MONTONE.42

User's Manual

Version 2.0

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About This Manual

How to Use This Manual

This manual guides you through the installation and operation of the device. Use the Table of Contents at the beginning of the manual or Index Directory at the end of the document 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.

Conventions

The following symbols are used to draw your attention to:

TIPS

indicate useful hints and shortcuts.

NOTES

are used for important points of clarification or cross references.

WARNINGS!

alert you when an action should always be observed.

CHAPTER 1: Overview

Introduction

Welcome to MONTONE.42, DirectOut's fully AES67-compliant MADI (AES10) to Audio-over-IP bridge based on RAVENNA audio networking technology. MONTONE.42 provides seamless integration of network audio with existing infrastructures. Equipped with four MADI and two gigabit network ports, it serves as a versatile link for broadcast, live-sound and studio applications.

Feature Summary

MADI Ports	4 ports - individually configurable: - SFP (empty cage without module) - SC-Socket multi/single-mode - coaxial BNC, 75 Ω
Network	2 x RJ45 Socket (Gigabit-Ethernet)
Video Reference (I):	coaxial BNC (75 Ω termination switchable) black burst (PAL, NTSC)
Word Clock (I/O):	2 x coaxial BNC (75 Ω termination switchable)
AoIP Protocols	RAVENNA AES67 ST 2110-30 (Uncompressed audio) ST 2110-31 (AES3 Transparent Transport) ST 2022-7 (Seamless Protection Switching)
MADI Formats	56/64 channel, 48k/96k Frame, S/MUX
Sample Rates	44.1, 48, 88.2, 96, 176.4, 192 kHz +/-12.5%
Device Control	remote: via network browser local: via five way push button and display
USB Port	USB 2.0 port for firmware updates
Power Supply	This device is equipped with two wide range power supplies (84 V to 264 V AC / 47 Hz to 63 Hz / safety class 1)

How it works

Network: Up to 32 audio streams can be configured with an individual number of audio channels. Each stream is assembled via the signal routing matrix and output to the network.

MADI: Up to 32 audio streams can be subscribed from the network and output via the routing matrix to the local MADI ports or the network.

The routing matrix also allows for signal routing between the MADI I/Os without using the network. The routing is available on a per channel basis.

Applications

MONTONE.42 can be used for signal distribution, streaming audio, conversion of RAVENNA or AES67 compliant network audio to AES10, conversion of different MADI signals.

Typical applications include:

- local breakout in a RAVENNA network
- stream generator
- stream monitoring (headphones)
- format conversion of a MADI signal (SFP <> SC <> BNC)
- signal distribution (routing matrix)
- ...
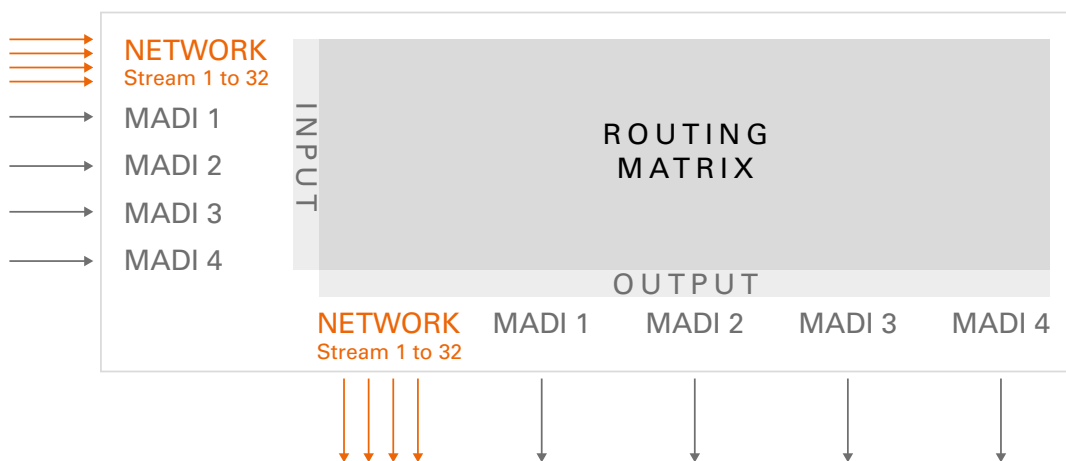
CHAPTER 2: Legal issues & facts

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 grounded. The device is grounded through its IEC power connections.
- All devices must be connected to the mains using the three-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 5º C and 45º 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 heating 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 DirectOut 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 for repair.

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.

Updates

DirectOut products are continually in 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.

This guide refers to the following firmware versions:
- RAVENNA module: 4.5 / 4.27 (hardware / software)
- Main frame: 2.0 / 2.4 (FPGA / MB)

Intended Operation

MONTONE.42 is designed for conversion / routing between Audio-over-IP and MADI signals. MADI refers to AES10, Audio-over-IP refers to RAVENNA (including AES67 and SMPTE ST 2110-30, ST 2110-31).

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.

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 36 months for all components that are essential for proper and intended operation of the device. The date of purchase is applied for this period.
Consumable parts (e.g. battery) are excluded from warranty claims.

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 2011/65/EU and 2015/863.

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:
DirectOut GmbH,
Leipziger Str. 32
09648 Mittweida
Germany
Only stamped parcels will be accepted!
WEEE-Reg.-No. DE 64879540

Contact
DirectOut GmbH
Leipziger Str. 32, 09648 Mittweida, Germany
Phone: +49 (0)3727 5665-100
Fax: +49 (0)3727 5665-101
Mail: sales@directout.eu
www.directout.eu

Contents

The contents of your MONTONE.42 package should include:

- 1 x MONTONE.42 (19'', 1 RU)
- 2 x power chord
- 2 x fixing unit for power plug
- 1 x network cable
- 1 x Manual

To complete the delivery please download from the DirectOut website: www.directout.eu

- USB Serial driver

Accessory

Two different optical SFP transceiver for MADI transmission are available from DirectOut GmbH:

- Multimode SFP transceiver with LC connectors (No: DOICT0129)
- Singlemode SFP transceiver with LC connectors (No: DOICT0130)

Specification of the optical SFP modules:

SFP	Multimode	Singlemode
Wavelength TX	1310 nm	1310 nm
Wavelenght RX	1310 nm	1310 nm
Distance	2 km	10 km
Powerbudget (dB)	11 dB	12 dB
Protocols	Fast Ethernet OC3/STM1	Gigabit Ethernet, Gigabit Fibre Channel
Bandwidth from	100 Mbit/s	1.050 Gbit/s
Bandwidth	155 Mbit/s	1.250 Gbit/s
Laser	FP	FP
Receiver Type	PIN	PIN
Connector	LC	LC
Wavelength TX min	1260 nm	1260 nm
Wavelength TX max	1360 nm	1360 nm
Wavelength RX min	1260 nm	1260 nm
Wavelength RX max	1620 nm	1600 nm
Transmit min	- 19.00 dBm	- 9.00 dBm
Transmit max	- 14.00 dBm	- 3.00 dBm
Receive min	- 30 dBm	- 21.00 dBm
Receive max (Receiver overload)	- 5.00 dBm	- 3.00 dBm
Temperature (min)	0° Celsius	0° Celsius
Temperature (max)	70° Celsius	70° Celsius
Type of DDM/DOM	internal	internal
Extinction Ratio	8.20 dB	9 dB

CHAPTER 3: Installation

Installing the Device

1. Open the packaging and check that the contents have been delivered complete and undamaged.
2. Fix the device in a 19'' frame with four screws, or place it 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 5º C and 45º C and a maximum relative humidity of 80%, non-condensing.
Ensure that the unit has sufficient air circulation for cooling.

3. Remove the protective cap from the optical MADI port(s) before use.

NOTE

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

4. Connect signal cable(s) for the MADI signals.

5. Connect a network cable to one of the RJ-45 network port(s).

6. Optional: Connect an USB cable to the USB port for firmware updates. This requires the USB Serial driver (Windows) being installed first. The driver and the installation instructions are available at www.directout.eu.

7. Using the power cord provided connect the PSUs to a matching power supply:

WARNING!

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

8. Turn on the power switches:

After successful booting (about 30 s) the currently installed firmware and software can be checked in the display at the front panel. The menu is controlled by the navigation switch at the right-hand side of the display.

There are four positions to check:
- Main frame (Update via USB)
  - Montone / Information / MB Version
  - Montone / Information / FPGA Version
- RAVENNA Module (Update via network)
  - RAVENNA Modul / Information / SW Version
  - RAVENNA Modul / Information / HW Version

The menu map is explained in "CHAPTER 5: Front Panel Control" on page 26.

NOTE

To update the firmware of the main frame (not the module) an installed USB serial driver (Windows®) and the Update Tool are necessary. The software and the installation instructions are available at
www.directout.eu.
See "Appendix B- Firmware Update" on page 85 for description of the module´s update procedure.

9. Check the network settings of your computer. The default IP address of MONTONE.42 on PORT 1 is 192.168.0.1.

NOTE

The network settings (PORT 1) of MONTONE.42 can also be checked and modified at the front panel.
Position: RAVENNA Modul / Configuration / IP Address

If you have a DHCP server running in your network you can use PORT 2 to automatically assign an IP address.

10. Enter http://<IP Address> (default IP: 192.168.0.1) in the navigation bar of your browser to open the control website.

The user interface is explained in „CHAPTER 6: Remote Operation" on page 34.

TIP

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

CHAPTER 4: 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 or 48 kHz = 1 FS
- 88.2 kHz or 96 kHz = 2 FS
- 176.4 kHz or 192 kHz = 4 FS

Global Control

The display on the front panel indicates the power supply. The power switches are on the back panel:

Power	**2 Switches** Enable / disable power supply.
Power	**2 C13 sockets** Connect the power supply here (84- 264 V AC).

POWER PSU1 & PSU2	**LED green - indicates state of power supply** ⚪ (OFF) = power supply not working 🟢 (ON) = power supply working

NOTE

The green LEDs (PSU 1 & PSU 2) indicate that a working power supply is connected to the power supply unit. Note that an unlit LED does not guarantee that the device is free of voltage. To ensure that the device is completely disconnected from mains voltage, the power chords must be disconnected.

MADI Signals

The device is equipped with four slots each of can house one of three different i/o-modules or an empty SFP cage. The configuration needs to be specified at order (configure to order).

Available are:

- SC optical multi-mode
- SC optical single-mode
- BNC coaxial, 75 Ω
- SFP cage (without module)

1	BNC OUT / IN	**2 x BNC socket (coaxial)** OUT: MADI output (64 ch), connect for MADI output signal here. IN: MADI input (64 ch), connect MADI input signal here.
2	SC OUT / IN	**2 x SC socket (optical)** OUT: MADI output (64 ch), connect for MADI output signal here. IN: MADI input (64 ch), connect MADI input signal here.
3	SFP	**1 x SFP cage*** Insert SFP module here and connect MADI input/output

Network

Two gigabit-ethernet ports are used for transmission of Audio-over-IP and clock data and to control the device via a web browser interface. Firmware updates of the RAVENNA module also use the network connection.
The networks ports are redundant. Both inputs are being processed while both outputs carry the same stream data. If needed one port can be used for streaming and one port for configuration purposes.

NETWORK Port 1	**RJ 45 socket** Connect here for network transmission.
NETWORK Port 2	**RJ 45 socket** Connect here for network transmission.
NETWORK LED left (Port 1 & 2)	**LED orange - indicates the link state of the network connection*.** (ON) = device link active (OFF) = device link not active
NETWORK LED right (Port 1 & 2)	**LED green - indicates the activity state of the network connection.** (ON) = data sent or received (OFF) = no data transmission

* Some possible reasons that lead to an inactive link:
  • device switched off
  • connected device switched off
  • cabling issue

The bandwidth of the network connection is displayed at the front panel.

NETWORK 100 (Port 1 & 2)	**LED yellow - indicates a 100 Mbit/s connection** ◯ (OFF) = no link ◯ (ON) = link with 100 Mbit/s
NETWORK 1G (Port 1 & 2)	**LED green - indicates a 1 Gbit/s connection** ◯ (OFF) = no link ◯ (ON) = link with 1 Gbit/s
NETWORK STATE	**LED green - indicates the state of the RAVENNA module** ◯ (OFF) = module not ready ◯ (ON) = module ready

USB

The USB port at the rear panel is used for firmware updates of the main frame.

USB	**USB 2.0 socket (Type B)** Connect here for firmware updates.

NOTE

The use of the USB port requires the USB Serial driver (Windows) being installed first. The driver and the installation instructions are available at www.directout.eu.

Clocking

The device offers several options for clocking.

- PTP (Precision Time Protocol) - IEEE1588-2008 / PTPv2
- Word Clock
- Video Reference - NTSC/PAL (black burst)
- MADI input
- internal clock generator (not PTP)

When PTP (network) is selected the device can either act as slave or as network grandmaster. There is also a mechanism provided that allows to auto-negotiate the PTP master/slave state between connected devices.

WCK OUT / IN	2 x BNC socket (coaxial), 75 Ω OUT: word clock output, connect here for word clock output signal (AES11) IN: word clock input, connect word clock signal (AES11) here.
VIDEO SYNC	1 x BNC socket (coaxial), 75 Ω Video reference input, connect video reference signal (black burst) here.

NOTE

If MONTONE.42 is synchronised to a different clock source than PTP it shall be Grandmaster in order to provide synchronised streams. See also "PTP Settings" on page 37.

The front panel informs about selected clock sources and their lock / sync state.

CLOCK SOURCE MADI (port 1 to 4) PTP WCK VIDEO INT	**LED green - indicates the lock / sync state of MADI input, PTP-clock, word clock, video input signal or the internal clock generator.** ○ (OFF)　　　= no signal lock ● (ON)　　　= signal lock, in sync ☼ (blinking)　= signal lock, not in sync with selected clock source 　　　　　　　　or 　　　　　　　input selected as clock source and no signal lock.

Sample Rate

The base rate (44.1 kHz, 48 kHz) and the scaling factor (1 FS, 2 FS, 4 FS) of the main frame is displayed by three leds at the front panel.

SAMPLE RATE 44.1k	**LED green - indicates the base rate of the audio engine.** ○ (OFF) = base rate is different from 44.1 kHz ● (ON) = base rate of 44.1 kHz (or multiple of) is used
SAMPLE RATE 48k	**LED green - indicates the base rate of the audio engine.** ○ (OFF) = base rate is different from 48 kHz ● (ON) = base rate of 48 kHz (or multiple of) is used
SAMPLE RATE 2 FS	**LED yellow - indicates the scaling factor of the base rate.** ○ (OFF) = scaling factor is 1 FS ● (ON) = scaling factor is 2 FS ● (heartbeat) = scaling factor is 4 FS

NOTE

At higher sample rates the number of audio channels of a single MADI stream is reduced depending on the integer of the scaling factor:
- 64 channels at 1 FS
- 32 channels at 2 FS
- 16 channels at 4 FS

MADI Output

The signal format of the MADI output can be adjusted individually for each MADI port. Two leds inform about channel mode and frame format.

The channel mode differs by transmission of either 56 audio channels (56 ch mode) or 64 audio channels (64 ch mode).

The frame format '96k Frame' is available for 2 FS transmission only. 1 FS and 4 FS only use '48k Frame'. At 2 FS it can be either '48k Frame' or '96k Frame'.

FORMAT 56ch	LED green - indicates the use 56 ch mode.
	○ (OFF) = no MADI output uses 56 ch mode
	● (ON) = at least one MADI output uses 56 ch mode
FORMAT 96k	LED yellow - indicates the use of 96k Frame.
	○ (OFF) = no MADI output transmits a 96k Frame signal
	● (ON) = at least one MADI output transmits a 96k Frame signal

Termination

The coaxial connection of the word clock and video input can be terminated with 75 Ω to match the impedance according the wiring. It shall be activated if the signal is not daisy chained to another device.

TERM. 75 Ω	LED yellow - indicates the activation state of 75 Ω termination of the word clock input and video input.
	○ (OFF) = input not terminated
	● (ON) = input terminated with 75 Ω

CHAPTER 5: Front Panel Control

Introduction

The display at the front panel informs about basic settings such as IP address, clocking, status of audio-streams, etc.. The five way push button is used for navigating the menu and adjusting device parameters.

NOTE

To configure streams, to route audio signals and for advanced network setup remote access (Java applet) is required.

Navigation control

Navigation control via the five way push button:

Button	Functions
▲	navigation within hierarchie modify values
▼	navigation within hierarchie modify values
►	navigation across hierarchies enter menu
◄	navigation across hierarchies exit menu
OK	enter edit mode to modify values confirm query

Headphones - Level

The level setting for the volume of the headphones is accessed from the IDLE screen.
- Press the up or down button to enter the volume control setting.
- Modify the level with the up and down buttons

After 10 seconds the page will resume to IDLE screen automatically.

IDLE Screen

The IDLE screen displays two pages for monitoring of:
- PTP-clock
- Status RAVENNA module

Press 'OK' to toggle the display between page 1 and 2.
Exit the menu to resume to IDLE screen (left button).

PTP-clock	Parameter	Values
line 1 (P)	clock state	Master = Module is master Slave = Module is slave
line 2 (J)	max-PTP-clock jitter per second	μ seconds (in slave mode only)
line 3 (O)	offset to clock master	μ seconds (in slave mode only)

Status RAVENNA Module	Parameter	Values
line 1 (E)	State input stream 1 to 32	\<number> solid = stream enabled and connected \<number> blinking = stream enabled, no connection * = stream not enabled
line 2 (A)	State output stream 1 to 32	\<number> solid = stream enabled and connected \<number> blinking = stream enabled, no connection * = stream not enabled
line 3 (P)	\<S> = clock state PTP	\<S> solid = clock state ok \<S> blinking = PTP-clock jitter > 20μs
	\<W> = clock state word clock	\<W> solid = clock state ok \<W> blinking = error, module not PTP master \<W> * = word clock deactivated
	\<M> = master state	\<M> solid = module is PTP master \<M> * = module is not master
	\<S> = slave state	\<S> solid = module is PTP slave \<S> * = module is not slave
	\<O> = one switch jitter filter	\<O> solid = filter is active and ok \<O> blinking = warning- too many PTP packets with high jitter
	\<AE>	\<R> solid = state audio engine Rx (receiver) ok \<R> blinking = errors while receiving audio data \<S> solid = state audio engine Tx (transmitter) ok \<S> blinking = errors while sending audio data

Parameters

The main frame and RAVENNA module each feature an individual set of parameters. Some parameter changes require a reboot of the device to become valid.

Parameters - Main frame

Path	Parameter	Explanation	read only
Information	MB Version	Software version	●
	FPGA Version	Hardware version	●
Configuration	Clock Source	Clock Source of main frame	○
	Sample Rate	Sample rate of main frame (base rate)	○
	Sample Rate FS	Scaling factor of base rate	○
	MADI Channels (1 to 4)	Channel mode for MADI signal output	○
	MADI Frame (1 to 4)	Frame format for MADI signal output	○
	MADI Redundancy	Redundancy modes for the MADI I/Os	○
	Fan min.	Temperature threshhold for minimum fan speed.	○
	Fan max.	Temperature threshhold for maximum fan speed.	○
	Term	Termination for video sync and word clock input.	○
	Default Setting	Restore device settings to factory defaults. Confirmation required!	○
	Language	Menu language	○
	Contrast	Contrast level of display	○

Path	Parameter	Explanation	read only
State	Temperature	Measured internal temperature	●
	Fan	Actual fan speed	●
	Voltage PSU1	Voltage 12 V (PSU1)	●
	Voltage PSU2	Voltage 12 V (PSU2)	●
	Voltage 5P	Voltage 5 V	●
	Voltage 3P3	Voltage 3.3 V	●
	Voltage 1P2	Voltage 1.2 V	●
	Voltage 1P2MGT	Voltage 1.2 V	●

Menu Map - Main frame

```
┌─────────────────┐
│ Phones Volume   │
└─────────────────┘
        ↕
┌─────────────────┐      ┌──────────┐      ┌──────────┐      ┌──────────────┐      ┌──────────────┐
│ IDLE Screen     │ ←──→ │ Menu     │ ←──→ │ Montone  │ ←──→ │ Information  │ ←──→ │ MB Version   │
└─────────────────┘      └──────────┘      └──────────┘      └──────────────┘      └──────────────┘
        ↕                                                                                    ↕
┌─────────────────┐                                                              ┌──────────────┐
│ Phones Volume   │                                                              │ FPGA Version │
└─────────────────┘                                                              └──────────────┘
                                                                                         ↕
                                                  ┌───────────────┐      ┌──────────────┐      ┌──────────┐
                                                  │ Configuration │ ←──→ │ Clock Source │ ←──→ │ MADI 1   │
                                                  └───────────────┘      └──────────────┘      └──────────┘
                                                                                                     ↕
                                                                                               ┌──────────┐
                                                                                               │ MADI 2   │
                                                                                               └──────────┘
                                                                                                     ↕
                                                                                               ┌──────────┐
                                                                                               │ MADI 3   │
                                                                                               └──────────┘
                                                                                                     ↕
                                                                                               ┌──────────┐
                                                                                               │ MADI 4   │
                                                                                               └──────────┘
                                                                                                     ↕
                                                                                               ┌──────────┐
                                                                                               │ PTP      │
                                                                                               └──────────┘
                                                                                                     ↕
                                                                                               ┌──────────┐
                                                                                               │ WCK      │
                                                                                               └──────────┘
                                                                                                     ↕
                                                                                               ┌──────────┐
                                                                                               │ Video    │
                                                                                               └──────────┘
                                                                                                     ↕
                                                                                               ┌──────────┐
                                                                                               │ INT      │
                                                                                               └──────────┘

                                                                         ┌──────────────┐      ┌──────────┐
                                                                         │ Sample Rate  │ ←──→ │ 44.1 k   │
                                                                         └──────────────┘      └──────────┘
                                                                                               ┌──────────┐
                                                                                               │ 48 k     │
                                                                                               └──────────┘

                                                                         ┌──────────────┐      ┌──────────┐
                                                                         │ Sample Rate FS│ ←──→ │ 1 FS     │
                                                                         └──────────────┘      └──────────┘
                                                                                               ┌──────────┐
                                                                                               │ 2 FS     │
                                                                                               └──────────┘
                                                                                               ┌──────────┐
                                                                                               │ 4 FS     │
                                                                                               └──────────┘

                                                                       • ┌──────────────┐      ┌──────────┐
                                                                         │ MADI Channels│ ←──→ │ 56 ch    │
                                                                         └──────────────┘      └──────────┘
                                                                                               ┌──────────┐
                                              • For MADI I/O                                   │ 64 ch    │
                                                #1 to #4 each                                  └──────────┘

                                                                       • ┌──────────────┐      ┌──────────┐
                                                                         │ MADI Frame   │ ←──→ │ 48 k     │
                                                                         └──────────────┘      └──────────┘
                                                                                               ┌──────────┐
                                                                                               │ 96 k     │
                                                                                               └──────────┘

                                                                         ┌───────────────┐      ┌──────────┐
                                                                         │ MADI Redundanc│ ←──→ │ None     │
                                                                         └───────────────┘      └──────────┘
                                                                                                ┌──────────┐
                                                                                                │ M1/M2    │
                                                                                                └──────────┘
                                                                                                ┌──────────┐
                                                                                                │ M3/M4    │
                                                                                                └──────────┘
                                                                                                ┌──────────────────┐
                                                                                                │ M1/M2 & M3/M4    │
                                                                                                └──────────────────┘

                                                                         ┌──────────────┐      ┌──────────────────────┐
                                                                         │ Fan min.     │ ←──→ │ 20°C <= x < Fan max. │
                                                                         └──────────────┘      └──────────────────────┘
                                                                                                ┌──────────────────────┐
                                                                         ┌──────────────┐      │ Fan min. < x <= 60°C │
                                                                         │ Fan max.     │ ←──→ └──────────────────────┘
                                                                         └──────────────┘
```

Phones Volume

IDLE Screen ←→ Menu ←→ Montone ←→ Information ←→ MB Version

Fan max. ←→ Fan min. < x <= 60°C

Term ←→ Off
75 Ohm

Default Setting ←→ No
Yes

Language ←→ Deutsch
English

Contrast ←→ 0- 19

State ←→ Temperature
Fan 1
Fan 2
Voltage PSU1
Voltage PSU2
Voltage 5P
Voltage 3P3
Voltage 1P2
Voltage 1P2MGT

Ravenna Modul ←→ Information ←→ Device Name

Parameters - RAVENNA Module

Path	Parameter	Explanation	read only
Information	Device Name	mDNS name (Bonjour, Zeroconf)	●
	SW Version	Software version	●
	HW Version	Hardware version	●
	MAC Address	Hardware identification of network port 1	●
	IP Address	IP address of device at port 1	●
	Subnet Mask	Range of IP addresses within network	●
	DNS Server	IP Address of Domain Name Server	●
Configuration	Connection Type*	Static IP Address or DHCP/Zeroconf (address is assigned by server)	○
	Dyn. Prot.*	Setting of protocol for dynamic connection	○
	IP Address*	IP address of device	○
	Subnet Mask*	Range of IP addresses within network	○
	DNS Server*	IP Addresse of Domain Name Server	○
	HTTP Port*	Port for remote control (default 80)	○
Default Setting	No	Resume- no changes.	○
	Yes	Restore default settings of device. All settings will be overwritten!	○
Reboot	No	Resume- no changes.	○
	Yes	Restart device. Audio will be interrupted!	○

* requires reboot of the device to become valid.

Menu Map - RAVENNA Module

```
┌──────────────┐
│Phones Volume │
└──────────────┘
       ↕
┌──────────────┐      ┌──────────────┐      ┌──────────────┐      ┌──────────────┐      ┌──────────────┐
│ IDLE Screen  │◄────►│    Menu      │◄────►│   Montone    │◄────►│ Information  │◄────►│  MB Version  │
└──────────────┘      └──────────────┘      └──────────────┘      └──────────────┘      └──────────────┘
       ↕                                            ↑                    ↑                    ↑
                                                    ↓
                                            ┌──────────────┐      ┌──────────────┐      ┌──────────────┐
                                            │ Ravenna Modul│◄────►│ Information  │◄────►│ Device Name  │
                                            └──────────────┘      └──────────────┘      └──────────────┘
                                                                         │                    ↕
                                                                         │             ┌──────────────┐
                                                                         │             │  SW Version  │
                                                                         │             └──────────────┘
                                                                         │                    ↕
                                                                         │             ┌──────────────┐
                                                                         │             │  HW Version  │
                                                                         │             └──────────────┘
                                                                         │                    ↕
                                                                         │             ┌──────────────┐
                                                                         │             │ MAC Address *│
                                                                         │             └──────────────┘      * Port 1
                                                                         │                    ↕
                                                                         │             ┌──────────────┐
                                                                         │             │ IP Address * │
                                                                         │             └──────────────┘
                                                                         │                    ↕
                                                                         │             ┌──────────────┐
                                                                         │             │ Subnet Mask  │
                                                                         │             └──────────────┘
                                                                         │                    ↕
                                                                         │             ┌──────────────┐
                                                                         │             │  DNS Server  │
                                                                         │             └──────────────┘
                                                                         │
                                            ┌──────────────┐      ┌──────────────┐      ┌──────────────┐
                                            │Configuration │◄────►│Connection Typ│◄────►│   dynamic    │
                                            └──────────────┘      └──────────────┘      └──────────────┘
                                                   │                    ↕                    ↕
                                                   │                                  ┌──────────────┐
                                                   │                                  │    static    │
                                                   │                                  └──────────────┘
                                                   │             ┌──────────────┐      ┌──────────────┐
                                                   │             │  Dyn Prot.   │◄────►│DHCP/Zeroconf │
                                                   │             └──────────────┘      └──────────────┘
                                                   │                    ↕
                                                   │             ┌──────────────┐
                                                   │             │  IP Adress   │
                                                   │             └──────────────┘
                                                   │                    ↕
                                                   │             ┌──────────────┐
                                                   │             │ Subnet Mask  │
                                                   │             └──────────────┘
                                                   │                    ↕
                                                   │             ┌──────────────┐
                                                   │             │  DNS Server  │
                                                   │             └──────────────┘
                                                   │                    ↕
                                                   │             ┌──────────────┐
                                                   │             │  HTTP Port   │
                                                   │             └──────────────┘
                                            ┌──────────────┐      ┌──────────────┐
                                            │Default Setting│◄───►│     No       │
                                            └──────────────┘      └──────────────┘
                                                   │                    ↕
                                                   │             ┌──────────────┐
                                                   │             │     Yes      │
                                                   │             └──────────────┘
                                            ┌──────────────┐      ┌──────────────┐
                                            │   Reboot     │◄────►│     No       │
                                            └──────────────┘      └──────────────┘
                                                                        ↕
                                                                 ┌──────────────┐
                                                                 │     Yes      │
                                                                 └──────────────┘
```
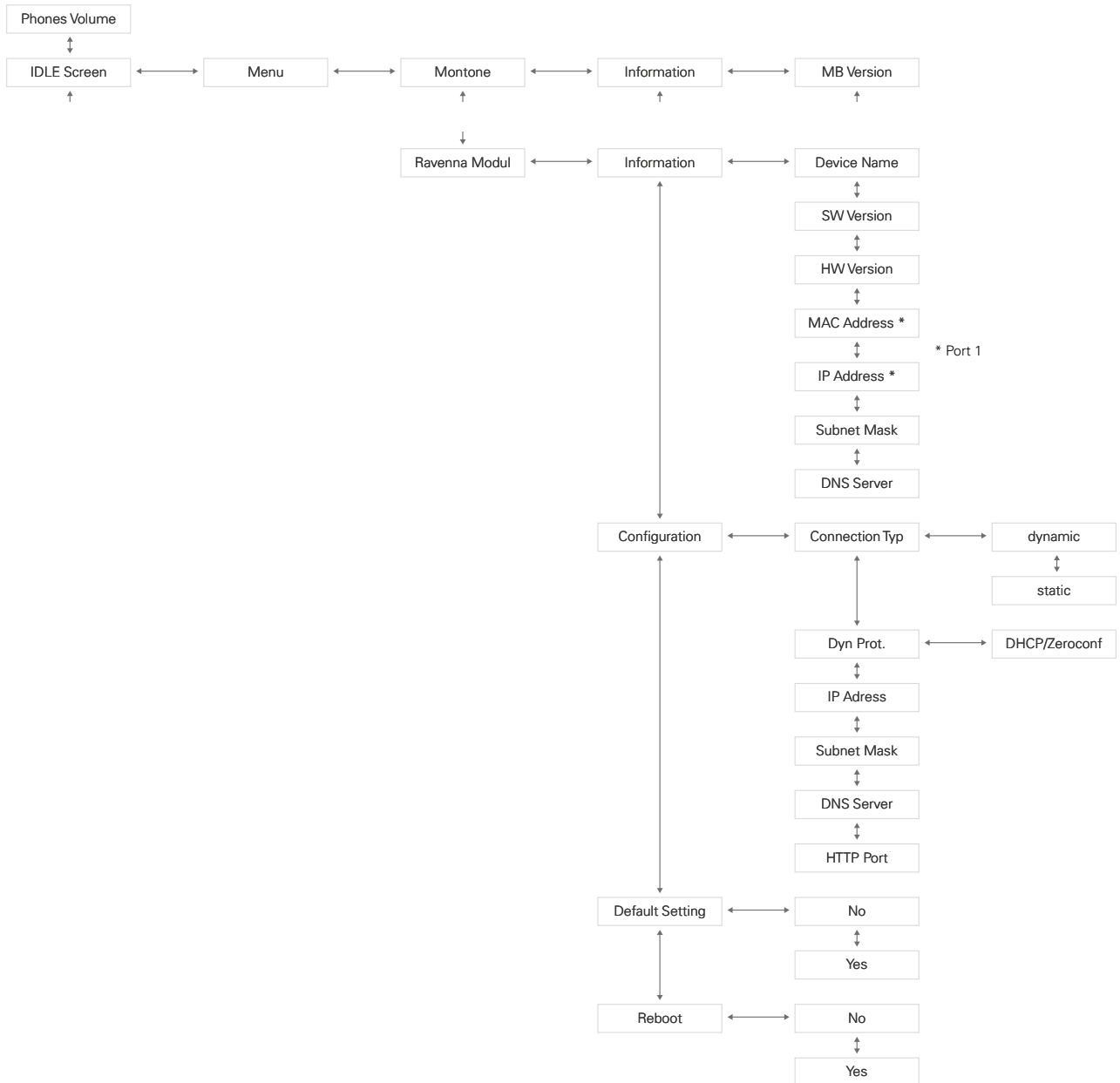
CHAPTER 6: Remote Operation

Introduction

All functions of the device are accessible through a browser based interface (hmtl5 / javascript).

Enter http://<IP Address> (default IP @ PORT 1: 192.168.0.1) in the navigation bar of your browser to open the control page.

The size of the window and the zoom level can be varied. The page is organized in tabs, pulldown menus or hyperlinks offer access to the values of a parameter. Some values use an input field (e.g. IP address).

NOTE

Firmware 2.20 introduced a revised gui replacing the java applet that had been deployed previously.

Status - Overview

The tab 'STATUS' is divided into several sections:

- SYNC   - monitoring sync state, clock selection, links to I/O settings
- NETWORK   - display network info, link to network settings
- DEVICE   - monitoring device info, link to device settings, phones level control
- INPUT STREAMS - monitoring and control input streams, link to input stream settings
- OUTPUT STREAMS - monitoring and control output streams, link to output stream settings

Hyperlinks open a popup window to adjust related settings. Most settings are updated immediately without further notification. To exit a popup window click the button in the top right corner.

Mouse overs are used to display further information (e.g. connection speed of network link).

NOTE

The web user interface updates itself when changes are applied by other instances (other browsers, external control commands).

Status - Sync
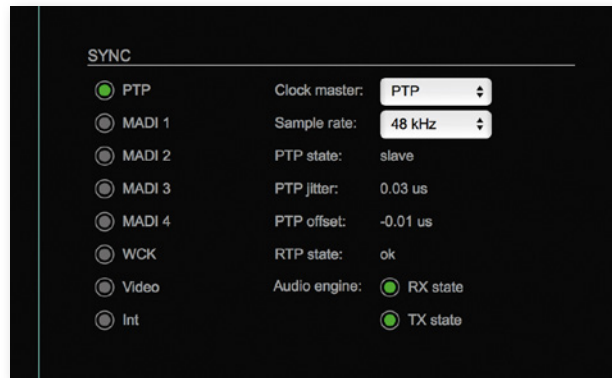
PTP, MADI 1-4, WCK, VIDEO, INT	Displays clock source and state for the main frame: ◯ (OFF) = not locked 🟢 (ON) = locked and in sync with clock master 🔆 (blinking) = locked but not in sync with clock master
Clock master	Pulldown menu to select clock source of the main frame (PTP, MADI 1-4, WCK, VIDEO, INT)
Sample rate	Pulldown menu to adjust sample rate of the main frame (44.1 / 48 / 88.2 / 96 / 176.4 / 192 kHz).
PTP state	State of PTP (Master / Slave).
PTP jitter	PTP-clock jitter per second
PTP offset	Offet relative to PTP-clock master
RTP state	Status of packet processing (OK, Error*)
Audio engine RX state	State of module's audio engine- receiving 🟢 (ON) = ok, receiving data 🔴 (blinking) = not all received packets can be processed
Audio engine TX state	State of module's audio engine- sending 🟢 (ON) = ok, sending data 🔴 (blinking) = not all packets can be sent to the network

* Error: packet time stamps are out of bounds.
  Possible reasons: stream offset may be too small or transmitter or receiver are not synced properly to the Grandmaster.

Hyperlinks:
- PTP / PTP state (p 37)
- MADI 1 to 4 (p 38)
- WCK (p 37)
- VIDEO (p 18)

PTP Settings

PTP Input	Port selection for PTP clock input. 'Port 1 & 2' means input redundancy.
Mode	PTP-clock master / slave configuration is auto negotiated between devices in the network. Module's master / slave state may change automatically.
Profile	PTP profile selection (default E2E, default P2P, media E2E, media P2P, customized)
Customized profile	Edit opens the tab 'ADVANCED' to adjust the custom profile.

WCK / VIDEO

WCK / VIDEO TERMINATION	Termination state for word clock and video inputs (off / on)

MADI 1 to 4

Frame Format	Frame format for MADI output signal (48k / 96k Frame)*
Channel Mode	Channel mode for MADI output signal (56 ch / 64 ch)
Redundance Port	Selection for redundant port (none / 1 and 2 / 3 and 4)
Subcode Transparency	off = new subcode data is generated on = incoming subcode is preserved at the output, depending on the transparency setting.
Transparency Mode	VUCP only = only VUCP bits are preserved ** full = all subcode data is preserved

* 96k Frame format is available at 2 FS operation only.

** Validity (V), User (U), Channel Status (C), Parity (P)

NOTE

Full transparency pass-through of the incoming subcode data may lead to a corrupt output signal when no signal is available from the assigned input source.

The settings are equivalent for all MADI ports.

See „Appendix C- AES3 Transparency" on page 86 for working with subcode data and transmission according to SMPTE ST 2110-31.

Status - Network
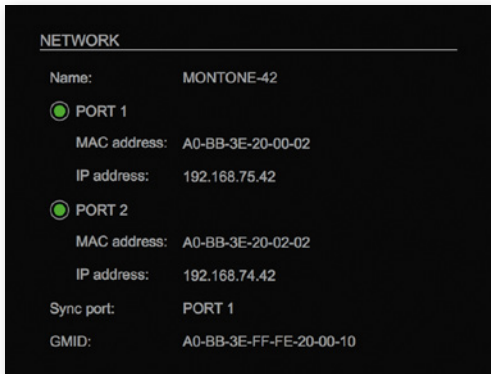
Name	Module's name in the network. Used e.g. for mDNS service. The name needs to be unique throughout the network.
PORT 1 / PORT 2	Monitoring state of network ports ○ (OFF) = not connected ● (ON) = connected with the network
MAC address	Hardware identification of network ports.
IP address	IP address of device
Sync port	Selected port for PTP sync
GMID	Grand Master ID (PTP)

Hyperlinks
- Name / IP address (p 40)

Mouse over:
- LED Port 1- indicating link state and connection speed
- LED Port 2- indicating link state and connection speed

Network Settings

The two network ports are configured individually.

Device name	Input field - Module's name in the network. Used e.g. for mDNS service. The name needs to be unique throughout the network.
Dynamic IP address (IPv4)	Switch to enable the device's DHCP client. IP address is assigned by DHCP server. If no DHCP is available the IP address is determined via Zeroconf.
Static IP address (IPv4)	Switch to disable the device's DHCP client. Manual configuration of network parameters.
IP address (IPv4)	Module´s IP Address
Subnet mask (IPv4)	Module's subnet mask
Gateway (IPv4)	IP address of gateway
DNS server (IPv4)	IP address of DNS server
Apply	Button to confirm changes. Another popup window will appear to confirm a reboot of the module.

Status - Device
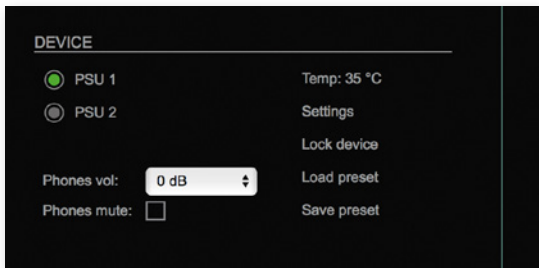
PSU 1 & 2	Indicates state of power supply. ○ (OFF) = power supply inactive ● (ON) = power supply active
Phones vol	Volume setting for headphones output (-∞ to +12)
Phones mute	Click checkbox to mute / unmute the signal of phones output
Temp	Measured internal temperature
Settings	Opens a popup window to configure the device.
Lock device	Lock or unlock the device control. A password is required, it can be defined in the 'Settings'.
Load preset	Opens a dialog to store the device settings to a file. Filetype: .rps
Save preset	Opens a dialog to restore the device settings from a file. Filetype: .rps

Hyperlinks:
- Save preset

Mouse over:
- LED PSU 1- indicating voltage of PSU outputs
- LED PSU 2- indicating voltage of PSU outputs

Settings
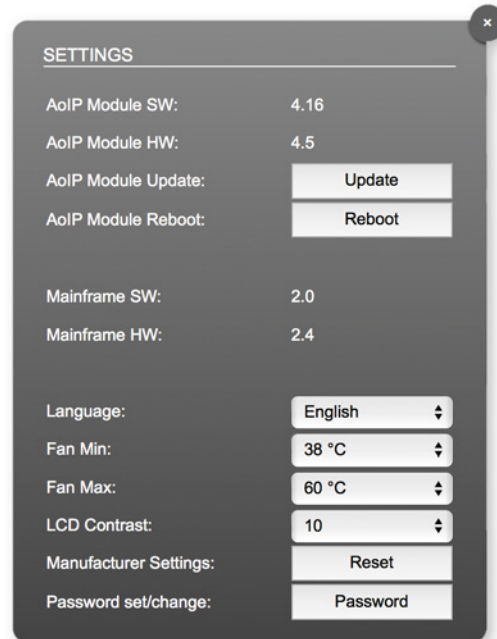
AoIP Module SW	Module´s software version. It is updated together with hardware version via network.
AoIP Module HW	Module´s bitstream version. It is updated together with software version via network.
AoIP Module Update	Opens a dialog for selection of the update file - see "Appendix B- Firmware Update" on page 85.
AoIP Module Reboot	Restart of the AoIP module. Confirmation required. Audio transmission will be interrupted.
Mainframe SW	Software version (MB version) of the mainframe. It is updated together with the hardware version via USB (Firmware Update Tool).
Mainframe HW	Hardware version (FPGA version) of the mainframe. It is updated together with the software version via USB (Firmware Update Tool).
Language	Menu language (english, german).
Fan Min	Temperature threshold for minimum fan speed (20° to 59° C).
Fan Max	Temperature threshold for maximum fan speed (41° to 60° C).
LCD Contrast	Contrast level of front panel display (0 to 19).

Manufacturer Settings Reset	Restore device settings to factory defaults. Confirmation required.
Password set/change Password	Dialog to set or modify the device password.
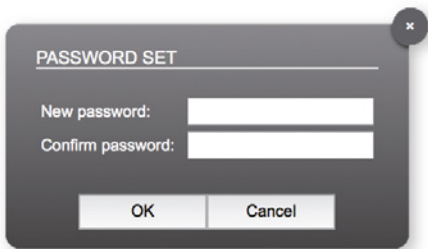
If the password is lost, access can be regained by resetting to factory defaults at the front panel.

NOTE

The password must be 8 to 30 characters long and must not contain the characters <#> and ,<space>.

Lock Device
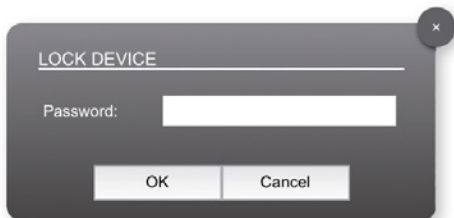
To prevent from unauthorized access, remote operation can be restricted to monitoring display only.

Load Preset
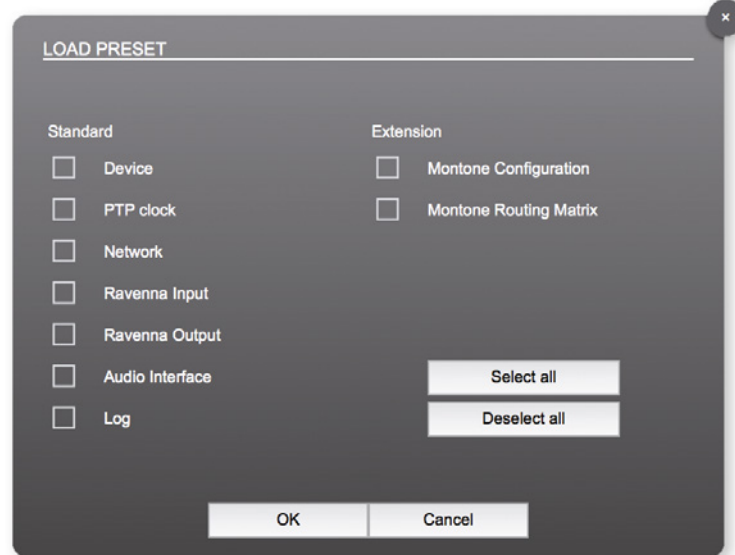
The device configuration can be stored to a single file (.rps).
Restoring the configuration a dialog prompts for selection of individual settings.
This enhances flexibility at setup changes when a particular adjustment shall be preserved or just a single adjustment shall be restored.

Status - Input Streams
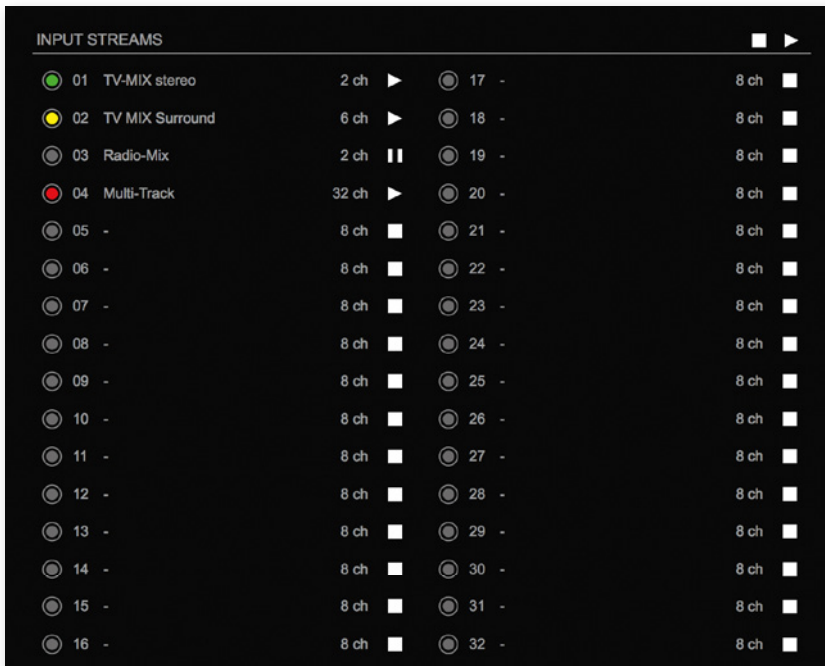
The device can subscribe up to 32 streams. The overview displays the basic information of each stream. The input stream name can be set manually (discovery protocol: manually, see page 54) overriding the SDP's stream name information.

A backup stream can be defined as source after an adjustable timeout. A central active / inactive switch allows to toggle the stream state of all input streams at once.

01 to 32	State of incoming streams
	○ (OFF) = stream not activated
	○ (ON) = stream activated, receiving data
	○ (ON) = stream activated, receiving data via one port only (input redundancy)
	○ (blinking) = stream activated, not receiving data (unicast, connection not established)
01 to 32 Name	Name of stream gathered from SDP or set manually in the stream settings dialog.
01 to 32 xx ch	Number of audio channels transported by the stream

01 to 32 ⏸ ■ ▶	Click to activate or deactivate single stream. ▶ = stream activated ■ = stream deactivated ⏸ = stream not active, defined as backup-stream
INPUT STREAMS ■ ▶	Click to activate or deactivate all streams. ▶ = activate all streams ■ = deactivate all streams (requires confirmation)

Backup Streams

Example:

Backup stream (input 3) that will act as source in the audio matrix if the current session (input 1) fails. Switch-over occurs after the defined timeout (1s).

Stream 3 is marked accordingly in the status view
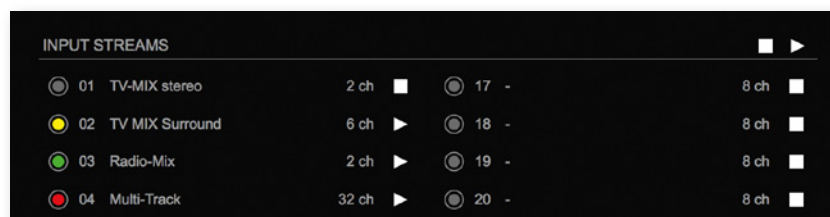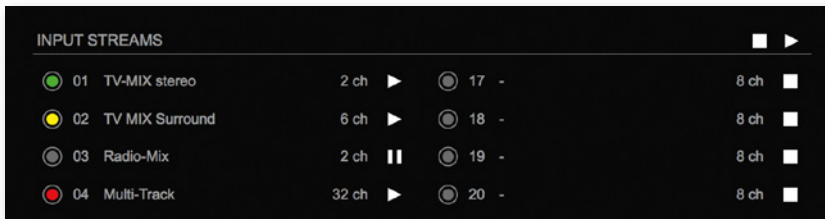
Input 1 failed and Input 3 becomes active after the timeout.

NOTE

In case the main input fails the main stream is stopped (IGMP LEAVE) before the backup stream is being activated. This behaviour ensures that the required network bandwidth does not increase in case of a failure.

Hyperlinks:
- Name (p 48)

Mouse over:
- LED- indicating stream state

NOTE

Firmware 4.2 / 4.7 introduces Source-Specific Multicast (SSM) support for IGMP v3, v2 and v1 added (SSM via protocol only in IGMP v3, SSM via internal filtering is applied for IGMP v2 and v1) - see "Source Specific Multicast" on page 54.

Input Stream Settings

Up to 32 input streams can be subscribed. Each stream is organized in a 'RAVENNA session' (SDP = Session Description Protocol) that describes the stream parameters (audio channels, audio format, etc.).

The stream settings allow to adjust the processing of the received audio data (offset, signal routing). The receiving of stream data starts once the stream has been enabled.

The settings displayed vary depending on the selected discovery protocol.

TIP

A sample offset of at least doubled packet time (samples per frame) is recommended
Example: Samples per frame = 16 (0.333 ms) ⇨ Offset ≥ 32 (0.667 ms)

It may be helpful to alter the stream discovery protocol if an expected stream can't be discovered by the device.

Activate stream	Stores parameters and activates or deactivates the receiving of audio data. (Unicast: additionally the negotiation of the connection)
Stream input	Selects one or both network ports used for stream input. Both ports means input redundancy.
Backup Stream	Selects a backup stream that will act as source in the audio matrix if the current session fails. Switch-over occurs after the defined timeout.
Backup Stream Timeout	Defines timeout [1 s to 120 s] before switch-over to backup stream.
Stream name	Name of stream gathered from SDP
Stream state	Information about stream state: connected not connected receiving data read successfull error
Stream state message	Status info related to stream state - see page 84 for a list of entries.
Stream state offset max	Measured value (maximum). A high value indicates that the media offset of the source might not match the adjusted media offset of the device.
Stream state offset min	Measured value (minimum). The offset should not become negative.
Stream state ip address src PORT 1	Multicast address of input stream subscribed at PORT 1. Unicast transmission: IP address of sender.
Stream state ip address src PORT 2	Multicast address of input stream subscribed at PORT 2. Unicast transmission: IP address of sender.
Offset fine	Enables adjustment of offset in increments of one sample.
Offset in samples	Modules output delay of received audio data (input buffer).
Start channel	Assignment of first stream channel in the audio matrix. E.g. stream with two channels, starting at channel 3 is available at channel 3 & 4 of the routing matrix.
Discovery protocol	Connection protocol or manual setup. RTSP = Real Time Streaming Protocol SIP = Session Initiation Protocol SAP = Session Announcement Protocol
Session PORT 1	Selection of discovered streams at PORT 1
Session PORT 2	Selection of discovered streams at PORT 2

Stream Discovery in AoIP environments is a colorful mixture of different mechanisms. To serve a successful stream management MONTONE.42 provides a bunch of options, not making operation easier but effective.

Discovery RTSP (Session)

Discovery RTSP (URL)

URL	URL (Uniform Ressource Locator) of the session of the device that is serving streams. Examples: rtsp://192.168.74.44/by-id/1 or rtsp://ProducerCom.local:80/by-name/TV-Mix-Stereo
Receive SDP	Recalls the stream configuration of the defined session(s).

NOTE

In case the automatic stream announcement and discovery of RAVENNA streams fails or cannot be used in a given network, the stream's SDP file can also be obtained via an RTSP URL.

Discovery SIP (Session) - Unicast streams only

Number of channels	Number of audio channels in the stream
RTP-Payload-ID	RTP-Payload-ID of the audio stream (Real-Time Transport Protocol). Describes the format of the transported content.
Audio Format	Stream's audio format (L16 / L24 / L32 / AM824)*
Samples per Frame	Number of blocks containing payload (audio) per ethernet frame - see packet time on p 82.
RTP dst port	Stream's destination port for RTP
RTCP dst port	Stream's destination port for RTCP (Real-Time Control Protocol)

* L16 = 16 bit audio / L24 = 24 bit audio / L32 = 32 bit audio /
  AM824 = standardized according to IEC 61883, allows AES3 transparent
  transmission (SMPTE ST 2110-31).

Discovery SIP (URL) - Unicast streams only

URL	URL (Uniform Ressource Locator) of the session of the device that is serving streams.
Receive SDP	Recalls the stream configuration of the defined session(s).
Number of channels	Number of audio channels in the stream
RTP-Payload-ID	RTP-Payload-ID of the audio stream (Real-Time Transport Protocol). Describes the format of the transported content.
Audio Format	Stream's audio format (L16 / L24 / L32 / AM824)*
Samples per Frame	Number of blocks containing payload (audio) per ethernet frame - see packet time on p 82.
RTP dst port	Stream's destination port for RTP
RTCP dst port	Stream's destination port for RTCP (Real-Time Control Protocol)
SIP route	SIP-router-address that is used for SIP communication

* L16 = 16 bit audio / L24 = 24 bit audio / L32 = 32 bit audio / AM824 = standardized according to IEC 61883, allows AES3 transparent transmission (SMPTE ST 2110-31).

Discovery SAP

Discovery protocol:	SAP (Dante/AES67 Session)
Session PORT 1:	Radio-Mix@PORT 1
Session PORT 2:	

SAP is used in Dante environments.

Manual Setup

Stream name (manual)	Stream name for display in status view and matrix. Can be specified individually, different than the name gathered from the SDP.
Number of channels	Number of audio channels in the stream
RTP-Payload-ID	RTP-Payload-ID of the audio stream (Real-Time Transport Protocol). Describes the format of the transported content.
Audio Format	Stream's audio format (L16 / L24 / L32 / AM824)
Media Offset	Offset between stream's timestamp and PTP-clock
Dst IP address	Multicast IP address of audio stream
SSM	Activate Source Specific Multicast filter for this stream.*
Src IP address	IP address of sending device.*
RTP dst port	Stream's destination port for RTP
RTCP dst port	Stream's destination port for RTCP (Real-Time Control Protocol)

* An RTP packet contains the IP address of the sender (source IP) and the stream's multicast address (destination IP). With SSM activated the receiver only accepts RTP packets of a certain destination IP that are originated by a sender with the specified source IP.

NOTE

RTP Payload ID must match between sender and receiver.

Status - Output Streams

The device can send up to 32 streams. The overview displays the basic information of each stream.

01 to 32	State of outgoing streams ⚪ (OFF) = stream not activated 🟢 (ON) = stream activated, sending data 🟡 (ON) = stream activated, stream output via both ports selected, but one port is not linked to the network.
01 to 32 Name	Name of stream defined in the settings
01 to 32 xx ch	Number of audio channels transported by the stream
01 to 32 ■ ▶	Activate or deactivate stream. ▶ = stream activated ■ = stream deactivated
OUTPUT STREAMS ■ ▶	Click to activate or deactivate all streams. ▶ = activate all streams ■ = deactivate all streams (requires confirmation)

Hyperlinks:
- Name (p 56)

Mouse over:
- LED- indicating stream state

Output Stream Settings

```
01 - OUTPUT STREAM SETTINGS

Activate Stream:                              [ ]
Stream Output:                                PORT 1 & 2        ▼

Stream name (ASCII):                          Stage-A
    RTSP URL (HTTP tunnel) (by-name):         rtsp://MONTONE-42.local:80/by-name/Stage-A
    RTSP URL (HTTP tunnel) (by-id):           rtsp://MONTONE-42.local:80/by-id/1
    RTSP URL (by-name):                       rtsp://MONTONE-42.local/by-name/Stage-A
    RTSP URL (by-id):                         rtsp://MONTONE-42.local/by-id/1
    SIP URI:                                  sip:Stage-A@MONTONE-42.local

    SDP:                                      v=0
                                              o=- 1 2557959301 IN IP4 192.168.74.42
                                              s=Stage-A
                                              t=0 0
                                              a=group:DUP S1 S2

Unicast:                                      [ ]
RTP payload ID:                               98
Samples per Frame (packet time):              48 (1.00 ms)     ▼
Audio format:                                 L24              ▼
Start channel:                                1                ▼
Number of channels:                           8                ▼


PORT 1                                        PORT 2

RTP dst port:          5004                   RTP dst port:          5004
RTCP dst port:         5005                   RTCP dst port:         5005
Dst IP address (IPv4): 239.69.1.1             Dst IP address (IPv4): 239.2.0.1
Use SIP server:        [ ]                    Use SIP server:        [ ]
SIP server URL:                               SIP server URL:
```

Up to 32 output streams can be sent to the network. Each stream is organized in a session (SDP = Session Description Protocol) that describes the stream parameters (audio channels, audio format, packet time, etc.), which can be adjusted in these settings.

Each stream may be labelled with an individual stream name (ASCII) which is useful for enhanced comfort at organizing the setup. To start the transmission the stream needs to be activated.

TIP

Once the stream is active, the SDP data is displayed and may be copied from the window or downloaded via http://<montone.42>/sdp.html?ID=<stream no.>.

Activate stream	Stores parameters and activates or deactivates the trasnmission of audio data. (Unicast: additionally the negotiation of the connection)
Stream Output	Selects one or both network ports used for stream output. Both ports means output redundancy.
Stream name (ASCII)	Individually defined name of an output stream. It is used in the URL which is indicated in different ways below.*
RTSP URL (HTTP tunnel) (by-name) / (by id)	Current used RTSP-URL of stream with HTTP port used for RTSP, stream name or stream id.
RTSP URL (by-name) / (by id)	Current used RTSP-URL of stream with stream name or stream id.
SIP URL	Current used SIP-URL of stream.
SDP	SDP data of the active stream.
Unicast	If activated, the stream is sent in unicast mode.**
RTP payload ID	Stream's payload id
Samples per Frame	Number of blocks containing payload (audio) per ethernet frame - see packet time on p 82.
Audio format	Stream's audio format (L16 / L24 / L32 / AM824) ***
Start channel	Assignment of first stream channel from the audio matrix. E.g. stream with eight channels, starting at channel 3 is fed from channel 3 to 10 of the routing matrix.
Number of channels	Number of audio channels in the stream.
RTP dst port	Stream's destination port for RTP
RTCP dst port	Stream's destination port for RTCP (Real-Time Control Protocol)
Dst IP address (IPv4)	Stream's IP address for multicast (should be unique for each stream).
Use SIP server	If activated, the RAVENNA module will register at the defined SIP server.
SIP server URL	URL of SIP server for registering.

*   Only ASCII characters are allowed.

** A unicast stream can only be received by one device. If a device is already receiving the stream, further connection calls by other clients are answered with ‚service unavailable' (503). The release time after disconnect or interruption of the client's connection amounts to about 2 minutes.

*** L16 = 16 bit audio / L24 = 24 bit audio / L32 = 32 bit audio / AM824 = standardized according to IEC 61883, allows AES3 transparent transmission (SMPTE ST 2110-31).

AES67 and ST 2110-30

TIP

AES67 Streams

To create output streams for interoperability in AES67 environments please consult the information document Info - AES67 Streams.

TIP

SMPTE 2110-30/31 Streams

To create output streams for interoperability in SMPTE ST 2110 environments please consult the information document Info - ST2110-30 Streams.

Both documents are available on the product page.

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Matrix
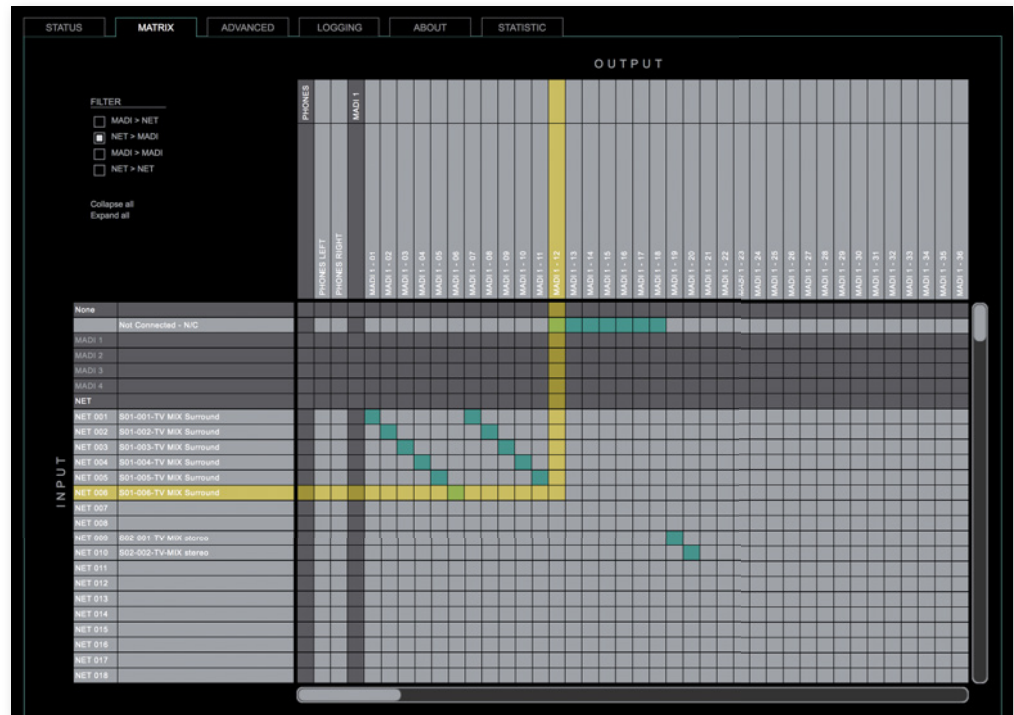
The tab 'MATRIX' manages 256 MADI channels (MADI 1 to MADI 4) and 256 network channels (NET 001 to NET 256).

Organisation

- Inputs   -   vertical column
- Outputs -   horizontal row
- Click on MADI 1 to 4 or NET to expand or collapse the corresponding i/o.
- NET i/os display the stream label in the second column or row of assigned streams.
- Stream label: <SXX>-<XXX>-<Stream Name>
  S<XX> = numbering of the stream in the tab 'STATUS'
  <XXX> = numbering of audio channels contained in stream

Filter

Viewing filters can be applied to focus on used areas for patching.

MADI > NET	MADI inputs and NET outputs
NET > MADI	NET inputs and MADI outputs
MADI > MADI	MADI inputs and MADI outputs
NET > NET	NET inputs and NET outputs
Collapse all	all i/os collapsed
Expand all	all i/os expanded

Patching

- A yellow crossline marks the hotspot for setting a patch.
- Patches are marked be a green square.
- To set a patch
  Move the hotspot to the desired position + Click
- To delete a patch
  Move the hotspot up to ‚Not Connected- NC' + Click
  or
  ALT + Click the current patch
- Multi-channel patches (diagonal and horizontal):
  SHIFT + Click start + Click end
- Multi-channel patches to N/C
  ALT + SHIFT + Click start + Click end

Advanced - Overview

The tab 'ADVANCED' is divided into several sections:

- PTP SETTINGS   - definition of PTP source, mode and profile
- PTP PROFILE CURRENT SETTINGS   - definition of a customized PTP profile
- CURRENT PTP MASTER   - monitoring PTP characteristics
- PTP STATISTIC   - monitoring device's PTP state, jitter and delay
- PTP CLOCK SETTINGS   - definition of adaption algorithms to reduce jitter
- NETWORK ADVANCED SETTINGS   - definition of network and QoS characteristics
- PTP JITTER   - graphical display of measured PTP jitter

Advanced - PTP Settings

PTP Input	Selects one or both network ports used for PTP input. Both ports means input redundancy. *	
IP Mode	Multicast =	Sync messages and delay request are sent as multicast message to every node within the network.
	Hybrid =	Sync messages are sent as multicast, delay requests are sent as unicast messages directly to the Grandmaster or Boundary Clock.**
	Unicast =	Sync messages are sent as unicast, delay requests are sent as unicast messages directly to the Grandmaster or Boundary Clock.***

* Using redundant PTP-operation a switch-over is triggered not only at signal loss of the Grandmaster but depends on the quality of the PTP clock. Changes (e.g. clock class) are observed permanently and the algorithm decides for the best signal present.

** Hybrid Mode reduces the workload for all nodes in the network as they do not receive the (unnecessary) delay requests from other devices anymore.

*** Unicast Mode may help when multicast routing is not possible within the network. As an opposite to the Hybrid Mode it increases the workload of the grandmaster since sync messages must be sent to each single slave individually.

PTP SETTINGS	
PTP Input:	PORT 2
IP mode:	Unicast
Mode:	slave only
Profile:	media E2E

Mode	auto	= PTP-clock master / slave configuration is auto negotiated between devices in the network. Module's master / slave state may change automatically.
	slave only	= PTP-clock slave configuration is preferred. Module clocks to another device in the network
	preferred master	= PTP-clock master configuration is preferred. Module acts as network grandmaster. Priority values are adjusted automatically to ensure Grandmaster status. *
	master only	= PTP-clock master is forced. **
Profile	Selects predefined PTP profile (default E2E, default P2P, media E2E, media P2P) or activates customized PTP profile.	

*   If more than one device announces as PTP-clock master the network Grandmaster is determined following the Best Master Clock Algorithm (BMCA).

**   'Master only' configures the device to act as Unicast Grandmaster. This setting is available only with PTP Mode set to 'unicast'

NOTE

PTP profile ‚customized' allows for individual adjustment of the PTP parameters. If profile is set to ‚media' or ‚default' the PTP parameters cannot be altered and are displayed only. Factory default setting is PTP Media Profile E2E.

Advanced - PTP Unicast
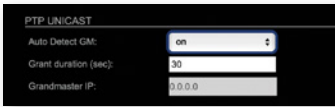
Auto Detect GM	on = enables the automatic detection of the grandmaster * off = IP address of grandmaster needs to be defined manually
Grant duration (sec)	Time period during which the slave receives sync messages from the grandmaster.**
Grandmaster IP	IP address of the grandmaster. ***

*   'Auto Detect GM' is a proprietary function and might not be supported by 3rd party GMs.

**   Depending on the temporary workload of the grandmaster the negotiation may fail.

*** This value is used only with 'Auto Detect GM' set to <off>.

About PTP Unicast

Since the BMCA is not available with PTP unicast, the PTP properties of the devices require some extra configuration.

Example:

Grandmaster	IP Mode Unicast, Mode Master only
Slave(s)	IP Mode Unicast, Mode Slave Only, Auto Detect GM ON, Grant Duration 30 sec

Advanced - PTP Profile Customized Settings

The settings become available with PTP profile set to 'customized'.

Clock class	PTP-clock's class according to IEEE 1588 [read only]
Accuracy	PTP-clock's accuracy according to IEEE 1588 [read only]
Clock domain PORT 1	PTP-clock's domain at PORT 1
Clock domain PORT 2	PTP-clock's domain at PORT 2
Priority 1	Priority setting for master announcement (the smaller the value the higher the priority)
Priority 2	If value 'Priority1' (and other PTP-clock parameters) of more than one device in the network match: Priority setting for master announcement (the smaller the value the higher the priority)
Announce	Intervall of sending announce-packets for auto-negotiation.
Sync	Intervall of sending sync-packets to the PTP-clock slaves in the network.
Min delay request	Intervall of sending End-To-End packets of PTP-clock slave to PTP-clock master. To determine the offset slave-to-master.
Min pdelay request	Intervall of sending Peer-To-Peer packets between two PTP-clocks. To determine the offset master-to-slave and slave-to-master.
Announce receipt timeout	Number of missed announce-packets (threshold) to reinitialize the negotiation of PTP-clock master.
One step clock	Timestamp of PTP-clock is integrated in PTP-sync-packets. No follow-up packets are sent. No = Two step clock is used
Slave only	PTP-clock is always slave.
Delay mechanism	E2E- Offset slave-to-master is determined by End-To-End packets. P2P- Offset master-to-slave and slave-to-master is determined by Peer-To-Peer packets.

Advanced - Current PTP Master

Monitoring display only.

Clock class	PTP-clock's class according to IEEE 1588
Accuracy	PTP-clock's accuracy according to IEEE 1588
Clock domain	PTP-clock's domain at selected input port
Priority 1	Priority setting for master announcement (the smaller the value the higher the priority)
Priority 2	If value 'Priority1' (and other PTP-clock parameters) of more than one device in the network match: Priority setting for master announcement (the smaller the value the higher the priority)
GMID	ID of current Grandmaster
Sync port	Selected port for PTP clock
IPv4	IP address of Grandmaster or switch *

* when using a boundary clock

Advanced - PTP Statistic
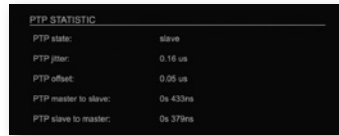
Monitoring display only.

PTP state	Information about current PTP-clock state:
	    intialize
	    error
	    deactivated
	    receiving data
	    pre master
	    master
	    passive
	    not calibrated
	    slave

PTP jitter	PTP-clock jitter in microseconds (µs)
PTP offset	Offset relative to PTP-clock master
PTP master to slave	Absolute offset master-to-slave in nanoseconds
PTP slave to master	Absolute offset slave-to-master in nanoseconds

Advanced - PTP Clock Setting

No PTP Switch 1 Gbit/s	Adapted PTP-clock algorithm to reduce clock jitter using 1 GB network switches without PTP support. Max. number of 1 Gbit/s switches: less than 10
No PTP Switch 100 Mbit/s	Adapted PTP-clock algorithm to reduce clock jitter using 100 MB network switches without PTP support. Max. number of 100 Mbit/s switches: 1

Advanced - Network Advanced Settings
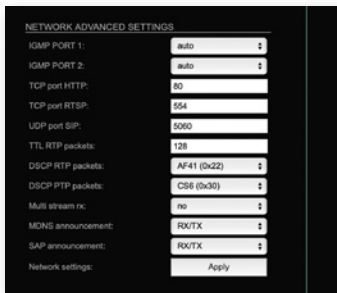
IGMP PORT 1	Definition or auto-select of IGMP version used to connect to a multicast router at port 1.
IGMP PORT 2	Definition or auto-select of IGMP version used to connect to a multicast router at port 2
TCP port HTTP	TCP port for HTTP
TCP port RTSP	TCP port for RTSP
UDP port SIP	UDP port for SIP
TTL RTP packets	Time-To-Live of RTP packets - default: 128
DSCP RTP packets	DSCP marking of QoS of RTP packets - default: AF41
DSCP PTP packets	DSCP marking for QoS of PTP packets - default: CS6*
Multi stream rx	If activated, the device allows to subscribe to the same multicast stream more than one time - default: off
MDNS announcement	Announcement of streams via MDNS can be controlled to optimize network traffic or CPU load. Values: Off, RX, TX or RX/TX **
SAP announcement	Announcement of streams via SAP can be controlled to optimize network traffic or CPU load. Values: Off, RX , TX or RX/TX **
Network settings Apply	Confirms and saves changes being made. Reboot required.

*   AES67 specifies EF, but some implementations use EF for Audio streaming.
   To avoid overlapping of RTP and PTP packets in the same queue CS6 has been
   chosen as default.

** RX = receive, TX = transmit, RX/TX = receive and transmit

NOTE

Firmware 4.2 / 4.7 introduces Source-Specific Multicast (SSM) support for IGMP
v3, v2 and v1 added (SSM via protocol only in IGMP v3, SSM via internal filtering is
applied for IGMP v2 and v1) - see "Source Specific Multicast" on page 54.

Advanced - PTP Jitter
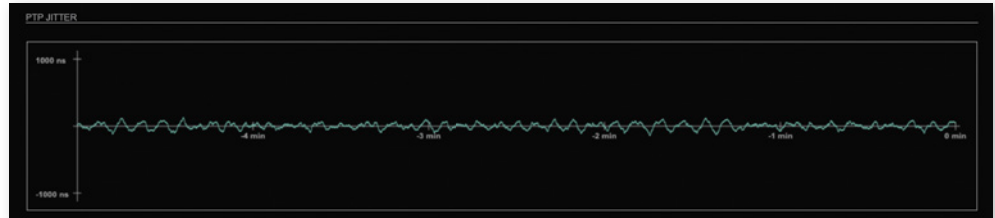
Graphical display of measured PTP jitter.

NOTE

An error message next to Jitter measurement is displayed if delay requests are not being answered by Grandmaster.

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Logging
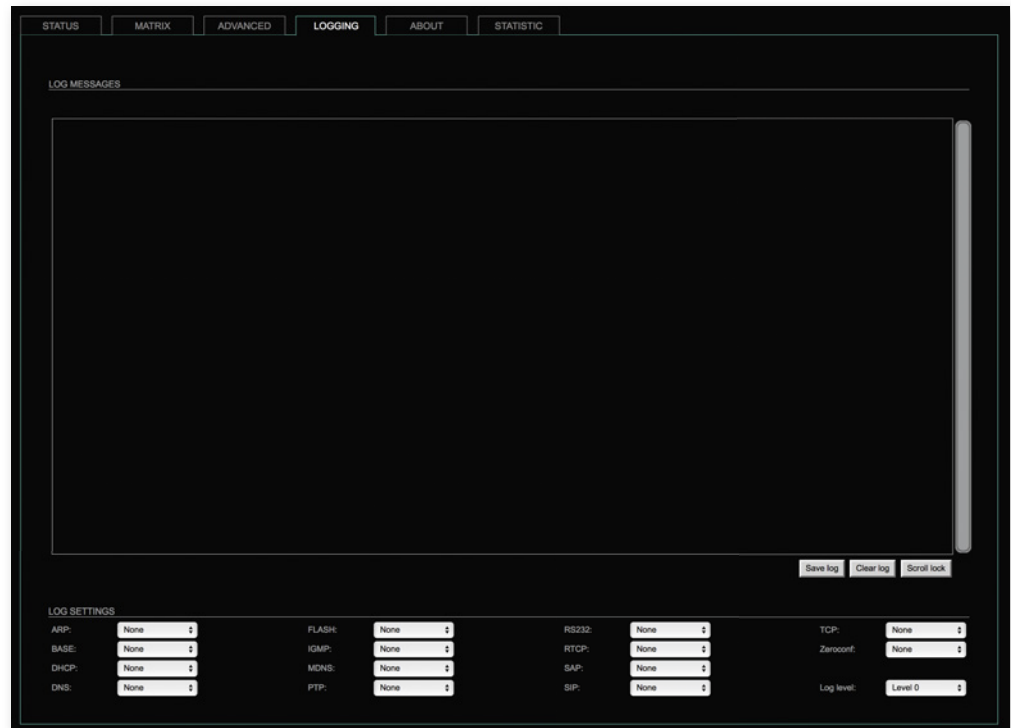
The tab 'LOGGING' displays logging depending on the 'Log Settings'. The logging can be enabled individually for different protocols, each of with an adjustable filter. An adjustable log level specifies the information detail of each entry.

To save a log the content of the view can be copied and pasted to a text document.

Log Level

0	log data
1	level and log data
2	protocol, level and log data
3	protocol, process-id of requesting process, process-id of running process, level and log data
4	protocol, process-id of requesting process, process-id of running process, level, processor time in ticks and log data
5	protocol, process-id of requesting process, process-id of running process, level, processor time in ticks, file name and line and log data

Protocol Types

ARP	Address Resolution Protocol
BASE	Basic operation of module
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
FLASH	Process for updating the module
IGMP	Internet Group Management Protocol
MDNS	Multicast Domain Name System
PTP	Precision Time Protocol
RS232	Serial Protocol
RTCP	Real Time Control Protocol
SAP	Session Announcement Protocol
SIP	Session Initiation Protocol
TCP	Transmission Control Protocol
Zeroconf	Zero Configuration Protocol

Log Filter

NONE	logging disabled
ERROR	error occurred
WARNING	warnings- condition that may lead to unwanted behavior or an error
INFO 1	log info* + warning + error
INFO 2	log info* + warning + error
INFO 3	log info* + warning + error
INFO 4	log info* + warning + error

* increasing amount of log info starting from ‚INFO 1'

Log Operation

Save log	Downloads the current log entries to a text-file (log.txt).
Clear log	Deletes all log entries without further prompt.
Scroll lock	Interrupts automatic scrolling of the list view to allow copying the content to a text file via copy & paste. If scrolling is stopped for a longer period of time the display may not list all entries.

Statistic
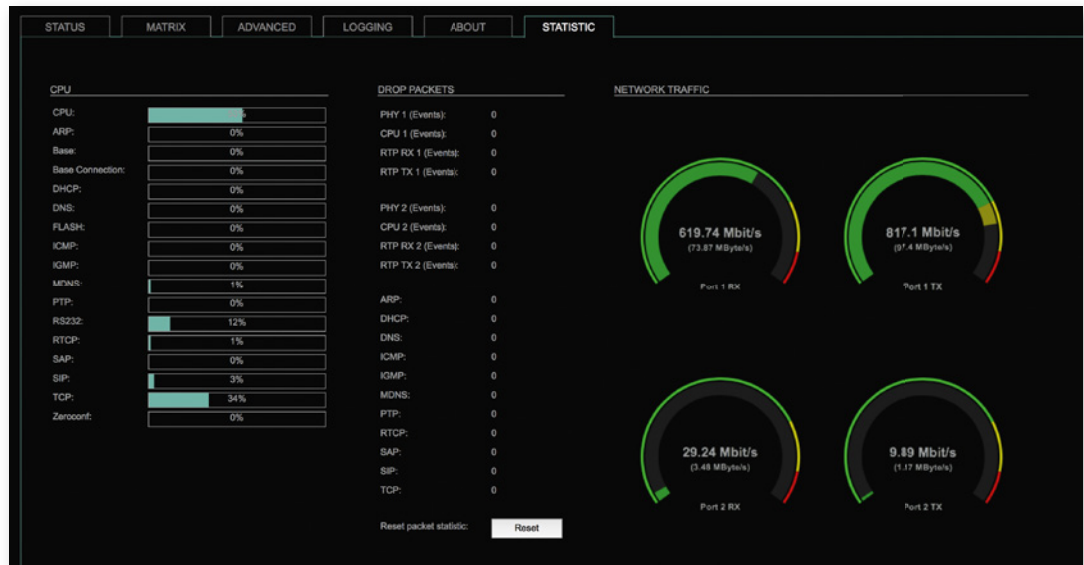
The tab 'STATISTIC' displays an overview of the CPU load of the particular processes, an error counter and a monitor display to indicate the incoming (RX) and outgoing (TX) network traffic on both network ports individually.

See "Protocol Types" on page 73.

CHAPTER 7: 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
DirectOut representative or visit 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.
No signal at the output port.	Connections (input / output) are mixed up.	Check the connections and change the cables if necessary. Check the routing matrix.
No signal at the output port.	Signal cable defective.	Exchange the signal cable.
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.
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.
Stream does not connect	stream configuration not suited or matching	check stream configuration, especially IP address, ports and payload ID, SSM active?

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Maintenance

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

NOTE!

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

CHAPTER 8: Technical Data

Dimensions
- Width 19'' (483 mm)
- Height 1 RU (44.5 mm)
- Depth 10'' (254 mm)
- Weight about 4 kg

Power Consumption
- 15 W (typical)

Power Supply
- 2 x 84 V- 264 V AC / 47 Hz- 63 Hz / Safety class 1

Fuses
- Fuse 250 V- 2 A (slow-blow) – 2 fuses per power supply

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

MADI Port SC optical
- 1 x SC socket FDDI (input / output)
- ISO/IEC 9314-3
- Wave length 1310 nm
- Multi-Mode 62.5/125 or 50/125

MADI Port BNC coaxial
- 2 x BNC socket (input / output)
- Impedance: 75 Ω
- 0.3 V up to 0.6 V (peak to peak)

MADI Port SFP
- 1 x SFP (empty cage without module)

Word Clock
- 2 x BNC socket (input / output)
- Impedance: 75 Ω (termination switchable)

Video Sync
- 1 x BNC socket (input)
- PAL / NTSC (black burst)
- Impedance: 75 Ω (termination switchable)

Sample Rate
- 30- 50 kHz @1 FS
- 60- 100 kHz @2 FS
- 120- 200 kHz @4FS

MADI Format (I/O)
- 48k Frame, 96k Frame
- 56 channel, 64 channel

Phones
- 1 x TRS jack 6.3 mm (stereo)
- Level: +11 dBu
- SNR:-113 dB /-117 dBA
- THD+N:-104 dB
- THD:-101 dB

USB
- 1 x USB socket (Type B)
- for firmware updates

NETWORK
- 2 x RJ45 socket (Gigabit Ethernet)
- for transmission of Audio-over-IP and control data and firmware updates

NETWORK LAYER
- Layer 3

NETWORK I/O
- 32 streams
- 256 channels

STANDARDS
- RAVENNA
- AES67
- SMPTE ST 2110-30 (Uncompressed audio)
- SMPTE ST 2110-31 (AES3 Transparent Transport)
- SMPTE ST 2022-7 (Stream Redundancy)
- SMPTE ST 2059 (PTP, acting as slave only)

Index

Glossary

Audio Format	Payload format of audio data- also known as 'codec'
Bonjour	Apple´s implementation of zeroconf.
DiffServ	Differentiated Services- mechanism for classifying and managing network traffic, prioritization of services (e.g. low-latency traffic)
DSCP	The differentiated services code point (DSCP) is a 6-bit field in the IP packet header that is used for classification purposes. DSCP is part of the differentiated services architecture.
IGMP	Internet Group Management Protocol (IGMP) is a communications protocol used by hosts to report their multicast group memberships to IPv4 routers.
IP	Internet Protocol- used to build logical units (subnets) in a network
HTTP	Hyper Text Transfer Protocol- data transmission for application layer, e.g. websites
Latency	delay introduced by packetizing or buffering- number of samples per frame divided by sample rate- also known as 'frame size'
mDNS	Multicast DNS- resolves host names to IP addresses, part of zeroconf
Multicast	one sender to many receivers
Packet	formatted unit of data- consists of control information and user data (payload)
Packet Time	The real-time duration of the media data contained in a media packet. For example, a packet containing 24 samples of 48 kHz audio has a packet time of 24 ÷ 48 kHz = 500 microseconds. Short packet times allow for lower latency but introduce overhead and high packet rates that may overtax some devices or networks. Long packet times imply higher latency and require additional buffering which may not be available on memory-constrained devices.
PTP	Precision Time Protocol- used to synchronize clocks throughout a network- defined in IEEE 1588-2008
QoS	Quality of Service- overall performance of a network
RTP	Real Time Transport Protocol- used for transmission of realtime data
RTCP	Real Time Control Protocol- controls quality of transmission and negogiates QoS parameters

RTSP	Real Time Streaming Protocol- controls media streaming server, 'network remote'
SDP	Session Description Protocol- describes the configuration of a stream
Session	describes the stream parameters (audio format, number of channels,…)
Unicast	point to point connection between sender and receiver
URL	Uniform Resource Locator- references to a resource on a network.
Zeroconf	assignment of numeric network addresses for networked devices, automatic distribution and resolution of computer hostnames, and automatic location of network services

Appendix A - Stream State Messages

Status info related to stream state:

Errors:

    error: SDP method ‚DESCRIBE' not available

    error: SDP method ‚SETUP' not available

    error: transmission failure

    error: service not available

    error: SDP- audio format not matching

    error: SDP- faulty ip-address for origin (‚o=')

    error: SDP- faulty ip-address for connection data (‚c=')

    error: SDP- error in media description (‚m=')

    error: SDP- error in attribute ‚rtmap' (‚a=rtmap')

    error: SDP- parsing of SDP failed

    error: connection timeout

    error: SDP- number of channels not correct

    error: SDP- sample rate invalid

    error: SDP- unicast transmission not supported by connection protocol

    error: SIP- SDP not acceptable (603)

    error: SIP- global failure (6xx)

    error: SIP- server error (5xx)

    error: SIP- client error (4xx)

    error: SAP- related SDP not found in cache

Warnings:

    warning: SDP- PTP clock domain not correct

    warning: SDP- wrong PTP master

    warning: SDP- attribute 'ptime' larger than offset ('a=ptime')

    warning: SDP method 'DESCRIBE' not available

Appendix B - Firmware Update

The MONTONE.42 is the mainframe hosting a network module.

Updating Mainframe
The mainframe is updated via USB using the Firmware Update Tool ('DO Update').
Visit www.directout.eu and navigate to the MONTONE.42 product page.
Download:
- Installation USB Control - this document will guide you through the necessary steps
- Firmware MONTONE.42 Mainframe
- Firmware Update Tool
- USB Serial Driver

Updating Network Module
The network module is updated via network.
Visit www.directout.eu and navigate to the MONTONE.42 product page.
Download:
- Firmware RAVENNA Module

Open the control page of the device and navigate to the tab STATUS and click SETTINGS in the top right corner (p 42).

Click 'Update' and browse to the update file after unzipping first.
Example: aoip_hw_4_2_sw_4_7.update

Folllow the instructions displayed.

WARNING!

It is strongly recommended to backup the device configuration (Save Preset) before running any update.

Appendix C - AES3 Transparency

Firmware 4.5 / 4.16 introduces support according to SMPTE ST 2110-31 (AES3 Transparent Support).

For transparent AES3 transmission:
- set Audio Format to 'AM824' (see Output Stream Settings on page 57)
- set Subcode Transparency to 'on' and define the Transparency mode (see MADI 1 to 4 on page 38)

NOTE

To accomodate the most applications (e.g. Dolby E transmission) transparency mode VUCP is sufficient.

Full transparency pass-through of the incoming subcode data may lead to a corrupt output signal when no signal is available from the assigned input source.