

visual engineering  
**LIGHTWARE**



## User's Manual

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MX4x4DVI, MX4x4DVI-DL  
MX6x6DVI, MX6x6DVI-DL  
MX8x8DVI, MX8x8DVI-DL



## IMPORTANT SAFETY INSTRUCTIONS

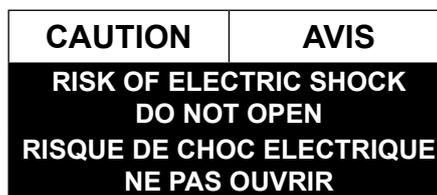
### Class I apparatus construction.

This equipment must be used with a mains power system with a protective earth connection. The third (earth) pin is a safety feature, do not bypass or disable it. The equipment should be operated only from the power source indicated on the product.

To disconnect the equipment safely from power, remove the power cord from the rear of the equipment, or from the power source. The MAINS plug is used as the disconnect device, the disconnect device shall remain readily operable.

There are no user-serviceable parts inside of the unit. Removal of the cover will expose dangerous voltages. To avoid personal injury, do not remove the cover. Do not operate the unit without the cover installed.

The appliance must be safely connected to multimedia systems. Follow instructions described in this manual.



### Replacing the AC fuse

Unplug the AC power cord from the device. Locate the AC fuse on the rear panel. Replace only the AC fuse as indicated on the rear panel. Connect the power cord to the switcher and to the AC power source. Make sure the switcher is working properly.

### Ventilation

For the correct ventilation and to avoid overheating ensure enough free space around the appliance. Do not cover the appliance, let the ventilation holes free and never block or bypass the ventilators (if any).

### WARNING

To prevent injury, the apparatus is recommended to securely attach to the floor/wall or mount in accordance with the installation instructions. The apparatus shall not be exposed to dripping or splashing and that no objects filled with liquids, such as vases, shall be placed on the apparatus. No naked flame sources, such as lighted candles, should be placed on the apparatus.

### WEEE ( Waste Electrical & Electronic Equipment )



This marking shown on the product or its literature, indicates that it should not be disposed with other household wastes at the end of its working life. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources. Household users should contact either the retailer where they purchased this product, or their local government office, for details of where and how they can take this item for environmentally safe recycling. Business users should contact their supplier and check the terms and conditions of the purchase contract. This product should not be mixed with other commercial wastes for disposal.

## Limited Warranty Statement

1. Lightware Visual Engineering LLC (Lightware) warrants to all trade and end user customers that any Lightware product purchased will be free from manufacturing defects in both material and workmanship for three (3) years from purchase unless stated otherwise below. The warranty period will begin on the latest possible date where proof of purchase/delivery can be provided by the customer. In the event that no proof can be provided (empty 'Date of purchase' field or a copy of invoice), the warranty period will begin from the point of delivery from Lightware.

1.1. 25G and MODEX product series will be subject to a seven (7) year warranty period under the same terms as outlined in this document.

1.2. If during the first three (3) months of purchase, the customer is unhappy with any aspect of a Lightware product, Lightware will accept a return for full credit.

1.3. Any product that fails in the first six (6) months of the warranty period will automatically be eligible for replacement and advanced replacement where available. Any replacements provided will be warranted for the remainder of the original unit's warranty period.

1.4. Product failures from six (6) months to the end of the warranty period will either be repaired or replaced at the discretion of Lightware. If Lightware chooses to replace the product then the replacement will be warranted for the remainder of the original unit's warranty period.

2. The above-stated warranty and procedures will not apply to any product that has been:

2.1. Modified, repaired or altered by anyone other than a certified Lightware engineer unless expressly agreed beforehand.

2.2. Used in any application other than that for which it was intended.

2.3. Subjected to any mechanical or electrical abuse or accidental damage.

2.4. Any costs incurred for repair/replacement of goods that fall into the above categories (2.1., 2.2., 2.3.) will be borne by the customer at a pre-agreed figure.

3. All products to be returned to Lightware require a return material authorization number (RMA) prior to shipment and this number must be clearly marked on the box. If an RMA number is not obtained or is not clearly marked on the box, Lightware will refuse the shipment.

3.1. The customer will be responsible for in-bound and Lightware will be responsible for out-bound shipping costs.

3.2. Newly repaired or replaced products will be warranted to the end of the originally purchased products warranty period.

In case of defect please call your local representative or contact Lightware at

Lightware Sales:  
[sales@lightware.com](mailto:sales@lightware.com)  
+36 1 255 3800

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## DOCUMENT INFORMATION

This User's Manual applies to the following versions of the mentioned software, firmware, and hardware:

Item	Version
Lightware Device Controller (LDC) software	v1.16.0b5
Lightware Bootloader software (for MX6x6DVI/DVI-DL, MX8x8DVI/DVI-DL models)	v3.3.2
Matrix Firmware Updater software (for MX4x4DVI, MX4x4DVI-DL models)	v1.3.0.
Web Content firmware	v1.4.1
Web Server firmware	v1.1.5
CPU board / MX-CPU firmware (for MX6x6DVI/DVI-DL, MX8x8DVI/DVI-DL models)	v2.5.0
CPU board / MX-CPU firmware (for MX4x4DVI, MX4x4DVI-DL models)	v2.3.1
Control Panel firmware	v1.0.8
Motherboard PCB	v1.1

Document revision: **2.1**

Release date: 07-11-2018

Editor: Laszlo Zsedenyi

## SYMBOL LEGEND



### **INFO**

*A notice which may contain useful information. Procedure can be successful without reading it.*



### **ATTENTION!**

*An attention which is recommended to read. Procedure can be unsuccessful without reading it.*



### **WARNING!**

*Important warning which is highly recommended to read and keep in every case.*



### **TIPS AND TRICKS**

*Tips and tricks which you may have not known yet but can be useful.*



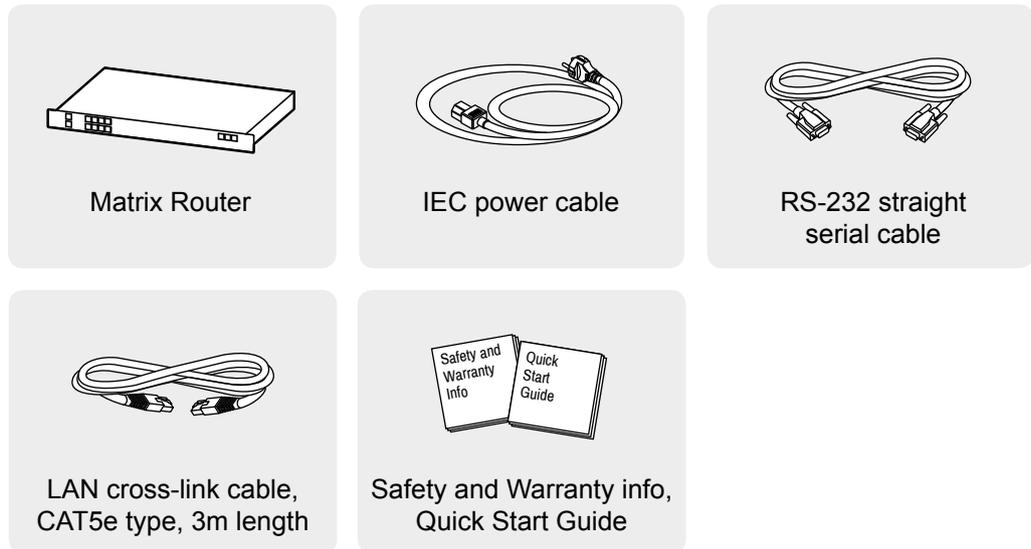
### **Printer icon**

Lightware Visual Engineering supports green technologies and eco-friendly mentality. Thus, this document is made for digital usage primarily. If you need to print out few pages for any reason, we indicated some summary sheets with a printer-friendly icon which can be found at the left bottom corner of the actual page.

# 1. Introduction

Thank You for choosing Lightware matrix routers. The standalone DVI matrix routers handle DVI signal through various DVI inputs and DVI outputs respectively, which routes any input(s) to any combination of output(s). It can be controlled either by RS-232 port, TCP/IP LAN connection, or by the built-in website - depending on the capabilities of the appliance. Crosspoint switching is done instantly without frame delay or frame latency.

## 1.1. Box Contents



## 1.2. Description

Lightware MX4x4DVI, MX6x6DVI and MX8x8DVI are single link, MX4x4DVI-DL, MX6x6DVI-DL and MX8x8DVI-DL are dual link DVI matrix switchers with 4, 6 or 8 DVI inputs and 4, 6 or 8 DVI outputs respectively, that routes any input(s) to any combination of output(s).

The router conforms to DVI 1.0 specification, and switches signals between 25 - 165 MHz pixel clock frequency: from 640x480@60Hz to 1920x1200@60Hz or 2048x1080@60Hz PC resolutions in single link, and up to 3840x2400@30Hz or 4096x2400@24Hz in dual link mode. See section [4.2 on page 17](#) for more information about dual link signals.

The input signal is not equalized, therefore only standard length (max. 5 meter) DVI cables can be used.

The switcher has an RS-232 (or RS-422 optional) and an RJ45 LAN port for remote control applications and a control panel for local control operation. Front panel buttons are illuminated and easily relegendable with text for informative system integration.

## 1.3. Features

### **Advanced EDID Management**

The user can emulate any EDID on the switcher's inputs independently, read out and store any attached monitor's EDID in 100 internal memory locations, upload and download EDID files using Lightware Device Control Software.

### **4x4 / 6x6 / 8x8 Non-blocking Crosspoint Matrix Architecture**

The router allows any input to be switched to any output or more outputs simultaneously.

### **1.65 Gb/s channel transmission**

Routes any DVI single link signal between 25 and 330 MHz pixel clock frequency conforming to DVI 1.0 standard or dual link depending on the model type.

### **Supports all HDTV resolutions**

720p, 1080i and 1080p etc. without HDCP encoding - Unencrypted HDTV signals up to 165 MHz pixel clock frequency regardless of resolution are passed through the matrix switches.

### **Relegendable buttons**

Each button has an easy removable flat cap and a translucent label which can be inserted under it to identify sources and destinations.

### **RS-232 control**

Simple ASCII-based RS-232 protocol is used for switching, preset calling, status request, etc.

### **Ethernet control**

TCP/IP Ethernet 10Base-T or 100Base TX (Auto-Sensing).

### **Fiber cable support**

Self powered DVI fiber cables using +5V from DVI sources (VGA cards, etc.) usually are consuming more than 50 mA, which load is maximum allowed by DVI 1.0 standard. It supports +5V 500 mA constant current output on each DVI output to power long distance fiber optical cables.

### **Universal power supply**

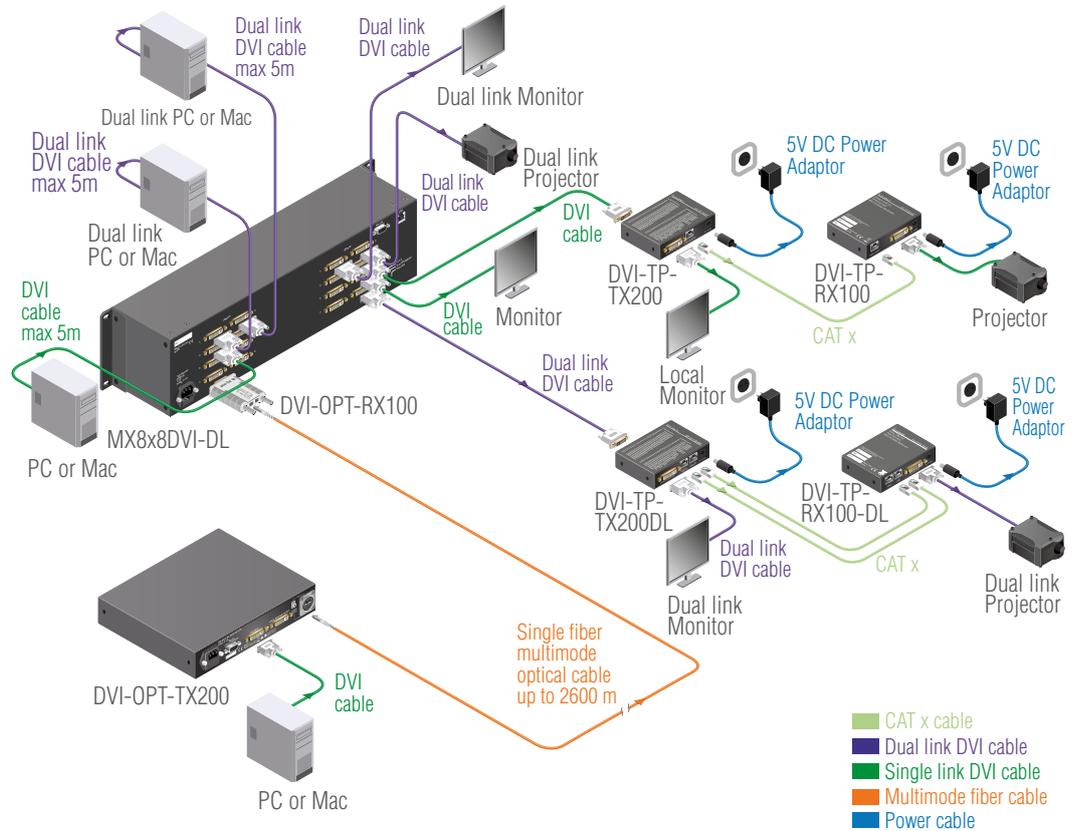
The unit accepts AC voltages from 100 to 240 Volts with 50 or 60 Hz line frequency on standard IEC connector.

### **Power failure memory**

In case of a power failure the unit stores its latest configuration, and after next power up it loads automatically.

## 1.4. Typical Application

The following figure shows an example for the standalone application of MX8x8DVI-DL.

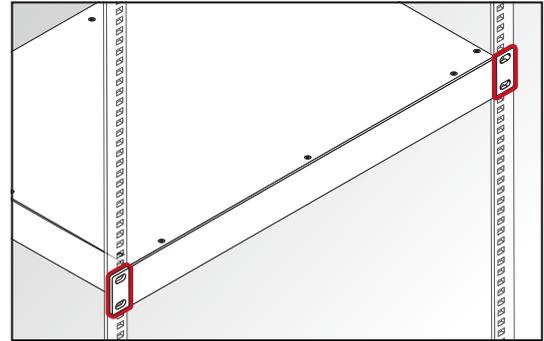


## 2. Installation

### 2.1. Mounting

The housing of MX8x8DVI series matrix contains built-in rack ears with mounting holes for the easy setup in rackmount enclosures and any rack environment.

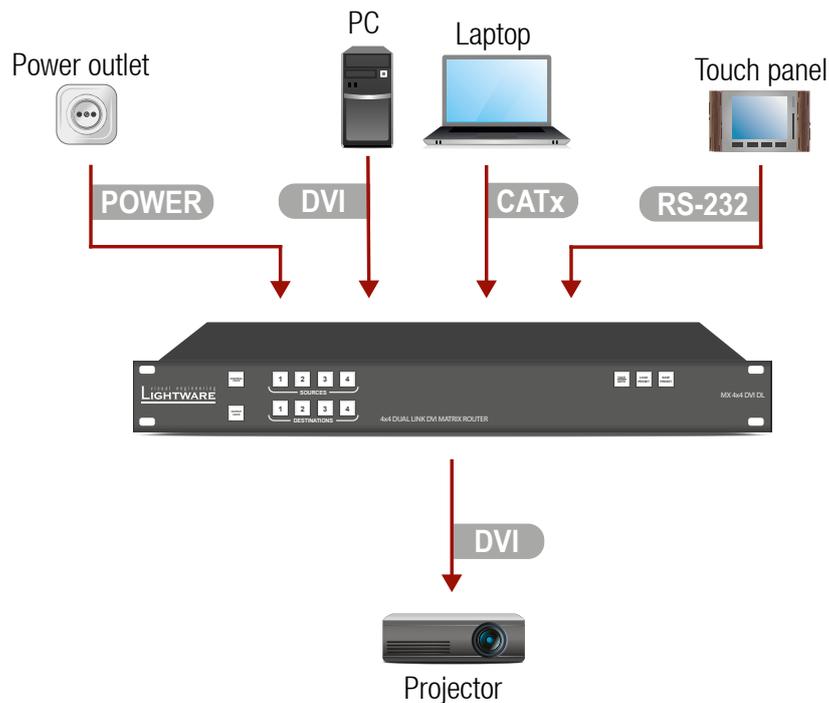
MX8x8DVI and MX8x8DVI-DL matrix switchers are two-unit high, but the mounting process is similar to installing of the one-unit high devices (MX4x4DVI, 4x4DVI-DL, 6x6DVI and 6x6DVI-DL).



#### **ATTENTION!**

To ensure the correct ventilation and avoid overheating let enough free space around the appliance. Do not cover the appliance, let the ventilation holes free on both sides.

### 2.2. Connecting Steps



- DVI** Connect the matrix and one or more source devices (e.g. PC) to the input ports by DVI cables.

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- CATx** In order to control the matrix via Ethernet, connect the device to a LAN switch/router, and connect a controller (e.g. a Laptop).

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- RS-232** Optionally for RS-232 control: connect a controller/controlled device (e.g. Touch panel) to the RS-232 port.

---

- DVI** Connect one or more sink device (e.g. Projector) to output ports.

---

- Power** As the final step of the installation connect the power cord to the AC power socket and to the matrix.

## 2.3. Connection of Serial Devices

### 2.3.1. General Information

There are two types of devices in general serial communication:

- **Data Terminal Equipment:** Data Terminal Equipment (DTE) is an end instrument that converts user information into signals or reconverts received signals. Typical DTE devices: computers, LCD touch panels and control systems.
- **Data Circuit-terminating Equipment:** Data Circuit-terminating Equipment (DCE) is a device that sits between the DTE and a data transmission circuit. It is also called data communication equipment and data carrier equipment. Typical DCE devices: projectors, industrial monitors and amplifiers.

Among others the pin assignment is different between DTE and DCE.

	DTE	DCE
<b>Pin 2:</b>	RD	TD
<b>Pin 3:</b>	TD	RD

RD: Received Data (digital input)

TD: Transmitted Data (digital output)

Different type of serial cables must be used between different serial devices.

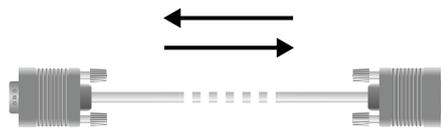
	DTE	DCE
<b>DTE</b>	Null-modem	TD
<b>DCE</b>	Straight	Null-modem*

\* In general contact DCE with DCE by tail-circuit serial cable.

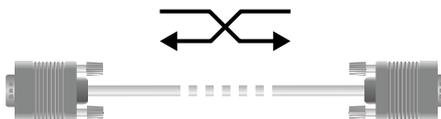
### 2.3.2. Types of Serial Cables

#### Straight Serial Cable

Straight pin-outs both ends. For the detailed RS-232 connector pinout see section [3.5.2 on page 14](#).



#### Null-modem Serial Cable



Straight pin-out at the one end and cross pin-out at the other end (interchange lines of TX and RX).

Serial cables between devices may have male or female plugs and their type may be straight or null-modem in usual.



#### **ATTENTION!**

*The cable type does not depend on the plug type.*

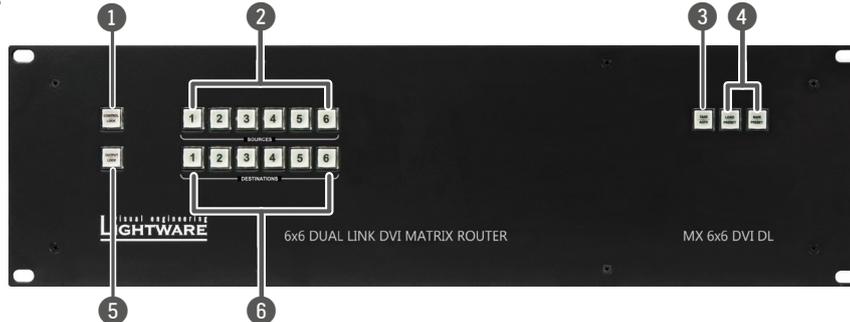
## 3. Product Overview

### 3.1. Front View

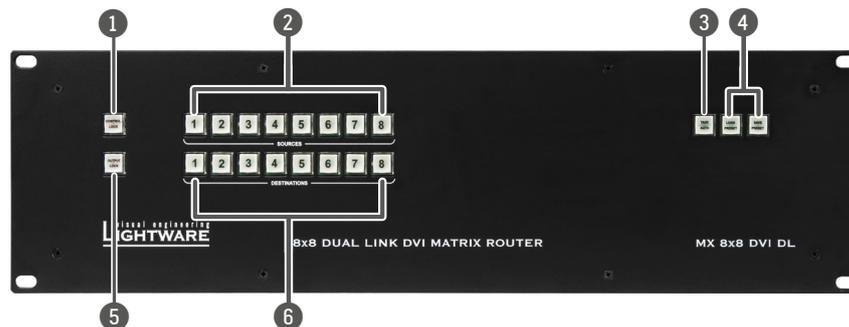
MX4x4DVI-DL



MX6x6DVI-DL



MX8x8DVI-DL

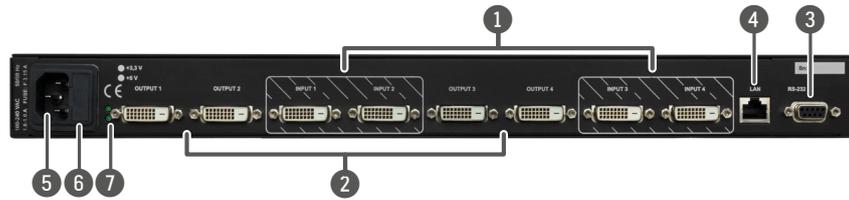


### 3.2. Front View Legend

- 1 Control lock** Disables or enables front panel operation. When red illuminated, all operations are prohibited on front the panel. See section [5.2.1 on page 19](#) for more information.
- 2 Source buttons** Source buttons have three functions: to select an input, to select a preset and to view the selected input's state (only in Take mode). For details see section [5.2 on page 19](#).
- 3 Take/Auto** Displays the actual switching mode of the router (**Take** or **Autotake**). Long press toggles the switching mode, short press executes switching in **Take** mode. For details see section [5.2.2 on page 19](#).
- 4 Preset buttons** **Load preset** button loads and executes a previously saved preset. **Save preset** button stores actual matrix state in one of the preset memories. For details see section [5.2.5 on page 21](#).
- 5 Output Lock** Locks and protects one (or more) outputs, inhibits accidental input changing on protected output. For details see section [5.2.5 on page 21](#).
- 6 Destination buttons** Destination buttons have two functions: to select an output, or to view the selected output's state. See section [5.2 on page 19](#) for more information.

### 3.3. Rear View

MX4x4DVI-DL



MX6x6DVI-DL



MX8x8DVI-DL



### 3.4. Rear View Legend

- |   |                              |  |
|---|------------------------------|--|
| ① | <b>Input connectors</b>      | 29 pole DVI-I digital-only female receptacle connectors. Connect DVI source devices to these connectors. For more information see section <a href="#">3.5.1 on page 14</a> . |
| ② | <b>Output connectors</b>     | 29 pole DVI-I digital-only female receptacle connectors. Connect DVI sink devices to these connectors. For more information see section <a href="#">3.5.1 on page 14</a> .   |
| ③ | <b>Serial port</b>           | 9 pole D-sub female connector. Can be ordered with RS-232 or RS-422 control for details see section <a href="#">3.5.2 on page 14</a> .                                       |
| ④ | <b>Ethernet port</b>         | RJ45 connector. Remote control port for connecting the unit to Local Area Network (LAN) for details see section <a href="#">3.5.3 on page 15</a> .                           |
| ⑤ | <b>AC Power connector</b>    | Standard IEC power connector. The router works with 100 to 240 Volts, 50 or 60 Hz power sources for details see section <a href="#">5.1 on page 19</a> .                     |
| ⑥ | <b>AC fuse</b>               | Replace only F3.15A type for MX4x4DVI and F1A type for MX6x6DVI and MX8x8DVI.  |
| ⑦ | <b>DC voltage indicators</b> | LED indicators for internal DC power voltages.   |
| ⑧ | <b>CPU live LED</b>          | Continuously blinking LED if the CPU works properly (only on MX6x6DVI and MX8x8DVI variants).  |

### 3.5. Electrical Conncetors

#### 3.5.1. DVI Inputs and Outputs

Matrix switchers provide 29 pole DVI-I connectors, however only digital pins are internally connected. This way, users can plug in any DVI connector, but keep in mind that no analog signals are processed. No input equalization is provided.



No output reclocking is provided.



**INFO**

*Always use high quality DVI cable for connecting sources and displays.*

#### Fiber Cable Powering

As a special feature MX8x8DVI / MX8x8DVI-DL, MX6x6DVI / MX6x6DVI-DL MX4x4DVI / MX4x4DVI-DL is able to supply 500 mA current on DDC +5V output (pin 14 on output connectors) to power fiber optical DVI cables. Standard DVI outputs or VGA cards supply only 55 mA current on +5V output, thus unable to power directly a fiber optical cable.



**INFO**

*The matrix switcher does not check if the connected sink (monitor, projector or other equipment) supports Hotplug or EDID signals but outputs the selected signal immediately after switch command.*

#### 3.5.2. RS-232 / RS-422 Control Port

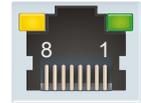
Lightware MX8x8DVI / MX8x8DVI-DL, MX6x6DVI / MX6x6DVI-DL MX4x4DVI / MX4x4DVI-DL, can be remote controlled through industry standard 9 pole D-SUB female connector located on the rear panel of the unit. The router can be ordered with RS-232 or RS-422 control port.



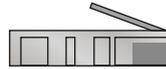
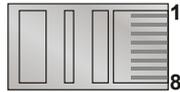
D-sub connector pin assignment		
Pin nr.	RS-232	RS-422
1	NC - non connected	TX- data transmit complement
2	<b>TX data transmit (output)</b>	TX- data transmit true
3	<b>RX data receive (input)</b>	RX+ data receive true
4	DTR (Internally connected to Pin 6)	RX- data receive complement
5	<b>GND signal ground (shield)</b>	GND signal ground(shield)
6	DSR (Internally connected to Pin 4)	NC - non connected
7	RTS (Internally connected to Pin 8)	NC - non connected
8	CTS (Internally connected to Pin 7)	NC - non connected
9	NC - non connected	NC - non connected

### 3.5.3. Ethernet Port

The matrix can be remote controlled via Ethernet as well. The matrix can be connected to a LAN hub, switch or router with a UTP patch cable. If connecting to a computer directly, a cross UTP cable has to be used! See more information about remote operation in section [5.3 on page 23](#).



#### The Wiring of Twisted Pair Cables



Lightware recommends the termination of TP cables on the basis of TIA/EIA T 568 A or TIA/EIA T 568 B standards.

#### Ethernet Pin Connections

Pin	TIA/EIA T568 A	Color and name	TIA/EIA T568 B	Color and name
1		white/green stripe		white/orange stripe
2		green solid		orange solid
3		white/orange stripe		white/green stripe
4		blue solid		blue solid
5		white/blue stripe		white/blue stripe
6		orange solid		green solid
7		white/brown stripe		white/brown stripe
8		brown solid		brown solid

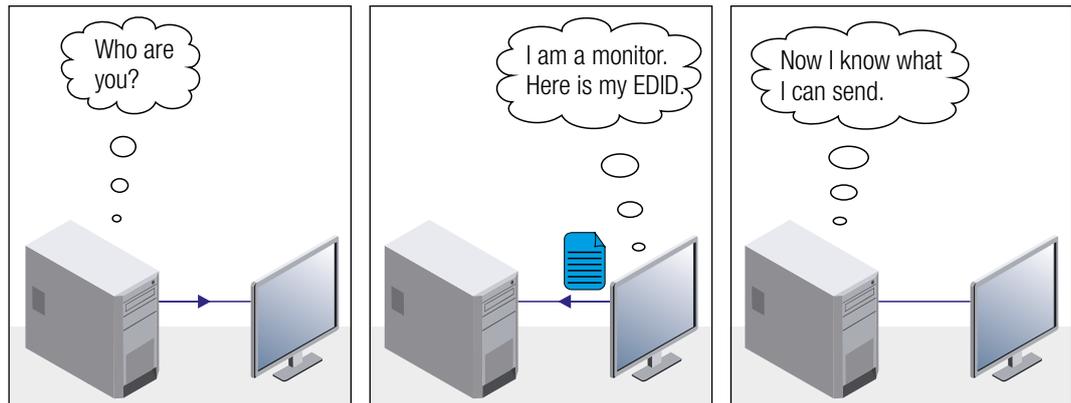
## 4. Technologies

### 4.1. EDID Management

#### 4.1.1. Understanding the EDID

The Extended Display Identification Data (EDID) is the passport of display devices (monitors, TV sets, projectors). It contains information about the capabilities of the display, such as supported resolutions, refresh rates (these are called Detailed Timings), the type and manufacturer of the display device, etc.

After connecting a source to a display (DVI, HDMI, DP), the source reads out the EDID to determine the resolution and refresh rate of the image to be transmitted.



**EDID Communication**

Most DVI computer displays have 128-byte long EDID structure. However, Digital Televisions and HDMI capable displays may have another 128 bytes, which is called E-EDID and defined by CEA (Consumer Electronics Association). This extension contains information about additional Detailed Timings, audio capabilities, speaker allocation and HDMI capabilities. It is important to know that all HDMI capable devices must have CEA extension, but not all devices with CEA extension are HDMI capable.

#### Common Problems Related to EDID

**Problem:** “My system consists of the following: a computer, a Lightware device, a WUXGA (1920x1200) LCD monitor, and an SXGA (1280x1024) projector. I would like to see the same image on the monitor and the projector. What EDID should I choose on the Lightware device?”

**Solution:** If you want to see the image on both displays, you need to select the resolution of the smaller display (in this case SXGA), otherwise the smaller display may not show the higher resolution image.

**Problem:** “I have changed to a different EDID on an input port of the Lightware device to have a different resolution but nothing happens.”

**Solution:** Some graphics cards and video sources read out the EDID only after power-up and later they do not sense that EDID has been changed. You need to restart your source to make it read out the EDID again.

### 4.1.2. Advanced EDID Management

Each DVI sink (e.g. monitors, projectors, plasma displays, etc...) must support the EDID data structure. Source BIOS and operating systems are likely to query the sink using DDC2B protocol to determine what pixel formats and interface are supported. DVI standard uses EDID data structure to identify the monitor type and capabilities. Most DVI sources (VGA cards, set top boxes, etc.) will output DVI signal after accepting the connected sink's EDID information. In the case of EDID readout failure or missing EDID, the source will not output DVI video signal.

Lightware devices provide the Advanced EDID Management function that helps system integration. The built-in EDID Router can store and emulate factory pre-programmed- and User programmable EDIDs. The EDID of the attached monitors or projectors for each output are stored in a non-volatile memory. This way the EDID of a monitor is available when the monitor is unplugged or switched off.

Any EDID can be emulated on any input. An emulated EDID can be copied from the EDID router's memory (static EDID emulation), or from the last attached monitor's memory (dynamic EDID emulation). For example, the Lightware device can be set up to emulate a sink device, which is connected to one of the outputs. In this case, the EDID automatically changes, if the monitor is replaced with another display device (as long as it has a valid EDID).

EDID is independently programmable for all inputs without affecting each other. All inputs have their own EDID circuit.



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**INFO**

*The user is not required to disconnect the video cable to change an EDID as opposed to other manufacturer's products. EDID can be changed even if a source is connected to the input and powered ON.*

---



---

**INFO**

*When EDID has been changed, the router toggles the HOTPLUG signal for 2 seconds. Some sources do not sense this signal. In such cases, the source device must be restarted or powered OFF and ON again.*

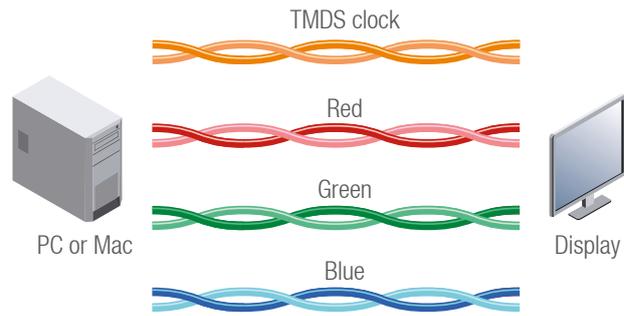
---

## 4.2. Dual-Link DVI Signal

The Dual-Link DVI interface can operate in either Single-Link or Dual-Link mode. The chosen mode depends on the pixel clock frequency of the signal and it is selected by the hardware automatically. For pixel clock frequencies lower than 165 MHz, Single-Link mode is selected. For higher pixel clock frequencies (up to 330 MHz), Dual-Link mode is selected. It is important to know that pixel clock frequency is not the same as TMDS clock frequency when it comes to Dual-Link DVI.

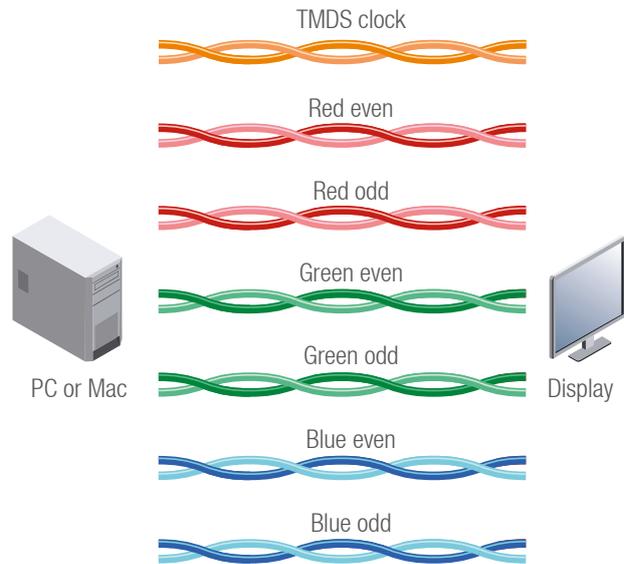
The pixel clock frequency in Single-Link transmission is a 10th part of the data rate. The maximum data rate of the Single-Link transmission is 1.65 Gbps per TMDS channel and the maximum pixel clock frequency is 165 MHz. In this case the pixel clock frequency equals the TMDS clock frequency. The pixel clock frequency in Dual-Link transmission (when in Dual-Link mode) is a 5th part of the data rate. The maximum data rate of Dual-Link transmission is still 1.65 Gbps per TMDS channel but the maximum pixel clock frequency is 330 MHz. In this case the pixel clock frequency is two times the TMDS clock frequency.

The DVI standard maximizes the data rate of the TMDS channels in 1.65 Gbps. Dual-Link DVI interface enables a higher resolution compared to the Single-Link transmission by doubling the number of wire pairs to transmit the video signal. In Single-Link cables 3 wire pairs carry the color information (red, green and blue) and one wire pair carries the clock signal (TMDS clock).



**Video lines of the Single-Link interface**

In Dual-Link cables, 6 wire pairs carry the color information next to the TMDS clock signal. One color component is carried by two wire pairs, where one wire pair carries the odd pixels and the other wire pair carries the even pixels.



**Video lines of the Dual-Link interface**



**INFO**

*The colors of the wire pairs in the picture represent the color information they carry and not the color of the actual wires inside the cable.*

## 5. Operation

### 5.1. Powering on

Connect the power cord to the router's IEC standard power input connector. The unit is immediately powered ON when the power cord is connected to the AC source. The router does not have a power switch; it remains powered on, until AC line voltage is present. After powered on, the unit performs a self-test, then all front panel buttons light up for one second. After the self-test the router reloads its last configuration and it is ready to use.



#### INFO

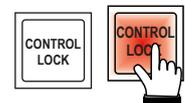
At switching ON, the router reloads the latest settings which were used before it was turning off. The unit has an internal emergency memory which stores all current settings, and ties configurations. This memory is independent from presets and invisible for the user. This built-in feature helps the system to be ready immediately in case of power failure or accidentally powering down.

### 5.2. Basic Control Panel Operations

#### 5.2.1. CONTROL LOCK

Front panel button operations can be enabled or disabled using **Control Lock** button, while RS-232 and Ethernet control is still enabled. If the button is not illuminated, front panel button operations are enabled. If it illuminates red continuously, front panel operations are disabled.

Press the **Control Lock** button to toggle the control lock state.



#### 5.2.2. TAKE / AUTOTAKE Modes

The matrix has two different switching modes: **Take** and **Autotake**. If the **Take** button is unlit, **Take** mode is active. When the **Take** button continuously illuminates green, **Autotake** mode is selected. Press and hold the **Take** button for five seconds to change between **Take** and **Autotake** modes.



#### 5.2.3. Viewing the Crosspoint State

The current switching status can be checked on the front panel by using the front panel buttons. The crosspoint state is displayed slightly different in **Take** or **Autotake** modes because of the different switching methods.



#### INFO

View mode does not mean, that the matrix has to be switched in different modes, viewing and switching can be done after each other, without pressing any special buttons.

#### Viewing the Current State in Take Mode

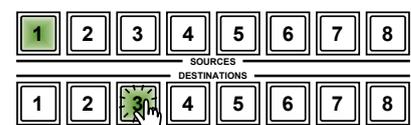
If the matrix is in **Take** mode, the user can verify both input and output connections. In **Take** mode no accidental change can be done unless **Take** button is pressed.

Press and release a **source button**. Now the selected source button and all destination buttons which are currently connected to the selected source will light up. This informative display will remain active for three seconds, then all buttons turn to dark.



Sample drawing shows that Input 1 is currently connected to the Output 2, 3, and 5 ports.

If every source, destination, and **Take** buttons are unlit (the unit is in **Take** mode, and no input was selected in the last 3 seconds), press and release a **destination button** to see its current state. Now the source button, which is connected to the selected destination, will light up.

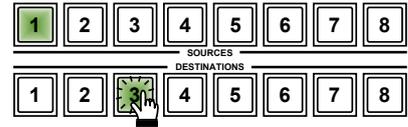


Sample drawing shows that Output 3 is connected to the Input 1.

### Viewing the Current State in Autotake Mode

In **Autotake** mode only the states of destinations can be viewed.

Press and release the required **destination button**. Now the source button, which is connected to the selected destination, will light up.



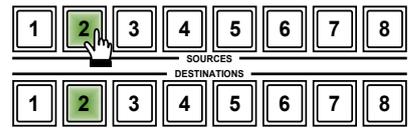
### 5.2.4. Switching Operations

#### Switching in Take Mode

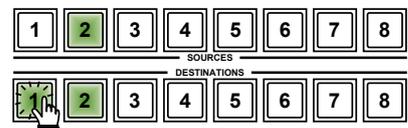
Take mode allows the user to connect or disconnect multiple outputs to an input at once. This mode is useful when the time delay is not allowed between multiple switching. The commands are only realized when the **Take** button is pressed.



**Step 1.** First, press and release the desired **source button**. The pressed source button and all destination buttons which are currently connected to the source lights up.



**Step 2.** Press and release the desired **destination buttons** which have to be (dis)connected to/from the selected source. The preselected destination buttons will blink. If no button is pressed for three seconds, the buttons will turn to dark.



**Step 3.** Press and release **Take** button; the selected input is switched to the selected output(s).

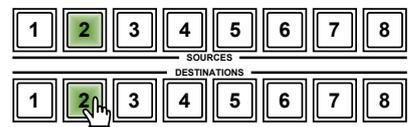


#### Switching in Autotake Mode

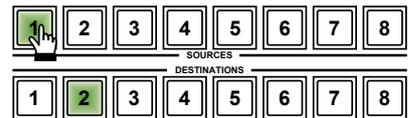
Autotake mode is useful when immediate actions must be done or fast switching is needed between sources on a particular destination. In this mode switching occurs immediately upon pressing one of the input selector buttons.



**Step 1.** Press and release the desired **destination button**. The pressed destination button and the actually connected source button light up green. If no source is connected (the output is muted) no source button will light up.



**Step 2.** Press and release the desired **source button**. The switch action will be executed immediately. Switching between sources to the selected destination can be done directly.



### 5.2.5. Preset Operations

The matrix routers have 32 user programmable presets. Each preset stores a configuration regarding all input connections and mute state for all outputs. All presets are stored in a non-volatile memory; the matrix keeps presets even in the case of a power down. Memory numbers are assigned to source buttons; if the frame has fewer buttons, the higher numbered presets are available only by software control.

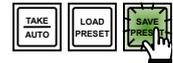
#### Saving a Preset in TAKE Mode

**Step 1.** Create the desired connections which have to be saved.

**Step 2.** Press and release the **Save Preset** button.

**Step 3.** Press and release a **source button** according to the desired memory address.

**Step 4.** Press and release **Take** button. Now the current configuration is stored in the selected memory.



#### INFO

*Preset#1..Preset#4 are available via front panel buttons, Preset#5..Preset#32 are accessible via software control.*



#### ATTENTION!

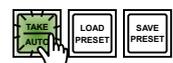
*Preset save action always stores the current configuration for all outputs including mute state but ignoring lock state.*

#### Loading a Preset in TAKE Mode

**Step 1.** Press and release **Load Preset** button.

**Step 2.** Press and release a **source button** according to the desired memory address.

**Step 3.** Press and release **Take** button. Now the selected preset is loaded.



#### ATTENTION!

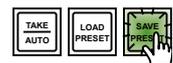
*Loading a preset modifies all output states that are not currently locked.*

#### Saving a Preset in AUTOTAKE Mode

**Step 1.** Create the desired connections which have to be saved.

**Step 2.** Press and release **Save preset** button.

**Step 3.** Press and release a **source button** according to the desired memory address. Now the current configuration is stored in the selected memory.



#### ATTENTION!

*Preset save action always stores the current configuration for all outputs including mute state but ignoring lock state.*

#### Loading a Preset in AUTOTAKE Mode

**Step 1.** Press and release **Load Preset** button.

**Step 2.** Press and release a source button according to the desired memory address. Now the selected preset is loaded.



#### ATTENTION!

*Loading a preset modifies all output states that are not currently locked.*

### 5.2.6. OUTPUT LOCK

The feature prevents an accidental switching to the locked destination in the case of an important signal. Locking a destination means, that no input change or muting can be executed on that particular destination. Destinations can be independently locked or unlocked. Locking a destination does not affect other destinations.



**ATTENTION!**

*In case of MX4x4DVI(-DL), the output locking is valid only for front panel operations. If an output is locked, the connected input can be changed by Lightware Device Controller or by protocol commands.*

#### Viewing the Locked Outputs in TAKE Mode

**Step 1.** Press and release the **Output Lock** button.

**Step 2.** The **Output Lock** button starts to blink and all the buttons of any locked destinations light up and remain illuminated for three seconds.



#### Locking an Output in TAKE Mode

**Step 1.** Press and release the **Output Lock** button.

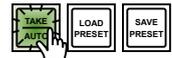
**Step 2.** Now the **Output Lock** button starts to blink and all the locked output's buttons illuminate green (view state).

**Step 3.** If no button is pressed for three seconds, the matrix returns to idle state.

**Step 4.** If an unlit **destination button** is pressed, it starts to blink, to indicate that it is preselected for output locking.



**Step 5.** Press and release **Take** button. The selected destinations are now locked.



#### Unlocking an Output in TAKE Mode

**Step 1.** Press and release the **Output Lock** button.

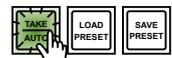
**Step 2.** Now the **Output Lock** button starts to blink and all the locked output's buttons illuminate green (view state).

**Step 3.** If no button is pressed for three seconds, the matrix returns to idle state.

**Step 4.** If an illuminating **destination button** is pressed, it goes off, to indicate that it is preselected for unlocking.



**Step 5.** Press and release the **Take** button. The deselected destinations are now unlocked.



#### Viewing Locked Outputs in AUTOTAKE Mode

In **Autotake** mode a destination is selected all the time. Therefore the currently selected output and input buttons are illuminated. The **Output Lock** button illuminates regarding the lock state of the current output. Viewing all locked outputs is not possible in **Autotake** mode, as pressing the **Output Lock** button instantly locks or unlocks the current output.

#### Locking an Output in AUTOTAKE Mode

**Step 1.** Press and release the required **destination button**. Now the selected destination button and the currently configured source button light up (view mode).



**Step 2.** Press and release the **Output Lock** button. Now the **Output Lock** button lights up in red, and lock function is activated at once. No source can be changed at the locked destination.



### Unlocking an Output in AUTOTAKE Mode

**Step 1.** Press and release the required **destination button** which was previously locked. Now the selected destination button and the currently configured source button and the **Output Lock** button light up.



**Step 2.** Press and release the **Output Lock** button (deselect). Now the **Output Lock** button turns off, and the locking function is canceled.



## 5.3. Remote Operation

Lightware matrix routers can be controlled through various interfaces remotely. This makes possible to use such functions which are not accessible via the front panel. Also, this helps system integrators and operators to control multiple devices in a complicated system through a single user interface.

### 5.3.1. Control Interfaces

The user can connect to the matrix via

- Ethernet (TCP/IP),
- Serial port (RS-232 or RS-422).

The available remote connections and the relating chapters are listed below.



#### **ATTENTION!**

*The matrix can be connected to a LAN hub, switch or router via the Ethernet port by a UTP patch cable. Use the supplied cross-link cable when connecting the computer directly!*

User Interface	Connection Type		Further Information
	Ethernet Port	Serial Port	
Built-in website	✓	-	Chapter <a href="#">6 on page 26</a>
Lightware Device Controller software	✓	✓	Chapter <a href="#">7 on page 32</a>
Third-party control system	✓	✓	Chapter <a href="#">8 on page 46</a>

### 5.3.2. User Interface Comparison

The built-in website and the Lightware Device Controller software have little different capabilities. The table below summarizes the main differences, helping you to select the interface that suits your needs.

Function	Lightware Device Controller (LDC)	Built-in website
Platform	Windows or Mac	Any platform
Installation	Installation required	Web browser needed only
I/O and preset names	✓	-
Preview presets	✓	-
Easy EDID Creator	✓	-
EDID Editor	✓	-
EDID upload / download	✓	-

### 5.3.3. Multiple Simultaneous Connections

The matrix allows simultaneous remote control over multiple interfaces. Web control, Lightware Device Controller Software over Ethernet and Lightware Device Controller Software with serial connections can be used at the same time.

### 5.3.4. Serial Port Settings

Standalone DVI matrix routers can be ordered with either RS-232 or RS-422 communication port. The port settings are done in the factory. D-SUB connector pin assignments can be found in section [3.5.2 on page 14](#).

The device uses standard RS-232 interface with the following settings:

- 9600 Baud,
- 8 data bit,
- 1 stop bit,
- No parity.

### 5.3.5. IP Settings

The Ethernet port can be configured remotely by using Lightware Device Controller Software or the built-in website. The factory default IP settings or DHCP mode can be activated quickly by the front panel buttons. To reset the IP configuration perform the following:

#### Resetting the IP address

Reset to factory default IP configuration or to DHCP mode with front panel buttons.

**Step 1.** Switch the matrix to **Take** mode if used previously in **Autotake** mode by pressing **Take** button for 3 seconds (light will go off).

**Step 2.** Press and release **Control Lock** button (it lights in up red continuously).

**Step 3.** Press and keep pressed the **Output Lock** button (the current protocol indication will light up).

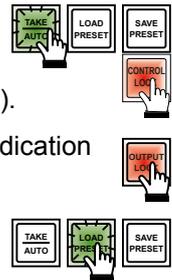
**Step 4.** Press and release the **Load Preset** button to set the factory default IP settings:

- IP address: 192.168.254.254,
- port number: 10001,
- subnet mask: 255.255.0.0,
- gateway: 0.0.0.0.

**Step 5.** A light sequence will occur to confirm the command (**Take/Auto**, **Load Preset** and **Save Preset** buttons will light up one after the other).

**Step 6.** Connect the LAN cable to the Ethernet port if it was unplugged.

**Step 7.** Wait about 20 seconds before connecting the matrix via Ethernet.



### 5.3.6. Control Protocols

Matrix routers can be controlled by multiple control protocols. Lightware matrix routers have a special protocol, but to interoperate with third-party devices, a secondary protocol is also provided.



#### INFO

*Lightware Device Controller software and the built-in website works only with LW protocol (#1)!*

The currently used protocol can be viewed or changed any time on the matrix front panel or by sending protocol commands.

#### Changing (viewing) Protocol on the Front Panel

**Step 1.** Switch the matrix to **Take** mode if used previously in **Autotake** mode by pressing **Take** button for 4 seconds. (light will go off)

**Step 2.** Press and release **Control Lock** button (it lights in up red continuously)

**Step 3.** Press and keep pressed the **Output Lock** button. Now the active protocol is displayed: (view protocol) One source button lights up according to the current protocol:

- Source#1 lights: Lightware protocol is active
- Source#2 lights: Protocol#2 is active

**Step 4.** Changing/viewing:

- a) If you do not want to change the protocol, release the **Output Lock** button (view only).
- b) If you want to change the protocol keep the **Output Lock** button pressed, and press the desired **source button**.

#### Changing (viewing) Protocol via Remote Connection

Connect to the matrix via a control interface, then use the commands described in section [8.4.7 on page 56](#).

## 6. Software Control - Using the Built-in Web

### 6.1. Accessing the Built-in Website of the Matrix

Lightware matrix switchers have a built-in web page, which can be accessed over TCP/IP protocol and offers you full control over all settings even if you don't have the opportunity to install new programs. The router's built-in website is compatible with most widely spread browsers and requires no additional software components such as ActiveX controls. The web interface functionality has been tested and confirmed with the most used browsers (Mozilla Firefox, Internet Explorer, Opera, Safari and Google Chrome).

To access the webpage just run your preferred web browser and type the IP address of the router as URL. The computer and the router have to be in the same subnet.



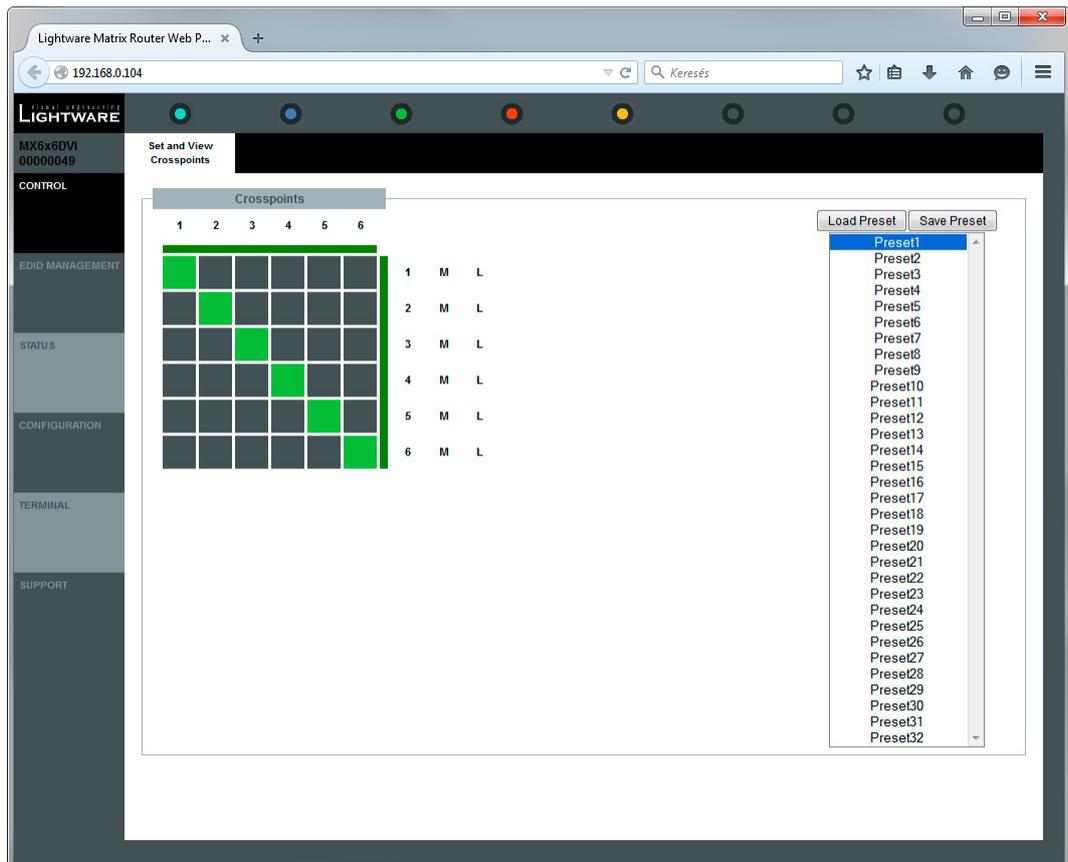
**INFO**

The only way to find out the router's IP address (if it is not known) is to search for devices with the Lightware Device Controller software. If this is not possible for some reason, the IP address can be reset to factory default (192.168.254.254) with the front panel buttons. See section [5.3.5 on page 24](#) for more information.



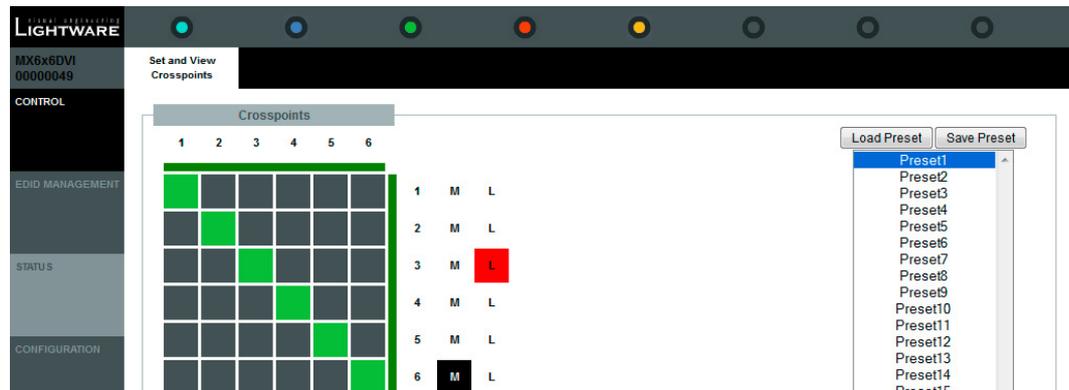
**INFO**

Only one opened web page is allowed simultaneously. Other TCP/IP connections are prohibited while the web page is opened. Using more instances of the web page simultaneously will result in inadequate operations.



## 6.2. Control Menu

### 6.2.1. Crosspoint Switching



1; 2; 3... columns represent the inputs, and the 1; 2; 3... rows represent the outputs. Each green square represents a live connection. For making a connection click on the desired grey square.

#### Mute outputs

Outputs can be easily muted by clicking the button titled **M** beside the output. This means that no signal will be present at this output.



#### **ATTENTION!**

If CPU FW version 1.4.8 is installed in the matrix, the muted output will be unmuted when an input is switched to the destination. If CPU FW 2.4.4 or above is installed in the matrix, the switching does not change mute state. See appendix in section [11.1 on page 72](#) for more information.

#### Lock outputs

Outputs can be locked to any inputs. After locking an input to an output no switching is permitted for this output unless it is unlocked again.



#### **INFO**

Loading a preset does not change neither the lock state nor the switch state of a locked output. If an output is locked to an input before preset loading, it will also be locked that input after preset loading, so locked outputs ignore the preset.

### 6.2.2. Preset Operations

Preset operations can be done in the right panel of the **Control → Set and View Crosspoints** page. Each Lightware matrix switcher has 32 preset memories that can be loaded and saved any time.

Front panel Preset operations effect only the first 8 preset memories, all others from 9 to 32 are available only via the Device Controller software or the router's built-in website.

#### Save Preset

**Step 1.** Make the desired configuration on matrix switching area.

**Step 2.** Select the desired preset memory location (Preset1...Preset32).

**Step 3.** Press **Save Preset** button. Now a message box appears that the preset is stored.

#### Load Preset

**Step 1.** Highlight the preset memory location (Preset1...Preset32) you want to load as next configuration.

**Step 2.** Press **Load Preset** button. Now the preset is loaded.

**Step 3.** The new I/O configuration is displayed on the matrix switching area.

### 6.3. EDID Management Menu

When the user enters the menu first, the whole EDID list is being downloaded from the matrix. It may take up to 20 seconds for the first time. After the EDIDs are downloaded, two EDID lists are displayed. The content can be set by the user from the followings:

- **Emulated EDID list:** It contains the resolutions and the vendor names of the EDID reported to the source for each input separately.
- **Last attached Monitor's EDID list:** It contains the resolutions and vendor names of the display devices connected to matrix switcher's output.
- **Factory EDID list:** Factory pre-programmed EDIDs with the most common resolutions (cannot be modified).
- **User memory:** User programmable EDID memories.

#### 6.3.1. Change Emulated EDID at One or All Inputs

**Step 1.** Select the desired EDID lists to the two windows.

**Step 2.** Click on the EDID that will be copied (emulated) to the desired place. The selected EDID will be displayed in a small yellow window at the mouse cursor:

Factory 27 LWR 1600x1200@60.0Hz 1600x1200@60

**Step 3.** To switch (emulate) the EDID

- a) on a certain input, click on it in the other EDID list window;
- b) on ALL in inputs, click on the **Switch to all input** button on the bottom.

To cancel the operation click on the **Cancel** button.

The screenshot shows the EDID Management interface. On the left is a sidebar with menu items: CONTROL, EDID MANAGEMENT (highlighted), STATUS, CONFIGURATION, TERMINAL, and SUPPORT. The main area is titled 'EDID Routing' and contains two windows:

- Factory EDID List:** A table with columns: Memory, Manufacturer, Resolution, and Monitor Name. It lists 22 factory EDIDs (Factory 1 to Factory 22) with various resolutions and refresh rates.
- Emulated EDID List:** A table with columns: EDID Inputs, Manufacturer, Resolution, and Monitor Name. It lists 6 inputs (Input 1 to Input 6). 'Input 4' is highlighted in yellow, showing it is set to 'Factory 19 LWR 1280x1024@60.1Hz 1280x1024@60'.

At the bottom of the interface, there are two buttons: 'SWITCH TO ALL INPUT' and 'CANCEL'.



**INFO**  
Switching to ALL inputs may take several seconds.

The user can switch and learn EDIDs also in the Last Attached Monitors EDIDs window. Switching an EDID from this list to an input results dynamic EDID routing. This means that the emulated EDID changes automatically, if a new monitor is attached to the output, by simply copying the data from the monitor.

## 6.4. Status Menu

Basic device information, such as the installed cards' firmware and hardware revisions are displayed in this window.

### Report section

#### Generate report

The built-in web also allows to get information from the matrix and save it to a report file. This information package can be sent to Lightware when a problem may arise with the device.



#### INFO

*When a report is necessary to generate, always let the devices be connected to the matrix, do not disconnect them.*

**Step 1.** Press the big red button on the bottom; the report is being generated.

**Step 2.** When the report is ready click on the info box to download it.

The report contains the following information:

- Current command protocol
- The equipment type and serial number
- Current crosspoint state
- Firmware versions of the internal controllers
- Installed I/O board types and versions

#### Custom report

Custom command file can be created and sent to the extender. The file is generated by Lightware support. This is needed when some special commands has to be used for configuring or troubleshooting.



#### INFO

*This function is only for special troubleshooting cases.*

## 6.5. Configuration Menu

The unit's network values are displayed when you select Configuration → Network Settings.



#### INFO

*It is possible to reload factory default IP setup using the front panel buttons. See section [5.3.5 on page 24](#).*

### 6.5.1. IP Configuration

#### To assign IP address automatically

The matrix switcher supports three of the most used automatic IP configuration protocols.

**Step 1.** Click on **Configuration menu**.

**Step 2.** Select Obtain IP address automatically.

**Step 3.** Enter the following (as necessary):

- **BOOTP:** Select Enable to permit the Bootstrap Protocol (BOOTP) server to assign the IP address from a pool of addresses automatically.
- **DHCP:** Select Enable to permit the Dynamic Host Configuration Protocol (DHCP) server to assign leased IP address to the matrix unit automatically.
- **AutoIP:** Select Enable to permit the matrix to generate an IP in the 169.254.x.x address range with Class B subnet.



**INFO**

*Disabling BOOTP, DHCP, and AutoIP (all three checkboxes) is not advised as the only available IP assignment method will then be ARP or serial port.*

**Step 4.** When you are finished, click **Apply Settings** button.



**INFO**

*To continue using the website, you must type the new IP address in the browser.*

**To assign an IP address manually**

The IP address can be also set manually and enter the related network settings.

**Step 1.** Click on Configuration menu.

**Step 2.** Select Fix IP Configuration.

**Step 3.** Enter the followings (as necessary):

- **IP Address:** If DHCP is not used to assign IP addresses, enter it manually in decimal-dot notation. The IP addresses must be set to a unique value in the network.
- **Subnet Mask:** A subnet mask defines the number of bits taken from the IP address that are assigned for the host part.
- **Default Gateway:** The gateway address, or router, allows communication to another LAN segments. The gateway address should be the IP address of the router connected to the same LAN segment as the matrix. The gateway address must be within the local network.

**Step 4.** When you are finished, click **Apply Settings** button.



**INFO**

*To continue using the website, you must type the new IP address in the browser.*

**Loading the default IP settings**

**Step 1.** Click on the **Load Default** button. Now the factory default IP address, Subnet Mask and Gateway address is loaded into the input boxes. But they are not saved.

**Step 2.** To save the settings, click on **Apply Settings** button.

**Step 3.** The default fix IP settings are applied:

- **IP Address:** 192.168.254.254
- **Subnet Mask:** 255.255.0.0
- **Default Gateway:** 0.0.0.0

**6.5.2. TCP Port Configuration**

The user can configure the TCP port number, which is used to communicate with the matrix router through LAN. The input box initially contains the current setting.

**Step 1.** Type the desired TCP port number into the input box.

**Step 2.** Press the **Apply Settings** button. The new port will be active after the next connection.

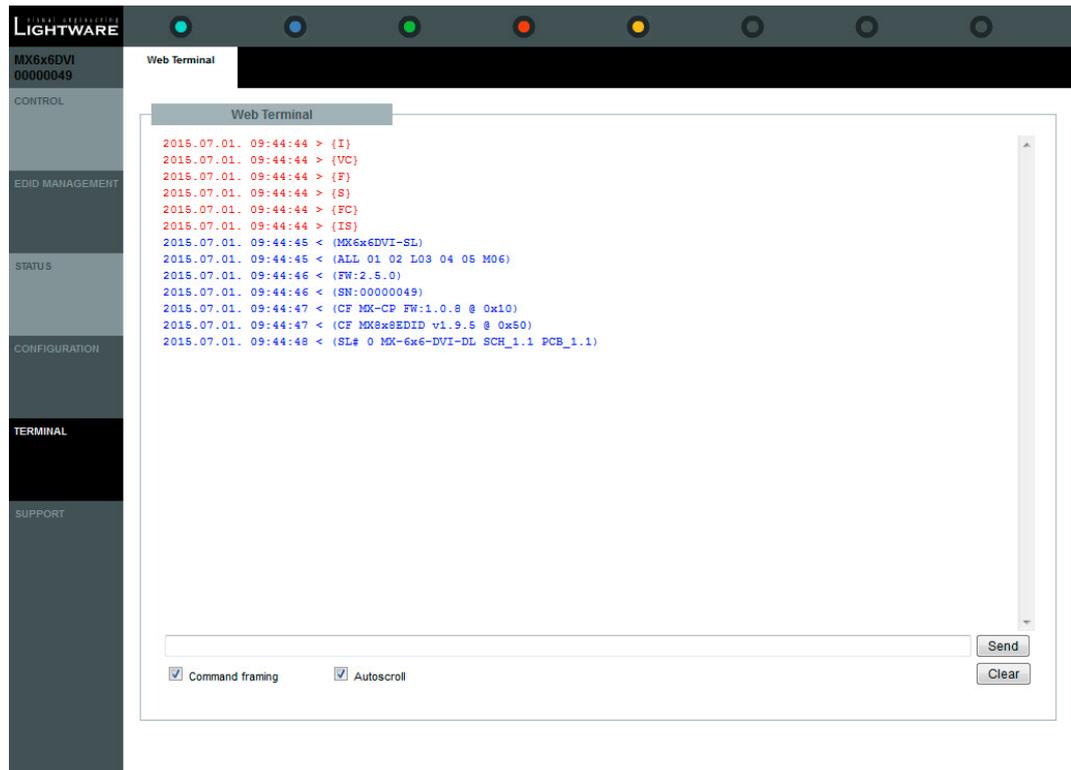
### Loading the default TCP Port settings

**Step 1.** Click on **Load Default** button. Now the factory default value is in the input box, but it is not saved.

**Step 2.** To save, click on **Apply Settings** button. The new port will be active after the next connection.

## 6.6. Terminal Menu

This general terminal window is intended mainly for testing and debugging purposes. All commands can be used here that are discussed in the programmer's reference. The command text can be typed directly.



By default commands are automatically surrounded by framing brackets. Every sent command and every received response gets an arrow (> or <) prefix, and has different font colors in order to help distinguishing.

The timecode in every row shows the exact time when the command was sent or the response received.

If the **Command framing** checkbox is unchecked, you can send multiple commands together, however in this case you have to type in the framing brackets manually.

## 7. Software Control - Using Lightware Device Controller

The device can be controlled by a computer through the Ethernet port and RS-232/RS-422 using Lightware Device Controller (LDC). The software can be installed on a Windows PC or mac OS. The application and the User's manual can be downloaded from [www.lightware.com](http://www.lightware.com). The Windows and the Mac versions have the same look and functionality.

### 7.1. Install and Upgrade



**INFO**

After the installation, the Windows and the Mac application has the same look and functionality.

#### Installation for Windows OS

Run the installer. If the User Account Control drops a pop-up message click **Yes**.

During the installation you will be prompted to select the type of the installation: **normal** and the **snapshot** install:

Normal install	Snapshot install
Available for Windows and mac OS	Available for Windows
The installer can update only this instance	Cannot be updated
Only one updateable instance can exist for all users	More than one different version can be installed for all users

*Comparison of installation types*



**ATTENTION!**

Using the Normal install as the default choice is highly recommended.

#### Installation for mac OS

Mount the DMG file by double clicking on it and drag the LDC icon over the Applications icon to copy the program into the Applications folder. If you want to copy the LDC into another location just drag the icon over the desired folder.

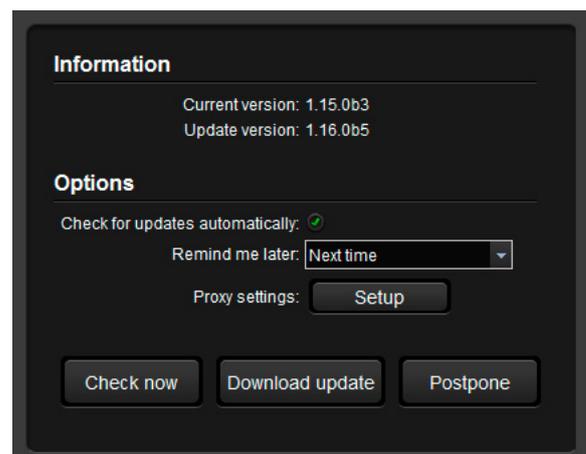
#### Upgrading of LDC

**Step 1.** Run the application.

The **Device Discovery** window appears automatically and the program checks the available updates on our website and opens the update window if the LDC found updates.

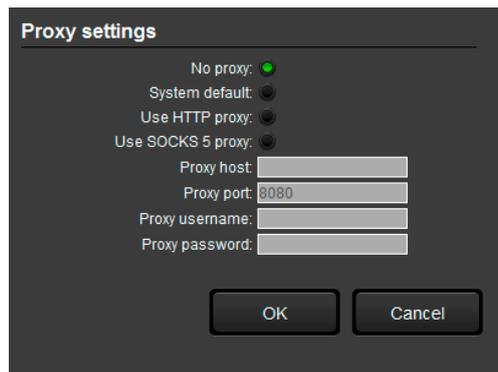
The current and the update version number can be seen at the top of the window. They are shown in this window even with the snapshot install.

The **Update** window can also be opened by clicking the **About icon** (?) and the **Update** button.



**Step 2.** Set the desired update setting in the **Options** section.

- If you do not want to check for the updates automatically, uncheck the **circle**, which contains the green tick.
- If you want to postpone the update, a reminder can be set with different delays from the **drop down list**.
- If the proxy settings do not range with the required settings, set the proper values then click the **OK** button.



**Proxy settings**

No proxy:

System default:

Use HTTP proxy:

Use SOCKS 5 proxy:

Proxy host:

Proxy port:

Proxy username:

Proxy password:

**OK** **Cancel**

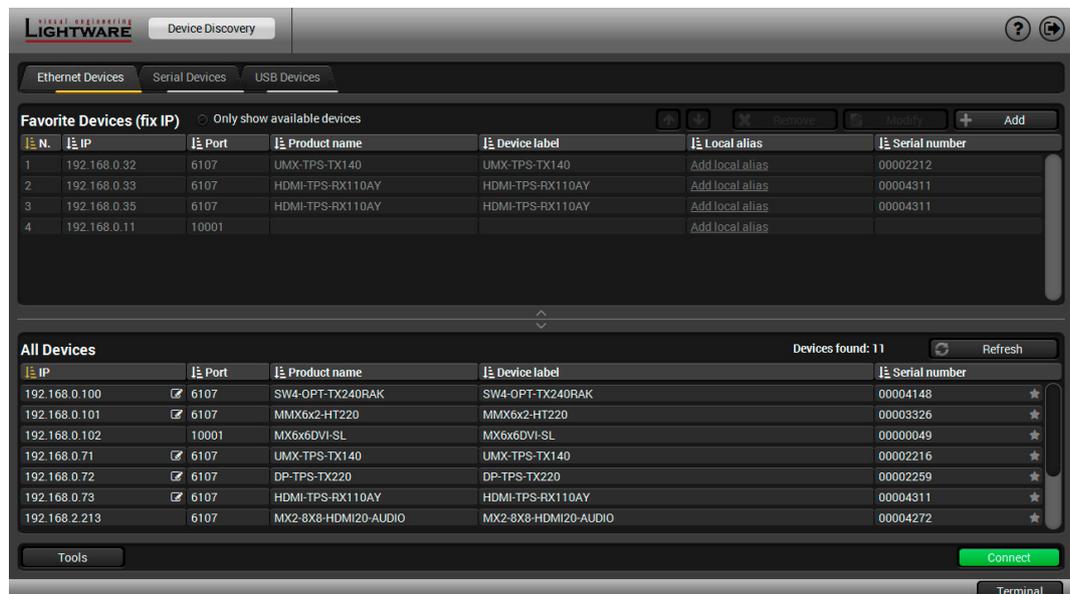
**Step 3.** Click the **Download update** button to start the upgrading.

The updates can be checked manually by clicking the **Check now** button.

## 7.2. Establishing the Connection

**Step 1.** Connect the device to a computer via Ethernet or serial connection.

**Step 2.** Run the controller software. The device discovery window appears automatically.



The screenshot shows the Lightware Device Discovery window. It has tabs for Ethernet Devices, Serial Devices, and USB Devices. The Ethernet Devices tab is active, showing a table of discovered devices. Below this is a section for All Devices, which lists 11 devices found. At the bottom, there are buttons for Tools, Connect, and Terminal.

N.	IP	Port	Product name	Device label	Local alias	Serial number
1	192.168.0.32	6107	UMX-TPS-TX140	UMX-TPS-TX140	Add local alias	00002212
2	192.168.0.33	6107	HDMI-TPS-RX110AY	HDMI-TPS-RX110AY	Add local alias	00004311
3	192.168.0.35	6107	HDMI-TPS-RX110AY	HDMI-TPS-RX110AY	Add local alias	00004311
4	192.168.0.11	10001			Add local alias	

IP	Port	Product name	Device label	Serial number
192.168.0.100	<input checked="" type="checkbox"/> 6107	SW4-OPT-TX240BRAK	SW4-OPT-TX240BRAK	00004148
192.168.0.101	<input checked="" type="checkbox"/> 6107	MMX6x2-HT220	MMX6x2-HT220	00003326
192.168.0.102	10001	MX6x6DVI-SL	MX6x6DVI-SL	00000049
192.168.0.71	<input checked="" type="checkbox"/> 6107	UMX-TPS-TX140	UMX-TPS-TX140	00002216
192.168.0.72	<input checked="" type="checkbox"/> 6107	DP-TPS-TX220	DP-TPS-TX220	00002259
192.168.0.73	<input checked="" type="checkbox"/> 6107	HDMI-TPS-RX110AY	HDMI-TPS-RX110AY	00004311
192.168.2.213	6107	MX2-8X8-HDMI20-AUDIO	MX2-8X8-HDMI20-AUDIO	00004272

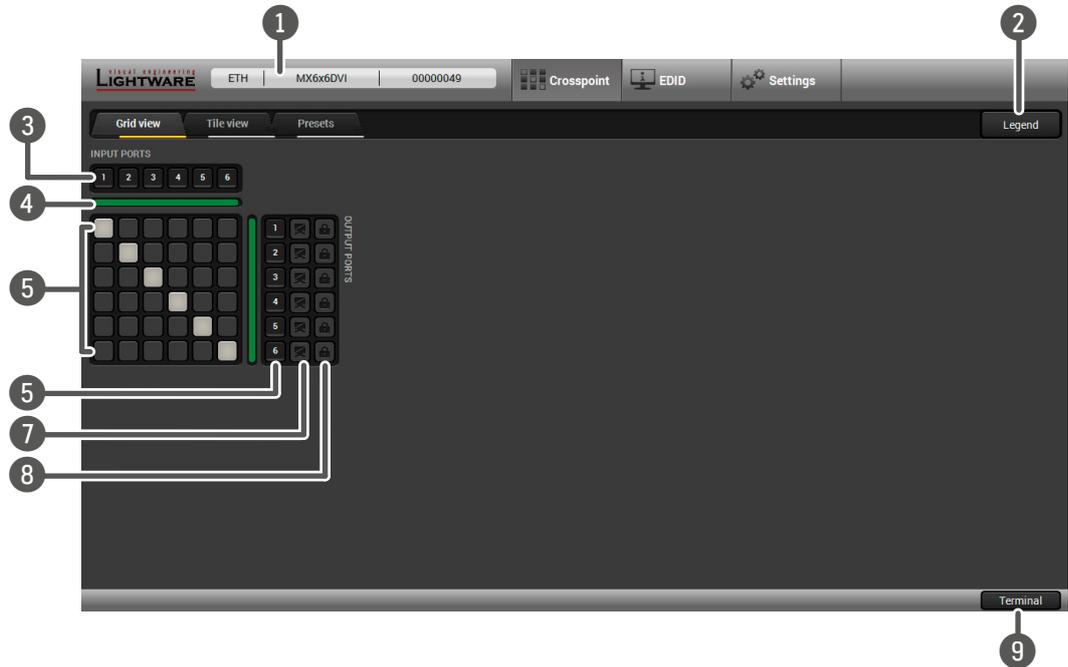
### *Device discovery window in LDC*

**Step 3.** Select the unit from the discovered Ethernet devices. Double click on the name of the switcher or select the device and click on the green **Connect** button.

If your device is connected to the computer via serial link, select **Serial Devices** tab. Click on the **Query** button next to the desired serial port to display the name of the device and serial number. Double click on the receiver or select the device and click on the green **Connect** button.

### 7.3. Crosspoint Menu - Grid View

When the LDC finds the hardware, it determines the product type, and the LDC starts with the default page, showing the Grid view of the Crosspoint menu.



- 1 Information ribbon** This label shows the interface type, the name and the serial number of the connected device. If the device has more than one interface, the ribbon shows only that one, which has made the connection. The device discovery window can be started by clicking on this ribbon.
- 2 Legend** Clicking on the **Legend** button a pop-up window displays the meaning of colors and icons of I/O ports and type of I/O boards.
- 3 Input ports** Each number represents an input port. Click on the port to display the Properties window.
- 4 Type of the input board** The color of the line shows what kind of input board is installed (see next section).
- 5 Connections** Light grey square means the port is available but no connection between the input and the output. White square means there is a connection between the input and the output port.
- 6 Type of the output board** The color of the line (green) shows that the input and output ports are for transmitting DVI video signal.
- 7 Output ports** Each number represents an output port. Click on the port to display the Properties window.
- 8 Mute and lock buttons** Outputs can be easily muted by clicking on the mute button; for the prevention of the unwanted switching, outputs can be locked to any input.
- 9 Terminal** This general-purpose terminal is created mainly for testing and debugging purposes.

### 7.3.1. Crosspoint Operations

#### Switching

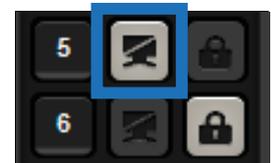
To make a connection, click on the desired square. If there is no connection between the desired input and output (the square is dark grey), the mouse pointer becomes a hand (link pointer) before the clicking. If the output port is not locked, then the connection is made, the square becomes white and the cursor is changed back to a pointer.

For example, input 6 is not connected to output 2 according to the first picture above. After the connection, the square becomes light grey.



#### Muting Outputs

Outputs can be easily muted by clicking on the button figured a crossed monitor beside the output. This means that no signal is present at this output. If mute is active, the color of the button's background changes to white.



#### INFO

Switching muted outputs does not unmute them, muting remains active until mute button is clicked again.

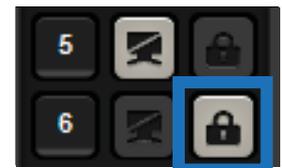


#### INFO

Outputs can be disconnected from any inputs (by protocol command). In this case the crosspoint view will not show any white square for the disconnected output and the output will have no signal just like when muted. Click on a crosspoint square to connect the output again to an input.

#### Locking Outputs

Outputs can be locked to any input. After locking an input to an output, no switching is permitted to this output unless it is unlocked again. If output lock is active, the color of the button's background changes to white.



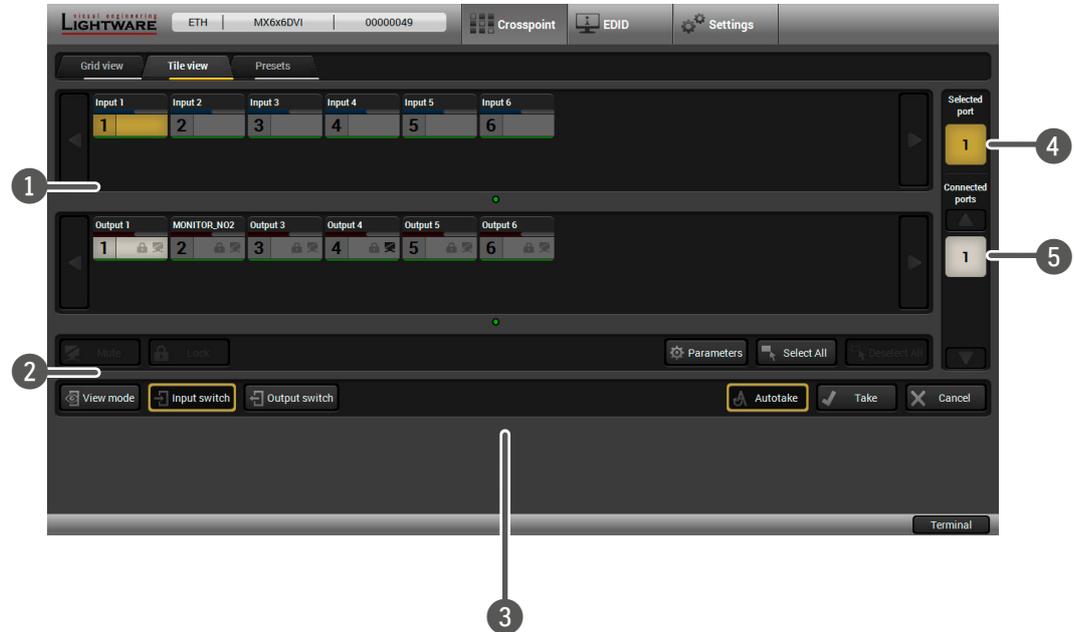
#### INFO

Loading a preset does not change either the lock state or the switch state of a locked output. If an output is locked to an input before preset loading it will also be locked to that input after preset loading, so locked outputs ignore the preset.

## 7.4. Crosspoint Menu - Tile View

Tile view is to display the input and output ports by tiles. Each tile means an input or output port and additionally shows the most important port and signal information. Thus, user can check the status of many ports at the same time without clicking on a port or opening port settings window.

### 7.4.1. Layout and Controllers



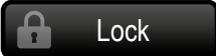
- |   |                   |  |
|---|-------------------|--|
| ① | Input ports       | Each tile represents an input port.  |
| ② | Output ports      | Each tile represents an output port.   |
| ③ | Page indicator    | Current page is displayed with green dot; if other pages exist, they are displayed with black dots.                    |
| ④ | Selected port     | Last selected port is displayed with yellow background on the port bar. Press the button to open port settings window. |
| ⑤ | Connected port(s) | Those ports are listed (with white background) on the port bar, which are connected to the Selected port.              |

### Display Modes

Three display modes are defined in Tile view for matrix switchers:

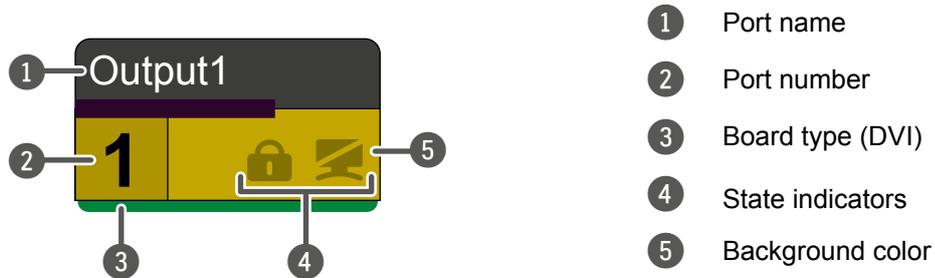
- View mode,
- Input switch mode and
- Output switch mode.

**Control Buttons**

 Mute	Mute or unmute selected output port(s)	 Parameters	Open port settings window
 Lock	Lock or unlock selected output port(s)	 Select All	Select all ports (only in output switch mode)
 View mode	Activate View mode	 Deselect All	Deselect all ports (only in output switch mode)
 Input switch	Activate Input switch mode	 Autotake	Toggle Autotake mode ON/OFF
 Output switch	Activate Output switch mode	 Take	Execute crosspoint changes in Take mode

**Port Tiles**

The colors of the port tiles and the displayed icons represent different states and information about selected port:



**i** *INFO*  
Legend button in the Grid View helps identify the meanings of colors and icons.

**State Indicators**

Following icons display different states of the output port:

Icon	Icon is grey	Icon is black
	Port is unmuted	Port is muted
	Port is unlocked	Port is locked

**7.4.2. View Mode**

This mode was designed to display crosspoint state of a selected and its connected port(s).



**i** *INFO*  
Crosspoint settings cannot be changed in View mode but port settings are available.

### 7.4.3. Switching Operations

Crosspoint changes can be made in **Input switch mode** and **Output switch mode**. The working method is the same in both cases but the priority is different.

#### Input Switch Mode

The mode can be also named as 'Input priority-mode'. In the mode an input port has to be selected at first then the connected output port(s) is/are shown. Thus, the output port(s) connected to the input port can be changed.

#### Output Switch Mode

This mode can be also named as 'Output priority-mode'. In the mode an output port has to be selected at first then connected input port is shown. Thus, the output port connected to the input port can be changed.



#### **ATTENTION!**

*Output ports can be (un)locked, (un)muted only in Output switch mode.*

#### Take Mode

If the **Autotake** button is outlined with black color Take mode is active. In Take mode any crosspoint change – (dis)connect ports to/from the previously selected port – is executed only after pressing the **Take** button. Following steps describe the process of the switching:



**Step 1.** Press the desired **Input switch** or **Output switch** button to select switching mode.

**Step 2.** Select the desired port; it will be highlighted with yellow color and displayed on the port bar on the right, too.

**Step 3.** Connected port(s) is/are highlighted with white color and displayed on the port bar on the right, too.

**Step 4.** Create the desired crosspoint settings by (de)selecting the ports; they will start to blink.

**Step 5.** Press **Take** button to execute changes or **Cancel** to ignore the operations.



#### **INFO**

*Take mode remains active until it is switched off. Selecting another view mode or menu does not change the Take/Autotake mode state.*

#### Autotake mode

If the Autotake button is outlined with yellow color Autotake mode is active. In this mode any crosspoint change – (dis)connect ports to/from the previously selected port – is executed immediately after pressing the port button. Following steps describe the process of the switching:



**Step 1.** Press the desired **Input switch** or **Output switch** button to select switching mode.

**Step 2.** Select the desired port; it will be highlighted with yellow color and displayed on the port bar on the right, too.

**Step 3.** Connected ports are highlighted with white color and displayed on the port bar on the right, too.

**Step 4.** Create the desired crosspoint settings by (de)selecting the ports; the changes are executed immediately.



#### **INFO**

*Autotake mode remains active until it is switched off. Selecting another view mode or menu does not change the Take/Autotake mode state.*

## 7.4.4. Port Properties

### Port settings

Press the desired port button on the port bar on the right.

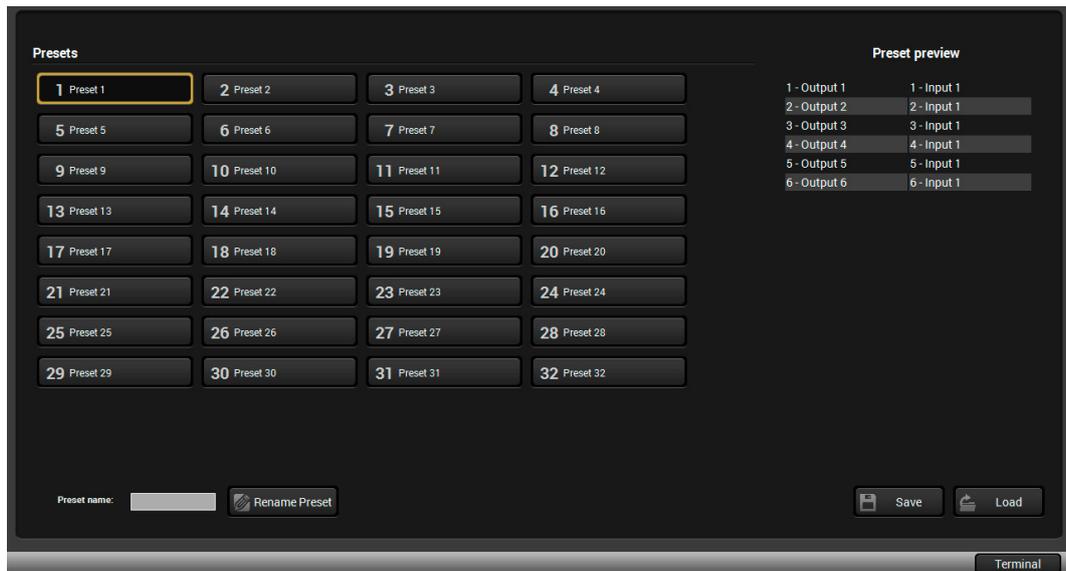


#### INFO

Port settings of the selected port are also available by pressing the Parameters button.



## 7.5. Presets



Preset operations can be done in Crosspoint submenu on the **Preset** tab. Each Lightware matrix switcher has 32 preset memories that can be loaded and saved at any time.



#### INFO

A preset setting stores the crosspoint and the muted/unmuted states of the outputs.

### Loading a preset

**Step 1.** Select **Preset** tab from Crosspoint menu.

**Step 2.** Select the preset memory (Preset1...Preset32) you want to load as the next crosspoint configuration.

**Step 3.** Press the **Load** button below; now the preset is loaded.

### Saving a preset

**Step 1.** Make the desired crosspoint connections in **Tile view** or **Grid view**.

**Step 2.** Select the preset memory (Preset1...Preset32) where you want to save your current crosspoint connections.

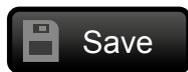
**Step 3.** Press the **Save** button; a confirmation message is displayed.

## 7.6. EDID Menu

Advanced EDID Management can be accessed by selecting the EDID menu. There are two panels: left one contains Source EDIDs, right one contains Destination places where the EDIDs can be emulated or copied.



### Control buttons



Save

Exporting an EDID (save to a file)



Executing EDID emulation or copying (Transfer button)



Upload

Importing an EDID (load from a file)



Select All

Selecting all memory places in the right panel



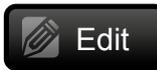
Info

Display EDID Summary window



Deselect All

Selecting none of the memory places in the right panel



Edit

Opening Advanced EDID Editor with the selected EDID



Create

Opening Easy EDID Creator

## 7.7. EDID Operations

### Changing Emulated EDID

- Step 1.** Choose the desired EDID list on the source panel and select an EDID.
- Step 2.** Press the **Emulated** button on the top of the Destination panel.
- Step 3.** Select the desired port on the right panel (one or more ports can be selected); the EDID(s) will be highlighted with a yellow cursor.
- Step 4.** Press the **Transfer** button to change the emulated EDID.

## Learning an EDID

The process is the same as changing the emulated EDID; the only difference is the Destination panel: press the **User** button. Thus, one or more EDIDs can be copied into the user memory either from the factory memory or from a connected sink (Dynamic).

## Exporting an EDID



### ATTENTION!

*This function is working on Windows and Mac OS X operating systems and under Firefox or Chrome web browsers only.*

Source EDID can be downloaded as a file (\*.bin, \*.dat or \*.edid) to the computer.

**Step 1.** Select the desired **EDID** from the Source panel (the line will be highlighted with yellow).

**Step 2.** Press the **Save** button to open the dialog box and save the file to the computer.

## Importing an EDID

Previously saved EDID (\*.bin, \*.dat or \*.edid file) can be uploaded to the user memory:

**Step 1.** Press the **User** button on the top of the Source panel and select a memory slot.

**Step 2.** Press the **Upload** button below the Source panel.

**Step 3.** Browse the file in the opening window then press the **Open** button. Browsed EDID is imported into the selected User memory.



### ATTENTION!

*The imported EDID overwrites the selected memory place even if it is not empty.*

## Deleting EDID(s)

The EDID(s) from User memory can be deleted as follows:

**Step 1.** Press User button on the top of the Destination panel.

**Step 2.** Select the desired memory slot(s); one or more can be selected (Select All and Deselect All buttons can be used). The EDID(s) will be highlighted with yellow.

**Step 3.** Press the Delete selected button to delete the EDID(s).

The screenshot shows a software interface for configuring EDID. On the left is a vertical menu with the following items: General, Power Management, Gamma / Colors, Established Timings, Standard Timings, Preferred Timing Mode, 2nd Descriptor Field, 3rd Descriptor Field, 4th Descriptor Field, CEA General, CEA Video, CEA Audio, CEA Speaker Allocation, CEA HDMI, CEA Colorimetry, and CEA Detailed Timing Descriptors. The 'General' tab is selected, displaying the following information:

General	
EDID version:	1
EDID revision:	3
Manufacturer ID:	SAM (Samsung Electric Company)
Product ID:	8E09
Monitor serial number:	Not present
Year of manufacture:	2012
Week of manufacture:	9
Signal interface:	Digital
Separate Sync H&V:	-
Composite sync on H:	-
Sync on green:	-
Serration on VS:	-
Color depth:	Undefined
Interface standard:	Not defined
Color spaces:	RGB 4:4:4 & YCrCb 4:4:4
Aspect ratio:	0.56
Display size:	52 cm X 29 cm

### 7.7.1. Editing an EDID

Select an EDID from Source panel and press Edit button to display Advanced EDID Editor window. The editor can read and write all descriptors, which are defined in the standards, including the additional CEA extension. Any EDID from the device's memory or a saved EDID file can be loaded into the editor. The software resolves the raw EDID and displays it as readable information to the user. All descriptors can be edited, and saved in an EDID file, or uploaded to the User memory. For more details about EDID Editor please visit our website ([www.lightware.com](http://www.lightware.com)) and download EDID Editor user's manual.

	0	1	2	3	4	5	6	7	8	9
0	00	FF	FF	FF	FF	FF	FF	00	4C	2D
10	8E	09	00	00	00	00	09	16	01	03
20	80	34	1D	78	0A	7D	D1	A4	56	50
30	A1	28	0F	50	54	BD	EF	80	71	4F
40	81	C0	81	00	81	80	95	00	A9	C0
50	B3	00	01	01	02	3A	80	18	71	38
60	2D	40	58	2C	45	00	09	25	21	00
70	00	1E	66	21	56	AA	51	00	1E	30
80	46	8F	33	00	09	25	21	00	00	1E
90	00	00	00	FD	00	18	4B	1A	51	17
100	00	0A	20	20	20	20	20	20	00	00
110	00	FC	00	54	32	34	42	33	30	31
120	0A	20	20	20	20	20	01	6C		

### 7.7.2. Creating an EDID

Since above mentioned Advanced EDID Editor needs more complex knowledge about EDID, Lightware introduced a wizard-like interface for fast and easy EDID creation. With Easy EDID Creator it is possible to create custom EDIDs in four simple steps. By clicking on the **Create** button below Source panel, **Easy EDID Creator** is opened in a new window. For more details about EDID Editor please visit our website ([www.lightware.com](http://www.lightware.com)) and download EDID Editor user's manual.

**Step 1 - Select Resolution**

Welcome to the Easy EDID Creator!

With this program you are able to create a unique EDID according to your demands by answering three simple questions. Details can be added or changed later if needed. Please select the preferred resolution, scan mode and frame rate. If you don't find the proper mode in the list, then enter it and the program will estimate the best blanking times.

Preferred resolution:

Set up a secondary resolution

Advanced settings

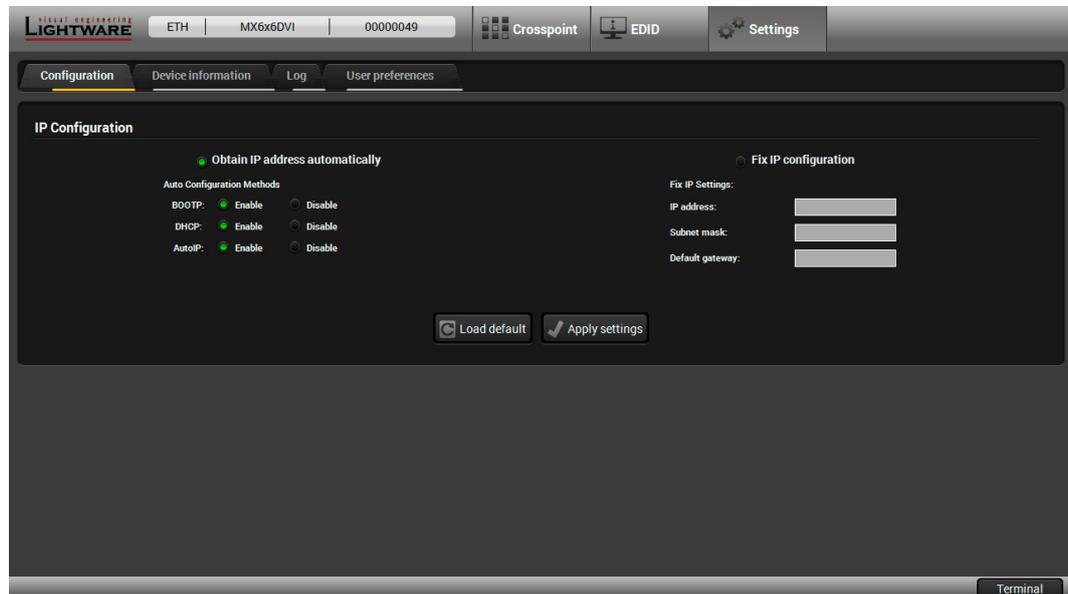
Use VESA DMT whenever possible

Timing standard:

## 7.8. Settings Menu

### 7.8.1. Configuration Tab

Network related settings are available on this tab.



#### IP Configuration

The IP address and TCP/IP port can be set up here.

##### Obtain IP address automatically

By selecting the Obtain IP address automatically option, the matrix gets the IP address from the DHCP server on the LAN. If DHCP server is not present, the device gets an AutoIP address from 169.254.xxx.xxx domain automatically. Set BOOTP, DHCP and AutoIP settings according to your network requirements. Always press the **Apply settings** button to save changes.



##### INFO

Load default button restores the default network settings (fix IP) to the device: fix IP Address: 192.168.254.254, Subnet Mask: 255.255.0.0, Default Gateway: 0.0.0.0.



##### INFO

When serial port is used for connection, these settings cannot be changed.

##### Fix IP configuration

In this case, connected device has an IP address configuration set up by the user/administrator. Depending on modified settings, you might need to restart the device and the Control Software. Always press the **Apply settings** button to save changes.



##### INFO

Load default button restores the default network settings (fix IP) to the device: fix IP Address: 192.168.254.254, Subnet Mask: 255.255.0.0, Default Gateway: 0.0.0.0.



##### INFO

When serial port is used for connection, these settings cannot be changed.

### 7.8.2. Device Information Tab

The following information can be found on this tab: Device type, Serial number, MAC address and the installed cards with hardware- and firmware versions.

### 7.8.3. Log Tab

#### Report section

##### Generate a report

LDC is able to collect information from the matrix and save it to a report file. This information package can be sent to Lightware when a problem may arise with the device.



##### INFO

*When a report is necessary to generate, always let the devices be connected to the matrix, do not disconnect them. The Controller Software will collect information about the devices and about their status.*

##### Generate a report file

**Step 1.** Press the big red button on the Log tab in the Settings menu: **Download report**.

**Download report**

**Step 2.** The Save as dialog box appears. Select the place where you want to save the report file. The default file name can be changed.

**Step 3.** LDC collects the needed information. This may take up to 5 minutes.

**Step 4.** When the process is finished, the folder is opened, where the file was saved.

The report contains the following information:

- Current command protocol
- The equipment type and serial number
- Current crosspoint state
- Firmware versions of the internal controllers
- Installed I/O board types and versions

##### Browse command file

The Lightware Device Controller is able to send a custom command file to the matrix. The command file can be generated by Lightware support. This is needed when some special commands has to be used for configuring or troubleshooting.

**Generate report from file**



##### INFO

*This function is only for special troubleshooting cases.*

### 7.8.4. User Preferences Tab

On this tab, some details in the layout of the Lightware Device Controller can be customized:

- Default crosspoint view: Grid view/Tile view
- Default view mode on Tile view: View mode/Input switch/Output switch
- Default Autotake state: On/Off
- Confirm Switch All operation: On/Off

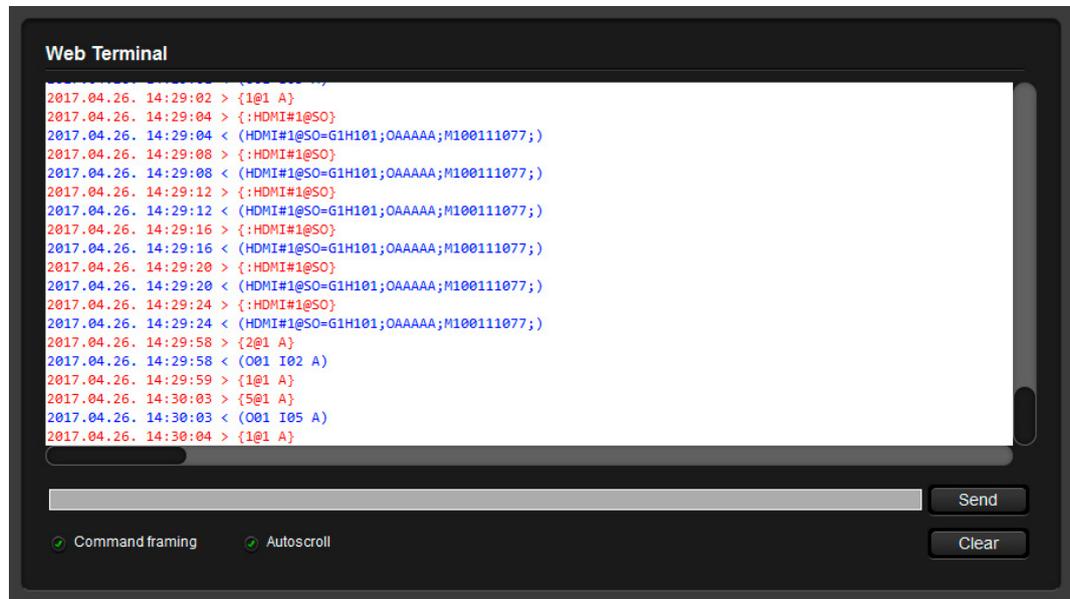


##### INFO

*Changing the layout settings is saved automatically without confirmation.*

## 7.9. Terminal

The terminal is created mainly for testing and debugging purposes. The terminal is available via serial RS-232 or TCP/IP LAN connection. The command text can be typed directly. Press **Terminal** button in the right bottom corner to open the window.



```

Web Terminal
2017.04.26. 14:29:02 > {1@1 A}
2017.04.26. 14:29:04 > {;HDMI#1@SO}
2017.04.26. 14:29:04 < (HDMI#1@SO=G1H101;OAAAAA;M100111077;)
2017.04.26. 14:29:08 > {;HDMI#1@SO}
2017.04.26. 14:29:08 < (HDMI#1@SO=G1H101;OAAAAA;M100111077;)
2017.04.26. 14:29:12 > {;HDMI#1@SO}
2017.04.26. 14:29:12 < (HDMI#1@SO=G1H101;OAAAAA;M100111077;)
2017.04.26. 14:29:16 > {;HDMI#1@SO}
2017.04.26. 14:29:16 < (HDMI#1@SO=G1H101;OAAAAA;M100111077;)
2017.04.26. 14:29:20 > {;HDMI#1@SO}
2017.04.26. 14:29:20 < (HDMI#1@SO=G1H101;OAAAAA;M100111077;)
2017.04.26. 14:29:24 > {;HDMI#1@SO}
2017.04.26. 14:29:24 < (HDMI#1@SO=G1H101;OAAAAA;M100111077;)
2017.04.26. 14:29:58 > {2@1 A}
2017.04.26. 14:29:58 < (001 I02 A)
2017.04.26. 14:29:59 > {1@1 A}
2017.04.26. 14:30:03 > {5@1 A}
2017.04.26. 14:30:03 < (001 I05 A)
2017.04.26. 14:30:04 > {1@1 A}



 Command framing  Autoscroll


```

Commands are automatically surrounded by framing brackets by default. Every sent command is red-colored and gets a > prefix. Received responses are blue-colored and starts with <.

The timecode in every row shows the exact time when the command was sent or the response received.

If the **Command framing** checkbox is unchecked, you can send multiple commands together, however in this case you have to type in the framing brackets manually.

If the **Autoscroll** checkbox is checked, the window is scrolled down automatically when a new row is added.

The window can be emptied by pressing the **Clear** button.



### TIPS AND TRICKS

The typed commands can be "browsed" when the cursor is in the command line and you press the up button on the keyboard. The commands are stored until the LDC is closed.

## 8. Programmers' Reference



### INFO

*The matrix router supports LW1 command protocol set only. LW2 and LW3 command sets are not supported.*

Users can connect to the matrix through Ethernet, or serial port as well. After establishing connection, there is no difference between connection types (except some rare cases, which are uniquely noted).

Lightware matrix routers can be controlled with external devices which can communicate according to the router protocol. Lightware routers have a special protocol, but to inter-operate with third party devices, a secondary protocol is also provided.

### 8.1. Changing and Viewing Protocols

The router is equipped with multiple router protocols.

**Step 1.** Switch the router to **Take** mode if used previously in **Autotake** mode by pressing **Take** button for 4 seconds. (light will go off)

**Step 2.** Press and release **Control Lock** (**Control Lock** button lights in up red continuously)

**Step 3.** Press and keep pressed the **Output Lock** button. Now one of the source buttons will light up according to the current protocol (view protocol):

**Step 4.** If Source#1 button lights: Lightware protocol is active

**Step 5.** If Source#2 button lights: Protocol#2 is active

**Step 6.** If you do not want to change the protocol, release the **Output Lock** button. (view only)

**Step 7.** If you want to change the protocol, keep the **Output Lock** button pressed, and press the desired **Source** button, accordingly to the new protocol. The desired **Source** button starts blinking, the router performs a reset straight away and all buttons light up for 3 seconds. Now the new protocol is active.

### 8.2. Protocol Description

The protocol description hereinafter stands for Lightware protocol.

The matrix switchers accept commands surrounded by curly brackets - { } - and responds data surrounded by round brackets - ( ) - only if a command was successfully executed. All input commands are converted to uppercase, but respond commands can contain upper and lower case letters as well.

#### Legend for control commands:

<in> = input number in 1 or 2 digit ASCII format (01,5,07,16 etc.)

<out> = output number in 1 or 2 digit ASCII format

<in<sup>2</sup>> = input number in 2 digit ASCII format (01, 02, 10, 12 etc.)

<out<sup>2</sup>> = output number in 2 digit ASCII format (01, 02, 10, 12 etc.)

<loc> = location number in 1, 2 or 3 digit ASCII format

<id> = id number in 1 or 2 digit ASCII format

<id<sup>2</sup>> = id number in 2 digit ASCII format

CrLf = Carriage return, Line feed (0x0D, 0x0A)

• = space character (0x20)

→ = each command issued by the controller

← = each response received from the router

## 8.3. Switching and Control Commands

### 8.3.1. Switch One Input to One Output

Supported variants: All



#### ATTENTION!

For MX6x6DVI / MX6x6DVI-DL and MX8x8DVI / MX8x8DVI-DL devices: If CPU FW version 1.4.8 is installed in the matrix, the muted output will be unmuted when an input is switched to the destination. If CPU FW 2.5.0 or above is installed in the matrix, the switching does not change mute state. See appendix in section [11.1 on page 72](#) for more information.

**Description:** Switch input <in> to output <out>.

Format	Example
Command {<in>@<out>}	→ {1@4}
Response (O<out <sup>2</sup> >●I<in <sup>2</sup> >)CrLf	← (O05 I01)CrLf

**Explanation:** Input 1 is switched to output 4.

### 8.3.2. Switch One Input to all Output

Supported variants: All



#### ATTENTION!

For MX6x6DVI / MX6x6DVI-DL and MX8x8DVI / MX8x8DVI-DL devices: If CPU FW version 1.4.8 is installed in the matrix, the muted output will be unmuted when an input is switched to the destination. If CPU FW 2.5.0 or above is installed in the matrix, the switching does not change mute state. See appendix in section [11.1 on page 72](#) for more information.

**Description:** Switch input <in> to output <out>.

Format	Example
Command {<in>@O}	→ {02@O}
Response (I<in <sup>2</sup> >●ALL)CrLf	← (I01 ALL)CrLf

**Explanation:** Input 2 is switched to all outputs, except the locked ones.

### 8.3.3. View Connection on all Outputs

Supported variants: All



#### ATTENTION!

For MX6x6DVI / MX6x6DVI-DL and MX8x8DVI / MX8x8DVI-DL devices: If CPU FW version 1.4.8 is installed in the matrix, an extra space character is sent after the last output: (ALL●<O1>●<O2>●<O3>●<O4>●<O5>●<O6>●<O7>●<O8>●). See appendix in section [11.1 on page 72](#) for more information.

**Description:** Viewing all outputs' connection results in different response length, because it depends on the router's type (length = 8 for MX8x8DVI / MX8x8DVI-DL, length = 6 for MX6x6DVI / MX6x6DVI-DL, length = 4 for MX4x4DVI / MX4x4DVI-DL). The response below supposes a router having 8 outputs.

Format	Example
Command {VC}	→ {VC}
Response (ALL●<O1>●<O2>●<O3>●<O4>●<O5>●<O6>●<O7>●<O8>)CrLf	← (ALL 02 02 02 05 05 05 08 08)CrLf

**Legend 1:** All <Ox> indexes show the corresponding output's connection state. If value <O5> equals 04 it means that output 5 is connected to input 4. <O1>..<O8> are two digit ASCII characters. (01, 02, 04, etc.)

**Explanation 1:** Viewing connection for all outputs. Input 2 is connected to outputs 1, 2 and 3. Input 5 is connected to outputs 4, 5 and 6. Input 8 is connected to output 7 and 8.



**INFO**

If an output is locked, muted, or both locked and muted, the response format changes. If outputs are muted you get a letter 'M', if locked a letter 'L' and if muted and locked at the same time 'U' before the 2 digit numbers. In case of MX4x4DVI/DVI-DL, the response format of the muted and locked output port is '00'.

Format	Example
Command {VC}	→ {VC}
Response (ALL●<O1>●<O2>●<O3> ●<O4>●<O5>●<O6>●<O7> ●<O8>)CrLf	← (ALL M02 L02 U02 05 05 05 08 08)CrLf

**Legend 2:** Any <Ox> indexes can be a two digit number, or there can be a leading character showing the mute and/or lock state for the corresponding output.

Index	Legend	Explanation - MX8x8DVI/DVI-DL, MX6x6DVI/DVI-DL
<Ox>	<in <sup>2</sup> >	<Ox> is connected to <in <sup>2</sup> >, <Ox> neither muted or locked.
<Ox>	M<in <sup>2</sup> >	<Ox> is connected to <in <sup>2</sup> >, <Ox> is muted, and unlocked.
<Ox>	L<in <sup>2</sup> >	<Ox> is connected to <in <sup>2</sup> >, <Ox> is not muted, but locked.
<Ox>	U<in <sup>2</sup> >	<Ox> is connected to <in <sup>2</sup> >, <Ox> is muted and locked.

Index	Legend	Explanation - MX4x4DVI/DVI-DL
<Ox>	00	<Ox> is muted or locked.

**Explanation 2:** Viewing connection for all outputs. Input 2 is connected to outputs 1, 2 and 3. Output 1 is muted. Output 2 is locked. Output 3 is muted and locked. Input 5 is connected to outputs 4, 5 and 6. Input 8 is connected to output 7 and 8.

### 8.3.4. View Mutes on All Output

**Supported variants:** All

**Description:** Viewing all outputs' connection results in different response length, because it depends on the router's type (length = 8 for MX8x8DVI / MX8x8DVI-DL, length = 6 for MX6x6DVI / MX6x6DVI-DL, length = 4 for MX4x4DVI / MX4x4DVI-DL). The response below supposes a router having 8 outputs.

Format	Example (MX8x8)
Command {VM}	→ {VM}
Response (MUT●<M1>●<M2>●<M3> ●<M4>●<M5>●<M6>●<M7> ●<M8>)CrLf	← (MUT 1 0 1 1 0 0 0 0 )CrLf

**Legend:** All <Mx> indexes are one digit numbers, showing the mute state for the corresponding output. If <Mx> equals 0 the output x is unmuted. If <Mx> equals 1, the output x is muted.

**Explanation:** Output 1, 3 and 4 are muted, the other outputs are not muted.

### 8.3.5. Mute Specified Output

**Supported variants:** All

**Description:** Mute output <out>.

Format	Example
Command {#<out>}	→ {#03}
Response (1MT<out?>)CrLf	← (1MT03)CrLf

**Explanation:** Output 3 is muted. Now no signal presents on output 3.

### 8.3.6. Unmute Specified Output

**Supported variants:** All



#### **ATTENTION!**

For MX6x6DVI / MX6x6DVI-DL and MX8x8DVI / MX8x8DVI-DL devices: If CPU FW version 1.4.8 is installed in the matrix, the muted output will be unmuted when an input is switched to the destination. If CPU FW 2.5.0 or above is installed in the matrix, the switching does not change mute state. See appendix in section [11.1 on page 72](#) for more information.

**Description:** Unmute output <out>.

Format	Example
Command {+<out>}	→ {+03}
Response (0MT<out²>)CrLf	← (0MT03)CrLf

**Explanation:** Output 3 is unmuted. Now output 3 is switched to the input it was connected to prior to the mute command.

### 8.3.7. Lock Specified Output

**Supported variants:** MX8x8DVI / MX8x8DVI-DL, MX6x6DVI / MX6x6DVI-DL

**Description:** Lock output <out>. Output's state cannot be changed until unlocking.

Format	Example
Command {#<out>}	→ {#>05}
Response (1LO<out²>)CrLf	← (1LO05)CrLf

**Explanation:** Output 5 is locked.



#### **INFO**

The locking function of the output ports for MX4x4DVI / MX4x4DVI-DL is available only by front panel operation.

### 8.3.8. Unlock Specified Output

**Supported variants:** MX8x8DVI / MX8x8DVI-DL, MX6x6DVI / MX6x6DVI-DL

**Description:** Unlock output <out>. Now output 3 state can be changed.

Format	Example
Command {+<<out>}	→ {+<05}
Response (0LO<out²>)CrLf	← (0LO05)CrLf

**Explanation:** Output 5 is locked.



#### **INFO**

The router issues the above response regardless of the previous state of the output (either it was locked or unlocked).



#### **INFO**

The unlocking function of the output ports for MX4x4DVI / MX4x4DVI-DL is available only by front panel operation.

### 8.3.9. Save Preset to the Specified Memory Location

**Supported variants:** All

**Description:** Save current crosspoint configuration (output states) to preset <id>.

Format	Example
Command {\$<id>}	→ {\$4}
Response (SPR<id <sup>2</sup> >)CrLf	← (SPR04)CrLf

**Explanation:** Current crosspoint state is saved to preset 4, including the mute state of the outputs.



*INFO*

*Lock states are not saved. Lock state is assigned to the physical output of the router. Presets don't affect output locks.*

### 8.3.10. Load Preset to the Specified Memory Location

**Supported variants:** All

**Description:** Load preset <id>.

Format	Example
Command {%<id>}	→ {%4}
Response (LPR<id <sup>2</sup> >)CrLf	← (LPR04)CrLf

**Explanation:** Current crosspoint state is changed according to preset 4, including the mute state of the outputs.



*INFO*

*Lock states are not loaded. Lock state is assigned to the physical output of the router. In MX8x8DVI / MX8x8DVI-DL and MX6x6DVI / MX6x6DVI-DL presets do not affect output locks, but in MX4x4DVI / MX4x4DVI-DL the loaded presets unlock the output ports.*

### 8.3.11. Preview Preset

**Supported variants:** MX8x8DVI/MX8x8DVI-DL and MX6x6DVI/MX6x6DVI-DL if the CPU FW version is above 1.4.8. See appendix in section [11.1 on page 72](#) for more information.

**Description:** Preview preset <id> without loading.

Format	Example
Command {VP#<id>=?}	→ {VP#3=?}
Response (VP#<id>=●<O1>●<O2> ●<O3>●<O4>●<O5>●<O6> ●<O7> ●<O8>●)CrLf	← (VP#3= 02 M02 M01 02 02 01 01 01 ) CrLf

**Legend:** Any <Ox> indexes can be a two digit number, or there can be a leading character showing the mute state for the corresponding output.

**Explanation:** Viewing connections for preset 3. Input 2 is connected to outputs 1, 2, 4 and 5. Input 1 is connected to outputs 3, 6, 7 and 8. Output 2 and 3 are muted. The shown input connections for these outputs are not active, but the last connection that was routed to that output before it was muted.

Index	Legend	Explanation
<Ox>	<in <sup>2</sup> >	<Ox> is connected to <in <sup>2</sup> >, <Ox> is not muted.
<Ox>	M<in <sup>2</sup> >	<Ox> is connected to <in <sup>2</sup> >, <Ox> is muted.

### 8.3.12. Renaming Presets / Inputs / Outputs

**Supported variants:** MX8x8DVI/MX8x8DVI-DL and MX6x6DVI/MX6x6DVI-DL if the CPU FW version is above 1.4.8. See appendix in section [11.1 on page 72](#) for more information.

**Description:** Allows storing names for each preset / input / output. Any 16-byte long string is allowed. All characters are converted to uppercase! The router accepts <id> greater than the current I/O setup but treats it as modulo output. So if <id> = 9 on a 8x8 router, then it will be treated as 1. All router models have 32 presets memories.

#### Rename a preset

	Format	Example
Command	{PNAME#<id>= <preset_name>}	→ {PNAME#1=first preset}
Response	(PNAME#<id>= <preset_name>)CrLf	← (PNAME#1=FIRST PRESET)CrLf

**Explanation:** Preset 1 was named as “first preset”.

#### Rename an input

	Format	Example
Command	{INAME#<id>= <input_name>}	→ {INAME#3=Media Player}
Response	(INAME#<id>= <input_name>)CrLf	← (INAME#3=MEDIA PLAYER)CrLf

**Explanation:** Input 3 was named as “media player”.

#### Rename an output

	Format	Example
Command	{ONAME#<id>= <output_name>}	→ {ONAME#2=Monitor_no2}
Response	(ONAME#<id>= <output_name>)CrLf	← (ONAME#2=MONITOR_NO2)CrLf

**Explanation:** Output 2 was named as “monitor\_no2”.

### 8.3.13. Query names Presets / Inputs / Outputs

**Supported variants:** MX8x8DVI/MX8x8DVI-DL and MX6x6DVI/MX6x6DVI-DL if the CPU FW version is above 1.4.8. See appendix in section [11.1 on page 72](#) for more information.

**Description:** Each preset / input / output name can be read from the router.

#### Read a preset's name

	Format	Example
Command	{PNAME#<id>=?}	→ {PNAME#1=?}
Response	(PNAME#<id>= <preset_name>)CrLf	← (PNAME#1=FIRST PRESET)CrLf

**Explanation:** Name of preset 1 is “first preset”.

#### Read an input's name

	Format	Example
Command	{INAME#<id>=?}	→ {INAME#3=?}
Response	(INAME#<id>= <input_name>)CrLf	← (INAME#3=MEDIA PLAYER)CrLf

**Explanation:** Name of input 3 is “media player”.

### Read an output's name

Format	Example
Command {ONAME#<id>=?>}	→ {ONAME#2=?}
Response (ONAME#<id>=<output_name>)CrLf	← (ONAME#2=MONITOR_NO2)CrLf

**Explanation:** Name of output 2 is "monitor\_no2".

### 8.3.14. Set Default Names of Presets / Inputs / Outputs

**Supported variants:** MX8x8DVI/MX8x8DVI-DL and MX6x6DVI/MX6x6DVI-DL if the CPU FW version is above 1.4.8. See appendix in section [11.1 on page 72](#) for more information.

**Description:** Renames all preset / input / output names to the default: Preset 1..32 / Input 1.. / Output 1.. respectively.



**INFO**

The <id> field is not relevant here, only has to be a valid one. The command will affect ALL Presets / Inputs / Outputs disregarding the actual number that was in the command.

#### Reload default preset names

Format	Example
Command {PNAME#<id>=!}	→ {PNAME#2=!}
Response (PNAME#<id>=Preset<id>)CrLf	← (PNAME#2=Preset 2)CrLf

#### Reload default input names

Format	Example
Command {INAME#<id>=!}	→ {INAME#4=!}
Response (INAME#<id>=Input<id>)CrLf	← (INAME#4=Input 4)CrLf

#### Reload default output names

Format	Example
Command {ONAME#<id>=!}	→ {ONAME#3=!}
Response (ONAME#<id>=Output<id>)CrLf	← (ONAME#3=Output 3)CrLf

### 8.3.15. Reload Factory Default Output Setup

**Supported variants:** All



**ATTENTION!**

For MX6x6DVI / MX6x6DVI-DL and MX8x8DVI / MX8x8DVI-DL devices: If CPU FW version 1.4.8 is installed in the matrix, the response is not above mentioned but be the following: (DVP FF FF FF FF FF FF 05 ). See appendix in section [11.1 on page 72](#) for more information.

**Description:** Reload factory default output drive currents.

Format	Example
Command {r00}	→ {r00}
Response (APWSE)CrLf	← (APWSE)CrLf

### 8.3.16. Query IP Settings

**Supported variants:** MX8x8DVI/MX8x8DVI-DL and MX6x6DVI/MX6x6DVI-DL if the CPU FW version is above 1.4.8. See appendix in section [11.1 on page 72](#) for more information.

**Description:** IP setup can be retrieved from the router with this command.

Format	Example
Command {IP_CONFIG=?}	→ {IP_CONFIG=?}
Response (IP_CONFIG=<id> •<ip_address>•<port> •<mask>•<gateway>)CrLf	← (IP_CONFIG=0 192.168.2.106 10001 255.0.0.0 192.168.2.1)CrLf

#### Legend

Identifier	Description	Default value
<id>	0-fix IP, 7-DHCP	0
<ip_address>	IP address	192.168.254.254
<port>	IP port of the router	10001
<mask>	subnet mask	255.255.0.0
<gateway>	gateway address	0.0.0.0

**Explanation:** The router has a fix 192.168.2.106 IP address on the 255.0.0.0 subnet with a gateway on 192.168.2.1 and communicates over port no. 10001.



#### INFO

If the matrix responds only zeros for this command, please unplug from power source, reconnect and try again.

### 8.3.17. Reload Factory Default IP Settings

**Supported variants:** MX8x8DVI/MX8x8DVI-DL and MX6x6DVI/MX6x6DVI-DL if the CPU FW version is above 1.4.8. See appendix in section [11.1 on page 72](#) for more information.

**Description:** After issuing this command over serial connection the router will reload the factory default IP setup.

Format	Example
Command {IP_CONFIG=!}	→ {IP_CONFIG=!}
Response (Changing IP configuration...) CrLf (DONE!)CrLf or (FAILED!)CrLf	← (Changing IP configuration...)CrLf (DONE!)CrLf or (FAILED!)CrLf

Parameters after successful command execution: (it takes about 20 seconds)

Parameter	Value
IP address	192.168.254.254
port number	10001
Subnet mask	255.255.0.0
Gateway	0.0.0.0



#### INFO

IP settings can NOT be changed with this protocol command via Ethernet connection, only via serial port. To change the IP settings via Ethernet, use the Lightware Device Controller software (see section [7.8 on page 43](#)) or the built-in website (see section [6.5.1 on page 29](#)). Default setting can be reloaded by the front panel buttons as well (see section [5.3.5 on page 24](#)).

### 8.3.18. Load DHCP IP Settings (Only IP Address!)

**Supported variants:** MX8x8DVI/MX8x8DVI-DL and MX6x6DVI/MX6x6DVI-DL if the CPU FW version is above 1.4.8. See appendix in section [11.1 on page 72](#) for more information.

**Description:** After issuing this command over serial connection the router will reload the factory default IP setup.

Format	Example
Command {IP_CONFIG=D}	→ {IP_CONFIG=D}
Response (Changing IP configuration...)CrLf (DONE!)CrLf or (FAILED!)CrLf	← (Changing IP configuration...)CrLf (DONE!)CrLf or (FAILED!)CrLf

Parameters after successful command execution: (it takes about 20 seconds)

Parameter	Value
IP address	Acquired with DHCP
Port number	unchanged
Subnet mask	unchanged
Gateway	unchanged



**INFO**

IP settings can NOT be changed with this protocol command via Ethernet connection, only via serial port. To change the IP settings via Ethernet, use the Lightware Device Controller software (see section [7.8 on page 43](#)) or the built-in website (see section [6.5.1 on page 29](#)). Default setting can be reloaded by the front panel buttons as well (see section [5.3.5 on page 24](#)).

## 8.4. Router Status Commands

### 8.4.1. View Product Type

**Supported variants:** All



**ATTENTION!**

For MX6x6DVI / MX6x6DVI-DL and MX8x8DVI / MX8x8DVI-DL devices: If CPU FW version 1.4.8 is installed in the matrix, the product type is "MX8X8DVI\_S" and "MX8X8DVI\_D". See appendix in section [11.1 on page 72](#) for more information.

**Description:** The router responds its name.

Format	Example
Command {i}	→ {i}
Response (<PRODUCT_TYPE>)CrLf	← (MX8X8DVI-DL)CrLf

**Legend:**

<PRODUCT_TYPE>	inputs	outputs	interface
MX4X4DVI-SL	4	4	single link
MX6X6DVI-SL	6	6	single link
MX8X8DVI-SL	8	8	single link
MX4X4DVI-DL	4	4	dual link
MX6X6DVI-DL	6	6	dual link
MX8X8DVI-DL	8	8	dual link

### 8.4.2. View Serial Number

**Supported variants:** All

**Description:** The router responds its 8-digit serial number.

Format	Example
Command {s}	→ {s}
Response (<SERIAL_NUMBER>)CrLf	← (SN:09410135)CrLf



**INFO**

Only the last 4 numbers are written onto the back of the router.

### 8.4.3. View Firmware Version of the CPU

**Supported variants:** All

**Description:** View the CPU firmware revision. To view another controller's firmware revision see → 'Query cards' firmware' {FC}.

Format	Example
Command {f}	→ {f}
Response (<FW_VERSION>)CrLf	← (FW:2.5.0)CrLf

### 8.4.4. View the Installed Hardware of the I/O Cards

**Supported variants:** All



**ATTENTION!**

MX6x6DVI / MX6x6DVI-DL and MX8x8DVI / MX8x8DVI-DL devices: If CPU FW version 1.4.8 is installed in the matrix, the response will contain an extra space character after the PCB version: (SL# 0 MX-8x8-DVI-DL SCH\_1.1 PCB\_1.1●). See appendix in section [11.1 on page 72](#) for more information.

**Description:** Shows the hardware name and revision of the installed cards.



**INFO**

This router model is a compact type, so there are no separate input / output cards.

Format	Example
Command {is}	→ {is}
Response (<SL# 0 MB_DESCRIPTOR>)CrLf	← (SL# 0 MX-6x6-DVI SCH_1.1 PCB_1.1)CrLf

**Explanation 1:** (MX6x6DVI router): The router has only one card, with 6 inputs and 6 outputs. All cards are single link DVI-D.

Format	Example
Command {is}	→ {is}
Response (<SL# 0 MB_DESCRIPTOR>)CrLf	← (SL# 0 MX-8x8-DVI-DL SCH_1.1 PCB_1.1)CrLf

**Explanation 2:** (MX8x8DVI-DL router): The router has only one card, with 8 inputs and 8 outputs. The router is dual link capable.

### 8.4.5. View the Installed Firmware of the Controllers

**Supported variants:** All

**Description:** Shows the firmware revisions of the installed controllers.

Format	Example
Command {fc}	→ {fc}
Response (<CARD_FIRMWARE>)CrLf	← (CF MX-CP FW:1.0.4 @ 0x10)CrLf ← (CF MX8x8EDID v1.9.1 @ 0x50)CrLf

### 8.4.6. View Current Control Protocol

**Supported variants:** All

**Description:** Shows the RS-232, TCP/IP control protocol.

Format	Example
Command {p_?}	→ {p_?}
Response CURRENT●PROTOCOL●=#<x>CrLf	← (CURRENT PROTOCOL = #1)CrLf

**Legend:** <x> stands for the active protocol.

**Explanation:** Protocol 1 is active here.

### 8.4.7. Set Current Control Protocol

**Supported variants:** All

**Description:** Sets the current RS-232, TCP/IP control protocol (Default is '1').

Format	Example
Command {p_x}	→ {p_1}
Response (PROTOCOL●#<x>●SELECTED!)CrLf	← (PROTOCOL #1 SELECTED!)CrLf

**Legend:** <x> stands for the active protocol.

**Explanation:** Protocol 1 is active here.

## 8.5. EDID Router Commands

### 8.5.1. Route EDID to the Selected Input (Static)

**Supported variants:** All

**Description:** Copies EDID from location <loc> to input <in>. <loc> must be 1..100.

Format	Example
Command {<in>:<loc>}	→ {5:10}
Response (E_SW_OK)CrLf	← (E_SW_OK)CrLf ← (E_S_C) CrLf

**Explanation:** EDID from memory location 10 is copied to input 5.



**INFO**

The router send (E\_S\_C) only if the new EDID is different from the earlier one.

### 8.5.2. Route EDID to the Selected Input (Dynamic)

**Supported variants:** All

**Description:** Copies EDID from location <loc> to input <in>. Location <loc> should be 101...108 (MX8x8DVI, MX8x8DVI-DL) or 101...106 (MX6x6DVI, MX6x6DVI-DL) or 101...104 (MX4x4DVI, MX4x4DVI-DL) as opposed to static routing where <loc> should be between 1..100.

Format	Example
Command {<in>:<loc>}	→ {4:102}
Response (E_SW_OK)CrLf	← (E_SW_OK)CrLf
(E_S_C) CrLf	← (E_S_C) CrLf



*INFO*

*Outputs 1..8 are mapped to logical addresses 101..108.*

**Explanation:** EDID from memory location 10 is copied to input 5.

After choosing dynamic EDID routing to one (or all inputs) the router will follow the EDID changes occurring on the output it was connected to. Every time a different EDID is recognized on the output, it is copied instantly to the input.

### 8.5.3. Route one EDID to all Inputs

**Supported variants:** All

**Description:** Copies EDID from the selected location <loc> to all inputs.

Format	Example
Command {A:<loc>}	→ {A:48}
Response (E_SW_OK)CrLf	← (E_SW_OK)CrLf
(E_S_C) CrLf	← (E_S_C) CrLf

**Explanation:** EDID from memory location 48 is copied to all inputs.

### 8.5.4. View EDID Switch Status on all Inputs

**Supported variants:** MX8x8DVI/MX8x8DVI-DL and MX6x6DVI/MX6x6DVI-DL if the CPU FW version is above 1.4.8. See appendix in section [11.1 on page 72](#) for more information.

**Description:** Indexes show the actual input and the number at the given index (<in1>..*inN*>) shows which EDID is switched to that particular input where N represents the maximal input number of the given configuration.

Format	Example
Command {VEDID}	→ {VEDID}
Response (VEDID●<IN1>●<IN2>● <IN3>●<IN4>●<IN5>● <IN6>●<IN7> ●<IN8>)CrLf	← (VEDID 048 048 053 101 101 101 101 101)CrLf

**Legend:** Any <INx> indexes are three digit numbers showing the current EDID that is routed to the corresponding input. Respond length depends on input number of the router.

**Explanation:** Factory preset EDID from memory location 48 is emulated on inputs 1 and 2. User saved EDID from memory location 53 is emulated on input 3. EDID from output 1 is dynamically emulated on inputs 5, 6, 7, and 8.

### 8.5.5. Learn EDID

**Supported variants:** All

**Description:** Learn EDID from the specified output <out> to the specified location <loc>. Memory locations 51..100 are available for saving learned EDIDs.

Format	Example
Command {<out>><loc>}	→ {4>51}
Response (E_SW_OK)CrLf	← (E_SW_OK)CrLf
(E_S_C) CrLf	← (E_S_C) CrLf

**Explanation:** EDID from output 4 is saved to EDID memory location 51.



**ATTENTION!**

If CPU FW version 1.4.8 is installed in the matrix, the response will be (E\_SA\_OK). See appendix in section [11.1 on page 72](#) for more information.

### 8.5.6. View EDID Validity Table

**Supported variants:** All

**Description:** Shows EDID validity table, which contains information about the EDID states.

Format	Example
Command {wv}	→ {wv}
Response (EV●<VALIDITY_TABLE> )CrLf	← (EV 11111111111111111111 1111111111111111111111111111111111 11111011111000000000 000000001100000000 0000000111111111133 333311) CrLf

Character	Description	Example
1-50	Factory preset EDIDs	111111111 111111111 111111111 111111111 111111111
51-100	User saved EDIDs	111110111 100000000 000000001 100000000 000000011
101-108	Outputs' EDID state	11111111
109-116	Emulated EDIDs on the inputs	33333311

**Legend:** Response length is 116 characters. Each number represents the EDID validity state for the corresponding memory location. The first 50 numbers (bold) are representing the factory preset EDIDs, the second 50 numbers are representing the User saved EDIDs. Next 8 numbers (italic) are showing the outputs' EDID state, and the last 8 numbers (bold and italic) are showing the emulated EDIDs on the inputs.

Value	Description
'0'	invalid EDID
'1'	valid EDID
'3'	changed EDID

If a changed EDID is queried by the {wh} command (see next section), its value returns to '1'.

**Explanation:** There is one '3' in the table on the 113th position. This means that the emulated EDID on input 5 is changed since the last EDID query on that port.

### 8.5.7. View EDID Header

**Supported variants:** All

**Description:** EDID\_HEADER consist of 3 fields:

<b>PNPID code</b>	The three letter abbreviation of the manufacturer
<b>Preferred resolution</b>	The resolution and refresh rate stored in the preferred detailed timing block.
<b>Name</b>	The name of display device stored in product descriptor.

Format	Example
Command {wh<loc>}	→ {wh104}
Response (EH#<loc>●<EDID_HEADER>) CrLf	← (EH#104 NEC 1280x1024@60 LCD1970NXp)

**Explanation:** Shows the EDID from memory location 104.

### 8.5.8. Download EDID Content from the Router

**Supported variants:** All

**Description:** EDID hex bytes can be read directly. The router will issue the whole content of the EDID present on memory location <loc> (256 bytes).

Format	Example
Command {we<loc>}	→ {we1}
Response (EB#<loc>●<B1> ●<B2>●..●<B256>)CrLf	← (EB#1 00 FF FF FF FF FF FF 00 32 F2 00 00 00 ... .. 00 92) CrLf

**Legend:** <B1>..<B256> are space separated hex characters displayed in ASCII format.

**Explanation:** Full EDID from memory location 1 is downloaded.

### 8.5.9. Upload EDID Content to the Router

**Supported variants:** All

**Description:** EDID hex bytes can be written directly to the user programmable memory locations (locations #51...#100).

**Sequence:**

**Step 1.** Prepare the router to accept EDID bytes to the specified location <loc> with command {WL#<loc>}

**Step 2.** Router responds that it is ready to accept EDID bytes with (E\_L\_S)CrLf

**Step 3.** Send 1 block of EDID (1 block consist of 8 bytes of hex data represented in ASCII format) with command {WB#<num>•<B1>•<B2>•<B3>•<B4>•<B5>•<B6>•<B7>•<B8>}

**Step 4.** The router acknowledges with response (EL#<num>)

**Step 5.** Repeat steps 3 and 4 to send the remaining 31 blocks of EDID (32 altogether)

**Step 6.** After the last acknowledge, the router indicates that the EDID status changed by sending (E\_S\_C) CrLf

Format	Example
Command {WL#<loc>}	→ {WL#53}
Response (E_L_S)CrLf	← (E_L_S) CrLf
Command {WB#1•<B1>•<B2>•<B3>•<B4>•<B5>•<B6>•<B7>•<B8>}	→ {WB#1 00 FF FF FF FF FF FF 00}
Response (EL#•)CrLf	← (EL#1) CrLf
Command {WB#2•<B9>•<B10>•<B11>•<B12>•<B13>•<B14>•<B15>•<B16>}	→ {WB#2 38 A3 8E 66 01 01 01 01}
Response (EL#•)CrLf	← (EL#2) CrLf
.	.
.	.
.	.
Command {WB#32•<B249>•<B250>•<B251>•<B252>•<B253>•<B254>•<B255>•<B256>}	→ {WB#32 36 59 42 0A 20 20 00 96}
Response (EL#•)CrLf	← (EL#32) CrLf
Response (E_S_C) CrLf	← (E_S_C) CrLf

**Legend:** <num> represents the sequential number of every 8 byte part of EDID. <num> is between 1 and 32. <B1>..<B256> are the bytes of EDID.

**Explanation:** <num> represents the sequential number of every 8 byte part of EDID. <num> is between 1 and 32. <B1>..<B256> are the bytes of EDID.

## 8.6. Router Initiated Commands

### 8.6.1. EDID Status Changed

**Supported variants:** All

**Description:** This is sent after all commands which changes the EDID (EDID copy, EDID switch), or after a new EDID source ie. a new display device is connected to the router.

Format	Example
Command various	→ {5:101}
Response (E_S_C) CrLf	← (E_SW_OK)CrLf
	← (E_S_C) CrLf

**Explanation:** Copy EDID from output 1 to input 5 (dynamic emulation). First response confirms the EDID routing command. (E\_S\_C) response is an automatic message that is sent because an EDID has changed.



#### INFO

The router stores the last attached display device's EDID connected to the output. After disconnecting this device its EDID is still present at the router's memory, therefore no status change message is issued by the router if a display device having the same EDID is connected to that output. (The same display device is connected again, or another display device (same brand)).



#### INFO

To keep your application in sync with the router it is recommended to issue a show validity ({wv}) command after receiving an EDID status changed response, and read all location indicating '3' in the table, as the change of these EDID triggered the EDID status changed response.

### 8.6.2. Error Responses

**Supported variants:** All



#### ATTENTION!

There are minor differences between the error responses according to the installed CPU FW version as indicated below. See appendix in section [11.1 on page 72](#) for more information.

#### Invalid input number

**Description:** Given input number exceeds the maximum number of inputs or equals zero.

Response if CPU FW version 1.4.8 is installed	(ERR1)CrLf
Response if CPU FW version 2.5.0 or above is installed	(ERR01)CrLf

#### Invalid output number

**Description:** Given output number exceeds the installed number of outputs or equals zero.

Response if CPU FW version 1.4.8 is installed	(ERR2)CrLf
Response if CPU FW version 2.5.0 or above is installed	(ERR02)CrLf

#### Invalid value

**Description:** Given value exceeds the maximum allowed value can be sent.

Response if CPU FW version 1.4.8 is installed	(ERR3)CrLf
Response if CPU FW version 2.5.0 or above is installed	(ERR03)CrLf

#### Invalid preset number

**Description:** Given preset number exceeds the maximum allowed preset number.

Response if CPU FW version 1.4.8 is installed	(ERR4)CrLf
Response if CPU FW version 2.5.0 or above is installed	(ERR04)CrLf



#### INFO

The maximum preset number is limited to 32 for all routers.

## 8.7. Protocol Commands Quick Summary

### Switching and Control Commands

Operation		Command	Supported variants
<a href="#">Switch One Input to One Output</a>	<a href="#">8.3.1.</a>	{<in>@<out>}	All
<a href="#">Switch One Input to all Output</a>	<a href="#">8.3.2.</a>	{<in>@O}	All
<a href="#">View Connection on all Outputs</a>	<a href="#">8.3.3.</a>	{VC}	All
<a href="#">View Mutes on All Output</a>	<a href="#">8.3.4.</a>	{VM}	All
<a href="#">Mute Specified Output</a>	<a href="#">8.3.5.</a>	{#<out>}	All
<a href="#">Unmute Specified Output</a>	<a href="#">8.3.6.</a>	{+<out>}	All
<a href="#">Lock Specified Output</a>	<a href="#">8.3.7.</a>	{#<out>}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL
<a href="#">Unlock Specified Output</a>	<a href="#">8.3.8.</a>	{+<<out>}	MX8x8DVI / MX8x8DVI-DL, MX6x6DVI / MX6x6DVI-DL
<a href="#">Save Preset to the Specified Memory Location</a>	<a href="#">8.3.9.</a>	{\$<id>}	All
<a href="#">Load Preset to the Specified Memory Location</a>	<a href="#">8.3.10.</a>	{%<id>}	All
<a href="#">Preview Preset</a>	<a href="#">8.3.11.</a>	{VP#<id>=?}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL (above CPU FW 1.4.8.)
<a href="#">Renaming Presets</a>	<a href="#">8.3.12.</a>	{PNAME#<id>= <preset_name>}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL (above CPU FW 1.4.8.)
<a href="#">Renaming Inputs</a>	<a href="#">8.3.12.</a>	{INAME#<id>= <input_name>}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL (above CPU FW 1.4.8.)
<a href="#">Renaming Outputs</a>	<a href="#">8.3.12.</a>	{ONAME#<id>= <output_name>}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL (above CPU FW 1.4.8.)
<a href="#">Query names Presets</a>	<a href="#">8.3.13.</a>	{PNAME#<id>=?}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL (above CPU FW 1.4.8.)
<a href="#">Query names Inputs</a>	<a href="#">8.3.13.</a>	{INAME#<id>=?}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL (above CPU FW 1.4.8.)
<a href="#">Query names Outputs</a>	<a href="#">8.3.13.</a>	{ONAME#<id>= ?>}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL (above CPU FW 1.4.8.)
<a href="#">Set Default Names of Presets</a>	<a href="#">8.3.14.</a>	{PNAME#<id>=!}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL (above CPU FW 1.4.8.)
<a href="#">Set Default Names of Inputs</a>	<a href="#">8.3.14.</a>	{INAME#<id>=!}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL (above CPU FW 1.4.8.)
<a href="#">Set Default Names of Outputs</a>	<a href="#">8.3.14.</a>	{ONAME#<id>=!}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL (above CPU FW 1.4.8.)
<a href="#">Reload Factory Default Output Setup</a>	<a href="#">8.3.15.</a>	{r00}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL (above CPU FW 1.4.8.)

Operation		Command	Supported variants
<a href="#">Query IP Settings</a>	<a href="#">8.3.16.</a>	{IP_CONFIG=?}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL (above CPU FW 1.4.8.)
<a href="#">Reload Factory Default IP Settings</a>	<a href="#">8.3.17.</a>	{IP_CONFIG=!}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL (above CPU FW 1.4.8.)
<a href="#">Load DHCP IP Settings (Only IP Address!)</a>	<a href="#">8.3.18.</a>	{IP_CONFIG=D}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL (above CPU FW 1.4.8.)

### Router Status Commands

Operation		Command	Supported variants
<a href="#">View Product Type</a>	<a href="#">8.4.1.</a>	{i}	All
<a href="#">View Serial Number</a>	<a href="#">8.4.2.</a>	{s}	All
<a href="#">View Firmware Version of the CPU</a>	<a href="#">8.4.3.</a>	{f}	All
<a href="#">View the Installed Hardware of the I/O Cards</a>	<a href="#">8.4.4.</a>	{is}	All
<a href="#">View the Installed Firmware of the Controllers</a>	<a href="#">8.4.5.</a>	{fc}	All
<a href="#">View Current Control Protocol</a>	<a href="#">8.4.6.</a>	{p_?}	All
<a href="#">Set Current Control Protocol</a>	<a href="#">8.4.7.</a>	{p_x}	All

### EDID Router Commands

Operation		Command	Supported variants
<a href="#">Route EDID to the Selected Input (Static)</a>	<a href="#">8.5.1.</a>	{<in>:<loc>}	All
<a href="#">Route EDID to the Selected Input (Dynamic)</a>	<a href="#">8.5.2.</a>	{<in>:<loc>}	All
<a href="#">Route one EDID to all Inputs</a>	<a href="#">8.5.3.</a>	{A:<loc>}	All
<a href="#">View EDID Switch Status on all Inputs</a>	<a href="#">8.5.4.</a>	{VEDID}	MX8x8DVI, MX8x8DVI-DL, MX6x6DVI, MX6x6DVI-DL (above CPU FW 1.4.8.)
<a href="#">Learn EDID</a>	<a href="#">8.5.5.</a>	{<out>><loc>}	All
<a href="#">View EDID Validity Table</a>	<a href="#">8.5.6.</a>	{wv}	All
<a href="#">View EDID Header</a>	<a href="#">8.5.7.</a>	{wh<loc>}	All
<a href="#">Download EDID Content from the Router</a>	<a href="#">8.5.8.</a>	{we<loc>}	All
<a href="#">Upload EDID Content to the Router</a>	<a href="#">8.5.9.</a>	{WL#<loc>}	All

### Router Initiated Commands

Operation	See in chapter	Command	Supported variants
<a href="#">EDID Status Changed</a>	<a href="#">8.6.1.</a>		All
<a href="#">Error Responses</a>	<a href="#">8.6.2.</a>		All

## 9. Firmware Upgrade

This chapter is meant to help customers perform firmware upgrades on our products by giving a few tips on how to start and by explaining the features of the Bootloader and Matrix Firmware upgrader software. To get the latest software and firmware pack please contact [support@lightware.com](mailto:support@lightware.com).



**WARNING!**

*All EDIDs in the User Memory will be lost after the firmware upgrade. Save the user EDIDs before processing the upgrade.*

### 9.1. The Upgrade Process of MX4x4DVI/DVI-DL



**INFO**

*In case of MX4x4DVI/DVI-DL, the upgrade process can be executed by v1.3.0 Lightware Matrix Firmware Updater software.*

#### Detailed Instructions

**Step 1.** Installing the Lightware Matrix Firmware Updater software.

**Step 2.** Downloading and saving all the firmware files that you want to upgrade.

**Step 3.** Connect to the matrix via RS-232 port. Use a straight through serial cable between the computer and the matrix.

**Step 4.** Switch on the matrix by connecting the AC power cable.

**Step 5.** Check the current protocol setting:

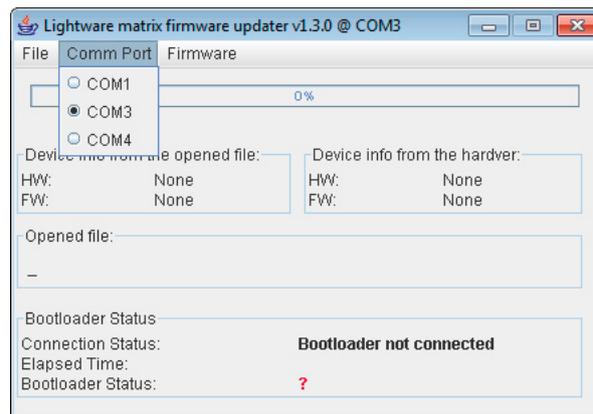
- a) Switch the matrix to TAKE mode,
- b) Press the CONTROL LOCK button,
- c) Press and keep pressed the OUTPUT LOCK button:
  - If SOURCE 1 lights up: LW protocol is active,
  - If SOURCE 2 lights up: Protocol #2 is active.

If necessary set the protocol by pressing SOURCE 1.

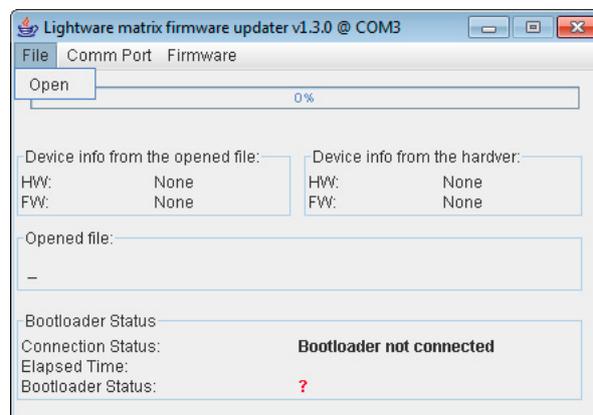
**Step 6.** Launch LW\_bootloader\_v1\_3\_0.



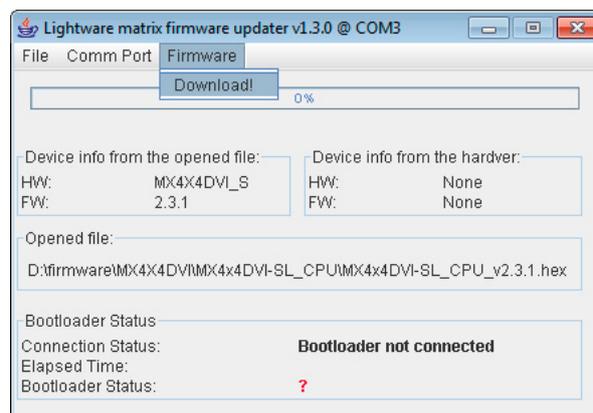
**Step 7.** Select the desired COM port from the **Comm Port** menu.



**Step 8.** Load the new firmware file by selecting the **File / Open** menu and browsing the file.

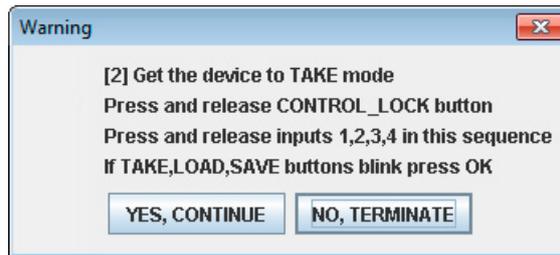


**Step 9.** Select **Firmware / Download!** from the menu.



**Step 10.** Enable bootloader mode.

Switch the matrix to bootloader mode as follows:



1. Switch the unit to Take mode
2. Press and release the **Control Lock** button
3. Press and release Source 1, 2, 3 and 4 buttons sequentially.
4. **Take, Load Preset** and **Save Preset** buttons start blinking.

**Step 11.** Press **Yes, continue** button to start the erasing and programming process. When the process is finished, Bootloader status is changed to Ready; the window can be closed. Switch the matrix off and on again.



**INFO**

Once the firmware upgrade failed, the router will NOT indicate its bootloader enabled state with **Take, Load** and **Save** buttons blinking, because previous software has been deleted, but steps 1 to 10 can still be repeated.

## 9.2. The Upgrade Process of MX8x8DVI/DVI-DL and MX6x6DVI/DVI-DL



**INFO**

In case of MX6x6DVI/DVI-DL and MX8x8 DVI/DVI-DL the upgrade process can be executed by Lightware Bootloader software.

### Upgrading Steps in a Nutshell

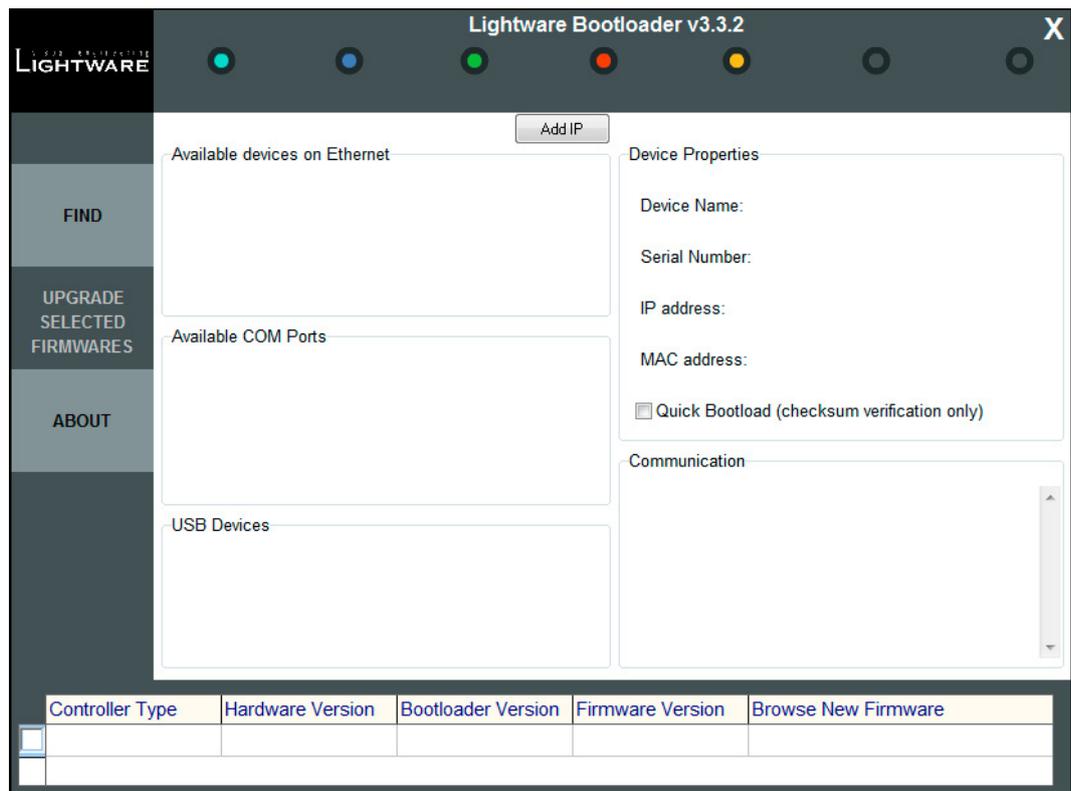
- Step 1.** Installing the Lightware Bootloader Software.
- Step 2.** Downloading and saving all the firmware files that you want to upgrade.
- Step 3.** Connecting the Lightware device and the computer over the LAN port.
- Step 4.** Starting the Lightware Bootloader application.
- Step 5.** Finding the device.
- Step 6.** Establishing the connection with the device.
- Step 7.** Selecting firmwares to upgrade.
- Step 8.** Starting the upgrade process.
- Step 9.** Restarting the device.

### Detailed Instructions

Use the Lightware Bootloader application to upgrade the router's firmware(s).

In case of MX8x8DVI(-DL) and MX6x6DVI(-DL), the matrix router can only be upgraded via LAN, so connect the matrix router to the local subnet or directly to the windows based computer with an Ethernet crosslink cable. Be sure that there is no other active connection with the router via Ethernet.

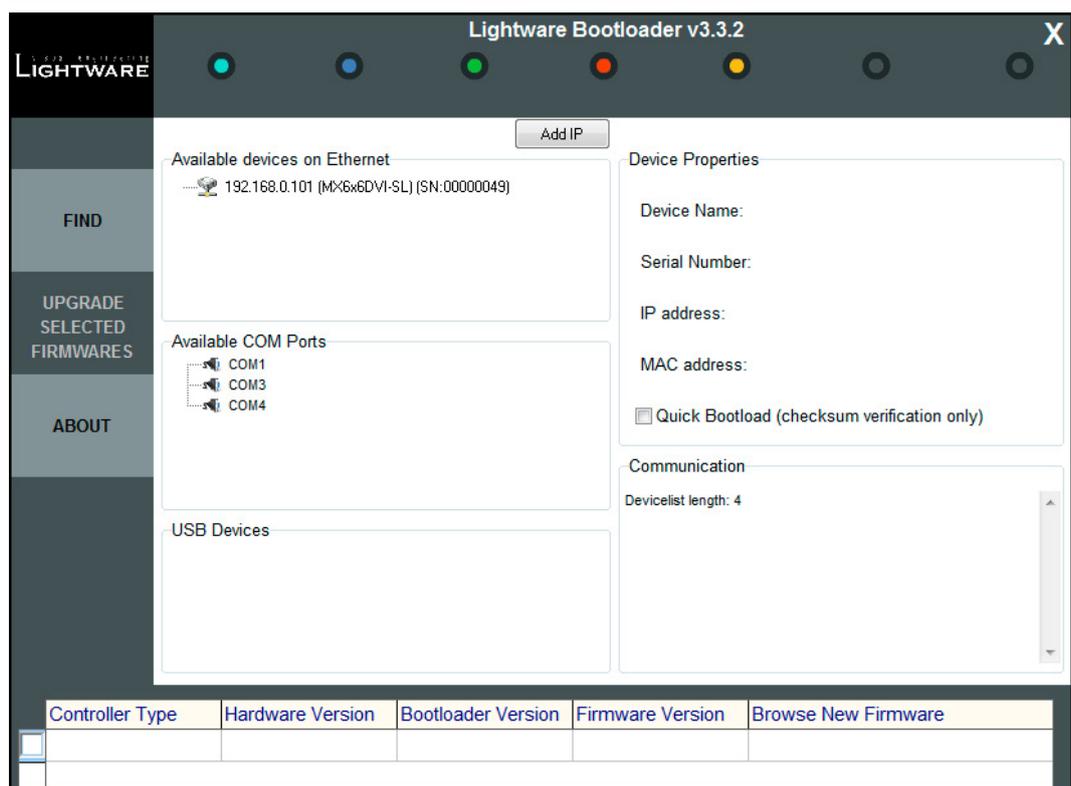
- Step 1.** Installing the bootloader application (contact [support@lightware.com](mailto:support@lightware.com)).
- Step 2.** Downloading and saving all the firmware files that you want to upgrade. If you have a zipped archive, extract it.
- Step 3.** Connecting the Lightware device and the computer via LAN/serial port.

**Step 4.** Starting the Lightware Bootloader application.**Step 5.** Finding the device.

If the bootloader finds one or more routers their IP addresses, type and serial number are listed in the tree view window. Press the **Find** button.

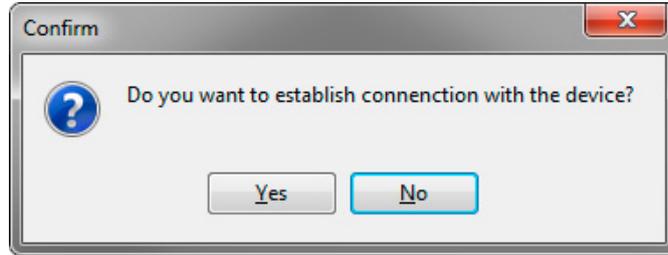
**ATTENTION!**

*Note, that you must wait until all the devices on the network completely start up, before pressing Find button.*



**Step 6.** Establishing the connection with the device.

Double click on the IP address, then click to establish connection with the matrix router. It will take 10-15 seconds to get all information from the router.



**ATTENTION!**

The bootloader application will restart the router when it establishes the connection. All connected DVI sources and monitors will act as if the router was powered down. The matrix beeps when it is rebooted.

**Step 7.** Review the firmware versions.

After the connection is made, the device properties, and the installed controller modules are displayed.

Controller Type	Hardware Version	Bootloader Version	Firmware Version	Browse New Firmware
<input type="checkbox"/> MX-DVI-CPU	HW:1.1	FW:1.1.1	FW:2.5.0	
<input type="checkbox"/> MX-CP1	HW:2.1	FW:1.0.4	FW:1.0.8	
<input type="checkbox"/> Web Server			FW:1.10.0	
<input type="checkbox"/> Web Content			FW:1.4.1	

Select the desired controllers which need firmware upgrade by clicking the checkbox(es). MX-DVI-CPU is the main processor's firmware. MX-CP1 is the firmware for the front panel. EDID router has a separate controller as well, but it is not firmware upgradeable in this product.

**Step 8.** Browse for the new firmware(s).

Click the corresponding cell in the **Browse New Firmware** column. A dialog pops up, to confirm if you really want to modify the path. Now you can browse for the new firmware file to upload. After opening the new file, the new firmware field will contain the name of the firmware file.

	Controller Type	Hardware Version	Bootloader Version	Firmware Version	Browse New Firmware
<input checked="" type="checkbox"/>	MX-DVI-CPU	HW:1.1	FW:1.1.1	FW:2.5.0	MX-CPU1_CPU_v2.5.0.hex
<input checked="" type="checkbox"/>	MX-CP1	HW:2.1	FW:1.0.4	FW:1.0.8	MX-CP_V2_no1_v1.0.8.hex
<input checked="" type="checkbox"/>	Web Server			FW:1.10.0	WEBSERVER_MX-CPU1_v1.1.6.ro
<input checked="" type="checkbox"/>	Web Content			FW:1.4.1	WEBCONTENT_MX-CPU1_LWR_v

**Step 9.** Upgrade firmware(s)

Click **Upgrade selected firmwares** button. A confirmation message appears. After clicking the **Yes** button the selected controllers are being reprogrammed, with the firmware you selected. If you select a file that does not fit for the selected controller, you will get an information message about which file is wrong. If you selected a controller to upgrade, but you had not selected a file for it, then you will also get an information message about which file is missing.

**Quick Bootload** mode can be switched on or off any time. It makes the bootloader software faster by only checking the checksum of the controller. No data verification is done after writing if the checksum was correct.

**ATTENTION!**

*The reprogramming can take between 3-8 minutes per controller.*

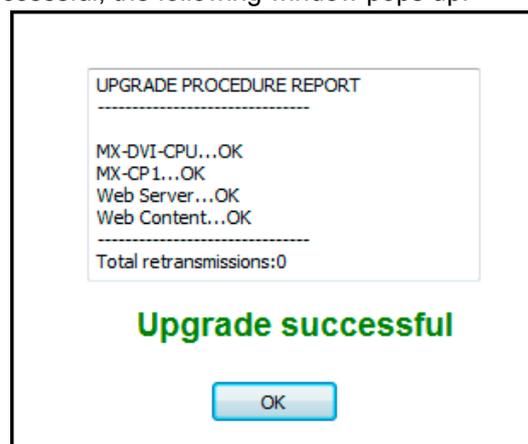
A progress bar will show the current state of the reprogramming on the bottom of the window. In the case of certain boards first the erasing process is run before the programming, so the progress bar runs up twice.



When the reprogramming is finished, a **Done!** message will appear in the bottom left corner. The application closes the connection, and the router restarts.

**Step 10.** Done!

If the upgrade was successful, the following window pops up:



Now you can close the application, or you can select another matrix router to upgrade. After closing the bootloader application, switch the upgraded devices off and then on. Now the router is ready to be used with the new firmware!

## 10. Troubleshooting

Usually, if the system seems not to transport the signal as expected, the best strategy for troubleshooting is to check signal integrity through the whole signal chain starting from source side and moving forward to matrix end.

At first, check front panel buttons and take the necessary steps according to their states. For more information about status see section [3.1 on page 12](#).

### Pictogram Legend

-  Section to connections/cabling.
-  Section to front panel operation.
-  Section to LDC software.
-  Section to LW2 protocol commands.

Symptom	Root cause	Action	Refer to
<b>Video signal</b>			
<b>No picture on the video output</b>	Device or devices are not powered properly	Check the matrix and the other devices if they are properly powered; try to unplug and reconnect them.	 <a href="#">5.1</a>
	Cable connection problem	Cables must fit very well, check all the connectors.	 <a href="#">3.5</a>
	Cable connection problem	Although the router is equipped with DVI-I connectors, analog signals are not supported. You cannot use VGA cables with DVI-VGA adapter plugs.	 <a href="#">3.5.1</a>
	The output is muted	Check the mute state of output ports.	 <a href="#">7.3</a>  <a href="#">8.3.5</a>
	Wrong crosspoint setting	Check the connection between the input and output port either on the front panel or from web or the control software.	 <a href="#">5.2.4</a>  <a href="#">7.3.1</a>  <a href="#">8.3</a>
	Display is not able to receive the video format	Check the emulated EDID; select another (e.g. emulate the display's EDID on the input port).	 <a href="#">7.7</a>  <a href="#">8.5</a>
<b>RS-232 signal</b>			
<b>Connected serial device does not respond</b>	Cable type	Check whether your mail to female straight serial cable is properly connected.	 <a href="#">2.3</a>
	Software settings	In most cases there are more COM ports present in the operating system. Please verify the connection settings of your software. The router communicates with 9600 Baud, 8 data bit, No parity, 1 stop bit.	<a href="#">5.3.4</a>
	Protocol setting	Check whether the proper protocol is selected. Select Protocol #1 in order to use the matrix with the controller software.	 <a href="#">8.1</a>

Symptom	Root cause	Action	Refer to
<b>Network</b>			
<b>No LAN connection can be established</b>	LAN cable type	If you connect the router directly to your computer, you must use a cross-link cable. If the matrix is connected to an Ethernet hub, switch or router, you have to use a straight patch LAN cable.	 <a href="#">3.5.3</a>
	Incorrect IP address is set (fix IP)	Use dynamic IP address by enabling DHCP option.	 <a href="#">5.3.5</a>  <a href="#">7.8</a>  <a href="#">8.3.18</a>
		Restore the factory default settings (with fix IP).	 <a href="#">2.3.1</a>  <a href="#">7.8</a>  <a href="#">8.3.17</a>
	IP address conflict	Check the IP address of the other devices, too.	
	Only one connection is allowed simultaneously.	Check whether there is another open connection (e.g. opened router web interface, running control software over Ethernet). Try restarting the router if you have no other option.	

## 11. Appendix

### 11.1. CM-1002 Notes

#### MX6x6DVI, MX8x8DVI, MX-6x6DVI-DL, MX8x8DVI-DL

#### Notes on upgrade CPU versions from 1.4.8 to 2.5.0 and above

From January 2014 Lightware ships these matrix routers with an improved CPU firmware. This change includes some new features and also may affect the remote control operations. Please consider these protocol changes if you control the matrix with an external controller.

These differences are highlighted here and in the User Manual revision v1.1 as well.

Last version of earlier generation CPU firmware: v 1.4.8

First version of current generation CPU firmware: v 2.5.0

#### Differences in operation

##### Output mute

Function	CPU 1.4.8	CPU 2.5.0 and above	Notes
Switch unmutes muted output	Yes	No	-
Switch let muted output in mute state until unmute command issued	No	Yes	-

##### Firmware upgrade

Function	CPU 1.4.8	CPU 2.5.0 and above	Notes
Upgrade possible with Bootloader v1.3.0	Yes	No	-
Upgrade possible with Bootloader v3.x.x	Yes	Yes	-

#### Differences in Command Responses

Command	CPU 1.4.8 Response	CPU 2.5.0 and above Response	Notes
{r00}	(DVP FF FF FF FF FF FF 05 )	(APWSE)CrLf	Reload factory default output setup
-	(ERR1)CrLf	(ERR01)CrLf	Invalid Input number
-	(ERR2)CrLf	(ERR02)CrLf	Invalid Output number
-	(ERR3)CrLf	(ERR03)CrLf	Invalid value
-	(ERR4)CrLf	(ERR04)CrLf	Invalid Preset number
{vc}	(ALL<O1><O2><O3><O4><O5><O6><O7><O8>)CrLf	(ALL<O1><O2><O3><O4><O5><O6><O7><O8>)CrLf	View connection on all outputs (no extra space character after output 8)
{vm}	(MUT<M1><M2><M3><M4><M5><M6><M7><M8>)CrLf	(MUT<M1><M2><M3><M4><M5><M6><M7><M8>)CrLf	v1.0 Manual was wrong: (MUT<M1><M2><M3><M4><M5><M6><M7><M8>)CrLf
{i}	(MX8X8DVI_D)CrLf or (MX8X8DVI_S)CrLf	(MX8X8DVI-DL)CrLf or (MX8X8DVI-SL)CrLf	View product type
{is}	(SL# 0 MX-8x8-DVI-DL SCH_1.1 PCB_1.1)	(SL# 0 MX-8x8-DVI-DL SCH_1.1 PCB_1.1)	View Installed i/o cards' hardware
{4>51}	(E_SA_OK)CrLf	(E_SW_OK)CrLf	Save EDID from output to memory location (Learn EDID)

**Commands that CPU 1.4.8 doesn't recognize**

Command	CPU 1.4.8 support	CPU 2.5.0 and above support	Notes
{IP_CONFIG=?}	No	Yes	Query IP settings
{IP_CONFIG=!}	No	Yes	Reload factory default IP settings
{IP_CONFIG=D}	No	Yes	Load DHCP IP settings (only IP address!)
{VP#<id>=?}	No	Yes	Preview preset
{PNAME#<id>= <name>}	No	Yes	Renaming Presets
{INAME#<id>= <name>}	No	Yes	Renaming Inputs
{ONAME#<id>= <name>}	No	Yes	Renaming Outputs
{PNAME#<id>= ?}	No	Yes	Query names of Presets
{INAME#<id>= ?}	No	Yes	Query names of Inputs
{ONAME#<id>= ?}	No	Yes	Query names Outputs
{PNAME#<id>= !}	No	Yes	Set default names of Presets
{INAME#<id>= !}	No	Yes	Set default names of Inputs
{ONAME#<id>= !}	No	Yes	Set default names of Outputs
{VEDID}	No	Yes	View EDID switch status on all inputs

## 11.2. Specifications

### 11.2.1. MX6x6DVI, MX6x6DVI-DL, MX8x8DVI, MX8x8DVI-DL

#### General

Compliance .....	CE
EMI/EMC .....	EN 55032:2015, EN 55035:2017
Safety .....	EN 60065
RoHS compliance .....	Yes
Warranty .....	3 years
Cooling.....	Fan, air flows right to left (as viewed from front)
Operating temperature.....	-20°C ~ +50°C
Humidity.....	10 ~ 90% RH

#### Power

AC power connector .....	IEC-320 C14 receptacle (filtered)
Power source .....	100-240 V AC 50/60 Hz 3 A
Power supply .....	Internal

#### Enclosure

Rack mountable .....	Yes, 3U high
Material .....	1 mm Metal
Dimensions .....	482 mm W x 102 mm D x 133 mm H
Net Weight .....	approx. 4.15 kg

#### Inputs

Connectors .....	29-pole DVI-I digital only
Input cable equalization .....	No
EDID emulation .....	Yes, for each input connector

#### Signal

Data rate: .....	all between 25 Mbps and 1.65 Gbps / TMDS channel
Channels: .....	1x TMDS Clock + 3x TMDS Colors (6x TMDS for Dual link)
Resolutions: .....	all from 640x480
.....	up to 1920x1200@60Hz or 2048x1080@60Hz (single link)
.....	up to 3840x2400@30Hz or 4096x2400@24Hz (dual link)
Color depth: .....	24 bits, 8 bit/color
Color format .....	RGB only
HDTV resolutions: .....	720p, 1080i, 1080p
HDCP compliant: .....	No

#### Outputs

Connectors.....	29 pole DVI-I digital only
Output pre-emphasis .....	No
Reclocking .....	No
+5V output current .....	500 mA continuous each, with overcurrent protection

**Control**

Front Panel buttons.....	Yes
Serial Port .....	9 pole D-SUB female RS-232 or RS-422
Baud rate .....	9600 Baud, 8 bit, 1stop bit, no parity
Ethernet port .....	RJ45 female connector
Ethernet protocol.....	TCP/IP, HTTP, TFTP, Telnet
IP address assignment .....	fixed, DHCP, BOOTP, and AutoIP

**11.2.2. MX4x4DVI, MX4x4DVI-DL****General**

Compliance .....	CE
EMI/EMC .....	EN 55032:2012, EN 55024:2011
Safety .....	EN 60065
RoHS compliance .....	Yes
Warranty .....	3 years
Cooling.....	Fan, air flows right to left (as viewed from front)
Operating temperature.....	-20°C ~ +50°C
Humidity.....	10 ~ 90% RH

**Power**

AC power connector .....	IEC-320 C14 receptacle (filtered)
Power source .....	100-240 V AC; 50~60 Hz; 1.4 - 1.0 A
Power supply .....	Internal

**Enclosure**

Rack mountable .....	Yes, 1U high
Material .....	1 mm Metal
Dimensions .....	(482mm W*) 446 mm W x 302 mm D x 44 mm H
* with rack mounting ears	
Net Weight .....	approx. 3.00kg

**Inputs**

Connectors .....	29-pole DVI-I digital only
Input cable equalization .....	No
EDID emulation .....	Yes, for each input connector

**Signal**

Data rate: .....	all between 25 Mbps and 1.65 Gbps / TMDS channel
Channels: .....	1x TMDS Clock + 6x TMDS Colors
Resolutions (single link).....	all between 640x440 and 1920x1200@60Hz
Resolutions (dual link).....	all between 640x440 and 3840x2400@60Hz
Color depth: .....	maximum 24 bits, 8 bit/color
HDTV resolutions:.....	720p, 1080i, 1080p
HDCP compliant: .....	No

**Outputs**

Connectors..... 29 pole DVI-I digital only  
Output pre-emphasis ..... No  
Reclocking ..... No  
+5V output current .....500 mA continuous on each output

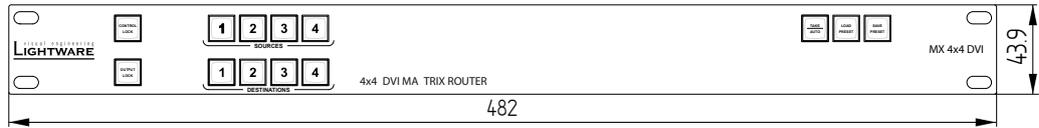
**Control**

Front Panel buttons..... Yes  
Serial Port ..... 9 pole D-SUB female RS-232 or RS-422  
Baud rate ..... 9600 Baud, 8 bit, 1stop bit, no parity  
Ethernet port ..... RJ45 female connector  
Ethernet protocol..... TCP/IP, HTTP, TFTP, Telnet  
IP address assignment .....fixed, DHCP, BOOTP, and AutoIP

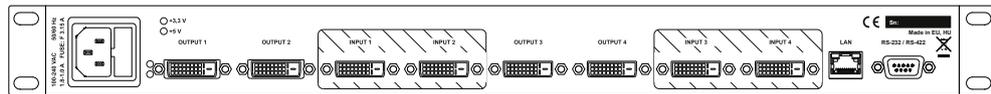
## 11.3. Mechanical Drawings

### 11.3.1. MX4x4DVI, MX4x4DVI-DL

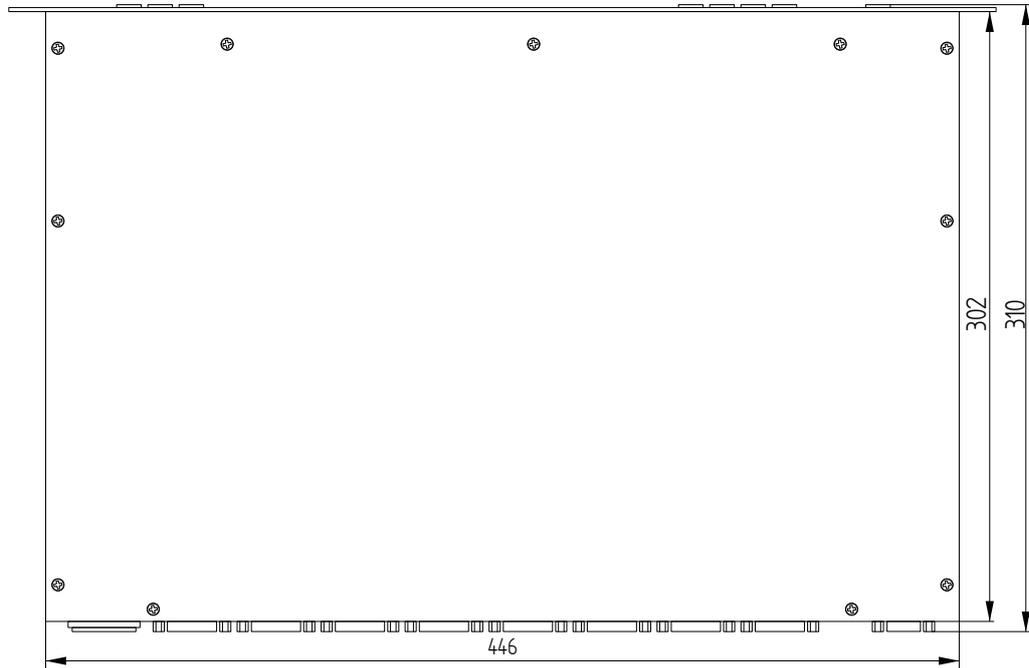
Front View



Rear View



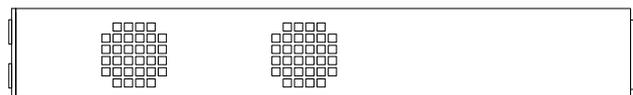
Top View



Left View

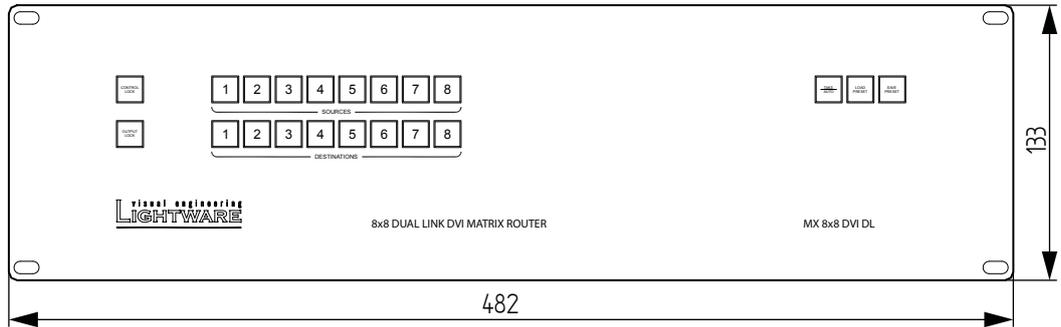


Right View

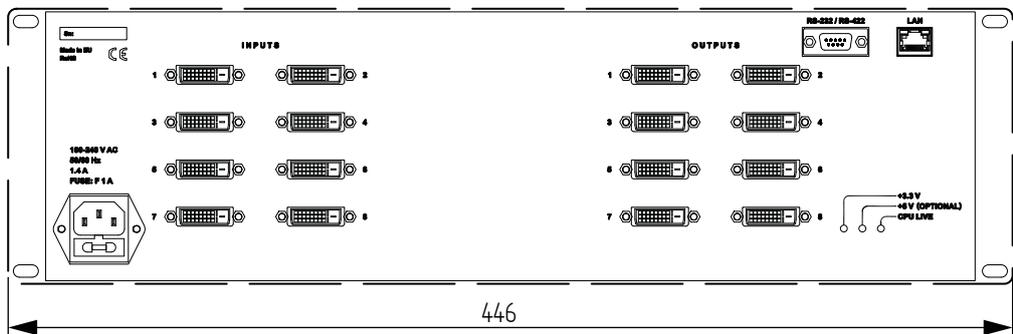


### 11.3.2. MX8x8DVI, MX8x8DVI-DL

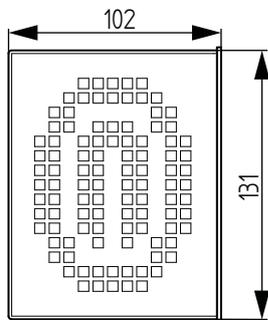
Front View



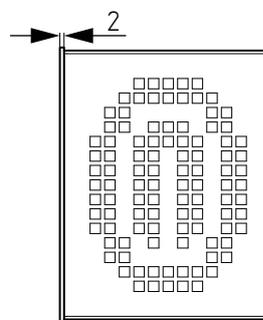
Rear View



Left View



Right View



## 11.4. Factory EDID list

MEMORY	Resolution				MEMORY	Resolution			
01	640 x	480	@ 60.0	Hz	26	1600 x	1200	@ 50.0	Hz
02	640 x	480	@ 75.0	Hz	27	1600 x	1200	@ 60.0	Hz
03	848 x	480	@ 60.0	Hz	28	1920 x	1200	@ 59.55	Hz
04	800 x	600	@ 50.0	Hz	29	1920 x	1200	@ 50.0	Hz
05	800 x	600	@ 60.30	Hz	30	1440 x	480i	@ 60.3	Hz
06	800 x	600	@ 74.99	Hz	31	640 x	480	@ 59.94	Hz
07	1024 x	768	@ 49.98	Hz	32	720 x	480	@ 59.92	Hz
08	1024 x	768	@ 60.0	Hz	33	1440 x	480i	@ 60.0	Hz
09	1024 x	768	@ 75.0	Hz	34	720 x	576	@ 50.0	Hz
10	1152 x	864	@ 75.0	Hz	35	1280 x	720	@ 50.0	Hz
11	1280 x	768	@ 50.0	Hz	36	1280 x	720	@ 60.0	Hz
12	1280 x	768	@ 59.92	Hz	37	1920 x	1080i	@ 50.3	Hz
13	1280 x	768	@ 75.0	Hz	38	1920 x	1080i	@ 50.0	Hz
14	1360 x	768	@ 60.1	Hz	39	1920 x	1080i	@ 60.5	Hz
15	1364 x	768	@ 50.0	Hz	40	1920 x	1080	@ 24.0	Hz
16	1364 x	768	@ 59.93	Hz	41	1920 x	1080	@ 24.99	Hz
17	1364 x	768	@ 74.98	Hz	42	1920 x	1080	@ 30.0	Hz
18	1280 x	1024	@ 50.0	Hz	43	1920 x	1080	@ 50.0	Hz
19	1280 x	1024	@ 60.1	Hz	44	1920 x	1080	@ 49.99	Hz
20	1280 x	1024	@ 75.1	Hz	45	1920 x	1080	@ 60.0	Hz
21	1366 x	1024	@ 59.99	Hz	46	2048 x	1080	@ 49.99	Hz
22	1400 x	1050	@ 49.99	Hz	47	2048 x	1080	@ 50.0	Hz
23	1400 x	1050	@ 59.99	Hz	48	2048 x	1080	@ 59.99	Hz
24	1400 x	1050	@ 75.0	Hz	49				
25	1680 x	1050	@ 59.99	Hz	50	2560 x	1600	@ 59.85	Hz

## 11.5. DVI Timing Examples

Resolution	Vertical frequency (Hz)	Horizontal frequency (KHz)	Pixel Clock frequency (MHz)	Comment
<b>640x480</b>	60.00	31.47	25.18	<b>DOS VGA</b>
<b>800x600</b>	60.32	37.88	40	<b>VESA SVGA</b>
<b>800x600</b>	75.00	46.87	49.5	<b>VESA SVGA</b>
<b>832x624</b>	74.55	49.72	57.29	<b>MACINTOSH</b>
<b>1280x720</b>	60.00	45.00	74,25	<b>HDTV 720p</b>
<b>1024x768</b>	60.00	48.36	65	<b>VESA XGA</b>
<b>1024x768</b>	75.00	60.02	78.75	<b>VESA XGA</b>
<b>1360x768</b>	47.7	60.00		<b>WIDE-XGA</b>
<b>1152x870</b>	75.06	68.68	100	<b>MACINTOSH</b>
<b>1280x1024</b>	75.00	80.00	135.00	<b>VESA SXGA</b>
<b>1400x1050</b>	60.00	65.64	121.82	<b>SXGA+</b>
<b>1920x1080</b>	60.00	67.50	148.5	<b>HDTV 1080p</b>
<b>2048x1080</b>	60.00	67.50	157.3	<b>2K</b>
<b>1600x1200</b>	60.00	75.00	162	<b>VESA UXGA</b>
<b>1920x1200</b>	60.00	75.00	162	<b>VESA</b>

## 11.6. ASCII Table

The most frequently used characters are highlighted.

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
0	00	[NUL]	32	20	[Space]	64	40	@	96	60	`
1	01	[SOH]	33	21	!	65	41	A	97	61	a
2	02	[STX]	34	22	"	66	42	B	98	62	b
3	03	[ETX]	35	23	#	67	43	C	99	63	c
4	04	[EOT]	36	24	\$	68	44	D	100	64	d
5	05	[ENQ]	37	25	%	69	45	E	101	65	e
6	06	[ACK]	38	26	&	70	46	F	102	66	f
7	07	[BEL]	39	27	'	71	47	G	103	67	g
8	08	[BS]	40	28	(	72	48	H	104	68	h
9	09	[TAB]	41	29	)	73	49	I	105	69	i
10	0A	[LF]	42	2A	*	74	4A	J	106	6A	j
11	0B	[VT]	43	2B	+	75	4B	K	107	6B	k
12	0C	[FF]	44	2C	,	76	4C	L	108	6C	l
13	0D	[CR]	45	2D	-	77	4D	M	109	6D	m
14	0E	[SOH]	46	2E	.	78	4E	N	110	6E	n
15	0F	[SI]	47	2F	/	79	4F	O	111	6F	o
16	10	[DLE]	48	30	0	80	50	P	112	70	p
17	11	[DC1]	49	31	1	81	51	Q	113	71	q
18	12	[DC2]	50	32	2	82	52	R	114	72	r
19	13	[DC3]	51	33	3	83	53	S	115	73	s
20	14	[DC4]	52	34	4	84	54	T	116	74	t
21	15	[NAK]	53	35	5	85	55	U	117	75	u
22	16	[SYN]	54	36	6	86	56	V	118	76	v
23	17	[ETB]	55	37	7	87	57	W	119	77	w
24	18	[CAN]	56	38	8	88	58	X	120	78	x
25	19	[EM]	57	39	9	89	59	Y	121	79	y
26	1A	[SUB]	58	3A	:	90	5A	Z	122	7A	z
27	1B	[ESC]	59	3B	;	91	5B	[	123	7B	{
28	1C	[FS]	60	3C	<	92	5C	\	124	7C	
29	1D	[GS]	61	3D	=	93	5D	]	125	7D	}
30	1E	[RS]	62	3E	>	94	5E	^	126	7E	~
31	1F	[US]	63	3F	?	95	5F	_	127	7F	[DEL]

## 11.7. Document Revision History

Document	Release date	Changes	Editor
Rev. 0.8b	19-04-2010	First beta edition	Tamas Lehel
Rev. 1.0	02-06-2010	Initial version	Tamas Lehel
Rev. 1.1	09-01-2014	Highlighting firmware version differences. Minor typographic corrections.	Laszlo Zsedenyi
Rev. 1.2	27-01-2015	Software control chapter is upgraded with LDC; Web control and Firmware upgrade chapters upgraded.	Laszlo Zsedenyi
Rev. 1.3	16-12-2015	Safety instructions updated, CE page pulled out	Laszlo Zsedenyi
Rev. 2.0	11-07-2017	Added MX4x4DVI, MX4x4DVI-DL device information, added Installation chapter, added Front view/rear view figures (all variants), new table for of troubleshooting chapter	Judit Barsony
Rev. 2.1	07-11-2018	IP address setting method clarified.	Laszlo Zsedenyi