DirectOut TECHNOLOGIES

SG.MADI

User's Manual

Version 1.2

Table of contents

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

SG.MADI is a SoundGrid / MADI converter linking SoundGrid® and MADI (AES10), offering extra features tailored for broadcast, live and studio applications.

SoundGrid® is a layer2-based network protocol offered by Waves for Audio-over-Ethernet networking and real-time processing solutions to deliver uncompressed, multi-channel, low-latency digital audio over Ethernet networks.

Feature Summary

MADI Ports	2 x I/O ports - individually configurable with BNC coaxial, SC optical or SFP
MADI Formats	56/64 channel, 48k/96k Frame
Sample Rates	44.1, 48, 88.2, 96 kHz +/-12.5%
Network	2 x RJ45 Socket (1 Gbit/s), 128 channels (I/O)
Mic Input	2 x XLR, phantom power switchable
Line Out	2 x XLR, balanced with trim controller
Headphone Out	1 x 6.3 mm TRS jack, unbalanced with trim controller
Audio Driver	Windows® (ASIO), macOS® (Core Audio)
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

The device is controlled via network from a computer running the SoundGrid Studio application which is used for configuring and patching hardware and software I/Os on the SoundGrid network and the local SoundGrid ASIO/Core Audio driver.

Available I/Os:

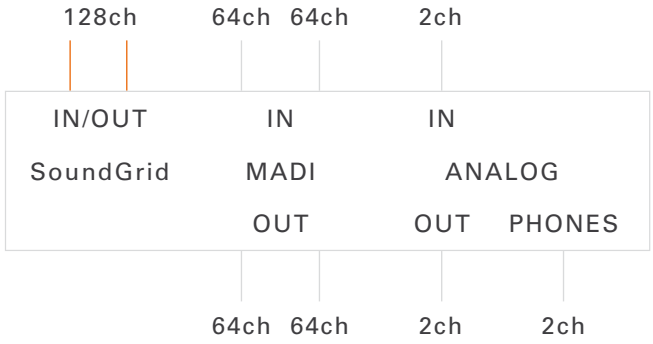
- 128 channels network audio I/O, SoundGrid
- 128 channels MADI I/O
- 2 channels analog I/O + Headphones output

Applications

SG.MADI meets a rich set of challenging applications:

- multi-stage venues connecting MADI and SoundGrid® consoles
- monitoring SoundGrid® and MADI signals
- inserting SoundGrid® DSP Server with Waves plug-ins into a MADI environment
- integrating outboard equipment and DAWs to a SoundGrid® environment
- remote control of external components via SoundGrid® / MADI

Scheme



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 5° C and 45° C and a maximum relative humidity of 80 %, non-condensing.
- The cabinet of the device will heat up. Do not place the device close to 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.

Intended Operation

SG.MADI is designed for conversion / routing between network audio and MADI signals. MADI refers to AES10, network audio refers to SoundGrid® from Waves.

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 two years for all components that are essential for proper and intended operation of the device. The date of purchase is applied for this period.
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 2002/95/EC.

WEEE

(Directive on Waste Electrical and Electronic Equipment)
Due to the directive 2002/96/EC for waste disposal this device must be recycled.
For correct recycling please dispatch the device to:
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 SG.MADI package should include:

- 1 x SG.MADI (19'', 1 RU)
- 2 x power chord
- 1 x fixing unit for power plug
- 1 x Manual

To complete the delivery please download from the Waves website: www.waves.com

- Waves Central

You will need to register with a Waves account.

Accessory

Two different optical SFP transceiver 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 5° C and 45° C and a maximum relative humidity of 80%, non-condensing.
Ensure that the unit has sufficient air circulation for cooling.

3. 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.

WARNING!

All module slots must be fitted with a module each. Otherwise live parts become accessible which may cause serious harm to your health. An open housing may also cause inappropriate operation conditions due to an insufficient electromagnetic shielding.

5. Plug in the network cable to the ethernet port(s) to connect the device with your computer.

NOTE

If you are using one SG.MADI unit, connect it directly to your computer's gigabit ethernet port using the supplied cable.
If you are using multiple interfaces, connect them all to a SoundGrid-compatible switch, and connect the switch to your computer's ethernet port.
A list of approved switches is available at:
www.waves.com > Products > Hardware > SoundGrid Switches.

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

WARNING!

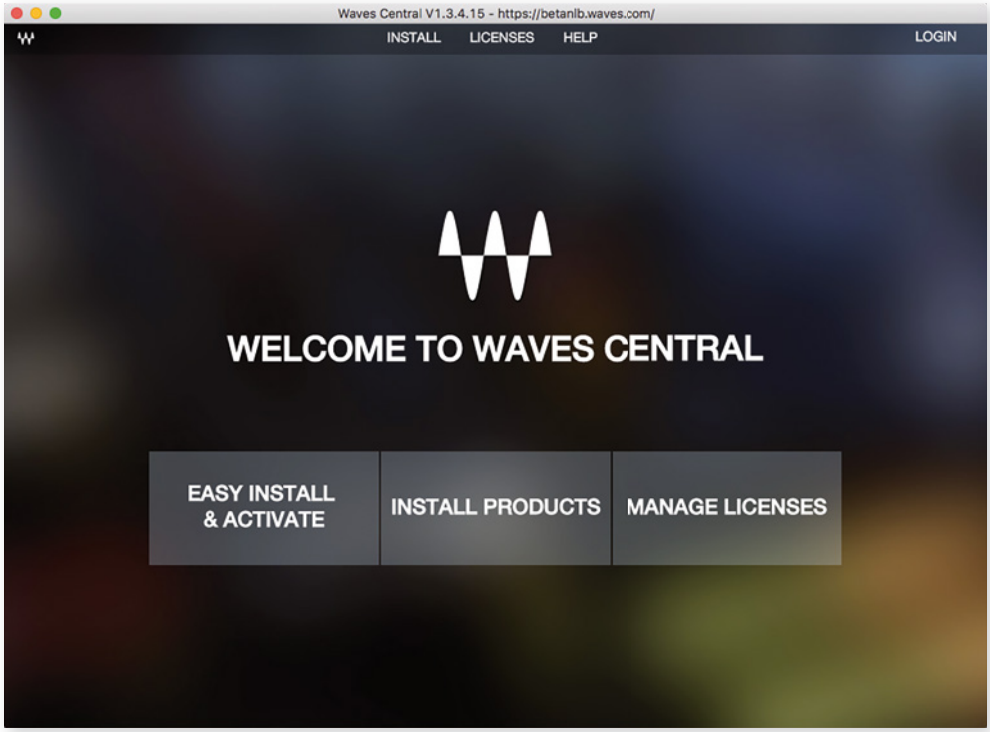
This device must be connected to the mains using the three-cord power leads supplied with the system. Only supply the voltages and signals indicated (84 V – 264 V).

7. Turn on the power switch.

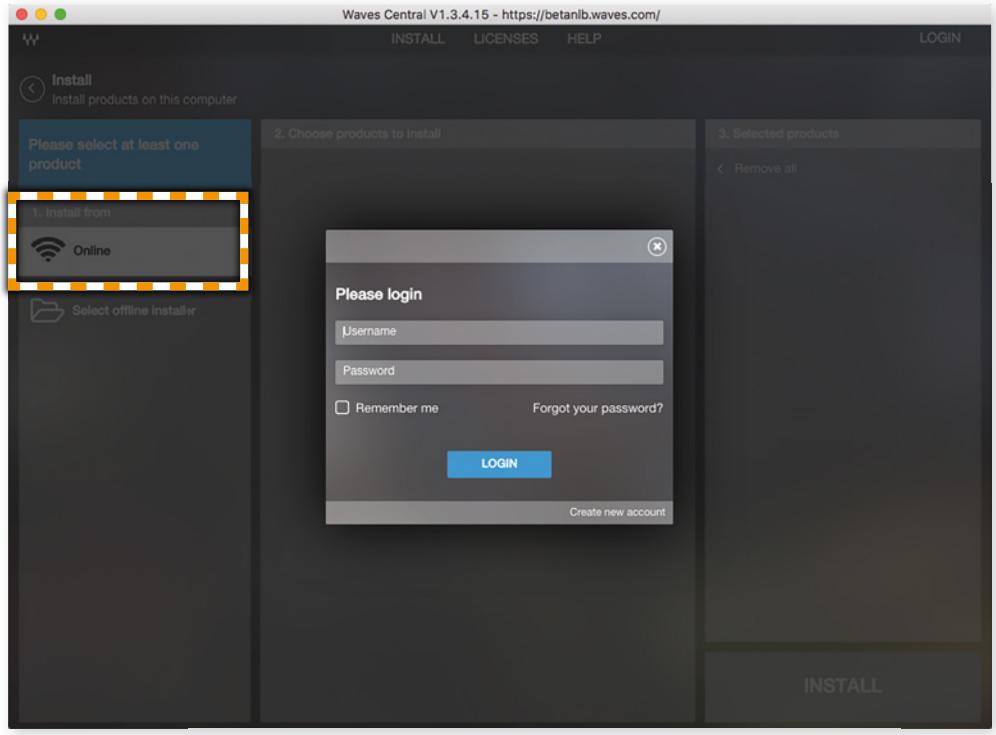
8. Download 'Waves Central' for Mac or PC, as needed.
Link: www.waves.com > Downloads > Latest Version

9. Run the installer and follow the onscreen instructions when finished.
Launch Waves Central.

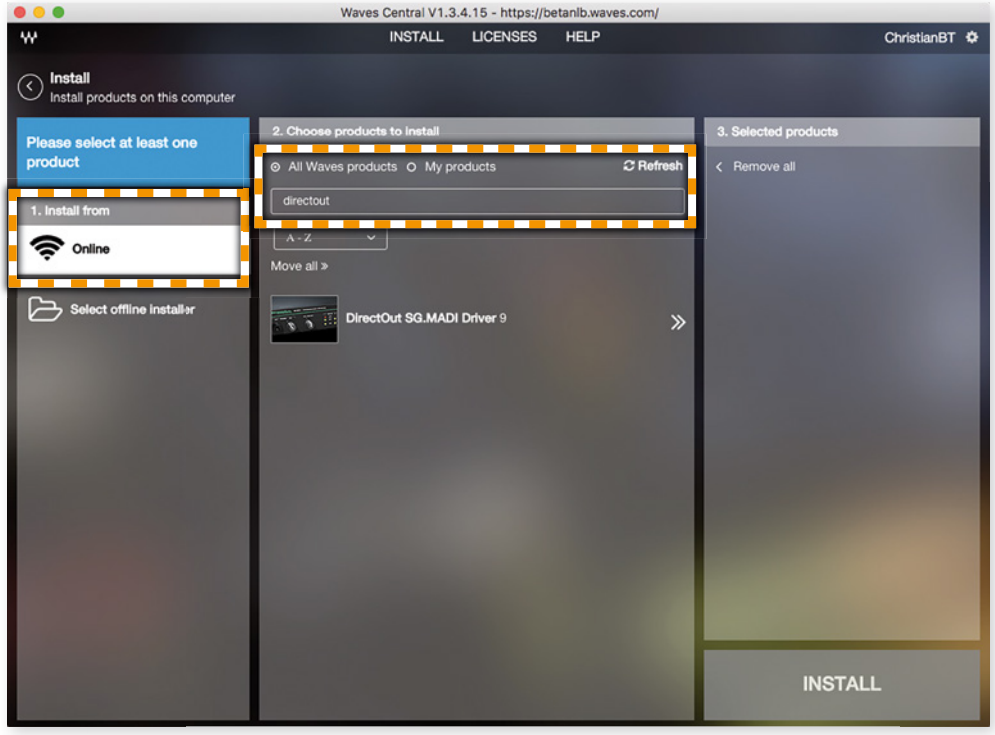
10. Click on 'INSTALL PRODUCTS'.



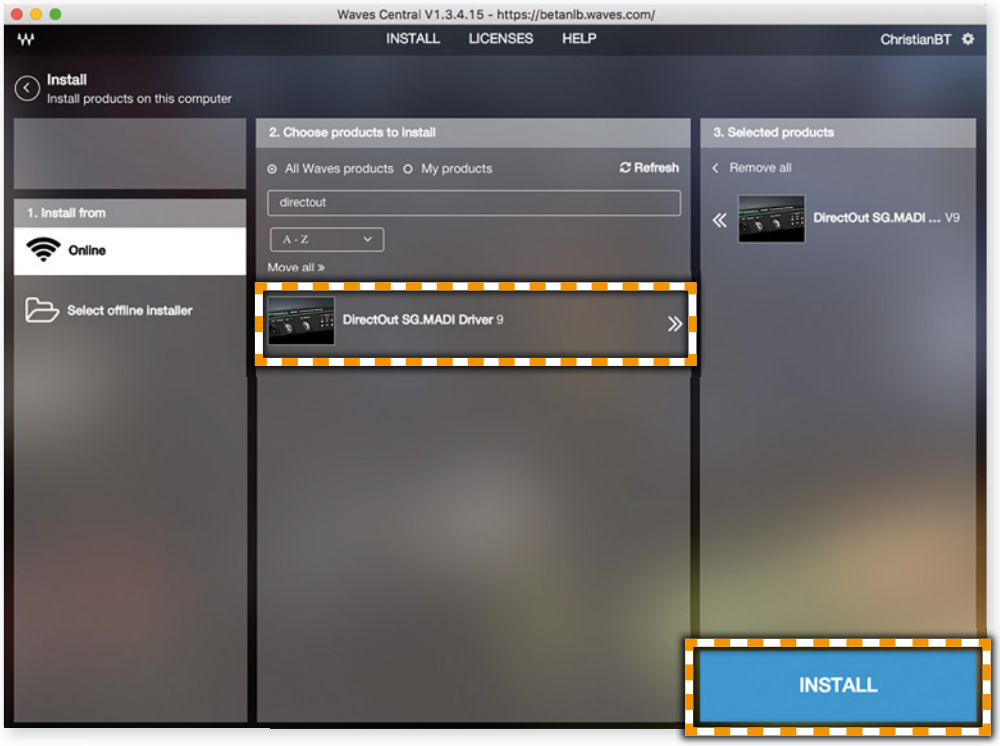
11. Select 'Online' in the leftmost column to install from online. The login dialog will appear. Login with your Waves account.



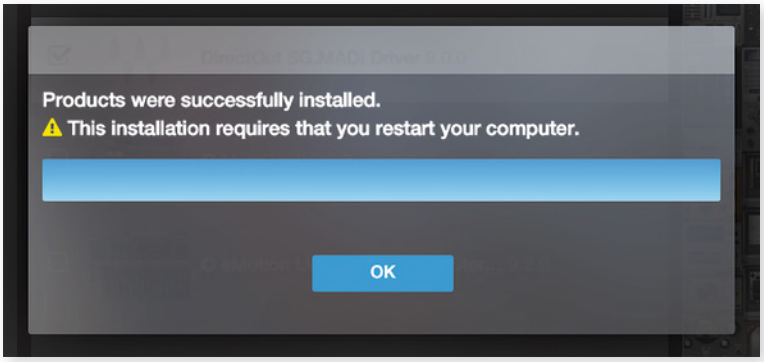
12. Search 'All Waves products' for 'directout'.



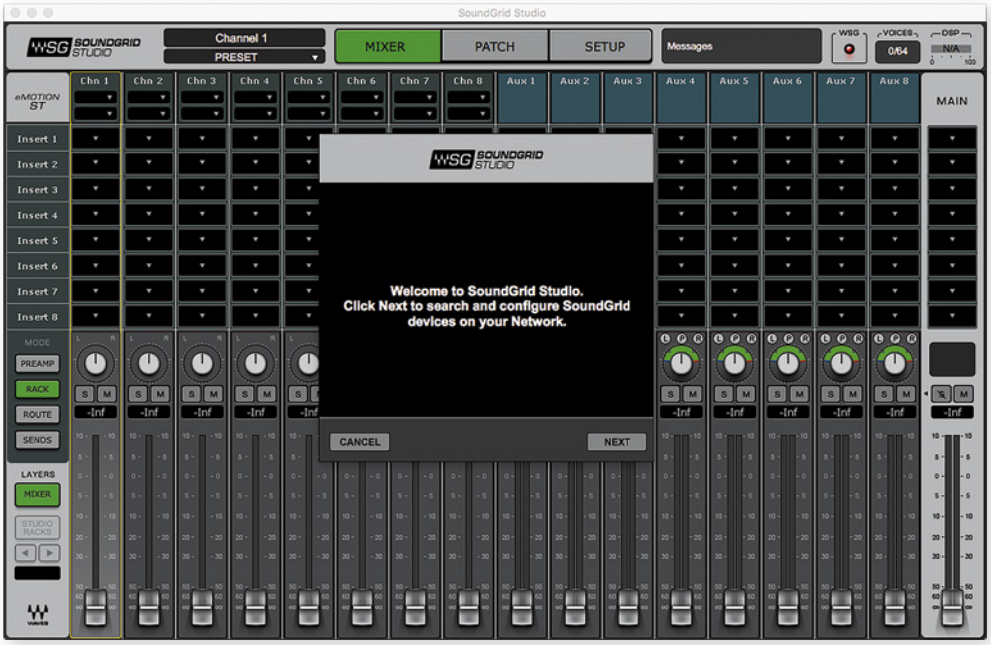
13. Choose 'DirectOut SG.MADI Driver 9' to move it to the rightmost installation column and click the button 'INSTALL' to start the installation process.



14. Restart your computer.



15. Launch 'SoundGrid Studio' and follow the instructions.



SoundGrid Studio will scan the network for devices and update the device's firmware if necessary.

WARNING

Never disconnect any connection (network, power supply) during the firmware update process. Disconnecting may lead to a defective device state which may require to return the device to factory.

Firmware update running.

16. Restart the SG.MADI device after the update.

The control panel is described in „CHAPTER 5: Controlling“ on page 29.

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

NOTE

Scaling factor 4 FS is currently not supported by SoundGrid.

Global Control

LEDs on the front panel indicate the power supply.

PSU 1 & 2 [rear]	**Switch** Enable / disable power supply.
PSU 1 & 2 [rear]	**2 x C13 socket** Connect the power supply here (84- 264 V AC).
PSU 1 & 2 [front]	**LED (green) - indicates state of power supply** (OFF) = power supply not working (ON) = power supply working (blinking) = power supply has stopped 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 two slots each of can house one of three different i/o-modules.

Available are:

- SC optical multi-mode or single-mode
- BNC coaxial, 75 Ω
- SFP (without module - see„Accessory“ on page 13)

MADI 1 OUT / IN	**2 x SC socket (optical)*** OUT: MADI output, connect for MADI output signal here. IN: MADI input, connect MADI input signal here.
MADI 2 OUT / IN	**2 x BNC socket (coaxial)*** OUT: MADI output, connect for MADI output signal here. IN: MADI input, connect MADI input signal here.

* configuration example

Modules

SC module

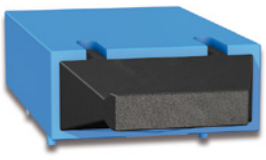
BNC module

SFP module

Single-Mode / Multi-Mode

The SC ports are multi-mode as default. It is possible to equip the device with single-mode SC ports. The housing of single-mode ports is colored blue.

multi-mode



single-mode

Analog Signals

Two analog I/Os and a headphones output are available. The line output and the headphones output feature a level trim controller at the front. For the analog inputs there is a led display monitoring input level and status of phantom power.

MIC INPUT 1 & 2	**2 x XLR female, balanced*** Connect analog input signal here.
LINE OUTPUT 1 & 2	**2 x XLR male, balanced** Connect for analog output signal here.
PHONES OUT	**1 x TRS jack 6.3 mm (stereo)** Connect for headphones output signal here.
PHONES VOL	**1 x Potentiometer for volume control of headphones output**** Turn the knob to adjust the volume.
VOL LINE OUT	**1 x Potentiometer for volume control of line output**** Turn the knob to adjust the volume.
MIC IN (1 & 2) OVR	**LED (red): indicates an analog input overload.** (ON) = analog input signal equals to more than -1 dBFS
MIC IN (1 & 2) SIG	**LED (green): indicates signal level of channel input.** (ON) = analog input signal equals to more than -80 dBFS. The light intensity of the LED depends on the audio level.
MIC IN (1 & 2) P48	**LED (yellow): indicates activation status of phantom power** (OFF) = phantom power not active (ON) = phantom power active

* Phantom power (48 V) and gain control are accessible in the remote control. The input sensitivity ranges from - 56 to + 24 dBu, corresponding a gain range from 0 to 80 dB, which is adjustable in 1 dB steps.

** Both a fader in the remote control and the potentiometer affect the level - see page 38. The setting of the potentiometer is not reflected in the remote control.

Network

Two gigabit-ethernet ports are used for transmission of network audio and to control the device. Firmware updates also use the network connection.

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

NOTE

For correct operation of the SoundGrid network a dedicated network card supporting 1 Gbit/s is required on your computer.

Clocking

The device offers several options for clocking.

- MADI input
- SoundGrid (SoE)
- Word Clock
- Internal clock generator

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.

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

SYNC MADI (Port 1 & 2) SG WCK INT	**LED green - indicates the lock / sync state of MADI input, SoundGrid, word clock 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) is displayed by four 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.*** (ON) = scaling factor is 2 FS
SAMPLE RATE 4 FS	**LED (white) - indicates the scaling factor of the base rate.*** (ON) = scaling factor is 4 FS

* If both LED 2 FS and 4 FS are off, the scaling factor is 1 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

Scaling factor 4 FS is currently not supported by SoundGrid.

Termination

The coaxial connection of the word clock 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.

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

SG State

The status of the SoundGrid network card is monitored by a LED at the front.

SG STATE	**LED (RGB) - indicates the state of the SoundGrid card.** ● (ON, blue) = normal operation, all ok ● (blinking, red) = no SG host connected or network cable not connected ● (ON, yellow) = firmware update in progress ● (various colors) = identification

GPI / GPO

Two GPIs and two GPOs are available via DSUB-9 connectors

Each GPI (General Purpose Input) can be triggered by connecting the input pin with ground (GND) or by a voltage source between input pin and ground. The high level of the voltage may range between 2 V and 24 V due to a safety limiter in the input.

Each GPO (General Purpose Output) uses a low resistance (FET) switch to ground (GND). It can handle an external voltage source between 0 V and 24 V.
A 5 V local voltage source can also be used for signalling purposes. Its output is current-limited to 200 mA.

GPI	**DSUB-9 socket (female)** Connect for two GPIs. Pinout: see „Appendix A-Wiring Sketches“ on page 52
GPO	**DSUB-9 socket (female)** Connect for two GPOs. Pinout: see „Appendix A-Wiring Sketches“ on page 52

CHAPTER 5: Controlling

SoundGrid host

The remote control of SG.MADI requires a SoundGrid host application such as SoundGrid Studio, MultiRack SoundGrid or eMotion LV1 being installed. From here the control panel for SG.MADI can be launched.

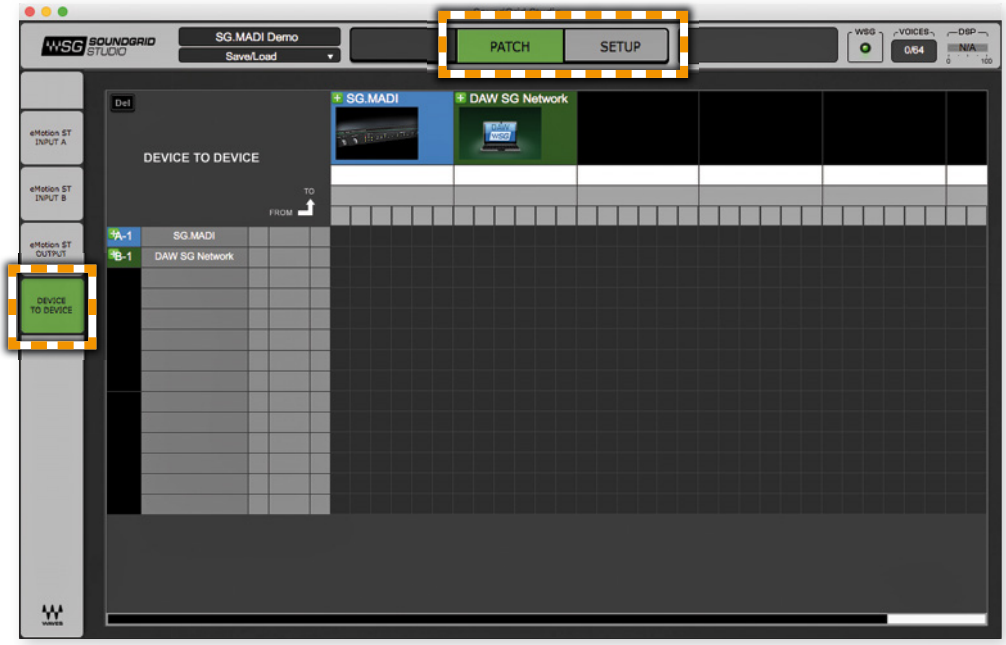
SoundGrid Studio in setup mode showing SG.MADI in the device rack of the system inventory.

Next to the device there are three buttons:

FW	**Indicates the status of the device's firmware** grey = firmware compatible blue = firmware compatible, but newer version exists red = firmware not compatible and must be updated in order to use.
ID	**Button**. Click to show a rainbow pattern on the LED 'SG STATE' at the front panel.
Control wheel	**Button** Click to open the control panel for SG.MADI

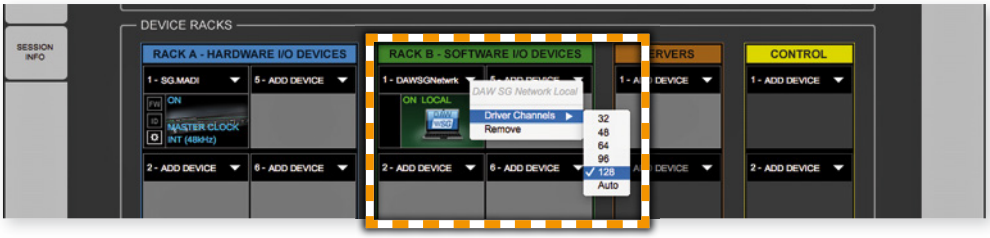
Signal Routing

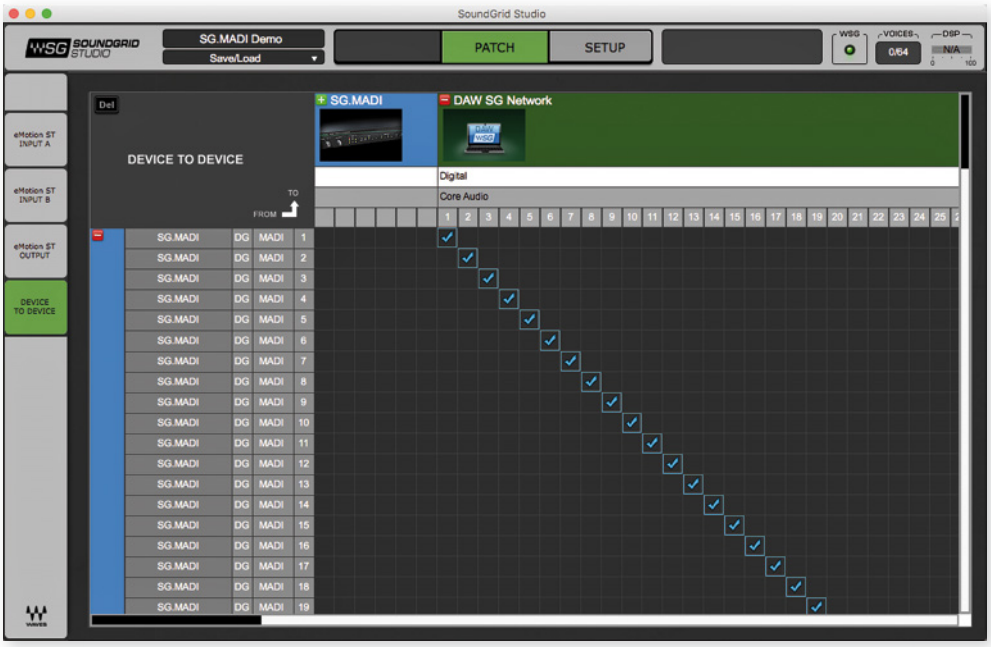
To setup your signal routing between devices open the tab ‚PATCH' and switch to the routing matrix ‚DEVICE TO DEVICE. With SG.MADI connected you should see two MADI I/Os and 128 channels of SoundGrid.



Matrix in collapsed view. 'SG.MADI' are the two MADI I/Os of SG.MADI. 'DAW SG Network' is the SoundGrid Network (Core Audio driver).

- Inputs are arranged vertically, outputs are arranged horizontally.
- The name of the devices can be modified, double click the name to edit.
- If there is no signal detected at a MADI input the matrix will show 56 input channels.
- The patches can be saved / restored to / from a file via the button ‚Save/Load'.
- Signal Routing for the analog I/Os is accessible in the tab 'SETUP' of the SG.MADI control panel - see page 38 or page 40.
- The number of SoundGrid Driver channels is adjustable in the system inventory (setup mode).

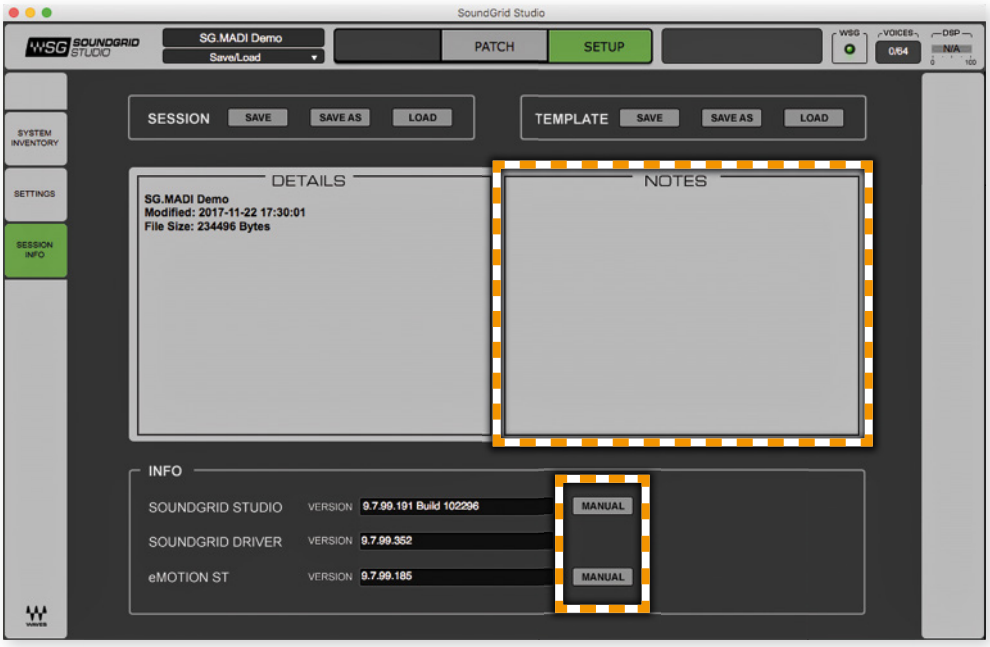




Matrix in expanded view. Example: 1:1 patch MADI input to SoundGrid network.

Session Info

The tab ‘SESSION INFO’ in the section ‘SETUP’ can be used to add notes to a routing session. Further it offers a links to further information around SoundGrid Studio and eMotion ST.



SG.MADI Control

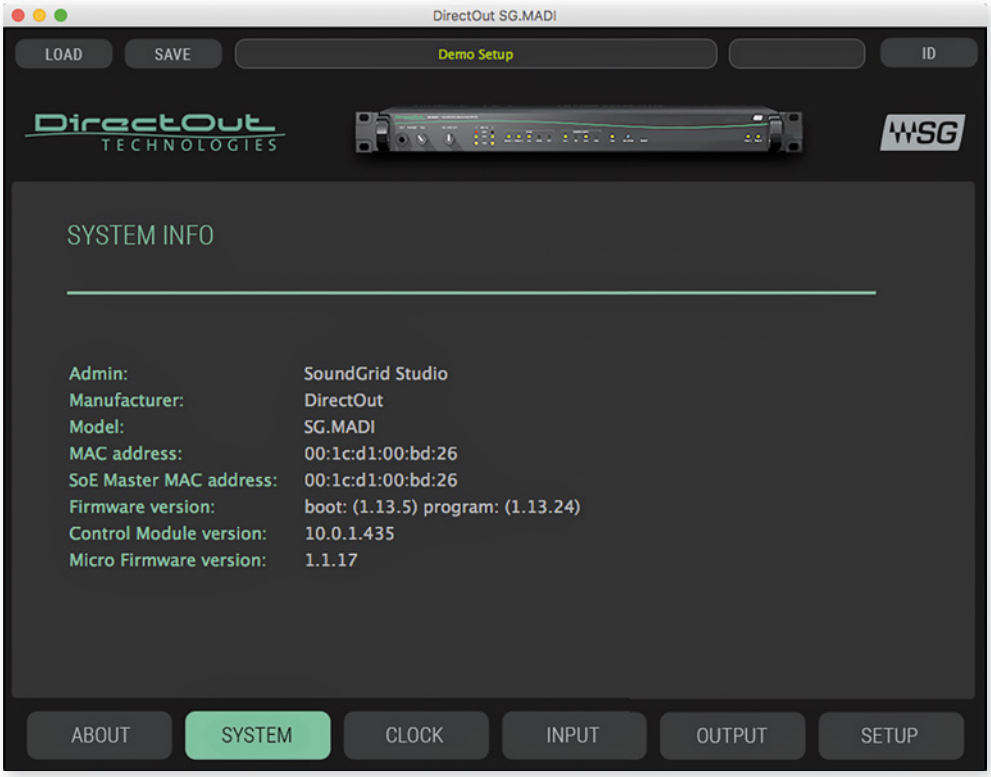
The control panel is organized into different tabs:

- ABOUT = device overview
- SYSTEM = hardware related information
- CLOCK = clock settings and status info for SG.MADI
- INPUT = level display for the analog and MADI inputs
- OUTPUT = level display for the analog and MADI outputs
- SETUP = device control (level, phantom power, GPO…)

To navigate click on the corresponding button at the bottom.

Tab 'ABOUT' displaying the device information.

LOAD	**Button** Click to load a stored session.
SAVE	**Button** Click to restore a session from file.
Demo...	**Text field displaying the name fo the current session.** Click to edit the name
ID	**Button** Click to show a rainbow pattern on the LED 'SG STATE' at the front panel.



Tab 'SYSTEM' displaying hardware related information.
You may need this information for support incidents.

Clocking

SG.MADI can be clocked to various sources:

- MADI input 1 or 2
- Word clock
- SoE (Sync over Ethernet)
- Internal clock generator

At the same time the device may act as SoE master to provide clock information to for other network devices.

SOURCE upper	**Drop-down menu to select clock source type.** Click to select from the list. Values: Internal, External word clock, Digital, SoE*
SOURCE lower	**Drop-down menu to select the signal source.** Click to select from the list. Values: MADI Port 1, MADI Port 2
SAMPLE RATE	**Drop-down menu to define the sample rate.**** Click to select from the list. Values: 44.1 / 48 / 88.2 / 96 kHz

* SoE becomes available when a SoE master is detected in the network. Device can't be SoE master and SoE slave at the same time.

** When clocking to Digital or Word Clock the base rate is defined. So the menu is used only to adjust the correct scaling factor (44.1 / 48 kHz = 1 FS < > 88.2 / 96 kHz = 2 FS) - see page 21.

STATUS	**Display** Reports the presence or absence of sync between SG.MADI and the SoundGrid network.
SOE	**Display** Indicates whether SG.MADI is master or a slave in the SoundGrid network.
CURRENT CLOCK SOURCE	**Display** Displays the current sync method. If the selected clock source is lost, the fallback source is displayed in red letters instead.*
WORD CLOCK TERMINATION	**Button to adjust word clock termination status.**** Click to toggle termination state between ON and OFF.
STATUS MADI 1 / 2 WORD CLOCK	**Display to monitor input signal status.** Sync = input signal detected, in sync with current clock source Lock = input signal detected, not in sync with current clock source No lock = no valid input signal detected

* Fallback sequence: the system clock will switch to internal, if the selected clock source (Digital or Word Clock or SoE) fails.

** Termination shall be activated if the signal is not daisy chained to another device.

Level Display

Two tabs show a channel based level display of the analog and MADI inputs and outputs.

MIC 1 / MIC 2	**Level display*** Monitoring the level of the two analog inputs (XLR jack) at the rear panel of the device.
LINE OUT	**Level display*** Monitoring the level of the two analog outputs (XLR jack) at the rear panel of the device.
MADI 1 INPUT MADI 2 INPUT	**Level display** Monitoring the level of each MADI input channel individually. LED red = -1 dBFS = level > -1 dBFS LED yellow = -10 dBFS < level < -1 dBFS LED green = -40 dBFS < level < -10 dBFS
MADI 1 OUTPUT MADI 2 OUTPUT	**Level display** Monitoring the level of each MADI output channel individually. LED red = -1 dBFS = level > -1 dBFS LED yellow = -10 dBFS < level < -1 dBFS LED green = -40 dBFS < level < -10 dBFS

* The level display is located post faders. Check the level setting of both the fader in the remote control and the potentiometer at the front panel.

Setup

The tab SETUP provides access to the device functions of SG.MADI:

- Level / volume control of the analog I/Os
- Monitoring output source (phones / line out)
- Mic / line inputs routing
- Control of GPOs
- MADI output source and format
- MADI input status display
- Fan control

Analog Outputs

PHONES ON	**Button** Click to toggle the phones output between ON and OFF.
PHONES	**Fader*** Click and move to adjust volume level of phones output.
PHONES Vol	**Display** Indicates the numeric value of adjusted volume. Range:-90 to 0 dB in 1 dB steps
PHONES bargraph/field	**Level Display**** Indicates the current signal level feeding the phones output.

PHONES rotary knobs	**Drop-down menu to select the signal source.***** Click, hold and move to select the signal source individually for the left and right channel of the phones output. Values: SG 1 to 128, MADI 1-1 to MADI 1-64, MADI 2-1 to MADI 2-64
PHONES field	**Display** Indicates the selected source for the phones output.
LINE OUT ON	**Button** Click to toggle the phones output between ON and OFF.
LINE OUT	**Fader*** Click and move to adjust volume level of line output.
LINE OUT Vol	**Display** Indicates the numeric value of adjusted volume. Range:-90 to 0 dB in 1 dB steps
LINE OUT bargraph/field	**Level Display**** Indicates the current signal level feeding the line output.
LINE OUT rotary knobs	**Drop-down menu to select the signal source.***** Click, hold and move to select the signal source individually for the left and right channel of the line output. Values: SG 1 to 128, MADI 1-1 to MADI 1-64, MADI 2-1 to MADI 2-64
LINE OUT field	**Display** Indicates the selected source for the line output.

* Both the fader in the remote control and the potentiometer at the front panel affect the level - see page 23.

** The level display is located post faders. Check the level setting of both the fader in the remote control and the potentiometer at the front panel.

*** SG 1 - 128 = SoundGrid network, channel 1 to 128
MADI 1-1 to MADI 1-64 = MADI 1 input, channel 1 to 64
MADI 2-1 to MADI 2-64 = MADI 2 input, channel 1 to 64

Analog Inputs

The controls for Mic / Line 1 and Mic / Line 2 are identical.
Each input can be assigned to two different destinations (A / B).

Mic / Line 48V	**Button** Click to toggle phantom power between ON (green) and OFF (black).
Gain / Sensitivity	**Fader** Click and move to adjust signal gain for the mic / line input. Range: 0 to 80 dB in 1 dB steps (corresponding input sensitivity +24 dBu to -56 dBu)
Gain / Sensitivity field	**Display** Indicates the numeric value of adjusted gain.
Gain / Sensitivity bargraph/field	**Level Display** Indicates the current input signal level of mic / line input.

Control Setting ON	**Button / Display** Click to toggle mic / line input between ON (green) and OFF (black). Button function is available only with Control Setting 'GUI'. If the Control Setting is not 'GUI', the button only serves to display the ON / OFF status.
Control Setting	**Drop-down menu to define which source controls ON / OFF state.*** Click to select the method for switching between ON and OFF. Values: GPI 1, GPI 2, MADI 1, MADI 2, GPI 1 inv., GPI 2 inv., MADI 1 inv., MADI 2 inv., GUI
Destination A / B ON	**Button** Click to toggle signal output to destination between ON (green) and OFF (black).
Destination A / B rotary knobs	**Drop-down menu to select the signal source.**** Click, hold and move to select the signal source for destination A or B. Values: SG 1 to 128, MADI 1-1 to MADI 1-64, MADI 2-1 to MADI 2-64
Destination A / B field	**Display** Indicates the selected destination for the mic / line input signal.

* GPI 1/2 = GPI input 1/2
MADI 1/2 = MADI 1 / 2 input signal (embedded control data)
GPI 1/2 inv. = same as GPI 1 / 2, but inverted behavior
MADI 1/2 inv. = same as MADI 1 / 2, but inverted behavior
GUI = control panel

** SG 1 - 128 = SoundGrid network, channel 1 to 128
MADI 1-1 to MADI 1-64 = MADI 1 input, channel 1 to 64
MADI 2-1 to MADI 2-64 = MADI 2 input, channel 1 to 64

NOTE

The output routing of destination A and B will override the MADI output routing on the particular channels.

GPO

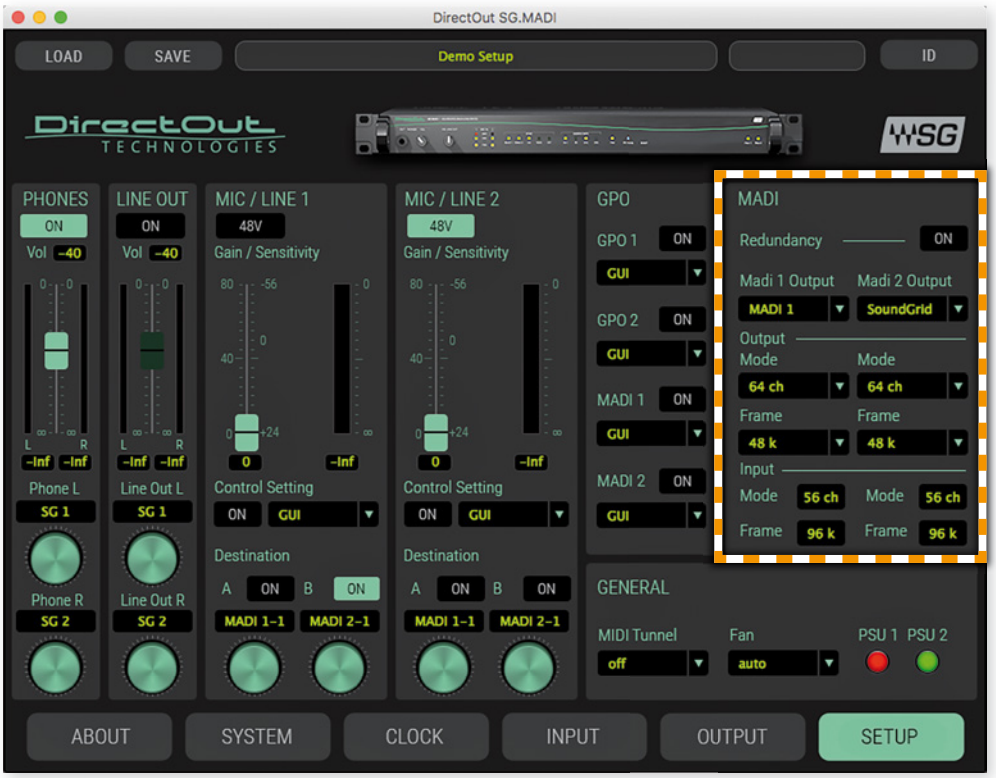
SG.MADI provides two physical GPOs (GPO 1/2) that may be triggered by various sources. Further a separate GPO control signal may be embedded into the MADI output signal - individually for each MADI output (MADI 1/2).

GPO 1/2 ON	**Button / Display** Click to toggle GPO 1/2 between ON (green) and OFF (black). Button function is available only with Control Setting 'GUI'. If the Control Setting is not 'GUI', the button only serves to display the ON / OFF status.
GPO 1/2	**Drop-down menu to define which source controls ON / OFF state.*** Click to select the method for switching between ON and OFF. Values: GPI 1, GPI 2, MADI 1, MADI 2, GPI 1 inv., GPI 2 inv., MADI 1 inv., MADI 2 inv., GUI

MADI 1/2 ON	**Button / Display** Click to toggle GPO via MADI 1/2 between ON (green) and OFF (grey). Button function is available only with Control Setting 'GUI'. If the Control Setting is not 'GUI', the button only serves to display the ON / OFF status.
MADI 1/2	**Drop-down menu to define which source controls ON / OFF state.*** Click to select the method for switching between ON and OFF. Values: GPI 1, GPI 2, MADI 1, MADI 2, GPI 1 inv., GPI 2 inv., MADI 1 inv., MADI 2 inv., GUI

* GPI 1/2 = GPI input 1/2
MADI 1/2 = MADI 1 / 2 input signal (embedded control data)
GPI 1/2 inv. = same as GPI 1 / 2, but inverted behavior
MADI 1/2 inv. = same as MADI 1 / 2, but inverted behavior
GUI = control panel

MADI Input / Output



SG.MADI is equipped with two module based MADI ports. Each MADI output may be assigned to three different sources:

- MADI 1
- MADI 2
- SoundGrid

Channel based routing is set in the tab ‚PATCH', page ‚DEVICE TO DEVICE' - see page 30.

The signal format (channel mode / frame format) of the outputs can be configured for each port individually. The format of the input signal is displayed separately below.

The two MADI inputs may be configured as redundant. Activated redundancy implies:

- only one MADI input is used (initial priority MADI 1)
- both MADI outputs are carrying identical signals
- strip for MADI 2 output becomes inactive
- MADI 1 output source: Setting ‘MADI 1‘ or ‚MADI 2‘ will fed the particular MADI input that is selected by the redundancy mechanism (ignoring the numbering).

The controls for MADI 1 Output and MADI 2 Output are identical.

Redundancy ON	**Button** Click to toggle MADI input redundancy between ON (green) and OFF (black).
MADI 1 Output	**Drop-down menu to select the source for MADI 1 output.*** Click to select. Values: MADI 1, MADI 2, SoundGrid
Mode	**Drop-down menu to select the channel mode for MADI 1 output signal.** Click to select. Values: 56 ch, 64 ch (28 ch, 32 ch @ 2 FS)
Frame	**Drop-down menu to select the frame format for MADI 1 output signal.** Click to select. Values: 48 k, 96 k (96k Frame is active @ 2 FS only)
Mode	**Display** Monitors the detected channel mode of MADI input signal. Values: 56 ch, 64 ch (28 ch, 32 ch @ 2 FS)
Input Frame	**Display** Monitors the detected frame mode of MADI input signal. Values: 48 k, 96 k

* Selecting either MADI input will result in 1:1 patching which cannot be altered in the matrix ('PATCH' / 'Device to Device').

NOTE

The output routing of destination A and B (Analog Inputs - page 40) will override the MADI output routing on the particular channels.

General

MIDI Tunnel enables to transport control data via a MADI link. For example an ANDIAMO.MC may be remote controlled from the connected SG host via MIDI data that is embedded into the MADI link. A closed loop between MADI input, remote device and MADI output is required for proper operation.

Fan control offers the possibility to adapt the fan speed / noise to the environmental conditions.

Two LEDs inform about the status of the power supplies.

MIDI Tunnel*	**Drop-down menu to select the MADI link for transport of control data.** Click to select. off = no de-/embedder active MADI 1 = de-/embedder activ on MADI port 1 MADI 2 = de-/embedder activ on MADI port 2
Fan	**Drop-down menu to select the behaviour of the fan control.** Click to select. auto = fan speed is controlled by the temperature sensor slow = fan always on, at slow speed mid = fan always on, at mid speed high = fan always on, at high speed
PSU [1 / 2]	**LEDs to monitor the status of the power supply.** LED green = power supply on LED red = power supply off LED red (blinking) = power supply off after on

* MIDI Tunnel is currently not supported.

CHAPTER 6: Troubleshooting and Maintenance

Troubleshooting

To identify a possible defect with the device please consult the following table. If the fault cannot be resolved using these instructions, please contact your local DirectOut representative or visit support.directout.eu.

Waves support: https://www.waves.com/support

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.
No signal at the analog outputs.	Source not patched or channel strip switched off or level setting of either gui or potentiometer off.	Check signal routing or check the on/off state of channel strip or check fader in the gui and potentiometer at the front panel.

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 7: Technical Data

Dimensions

- Width 19'' (483 mm)
- Height 1 RU (44.5 mm)
- Depth 7.8'' (200 mm)
- Weight about 3500 g

Power Consumption

- 15 W

Power Supply

- 2 x C13 sockets
- 84 V- 264 V AC / 47 Hz- 63 Hz / Safety class 1

Environmental Conditions

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

MADI Ports SC optical

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

MADI Ports BNC coaxial

- BNC socket (input / output)
- Impedance: 75 Ω
- 0.3 V up to 0.6 V (peak to peak)

MADI Ports SFP

- empty cage without module

Sample Rate

- 30 - 50 kHz @ 1 FS
- 60 - 100 kHz @ 2 FS
- 120 - 200 kHz @ 4FS (not support currently by SoundGrid)

MADI Format (I/O)

- 48k Frame, 96k Frame
- 56 channel, 64 channel

Network

- 2 x RJ45 socket (Gigabit Ethernet)
- for transmission of network audio, control data and firmware updates
- Network-Layer 2
- 128 channels I/O
- Standard: SoundGrid
- Audio driver: Windows® (ASIO), macOS® (Core Audio)

Word Clock

- 1 x BNC socket (75 Ω impedance) - input
- 1 x BNC socket (75 Ω impedance) - output
- Termination 75 Ω switchable
- AES11 (DARS supported)

Analog Input

- 2 x XLR female, balanced
- SNR: -115 dBFS @ 0 dB Gain
- EIN: tba
- THD @ -1 dBFS:-113 dB
- Frequency Response:-0.5 dB (10 Hz to FS/2)
- Input Sensitivity: -56 to +24 dBu (equals to a gain range from 0 to 80 dB)
- +48 V phantom power (switchable)

Analog Output

- 2 x XLR male, balanced
- Output level: +24 dBu
- SNR: -115 dB RMS
- THD @ 0 dBFS:-105 dB

Phones

- 1 x TRS jack 6.3 mm (stereo)
- Output level: +18 dBu
- SNR:-115 dB unweighted
- THD @ 0 dBFS: -105 dB

GPI

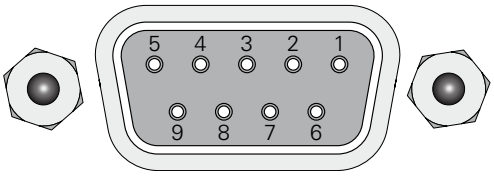
- 1 x DSUB-9 socket female
- 2 x Voltage input 2 V- 24 V

GPO

- 1 x DSUB-9 socket female
- 2 x FET Switch (0 V- 24 V)
- 1 x Voltage Source (5 V, max 200 mA)

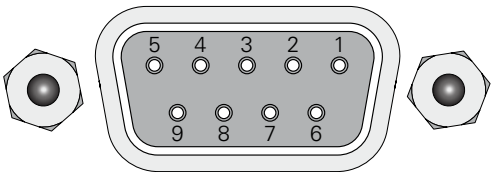
Appendix A - Wiring Sketches

DSUB-9 (female) - GPI



Pin	Signal	Effect
1	N/C	
2	N/C	
3	GND	
4	GND	
5	GND	
6	Voltage 1	GPI 1
7	Voltage 2	GPI 2
8	N/C	
9	N/C	

DSUB-9 (female) - GPO



Pin	Signal	Effect
1	N/C	
2	N/C	
3	GND	
4	5P (+5 V)	
5	5P (+5 V)	
6	GND (FET)	GPO 1
7	GND (FET)	GPO 2
8	N/C	
9	N/C	

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