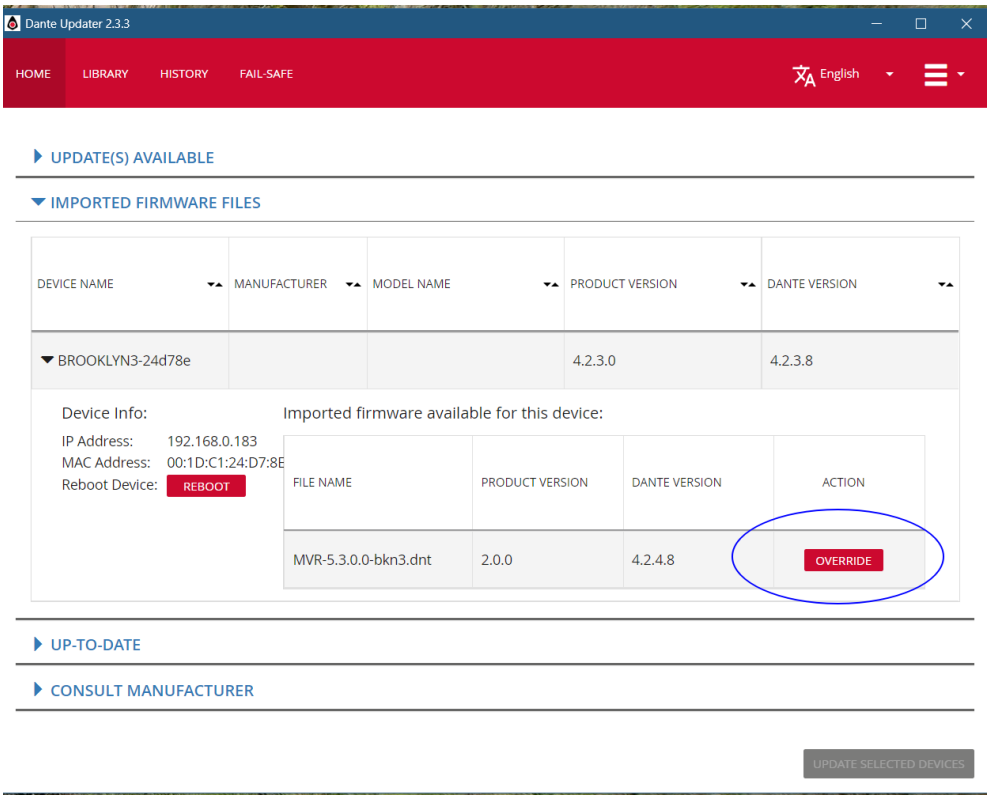
4. Click "LIBRARY then IMPORTED FILES"



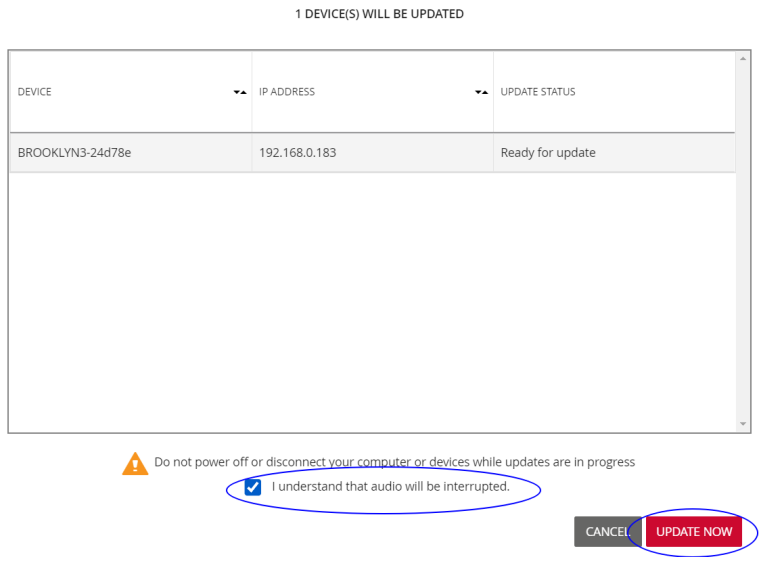
5. Click "IMPORT FIRMWARE" and select the **MVR-x.x.x.x-bkn3.dnt** file from the firmware package.



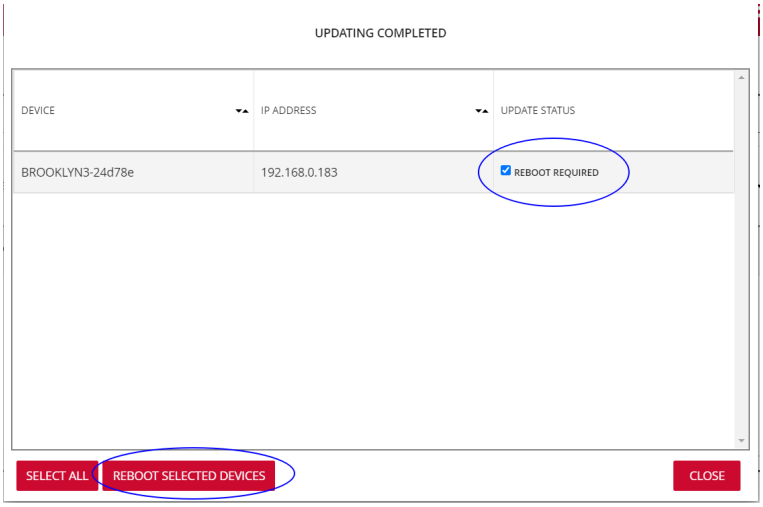
6. The imported file shows now up in the list.



6. Within "HOME/IMPORTED FIRMWARE FILES", click "OVERRIDE" and confirm the warning.



7. Select the device, confirm the warning" and click "UPDATE NOW". The process takes about 3 minutes.



8. Check "REBOOT REQUIRED", then click "REBOOT SELECTED DEVICES".

12. COMMAND LINE REFERENCE

```
The commands listed below are available. Type 'help' to see this list.
Most commands can be called without an argument and return the current setting.

preset [<store|recall> [<num>]]: store/recall preset number <num>

volume [<vol>|+|-]:  Sets the volume of the monitor output (0-99)

monitor [<source>:<channel>]: Sets the source of the monitor output
    Available sources: AES3ADAT,MADISFP1,MADISFP2,MADICOAX,AES50TP1,AES50TP2,
                       DANTE1,DANTE2,FLEXLINK1,FLEXLINK2,FLEXLINK3 channels:1-64

headamp <stagebox> <channel> [<gainstep>|<phantom>]: Remote-control headamp
    <stagebox>  Stagebox number (1 or 2)
    <channel>   Channel number (1..64)
    <gainstep>  Gainstep to set (1..20)
    <phantom>   Phantom power, values: 'on' or 'off'

clock A|B [<source> [<srate>|<smux>]]: Sets the clock source for clock A (main) or B
(SRC)
    Available Sources: AES3,ADAT,MADISFP1,MADISFP2,MADICOAX,DANTE,FLEXLINK
    Sample rates (for DANTE,INTERNAL): 44100,48000,88200,96000,176400,192000
    SMUX (for AES3,ADAT,MADISFP*,MADICOAX,AES50TP* in TP mode,WORDCLOCK): 1,2,4

route [<dst> [<src>]]: Routes specified channels from <src> to <dst>.
    <dest>, <source>   interface, channel range or number spec, either:
    <if>               all channels of interface <if>
    <if>:<start>       single channel of interface <if>
    <if>:<start>-<end> channels of interface <if>, from <start> until <end>
    Available interfaces: AES3ADAT,MADISFP1,MADISFP2,MADICOAX,AES50TP1,AES50TP2,
                          DANTE1,DANTE2,FLEXLINK1,FLEXLINK2,FLEXLINK3,NONE

    When called with no params, all active routes are printed. When called with <dst>
    only, all routes to this destination are printed.

asrc enable|disable [<in> <out>]: Configures the ASRC.
    disable     Turn off ASRC
    enable      Turn on ASRC, using previously set parameters or those specified below:
    <in> <out>  Interfaces which should run on the alternate clock B. Values:
                AES3ADAT,MADISFP1,MADISFP2,MADICOAX,AES50TP1,AES50TP2,
                DANTE1,DANTE2,FLEXLINK1,FLEXLINK2,FLEXLINK3
                Multiple values may be combined with comma, e.g. 'MADISFP1,MADISFP2'
                If 'NONE' is specified, the ASRC is turned off for the
                respective direction. If both <in> and <out> are
                set to 'NONE' the ASRC is turned off.
                Alternatively, <in> and <out> can be specified as hex bit mask
                (0x0001=AES3ADAT ... 0x0400=FLEXLINK3)
    NOTE: Use the "clock B" command to set the clock source for these interfaces.

setting <number> [<value>]: Sets/retrieves configuration setting <number>
    Used to fine-tune the behavior of the multiverter. For a list of available settings
    please refer to chapter "Configuration settings" in the manual.

key <strokes>: Simulates keystrokes on the front panel, or locks/unlocks the front panel
    <strokes> is a string consisting of one or more characters:
    r(e)call,(s)tore,(r)outing,(c)locksource,(d)omain,(m)onitor,(b)ack,(.)ok,(<)left,
```

```
(>)right
    (l): lock the front panel
    (u): unlocks the front panel
    (_): a dash preceding the key means 'long press'

version: Retrieves device version

id: Retrieves device version in JSON-Format (same as "config i")

config [query] [<json_string>]: Set and/or get device config in JSON format.
   'query' can be left out or any combination of what to get:
    ?  query changes only since last call, must be specified as first flag in combination
       with any of the letter options listed below. It has the effect that unchanged
       options are omitted from the answer
    *  everything
    c  configuration
    h  headamps
    p  parameters
    r  routing
    s  status
    i  identification
```

13. SPECIFICATIONS

<table>
<tr><th>Parameter</th><th>Value</th></tr>
<tr><td>Dimensions</td><td>482x45x230mm (WxHxD) including built-in connectors</td></tr>
<tr><td>Weight</td><td>2.25 kg</td></tr>
<tr><td>Operating temperature</td><td>0..+50°C, non-condensing</td></tr>
<tr><td>Storage temperature</td><td>-40..+85°C, non-condensing</td></tr>
<tr><td>Power consumption</td><td>9W typical., 30W maximum
Each AC input: 90..240VAC, 50-60Hz, 0.75A
DC input: 9-24VDC (up to 30V tolerant), 2.5A peak</td></tr>
<tr><td>Channel count</td><td>704x704 in x1 modes
352x352 x2 modes
176x176 x4 modes

All inputs and outputs can be used at the same time.</td></tr>
<tr><td>Sample rates</td><td>44.1 / 48 / 88.2 / 96 / 176.4 / 192 kHz +/-100ppm
Varispeed operation is not supported</td></tr>
<tr><td>Latency</td><td>The table below shows the overall latency (receive+convert+transmit) between the various interfaces in number of samples.
For x1 modes (44.1/48kHz), n is 1
For x2 modes (88.2/96kHz), n is 2.
For x4 modes (176.4/192kHz), n is 4.
The Dante latency “d” depends on the setting in the Dante controller which should be chosen according to the network topology, and can range from 150µs to 5ms.
<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="5">Output</th></tr>
<tr><th>ADAT</th><th>MADI</th><th>AES50</th><th>Dante</th><th>FlexLink</th></tr>
<tr><th rowspan="5">Input</th><th>ADAT</th><td>4*n</td><td>4*n</td><td>5*n</td><td>4*n+d</td><td>4*n</td></tr>
<tr><th>MADI</th><td>3*n</td><td>3*n</td><td>4*n</td><td>3*n+d</td><td>3*n</td></tr>
<tr><th>AES50</th><td>4*n</td><td>4*n</td><td>5*n</td><td>4*n+d</td><td>4*n</td></tr>
<tr><th>Dante</th><td>4*n+d</td><td>4*n+d</td><td>5*n+d</td><td>-</td><td>4*n+d</td></tr>
<tr><th>FlexLink</th><td>3*n</td><td>3*n</td><td>4*n</td><td>3*n+d</td><td>3*n</td></tr>
</table></td></tr>
<tr><td>AES3 ports</td><td>16x16ch (8 input + 8 output ports) on 2*DB25 connectors
Pinout can be jumpered per connector internally to "Tascam" or "Yamaha"
Inputs and outputs are fully transformer isolated</td></tr>
<tr><td>ADAT ports</td><td>32x32ch (4 input+4 output ports), 8x8ch each in ADAT mode, 2x2ch each in AES3 and SPDIF modes</td></tr>
<tr><td>MADI SFP ports (2x)</td><td>100 MBit SFP module with LC connector,
50/125 µm or 62.5/125 µm multi-mode fiber 1300nm, up to 2km total length.
Can be changed to other SFP modules (i.e. single mode or coaxial).
There is NO vendor lock (Appsys policy).

64ch@44.1/48kHz, 32ch@88.2/96kHz, 16ch@176.4/192kHz
56/57/64 channel support, all AES3 bits (U, C, V) preserved</td></tr>
<tr><td>MADI BNC port</td><td>Standard AES10 coaxial port. Use with up to 100meters of 75 ohm coaxial cable
64ch@44.1/48kHz, 32ch@88.2/96kHz, 16ch@176.4/192kHz</td></tr>
</table>

Parameter	Value
	56/57/64 channel support, all AES3 bits (U, C, V) preserved
AES50/MADI-TP ports (2x)	**AES50 mode:** AES50 3.1 compatible 48ch@44.1/48kHz, 24ch@88.2/96kHz Pinout*: Data on 1/2, 3/6; Sync on 4/5, 7/8 AUX data supported (pass-through or generate-by-MVR) **MADI-TP mode:** AES-X 213 (upcoming MADI specification) compatible. 64ch@44.1kHz, 56ch@48kHz, 32ch@88.2, 28ch@96kHz, 16ch@176.4kHz, 14ch@192kHz Pinout*: MADI-TP on 4/5, 7/8 56/57/64 channel support, all AES3 bits (U, C, V) preserved * Pinout can be jumpered internally, independent of operation mode
Wordclock port	Output: 5.0Vpp nominal, able to drive two parallel 75 Ohm terminations Input: 1.0Vpp...5.0Vpp
Dante/AES67 port	2x Gigabit Ethernet, configurable either as “Switch” or as “Redundant connection” in the Dante controller. Device prefix: “MVR64” 64ch@44.1/48kHz, 32ch@88.2/96kHz, 16ch@176.4/192kHz Prepared for 128ch@48k when firmware update from Audinate is available
Network control port	100 MBit/s, internally bridged with Dante
MIDI port	MIDI TRS pinout according to midi.org (Tip = DIN pin 5, Ring = DIN pin 4, Sleeve = DIN pin 2 Standard isolated input, standard MIDI output Data received on IN is passed unaltered to THRU
Headphones	2x125mW into 32Ohm (@0.01% THD+N) Bandwidth: 22Hz to 22kHz
ESD protection	all ports: +/- 15kV (Human Body Model)
USB port	USB 2.0 (FTDI 2232). Remote control via web browser or command line / Firmware update No audio connection
RS485 port	Male D-Sub 9pin, Yamaha AD8HR compatible Pinout: 2=RX-, 3=TX-, 4=TX+, 5=GND, 6=RX+
Extension port	HDMI connector type (protocol *NOT* HDMI compatible!). 192ch@44.1/48kHz, 96ch@88.2/96kHz, 48ch@176.4/192kHz

Table 3: Specifications

14. ACCESSORIES

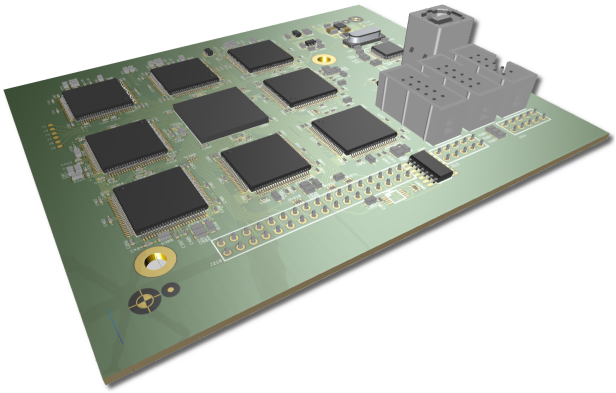
14.1. MTA-64 Adapter for MADI-TP

With the MTA-64, the becomes capable of connecting to the MADI-TP (MADI over Twisted Pair) variants used in DiGiCo and Soundcraft/Studer/Harman desks. It's connected between the multiverters MADI-TP port and the console or stagebox and adapts signal levels and pin-outs.

What's more: you don't need any special crossover cables thanks to internal MDIX logic - any standard 1:1 Cat5 cable will do, no matter if you want to connect to your console or the stagebox.

14.2. SRC-64 Samplerate Converter Module

The SRC-64 add-on module - available as separate hardware - adds the capability of asynchronous sample rate conversion to your multiverter. It features highest analog performance (THD+N -134dB typ.) , 128 channel uni-directional or 64 channel bi-directional conversion between any interfaces supported by the multiverter plus a number of special modes for maximum flexibility. The SRC can be assigned to any (even multiple) input and/or outputs of the multiverter.



14.3. "Flexiverter" Extension boxes

Various extension boxes for connection to the “FlexLink” port are available. These boxes are designed to add support for non-built-in interfaces, and to add additional ports to the system. A total of 192ch@48kHz can be added to the Multiverter (all channels of one FLX-* box plus all channels from its optional AUX card):

Currently available[5] models:

Product	Purpose
FLX-AES3	External break-out box with 16x16ch of AES3. Can additionally be equipped with an AUX card for more protocols or channels.
FLX-AES50	External break-out box with two AES50 ports (total 96ch@48k). Can additionally be equipped with an AUX card for more protocols or channels.
FLX-DANTE	External break-out box with two DANTE ports (total 64ch@48k). Can additionally be equipped with an AUX card for more protocols or channels.
FLX-MADI	External break-out box with one MADI SFP port and one MADI coaxial port (total 128ch@48k). Can additionally be equipped with an AUX card for more protocols or channels.

5 As of 2023-07

15. APPENDIX

15.1. Warranty

We offer a full two (2) year warranty from the date of purchase. Within this period, we repair or exchange your device free o/f charge in case of any defect*. If you experience any problems, please contact us first. We try hard to solve your problem as soon as possible, even after the warranty period.
* Not covered by the warranty are any damages resulting out of improper use, willful damage, normal wear-out (especially of the connectors) or connection with incompatible devices.

15.2. Manufacturer contact

Appsys ProAudio
Rolf Eichenseher
Bullingerstr. 63 / BK241
CH-8004 Zürich
Switzerland

www.appsys.ch
info@appsys.ch
Phone: +41 43 537 28 51
Mobile: +41 76 747 07 42

15.3. FCC Compliance

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

This equipment has been verified to comply with the limits for a class B computing device, pursuant to FCC Rules. In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications

made to the equipment without the approval of manufacturer could void the user's authority to operate this equipment.

15.4. Recycling

According to EU directive 2002/96/EU, electronic devices with a crossed-out dustbin may not be disposed into normal domestic waste.
Please return the products back for environment-friendly recycling, we'll refund you the shipping fees.

15.5. About this document

Rev.	Changes
1	Initial release

Document Revision: 1 · 2023-07-23
Referenced firmware version: 6.0

Declaration of Conformity

The manufacturer:

Appsys ProAudio
Rolf Eichenseher
Bullingerstr. 63 BK 241
CH-8004 Zürich
Switzerland

declares under sole responsibility that the products mentioned below:

Multiverter MVR mkII

meet the requirements of the following standards:

EN 55024:2010
EN 55032:2015 Class B
EN 61000-3-2:2006/A1/A2:2009
EN 61000-3-3:2009
EN 61000-6-3:2007/A1:2011

Therefore the product fulfills the demand of the following EC directives:

73/23/EWG
(Directive related to electrical equipment designed for use within certain voltage limits)

89/336/EWG
(Directive related to electromagnetic compatibility)

The devices are marked accordingly.
Zürich, 04.04.2023

Rolf Eichenseher (CEO)