# M.1K2

Hardware Guide



Version 1.4

Copyright

**Table of contents**

# About This Document

## How to Use This Document

This document guides you through the installation and operation of the device. For information about the graphical user interface (GUI) please consult the offline help available from our website or use the online help within the gui.

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

The M.1K2 is a 16 port MADI Routing System. It provides routing of whole ports down to single channel level offering a 1024 by 1024 crosspoint matrix.



You can distribute MADI signals en bloc in a port matrix and you may also create your own MADI stream using the channel matrix. PolySync™ provides the ability to use different clock sources on individual ports. So the router may be divided into single 'clock groups' that can run at different sample rates.

Port redundancy may be applied to have a spare signal that will be used when an input signal breaks. Two extra matrices may route serial data and MIDI data- that is embedded into the MADI signal- independently from the audio signal.

Doppelganger (Device Mirroring) allows one (or more) M.1K2s to be configured to act as a slave to one master device. All configuration data (crosspoints, port configuration, labels etc.) is synchronized continuously.

SNMP Simple Network Management Protocol (v1/v2) allows for monitoring of essential device information such as power supply state; temperature; MADI signal/synchronization state.

More features such as I/O labelling, snapshot and user management offer the chance to personalize your setup all-embracing.

## Feature Summary

| | |
|---|---|
| MADI I/Os | 2 x slots with eight MADI ports each<br>Module types: coaxial (BNC), optical SC (multi-mode) and SFP (multi-mode)<br>single-mode upon request |
| MADI Formats | 56/64 channel, 48k/96k Frame, S/MUX 2/4 |
| Sample Rates | 30 kHz to 50 kHz<br>(and their multiples- 2FS, 4FS) |
| Clock Inputs | 1 x Word clock   coaxial BNC<br>75 Ω termination switchable<br>1 x Video   coaxial BNC<br>75 Ω termination switchable<br>Black Burst (PAL, NTSC) |
| Clock Outputs | 2 x Word clock   coaxial BNC |
| Serial Data / MIDI | 1 x RS232   DSUB-9<br>1 x RS422/485   DSUB-9<br>1 x MIDI in/out  (DIN) |
| GPO | 4 x GPO   DSUB-9 |
| Device Monitoring | SNMP v1/v2 |
| Device Mirroring | Doppelgaenger Mode |
| Control Plug-Ins | Telnet, Pro-Bel SWP-08 (network and serial), MIDI, Jupiter, JSON |
| USB Port | USB 2.0 port for virtual COM port (RS 232) |
| 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) |

## Applications

M.1K2 can be used for distribution and creation of whole MADI streams, routing of single audio channels between MADI streams and independent routing of embedded serial data and MIDI data.

**Typical applications include:**
- distribution of audio signals in OB van with integrated switching protocol (e.g. SWP08)
- central switch in studio environments- PolySync™ and browser control
- connection between remote mic preamps and mixing consoles (serial matrix)
- show control using snapshots
- fallback system- port redundancy, device mirroring
- ...

## 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.

### Intended Operation

M.1K2 is designed for distribution of MADI signals (AES10) and routing of serial data (RS-232 and RS-422/485) and MIDI data.

## 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 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 M.1K2 package should include:

- 1 x M.1K2 (19'', 2 RU)
- 2 x power chord
- 2 x fixing unit for power plug
- 1 x Hardware Guide

To complete the delivery please download from the M.1K2 product page on the DirectOut website (www.directout.eu):

- USB Serial driver
- latest firmware

Three different types of I/O modules are available:

- BNC coaxial
- SC optical (single-mode or multi-mode or mixed)
- SFP (empty cage, modules not included in delivery)

## NOTE!

Check the I/O configuration of your device before proceeding with the installation.

# 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.

Do not cover the fan outlets and the slots at the sides of the device!

Do not block the fans by putting objects through the protective grid!

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.** Using the power cord provided connect the PSU 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).

**5.** Turn on the power switch and check the status of the PSU leds on the front panel:



**6.** Network integration of the controller (online wizard for initial setup of the network connection)- see „Network integration" on page 16.

**7.** Check if the latest firmware is installed on the device. It is highly recommended to use the latest version.
To check the firmware version, open the GUI in a browser and go to 'Misc- Version- System Information'.

✏️ **NOTE!**

For help with the firmware update procedure see „Appendix E- Firmware Update Instruction" on page 32.

**8.** Optional: Connect a USB cable to the USB port for use of the virtual com port. This requires the USB Serial driver (Windows) being installed first. The driver is available from the product page at www.directout.eu.

## NOTE!

For help with the USB driver installation see „Appendix F- USB Serial Driver Installation" on page 36.

## TIP!

Use the DirectOut Release Map to match your DirectOut device with the latest firmware or software release.
Link: http://www.directout.eu/upload/dokumente/dotec_release_map.pdf

## TIP!

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

### Network integration

To set up your DirectOut M.1K2 initially (or after a reset) you need a working IP connection with the controller of the device. M.1K2 is delivered with a fixed IP address (10.0.0.24). So first you will have to change the network settings of your computer to setup the IP connection. An online wizard will guide through all necessary steps then.

## NOTE!

For some basics about networking see page 30.

### Requirements
- computer with ethernet port- access privileges to network settings required
- standard network cable (e.g. CAT5)

### Installation
1. Connect M.1K2 with your computer using a standard network cable (e.g. CAT5).

## WARNING!

The network interface does not comply the requirements of IEEE 802.3af or IEEE 802.3at (aka 'PoE- power over ethernet'). Connecting to an PoE infrastructure may damage the device.

2. Go to to the network settings of your operating system
   - Mac OS X: System settings- Network- Ethernet *
   - Windows Control panel- Network and Internet- Network and Sharing Center- Manage network connections **

* Link:
https://support.apple.com/kb/PH21632?viewlocale=en_US&locale=de_DE

** Link:
http://windows.microsoft.com/en-us/windows/change-tcp-ip-settings#1TC=windows-7

## NOTE!

It is recommended that you store your original network settings before modifying them.

**3.** Change IP address setting to manual if set to DHCP and enter:
- IP address: 10.0.0.20
- subnet mask: 255.255.255.0

**4.** Open an internet browser (e.g. Chrome, Firefox) and enter http://10.0.0.24 to open the GUI of the controller. The online wizard will open automatically and guide you through all necessary steps.

## NOTE!

Following you may want to restore the network settings of your computer to the original values.

**5.** After setup log in and check the firmware version (go to 'Misc-Version-System Information'). If a newer firmware is available, go to 'Configuration-Device-Firmware Update' and perform a firmware update.
The latest version of the firmware is available on the M.1K2 product page at www.directout.eu.

# CHAPTER 4: Operation

### Introduction

This chapter describes the basic operation of the device.

### Global Control

The control on the right of the front panel indicates the power supply. Power switches are on the back panel:



| PSU 1 & PSU 2 (rear) | **2 Switches**<br>Enable / disable power supply. |
|---|---|
| PSU 1 & PSU 2 (rear) | **C13 socket**<br>Connect the power supply here (84- 264 V AC). |
| PSU 1 & PSU 2 (front) | **2 LEDs (green): indicate the status of both power supply units**<br><br>LED OFF  = Power supply inactive<br>LED ON  = Power supply active<br>LED blinking<br>4 times per second = The power supply was active, and is now inactive. Whether this is a fault state depends on the circumstances. |

If both PSU LEDs are blinking and the fan is blowing at full speed, the FPGA is being programmed. This only happens during reboot after an update.

## 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.

## Device State & RESET

As most of the system information is available in the GUI (or a telnet shell) only, the basic system state is indicated by the led 'STATE'.
If the device can't be reached via network an emergency recovery may be executed using the RESET button. See „Appendix A- Emergency recovery" on page 26.



| STATE | **LED (green) indicates current system state.** |
|---|---|
| | LED ON = controller is idle (normal operation) |
| | LED "heartbeat" = controller is idle (normal operation) |
| | LED blinking once per second = factory default network setting is active |
| | LED blinking 4 times per second = unsaved configuration data, device will return to idle state after saving to the flash memory. |
| RESET | **Push button** Press and hold > 5 seconds for emergency recovery. |

## NOTE!

The behaviour of the led 'STATE' may be configured in the GUI. Please consult the offline help available from our website or use the online help within the GUI.

## User data (Serial, MIDI, GPO)

For remote application and signaling purposes there are connection possibilities for RS 232 / 422 / 485, MIDI and General Purpose Output (GPO).

Serial signals can be routed either by using user bits* of a MADI frame. 4 GPOs can be triggered manually or automatically by a system event.



| SERIAL 232 | **DSUB-9 socket (male)** |
|---|---|
| | Connect RS-232 signal here. |
| | Observe the correct pin assignment**. For safe operation lock the connection using the jack bolts. |
| SERIAL 4xx | **DSUB-9 socket (female)** |
| | Connect RS-422 or RS-485 signal here. |
| | Observe the correct pin assignment**. For safe operation lock the connection using the jack bolts. |
| GPO | **DSUB-9 socket (female)** |
| | Connect GPO signals here. |
| | Observe the correct pin assignment**. For safe operation lock the connection using the jack bolts. |
| MIDI OUT | **DIN socket** |
| | Connect MIDI output signal here. |
| MIDI IN | **DIN socket** |
| | Connect MIDI input signal here. |

* Tunneling of MIDI signals is compatible to the transmission method used by all other DirectOut devices and RME products. Tunneling of RS-232 and RS-4xx data is compatible to the transmission method used by Studer / Soundcraft.

** The pin assignment is described in „Appendix B- DSUB-9 Pin assignments" on page 27

The USB port may be used as serial port too-
see „Remote Operation" on page 22.

## Clocking

M.1K2 may use a variety of clock sources:

- internal (44.1 kHz / 48 kHz)
- word clock
- video (PAL / NTSC)
- a specific MADI input port

The system may be operated with one clock source only or may use different clock sources at a time (PolySync™). That means that one can use a bunch of ports with clock source 'A' while another portion is clocked by clock source 'B'.
The selected clock source is output at both word clock outputs.



| VIDEO IN | **1 x BNC socket (coaxial)**<br>Connect video reference signal here (black burst PAL or NTSC; the video standard is detected automatically). |
|---|---|
| WCK IN | **1 x BNC socket (coaxial)**<br>Connect word clock signal here. |
| WCK OUT | **2 x BNC socket (coaxial)**<br>Connect here to receive word clock output signal. The left socket provides the base rate only (44.1 / 48 kHz). The right socket outputs full sample rate word clock- also multiples of the base rate (2 FS / 4 FS). |
| 75 Ω | **LED (yellow): indicates the termination status of word clock and video input.**<br>LED ON = termination enabled<br>LED OFF = termination disabled |
| SYNC (VIDEO IN) | **LED (green): indicates the sync status of the incoming video signal**<br>LED ON = signal locked<br>LED OFF = no signal present<br>LED flashing = signal present, not locked |
| SYNC (WCK IN) | **LED (green): indicates the sync status of the incoming word clock signal**<br>LED ON = signal locked<br>LED OFF = no signal present<br>LED flashing = signal present, not locked |

## Remote Operation

M.1K2 may be controlled via an ethernet connection or serial data input.



| NETWORK | **RJ45 socket** |
| --- | --- |
| | Connection for ethernet control |
| | Requires a standard CAT5 cable for connection with ethernet network (10 / 100 MBit/s). |
| USB | **USB socket (2.0)** |
| | USB connection for virtual serial port. Requires a standard USB cable (Type B). |

### NOTE!

To use the USB port as virtual serial port a serial USB driver (for Windows®) has to be installed on the computer first. The driver is available on the M.1K2 product page at www.directout.eu. See „Appendix F- USB Serial Driver Installation" on page 36.

# CHAPTER 5: 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. |

## 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 6: Technical Data

**Dimensions**
- Width 19'' (483 mm)
- Height 2 RU (89 mm)
- Depth 10'' (254 mm)

**Weight**
- about 4 kg

**Power Consumption**
- typical 0.2 A (@84 V) up to max. 0.1 A (@264 V)
- max. 0.4 A (@84 V) up to max. 0.2 A (@264 V)

**Power Supply**
- 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 - coaxial**
- 16 x BNC socket (8 x input / 8 x output)
- Impedance: 75 Ω
- 0.3 V up to 0.6 V (peak to peak)

**MADI Port - optical SC**
- 8 x SC socket FDDI (input / output)
- ISO/IEC 9314-3
- Wave length: 1310 nm
- Multi mode 62.5/125 μm or 50/125 μm
- optional: single mode 9/125 μm

**MADI Port - SFP**
- 8 x SFP cage without module
- Wave length: depending on used transceiver (typical 1310 nm)
- Multi mode 62.5/125 μm or 50/125 μm
- Single mode 9/125 μm

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

**MADI Format (I/O)**
- 48k Frame, 96k Frame
- 56 channel, 64 channel
- S/MUX 2/4

**Word Clock**
- 1 x BNC socket (75 Ω impedance)- input
- 2 x BNC socket (75 Ω impedance)- output
- Termination 75 Ω switchable

**Video**
- 1 x BNC socket (75 Ω impedance)- input
- Termination 75 Ω switchable

**MIDI**
- 2 x DIN socket (input / output)

**Serial Communication**
- RS-232
- RS-422 / RS-485

**General Purpose Output (GPO)**
- 4 x Avago ASSR-1411-S optical MOSFETs up to 60 V / 600 mA switching (AC or DC)

**Ethernet**
- RJ45 socket (10/100 Mbit/s full duplex- auto negotiation),
- IEEE 802.3i/u

**USB**
- 1 x USB 2.0 socket (Type B)
- may be used as virtual serial port (Windows® only)

**Cable Specifications**
- coaxial cable- impedance 75 Ω, screening attenuation better than 85 dB

# Appendix A - Emergency recovery

There is one static network configuration which you cannot modify, it is called 'Factory preset'. If you somehow managed to create a dysfunctional set of network settings or cannot reach the device for other reasons, you can always return to the factory preset via the front panel.

Procedure: Press the RESET button on the front panel for about 5 seconds. As soon as you press the button, it will start flashing rapidly. When it stops flashing, the factory preset has been activated. You can then access the device via the initial IP address (10.0.0.24).

The LED STATE indicates the operating condition:

| LED | Operating Condition |
|-----|---------------------|
| Constant on | The controller is idle (normal operation). |
| Heartbeat | The controller is idle (normal operation). |
| Blinking once per second | The factory default network settings are active. This state should only be active when configuring the device for the first time, or after the RESET button has been pressed. You can configure the network in 'Configuration-Device-Network' settings. |
| Blinking 4 times per second | There is unsaved configuration data. After the changes have been written safely to the flash memory, the state LED returns to the idle state. |

## NOTE!

This procedure will only reset the IP configuration. All other device settings (e.g. routing, channel labels, clocking, ...) will remain unchanged.

# Appendix B - DSUB-9 Pin assignments

## RS-232

The RS-232 port handles bitrates of 9600, 19200, 38400 and 115200 bps without RTS/CTS support.
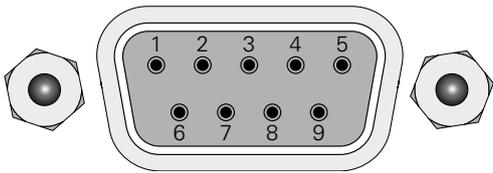


jack- male

| PIN | Signal |
|-----|--------|
| 2 | RX |
| 3 | TX |
| 5 | GND |

## RS-4xx

The RS-4xx port can be configured to handle RS-422 or RS-485 signals and bitrates of 9600, 19200, 38400 and 115200 bps.
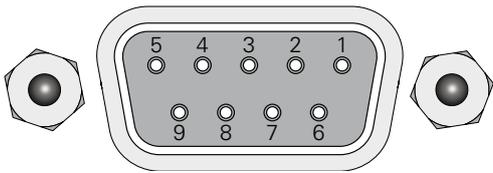


jack- female

| PIN | Signal |
|-----|--------|
| 1 | GND |
| 2 | RS-422 RX+ |
| 3 | RS-422 TX- / RS-485 RX- |
| 4 | GND |
| 5 | |
| 6 | GND |
| 7 | RS-422 RX- |
| 8 | RS-422 TX+ / RS-485 RX+ |
| 9 | |

## GPO

M.1K2 has four GPOs which can be switched manually or triggered by certain events. Ground-free switching is performed by Avago ASSR-1411-S optical MOSFETs, which can switch up to 60 V, 0.6 A AC or DC.
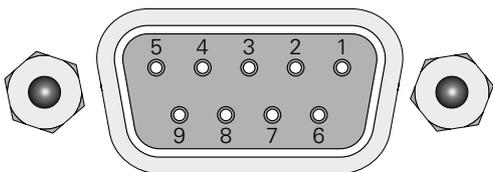


jack- female

| PIN | Signal |
|-----|--------|
| 1/6 | GPO 1 |
| 2/7 | GPO 2 |
| 3/8 | GPO 3 |
| 4/9 | GPO 4 |

# Appendix C - Installing / Replacing I/O modules

Three different modules are available to fit in to the two slots of M.1K2. If necessary the modules may be replaced or swapped executing the following steps.
Requirements:
- I/O module
- Screwdriver (Phillips 1)

The installation of the module does not require to open the device. The module is inserted at the front side of the device.

**ESD (Electrostatic Discharge)**
The components of the module may be damaged by electrostatic discharge. Observe the precautions (e.g. the use of an antistatic wrist strap) for the handling of parts that are susceptible to electrical discharge.

1. Remove all cables from the device.

2. Loose both phillips screws at the left and right side of the blind plate using the screwdriver.

3. Remove the blind plate or module at the front side of the device.

**TIP!**

As the device must not be operated with an opening, you may want to keep the blind plate in case of deinstallation of the module.

4. Unpack the module from the protective bag. Touch the module at the metal plate only.

5. Insert the module with the pins ahead into the guide rails and put it softly into the device. To connect the pins of the module with the backplane of the device smart pressure is needed finally.

6. Fix the metal plate of the module screwing both screws in the front panel.

## Modules

BNC- Module, coaxial
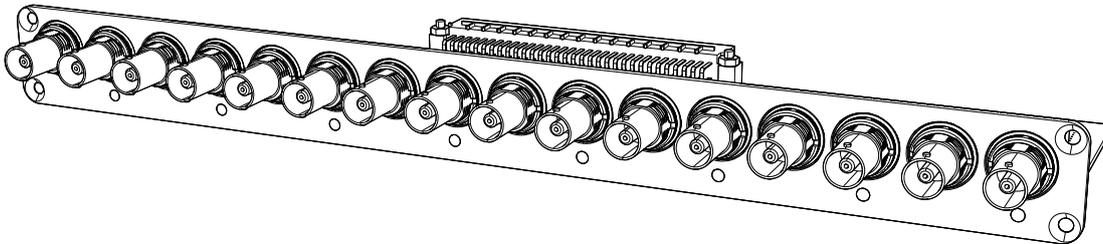
SC- Module, optical
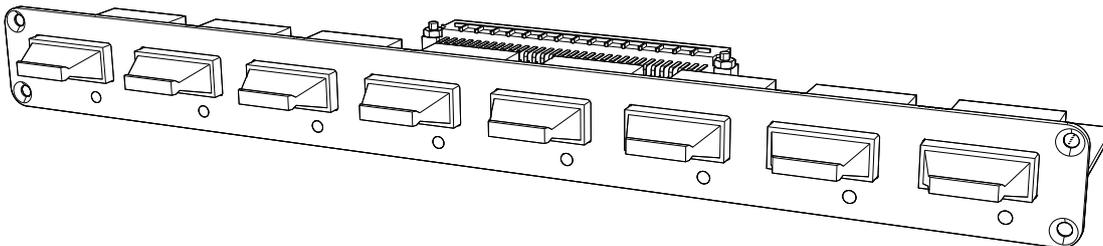
SFP- Module, empty cages
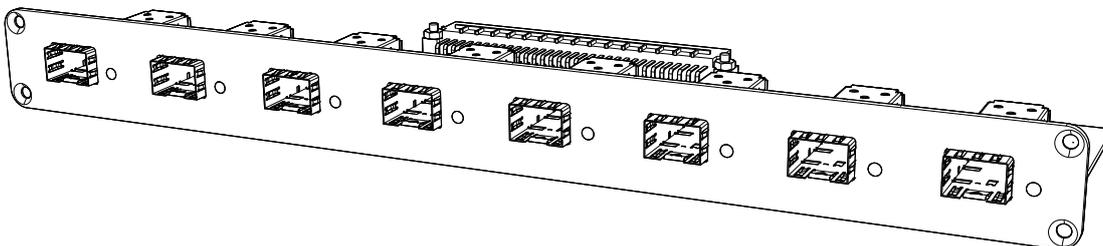
## Appendix D - How to - Network

The following guide aims to familiarize with basic information to setup a TCP/IP network. Some terms and techniques are explained to conduct you through the first steps.

### Terms

**IP Address** - Address of a device within your local network. Must be unique. Example: 192.168.74.15 or 10.0.0.24

**Gateway** - Address of the network router. When connecting only two devices 'peer to peer', use the ip address of one device if it is needed to be declared. Example: 192.168.74.1 or 10.0.0.20

**DNS** - Address of Domain Name Server. If you are using a network router with internet access the IP address of the router can be used here. One may define a second DNS for use once the first one fails. Example: 192.168.74.1 (same as gateway) or 8.8.8.8 (Google DNS server) or other…

**Network router** - device that handles the traffic within a network. Often used with integrated ADSL modem. Not necessary to setup a peer to peer connection between two devices only. Has IP address (Gateway).

**DHCP** - Dynamic host configuration protocol. It is used to assign address parameters automatically to devices that are connected to a DHCP server. Network router often act as DHCP server.

### NOTE!

You can use the device's MAC address (written on the back panel of the M.1K2) in order to find out the IP address that has been assigned to it by the DHCP server.

**Network Mask** - a bitmask that splits the network into two parts
- Network contingent: fixed - identical for all devices
- Device contingent: variable - unique for each device, defines the number of available addresses within the network

The network mask (like the IP address) contains of 32 bits and is often expressed by decimals. The result of two binary calculations defines both contingents.

Example:

|  |  |  |  |  |
|---|---|---|---|---|
|  | IP address | 1100'0000 1010'1000 0100'1010 0000'1111 | 192.168.74.15 |
| AND | network mask | 1111'1111 1111'1111 1111'1111 0000'0000 | 255.255.255.0 |
|  | network contingent | 1100'0000 1010'1000 0100'1010 0000'0000 | 192.168.74.0 |

|  |  |  |  |  |
|---|---|---|---|---|
|  | IP address | 1100'0000 1010'1000 0100'1010 0000'1111 | 192.168.74.15 |
| NAND | network mask | 0000'0000 0000'0000 0000'0000 1111'1111 | 255.255.255.0 |
|  | device contingent | 0000'0000 0000'0000 0000'0000 0000'1111 | 0.0.0.15 |

24 bits are already set for the network contingent, leaving 8 bits
($2^8$ = 256) left for the variable device contingent. The smallest address
192.168.74.0 defines the network and the biggest address 192.168.74.255
is reserved. So there are 254 different IP addresses available (192.168.74.1-
192.168.74.254).

In a network environment each device (computer, printer, M.1K2…) needs
its own and unique IP address. This can be achieved by a manual setup or by
using a DHCP server within a network.

The use of a DHCP may ease up the administration of a network. However,
if fixed and known addresses are a need, it is helpful to set up a network
manually.

## Example 1 - Peer to Peer

IP Adress: 10.0.0.20
Network Mask: 255.255.255.0
Gateway: 10.0.0.20
DNS: 8.8.8.8

IP Adress: 10.0.0.24
Network Mask: 255.255.255.0
Gateway: 10.0.0.20
DNS 1: 8.8.8.8
DNS 2: 8.8.8.8

The devices are connected directly. This setup may be used at initial
operation of the M.1K2.

## Example 2 - Network with router

IP Adress: 192.168.74.1
Network Mask: 255.255.255.0
Gateway: 192.168.74.1
DNS: 8.8.8.8

IP Adress: 192.168.74.5
Network Mask: 255.255.255.0
Gateway: 192.168.74.1
DNS: 8.8.8.8

IP Adress: 192.168.74.2
Network Mask: 255.255.255.0
Gateway: 192.168.74.1
DNS: 8.8.8.8

IP Adress: 192.168.74.15
Network Mask: 255.255.255.0
Gateway: 192.168.74.1
DNS 1: 192.168.74.1
DNS 2: 8.8.8.8

Three devices are connected by a router that handles the traffic within the
network. Each device has its own <ip address>.

## Appendix E - Firmware Update Instruction

This instruction describes the firmware update procedure for the M.1K2.

### Requirements:

- M.1K2
- Network access to the M.1K2
- Access to the admin account of the controller

### NOTE!

It is recommended that you backup the configuration data of the device (Configuration- Backup/Restore in the GUI) before performing the firmware update procedure.

### Installation

1. Download the update file ('M.1K2 Firmware') from the product page at www.directout.eu

2. Open an internet browser (e.g. Chrome, Firefox) and open the GUI of the controller. Go to 'Configuration- Device'.

3. Go to 'Firmware Update' by expanding the dialog ('+' top right corner).

4. Select 'Choose File' and browse to the downloaded update file (file extension '.1k2').

| Routing | Configuration | Tools | Misc | My Account | |
| Ports | WCK | Device | User | Backup/Restore | |

# Global Settings

| Network Settings | ? | + |

| Contact | ? | + |

| GPOs | ? | + |

| Plugin Configuration | ? | + |

| Doppelgänger Slave Configuration | ? | + |

| Doppelgänger Master Configuration | ? | + |

| Device Hardening | ? | + |

| Fan | ? | + |

| Status LEDs | ? | + |

| System Snapshots | ? | + |

| Labels | ? | + |

| Firmware Update | ? | − |

Upload a firmware update file (*.1k2):

Update file: [Durchsuchen...] Keine Datei ausgewählt.

[Begin update]

**5.** Select 'Begin update'. The file will be uploaded, checked and detailed update information will be shown after a few seconds. Please read this carefully!

**6.** Confirm the update with 'Begin update!'.
The update process may take several minutes. While updating the device is not accessible and audio will not be processed. After update the device is rebooted automatically. The network configuration remains unchanged.

**7.** After the update you need to log in again. You may check the version of the firmware by navigating to 'Misc‑ Version'.

**Version Information**

**System information**

| | |
|---|---|
| Website version: | Mar 24 2016 |
| httpd version: | httpd v5b (Mar 24 2016) |
| controld version: | controld v8 (Mar 24 2016) |
| tempd version: | tempd v6 (Mar 24 2016) |
| mdnsd version: | mdnsd v8 (Mar 24 2016) |
| syncd version: | syncd v5 (Mar 24 2016) |
| fand version: | fand v4 (Mar 24 2016) |
| frontpaneld version: | frontpaneld v2 (Mar 24 2016) |

**Device information**

| | |
|---|---|
| Device key: | Valid |
| Device serial: | 23714512 |
| FPGA board version: | 2 |
| FPGA Firmware: | 3.6, Build 1 |
| Uptime: | 6m24s (54% idle) |
| Operating hours: | 122 h |

## NOTE!

It is strongly recommended to clear the browser cache after the update to ensure proper browser behaviour at next login.

# Appendix F - USB Serial Driver Installation

This instruction describes the procedure of installing the USB serial driver on Windows®.

### Requirements

- M.1K2
- USB cable (Type B)
- Windows® PC (supported operating systems: XP, Vista, 7, 8, 10)
- USB serial driver from M.1K2 product page at www.directout.eu

### Driver details

This driver (m1k2-black-usb.inf) provides access to the virtual COM port. The driver works with the M.1K2- black panel version only.

### Installation

1. Unpack the driver files into a temp directory.

2. Connect the USB port of M.1K2 to an USB port of your computer.

3. Switch the device on.

When connecting the device Windows will try to download driver files from the Windows Update server. As the DirectOut drivers are not distributed through the Microsoft Update Service this attempt will fail.

4. Open the 'Device Manager'. It will show an unknown device called 'M.1K2'.
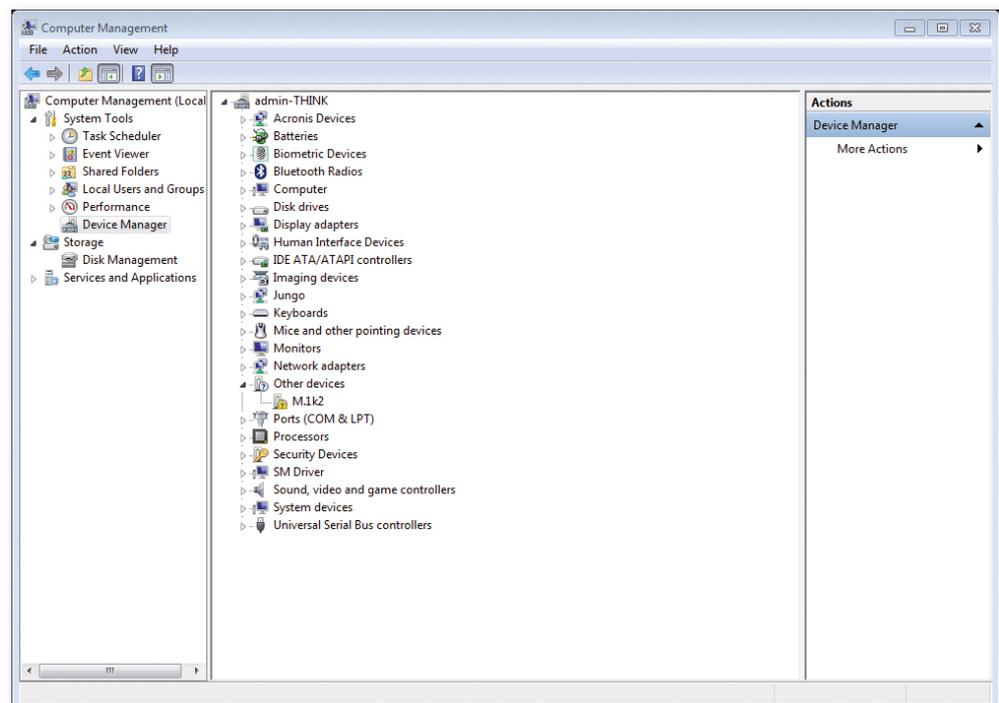
**5.** Right click on 'M.1K2' and select 'Update Driver Software…'.
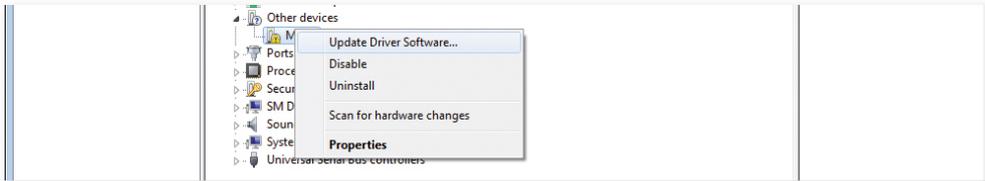


**6.** Browse to the location where you downloaded and unpacked the driver and select the folder.
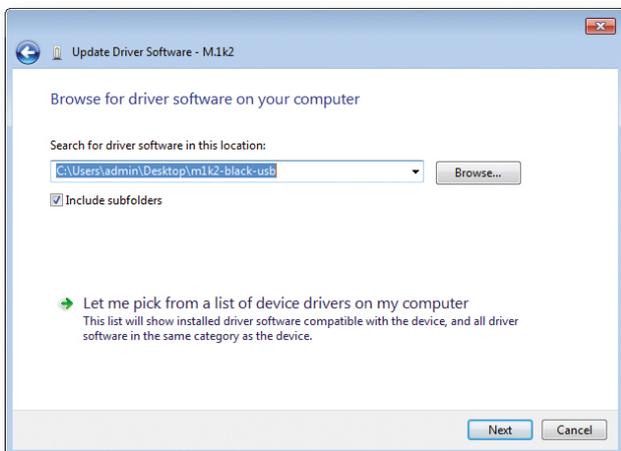


**7.** Click 'Next'. A security warning will occur.
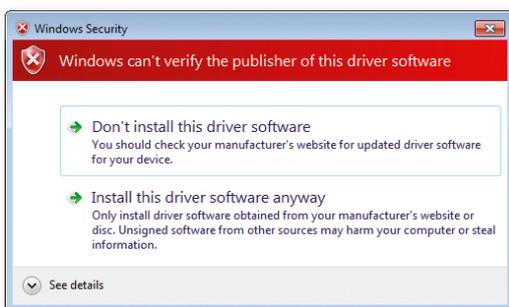


**8.** Click 'Install…' to continue.

After a successful installation the ‚Device Manager' will show a ‚M.1K2 Serial Port'. The port number is assigned by Windows automatically.
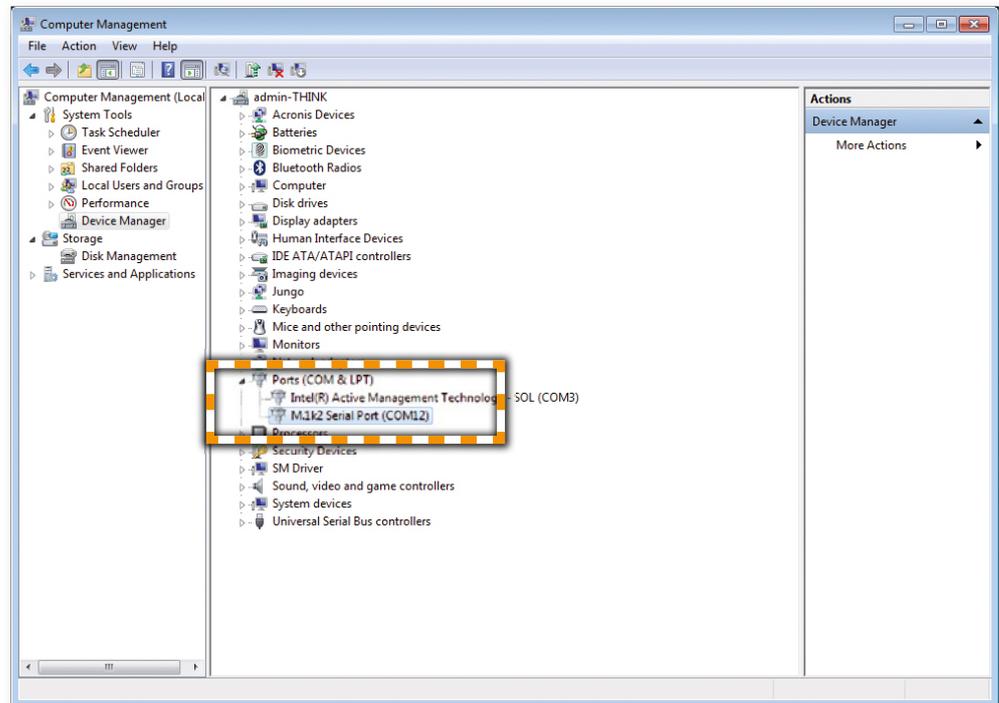


### Deinstallation

To uninstall the driver the device must be connected to the computer.
To remove the USB Serial driver from your system, please execute the following instructions:

**1.** Open the 'Device Manager'.

**2.** Select the node 'Ports (COM & LPT)' and decollapse it.

**3.** Right click on 'M.1K2 Serial Port'

**4.** Select Uninstall

**5.** Check the 'Delete the driver software for this device' field and click 'OK'.

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