LIGHTWARE
INNOVATIVE. RELIABLE. MADE IN EUROPE.

User's Manual

HDMI-3D-OPT-TX210DD
HDMI-3D-OPT-RX110DD

Fiber Optical Multimedia Extender

v1.3 15-01-2024

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 of along 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 eletric 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

Go back to the previous page. If you clicked on a link previously, you can go back to the source page by pressing the button.

Navigate to the Table of Contents.

Step back one page.

Step forward to the next page.

Document Information

All presented functions refer to the indicated products. The descriptions have been made while testing these functions in accordance with the indicated Hardware/Firmware/Software environment:

Item		Version
Lightware Device Controller (LDC) software		2.7.5b2
Lightware Device Updater v2 (LDU2) Software		2.23.0b1
Firmware package	HDMI-3D-OPT-TX210DD	1.2.1
	HDMI-3D-OPT-RX110DD	2.1.1
Hardware	HDMI-3D-OPT-TX210DD	1.1
	HDMI-3D-OPT-RX110DD	1.3

Document revision: **v1.3**

Release date: **15-01-2024**

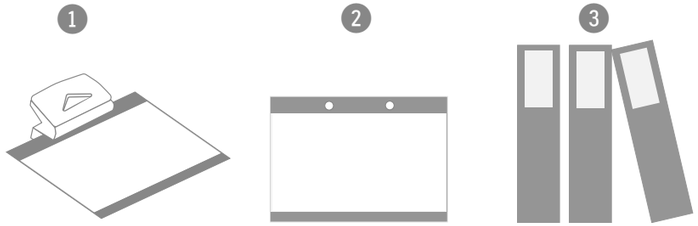
Editor: Tamas Forgacs

About Printing

Lightware Visual Engineering supports green technologies and eco-friendly mentality. Thus, this document is primarily made for digital use. If you need to print out a few pages for any reason, follow the recommended printing settings:

- Page size: A4
- Output size: Fit to page or Match page size
- Orientation: Landscape

TIPS AND TRICKS: Thanks to the size of the original page, a border around the content (gray on the second picture below) makes it possible to organize the pages better. After punching holes in the printed pages, they can easily be placed into a ring folder.



Hashtag (#) Keywords in the Document

This user's manual contains keywords with hashtags (#) 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.

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Introduction

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

1.1. Description

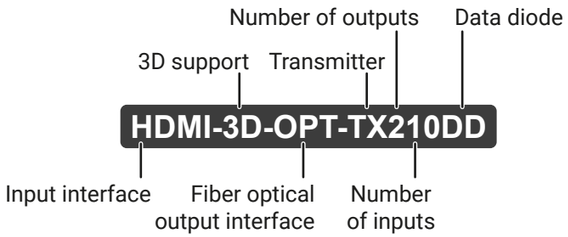
HDMI-3D-OPT-DD series transmitter and receiver pair extends HDMI 1.4, DVI 1.0 and RS-232 signals over one multi-mode fiber, and transmits video signal with embedded audio to a distance of up to 2500 meters.

HDMI-3D-OPT-TX210DD transmitter was designed to handle HDMI 1.4 digital video signal and analog stereo audio from local inputs, or HDMI embedded audio from 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.

HDMI-3D-OPT-RX110DD optical receiver provides extension of uncompressed Full-HD video and audio over one multimode fiber for up to 2500 m. The unit offers an analog audio output, and works at all standard AV resolutions.

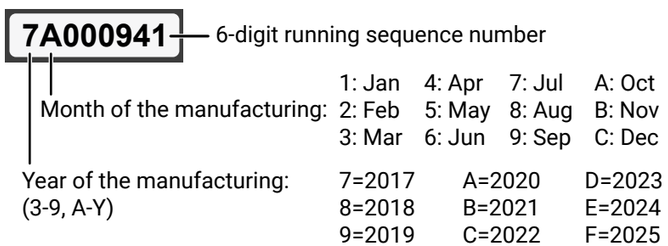
HDMI-3D-OPT-DD series extenders offer data diode technology, which means that an optical fiber with a sender on one side and a receiver on the other ensures that data can only be transferred in a forward direction, and never in reverse. This means no two-way transfer, preventing leakage and manipulation from taking place.

Model Denomination



About the Serial Number

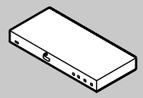
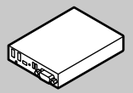
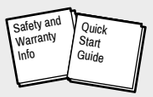
Lightware devices contain a label indicating the unique serial number of the product. The structure is the following:



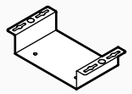
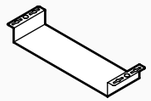
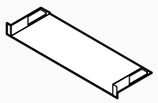
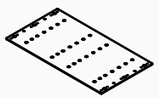
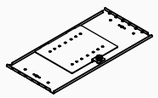
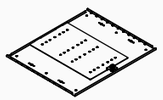
1.2. Box Contents

The following tables describe all supplied and optional accessories of the HDMI-3D-OPT-DD series extenders by models. The optional (not-supplied) accessories can be purchased separately; please contact sales@lightware.com.

1.2.1. Supplied Accessories

			HDMI-3D-OPT-TX210DD	HDMI-3D-OPT-RX110DD
Supplied devices		Transmitter unit	✔	-
		Receiver unit	-	✔
Supplied accessories		Phoenix Combicon® 3-pole connector	✔	-
		Phoenix Combicon® 5-pole connector	✔	✔
		Safety and Warranty Info, Quick Start Guide	✔	✔

1.2.2. Optional Accessories

			HDMI-3D-OPT-TX210DD	HDMI-3D-OPT-RX110DD
Optional accessories		Under-desk kit	-	✔
		Under-desk double kit	✔	✔
		1U high rack shelf	✔	✔
		UD Mounting Plate F110	-	✔
		UD Mounting Plate F120	✔	✔
		UD Mounting Pro P110	-	✔
		UD Mounting Pro P140	✔	✔

1.3. Compatible Devices

HDMI-3D-OPT-DD series extenders are compatible with **each other only**.

1.4. Features

General

Data Diode Technology

An optical fiber with a sender on one side and a receiver on the other ensures that data can only be transferred in a forward direction, and never in reverse. This means there is no two-way transfer, preventing leakage and manipulation from taking place.

3D and 4K Support

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

Signal Transmission for up to 2500 m

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

Single Fiber Technology

HDMI 1.4 signal with 4k@30Hz signal transmission over a single fiber cable.

Pixel Accurate Reclocking

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

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.

LDC

The Lightware Device Controller (LDC) application keeps receiving updates, adding new features and tools. The latest edition of LDC has gotten more intuitive, user friendly, smarter and has a modern user interface. The LDC is available for both Windows and macOS operating systems.

For Transmitter Only

Deep Color Support and Conversion

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

Audio Embedding Function

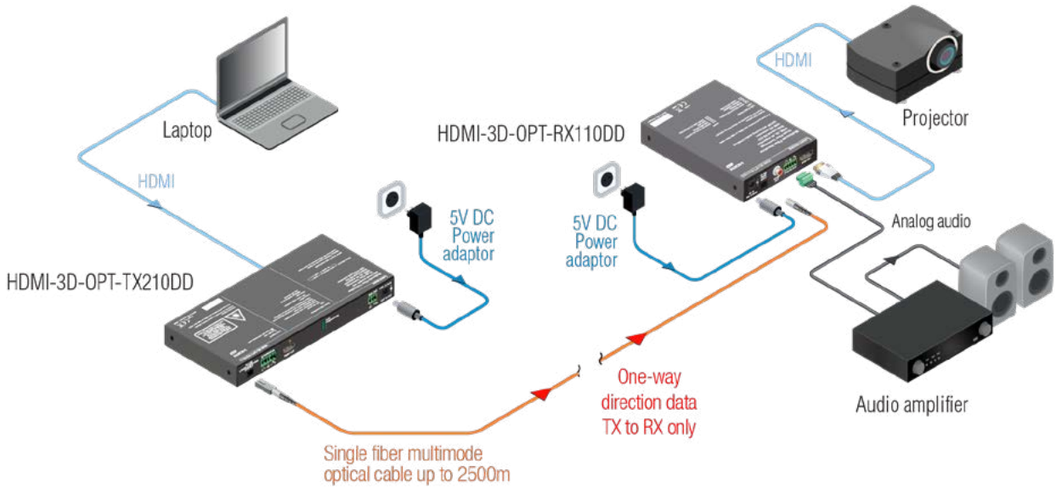
External analog audio signal can be embedded in the video stream.

For Receiver Only

Audio De-Embedding Function

Embedded audio signal can be de-embedded from the video stream to analog audio ports.

1.5. Typical Application



2

Product Overview

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

2.1. HDMI-3D-OPT-TX210DD

2.1.1. Front View

1 USB connector — USB interface for LDC connection and firmware update purpose.

USB LED

off	USB is disconnected, or there is no USB data transfer over the port.
blinking	Device control mode is active.

2 HDMI input — HDMI connector for DVI video or HDMI video and audio signals. The port supports DVI 1.0 and HDMI 1.4 standards.

Video source LED

off	Video source is not connected.
on	Video source is active.
blinking	Video source is connected, but no signal is detected.

Audio source LED

off	Audio source is not selected.
blinking	Audio source is selected, but no signal is detected (digital inputs only).
on (with short pause)	Audio source is selected and the port is active, but not embedded into the output video stream (DVI output mode).
on (continuously)	Audio source is selected, the port is active, and the audio is embedded into the output video stream (HDMI output mode).

3 Audio1 input — 3.5 mm Jack connector for asymmetric analog audio input signal.

AUDIO1 LED

off	Audio source is not selected.
blinking	Audio source is selected, but no signal is detected (digital inputs only).
on (with short pause)	Audio source is selected and the port is active, but not embedded into the output video stream (DVI output mode).
on (continuously)	Audio source is selected, the port is active, and the audio is embedded into the output video stream (HDMI output mode).

4 Reset button — Reboots the device (the same as disconnecting from the power source and reconnecting again).

5 Audio Select button — Button for switching between audio sources. See the details in the Audio Select Button section.

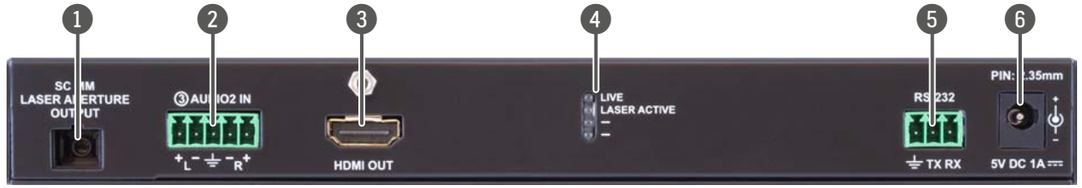
6 Audio2 status LED — The LED gives feedback about the actual connection status of the Audio2 input port (located on the rear side of the device).

AUDIO2 LED

off	Audio source is not selected.
blinking	Audio source is selected, but no signal is detected (digital inputs only).
on (with short pause)	Audio source is selected and the port is active, but not embedded into the output video stream (DVI output mode).
on (continuously)	Audio source is selected, the port is active, and the audio is embedded into the output video stream (HDMI output mode).

7 Show Me button — Special functions are available via this button (switch to bootload mode, restore factory default settings, condition launching in Event Manager). For the details about special functions, see the Special Functions of the Transmitter section.

2.1.2. Rear View



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. The pin assignment can be found in the Analog Stereo Audio Connector (5-pole Phoenix) section, the wiring guide can be found in the Cable Wiring Guide section.
3	**HDMI output**	Local HDMI output with the same AV content as the fiber optical output.
4	**Status LEDs**	The LEDs give immediate feedback about the actual state of the device.

LIVE

	off	Device is not powered.
	blinking (green)	Device is powered and operational.
	blinking (red)	Alert detected.
	blinking (yellow)	Device is in firmware update (bootload) mode.
	on (yellow)	Device is powered, but not operational.

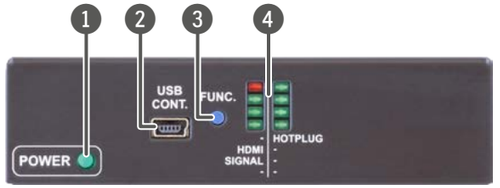
LASER ACTIVE

	on	Laser transmission is enabled.

5	**RS-232**	3-pole Phoenix connector for RS-232 serial communication. The pin assignment can be found in the RS-232 Connector section, the wiring guide can be found in the Cable Wiring Guide section.
6	**5V DC input**	Connect the output of the supplied 5V DC power adaptor. For more information, see the 5V DC Connection section.

2.2. HDMI-3D-OPT-RX110DD

2.2.1. Front View



1	**Power LED**	The LED indicates the power status of the device.

	off	Device is not powered.
	on	Device is powered and operational.

2	**USB Control**	USB interface for LDC connection and firmware update purpose.
3	**Function button**	Factory default settings and bootload mode can be recalled using the button. See the details in the Special Functions of the Receiver section.
4	**Status LEDs**	The LEDs give immediate feedback about the actual state of the device.

HDMI

	off	The input signal type is DVI.
	blinking	The input signal type is HDMI, but the output signal is DVI.
	on	The input and output signal type is HDMI.

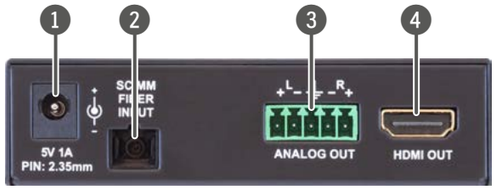
SIGNAL

	on	Valid video clock signal is present on the fiber input port of the receiver.

HOTPLUG

	on	Powered sink device is connected to the HDMI OUT port and sends hotplug signal.

2.2.2. Rear View



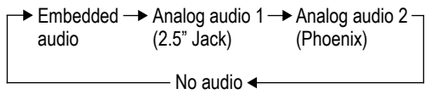
1	**5V DC input**	Connect the output of the supplied 5V DC power adaptor. For more information, see the 5V DC Connection section.
2	**SC fiber input**	Connect a multi-mode single fiber optical cable between the receiver and the transmitter.
3	**Analog audio output**	5-pole Phoenix connector for balanced analog audio output signal. The pin assignment can be found in the Analog Stereo Audio Connector (5-pole Phoenix) section, the wiring guide can be found in the Cable Wiring Guide section.
4	**HDMI output**	HDMI connector for DVI video or HDMI video and audio signals. The port supports DVI 1.0 and HDMI 1.4 standards.

2.3. Front Panel Buttons of the Transmitter

2.3.1. Audio Select Button

Desired audio input can be selected by the **Audio Select button** from the front panel. The selection order of the inputs is described on the right.

#button #frontpanel



2.3.2. 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.

#showme

2.4. Special Functions of the Transmitter

2.4.1. Recalling Factory Defaults 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 pressing the **Show Me** button **for 10 seconds**. After 5 seconds the 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

2.4.2. Control Lock

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

Control lock can be deactivated in the Lightware Device Controller (LDC) software (see the details in the Status section), or via LW3 protocol command (see the details in the Lock the Front Panel Buttons section).

#controllock #lockbutton

2.4.3. Resetting the Device

In a few cases (after firmware update, etc) you may need to reset the device. Pushing the reset button gives the same result as disconnecting and reconnecting the power adaptor to the transmitter. To reset 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 restore the settings to factory defaults. To restore the factory default setting, see the previous section.

#reset #reboot #restart

2.4.4. 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 pressing 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.

#bootload

2.5. Special Functions of the Receiver

2.5.1. Recalling 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 pressing the **Function** button **for 10 seconds**. After 5 seconds the 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.

#frontpanel #button #function #factory

2.5.2. 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** while the **Function** button is being pressed. If the device is switched to bootload mode, the Status LEDs are blinking quickly (less than 500 ms duty cycle).

#bootload

3

Installation

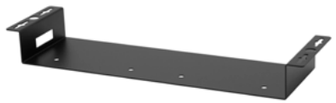
This chapter is about the installation of the device and connecting to other appliances, also presenting the mounting options and further assembly steps.

3.1. Mounting Options

To mount the transmitter, Lightware supplies optional accessories for different usage. There are two kinds of mounting kits with a 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 with 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 it easy to mount a single device on any flat surface, e.g. furniture. The 1U high rack shelf provides mounting holes for the fastening of up to two half-rack or four quarter-rack sized units. Pocket-sized devices can also be fastened to the shelf. To order mounting accessories, please contact sales@lightware.com.

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

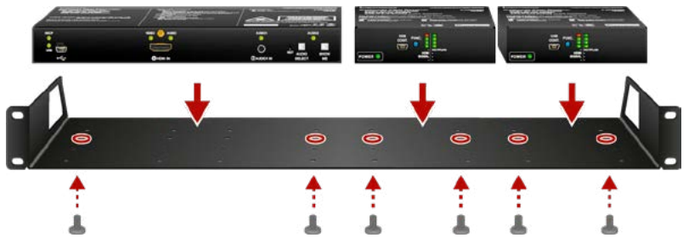
INFO: The transmitters are half-rack sized, the receiver is quarter-rack sized.

More details about the accessories and the mounting can be found in the Mounting Assembly Guide.

3.1.1. Rack Shelf Mounting

1U High Rack Shelf

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



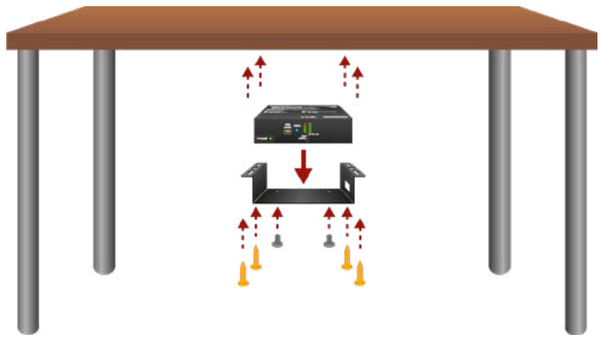
The 1U high rack shelf provides mounting holes for the fastening of up to two half-rack or four quarter-rack sized units. Pocket sized devices can also be fastened to the shelf.

3.1.2. Under-Desk Mounting

Under-Desk Mounting Kit

The UD kit allows a receiver to be easily mounted on any flat surface (e.g. furniture).

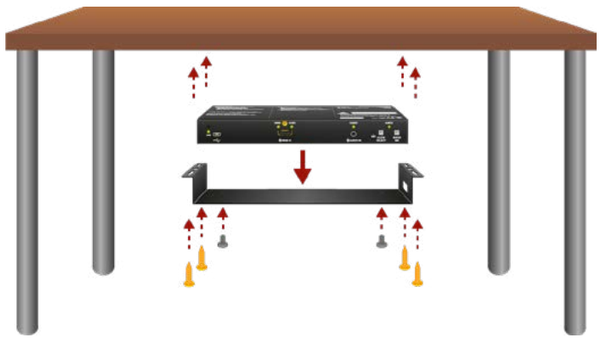
ATTENTION! Only quarter-rack sized units (HDMI-3D-OPT-RX110DD receiver) can be installed to the kit.



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

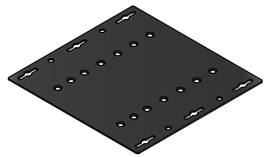
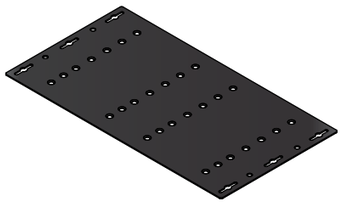
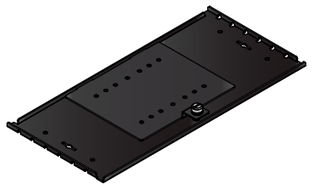
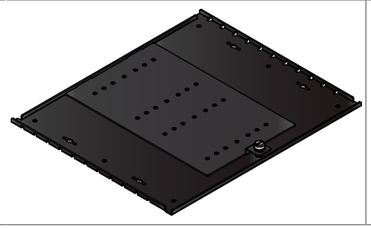
Under-Desk Double Mounting Kit

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.

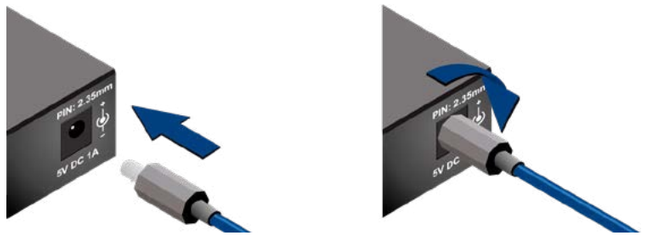
Under-Desk Mounting Plates

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

3.2. Electrical Connections

3.2.1. 5V DC Connection



Locking DC connector

The extenders are built with locking 5V DC connector. Do not forget to turn the plug clockwise direction 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.

3.2.2. HDMI Connector

The extenders provide standard 19-pole HDMI connectors for input and output. The port supports DVI 1.0 and HDMI 1.4 standards both in case of the transmitter and the receiver. Always use high-quality HDMI cable for connecting sources and displays.

3.2.3. SC Fiber Optical Connector

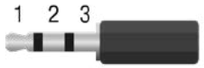
HDMI-3D-OPT-DD series transmitter and receiver provide multimode SC fiber optical input and output connectors.

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.

3.2.4. 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

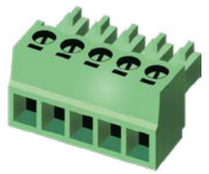
Jack audio plug pin assignments

You can find more information about audio functions in the Audio Interface section.

3.2.5. Analog Stereo Audio Connector (5-pole Phoenix)

The 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 functions in the Audio Interface section. Audio cable wiring guide is in the Cable Wiring Guide section.

3.2.6. RS-232 Connector

HDMI-3D-OPT-TX210DD transmitter 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

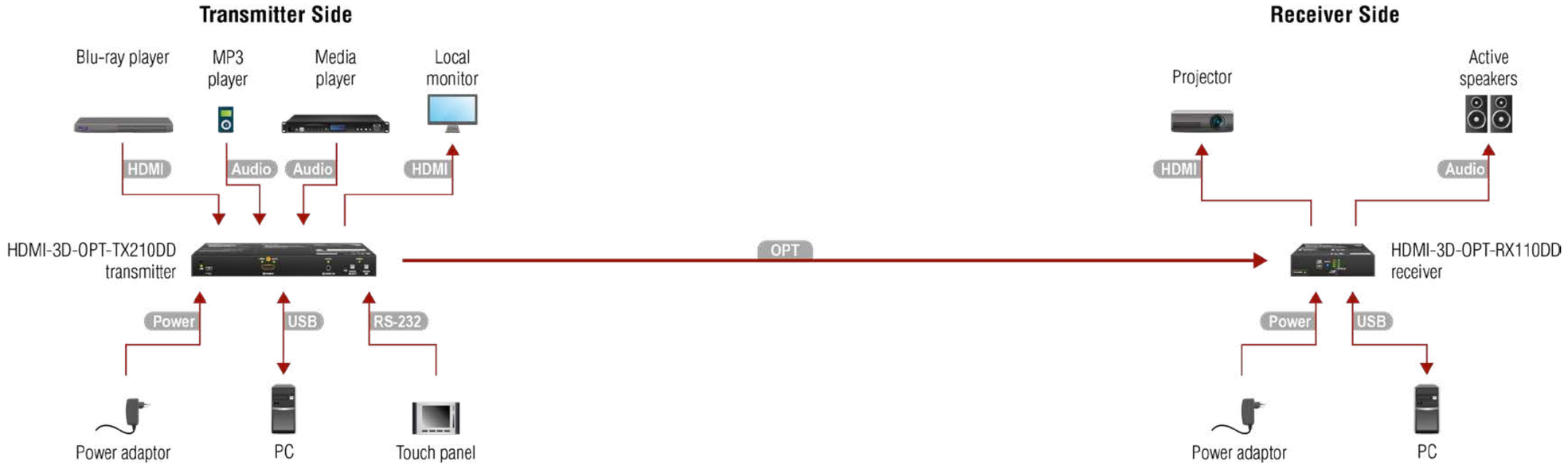
Phoenix® Combicon series (3.5mm pitch, 3-pole), type: MC 1.5/3-ST-3.5.

Guide for the correct wiring can be found in the Cable Wiring Guide section.

3.2.7. USB Mini Connector

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

3.3. Connecting Steps



Transmitter Side	
OPT	Connect the transmitter and the receiver using a multimode single fiber optical cable.
HDMI	Connect the source (e.g. a Blu-ray player) to the input port of the transmitter by a HDMI cable.
Audio	Optionally connect an assymmetric 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 control: connect the transmitter to the computer by the USB mini B-type cable.
RS-232	Optionally for RS-232 control: connect a controller device (e.g. a touch panel) to the RS-232 port.
Power	Connect the power adaptor to the DC input of the transmitter first, then to the AC power socket.

Receiver Side	
OPT	Connect the receiver and the transmitter 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.
Audio	Optionally connect an analog audio device with balanced audio signal (e.g. active speakers) 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.
Power	Connect the power adaptor to the DC input of the receiver first, then to the AC power socket.

ATTENTION! HDMI-3D-OPT-DD series extenders are compatible only with each other.

4

Device Concept

The following chapter describes the features of the device with a few real-life examples. The topics that are described:

4.1. Data Diode Extender Concept

Data Diode Technology

> DEFINITION: A data diode (also referred to as unidirectional gateway, deterministic one-way boundary device or unidirectional network) is a network appliance or device allowing data to travel only in one direction. [1]

An optical fiber with a sender on one side and a receiver on the other ensures that data can only be transferred in a forward direction, and never in reverse. This means there is no two-way transfer, preventing leakage and manipulation from taking place.

If a data diode is directed out from a high security network towards a network with a lower security level, data can be transferred while the network stays protected. By transferring information via a data diode, you are guaranteed that no one can use the same connection in the opposite direction to reach the secure network and manipulate its environment. [2]

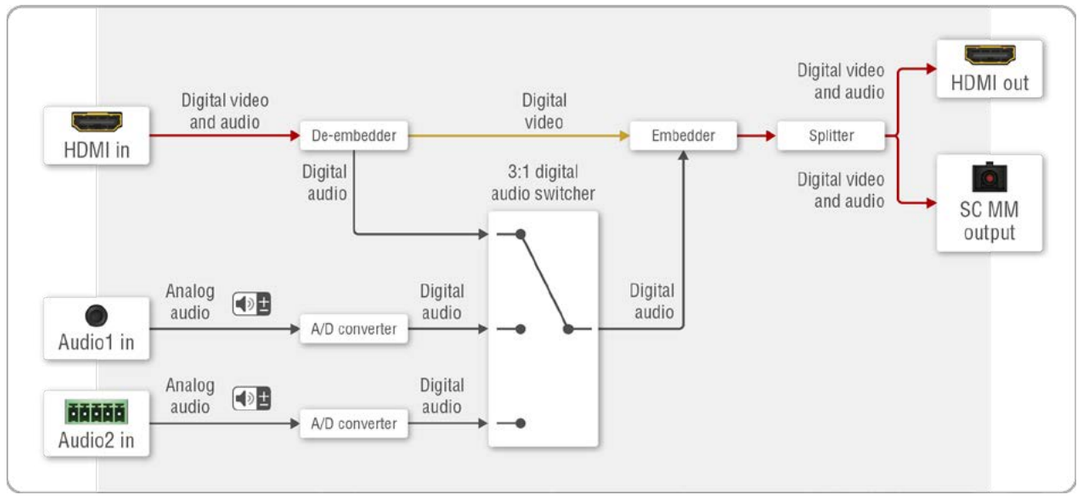
[1] Source: https://csrc.nist.gov/glossary/term/data_diode

[2] Source: https://advenica.com/en/blog/2019-02-19/what-is-a-data-diode-and-how-does-it-work

4.1.1. Transmitter Concept

HDMI-3D-OPT-TX210DD transmitter has a multimode single fiber output interface, which is able to transmit different type of signals at the same time. The transmitter accepts digital video HDMI) and analog audio sources (Jack and 5-pole Phoenix). The device can be controlled over RS-232 (3-pole Phoenix) and USB interfaces.

Port Diagram

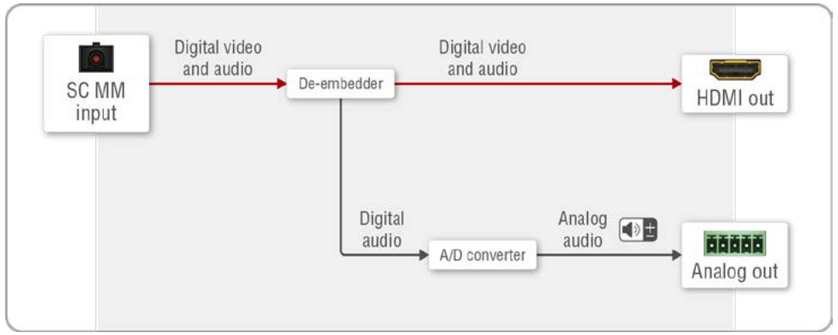


Port diagram of the AV interfaces for HDMI-3D-OPT-TX210DD transmitter

4.1.2. Receiver Concept

HDMI-3D-OPT-RX110DD receiver has a multi-mode single fiber input interface, which is able to receive different types of signals at the same time. The device accepts digital video and digital/analog audiosignals over a single fiber cable. The device is able to de-embed the audio signal to the analog (5-pole Phoenix) port, and transmit it to the audio source device. The unit can be controlled via USB interface (USB mini B-type).

Port Diagram



Port diagram of the AV interfaces for HDMI-3D-OPT-RX110DD receiver

4.2. Video Interface

The transmitter is able to receive digital video signal over the HDMI input port. Supported AV standards are DVI 1.0 and HDMI 1.4 with up to 4096x2160@30Hz resolution.

The digital video signal with the embedded digital audio is transmitted to the receiver over the multimode fiber optical interface. See the maximum fiber cable distances in the Maximum Fiber Cable Extensions section.

The receiver can receive the AV signal over the fiber optical interface and transmits it to the HDMI output port. Supported AV standards are DVI 1.0 and HDMI 1.4 with up to 4096x2160@30Hz resolution.

4.3. Audio Interface

4.3.1. Audio Inputs and Modes - Transmitter

The transmitter can receive audio from two type of sources:

- **Embedded** (over HDMI port);
- **Analog audio sources** (over 3,5mm Jack and 5-pole Phoenix ports).

Audio signal coming from the analog inputs can be assigned to the video input as embedded audio. 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:

- Audio of the original signal, or
- Analog audio signal.

4.3.2. Audio Outputs and Modes - Receiver

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

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

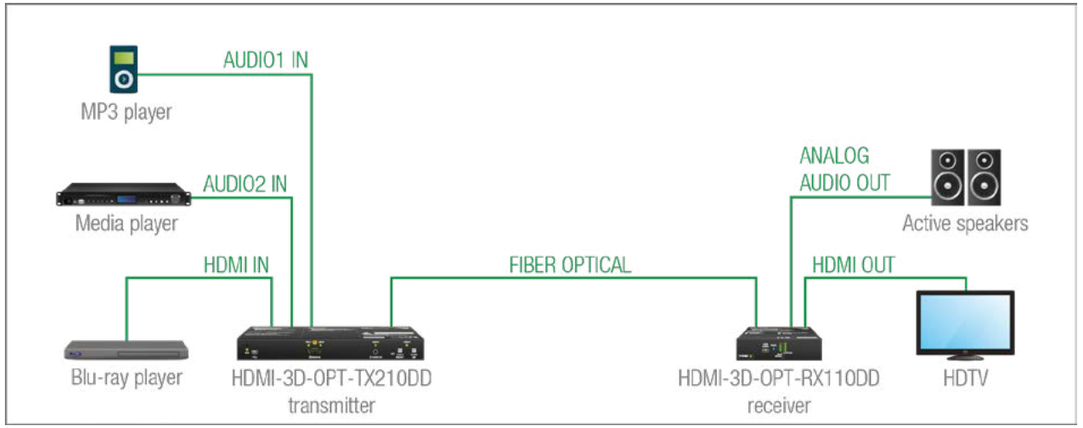
The digital audio signal coming from the the optical input port can be transmitted on any audio output ports: HDMI or the analog audio output port. The volume and balance levels are adjustable on the analog output port.

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	✓	-

4.3.3. Audio Signal Routing - Example



The Concept

Two audio source devices are connected to the trasmitter: 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 are two audio source devices: 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 into the HDMI signal, the user can transmit audio from three type of sources:

- analog audio of the MP3 player;
- analog audio of the media player;
- or the embeded digital audio of the Blu-ray player.

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

The receiver has a built-in de-embedder function, so user can transmit audio signal to:

- the active speakers;
- and the HDTV as well.

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

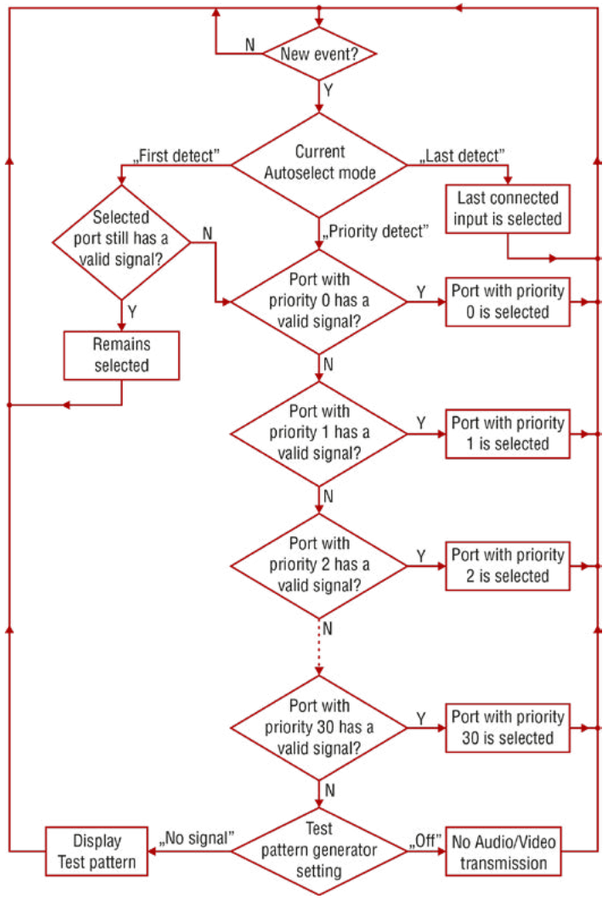
4.4. The Autoselect Feature

DIFFERENCE: Autoselect feature is available for the **audio ports only**.

Beside the manual selection of crosspoints, you can choose the Autoselect option in case of audio ports.

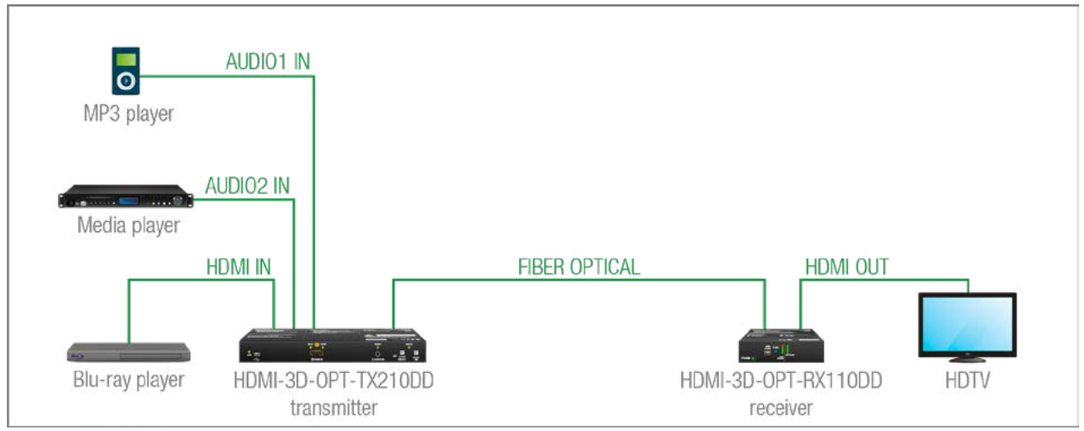
There are three types of Autoselect as follows.

- **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 audio source connected to the transmitter but the MP3 player, AUDIO1 IN input will be automatically switched to the optical output. If the MP3 player and the media player are also connected to the transmitter, AUDIO2 IN 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 from 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):

Source device	Input port	Priority
MP3 player	I2 (AUDIO1 IN)	**2**
Media player	I3 (AUDIO2 IN)	**1**
Blu-ray player	I1 (HDMI IN)	**0**

Priorities can be set in Lightware Device Controller (LDC) software (see related settings in the Autoselect Feature section), via LW2 protocol command (see related settings in the Change the Audio Input Priorities section) and via LW3 protocol command (see related settings in the Change the Input Port Priority section).

4.5. Control Interfaces

HDMI-3D-OPT-DD series extenders can be managed and supervised over two types of interfaces:

- **USB** (via USB mini B-type connector) - both in case of the transmitter and the receiver;
- **RS-232** (via 3-pole Phoenix connector) - in case of the transmitter only.

Software Control Modes

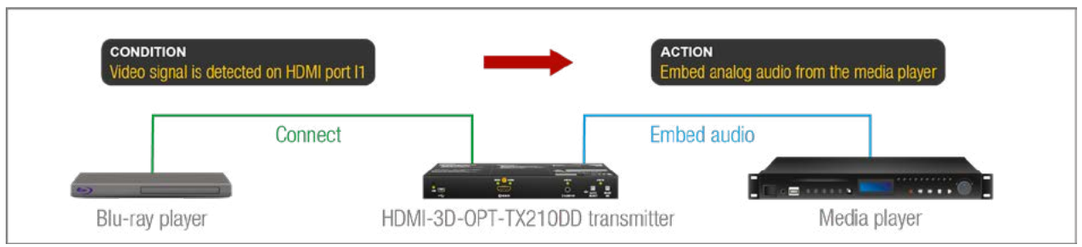
The user has more possibilities to control the device remotely. The following list contains the software control modes:

- **Lightware Device Controller (LDC)** - you can connect to the device via our control software using Ethernet 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.

4.6. Further Built-in Features

4.6.1. 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 the creation of Events by defining a Condition and an Action.



Event Manager example

See more information about the settings in the Event Manager section.

4.6.2. Device Cloning – Configuration Backup and Restore

Configuration cloning of HDMI-3D-OPT-DD series extenders 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.

4.6.3. Advanced EDID Management

Factory Preset EDIDs

The factory EDIDs (F1-F136) are factory preprogrammed and cannot be modified. These are the most common signal formats. 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 sink connected to the outputs of the device. 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.

HDMI-3D-OPT-DD series extenders applies **static** 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.

See more information about the settings in the EDID Menu section in the LDC software.

5

Software Control - Lightware Device Controller

The device can be controlled by a computer through USB or RS-232 interfaces with the Lightware Device Controller (LDC). The software can be installed on a Windows PC or macOS. The application and the User's Manual can be downloaded from www.lightware.com.

5.1. 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 exeptions 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.

5.2. Establishing the Connection

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

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

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 with 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.

5.2.1. Serial Tab

If the device is connected via the RS-232 port, click on the **Query** button next to the desired serial port to display the device's name and serial number. Double-click on the device or select it and click on the green **Connect** button.

ATTENTION! Before the device is connected via the local RS-232 port, make sure that **LW3 protocol** is set on the serial port. Furthermore, the RS-232 port must be free and other serial connection must not be established to the device over that port.

Factory Default Values for RS-232 Port

BAUD rate: 57600

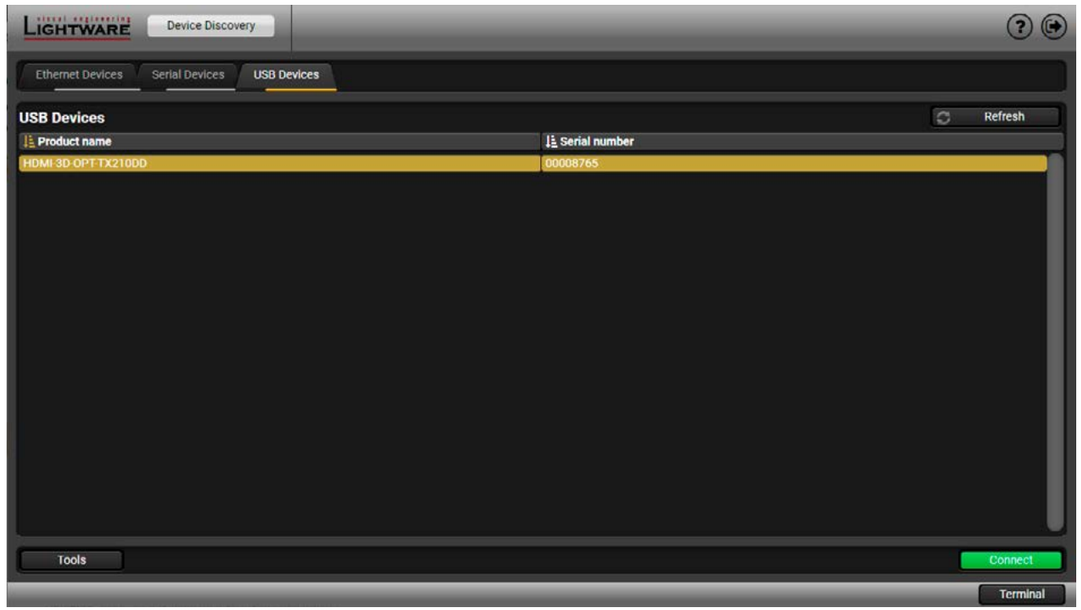
Data bits: 8

Parity: No

Stop bits: 1

5.2.2. USB Tab

Connect the device to a PC/computer over the USB mini-B type connector. Refresh the list and double-click on the device or select it and click on the green **Connect** button.



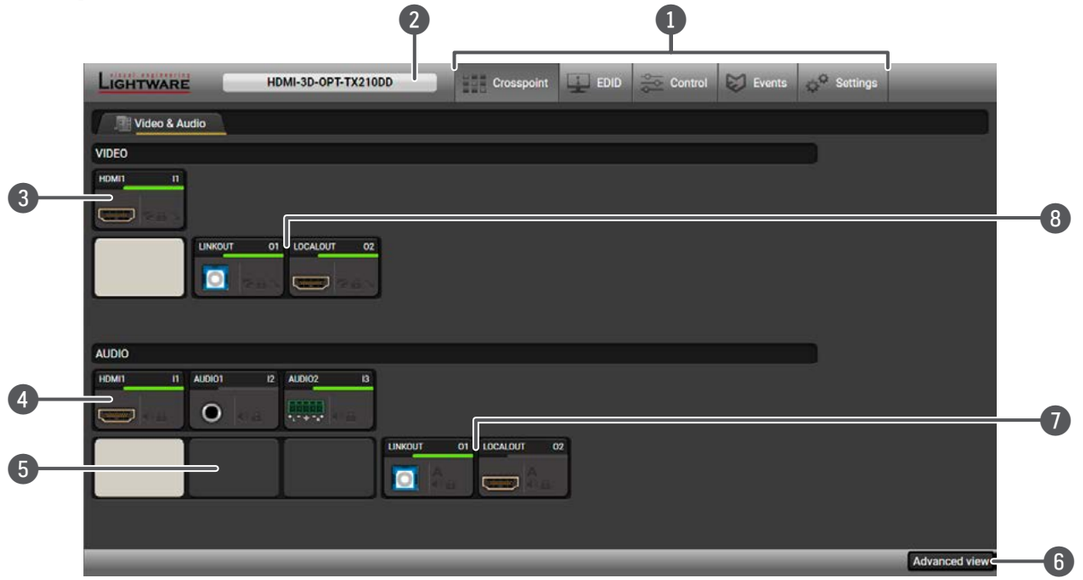
5.2.3. Further Tools

The **Tools** menu contains the following options:

- **Log Viewer:** The tool can be used for reviewing log files that have been saved previously.
- **Create EDID:** This tool opens the Easy EDID Creator wizard, which can be used for creating unique EDIDs in a few simple steps. Functionality is the same as that of the Easy EDID Creator.
- **Demo Mode:** This is a virtual MX-FR17 matrix router with full functionality built into the LDC. Functions and options are the same as that of the real MX-FR17 device.

The **Terminal** window is also available by pressing its button on the bottom.

5.3. Crosspoint Menu

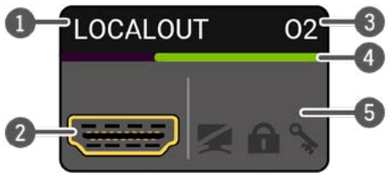


1	**Main menu**	The available menu items are displayed. The active one is showed with dark grey background color.*#crosspoint #switch*
2	**Information ribbon**	The label shows the device label that can be edited in the Settings menu - Status tab. Device discovery window can be displayed by clicking on 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	**Audio Connections**	The audio crosspoint connections can be selected in this table.
6	**Advanced view**	Displaying the Advanced View (Terminal Window), showing the Terminal window and the LW3 protocol tree.
7	**Audio output ports**	The audio output of the optical link and local HDMI out ports. Clicking on the tile opens the Port Properties Windows.
8	**Video output ports**	The video output of the optical link and local HDMI out ports. Clicking on the tile opens the Port Properties Windows.

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

The following icons display different states of the port/signal:

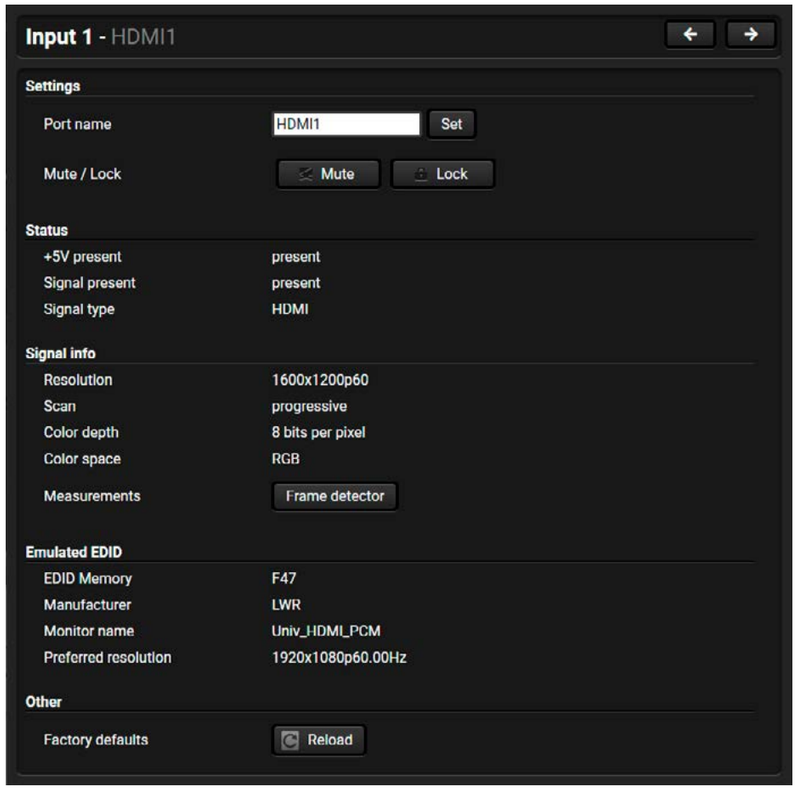
Icon	Icon is grey	Icon is black	Icon is green
	Port is unmuted	Port is muted	-
	Port is unlocked	Port is locked	-
	Autoselect is disabled	-	Autoselect is enabled

5.4. 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*

5.4.1. Video Input

Clicking on the HDMI1 video input port icon opens the Port properties window. You can find the most important information and settings in the panel.



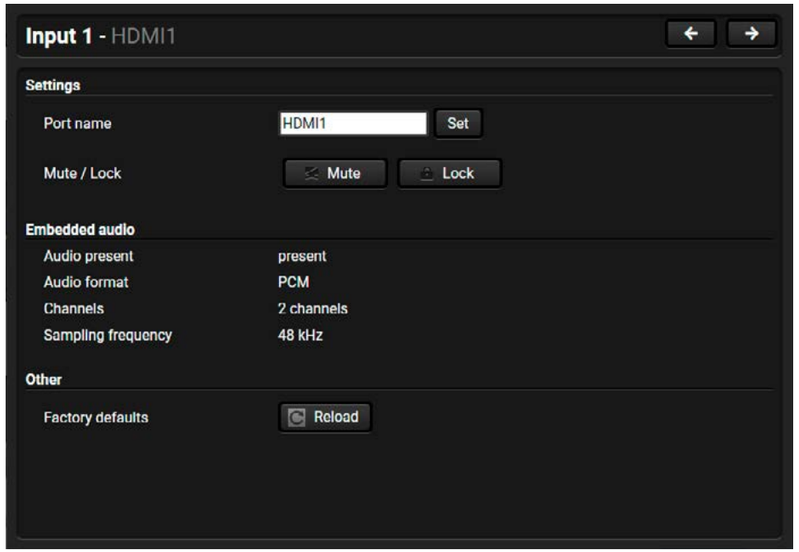
Port properties window of the HDMI video input

Available settings:

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

5.4.2. Digital Audio Input

Clicking on the HDMI audio input port icon opens the Port properties window. You can find the most important information and settings in the panel.



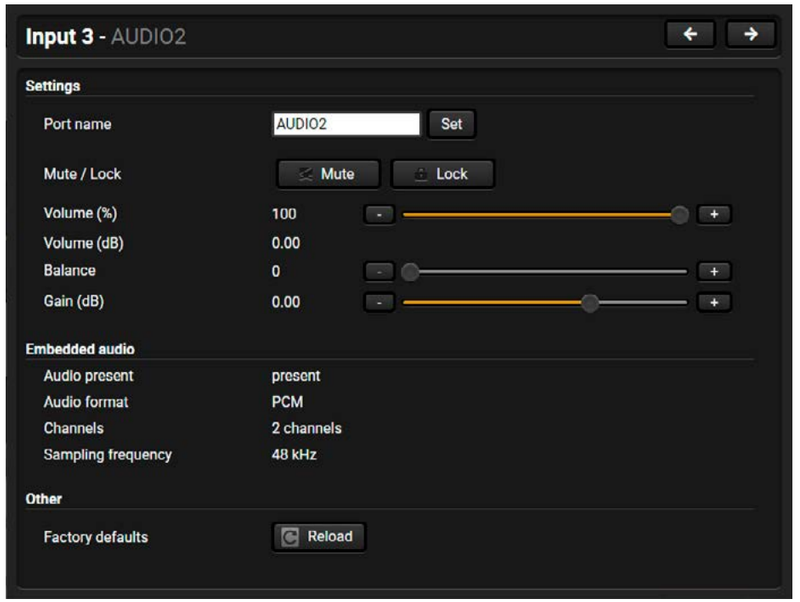
Port properties window of the HDMI audio input

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.

5.4.3. Analog Audio Inputs (TX)

Clicking on the Audio1 (3.5mm Jack) or Audio2 (3-pole Phoenix) audio input port icon opens the Port properties window. You can find the most important information and settings in the panel:



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

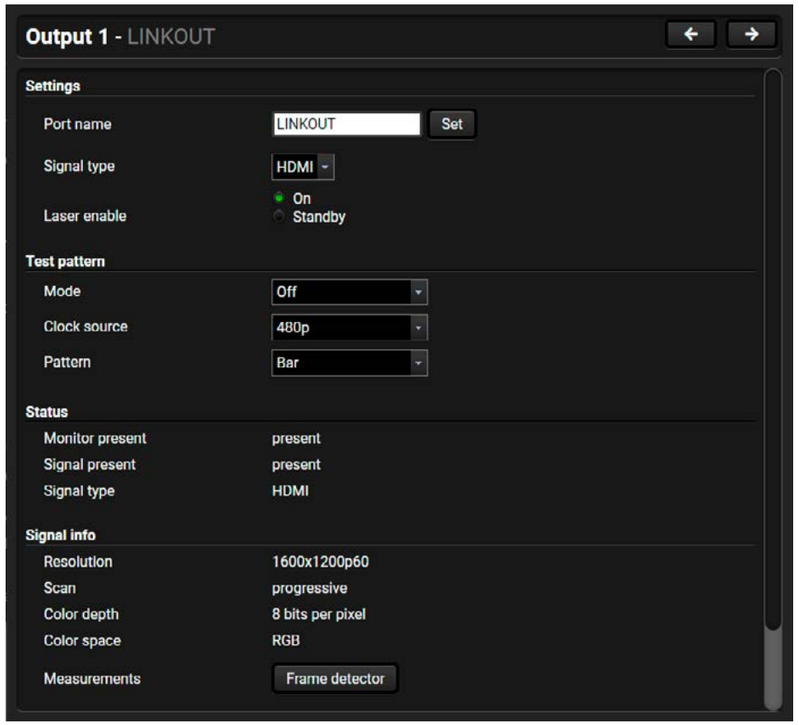
Certain parameters of the analog audio input signal can be set as follows:

- **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.

#audio #analogaudio #volume #balance #gain

5.4.4. Optical Video Output

Click on the LINKOUT output port to display the port properties. You can find the most important information and settings in the panel.



Port properties window of the optical video output

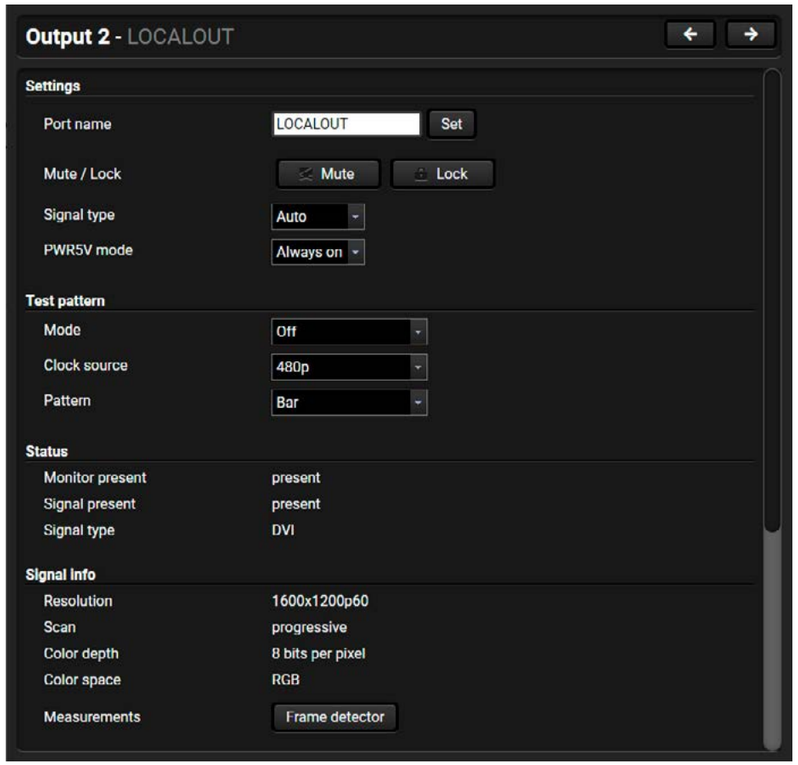
Available settings:

- **Signal type**: Auto / DVI / HDMI - The outgoing signal format can be selected from a drop-down menu;
- **Laser enable:**
  - **On**: high-speed (AV signal) and low-speed (serial, USB) communications are transmitted.
  - **Standby**: only low-speed (serial, USB) communication is transmitted.
- **Test pattern**: configuration settings of the test pattern. See more details in the Test Pattern section.
- Frame Detector;
- Reloading **factory default settings** for the selected port.

#optical #signaltype

5.4.5. Local Video Output

Click on the Local HDMI output port to display the port properties. You can find the most important information and settings in the panel. *#signaltype*



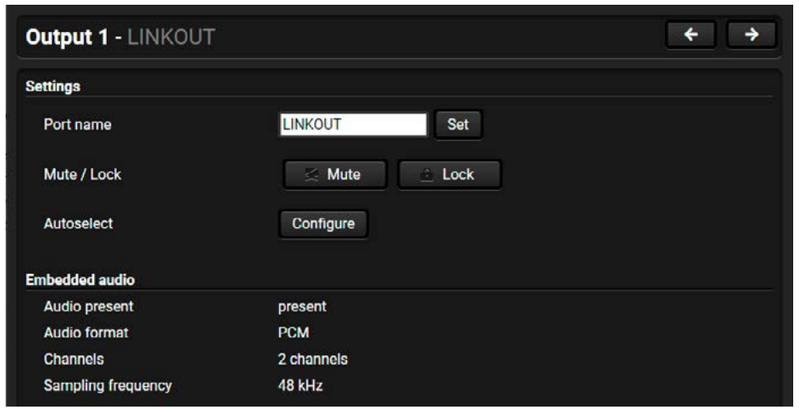
Port properties window of the optical video output

Available settings:

- **Mute/unmute** the port;
- **Lock/unlock** the port;
- **Signal type**: Auto / DVI / HDMI - The outgoing signal format can be selected from a drop-down menu;
- **Power 5V mode**: Auto / Always on / Always off - The setting lets the source and the sink devices be connected – independently from the transmitted signal;
- **Test pattern**: configuration settings of the test pattern. See more details in the Test Pattern section.
- Frame Detector;
- Reloading **factory default settings** for the selected port.

5.4.6. Digital Audio Output

Click on the output port to display its properties. You can find the most important information and settings in the panel.



Port properties window of the optical link audio output

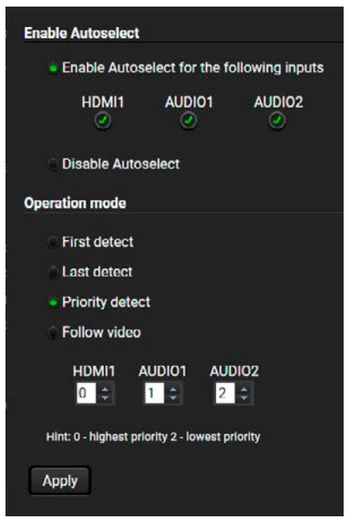
Available settings:

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

5.4.7. Autoselect Feature

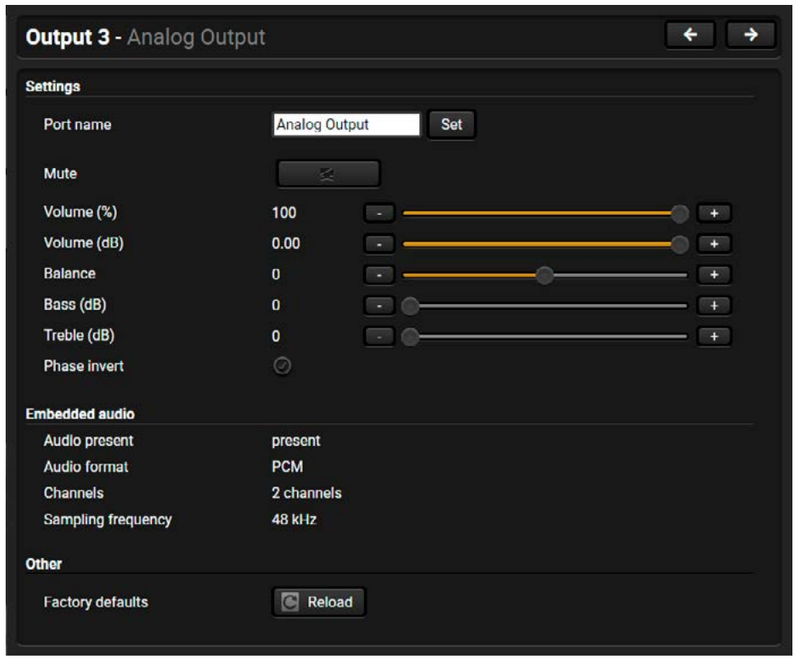
Clicking on the Autoselect Configure button on one of the output port properties windows opens the Autoselect feature configurator. Pay attention to the following settings for the proper operation of Autoselect function: *#autoselect*

- Set the Autoselect settings to be enabled for the desired input ports;
- Set the desired Operation mode (see more details about it in The Autoselect Feature section);
- Set the priority number in the case of Priority detect operation mode.
- Always click on the Apply button after the changes to launch the new settings.



5.4.8. Analog Audio Output (RX)

DIFFERENCE: Only HDMI-3D-OPT-RX110DD model is built with an analog audio output port.



Port properties window of the analog audio output of the receiver

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

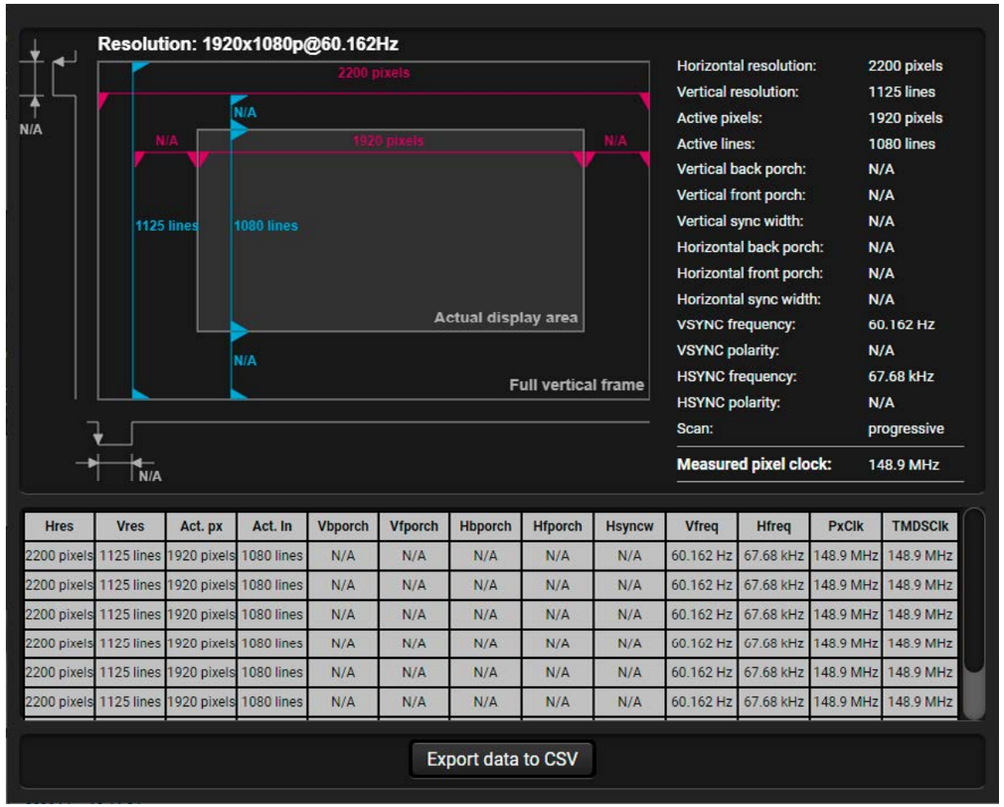
- **Mute/unmute** the port;
- **Volume**: from 0 dB to -63.00 dB, in step 1.00 dB (default is 0 dB);
- **Balance**: from 0 to 100, in step 1 (default is 50 = center);
- **Bass**: from 0 dB to 24.00 dB, in step 2.00 dB (default is 0 dB);
- **Treble**: from 0 dB to 6.00 dB, in step 2.00 dB (default is 0 dB);
- **Phase invert** switcher;
- Reloading **factory default settings** for the selected port.

#audio #analogaudio #volume #balance

5.5. Diagnostic Tools

5.5.1. 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*



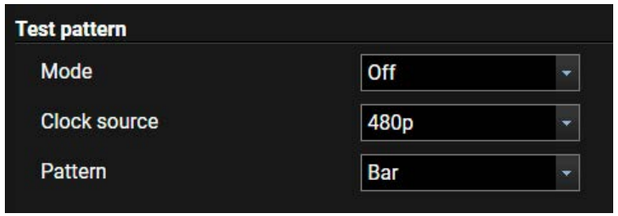
Hres	Vres	Act. px	Act. ln	Vbporch	Vfporch	Hbporch	Hfporch	Hsyncw	Vfreq	Hfreq	PxClk	TMDSClk
2200 pixels	1125 lines	1920 pixels	1080 lines	N/A	N/A	N/A	N/A	N/A	60.162 Hz	67.68 kHz	148.9 MHz	148.9 MHz
2200 pixels	1125 lines	1920 pixels	1080 lines	N/A	N/A	N/A	N/A	N/A	60.162 Hz	67.68 kHz	148.9 MHz	148.9 MHz
2200 pixels	1125 lines	1920 pixels	1080 lines	N/A	N/A	N/A	N/A	N/A	60.162 Hz	67.68 kHz	148.9 MHz	148.9 MHz
2200 pixels	1125 lines	1920 pixels	1080 lines	N/A	N/A	N/A	N/A	N/A	60.162 Hz	67.68 kHz	148.9 MHz	148.9 MHz
2200 pixels	1125 lines	1920 pixels	1080 lines	N/A	N/A	N/A	N/A	N/A	60.162 Hz	67.68 kHz	148.9 MHz	148.9 MHz
2200 pixels	1125 lines	1920 pixels	1080 lines	N/A	N/A	N/A	N/A	N/A	60.162 Hz	67.68 kHz	148.9 MHz	148.9 MHz

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.

5.5.2. Test Pattern



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

The test pattern feature generates an image that can be displayed when there is no incoming signal on the port. The following settings can be set:

Mode

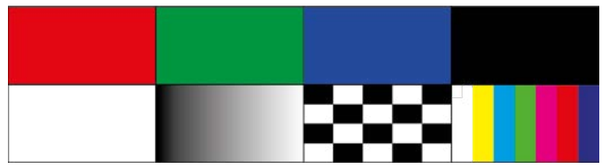
- **On**: the video output port always transmits the test pattern.
- **No signal**: the video output port transmits the test pattern if there is no incoming signal on the selected input port.
- **Off**: the test pattern function is disabled, the video output port transmits the video signal of the selected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

Clock Source

- 480p
- 576p
- Original video signal

Pattern

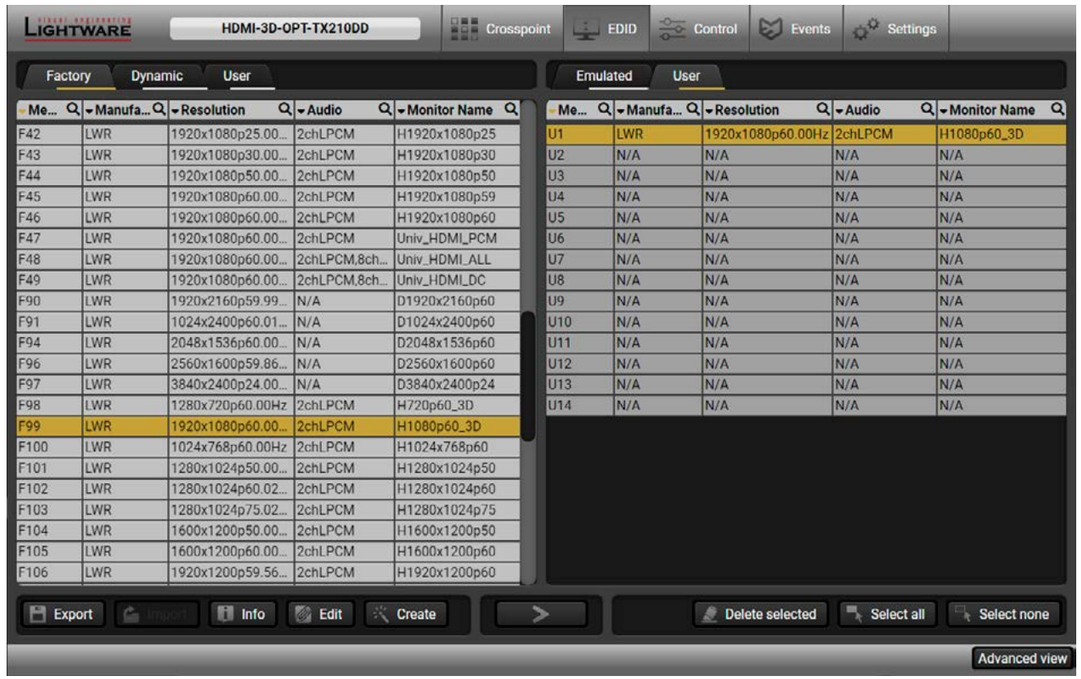
- Red
- Green
- Blue
- Black
- White
- Ramp
- Chess
- Bar
- Cycle



#testpattern

5.6. EDID Menu

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



EDID menu

Control Buttons

Export	Exporting an EDID (save to a file)	>	Transfer button: executing EDID emulation or copying
Import	Importing an EDID (load from a file)	Delete selected	Deleting EDID (from User memory)
Info	Display EDID Summary window	Select all	Selecting all memory places in the right panel
Edit	Opening Advanced EDID Editor with the selected EDID	Select none	Selecting none of the memory places in the right panel
Create	Opening Easy EDID Creator		

5.6.1. 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 background.

Step 4. Press the **Transfer** button to change the emulated EDID.

Learning an EDID

The process is the same as when changing the emulated EDID; the only difference is the Destination panel: press the **User** button. This way 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! ATTENTION!** This function works 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! 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:

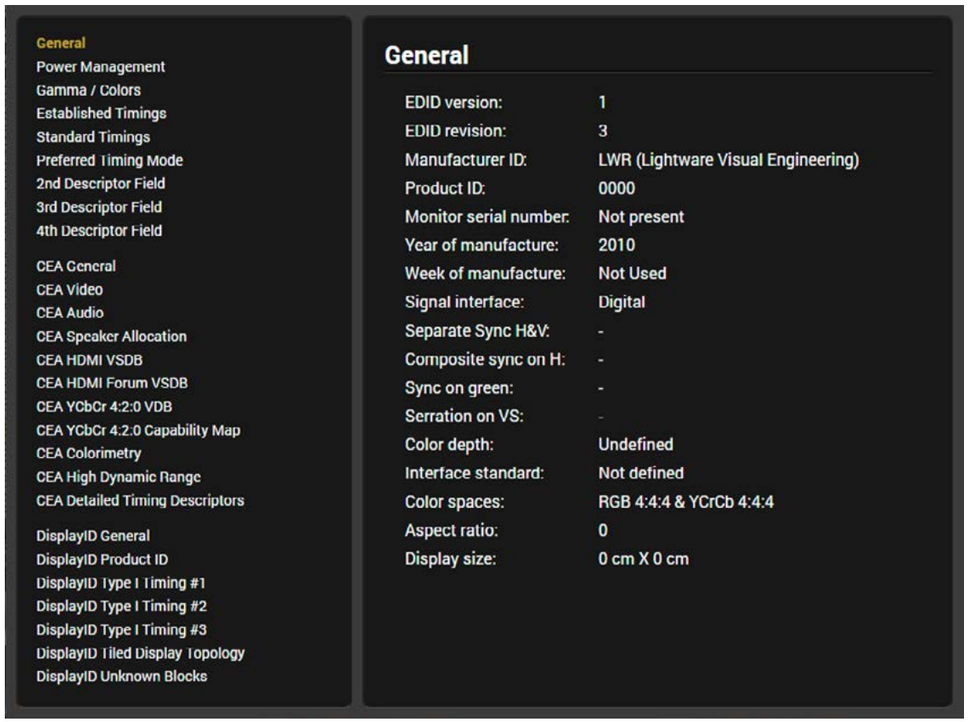
Step 1. Press **User** button on the top of the Destination panel.

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).

5.6.2. EDID Summary Window

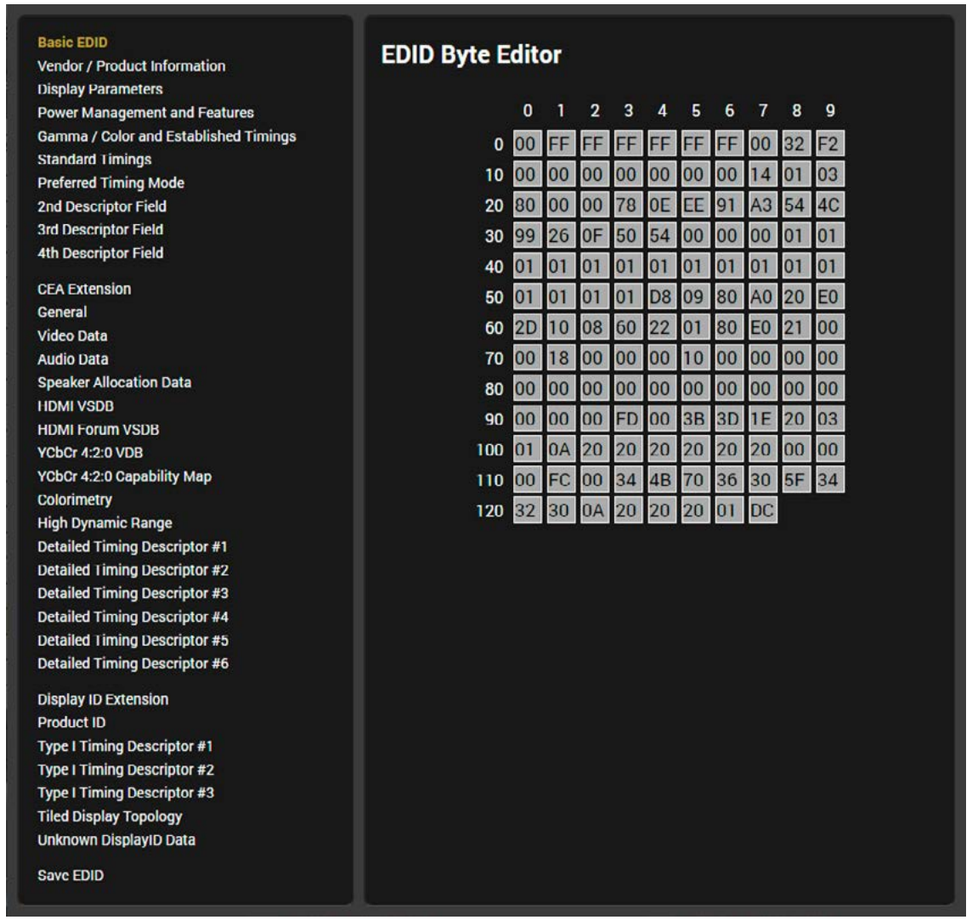
Select an EDID from the Source panel and press the **Info** button to display the EDID summary.



EDID summary window

5.6.3. Editing an EDID

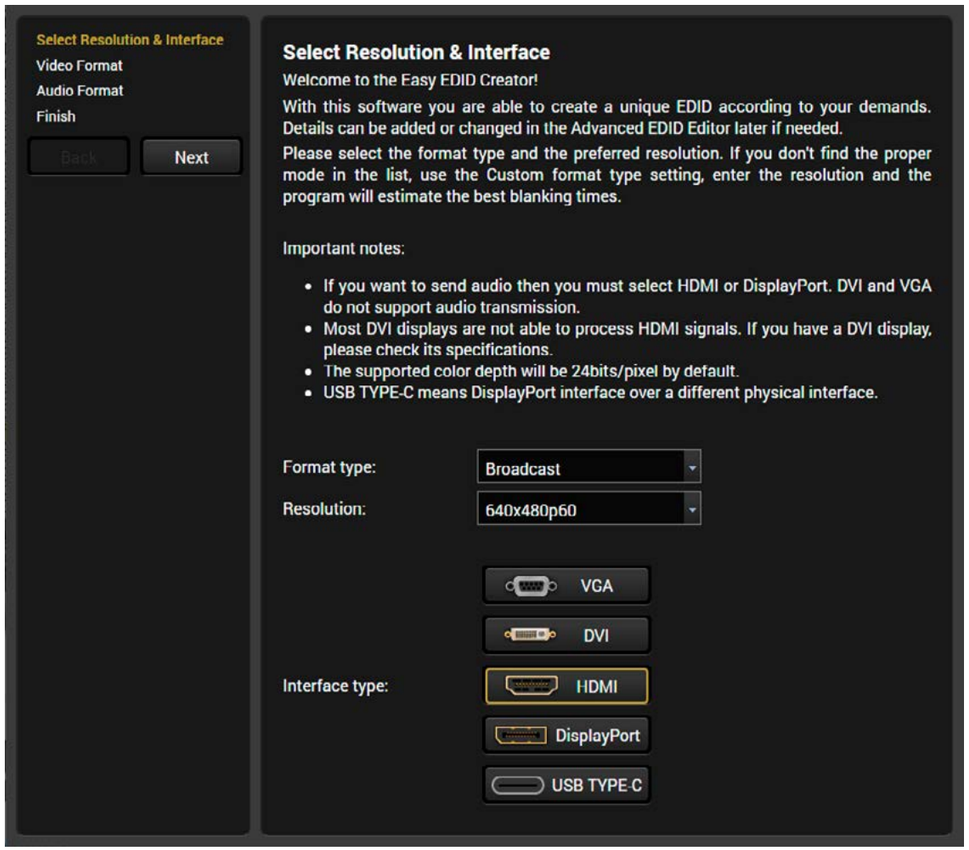
Select an EDID from the Source panel and press the Edit button to display the Advanced EDID Editor window. The editor can read and write all descriptors, which are defined in the standards, including the additional CEA extensions. Any EDID from the device's memory or a saved EDID file can be loaded into 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) and download EDID Editor Application Notes.



EDID Editor window

5.6.4. Creating an EDID - Easy EDID Creator

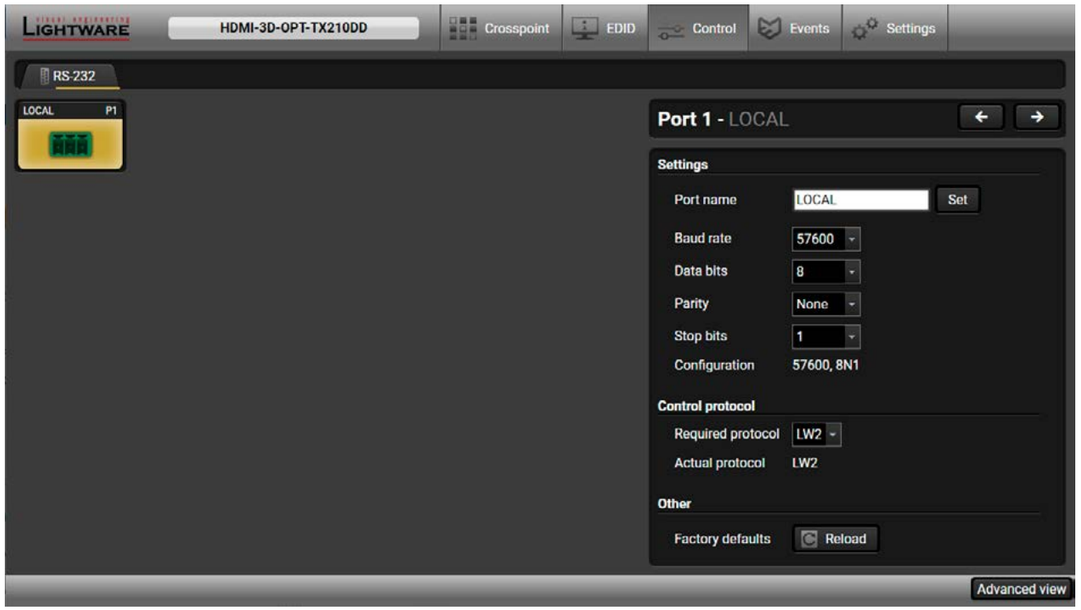
Since the above mentioned Advanced EDID Editor needs more complex knowledge about EDID, Lightware introduced a wizard-like interface for fast and easy EDID creation. With Easy EDID Creator, it is possible to create custom EDIDs in four simple steps. By clicking on the **Create** button below Source panel,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



EDID Creator window

5.7. Control Menu

RS-232



RS-232 tab in Control menu

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

- **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;
- **Control protocol**: LW2 or LW3;
- Reloading the Factory Default Settings.

#rs232 #rs-232 #serial

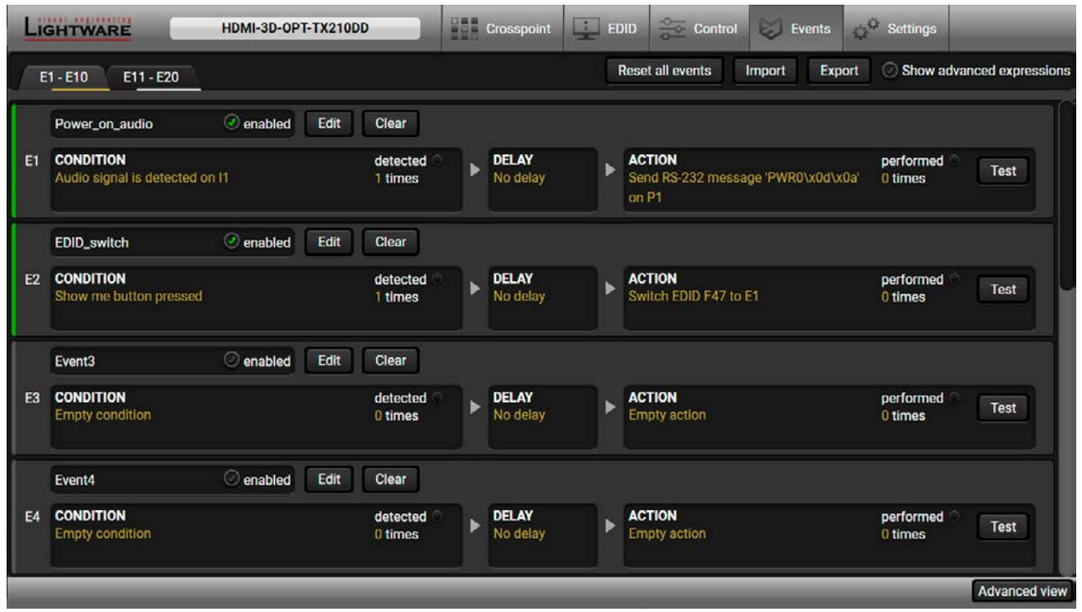
5.8. Event Manager

The feature means that the device can sense changes on its ports, and is 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 being present or button is pressed) are necessary for 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) 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 audio signal has been detected on the I1 port, the port has to be switched to the O1. The settings can be done via the LDC in the Events menu, or by LW3 protocol commands. The number of the configurable events depends on the device what you are currently using.

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 have been 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**.

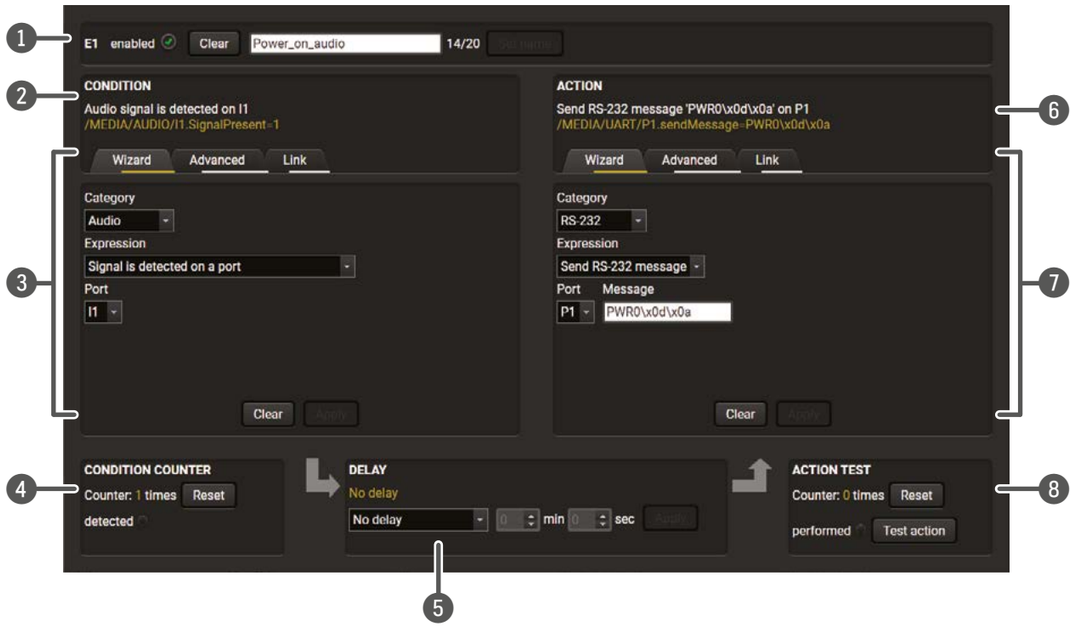


Control menu, Event Manager tab

#eventmanager

5.8.1. The Event Editor

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

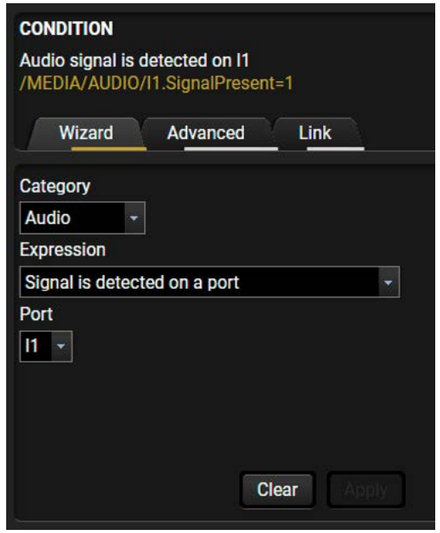


1	**Event header**	The name of the Event is displayed. Type the desired name and press the Set name button. The Event can be cleared by the Clear button. Use the tick mark to enable/disable the Event.
2	**Condition header**	If the condition is set, the description (white colored text) and the exact LW3 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 tools are available to set the condition. The parameters and settings are displayed below the buttons.
4	**Condition counter**	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 tools are 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.

5.8.2. 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.

INFO: This mode is also available for setting the **Action**.

Advanced Mode

The goal of this mode is the same as that 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.

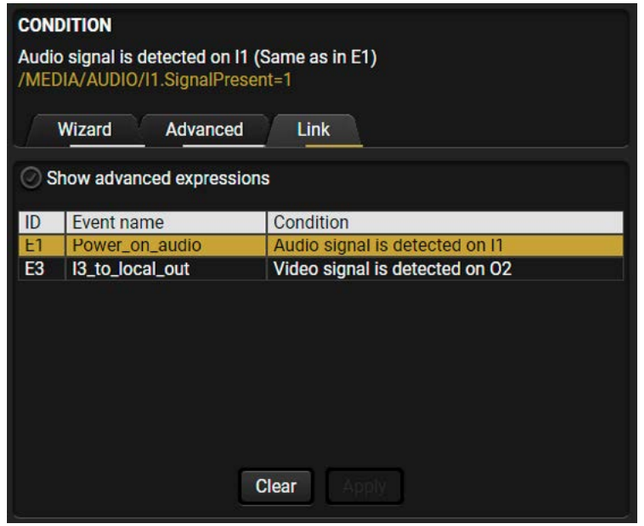
Step 3. Select the desired **Property** from the menu. The **manual** of the property is displayed below to help select the necessary property and to set the value.

Step 4. Set the desired **value** and **operator**, then press the **Apply** button to store settings.

INFO: This mode is also available for setting the **Action**.

The Link Tool

The new interface allows creating more actions for the same condition. In this 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 shows 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.

INFO: This mode is also available for setting the **Action**.

5.8.3. Special Tools and Accessories

The Name of the Event

The name of a port can be changed by typing the new name and clicking on 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

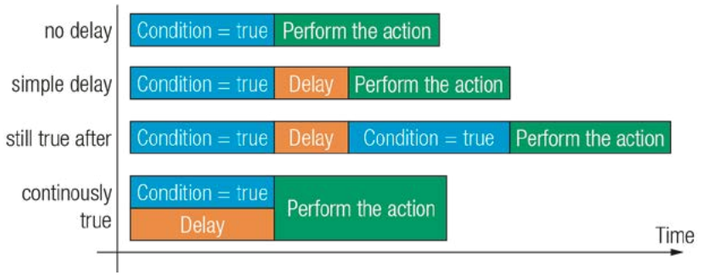
When the desired Condition is arranged, the setting can be tested. The Event list and the Event editor contains a small panel that shows whether the set condition is detected; the **Counter** can be reset by the button in Event editor. If the Condition is true, the **detected** mark turns green for two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

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 the settings below:



- **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, but just the expression is displayed. The option is available in the Event list window, or when Link tool is used.

5.8.4. 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.

5.8.5. Export and Import Events

The feature allows saving all the Events. The backup file can be uploaded to another HDMI-3D-OPT-TX210DD transmitter.

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.

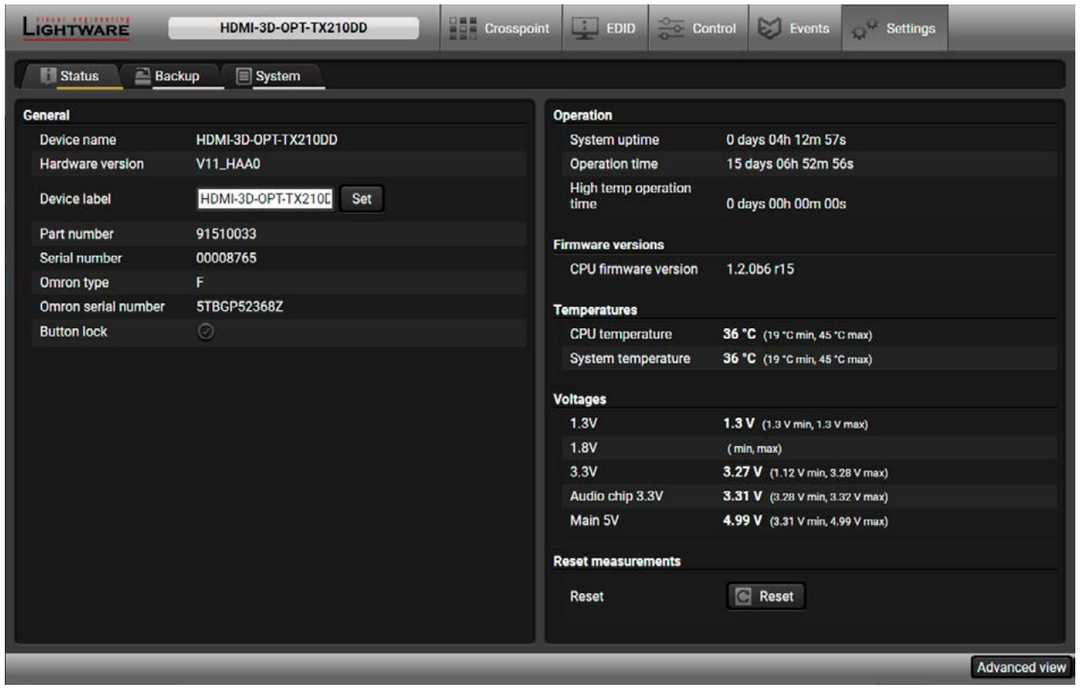
Import all the Events

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.

5.9. Settings Menu

5.9.1. Status



Status tab in Settings menu

The most important hardware and software related informations 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 #lockbutton #button #controllock #label #devicelabel #producttype #serialnumber*

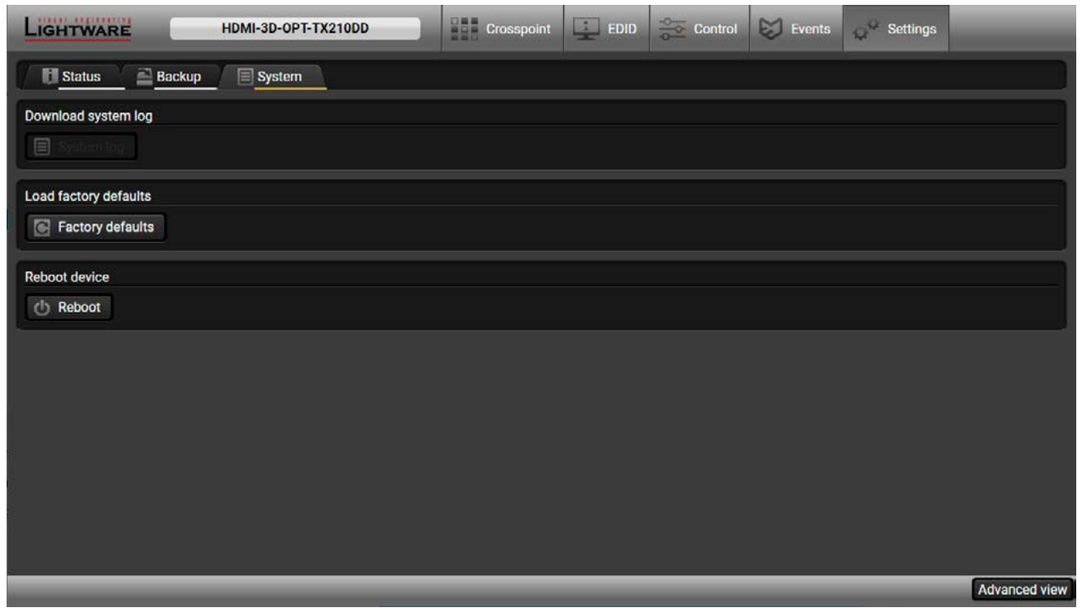
Button Lock

The operation of the front panel buttons can be locked. The setting can be disabled only by the LCD software or by an LW3 protocol command (see the details in the Lock the Front Panel Buttons section).

5.9.2. Backup

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

5.9.3. System



System tab in Settings menu

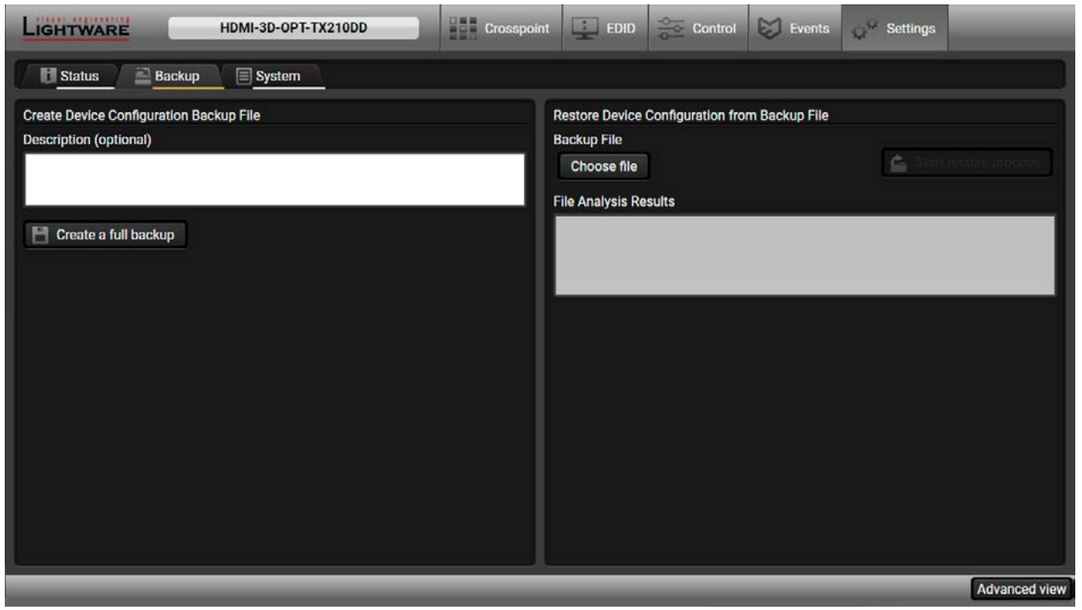
Three functions are available under System tab:

- **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 #reset

5.10. Configuration Cloning (Backup Tab)

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*



Backup tab in the Settings menu

5.10.1. 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).
Step 4. Connect to the other device that 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.

5.10.2. 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 that 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 section.

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

5.10.3. Upload the Settings to a Device (Restore)

WARNING! Please note that the settings will be permanently overwritten with the restored parameters in the device. Withdrawal is not possible.

ATTENTION! The cloning can be successful if 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.

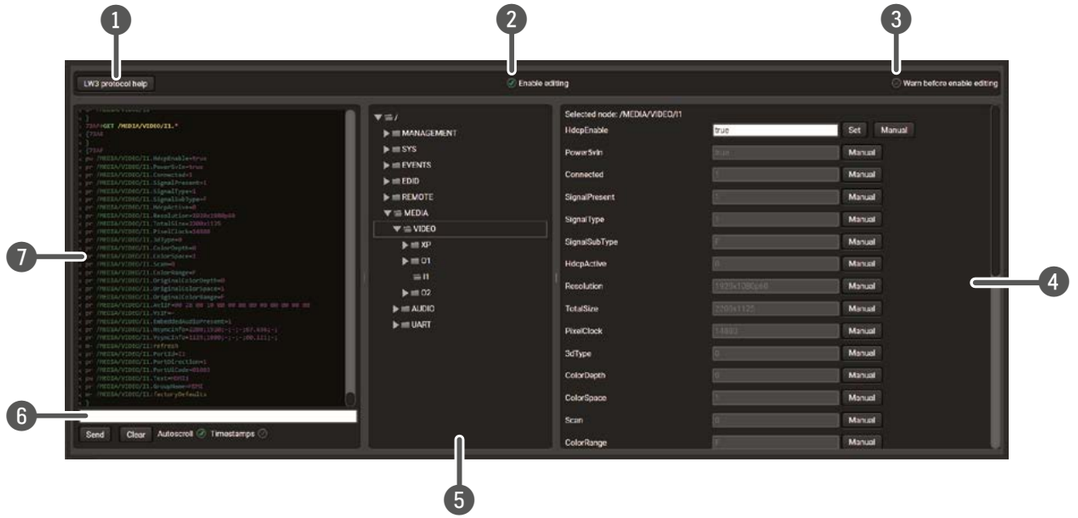
Step 2. Click on the **Choose file** button on the right panel and **browse** the desired file.

Step 3. The file is checked and the result will be displayed in the textbox below. If the file is correct, the settings can be restored.

Step 4. Press the **Start restore process** button and click on the **Yes** button when asked.

Step 5. Reboot the device to apply the network settings after finishing.

5.11. Advanced View (Terminal Window)



1	**LW3 protocol help**	Pushing the button results a help window opening which describes the most important informations 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 is checked, a warning window pops up when you enable Edit mode.
4	**Node list**	Correspondent parameters and nodes are shown which are connected to the selected item in the protocol tree. The commands typed in these fields are escaped automatically **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.
5	**Protocol tree**	LW3 protocol tree; select an item to see its content.
6	**Command line**	The commands typed in this line are not escaped automatically. See more information in the Escaping section.
7	**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.

6

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.

6.1. 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

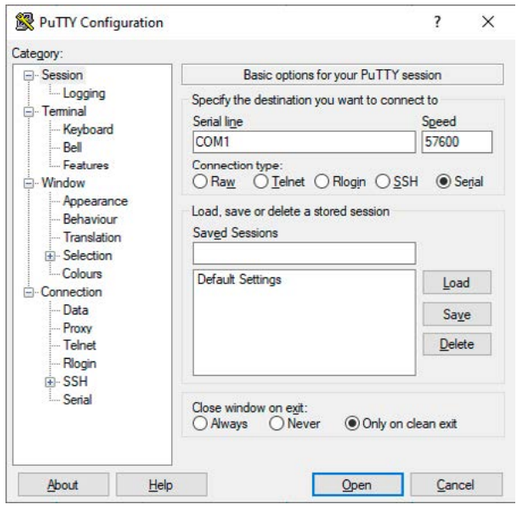
Format	Explanation
<in>	Input number in 1 or 2 digit ASCII format (01, 5, 07, 16, etc.)
<out>	Output number in 1 or 2 digit ASCII format
<in/out>	input or output port number in 1 or 2 digit ASCII format *
<in2>	Input number in 2 digit ASCII format (01, 02, 10, 12 etc.)
<out2>	Output number in 2 digit 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.

6.2. 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 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 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 Protocol Setting section).

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

6.3. General LW2 Commands

6.3.1. 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.

6.3.2. View Product Type

The device responds with its name.

Command and Response *#producttype*

→ {i}
← (I:<PRODUCT_TYPE>)CrLf

Example

→ {i}
← (I:HDMI-3D-OPT-TX210DD)

6.3.3. 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)

6.3.4. 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.

6.3.5. 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.

6.3.6. Compile Time

Returns the date of when the CPU firmware was compiled.

Command and Response

→ {CT}
← (Complied: <DATE&TIME>)CrLf

Example

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

6.3.7. 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.

6.3.8. 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).

6.3.9. 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.

6.3.10. 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)

6.3.11. Restart the Device

The device can be restarted without unplugging power.

Command and Response *#reboot #restart #reset*

→ {RST}
←

Example

→ {rst}
←

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

6.3.12. 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.

6.4. AV Port Settings

6.4.1. Mute Output

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

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

→ {#<out>•<layer>}

← (1MT<out2>•<layer>)CrLf

Parameters

Parameter	Parameter description	Value	Parameter value
<layer>	Signal type of the layer	**A**	audio layer
		V	video layer
		AV	audio & video layer
<out>	Output port	**O1**	HDMI out
<in>	Input port	**I1**	HDMI in

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

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.

6.4.2. Unmute 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.

6.4.3. Lock Output

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

Command and Response

→ {#><out>•<layer>}

← (1LO<out²>•<layer>)CrLf

Example

→ {#>01 A}

← (1LO01 A)

6.4.4. Unlock Output

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

Command and Response

→ {+<out>•<layer>}

← (0LO<out2>•<layer>)CrLf

Example

→ {+<01 V}

← (0LO01 V)

O1 video output port is unlocked.

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

6.4.5. View 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>•<O01>•<O02>)CrLf

Parameters

O01 shows the corresponding output's connection state.

Parameter	Parameter description	Value	Parameter value
<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 V}
← (ALLV 01)
← (ALLA 01 02)

I1 video input port is connected to the O1 (optical out) and O2 (local HDMI out) video output ports.

6.4.6. View Crosspoint Size

Shows the physical crosspoint size.

Command and Response

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

Parameters

Parameter	Parameter description	Value	Parameter value
<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=1x2 V)
← (SIZE=3x2 A)

The device has a video crosspoint (1 input and 2 outputs) and an audio crosspoint (3 inputs and 2 outputs).

6.4.7. Change the Audio Autoselect Mode

The autoselect mode of the audio output can be changed.

Command and Response *#autoselect*

→ {AS_A<out>=<state>;<mode>}
← (AS_A<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

Example

→ {as_a1=E;P}
← (AS_A1=E;P)

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

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

6.4.8. Change 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

Parameter	Parameter description	Value	Value description
<in1_prio> <in2_prio> <inn_prio>	Priority number of the input ports	**0-2, 31**	**0:** highest priority **2:** lowest priority **31**: skip the port from the priority list

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 for all the ports during the change, 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.

6.5. RS-232 Settings

6.5.1. RS-232 Parameters Settings

Command and Response *#serial #rs232 #rs-232*

→ {RS232_LOCAL_FORMAT=<BaudRate>;<DataBit>;<Parity>;<StopBit>}

← (RS232_LOCAL_FORMAT=<BaudRate>;<DataBit>;<Parity>;<StopBit>)CrLf

Parameters

Parameter	Parameter description	Value	Parameter value
<BaudRate>	Baud rate	**X**	No change
		4800	4800
		7200	7200
		9600	9600
		14400	14400
		19200	19200
		38400	38400
		57600	57600
		115200	115200
<DataBit>	Data bit	**X**	No change
		8	8
		9	9
<Parity>	Parity	**X**	No change
		N	None
		E	Even
		O	Odd
<StopBit>	Stop Bit	**X**	No change
		1	1
		1,5	1,5
		2	2

Example

→ {rs232_local_format=9600;8;O;X}

← (RS232_LOCAL_FORMAT=9600;8;O;X)

Explanation

RS -232 port is set as the following: the baud rate to 9600, data bit to 8, parity to odd, and stop bit is not changed, it remained 1.

INFO: The actual RS-232 parameters can be queried by the {RS232_LOCAL_FORMAT=?} command.

6.5.2. RS-232 Control Protocol Port Setting

The control protocol of local RS -232 port can be set as follows.

Command and Response *#protocol*

→ {RS232_LOCAL_PROT=<protocol>}

← (RS232_LOCAL_PROT=<protocol>)CrLf

Parameters

Parameter	Parameter description	Value	Parameter value
<protocol>	RS-232 control protocol	**LW2**	LW2 control protocol
		LW3	LW3 control protocol

Example

→ {rs232_local_prot=lw2}

← (RS232_LOCAL_PROT=LW2)

INFO: The actual RS-232 parameters can be queried by the {RS232_LOCAL_PROT=?} command.

6.6. 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

Mute Output
→ {#<out>•<layer>}

Unmute Output
→ {+<out>•<layer>}

Lock Output
→ {#><out>•<layer>}

Unlock Output
→ {+<<out>•<layer>}

View Connection State on the Output
→ {VC•<layer>}

View Crosspoint Size
→ {getsize•<layer>}

Change the Audio Autoselect Mode
→ {AS_A<out>=<state>;<mode>}

Change the Audio Input Priorities
→ {PRIO_A<out>=<in1_prio>;<in2_prio>;...;<inn_prio>}

RS-232 Settings

RS-232 Parameters Settings
→ {RS232_LOCAL_FORMAT=<BaudRate>;<DataBit>;<Parity>;<StopBit>}

RS-232 Control Protocol Port Setting
→ {RS232_LOCAL_PROT=<protocol>}

7

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.

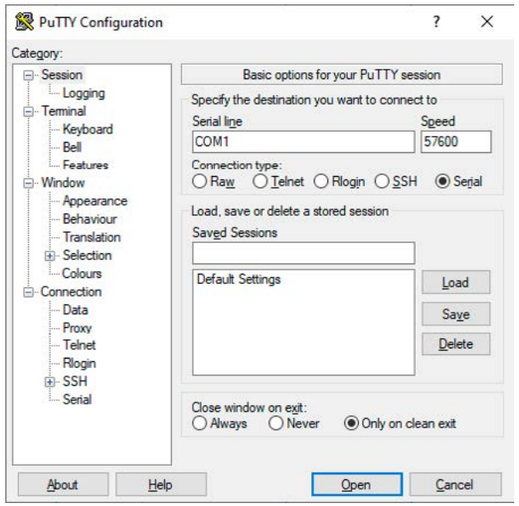
7.1. Overview

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.

7.2. 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**).

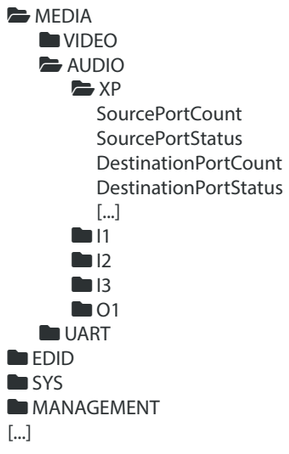
Step 4. Select the **Serial** connection type, and open the connection.

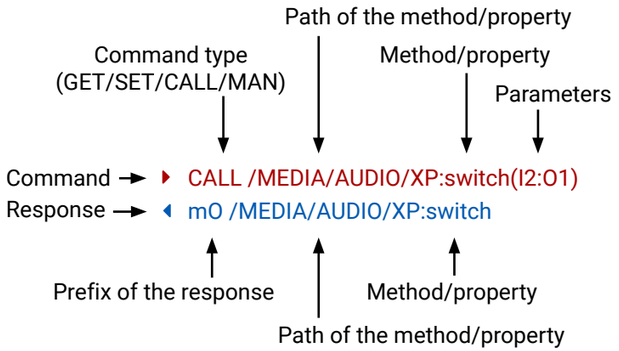
ATTENTION! Make sure that the control protocol is set to LW3 on the serial port. The protocol setting can be checked in LDC (see the details in the RS-232 section) and via LW2 protocol command (see the details in the RS-232 Control Protocol Port Setting section).

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

7.3. Protocol Rules

7.3.1. LW3 Tree Structure and Command Structure (examples)





7.3.2. 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.

7.3.3. 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. **I1;I3** or **F27:E1;F47:E2**
▸	Sent command
◂	Received response
·	Space character

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

7.3.4. 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
- pr /MEDIA/UART.PortCount=1
- pr /MEDIA/UART.PortUi=P1:12209
- pr /MEDIA/UART.P1=RS-232

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.ColorSpaceMode=0
- pw /MEDIA/VIDEO/I1.ColorSpaceMode=0

CALL command

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

- CALL /MEDIA/VIDEO/XP:unlock(I1)
- mO /MEDIA/VIDEO/XP:unlock

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.Pwr5vMode
- pm /MEDIA/VIDEO/O1.Pwr5vMode ["0" | "1" | "2"] 0 - Auto, 1 - Always On, 2 - Always Off

7.3.5. 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
n-	a node
nE	an error for a node
nm	a manual for a node
pr	a read-only property
pw	read-write property
pE	an error for the property

Prefix	Description
pm	a manual for the property
m-	a method
mO	a response after a successful method execution
mF	a response after a failed method execution
mE	an error for a method
mm	a manual for a method

7.3.6. 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:O1)
- mE /MEDIA/VIDEO/XP:switch %E004:Invalid value

7.3.7. 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\(01\))**

7.3.8. 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=F89:E1;D1:E2;D1:E3;D1:E4;F89:E5
- 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.

7.3.9. 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/*

7.3.10. 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/O3 o- /MEDIA/AUDIO/O3 GET /MEDIA/AUDIO/O3.VolumePercent pw /MEDIA/AUDIO/O3.VolumePercent=100.00	**connection #1**
GET /MEDIA/AUDIO/O3.VolumePercent pw /MEDIA/AUDIO/O3.VolumePercent=100.00 SET /MEDIA/AUDIO/O3.VolumePercent=50.00 pw /MEDIA/AUDIO/O3.VolumePercent=50.00	**connection #2**
CHG /MEDIA/AUDIO/O3.VolumePercent=50.00	**connection #1**

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.

7.4. System Commands

7.4.1. 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=HDMI-3D-OPT-TX210DD

7.4.2. 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=TX210DD_Control_room
- pw /MANAGEMENT/UID.DeviceLabel=TX210DD_Control_room

7.4.3. Query the Serial Number

Command and Response *#serialnumber*

- GET·/.SerialNumber
- pr·/.SerialNumber=<serial_nr>

Example

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

7.4.4. 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

7.4.5. Restarting the Device

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

Command and Response *#reboot #reset #restart*

- CALL·/SYS:reset()
- mO·/SYS:reset=

Example

- CALL /SYS:reset()
- mO /SYS:reset=

7.4.6. Restore the Factory Default Settings

Command and Response *#factory*

- CALL·/SYS:factoryDefaults()
- mO·/SYS:factoryDefaults=

Example

- CALL /SYS:factoryDefaults()
- mO /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.

7.4.7. 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	1	**None** - All functions of the front panel buttons are enabled.
		2	**Locked** - The front panel buttons are locked and they can be unlocked by pressing the **Audio select** and the **Show me** buttons, or with an LW3 protocol command.
		3	**Force locked** - 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

7.5. Video Port Settings

INFO: Video port numbering can be found in the Port Numbering section. *#status #portstatus*

7.5.1. 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>

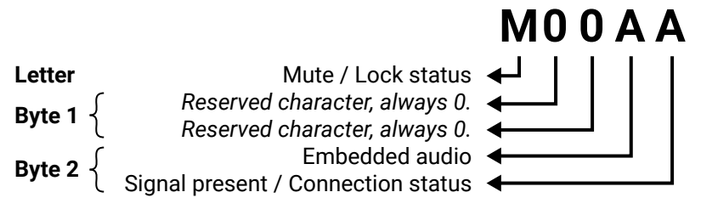
The response contains 5 ASCII characters for each port. The first character indicates the mute/lock state, the next four characters represent a 2-byte HEX code showing the current state of the input ports.

Example

- GET /MEDIA/VIDEO/XP.SourcePortStatus
- pr /MEDIA/VIDEO/XP.SourcePortStatus=T00AF

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
0 0	Reserved	Reserved	Reserved	Reserved	Unknown			
0 1					Reserved			
1 0					No embedded audio	Reserved	No signal	Not connected
1 1					Embedded audio presents		Signal presents	Connected

The Most Common Received Port Status Responses

	T	0		0		A		A	
T00AA	Unlocked, Unmuted	0 0	0 0	0 0	0 0	1 0	1 0	1 0	1 0
		Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	No signal	Not connected

	T	0		0		A		B	
T00AB	Unlocked, Unmuted	0 0	0 0	0 0	0 0	1 0	1 0	1 0	1 1
		Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	No signal	Connected

	T	0		0		A		F	
T00AF	Unlocked, Unmuted	0 0	0 0	0 0	0 0	1 0	1 0	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	Signal presents	Connected

	T	0		0		E		F	
T00EF	Unlocked, Unmuted	0 0	0 0	0 0	0 0	1 1	1 0	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	Embedded audio presents	Not encrypted	Signal presents	Connected

7.5.2. 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, Muted	0 0	0 0	0 0	0 0	1 0	1 1	1 1	1 1
	Reserved	Reserved	Reserved	Reserved	No embedded audio	Encrypted	Signal presents	Connected

7.5.3. Query the Video Crosspoint Setting

Command and Response

- GET·/MEDIA/VIDEO/XP.DestinationConnectionList
- pr·/MEDIA/VIDEO/XP.DestinationConnectionList=<in>

Example

- GET /MEDIA/VIDEO/XP.DestinationConnectionList
- pr /MEDIA/VIDEO/XP.DestinationConnectionList=I1

7.5.4. 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

7.5.5. 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

7.5.6. 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

7.5.7. 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

7.5.8. 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

7.5.9. 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

7.5.10. 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

7.5.11. 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

7.5.12. 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*

- 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**	**Always off**: the test pattern is not displayed on the output.
		1	**Always on**: the test pattern is displayed on the output.
		2	**Auto**: the test pattern is displayed if there is no signal on the input port.

Example

- SET /MEDIA/VIDEO/O1.TpgMode=2
- pw /MEDIA/VIDEO/O1.TpgMode=2

7.5.13. Test Pattern Generator Clock Source

Command and Response

- SET·/MEDIA/VIDEO/<out>.TpgClockSource=<clock_frequency>
- pw·/MEDIA/VIDEO/<out>.TpgClockSource=<clock_frequency>

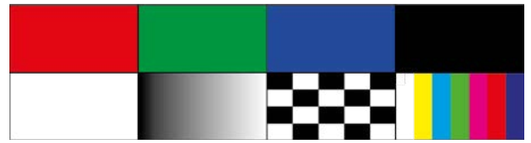
Parameters

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/O1.TpgClockSource=576
- pw /MEDIA/VIDEO/O1.TpgClockSource=576

7.5.14. 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/O1.TpgPattern=GREEN
- pw /MEDIA/VIDEO/O1.TpgPattern=GREEN

7.5.15. 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/O1.HdmiModeSetting=2
- pw /MEDIA/VIDEO/O1.HdmiModeSetting=2

7.6. Audio Port Settings

INFO: Audio port numbering can be found in the Port Numbering section.

7.6.1. 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>

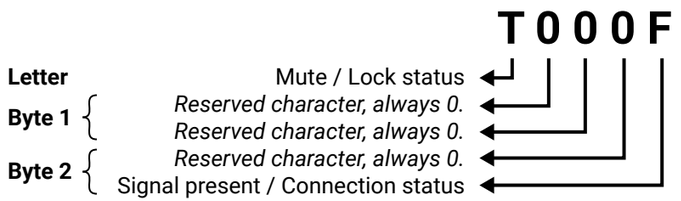
The response contains 5 ASCII characters for each port. The first character indicates the mute/lock state, the next four characters represent a 2-byte HEX code showing the current state of the input ports.

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
0 0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Unknown	
0 1							Reserved	
1 0							No signal	Not connected
1 1							Signal presents	Connected

Example and Explanation (for input 2, M000B):

M	**0**		**0**		**0**		**B**	
Unlocked, Muted	0 0	0 0	0 0	0 0	0 0	0 0	1 0	1 1
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	No signal	Connected

The Most Common Received Port Status Responses

T000A	**T**	**0**		**0**		**0**		**A**	
	Unlocked, Unmuted	0 0	0 0	0 0	0 0	0 0	0 0	1 0	1 0
		Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	No signal	Not connected

T000B	**T**	**0**		**0**		**0**		**B**	
	Unlocked, Unmuted	0 0	0 0	0 0	0 0	0 0	0 0	1 0	1 1
		Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	No signal	Connected

T000F	**T**	**0**		**0**		**0**		**F**	
	Unlocked, Unmuted	0 0	0 0	0 0	0 0	0 0	0 0	1 1	1 1
		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.

T000C	**T**	**0**		**0**		**0**		**C**	
	Unlocked, Unmuted	0 0	0 0	0 0	0 0	0 0	0 0	1 1	0 0
		Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Signal presents	Unknown

7.6.2. 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	0 0	0 0	0 0	0 0	0 0	0 0	1 1	1 1
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Signal presents	Connected

7.6.3. 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.

7.6.4. 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

7.6.5. 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 1st letter	**E**	Autoselect is enabled.
		D	Autoselect is disabled.
	Two-letter code of the Autoselect settings 2nd letter	**F**	**First detect**: the first active audio input is selected.
		P	**Priority detect**: always the highest priority active audio input will be selected.
		L	**Last detect**: always the last attached input is switched to the output automatically.
		S	**Static**: 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.

7.6.6. 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.

7.6.7. Query the Input Port Priority

Command and Response

- GET·/MEDIA/AUDIO/XP.PortPriorityList
- pr·/MEDIA/AUDIO/XP.PortPrioirtyList=<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.

7.6.8. Change the Input Port Priority

Command and Response *#audio*

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

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

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.

7.6.9. 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

7.6.10. 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

7.6.11. 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

7.6.12. 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

7.6.13. 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

7.6.14. 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

7.6.15. 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

7.6.16. 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

7.7. Analog Audio Port Settings

DIFFERENCE: Only the transmitter is built with analog audio input ports and only the receiver is built with analog audio output ports.

7.7.1. 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

7.7.2. 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

7.7.3. 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

7.7.4. 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

7.8. 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*

7.8.1. 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.

7.8.2. 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.

7.8.3. 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**.

7.8.4. 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

7.8.5. 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

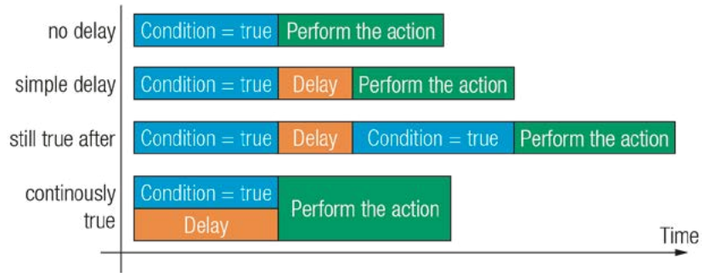
- SET /EVENTS/E2.Action=1
- pw /EVENTS/E2.Action=1

The Action of the E2 Event is set to be the same as set for E1 Event.

7.9. Event Manager Tool Kit

7.9.1. 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 **again** 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 **continuously** 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.

7.9.2. 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

7.9.3. 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

7.9.4. 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)
- mO·/EVENTS/E<loc>:triggerCondition

Example

- CALL /EVENTS/E1:triggerCondition(1)
- mO /EVENTS/E1:triggerCondition

The Condition of Event1 is fulfilled, the set Action will be launched (after the delay if set).

7.9.5. 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

7.9.6. 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

7.9.7. 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

7.10. RS-232 Port Configuration

7.10.1. Protocol Setting

Command and Response *#rs232 #rs-232 #serial*

- 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

7.10.2. BAUD Rate Setting

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

7.10.3. Databits Setting

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

7.10.4. Stopbits Setting

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

7.10.5. Parity Setting

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

7.11. 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

7.11.1. 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.

7.11.2. 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

7.11.3. 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

7.11.4. 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

7.11.5. 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

7.11.6. 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.

7.11.7. Deleting an EDID from User Memory

Command and Response

- CALL·/EDID:delete(<user>)
- mO·/EDID:delete

Example

- CALL /EDID:delete(U1)
- mO /EDID:delete

7.11.8. 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 a factory default one. See the table in the Factory EDID List section.

7.12. 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()

Restore 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

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>)

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)

RS-232 Port Configuration

Protocol Setting

- SET·/MEDIA/UART/<port>.ControlProtocol=<protocol>

BAUD Rate Setting

- SET·/MEDIA/UART/<port>.Baudrate=<baudrate>

Databits Setting

- SET·/MEDIA/UART/<port>.DataBits=<databits>

Stopbits Setting

- SET·/MEDIA/UART/<port>.StopBits=<stopbits>

Parity Setting

- SET·/MEDIA/UART/ <port>.Parity=<parity>

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 an 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()

8

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 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:

8.1. Use Case Studies

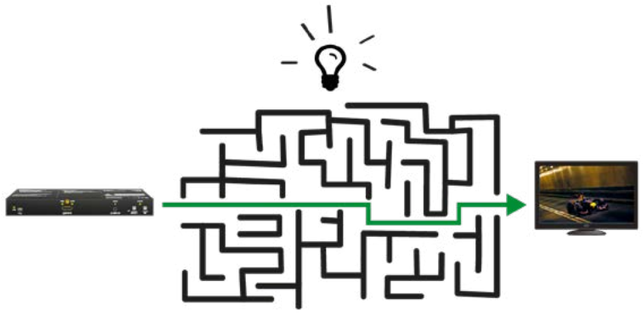
At first, check front panel LEDs and take the necessary steps according to their states. For more information about status, LEDs refer to the HDMI-3D-OPT-TX210DD (TX) and HDMI-3D-OPT-RX110DD (RX) sections.

Symptom	Root cause	Action	Refer to
Video signal			
No picture on the video output	Device or devices are not powered properly	Check the transmitter, the receiver and the other devices if they are properly powered; try to unplug and reconnect them.	3.2
	Cable connection problem	Cables must fit very well, check all the connectors (HDMI and optical cables).	3.2.2 3.2.3
	Optical cable became contaminated	Use special fiber optical cable cleaning equipment to clean it carefully.	
	No incoming signal (TX)	No video signal is present on the HDMI input port. Check the source device and the HDMI cable.	3.2.2
	No incoming signal (RX)	If the front panel LASER ACTIVE LED of the transmitter does not light, no connection is established between the TX and RX. Check the cable connections on the SC optical ports.	3.2.3
	HDMI input port is muted (TX)	Check the mute state of the input port (on TX side).	5.4.1 7.5.1
	HDMI output port is muted (RX)	Check the mute state of the output port (on RX side).	5.4 6.4.5 7.5.2
No picture on the video output	Sink device is not able to receive/display the video format	Check the emulated EDID; select another (e.g. emulate the EDID of the display on the input port).	5.6 7.11
Not the desired picture displayed on the video output	Video output is set to test pattern statically (RX)	Check Test pattern settings in the HDMI output properties (RX).	5.5.2 7.5.12
	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
Audio signal			
No audio is present on output	Source audio volume is low or muted	Check the audio settings of the source.	
	The incoming audio signal is unsupported	Query the status of the audio output port and select a supported signal source	5.4 7.6.1
	The analog audio output port is muted	Check the analog audio output port properties	5.4 7.6.2
	Volume of the analog audio port is set low	Check the analog audio input/output port properties	5.4.3 5.4.8 7.7
HDMI output signal contains no audio	DVI EDID is emulated	Check the EDID and select and HDMI EDID to emulate (the setting is available in the transmitter side).	5.6 7.11
	Signal type is set to DVI	Check the properties of the output port and set the signal type to HDMI or Auto.	5.4.4 7.5.15
Not the desired audio can be heard on the output	Audio stream is switched to another output	Check which audio stream is switched to the current output.	5.3 7.6.3
RS-232 signal			
Connected serial device does not respond	Cable connection problem	Check the connectors to fit well; check the wiring of the plugs.	3.2.7
	RS-232 settings are different	Check the port settings of the endpoint and the connected serial device.	5.7 6.5 7.10
Miscellaneous			
Front panel button is out of operation	The buttons are locked	Disable control lock.	5.9.1 7.4.7

8.2. 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 information above you can give us the better. Please send this information to the Lightware Support Team (support@lightware.com) to speed up the troubleshooting process.

9

Technologies

The following sections contain descriptions and useful technical information on 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 following:

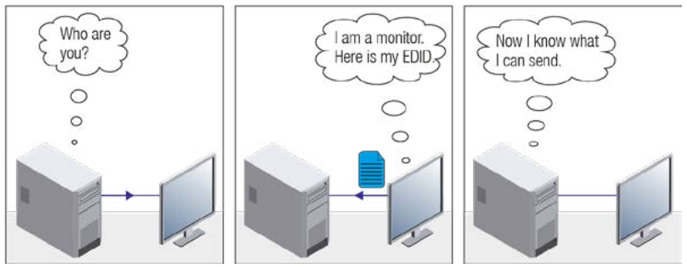
- EDID Management
- Pixel Accurate Reclocking

9.1. EDID Management

9.1.1. Understanding the EDID

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

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



EDID Communication

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

Common Problems Related to EDID

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

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

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

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

9.1.2. 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.

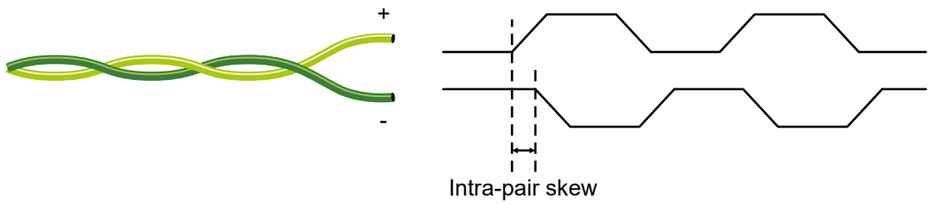
9.2. Pixel Accurate Reclocking

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:

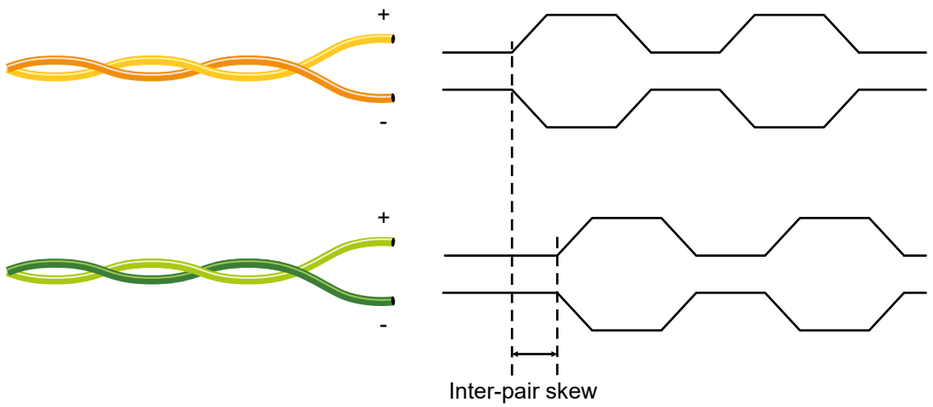
Intra-pair skew

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.



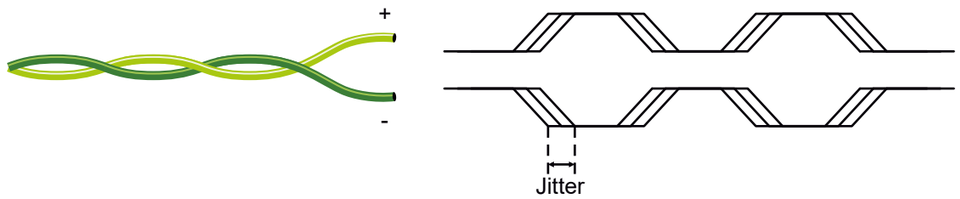
Inter-pair skew

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.



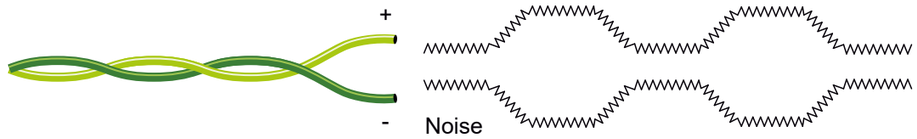
Jitter

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.

10

Appendix

Tables, drawings, guides, hashtag keyword list and technical details as follows:

10.1. Specification

INFO: Specificatios are subject to change without notice.

10.1.1. HDMI-3D-OPT-TX210DD

General

Compliance	CE, UKCA
EMC (emission)	EN 55032:2015+A1:2020
EMC (immunity)	EN 55035:2017+A11:2020
RoHS	EN 63000:2018
Electrical safety (device)	EN 62368-1:2020
Laser safety	EN 60825-1:2014+A11:2021
Warranty	3 years
Operating temperature	0 to +50˚C (+32 to +122˚F)
Operating humidity	10% to 90%, non-condensing
Cooling	Passive

Power

Power supply option	Power adaptor
Power consumption (maximum)	7.9W
Heat dissipation (maximum)	27 BTU/h

Power Adaptor

Supported power source	100-240 V AC; 50/60 Hz
Supplied power	5V DC, 1A
AC power plug	Interchangable (EU, UK, JP/US, AUS/NZ)
DC power plug	Locking DC connector (2.35 mm pin)

Enclosure

Enclosure material	1 mm steel
Dimensions in mm	221 W x 100.4 D x 26 H
Dimensions in inch	8.7 W x 3.95 D x 1 H
Weight	605 g (1.33 lbs)

Video Input

HDMI Input

Connector type	19-pole HDMI Type A receptacle
AV standard	DVI 1.0, HDMI 1.4
Color space	RGB, YCbCr
Supported resolutions at 8 bits/color *	up to 4096x2048@30Hz (4:4:4) or 4096x2048@60Hz (4:2:0) up to 3840x2160@30Hz (4:4:4) or 3840x2160@60Hz (4:2:0) 1920x1080@60Hz (4:4:4) up to 12 bits/color
Audio formats	8 channel PCM, Dolby TrueHD DTS-HD Master Audio 7.1

Video Output

HDMI Output

Connector type	19-pole HDMI Type A receptacle
AV standard	DVI 1.0, HDMI 1.4
Color space	RGB, YCbCr
Supported resolutions at 8 bits/color *	up to 4096x2048@30Hz (4:4:4) or 4096x2048@60Hz (4:2:0) up to 3840x2160@30Hz (4:4:4) or 3840x2160@60Hz (4:2:0) 1920x1080@60Hz (4:4:4) up to 12 bits/color
Audio formats	8 channel PCM, Dolby TrueHD DTS-HD Master Audio 7.1

* All standard VESA and CEA resolutions up to 300MHz (HDMI1.4) and other custom resolutions up to 300Mhz are supported.

Fiber Optical Port

Connector type	SC simplex
Fiber type	50/125 SC Multimode fiber (preferred), 62.5/125 SC Multimode fiber
Laser forward wavelengths	778; 800; 825; 850 nm
Laser class specification	Class 3R
Transmitter output OMA *	-6.25 dBm (worst case)
Receiver OMA * sensitivity	-14.25 dBm (worst case)
Optical loss budget	8 dBm (worst case)

* OMA: Optical Modulation Amplitude

Audio Ports

Analog Audio Input 1

Connector type	3.5 mm TRS (1/8" jack)
Audio formats	2-ch PCM
Sampling frequency	48 kHz
Maximum input level	+0 dBu, 0.77 Vrms, 2.19 Vpp
Signal transmission	Unbalanced signal
Volume	-95.62 dB - 0 dB
Balance	0 - 100 (50 = center)
Gain	0 dB - 6 dB

Analog Audio Input 2

Connector type	5-pole Phoenix connector
Audio formats	2-ch PCM
Sampling frequency	48 kHz
Maximum input level	+0 dBu, 0.77 Vrms, 2.19 Vpp
Signal transmission	Balanced / unbalanced signal
Volume	-95.62 dB - 0 dB
Balance	0 - 100 (50 = center)
Gain	-12 dB - +6 dB

Control Ports

RS-232 Serial Port

Connector type	3-pole Phoenix connector
Baud rates	Between 4800 and 115200 BAUD
Data bits	8 or 9
Parity	None / Odd / Even
Stop bits	1 / 1.5 / 2

USB Port

Connector type	USB mini-B type
USB compliance	USB 2.0

10.1.2. HDMI-3D-OPT-RX110DD

General

Compliance	CE, UKCA
EMC (emission)	EN 55032:2015+A1:2020
EMC (immunity)	EN 55035:2017+A11:2020
RoHS	EN 63000:2018
Electrical safety (device)	EN 62368-1:2020
Laser safety	EN 60825-1:2014+A11:2021
Warranty	3 years
Operating temperature	0 to +50˚C (+32 to +122˚F)
Operating humidity	10% to 90%, non-condensing
Cooling	Passive

Power

Power supply option	Power adaptor
Power consumption (maximum)	6.5 W
Heat dissipation (maximum)	22.2 BTU/h

Power Adaptor

Supported power source	100-240 V AC; 50/60 Hz
Supplied power	5V DC, 1A
AC power plug	Interchangable (EU, UK, JP/US, AUS/NZ)
DC power plug	Locking DC connector (2.35 mm pin)
Electrical safety	EN 62368-1:2014, Class II

Enclosure

Enclosure material	1 mm steel
Dimensions in mm	100.4 W x 131.9 D x 26 H
Dimensions in inch	3.95 W x 5.19 D x 1 H
Weight	430 g (0.95 lbs)

Video Output

HDMI Output

Connector type	19-pole HDMI Type A receptacle
AV standard	DVI 1.0, HDMI 1.4
Color space	RGB, YCbCr
Supported resolutions at 8 bits/color *	up to 4096x2048@30Hz (4:4:4) or 4096x2048@60Hz (4:2:0)
	up to 3840x2160@30Hz (4:4:4) or 3840x2160@60Hz (4:2:0)
	1920x1080@60Hz (4:4:4) up to 12 bits/color
Audio formats	8 channel PCM, Dolby TrueHD
	DTS-HD Master Audio 7.1

* All standard VESA and CEA resolutions up to 300MHz (HDMI1.4) and other custom resolutions up to 300Mhz are supported.

Fiber Optical Port

Connector type	SC simplex
Fiber type	50/125 SC Multimode fiber (preferred), 62.5/125 SC Multimode fiber
Laser wavelengths (receives only)	778; 800; 825; 850 nm
Transmitter output OMA **	-6.25 dBm (worst case)
Receiver OMA * sensitivity	-14.25 dBm (worst case)
Optical loss budget	8 dBm (worst case)

** OMA: Optical Modulation Amplitude

Audio Port

Analog Audio Output

Connector type	5-pole Phoenix connector
Audio formats	2-ch PCM
Sampling frequency	48 kHz
Signal transmission	Balanced / unbalanced signal
Volume	-63 dB - 0 dB
Balance	0 - 100 (50 = center)
Nominal Differential Output Level @ 0 dB Gain	+4 dBu
Nominal Differential Output Level @ 3 dB Gain	+7 dBu

Control Port

USB Port

Connector type	USB mini-B type
USB compliance	USB 2.0

10.2. Factory Default Settings

10.2.1. HDMI-3D-OPT-TX210DD

Parameter	Setting/Value
Video output port settings (optical link and local HDMI)	
Test pattern mode	Off
Test pattern resolution	480p
Test pattern	Bar
Signal type	Auto
Laser enable	On
Analog audio input port properties	
Volume	0.00 dB
Balance	0 (center)
Gain	0.00 dB
RS-232 settings	
Control protocol	LW2
Baud rate / Databits / Parity / Stopbits	57600 / 8 / No / 1

10.2.2. HDMI-3D-OPT-RX110DD

Parameter	Setting/Value
HDMI output port properties	
Signal type	Auto
Power 5V mode	Always on
Test pattern mode	Off
Test pattern resolution	480p
Test pattern	Bar
Analog audio output port properties	
Volume	0.00 dB (100%)
Balance	0 (center)
Bass	0.00 dB
Treble	0.00 dB
Phase invert	Disabled

10.3. 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 (LDC).

HDMI-3D-OPT-TX210DD

Port name	Video port number		Emulated EDID memory	Audio port number	
	LW2	LW3		LW2	LW3
HDMI in	01	I1	E1	01	I1
Audio1 in	-	-	-	02	I2
Audio2 in	-	-	-	03	I3
Optical link out	01	O1	-	01	O1
Local HDMI out	02	O2	-	02	O2

HDMI-3D-OPT-RX110DD

Port name	Video port number		Emulated EDID memory	Audio port number	
	LW2	LW3		LW2	LW3
Optical link in	01	I1	E1	01	I1
HDMI out	01	O1	-	01	O1
Analog audio out	-	-	-	02	O2

10.4. Maximum Fiber Cable Extensions

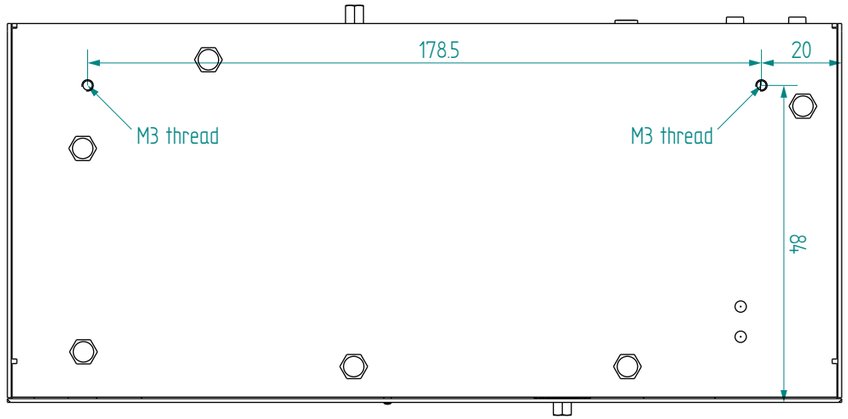
	OM1	OM2	OM3	OM4
	(62.5/125)	(50/125)	(50/125)	(50/125)
1080p@60Hz 24 bpp	250 m	600 m	1200 m	2500 m
1080p@60Hz 36 bpp	150 m	400 m	800 m	1300 m
4096x2048@30Hz 24 bpp	Not supported	350 m	700 m	1100 m

10.5. Mechanical Drawings

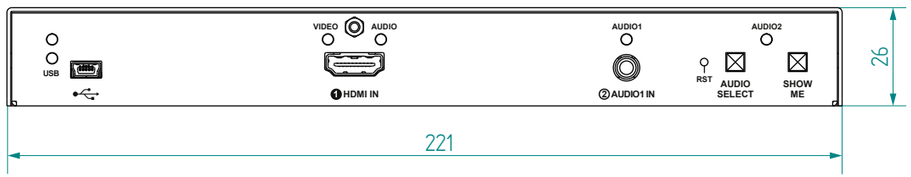
10.5.1. HDMI-3D-OPT-TX210DD

The following drawings present the physical dimensions of the transmitter. Dimensions are in mm.

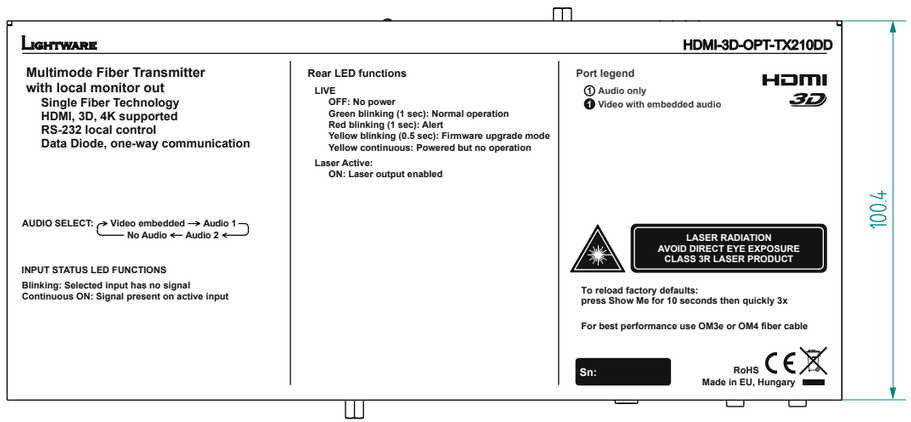
Bottom View



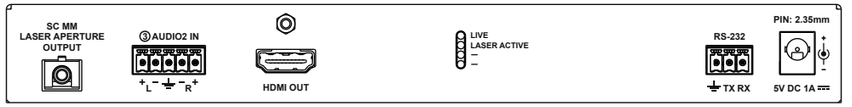
Front View



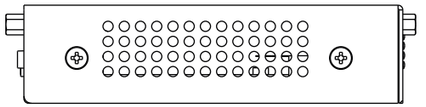
Top View



Rear View



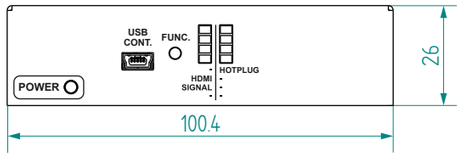
Side View



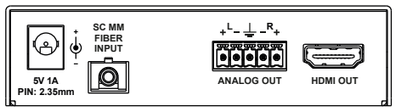
10.5.2. HDMI-3D-OPT-RX110DD

The following drawings present the physical dimensions of the receiver. Dimensions are in mm.

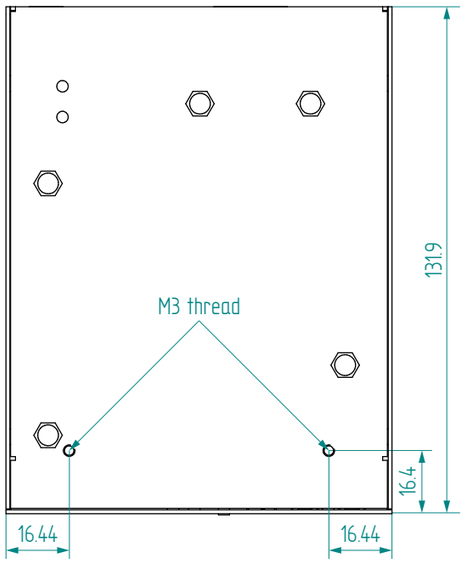
Front View



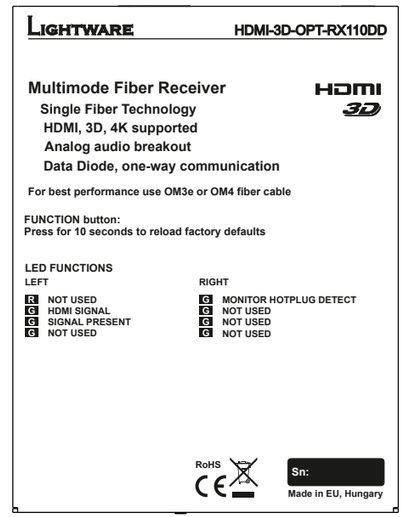
Rear View



Bottom View



Top View



10.6. 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
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
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.

10.7. 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 following will be overwritten:

General
Device label, Control (button) lock
HDMI input port
Video port name, Audio port name
Analog audio input ports
Volume, Balance, Gain, Port name
Crosspoint settings
Audio crosspoint setting, Audio autoselect settings, Mute ports, Lock ports
Optical output port
Video port name, Audio port name
Test pattern mode, clock source and type
HDMI mode
Local output port
Port name, HDMI mode, Power +5V mode
Test pattern mode, clock source, and type
Serial port
Control protocol, Baud rate, Data bits, Stop bits, Parity
Further settings
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.

10.8. 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. Ligthware 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.

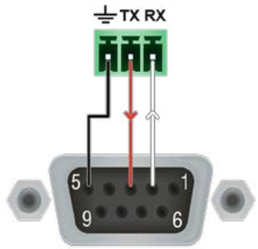
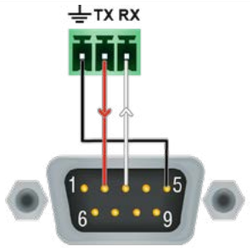
ATTENTION! There are numerous types of regularly used connector and cable types to connect audio devices. Please always make sure that a connector or cable fits your system before use.

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.

10.8.1. 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:

Lightware device and a DCE D-SUB 9 and Phoenix	Lightware device and a DTE D-SUB 9 and Phoenix
 2: TX data 3: RX data 5: Ground	 2: RX data 3: TX data 5: Ground

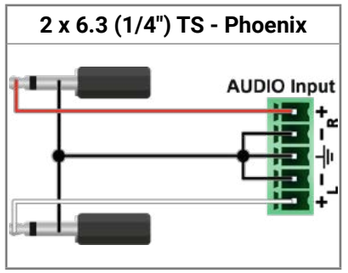
10.8.2. Audio Ports

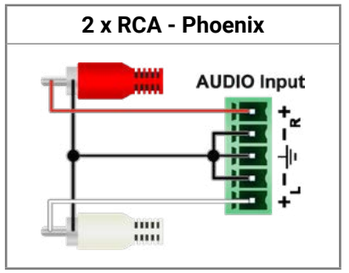
The Pinout of the 5-pole Phoenix Connector

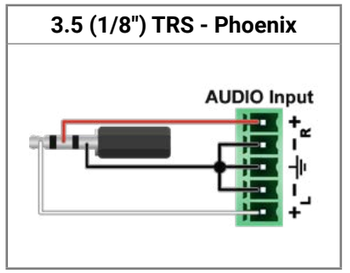
Pin nr.	Signal
1	Left+
2	Left-
3	Ground
4	Right-
5	Right+

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

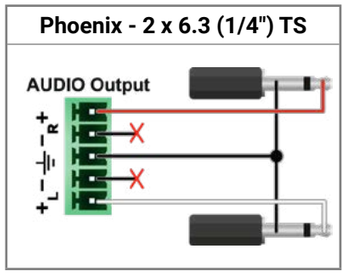
From Unbalanced Output to Balanced Input

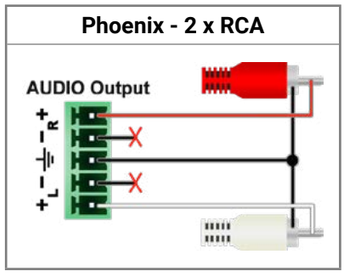


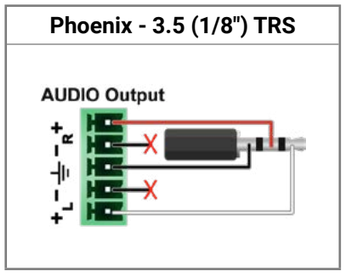




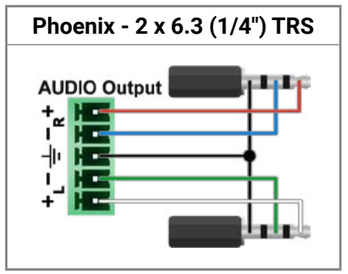
From Balanced Output to Unbalanced Input

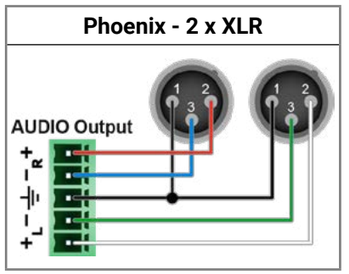


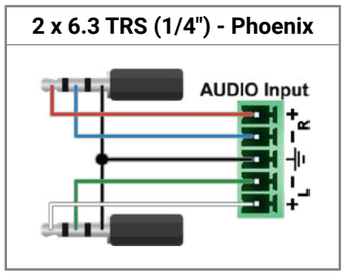


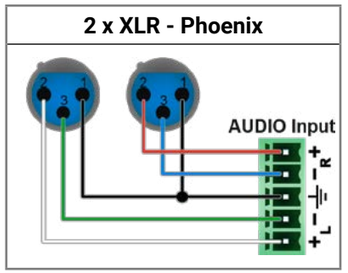


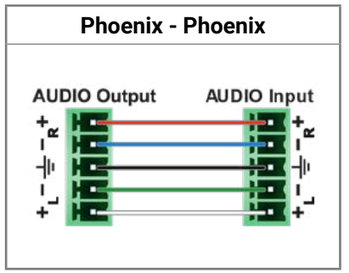
From Balanced Output to Balanced Input











10.9. Release Notes of the Firmware Packages

The following list below shows the released firmware packages with important notes.

10.9.1. Transmitter

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

10.9.2. Receiver

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

10.10. 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
#advancedview	Advanced view / Terminal window
#analogaudio	Analog audio related settings
#audio	Audio related settings
#autoselect	Autoselect feature settings
#backup	Configuration cloning (backup)
#balance	Balance (for analog audio) setting
#bootload	Bootload mode setting
#button	Front panel button related setting
#configurationcloning	Configuration cloning (backup)
#controllock	Button lock setting
#crosspoint	Crosspoint switch setting
#devicelabel	Device label
#diagnostic	Failure diagnostic related tool/information
#edid	EDID related settings
#eventmanager	Event manager
#factory	Factory default settings
#firmwareversion	Firmware version query
#framedetector	Frame detector in LDC
#frontpanel	Front panel button related setting
#function	Function button
#gain	Gain (for analog audio) setting
#label	Device label
#lock	Port lock setting
#lockbutton	Front panel button lock setting
#log	System log
#mute	Port mute setting
#optical	Fiber optical port related settings
#portstatus	Source/destination port status query
#producttype	Product type query
#protocol	RS-232 protocol setting
#reboot	Restarting the device
#restart	Restarting the device
#rs232	RS-232 related settings
#rs-232	RS-232 related settings
#serial	RS-232 related settings
#serialnumber	Serial number query
#showme	Show Me button
#signaltype	HDMI/DVI signal type setting
#status	Status query
#switch	Crosspoint switch setting
#systemlog	System log
#terminal	Advanced view / Terminal window
#testpattern	Test pattern (no sync screen) settings
#unlock	Port unlock setting
#unmute	Port unmute setting
#volume	Volume (for analog audio) setting

10.11. Further Information

Limited Warranty Statement

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

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

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

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

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

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

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

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

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

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

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

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

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

Document Revision History

Rev.	Release date	Changes	Editor
1.0	16-03-2022	Initial release	Tamas Forgacs
. . .			
1.2	08-12-2022	Minor corrections for HTML export	Tamas Forgacs
1.3	15-01-2024	Specifications updated	Tamas Forgacs

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