

visual engineering  
**LIGHTWARE**

**User's Manual**



**HDMI-3D-OPT-TX210A**  
**HDMI-3D-OPT-TX210RAK**  
**SW4-OPT-TX240RAK**  
**HDMI-3D-OPT-RX150RA**

Fiber Optical Multimedia Extender

## Important Safety Instructions

### Class II apparatus construction.

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.

### Ventilation

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

### WARNING

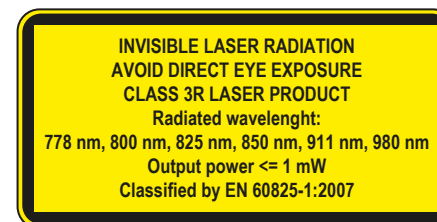
To prevent injury, the apparatus is recommended to be securely attached to the floor/wall or mounted in accordance with the installation instructions. The apparatus shall not be exposed to dripping or splashing, and no objects filled with liquids, such as vases, shall be placed on the apparatus. No naked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

## Waste Electrical & Electronic Equipment WEEE

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.



### Caution: Laser product



## Common Safety Symbols

Symbol	Description
	Direct current
	Alternating current
	Double insulation
	Caution, possibility of electric shock
	Caution
	Laser radiation

## Symbol Legend

The following symbols and markings are used in the document:

**WARNING!** Safety-related information that is highly recommended to read and keep in every case!

**ATTENTION!** Useful information for performing a successful procedure; it is recommended to read.


**DIFFERENCE:** Feature or function that is available with a specific firmware/hardware version or product variant.


**INFO:** A notice, which may contain additional information. Procedure can be successful without reading it.


**DEFINITION:** The short description of a feature or a function.


**TIPS AND TRICKS:** Ideas that you may have not known yet, but can be useful.

## Navigation Buttons

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 Navigate to the Table of Contents.

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 Step forward to the next page.

## 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	2.7.5b2
Lightware Device Updater (LDU) software	1.5.3b4
Controller firmware - Transmitters	1.2.1
Controller firmware - Receiver	2.1.1
Hardware - Transmitters	1.1
Hardware - Receiver	1.3

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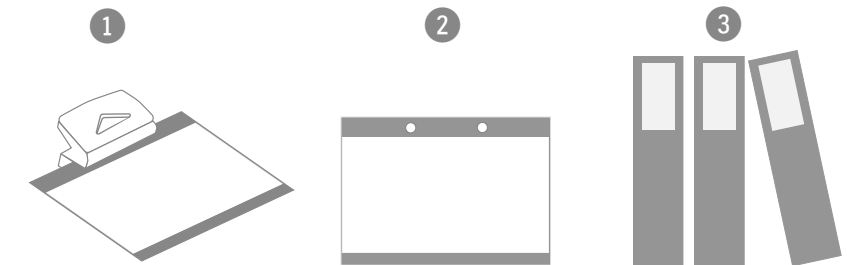
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## Hashtag (#) Keywords in the Document

This user's manual contains keywords with hashtags (#) to help you find the relevant information as quick as possible.

The format of the keywords is the following:

#<keyword>

The usage of the keywords: use the **Search** function (Ctrl+F / Cmd+F) of your PDF reader application, type the # (hashtag) character and the wished keyword.

The **#new** special keyword indicates a new feature/function that has just appeared in the latest firmware or software version.

### Example

#dhcp

This keyword is placed at the DHCP setting command in the LW3 Programmer's reference section.

See the list of all hashtag keywords of the document in the [Hashtag Keyword List](#) section.

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# 1

## Introduction

Thank you for choosing Lightware's HDMI-3D-OPT series device. In the first chapter we would like to introduce the device highlighting the most important features in the below listed sections:

- ▶ DESCRIPTION
- ▶ COMPATIBLE DEVICES
- ▶ BOX CONTENTS
- ▶ MODEL COMPARISON OF THE TRANSMITTERS
- ▶ FEATURES
- ▶ TYPICAL APPLICATION

### 1.1. Description

HDMI-3D-OPT series transmitters and receivers extend HDMI 1.4, DVI 1.0, HDCP and bi-directional RS-232 signals over one multi-mode fiber and transmit video signal with embedded audio to a distance of up to 2500 meters.

The extender was designed to handle HDMI 1.4 and DP 1.1 digital video signals and analog stereo audio from local inputs or HDMI embedded audio up to eight-channel PCM or HBR audio. Analog audio is converted into digital format. The device has a local HDMI video output for monitoring. The video and the embedded audio of the local output is the same as the one transmitted via the OPT link. The HDMI-3D-OPT series extenders handles HDCP encryption.

Using the factory, custom or transparent EDID emulation the user can fix and lock EDID data on each input connector. Advanced EDID Management forces the required resolution from any video source and fixes the output format conforming to the system requirements. The unit offers bi-directional and transparent RS-232.

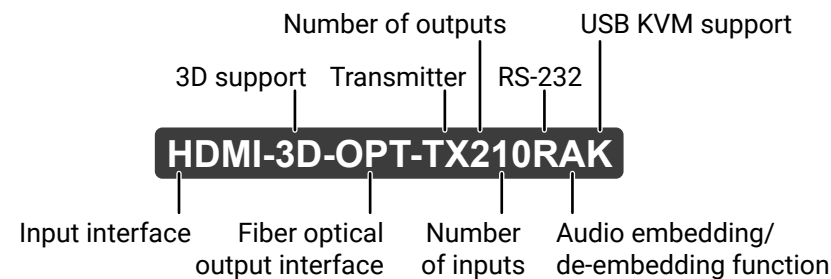
All devices can be mounted on a rack shelf or used standalone. HDMI-3D-OPT series extenders are compatible with both OPT series extenders and matrix switchers.

The device features Pixel Accurate Reclocking, a Lightware technology to eliminate jitter and skew generated by low quality sources and multiple daisy-chained devices.

Single fiber technology makes these units fully HDMI and HDCP compliant without a need of a second fiber cable or copper connections. The bi-directional communication required for HDCP handshaking is performed via the same fiber core that transmits the video signal.

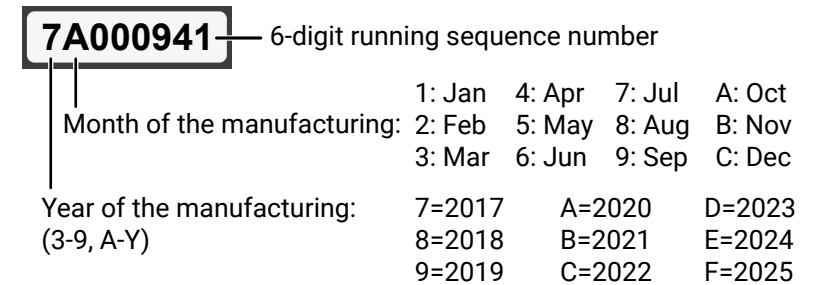
Galvanic isolation between source and display helps avoiding ground loops and hum effects. No delay occurs in the signal during optical conversion, the video image is transported without frame latency. This feature is crucial in 3D applications and systems where audio is processed separately.

#### Model Denomination



### About the Serial Number

Lightware devices contain a label indicating the unique serial number of the product. The structure is the following:



### 1.2. Compatible Devices

#### Transmitter

The transmitters are compatible with the following receivers and input boards:

- HDMI-3D-OPT-RX150RA receiver;
- MX modular frames with MX-DVI-OPT-IB and MX-HDMI-OPT-IB cards.

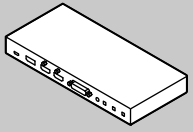
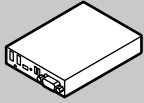


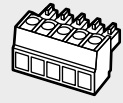
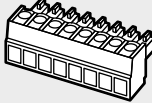

#### Receiver

The receiver is compatible with the following transmitters and output boards:

- HDMI-3D-OPT series transmitters;
- UMX-OPT-TX150R transmitter;
- HDMI-OPT series transmitters;
- MX modular frames with MX-DVI-OPT-OB and MX-HDMI-OPT-OB cards.

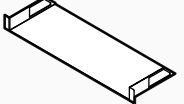
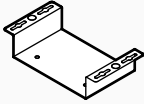
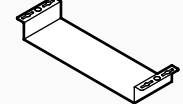
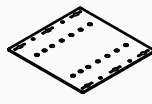
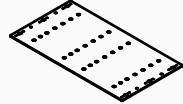
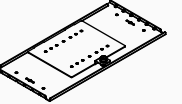
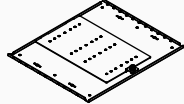
## 1.3. Box Contents

### 1.3.1. Supplied Accessories

	Supplied devices		Supplied accessories				
							
	Transmitter device	Receiver device	5V DC power adaptor	Phoenix® Combicon 3-pole connector	Phoenix® Combicon 5-pole connector	Phoenix® Combicon 8-pole connector	Safety and warranty info, QSG
HDMI-3D-OPT-TX210A	✓	-	✓	✓	✓	-	✓
HDMI-3D-OPT-TX210RAK	✓	-	✓	✓	✓	-	✓
SW4-OPT-TX240RAK	✓	-	✓	✓	✓	✓	✓
HDMI-3D-OPT-RX150RA	-	✓	✓	-	✓	-	✓












### 1.3.2. Optional Accessories

The following table describes all supplied and optional accessories of the HDMI-3D-OPT series devices by models. The optional (not-supplied) accessories can be purchased separately; please contact [sales@lightware.com](mailto:sales@lightware.com).

	Optional accessories						
							
	1U High Rack Shelf	UD Mounting Kit	UD Mounting Kit Double	UD Mounting Plate F110	UD Mounting Plate F120	UD Mounting Pro P110	UD Mounting Pro P140
HDMI-3D-OPT-TX210A	✓	-	✓	-	✓	-	✓
HDMI-3D-OPT-TX210RAK	✓	-	✓	-	✓	-	✓
SW4-OPT-TX240RAK	✓	-	✓	-	✓	-	✓
HDMI-3D-OPT-RX150RA	✓	✓	✓	✓	✓	✓	✓

## 1.4. Model Comparison of the Transmitters

The available models have different features depending on their design. The following table contains the most important differences between the models:

	Ports										Optical output			
	Video ports				Audio ports		Interface ports							
	 ↑ HDMI input	 ↑ DVI-D input	 ↑ DP input	 ↓ Local HDMI output	 ↑ Jack 3.5 input	 ↑ Phoenix input	 Ethernet	 RS-232	 GPIO	 USB KVM		AV signal transmission	Ethernet signal transmission	Serial communication *
<b>HDMI-3D-OPT-TX210A</b>	✓	-	-	✓	✓	✓	-	✓	-	-	✓	-	Control mode	-
<b>HDMI-3D-OPT-TX210RAK</b>	✓	-	-	✓	✓	✓	-	✓	-	✓	✓	-	Control mode Passthrough mode	✓
<b>SW4-OPT-TX240RAK</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Control mode Passthrough mode Command injection mode	✓

\* See more information about serial interface modes in the [Serial Interface](#) section.



### 1.5. Features



**3D and 4K Support**

High bandwidth allows extension of resolutions up to 4K and even 3D sources and displays are supported.



**Signal Transmission up to 2500 m**

Video and audio signal transmission (DVI, HDMI or DisplayPort, and RS-232) over one multi-mode fiber optical cable.



**Deep Color Support and Conversion**

It is possible to transmit the highest quality 36-bit video streams for perfect color reproduction.



**Autoselect Function for Video Inputs**

The Autoselect feature can sense the port status on the video input ports and select automatically one of them. Priority number can be set for each input port and the feature allows to set various modes for the automatic input selection (First detect, Last detect, Priority mode).



**HDCP-compliant**

The receiver fulfills the HDCP standard. HDCP capability on the digital video inputs can be disabled when non-protected content is extended.



**Built-in Event Manager**

The Event Manager tool takes care of all the necessary control in a smaller configuration by performing predefined actions in response to device status changes. Hence, in a less complex environment, there is no need to invest in additional control solutions, which makes the receiver the best choice for numerous applications.



**Pixel Accurate Reclocking**

Each output has a clean, jitter free signal, eliminating signal instability and distortion caused by long cables or connector reflections.



**USB KVM**

Connected USB HID devices (e.g. keyboard, mouse, USB HUB) are extended from transmitter to receiver thus a computer can be remote controlled.



**Bi-directional RS-232 Pass-through**

AV systems can also contain serial port controllers and controlled devices. Serial port pass-through supports any unit that works with standard RS-232.

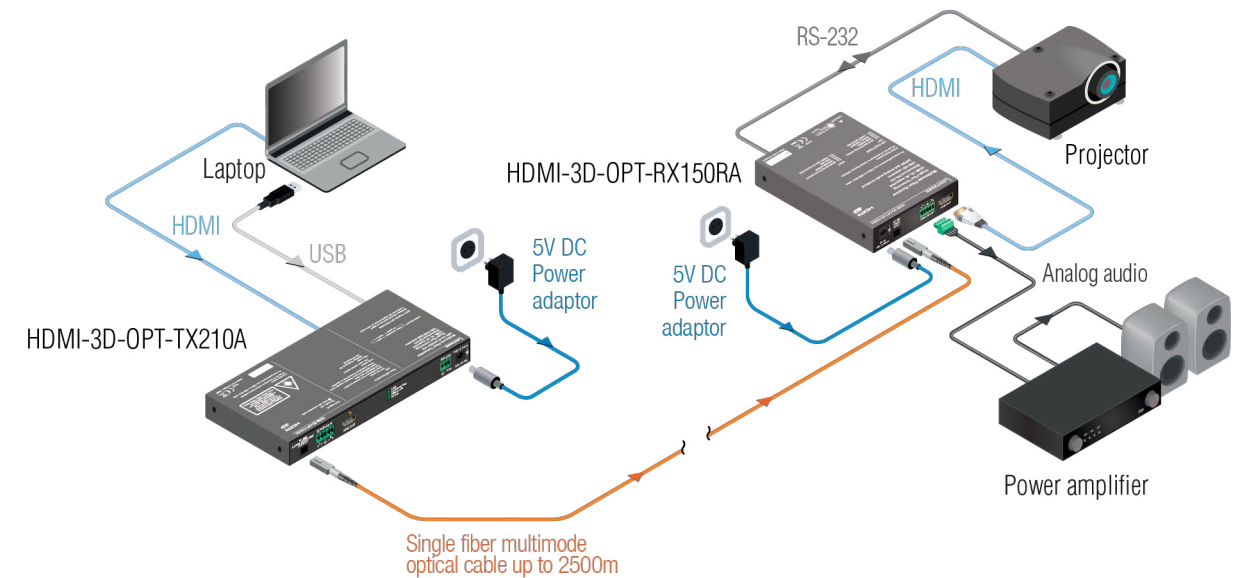


**GPIO Control Port**

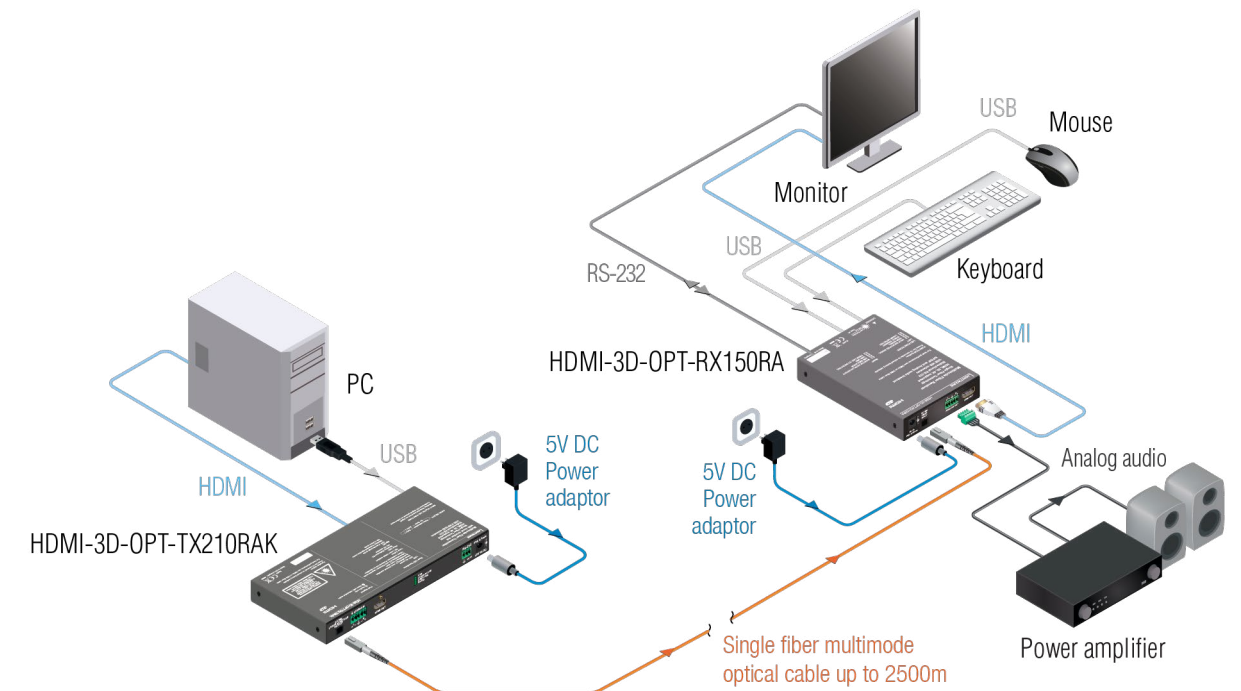
7 GPIO pins operating at TTL digital signal levels and can be controlled with both LW2 and LW3 commands.

### 1.6. Typical Application

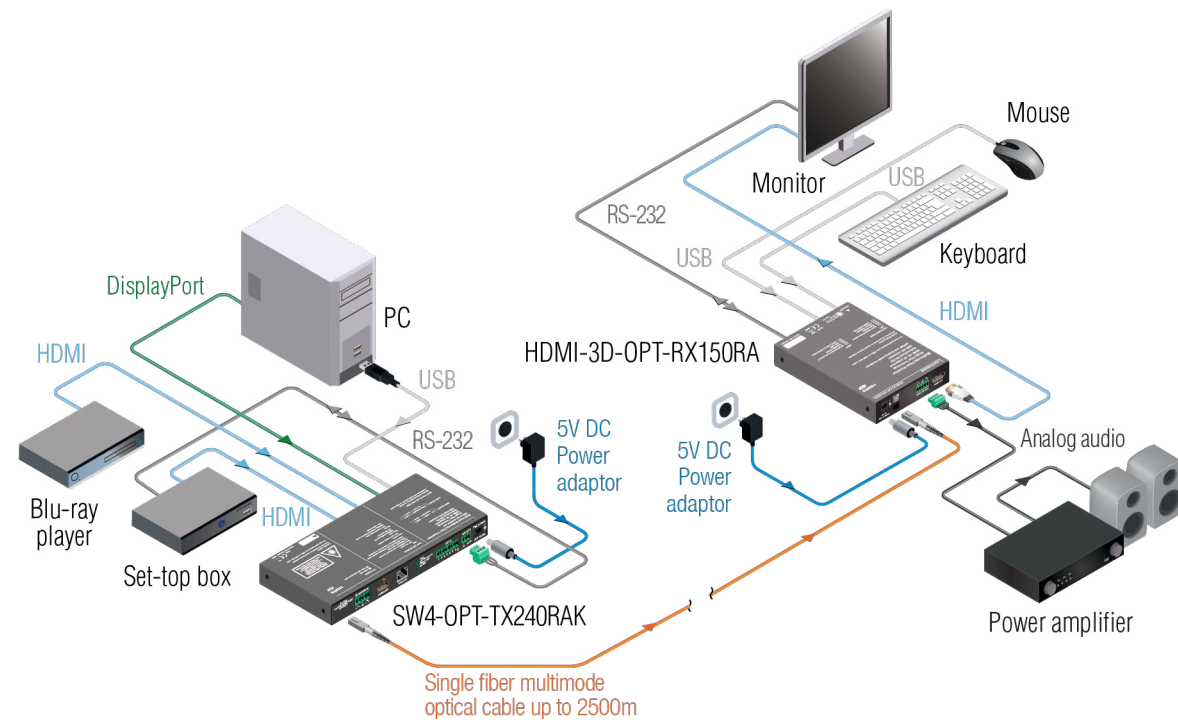
Application Diagram - HDMI-3D-OPT-TX210A



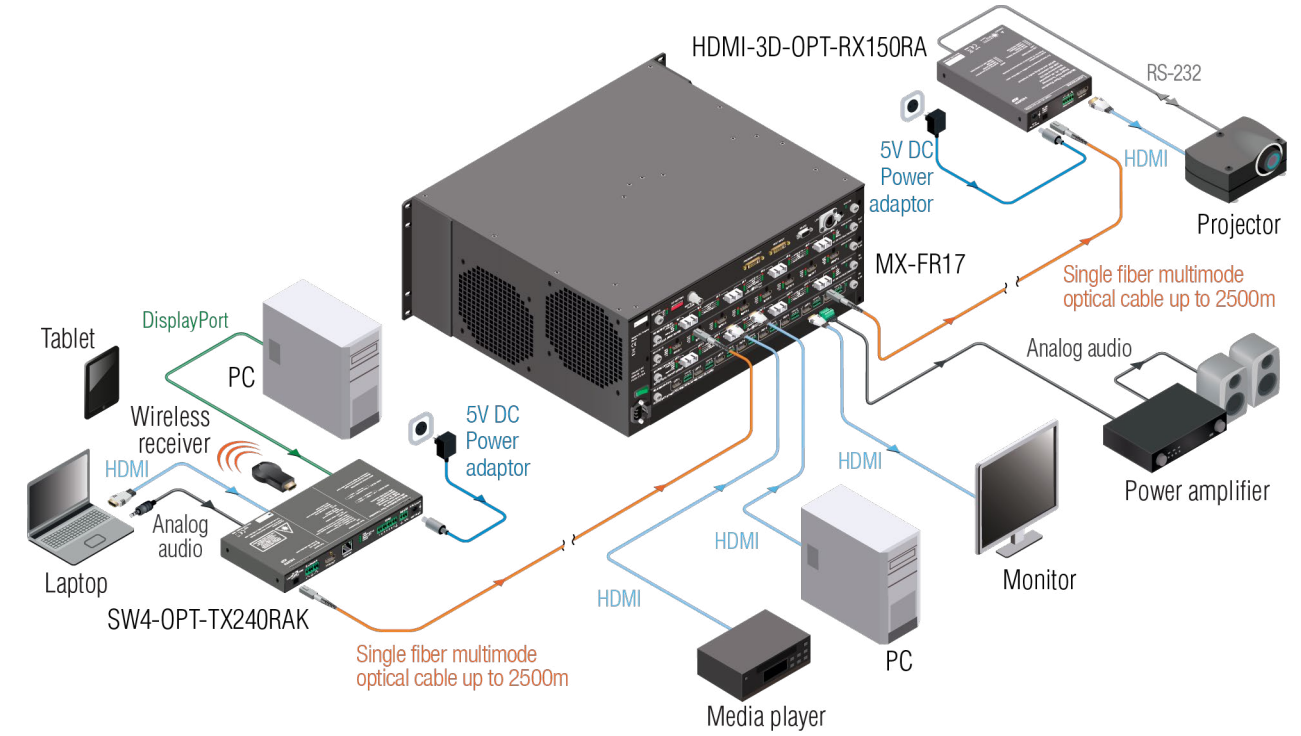
Application Diagram - HDMI-3D-OPT-TX210RAK



Application Diagram - SW4-OPT-TX240RAK



Integrated System Diagram - SW4-OPT-TX240RAK



# 2

## Product Overview

The following sections are about the physical structure of the device, input/output ports and connectors.

- ▶ [FRONT VIEW - TRANSMITTER](#)
- ▶ [REAR VIEW - TRANSMITTER](#)
- ▶ [FRONT AND REAR VIEW - RECEIVER](#)

## 2.1. Front View - Transmitter

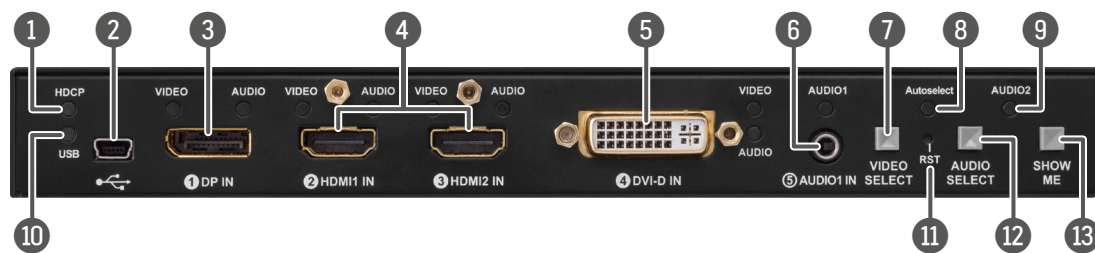
### HDMI-3D-OPT-TX210A



### HDMI-3D-OPT-TX210RAK



### SW4-OPT-TX240RAK



- |           |                              |   |
|-----------|------------------------------|---|
| <b>1</b>  | <b>HDCP status LED</b>       | LED gives feedback about the HDCP status of the video output signal. See details in the <a href="#">HDCP LED</a> section.   |
| <b>2</b>  | <b>USB connector</b>         | USB interface for LDC connection, firmware update purpose, and USB KVM function.  |
| <b>3</b>  | <b>DisplayPort input</b>     | DisplayPort connector for DisplayPort video and audio signal.   |
| <b>4</b>  | <b>HDMI input</b>            | HDMI connector for DVI video or HDMI video and audio signal.  |
| <b>5</b>  | <b>DVI-D input</b>           | DVI-I connector for DVI-D or HDMI video and audio signal.   |
| <b>6</b>  | <b>Audio1 input</b>          | 3.5 mm Jack connector for asymmetric analog audio input signal.   |
| <b>7</b>  | <b>Video Select button</b>   | Button for switching between video sources. See the details in the <a href="#">Video Select Button</a> section.   |
| <b>8</b>  | <b>Autoselect status LED</b> | LED gives feedback about the status of Autoselect feature. See the details in the <a href="#">Autoselect LED</a> section.   |
| <b>9</b>  | <b>Audio2 status LED</b>     | LED gives feedback about actual connection status of Audio2 input port (on the rear side of device).  |
| <b>10</b> | <b>USB LED</b>               | LED gives feedback about the status of USB operations (LDC control, firmware update, and USB KVM function). See the details in the <a href="#">USB LED</a> section.   |
| <b>11</b> | <b>Reset button</b>          | Reset button reboots the extender. This is the same as disconnecting the device from the power source and reconnecting it again.  |
| <b>12</b> | <b>Audio Select button</b>   | Button for switching between audio sources. See the details in the <a href="#">Audio Select Button</a> section.   |
| <b>13</b> | <b>Show Me button</b>        | Special functions are available with this button (switch to bootload mode, enable DHCP, restore factory default settings, condition launching in <a href="#">Event Manager</a> ). For the details about special functions see the <a href="#">Special Button Functions - Transmitter</a> section. |

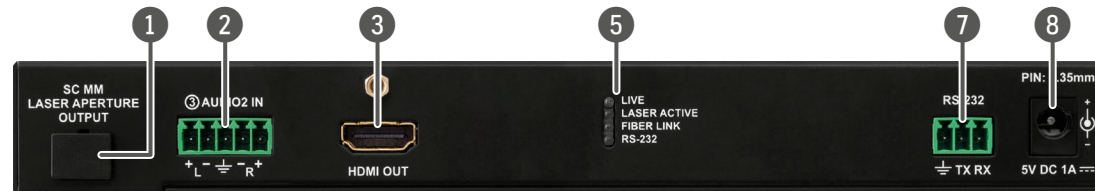
**INFO:** Operation of the audio and video status LEDs can be found in the [Video Input LEDs](#) and the [Audio Input LEDs](#) sections.

## 2.2. Rear View - Transmitter

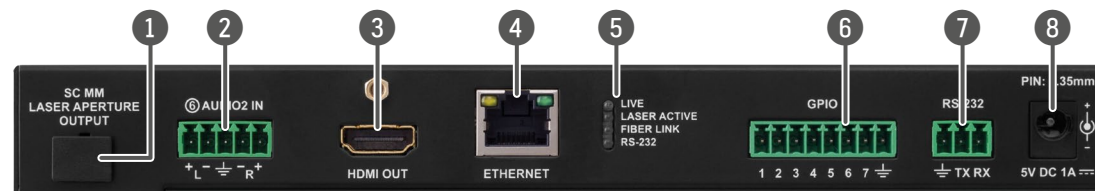
### HDMI-3D-OPT-TX210A



### HDMI-3D-OPT-TX210RAK



### SW4-OPT-TX240RAK



#### 1 SC fiber output

Connect a multimode single fiber optical cable between the transmitter and the receiver unit. Maximum fiber cable distances can be found in the [Maximum Fiber Cable Extensions](#) section.

#### 2 Audio2 input

5-pole Phoenix connector for balanced analog audio input signal. Pin assignment can be found in the [Analog Stereo Audio Connector \(5-pole Phoenix\)](#) section.

#### 3 HDMI output

Local HDMI output with the same A/V content as the fiber optical output.

#### 4 Ethernet

Locking RJ45 connector for configuring the device using Lightware Device Controller (LDC). Any third-party control system can use this port to control the device.

#### 5 Status LEDs

The LEDs give immediate feedback about actual state of the device. See the details in the [Rear Panel Status LEDs - Transmitter](#) section.

#### 6 GPIO

8-pole Phoenix connector for configurable general purpose input/output ports. Pin assignment can be found in the [GPIO - General Purpose Input/Output Ports](#) section.

#### 7 RS-232

3-pole Phoenix connector for RS-232 serial port. Pin assignment can be found in the [RS-232 Connector \(3-pole Phoenix\)](#) section.

#### 8 5V DC input

Local power in; connect the output of the supplied 5V DC power adaptor. For more information see the [5V DC Connection](#) section.



## 2.3. Front and Rear View - Receiver



- 1 USB KVM ports**    USB KVM ports for HID-compatible devices (preferably keyboard and mouse). See more information in the [USB KVM Function](#) section.
- 2 Power LED**    The LED indicates the power status of the device. See the details in the [POWER LED](#) section.
- 3 USB control port**    USB interface for LDC connection, and firmware update purpose.
- 4 Function button**    Factory default settings and bootload mode can be called using the button. See the details in the [Special Button Functions - Receiver](#) section.
- 5 Status LEDs**    The LEDs give immediate feedback about actual state of the device. See the details in the [Status LEDs](#) section.
- 6 RS-232**    D-sub connector for RS-232 serial port.
- 7 5V DC input**    Local power in; connect the output of the supplied 5V DC power adaptor. For more information see the [5V DC Connection](#) section.
- 8 SC fiber input**    Connect a multi-mode single fiber optical cable between the receiver and the transmitter unit. Maximum fiber cable distances can be found in the [Maximum Fiber Cable Extensions](#) section.
- 9 Analog audio output**    5-pole Phoenix connector for balanced analog audio output signal. Pin assignment can be found in the [Analog Stereo Audio Connector \(5-pole Phoenix\)](#) section.
- 10 HDMI output**    HDMI connector for DVI video or HDMI video and audio.



# 3

## Front Panel Control

This chapter is about the operating of operating the device, describing the functions that are available by the front panel controls:

- ▶ [FRONT PANEL LEDs - TRANSMITTER](#)
- ▶ [FRONT PANEL BUTTONS - TRANSMITTER](#)
- ▶ [SPECIAL BUTTON FUNCTIONS - TRANSMITTER](#)
- ▶ [REAR PANEL STATUS LEDs - TRANSMITTER](#)
- ▶ [FRONT PANEL LEDs - RECEIVER](#)
- ▶ [SPECIAL BUTTON FUNCTIONS - RECEIVER](#)

## 3.1. Front Panel LEDs - Transmitter

### 3.1.1. Video Input LEDs



- OFF:** The video source is not selected.
- BLINKING:** The video source is selected but signal is not detected.
- ON:** The video source is selected and signal is detected.

**INFO:** When Autoselect is enabled and video signal is not present at all, video LEDs blink.

### 3.1.2. Audio Input LEDs



- OFF:** The audio source is not selected.
- BLINKING:** The audio source is selected but no signal is detected, regardless of the output mode (e.g. DVI EDID is emulated on the port with HDMI signal).
- ON (with short pause):** Audio source is selected, the audio is embedded to the output video stream.
- ON (continuously):** Audio source is selected, the port is active but audio is not embedded in the video stream (e.g. the output mode is DVI).

### 3.1.3. HDCP LED



- OFF:** Video output signal is not encrypted with HDCP.
- ON:** Video output signal is encrypted with HDCP.

#frontpanel

### 3.1.4. USB LED



#### HDMI-3D-OPT-TX210A

- OFF:** USB is disconnected or there is no USB data transfer over the port.
- BLINKING (green):** USB connection is established between the transmitter and the computer.

#### HDMI-3D-OPT-TX210RAK / SW4-OPT-TX240RAK

- OFF:** USB is disconnected or there is no USB data transfer over the port.
- ON (green):** USB KVM: composite mode is active.
- ON (yellow):** USB KVM: transparent mode is active.

### 3.1.5. Autoselect LED



- OFF:** Autoselect function is disabled.
- BLINKING:** Autoselect function is enabled, searching for signal (the video input LEDs are also blinking).
- ON:** Autoselect function is enabled, the active video signal is found (the selected video input's LED is also ON).

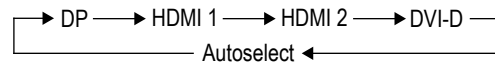
## 3.2. Front Panel Buttons - Transmitter

### 3.2.1. Video Select Button



Only for SW4-OPT-TX240RAK model: desired video input can be selected by the **Video Select** button from the front panel. The selection order of the inputs is the following:

**SW4-OPT-TX240RAK:**



### 3.2.2. Audio Select Button

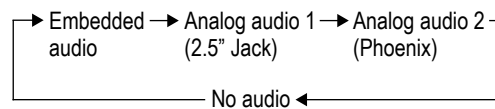


Desired audio input can be selected by the **Audio Select** button from the front panel. The selection order of the inputs depends on the model as follows:

**HDMI-3D-OPT-TX210A:**

**HDMI-3D-OPT-TX210RAK:**

**SW4-OPT-TX240RAK:**



### 3.2.3. Programmable Show Me Button



Action or an operation can be assigned to the Show Me button. "Show Me button pressed" is a condition that can be selected in the Event Manager. See more details in the [Event Manager](#) section.

`#frontpanel #button #showme`

## 3.3. Special Button Functions - Transmitter

### 3.3.1. Enable DHCP (Dynamic) IP Address

**DIFFERENCE:** This function is available for the SW4-OPT-TX240RAK model only.



The device has a static IP address as a factory default setting. If this setting does not fit to the circumstances during install or usage, DHCP can be enabled from the front panel:

- Step 1.** Make sure the device is powered on and operational.
- Step 2.** Press and keep pressed the **Show Me** button for 5 seconds.
- Step 3.** After 5 seconds front panel LEDs start blinking; release the button and press it 3 times again quickly (within 3 seconds).
- Step 4.** The LEDs get dark, DHCP gets enabled.

### 3.3.2. Reset to Factory Default Settings



To restore factory default values, do the following steps:

- Step 1.** Make sure the device is powered on and operational.
- Step 2.** Press and keep pressed the **Show Me** button for 10 seconds. After 5 seconds front panel LEDs start blinking but keep on pressing the button.
- Step 3.** After 10 seconds the LEDs start blinking faster; release the button and press it **3 times** again quickly (within 3 seconds).
- Step 4.** The LEDs get dark, the device restores the factory default settings and reboots.

Factory default settings are listed in the [Factory Default Settings](#) section. `#factory`

### 3.3.3. Control Lock



Press the **Audio Select** and **Show Me** buttons **together** (within 100 ms) to disable/enable front panel buttons; front panel LEDs blink 4 times when locking/unlocking. If the control lock is enabled and a button is pressed, front panel LEDs blink 3 times quickly. *#controllock #lockbutton*

### 3.3.4. Restarting of the Device



In few cases (after firmware update, etc) you may need to restart the device. Pushing the reset button results the same as you disconnect and reconnect the power adaptor to the transmitter. To restart the device follow the steps:

**Step 1.** Push the button with a thin object for a second.

**Step 2.** Wait until the device reboots. You can use the transmitter when the LIVE LED is blinking slowly again.

**ATTENTION!** Resetting the device does not reset the settings to factory defaults. To reset factory default settings see previous section.

*#restart #reboot*

### 3.3.5. Entering Firmware Update Mode



It may happen that the firmware update process is not successful and the device cannot be switched to bootload mode automatically. In this case, the device can be forced into firmware update mode as follows:

**Step 1.** Make sure the transmitter is powered off.

**Step 2.** Press and keep pressed the **Show Me** button.

**Step 3.** Power on the transmitter while the **Show Me** button is being pressed. If the device is switched to firmware update mode the LIVE LED is blinking quickly (less than 500 ms duty cycle). The other LEDs are off.

The procedure of firmware update can be found in the [Firmware Update](#) chapter. *#bootload*

## 3.4. Rear Panel Status LEDs - Transmitter

### 3.4.1. LIVE LED



- ON (yellow):** The device is powered but not operational.
- BLINKING (green):** The device is powered and operational.
- BLINKING (red):** Alert is detected.
- BLINKING (yellow):** Firmware update mode, device is in bootload mode.
- OFF:** The device is not powered.

### 3.4.2. LASER ACTIVE LED



- ON (red):** Laser transmission is enabled.

### 3.4.3. FIBER LINK LED



- ON:** Fiber link is established.  
**OFF:** No fiber link between the transmitter and the receiver.

### 3.4.4. RS-232 LED



- ON:** RS-232 ports (local and link) are in [Control Mode](#).  
**BLINKING:** [Command Injection Mode](#) is active. (only in case of SW4-OPT-TX240RAK model)  
**OFF:** RS-232 ports (local and link) are in [Pass-through Mode](#).

**DIFFERENCE:** Only HDMI-3D-OPT-TX210RAK and SW4-OPT-TX240RAK models has RS-232 LED.

## 3.5. Front Panel LEDs - Receiver

### 3.5.1. POWER LED



- ON:** The receiver is powered.

#frontpanel

### 3.5.2. Status LEDs



#### HDCP

- ON:** Video input signal is encrypted with HDCP.  
**OFF:** Video input signal is not encrypted with HDCP.

#### HDMI

- ON:** The input and output signal type is HDMI.  
**BLINKING:** The input signal type is HDMI but the output signal is DVI.  
**OFF:** The input signal type is DVI.

#### SIGNAL

- ON:** A valid video clock signal is present on the fiber input port of the receiver.

#### LASER

- ON:** The laser signal of a connected transmitter is detected on the fiber input port.

#### HOTPLUG

- ON:** A powered sink device is connected to the HDMI OUT port and sends hotplug signal.

#### EMULATE

- ON:** Composite port is active in the USB KVM crosspoint.  
**OFF:** No port is active or transparenens port is active in the USB KVM crosspoint.

#### USB LINK

- ON:** USB KVM signal is detected on the fiber input port.

#### FIBER LINK

- ON:** A powered transmitter is connected to the receiver and they can communicate over the fiber optical cable.

## 3.6. Special Button Functions - Receiver

### 3.6.1. Reset to Factory Default Settings



To restore factory default values, do the following steps:

- Step 1.** Make sure the device is powered on and operational.
- Step 2.** Press and keep pressed the **Show Me** button for 10 seconds. After 5 seconds front panel LEDs start blinking but keep on pressing the button.
- Step 3.** After 10 seconds the LEDs start blinking faster; release the button and press it 3 times again quickly (within 3 seconds).
- Step 4.** The LEDs get dark, the device restores the factory default settings and reboots.

Factory default settings are listed in the [Factory Default Settings](#) section.

*#frontpanel #button #function #factory*

### 3.6.2. Entering Firmware Update Mode



It may happen that the firmware update process is not successful and the device cannot be switched to bootload mode automatically. In this case, the device can be forced into firmware update mode as follows:

- Step 1.** Make sure the receiver is powered off.
- Step 2.** Press and keep pressed the **Function** button.
- Step 3.** Power on the receiver. If the device is switched to bootload mode the Status LEDs are blinking quickly (less than 500 ms duty cycle).

The procedure of firmware update can be found in the [Firmware Update](#) chapter. *#bootload*



# 4

## Installation

The chapter is about the installation of the device and connecting to other appliances, presenting also the mounting options and further assembly steps:

- ▶ [MOUNTING OPTIONS](#)
- ▶ [CONNECTING STEPS](#)
- ▶ [ELECTRICAL CONNECTIONS](#)

### 4.1. Mounting Options

To mount the transmitter Lightware supplies optional accessories for different usage. There are seven kinds of mounting kits with similar fixing method. The device has two mounting holes with inner thread on the bottom side; see the bottom view in the [Mechanical Drawings](#) section. Fasten the device by the screws enclosed to the accessory:



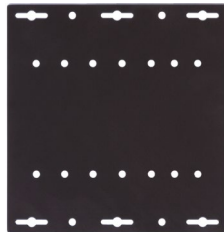
1U high rack shelf



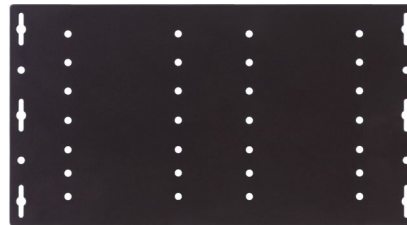
Under-desk mounting kit



Under-desk double mounting kit



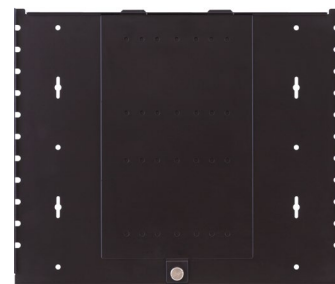
UD Mounting Plate F110



UD Mounting Plate F120



UD Mounting Pro P110



UD Mounting Pro P140

The Under-desk double mounting kit makes easy to mount a single device on any flat surface, e.g. furniture. 1U high rack shelf provides mounting holes for fastening two half-rack or four quarter-rack sized units. Pocket-sized devices can also be fastened on the shelf. To order mounting accessories please contact [sales@lightware.com](mailto:sales@lightware.com).

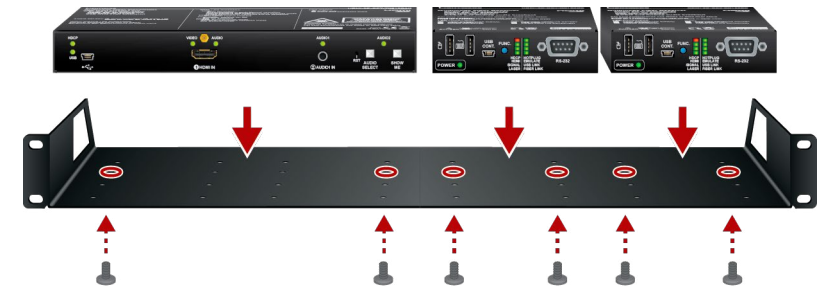
**WARNING! Always use the supplied screws. Using different (e.g. longer) ones may cause damage the device.**

**INFO:** The transmitters are half-rack sized, the receiver is quarter-rack sized.

#### 4.1.1. Rack Shelf Mounting

##### 1U High Rack Shelf

Allows rack mounting for half-rack, quarter-rack and pocket sized units.

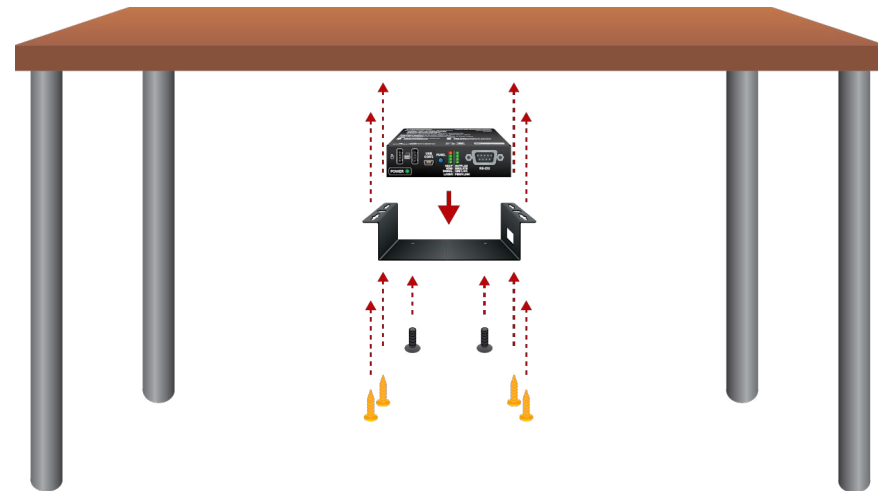


1U high rack shelf provides mounting holes for fastening two half-rack or four quarter-rack sized units. Pocket sized devices can also be fastened on the self.

### 4.1.2. Under-Desk Mounting

#### Under-desk Mounting Kit

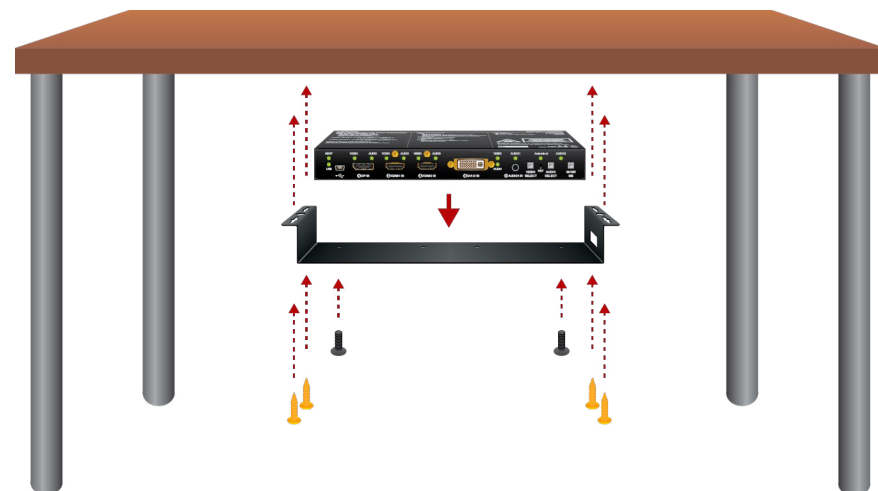
The UD kit allows a receiver to be easily mounted on any flat surface (e.g. furniture). Only quarter-rack sized units (HDMI-3D-OPT-RX150RA receiver) can be installed to the kit.



INFO: The chipboard screws are not supplied with the mounting kit.

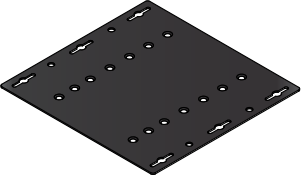
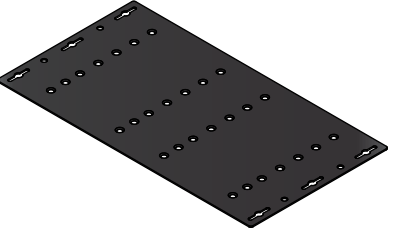
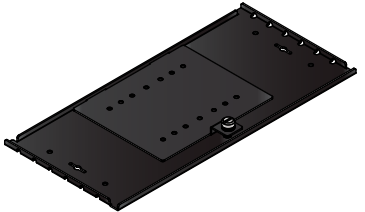
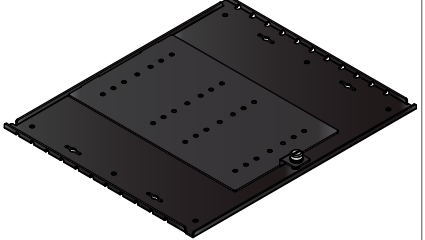
#### Under-desk Double Mounting Kit

The UD-kit double makes it easy to mount a single transmitter or multiple receivers on any flat surface (e.g. furniture).



INFO: The chipboard screws are not supplied with the mounting kit.

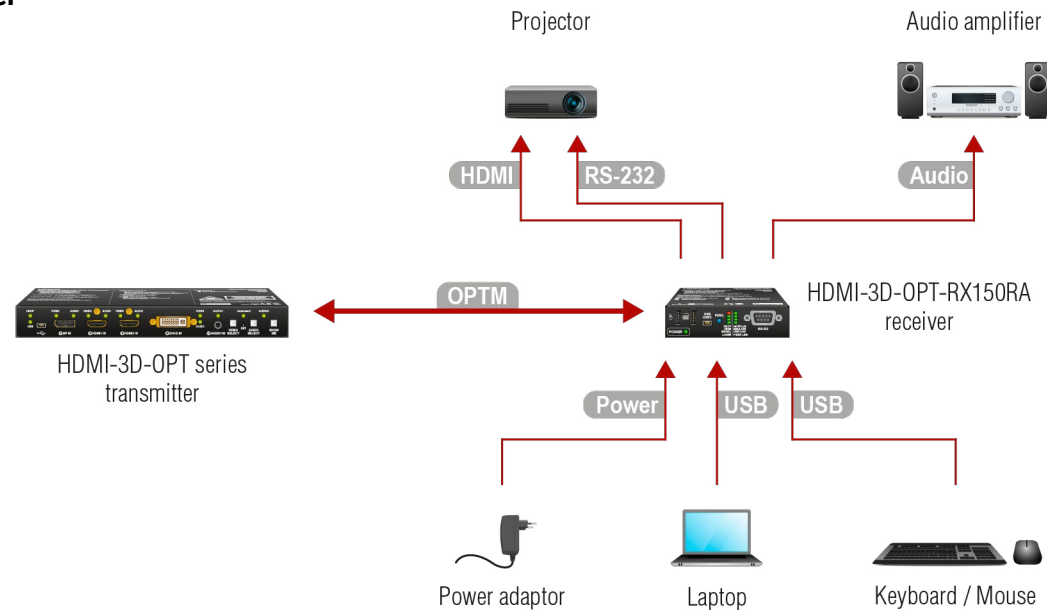
#### Under-Desk Mounting Plates

Accessory	Number of mountable devices	Features
<b>UD Mounting Plate F110</b> 	1 quarter-rack sized	Lightweight design
<b>UD Mounting Plate F120</b> 	2 quarter-rack sized or 1 half-rack sized	Lightweight design
<b>UD Mounting Pro P110</b> 	1 quarter-rack sized	Easy to change the mounted device
<b>UD Mounting Pro P140</b> 	2 quarter-rack sized or 1 half-rack sized	Easy to change the mounted devices

INFO: For more details about the options of the applications and the assembly steps, please download the **Mounting Accessory Guide** from our website: [https://lightware.com/pub/media/lightware/filedownloader/file/Assembly-Guide/Mounting\\_AG.pdf](https://lightware.com/pub/media/lightware/filedownloader/file/Assembly-Guide/Mounting_AG.pdf)

## 4.2. Connecting Steps

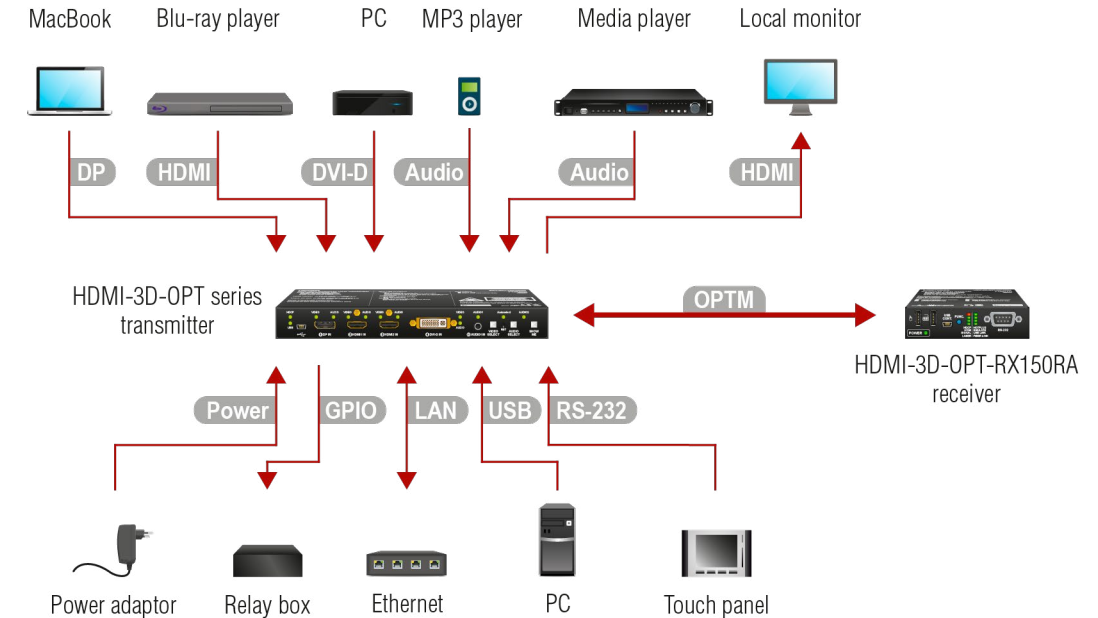
### 4.2.1. Receiver



- OPTM** Connect the receiver and the compatible transmitter (e.g. a HDMI-3D-OPT series transmitter) or matrix output board using a multimode single fiber optical cable.
- HDMI** Connect the sink device (e.g. a projector) to the HDMI output port by an HDMI cable.
- RS-232** Optionally for RS-232 control: connect a controller/controlled device (e.g. projector) to the RS-232 port.
- Audio** Optionally connect an analog audio device with balanced audio signal (e.g. audio amplifier) to the 5-pole Phoenix audio output port. See the [Cable Wiring Guide](#) for the correct wiring.
- USB** Optionally for USB control: connect the receiver to the controller device (e.g. laptop) by a USB mini B-type cable.
- USB** Optionally for USB HID extension: connect at least one USB HID device (e.g. keyboard and/or mouse) to the receiver.
- Power** Connect the power adaptor to the DC input of the receiver first, then to the AC power socket.

**ATTENTION!** Only HID-compliant devices are supported by the extenders. Non-HID devices (USB sticks, webcams, etc) will not be working with the receiver.

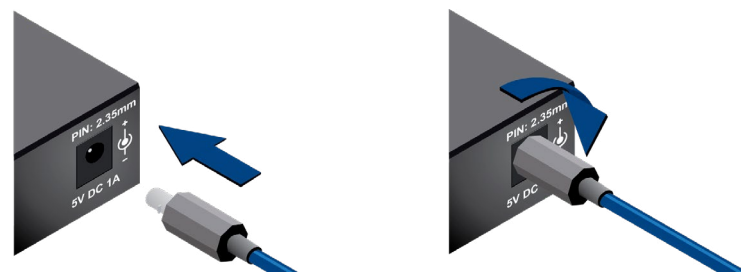
### 4.2.2. Transmitter



- OPTM** Connect the transmitter and the compatible receiver (e.g. a HDMI-3D-OPT-RX150RA) or matrix input board using a multimode single fiber optical cable.
- DP**  
**HDMI**  
**DVI-D** Connect the source(s) (e.g. a MacBook / Blu-ray player / PC) to the input port(s) of the transmitter by a DP / DVI-D / HDMI cable(s).
- Audio** Optionally connect an asymmetric audio device with unbalanced audio signal (e.g. an MP3 player) to the 2.5" TRS (jack) audio input port.
- Audio** Optionally connect a symmetric audio device with balanced audio signal (e.g. a media player) to the 5-pole Phoenix audio input port. See the [Cable Wiring Guide](#) for the correct wiring.
- HDMI** Connect the local sink device (e.g. a monitor) to the HDMI output port by an HDMI cable.
- USB** Optionally for USB HID extension: connect the transmitter to the computer by the USB mini B-type cable.
- RS-232** Optionally for RS-232 control: connect a controller/controlled device (e.g. a touch panel) to the RS-232 port.
- LAN** Optionally connect the switcher to a LAN network in order to control the device.
- GPIO** Optionally connect a controller/controlled device (e.g. relay box) to the GPIO port.
- Power** Connect the power adaptor to the DC input of the transmitter first, then to the AC power socket.

### 4.3. Electrical Connections

#### 4.3.1. 5V DC Connection



*Locking DC connector*

The extenders are built with locking 5V DC connector. Do not forget to turn the plug counterclockwise before disconnecting the power adaptor.

**WARNING! Always use the supplied 5V power adaptor. Warranty void if damage occurs due to use of a different power source.**

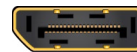
#### 4.3.2. HDMI Connector

The extenders provide standard 19-pole HDMI connector for input and output. Always use high-quality HDMI cable for connecting sources and displays.



#### 4.3.3. DisplayPort Connector

SW4-OPT-TX240RAK transmitter provides standard 20-pole DisplayPort connector for input. Always use high quality DP cable for connecting DisplayPort devices.



#### 4.3.4. SC Fiber Optical Connector

HDMI-3D-OPT series transmitters and receivers provide multimode SC fiber optical input and output connectors.



Maximum fiber cable distances can be found in the [Maximum Fiber Cable Extensions](#) section.

**WARNING! Please do not look directly into the SC fiber optical connector if the cable is connected to the transmitter only and the laser is active.**

#### 4.3.5. DVI-I Connector

SW4-OPT-TX240RAK transmitter provides 29-pole „digital only” DVI-I Dual-Link connectors (only digital pins are internally connected) for input and local output. This way, users can plug in any DVI connector, but keep in mind that analog signals (such as VGA or RGBHV) are not processed.

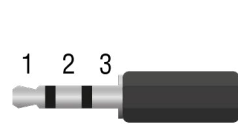
Always use high-quality DVI cable for connecting sources and displays.



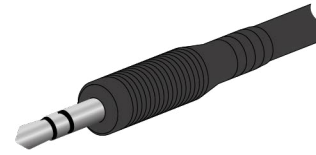
Pin	Signal	Pin	Signal
1	TMDS Data2-	16	Hot Plug Detect
2	TMDS Data2+	17	TMDS Data0-
3	TMDS Data2 Shield	18	TMDS Data0+
4	Not connected	19	TMDS Data0 Shield
5	Not connected	20	Not connected
6	DDC Clock	21	Not connected
7	DDC Data	22	TMDS Clock Shield
8	Not connected	23	TMDS Clock+
9	TMDS Data1-	24	TMDS Clock-
10	TMDS Data1+	C1	Not connected
11	TMDS Data1 Shield	C2	Not connected
12	Not connected	C3	Not connected
13	Not connected	C4	Not connected
14	+5V Power	C5	GND
15	GND (for +5V)		

#### 4.3.6. Analog Stereo Audio Connector (3.5 mm Jack)

The connector is used for receiving unbalanced analog audio signal. It is also known as (3.5 mm or approx. 1/8") audio jack, phone jack, phone plug and mini-jack plug.



Pin nr.	Signal
1	Left
2	Right
3	Ground



**Jack audio plug pin assignments**

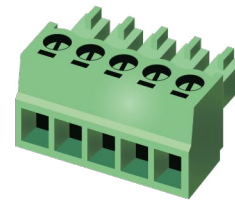
You can find more information about audio functions in the [Audio Interface](#) section.

#### 4.3.7. Analog Stereo Audio Connector (5-pole Phoenix)

5-pole Phoenix connector is used for balanced analog audio output. Unbalanced audio signals can be connected as well. For unbalanced output connect + and ground to the source and connect - to the ground.



Pin nr.	Signal
1	Left+
2	Left-
3	Ground
4	Right-
5	Right+



**Analog audio connector and plug pin assignments**

##### Compatible Plug Type

Phoenix® Combicon series (3.5mm pitch, 5-pole), type: MC 1.5/5-ST-3.5.

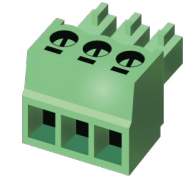
You can find more information about analog audio function in the [Audio Interface](#) section. Audio cable wiring guide is in the [Cable Wiring Guide](#) section.

#### 4.3.8. RS-232 Connector (3-pole Phoenix)

The extender contains a 3-pole Phoenix connector which is used for RS-232 serial connection.



Pin nr.	Signal
1	Ground
2	TX data
3	RX data



**RS-232 connector pin assignments**

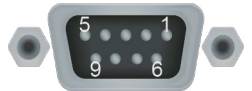
##### Compatible Plug Type

Phoenix® Combicon series (3.5mm pitch, 3-pole), type: MC 1.5/3-ST-3.5.

You can find more information about RS-232 interface in the [Serial Interface](#) section.

#### 4.3.9. RS-232 Connector (D-sub)

HDMI-3D-OPT-RX150RA receiver contains RS-232 port which can be connected by an industry standard 9-pole D-sub female connector.



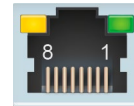
Pin nr.	RS-232 pin-out
1	Not connected
2	<b>TX data transmit (output)</b>
3	<b>RX data receive (input)</b>
4	DTR (Internally connected to Pin 6)
5	<b>GND signal ground (shield)</b>
6	DSR (Internally connected to Pin 4)
7	RTS (Internally connected to Pin 8)
8	CTS (Internally connected to Pin 7)
9	Not connected

You can find more information about RS-232 interface in the [Serial Interface](#) section.



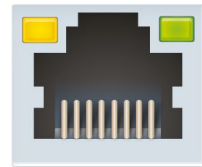
### 4.3.10. Ethernet Connector

The extender provides standard RJ45 connectors for LAN port. Always use high quality Ethernet cable for connecting transmitters and receivers.

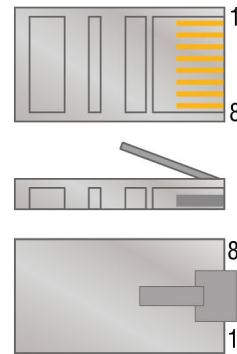


#### Wiring LAN Cables

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



Pin	TIA/EIA T568A	TIA/EIA T568B
1	white/green	white/orange
2	green	orange
3	white/orange	white/green
4	blue	blue
5	white/blue	white/blue
6	orange	green
7	white/brown	white/brown
8	brown	brown



Pin assignments of RJ45 connector types

### 4.3.11. USB Mini Connector

The extenders provide standard USB mini B-type connector for software control and USB KVM purposes.



You can find more information about USB KVM function in the [USB KVM Function](#) section.

### 4.3.12. USB Connector for KVM

HDMI-3D-OPT-RX150RA receiver provides USB 2.0 connectors for KVM function supporting purpose. The unit has 2x USB 2.0 A-type connectors.



You can find more information about USB KVM function in the [USB KVM Function](#) section.

### 4.3.13. GPIO - General Purpose Input/Output Ports

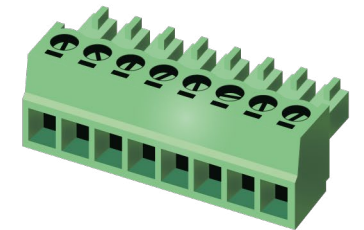
SW4-OPT-TX240RAK transmitter contains a 8-pole Phoenix connector with seven GPIO pins, which operates at TTL digital signal levels and can be set to high or low level (Push-Pull). The direction of the pins can be input or output (adjustable). Voltage ranges for GPIO inputs are the following:

	Input voltage [V]	Output voltage [V]	Max. current [mA]
Logical low level	0 - 0.8	0 - 0.5V	30
Logical high level	2 - 5	4.5 - 5V	18

INFO: The maximum total current for the seven GPIO pins is 180 mA.



Pin nr.	Signal
1	Configurable
2	
3	
4	
5	
6	
7	
8	Ground



GPIO connector and plug pin assignments

#### Compatible plug type

Phoenix® Combicon series (3.5mm pitch 8-pole), type: MC 1.5/8-ST-3.5.

You can find more information about GPIO interface in the [GPIO Interface](#) section.

# 5

## Device Concept

The following sections are about the physical structure of the device, input/ output ports and connectors:

- ▶ [ACCEPTED SIGNALS](#)
- ▶ [PORT DIAGRAMS](#)
- ▶ [AUDIO INTERFACE](#)
- ▶ [VIDEO INTERFACE](#)
- ▶ [THE AUTOSELECT FEATURE](#)
- ▶ [USB KVM FUNCTION](#)
- ▶ [CONTROLLING FEATURES](#)
- ▶ [FURTHER BUILT-IN FEATURES](#)
- ▶ [SOFTWARE CONTROL MODES](#)

## 5.1. Accepted Signals

### 5.1.1. Transmitter

HDMI-3D-OPT-TX200 series transmitters have a multimode single fiber output interface which is able to transmit different type of signals at the same time. The transmitter accepts digital video (DP, HDMI, and DVI-D) and analog audio sources (Jack and 5-pole Phoenix). The device can be controlled over LAN, RS-232 (3-pole Phoenix), and USB interfaces. The transmitter is able control third-party devices using the built-in GPIO ports. The transmitter also has USB KVM function.

#### Interfaces of HDMI-3D-OPT-TX210A



#### Interfaces of HDMI-3D-OPT-TX210RAK



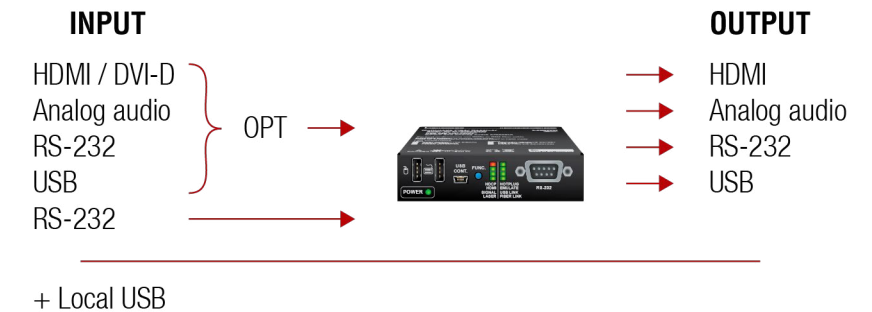
#### Interfaces of SW4-OPT-TX240RAK



### 5.1.2. Receiver

HDMI-3D-OPT-RX150RA receiver has a multi-mode single fiber input interface which is able to receive different type of signals at the same time. The device accepts digital video and digital/analog audio, RS-232, and USB KVM signals over a single fiber cable. The device is able to deembed the audio signal to the analog (5-pole Phoenix) and transmit it to the audio source devices. The unit can be controlled USB interface (USB mini B-type) and built with a bidirectional RS-232 port (D-sub). The device also has USB KVM function.

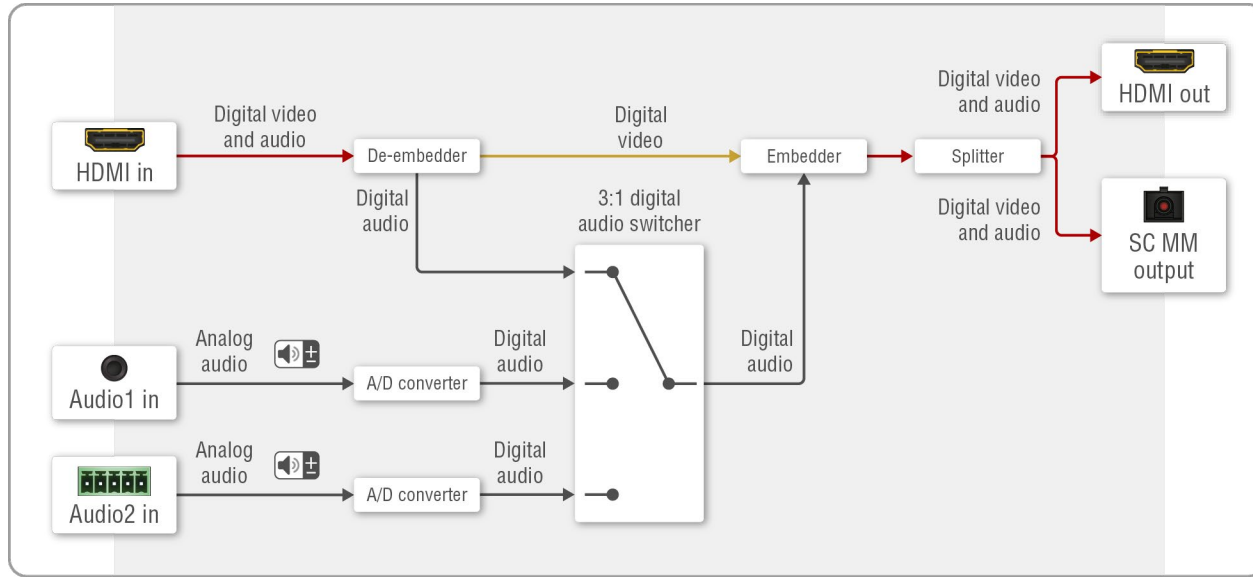
#### Interfaces of HDMI-3D-OPT-RX150RA



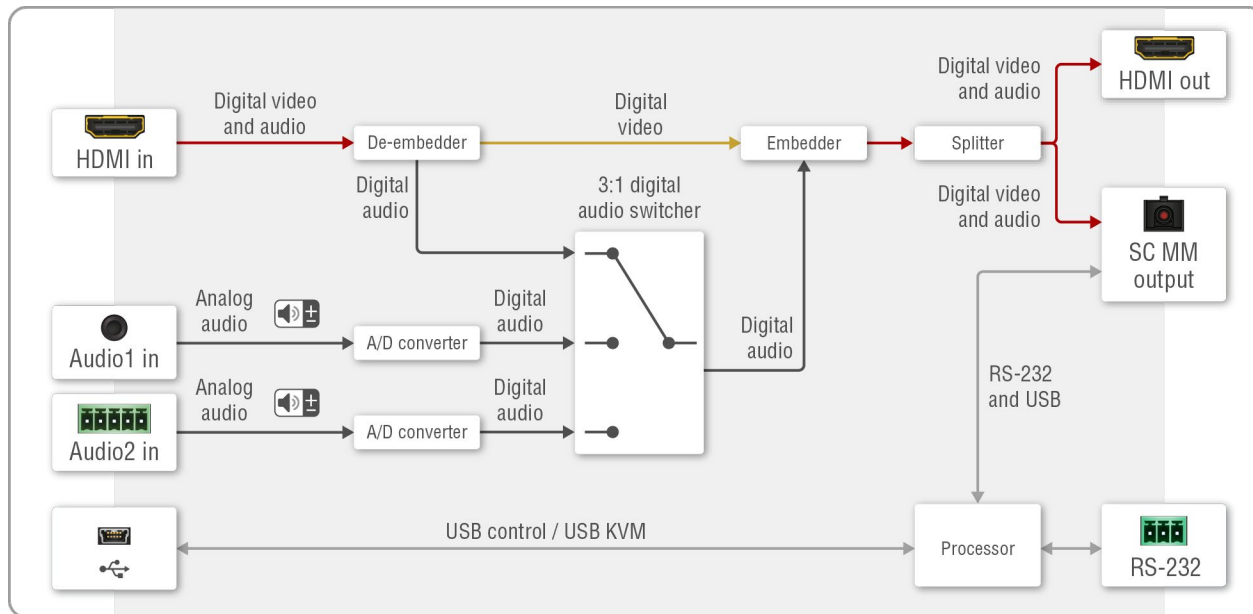
## 5.2. Port Diagrams

The following diagrams introduce the route of the different signal types (including the audio/video and control signals as well) from the input to the output ports in the device.

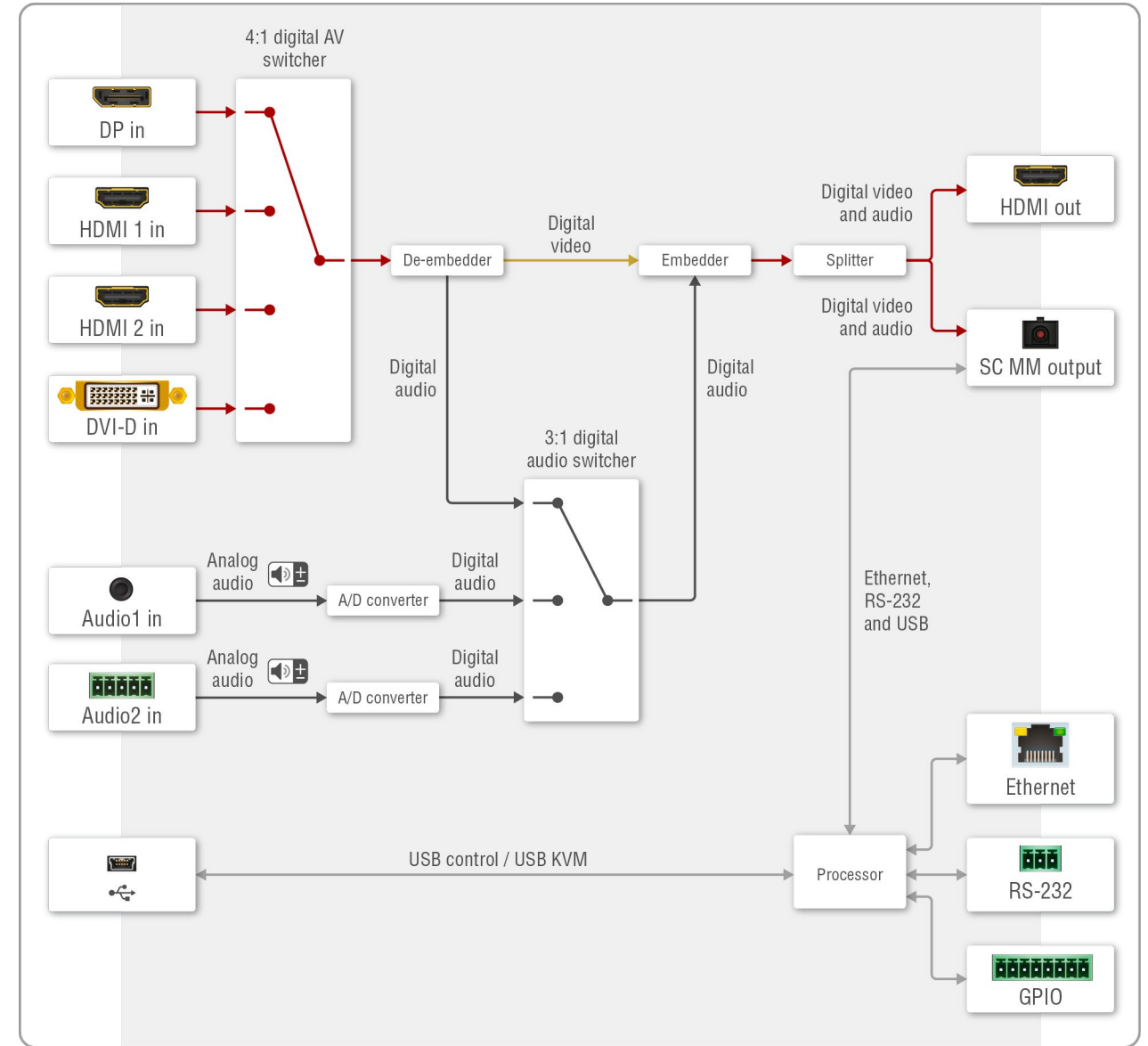
**HDMI-3D-OPT-TX210A**



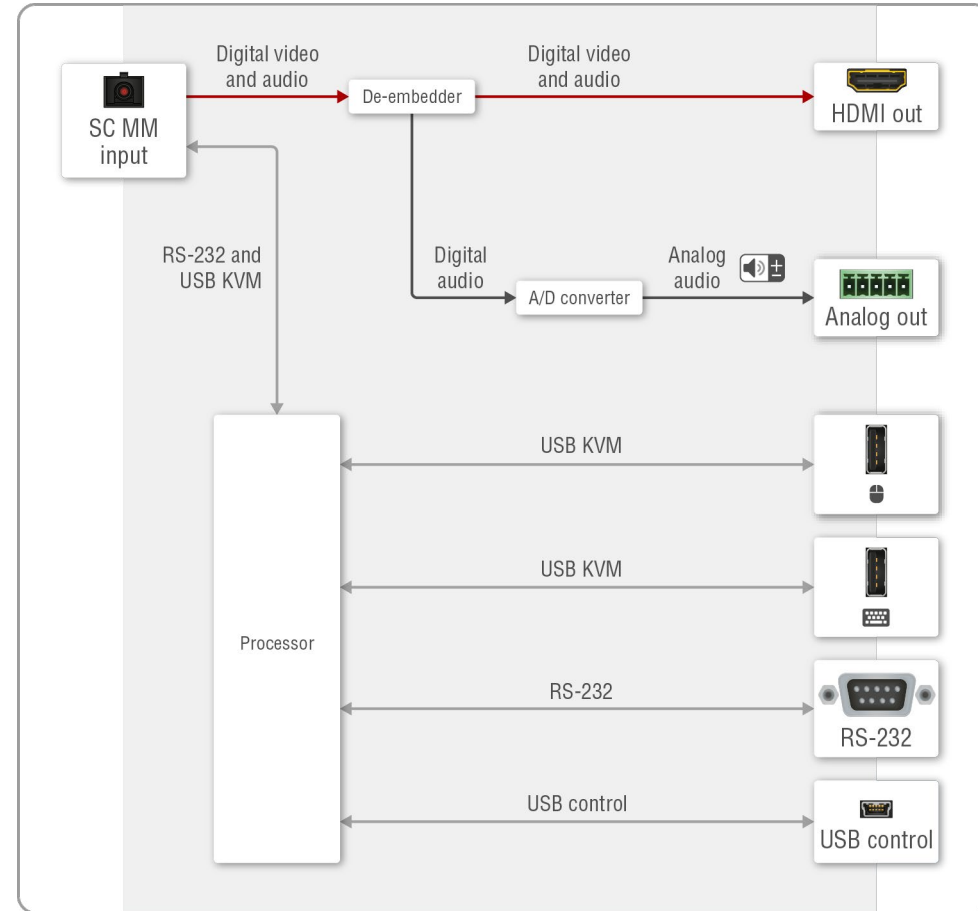
**HDMI-3D-OPT-TX210RAK**



**SW4-OPT-TX240RAK**



**HDMI-3D-OPT-RX150RA**



**5.3. Audio Interface**

**5.3.1. Audio Inputs and Modes - Transmitter**

The transmitter can receive audio from two type of sources:

- Embedded (2x HDMI, 1x DP, 1x DVI-D);
- Analog audio sources (1x Jack and 1x 5-pole Phoenix).

The audio coming from the analog inputs can be assigned to any video input. The gain levels of the analog audio input and the volume of the analog audio output ports are adjustable.

**Audio Embedding – Allowed Connections**

When the desired video signal is selected, the audio of the transmitted signal can be:

- The audio of the original signal, or
- The analog audio signal.

**INFO:** In case of SW4-OPT-TX240RAK model the audio of the HDMI 2 input can be embedded only in the original video stream. The audio of HDMI1 input cannot be mixed with the video of HDMI 2 input and vice versa.

**5.3.2. Audio Outputs and Modes - Receiver**

The receiver can transmit audio on three types of audio ports:

- Embedded (HDMI);
- Analog balanced audio (5-pole Phoenix).

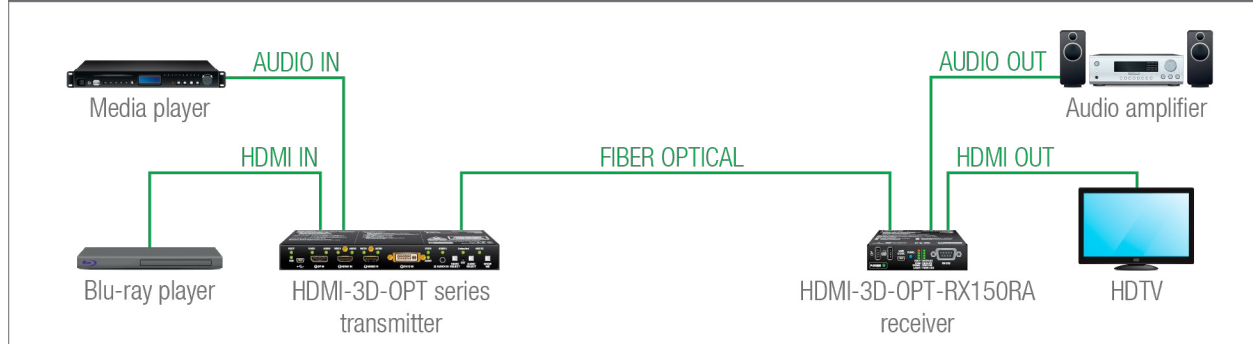
The digital audio signal coming from the the optical input port can be transmitted on any audio output ports: HDMI or the analog audio output port. The volume and balance levels are adjustable on the analog output port.

**Supported Audio Formats**

The table below shows the supported audio formats by output ports.

Audio formats	Audio outputs	
	Embedded audio	Analog audio output
Multichannel PCM	Max 8 channel (up to 192 kHz)	Stereo PCM (up to 48 kHz)
Dolby Digital 2.1	✓	-
Dolby Digital 5.1	✓	-
Dolby Digital 7.1	✓	-
DTS 2.1	✓	-
DTS 5.1	✓	-
DTS 7.1	✓	-
Dolby TrueHD (HBR)	✓	-
DTS-HD (HBR)	✓	-
DTS-HD Master Audio (HBR)	✓	-
All other HDMI specified standards	✓	-

### 5.3.3. Audio Options - Example



#### The Concept

Two audio source devices are connected to the transmitter: a Blu-ray player which has embedded digital audio on HDMI; and a media player which sends analog audio to the transmitter. On the receiver's side there is two audio source device: an HDTV which can receive digital audio on HDMI; and an audio amplifier which can receive analog or digital audio signals as well.

As the transmitter is able to embed the analog audio signal to the HDMI signal, the user can transmit the audio of the Blu-ray player or the audio of the media player as well.

**INFO:** One audio (embedded or analog) and one video signals can be transmitted via the optical output at the same time.

The receiver has built-in de-embedder function so the user can transmit audio signal to the audio amplifier and HDTV as well.

All related audio settings are available in the Lightware Device Controller software, see the [Port Properties Windows](#) section.

### 5.4. Video Interface

#### Transmitter

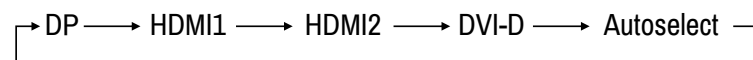
The video crosspoint settings can be controlled by any of the following ways:

- Pressing **Video Select** button on the device,
- Using Lightware Device Controller (LDC),
- Sending LW2 or LW3 protocol commands, or
- Using the **Autoselect** function.

**INFO:** The audio/video signal on the local HDMI output port is always the same as on the optical output port.

#### Direct Selection on SW4-OPT-TX240RAK Transmitter

Desired video input can be selected by the **Video select** button, the order is the following:

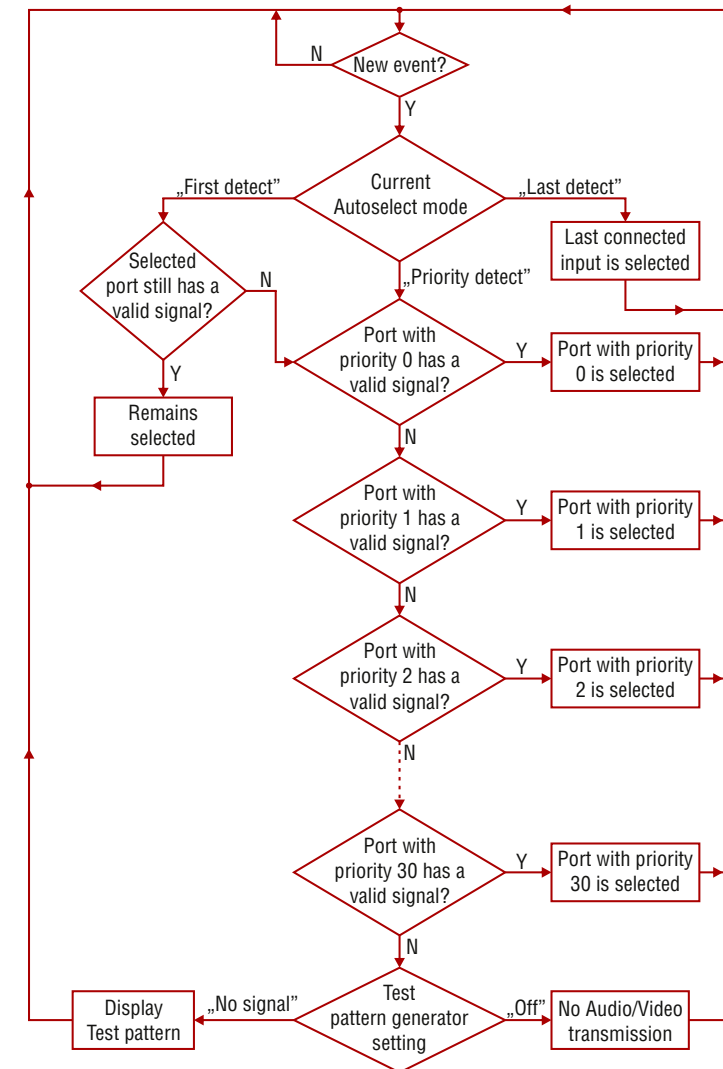


### 5.5. The Autoselect Feature

Beside of manual selecting of crosspoints you can choose the Autoselect option both in case of audio and video ports.

There are three types of Autoselect as follows.

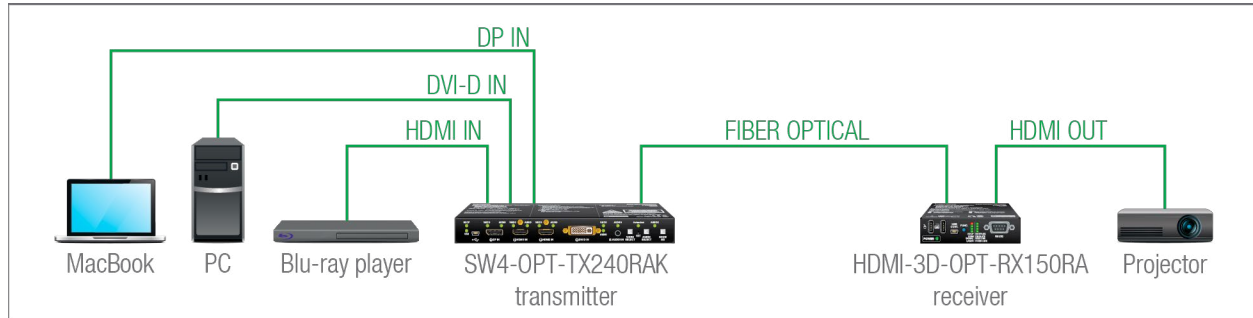
- First detect mode:** selected input port is kept connected to the output while it has an active signal.
- Priority detect mode:** always the highest priority active input is selected to transmit.
- Last detect mode:** always the last attached input is selected to transmit.



**Flowchart of Autoselection modes**



**Automatic Input Selection - Example**



**The Concept**

If there is no other source connected to the transmitter, but the MacBook, DP input will be automatically switched to the optical output. If the MacBook and the PC are also connected to the transmitter, DVI-D input will be switched to the optical output. If the Blu-ray player is connected on the HDMI input of the transmitter, it will be switched to the optical output – independently of the presence of other video signals.

**Settings**

- **Optical output:** Set the Autoselect to **Enabled**. Set Autoselect mode to Priority detect. The priorities are the following (the lowest number means the highest priority):The priorities are the followings:

Source device	Input port	Priority
MacBook	I1 (DP IN)	2
PC	I4 (DVI-D IN)	1
Blu-ray player	I2 (HDMI IN)	0

Priorities can be set in Lightware Device Controller software, see related settings in the [Video Outputs](#) and [Digital Audio Outputs](#) sections.

**5.6. USB KVM Function**

HDMI-3D-OPT-TX210RAK, SW4-OPT-TX240RAK, and the HDMI-3D-OPT-RX250RA extenders support HID-compliant (Human Interface Device) devices to transmit USB signal between the source and sink devices. The transmitter connects to the controlled device (e.g. PC) and the controlling devices (e.g. computer mouse, keyboard, touch panel) are connected to the receiver.

**ATTENTION!** Only HID-compliant devices are supported by the extenders. Non-HID devices (USB sticks, webcams, etc) will not be working with the extenders.

USB KVM function can be used in two different modes: **Transparent** and **Composite mode**. The following sections show the difference between the two modes:

**Transparent Mode**

Transparent mode is a simple USB data transmission between the extenders. The same data is transmitted on the TX side which is received on the RX side. The content of the transmitted packets are unknown to the Lightware infrastructure so the data is not modified by any means during the transmission.

**Key Features:**

- Supports all HID-compliant devices.
- Driver software for all connected USB devices has to be installed on the controlled computer. When you switch a crosspoint between two sources, the connected mouse and keyboard will be detected as a new hardware in the operating system.

**Composite Mode**

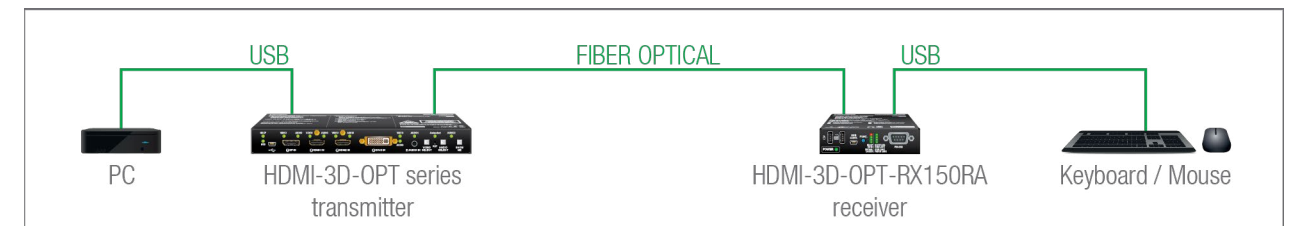
The composite mode is an advanced data transmission method, recommended for most users. The devices use their own data packets during data transmission. Thus, the content of the transmitted packets is known to the Lightware infrastructure.

**Key Features:**

- Supports the following HID-compliant devices: computer mouse, keyboard built with 107 keys and/or specific multimedia keys.
- No driver software is needed for the connected devices. The operating system uses the driver of the extender to establish the connection for the USB devices.

**INFO:** You can find the related settings for Lightware Device Controller software in the [USB KVM](#) section.

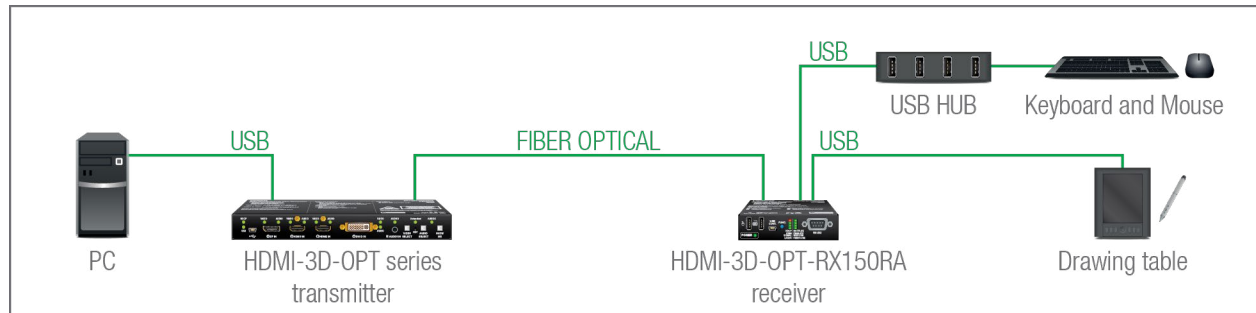
**USB KVM - Example 1**



**The Concept**

The PC is connected to the transmitter with a USB cable. The signal is transmitted over the fiber optical line from the receiver which is connected to the controller devices (to the keyboard and the mouse) to the transmitter. The physical distance between the controlled PC and the controller devices can be up to 2500 meters.

### USB KVM - Example 2



#### The Concept

Two devices are connected to the USB ports of the Receiver:

- A **Drawing table**;
- A **USB HUB** which has four USB ports - a **Keyboard** and a **Mouse** are connected to the HUB.

The PC can be controlled by the keyboard and the mouse, as well as the drawing table is also working as an input device beside of them.

#### Settings:

- **Keyboard and mouse (via the USB HUB):** the devices need to be set to **Composite** mode. The extenders can handle both of them if the devices are HID-compliant computer mouse and/or keyboard built with 107 keys and/or specific multimedia keys.
- **Drawing table:** the device needs to be set to **Transparent** mode because this kind of devices may have special functions which cannot be supported by the composite mode.

All related settings are available in the LDC software, see the [USB KVM](#) section.

**INFO:** The extenders support up to 8 physical USB HUB ports.

## 5.7. Controlling Features

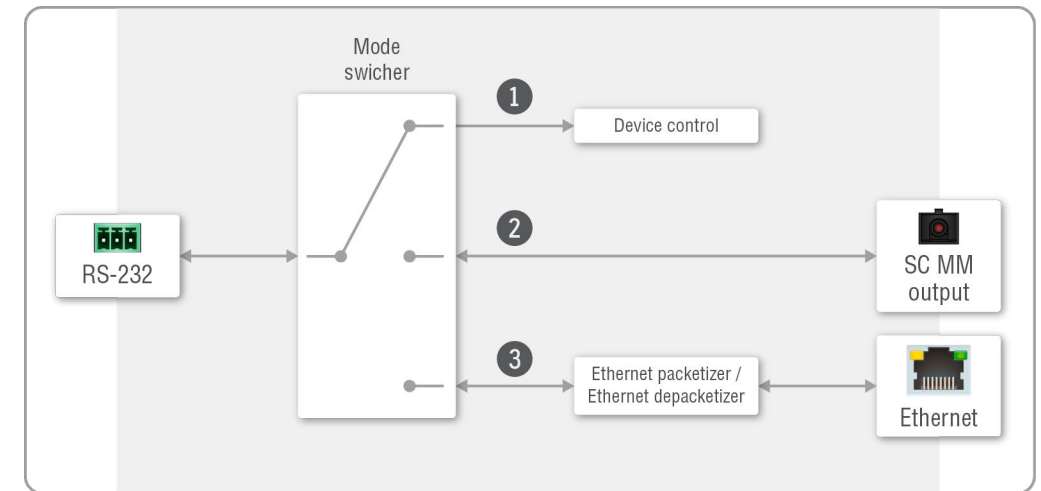
The interfaces of the HDMI-3D-OPT series extenders can be used to install the device at various point of a complex A/V system. Besides, the transmitter and the receiver are able to handle controlling functions. This section is about to present the possibilities through the control ports built-in the the extenders.

### 5.7.1. Serial Interface

**DIFFERENCE:** Only HDMI-3D-OPT-TX210RAK and SW4-OPT-TX240RAK transmitters, and HDMI-3D-OPT-RX150RA receiver have RS-232 interface.

#### Technical Background

Serial data communication can be established via the local RS-232 port (Phoenix connector) or via the optical line. The RS-232 ports – which are connected to the processor (CPU) – can be configured separately (e.g. if the Baud rates are different, the microcontroller does the conversion automatically between the ports). The RS-232 port can be switched to Control mode, Command Injection mode, or can be Pass-through mode; see the following figure.



*The block diagram of the serial interface*

The following settings are defined:

- 1 The Local serial port is in **Control mode**.
- 2 The Local serial port is in **Pass-through mode**.
- 3 The Local serial port is in **Command Injection mode**.

All settings are available in the LDC software, see settings in the [RS-232](#) section.

#### Control Mode

The incoming data from the given port is processed and interpreted by the CPU. The mode allows to control the matrix directly. LW2 or LW3 protocol commands are accepted – depending on the current port setting.

#### Pass-through Mode

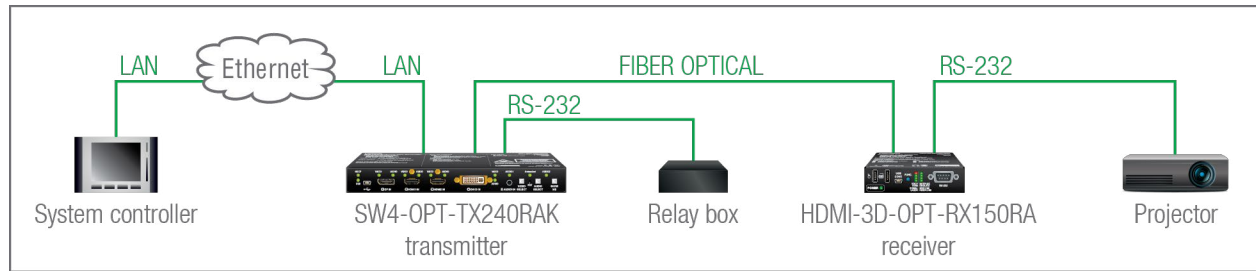
In pass-through mode, the given device forwards the data that is coming from one of its ports to another same type of port. The command is not processed by the CPU. Incoming serial data is forwarded from one port to another port inside the extender.

#### Command Injection Mode

**DIFFERENCE:** HDMI-3D-OPT-RX150RA receiver has no command injection mode.

In this mode, the extender works as a TCP/IP <-> RS-232 bidirectional converter. The TCP/IP data signal is converted to RS-232 data and vice versa. TCP/IP port numbers are defined for the serial ports (optical link and local) for this purpose. E.g. the default Command Injection port number of the local RS-232 port is 8001. If data is coming from the optical interface which addresses to the port no. 8001, it will be transmitted to the Tx pin of the local RS-232 port. That also works in the opposite direction of course and the method is the same on the serial interface of the optical port as well.

### RS-232 Signal Transmission - Example 1



The following ways are available for controlling the devices:

- The **System controller** can communicate with the **Transmitter** by LW2/LW3 protocol commands sent to the local IP:port address.
- The **System controller** can communicate directly with the **Projector** or an **Extender** via their IP:port address.
- The **System controller** can communicate directly with the RS-232 **Relay box** connected to the **Transmitter**. In this case, **Command Injection** mode has to be enabled on the local RS-232 port.
- The **Transmitter** can send a command (e.g. as an action by the Event Manager) to the IP:port address of the **Projector** or the **Receiver** by using LW3 protocol methods.

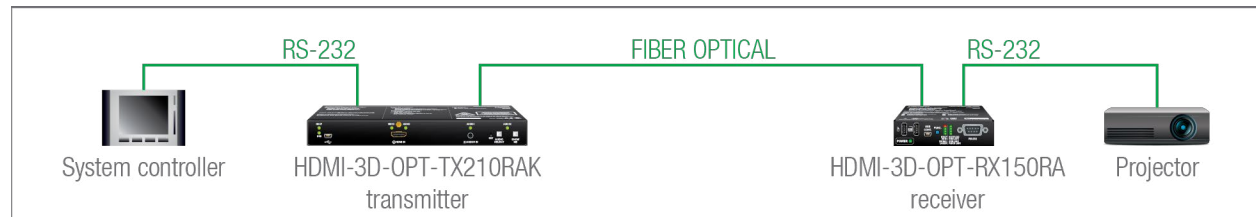
#### Command Sending

- You can send LW3 protocol commands to the **192.168.0.100:6107** port to control the transmitter.
- You can send LW2 protocol commands to the **192.168.0.100:10001** port to control the transmitter.
- You can send commands to the **192.168.0.100:8001** port to control the projector. This port number means the RS-232 interface of the optical output port (O1).

**DIFFERENCE:** Only SW4-OPT-TX240RAK model has Ethernet LAN port.

**INFO:** Above values are examples and based on factory default settings.

### RS-232 Signal Transmission - Example 2



#### The Concept

You can control the **Projector** over the extenders with the **System controller**. The controller is connected to the local RS-232 port of the **Transmitter** which transmits the signal toward the **Receiver** over the fiber optical line. The **Projector** is connected to the local RS-232 port of the **Receiver**. The serial connection is bidirectional which means the controller gets back the responses of the projector.

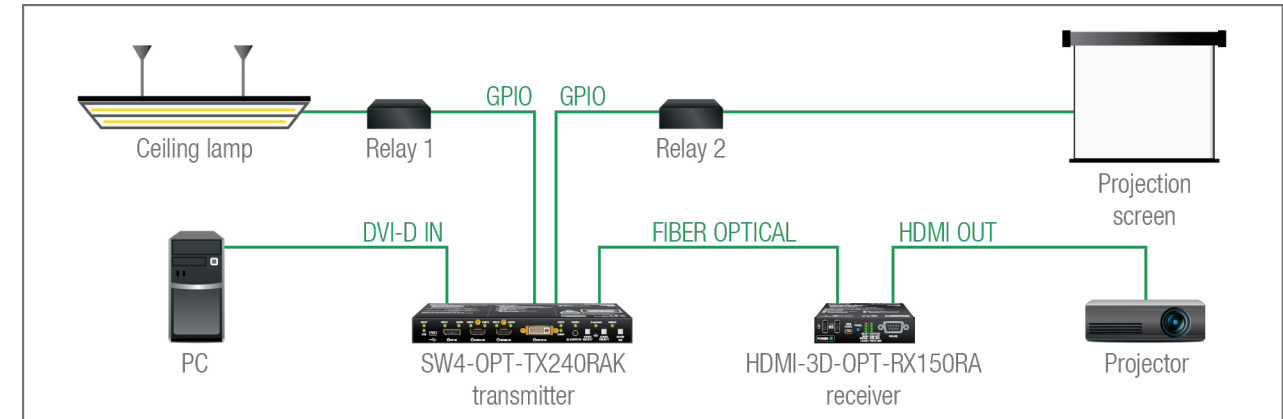
In this case the RS-232 port of the transmitter and receiver either has to be set to **Pass-through mode**.

### 5.7.2. GPIO Interface

**DIFFERENCE:** Only SW4-OPT-TX240RAK model has GPIO interface.

The GPIO (General Purpose Input/Output) port is a multifunctional input/output interface to control the SW4-OPT-TX240RAK transmitter or third-party devices and peripherals. You can establish connection between the controller/controllable device and the transmitter by the 8-pole Phoenix connector. The derivation of the seven pin is configurable independently based on the purpose of the application.

#### GPIO Options - Example



#### The Concept

Ceiling lamp is turned off by Relay 1 and projection screen is rolled down by Relay 2 when signal received from the PC over the DVI-D input. Both relays are controlled by the GPIO port.

#### Settings of the Transmitter

- **For Relay 1:** create an event in Event Manager: when signal is present on Input 1 (I1) then set GPIO pins to low level for Relay 1 opening. Also create another event when signal is not present on Input 1 (I1) then set GPIO pins to high level for Relay 1 closing.
- **For Relay 2:** create an event in Event Manager when signal is present on Input 1 (I1) then set GPIO pins to high level for Relay 2 closing. Also create another event when signal is not present on Input 1 (I1) then set GPIO pins to low level for Relay 2 opening.

When the PC starts to play the video presentation, the signal is received over the DVI-D input so GPIO pins send signal to Relay 1 to open which results turning off the lights. Furthermore GPIO pins also send signal to Relay 2 to close and the projection screen is rolled down. When the presentation is ended, signal ceases on the DVI-D input, so GPIO pins send signal to Relay 1 to close which results turning on the lights and sends signal to Relay 2 to open so projection screen returns to its enclosure.

**ATTENTION!** Please always check the electrical parameters of the devices what you want to control. The maximum current of one GPIO pin is 30 mA, the maximum total current for the seven pins is 180 mA.

See the LDC settings for GPIO port in the [GPIO](#) section. See also the details about the Event Manager settings in the [Event Manager](#) section.

### 5.7.3. USB Control Interface

The device can be controlled over front panel USB mini B-type connector. This interface only supports LW3 protocol. The interface can be used to establish the connection to Lightware Device Controller software.

### 5.7.4. Ethernet Control Interface

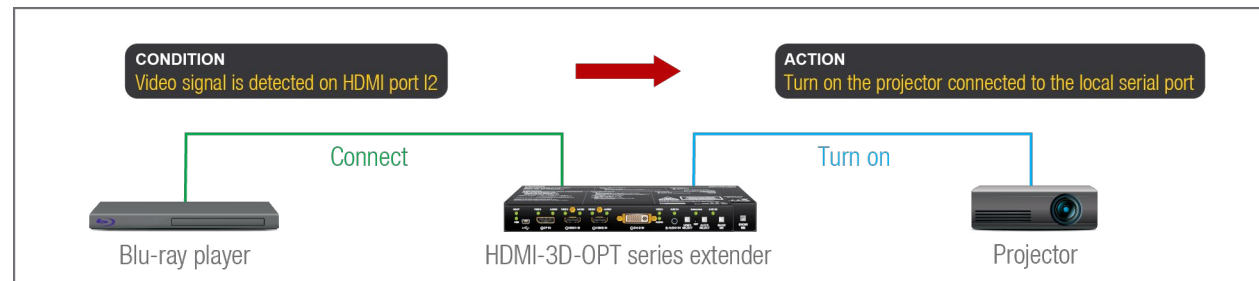
INFO: Only SW4-OPT-TX240RAK model has Ethernet control interface.

The device can be controlled over rear panel standard RJ45 connector. The interface can be used to establish the connection to Lightware Device Controller software.

## 5.8. Further Built-in Features

### 5.8.1. Automatically Launched Actions - The Event Manager

The Event Manager feature means that the device can sense changes on its ports and is able to react according to the pre-defined settings. Lightware Device Controller contains a user-friendly software tool and allows to create Events by defining a Condition and an Action.



*Event Manager example*

See more information about the settings in the [Event Manager](#) section.

### 5.8.2. Advanced EDID Management

#### Factory Preset EDIDs

The factory EDIDs (F1-F136) are factory preprogrammed and cannot be modified. These are the most common resolutions. They are specially provided to force graphic cards to output only the exact pixel resolution and refresh rate.

Universal EDID allows multiple resolutions including all common VESA defined resolutions. The use of universal EDID is recommended for fast and easy system setup.

### Sources and Destinations

The EDID memory consists of four parts:

- **Factory EDID** list shows the pre-programmed EDIDs (F1-F136).
- **Dynamic EDID** list shows the display device connected to the device's outputs. The unit stores the last display devices' EDID on either output, so there is an EDID shown even if there is no display device attached to the output port at the moment.
- **User memory** locations (U1 – U14 for the transmitter; U1 – U15 for the receiver) can be used to save custom EDIDs.
- **Emulated EDID** list shows the currently emulated EDID for the inputs. The source column displays the memory location that the current EDID was routed from.

The source reads the EDID from the Emulated EDID memory on the INPUT port. Any EDID from any of the User/Factory/Dynamic EDID lists can be copied to the user memory.

There are two types of emulation: **static** and **dynamic**.

- **Static EDID emulation:** an EDID from the Factory or User EDID list is selected. Thus, the Emulated EDID remains the same until the user emulates another EDID.
- **Dynamic EDID emulation:** it can be enabled by selecting D1 or D2 EDID memory. The attached monitor's EDID is copied to the input; if a new monitor is attached to the output, the emulated EDID changes automatically.

See more information about the settings in the [EDID Menu](#) section.

### 5.8.3. Extender Cloning – Configuration Backup and Restore



The configuration cloning of HDMI-3D-OPT series devices is a simple method that eliminates the need to repeatedly configure certain devices to have identical (non-factory) settings. If the devices are installed in the same type of system multiple times then it is enough to set up only one device to fit the user's needs and then copy those settings to the others, thus saving time and resources.

See more information about the settings in the [Configuration Cloning \(Backup Tab\)](#) section.

## 5.9. Software Control Modes

User has more possibilities to control the device besides the front panel buttons. The following list contains the software control modes:

- **Lightware Device Controller (LDC)** - you can connect to the device via our control software using Ethernet or RS-232 interface and control or configure the device as you wish. For the details see the [Software Control - Lightware Device Controller](#) chapter.
- **LW2 protocol commands**: you can configure the device by using the reduced command set of LW2 protocol. For more details see the [LW2 Programmer's Reference](#) chapter.
- **LW3 protocol commands**: you can configure the device by using the full-range command set of LW3 protocol. For more details see the [LW3 Programmer's Reference](#) chapter.

# 6

## Software Control - Lightware Device Controller

The device can be controlled by a computer through USB, RS-232 and Ethernet (only for SW4-OPT-TX240RAK model) interfaces by the Lightware Device Controller (LDC). The software can be installed on a Windows PC or macOS. The application can be downloaded from [www.lightware.com](http://www.lightware.com).

- ▶ INSTALL AND UPDATE
- ▶ RUNNING THE LDC
- ▶ ESTABLISHING THE CONNECTION
- ▶ CROSSPOINT / PORT CONTROL MENU
- ▶ PORT PROPERTIES WINDOWS
- ▶ DIAGNOSTIC TOOLS
- ▶ USB KVM
- ▶ EDID MENU
- ▶ CONTROL / DEVICE CONTROL MENU
- ▶ EVENT MANAGER
- ▶ SETTINGS MENU
- ▶ CONFIGURATION CLONING (BACKUP TAB)
- ▶ ADVANCED VIEW WINDOW



## 6.1. Install and Update

**INFO:** After the installation, the Windows and the macOS applications have the same look and functionality.

### Minimum System Requirement

**RAM:** 1 GB

**Minimum display resolution:** 1280x720

### 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 macOS	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 macOS

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.

**ATTENTION!** Please check the **firewall settings** on the macOS device. LDC needs to be added to the exceptions of the blocked software for the proper operation.

### Updating LDC

**Step 1.** Run the application.

The **Device Discovery** window appears automatically and the program checks the available updates on Lightware's website, and opens the update window if LDC updates are found.

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

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

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

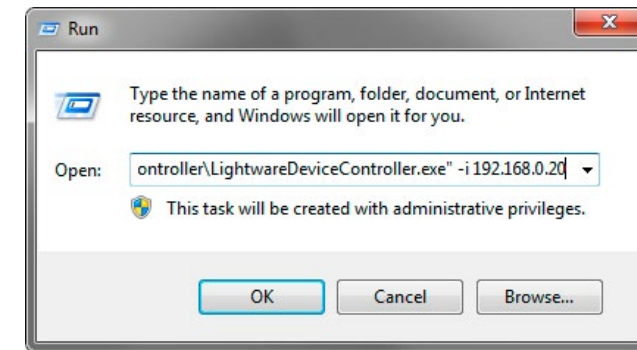
- If you do not want to check for the updates automatically, uncheck **the circle** that contains the green tick.
- If you want to postpone the update, a reminder can be set with different delays from the **drop down list**.
- If the proxy settings traverse the update process, set the proper values then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

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

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

## 6.2. Running the LDC

The common way to start the software is to double-click on the LDC icon. But the LDC can also be run by command line parameters as follows:



*Launching of LDC in a Run window in Windows operating system*

### Connecting to a Device with Static IP Address

**Format:** LightwareDeviceController -i <IP\_address>:<port>

**Example:** LightwareDeviceController -i 192.168.0.20:6107

The LDC is connected to a device with the indicated static IP address directly; the Device Discovery window is not displayed. When the port number is not set, the default port is used: 10001 (LW2 protocol). For LW3 devices, use the **6107** port number.

### Adjusting the Zoom

The window can be zoomed to a specific value to fit to the resolution of the desktop (higher/lower). '1' is the default value (100%).

**Format:** LightwareDeviceController -z <magnifying\_value>

**Example:** LightwareDeviceController -z 1.2

**ATTENTION!** The last set value is stored and applied when LDC is started without a parameter.

### 6.3. Establishing the Connection

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

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

#### Changing the IP Address

To modify IP address settings quickly, it is not necessary to enter the device's settings/network menu, you can set them by clicking on the pencil icon next to the IP address.

You can see the new settings only in this window.

*#network #ipaddress #dhcp #mac*

#### Identifying the Device

Clicking on the icon makes the four front panel LEDs blink in green for 10 seconds. The feature helps to identify the device itself in the rack shelf. *#identifyme*

#### Import/Export the List of Favorite Devices

**DIFFERENCE:** This feature is available only from LDC version v2.5.5.

The list of favorite devices can be exported/imported using the dedicated buttons (saved as \*.JSON file). The list can be imported later (in another computer, too), but please note that the current list will be overwritten by the imported list.

This will change the IP address settings of the selected device remotely.

DHCP  Fix IP

Serial number: 00004148

IP Address: 192.168.0.100

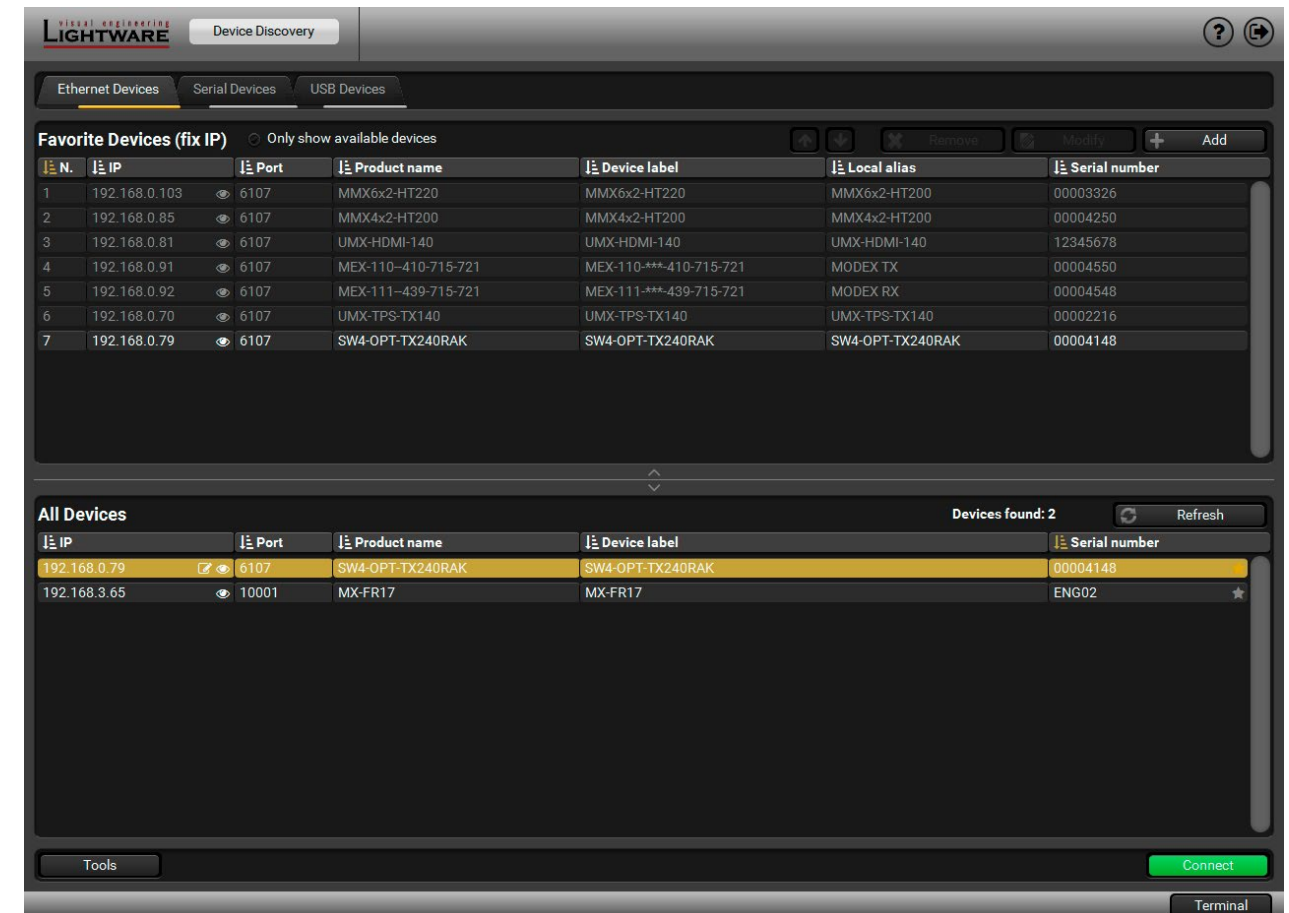
Network mask:

Default gateway:

#### Device Discovery Window

**Step 1.** Connect the device to a computer via USB, RS-232 or Ethernet.

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



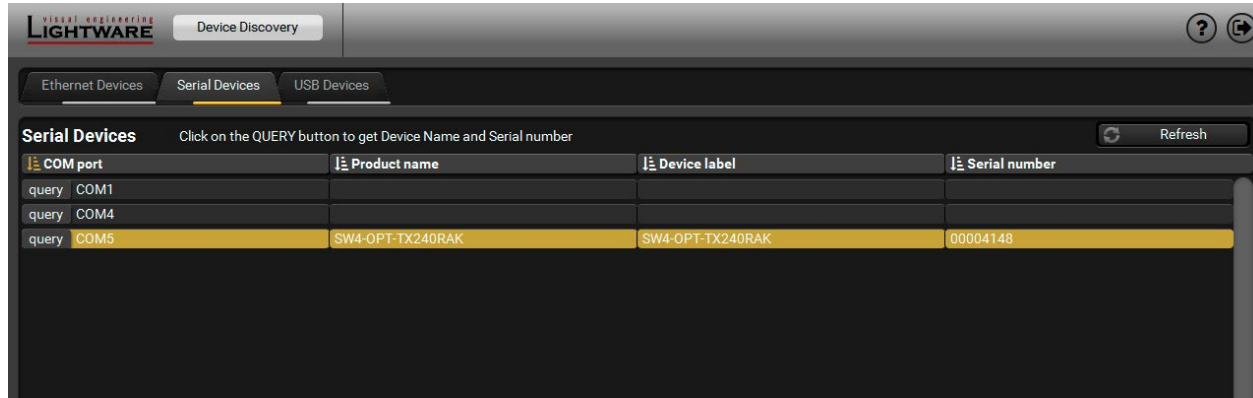
The screenshot shows the 'Device Discovery' window in the LDC software. It has tabs for 'Ethernet Devices', 'Serial Devices', and 'USB Devices'. The 'Favorite Devices (fix IP)' section is selected, showing a table of discovered devices. Below it, the 'All Devices' section shows a summary of 'Devices found: 2' and a 'Refresh' button. At the bottom, there are 'Tools' and 'Connect' buttons, and a 'Terminal' button.

N.	IP	Port	Product name	Device label	Local alias	Serial number
1	192.168.0.103	6107	MMX6x2-HT220	MMX6x2-HT220	MMX6x2-HT200	00003326
2	192.168.0.85	6107	MMX4x2-HT200	MMX4x2-HT200	MMX4x2-HT200	00004250
3	192.168.0.81	6107	UMX-HDMI-140	UMX-HDMI-140	UMX-HDMI-140	12345678
4	192.168.0.91	6107	MEX-110-410-715-721	MEX-110-***-410-715-721	MODEX TX	00004550
5	192.168.0.92	6107	MEX-111-439-715-721	MEX-111-***-439-715-721	MODEX RX	00004548
6	192.168.0.70	6107	UMX-TPS-TX140	UMX-TPS-TX140	UMX-TPS-TX140	00002216
7	192.168.0.79	6107	SW4-OPT-TX240RAK	SW4-OPT-TX240RAK	SW4-OPT-TX240RAK	00004148

IP	Port	Product name	Device label	Serial number
192.168.0.79	6107	SW4-OPT-TX240RAK	SW4-OPT-TX240RAK	00004148
192.168.3.65	10001	MX-FR17	MX-FR17	ENG02

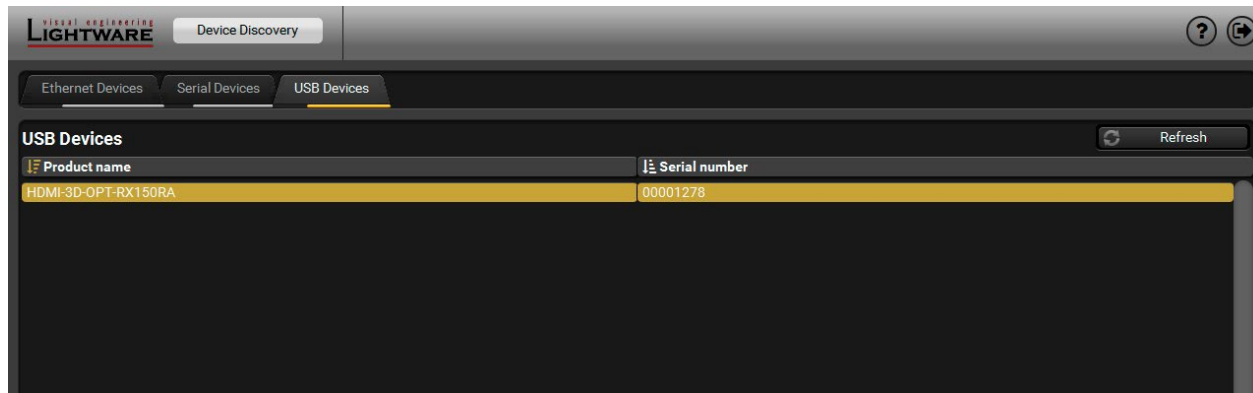
Device discovery window in LDC

**Step 3.** Select the unit from the discovered Ethernet devices or under Serial devices; when the device is connected through RS-232 click on the **Query** button next to the desired serial port to display the device's name and serial number. Double click on the transmitter or select the device and click on the **Connect** button.



Serial devices tab in LDC

**ATTENTION!** Before the device is connected via the local RS-232 port, make sure that **Control mode** and **LW3 protocol** are set on the serial port.



USB tab in LDC

### 6.4. Crosspoint / Port Control Menu

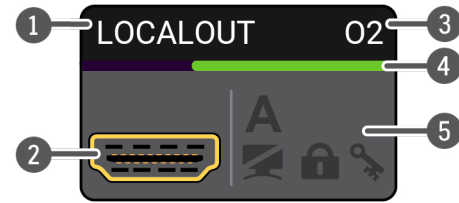


- 1 **Main menu** The available menu items are displayed. The active one is showed with dark grey background color.
- 2 **Information ribbon** The label shows the device label which can be edited in the Settings menu - **Status** tab. Device discovery window can be displayed by clicking on this ribbon.
- 3 **Video input ports** Each tile represents a video input port. The tile below the port shows the current crosspoint setting; if the port is switched to the output, the color of the tile is white, otherwise grey.
- 4 **Audio input ports** Each tile represents an audio input port. The tile below the port shows current crosspoint setting; if the port is switched to the output, the color of the tile is white, otherwise grey. Dark grey means the audio port is not allowed to embed in the current video input port.
- 5 **Advanced view** Displaying the **Advanced View Window**, showing the Terminal window and the LW3 protocol tree.
- 6 **Audio output ports** The audio output of the optical link and local HDMI out ports. Clicking on the tile opens the **Digital Audio Outputs** port properties window.
- 7 **Video output ports** The video output of the optical link and local HDMI out ports. Clicking on the tile opens the **Video Outputs** port properties window. `#crosspoint #switch`

### Port Tiles

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

- 1 Port name
- 2 Port icon
- 3 Port number
- 4 Signal present indicator  
green: present  
grey: not present
- 5 State indicators



### State Indicators

Following icons display different states of the port/signal:

Icon	Icon is grey	Icon is black	Icon is green
	Signal is not encrypted with HDCP	Signal is encrypted with HDCP	-
	Port is unmuted	Port is muted	-
	Port is unlocked	Port is locked	-
	Autoselect is disabled	-	Autoselect is enabled

## 6.5. Port Properties Windows

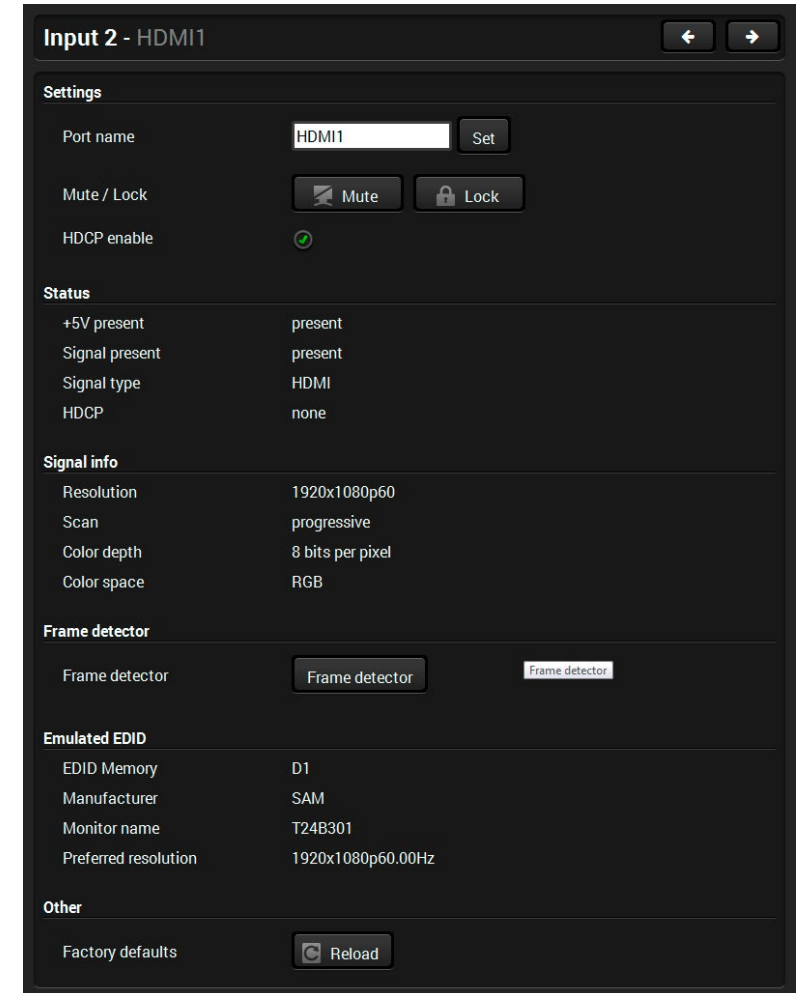
Clicking on the port tile opens the Port properties window. This section shows the available settings and status information by port types. #status #portstatus #mute #unmute #lock #unlock #hdcp #signaltype #power5v #audio #autoselect

### 6.5.1. Video Inputs

Clicking on the HDMI, DisplayPort, or DVI-D video input port icon results opening the Port properties window. The most important information and settings are available from the panel.

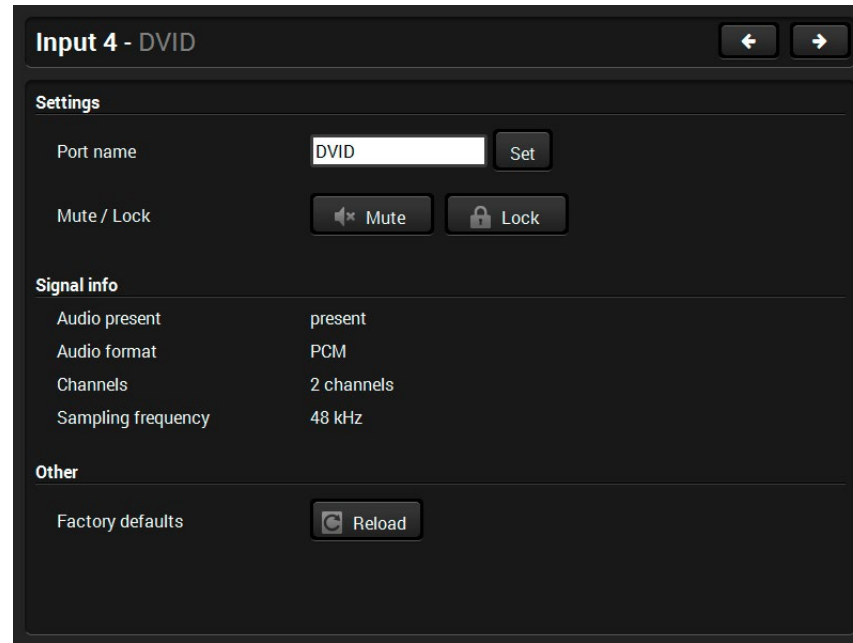
#### Available settings:

- Mute/unmute the port;
- Lock/unlock the port;
- HDCP setting (enable / disable);
- [Frame Detector](#);
- Reloading factory default settings for the selected port.



### 6.5.2. Digital Audio Inputs

Clicking on the HDMI, DisplayPort, or DVI-D audio input port icon results opening the Port properties window. The most important information and settings are available from the panel.



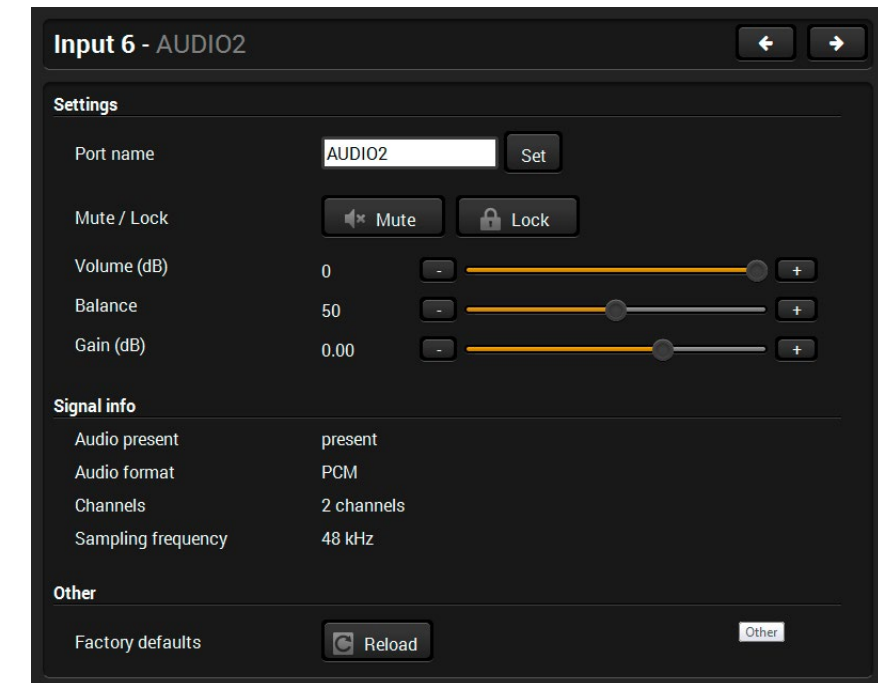
**Port properties window of the DVI-D audio input**

Certain parameters of the embedded audio input signal can be set as follows:

- Mute/unmute the port;
- Lock/unlock the port;
- Reloading factory default settings for the selected port.

### 6.5.3. Analog Audio Inputs

Clicking on the analog audio input port icon results opening the Port properties window. The most important information and settings are available from the panel



**Port properties window of the Analog Audio 2 (Phoenix) input**

Certain parameters of the analog audio input signal can be set as follows:

- Mute/unmute the port;
- Lock/unlock the port;
- Volume: from 0 dB to -95.62 dB, in step 0.375 dB (default is 0 dB);
- Balance: from 0 to 100, in step 1 (default is 50 = center);
- Gain: -12 to 6 dB, in step 3 dB (default is 0 dB);
- Reloading factory default settings for the selected port.

*#analogaudio #volume #balance #gain*

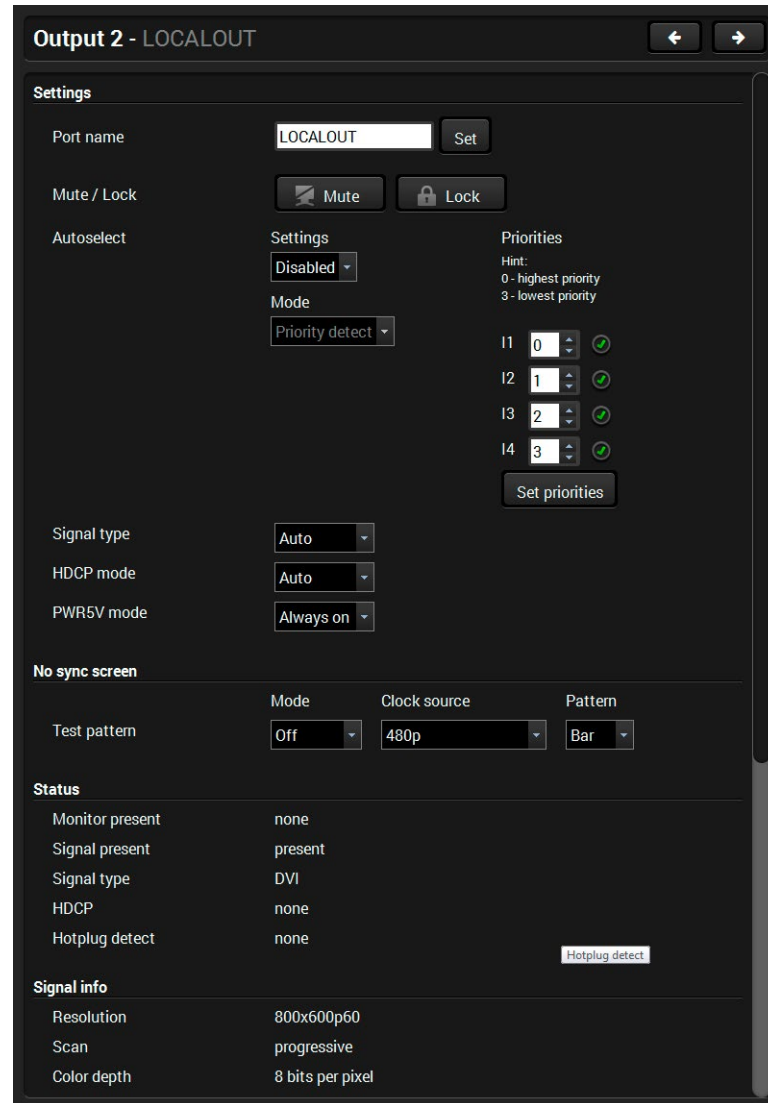


### 6.5.4. Video Outputs

Click on the output port to display its properties. The most important information and settings are available from the panel.

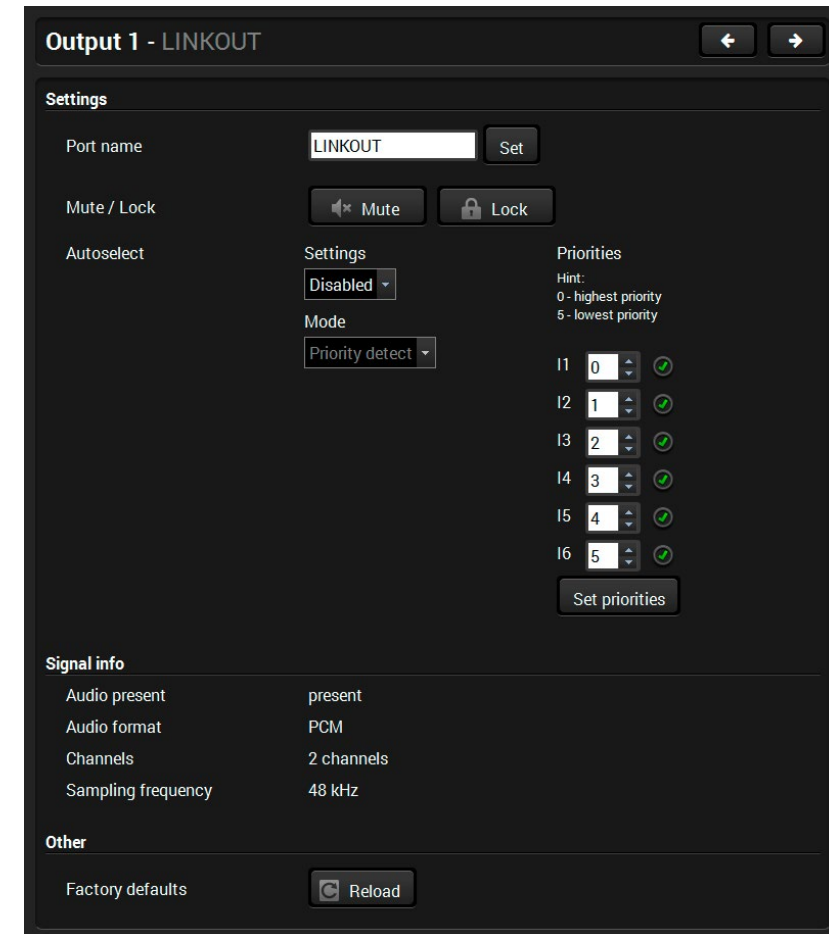
#### Available settings:

- Mute/unmute the port;
- Lock/unlock the port;
- **Autoselect settings:** enable / disable, mode, and priorities. (See more details about the feature in [The Autoselect Feature](#) section);
- **Signal type:** Auto / DVI / HDMI - The outgoing signal format can be selected by a drop-down menu;
- **HDCP mode:** Auto / Always - The transmitter forces the source sent the signal without encryption if the content allows when Auto mode is selected;
- **Power 5V mode:** Auto / Always on / Always off - The setting lets the source and the sink devices be connected – independently from the transmitted signal;
- **Laser enable:**
  - **On:** high-speed (AV signal) and low-speed (serial, USB) communications are transmitted.
  - **Standby:** only low-speed (serial, USB) communication is transmitted.
- **No sync screen:** configuration settings of the test pattern. See more details in the [No Sync Screen \(Test Pattern\)](#) section.
- [Frame Detector](#);
- Reloading factory default settings for the selected port.



### 6.5.5. Digital Audio Outputs

Click on the output port to display its properties. The most important information and settings are available from the panel.



*Port properties window of the optical link audio output*

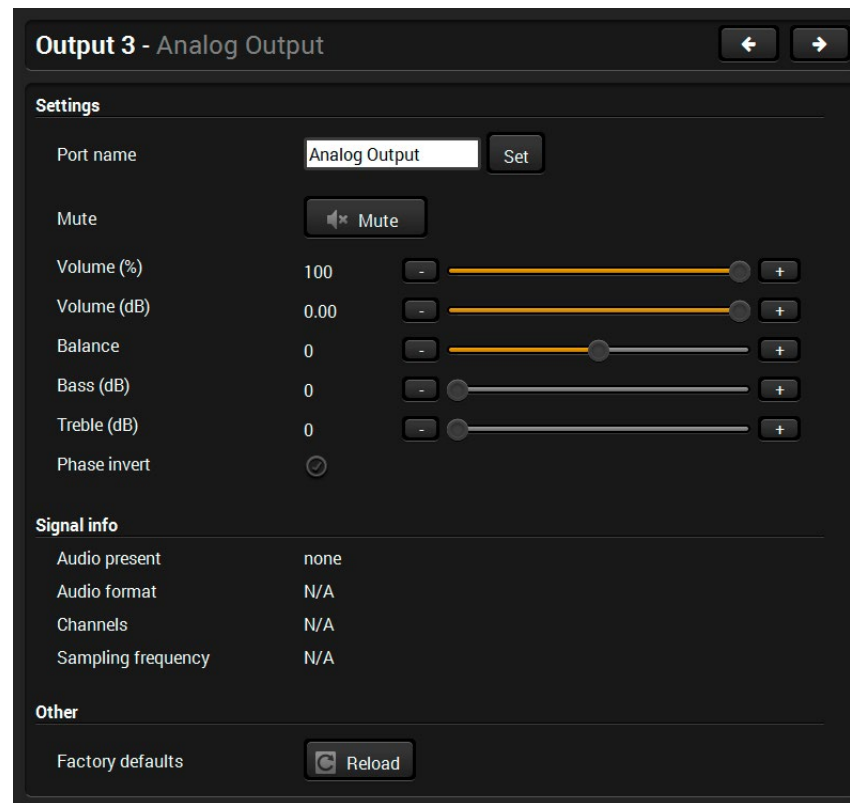
#### Available settings:

- Mute/unmute the port;
- Lock/unlock the port;
- **Autoselect settings:** enable / disable, mode, and priorities. (See more details about the feature in [The Autoselect Feature](#) section);
- Reloading factory default settings for the selected port.



### 6.5.6. Analog Audio Output

Click on the output port to display its properties. The most important information and settings are available from the panel.



**Port properties window of the analog audio output**

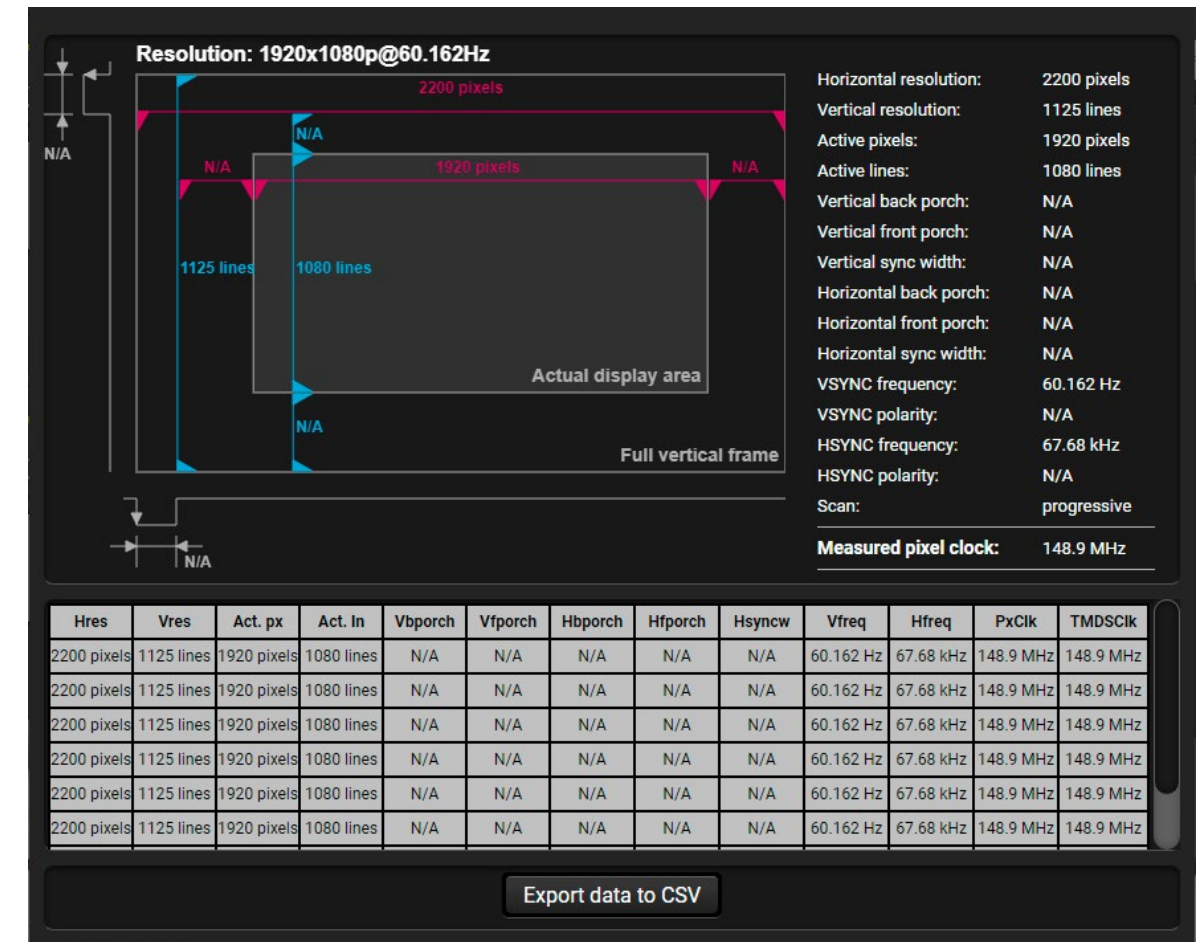
Certain parameters of the analog audio output signal can be set as follows:

- Mute/unmute the port;
- Lock/unlock the port;
- Volume (%): from 100% to 0%, in step 1% (default is 100%);
- Volume (dB): from 0 dB to -63 dB, in step 1 dB (default is 0 dB);
- Balance: from -100 to 100, in step 1 (default is 0 = center);
- Bass (dB): from 0 dB to 24 dB, in step 2 dB (default is 0 dB);
- Treble (dB): from 0 dB to 6 dB, in step 2 dB (default is 0 dB);
- Phase invert: enable / disable;
- Reloading factory default settings for the selected port.

## 6.6. Diagnostic Tools

### 6.6.1. Frame Detector

The ports can show detailed information about the signal, like full size and active video resolution. This feature is a good troubleshooter if compatibility problems occur during system installation. To access this function, open the port properties window and click on the **Frame detector** button. `#framedetector #diagnostic`

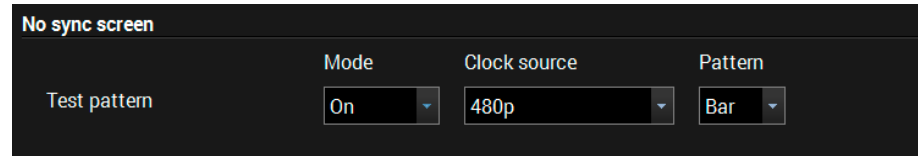


**Frame detector window**

Lightware's Frame Detector function works like a signal analyzer, and makes it possible to determine the exact video format that is present on the port, thus helping to identify many problems. E.g. actual timing parameters may differ from the expected, and this may cause some displays to drop the picture.

Frame Detector measures detailed timings on the video signals just like a built-in oscilloscope, but it is much more easy to use. The actual display area shows the active video size (light grey). The dark grey area of the full frame is the blanking interval, which can contain the info frames and embedded audio data for HDMI signals. Shown values are measured directly on the signal and not retrieved only from the HDMI info frames.

### 6.6.2. No Sync Screen (Test Pattern)



#### *Test pattern options in the port properties window of the optical output*

The No sync screen feature generates an image which can be displayed when there is no incoming signal on the port. The following settings can be set for the Test Pattern function:

#### Mode

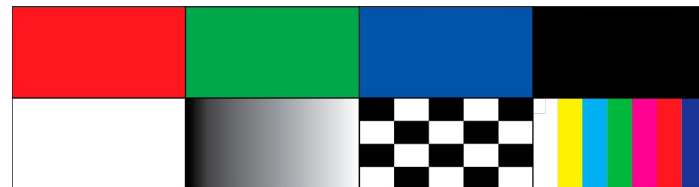
- **On:** the video output port always transmits the test pattern.
- **No signal:** the video output port transmits the test pattern if there is no incoming signal on the selected input port.
- **Off:** the test pattern function is disabled, the video output port transmits the video signal of the selected input port.

#### Clock Source

- 480p
- 576p
- Original video signal

#### Pattern

- Red
- Green
- Blue
- Black
- White
- Ramp
- Chess
- Bar
- Cycle



#testpattern #nosyncscreen

## 6.7. USB KVM

### 6.7.1. USB KVM in the Receiver



#### *USB KVM layer in the Receiver*

Two USB modes can be set on the USB KVM tab: **Transparent** and **Composite**. For the detailed information about the these modes see the [USB KVM Function](#) section.

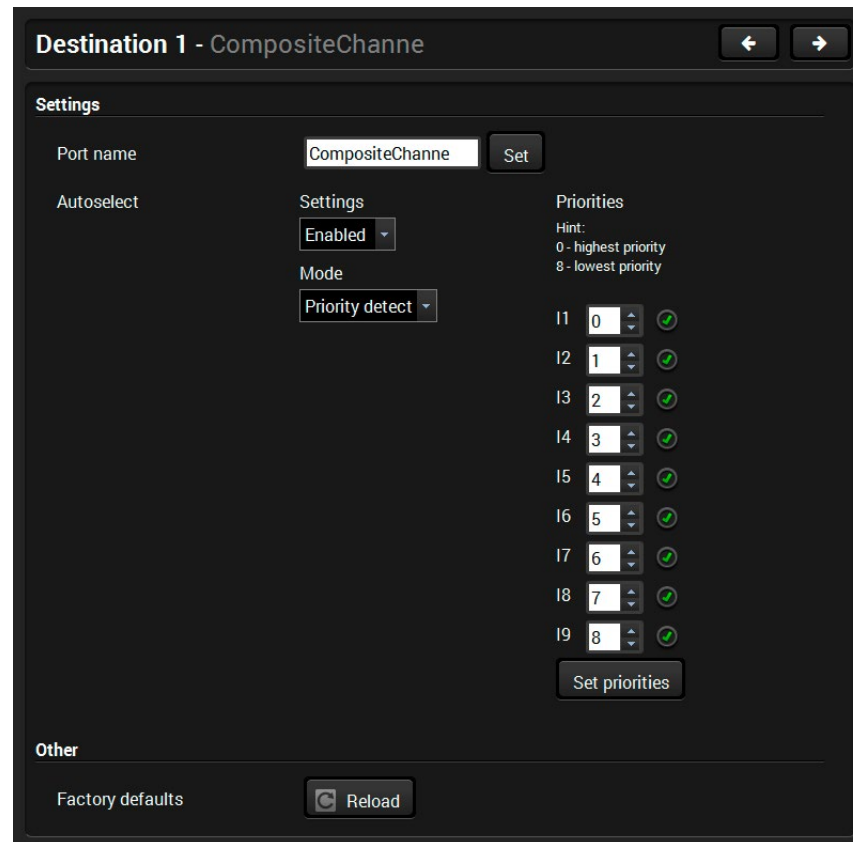
You can use the crosspoint selectors for switching between the USB modes. The factory default settings is the **Autoselect** (indicated with green A on the output side) which means the extender recognizes the attached USB HID devices and sets the mode automatically. In this case the A icon is highlighted in green on the output ports.

You can recall the default crosspoint settings by clicking on the **Reset XP** button.

#kvm #usbkvm #switch #crosspoint

## Port Properties

Click on the output port to open the port properties window. The most important status information is displayed on the panel and the **Autoselect mode** and the **priorities** can be set.



**Port properties window - Composite mode**

## Using of USB HUBs



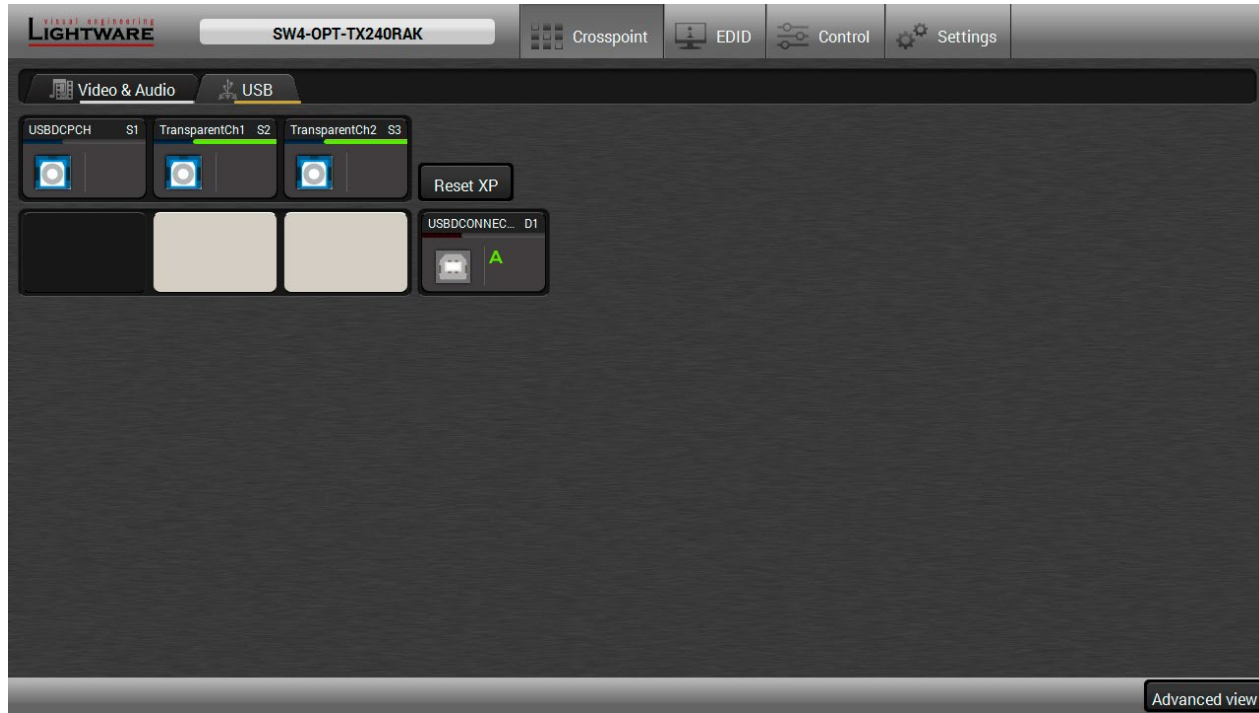
### **USB KVM layer in case of a connected 4-port USB HUB**

The receiver is built with two physical USB ports but the users are able to extend the number of the handled HID-compliant devices using USB HUBs. The extender can handle up to 5 USB ports.

**ATTENTION!** The transparent channels can handle one USB device only, the composite channel can handle more HID-compliant devices.



### 6.7.2. USB KVM in the Transmitter



**USB KVM layer in the Transmitter**

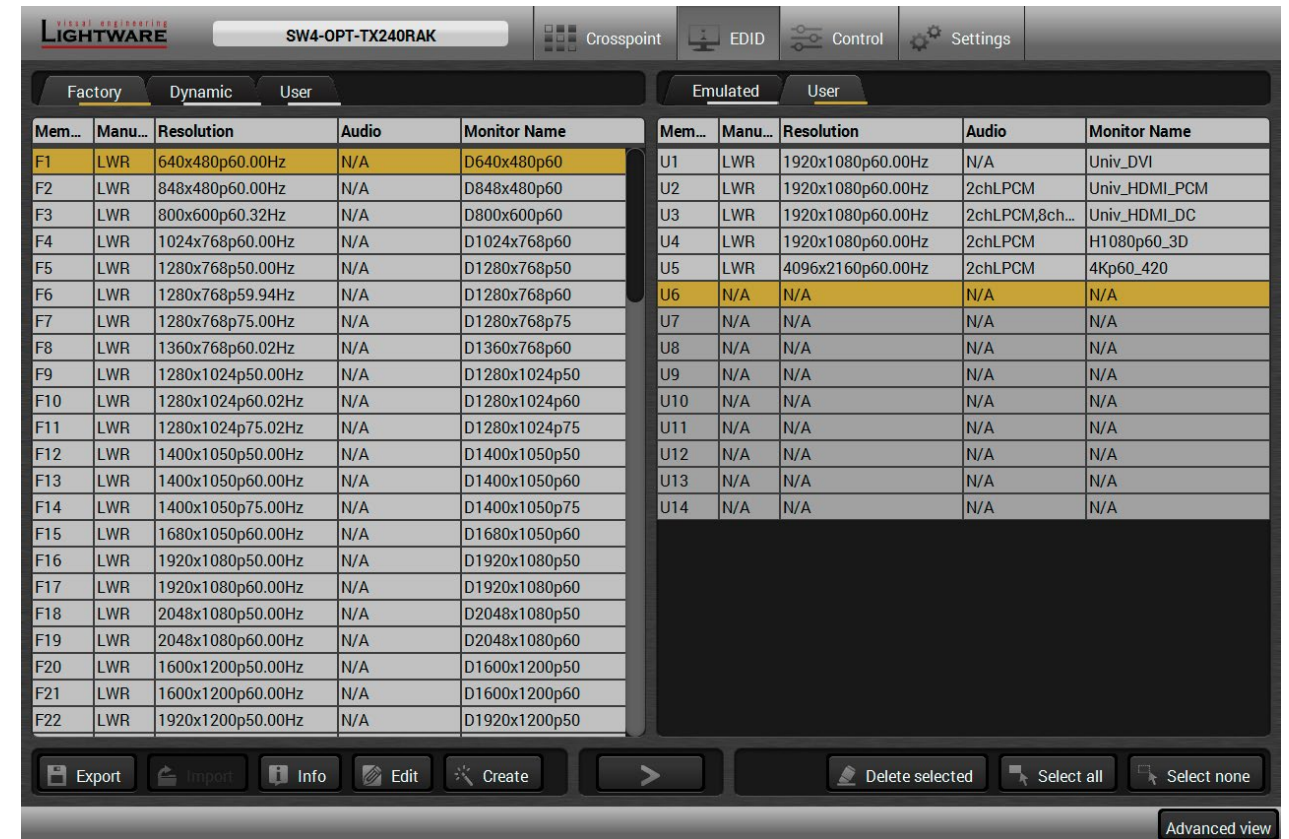
The crosspoint status can be set on the USB KVM tab. USB mode can be **Transparent** or **Composite**, see the details in the [USB KVM Function](#) section. The green highlights indicate the active USB mode. The USB KVM function works only if crosspoint is set to the active USB channel.

You can recall the default crosspoint settings by clicking on the **Reset XP** button.

**INFO:** Crosspoint switching in the transmitter between the composite and transparent channels will be successful only in the case of presence of active USB devices on the receiver side.






### 6.8. 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.







**EDID menu**

#### Control Buttons


-  Export: Exporting an EDID (save to a file)
-  Import: Importing an EDID (load from a file)
-  Info: Display EDID Summary window
-  Edit: Opening Advanced EDID Editor with the selected EDID
-  Create: Opening Easy EDID Creator

#### #edid

-  Transfer button: executing EDID emulation or copying
-  Delete selected: Deleting EDID (from User memory)
-  Select all: Selecting all memory places in the right panel
-  Select none: Selecting none of the memory places in the right panel

### 6.8.1. 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 macOS 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 (line will be highlighted with yellow). 
- Step 2.** Press the **Export** 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 **Import** 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.

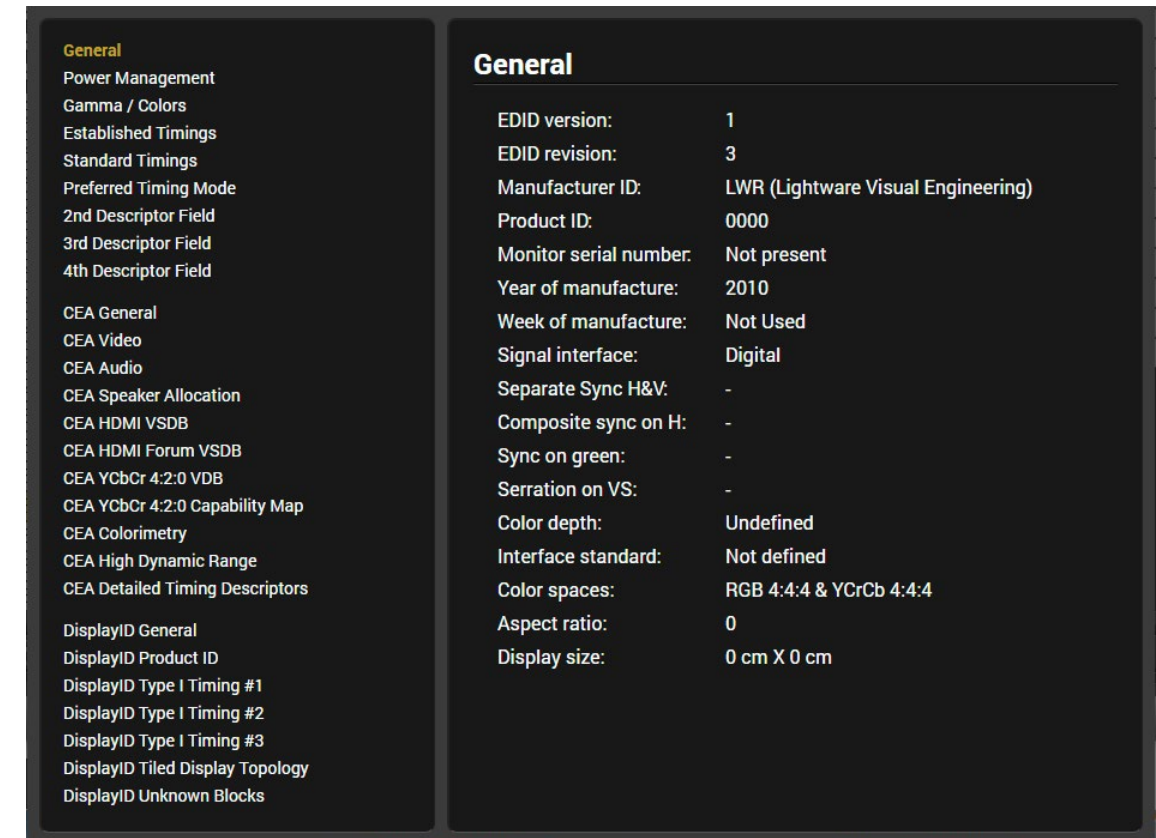
#### Deleting EDID(s)

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 “Select None” buttons can be used). The EDID(s) will be highlighted with yellow.
- Step 3.** Press the **Delete selected** button to delete the EDID(s).

### 6.8.2. EDID Summary Window

Select an EDID from the Source panel and press the **Info** button to display the EDID summary. 



The screenshot shows the EDID summary window with two main panels. The left panel lists various EDID categories, and the right panel displays the details for the selected 'General' section.

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 VSDB	
CEA HDMI Forum VSDB	
CEA YCbCr 4:2:0 VDB	
CEA YCbCr 4:2:0 Capability Map	
CEA Colorimetry	
CEA High Dynamic Range	
CEA Detailed Timing Descriptors	
DisplayID General	
DisplayID Product ID	
DisplayID Type I Timing #1	
DisplayID Type I Timing #2	
DisplayID Type I Timing #3	
DisplayID Tiled Display Topology	
DisplayID Unknown Blocks	

General	
EDID version:	1
EDID revision:	3
Manufacturer ID:	LWR (Lightware Visual Engineering)
Product ID:	0000
Monitor serial number:	Not present
Year of manufacture:	2010
Week of manufacture:	Not Used
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
Display size:	0 cm X 0 cm

*EDID summary window*



### 6.8.3. Editing an EDID

Select an EDID from the Source panel and press the Edit button to display the Advanced EDID Editor window. The editor can read and write all descriptors, which are defined in the standards, including the additional CEA extensions. 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 Application Notes](#).



**Basic EDID**

- Vendor / Product Information
- Display Parameters
- Power Management and Features
- Gamma / Color and Established Timings
- Standard Timings
- Preferred Timing Mode
- 2nd Descriptor Field
- 3rd Descriptor Field
- 4th Descriptor Field
- CEA Extension
- General
- Video Data
- Audio Data
- Speaker Allocation Data
- HDMI VSDB
- HDMI Forum VSDB
- YCbCr 4:2:0 VDB
- YCbCr 4:2:0 Capability Map
- Colorimetry
- High Dynamic Range
- Detailed Timing Descriptor #1
- Detailed Timing Descriptor #2
- Detailed Timing Descriptor #3
- Detailed Timing Descriptor #4
- Detailed Timing Descriptor #5
- Detailed Timing Descriptor #6
- Display ID Extension
- Product ID
- Type I Timing Descriptor #1
- Type I Timing Descriptor #2
- Type I Timing Descriptor #3
- Tiled Display Topology
- Unknown DisplayID Data
- Save EDID

#### EDID Byte Editor

	0	1	2	3	4	5	6	7	8	9
0	00	FF	FF	FF	FF	FF	FF	00	32	F2
10	00	00	00	00	00	00	00	14	01	03
20	80	00	00	78	0E	EE	91	A3	54	4C
30	99	26	0F	50	54	00	00	00	01	01
40	01	01	01	01	01	01	01	01	01	01
50	01	01	01	01	D8	09	80	A0	20	E0
60	2D	10	08	60	22	01	80	E0	21	00
70	00	18	00	00	00	10	00	00	00	00
80	00	00	00	00	00	00	00	00	00	00
90	00	00	00	FD	00	3B	3D	1E	20	03
100	01	0A	20	20	20	20	20	00	00	
110	00	FC	00	34	4B	70	36	30	5F	34
120	32	30	0A	20	20	20	01	DC		

EDID Editor window

### 6.8.4. Creating an EDID - Easy EDID Creator

Since the 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 Application Notes](#).



**Select Resolution & Interface**

Video Format

Audio Format

Finish

Back
Next

#### Select Resolution & Interface

Welcome to the Easy EDID Creator!

With this software you are able to create a unique EDID according to your demands. Details can be added or changed in the Advanced EDID Editor later if needed.

Please select the format type and the preferred resolution. If you don't find the proper mode in the list, use the Custom format type setting, enter the resolution and the program will estimate the best blanking times.

**Important notes:**

- If you want to send audio then you must select HDMI or DisplayPort. DVI and VGA do not support audio transmission.
- Most DVI displays are not able to process HDMI signals. If you have a DVI display, please check its specifications.
- The supported color depth will be 24bits/pixel by default.
- USB TYPE-C means DisplayPort interface over a different physical interface.

Format type: Broadcast

Resolution: 640x480p60

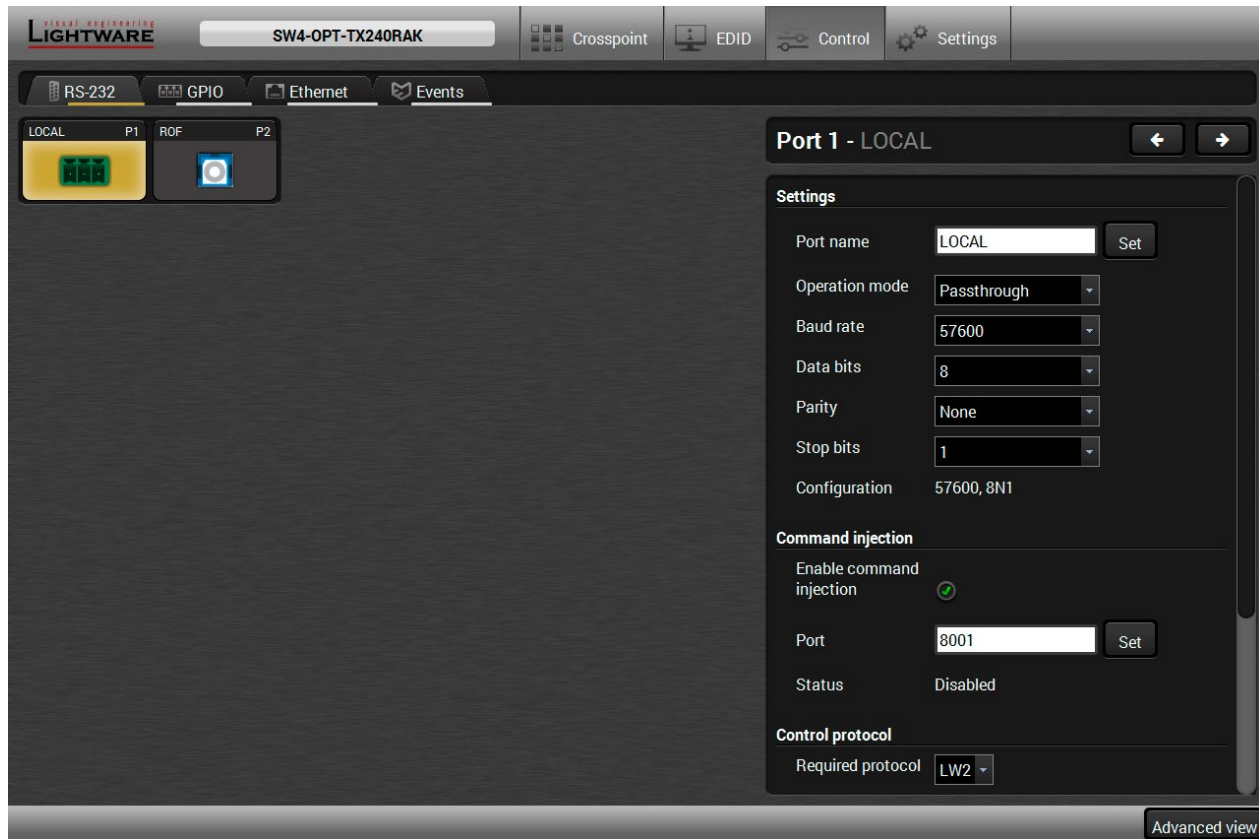
VGA
DVI
HDMI
DisplayPort
USB TYPE-C

EDID Creator window



## 6.9. Control / Device Control Menu

### 6.9.1. RS-232

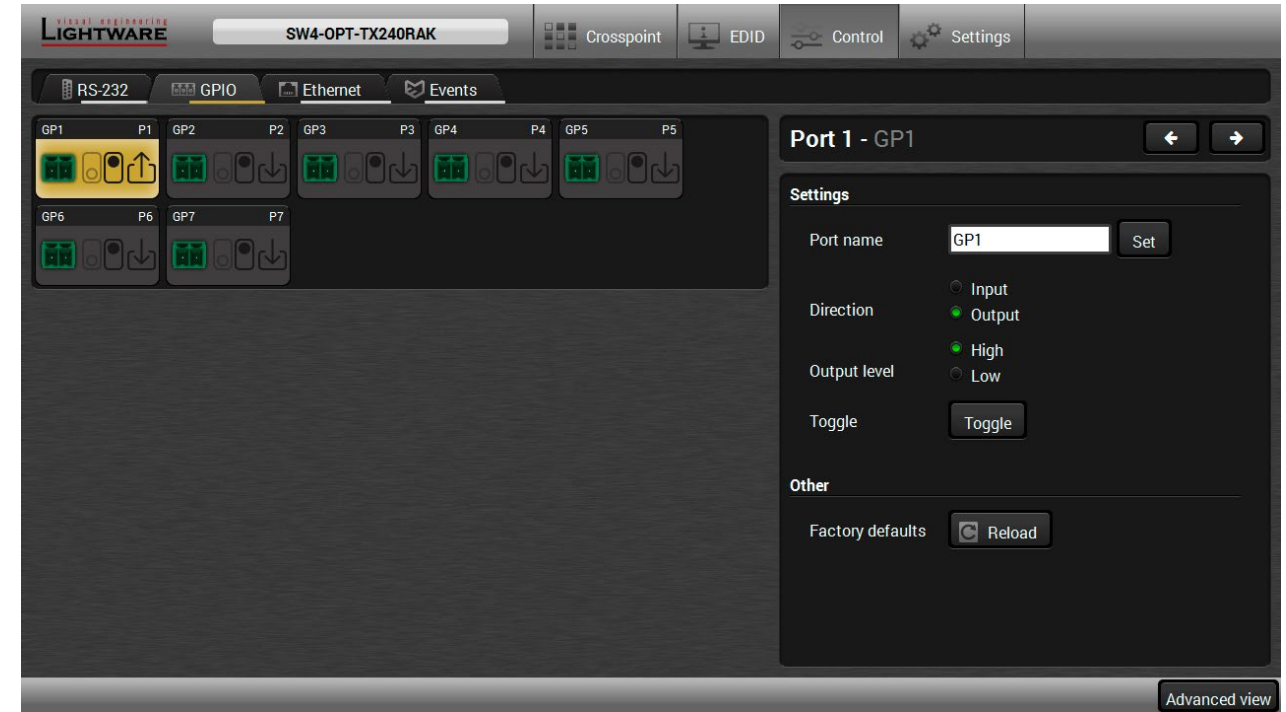


*RS-232 tab in Control menu*

The following settings and functions are available on the **local** and **optical link** RS-232 port:

- **Operation mode:** Control, Pass-through, and Command Injection (for more details about serial interface modes see the [Serial Interface](#) section);
- Baud rate: 4800, 7200, 9600, 14400, 19200, 38400, 57600, 115200;
- Data bits: 8 or 9;
- Parity: None, Odd, or Even;
- Stop bits: 1, 1.5, or 2;
- Command injection: enable or disable;
- Command injection port number;
- Control protocol: LW2 or LW3;
- Message sending via serial port;
- Reloading the [Factory Default Settings](#). `#rs232 #rs-232 #serial #protocol #message #commandinjection`

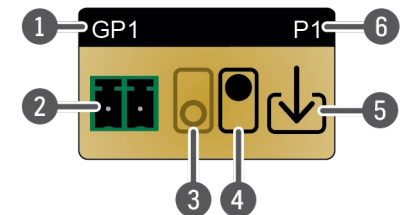
### 6.9.2. GPIO



*GPIO tab in Control menu*

The GPIO port has 7 pins, which operate at TTL digital signal levels and can be controlled by LDC or protocol commands. Select a GPIO pin and under the Port settings section; the settings (pin direction and input level) are displayed on the port tiles as well:

- |   |                     |   |   |
|---|---------------------|---|---|
| 1 | GPIO pin name       | 4 | High level indicator *                                  |
| 2 | GPIO port icon      | 5 | Pin direction:<br>Input: down arrow<br>Output: up arrow |
| 3 | Low level indicator | 6 | GPIO port number  |

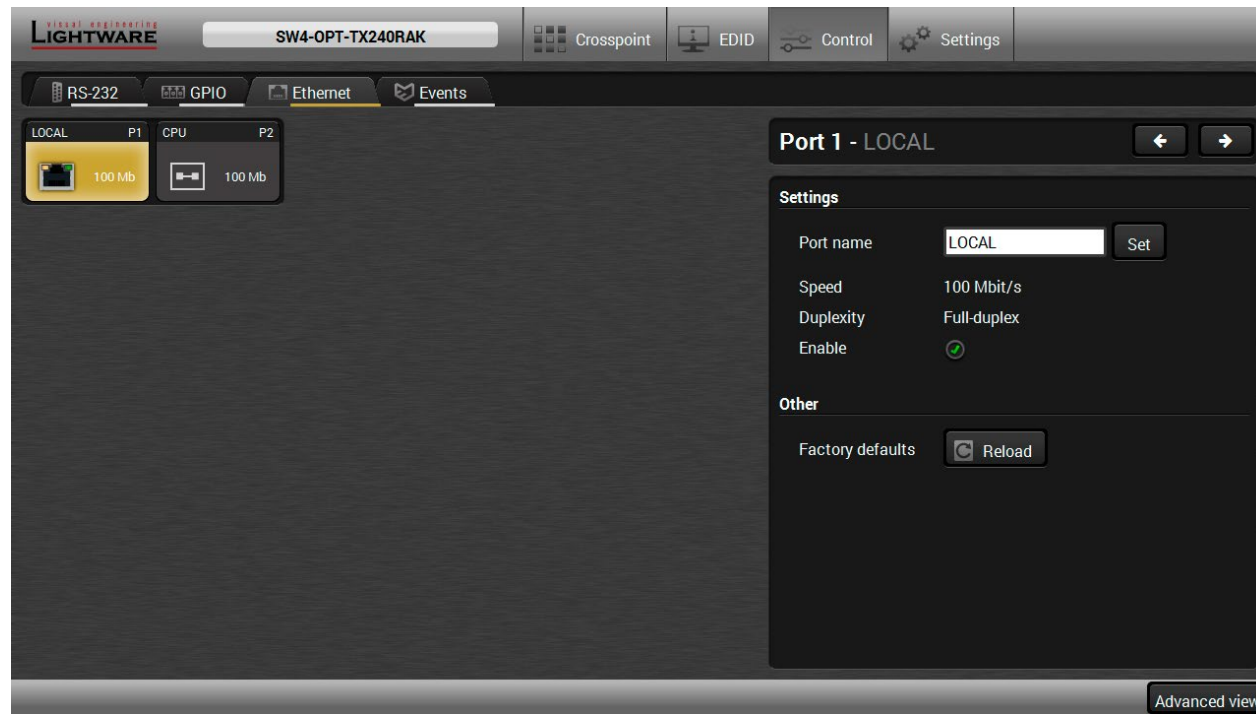


\* Highlighted with black means the current setting.

**INFO:** Output level can be set only in case of setting the pin direction to Output. In case of input direction the output level setting and the Toggle button is not available.

For more details about GPIO interface see the [GPIO Interface](#) section. `#gpio`

### 6.9.3. Ethernet



**Ethernet tab in Control menu**

Two ports are displayed in the Ethernet settings: Local and CPU. You can check the status of the Ethernet line by each ports: the speed and the duplexity of the connection.

The following settings are available for the local port:

- Enable / disable the port;
- Reloading factory defaults.

**ATTENTION!** If the Ethernet port is set to disabled, this may break the connection with the device.

**INFO:** CPU Ethernet port cannot be disabled.

#ethernet

### 6.10. Event Manager

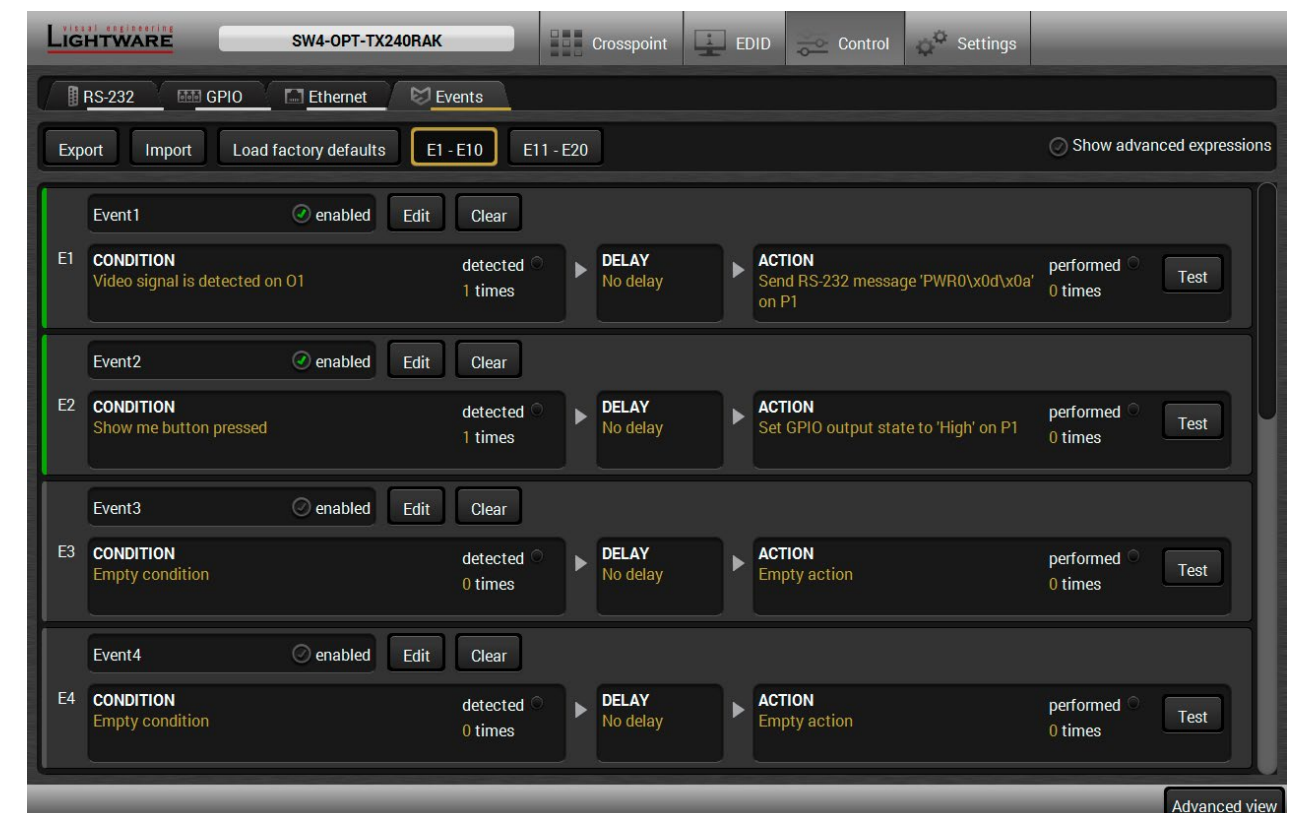
The feature means that the device can sense changes on its ports and able to react according to the pre-defined settings. The development idea of the Event manager is based on users' feedbacks. In many cases internal events (such as signal present or HDCP active) are necessary to display but it is not easy when the device is hard to access (e.g. built under the desk). For more details and examples about Event Manager please visit our website ([www.lightware.com](http://www.lightware.com)) and download **Event Manager user's guide** in the Downloads section.



The Event manager can be configured to perform an action if a condition has been detected. E.g. the desired setup is that after a certain type of signal has been detected on I1 port, the port has to be switched to O1. The settings can be done via the LDC in the Control/Events tab, or by LW3 protocol commands. Configurable events number depends on the device what you are using actually.

Numerous new ideas and requests have been received in connection with the features and settings of the Event manager since the first release. Therefore, the user interface has been re-designed and many new functions implemented. The Event editor can be opened by pressing the **Edit** button at each Event.

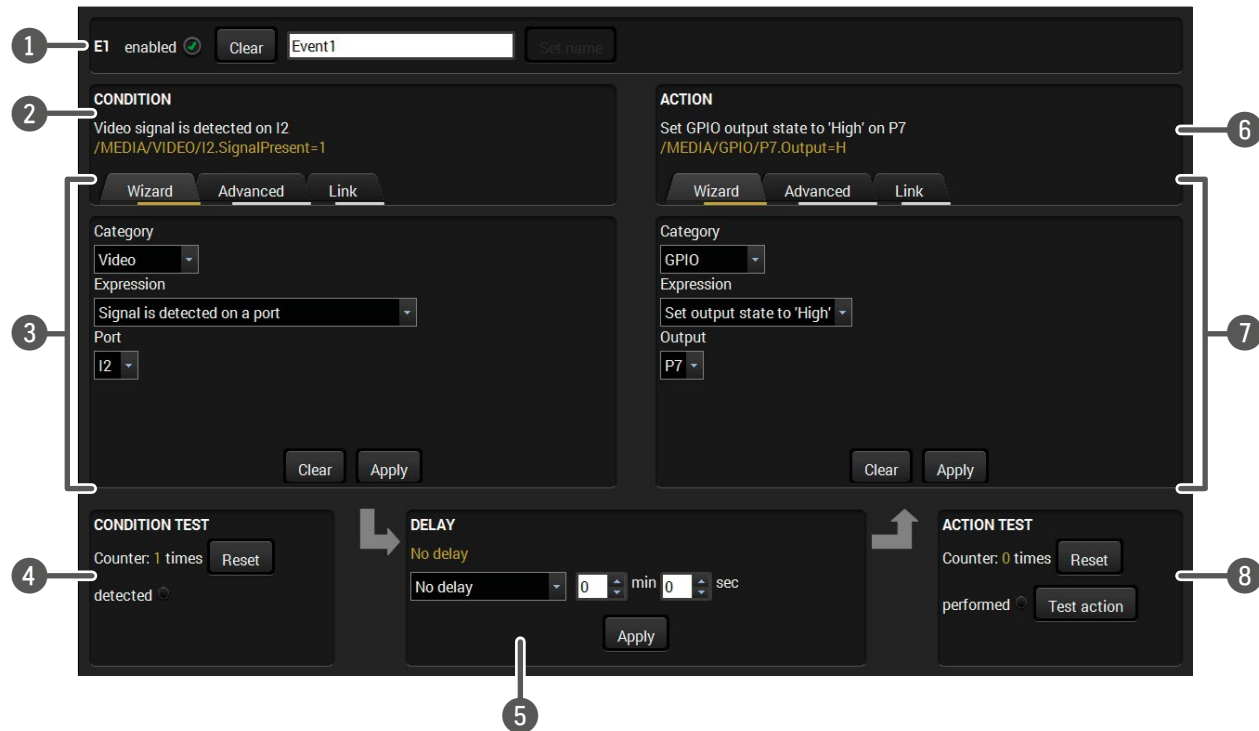
There is a **grey bar** on the left of the Event panel in each line. If a condition and an action are set and the Event is enabled, the bar is displayed in **green**. #eventmanager



**Control menu, Event Manager tab**

## The Event Editor

Press the **Edit** button in the desired Event line to open the Event editor window.



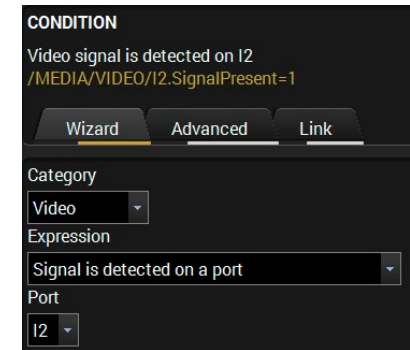
- 1 **Event header** The name of the Event is displayed. Type the desired name and press the Set name button. The Event can be cleared by the Clear button. Use the tick mark to enable/disable the Event.
- 2 **Condition header** If the condition is set, the description (white colored text) and the exact LW3 protocol expression (yellow colored text) can be seen. If the advanced mode was used the description is "Custom condition".
- 3 **Condition panel** The Wizard, the Advanced or the Link tool is available to set the condition. The parameters and settings are displayed below the buttons.
- 4 **Condition test** The set condition can be tested to see the working method in the practice.
- 5 **Delay settings** The action can be scheduled to follow the condition after the set time value.
- 6 **Action header** If the action is set, the description (white colored text) and the exact LW3 protocol expression (yellow colored text) can be seen. If the advanced mode was used the description is "Custom action".
- 7 **Action panel** The Wizard, the Advanced or the Link tool is available to set the action. The parameters and settings are displayed below the buttons.
- 8 **Action test** The set action can be tested to see the working method in the practice.

### 6.10.1. Create or Modify an Event

#### Wizard Mode

The wizard mode lists the most common conditions and actions, so the user does not have to look for LW3 nodes and properties.

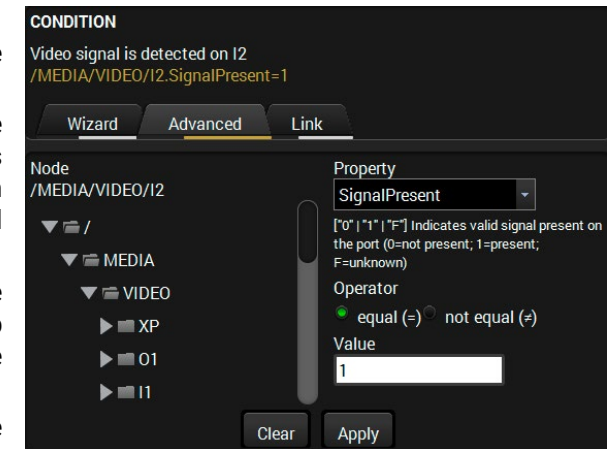
- Step 1. Click on the **Edit** button of the desired Event; the **Event editor** is displayed.
- Step 2. The wizard mode is displayed as default. Select the desired **Category** first (e.g. Audio or Video).
- Step 3. Select the desired **Expression** from the drop-down menu. If any other parameter is necessary to set, it is going to be displayed.
- Step 4. Press the **Apply** button to store the settings of the Condition.



#### Advanced Mode

The goal of this mode is the same as of the wizard: set the properties and methods for conditions and actions. The difference is the number of the available and usable properties and methods of the LW3 protocol. Advanced mode allows almost all of it.

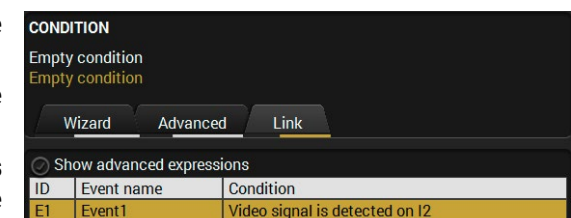
- Step 1. Click on the **Edit** button of the desired Event; the **Event editor** is displayed.
- Step 2. The wizard mode is the default, press the **Advanced** button. The LW3 protocol tree is displayed showing the list of the properties in the drop-down menu. Navigate to the desired node.
- Step 3. Select the desired **Property** from the menu. The **manual** of the property is displayed below to help to select the necessary property and to set the value.
- Step 4. Set the desired **value** and **operator**, then press the **Apply** button to store settings.



#### The Link Tool

The new interface allows creating more actions to the same condition. In that case, a condition can trigger more actions. To set such an Event, the Link tool has been introduced.

- Step 1. Click on the **Edit** button of the desired Event; the **Event editor** is displayed.
- Step 2. The wizard mode is displayed as default, press the **Link** button.
- Step 3. All the saved Events are analyzed and the **conditions** are listed (it takes some seconds to finish). The **Show advanced expressions** option allows showing the exact path and set the value of the given property.
- Step 4. Select the desired **Condition** and press the **Apply** button to store the settings.





### 6.10.2. Special Tools and Accessories

#### The Name of the Event

The name of a port can be changed by typing the new name and clicking the **Set** button. The following characters are allowed when naming:

Letters (A-Z) and (a-z), numbers (0-9), special characters: hyphen (-), underscore (\_), and space ( ).

#### Enable or Disable an Event

The set Event can be enabled or disabled in the Event list, or directly in the Event editor window by setting the **tick mark** beside the name.

#### Testing the Condition

When the desired Condition is arranged, the setting can be tested. The Event list and the Event editor contains a small panel that shows if the set condition is detected and how many times. The **Counter** can be reset by the button in Event editor. If the Condition is true, the **detected** mark turns green for two seconds and the **Counter** is increased.

#### Testing the Action

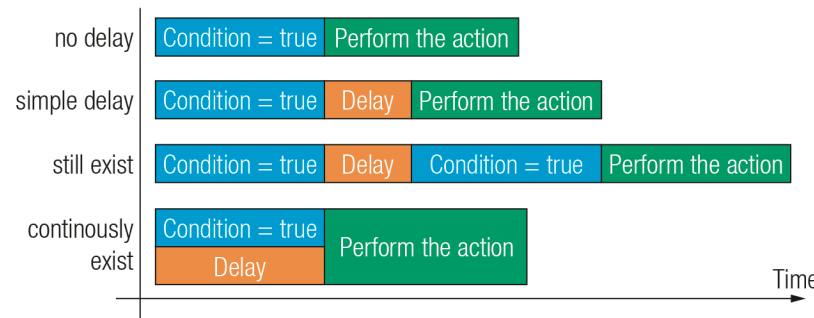
The method is the same as testing the Condition, but in this case, the Action can be triggered manually by pressing the **Test** button.

**TIPS AND TRICKS:** The Test button is also placed on the Action panel in the Event list. Thus, you can check the Actions without opening the Event editor.

#### Delay the Action

In most cases the Action is performed immediately after the Condition is detected. But sometimes a delay is necessary between the Condition and the Action. Therefore, the new Event manager contains the Delay panel which allows that feature with below settings:

- **No delay:** when the Condition is detected, the Action is launched.
- **Simple delay:** when the Condition is detected, the Action is launched after the set time interval.
- **Still true after:** when the Condition is detected, the Action is launched after the set time interval only if the Condition still exists.
- **Continuously true:** when the Condition is detected, the Action is launched after the set time interval only if the Condition has been existing continuously.



**TIPS AND TRICKS:** **Show advanced expressions** option is a useful tool when you look for the path or value of a property. The option is available in the Event list window or when Link tool is used.

### 6.10.3. Clear One or More Event(s)

#### Clear an Event

Press the **Clear** button in the Event list or in the header section in the Event editor.

#### Clear all Events

When all the Events must be cleared press the **Load factory defaults** button above the Event list. You will be prompted to confirm the process.

### 6.10.4. Export and Import Events

The feature allows saving all the Events. The backup file can be uploaded to another HDMI-3D-OPT series extender.

#### Export all the Events

**Step 1.** Press the **Export** button above the Event list.

**Step 2.** The Save as dialog box will appear. Set the desired folder and file name, then press the **Save** button.

The generated file is a simple text file which contains LW3 protocol commands. The file can be viewed by a simple text editor, e.g. Notepad.

**ATTENTION!** Editing the file is recommended only for expert users.

#### Import all the Events

**Step 1.** Press the **Import** button above the Event list.

**Step 2.** The Open dialog box will appear. Select the desired folder and file, then press the **Open** button.

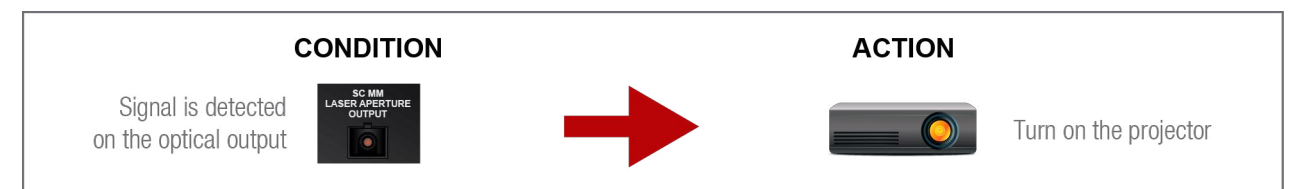
### 6.10.5. Event Creating - Example

The following example shows you on a real-life situation how to set up an Event.

#### The Concept

The SW4-OPT-TX240RAK is connected to a projector by the optical output port. The transmitter is also connected to the projector by the RS-232 port and can send commands via the serial line.

The task is to turn on the projector when signal is detected on the optical output port.



#### RS-232 Settings

Make sure that the serial line is established between the transmitter and the projector. Check that the RS-232 settings of the transmitter is set exactly the same which required for the projector: baud rate, data bits, parity, stop bits. The transmitter needs to be set to: Control protocol: LW3; and RS-232 mode: Pass-through. See the relevant LDC settings in the [RS-232](#) section.

## Setting the Event

You can create the Event in the Wizard in few simple steps:

**Step 1.** Set the condition.

Select the required parameters to set the condition:

- **Category:** Video;
- **Expression:** Signal is detected on a port;
- **Port:** O1.

Click on the **Apply** button to complete the procedure. When it is done, the condition appears on the upper side in textual and LW3 command format as well.

**Step 2.** Set the action.

If the condition is fulfilled, the following action needs to be launched: the receiver sends a command to the projector over the serial line:

- **Power on** - the required command which is accepted by the projector: PWR0<CR><LF>

For this instance the command has to be closed with the <CR><LF> characters so they need to be escaped. You can use the following format for escaping:

```
<command1><\x0d\x0a><command2><\x0d\x0a>...
...<commandn><\x0d\x0a>
```


In the current case the command is: PWR0\x0d\x0a

Select the required parameters to set the action:

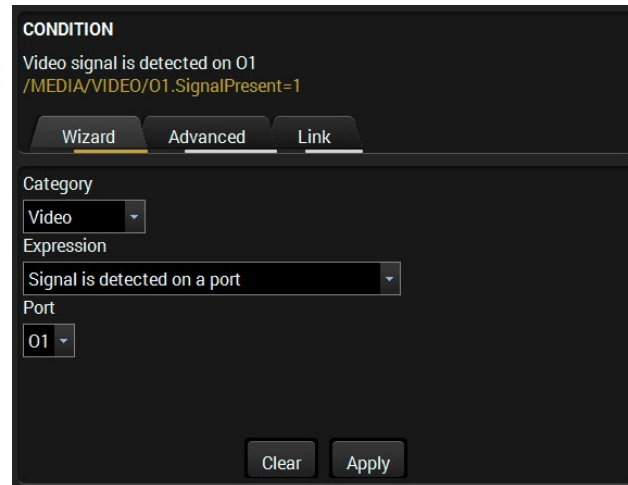
- **Category:** RS-232;
- **Expression:** Send RS-232 message;
- **Port:** P1;
- **Message:** PWR0\x0d\x0a

**Step 3.** Enable the Event.

Select the **E1 enabled** pipe in upper left corner to set the Event as launched.

E1 enabled 

**INFO:** If you do not find the required category/expression/etc what you need, choose the Advanced mode in the Wizard where the entire LW3 structure tree is available. For example instead of signal detection you can set a specified resolution or color range either as a condition.



**CONDITION**  
Video signal is detected on O1  
/MEDIA/VIDEO/O1.SignalPresent=1

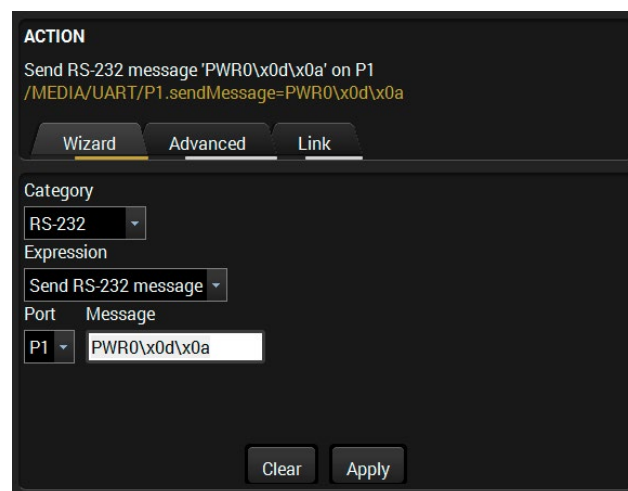
Wizard Advanced Link

Category  
Video

Expression  
Signal is detected on a port

Port  
O1

Clear Apply



**ACTION**  
Send RS-232 message 'PWR0\x0d\x0a' on P1  
/MEDIA/UART/P1.sendMessage=PWR0\x0d\x0a

Wizard Advanced Link

Category  
RS-232

Expression  
Send RS-232 message

Port Message  
P1 PWR0\x0d\x0a

Clear Apply

## 6.11. Settings Menu

### 6.11.1. Status



**SW4-OPT-TX240RAK** Crosspoint EDID Control Settings

Status Network Backup System

**General**

Device name	SW4-OPT-TX240RAK
Hardware version	V10_DAA0
Device label	SW4-OPT-TX240RAK <b>Set</b>
Part number	91510027
Serial number	00004148
Omron type	D
Omron serial number	5TBGP52369H
MAC address	a8:d2:36:00:41:48

**Operation**

System uptime	0 days 00h 01m 22s
Operation time	12 days 22h 36m 21s
High temp operation time	0 days 00h 00m 00s

**Firmware versions**

CPU firmware version	1.1.0b5 r8
DP Chip Firmware version	1.0.4b0 r101

**Temperatures**

CPU temperature	46 °C (22 °C min, 53 °C max)
System temperature	46 °C (22 °C min, 52 °C max)

**Voltages**

1.3V	1.3 V (1.29 V min, 1.3 V max)
1.8V	1.89 V (1.88 V min, 3.26 V max)
3.3V	3.25 V (3.25 V min, 3.3 V max)
ADAU 3.3V	3.3 V (3.29 V min, 4.99 V max)
Main 5V	4.99 V (4.87 V min, 4.99 V max)

**Reset measurements**

Reset **Reset**

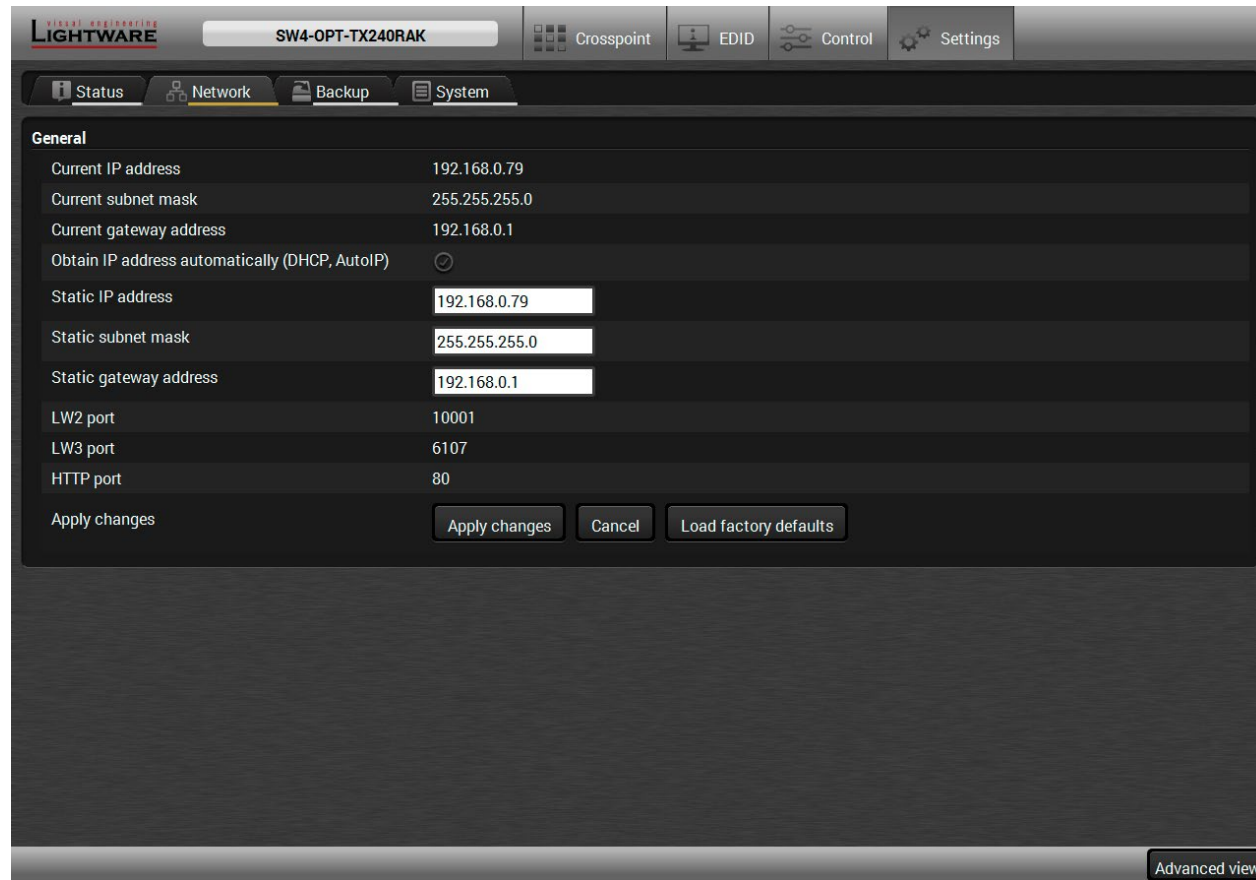
Advanced view

#### Status tab in Settings menu

The most important hardware and software related information can be found on this tab: hardware and firmware version, serial numbers, temperatures, operation time, and voltage information. Device label can be changed to unique description by the **Set** button.

```
#status #label #devicelabel #producttype #serialnumber
```

### 6.11.2. Network



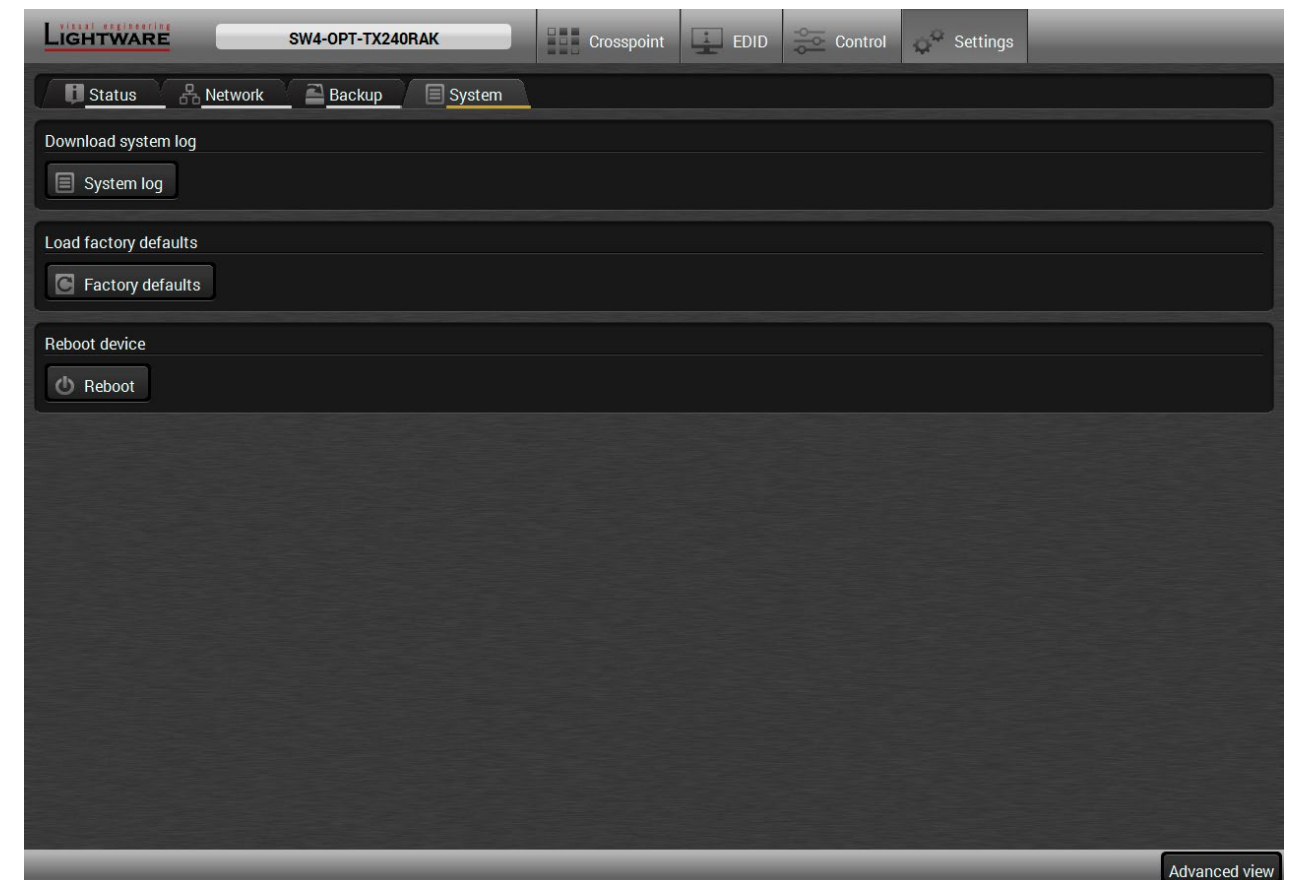
**Network tab in Settings menu**

IP address and DHCP settings can be set on this tab. Always press the **Apply settings** button to save changes. Factory defaults settings can be recalled with a dedicated button. *#ipaddress #network #dhcp*

### 6.11.3. Backup

Details about this function can be found in the [Configuration Cloning \(Backup Tab\)](#) section.

### 6.11.4. System



**System tab in Settings menu**

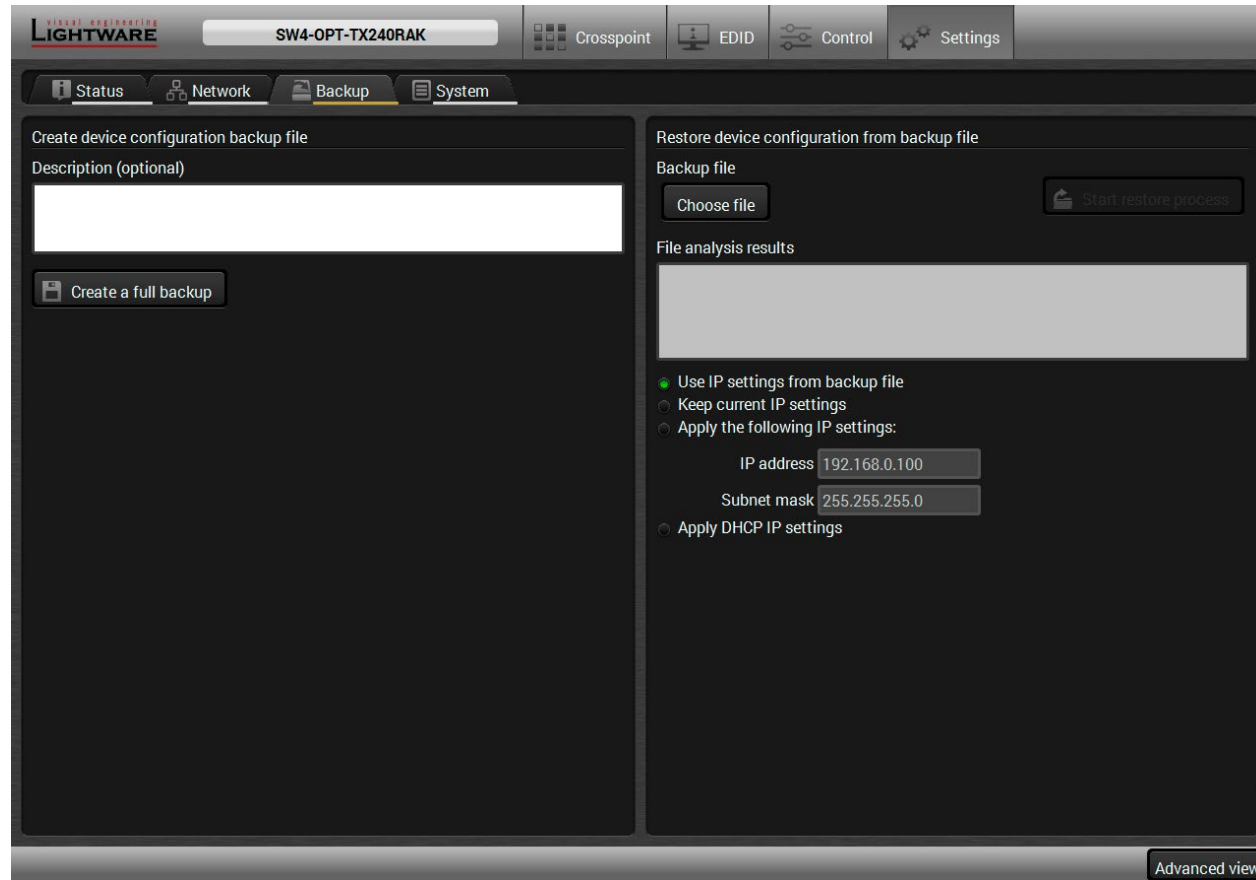
Three functions are available under System tab:

- **Download system log** - saving the file of the device.
- **Load factory defaults** - recalling factory defaults settings and values. All factory default settings are listed in the [Factory Default Settings](#) section.
- **Reboot** - rebooting the system.

*#systemlog #log #factory #reboot #restart*



## 6.12. Configuration Cloning (Backup Tab)



**Backup tab in Settings menu**

Configuration cloning of Lightware LW3 devices is a simple method that eliminates the need to repeatedly configure certain devices to have identical (non-factory) settings. If the devices are installed in the same type of system multiple times then it is enough to set up only one device to fit the user's needs and then copy those settings to the others, thus saving time and resources. *#backup #configurationcloning*

### 6.12.1. Steps in a Nutshell

Installing multiple devices with the same customized configuration settings can be done in a few easy steps:

- Step 1.** Configure one device with all your desired settings using the LDC software.
- Step 2.** Backup the full configuration file to your computer.
- Step 3.** If needed, make some modifications to the configuration file using a text editor (e.g. Notepad). E.g. modifying the static IP address is necessary when DHCP is not used.
- Step 4.** Connect to the other device which has to be configured and upload (restore) your configuration file.
- Step 5.** Done! You can have as many totally identical, customized devices as you like.

### 6.12.2. Save the Settings of a Device (Backup)

- Step 1.** Apply the desired settings in the transmitter (port parameters, crosspoint, etc.)
- Step 2.** Select the **Settings / Backup** tab from the menu.
- Step 3.** Write a short **description** in the text box on the left (optional).
- Step 4.** Press the **Create a full backup** button. You will be prompted to save the file to the computer. The default file name is the following:

`BACKUP_<DEVICE TYPE>_SN<SERIAL NUMBER>.LW3`

- Step 5.** Set the desired **file name**, select the folder and **save** the file.

**TIPS AND TRICKS:** Using the exact product type in the filename is recommended since it makes the file usage more comfortable.

#### About the Backup File

The backup file is a simple text file which contains LW3 protocol commands. The first line is the description and the further lines are the commands which will be executed during the restore process. The file can be viewed (and/or edited) by a simple text editor, e.g. Notepad.

See the entire list of saved data in the [Content of Backup File](#) section.

**ATTENTION!** Editing the command lines is only recommended for expert users.

### 6.12.3. Upload the Settings to a Device (Restore)

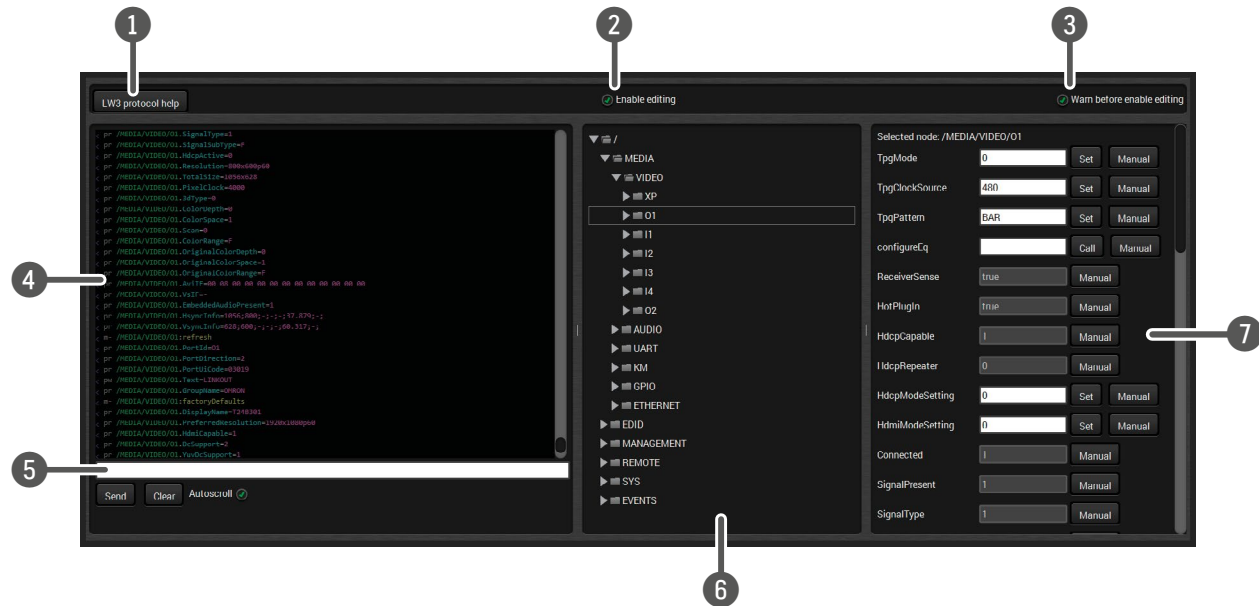
**WARNING!** Please note that the settings will be permanently overwritten with the restored parameters in the device. Undo is not available.

**ATTENTION!** The cloning is successful when the backup file is downloaded from the same type of source device as the destination device.

#### The Restoring Process

- Step 1.** Select the **Settings / Backup** tab from the menu.
- Step 2.** Click on the **Choose file** button on the right panel and **browse** to the desired file.
- Step 3.** The file is verified and the result will be displayed in the textbox below. If the file is correct, then the settings can be restored.
- Step 4.** Choose **IP settings** what you want to use after backup. You can apply settings from the backup file, keep actual settings, set it manually in a dialog box or apply DHCP.
- Step 5.** Press the **Start restore process** button and click on the **Yes** button when asked.
- Step 6.** Reboot the device to apply the network settings after finishing.

## 6.13. Advanced View Window



- 1 LW3 protocol help** Pushing the button results a help window opening which describes the most important information about LW3 protocol commands in HTML format.
- 2 Edit mode** The default appearance is the read-only mode. If you want to modify the values or parameters, tick the option. You will be prompted to confirm your selection. *#terminal #advancedview*
- 3 Warning mode** If this pipe checked in, a warning window pops up when you enable Edit mode.
- 4 Terminal window** Commands and responses with time and date are listed in this window. Sent command starts with '`>`' character, received response starts with '`<`' character. The color of each item depends on the type of the command and response. The content of the window can be emptied by the **Clear** button. If the **Autoscroll** option is ticked, the list is scrolled automatically when a new line is added.
- 5 Command line** Type the desired command and execute it by the **Send** button. Clear all current commands and responses in the Terminal window by the **Clear** button.
- 6 Protocol tree** LW3 protocol tree; select an item to see its content.
- 7 Node list** Correspondent parameters and nodes are shown which are connected to the selected item in the protocol tree.
  - Manual button:** Manual (short description) of the node can be called and displayed in the terminal window.
  - Set button:** Saves the value/parameter typed in the textbox.
  - Call button:** Calls the method, e.g. reloads factory default settings.

# 7

## LW2 Programmer's Reference

The device can be controlled through a reduced command set of LW2 protocol commands to ensure the compatibility with other Lightware products. The supported LW2 commands are described in this chapter.

- ▶ [LW2 PROTOCOL DESCRIPTION](#)
- ▶ [INSTRUCTIONS FOR THE TERMINAL APPLICATION USAGE](#)
- ▶ [GENERAL LW2 COMMANDS](#)
- ▶ [AV PORT SETTINGS](#)
- ▶ [NETWORK CONFIGURATION](#)
- ▶ [GPIO PORT CONFIGURATION](#)
- ▶ [LW2 COMMANDS – QUICK SUMMARY](#)

## 7.1. LW2 Protocol Description

The protocol description hereinafter stands for Lightware protocol. The commands can be sent to the device in RAW format via the TCP/IP port no. 10001.

The receiver accepts commands surrounded by curly brackets - { } - and responds with 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

Format	Explanation
<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/out>	input or output port number in 1 or 2 digit ASCII format *
<in2>	Input number in 2 digit ASCII format (01, 02, 10, 12 etc.)
<out2>	Output number in 2 digit ASCII format (01, 02, 10, 12 etc.)
<in2/out2>	input or output number in 2 digit ASCII format*
<loc>	Location number in 1, 2 or 3 digit ASCII format
<id>	id number in 1 or 2 digit ASCII format
<id2>	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

\* The command has the same arguments on the input ports and the output port, as well.

## 7.2. Instructions for the Terminal Application Usage

### Terminal Application

The LW2 protocol commands can be applied to the transmitter using a terminal application. You need to install one of them to your control device, for example **Putty** or **CLI**. *#terminal*

### Establishing Connection

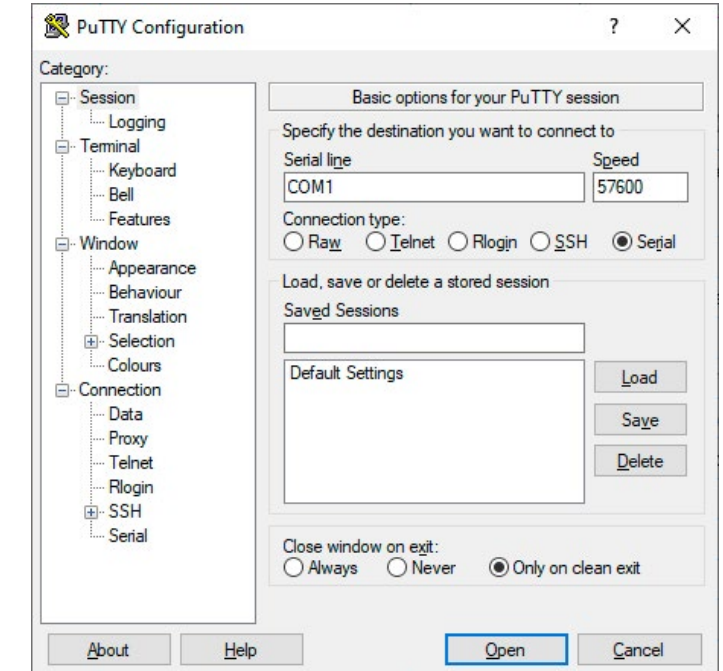
Follow the steps for establishing connection to the device:

- Step 1.** Connect the transmitter / receiver to the controller device over Ethernet or RS-232.
- Step 2.** Open the terminal application (e.g. Putty).
- Step 3.** Add the **Serial line** of the device and the **Speed** (default: **57600**).
- Step 4.** Select the **Serial** connection type, and open the connection.

**ATTENTION!** Make sure that the control protocol is set to LW2 on the serial port.

The protocol setting can be checked in LDC (see the details in the [RS-232](#) section) and via LW3 protocol command (see the details in the [Setting the Protocol](#) section).

Once the terminal window is opened, you can enter the LW2 protocol commands, which are listed in the following sections.



## 7.3. General LW2 Commands

### 7.3.1. List of All Available LW2 Commands

#### Command and Response

```
→ {lcmd}
← (LCMD# LCMD: List all commands)CrLf
← <LW2_commands>CrLf
← (LCMD END)CrLf
```

#### Example

```
→ {lcmd}
← (LCMD# LCMD: List all commands)
← (LCMD# PING: Always response PONG)
← (LCMD# CT: Compile time)
← ...
← (LCMD END)
```

INFO: The response is longer, not all the lines can be seen in the example.

### 7.3.2. View Product Type

The device responds with its name.

#### Command and Response *#producttype*

```
→ {i}
← (!:<PRODUCT_TYPE>)CrLf
```

#### Example

```
→ {i}
← (!:HDMI-3D-OPT-TX210DD)
```

### 7.3.3. Device Label Query

This command is for querying the label of the device, which can be changed in the [Status](#) menu in LDC or by LW3 command, see the [Set the Device Label](#) section.

#### Command and Response *#label #devicelabel*

```
→ {label}
← (LABEL=<device_label>)CrLf
```

#### Example

```
→ {label}
← (LABEL=TX210DD_ConferenceRoom)
```

### 7.3.4. Query Control Protocol

This command queries the active protocol of the currently used control interface.

#### Command and Response *#protocol*

```
→ {P_?}
← (CURRENT·PROTOCOL·:=·#<protocol>)CrLf
```

#### Example

```
→ {p_?}
← (CURRENT PROTOCOL = #1)
```

'#1' means the device communicates with LW2 protocol.

### 7.3.5. View Firmware Version of the CPU

#### Command and Response *#firmwareversion*

```
→ {F}
← (FW:<FW_VER><s>)CrLf
```

#### Example

```
→ {f}
← (FW:1.6.0b13 r99)
```

<FW\_VER> is the firmware version. It is followed by <s> string which may indicate special versions.

### 7.3.6. Compile Time

Returns the date of when the CPU firmware was compiled.

#### Command and Response

```
→ {CT}
← (Complied: <DATE&TIME>)CrLf
```

#### Example

```
→ {ct}
← (Complied: Sep 30 2021 14:07:56)
```

### 7.3.7. View Serial Number

The device responds with its 8-digit serial number.

**Command and Response** *#serialnumber*

```
→ {S}
← (SN:<SERIAL_N>)CrLf
```

**Example**

```
→ {s}
← (SN:5A004254)
```

The serial number structure can be found in the [About the Serial Number](#) section.

### 7.3.8. View Installed Board

Shows the hardware name and the revision of the installed boards.

**Command and Response**

```
→ {IS}
← (SL#0<MB_DESC>)CrLf
← (SL·END)CrLf
```

**Example**

```
→ {is}
← (SL# 0 HDMI-3D-OPT-TX210DD)
← (SL END)
```

The device reports its motherboard (slot 0).

### 7.3.9. View Firmware for All Controllers

Shows the firmware versions of all installed controllers.

**Command and Response**

```
→ {FC}
← (CF-<DESC>)CrLf
← (CF-<DESC>)CrLf
← ...
← (CF END)CrLf
```

**Example**

```
→ {fc}
← (CF HDMI-3D-OPT-TX210DD 1.2.0b1 r53)
← (CF END)
```

The device has one control panel.

### 7.3.10. Query Health Status

Internal voltages and measured temperature values are shown.

**Command and Response** *#status*

```
→ {ST}
← (ST-<DESC>)CrLf
```

**Example**

```
→ {st}
← (ST CPU 12.16V 5.03V 3.30V 3.33V 3.37V 1.30V 1.86V 1.00V 53.22C 53.26C)
```

### 7.3.11. Restart the Device

The device can be restarted without unplugging power.

**Command and Response** *#reboot #restart*

```
→ {RST}
←
```

**Example**

```
→ {rst}
←
```

The device reboots; no response is sent in this case.

### 7.3.12. Restore Factory Default Settings

Settings can be reset to factory default values as follows: *#factory*

**Command and Response**

```
→ {FACTORY=ALL}
← (FACTORY ALL...)CrLf
```

**Example**

```
→ {factory=all}
← (FACTORY ALL...).
```

All settings and parameters are reset to factory default, see the table in the [Factory Default Settings](#) section.



## 7.4. AV Port Settings

### 7.4.1. Switching an Input to the Outputs

Switching an input <in> to output <out>. Following commands with A, V, AV parameter value can take effect in multiple layers, according to their parameters. Depending on 'A' or 'V' it can change only the Audio or only the Video layer; 'AV' changes both. *#crosspoint #switch*

#### Command and Response

```
→ {<in>@<out>•<layer>}
← (0<out2>•I<in2>•<layer>)CrLf
```

#### Parameters

Parameter	Parameter description	Value	Value description
<layer>	Signal type of the layer	A	audio layer
		V	video layer
		AV	audio & video layer
<out>	Output port	O1	
<in>	Input port	I1..I6	Device-dependent, see the <a href="#">Input/Output Port Numbering</a> section
		0	Using the '0' (zero) value, the input will be disconnected and no signal will appear on the output.

INFO: The <layer> parameter usually can be skipped for legacy purposes. In this case, the devices change all (Video & Audio) layers, but using status commands it displays information about only the Video layer. Please use the AV option when available.

#### Example 1

```
→ {2@1 AV}
← (001 I02 AV)
```

I2 audio and I2 video input ports are switched to the O1 output port.

#### Example 2

```
→ {0@1}
← (001 I00)
```

**ATTENTION!** The response of this command does not show whether the output is muted. To check the mute status, a separate query has to be used, like {VC}.

### 7.4.2. Muting an Output

Mute the <out> output. The output signal is turned off.

#### Command and Response *#mute #lock #unmute #unlock*

```
→ {#<out>•<layer>}
← (1MT<out2>•<layer>)CrLf
```

#### Example

```
→ {#01 A}
← (1MT01 A)
```

**ATTENTION!** Muting does not change the state of the crosspoint, but disables the output itself. This way the last connection can be easily restored with an unmute command. Switching a muted output does not unmute the output.

### 7.4.3. Unmuting an Output

Unmute the <out> output.

#### Command and Response

```
→ {+<out>•<layer>}
← (0MT<out2>•<layer>)CrLf
```

#### Example

```
→ {+01 V}
← (0MT01 V)
```

INFO: Unmuting an output makes the previous connection active, as the crosspoint state has not been changed by the muting command, only the output was disabled.

### 7.4.4. Locking an Output

Locking an output port. The output's state cannot be changed until unlocking.

#### Command and Response

```
→ {#><out>•<layer>}
← (1LO<out2>•<layer>)CrLf
```

#### Example

```
→ {#>01 A}
← (1LO01 A)
```

### 7.4.5. Unlocking an Output

Unlocking an output port. The connection on output can be changed.

#### Command and Response

```
→ {+<<out>•<layer>}
← (OLO<out2>•<layer>)CrLf
```

#### Example

```
→ {+<01 V}
← (OLO01 V)
```

O1 video output port is unlocked.

INFO: The device issues the response above regardless of the previous state of the output (whether it was locked or unlocked).

### 7.4.6. Viewing Connection State on the Output

Viewing the crosspoint state of the device; showing the input port numbers connected to the outputs.

#### Command and Response *#crosspoint #switch*

```
→ {VC•<layer>}
← (ALL<layer>•<001>•<002>)CrLf
```

#### Parameters

001 shows the corresponding output's connection state.

Parameter	Parameter description	Value	Value description
<layer>	Signal type of the layer	A	audio layer
		V	video layer
		AV	audio & video layer

#### State letters

Letter	State	Example
L	Output is locked	L01
M	Output is muted	M01
U	Output is locked and muted	U01

#### Example

```
→ {VC AV}
← (ALLV 01 02)
← (ALLA 02 02 02)
```

I1 video input port is connected to the O1 video output port; I2 video input port is connected to the O2 video output port; I2 audio input port is connected to all the audio output ports (O1, O2, O3).

### 7.4.7. Viewing the Crosspoint Size

Shows the physical crosspoint size.

#### Command and Response

```
→ {getsize•<layer>}
← (SIZE=<size>•<layer>)CrLf
```

#### Parameters

Parameter	Parameter description	Value	Value description
<size>	Crosspoint size	<number_of_inputs>x<number_of_outputs>	
<layer>	Signal type of the layer	A	audio layer
		V	video layer
		AV	audio & video layer

#### Example

```
→ {GETSIZE AV}
← (SIZE=6x1 V)
← (SIZE=5x1 A)
```

The device has a video crosspoint (6 inputs and 1 output) and an audio crosspoint (5 inputs and 1 output).

### 7.4.8. Changing the Video Autoselect Mode

The autoselect mode of the video outputs can be changed.

#### Command and Response *#autoselect*

```
→ {AS_V<out>=<state>;<mode>}
← (AS_V<out>=<state>;<mode>)CrLf
```

#### Parameters

Parameter	Parameter description	Value	Value description
<state>	Showing the Autoselect state	E	autoselect is enabled
		D	autoselect is disabled
<mode>	The autoselect mode setting	F	First detect mode
		L	Last detect mode
		P	Priority detect mode

The output port numbers are listed in the [Input/Output Port Numbering](#) section.

#### Example

```
→ {as_v1=E;P}
← (AS_V1=E;P)
```

The Autoselect mode of audio output1 is enabled and set to Priority mode.

**INFO:** The Autoselect mode can be queried by typing the {as\_v<out>=?} command.

### 7.4.9. Changing the Audio Autoselect Mode

The autoselect mode of the audio output can be changed.

#### Command and Response

```
→ {AS_A<out>=<state>;<mode>}
← (AS_A<out>=<state>;<mode>)CrLf
```

#### Parameters

See the previous section.

#### Example

```
→ {as_a1=E;P}
← (AS_A1=E;P)
```

The Autoselect mode of audio output1 is enabled and set to Priority mode.

**INFO:** The Autoselect mode can be queried by typing the {as\_a<out>=?} command.

### 7.4.10. Changing the Video Input Priorities

The settings of video input priority can be changed as follows.

#### Command and Response

```
→ {PRIO_V<out>=<in1_prio>;<in2_prio>;...;<inn_prio>}
← (PRIO_V<out>=<in1_prio>;<in2_prio>;...;<inn_prio>)CrLf
```

#### Parameters

Parameter	Parameter description	Value	Value description
<in1_prio>	Priority number of the input ports	0-5,	0: highest priority
<in2_prio>		31	5: lowest priority
<inn_prio>			31: skip the port from the priority list

See more details about port numbering in the [Input/Output Port Numbering](#) section.

#### Example

```
→ {prio_v1=1;0;2;3}
← (PRIO_V1=1;0;2;3)
```

**ATTENTION!** Always set the priority of all ports when changing, otherwise the change will not be executed and the response will be the current setting (like querying the priority setting).

**INFO:** The video priorities can be queried by typing the {prio\_v<out>=?} command.

### 7.4.11. Changing the Audio Input Priorities

The settings of audio input priority can be changed as follows.

#### Command and Response

```
→ {PRIO_A<out>=<in1_prio>;<in2_prio>;...;<inn_prio>}
← (PRIO_A<out>=<in1_prio>;<in2_prio>;...;<inn_prio>)CrLf
```

#### Parameters

See the previous section.

#### Example

```
→ {prio_a1=1;0;2}
← (PRIO_A1=1;0;2)
```

Input 2 has the highest priority (0), Input 1 has the second highest (1). Input 3 has the lowest priority (2).

**ATTENTION!** Always set the priority of all ports when changing, otherwise the change will not be executed and the response will be the current setting (like querying the priority setting).

**INFO:** The audio priorities can be queried by typing the {prio\_a<out>=?} command.

## 7.5. Network Configuration

**DIFFERENCE:** This section refers to the SW4-OPT-TX240RAK model only.

### 7.5.1. Querying the Current IP Status

The IP address settings can be queried as follows. `#dhcp #ipaddress #network`

#### Command and Response

```
→ {IP_STAT=?}
← (IP_STAT=<type>;<ip_address>;<subnet_mask>;<gateway_addr>)CrLf
```

#### Parameters

Parameter	Parameter description	Value	Value description
<type>	Assignment of the IP address	0	static
		1	dynamic (DHCP)
<ip_addr>	IP address	(four decimal octets separated by dots)	
<subnet_mask>	Subnet mask	(four decimal octets separated by dots)	
<gateway_addr>	Gateway address	(four decimal octets separated by dots)	

#### Example

```
→ {ip_stat=?}
← (IP_STAT=0;192.168.0.100;255.255.255.0;192.168.0.1)
```

The device has a static (fix) IP address: 192.168.0.100; the subnet mask is 255.255.255.0, the gateway address is 192.168.0.1.

### 7.5.2. Setting the IP Address

IP address can be set as follows.

#### Command and Response

```
→ {IP_ADDRESS=<type>;<ip_address>}
← (IP_ADDRESS=<type>;<ip_address>)CrLf
```

#### Parameters

See the previous section.

#### Example

```
→ {ip_address=0;192.168.0.110}
← (IP_ADDRESS=0;192.168.0.110)
```

INFO: The IP address can be queried by typing the {ip\_address=?} command. The response contains the fix IP address that is stored in the device even if DHCP is enabled; in this case, this IP address is not valid.

### 7.5.3. Setting the Subnet Mask

Subnet mask can be set as follows.

#### Command and Response

```
→ {IP_NETMASK=<subnet_mask>}
← (IP_NETMASK=<subnet_mask>)CrLf
```

#### Parameters

See the [Querying the Current IP Status](#) section.

#### Example

```
→ {ip_netmask=255.255.255.0}
← (IP_NETMASK=255.255.255.0)
```

INFO: The subnet mask can be queried by typing the {ip\_address=?} command. The response contains the fix IP subnet mask that is stored in the device even if DHCP is enabled; in this case, this IP subnet mask is not valid.

### 7.5.4. Setting the Gateway Address

Gateway address can be set as follows.

#### Command and Response

```
→ {IP_GATEWAY=<gateway_addr>}
← (IP_GATEWAY=<gateway_addr>)CrLf
```

#### Parameters

See the [Querying the Current IP Status](#) section.

#### Example

```
→ {ip_gateway=192.168.0.50}
← (IP_GATEWAY=192.168.0.50)
```

INFO: The gateway address can be queried by typing the {ip\_gateway=?} command. The response contains the static IP gateway address that is stored in the device even if DHCP is enabled. In that case, the latest valid gateway address (for static IP) is stored.

### 7.5.5. Applying Network Settings

Apply the network settings and restart the network interface.

#### Command and Response

```
→ {ip_apply}
← (IP_APPLY)CrLf
```

#### Example

```
→ {ip_apply}
← (IP_APPLY)
```

### 7.5.6. Enabling/Disabling the Ethernet Port

#### Command and Response *#ethernet*

→ {ETH\_ENABLE=<switch>}  
 ← (ETH\_ENABLE=<switch>)CrLf

#### Parameters

If the <switch> parameter is **0**, the port is **disabled**. If its value is **1**, the port is **enabled**.

#### Example

→ {ETH\_ENABLE=1}  
 ← (ETH\_ENABLE=1)

## 7.6. GPIO Port Configuration

**DIFFERENCE:** This section refers to the SW4-OPT-TX240RAK model only.

### 7.6.1. Setting the Level and Direction for Each Pins

GPIO pins can be configured as follows. See more details about the GPIO connector in the [GPIO - General Purpose Input/Output Ports](#) section and about the interface in the [GPIO Interface](#) section.

#### Command and Response *#gpio*

→ {GPIO<pin\_nr>=<dir>;<level>}  
 ← (GPIO<pin\_nr>=<dir>;<level>)CrLf

#### Parameters

Parameter	Parameter description	Value	Value description
<pin_nr>	GPIO pin number	<b>0-6</b>	static
<dir>	The direction of the communication	<b>I</b>	Input
		<b>O</b>	Output
<level>	The level of the pin	<b>L</b>	Low
		<b>H</b>	High
		<b>T</b>	Toggle between low and high

#### Example

→ {gpio1=O;H}  
 ← (GPIO1=O;H)

GPIO pin 1 is set to output with high level.

**INFO:** The current GPIO pin configuration can be queried by typing the {GPIO<pin\_nr>=?} command.



## 7.7. LW2 Commands – Quick Summary

### General LW2 Commands

#### List of All Available LW2 Commands

→ {lcmd}

#### View Product Type

→ {i}

#### Device Label Query

→ {label}

#### Query Control Protocol

→ {P\_?}

#### View Firmware Version of the CPU

→ {F}

#### Compile Time

→ {CT}

#### View Serial Number

→ {S}

#### View Installed Board

→ {IS}

#### View Firmware for All Controllers

→ {FC}

#### Query Health Status

→ {ST}

#### Restart the Device

→ {RST}

#### Restore Factory Default Settings

→ {FACTORY=ALL}

### AV Port Settings

#### Switching an Input to the Outputs

→ {<in>@<out>•<layer>}

#### Muting an Output

→ {#<out>•<layer>}

#### Unmuting an Output

→ {+<out>•<layer>}

#### Locking an Output

→ {#><out>•<layer>}

#### Unlocking an Output

→ {+<<out>•<layer>}

#### Viewing Connection State on the Output

→ {VC•<layer>}

#### Viewing the Crosspoint Size

→ {getsize•<layer>}

#### Changing the Video Autoselect Mode

→ {AS\_V<out>=<state>;<mode>}

#### Changing the Audio Autoselect Mode

→ {AS\_A<out>=<state>;<mode>}

#### Changing the Video Input Priorities

→ {PRIO\_V<out>=<in1\_prio>;<in2\_prio>;...;<inn\_prio>}

#### Changing the Audio Input Priorities

→ {PRIO\_A<out>=<in1\_prio>;<in2\_prio>;...;<inn\_prio>}

**Network Configuration**

## Querying the Current IP Status

```
→ {IP_STAT=?}
```

## Setting the IP Address

```
→ {IP_ADDRESS=<type>;<ip_address>}
```

## Setting the Subnet Mask

```
→ {IP_NETMASK=<subnet_mask>}
```

## Setting the Gateway Address

```
→ {IP_GATEWAY=<gateway_addr>}
```

## Applying Network Settings

```
→ {ip_apply}
```

## Enabling/Disabling the Ethernet Port

```
→ {ETH_ENABLE=<switch>}
```

**GPIO Port Configuration**

## Setting the Level and Direction for Each Pins

```
→ {GPIO<pin_nr>=<dir>;<level>}
```

# 8

## LW3 Programmer's Reference

The device can be controlled through Lightware 3 (LW3) protocol commands to ensure the compatibility with other Lightware products. The supported LW3 commands are described in this chapter.

- ▶ [OVERVIEW](#)
- ▶ [INSTRUCTIONS FOR THE TERMINAL APPLICATION USAGE](#)
- ▶ [PROTOCOL RULES](#)
- ▶ [SYSTEM COMMANDS](#)
- ▶ [VIDEO PORT SETTINGS](#)
- ▶ [AUDIO PORT SETTINGS](#)
- ▶ [ANALOG AUDIO PORT SETTINGS](#)
- ▶ [EVENT MANAGER BASICS](#)
- ▶ [EVENT MANAGER TOOL KIT](#)
- ▶ [ETHERNET PORT CONFIGURATION](#)
- ▶ [RS-232 PORT CONFIGURATION](#)
- ▶ [ETHERNET MESSAGE SENDING](#)
- ▶ [RS-232 MESSAGE SENDING](#)
- ▶ [GPIO PORT CONFIGURATION](#)
- ▶ [EDID MANAGEMENT](#)
- ▶ [LW3 COMMANDS - QUICK SUMMARY](#)

## 8.1. Overview

The Lightware Protocol #3 (LW3) is implemented in almost all new Lightware devices (matrix switchers, signal extenders and distribution amplifiers) since 2012. The protocol is ASCII-based, and all commands are terminated with a carriage return (Cr, '\r') and line feed (Lf, '\n') pair. It is organized as a tree structure that provides outstanding flexibility and user-friendly handling with 'nodes', 'properties' and 'methods'. The **Advanced View** of the Lightware Device Controller software is the perfect tool for browsing and learning how the LW3 protocol can be used in practice.

## 8.2. Instructions for the Terminal Application Usage

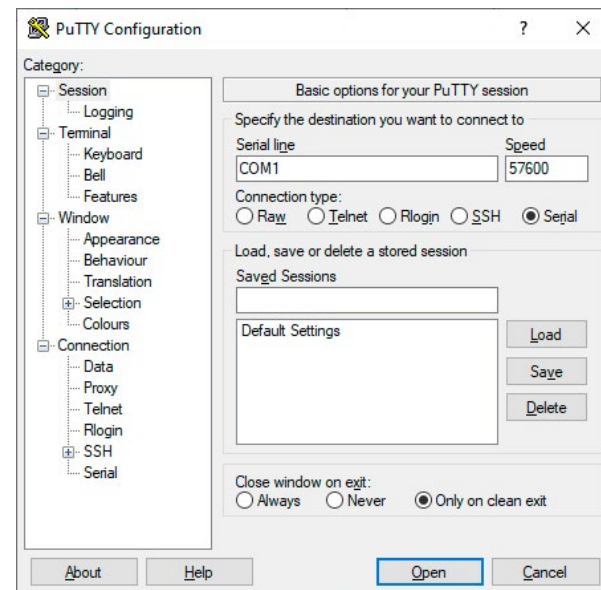
### Terminal Application

The LW3 protocol commands can be applied to the transmitter using a terminal application. You need to install one of them to your control device, for example **Putty** or **CLI**. `#terminal`

### Establishing Connection

Follow the steps for establishing connection to the device:

- Step 1.** Connect the transmitter to the controller device over **RS-232**.
- Step 2.** Open the terminal application (e.g. Putty).
- Step 3.** Add the **Serial line** of the device and the **Speed** (default: **57600**).
- Step 4.** Select the **Serial** connection type, and open the connection.

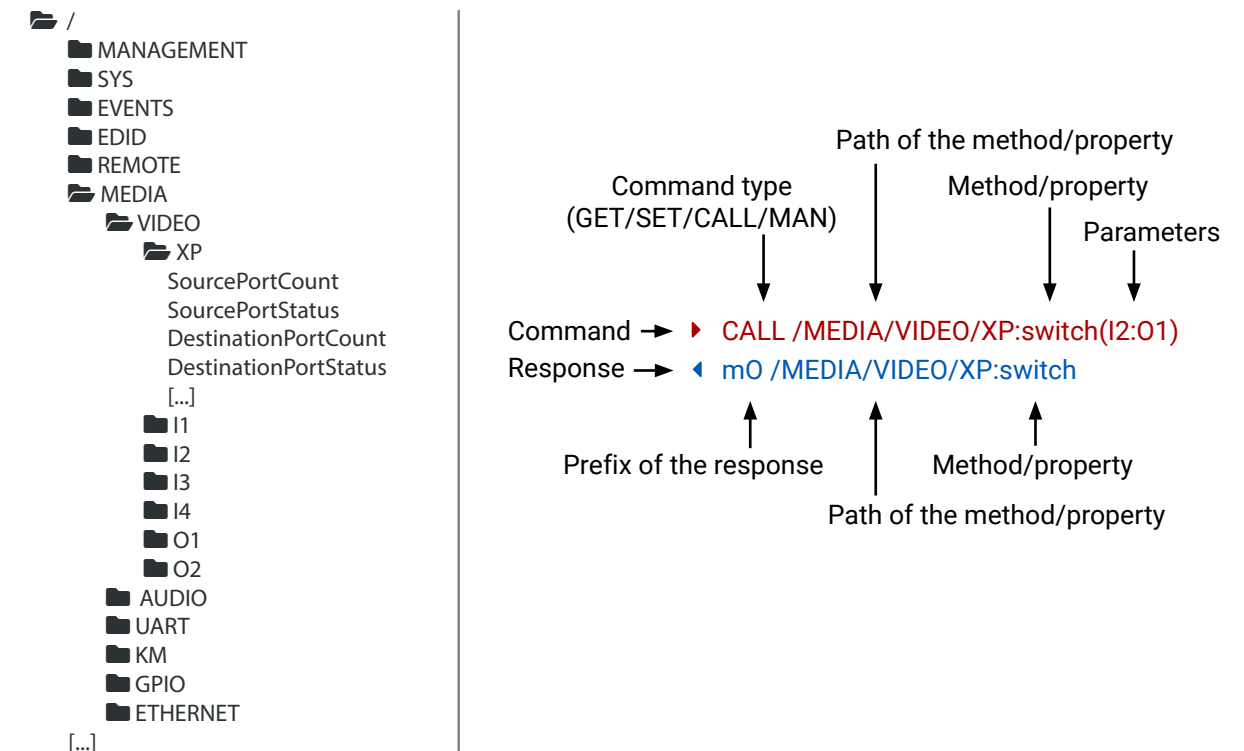


**ATTENTION!** Make sure that the control protocol is set to LW3 on the serial port. The protocol setting can be checked in LDC (see the details in the [RS-232](#) section).

Once the terminal window is opened, you can enter the LW3 protocol commands, which are listed in the following sections.

## 8.3. Protocol Rules

### 8.3.1. LW3 Tree Structure and Command Structure (examples)



### 8.3.2. General Rules

- All names and parameters are **case-sensitive**.
- The nodes are separated by a slash ('/') character.
- The node name can contain the elements of the **English alphabet and numbers**.
- The command lines have to be closed by Carriage return and Line Feed (CrLf).
- Use the **TCP port no. 6107** when using LW3 protocol over Ethernet.
- The length of a line (command/response, command type / prefix, path, method/property and parameters together) can be **max. 800 bytes**.
- When a command is issued by the device, the received response cannot be processed by the CPU.
- The node paths describe the exact location of the node, listing each parent node up to the root.

### 8.3.3. Legend for the Control Commands

#### Command and Response – Example

- ▶ GET /MEDIA/VIDEO/I2.SignalPresent
- ◀ pr /MEDIA/VIDEO/I2.SignalPresent=<signal\_present>

Format	Description
<in>	Input port number
<out>	Output port number
<port>	Input or output port number
<loc>	Location number
<parameter>	Specific property defined and described in the command
<expression>	Batched parameters: the underline means that more expressions or parameters can be placed by using a semicolon, e.g. <b>I1;I3</b> or <b>F27:E1;F47:E2</b>
▶	Sent command
◀	Received response
.	Space character

Further, not listed <parameters> are defined at each command.

### 8.3.4. Command Types

#### GET command

The **GET** command can be used to get the child nodes, properties and methods of a specific node. It can also be used to get the value of a property. Use the dot character (.) when addressing a property:

- ▶ GET /.SerialNumber
- ◀ pr /.SerialNumber=87654321

#### GETALL command

The **GETALL** command can be used to get all child nodes, properties and methods of a node with one command.

- ▶ GETALL /MEDIA/UART
- ◀ ns /MEDIA/UART/P1
- ◀ ns /MEDIA/UART/P2
- ◀ pr /MEDIA/UART.PortCount=2
- ◀ pr /MEDIA/UART.PortUi=P1:01209;P2:12219
- ◀ pr /MEDIA/UART.P1=LOCAL
- ◀ pr /MEDIA/UART.P2=ROF

#### SET command

The **SET** command can be used to modify the value of a property. Use the dot character (.) when addressing the property:

- ▶ SET /MEDIA/VIDEO/I1.HdcpEnable=true
- ◀ pw /MEDIA/VIDEO/I1.HdcpEnable=true

#### CALL command

A method can be invoked by the **CALL** command. Use the colon character (:) when addressing the method:

- ▶ CALL /MEDIA/VIDEO/XP:unlockSource(I1)
- ◀ m0 /MEDIA/VIDEO/XP:unlockSource

#### MAN command

The manual is a human readable text that describes the syntax and provides a hint for how to use the primitives. For every node, property and method in the tree there is a manual; type the MAN command to get the manual:

- ▶ MAN /MEDIA/VIDEO/O1.TpgMode
- ◀ pm /MEDIA/VIDEO/O1.TpgMode [0 | 1 | 2] 0 - Test pattern disabled, 1 - Test pattern enabled, 2 - Test pattern no signal mode.

### 8.3.5. Prefix Summary

**DEFINITION:** The prefix is a 2-character-long code that describes the type of the response.

The following prefixes are defined in the LW3 protocol:

Prefix	Description	Prefix	Description
n-	a node	pm	a manual for the property
nE	an error for a node	m-	a method
nm	a manual for a node	m0	a response after a successful method execution
pr	a read-only property	mF	a response after a failed method execution
pw	read-write property	mE	an error for a method
pE	an error for the property	mm	a manual for a method

### 8.3.6. Error Messages

There are several error messages defined in the LW3 protocol, all of them have a unique error number.

- ▶ CALL /MEDIA/VIDEO/XP:switch(IA:01)
- ◀ mE /MEDIA/VIDEO/XP:switch %E004:Invalid value



### 8.3.7. Escaping

**DEFINITION:** An escape sequence is a sequence of characters that does not represent itself when used inside a character or string literal, but is translated into another character or a sequence of characters.

Property values and method parameters can contain characters that are used as control characters in the protocol. They must be escaped. The escape character is the backslash ('\') and escaping means injecting a backslash before the character that should be escaped (like in C language).

Control characters are the following: \ { } # % ( ) \r \n \t

The **original** message: `CALL /MEDIA/UART/P1:sendMessage(Set(01))`

The **escaped** message: `CALL /MEDIA/UART/P1:sendMessage(Set\01\)`

### 8.3.8. Signature

**DEFINITION:** The signature is a four-digit-long hexadecimal value that can be optionally placed before every command to keep a command and the corresponding responses together as a group.

Each line is terminated with carriage return (Cr, '\r') and line feed (Lf, '\n') characters. In several cases the number of the lines in the response cannot be determined in advance, e.g. the client intends to receive the whole response and also wants to be sure that the received lines belong together and to the same command. In these cases a special feature, the 'signature' can be used. The response to that particular command will also be preceded by the signature, and the corresponding lines will be between brackets:

```
▶ 1700#GET /EDID.*
◀ {1700
◀ pr /EDID.EdidStatus=D1:E1;F136:E2;D1:E3;D1:E4
◀ m- /EDID:copy
◀ m- /EDID:delete
◀ m- /EDID:reset
◀ m- /EDID:switch
◀ m- /EDID:switchAll
◀ }
```

**INFO:** The lines of the signature are also Cr and Lf terminated.

### 8.3.9. Subscription

**DEFINITION:** Subscription to a node means that the user will get a notification if a property of the node changes.

A user can subscribe to any node. These notifications are asynchronous messages, and are useful to keep the client application up to date without having to periodically poll the node to detect a changed property. When the user does not want to be informed about the changes anymore, he can simply unsubscribe from the node.

**ATTENTION!** The subscriptions are handled separately for connections. Hence, if the connection is terminated, all registered subscriptions are deleted. After reopening a connection, all subscribe commands have to be sent in order to get the notifications of the changes on that connection.

#### Subscribe to a Node

```
▶ OPEN /MEDIA/VIDEO
◀ o- /MEDIA/VIDEO
```

#### Subscribe to Multiple Nodes

```
▶ OPEN /MEDIA/VIDEO/*
◀ o- /MEDIA/VIDEO/*
```

#### Unsubscribe from a Node

```
▶ CLOSE /MEDIA/VIDEO
◀ c- /MEDIA/VIDEO
```

#### Get the Active Subscriptions

```
▶ OPEN
◀ o- /MEDIA/VIDEO
◀ o- /EDID
◀ o- /DISCOVERY
```

#### Unsubscribe from Multiple Nodes

```
▶ CLOSE /MEDIA/VIDEO/*
◀ c- /MEDIA/VIDEO/*
```

### 8.3.10. Notifications about the Changes of the Properties

When the value of a property is changed, and the user is subscribed to the node that the property belongs to, an asynchronous notification is generated. This notification is called the 'change message'. The format of such a message is very similar to the response for the **GET** command:

```
◀ CHG /EDID.EdidStatus=F48:E1
```

#### A Short Example of How to Use the Subscription

There are two independent users controlling the device through two independent connections (**Connection #1** and **Connection #2**). The events in the rows occur after each other.

▶ OPEN /MEDIA/AUDIO/I5 ◀ o- /MEDIA/AUDIO/I5 ▶ GET /MEDIA/AUDIO/I5.VolumePercent ◀ pw /MEDIA/AUDIO/I5.VolumePercent=100.00	<b>connection #1</b>
▶ GET /MEDIA/AUDIO/I5.VolumePercent ◀ pw /MEDIA/AUDIO/I5.VolumePercent=100.00 ▶ SET /MEDIA/AUDIO/I5.VolumePercent=50.00 ◀ pw /MEDIA/AUDIO/I5.VolumePercent=50.00	<b>connection #2</b>
◀ CHG /MEDIA/AUDIO/I5.VolumePercent=50.00	<b>connection #1</b>

The first user (**Connection #1**) set a subscription to a node. Later the other user (**Connection #2**) made a change, and thanks to the subscription, the first user got a notification about the change.

## 8.4. System Commands

### 8.4.1. Query the Product Name

The name of the product is a read-only parameter and cannot be modified.

**Command and Response** *#producttype*

- ▶ GET /.ProductName
- ◀ pr /.ProductName=<product\_name>

**Example**

- ▶ GET /.ProductName
- ◀ pr /.ProductName=SW4-OPT-TX240RAK

### 8.4.2. Set the Device Label

**ATTENTION!** The device label can be changed to a custom text in the [Status](#) tab of the LDC software. This writable parameter is not the same as the ProductName parameter. *#devicelabel #label*

The default format of the device label is: LW\_<product\_name>\_<serial\_no>

**Command and Response**

- ▶ SET /MANAGEMENT/UID.DeviceLabel=<Custom\_name>
- ◀ pw /MANAGEMENT/UID.DeviceLabel=<Custom\_name>

The Device Label can be 39 characters long and ASCII characters are allowed. Longer names are truncated.

**Example**

- ▶ SET /MANAGEMENT/UID.DeviceLabel=SW4\_Control\_room
- ◀ pw /MANAGEMENT/UID.DeviceLabel=SW4\_Control\_room

### 8.4.3. Query the Serial Number

**Command and Response** *#serialnumber*

- ▶ GET /.SerialNumber
- ◀ pr /.SerialNumber=<serial\_nr>

**Example**

- ▶ GET /.SerialNumber
- ◀ pr /.SerialNumber=87654321

### 8.4.4. Query the Firmware Version

**Command and Response** *#firmwareversion*

- ▶ GET /SYS/MB.FirmwareVersion
- ◀ pr /SYS/MB.FirmwareVersion=<firmware\_version>

**Example**

- ▶ GET /SYS/MB.FirmwareVersion
- ◀ pr /SYS/MB.FirmwareVersion=1.2.0b1 r43

### 8.4.5. Restarting the Device

The devices can be restarted – the current connections (Ethernet, USB and RS-232) will be terminated.

**Command and Response** *#reboot #reset #restart*

- ▶ CALL /SYS:reset()
- ◀ m0 /SYS:reset=

**Example**

- ▶ CALL /SYS:reset()
- ◀ m0 /SYS:reset=

### 8.4.6. Recalling the Factory Default Settings

**Command and Response** *#factory*

- ▶ CALL /SYS:factoryDefaults()
- ◀ m0 /SYS:factoryDefaults=

**Example**

- ▶ CALL /SYS:factoryDefaults()
- ◀ m0 /SYS:factoryDefaults=

The device is restarted, current connections are terminated, and the default settings are restored. See the complete list in the [Factory Default Settings](#) section.

### 8.4.7. Lock the Front Panel Buttons

**Command and Response** #frontpanel #controllock #button

- ▶ SET /MANAGEMENT/UI.ControlLock=<lock\_status>
- ◀ pw /MANAGEMENT/UI.ControlLock=<lock\_status>

**Parameters**

Identifier	Parameter description	Value	Explanation
<lock_status>	Control lock status of the front panel buttons	0	<b>None</b> - All functions of the front panel buttons are enabled.
		1	<b>Locked</b> - The front panel buttons are locked and they can be unlocked by pressing the <b>Audio select</b> and the <b>Show me</b> buttons, or with an LW3 protocol command.
		2	<b>Force locked</b> - Locking and unlocking of the front panel buttons are possible only via protocol command.

**Example**

- ▶ SET /MANAGEMENT/UI.ControlLock=1
- ◀ pw /MANAGEMENT/UI.ControlLock=1

### 8.5. Video Port Settings

INFO: Video port numbering can be found in the [Input/Output Port Numbering](#) section.

#### 8.5.1. Query the Status of Source Ports

**Command and Response**

- ▶ GET /MEDIA/VIDEO/XP.SourcePortStatus
- ◀ pr /MEDIA/VIDEO/XP.SourcePortStatus=<in1\_state>;<in2\_state>;<...>;<in#\_state>

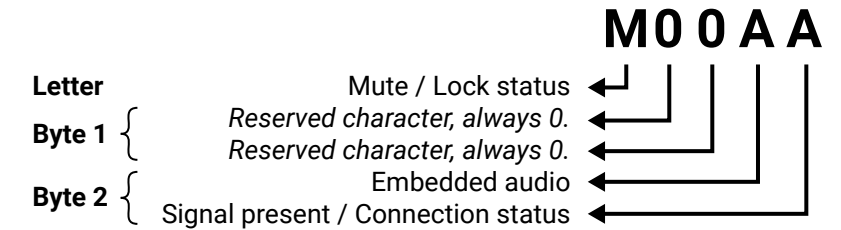
The response contains 5 ASCII characters for each port. The first character indicates the mute/lock state, the next four characters represent a 2-byte HEX code showing the current state of the input ports.

**Example**

- ▶ GET /MEDIA/VIDEO/XP.SourcePortStatus
- ◀ pr /MEDIA/VIDEO/XP.SourcePortStatus=T00FF;T00EF;T00AA;T00FF

**Parameters**

Letter (Character 1)		
	Mute state	Lock state
T	Unmuted	Unlocked
L	Unmuted	Locked
M	Muted	Unlocked
U	Muted	Locked



	Byte 1				Byte 2			
	Character 2		Character 3		Character 4		Character 5	
	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0
	Reserved	Reserved	Reserved	Reserved	Embedded audio status	Reserved	Signal present status	Connection status
00	Unknown							
01	Reserved							
10	Reserved	Reserved	Reserved	Reserved	No embedded audio	Reserved	No signal	Not connected
11					Embedded audio presents		Signal presents	Connected

## The Most Common Received Port Status Responses

T00AA	T	0		0		A		A	
	Unlocked, Unmuted	00	00	00	00	00	10	10	10
	Reserved	Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	No signal	Not connected

T00AB	T	0		0		A		B	
	Unlocked, Unmuted	00	00	00	00	00	10	10	10
	Reserved	Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	No signal	Connected

T00AF	T	0		0		A		F	
	Unlocked, Unmuted	00	00	00	00	00	10	10	11
	Reserved	Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	Signal presents	Connected

T00EF	T	0		0		E		F	
	Unlocked, Unmuted	00	00	00	00	00	11	10	11
	Reserved	Reserved	Reserved	Reserved	Reserved	Embedded audio presents	Not encrypted	Signal presents	Connected

T00BF	T	0		0		B		F	
	Unlocked, Unmuted	00	00	00	00	00	10	11	11
	Reserved	Reserved	Reserved	Reserved	Reserved	No embedded audio	Encrypted	Signal presents	Connected

T00FF	T	0		0		F		F	
	Unlocked, Unmuted	00	00	00	00	00	11	11	11
	Reserved	Reserved	Reserved	Reserved	Reserved	Embedded audio presents	Encrypted	Signal presents	Connected

## 8.5.2. Query the Status of Destination Port

Command and Response *#status #portstatus*

- ▶ GET-/MEDIA/VIDEO/XP.DestinationPortStatus
- ◀ pr-/MEDIA/VIDEO/XP.DestinationPortStatus=<out1\_state>;<out2\_state>;...;<out#\_state>

## Parameters

<out#\_state> The response contains 5 ASCII characters for each port. The first character indicates the mute/lock state, the next 2-byte long HEX code showing the current state of the output port.

## Example

- ▶ GET /MEDIA/VIDEO/XP.DestinationPortStatus
- ◀ pr /MEDIA/VIDEO/XP.DestinationPortStatus=M00BF;T00FF

## Legend

See at the previous section.

## Example and Explanation

M	0		0		B		F	
Unlocked,	00	00	00	00	10	11	11	11
Muted	Reserved	Reserved	Reserved	Reserved	No embedded audio	Encrypted	Signal presents	Connected

## 8.5.3. Query the Video Crosspoint Setting

## Command and Response

- ▶ GET-/MEDIA/VIDEO/XP.DestinationConnectionList
- ◀ pr-/MEDIA/VIDEO/XP.DestinationConnectionList=<in1>;<in2>;...;<in#>

## Example

- ▶ GET /MEDIA/VIDEO/XP.DestinationConnectionList
- ◀ pr /MEDIA/VIDEO/XP.DestinationConnectionList=11;11

### 8.5.4. Switching a Video Input

#### Command and Response *#crosspoint #switch*

- ▶ CALL /MEDIA/VIDEO/XP:switch(<in>:<out>)
- ◀ mO /MEDIA/VIDEO/XP:switch

#### Example

- ▶ CALL /MEDIA/VIDEO/XP:switch(I2:O1)
- ◀ mO /MEDIA/VIDEO/XP:switch

#### Example 2

- ▶ CALL /MEDIA/VIDEO/XP:switch(0:O1)
- ◀ mO /MEDIA/VIDEO/XP:switch

When using 0 (zero) value as an input, the input will be disconnected and no signal will appear on the output.

### 8.5.5. Disconnecting the Video Inputs

#### Command and Response *#crosspoint #switch*

- ▶ CALL /MEDIA/VIDEO/XP:switch(0:<out>)
- ◀ mO /MEDIA/VIDEO/XP:switch

#### Example

- ▶ CALL /MEDIA/VIDEO/XP:switch(0:O1)
- ◀ mO /MEDIA/VIDEO/XP:switch

Input ports are disconnected from the O1 port.

### 8.5.6. Querying the Video Autoselect Settings

#### Command and Response

- ▶ GET /MEDIA/VIDEO/XP.DestinationPortAutoselect
- ◀ pr /MEDIA/VIDEO/XP.DestinationPortAutoselect=<out1\_set>;<out2\_set>;<...>;<out#\_set>

#### Parameters

Identifier	Parameter description	Value	Parameter value
<out#_set>	Two-letter code of the Autoselect settings – 1 <sup>st</sup> letter	E	Autoselect is enabled.
		D	Autoselect is disabled.
	Two-letter code of the Autoselect settings – 2 <sup>nd</sup> letter	F	<b>First detect:</b> the first active video input is selected.
		P	<b>Priority detect:</b> it is always the highest priority active video input that will be selected.
		L	<b>Last detect:</b> it is always the last attached input that is automatically switched to the output.

#### Example

- ▶ GET /MEDIA/VIDEO/XP.DestinationPortAutoselect
- ◀ pr /MEDIA/VIDEO/XP.DestinationPortAutoselect=EL

#### Explanation

The response shows the settings of each output one by one. **EL:** the Autoselect is Enabled on the output, selected mode is Last detect. For more details, see [The Autoselect Feature](#) section.

### 8.5.7. Changing the Autoselect Mode

#### Command and Response *#autoselect*

- ▶ CALL /MEDIA/VIDEO/XP:setDestinationPortAutoselect(<out1\_set>;<out2\_set>;<...>;<out#\_set>)
- ◀ mO /MEDIA/VIDEO/XP:setDestinationPortAutoselect

#### Parameters

See the previous section.

#### Example 1

- ▶ CALL /MEDIA/VIDEO/XP:setDestinationPortAutoselect(O1:EP)
- ◀ mO /MEDIA/VIDEO/XP:setDestinationPortAutoselect

The setting is changed to **EP:** Autoselect is enabled (E); the mode is set to **priority detect** (P).

#### Example 2

- ▶ CALL /MEDIA/VIDEO/XP:setDestinationPortAutoselect(O1:D)
- ◀ mO /MEDIA/VIDEO/XP:setDestinationPortAutoselect

The setting is changed to **DPM:** Autoselect is disabled (D). The other settings remain unchanged. Since the outputs are linked, the change will affect local and link out.



### 8.5.8. Querying the Input Port Priority

#### Command and Response

- ▶ GET·/MEDIA/VIDEO/XP.PortPriorityList
- ◀ pr·/MEDIA/VIDEO/XP.PortPriorityList=<out1\_list>;<out2\_list>;<...>;<out#\_list>

The response shows the priority of each output one after another. The priority number can be from 0 to 31; 0 is the highest and 30 is the lowest priority. 31 means that the port will be skipped from the priority list.

#### Parameters

<out#\_list> The input port priority order of the given output port: <in1>,<in2>,<...>,<in>

#### Example

- ▶ GET /MEDIA/VIDEO/XP.PortPriorityList
- ◀ pr /MEDIA/VIDEO/XP.PortPriorityList=0,1,2,3,4,5

#### Parameters

	Output					
Video input port	I1	I2	I3	I4	I5	I6
Priority	0	1	2	3	4	5

Highest priority is assigned to I1 port.

**ATTENTION!** The same priority number can be set to different input ports. When the priority numbers match, the input port with the lowest port number will have the highest priority.

### 8.5.9. Changing the Input Port Priority

#### Command and Response

- ▶ CALL·/MEDIA/VIDEO/XP:setAutoselectionPriority(<in>\(<out>\):<prio>);(<in>\(<out>\):<prio>)
- ◀ mO·/MEDIA/VIDEO/XP:setAutoselectionPriority

#### Parameters

The <prio> parameter is the Priority number from 0 to 31, equal numbers are allowed (31 means that the port will be skipped from the priority list). An input port priority can be set on an output port. Many settings can be executed by separating them with a semicolon (no space), see the example below.

#### Example

- ▶ CALL /MEDIA/VIDEO/XP:setAutoselectionPriority(I1\ (O1\):4;I2\ (O1\):4)
- ◀ mO /MEDIA/VIDEO/XP:setAutoselectionPriority

#### Explanation

The priority number of Input 1 and Input 2 has been set to 4 on Output 1. The example shows that certain control characters have been escaped: the backslash “\” character is inserted before the “(” and “)” characters.

### 8.5.10. Mute Video Input

#### Command and Response #mute

- ▶ CALL·/MEDIA/VIDEO/XP:muteSource(<in>)
- ◀ mO·/MEDIA/VIDEO/XP:muteSource

#### Example

- ▶ CALL /MEDIA/VIDEO/XP:muteSource(I1)
- ◀ mO /MEDIA/VIDEO/XP:muteSource

### 8.5.11. Unmute Video Input

#### Command and Response #unmute

- ▶ CALL·/MEDIA/VIDEO/XP:unmuteSource(<in>)
- ◀ mO·/MEDIA/VIDEO/XP:unmuteSource

#### Example

- ▶ CALL /MEDIA/VIDEO/XP:unmuteSource(I1)
- ◀ mO /MEDIA/VIDEO/XP:unmuteSource

### 8.5.12. Lock Video Input

#### Command and Response #lock

- ▶ CALL·/MEDIA/VIDEO/XP:lockSource(<in>)
- ◀ mO·/MEDIA/VIDEO/XP:lockSource

#### Example

- ▶ CALL /MEDIA/VIDEO/XP:lockSource(I1)
- ◀ mO /MEDIA/VIDEO/XP:lockSource

### 8.5.13. Unlock Video Input

#### Command and Response #unlock

- ▶ CALL·/MEDIA/VIDEO/XP:unlockSource(<in>)
- ◀ mO·/MEDIA/VIDEO/XP:unlockSource

#### Example

- ▶ CALL /MEDIA/VIDEO/XP:unlockSource(I1)
- ◀ mO /MEDIA/VIDEO/XP:unlockSource

### 8.5.14. Mute Video Output

#### Command and Response #mute

- ▶ CALL /MEDIA/VIDEO/XP:muteDestination(<out>)
- ◀ mO /MEDIA/VIDEO/XP:muteDestination

#### Example

- ▶ CALL /MEDIA/VIDEO/XP:muteDestination(O1)
- ◀ mO /MEDIA/VIDEO/XP:muteDestination

### 8.5.15. Unmute Video Output

#### Command and Response #unmute

- ▶ CALL /MEDIA/VIDEO/XP:unmuteDestination(<out>)
- ◀ mO /MEDIA/VIDEO/XP:unmuteDestination

#### Example

- ▶ CALL /MEDIA/VIDEO/XP:unmuteDestination(O1)
- ◀ mO /MEDIA/VIDEO/XP:unmuteDestination

### 8.5.16. Lock Video Output

#### Command and Response #lock

- ▶ CALL /MEDIA/VIDEO/XP:lockDestination(<out>)
- ◀ mO /MEDIA/VIDEO/XP:lockDestination

#### Example

- ▶ CALL /MEDIA/VIDEO/XP:lockDestination(O1)
- ◀ mO /MEDIA/VIDEO/XP:lockDestination

### 8.5.17. Unlock Video Output

#### Command and Response #unlock

- ▶ CALL /MEDIA/VIDEO/XP:unlockDestination(<out>)
- ◀ mO /MEDIA/VIDEO/XP:unlockDestination

#### Example

- ▶ CALL /MEDIA/VIDEO/XP:unlockDestination(O1)
- ◀ mO /MEDIA/VIDEO/XP:unlockDestination

### 8.5.18. Setting the HDCP (Input Port)

HDCP capability can be enabled/disabled on the input ports, thus non-encrypted content can be seen on a non-HDCP compliant display. See more information in the [HDCP Management](#) section.

#### Command and Response #hdcp

- ▶ SET /MEDIA/VIDEO/<in>.HdcpEnable=<logical\_value>
- ◀ pw /MEDIA/VIDEO/<in>.HdcpEnable=<logical\_value>

#### Parameters

Identifier	Parameter description	Value	Parameter value
<logical_value>	HDCP enable/disable setting	<b>true</b>	HDCP encryption is enabled.
		<b>false</b>	HDCP encryption is disabled.

#### Example

- ▶ SET /MEDIA/VIDEO/I2.HdcpEnable=true
- ◀ pw /MEDIA/VIDEO/I2.HdcpEnable=true

INFO: HDCP can be set for digital video inputs (I2, I3, I4) only. The function is unavailable on the analog inputs (I1, I5).

### 8.5.19. Setting the HDCP (Output Port)

HDCP capability can be set to Auto/Always on the output ports, thus non-encrypted content can be transmitted to a non-HDCP compliant display. See more information in the [HDCP Management](#) section.

#### Command and Response #hdcp

- ▶ SET /MEDIA/VIDEO/<out>.HdcpModeSetting=<HDCP\_mode>
- ◀ pw /MEDIA/VIDEO/<out>.HdcpModeSetting=<HDCP\_mode>

#### Parameters

Identifier	Parameter description	Value	Parameter value
<HDCP_mode>	HDCP mode	<b>0</b>	Auto
		<b>1</b>	Always

#### Example

- ▶ SET /MEDIA/VIDEO/O1.HdcpModeSetting=0
- ◀ pw /MEDIA/VIDEO/O1.HdcpModeSetting=0

### 8.5.20. Test Pattern Generator Mode

The output port can send a special image towards the sink device for testing purposes. The setting is available on the input ports with the parameters listed below.

#### Command and Response *#testpattern #nosyncscreen*

- ▶ SET·/MEDIA/VIDEO/<out>.TpgMode=<mode>
- ◀ pw·/MEDIA/VIDEO/<out>.TpgMode=<mode>

#### Parameters

Identifier	Parameter description	Value	Parameter value
<mode>	Test pattern generator mode	0	<b>Always off:</b> the test pattern is not displayed on the output.
		1	<b>Always on:</b> the test pattern is displayed on the output.
		2	<b>Auto:</b> the test pattern is displayed if there is no signal on the input port.

#### Example

- ▶ SET /MEDIA/VIDEO/01.TpgMode=2
- ◀ pw /MEDIA/VIDEO/01.TpgMode=2

### 8.5.21. Test Pattern Generator Clock Source

#### Command and Response

- ▶ SET·/MEDIA/VIDEO/<out>.TpgClockSource=<clock\_frequency>
- ◀ pw·/MEDIA/VIDEO/<out>.TpgClockSource=<clock\_frequency>

#### Parameters

Identifier	Parameter description	Value	Parameter value
<clock_frequency>	Clock frequency	480	480p
		576	576p
		EXT	External clock (from actual TMDS source)

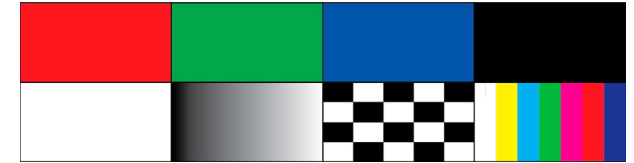
#### Example

- ▶ SET /MEDIA/VIDEO/01.TpgClockSource=576
- ◀ pw /MEDIA/VIDEO/01.TpgClockSource=576

### 8.5.22. Test Pattern Setting

#### Command and Response

- ▶ SET·/MEDIA/VIDEO/<out>.TpgPattern=<pattern>
- ◀ pw·/MEDIA/VIDEO/<out>.TpgPattern=<pattern>



#### Parameters

Identifier	Parameter description	Value	Parameter value
<pattern>	The test pattern displayed on the sink device	RED	Red
		GREEN	Green
		BLUE	Blue
		BLACK	Black
		WHITE	White
		RAMP	Ramp
		CHESS	Chess
		BAR	Bar
		CYCLE	Cycle setting means all the patterns are changed sequentially approx. every 2 seconds

#### Example

- ▶ SET /MEDIA/VIDEO/01.TpgPattern=GREEN
- ◀ pw /MEDIA/VIDEO/01.TpgPattern=GREEN

### 8.5.23. Signal Type Settings (Output Port)

#### Command and Response *#signaltype*

- ▶ SET·/MEDIA/VIDEO/<out>.HdmiModeSetting=<mode>
- ◀ pw·/MEDIA/VIDEO/<out>.HdmiModeSetting=<mode>

#### Parameters

Identifier	Parameter description	Value	Parameter value
<mode>	HDMI mode	0	Auto
		1	DVI
		2	HDMI

#### Example

- ▶ SET /MEDIA/VIDEO/01.HdmiModeSetting=2
- ◀ pw /MEDIA/VIDEO/01.HdmiModeSetting=2

## 8.6. Audio Port Settings

INFO: Audio port numbering can be found in the [Input/Output Port Numbering](#) section.

### 8.6.1. Query the Status of Source Ports

**Command and Response** `#status #portstatus #audio`

- ▶ GET /MEDIA/AUDIO/XP.SourcePortStatus
- ◀ pr /MEDIA/AUDIO/XP.SourcePortStatus=<in1\_state>;<in2\_state>;<...>; <in#\_state>

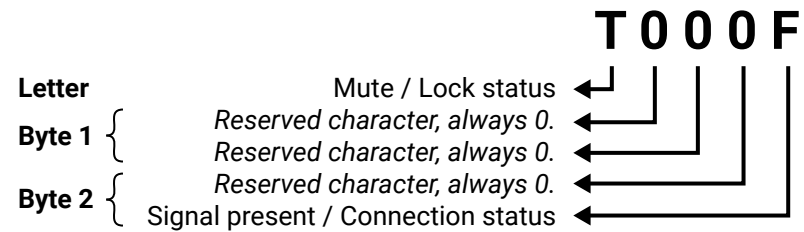
The response contains 5 ASCII characters for each port. The first character indicates the mute/lock state, the next four characters represent a 2-byte HEX code showing the current state of the input ports.

#### Example

- ▶ GET /MEDIA/AUDIO/XP.SourcePortStatus
- ◀ pr /MEDIA/AUDIO/XP.SourcePortStatus=T000F;M000B;T000A

#### Legend:

Letter (Character 1)		
	Mute state	Lock state
T	Unmuted	Unlocked
L	Unmuted	Locked
M	Muted	Unlocked
U	Muted	Locked



	Byte 1				Byte 2			
	Character 2		Character 3		Character 4		Character 5	
	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Signal present status	Connection status
<b>00</b>							Unknown	
<b>01</b>							Reserved	
<b>10</b>	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	No signal	Not connected
<b>11</b>							Signal presents	Connected

#### Example and Explanation (for input 2, M000B):

M	0		0		0		B	
Unlocked, Muted	00	00	00	00	00	00	10	11
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	No signal	Connected

#### The Most Common Received Port Status Responses

T000A	T	0		0		0		A	
	Unlocked, Unmuted	00	00	00	00	00	00	10	10
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	No signal	Not connected	

T000B	T	0		0		0		B	
	Unlocked, Unmuted	00	00	00	00	00	00	10	11
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	No signal	Connected	

T000F	T	0		0		0		F	
	Unlocked, Unmuted	00	00	00	00	00	00	11	11
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Signal presents	Connected	

**Only for Phoenix audio port:** Character 5 is C (11 00), which means signal is present, but the cable connection status, is unknown. The explanation is Phoenix connector has no pin that can indicate the connection status so this is always unknown.

### 8.6.2. Query the Status of Destination Port

#### Command and Response *#status #portstatus*

- ▶ GET·/MEDIA/AUDIO/XP.DestinationPortStatus
- ◀ pr·/MEDIA/AUDIO/XP.DestinationPortStatus=<out1\_state>

The response contains 5 ASCII characters for each port. The first character indicates the mute/lock state, the next 2-byte long HEX code showing the current state of the output port.

#### Example

- ▶ GET /MEDIA/AUDIO/XP.DestinationPortStatus
- ◀ pr /MEDIA/AUDIO/XP.DestinationPortStatus=T000F

#### Legend

See at previous section.

#### Example and Explanation

T	0		0		0		F	
Unlocked, Unmuted	00	00	00	00	00	00	11	11
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Signal presents	Connected

### 8.6.3. Query the Audio Crosspoint Setting

#### Command and Response

- ▶ GET·/MEDIA/AUDIO/XP.DestinationConnectionList
- ◀ pr·/MEDIA/AUDIO/XP.DestinationConnectionList=<in>

#### Example

- ▶ GET /MEDIA/AUDIO/XP.DestinationConnectionList
- ◀ pr /MEDIA/AUDIO/XP.DestinationConnectionList=I5

I5 input port is connected to the output port.

### 8.6.4. Switching Audio Input

#### Command and Response *#switch #crosspoint*

- ▶ CALL·/MEDIA/AUDIO/XP:switch(<in>:<out>)
- ◀ mO·/MEDIA/AUDIO/XP:switch

#### Example

- ▶ CALL /MEDIA/AUDIO/XP:switch(I2:O1)
- ◀ mO /MEDIA/AUDIO/XP:switch

**Explanation:** I2 port is connected to O1 port.

### 8.6.5. Query the Audio Autoselect Settings

#### Command and Response *#autoselect*

- ▶ GET·/MEDIA/AUDIO/XP.DestinationPortAutoselect
- ◀ pr·/MEDIA/AUDIO/XP.DestinationPortAutoselect=<out\_set>

The response shows the settings of each output one by one.

#### Parameters

Identifier	Parameter description	Value	Parameter value
<out_set>	Two-letter code of the Autoselect settings 1 <sup>st</sup> letter	E	Autoselect is enabled.
		D	Autoselect is disabled.
	Two-letter code of the Autoselect settings 2 <sup>nd</sup> letter	F	<b>First detect:</b> the first active audio input is selected.
		P	<b>Priority detect:</b> always the highest priority active audio input will be selected.
		L	<b>Last detect:</b> always the last attached input is switched to the output automatically.
		S	<b>Static:</b> the audio input follows the selected video if the video signal contains embedded audio.

#### Example

- ▶ GET /MEDIA/AUDIO/XP.DestinationPortAutoselect
- ◀ pr /MEDIA/AUDIO/XP.DestinationPortAutoselect=EL

#### Explanation

**EL:** the Autoselect is Enabled on output, selected mode is Last detect.

**INFO:** For more information about the Autoselect feature see [The Autoselect Feature](#) section.



### 8.6.6. Change the Autoselect Mode

#### Command and Response *#audio*

- ▶ CALL /MEDIA/AUDIO/XP:setDestinationPortAutoselect(<out>:<out\_set>)
- ◀ mO /MEDIA/AUDIO/XP:setDestinationPortAutoselect

#### Parameters

See at the previous section.

#### Example 1

- ▶ CALL /MEDIA/AUDIO/XP:setDestinationPortAutoselect(O1:EL)
- ◀ mO /MEDIA/AUDIO/XP:setDestinationPortAutoselect

The setting is changed to **EPM**: Autoselect is enabled (E); the mode is set to **Priority detect** (P), and the port will be disconnected if a higher priority port becomes active (M).

#### Example 2

- ▶ CALL /MEDIA/AUDIO/XP:setDestinationPortAutoselect(O1:D)
- ◀ mO /MEDIA/AUDIO/XP:setDestinationPortAutoselect

The setting is changed to **DPM**: Autoselect is disabled (D). The other settings remain unchanged.

■ INFO: For more information about the Autoselect feature see [The Autoselect Feature](#) section.

### 8.6.7. Query the Input Port Priority

#### Command and Response

- ▶ GET /MEDIA/AUDIO/XP.PortPriorityList
- ◀ pr /MEDIA/AUDIO/XP.PortPriorityList=<out1\_list>;<out2\_list>;<...>;<out#\_list>

The response shows the priority of each output one after another. The priority number can be from 0 to 31; 0 is the highest and 30 is the lowest priority. 31 means that the port will be skipped from the priority list.

#### Parameters

<out1\_list> The input port priority order of the given output port: <in1>,<in2>,...,<in>

#### Example

- ▶ GET /MEDIA/AUDIO/XP.PortPriorityList
- ◀ pr /MEDIA/AUDIO/XP.PortPriorityList=0,1,2

	Output		
Audio input port	I1	I2	I3
Priority	0	1	2

Highest priority is assigned to I1 port.

■ **ATTENTION!** The same priority number can be set to different input ports. When the priority numbers match, the input port with the lowest port number will have the highest priority.

### 8.6.8. Change the Input Port Priority

#### Command and Response *#audio*

- ▶ CALL /MEDIA/AUDIO/XP:setAutoselectionPriority(<in>\(<out>\):<prio>);(<in>\(<out>\):<prio>)
- ◀ mO /MEDIA/AUDIO/XP:setAutoselectionPriority

#### Parameters

<prio> Priority number from 0 to 31, equal numbers are allowed (31 means that the port will be skipped from the priority list).

An input port priority can be set on an output port. Many settings can be executed by separating with a semicolon (no space), see the example below.

#### Example

- ▶ CALL /MEDIA/VIDEO/XP:setAutoselectionPriority(I1\ (O1\):4;I2\ (O1\):4)
- ◀ mO /MEDIA/VIDEO/XP:setAutoselectionPriority

#### Explanation:

The priority number of input 1 and Input 2 has been set to 4 on output 1. The example shows that certain control characters have been escaped: the backslash “\” character is inserted before the “(” and “)” characters. See more information about the escaping in the [Escaping](#) section.

### 8.6.9. Mute Audio Input

#### Command and Response #mute

- ▶ CALL·/MEDIA/AUDIO/XP:muteSource(<in>)
- ◀ mO·/MEDIA/AUDIO/XP:muteSource

#### Example

- ▶ CALL /MEDIA/AUDIO/XP:muteSource(I1;I3)
- ◀ mO /MEDIA/AUDIO/XP:muteSource

### 8.6.10. Unmute Audio Input

#### Command and Response #unmute

- ▶ CALL·/MEDIA/AUDIO/XP:unmuteSource(<in>)
- ◀ mO·/MEDIA/AUDIO/XP:unmuteSource

#### Example

- ▶ CALL /MEDIA/AUDIO/XP:unmuteSource(I1;I2)
- ◀ mO /MEDIA/AUDIO/XP:unmuteSource

### 8.6.11. Lock Audio Input

#### Command and Response #lock

- ▶ CALL·/MEDIA/AUDIO/XP:lockSource(<in>)
- ◀ mO·/MEDIA/AUDIO/XP:lockSource

#### Example

- ▶ CALL /MEDIA/AUDIO/XP:lockSource(I2;I4)
- ◀ mO /MEDIA/AUDIO/XP:lockSource

### 8.6.12. Unlock Audio Input

#### Command and Response #unlock

- ▶ CALL·/MEDIA/AUDIO/XP:unlockSource(<in>)
- ◀ mO·/MEDIA/AUDIO/XP:unlockSource

#### Example

- ▶ CALL /MEDIA/AUDIO/XP:unlockSource(I1;I4)
- ◀ mO /MEDIA/AUDIO/XP:unlockSource

### 8.6.13. Mute Audio Output

#### Command and Response #mute

- ▶ CALL·/MEDIA/AUDIO/XP:muteDestination(<out>)
- ◀ mO·/MEDIA/AUDIO/XP:muteDestination

#### Example

- ▶ CALL /MEDIA/AUDIO/XP:muteDestination(O1)
- ◀ mO /MEDIA/AUDIO/XP:muteDestination

### 8.6.14. Unmute Audio Output

#### Command and Response #unmute

- ▶ CALL·/MEDIA/AUDIO/XP:unmuteDestination(<out>)
- ◀ mO·/MEDIA/AUDIO/XP:unmuteDestination

#### Example

- ▶ CALL /MEDIA/AUDIO/XP:unmuteDestination(O1)
- ◀ mO /MEDIA/AUDIO/XP:unmuteDestination

### 8.6.15. Lock Audio Output

#### Command and Response #lock

- ▶ CALL·/MEDIA/AUDIO/XP:lockDestination(<out>)
- ◀ mO·/MEDIA/AUDIO/XP:lockDestination

#### Example

- ▶ CALL /MEDIA/AUDIO/XP:lockDestination(O1)
- ◀ mO /MEDIA/AUDIO/XP:lockDestination

### 8.6.16. Unlock Audio Output

#### Command and Response #unlock

- ▶ CALL·/MEDIA/AUDIO/XP:unlockDestination(<out>)
- ◀ mO·/MEDIA/AUDIO/XP:unlockDestination

#### Example

- ▶ CALL /MEDIA/AUDIO/XP:unlockDestination(O1)
- ◀ mO /MEDIA/AUDIO/XP:unlockDestination

## 8.7. Analog Audio Port Settings

### 8.7.1. Setting the Volume in dB

**Command and Response** *#analogaudio #volume #balance #gain*

- ▶ SET•/MEDIA/AUDIO/<in|out>.VolumedB=<volume>
- ◀ pw•/MEDIA/AUDIO/<in|out>.VolumedB=<volume>

#### Parameters

Parameter	Parameter description
<volume>	Sets the input volume (attenuation) between -95.62 dB and 0 dB.

#### Example

- ▶ SET /MEDIA/AUDIO/I3.VolumedB=-15
- ◀ pw /MEDIA/AUDIO/I3.VolumedB=-15.000

### 8.7.2. Setting the Volume in Percent

**Command and Response**

- ▶ SET•/MEDIA/AUDIO/<in|out>.VolumePercent=<percent>
- ◀ pw•/MEDIA/AUDIO/<in|out>.VolumePercent=<percent>

#### Example

- ▶ SET /MEDIA/AUDIO/O3.VolumePercent=50
- ◀ pw /MEDIA/AUDIO/O3.VolumePercent=50.00

### 8.7.3. Setting the Balance

**Command and Response** *#balance*

- ▶ SET•/MEDIA/AUDIO/<in|out>.Balance=<balance>
- ◀ pw•/MEDIA/AUDIO/<in|out>.Balance=<balance>

#### Parameters

Parameter	Parameter description
<balance>	Sets the balance; -100 means left balance, +100 means right balance, step is 1. Center is 0 (default).

#### Example

- ▶ SET /MEDIA/AUDIO/I3.Balance=+25
- ◀ pw /MEDIA/AUDIO/I3.Balance=+25

### 8.7.4. Setting the Gain

INFO: The setting is available on the analog audio input port only.

**Command and Response** *#gain*

- ▶ SET•/MEDIA/AUDIO/<in>.Gain=<gain>
- ◀ pw•/MEDIA/AUDIO/<in>.Gain=<gain>

#### Parameters

Parameter	Parameter description
<gain>	Sets the input gain between -12 dB and 35 dB.

#### Example

- ▶ SET /MEDIA/AUDIO/I3.Gain=4
- ◀ pw /MEDIA/AUDIO/I3.Gain=4

## 8.8. Event Manager Basics

The Event Manager in the LDC allows the creation of any kind of Events. Sometimes, the events have to be arranged or modified by LW3 commands from another device. These commands are detailed in the coming sections. *#eventmanager*

### 8.8.1. How to arrange an Event?

The following are necessary to have a successful event:

- Defining the **Condition**
- Defining the **Action**
- Setting the **Delay** (optional)
- **Name** the Event and set to **Enabled**. (Setting the Event to **Enabled** as the last step is recommended.)

**Command and Response**

- ▶ SET•/EVENTS/E<loc>.Condition=<expression>
- ◀ pw•/EVENTS/E<loc>.Condition=<expression>

#### Parameters

The structure of the <expression> is: <node\_path>.<property>=<value>.

#### Example 1 – property changes to a set value

- ▶ SET /EVENTS/E1.Condition=/MEDIA/VIDEO/I1.SignalPresent=1
- ◀ pw /EVENTS/E1.Condition=/MEDIA/VIDEO/I1.SignalPresent=1

The Condition is fulfilled if the **SignalPresent** property changes to '1'.

**Example 2 – property changes anything but the set value**

In some cases, the opposite is necessary: when the property does **not** equal with the value. If you need so, the **ConditionInverted** property must be set to **true**:

- ▶ SET /EVENTS/E2.Condition=/MEDIA/VIDEO/O1.ConnectedSource=I1
- ◀ pw /EVENTS/E2.Condition=/MEDIA/VIDEO/O1.ConnectedSource=I1
- ▶ SET /EVENTS/E2.ConditionInverted=true
- ◀ pw /EVENTS/E2.ConditionInverted=true

The Condition is fulfilled if the **ConnectedSource** property does not equal with 'I1' (in other words: if other input port is connected to O1 than I1).

**Example 3 – property changes to anything**

When it is not the property value that matters, but the change of the property value, the change can be set as a condition. In this case, put a ? character to the end of the desired property:

- ▶ SET /EVENTS/E3.Condition=/MEDIA/VIDEO/O1.ConnectedSource?
- ◀ pw /EVENTS/E3.Condition=/MEDIA/VIDEO/O1.ConnectedSource?

If the **ConnectedSource** property changes (due to a crosspoint-switch), the set Condition is fulfilled.

**8.8.2. Setting a Condition by Linking Another Condition****Command and Response**

- ▶ SET /EVENTS/E<loc>.Condition=<event\_nr>
- ◀ pw /EVENTS/E<loc>.Condition=<event\_nr>

**Parameters**

The <event\_nr> means the number (location) of the linked event without letter 'E'.

**Example**

- ▶ SET /EVENTS/E2.Condition=1
- ◀ pw /EVENTS/E2.Condition=1

The Condition of the E2 Event is set to be the same as set for E1 Event.

**8.8.3. Setting a Condition by Linking More Conditions**

The first generation of the Event Manager is able to sense a change (one condition), but in some cases that is not enough. The practical experience has shown there is a need to examine more conditions (up to four) as follows: if one of the set conditions becomes true (while the other conditions are fulfilled), then the set Action is launched.

**Command and Response**

- ▶ SET /EVENTS/E<loc>.Condition=<event\_nr>&<event\_nr>&<event\_nr>&<event\_nr>
- ◀ pw /EVENTS/E<loc>.Condition=<event\_nr>&<event\_nr>&<event\_nr>&<event\_nr>

**Parameters**

The <event\_nr> parameters mean the numbers (locations) of the linked Events without letter 'E'. Up to four event number can be set.

**Example**

- ▶ SET /EVENTS/E4.Condition=1&2&3
- ◀ pw /EVENTS/E4.Condition=1&2&3

If two Conditions exist and the third is detected (changes to true), the Condition of E4 will be fulfilled and the Action of E4 will be launched.

**TIPS AND TRICKS:** You do not have to define Actions for E1, E2 and E3 Events, and you can leave those Disabled.

**8.8.4. Setting an Action by Specifying a Direct Path****Command and Response**

- ▶ SET /EVENTS/E<loc>.Action=<expression>
- ◀ pw /EVENTS/E<loc>.Action=<expression>

**Parameters**

The structure of the <expression> is: <node\_path>.<property\_or\_method>=<value>. Properties and methods are handled in the same way: dot (.) stands after the path in both cases, colon (:) is not used. Do not use brackets for methods. The <value> parameter is optional in case of certain methods.

**Example**

- ▶ SET /EVENTS/E1.Action=/MEDIA/AUDIO/XP.switch=I2:O1
- ◀ pw /EVENTS/E1.Action=/MEDIA/AUDIO/XP.switch=I2:O1

### 8.8.5. Setting an Action by Linking Another Action

#### Command and Response

- ▶ SET /EVENTS/E<loc>.Action=<event\_nr>
- ◀ pw /EVENTS/E<loc>.Action=<event\_nr>

#### Parameters

The <event\_nr> means the number (location) of the linked event without letter 'E'.

#### Example

- ▶ SET /EVENTS/E2.Action=1
- ◀ pw /EVENTS/E2.Action=1

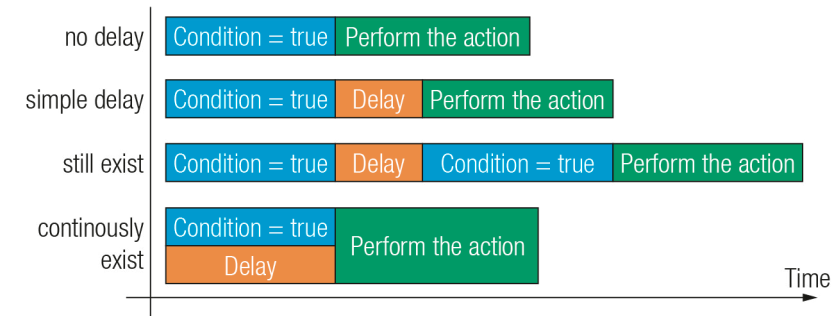
The Action of the E2 Event is set to be the same as set for E1 Event.

## 8.9. Event Manager Tool Kit

### 8.9.1. Setting the Delay

In most cases, the Action is performed immediately after the Condition is detected. But sometimes a delay is necessary between the Condition and the Action, thus the following delay options are defined:

*#eventmanager*



#### Command and Response (summary)

- ▶ SET /EVENTS/E<loc>.ConditionTimeout=<time>
- ◀ pw /EVENTS/E<loc>.ConditionTimeout=<time>
- ▶ SET /EVENTS/E<loc>.ConditionEndCheck=<true/false>
- ◀ pw /EVENTS/E<loc>.ConditionEndCheck=<true/false>
- ▶ SET /EVENTS/E<loc>.ConditionTimeoutContinuous=<true/false>
- ◀ pw /EVENTS/E<loc>.ConditionTimeoutContinuous=<true/false>

#### Parameters

The <time> parameter means seconds. Set the following properties for the desired delay type:

Delay type	Properties to set	Value	Result
no delay	/EVENTS/E<loc>.ConditionTimeout	0	The Action will be launched after the Condition is detected.
simple delay	/EVENTS/E<loc>.ConditionTimeout	<time>	If the Condition is detected, the action will be launched after the set time.
still true after	/EVENTS/E<loc>.ConditionTimeout	<time>	The Condition is fulfilled only if it is detected <b>again</b> after the set time.
	/EVENTS/E<loc>.ConditionEndCheck	true	
continuously true	/EVENTS/E<loc>.ConditionTimeout	<time>	The Condition is fulfilled only if it is existing <b>continuously</b> during the set time.
	/EVENTS/E<loc>.ConditionEndCheck	true	
	/EVENTS/E<loc>.ConditionTimeoutContinuous	true	

**Example 1 (simple delay)**

- ▶ SET /EVENTS/E1.ConditionTimeout=10
- ◀ pw /EVENTS/E1.ConditionTimeout=10

If the Condition is detected (the **ConditionDetect** property becomes **true**), the **ConditionTimeoutPending** property becomes **true**. 10 seconds later the **ConditionTimeoutPending** property becomes **false** and the set Action is launched.

**Example 2 ('still true after' delay type)**

- ▶ SET /EVENTS/E1.ConditionTimeout=10
- ◀ pw /EVENTS/E1.ConditionTimeout=10
- ▶ SET /EVENTS/E1.ConditionTimeoutPending=true
- ◀ pw /EVENTS/E1.ConditionTimeoutPending=true

If the Condition is detected (the **ConditionDetect** property becomes **true**), the **ConditionTimeoutPending** property becomes **true**. 10 seconds later the Condition is checked again (the **ConditionTimeoutPending** property becomes **false**). If the Condition can be detected again (the **ConditionDetect** property becomes **true** again), the Condition is fulfilled and the set Action is launched.

**Example 3 ('continuously true' delay type)**

- ▶ SET /EVENTS/E1.ConditionTimeout=10
- ◀ pw /EVENTS/E1.ConditionTimeout=10
- ▶ SET /EVENTS/E1.ConditionTimeoutContinuous=true
- ◀ pw /EVENTS/E1.ConditionTimeoutContinuous=true

If the Condition is detected (the **ConditionDetect** property becomes **true**), the **ConditionTimeoutPending** property becomes **true**. If the Condition can be detected in the following 10 seconds continuously (the **ConditionDetect** property stays **true**), the Condition is fulfilled, the **ConditionTimeoutPending** property becomes **false**, and the set Action is launched.

**8.9.2. Setting the Name of the Event****Command and Response**

- ▶ SET·/EVENTS/E<loc>.Name=<string>
- ◀ pw·/EVENTS/E<loc>.Name=<string>

**Parameters**

The <string> may contain letters (A-Z) and (a-z), numbers (0-9), special characters: hyphen (-), underscore (\_), and space ( ), up to 20 characters. Longer string results in an error, unaccepted characters are skipped.

**Example**

- ▶ SET /EVENTS/E1.Name=Projector\_ON
- ◀ pw /EVENTS/E1.Name=Projector\_ON

**8.9.3. Enable the Event****Command and Response**

- ▶ SET·/EVENTS/E<loc>.Enabled=<true/false>
- ◀ pw·/EVENTS/E<loc>.Enabled=<true/false>

**Parameters**

When the property value is **true** (or **1**), the Action will be launched if the Condition is detected. If the property is **false** (or **0**), the Action will not run, however, the Condition counter will be increased when detected.

**Example**

- ▶ SET /EVENTS/E1.Enabled=true
- ◀ pw /EVENTS/E1.Enabled=true

**8.9.4. Triggering a Condition**

This feature works like a condition is fulfilled. When a complex control system is built, a Condition may trigger numerous Actions. A typical example is when a system is powered on and the 'ready-to-use' state has to be loaded. In this case, there could be many actions that are based on the same condition. In order to reduce the number of the commands, you can trigger one 'key' condition, which starts the whole process.

**Command and Response**

- ▶ CALL·/EVENTS/E<loc>:triggerCondition(1)
- ◀ m0·/EVENTS/E<loc>:triggerCondition

**Example**

- ▶ CALL /EVENTS/E1:triggerCondition(1)
- ◀ m0 /EVENTS/E1:triggerCondition

The Condition of Event1 is fulfilled, the set Action will be launched (after the delay if set).

**8.9.5. Querying the Condition Counter**

This property shows how many times the Condition has been detected and triggered altogether. The counter is reset at boot.

**Command and Response**

- ▶ GET·/EVENTS/E<loc>.ConditionCount
- ◀ pw·/EVENTS/E<loc>.ConditionCount=<num\_value>

**Example**

- ▶ GET /EVENTS/E1.ConditionCount
- ◀ pw /EVENTS/E1>.ConditionCount=5



### 8.9.6. Querying the Condition Trigger Counter

This property shows how many times the Condition has been triggered, but does not contain the number of real detections. The counter is reset at boot.

#### Command and Response

- ▶ GET /EVENTS/E<loc>.ExternalConditionTriggerCount
- ◀ pw /EVENTS/E<loc>.ExternalConditionTriggerCount=<num\_value>

#### Example

- ▶ GET /EVENTS/E1.ExternalConditionTriggerCount
- ◀ pw /EVENTS/E1.ExternalConditionTriggerCount=2

### 8.9.7. Testing an Action

This tool is for launching the Action without detecting or triggering the Condition.

#### Command and Response

- ▶ CALL /EVENTS/E<loc>:ActionTest(1)
- ◀ mO /EVENTS/E<loc>:ActionTest

#### Example

- ▶ CALL /EVENTS/E1:ActionTest(1)
- ◀ mO /EVENTS/E1:ActionTest

## 8.10. Ethernet Port Configuration

### 8.10.1. Setting the DHCP State

**ATTENTION!** When you change a network property, the new value is stored, but the **applySettings** method must always be called to apply the new settings. When two or more network parameters are changed, the **applySettings** method is enough to be called once as a final step.

#### Command and Response #dhcp #network #ipaddress #ethernet

- ▶ SET /MANAGEMENT/NETWORK.DhcpEnabled=<dhcp\_status>
- ◀ pw /MANAGEMENT/NETWORK.DhcpEnabled=<dhcp\_status>

#### Parameters

If the <dhcp\_status> parameter is **true**, the current IP address setting is DHCP, if the parameter is **false**, the current IP address is static.

#### Example

- ▶ SET /MANAGEMENT/NETWORK.DhcpEnabled=true
- ◀ pw /MANAGEMENT/NETWORK.DhcpEnabled=true
- ▶ CALL /MANAGEMENT/NETWORK:applySettings(1)
- ◀ mO /MANAGEMENT/NETWORK:applySettings

INFO: The **applySettings** method will save and apply the new value and the device will reboot.

INFO: The current setting can be queried by the **GET** command.

### 8.10.2. Changing the IP Address (Static)

#### Command and Response

- ▶ SET /MANAGEMENT/NETWORK.StaticIpAddress=<IP\_address>
- ◀ pw /MANAGEMENT/NETWORK.StaticIpAddress=<IP\_address>

#### Example

- ▶ SET /MANAGEMENT/NETWORK.StaticIpAddress=192.168.0.85
- ◀ pw /MANAGEMENT/NETWORK.StaticIpAddress=192.168.0.85
- ▶ CALL /MANAGEMENT/NETWORK:applySettings(1)
- ◀ mO /MANAGEMENT/NETWORK:applySettings

INFO: The **applySettings** method will save and apply the new value and the device will reboot.

INFO: The current setting can be queried by the **GET** command.

### 8.10.3. Changing the Subnet Mask (Static)

#### Command and Response #ipaddress

- ▶ SET /MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>
- ◀ pw /MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>

#### Example

- ▶ SET /MANAGEMENT/NETWORK.StaticNetworkMask=255.255.255.0
- ◀ pw /MANAGEMENT/NETWORK.StaticNetworkMask=255.255.255.0
- ▶ CALL /MANAGEMENT/NETWORK:applySettings(1)
- ◀ m0 /MANAGEMENT/NETWORK:applySettings

INFO: The `applySettings` method will save and apply the new value and the device will reboot.

INFO: The current setting can be queried by using the [GET command](#).

### 8.10.4. Changing the Gateway Address (Static)

#### Command and Response

- ▶ SET /MANAGEMENT/NETWORK.StaticGatewayAddress=<gw\_address>
- ◀ pw /MANAGEMENT/NETWORK.StaticGatewayAddress=<gw\_address>

#### Example

- ▶ SET /MANAGEMENT/NETWORK.StaticGatewayAddress=192.168.0.5
- ◀ pw /MANAGEMENT/NETWORK.StaticGatewayAddress=192.168.0.5
- ▶ CALL /MANAGEMENT/NETWORK:applySettings(1)
- ◀ m0 /MANAGEMENT/NETWORK:applySettings

INFO: The `applySettings` method will save and apply the new value and the device will reboot.

INFO: The current setting can be queried by using the [GET command](#).

### 8.10.5. Applying Network Settings

#### Command and Response

- ▶ CALL /MANAGEMENT/NETWORK:ApplySettings(1)
- ◀ m0 /MANAGEMENT/NETWORK:ApplySettings

#### Example

- ▶ CALL /MANAGEMENT/NETWORK:ApplySettings(1)
- ◀ m0 /MANAGEMENT/NETWORK:ApplySettings

All network settings that have been changed are applied and the network interface restarts.

## 8.11. RS-232 Port Configuration

INFO: RS-232 port numbering can be found in the [Input/Output Port Numbering](#) section.

### 8.11.1. Setting the Protocol

#### Command and Response #rs232 #rs-232 #serial #protocol

- ▶ SET /MEDIA/UART/<port>.ControlProtocol=<protocol>
- ◀ pw /MEDIA/UART/<port>.ControlProtocol=<protocol>

#### Parameters

Identifier	Parameter description	Value	Parameter value
<protocol>	Control protocol which is applied on the selected serial port	0	LW2 protocol
		1	LW3 protocol

#### Example

- ▶ SET /MEDIA/UART/P1.ControlProtocol=1
- ◀ pw /MEDIA/UART/P1.ControlProtocol=1

### 8.11.2. Setting the BAUD Rate

#### Command and Response

- ▶ SET /MEDIA/UART/<port>.Baudrate=<baudrate>
- ◀ pw /MEDIA/UART/<port>.Baudrate=<baudrate>

#### Parameters

Identifier	Parameter description	Value	Parameter value
<baudrate>	BAUD rate value	0	4800
		1	7200
		2	9600
		3	14400
		4	19200
		5	38400
		6	57600
		7	115200

#### Example

- ▶ SET /MEDIA/UART/P1.Baudrate=2
- ◀ pw /MEDIA/UART/P1.Baudrate=2

### 8.11.3. Setting the Databits

#### Command and Response

- ▶ SET /MEDIA/UART/<port>.DataBits=<databits>
- ◀ pw /MEDIA/UART/<port>.DataBits=<databits>

#### Parameters

Identifier	Parameter description	Value	Parameter value
<databits>	Databits value	8	8
		9	9

#### Example

- ▶ SET /MEDIA/UART/P1.DataBits=8
- ◀ pw /MEDIA/UART/P1.DataBits=8

### 8.11.4. Setting the Stopbits

#### Command and Response

- ▶ SET /MEDIA/UART/<port>.StopBits=<stopbits>
- ◀ pw /MEDIA/UART/<port>.StopBits=<stopbits>

#### Parameters

Identifier	Parameter description	Value	Parameter value
<stopbits>	Stopbits value	0	1
		1	1,5
		2	2

#### Example

- ▶ SET /MEDIA/UART/P1.StopBits=0
- ◀ pw /MEDIA/UART/P1.StopBits=0

### 8.11.5. Setting the Parity

#### Command and Response

- ▶ SET /MEDIA/UART/ <port>.Parity=<parity>
- ◀ pw /MEDIA/UART/<port>.Parity=<parity>

#### Parameters

Identifier	Parameter description	Value	Parameter value
<parity>	Parity setting	0	None
		1	Odd
		2	Even

#### Example

- ▶ SET /MEDIA/UART/P1.Parity=0
- ◀ pw /MEDIA/UART/P1.Parity=0

### 8.11.6. Setting the RS-232 Operation Mode

#### Command and Response *#rs232 #rs-232 #serial #commandinjection*

- ▶ SET /MEDIA/UART/<port>.Rs232Mode=<mode>
- ◀ pw /MEDIA/UART/<port>.Rs232Mode=<mode>

#### Parameters

Identifier	Parameter description	Value	Parameter value
<stopbits>	Stopbits value	0	Pass-through
		1	Control
		2	Command injection

#### Example

- ▶ SET /MEDIA/UART/P1.Rs232Mode=1
- ◀ pw /MEDIA/UART/P1.Rs232Mode=1

INFO: See more information about RS-232 modes in the [Technical Background](#) section.

### 8.11.7. Enabling/Disabling Command Injection

#### Command and Response

- ▶ SET·/MEDIA/UART/<port>.CommandInjectionEnable=<logical\_value>
- ◀ pw·/MEDIA/UART/<port>.CommandInjectionEnable=<logical\_value>

#### Parameters

Identifier	Parameter description	Value	Parameter value
<logical_value>	Command injection enable/disable setting	<b>true</b>	Command injection is enabled.
		<b>false</b>	Command injection is disabled.

#### Example

- ▶ SET /MEDIA/UART/P1.CommandInjectionEnable=true
- ◀ pw /MEDIA/UART/P1.CommandInjectionEnable=true

INFO: The Command injection status is stored in another read-only property: /MEDIA/UART/<serial\_port>.CommandInjectionStatus.

## 8.12. Ethernet Message Sending

The device can be used for sending a message to a certain IP:port address. The three different commands allow controlling the connected (third-party) devices. *#message*

### 8.12.1. Sending a TCP Message (ASCII-format)

The command is for sending a command message in ASCII-format. This method allows escaping the control characters.

#### Command and Response

- ▶ CALL·/MEDIA/ETHERNET:tcpMessage(<IP\_address>:<port\_no>=<message>)
- ◀ mO·/MEDIA/ETHERNET:tcpMessage

#### Example

- ▶ CALL /MEDIA/ETHERNET:tcpMessage(192.168.0.103:6107=C00)
- ◀ mO /MEDIA/ETHERNET:tcpMessage

The 'C00' message is sent to the indicated IP:port address.

#### Example with HEX codes

- ▶ CALL /MEDIA/ETHERNET:tcpMessage(192.168.0.20:5555=C00\x0a\x0d)
- ◀ mO /MEDIA/ETHERNET:tcpMessage

The 'C00' message with CrLf (Carriage return and Line feed) is sent to the indicated IP:port address. The \x sequence indicates the HEXA code; see more information in the [Escaping](#) section.

### 8.12.2. Sending a TCP Text (ASCII-format)

The command is for sending a text message in ASCII-format. This method **does not allow** escaping or inserting control characters.

#### Command and Response

- ▶ CALL·/MEDIA/ETHERNET:tcpText(<IP\_address>:<port\_no>=<text>)
- ◀ mO·/MEDIA/ETHERNET:tcpText

#### Example

- ▶ CALL /MEDIA/ETHERNET:tcpText(192.168.0.103:6107=pwr\_on)
- ◀ mO /MEDIA/ETHERNET:tcpText

The 'pwr\_on' text is sent to the indicated IP:port address.

### 8.12.3. Sending a TCP Binary Message (HEX-format)

The command is for sending a binary message in Hexadecimal format. This method **does not require** escaping the control and non-printable characters.

#### Command and Response

- ▶ CALL·/MEDIA/ETHERNET:tcpBinary(<IP\_address>:<port\_no>=<HEX\_message>)
- ◀ mO·/MEDIA/ETHERNET:tcpBinary

#### Example

- ▶ CALL /MEDIA/ETHERNET:tcpBinary(192.168.0.103:6107=0100000061620000cdcc2c40)
- ◀ mO /MEDIA/ETHERNET:tcpBinary

The '0100000061620000cdcc2c40' message is sent to the indicated IP:port address.

INFO: There is no need to insert a space or other separator character between the binary messages.

#### 8.12.4. Sending a UDP Message (ASCII-format)

The command is for sending a UDP message in ASCII-format. This method allows escaping the control characters.

##### Command and Response

- ▶ CALL /MEDIA/ETHERNET:udpMessage(<IP\_address>:<port\_no>=<message>)
- ◀ mO /MEDIA/ETHERNET:udpMessage

##### Example

- ▶ CALL /MEDIA/ETHERNET:udpMessage(192.168.0.103:6107=C00)
- ◀ mO /MEDIA/ETHERNET:udpMessage

The 'C00' message is sent to the indicated IP:port address.

##### Example with HEX codes

- ▶ CALL /MEDIA/ETHERNET:udpMessage(192.168.0.20:9988=C00\x0a\x0d)
- ◀ mO /MEDIA/ETHERNET:udpMessage

The 'C00' message with CrLf (Carriage return and Line feed) is sent to the indicated IP:port address. The \x sequence indicates the HEXA code; see more information in the [Escaping](#) section.

#### 8.12.5. Sending a UDP Text (ASCII-format)

The command is for sending a text message in ASCII-format via UDP-protocol. This method **does not allow** escaping or inserting control characters.

##### Command and Response

- ▶ CALL /MEDIA/ETHERNET:udpText(<IP\_address>:<port\_no>=<text>)
- ◀ mO /MEDIA/ETHERNET:udpText

##### Example

- ▶ CALL /MEDIA/ETHERNET:udpText(192.168.0.20:9988=open)
- ◀ mO /MEDIA/ETHERNET:udpText

The 'open' text is sent to the indicated IP:port address.

#### 8.12.6. Sending a UDP Binary Message (HEX-format)

The command is for sending a binary message in Hexadecimal format. This method **does not require** escaping the control and non-printable characters.

##### Command and Response

- ▶ CALL /MEDIA/ETHERNET:udpBinary(<IP\_address>:<port\_no>=<HEX\_message>)
- ◀ mO /MEDIA/ETHERNET:udpBinary

##### Example

- ▶ CALL /MEDIA/ETHERNET:udpBinary(192.168.0.20:9988=433030)
- ◀ mO /MEDIA/ETHERNET:udpBinary

The '433030' message is sent to the indicated IP:port address.

■ INFO: There is no need to insert a space or other separator character between the binary messages.

### 8.13. RS-232 Message Sending

#### 8.13.1. Sending a Message (ASCII-format) via RS-232

The command is for sending a command message in ASCII-format. This method **allows** escaping the control characters. For more information, see the [Escaping](#) section.

##### Command and Response #message

- ▶ CALL /MEDIA/UART/P1:sendMessage(<message>)
- ◀ mO /MEDIA/UART/P1:sendMessage

##### Example

- ▶ CALL /MEDIA/UART/P1:sendMessage(PWR0)
- ◀ mO /MEDIA/UART/P1:sendMessage

The 'PWR0' message is sent out via the P1 serial port.

#### 8.13.2. Sending a Text (ASCII-format) via RS-232

The command is for sending a command message in ASCII-format. This method **does not require** escaping the control and non-printable characters.

##### Command and Response

- ▶ CALL /MEDIA/UART/P1:sendText(<message>)
- ◀ mO /MEDIA/UART/P1:sendText

##### Example

- ▶ CALL /MEDIA/UART/P1:sendText(open)
- ◀ mO /MEDIA/UART/P1:sendText

The 'open' text is sent out via the P1 serial port.

### 8.13.3. Sending a Binary Message (HEX-format) via RS-232

The command is for sending a binary message in Hexadecimal format. This method **does not require** escaping the control and non-printable characters.

#### Command and Response

- ▶ CALL /MEDIA/UART/P1:sendBinaryMessage(<message>)
- ◀ mO /MEDIA/UART/P1:sendBinaryMessage

#### Example

- ▶ CALL /MEDIA/UART/P1:sendBinaryMessage(433030)
- ◀ mO /MEDIA/UART/P1:sendBinaryMessage

The '433030' message is sent out via the P1 serial port.

### 8.13.4. Using Hexadecimal Codes

Hexadecimal codes can be inserted in the ASCII message when using:

**sendMessage command:** CALL /MEDIA/UART/P1:sendMessage(C00\x0D)

**tcpMessage command:** CALL /MEDIA/ETHERNET:tcpMessage(C00\x0D)

**udpMessage command:** CALL /MEDIA/ETHERNET:udpMessage(C00\x0D)

- C00: the message.
- \x: indicates that the following is a hexadecimal code.
- 0D: the hexadecimal code (Carriage Return)

## 8.14. GPIO Port Configuration

**DIFFERENCE:** Only SW4-OPT-TX240RAK model has GPIO interface.

**INFO:** Use the GET command to query a parameter. #gpio

#### Parameters

Parameter	Description
<port>	GPIO port number (1..8). Example: P1

### 8.14.1. Setting the Direction of a GPIO Pin

#### Command and Response

- ▶ SET /MEDIA/GPIO/<port>.Direction=<direction>
- ◀ pw /MEDIA/GPIO/<port>.Direction=<direction>

#### Parameters

Identifier	Parameter description	Value	Parameter value
<direction>	Direction of the GPIO pin	I	Input
		O	Output

#### Example

- ▶ SET /MEDIA/GPIO/P1.Direction=I
- ◀ pw /MEDIA/GPIO/P1.Direction=I

### 8.14.2. Setting the Output Level of a GPIO Pin

#### Command and Response

- ▶ SET /MEDIA/GPIO/<port>.Output=<value>
- ◀ pw /MEDIA/GPIO/ <port>.Output=<value>

#### Parameters

Identifier	Parameter description	Value	Parameter value
<value>	Level value of the GPIO pin	H	Logical high level
		L	Logical low level

#### Example

- ▶ SET /MEDIA/GPIO/P1.Output=H
- ◀ pw /MEDIA/GPIO/P1.Output=H



### 8.14.3. Toggling the Level of a GPIO Pin

#### Command and Response

- ▶ CALL·/MEDIA/GPIO/<port>:toggle()
- ◀ mO·/MEDIA/GPIO/ <port>:toggle

#### Example

- ▶ CALL·/MEDIA/GPIO/P1:toggle()
- ◀ mO /MEDIA/GPIO/P1:toggle

#### Explanation

If the direction of the pin is input: the output value is toggled. If the direction of the pin is output: the output value and the input value are toggled.

## 8.15. EDID Management

#### Parameters

Parameter	Description
<emulated>	The emulated EDID memory of the desired input port. Example: E1.
<dynamic>	Dynamic EDID memory index. Example: D1
<user>	User EDID memory index. Example: U1
<factory>	Factory EDID memory index. Example: F1

### 8.15.1. Query the Emulated EDIDs

#### Command and Response #edid

- ▶ GET·/EDID.EdidStatus
- ◀ pr·/EDID.EdidStatus=<dynamic|user|factory>:<emulated>;...;<dynamic|user|factory>:<emulated>

#### Example

- ▶ GET /EDID.EdidStatus
- ◀ pr /EDID.EdidStatus=D1:E1;D1:E2;D1:E3;D1:E4

Emulated EDID memory for input port is listed with the EDID number that is currently emulated on the input.

### 8.15.2. Query the Validity of a Dynamic EDID

#### Command and Response

- ▶ GET·/EDID/D/<dynamic>.Validity
- ◀ pr·/EDID/D/<dynamic>.Validity=<logical\_value>

#### Parameters

The <logical\_value> can be **true** or **false**.

#### Example

- ▶ GET /EDID/D/D1.Validity
- ◀ pr /EDID/D/D1.Validity=true

### 8.15.3. Query the Preferred Resolution of an User EDID

#### Command and Response

- ▶ GET·/EDID/U/<user>.PreferredResolution
- ◀ pr·/EDID/U/<user>.PreferredResolution=<resolution>

#### Example

- ▶ GET /EDID/U/U2.PreferredResolution
- ◀ pr /EDID/U/U2.PreferredResolution=1920x1080p60.00Hz

### 8.15.4. Emulating an EDID to an Input Port

#### Command and Response

- ▶ CALL·/EDID:switch(<dynamic|user|factory>:<emulated>)
- ◀ mO·/EDID:switch

#### Example

- ▶ CALL /EDID:switch(F49:E2)
- ◀ mO /EDID:switch

### 8.15.5. Emulating an EDID to All Input Ports

#### Command and Response

- ▶ CALL·/EDID:switchAll(<dynamic|user|factory>)
- ◀ mO·/EDID:switchAll

#### Example

- ▶ CALL /EDID:switchAll(F47)
- ◀ mO /EDID:switchAll

### 8.15.6. Copy an EDID to User Memory

#### Command and Response

- ▶ CALL /EDID:copy(<dynamic|emulated|factory|user>:<user>)
- ◀ mO /EDID:copy

#### Example

- ▶ CALL /EDID:copy(D1:U1)
- ◀ mO /EDID:copy

The EDID of the last connected sink of D1 (Output 1) has been copied to U1.

### 8.15.7. Deleting an EDID from User Memory

#### Command and Response

- ▶ CALL /EDID:delete(<user>)
- ◀ mO /EDID:delete

#### Example

- ▶ CALL /EDID:delete(U1)
- ◀ mO /EDID:delete

### 8.15.8. Resetting the Emulated EDIDs

#### Command and Response

- ▶ CALL /EDID:reset()
- ◀ mO /EDID:reset

#### Example

- ▶ CALL /EDID:reset()
- ◀ mO /EDID:reset

Calling this method switches all emulated EDIDs to factory default one. See the table in the [Factory EDID List](#) section.

## 8.16. LW3 Commands - Quick Summary

### System Commands

#### Query the Product Name

- ▶ GET·/.ProductName

#### Set the Device Label

- ▶ SET·/MANAGEMENT/UID.DeviceLabel=<Custom\_name>

#### Query the Serial Number

- ▶ GET·/.SerialNumber

#### Query the Firmware Version

- ▶ GET·/SYS/MB.FirmwareVersion

#### Restarting the Device

- ▶ CALL·/SYS:reset()

#### Recalling the Factory Default Settings

- ▶ CALL·/SYS:factoryDefaults()

#### Lock the Front Panel Buttons

- ▶ SET /MANAGEMENT/UI.ControlLock=<lock\_status>

### Video Port Settings

#### Query the Status of Source Ports

- ▶ GET·/MEDIA/VIDEO/XP.SourcePortStatus

#### Query the Status of Destination Port

- ▶ GET·/MEDIA/VIDEO/XP.DestinationPortStatus

#### Query the Video Crosspoint Setting

- ▶ GET·/MEDIA/VIDEO/XP.DestinationConnectionList

#### Switching a Video Input

- ▶ CALL·/MEDIA/VIDEO/XP:switch(<in>:<out>)

#### Disconnecting the Video Inputs

- ▶ CALL·/MEDIA/VIDEO/XP:switch(0:<out>)

#### Querying the Video Autoselect Settings

- ▶ GET·/MEDIA/VIDEO/XP.DestinationPortAutoselect

#### Changing the Autoselect Mode

- ▶ CALL·/MEDIA/VIDEO/XP:setDestinationPortAutoselect(<out1\_set>;<out2\_set>;<...>;<out#\_set>)

#### Querying the Input Port Priority

- ▶ GET·/MEDIA/VIDEO/XP.PortPriorityList

#### Changing the Input Port Priority

- ▶ CALL·/MEDIA/VIDEO/XP:setAutoselectionPriority(<in>\(<out>\):<prio>);(<in>\(<out>\):<prio>)

#### Mute Video Input

- ▶ CALL·/MEDIA/VIDEO/XP:muteSource(<in>)

#### Unmute Video Input

- ▶ CALL·/MEDIA/VIDEO/XP:unmuteSource(<in>)

#### Lock Video Input

- ▶ CALL·/MEDIA/VIDEO/XP:lockSource(<in>)

#### Unlock Video Input

- ▶ CALL·/MEDIA/VIDEO/XP:unlockSource(<in>)

#### Mute Video Output

- ▶ CALL·/MEDIA/VIDEO/XP:muteDestination(<out>)

#### Unmute Video Output

- ▶ CALL·/MEDIA/VIDEO/XP:unmuteDestination(<out>)

#### Lock Video Output

- ▶ CALL·/MEDIA/VIDEO/XP:lockDestination(<out>)

#### Unlock Video Output

- ▶ CALL·/MEDIA/VIDEO/XP:unlockDestination(<out>)

#### Setting the HDCP (Input Port)

- ▶ SET·/MEDIA/VIDEO/<in>.HdcpEnable=<logical\_value>

#### Setting the HDCP (Output Port)

- ▶ SET·/MEDIA/VIDEO/<out>.HdcpModeSetting=<HDCP\_mode>

#### Test Pattern Generator Mode

- ▶ SET·/MEDIA/VIDEO/<out>.TpgMode=<mode>

#### Test Pattern Generator Clock Source

- ▶ SET·/MEDIA/VIDEO/<out>.TpgClockSource=<clock\_frequency>

#### Test Pattern Setting

- ▶ SET·/MEDIA/VIDEO/<out>.TpgPattern=<pattern>

#### Signal Type Settings (Output Port)

- ▶ SET·/MEDIA/VIDEO/<out>.HdmiModeSetting=<mode>

**Audio Port Settings****Query the Status of Source Ports**

- ▶ GET·/MEDIA/AUDIO/XP.SourcePortStatus

**Query the Status of Destination Port**

- ▶ GET·/MEDIA/AUDIO/XP.DestinationPortStatus

**Query the Audio Crosspoint Setting**

- ▶ GET·/MEDIA/AUDIO/XP.DestinationConnectionList

**Switching Audio Input**

- ▶ CALL·/MEDIA/AUDIO/XP:switch(<in>:<out>)

**Query the Audio Autoselect Settings**

- ▶ GET·/MEDIA/AUDIO/XP.DestinationPortAutoselect

**Change the Autoselect Mode**

- ▶ CALL·/MEDIA/AUDIO/XP:setDestinationPortAutoselect(<out>:<out\_set>)

**Query the Input Port Priority**

- ▶ GET·/MEDIA/AUDIO/XP.PortPriorityList

**Change the Input Port Priority**

- ▶ CALL·/MEDIA/AUDIO/XP:setAutoselectionPriority(<in>\(<out>\):<prio>);(<in>\(<out>\):<prio>)

**Mute Audio Input**

- ▶ CALL·/MEDIA/AUDIO/XP:muteSource(<in>)

**Unmute Audio Input**

- ▶ CALL·/MEDIA/AUDIO/XP:unmuteSource(<in>)

**Lock Audio Input**

- ▶ CALL·/MEDIA/AUDIO/XP:lockSource(<in>)

**Unlock Audio Input**

- ▶ CALL·/MEDIA/AUDIO/XP:unlockSource(<in>)

**Mute Audio Output**

- ▶ CALL·/MEDIA/AUDIO/XP:muteDestination(<out>)

**Unmute Audio Output**

- ▶ CALL·/MEDIA/AUDIO/XP:unmuteDestination(<out>)

**Lock Audio Output**

- ▶ CALL·/MEDIA/AUDIO/XP:lockDestination(<out>)

**Unlock Audio Output**

- ▶ CALL·/MEDIA/AUDIO/XP:unlockDestination(<out>)

**Analog Audio Port Settings****Setting the Volume in dB**

- ▶ SET·/MEDIA/AUDIO/<in|out>.VolumedB=<volume>

**Setting the Volume in Percent**

- ▶ SET·/MEDIA/AUDIO/<in|out>.VolumePercent=<percent>

**Setting the Balance**

- ▶ SET·/MEDIA/AUDIO/<in|out>.Balance=<balance>

**Setting the Gain**

- ▶ SET·/MEDIA/AUDIO/<in>.Gain=<gain>

**Event Manager Basics****How to arrange an Event?**

- ▶ SET·/EVENTS/E<loc>.Condition=<expression>

**Setting a Condition by Linking Another Condition**

- ▶ SET·/EVENTS/E<loc>.Condition=<event\_nr>

**Setting a Condition by Linking More Conditions**

- ▶ SET·/EVENTS/E<loc>.Condition=<event\_nr>&<event\_nr>&<event\_nr>&<event\_nr>

**Setting an Action by Specifying a Direct Path**

- ▶ SET·/EVENTS/E<loc>.Action=<expression>

**Setting an Action by Linking Another Action**

- ▶ SET·/EVENTS/E<loc>.Action=<event\_nr>

**Event Manager Tool Kit****Setting the Delay**

- ▶ SET·/EVENTS/E<loc>.ConditionTimeout=<time>
- ▶ SET·/EVENTS/E<loc>.ConditionEndCheck=<true/false>
- ▶ SET·/EVENTS/E<loc>.ConditionTimeoutContinuous=<true/false>

**Setting the Name of the Event**

- ▶ SET·/EVENTS/E<loc>.Name=<string>

**Enable the Event**

- ▶ SET·/EVENTS/E<loc>.Enabled=<true/false>

**Triggering a Condition**

- ▶ CALL·/EVENTS/E<loc>.triggerCondition(1)

**Querying the Condition Counter**

- ▶ GET·/EVENTS/E<loc>.ConditionCount

**Querying the Condition Trigger Counter**

- ▶ GET·/EVENTS/E<loc>.ExternalConditionTriggerCount

**Testing an Action**

- ▶ CALL·/EVENTS/E<loc>:ActionTest(1)

**Ethernet Port Configuration****Setting the DHCP State**

- ▶ SET·/MANAGEMENT/NETWORK.DhcpEnabled=<dhcp\_status>

**Changing the IP Address (Static)**

- ▶ SET·/MANAGEMENT/NETWORK.StaticIpAddress=<IP\_address>

**Changing the Subnet Mask (Static)**

- ▶ SET·/MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>

**Changing the Gateway Address (Static)**

- ▶ SET·/MANAGEMENT/NETWORK.StaticGatewayAddress=<gw\_address>

**Applying Network Settings**

- ▶ CALL·/MANAGEMENT/NETWORK:ApplySettings(1)

**RS-232 Port Configuration****Setting the Protocol**

- ▶ SET·/MEDIA/UART/<port>.ControlProtocol=<protocol>

**Setting the BAUD Rate**

- ▶ SET·/MEDIA/UART/<port>.Baudrate=<baudrate>

**Setting the Databits**

- ▶ SET·/MEDIA/UART/<port>.DataBits=<databits>

**Setting the Stopbits**

- ▶ SET·/MEDIA/UART/<port>.StopBits=<stopbits>

**Setting the Parity**

- ▶ SET·/MEDIA/UART/ <port>.Parity=<parity>

**Setting the RS-232 Operation Mode**

- ▶ SET·/MEDIA/UART/<port>.Rs232Mode=<mode>

**Enabling/Disabling Command Injection**

- ▶ SET·/MEDIA/UART/<port>.CommandInjectionEnable=<logical\_value>

**Ethernet Message Sending****Sending a TCP Message (ASCII-format)**

- ▶ CALL·/MEDIA/ETHERNET:tcpMessage(<IP\_address>:<port\_no>=<message>)

**Sending a TCP Text (ASCII-format)**

- ▶ CALL·/MEDIA/ETHERNET:tcpText(<IP\_address>:<port\_no>=<text>)

**Sending a TCP Binary Message (HEX-format)**

- ▶ CALL·/MEDIA/ETHERNET:tcpBinary(<IP\_address>:<port\_no>=<HEX\_message>)

**Sending a UDP Message (ASCII-format)**

- ▶ CALL·/MEDIA/ETHERNET:udpMessage(<IP\_address>:<port\_no>=<message>)

**Sending a UDP Text (ASCII-format)**

- ▶ CALL·/MEDIA/ETHERNET:udpText(<IP\_address>:<port\_no>=<text>)

**Sending a UDP Binary Message (HEX-format)**

- ▶ CALL·/MEDIA/ETHERNET:udpBinary(<IP\_address>:<port\_no>=<HEX\_message>)

**RS-232 Message Sending****Sending a Message (ASCII-format) via RS-232**

- ▶ CALL·/MEDIA/UART/P1:sendMessage(<message>)

**Sending a Text (ASCII-format) via RS-232**

- ▶ CALL·/MEDIA/UART/P1:sendText(<message>)

**Sending a Binary Message (HEX-format) via RS-232**

- ▶ CALL·/MEDIA/UART/P1:sendBinaryMessage(<message>)

**Using Hexadecimal Codes****GPIO Port Configuration****Setting the Direction of a GPIO Pin**

- ▶ SET·/MEDIA/GPIO/<port>.Direction=<direction>

**Setting the Output Level of a GPIO Pin**

- ▶ SET·/MEDIA/GPIO/<port>.Output=<value>

**Toggling the Level of a GPIO Pin**

- ▶ CALL·/MEDIA/GPIO/<port>:toggle()

## EDID Management

### Query the Emulated EDIDs

- ▶ GET·/EDID.EdidStatus

### Query the Validity of a Dynamic EDID

- ▶ GET·/EDID/D/<dynamic>.Validity

### Query the Preferred Resolution of a User EDID

- ▶ GET·/EDID/U/<user>.PreferredResolution

### Emulating an EDID to an Input Port

- ▶ CALL·/EDID:switch(<dynamic|user|factory>:<emulated>)

### Emulating an EDID to All Input Ports

- ▶ CALL·/EDID:switchAll(<dynamic|user|factory>)

### Copy an EDID to User Memory

- ▶ CALL·/EDID:copy(<dynamic|emulated|factory|user>:<user>)

### Deleting an EDID from User Memory

- ▶ CALL·/EDID:delete(<user>)

### Resetting the Emulated EDIDs

- ▶ CALL·/EDID:reset()



# 9

## Firmware Update

The extender can be updated by using Lightware Device Updater (LDU) software over USB. The firmware pack with the necessary components (\*.lfp file) for your specific product, the LDU application can be downloaded from the Support page of our website [www.lightware.com](http://www.lightware.com).

- ▶ [ABOUT THE FIRMWARE PACKAGE \(LFP FILE\)](#)
- ▶ [SHORT INSTRUCTIONS](#)
- ▶ [INSTALL AND UPDATE](#)
- ▶ [DETAILED INSTRUCTIONS](#)
- ▶ [KEEPING THE CONFIGURATION SETTINGS](#)

**ATTENTION!** While the firmware is being updated, the normal operation mode is suspended as the transmitter is switched to bootload mode. Signal processing is not performed. Do not interrupt the firmware update. If any problem occurs, reboot the device and restart the process.

**ATTENTION!** The firmware update process has an effect on the configuration and the settings of the device. For more details, please see the [Keeping the Configuration Settings](#) section before the update.

### 9.1. About the Firmware Package (LFP file)

The firmware files are packed in one package which is called LFP file. You need only this file to do the update on your device.

- The package contains all the necessary components, binary, and other files; You do not have to get further files.
- There is a descriptor file in the package that contains each firmware with version number and a list showing the compatible devices. The descriptor is displayed after loaded the LFP file in the LDU.

### 9.2. Short Instructions

**Step 1.** Get the firmware pack and the Lightware Device Updater (LDU) application.

**Step 2.** Install the LDU application.

**Step 3.** Establish the connection between the computer and the device(s).

**Step 4.** Start the LDU and follow the instructions shown on the screen.

### 9.3. Install and Update

**INFO:** After the installation the Windows and the Mac application has the same look and functionality. This type of the installer is equal with the Normal install in case of Windows and results an updateable version with the same attributes.

#### Installation for Windows OS

**INFO:** The application can be installed under Windows XP or above.

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 install	Snapshot install
Available for Windows, macOS and Linux	Available for Windows only
The installer can update only this instance	Cannot be updated
One updateable instance may exist for all users	Many different versions can be installed for all users

**ATTENTION!** Using the Normal install as the default value is highly recommended.

#### Installation for macOS

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

## 9.4. Detailed Instructions

### 9.4.1. Establish the Connection

Make sure that the computer and the device are connected via an USB mini cable and the connection is established between them.

### 9.4.2. Prepare the Firmware Update in LDC

The device can be updated over USB in case of the USB crosspoint is set to the **Composite** channel only.

Start the Lightware Device Controller (LDC) software and navigate to the Crosspoint menu - USB tab. Check the crosspoint state and set it to the Composite channel.

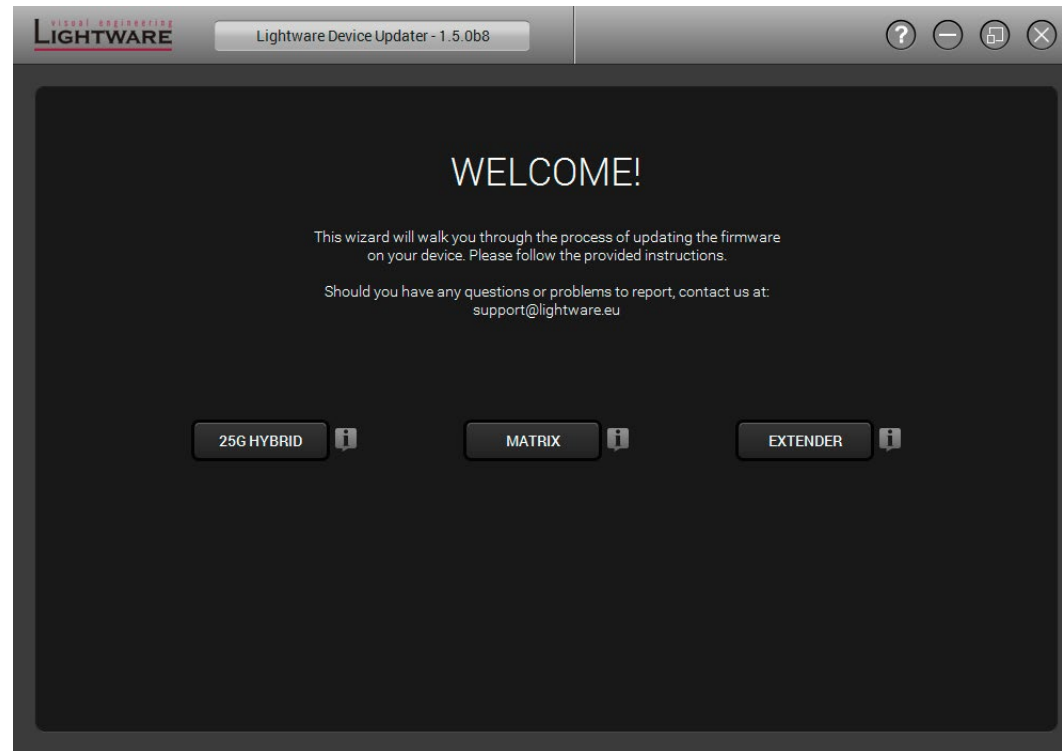


**USB crosspoint - Composite mode in LDC**

**ATTENTION!** After the setting is done it is highly recommended to close the LDC software to avoid the possible connection problem between the device and the LDU software.

### 9.4.3. Start the LDU and Follow the Instructions

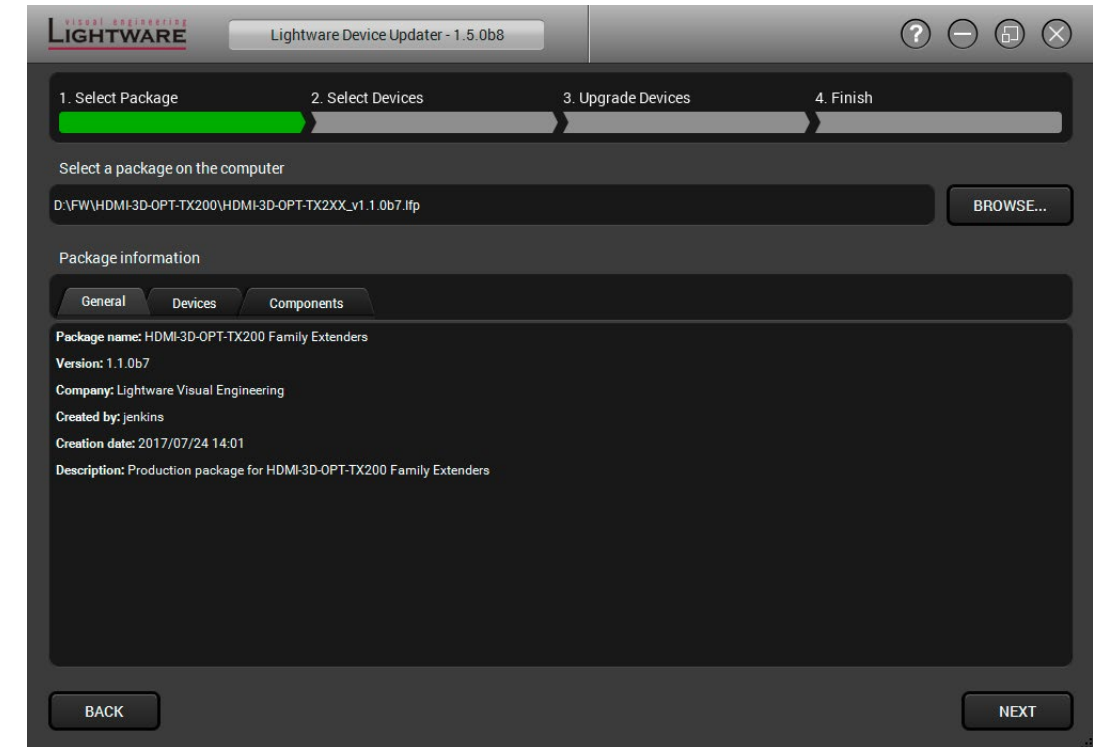
After launching LDU welcome screen appears:



After pressing the **i** button a list will appear showing the supported devices:  
Click on the **Extender** button on the main screen.

**Step 1.** Select the package.

Click on the Browse button and select the “.lfp” file that will be used for the update.



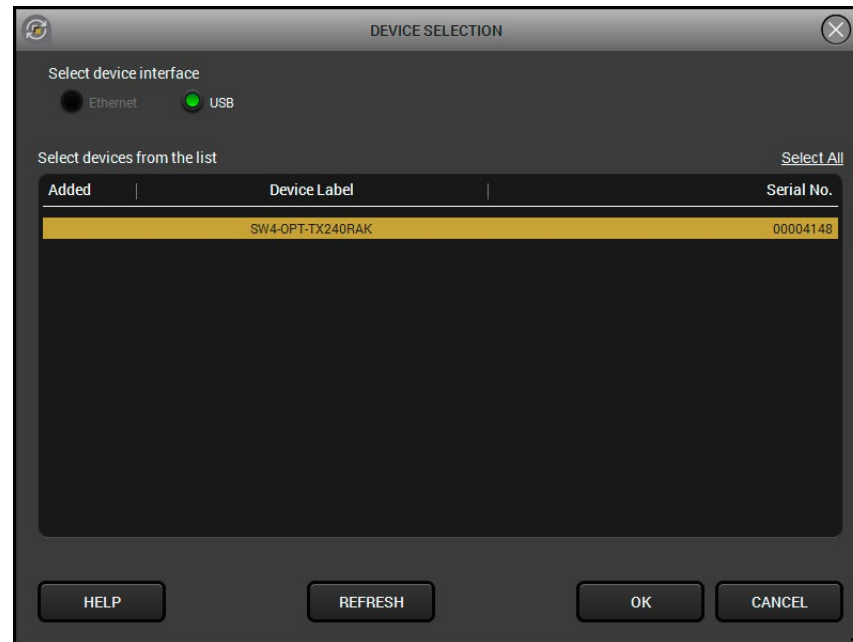
The package information is displayed:

- **General** version info, creation date, short description,
- **Devices** which are compatible with the firmware,
- **Components** in the package with release notes.

Click on the **Next** button and follow the instructions.

**TIPS AND TRICKS:** Files with “.lfp” extension are associated to LDU during installation. If you double click on the “.lfp” file, the application is launched, the package is loaded automatically and the screen above is shown.

**Step 2.** Select a device.

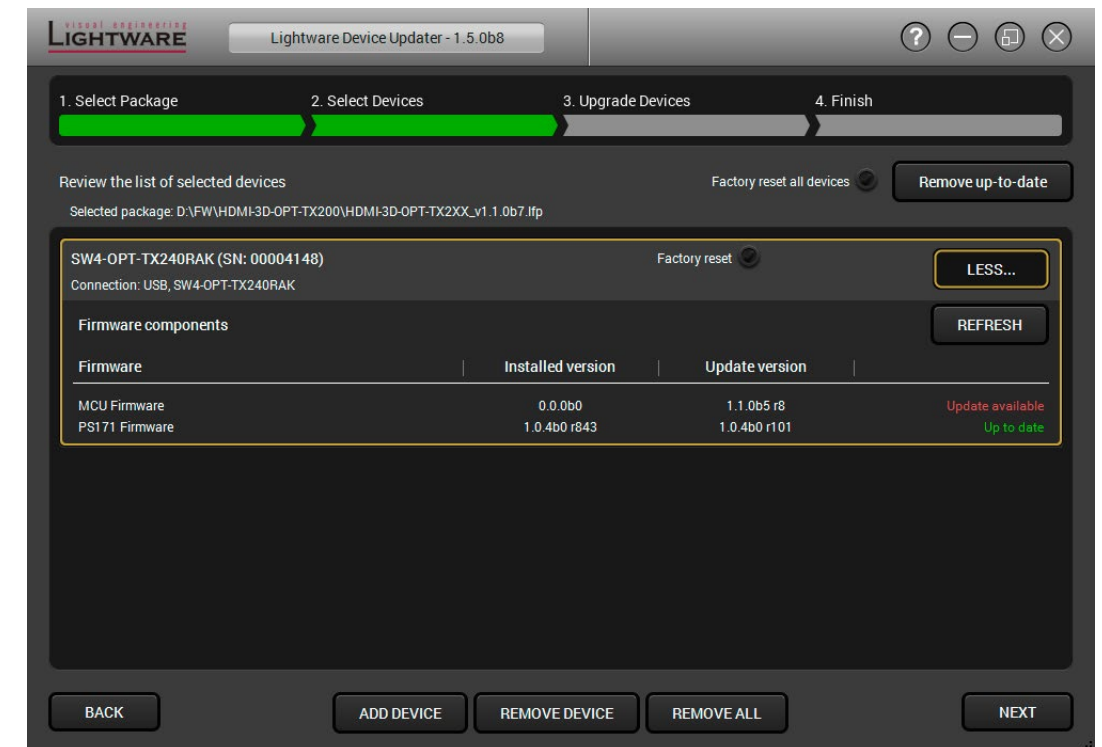


The next step is to select the desired device(s). The available and supported devices are searched for and listed automatically. If the desired device is not listed, update the list by clicking the **Refresh** button. Select the desired device by highlighting them: highlight them with a **yellow cursor**, then click **OK**.

A tick mark can be seen in the **Added** column if the device was added by the user previously.

### Firmware Components

The components of the installed and update firmware version for the selected devices are listed on the following screen. (Update version will be uploaded to the device.)



Add a device by clicking on the **Add device** button. The previous screen will be shown; select the desired device(s) and click **OK**.

Remove a device by selecting it (highlight with yellow) and clicking on the **Remove device** button, or by clicking on **Remove all** button to clear the list.

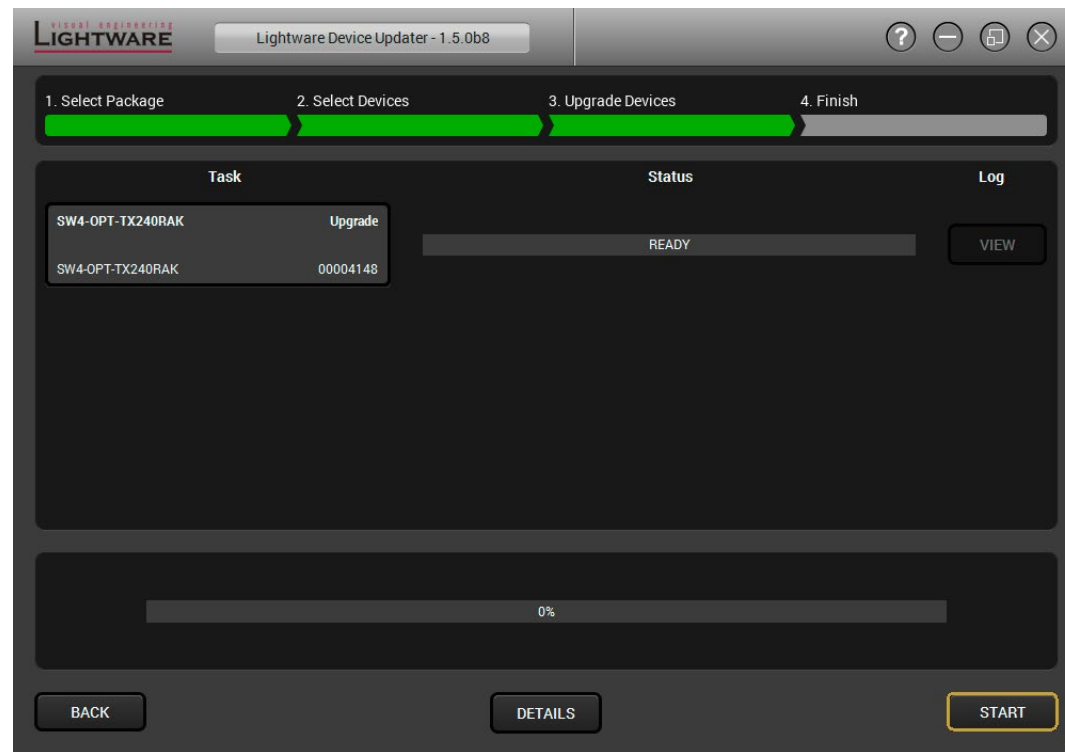
Enabling **Factory reset** will perform factory default values for all settings in the device. Three different status can exist:

- **Enabled by user:** all settings will set to factory default values.
- **Disabled by user:** your settings will be saved and restored after updating.
- **Enabled by default and not changeable by user:** firmware update must perform a factory reset to apply all changes coming with the new firmware version.

Click on the **Next** button to continue.

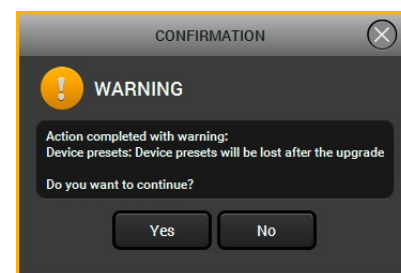
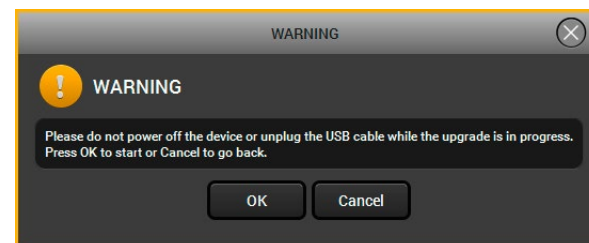
**Step 3.** Update the device.

Click on the **Start** button to start the update process.

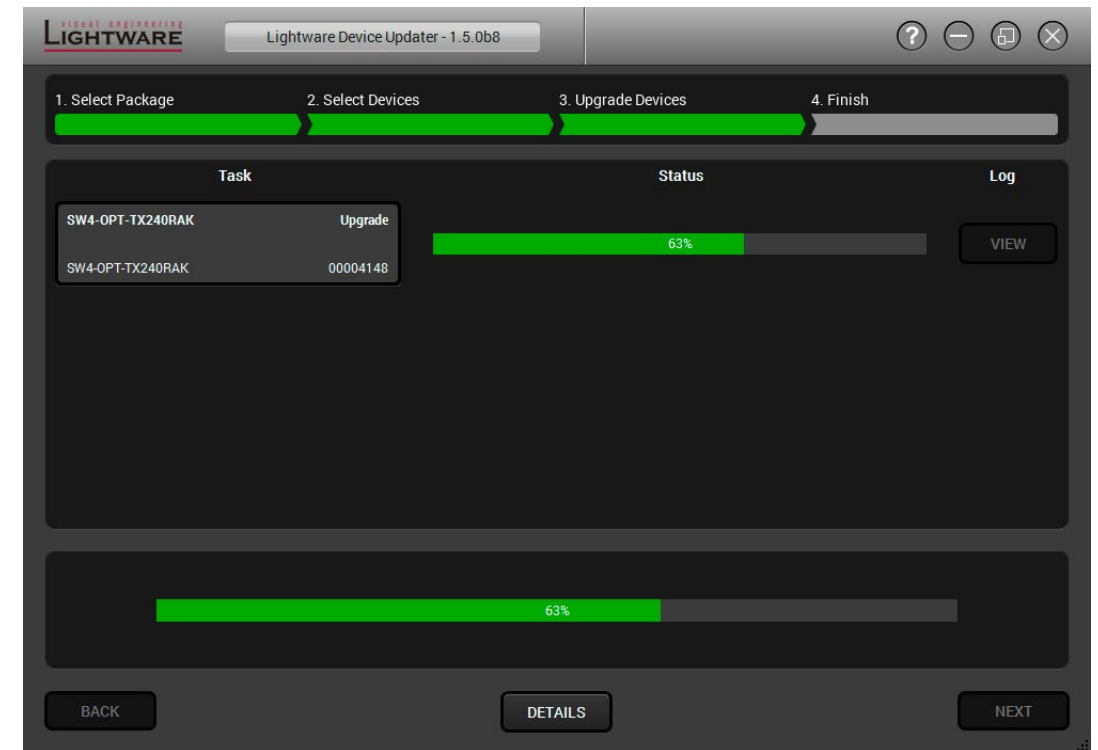


Two warning windows will pop up before updating the device:

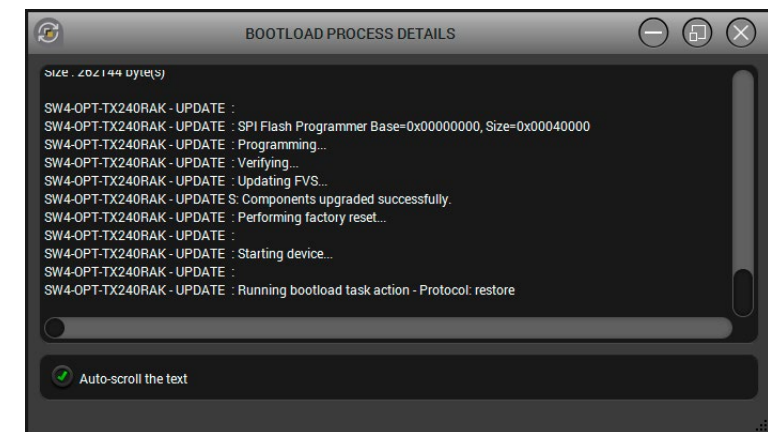
- Do not power off the device or unplug the USB cable while the update is in progress. Click **OK** to continue.
- The device presets will be lost after the update.



After you confirmed the warnings and clicked on the **Start** button, the update process starts immediately.

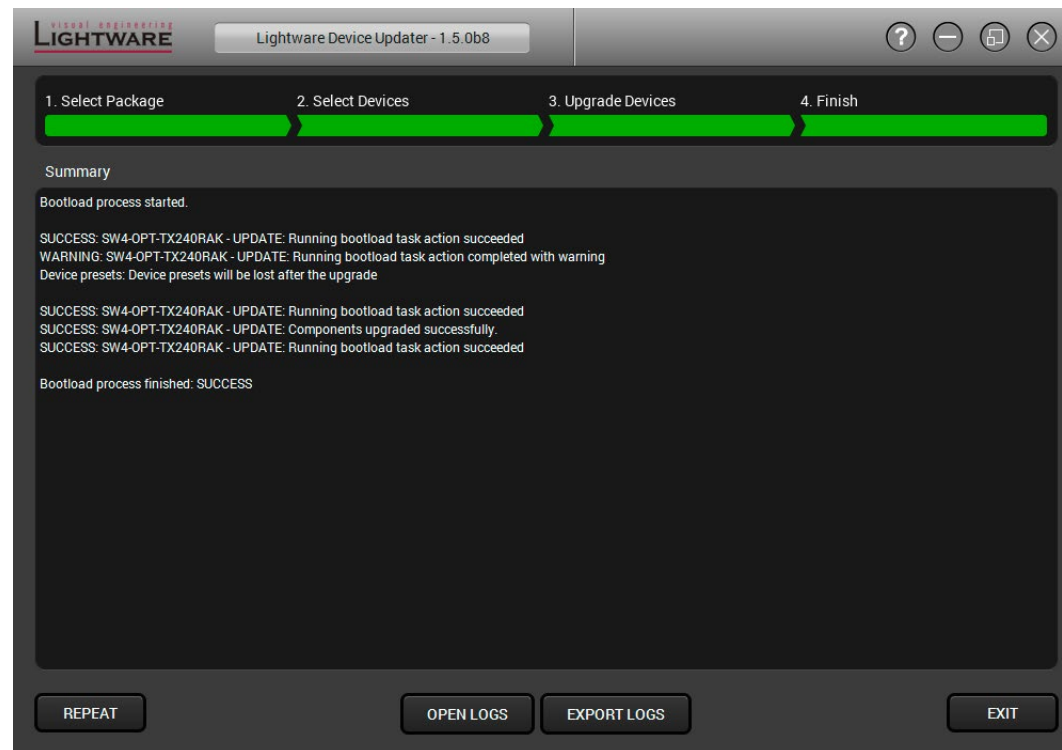


**Details** button opens a new window where the process is logged – see below.



**Step 4. Finish.**

If the update of a device is finished, the log can be opened by the **View** button on the right. When all the tasks are finished, a window appears. Click **OK** to close and **Next** to display the summary page.



Clicking on the **Repeat** button starts the process again with the selected device(s).

The **Open logs** button opens the temporary folder where the logs can be found.

**Export logs** by saving the files as a zipped file.

Press **Exit** to close the program.

If the update fails, the progress bar of the device turns to red. Restart the device(s) and repeat the process.

**ATTENTION!** Although the device is rebooted after the firmware update, switching it off and on again is recommended.



## 9.5. Keeping the Configuration Settings

**ATTENTION!** While the firmware is being updated, the normal operation mode is suspended, as the device is switched to bootload mode. Signal processing is not performed. Do not interrupt the firmware update. If any problem occurs, reboot the unit and restart the process.

By default, device configuration settings are restored when firmware update is finished. If factory reset has been chosen in the parameters window, all device settings will be erased. In the case of factory reset, you can save the settings of the device in the Lightware Device Controller software and restore it later.

The following flow chart demonstrates how this function works in the background.

### Step 1. Create a backup

The current configuration of the device is being saved into a configuration backup file on your computer.

### Step 2. Start the Update

The device reboots and starts in bootload mode (firmware update mode).

### Step 3. Update

The CPU firmware is changed to the new one.

### Step 4. Factory reset

All configuration settings are restored to the factory default values.

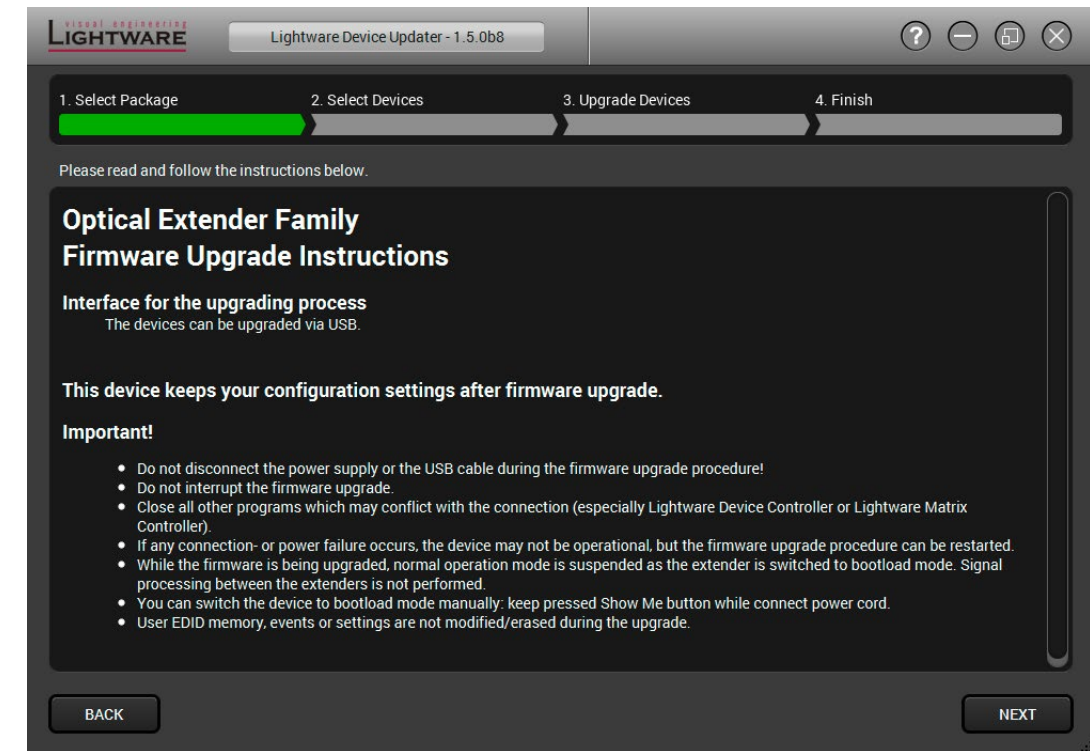
### Step 5. Conversion / Restore

The firmware package checks the backup data before the restoration procedure, and if it is necessary, a conversion is applied to avoid incompatibility problems between the firmware versions. All configuration settings are restored to the device after the conversion.

**If the factory default option is selected in the Parameters window, the conversion / restore procedure will not be performed!**

### Step 6. Finish

Once the firmware update procedure is finished, the device reboots and is ready to use.



**Instructions page in the optical extender firmware package**

**ATTENTION!** In specific cases restoring cannot be applied fully and certain settings are not copied back to the device. If a warning message appears, user can get back the original data from the backup. Logs of the update procedure contain all backup data, it can be exported at the end of the update procedure. In case of any question, please contact [support@lightware.com](mailto:support@lightware.com).






**ATTENTION!** In certain cases, the new firmware version requires setting all parameters to set factory defaults. In this case, the "Factory reset" option is enabled by default and not changeable by the user, see details in the [Firmware Components](#) section.

**ATTENTION!** The feature is only supported by LDU version 1.3.0 and above.

# 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 the receiver end.


















-  Link to connections/cabling section.
-  Link to front panel operation section.
-  Link to LDC software section.
-  Link to LW2 protocol commands section.
-  Link to LW3 protocol commands section.























The following sections are available in the chapter:

















- ▶ [USE CASE STUDIES](#)
- ▶ [HOW TO SPEED UP THE TROUBLESHOOTING PROCESS](#)

## 10.1. Use Case Studies

At first, check front panel LEDs and take the necessary steps according to their states. For more information about status, LEDs refer to [Rear Panel Status LEDs - Transmitter](#) and [Front Panel LEDs - Receiver](#) sections.

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 extenders and the other devices if they are properly powered; try to unplug and reconnect them.	 4.3
	Cable connection problem	Cables must fit very well, check all the connectors (video and optical cables).	 4.3
	Optical cable became contaminated	Use special fiber optical cable cleaning equipment to clean it carefully.	
	No incoming signal (transmitter)	No video signal is present on the HDMI/DVI-D/DP input ports. Check the source device and the HDMI/DVI/DP cable(s).	 4.3
	No incoming signal (receiver)	If the Signal LED does not light, no signal is present on the optical input port. Check the source device and the fiber cable.	 4.3
	The input port is muted	Check the mute state of input port.	 6.5.1  8.5.1
	The output port is muted	Check the mute state of output port.	 6.5.4  7.4.6  8.5.2
	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).	 6.8  8.15
	HDCP is disabled	Enable HDCP on the input and output ports.	 6.5.1  6.5.4  8.5.18  8.5.19
<b>Not the desired picture displayed on the video output</b>	Video output is set to test pattern (no sync screen) statically	Check test pattern settings in the properties of the output ports.	 6.6.2  8.5.22
	Video output is set to test pattern (no sync screen) as there is no picture on video source	Check video settings of the source.	

Symptom	Root cause	Action	Refer to	
<b>Audio signal</b>				
<b>No audio is present on output</b>	Source audio volume is low or muted	Check the audio settings of the source.		
	Audio input port is muted	Check the audio input port properties	 6.5.2  6.5.3  8.6.1	
	Audio output port is muted	Check the output port properties.	 6.5.5  7.4.6  8.6.2	
	Analog audio input: volume is set very low (TX)	Check the Analog audio input port settings (Volume).	 6.5.3  8.7.1  8.7.2	
	Analog audio output: volume is set very low (RX)	Check the Analog audio output port settings (Volume).	 6.5.6  8.7.1  8.7.2	
	<b>HDMI output signal contains no audio</b>	HDMI mode was set to DVI	Check the properties of the output port and set the signal type to HDMI or Auto.	 6.5.4  8.5.23
		DVI EDID is emulated	Check the EDID and select and HDMI EDID to emulate.	 6.8  8.15
<b>RS-232 signal</b>				
<b>Connected serial device does not respond</b>	Cable connection problem	Check the connectors to fit well; check the wiring of the plugs.	 4.3.8  4.3.9	
	RS-232 settings are different	Check the port settings of the extender and the connected serial device(s).	 6.9.1  8.11	
	RS-232 mode is not right	Check the RS-232 mode settings (control, pass-through, or command injection)	 6.9.1  8.11.6	

Symptom	Root cause	Action	Refer to
<b>Ethernet (only for SW4-OPT-TX240RAK)</b>			
<b>No LAN connection can be established</b>	Incorrect IP address is set (fix IP)	Use dynamic IP address by enabling DHCP option.	 3.3.1  6.11.2  8.10.1
		Restore the factory default settings (with fix IP).	 3.3.2  6.11.4  7.3.12  8.4.6
	IP address conflict	Check the IP address of the other devices, too.	
<b>USB KVM</b>			
<b>USB device does not operate</b>	Cables are not connected on both sides	Check the USB cable between TX and the computer.	
	Not supported USB device is connected	Keyboard, mouse (USB HID devices) are supported mostly, check your device type	
	USB crosspoint set to the non-active channel	Check the USB mode in the transmitter in LDC and change to the active channel.	 6.7.2
	Incorrect USB mode is set	Check the USB mode in the receiver in LDC and change to Composite or Transparent mode.	 6.7.1
<b>GPIO</b>			
<b>Connected device does not respond</b>	Cable connection problem	Check the connectors to fit well; check the wiring of the plugs.	 4.3.13
<b>Output level cannot be changed</b>	The direction of the selected pin is set to input	Check and modify the direction setting of the desired pin	 6.9.2  7.6.1  8.14
<b>Miscellaneous</b>			
<b>Front panel buttons are out of operation</b>	Buttons are locked	Unlock the buttons	 3.3.3
<b>Error messages received continuously</b>	Different protocol is set	Check the port protocol settings (LW2 / LW3) and use the proper protocol commands.	 6.9.1  8.11.1

## 10.2. How to Speed Up the Troubleshooting Process

Lightware's technical support team is always working hard to provide the fastest support possible. Our team's response time is one of the best in the industry and in the toughest of cases we can directly consult with the hardware or software engineer who designed the product to get the information from the most reliable source.

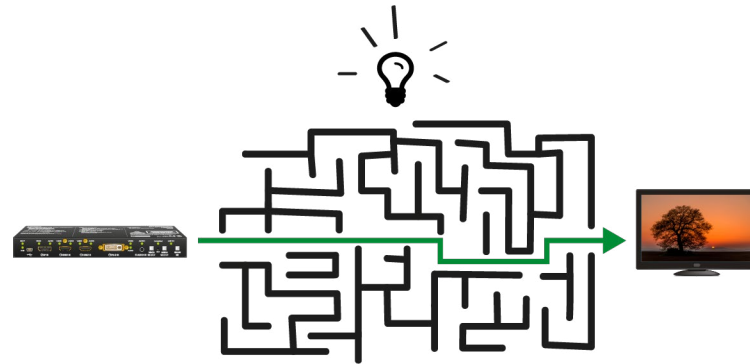
However, the troubleshooting process can be even faster... with your help.

There are certain pieces of information that push us in the right direction to finding the root cause of the problem. If we receive most of this information in the first e-mail or it is gathered at the time when you call us, then there is a pretty high chance that we will be able to respond with the final solution right away.

### This information is the following:

- Schematic (a pdf version is preferred, but a hand drawing is sufficient).
- Serial number(s) of the device(s) (it is either printed somewhere on the box or you can query it in the Device Controller software or on the built-in website).
- Firmware versions of the devices (please note that there may be multiple CPUs or controllers in the device and we need to know all of their firmware versions, a screenshot is the best option).
- Cable lengths and types (in our experience, it's usually the cable).
- Patch panels, gender changers or anything else in the signal path that can affect the transmission.
- Signal type (resolution, refresh rate, color space, deep color).
- Emulated EDID(s) (please save them as file and send them to us).
- Actions to take in order to re-create the problem (if we cannot reproduce the problem, it is hard for us to find the cause).
- Photo or video about the problem ('image noise' can mean many different things, it's better if we see it too).
- Error logs from the Device Controller software.
- In the case of Event Manager issue the event file and/or backup file from the Device Controller software.

The more of the above information you can give us the better. Please send these information to the Lightware Support Team ([support@lightware.com](mailto:support@lightware.com)) to speed up the troubleshooting process.



# 11

## Technologies

The following sections contain descriptions and useful technical information how the devices work in the background. The content is based on experiences and cases we met in the practice. These sections help to understand features and technical standards like the followings:

- ▶ [EDID MANAGEMENT](#)
- ▶ [HDCP MANAGEMENT](#)
- ▶ [PIXEL ACCURATE RECLOCKING](#)

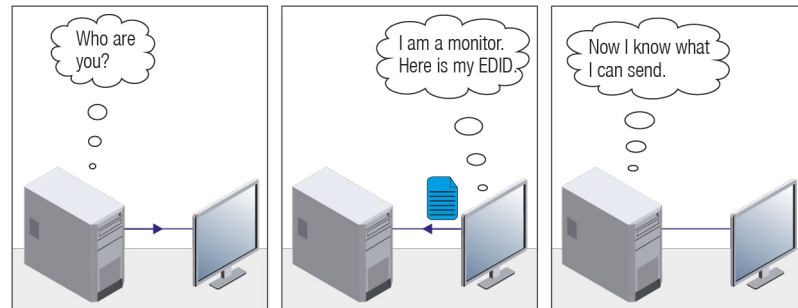


## 11.1. EDID Management

### 11.1.1. 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 is 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.

### 11.1.2. 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.

**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.

## 11.2. HDCP Management

Lightware Visual Engineering is a legal HDCP adopter. Several functions have been developed which helps to solve HDCP related problems. Complex AV systems often have both HDCP and non-HDCP components. The transmitter allows transmitting HDCP encrypted and unencrypted signals. The devices will be still HDCP compliant as they will never output an encrypted signal to a non-HDCP compliant display device. If an encrypted signal is switched to a non-compliant output, a red screen alert or muted screen will appear.

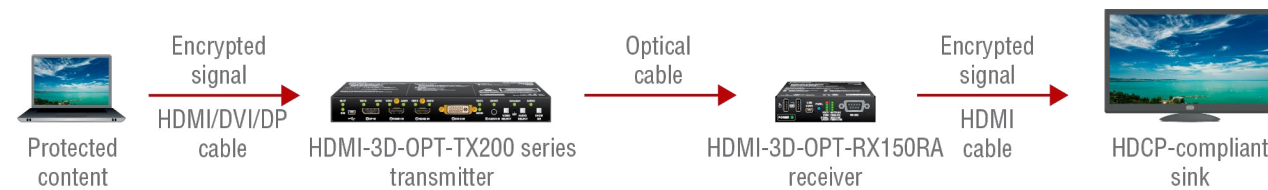
### 11.2.1. Protected and Unprotected Content

Many video sources send HDCP protected signal if they detect that the sink is HDCP capable – even if the content is not copyrighted. This can cause trouble if an HDCP capable device is connected between the source and the display. In this case, the content cannot be viewed on non-HDCP capable displays and interfaces like event controllers. Rental and staging technicians often complain about certain laptops, which are always sending HDCP encrypted signals if the receiver device (display, matrix router, etc.) reports HDCP compliancy. However, HDCP encryption is not required all the time e.g. computer desktop image, certain laptops still do that.

To avoid unnecessary HDCP encryption, Lightware introduced the HDCP enabling/disabling function: the HDCP capability can be disabled in the Lightware device. If HDCP is disabled, the connected source will detect that the sink is not HDCP capable, and turn off authentication.

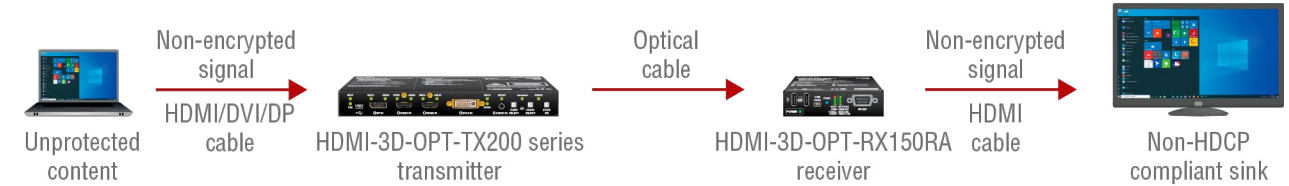
### 11.2.2. Disable Unnecessary Encryption

#### HDCP Compliant Sink



All the devices are HDCP-compliant, no manual setting is required, both protected and unprotected contents are transmitted and displayed on the sink.

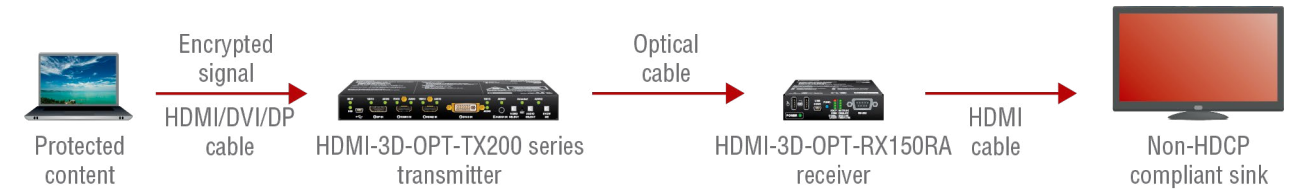
#### Not HDCP-compliant Sink 1.



Not-HDCP compliant sink is connected to the receiver. Some sources (e.g. computers) always send HDCP encrypted signals if the receiver device reports HDCP compliancy, however, HDCP encryption is not required all the time (e.g. computer desktop image). If HDCP is enabled in the transmitter, the image will not be displayed on the sink.

Setting the HDCP parameter to Auto on the output port and disable HDCP on the input port, the transmitted signal will not be encrypted if the content is not protected. Thus, non-HDCP compliant sinks will display non-encrypted signal.

#### Not HDCP-compliant Sink 2.



The layout is the same as in the previous case: non-HDCP compliant display device is connected to the receiver but the source would send protected content with encryption. If HDCP is enabled on the input port of the transmitter, the source will send encrypted signal. The sink is not HDCP compliant, thus, it will not display the video signal (but blank/red/muted/etc. screen). If HDCP is disabled on the input port of the transmitter, the source will not send the signal. The solution is to replace the display device to an HDCP-capable one.

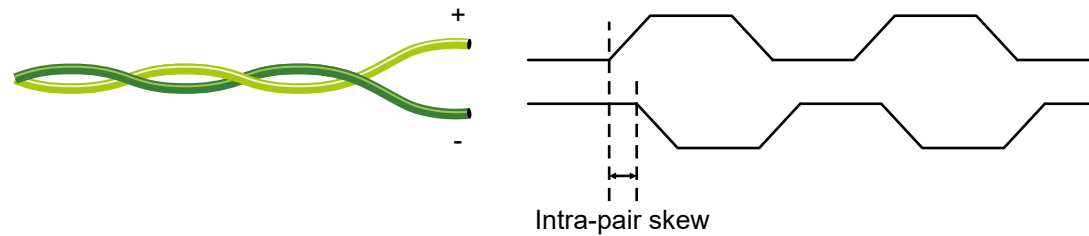
### 11.3. Pixel Accurate Reclocking

Signal reclocking is an essential procedure in digital signal transmission. After passing the reclocking circuit, the signal becomes stable, jitter-free, and can be transmitted over more equipment like processors, or event controllers. Without reclocking, sparkles, noise, and jaggies appear on the image.

Lightware's sophisticated Pixel Accurate Reclocking technology fixes more problems than general TMDS reclocking. It removes not only intra-pair skew, but inter-pair skew as well. The Pixel Accurate Reclocking circuit eliminates the following errors:

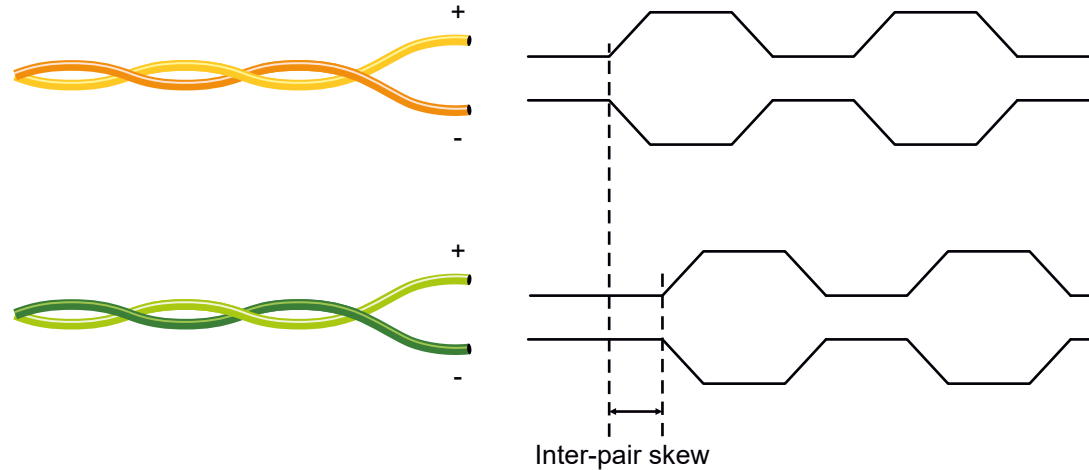
#### Intra-pair skew

Skew between the + and - wires within a differential wire pair (e.g. Data2- and Data2+). It's caused by different wire lengths or slightly different wire construction (impedance mismatch) in the DVI cable. It results in jitter.



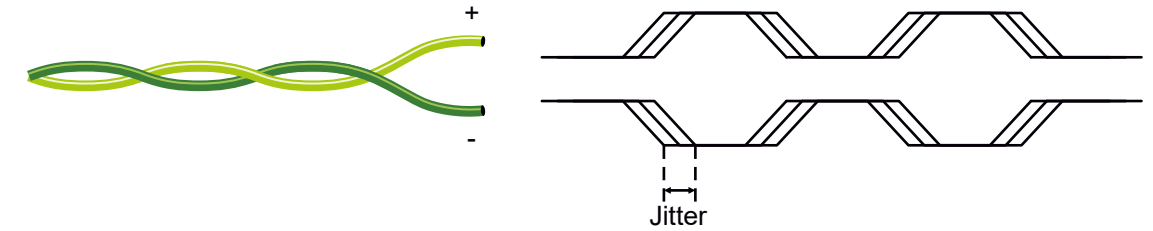
#### Inter-pair skew

Skew between two differential wire pairs in a cable. It is caused by different wire pair lengths or different number of twists in the DVI cable. Too much inter-pair skew results in color shift in the picture or sync loss.



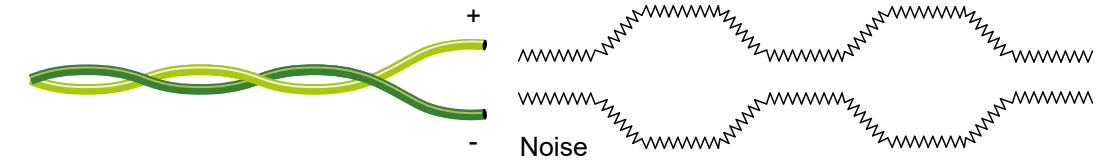
#### Jitter

Signal instability in the time domain. The time difference between two signal transitions should be a fixed value, but noise and other effects cause variations.



#### Noise

Electromagnetic interference between other electronic devices such as mobile phones, motors, etc. and the DVI cable are coupled onto the signal. Too much noise results in increased jitter.



**INFO:** The colors of the wire pairs in the pictures are for illustration and do not represent the color of the actual wires inside the cable.

# 12

## Appendix

Tables, drawings, guides, technical details and the hashtag keyword list as follows:

- ▶ SPECIFICATION
- ▶ INPUT/OUTPUT PORT NUMBERING
- ▶ FACTORY DEFAULT SETTINGS
- ▶ CONTENT OF BACKUP FILE
- ▶ MAXIMUM FIBER CABLE EXTENSIONS
- ▶ MECHANICAL DRAWINGS
- ▶ CABLE WIRING GUIDE
- ▶ FACTORY EDID LIST
- ▶ RELEASE NOTES OF THE FIRMWARE PACKAGES
- ▶ **HASHTAG KEYWORD LIST**
- ▶ FURTHER INFORMATION

## 12.1. Specification

INFO: Specifications are subject to change without notice.

### 12.1.1. HDMI-3D-OPT-TX200 series Transmitters

#### General

Compliance	CE, UKCA
EMC compliance (emission)	EN 55032:2015+A1:2020
EMC compliance (immunity)	EN 55035:2017+A11:2020
RoHS	EN 63000:2018
Electrical safety	EN 62368-1:2020
Laser safety	EN 60825-1:2014+A11:2021
Warranty	3 years
Cooling	Passive
Operating temperature	0 to +55°C (+32 to +122°F)
Operating humidity	10% to 90%, non-condensing

#### Power

Power supply	External power adaptor
Power adaptor	In 100-240 V AC 50/60 Hz, Out 5V DC, 1 A
Power connector	Locking DC connector (2.35 mm pin)
Power consumption (HDMI-3D-OPT-TX210A)	2,5 W (typ)
Power consumption (HDMI-3D-OPT-TX210RAK)	3 W (typ)
Power consumption (SW4-OPT-TX240RAK)	6 W (typ)

#### Enclosure

Rack mountable	Yes
Material	1 mm steel
Dimensions in mm	221W x 100.4D x 26H
Dimensions in inch	8.7 W x 3.95 D x 1.02 H
Weight (HDMI-3D-OPT-TX210A)	605 g
Weight (HDMI-3D-OPT-TX210RAK)	605 g
Weight (SW4-OPT-TX240RAK)	627 g

#### EDID Management

EDID emulation	Yes
EDID memory	84 factory presets, 14 user programmable

#### Video Inputs

##### DisplayPort input

DisplayPort connector type	20-pole, DP 1.1a receptacle
Color depth	Deep color support up to 36 bits, 12 bit/color
Color space	RGB, YCbCr 4:4:4, YCbCr 4:2:2, YCbCr 4:2:0
Video delay	0 frame
Max. resolutions	2560x1600@60 Hz 1920x1080@120 Hz, 8 bit/color 4096x2160@30 Hz
3D support	Yes
HDCP 1.4 compliant	Yes

##### HDMI input

HDMI connector type	19-pole HDMI Type A receptacle
Standard	DVI 1.0, HDMI 1.4
Color depth	Deep color support up to 36 bits, 12 bit/color
Color space	RGB, YCbCr 4:4:4, YCbCr 4:2:2, YCbCr 4:2:0
Video delay	0 frame
Max. resolutions	1600x1200@60 Hz, 36 bit 1920x1080@120 Hz 3840x2160@30 Hz, 24 bit
Reclocking	Pixel Accurate Reclocking
HDCP 1.4 compliant	Yes

##### DVI-I input with DVI-D support

Connector type	29-pole, DVI-I
Standard	DVI 1.0, HDMI 1.4
Color depth	Deep color support up to 36 bits, 12 bit/color
Color space	RGB, YCbCr 4:4:4, YCbCr 4:2:2, YCbCr 4:2:0
Video delay	0 frame
Max. resolutions	1600x1200@60 Hz, 36 bit 1920x1080@120 Hz 3840x2160@60 Hz, 24 bit
Reclocking	Pixel Accurate Reclocking
3D support	Yes
HDCP 1.4 compliant	Yes

**Audio Inputs****Embedded audio signal**

Supported on	DP, DVI-D, HDMI ports
Supported audio formats	PCM (up to 192 kHz), MPCM (up to 8 channels)

**Analog audio input**

Signal type	PCM, Compressed, DSD, High Bitrate
Sampling frequency	48 kHz
Volume	-78 dB – 0 dB
Balance	0 - 100 (50 = center)
Gain	0 dB – 6 dB
Connector	3.5 mm Jack, 5-pole Phoenix connector

**RS-232 Control**

Serial port connector	3-pole Phoenix connector
Available Baud rates	between 4800 and 115200

**GPIO**

Port connector	8-pole Phoenix connector
Port direction	Input or output

**USB**

USB connector	USB mini B type
USB 2.0 compliance	Yes

**Optical**

Fiber type	50/125 SC Multimode (preferred), 62.5/125 SC Multimode
Laser wavelengths	High speed lanes: 778; 800; 825; 850 nm
	Low speed lane: 911; 980 nm
Laser class specification	Class 3R

**12.1.2. HDMI-3D-OPT-RX150RA Receiver****General**

Compliance	CE, UKCA
EMC compliance (emission/ immunity)	EN 55032:2015 / EN 55024:2011
Warranty	3 years
Cooling	Passive
Operating temperature	0 to +55°C (+32 to +122°F)
Operating humidity	10% to 90%, non-condensing

**Power**

Power supply	External power adaptor
Power adaptor	In 100-240 V AC 50/60 Hz, Out 5V DC, 1 A
Power connector	Locking DC connector (2.35 mm pin)
Power consumption	3,9 W (typ); 6,5 W (max)

**Enclosure**

Rack mountable	Yes
Material	1 mm steel
Dimensions in mm	100.4W x 131.9D x 26H
Dimensions in inch	8.7 W x 3.95 D x 1.02 H
Weight	430 g

**HDMI Output**

HDMI connector type	19-pole HDMI Type A receptacle
Standard	DVI 1.0, HDMI 1.4
Color depth	Deep color support up to 36 bits, 12 bit/color
Color space	RGB, YCbCr 4:4:4, YCbCr 4:2:2, YCbCr 4:2:0
Video delay	0 frame
Max. resolutions	1600x1200@60 Hz, 36 bit 1920x1080@120 Hz, 24 bit 3840x2160@30 Hz, 24 bit
HDCP 1.4 compliant	Yes



**Audio Outputs****Embedded audio signal**

Supported on	DP, DVI-D, HDMI ports
Supported audio formats	PCM (up to 192 kHz) MPCM (up to 8 channels)

**Analog audio output**

Connector type	5-pole Phoenix connector
Signal type	PCM, Compressed, DSD, High Bitrate
Sampling frequency	48 kHz
Volume	-78 dB – 0 dB
Balance	-100 - 100 (0 = center)

**Optical**

Fiber type	50/125 SC Multimode (preferred), 62.5/125 SC Multimode
Laser wavelengths	High speed lanes: 778; 800; 825; 850 nm Low speed lane: 911; 980 nm
Laser class specification	Class 3R

**RS-232 Control**

Serial port connector	9-pole D-sub
Available Baud rates	between 4800 and 115200
Signal type	RX/TX bidirectional

**USB for KVM**

Connector type	2 x USB-A female
USB 2.0 compliance	Yes

**USB Control**

USB connector	USB mini B type
USB 2.0 compliance	Yes

**12.2. Input/Output Port Numbering**

The following tables contain the input and output ports with their ID numbers which shall be used when protocol command sending or in Lightware Device Controller.

**HDMI-3D-OPT-TX210A****Audio/Video Ports**

Port name	Video port nr. (LW2 / LW3)	Emulated EDID memory	Audio port nr. (LW2 / LW3)
HDMI in	I1	E1	I1
Audio1 in	-	-	I2
Audio2 in	-	-	I3
<b>Optical link out</b>	O1	-	O1
<b>Local HDMI out</b>	O2	-	O2

**HDMI-3D-OPT-TX210RAK****Audio/Video Ports**

Port name	Video port nr. (LW2 / LW3)	Emulated EDID memory	Audio port nr. (LW2 / LW3)
HDMI in	I1	E1	I1
Audio1 in	-	-	I2
Audio2 in	-	-	I3
<b>Optical link out</b>	O1	-	O1
<b>Local HDMI out</b>	O2	-	O2

**USB Ports**

Port name	Port nr. (LW3)
USB connector	D1
USB Composite channel	S1
USB Transparent channel 1	S2
USB Transparent channel 2	S3

**RS-232 Ports**

Port name	Port nr. (LW2 / LW3)
Local serial port	P1
Optical serial link	P2

**SW4-OPT-TX240RAK****Audio/Video Ports**

Port name	Video port nr. (LW2 / LW3)	Emulated EDID memory	Audio port nr. (LW2 / LW3)
DP in	I1	E1	I1
HDMI1 in	I2	E2	I2
HDMI2 in	I3	E3	I3
DVI-D in	I4	E4	I4
Audio1 in	-	-	I5
Audio2 in	-	-	I6
<b>Optical link out</b>	O1	-	O1
<b>Local HDMI out</b>	O2	-	O2

**USB Ports**

Port name	Port nr. (LW3)
USB connector	D1
USB Composite channel	S1
USB Transparent channel 1	S2
USB Transparent channel 2	S3

**RS-232 Ports**

Port name	Port nr. (LW2 / LW3)
Local serial port	P1
Optical serial link	P2

**HDMI-3D-OPT-RX150RA****Audio/Video Ports**

Port name	Video port nr. (LW2 / LW3)	Emulated EDID memory	Audio port nr. (LW2 / LW3)
<b>Optical link in</b>	I1	E1	I1
HDMI out	O1	-	O1
Analog audio out	-	-	O2

**USB Ports**

Port name	Port nr. (LW3)
USB connector - Mouse	S1
USB connector - Keyboard	S2
USB Composite channel	D1
USB Transparent channel 1	D2
USB Transparent channel 2	D3

**RS-232 Ports**

Port name	Port nr. (LW2 / LW3)
Local serial port	P1
Optical serial link	P2

## 12.3. Factory Default Settings

### 12.3.1. Transmitter

Parameter	Setting/Value
<b>Crosspoint settings *</b>	
Video	I1 (DisplayPort)
Audio	I1 (DisplayPort)
<b>Video input port settings (DP*, HDMI, DVI-D*)</b>	
HDCP	Enabled
<b>Video output port settings (optical link and local HDMI)</b>	
HDCP mode	Enabled
Autoselect *	Disabled
Autoselect mode *	Priority detect
Autoselect video priority *	0=DP, 1=HDMI, 2=HDMI2, 3=DVI-D
Test pattern mode	Off
Test pattern resolution	480p
Test pattern	Bar
Signal type	Auto
HDCP mode	Auto
Laser enable	On
<b>Analog audio input port properties</b>	
Volume	0.00 dB
Balance	0 (center)
Gain	0.00 dB
<b>Audio output port settings (optical link and local HDMI)</b>	
Autoselect *	Disabled
Autoselect mode *	Priority detect
Autoselect video priority *	0=DP, 1=HDMI, 2=HDMI2, 3=DVI-D, 4=Analog 1 (Jack), 5=Analog 2 (Phoenix)
<b>Network settings *</b>	
IP address	192.168.0.100
Subnet mask	255.255.255.0
Static gateway	192.168.0.1
DHCP	Disabled
LW2 / LW3 port number	10001
<b>RS-232 settings</b>	

Parameter	Setting/Value
Control protocol	LW2
Baud rate / Databits / Parity / Stopbits	57600 / 8 / No / 1
Operation mode	Pass-through
Command injection port nr.	8001
<b>GPIO port settings *</b>	
Direction	Input
Output level	High

\* Only for SW4-OPT-TX240RAK model.

### 12.3.2. Receiver

Parameter	Setting/Value
<b>Optical input port properties</b>	
HDCP	Enabled
<b>HDMI output port properties</b>	
Signal type	Auto
HDCP mode	Auto
Power 5V mode	Always on
Test pattern mode	Off
Test pattern resolution	480p
Test pattern	Bar
<b>Analog audio output port properties</b>	
Volume	0.00 dB (100%)
Balance	0 (center)
Bass	0.00 dB
Treble	0.00 dB
Phase invert	Disabled
<b>RS-232 settings</b>	
Control protocol	LW2
Baud rate / Databits / Parity / Stopbits	57600 / 8 / No / 1
Operation mode	Pass-through

For the procedure of reloading factory default values in LDC software see the [System](#) section, or using the function buttons see in the [Reset to Factory Default Settings](#) section for the transmitter and the [Reset to Factory Default Settings](#) section for the receiver.

## 12.4. Content of Backup File

The backup file contains numerous settings and parameters saved from the device. When the file is uploaded to a device, the followings will be overwritten:

<b>HDMI input port(s)</b>
Video port name, Audio port name, HDCP setting
<b>DP input port</b>
Video port name, Audio port name, HDCP setting
<b>DVI-D input port</b>
Video port name, Audio port name, HDCP setting
<b>Analog audio input ports</b>
Volume, Balance, Gain, Port name
<b>Crosspoint settings</b>
Audio autoselect settings, Mute ports, Lock ports, Switch ports
Video autoselect settings, Mute ports, Lock ports, Switch ports
<b>Optical output port</b>
Video port name, Audio port name
Test pattern mode, clock source, and type
HDCP mode, HDMI mode
RS-232 mode, Control protocol, CI port number, Port name
Remote port name, Enabled/Disabled setting
<b>Local output port</b>
Port name, HDCP mode, HDMI mode, Power +5V mode
Test pattern mode, clock source, and type
<b>Serial port</b>
RS-232 mode, Control protocol, Baud rate, Data bits, Stop bits, Parity
Port name and CI (Command Injection) port number
<b>Network settings (only for SW4-OPT-TX240RAK model)</b>
DHCP status (enable / disable)
Static IP address, Network mask, Gateway address
<b>Further settings</b>
GPIO port names, directions (input/output), and levels (high/low)
User EDID data (Transmitter: U1-U14; Receiver: U1-U15)
Event manager: settings of all Events (E1-E20)

For the description of backup/restore procedure see the [Configuration Cloning \(Backup Tab\)](#) section.

## 12.5. Maximum Fiber Cable Extensions

	OM1	OM2	OM3	OM4
	(62.5/125)	(50/125)	(50/125)	(50/125)
1080p@60Hz 24 bpp	250 m	600 m	1200 m	2500 m
1080p@60Hz 36 bpp	150 m	400 m	800 m	1300 m
4096x2048@30Hz 24 bpp	Not supported	350 m	700 m	1100 m

## 12.6. Mechanical Drawings

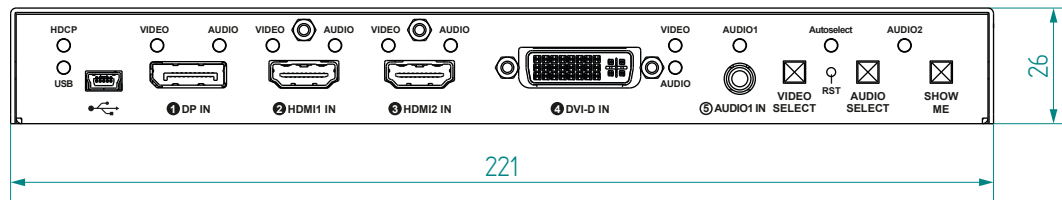
### 12.6.1. Transmitter

SW4-OPT-TX240RAK can be seen in the pictures but the dimensions are valid for all the models. Dimensions are in mm.

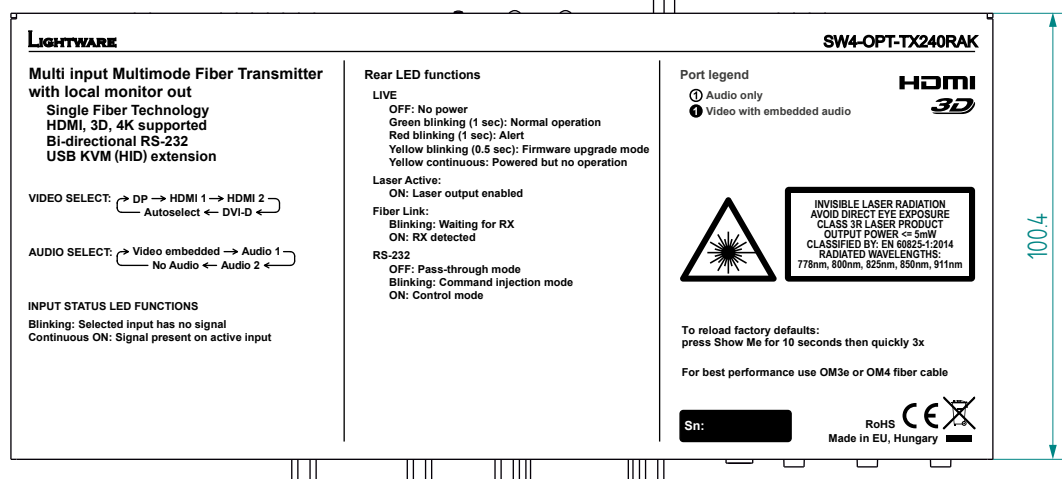
Bottom View



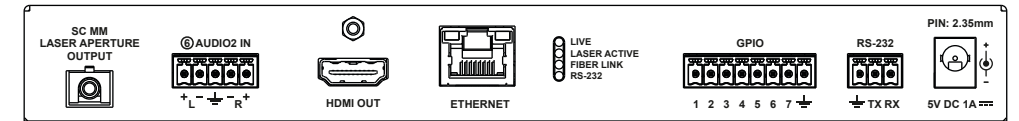
Front View



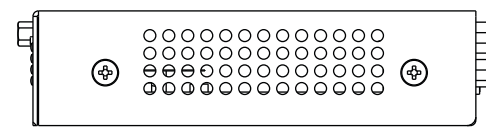
Top View



Rear View



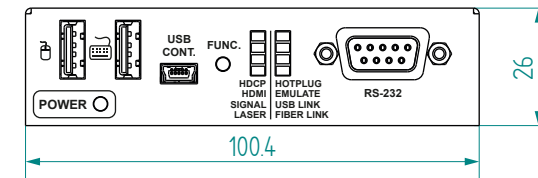
Side View



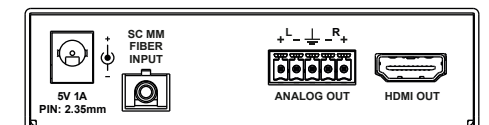
### 12.6.2. Receiver

The following drawings present the physical dimensions of the HDMI-3D-OPT-RX150RA receiver. Dimensions are in mm.

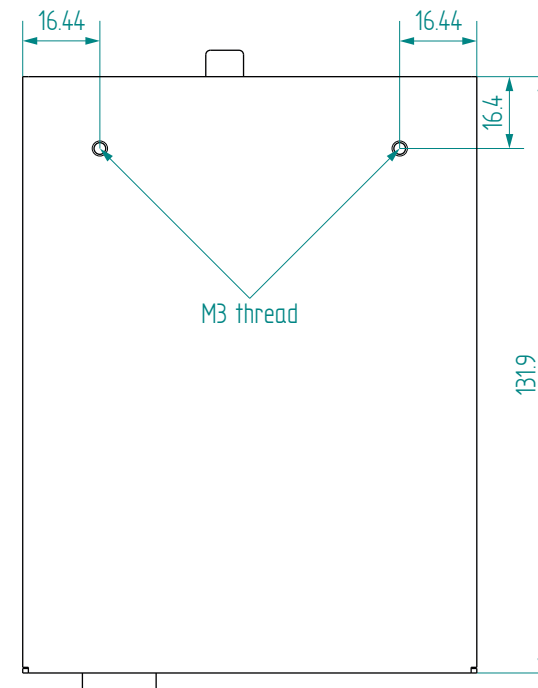
Front View



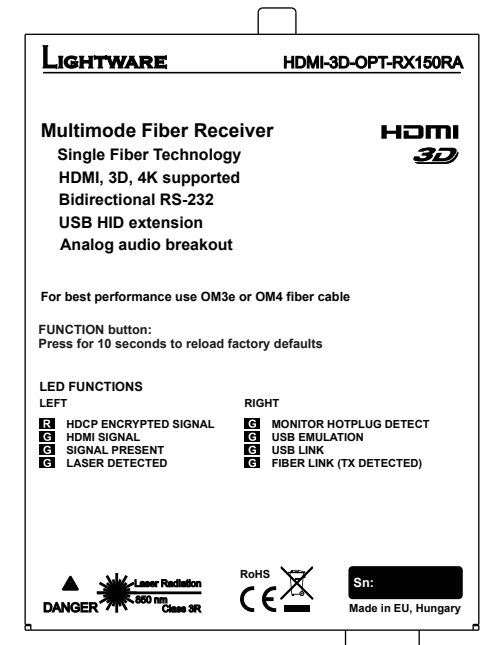
Rear View



Bottom View



Top View



## 12.7. Cable Wiring Guide

Inputs and outputs of audio devices are symmetric or asymmetric. The main advantage of the symmetric lines is the better protection against the noise, therefore, they are widely used in the professional audio industry. Symmetric audio is most often referred to as balanced audio, as opposed to asymmetric, which is referred to as unbalanced audio. Lighthouse products are usually built with 5-pole Phoenix connectors, so we would like to help users assembling their own audio cables. See the most common cases below.

**ATTENTION!** Symmetric and asymmetric lines can be linked with passive accessories (e.g. special cables), but in this case half of the line level is lost.

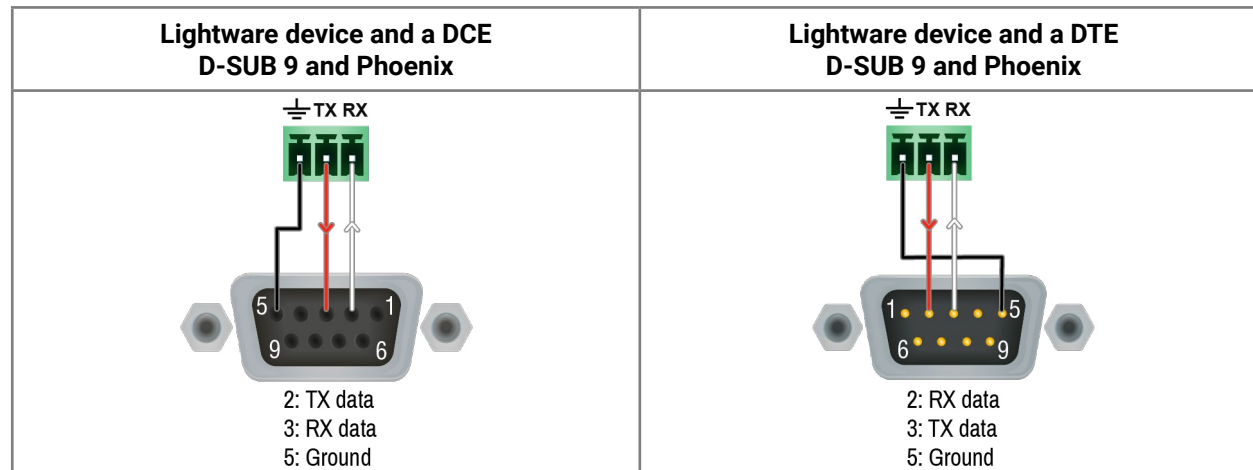
**ATTENTION!** There are numerous types of regularly used connector and cable types to connect audio devices. Please always make sure that a connector or cable fits your system before use.

**ATTENTION!** Never join the phase-inverted (negative, cold or -) poles (either right and left) to the ground or to each other on the output side, as this can damage the unit.

**INFO:** Use a galvanic isolation in case of a ground loop.

### 12.7.1. Serial Ports

The device is built with 3-pole Phoenix connector. See the examples below of connecting to a DCE (Data Circuit-terminating Equipment) or a DTE (Data Terminal Equipment) type device:

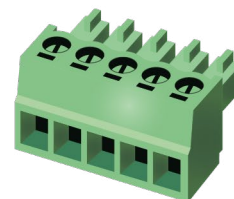


### 12.7.2. Audio Ports

The Pinout of the 5-pole Phoenix Connector

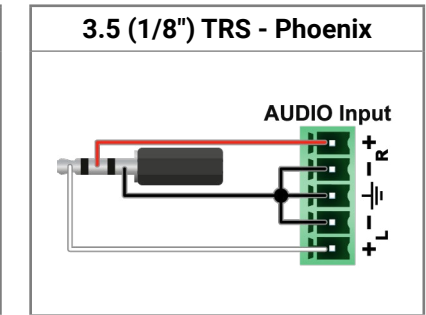
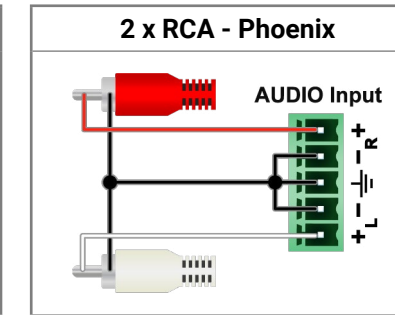
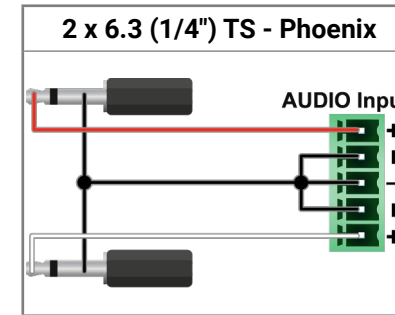


Pin nr.	Signal
1	Left+
2	Left-
3	Ground
4	Right-
5	Right+

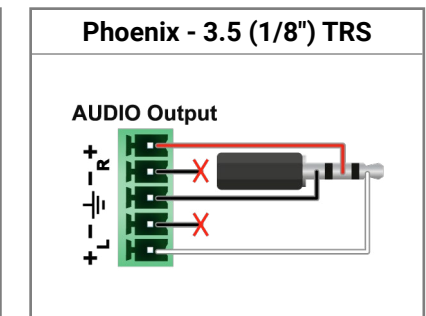
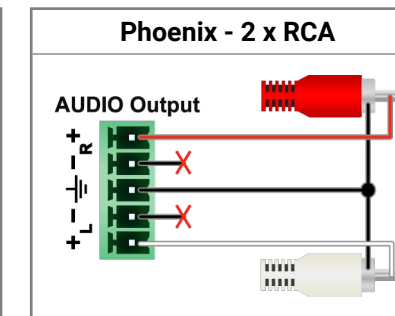
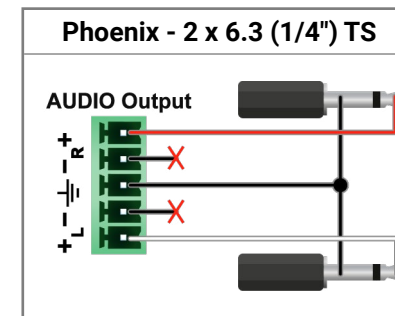


Compatible Plug Type: Phoenix® Combicon series (3.5mm pitch, 5-pole), type: MC 1.5/5-ST-3.5.

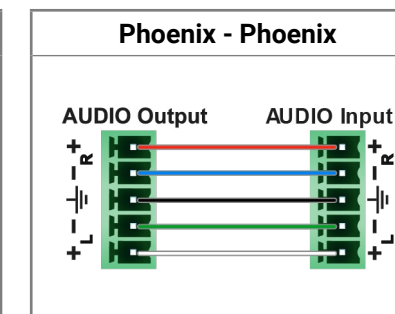
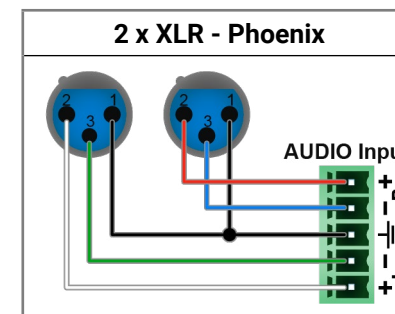
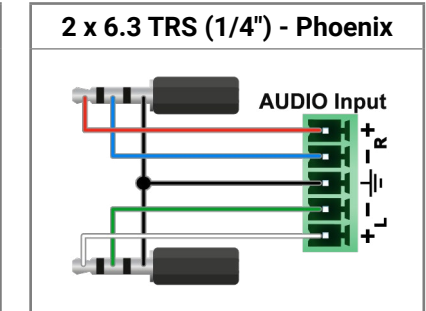
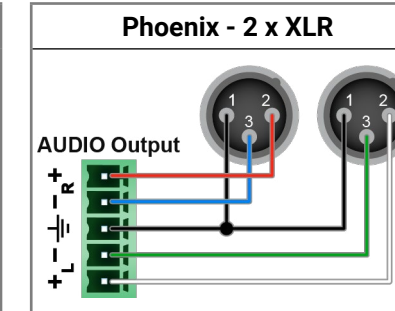
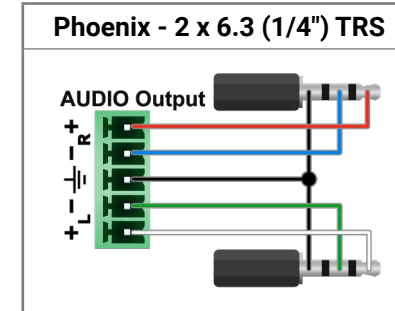
#### From Unbalanced Output to Balanced Input



#### From Balanced Output to Unbalanced Input



#### From Balanced Output to Balanced Input





## 12.8. Factory EDID List

Mem	Resolution	Type	EDID audio features
F1	640 x 480p @ 60.00 Hz	D	
F2	848 x 480p @ 60.00 Hz	D	
F3	800 x 600p @ 60.32 Hz	D	
F4	1024 x 768p @ 60.00 Hz	D	
F5	1280 x 768p @ 50.00 Hz	D	
F6	1280 x 768p @ 59.94 Hz	D	
F7	1280 x 768p @ 75.00 Hz	D	
F8	1360 x 768p @ 60.02 Hz	D	
F9	1280 x 1024p @ 50.00 Hz	D	
F10	1280 x 1024p @ 60.02 Hz	D	
F11	1280 x 1024p @ 75.02 Hz	D	
F12	1400 x 1050p @ 50.00 Hz	D	
F13	1400 x 1050p @ 60.00 Hz	D	
F14	1400 x 1050p @ 75.00 Hz	D	
F15	1680 x 1050p @ 60.00 Hz	D	
F16	1920 x 1080p @ 50.00 Hz	D	
F17	1920 x 1080p @ 60.00 Hz	D	
F18	2048 x 1080p @ 50.00 Hz	D	
F19	2048 x 1080p @ 60.00 Hz	D	
F20	1600 x 1200p @ 50.00 Hz	D	
F21	1600 x 1200p @ 60.00 Hz	D	
F22	1920 x 1200p @ 50.00 Hz	D	
F23	1920 x 1200p @ 59.56 Hz	D	
F24	2048 x 1200p @ 59.96 Hz	D	
F29	1920 x 1080p @ 60.00 Hz	U	
F30	1440 x 480i @ 60.05 Hz	H	2chLPCM
F31	1440 x 576i @ 50.08 Hz	H	2chLPCM
F32	640 x 480p @ 59.95 Hz	H	2chLPCM
F33	720 x 480p @ 59.94 Hz	H	2chLPCM
F34	720 x 576p @ 50.00 Hz	H	2chLPCM

Mem	Resolution	Type	EDID audio features
F35	1280 x 720p @ 50.00 Hz	H	2chLPCM
F36	1280 x 720p @ 60.00 Hz	H	2chLPCM
F37	1920 x 1080i @ 50.04 Hz	H	2chLPCM
F38	1920 x 1080i @ 50.00 Hz	H	2chLPCM
F39	1920 x 1080i @ 60.05 Hz	H	2chLPCM
F40	1920 x 1080i @ 60.05 Hz	H	2chLPCM
F41	1920 x 1080p @ 24.00 Hz	H	2chLPCM
F42	1920 x 1080p @ 25.00 Hz	H	2chLPCM
F43	1920 x 1080p @ 30.00 Hz	H	2chLPCM
F44	1920 x 1080p @ 50.00 Hz	H	2chLPCM
F45	1920 x 1080p @ 60.00 Hz	H	2chLPCM
F46	1920 x 1080p @ 60.00 Hz	H	2chLPCM
F47	1920 x 1080p @ 60.00 Hz	U	2chLPCM
F48	1920 x 1080p @ 60.00 Hz	U	2chLPCM, 8chLPCM, DD, DTS, AAC, DD+, DTS-HD, MLP, DST, WMAP
F49	1920 x 1080p @ 60.00 Hz	U	2chLPCM, 8chLPCM, DD, DTS, AAC, DD+, DTS-HD, MLP, DST, WMAP
F90	1920 x 2160p @ 59.99 Hz	D	
F91	1024 x 2400p @ 60.01 Hz	D	
F94	2048 x 1536p @ 60.00 Hz	D	
F96	2560 x 1600p @ 59.86 Hz	D	
F97	3840 x 2400p @ 24.00 Hz	D	
F98	1280 x 720p @ 60.00 Hz	H	2chLPCM
F99	1920 x 1080p @ 60.00 Hz	H	2chLPCM
F100	1024 x 768p @ 60.00 Hz	H	2chLPCM
F101	1280 x 1024p @ 50.00 Hz	H	2chLPCM
F102	1280 x 1024p @ 60.02 Hz	H	2chLPCM
F103	1280 x 1024p @ 75.02 Hz	H	2chLPCM
F104	1600 x 1200p @ 50.00 Hz	H	2chLPCM
F105	1600 x 1200p @ 60.00 Hz	H	2chLPCM

Mem	Resolution	Type	EDID audio features
F106	1920 x 1200p @ 59.56 Hz	H	2chLPCM
F107	2560 x 1440p @ 59.95 Hz	H	2chLPCM
F108	2560 x 1600p @ 59.86 Hz	H	2chLPCM
F109	3840 x 2400p @ 24.00 Hz	H	2chLPCM
F110	3840 x 2160p @ 24.00 Hz	H	2chLPCM
F111	3840 x 2160p @ 25.00 Hz	H	2chLPCM
F112	3840 x 2160p @ 30.00 Hz	H	2chLPCM
F118	3840 x 2160p @ 30.00 Hz	U	2chLPCM
F119	3840 x 2160p @ 30.00 Hz	U	2chLPCM, 8chLPCM, DD, DTS, AAC, DD+, DTS-HD, MLP, DST, WMAP
F120	3840 x 2160p @ 60.00 Hz	H	2chLPCM
F121	1440 x 1080p @ 59.91 Hz	H	2chLPCM
F122	2560 x 2048p @ 59.98 Hz	H	2chLPCM
F123	1280 x 800p @ 59.91 Hz	H	2chLPCM
F124	1440 x 900p @ 59.90 Hz	H	2chLPCM
F125	1368 x 768p @ 59.85 Hz	H	2chLPCM
F126	1600 x 900p @ 59.98 Hz	H	2chLPCM
F127	2048 x 1080p @ 60.00 Hz	H	2chLPCM
F128	2560 x 1080p @ 60.00 Hz	H	2chLPCM
F129	3440 x 1440p @ 24.99 Hz	H	2chLPCM
F130	3440 x 1440p @ 29.99 Hz	H	2chLPCM
F131	4096 x 2160p @ 25.00 Hz	H	2chLPCM
F132	4096 x 2160p @ 30.00 Hz	H	2chLPCM
F133	4096 x 2160p @ 60.00 Hz	H	2chLPCM
F134	3440 x 1440p @ 23.99 Hz	H	2chLPCM
F135	4096 x 2160p @ 24.00 Hz	H	2chLPCM
F136	3840 x 2400p @ 29.99 Hz	H	2chLPCM

The legend for the table can be found on the next page.

**Legend****D:** DVI EDID**H:** HDMI EDID**U:** Universal EDID, supporting many standard resolutions:

- **F29:** Universal EDID for DVI signals (no audio support).
- **F47:** HDMI EDID supporting PCM audio.
- **F48:** HDMI EDID supporting all type of audio.
- **F49:** HDMI EDID supporting all type of audio and deep color.
- **F89:** Universal EDID for analog signals (no audio support).
- **F118:** HDMI EDID supporting PCM audio and 4K@30 Hz signals.
- **F119:** HDMI EDID supporting all type of audio and 4K@30 Hz signals.

**DiD** (in column EDID features): with Display ID support

Please note that minor changes in the factory EDID list may be applied in further firmware versions.

**12.9. Release Notes of the Firmware Packages**

The following list below shows the released firmware packages with important notes.

**12.9.1. Transmitters**

Affected models:

- HDMI-3D-OPT-TX210A
- HDMI-3D-OPT-TX210RAK
- SW4-OPT-TX240RAK

**v1.2.1b3**

Release date: 2023-01-24

**Bugfix:**

- Fixed a bug that resulted the product restarts when connected to an Ethernet network.

**v1.2.0b7**

Release date: 2022-09-06

**New feature:**

- Support new product: HDMI-3D-OPT-TX210DD

**v1.1.1b5**

Release date: 2020-02-12

**New feature:**

- Manufacturing support.

**v1.1.0b7**

Release date: 2019-10-28

**New feature:**

- Initial release.

**12.9.2. Receiver**

Affected model:

- HDMI-3D-OPT-RX15RA

**v2.1.1b2**

Release date: 2023-01-24

**Bugfix:**

- Fixed a bug that resulted the product only responded to every second request on the serial port.

**v2.1.0b7**

Release date: 2022-09-06

**New feature:**

- Support new product: HDMI-3D-OPT-RX110DD

**v2.0.1b2**

Release date: 2019-10-28

**Bugfix:**

- Manufacturing support.

**v1.0.1b1**

Release date: 2012-09-01

**New feature:**

- Initial release

## 12.10. Hashtag Keyword List

This user's manual contains keywords with hashtag (#) to help you to find the relevant information as quick as possible.

The format of the keywords is the following:

#<keyword>

The usage of the keywords: use the **Search** function (Ctrl+F / Cmd+F) of your PDF reader application, type the # (hashtag) character and the wished keyword.

The **#new** special keyword indicates a new feature/function that has just appeared in the latest firmware or software version.

### Example

*#diagnostic*

This keyword is placed at the Diagnostic Tools section in the Lightware Device Controller (LDC) chapter where the description of the Frame detector and Test pattern tools can be found.

The following list contains all hashtag keywords placed in the document with a short description belonging to them. The list is in **alphabetical order** by the hashtag keywords.

Hashtag Keyword ↓	Description
<i>#advancedview</i>	Advanced view / Terminal window
<i>#analogaudio</i>	Analog audio related settings
<i>#audio</i>	Audio related settings
<i>#autoselect</i>	Autoselect feature settings
<i>#backup</i>	Configuration cloning (backup)
<i>#balance</i>	Balance (for analog audio) setting
<i>#bootload</i>	Bootload mode setting
<i>#button</i>	Front panel button related setting
<i>#configurationcloning</i>	Configuration cloning (backup)
<i>#controllock</i>	Button lock setting
<i>#crosspoint</i>	Crosspoint switch setting
<i>#devicelabel</i>	Device label
<i>#dhcp</i>	Dynamic IP address (DHCP) setting
<i>#diagnostic</i>	Failure diagnostic related tool/information
<i>#edid</i>	EDID related settings
<i>#eventmanager</i>	Event manager
<i>#factory</i>	Factory default settings

Hashtag Keyword ↓	Description
<i>#firmwareversion</i>	Firmware version query
<i>#framedetector</i>	Frame detector in LDC
<i>#frontpanel</i>	Front panel button related setting
<i>#function</i>	Function button
<i>#gain</i>	Gain (for analog audio) setting
<i>#hdcp</i>	HDCP-encryption related setting
<i>#ipaddress</i>	IP address related settings
<i>#kvm</i>	USB KVM related settings
<i>#label</i>	Device label
<i>#lock</i>	Port lock setting
<i>#lockbutton</i>	Front panel button lock setting
<i>#log</i>	System log
<i>#message</i>	Message sending via communication ports
<i>#mute</i>	Port mute setting
<i>#network</i>	Network (IP address) related settings
<i>#nosyncscreen</i>	Test pattern (no sync screen) settings
<i>#optical</i>	Fiber optical port related settings
<i>#portstatus</i>	Source/destination port status query
<i>#power5v</i>	Power 5V mode setting
<i>#producttype</i>	Product type query
<i>#protocol</i>	RS-232 protocol setting
<i>#reboot</i>	Restarting the device
<i>#restart</i>	Restarting the device
<i>#rs232</i>	RS-232 related settings
<i>#rs-232</i>	RS-232 related settings
<i>#serial</i>	RS-232 related settings
<i>#serialnumber</i>	Serial number query
<i>#showme</i>	Show Me button
<i>#signaltype</i>	HDMI/DVI signal type setting
<i>#status</i>	Status query
<i>#switch</i>	Crosspoint switch setting

Hashtag Keyword ↓	Description
<i>#systemlog</i>	System log
<i>#terminal</i>	Advanced view / Terminal window
<i>#testpattern</i>	Test pattern (no sync screen) settings
<i>#unlock</i>	Port unlock setting
<i>#unmute</i>	Port unmute setting
<i>#usbkvm</i>	USB KVM related settings
<i>#volume</i>	Volume (for analog audio) setting

## 12.11. Further Information

### Limited Warranty Statement

1. Lightware Visual Engineering PLC (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.

### Document Revision History

Rev.	Release date	Changes	Editor
1.0	31-08-2016	Initial release	Tamas Forgacs
...			
3.0	31-01-2023	Minor graphical updates; minor corrections for HTML export	Tamas Forgacs
3.1	12-12-2023	Specifications updated	Tamas Forgacs

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