DirectOut Technologies®

D.O.TEC® M.1k2

Hardware & Installation Guide

Version 1.1

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About This Manual

How to Use This Manual

This manual guides you through the installation and operation of the M1k2. For information about the graphical user interface (GUI) please consult the “Software Guide”.

Use the Table of Contents at the beginning of the manual or Index Directory (*page 30)* 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 tips and shortcuts.

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

Warning

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

CHAPTER 1: Overview

Introduction

The M.1k2 is a 16 port MADI router. 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.

Feature Summary

MADI I/Os	2 Slots with eight MADI ports each Module types: coaxial (BNC), optical SC (multi-mode) and SFP (multi-mode) *single-mode upon request*
MADI Formats	56/64 channel, 48k/96k Frame, S/MUX 2/4
Sample Rates	30 kHz to 50 kHz (and their multiples - 2FS, 4FS)
Clock Inputs	1 x Word clock coaxial BNC 75 Ω termination switchable 1 x Video coaxial BNC 75 Ω termination switchable Black Burst (PAL, NTSC)
Clock Outputs	2 x Word clock coaxial BNC
Serial Data / MIDI	1 x RS232 DSUB-9 1 x RS422/485 DSUB-9 1 x MIDI in/out (DIN)
GPO	4 x GPO DSUB-9

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USB Port	USB 2.0 port for virtual COM port (RS232)
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
- ...

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 D.O.TEC® 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.

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First Aid (in case of electric shock)

Warning

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

Contents

The contents of your 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 Manual

Updates

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

Intended Operation

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

Warning

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

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

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Conformity & Certificates

CE

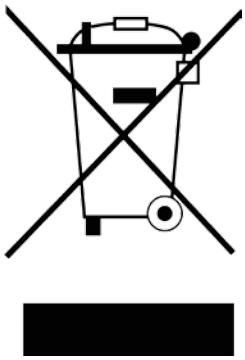
This device complies with the basic requests of applicable EU guidelines. The appropriate procedure for approval has been carried out.

RoHS

(Restriction of the use of certain Hazardous Substances)

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

WEEE



(Directive on Waste Electrical and Electronic Equipment)

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

For correct recycling please dispatch the device to:

IMM Elektronik GmbH,

Leipziger Strasse 32

09648 Mittweida

Germany

Only stamped parcels will be accepted!

WEEE-Reg.-No. DE 93924963

Contact

Sales:

DirectOut GmbH, Leipziger Strasse 32, 09648 Mittweida, Germany

Phone: +49 (0)3727 6205-333 // Fax: +49 (0)3727 6205-56

www.directout.eu

Manufacturer:

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

Phone: +49 (0)3727 6205-0 // Fax: +49 (0)3727 6205-56

www.imm-gruppe.de

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

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 suffcient air circulation for cooling. Do NOT cover the fan outlets and the slots at the sides of the device!

3. Remove the protective caps from the optical MADI ports before use.

Note

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

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4. Using the power cords provided connect both PSUs to a matching power supply:

Warning

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 PSUs on the front panel:

Tip

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

6. Network integration of the controller - see „Network integration“ on page 14.

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 „Firmware Update Instruction“ on page 28.

Network integration

To set up your D.O.TEC® M.1k2 initially (or after a reset) you need a working IP connection with the controller of the device. The M.1k2 is delivered with a fixed IP address. 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 26.

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).
2. Go to to the network settings of your operating system
    - Mac OS X: System settings - Network - Ethernet[1]
    - Windows 7 or Vista: Control panel - Network and Internet - Network and Sharing Center - Manage network connections2

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, go to **Configuration-Device-Firmware update** and perform an firmware update first. Download the latest version of the firmware and the update instructions from http://www.directout.eu/en/support/downloads/m.1k2.html.

1 http://docs.info.apple.com/article.html?path=Mac/10.7/en/mh11939.html
2 http://windows.microsoft.com/en-US/windows-vista/Change-TCP-IP-settings

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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 = 1 FS; 88.2 kHz = 2 FS ; 176 kHz = 4 FS

or

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

Global Control

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

Power	**2 Switches** Enable / disable power supply.
PSU 1 & PSU 2	**2 LEDs (green): indicate the status of both power supply units** LED OFF = Power supply inactive LED ON = Power supply active LED blinking 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.

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.

Note

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“ on page 22).

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 >5s for emergency recovery.

The behaviour of the LED “STATE” may be configured in the GUI (see the “Software Guide”).

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User data (Serial, MIDI, GPO)

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

Serial signals can be routed either by using userbits[1] of a MADI frame. 4 GPOs can be triggered manually or automatically by a system event.

RS 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.
RS 422 / 485	**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)** - 4 x General Purpose Output 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.

The USB port may be used as serial port too - see „Remote Operation“ on page 19.

1 Tunneling of MIDI signals is compatible to the protocol used by RME, tunneling of RS232 and RS4xx data is compatible to the protocol used by Studer / Soundcraft.

Clocking

The M.1k2 may use a variety of clock sources: internal (44.1 kHz / 48 kHz), word clock, video (PAL / NTSC) or 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	**BNC socket (coaxial)** connect video reference signal here (black burst PAL or NTSC; the video standard is detected automatically).
WCK IN	**BNC socket (coaxial)** connect word clock here.
WCK OUT	**2 x BNC socket (coaxial)** connect here to receive word clock output signal.
75 Ω	**LED (yellow): indicates the termination status of word clock and video input.** LED ON = termination enabled LED OFF = termination disabled.
Sync (Video)	**LED (green): indicates the sync status of the incoming video signal** LED ON = signal locked LED OFF = no signal present LED flashing = signal present, not locked.
Sync (WCK)	**LED (green): indicates the sync status of the incoming word clock signal** LED ON = signal locked LED OFF = no signal present LED flashing = signal present, not locked

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Remote Operation

The M.1k2 may be controlled via an ethernet connection or serial data input.

Ethernet	**RJ45 socket** Connection for ethernet control Requires a standard CAT5 cable for connection with ethernet network (100 mbit/s).
USB	**USB socket** USB connection for virtual serial port. Requires a standard USB cable (Type B).

To use the USB port as virtual serial port the D.O.TEC USB driver[1] (Windows 7, Vista, XP) has to be installed on the computer first.

Note

1 http://www.directout.eu/en/support/downloads/m.1k2.html

CHAPTER 5: Technical Data

Dimensions

- Width 19'' (48.26 cm)
- Height 2 HE (8.9 cm)
- Depth 10'' (25.4 cm)

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 (bayonet neill concelman)

- 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 (subscriber connector)

- 8 x SC socket FDDI (input / output)
- ISO/IEC 9314-3
- Wave length: 1300 nm
- Multi mode 62.5/125 µm or 50/125 µm
- optional: Single mode 9/125 µm

MADI Port - optical SFP (small form factor pluggable)

- 8 x SFP carrier with LC sockets FDDI (input / output)
- Wave length: depending on used transceiver (typical 1300 nm)
- Multi mode 62.5/125 µm or 50/125 µm
- optional: Single mode 9/125 µm

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Sample Rate

- 30 - 50 kHz @1 FS
- 60 - 100 kHz @2 FS
- 120 - 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
- WCLK signal
- Termination 75 Ω switchable

Video

- 1 x BNC socket (75 Ω impedance) - input

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)

USB

- 1 x USB 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 5s. As soon as you press the button, it will start flashing rapidly. If 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.

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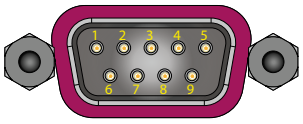
Appendix B

DSUB-9 Pin assignments

RS232

The RS232 port handles bitrates of 9600, 19200, 38400 and 115200 bps without RTS/CTS support.

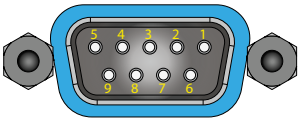


jack - male

Pin	Signal
2	RX
3	TX
5	GND

RS4xx

The RS4XX port can be configured to handle RS422 or RS485 signals and bitrates of 9600, 19200, 38400 and 115200 bps.

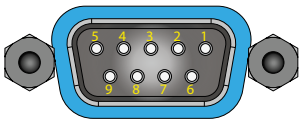


jack - female

Pin	Signal
1	GND
2	RS422 RX+
3	RS422 TX- / RS485 RX-
4	GND
5	
6	GND
7	RS422 RX-
8	RS422 TX+ / RS485 RX+
9	

GPO

The 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 60V, 0.6A 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 the 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.

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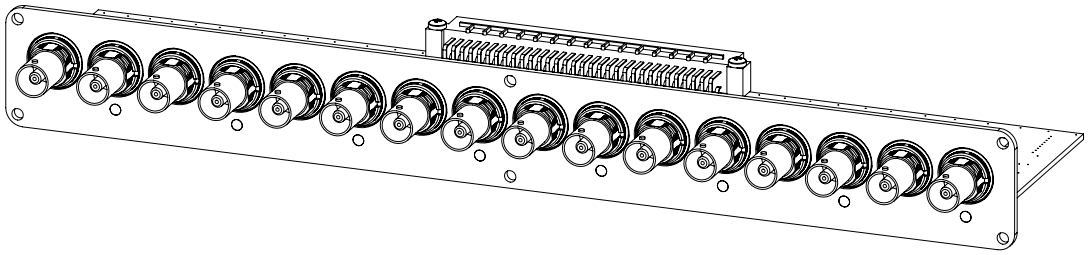
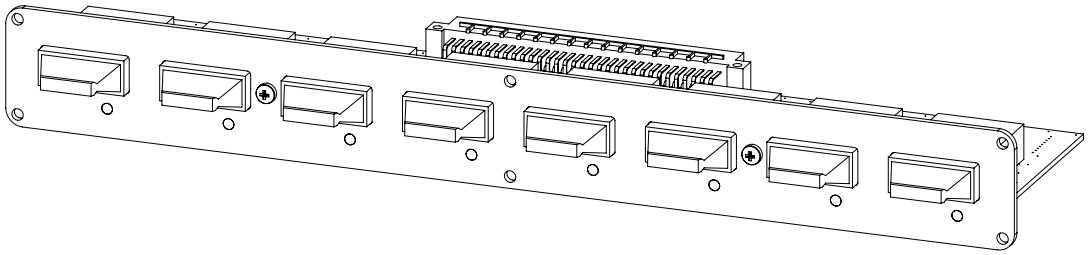
Modules

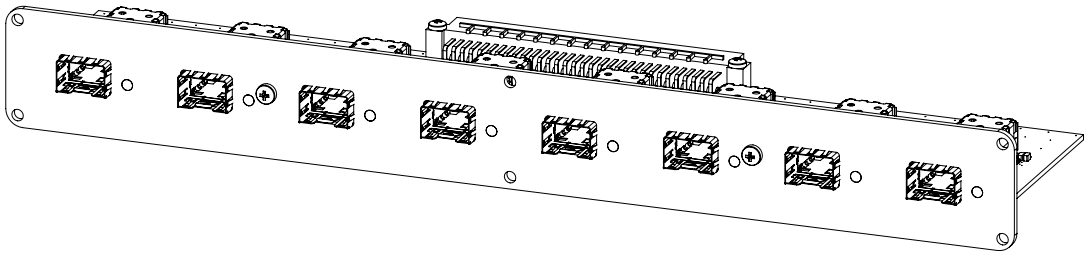
BNC - Module (coaxial)



SC - Module (optical)



SFP - Module (optical)



Appendix D

How to - Network

The following guide aims to familiarize with basic information to set-up 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: 8.8.8.8

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.

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	192.168.74.15

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).

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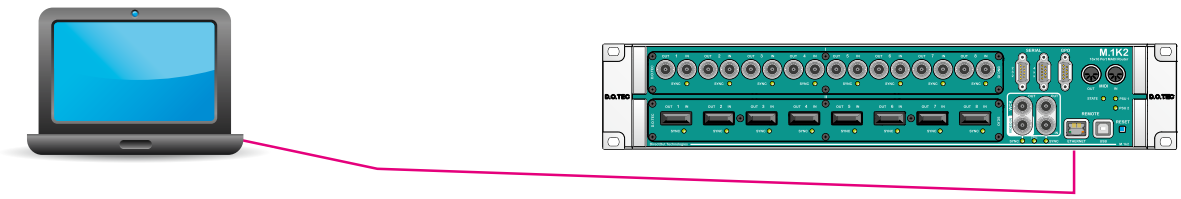
In a network environment each device (computer, printer, D.O.TEC® M.1k2…) needs its own and unique IP address. This can be achieved by a manual setup or by using a DHCP server within a network.

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



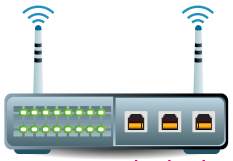
IP Adress: 10.0.0.20
Network Mask: 255.255.255.0
Gateway: 10.0.0.20
DNS: 8.8.8.8

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 D.O.TEC® 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

- D.O.TEC® 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.

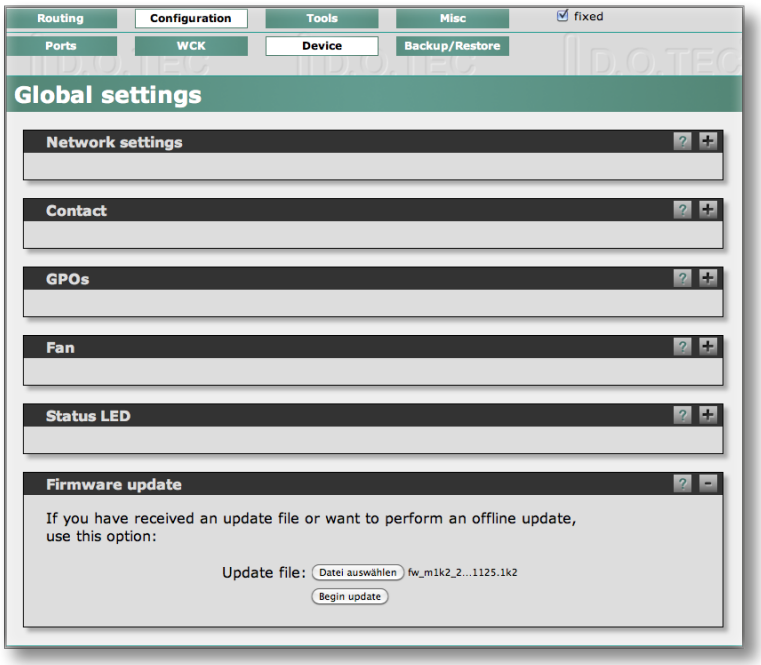
Installation

1. Download the update file (“M.1k2 Firmware”) at:

   http://www.directout.eu/en/support/downloads/m.1k2.html

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.

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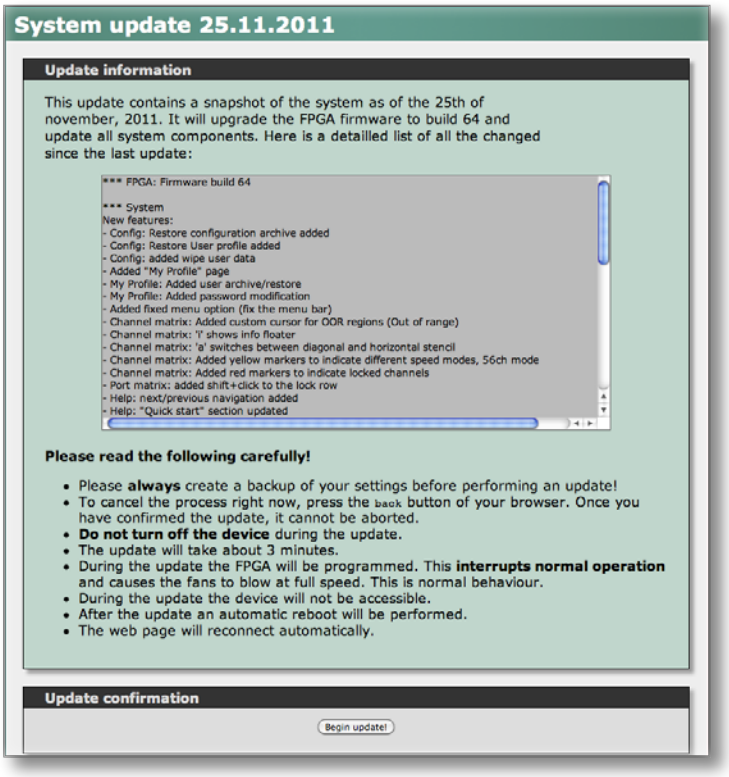
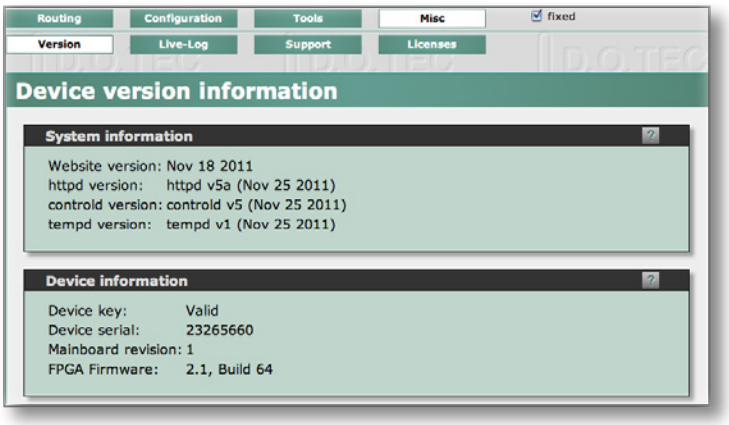
5. Select “Begin update”. The file will be uploaded, checked and detailed update information will be shown after a few seconds. Please read this carefully!



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.

Note



7. After the update you need to log in again. You may check the version of the firmware by navigating to “Misc - Version”.

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

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