

visual engineering
LIGHTWARE

User's Manual



MMX4x2-HDMI
MMX4x2-HT200

Standalone Multimedia Matrix Switcher

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

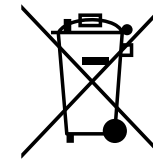
For the correct ventilation and to avoid overheating ensure enough free space around the appliance. Do not cover the appliance, let the ventilation holes free and never block or bypass the ventilators (if any).

WARNING






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

Waste Electrical & Electronic Equipment WEEE

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



Common Safety Symbols

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

Symbol Legend

The following symbols and markings are used in the document:

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


ATTENTION! Useful information to perform a successful procedure; it is recommended to read.


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 which 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 clicking 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 during testing these functions in accordance with the indicated Hardware/Firmware/Software environment:

Item	Version
Lightware Device Controller (LDC) software	1.20.0b5
Lightware Device Updater (LDU) software	1.5.2b3
Controller firmware	1.2.0
Hardware - MMX4x2-HDMI	1.0
Hardware - MMX4x2-HT200	1.2

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1

Introduction

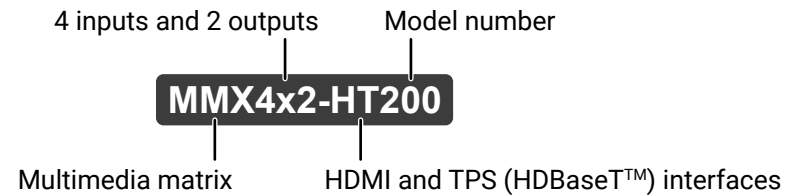
Thank you for choosing Lightware's MMX4x2 series device. In the first chapter we would like to introduce the device highlighting the most important features in the below listed sections:

- ▶ DESCRIPTION
- ▶ COMPATIBLE DEVICES
- ▶ BOX CONTENTS
- ▶ FEATURES
- ▶ TYPICAL APPLICATION

1.1. Description

MMX4x2 series device is a unique mini size matrix switcher. HT200 model has three HDMI inputs and one HDBaseT™ compatible TPS input port. It has two independent HDMI outputs. HDMI model has four HDMI inputs and two independent HDMI outputs. Audio can be de-embedded from the HDMI signal to a balanced 5-pole Phoenix (Euroblock) port and external audio signal can be embedded into the HDMI stream from another 5-pole Phoenix input port. The volume and gain properties of the audio signal can be modified at both input and output. The unit is fully 4K/UHD/3D capable and HDCP compliant. The device has built-in Event Manager tool configurable via the Lightware Device Controller software. Further control options are served by the USB, RS-232, IR (in and out) and Ethernet ports.

Model Denomination



1.2. Compatible Devices

The MMX4x2-HT200 matrix is compatible with other Lightware TPS transmitters, matrix TPS and TPS2 boards, 25G TPS2 boards, as well as third-party HDBaseT-extenders, displays, but not compatible with the phased out TPS-90 extenders.



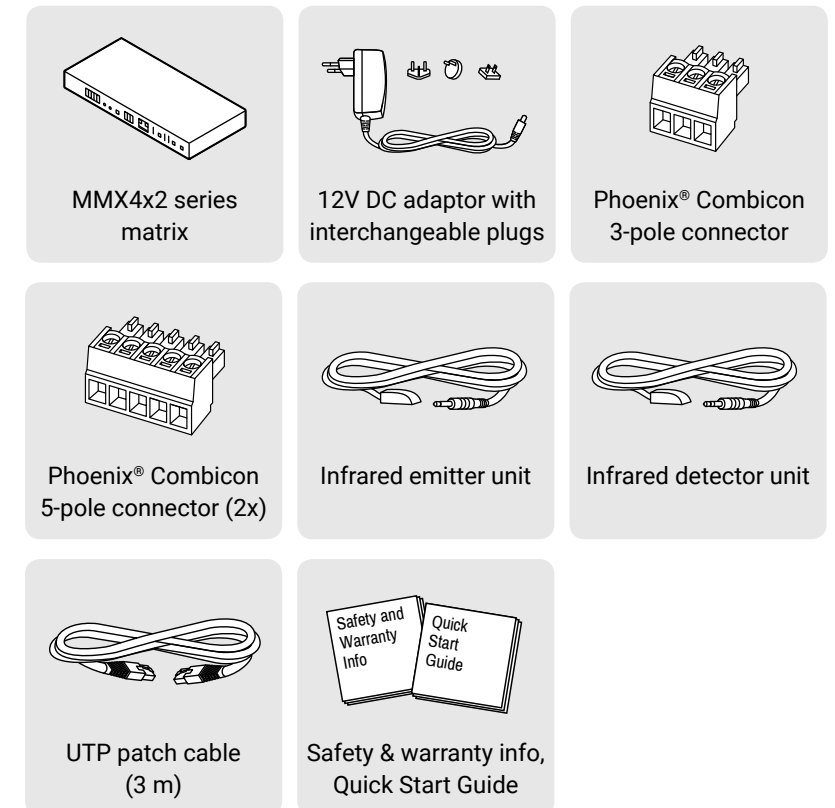
The MMX4x2-HT200 matrix is compatible with any third-party HDBaseT™ device.

HDBaseT™ and the HDBaseT Alliance logo are trademarks of the HDBaseT Alliance.

The List of Compatible Lightware Devices

- MX Modular matrix frames - MX-TPS/TPS2-OB
- 25G Modular matrix frames - 25G-TPS2-OB
- Standalone TPS matrix frames – MMX6x2-HT series
- TPS Transmitters:
 - HDMI-TPS-TX95/97
 - DVI-HDCP-TPS-TX95/97
 - UMX-TPS-TX100 series
 - WP-UMX-TPS-TX100 series
 - SW4-TPS-TX240
 - HDMI-TPS-TX200 series
 - DVI-HDCP-TPS-TX200 series
 - DP-TPS-TX200 series

1.3. Box Contents



1.4. Features



3D and 4K Support

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



Signal Transmission up to 170 m - Only for MMX4x2-HT200 model

Video and audio signal transmission (HDMI, Ethernet, RS-232, and Infrared over a single CAT5e... CAT7e cable).



Pixel Accurate Reclocking

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



Frame Detector and Signal Analysis

The exact video and audio signal format can be determined such as timing, frequencies, scan mode, HDCP encryption, color range, color space and audio sample rate.



Autoselect Function for Video Inputs

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



Audio Embedder and De-embedder Function

The analog audio can be embedded to HDMI outputs and embedded audio can be routed to the analog audio output.



HDCP-compliant

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



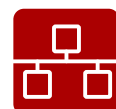
Built-in Event Manager

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



Bi-directional RS-232 Interface

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

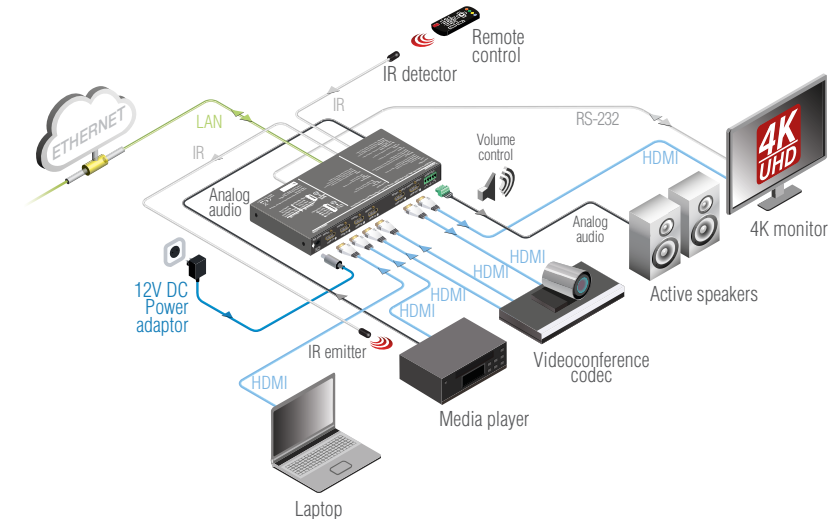


Ethernet Control

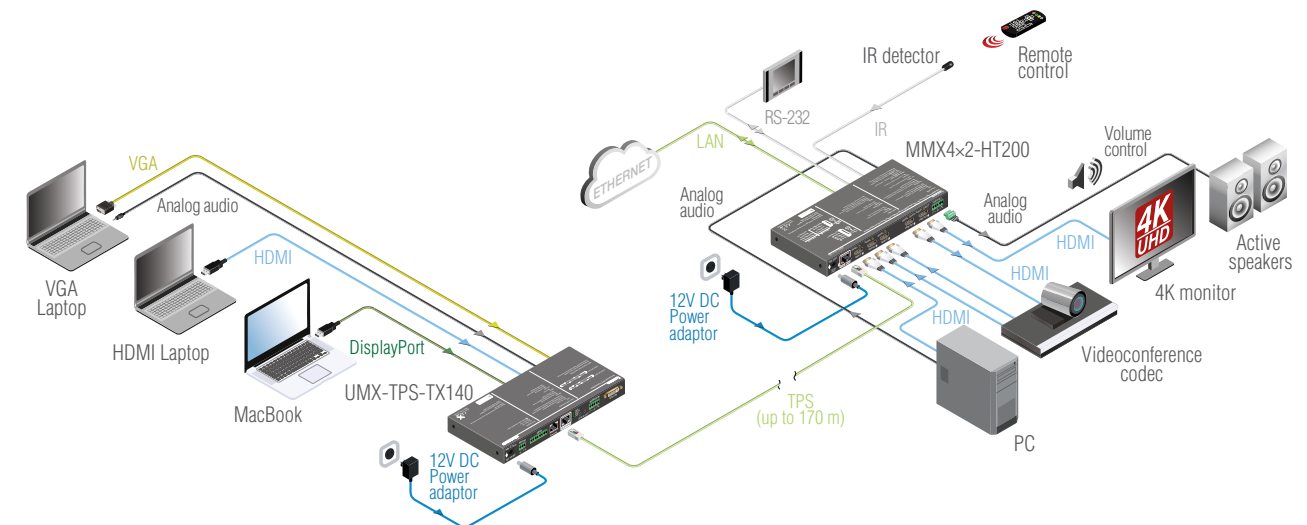
Multiple simultaneous TCP/IP connections are available with a simple ASCII-based protocol for controlling, configuring the receiver or perform a firmware upgrade.

1.5. Typical Application

Standalone Application - MMX4x2-HDMI



Standalone Application - MMX4x2-HT200



2

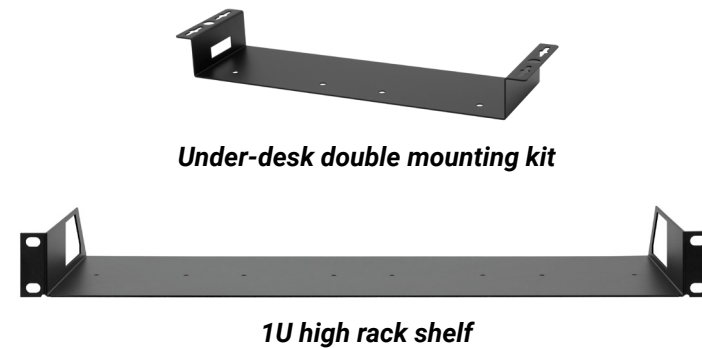
Installation

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

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

2.1. Mounting Options

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



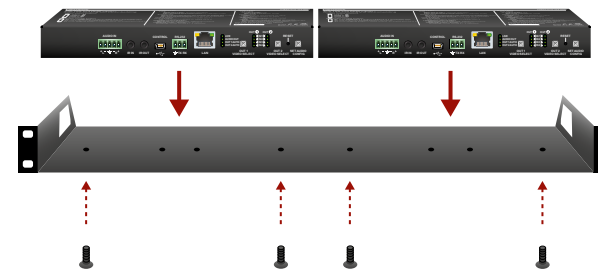
The Under-desk double mounting kit makes easy to mount a single device on any flat surface, e.g. furniture. 1U high rack shelf provides mounting holes for fastening two half-rack or four quarter-rack sized units. Pocket-sized devices can also be fastened on the shelf. To order mounting accessories please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

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

INFO: The matrix is half-rack sized.

2.1.1. 1U High Rack Shelf

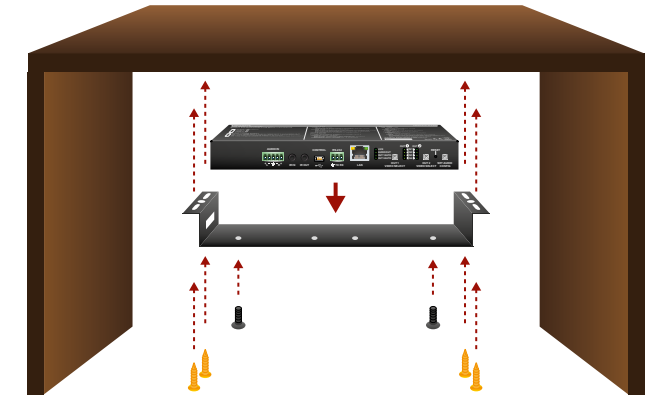
Allows rack mounting for half-rack, quarter-rack and pocket sized units.



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

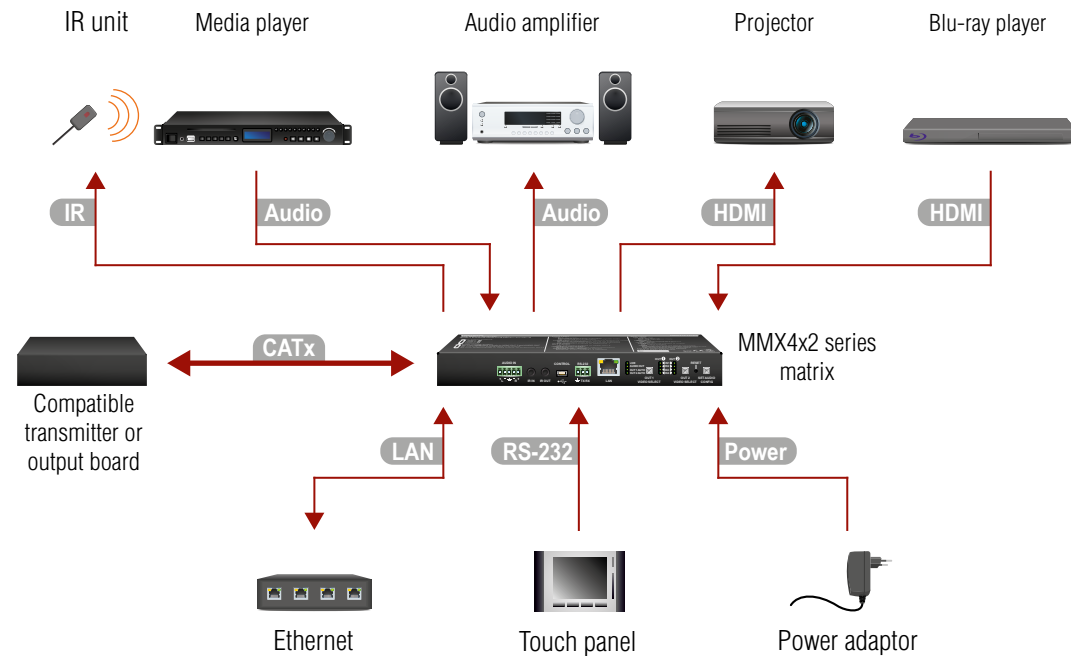
2.1.2. Under-desk Double Mounting Kit

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



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

2.2. Connecting Steps



CATx **For MMX4x2-HT200 model only:** connect the matrix and the transmitter by a CATx cable via the TPS connectors.

HDMI Connect the matrix and the input sources (e.g. Blu-ray player) by HDMI cables via the HDMI input ports.

HDMI Connect the sink devices to the HDMI output ports.

Audio Optionally connect an audio device (e.g. a media player) to the audio input port.

Audio Optionally connect an audio device (e.g. a audio amplifier) to the audio output port.

LAN Optionally connect the matrix to a LAN network in order to control the device.

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

IR Optionally for Infrared extension:
 - Connect the IR emitter to the IR OUT port of the device.
 - Connect the IR detector to the IR IN port of the device.

Power Connect the power adaptor to the DC input on the matrix first, then to the AC power socket.

3

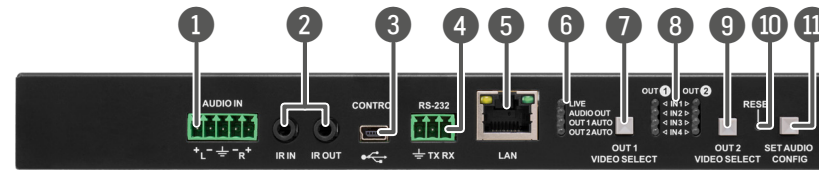
Product Overview

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

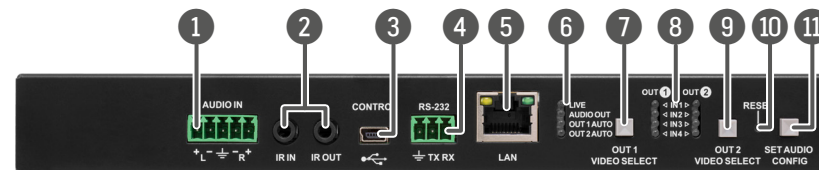
- ▶ [FRONT VIEW](#)
- ▶ [REAR VIEW](#)
- ▶ [ELECTRICAL CONNECTIONS](#)
- ▶ [COMPACT SIZE MATRIX CONCEPT](#)
- ▶ [PORT DIAGRAM](#)
- ▶ [TPS INTERFACE](#)
- ▶ [AUDIO INTERFACE](#)
- ▶ [VIDEO INTERFACE](#)
- ▶ [THE AUTOSELECT FEATURE](#)
- ▶ [CONTROLLING FEATURES](#)
- ▶ [FURTHER BUILT-IN FEATURES](#)

3.1. Front View

MMX4x2-HDMI



MMX4x2-HT200



- 1 **Audio input port** 5-pole Phoenix connector for balanced analog audio. Pin assignment can be found in the [Analog Audio Input and Output](#) section.
- 2 **IR IN and OUT** 3-pole TRS connector, also known as 3.5 mm (1/8") jack plug for optional IR receiver (IR IN) and transmitter (IR OUT). Pin assignments can be found in the [IR Connector](#) section.
- 3 **USB** USB interface for LDC connection to control the matrix.
- 4 **RS-232** 3-pole Phoenix connector for controlling the device with LDC, third-party control systems, or third-party device control. Pin assignment can be found in the [RS-232 Connector](#) section.
- 5 **Ethernet** Locking RJ45 connector for device control and firmware upgrade.

- 6 **Status LEDs** The LEDs give immediate feedback about current state of the device. See the details in the [Status LEDs](#) section.
- 7 **Video select button for Output 1** Pushing the button selects video source for Output 1. See the sequence in the [OUT 1 and OUT 2 Video Select Buttons](#) section.
- 8 **Input select LEDs** The LEDs give feedback about the current crosspoint settings.
- 9 **Video select button for Output 2** Pushing the button selects video source for Output 2. See the sequence in the [OUT 1 and OUT 2 Video Select Buttons](#) section.
- 10 **Reset button** Pressing reset button reboots the extender. It results the same as unplugging and re-plugging the power connector.
- 11 **Set Audio Config button** Audio configuration and special functions are available through this button. See more information about the audio configuration modes in the [Set Audio Config Button](#) section and the special functions in the [Special Functions](#) section.

3.2. Rear View

MMX4x2-HDMI



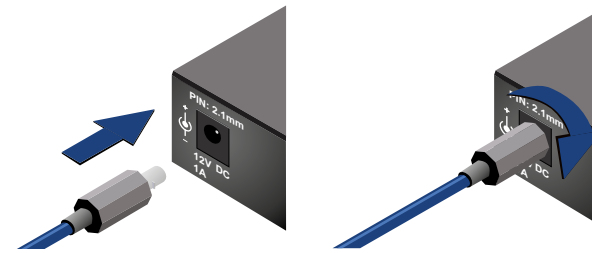
MMX4x2-HT200



- 1 12V DC 1A input port** Local power in; connect the output of the supplied 12V DC power adaptor. For more details see the next section.
- 2 TPS input port** Locking RJ45 connector. Connect a twisted pair cable between the transmitter and the matrix. Maximum cable extension distances can be found in the [Maximum Extension Distances](#) section.
- 3 HDMI input ports** HDMI input ports for sources. LED operation can be found in the [HDMI Input LEDs](#) section.
- 4 HDMI output ports** Connect an HDMI cable between the sink device and the matrix. LED operations can be found in the [HDMI Output LEDs](#) the [HDCP LEDs](#) sections.
- 5 Audio output port** 5-pole Phoenix connector for balanced analog audio output. Pin assignment can be found in the [Analog Audio Input and Output](#) section.

3.3. Electrical Connections

3.3.1. 12V DC Connection



Locking DC connector

Do not forget to turn the plug clockwise direction before disconnecting the power adaptor.

WARNING! Always use the supplied 12V power adaptor. Warranty void if damage occurs due to use of a different power source.

3.3.2. HDMI Connector

The extender provides standard 19 pole HDMI connector for output. Always use high quality HDMI cable for connecting sources and displays.

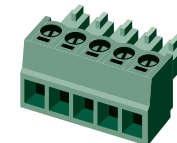
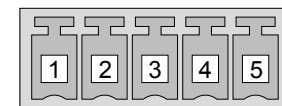


3.3.3. Analog Audio Input and Output

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



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



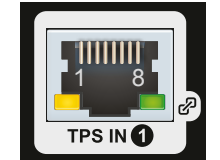
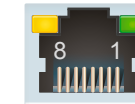
Analog audio connector and plug pin assignments

Compatible Plug Type

Phoenix® Combicon series (3.5mm pitch, 5-pole), type: MC 1.5/5-ST-3.5. You can find more information about analog audio function in the [Video Interface](#) section. Audio cable wiring guide is in the [Audio Cable Wiring Guide](#) section.

3.3.4. Ethernet Connector (TPS and LAN Ports)

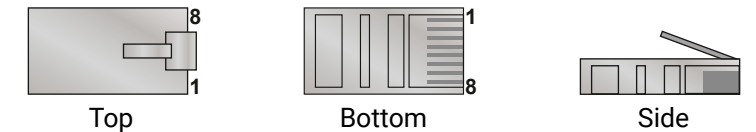
The extender provides standard RJ45 connectors for TPS IN and LAN ports. Always use high quality Ethernet cable for connecting transmitters and receivers. Maximum CATx cable distances for the TPS connection can be found in the [Maximum Extension Distances](#) section.



RJ45 connector for LAN port RJ45 connector for TPS input port

Wiring of TPS and LAN Cables

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



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

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

3.3.5. USB Connector

The matrix provides standard USB 2.0 mini B-type connector for software control purpose.



3.3.6. IR Connector

IR detector and IR emitter can be connected to the matrix with TRS (Tip, Ring, and Sleeve) connectors. They are also known as (3,5 mm or approx. 1/8") audio jack, phone jack, phone plug, and mini-jack plug. The pin assignments are the following for the detector and the emitter:

Detector – 3-pole TRS		Emitter – 2-pole TS	
1 Tip	Signal (active low)	1 Tip	+5V
2 Ring	GND	2 Ring	Signal (active low)
3 Sleeve	+5V	3 Sleeve	

INFO: Ring pole of the emitter is optional. If your IR emitter has three-pole TRS plug, then the Ring and the Sleeve are the same signal (Output -).

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

3.3.7. RS-232 Connector

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

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

RS-232 connector pin assignments

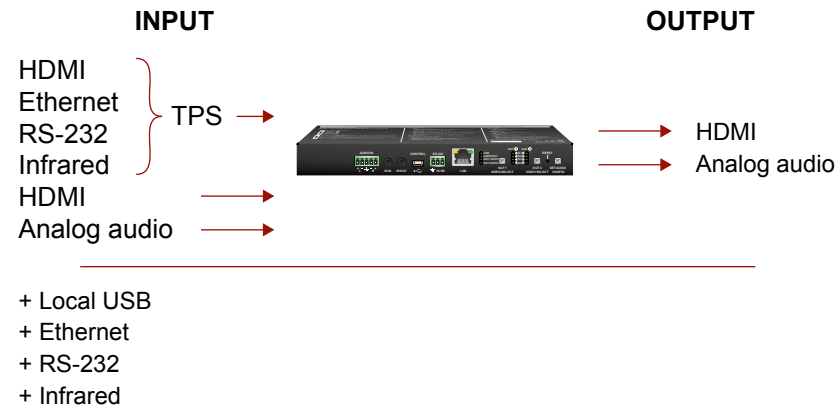
Compatible Plug Type

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

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

3.4. Compact Size Matrix Concept

MMX4x2 series device is a multifunctional audio/video matrix switcher with four inputs and two outputs designed into a compact size frame. The HT200 model is built with HDBaseT™ (TPS) technology. The device can be controlled over various interfaces, e.g. Ethernet, USB, RS-232, and Infrared, and built with audio embedder and de-embedder functions.

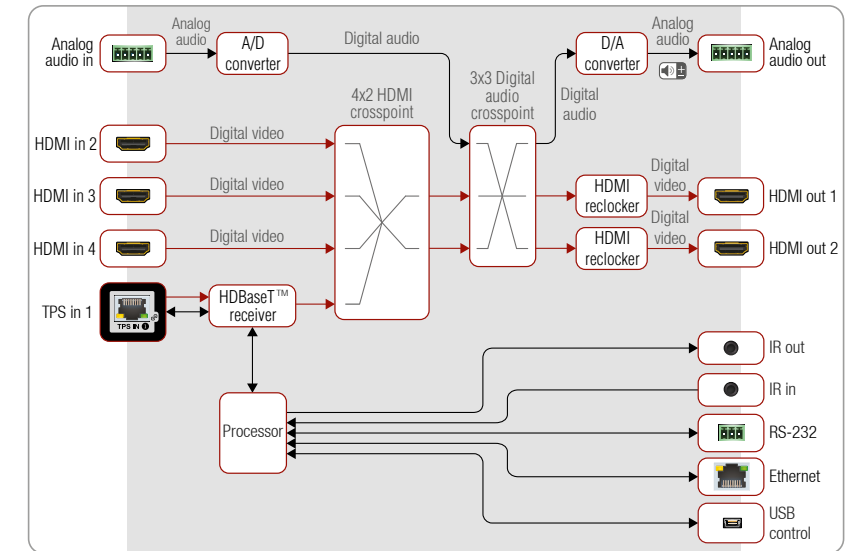


Summary of interfaces - MMX4x2-HT200

INFO: Only MMX4x2-HT200 model has TPS input. MMX4x2-HDMI model has HDMI+analog audio inputs and HDMI+analog audio outputs.

3.5. Port Diagram

The following figure describes the port diagram of the MMX4x2-HT200 matrix:



Port diagram of MMX4x2-HT200 matrix switcher

The device has four video input ports (one TPS, three HDMI) and the 4x2 HDMI crosspoint routes the video signal further to the two video output ports (HDMI). The device has also an analog audio input port (5-pole Phoenix) and an analog audio output port (5-pole Phoenix). The 3x3 Digital audio crosspoint routes the audio signals toward the HDMI (audio embedding) and analog audio output ports.

MMX4x2-HT200 model has TPS input which receives Ethernet, RS-232, Infrared beside of the HDMI/DVI signals.

The matrix has four different interfaces through user can control the unit itself or other third-party devices: Infrared (input and output), RS-232, Ethernet, and USB.

3.6. TPS Interface

The MMX4x2-HT200 model is built with TPS (Twisted Pair Single) interface which are using HDBaseT™ technology. It means the unit receives video, audio, Ethernet, RS-232, and Infrared signals via a single CATx cable.

TPS Interface Working Modes

The TPS working mode between the transmitter and the receiver is determined by the mode set in them. Both devices TPS mode settings together determine the finally established TPS transmission mode.

The following TPS modes are defined in the receiver:

- **Auto:** The TPS mode is determined automatically.
- **HDBaseT:** Ideal for high resolution signals up to 4K.
- **Long reach:** Ideal for big distances up to 1080p@60Hz with extended cable lengths.
- **LPPF1*:** Only RS-232 communication is transmitted (@ 9600 baud).
- **LPPF2*:** Only RS-232 (@ 9600 baud) and Ethernet communication are transmitted.

* LPPF: Low Power Partial Functionality.

		Selected mode on RX side				
		LPPF1	LPPF2	HDBaseT	Long reach	Auto
Selected mode on TX side	LPPF1	LPPF1	LPPF1	LPPF1	LPPF1	LPPF1
	LPPF2	LPPF1	LPPF2	LPPF2	LPPF2	LPPF2
	HDBaseT	LPPF1	LPPF2	HDBaseT	Long reach	HDBaseT
	Long reach	LPPF1	LPPF2	Long reach	Long reach	Long reach
	Auto	LPPF1	LPPF2	HDBaseT	Long reach	HDBaseT **

** If there is valid HDMI/DVI signal is on the TX side, the TPS mode will be HDBaseT on both side. If the transmitter does not transmits HDMI/DVI signal, the TPS mode will be changed to LPPF2 or LPPF1 automatically. Long reach mode is not available when both sides are set to Auto mode.

When using automatic operation mode selection, the device determines the mode of operation. If both half of the pair are set to Auto mode, the source side is the initiator. It will negotiate each state transition with its sink side partner.

When one of the devices is configured to manual operation mode selection, the other device may be placed in automatic mode. In this case, the mode transition negotiation is initiated by the host-managed device and the auto-mode device follows through. The allowed cable lengths and resolutions are listed in the [Maximum Extension Distances](#) section.

3.7. Audio Interface

3.7.1. Audio Input Modes

The device can receive embedded audio signal on the HDMI inputs and analog audio signal over the analog audio input port.

In case of MMX4x2-HT200 model embedded audio signal can be received on the TPS input port as well.

Audio Embedding

The matrix has a built-in audio embedder function what means the audio signal which is received on the analog audio input port is able to be embedded to the HDMI outputs.

3.7.2. Audio Output Modes

The MMX4x2 series matrix can transmit two types of audio:

- Embedded (HDMI) and
- Analog balanced stereo audio.

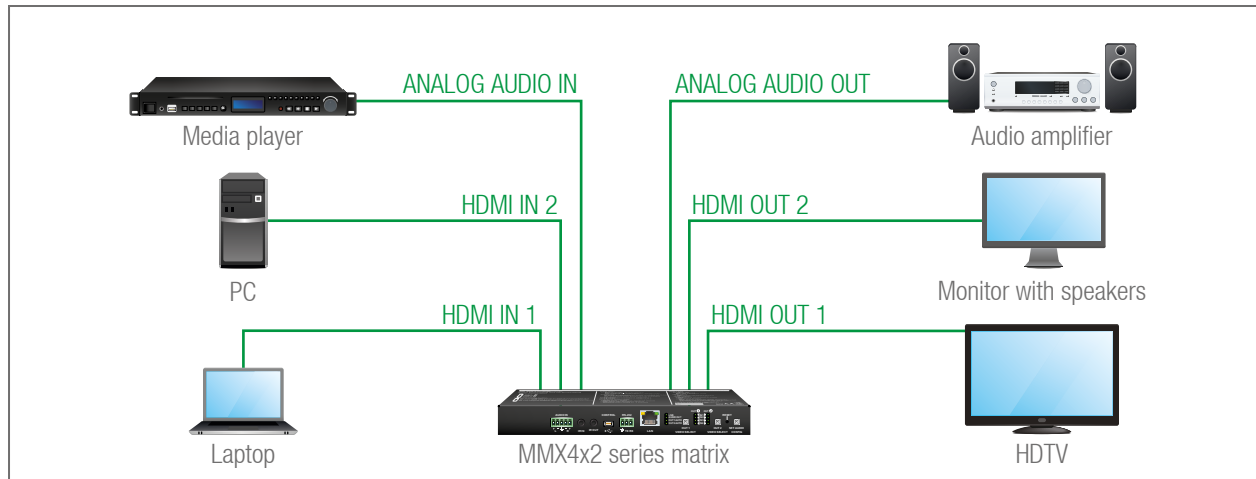
Audio De-embedding

The matrix has a built-in audio de-embedder which means the device is able to de-embed audio from its HDMI outputs to its analog audio output port.

ATTENTION! De-embedding function supports 2 channel PCM audio signals only. Other audio formats are not supported and de-embedding will not be successful.

See a life example about the audio options of the matrix on the next page.

3.7.3. Audio Options - Example



The Concept

Three sources are connected to the matrix: the Laptop on HDMI input 1, the PC on HDMI input 2, and a Media player on the analog audio input. On the output side three sink devices wait for the audio signals: an HDTV on HDMI output 1, a Monitor with speakers on HDMI output 2, and an Audio Amplifier on the analog audio output line. The video line of the Laptop is switched to HDTV and the PC is switched to the Monitor with speakers. The embedding and de-embedding functions of the matrix allow the infinite variations to transmit the analog and digital audio signals.

The following ways are available for the audio devices:

- When the sink device is the **HDTV**, the audio source can be the **Laptop**, the **PC**, and the **Media Player**.
- When the sink device is the **Monitor with speakers**, the audio source can be the **Laptop**, the **PC**, and the **Media player**.
- When the sink device is the **Audio amplifier**, the audio source can be the **Laptop**, the **PC** and the **Media player**.

INFO: All related settings are available in the LDC software, see the details in the [Crosspoint Menu](#) section.

3.8. Video Interface

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

- Pressing **OUT 1 / OUT 2 Video Select** button on the device,
- Using Lightware Device Controller (LDC),
- Sending LW2 or LW3 protocol commands, or
- Using the **Autoselect** function.

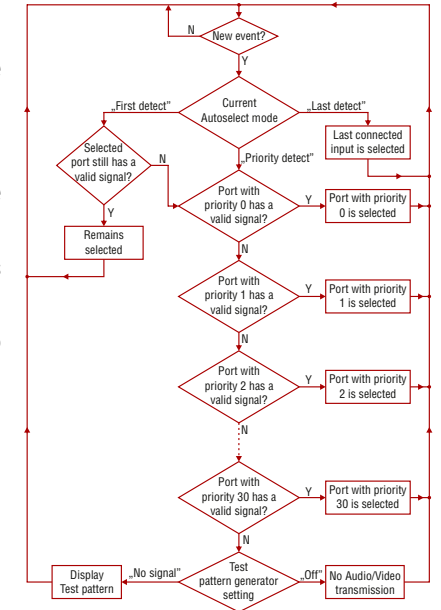
3.9. The Autoselect Feature

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

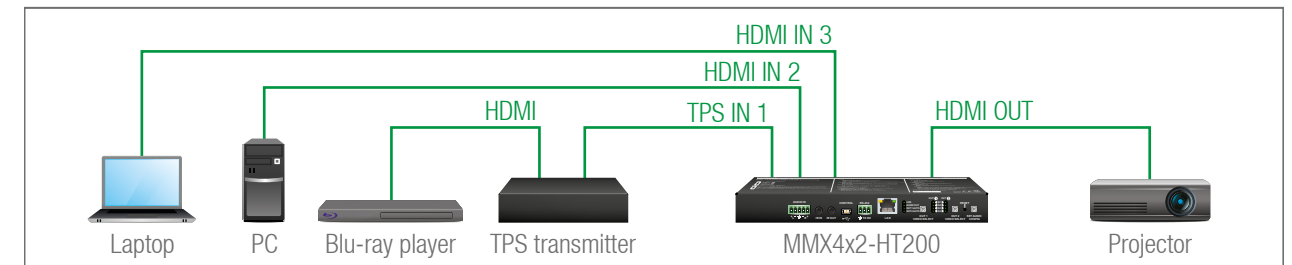
There are three types of Autoselect as follows:

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

Flowchart of Autoselection modes



Automatic Input Selection - Example



The Concept

If there is no other source connecting to the matrix, only the Laptop, the source on HDMI input 3 will be automatically switched to the HDMI output. If the Laptop and the PC are also connected to the matrix, the source on the HDMI input 2 will be switched to the HDMI output. If the Blu-ray player is connected through the TPS transmitter, TPS input 1 will be switched to the HDMI output – independently of the presence of the other video signals.

Settings

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

Source device	Input port	Priority
Laptop	I3 (HDMI IN 3)	2
PC	I2 (HDMI IN 2)	1
Blu-ray player (via a TPS transmitter)	I1 (TPS IN 1)	0

Priorities can be set in Lightware Device Controller software, see related settings in the [HDMI Video Output](#) section.

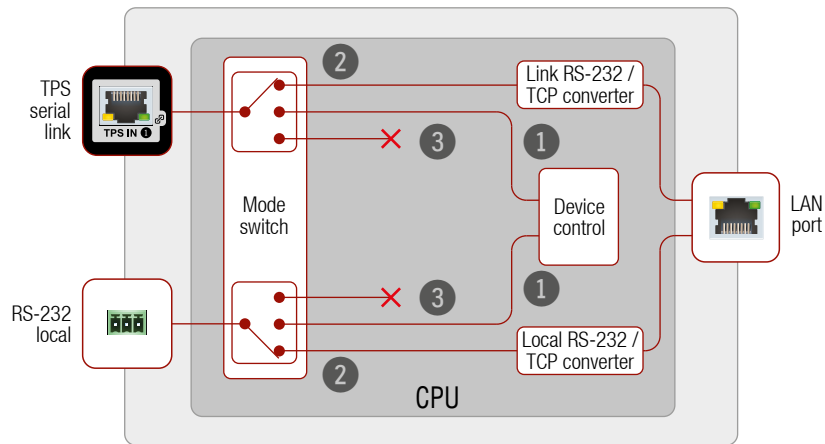
3.10. Controlling Features

3.10.1. Serial Interface

Technical Background

ATTENTION! Only MMX4x2-HT200 model has TPS serial link port.

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



Block diagram of the MMX4x2-HT200 serial interface

The following settings are defined:

- 1 The serial port is in **Control mode**.
- 2 The serial port is in **Command Injection mode**.
- 3 The serial port is **Disconnected**.

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

Only one mode can be used at a time: Control mode, or Command Injection mode, or can be disconnected. You can set different modes for the TPS serial link and local RS-232 port.

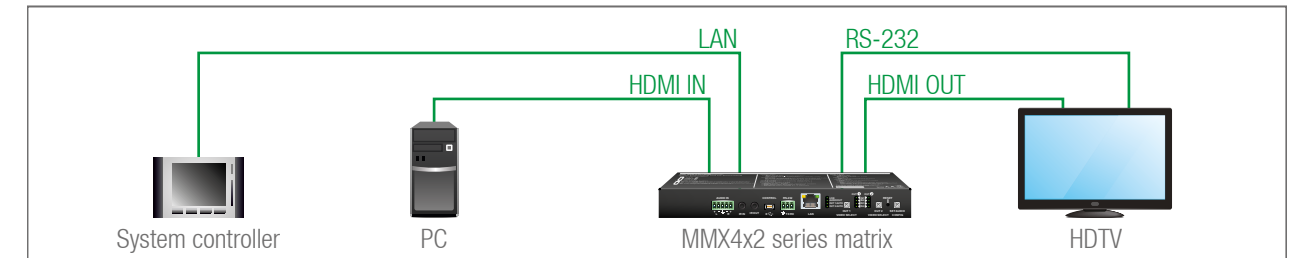
Control Mode

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

Command Injection Mode

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

RS-232 Signal Transmission – Example



The following ways are available for controlling the devices:

- The **System controller** can send TCP messages to the IP:port address of the **Matrix**. In this case the control is one-way, the System controller sends commands to the **HDTV**. You can see the details about TCP message sending in the [Sending Message via TCP Port](#) section.
- The **System controller** sends messages over the LAN port of the **Matrix** to the given port number. The Matrix converts the incoming TCP messages to RS-232 commands and transmits over the local RS-232 port to the **HDTV**. The local RS-232 port has to be set to Command Injection mode. In this case the direction of the communication is bi-directional between the Matrix and the System controller, so the answer of the HDTV is received by the System controller.

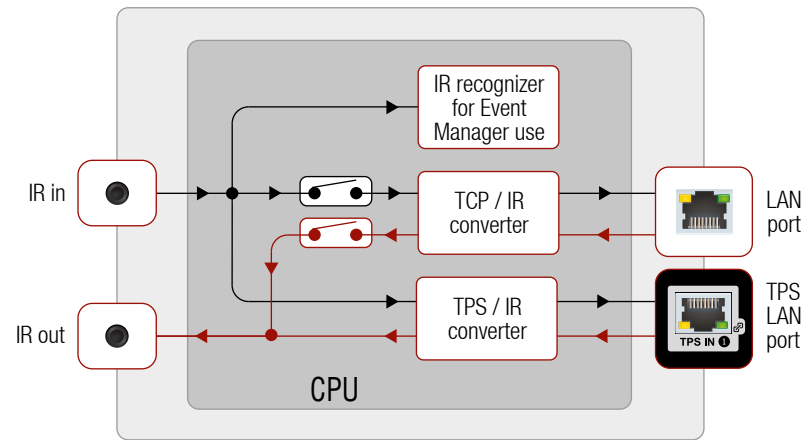
3.10.2. IR Interface

ATTENTION! The device has no built-in Infrared receiver and transmitter. For the complete usage attach the supplied IR emitter unit to the IR OUT and the IR detector unit to the IR IN connectors.

Technical Background

ATTENTION! Only MMX4x2-HT200 model has TPS LAN port.

The Infrared signal transmission is similar to the serial data communication. The MMX4x2 series matrix contains dedicated IR I/O connection and the MMX4x2-HT200 model can also transmit/receive IR signal via the TPS interface. The signal is in pronto HEX format in both cases.



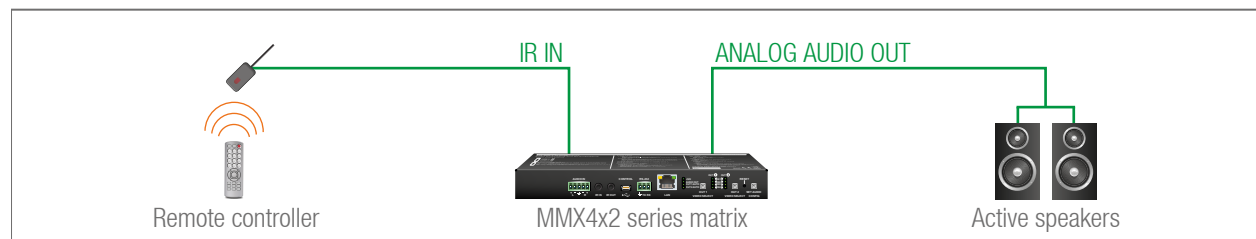
Block diagram of the IR interface

With the help of the device's IR recognizer functionality you can assign actions in Event manager. The second option is the command injection mode (like at serial interface in the previous section) where you can send IR commands over LAN. Command injection mode can be turned on and off by input/output ports.

INFO: All settings are available in the LDC software, see settings in the [Infra](#) section.

INFO: The modulation of output IR signal can be turned off or on by LW3 command, see the [Enable/Disable Output Signal Modulation](#) section.

Control by IR Signal - Example



The Concept

An IR detector is attached to the Infrared input port of the Matrix and IR signals are sent by the Remote controller. A pair of active speakers is also connected to the analog audio output port of the Matrix.

The volume can be controlled via the Matrix by using the remote controller with the following way:

- Set an action in **Event Manager** that if the volume control buttons are pressed on the **Remote controller**, increase or decrease the volume of the analog audio port of the **Matrix**. In this case you can control the audio device via the Matrix remotely. See the details about the Event Manager settings in the [Event Manager](#) section.

TIPS AND TRICKS: You can increase or decrease the levels of analog audio output ports in steps by LW3 protocol commands, see the details in the [Analog Audio Output Level Settings by Steps](#) section.

3.10.3. USB Control Interface

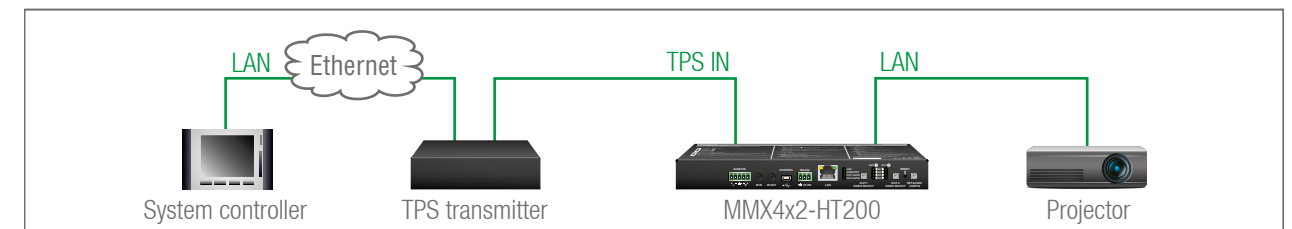
The device can be controlled over front panel USB port (mini B-type connector). This interface only supports LW3 protocol. The interface can be used to establish a connection to Lightware Device Controller software.

3.10.4. Ethernet Control Interface

The device can be controlled over front panel Ethernet port (standard RJ45 connector). This interface supports both LW2 and LW3 protocols.

The interface can be used to remote control the device with Lightware Device Controller and establish the connection to Lightware Device Updater software and perform firmware upgrade.

System Control via Local Ethernet (Example)



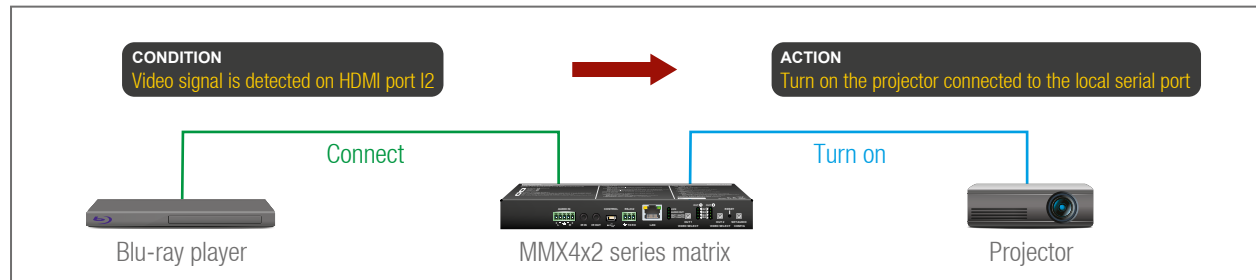
The following ways are available for device control:

- The **System controller** can communicate with the **Matrix** via the TPS line of the **Transmitter** with using LW2/LW3 protocol commands.
- The **System controller** can communicate directly with the **Projector** via their IP:port address.
- The **Matrix** can send commands (e.g. as an action by the Event Manager) to the IP:port address of the **Projector** by using LW3 protocol commands. See Event Manager usage in the [Event Manager](#) section, and find the related LW3 protocol commands in the [Sending Message via TCP Port](#) section.

3.11. Further Built-in Features

3.11.1. Automatically Launched Actions – The Event Manager

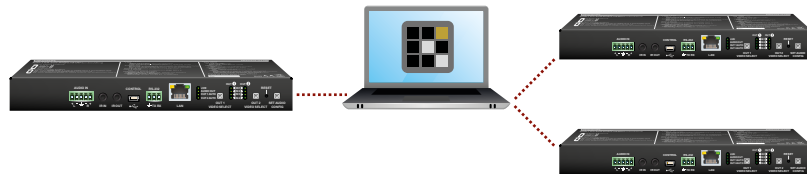
The Event Manager feature means that the device can sense changes on its ports and is able to react according to the pre-defined settings. Lightware Device Controller contains a user-friendly software tool and allows to create Events by defining a Condition and an Action.



Event Manager example

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

3.11.2. Matrix Cloning – Configuration Backup and Restore



The device (configuration) cloning of MMX4x2 series matrix 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.

3.11.3. Advanced EDID Management

Factory Preset EDIDs

The factory EDIDs (F1-F120) are factory preprogrammed and cannot be modified. These are the most common resolutions. They are specially provided to force graphic cards to output only the exact pixel resolution and refresh rate.

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

Sources and Destinations

The EDID memory consists of four parts:

- **Factory EDID** list shows the pre-programmed EDIDs (F1-F120).
- **Dynamic EDID** list shows the display device connected to the device's outputs. The unit stores the last display devices' EDID on either output, so there is an EDID shown even if there is no display device attached to the output port at the moment.
- **User memory** locations (U1 – U14) can be used to save custom EDIDs.
- **Emulated EDID** list shows the currently emulated EDID for the inputs. The source column displays the memory location that the current EDID was routed from.

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

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

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

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

3.11.4. Remote Firmware Upgrade of Connected Lightware Devices

INFO: This feature is available for MMX4x2-HT200 model only.

The firmware of the Lightware TPS devices can be upgraded individually by Lightware Device Updater (LDU) software. MMX4x2 -HT200 matrix contains a feature which allows having a faster and more comfortable firmware upgrade process. When the firmware of the connected extenders has to be upgraded the TPS connection is necessary towards the extenders – nothing else. The LDU will find the connected devices and can upgrade them.



The upgrade process is almost the same as in the case of the usual upgrade process. See the details of the process in the [Remote Firmware Upgrade of Connected Lightware Devices](#) section.

4

Operation

This chapter is about the powering and operating of the device describing the functions which are available by the front/rear controls:

- ▶ [FRONT PANEL LEDs](#)
- ▶ [FRONT PANEL BUTTONS](#)
- ▶ [SPECIAL FUNCTIONS](#)
- ▶ [REAR PANEL LEDs](#)
- ▶ [SOFTWARE CONTROL MODES](#)

4.1. Front Panel LEDs

4.1.1. Status LEDs



LIVE

- OFF:** The device is not powered.
- BLINKING:** (slow; 1 sec): Device is powered and operational.
(fast; 0,5 sec): Device is in bootload mode (firmware upgrade).
- ON:** The device is powered but no operation.

AUDIO OUT

- OFF:** Embedded audio is not present or analog audio output is muted.
- BLINKING:** Embedded audio format is not supported for audio de-embedding.
- ON:** Embedded audio is present and de-embedded.

OUT 1 AUTO

- OFF:** Autoselect is disabled on HDMI Output 1.
- ON:** Autoselect is enabled on HDMI Output 1.

OUT 2 AUTO

- OFF:** Autoselect is disabled on HDMI Output 2.
- ON:** Autoselect is enabled on HDMI Output 2.

INFO: You can find more information about Autoselect feature in [The Autoselect Feature](#) section.

4.1.2. Crosspoint Status LEDs (OUT 1 and OUT 2)



- ON:** Input is selected, signal is present.
- BLINKING (green):** Input is selected, signal is not present.
- BLINKING (amber):** Pre-programmed audio configuration (1..4) is selected by the **Set Audio Config** button. See the details in the [Set Audio Config Button](#) section.

4.2. Front Panel Buttons

4.2.1. OUT 1 and OUT 2 Video Select Buttons



You can select the input source for the desired output port with pushing the buttons. The sequence is the following for each device.

MMX4x2-HDMI:

→ HDMI IN ① → HDMI IN ② → HDMI IN ③ → HDMI IN ④ → Autoselect

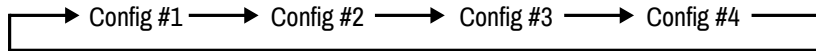
MMX4x2-HT200:

→ TPS IN ① → HDMI IN ② → HDMI IN ③ → HDMI IN ④ → Autoselect

4.2.2. Set Audio Config Button



You can select the pre-programmed audio configuration mode with pushing the button. The sequence is the following:



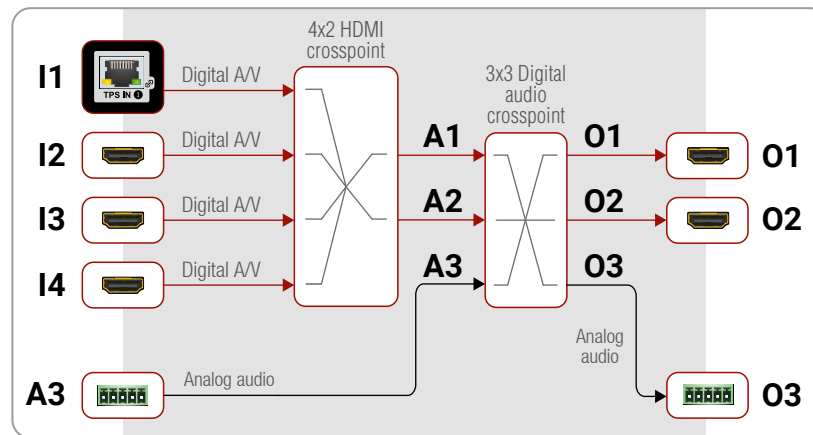
Config #1			
Copy HDMI OUT 1 audio to HDMI OUT 2 and Analog Audio Out.			
A1 (HDMI OUT 1 original)	A2 (HDMI OUT 2 original)	A3 (Analog In)	
✓			O1 (HDMI OUT 1)
✓			O2 (HDMI OUT 2)
✓			O3 (ANALOG OUT)

Config #2			
Copy HDMI OUT 2 audio to HDMI OUT 1 and Analog Audio Out.			
A1 (HDMI OUT 1 original)	A2 (HDMI OUT 2 original)	A3 (Analog In)	
	✓		O1 (HDMI OUT 1)
	✓		O2 (HDMI OUT 2)
	✓		O3 (ANALOG OUT)

Config #3			
Use audio from Analog Input on all outputs.			
A1 (HDMI OUT 1 original)	A2 (HDMI OUT 2 original)	A3 (Analog In)	
		✓	O1 (HDMI OUT 1)
		✓	O2 (HDMI OUT 2)
		✓	O3 (ANALOG OUT)

Config #4			
Keep Original Audio on HDMI outputs, de-embed from HDMI OUT 2 to Analog Audio Out.			
A1 (HDMI OUT 1 original)	A2 (HDMI OUT 2 original)	A3 (Analog In)	
✓			O1 (HDMI OUT 1)
	✓		O2 (HDMI OUT 2)
			O3 (ANALOG OUT)

The Port Diagram of MMX4x2-HT200:



4.3. Special Functions

4.3.1. Enable DHCP (Static) IP Address



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

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

4.3.2. Reset to Factory Default Settings



To restore factory default values, do the following steps:

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

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

4.3.3. Resetting the Device



In few cases (after firmware upgrade, etc) you may need to reset the device. Pushing the reset button results the same as you disconnect and reconnect the power adaptor to the matrix. To resetting 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 matrix when the LIVE LED is blinking slowly again.

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

4.3.4. Control Lock



Press the **OUT2 Video Select** and **Set Audio Config** buttons **together** (within 100 ms) to disable/enable front panel buttons; front panel LEDs blink 4 times when locking/unlocking. If the control lock is enabled and a button is pressed, front panel LEDs blink 3 times quickly.

4.3.5. Entering Firmware Upgrade Mode



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

Step 1. Make sure the matrix is powered off.

Step 2. Press and keep pressed the **Set Audio Config** button.

Step 3. Power on the matrix while the **Set Audio Config** button is being pressed. If the device is switched to firmware upgrade mode the LIVE LED is blinking quickly (less than 500 ms duty cycle). The other LEDs are off.

The procedure of firmware upgrade can be found in the [Firmware Upgrade](#) chapter.

4.4. Rear Panel LEDs

4.4.1. HDMI Input LEDs



OFF: Signal is not present on input.

ON: Signal is present on input.

4.4.2. TPS Input LED

INFO: The MMX4x2-HT200 model has TPS input port.



OFF: No TPS link is established between the matrix and the transmitter.

BLINKING: Low power mode or Ethernet fallback mode is active, see details in the [TPS Interface](#) section.

ON: TPS link is established.

4.4.3. HDMI Output LEDs



OFF: Output signal is not present or muted.

ON: Signal is present.

4.4.4. HDCP LEDs



OFF: Output signal is not HDCP-encrypted.

BLINKING: Non-HDCP capable device is connected, encrypted signal is replaced with red screen.

ON: Output signal is HDCP-encrypted.

4.5. Software Control Modes

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

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

5

Software Control - Lightware Device Controller

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

- ▶ INSTALL AND UPGRADE
- ▶ ESTABLISHING THE CONNECTION
- ▶ CROSSPOINT MENU
- ▶ PORT PROPERTIES WINDOWS
- ▶ DIAGNOSTIC TOOLS
- ▶ EDID MENU
- ▶ CONTROL MENU
- ▶ EVENT MANAGER
- ▶ SETTINGS MENU
- ▶ CONFIGURATION CLONING (BACKUP TAB)
- ▶ ADVANCED VIEW WINDOW

5.1. Install and Upgrade

INFO: After the installation, the Windows and the Mac application has the same look and functionality. This type of the installer is equal with the Normal install in case of Windows and results an updateable version with the same attributes.

Installation for Windows OS

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

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

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

Comparison of installation types

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

Installation for Mac OS X


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

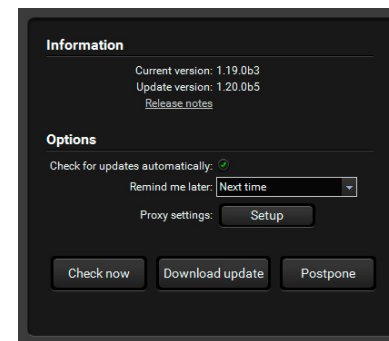
Upgrading of LDC

Step 1. Run the application.

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

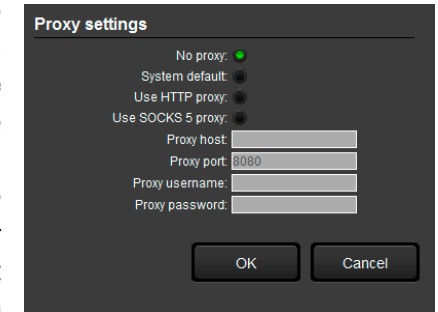
The current and the update version can be seen at the top of the window and they are shown in this window even with the snapshot install.

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



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

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



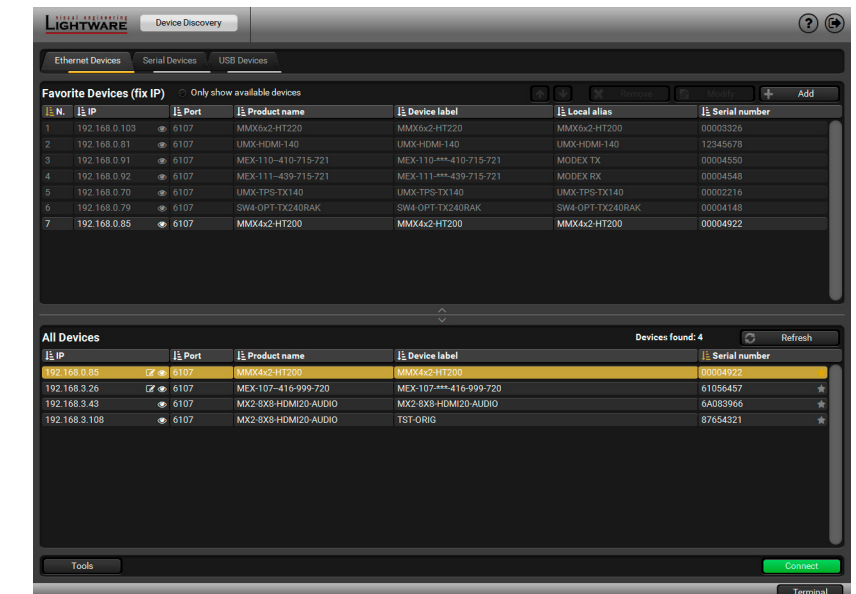
Step 3. Click the **Download update** button to start the upgrading.

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

5.2. Establishing the Connection

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

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

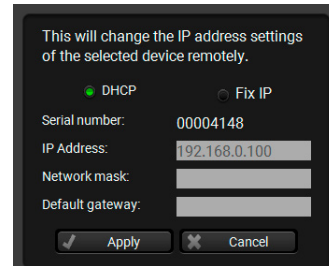


Device discovery window in LDC

Change IP Address

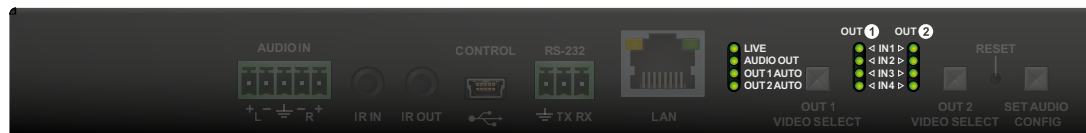
To modify IP address settings quickly it is not necessary to enter the device's settings/network menu, you can set them by clicking the pencil icon beside the IP address.

You can see the new settings only in this window.

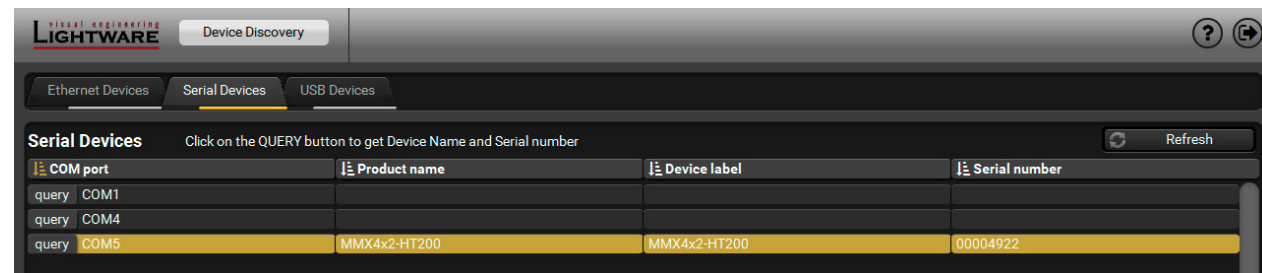


Identifying the Device

Clicking on the icon results the blinking of the status and crosspoint LEDs in green for 10 seconds. The feature helps to identify the device itself in the rack shelf.

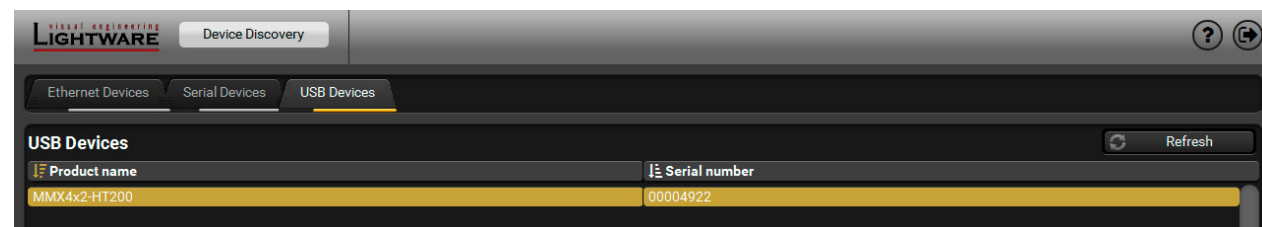


Step 3. Select the unit from the discovered Ethernet devices or under Serial devices; when the device is connected through RS-232 click on the **Query** button next to the desired serial port to display the device's name and serial number. Double click on the transmitter or select the device and click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



Serial devices tab in LDC

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

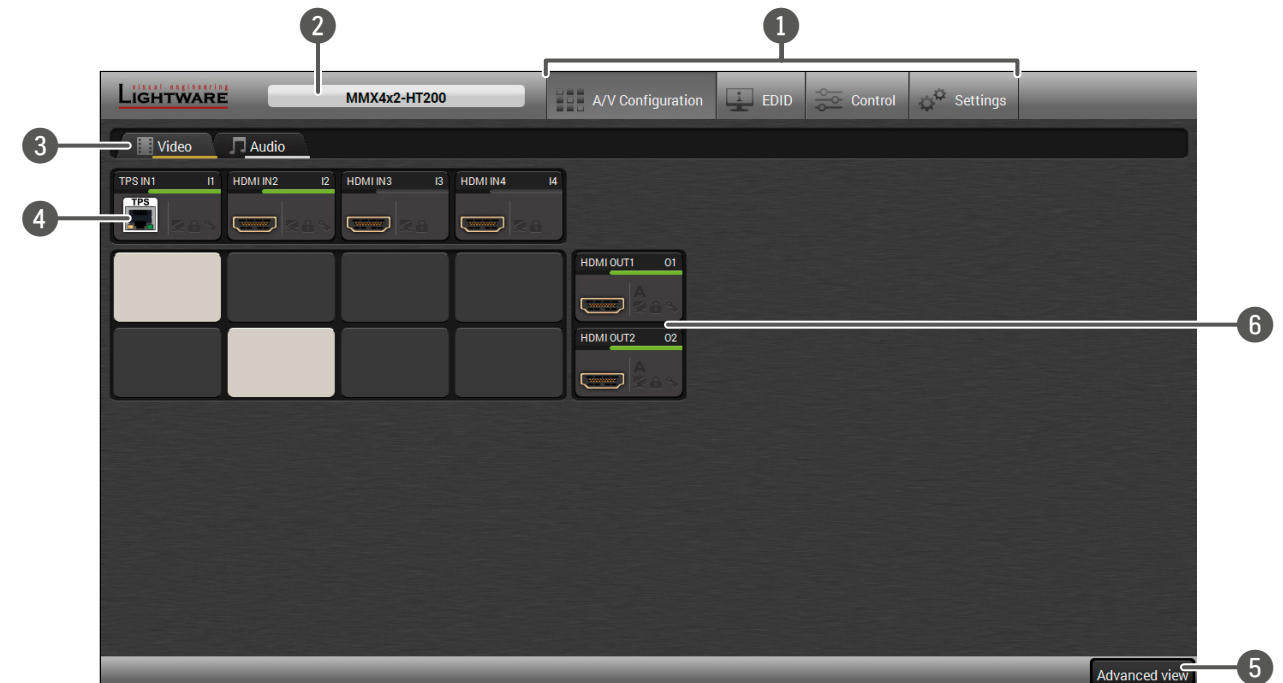


USB tab in LDC

5.3. Crosspoint Menu

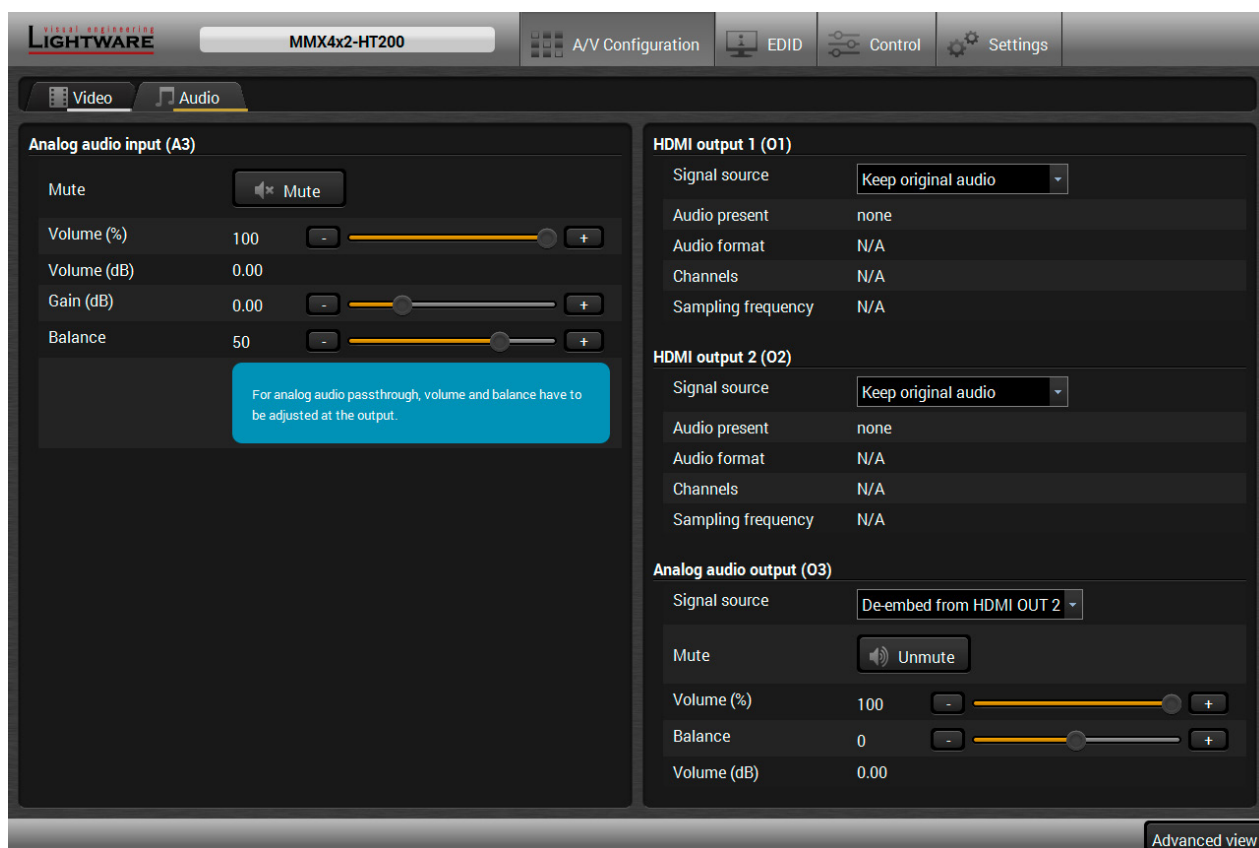
ATTENTION! The crosspoint menu and the audio port parameters are different in the case of firmware v1.1.0 and v1.2.0. If your device installed with v1.2.0, see the [The Crosspoint Menu for Firmware v1.2.0](#) section.

5.3.1. The Crosspoint Menu for Firmware v1.1.0



- 1 **Main menu** The available menu items are displayed. The active one is showed with dark grey background color.
- 2 **Information ribbon** The label shows the device label which can be edited in the Settings menu - [Status](#) tab. Device discovery window can be displayed by clicking on this ribbon.
- 3 **Submenu selector** The video crosspoint menu and the audio settings are available under the two tabs.
- 4 **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.
- 5 **Advanced view** Displaying the [Advanced View Window](#), showing the Terminal window and the LW3 protocol tree.
- 6 **Video output ports** HDMI output ports; clicking on the tile opens the [HDMI Video Output](#) port properties window.

5.3.1.1. Audio Tab



Analog Audio Input (A3)

The settings of analog audio input port are available on the panel.

- Mute/unmute the port;
- Volume (%): value can be set between 0 and 100. (The default is 100);
- Gain (dB): value can be set between -11.25 and 36. (The default is 0.00);
- Balance: value can be set between -100 and 100 where -100 is the left and 100 is right, center is 0 (default).

The Volume (dB) value changes with the Volume (%) settings between -95.62 and 0.

HDMI Output 1 (O1) and HDMI Output 2 (O2)

Settings and signal information are available on the panel.

Signal Source	
Keep original audio	The HDMI output transmits the original embedded audio which is received on in the TPS/HDMI input port.
Embed analog audio input	The audio signal of analog audio input is embedded to the HDMI output.

Analog Audio Output (O3)

The settings of analog audio output port are available on the panel.

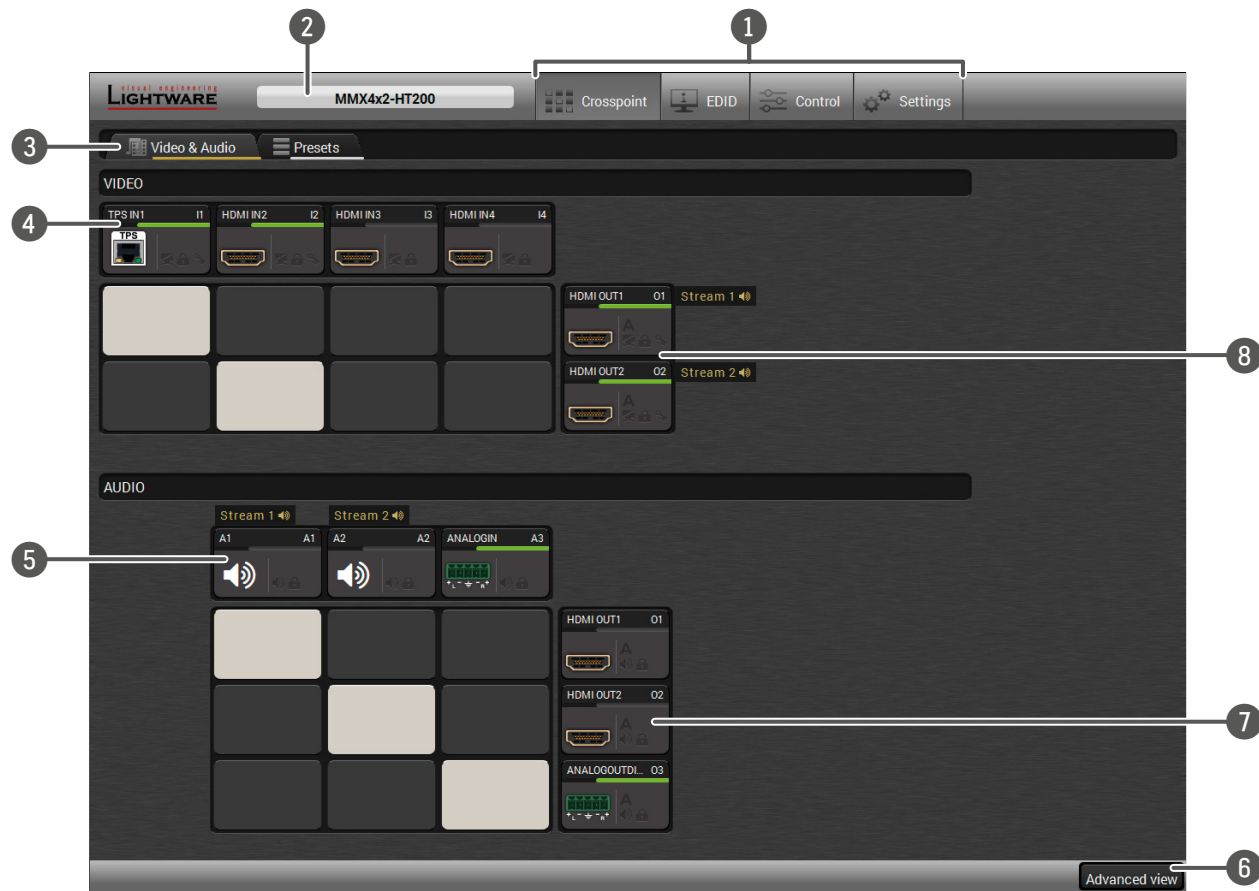
Signal Source	
De-embed from HDMI OUT 2	The analog audio output transmits the audio signal of HDMI output 2.
Analog pass-through	The analog audio output transmits the analog audio signal which is received on the analog audio input.

Analog Audio Settings:

- Mute/unmute the port;
- Volume (%): value can be set between 0 and 100. (The default is 100);
- Balance: value can be set between -100 and 100 where -100 is the left and 100 is right, center is 0 (default).

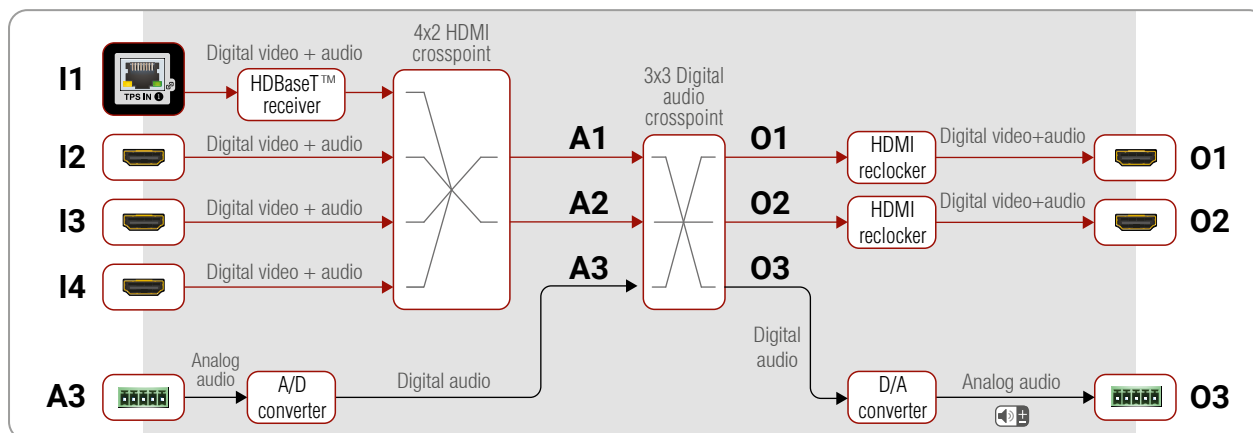
The Volume (dB) value changes with the Volume (%) settings between -95.62 and 0.

5.3.2. The Crosspoint Menu for Firmware v1.2.0



- 1 **Main menu** The available menu items are displayed. The active one is showed with dark grey background color.
- 2 **Information ribbon** The label shows the device label which can be edited in the Settings menu - [Status](#) tab. Device discovery window can be displayed by clicking on this ribbon.
- 3 **Submenu selector** The audio and video crosspoint menu and the presets settings are available under the two tabs.
- 4 **Video input ports** Each tile represents a video input port ([TPS Video Input](#) / [HDMI Video Input](#)). 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.
- 5 **Audio input ports** Each tile represents an audio input port. The A1 and A2 are logical audio ports, they mean the audio channel of the selected TPS/HDMI inputs. The A3 is the [Analog Audio Input](#).
- 6 **Advanced view** Displaying the [Advanced View Window](#), showing the Terminal window and the LW3 protocol tree.
- 7 **Audio output ports** HDMI and analog audio output ports; clicking on the O1/O2 tiles open the [Digital Audio Output](#) window; clicking on the O3 tiles open the [Analog Audio Output](#) window.
- 8 **Video output ports** HDMI video output ports; clicking on the tile opens the [HDMI Video Output](#) port properties window.

The Port Diagram of MMX4x2-HT200:

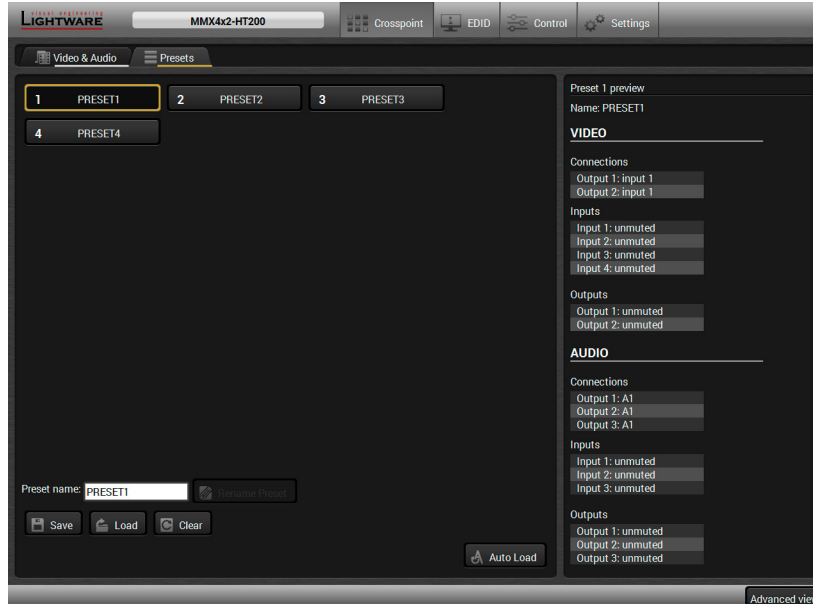


Steps of Crosspoint Selection:

- Step 1.** Select the source from the video inputs (I1...I4) in the VIDEO section. It will specify the digital audio input selection as well.
- Step 2.** Select the audio source from the audio inputs (A1...A3). A1 and A2 digital audio inputs come from the previously selected HDMI video outputs. A3 is the analog audio input which can be embedded to the HDMI output.

TIPS AND TRICKS: Pre-programmed audio crosspoint settings can be selected by the [Set Audio Config](#) button, see the details in the [Set Audio Config Button](#) section.

Presets Tab



Preset tab in the Crosspoint menu

The recent crosspoint states and settings can be saved in four presets and loaded when it required. You can set a unique name with the **Rename Preset** button and save with the **Save** button. Previously saved presets can be recalled by the **Load** button and delete the settings by the **Clear** button.

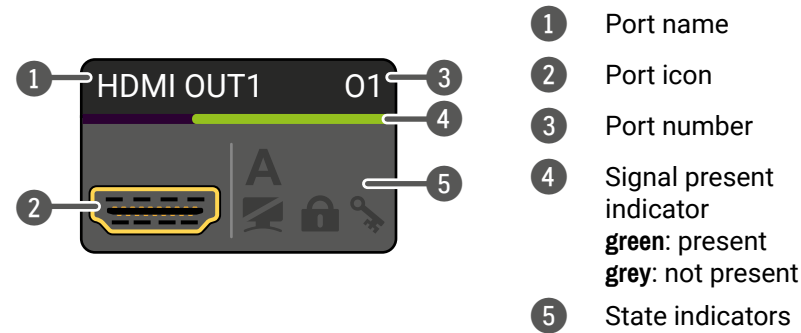
Auto Load Mode Button

When the **Auto Load** button is highlighted with green, the mode is active. In this case, confirmation is not required: the selected preset is loaded immediately when the button is pressed.



5.3.3. Port Tiles

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



State Indicators

Following icons display different states of the port/signal:

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

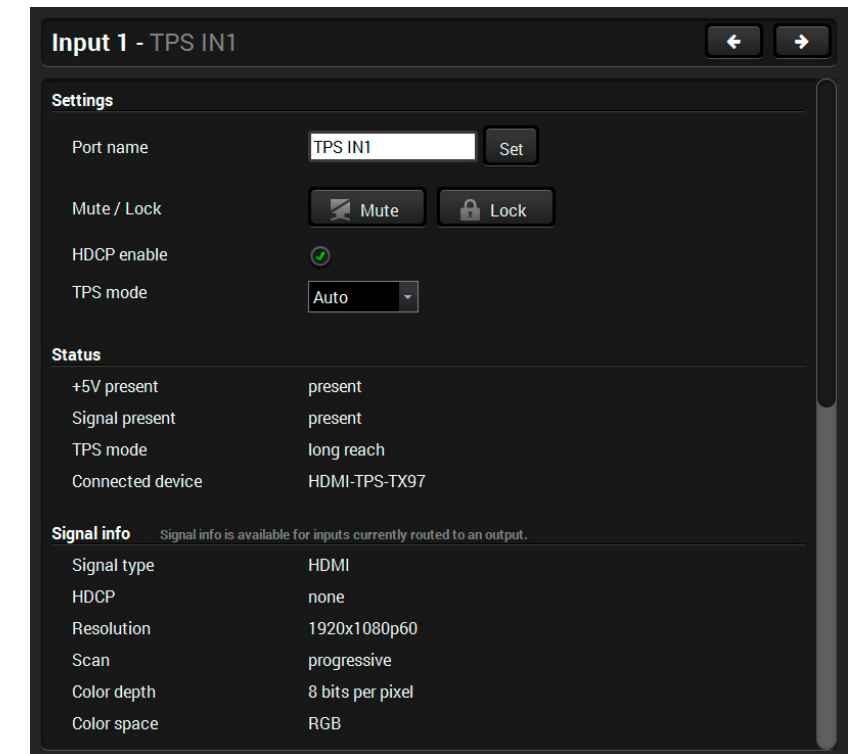
5.4. Port Properties Windows

Clicking on the port tile opens the Port properties window. This section shows the available settings and status information by port types.

5.4.1. TPS Video Input

INFO: Only MMX4x2-HT200 model has TPS input port.

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



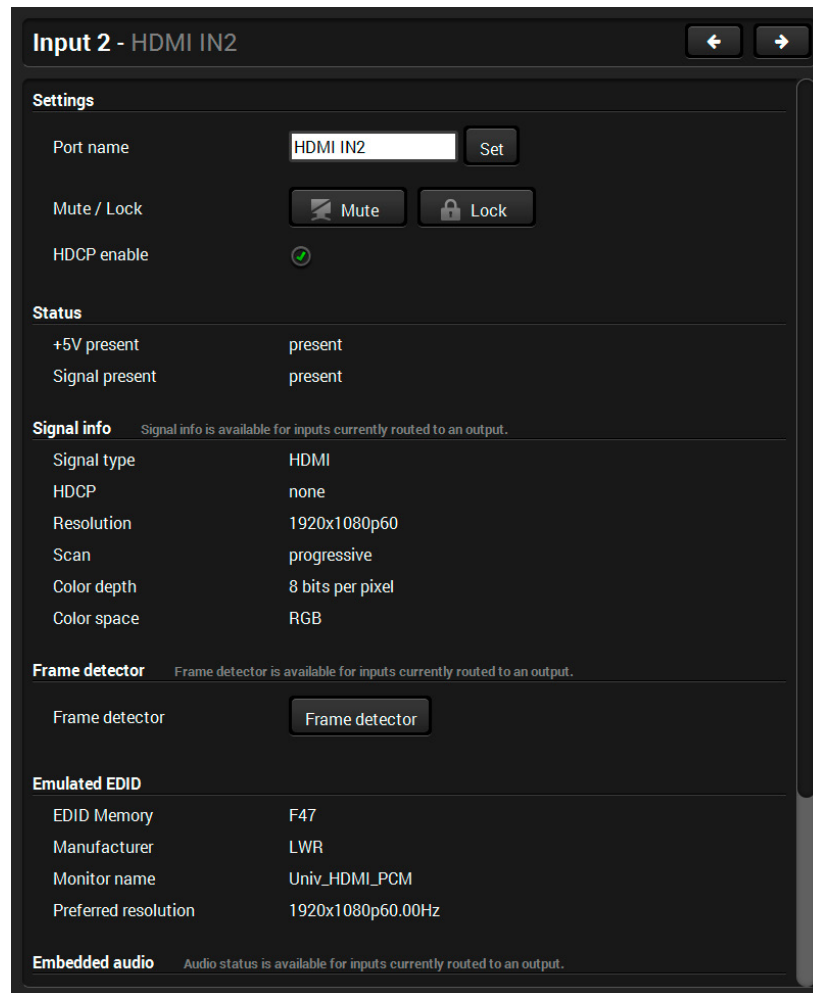
Port properties window of the TPS video input

Available settings and tools:

- Mute/unmute the port;
- Lock/unlock the port;
- HDCP setting (enable / disable);
- TPS mode (see the details in the [TPS Interface](#) section);
- [Frame Detector](#);
- [Cable Diagnostics](#);
- Reloading factory default settings for the selected port.

5.4.2. HDMI Video Input

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

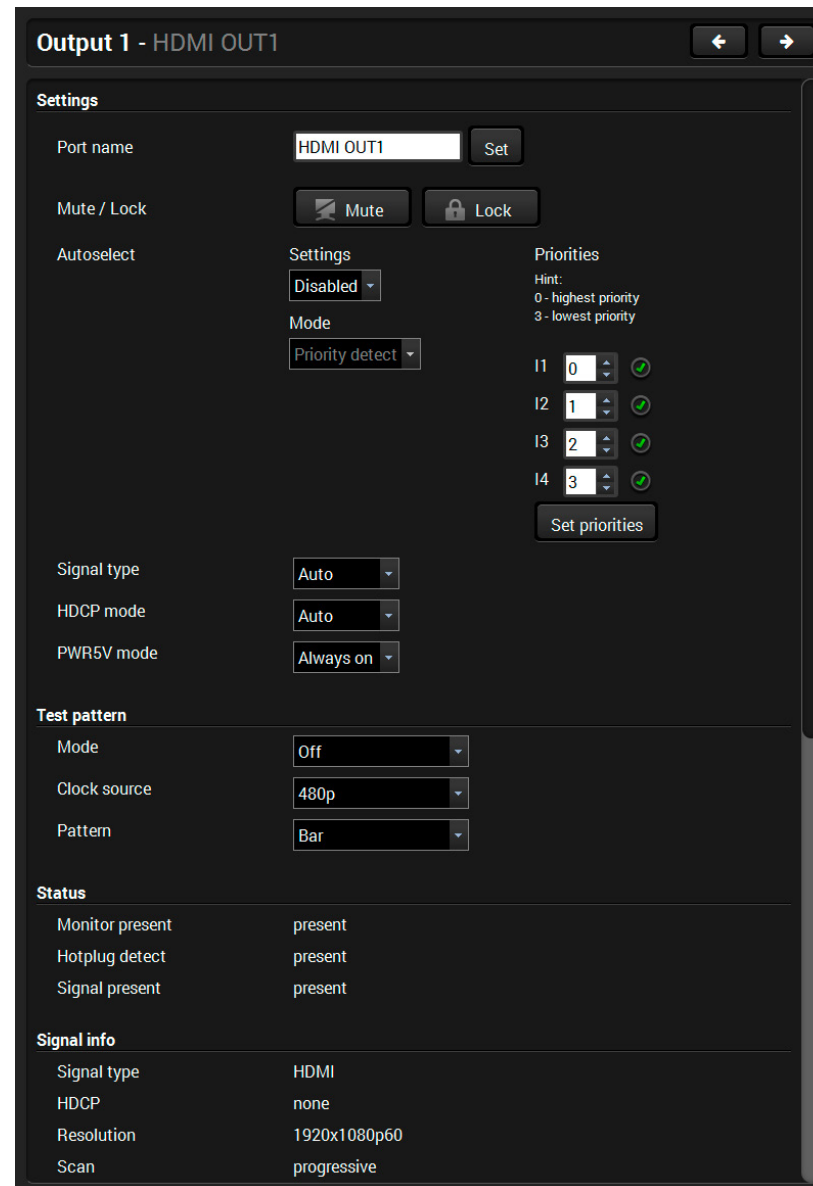


Port properties window of the HDMI video input

Available settings and tools:

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

5.4.3. HDMI Video Output



Port properties window of the HDMI video output

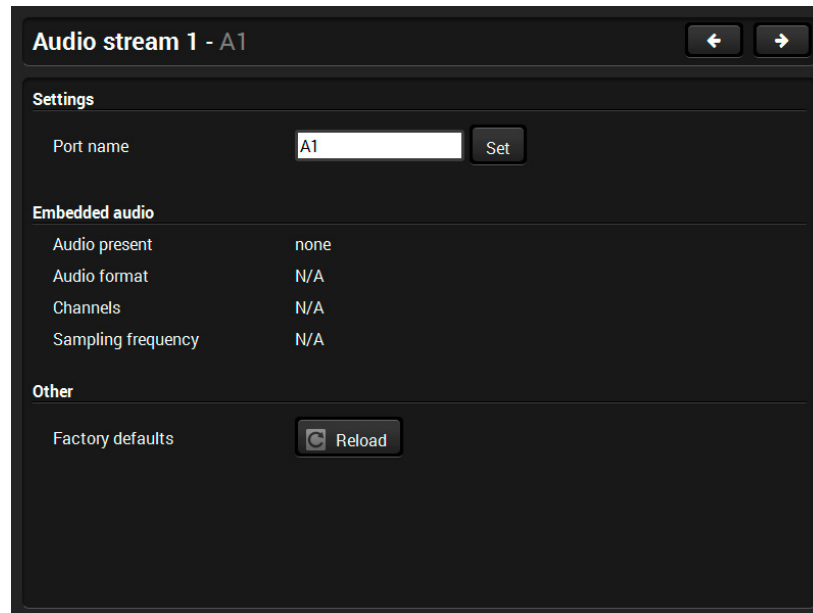
Available settings and tools:

- Mute/unmute the port;
- Lock/unlock the port;
- **Autoselect settings:** enable / disable, mode, and priorities. (See more details about the feature in [The Autoselect Feature](#) section). Pay attention for the following settings for the proper operation of Autoselect function:
 - Set the Autoselect settings to **Enabled**;
 - Be sure that no input is set to the same priority number;
 - Be sure that all priority values are filled in (no empty space);
 - Be sure that all inputs are enabled with the green pipe on the right side;
 - Always click on the **Set priorities** button after the changes to launch the new settings.
- **Signal type:** Auto / DVI / HDMI - The outgoing signal format can be selected by a drop-down menu;
- **HDCP mode:** Auto / Always - The transmitter forces the source sent the signal without encryption if the content allows when Auto mode is selected;
- **Power 5V mode:** Auto / Always on / Always off - The setting lets the source and the sink devices be connected – independently from the transmitted signal;
- **No sync screen:** configuration settings of the test pattern. See more details in the [No Sync Screen \(Test Pattern\)](#) section.
- [Frame Detector](#);
- Reloading factory default settings for the selected port.

5.4.4. Digital Audio Input

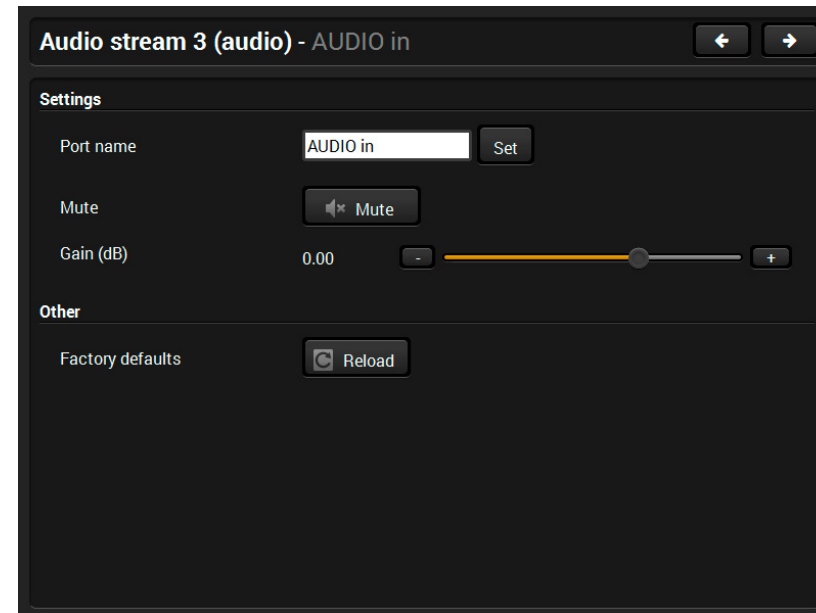
A1 and A2 inputs are logical audio ports which are the audio channels of the selected HDMI input ports.

ATTENTION! If the TPS/HDMI video input port is muted/locked, the digital audio input port belongs to it will also be muted/locked.



Port properties window of the A1 digital audio input

5.4.5. Analog Audio Input



Port properties window of the analog audio input

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

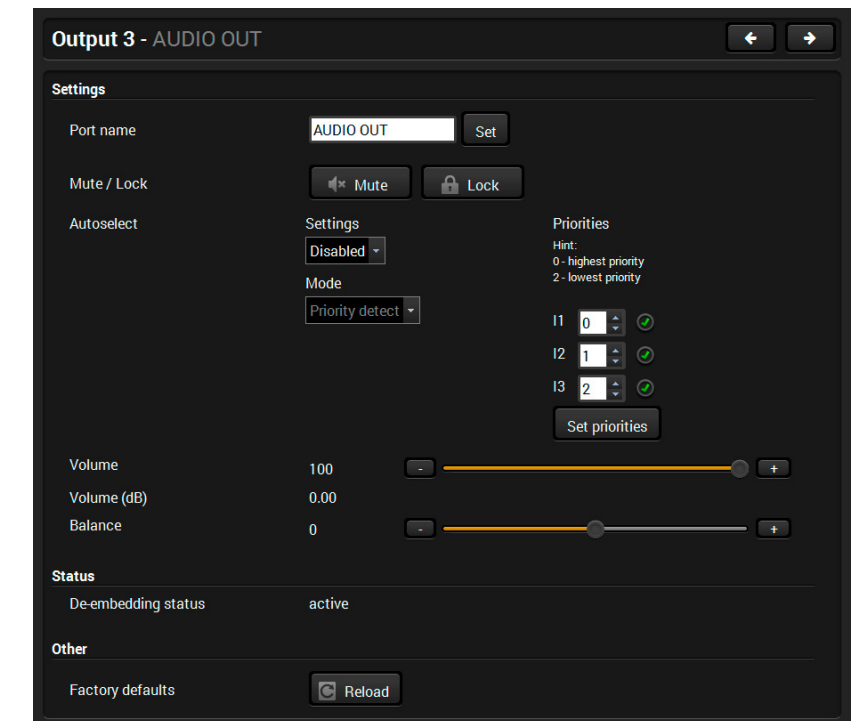
- Mute/unmute the port;
- Lock/unlock the port;
- Gain: -12 to 6 dB, in step 3 dB (default is 0 dB);
- Reloading factory default settings for the selected port.

5.4.6. Digital Audio Output

The port properties windows of the video and audio outputs are mirrored. For example the same window will be opened when you select the HDMI OUT1 on the Video or the Audio sections.

The available settings can be found in the [HDMI Video Output](#) section.

5.4.7. Analog Audio Output



Port properties window of the analog audio output

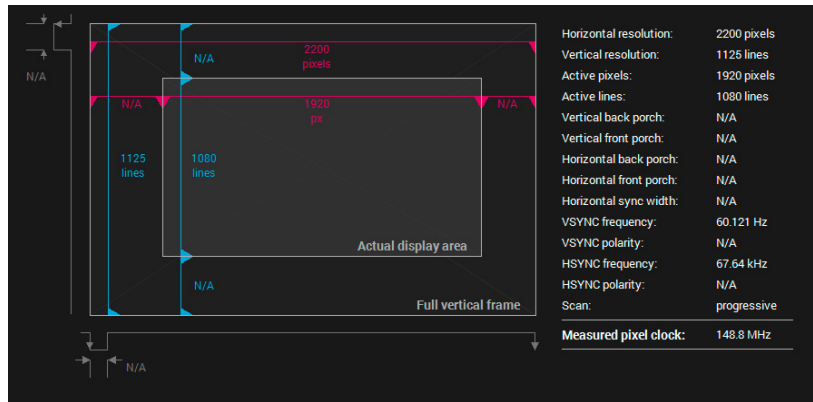
Available settings:

- Mute/unmute the port;
- Lock/unlock the port;
- **Autoselect settings:** enable / disable, mode, and priorities. (See more details about the feature in [The Autoselect Feature](#) section);
- Volume: from 100 to 0%, in step 1% (0 dB to -57 dB, in step 0.375 dB (default is 0 dB));
- Balance: from -100 to 100, in step 1 (default is 0 = center);
- Reloading factory default settings for the selected port.

5.5. Diagnostic Tools

5.5.1. Frame Detector

The ports can show detailed information about the signal like blanking intervals 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 **Frame detector** button.



Frame detector window

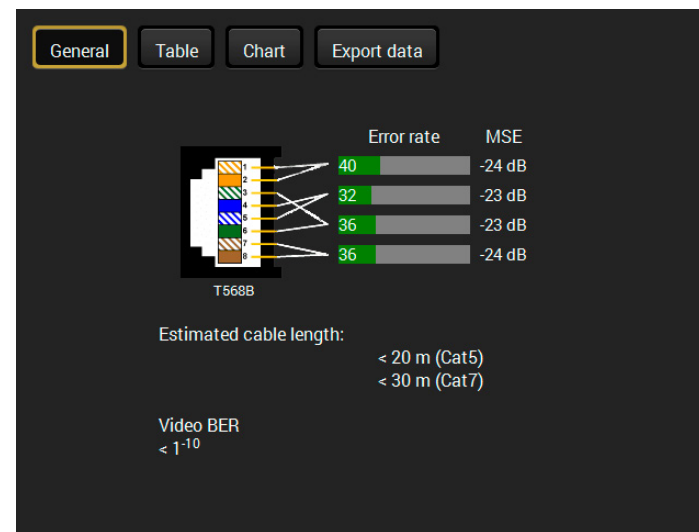
Lightware's Frame Detector function works like a signal analyzer and makes possible to determine the exact video format that is present on the port, thus helps to identify many problems. E.g. actual timing parameters may differ from the expected and this may cause some displays to drop the picture.

Frame Detector measures detailed timings on the video signals just like a built-in oscilloscope, but it is much more easy to use. Actual display area shows the active video size (light gray). Dark gray 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 actually on the signal and not retrieved only from the HDMI info frames.

5.5.2. Cable Diagnostics

The cable diagnostics is a useful tool to determine any cable related issues in case of TPS connection. The estimated cable length and the quality of the link are measured periodically and the diagnostic window shows the values in real-time. If the green bars hit the first line in the middle they turn into red. It means the number of the errors – during the extension – is higher than recommended. The link might be alive but recovering of the received data is not guaranteed.

INFO: Each bar represents a differential line in the CATx cable. The inappropriate termination of the cable usually causes high error rates. Check the cable terminations or change the cable.



Reference Values

Value	Explanation
10 ⁻¹⁰ -10 ⁻⁹	Excellent image quality
10 ⁻⁸	Minor error, not recognizable by eyes
10 ⁻⁷	Sometimes recognizable flash on a special test pattern
10 ⁻⁶	Small noise can be seen
10 ⁻⁵	Easy to recognize image error
10 ⁻⁴	Bad image quality

Above displayed "Video BER < 10⁻¹⁰" value means that on average there is 1 bad pixel after 10¹⁰ pixels, which means the number of the bit errors is about 1 pixel in every 15 minutes.

INFO: You can find more details about maximum twisted pair cable distances in the [Maximum Extension Distances](#) section.

Table and Chart Views

Cable diagnostics can be displayed in advanced modes as well. Two ways are available: **table view** and **chart view**. Data can be exported to a file on clicking on the **Export data** button.

The screenshot shows a window titled "Cable Diagnostics" with a table view selected. The table has columns for Date, MSE #1-4, Error rate #1-4, and Cable length. The data shows MSE values around -22 to -24 dB and Error rates around 26 to 52.

Date	MSE #1	MSE #2	MSE #3	MSE #4	Error rate #1	Error rate #2	Error rate #3	Error rate #4	Cable length
2016-11-12 09:57:23	-24	-22	-22	-22	28	52	32	34	< 20
2016-11-12 09:57:24	-24	-22	-22	-22	28	52	32	34	< 20
2016-11-12 09:57:25	-24	-22	-23	-23	28	46	30	34	< 20
2016-11-12 09:57:26	-24	-22	-22	-22	26	44	30	36	< 20
2016-11-12 09:57:27	-24	-22	-22	-22	26	44	30	36	< 20
2016-11-12 09:57:28	-24	-22	-23	-22	26	46	32	38	< 20
2016-11-12 09:57:29	-24	-22	-23	-22	26	46	32	38	< 20
2016-11-12 09:57:30	-24	-22	-23	-22	26	46	32	38	< 20

Table view of cable diagnostics

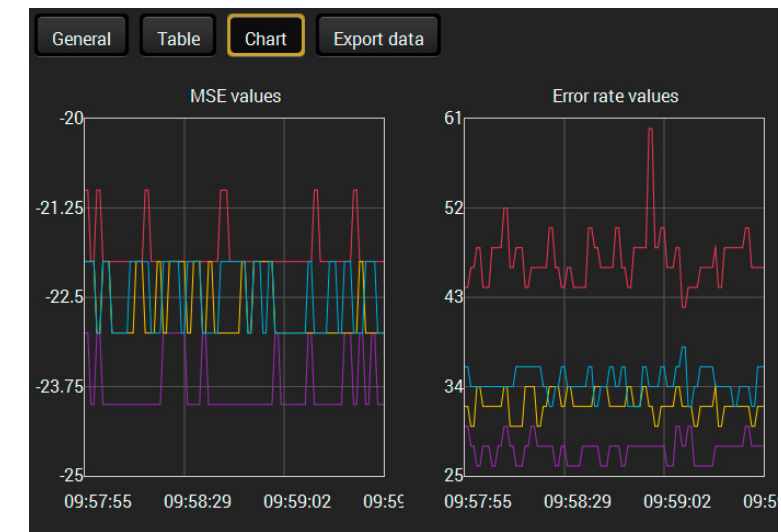
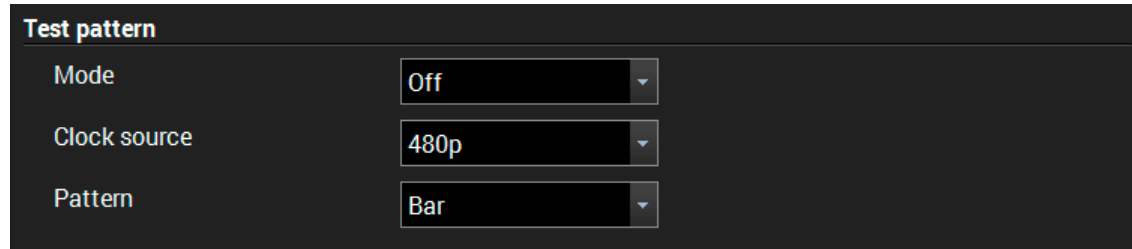


Chart view of cable diagnostics

5.5.3. No Sync Screen (Test Pattern)



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

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

Mode

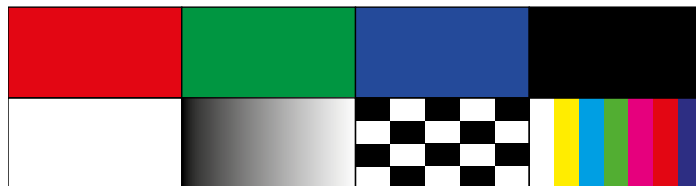
- **On:** the video output port always transmits the test pattern.
- **No signal:** the video output port transmits the test pattern if there is no incoming signal on the selected input port.
- **Off:** the test pattern function is disabled, the video output port transmits the video signal of the selected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

Clock Source

- 480p
- 576p
- Original video signal

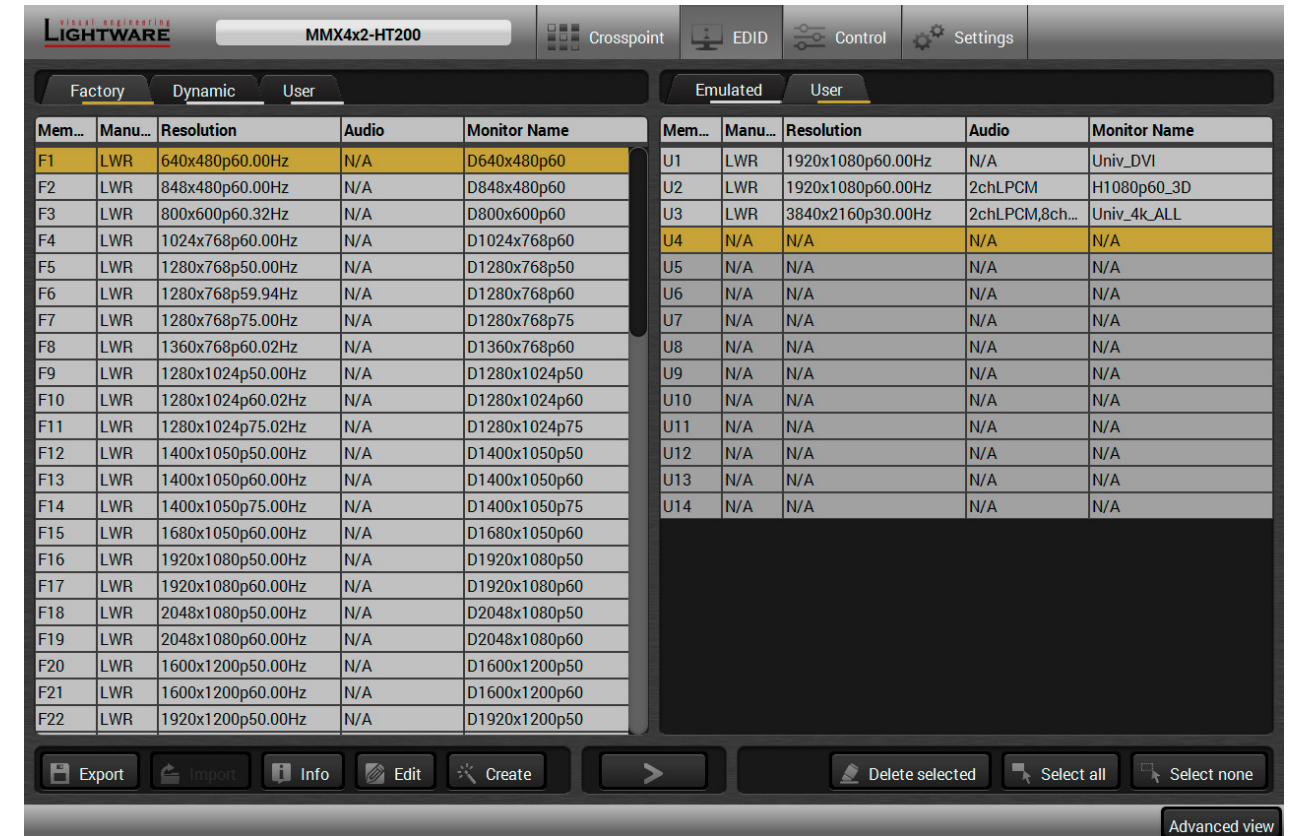
Pattern

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



5.6. EDID Menu

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




EDID menu

Control Buttons

- | | | | |
|--|---|--|--|
| | Exporting an EDID (save to a file) | | Transfer button: executing EDID emulation or copying |
| | Importing an EDID (load from a file) | | Deleting EDID (from User memory) |
| | Display EDID Summary window | | Selecting all memory places in the right panel |
| | Opening Advanced EDID Editor with the selected EDID | | Selecting none of the memory places in the right panel |
| | 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 cursor.
- Step 4.** Press the **Transfer** button to change the emulated EDID.


Learning an EDID

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

Exporting an EDID


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

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

- Step 1.** Select the desired **EDID** from the Source panel (line will be highlighted with yellow). 
- Step 2.** Press the **Export** button to open the dialog box and save the file to the computer.


Importing an EDID

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

- Step 1.** Press the **User** button on the top of the Source panel and select a **memory** slot. 
- Step 2.** Press the **Import** button below the Source panel.
- Step 3.** Browse the file in the opening window then press the **Open** button. Browsed EDID is imported into the selected User memory.

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

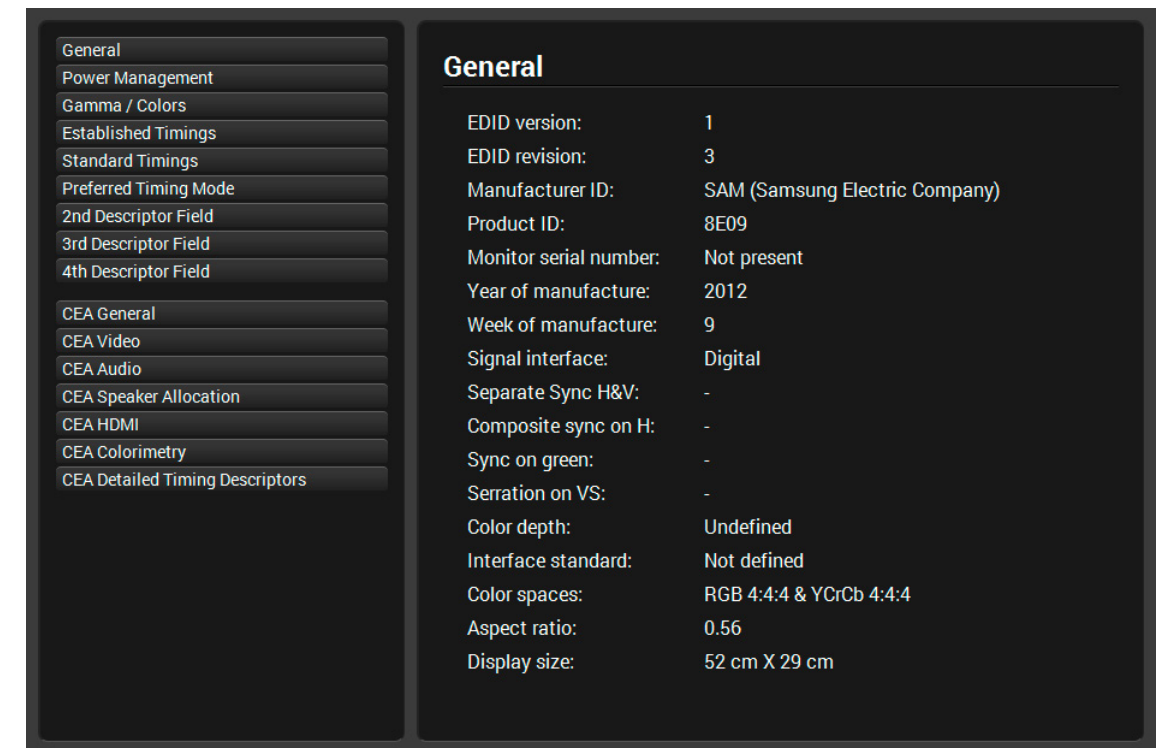
Deleting EDID(s)

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

- Step 1.** Press **User** button on the top of the Destination panel.
- Step 2.** Select the desired **memory** slot(s); one or more can be selected (“Select All” and “Select None” buttons can be used). The EDID(s) will be highlighted with yellow.
- Step 3.** Press the **Delete selected** button to delete the EDID(s).

5.6.2. EDID Summary Window

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



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

EDID summary window

5.6.3. Editing an EDID

Select an EDID from Source panel and press Edit button to display Advanced EDID Editor window. The editor can read and write all descriptors, which are defined in the standards, including the additional CEA 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 user's manual.



Basic EDID

- Vendor / Product Information
- Display Parameters
- Power Management and Features
- Gamma / Color and Established Timings
- Standard Timings
- Preferred Timing Mode
- 2nd Descriptor Field
- 3rd Descriptor Field
- 4th Descriptor Field
- CEA Extension
- General
- Video Data
- Audio Data
- Speaker Allocation Data
- HDMI
- Colorimetry
- Detailed Timing Descriptor #1
- Detailed Timing Descriptor #2
- Detailed Timing Descriptor #3
- Detailed Timing Descriptor #4
- Detailed Timing Descriptor #5
- Detailed Timing Descriptor #6
- Save EDID

EDID Byte Editor

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

EDID Editor window

5.6.4. Creating an EDID - Easy EDID Creator

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



Select Resolution & Interface

Video Format

Audio Format

Finish

Back Next

Select Resolution & Interface

Welcome to the Easy EDID Creator!

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

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

Important notes:

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

Format type: Broadcast

Resolution: 640x480p60

Interface type:

VGA

DVI

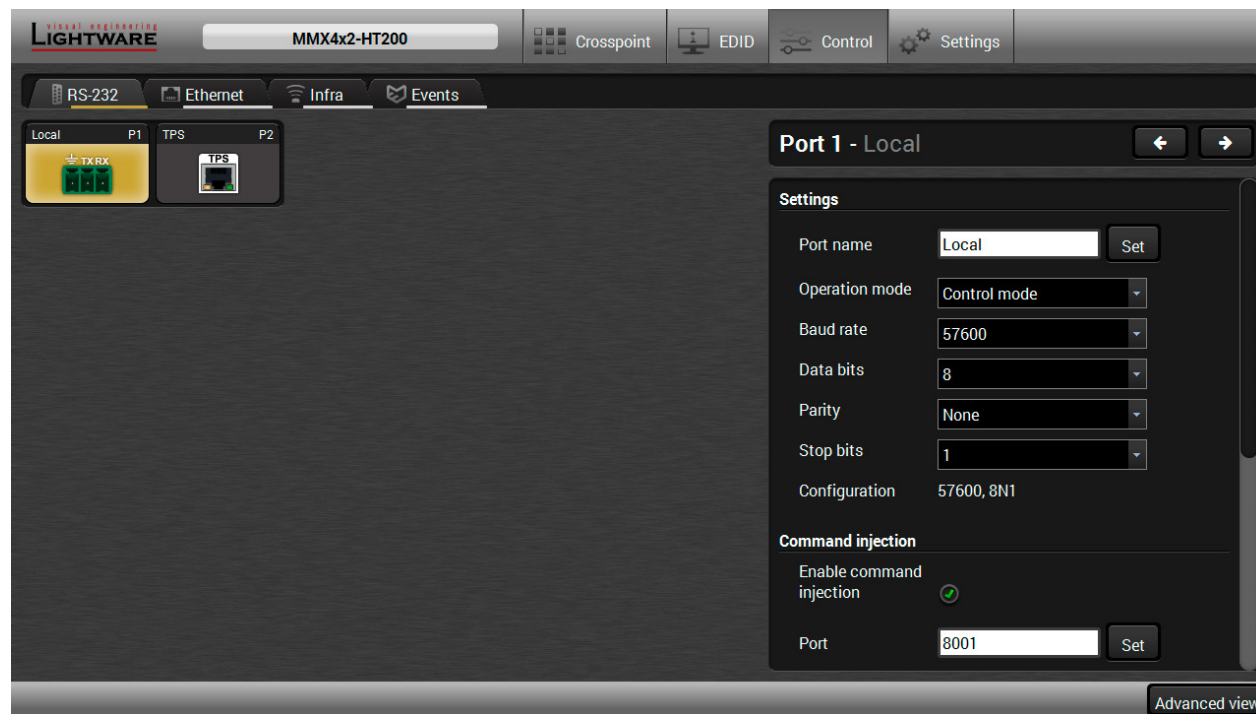
HDMI

DisplayPort

EDID Creator window

5.7. Control Menu

5.7.1. RS-232



RS-232 tab in Control menu

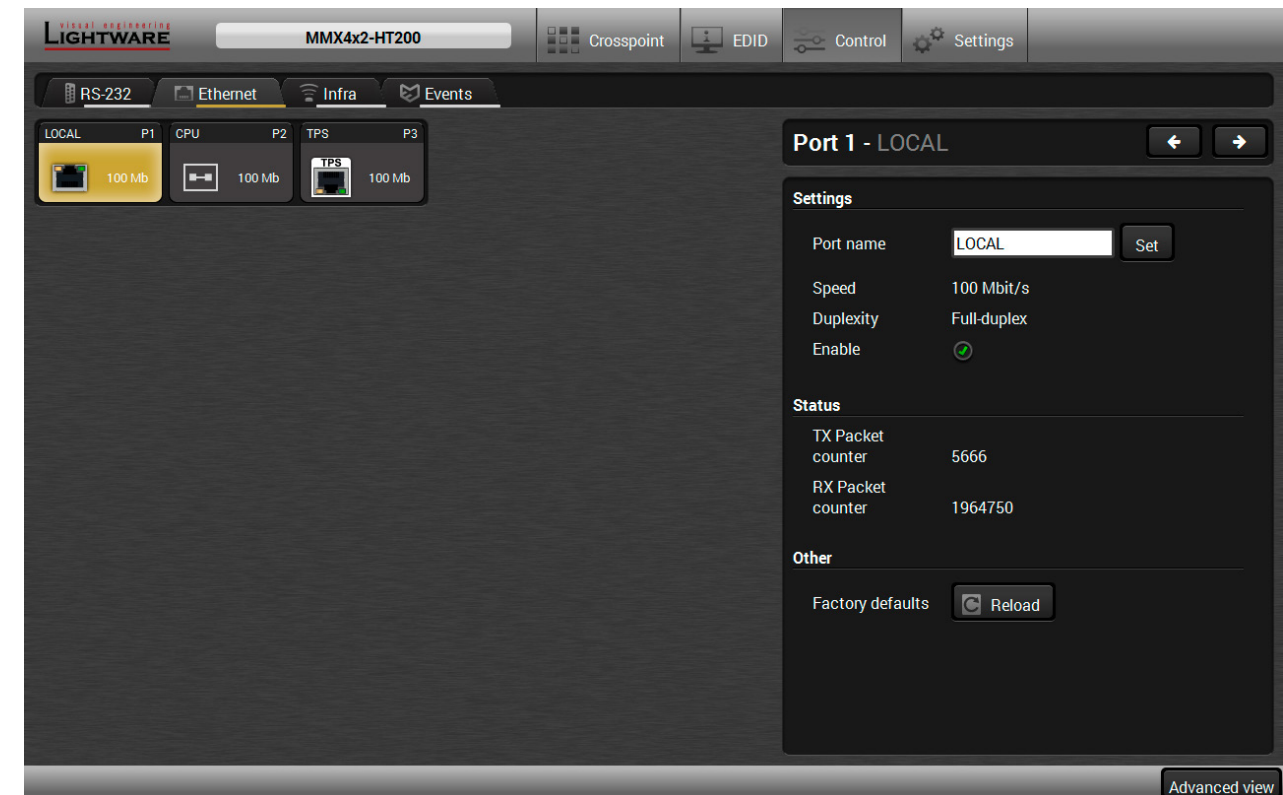
The following settings and functions are available (both on local and TPS* serial ports):

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

ATTENTION! If the matrix is connected to a TPS2 output board of a matrix frame, the RS-232 configuration settings (baud rate, data bits, e.t.c.) will not be changeable on the matrix side.

* Only MMX4x2-HT200 model has TPS serial port.

5.7.2. Ethernet



Ethernet tab in Control menu

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

The following settings are available for each ports:

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

* Only MMX4x2-HT200 model has TPS Ethernet port.

** CPU Ethernet port cannot be disabled.

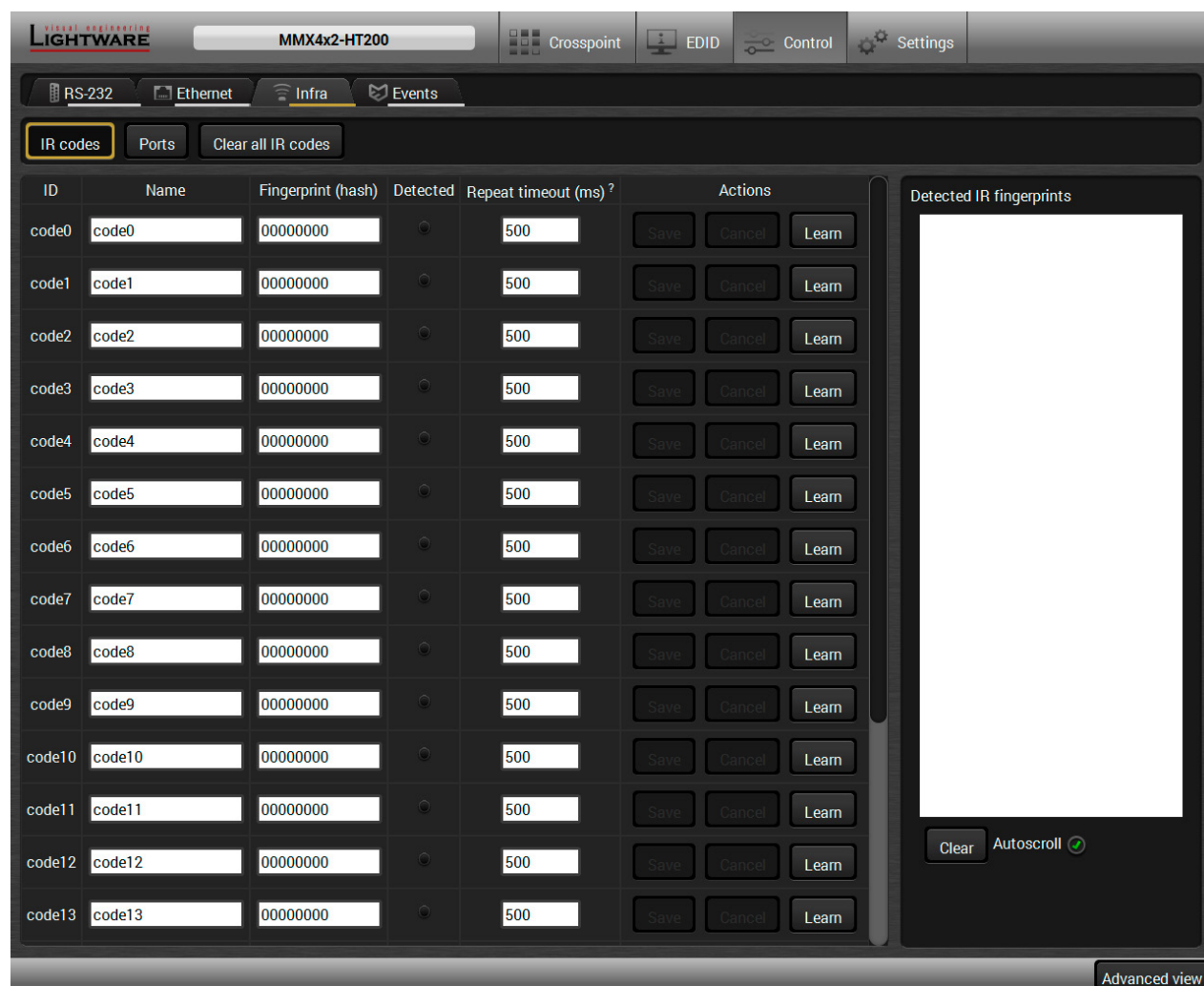
5.7.3. Infra

ATTENTION! The device has no built-in Infrared receiver and transmitter. For the complete usage attach an IR emitter unit to the IR OUT and an IR detector unit to the IR IN connectors.

Infrared (IR) receiver and transmitter options can be found on this tab. There are three submenus available under it: **IR codes**, **Ports**, and **Clear all IR codes**.

IR Codes

User can set the name of the IR code, the fingerprint (hash), and the repeat timeout in ms, as well as actions can be ordered to each IR codes.



IR codes window in Control menu

Description	Function
ID	Code number.
Name	You can give an unique name for the desired code.
Fingerprint (hash)	Fingerprint code in pronto hexa format.
Detected	Indicator gives feedback about the given IR code is detected currently.
Repeat timeout (ms)	You can set a timeout to avoid the involuntary code recurrence.
Actions	Action buttons for the desired IR code: Save: saving the fingerprint. Cancel: canceling the fingerprint. Learn: learning the detected IR code.
Detected IR fingerprints	You can check the detected IR codes in this panel. Pushing Clear button deleting all current fingerprints and switch on or off the automatic scrolling with the Autoscroll pipe.

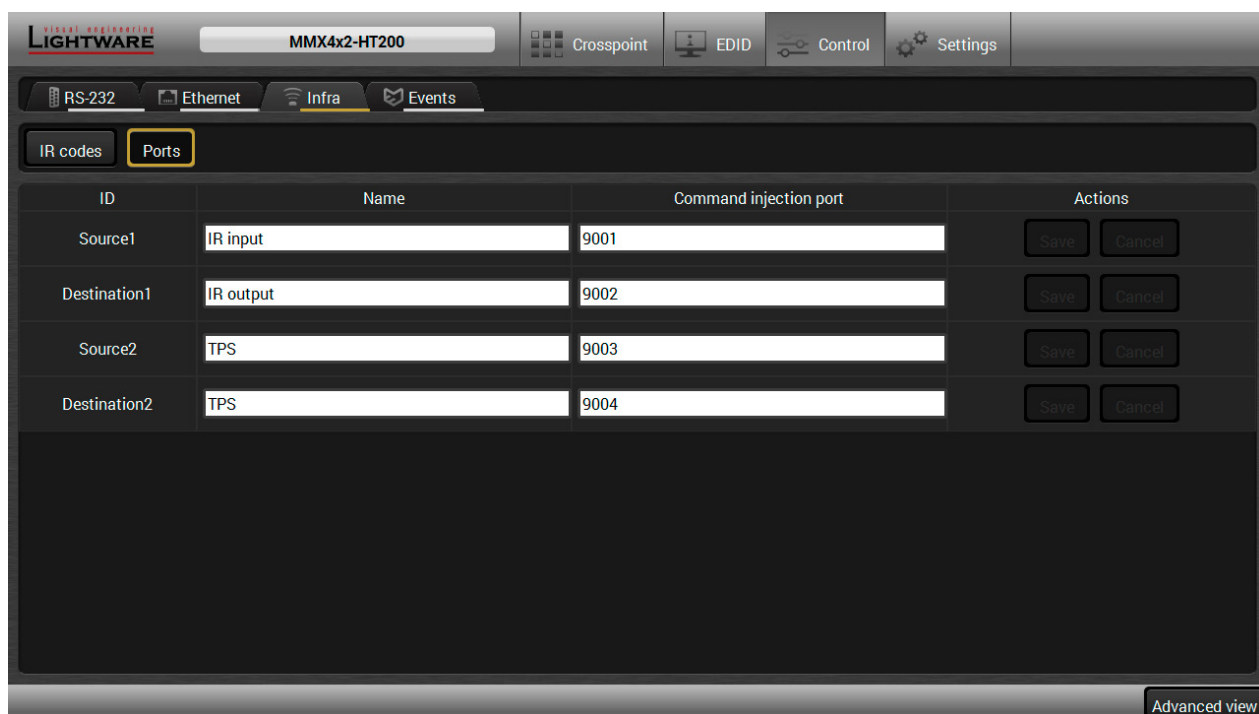
20 fingerprints can be stored in the device at the same time. Each of them can be ordered to an action in Event Manager. For more details about events see [Event Manager](#) section.

Learning IR Codes

- Step 1.** Connect the IR detector unit to the IR IN port of the receiver.
- Step 2.** Click on the **Learn** button.
- Step 3.** Turn the remote controller to the IR detector. A pop-up window appears in LDC - press your remote button to learn.
- Step 4.** Once the code is received, a new window pops up in LDC - learning completed. Click **OK** to continue.
- Step 5.** Optionally type a unique name for the code in the **Name** text box. The default name is code#, e.g. code0.

Ports

User can set the name and command injection port to each sources and destinations. For more details about IR interface see the [IR Interface](#) section.



Infra tab - Ports window

Clear all IR codes

Clicking on the button results deleting all stored IR fingerprints.

5.8. Event Manager

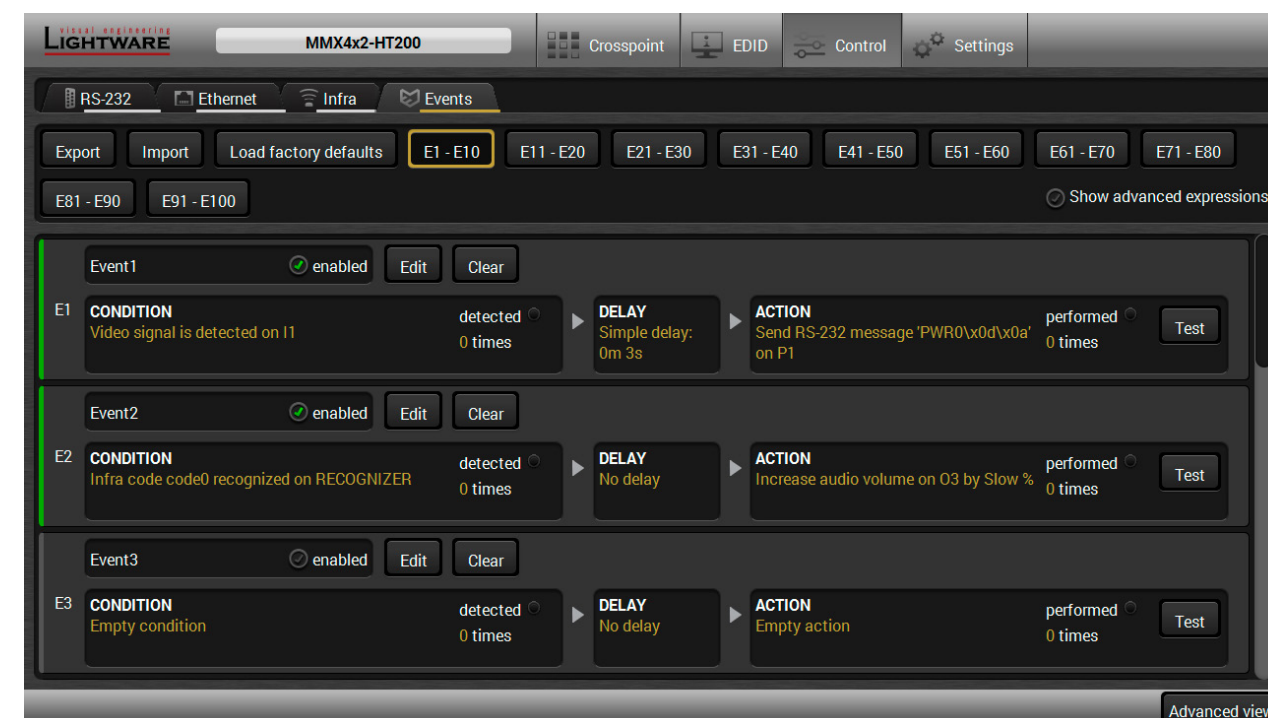
The feature means that the device can sense changes on its ports and able to react according to the pre-defined settings. The development idea of the Event manager is based on users' feedbacks. In many cases internal events (such as signal present or HDCP active) are necessary to display but it is not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



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

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

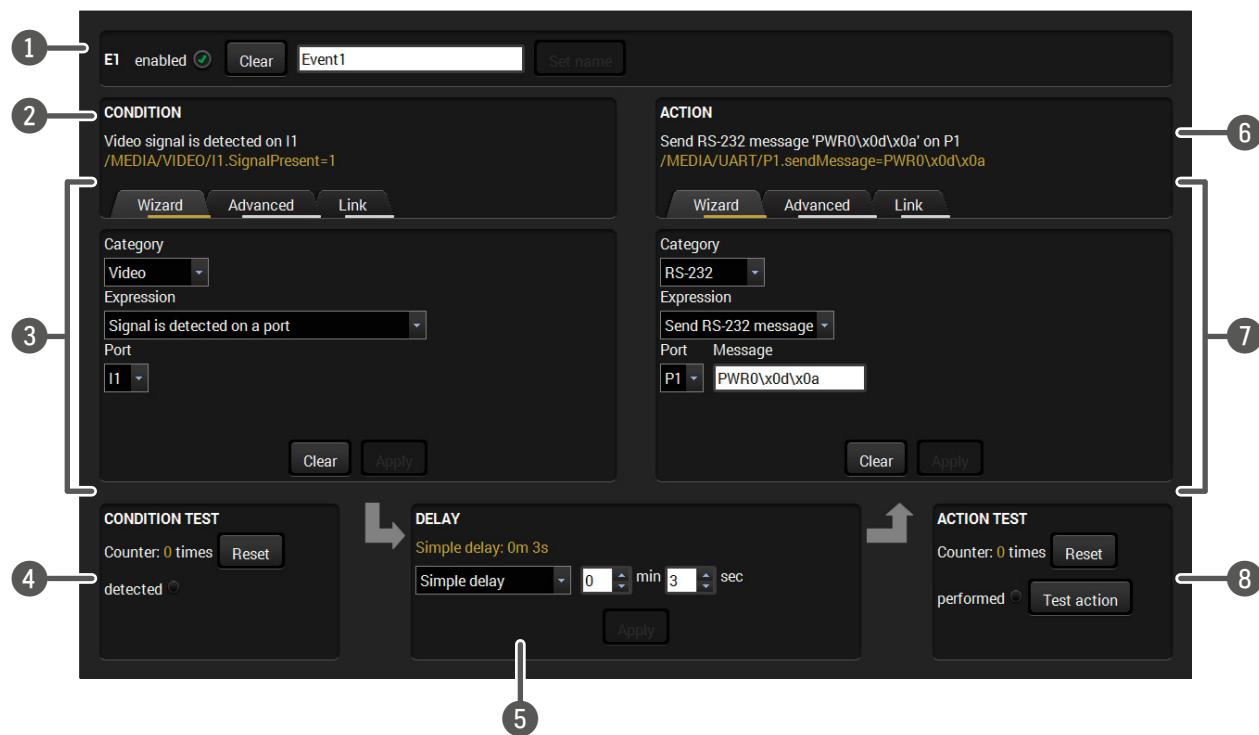
There is a **grey bar** on the left of the Event panel in each line. If a condition and an action are set and the Event is enabled, the bar is displayed in **green**.



Control menu, Event Manager tab

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 tool is available to set the condition. The parameters and settings are displayed below the buttons.
- 4 **Condition test** The set condition can be tested to see the working method in the practice.
- 5 **Delay settings** The action can be scheduled to follow the condition after the set time value.
- 6 **Action header** If the action is set, the description (white colored text) and the exact LW3 protocol expression (yellow colored text) can be seen. If the advanced mode was used the description is "Custom action".
- 7 **Action panel** The Wizard, the Advanced or the Link tool is available to set the action. The parameters and settings are displayed below the buttons.
- 8 **Action test** The set action can be tested to see the working method in the practice.

5.8.2. Create or Modify an Event

Wizard Mode

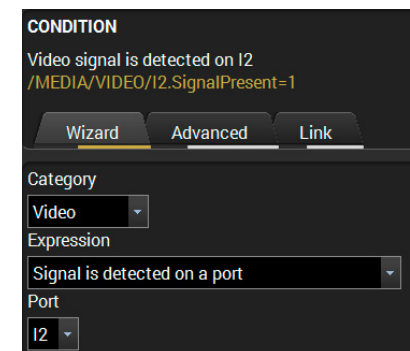
The wizard mode lists the most common conditions and actions, so the user does not have to look for LW3 nodes and properties.

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.



Advanced Mode

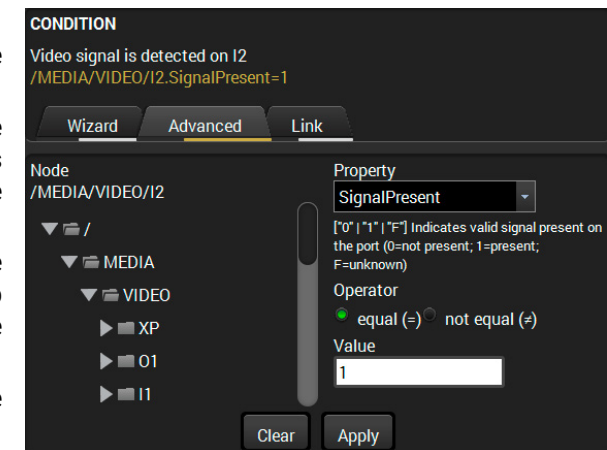
The goal of this mode is the same as of the wizard: set the properties and methods for conditions and actions. The difference is the number of the available and usable properties and methods of the LW3 protocol. Advanced mode allows almost all of it.

Step 1. Click on the **Edit** button of the desired Event; the **Event editor** is displayed.

Step 2. The wizard mode is the default, press the **Advanced** button. The LW3 protocol tree is displayed showing the list of the properties in the drop-down menu. Navigate to the desired node.

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

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



The Link Tool

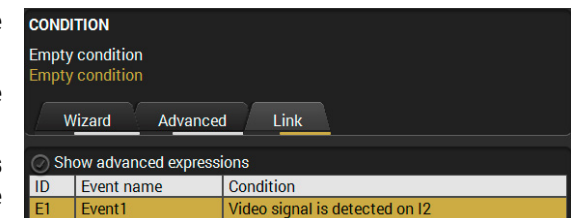
The new interface allows creating more actions to the same condition. In that case, a condition can trigger more actions. To set such an Event, the Link tool has been introduced.

Step 1. Click on the **Edit** button of the desired Event; the **Event editor** is displayed.

Step 2. The wizard mode is displayed as default, press the **Link** button.

Step 3. All the saved Events are analyzed and the **conditions** are listed (it takes some seconds to finish). The **Show advanced expressions** option allows showing the exact path and set the value of the given property.

Step 4. Select the desired **Condition** and press the **Apply** button to store the settings.



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 the **Set** button. The following characters are allowed when naming:

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

Enable or Disable an Event

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

Testing the Condition

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

Testing the Action

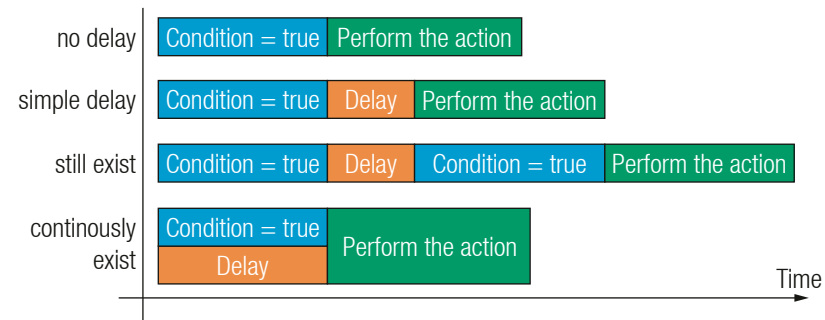
The method is the same as testing the Condition, but in this case, the Action can be triggered manually by pressing the **Test** button.

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

Delay the Action

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

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



The available delay settings of an Event

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 MMX4x2 series matrix.

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.

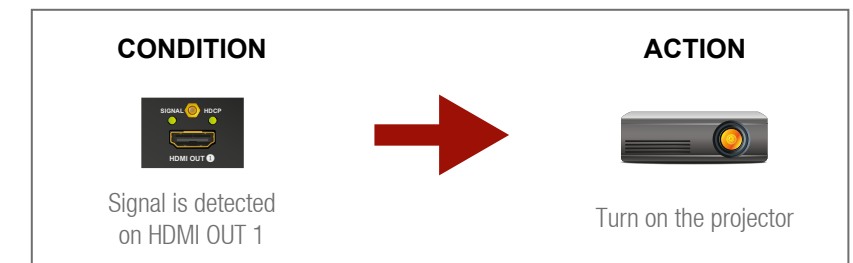
5.8.6. Event Creating - Example

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

The Concept

The MMX4x2-HDMI matrix is connected to a projector by the HDMI out 1 port. The matrix is also connected to the projector by the RS-232 port and can send commands via the serial line.

The task is to turn on the projector when signal is detected on the HDMI out 1 port.



RS-232 Settings

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

Setting the Event

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

Step 1. Set the condition.

Select the required parameters to set the condition:

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

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

Step 2. Set the action.

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

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

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

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


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

Select the required parameters to set the action:

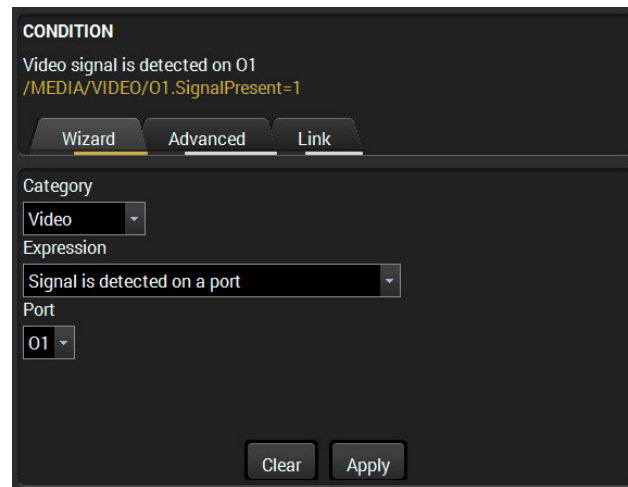
- **Category:** RS-232;
- **Expression:** Send RS-232 message;
- **Port:** P1;
- **Message:** PWR0\x0d\x0a

Step 3. Enable the Event.

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

E1 enabled 

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



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

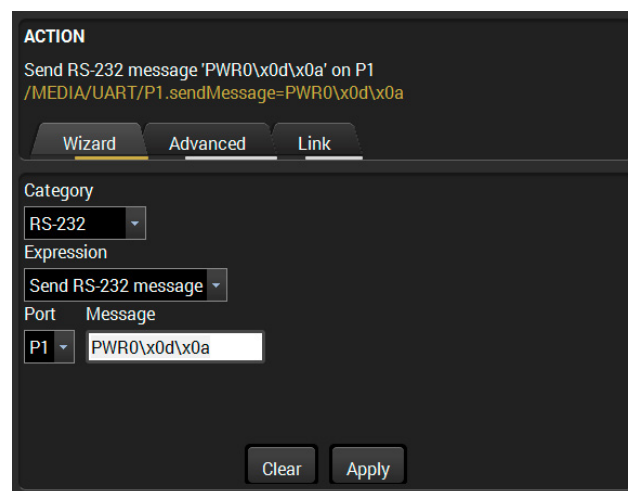
Wizard Advanced Link

Category
Video

Expression
Signal is detected on a port

Port
O1

Clear Apply



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

Wizard Advanced Link

Category
RS-232

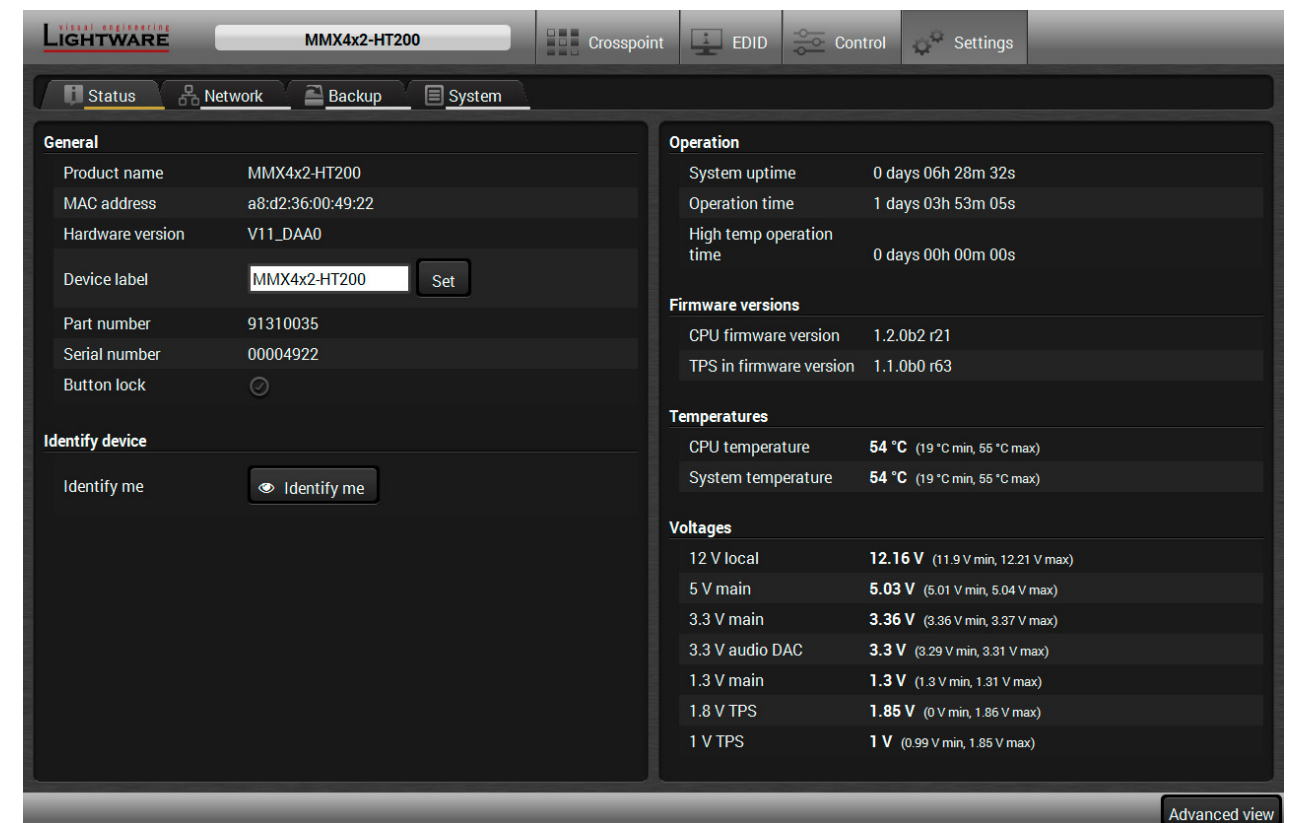
Expression
Send RS-232 message

Port Message
P1 PWR0\x0d\x0a

Clear Apply

5.9. Settings Menu

5.9.1. Status



General

Product name	MMX4x2-HT200
MAC address	a8:d2:36:00:49:22
Hardware version	V11_DAA0
Device label	MMX4x2-HT200 <input type="button" value="Set"/>
Part number	91310035
Serial number	00004922
Button lock	<input checked="" type="checkbox"/>

Identify device

Identify me

Operation

System uptime	0 days 06h 28m 32s
Operation time	1 days 03h 53m 05s
High temp operation time	0 days 00h 00m 00s

Firmware versions

CPU firmware version	1.2.0b2 r21
TPS in firmware version	1.1.0b0 r63

Temperatures

CPU temperature	54 °C (19 °C min, 55 °C max)
System temperature	54 °C (19 °C min, 55 °C max)

Voltages

12 V local	12.16 V (11.9 V min, 12.21 V max)
5 V main	5.03 V (5.01 V min, 5.04 V max)
3.3 V main	3.36 V (3.36 V min, 3.37 V max)
3.3 V audio DAC	3.3 V (3.29 V min, 3.31 V max)
1.3 V main	1.3 V (1.3 V min, 1.31 V max)
1.8 V TPS	1.85 V (0 V min, 1.86 V max)
1 V TPS	1 V (0.99 V min, 1.85 V max)

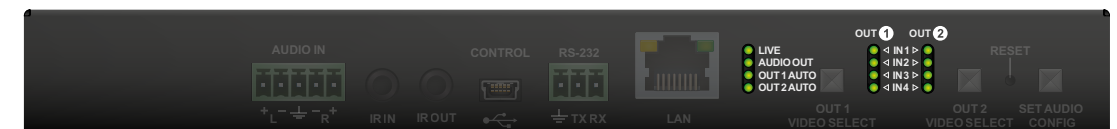
Advanced view

Status tab in Settings menu

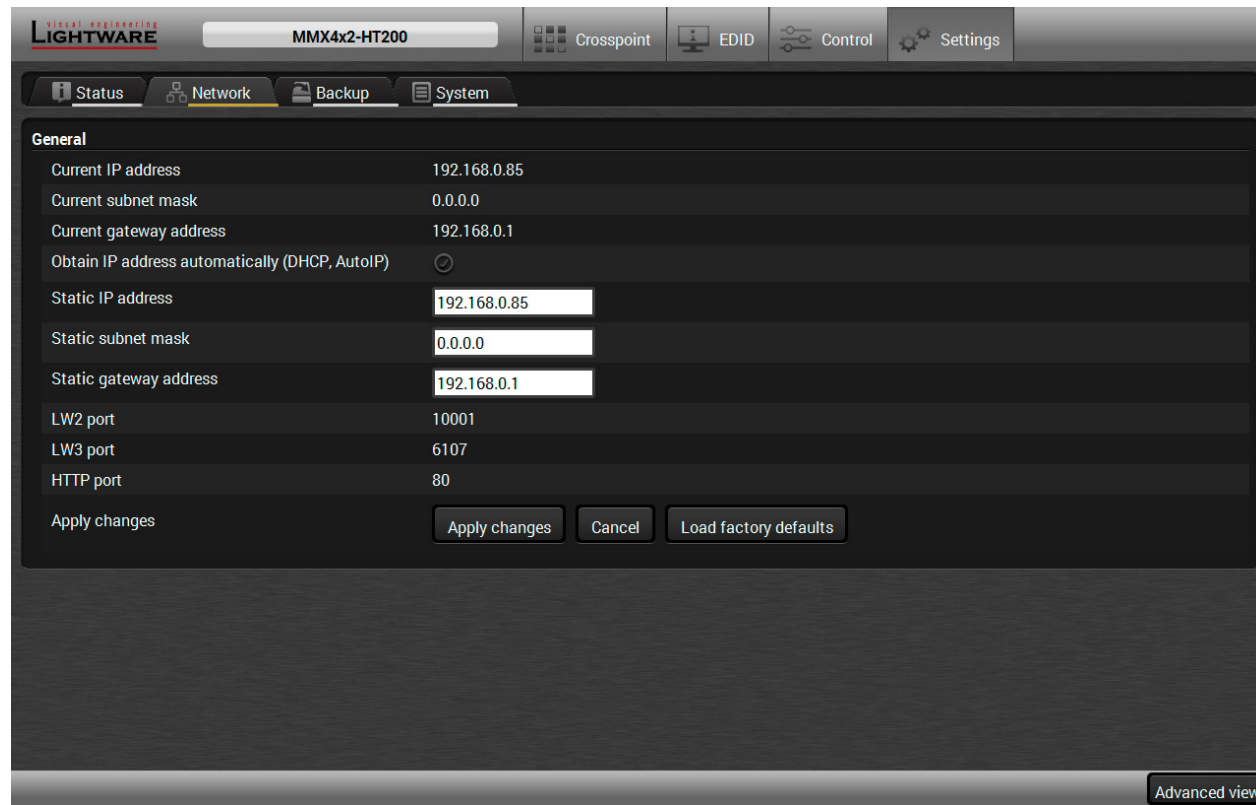
The most important hardware and software related information can be found on this tab: hardware and firmware version, serial numbers, temperatures, operation time, and voltage information. Device label can be changed to unique description by the **Set** button.

You can disable the functionality of the front panel buttons with marking the **Button lock** option. This is same method of the control lock made by the front panel buttons. See the details in the [Control Lock](#) section.

Clicking on the **Identify me** button results the blinking of the status and crosspoint LEDs in green for 10 seconds. The feature helps to identify the device itself in the rack shelf.



5.9.2. Network



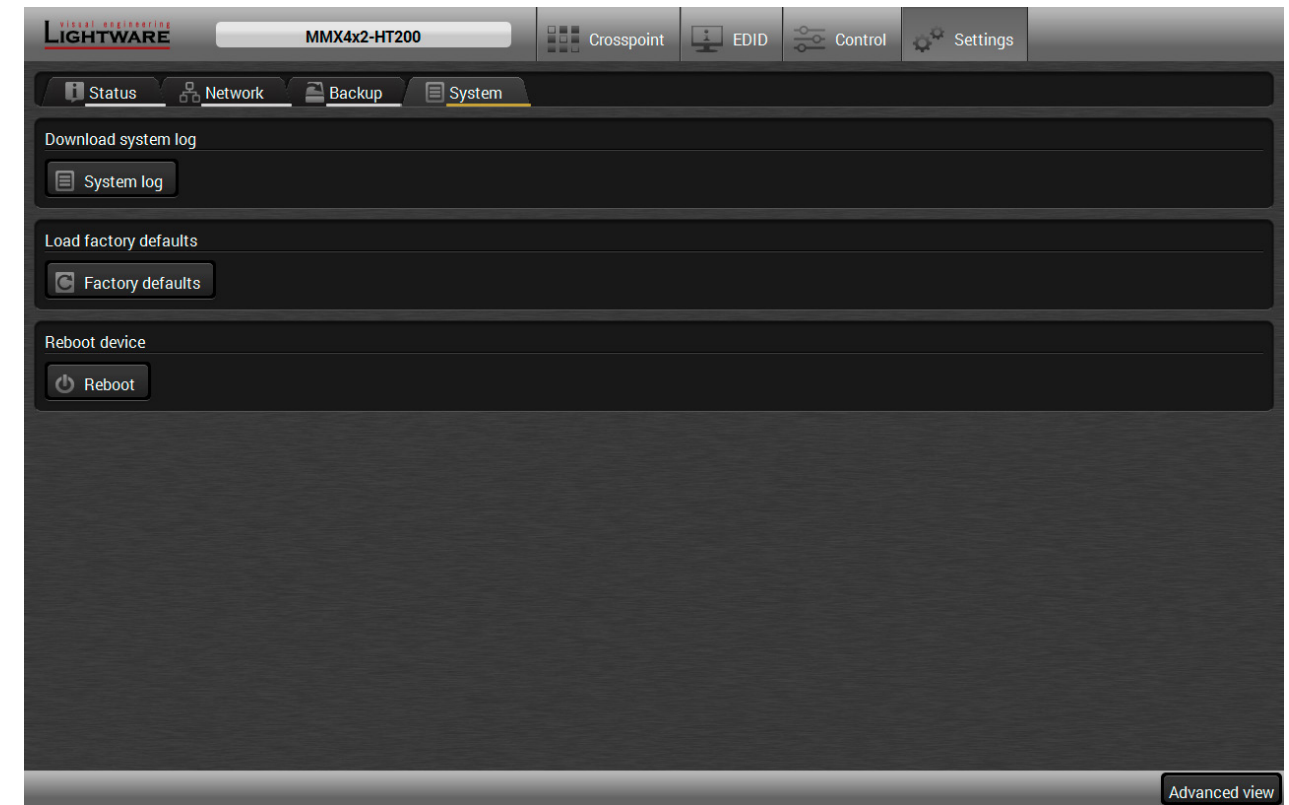
Network tab in Settings menu

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

5.9.3. Backup

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

5.9.4. System

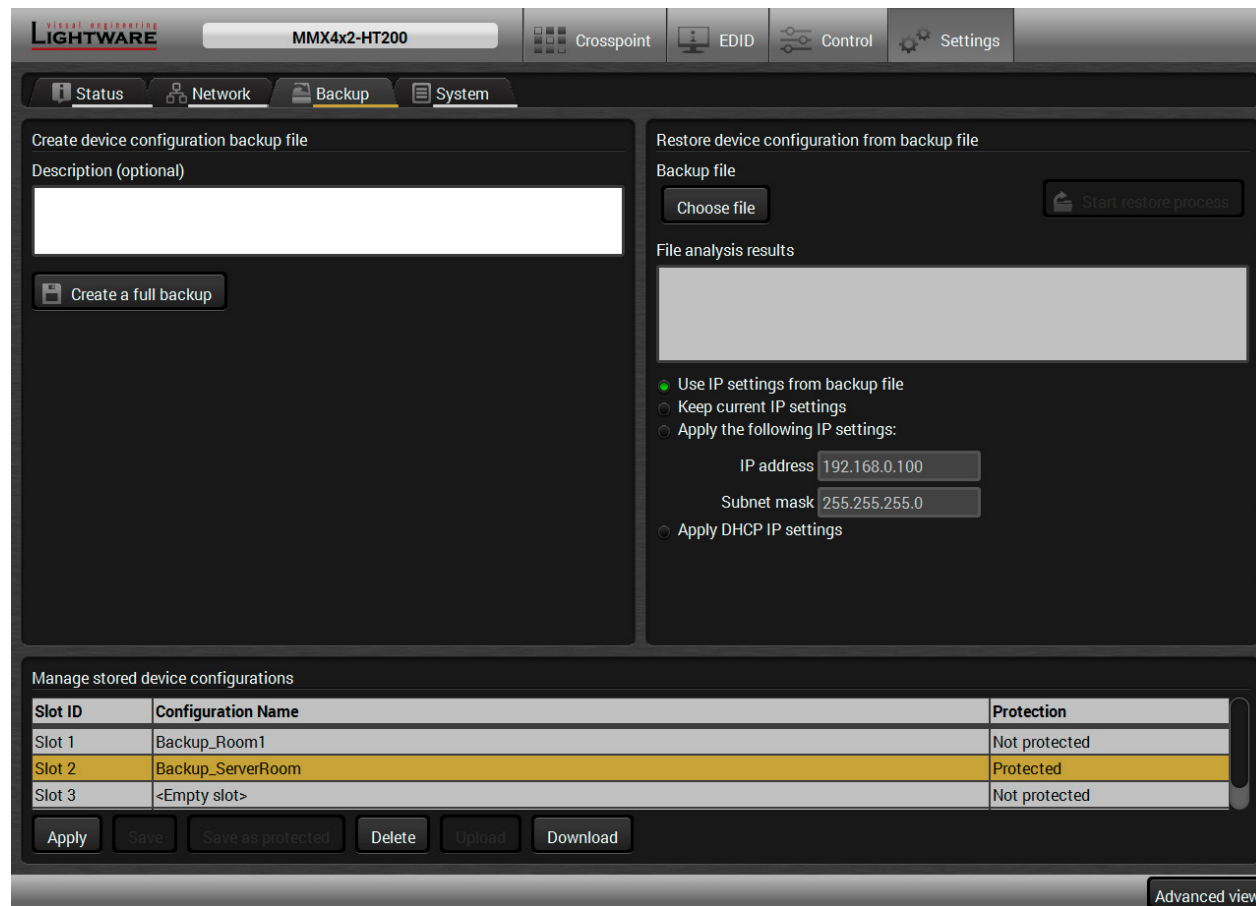


System tab in Settings menu

Three functions are available under System tab:

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

5.10. Configuration Cloning (Backup Tab)



Backup tab

The 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.

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

5.10.2. Save the Settings of the Device (Backup)

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

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

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

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

About the Backup File

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

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

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

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 is successful when the backup file is downloaded from the same type of source device as the destination device.

The Restoring Process

- Step 1.** Select the **Settings / Backup** tab from the menu.
- Step 2.** Click on the **Choose file** button on the right panel and **browse** 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.** Choose **IP settings** what you want to use after backup. You can apply settings from the backup file, keep actual settings, set it manually in a dialog box or apply DHCP.
- Step 5.** Press the **Start restore process** button and click on the **Yes** button when asked.
- Step 6.** Reboot the device to apply the network settings after finishing.

5.10.4. Create and Restore Backups from the Device Memory

MMX4x2 series matrix is able to store backups in its own memory and can be recalled from there so user does not need to save backup files to the local computer. Four slots are available for this purpose.

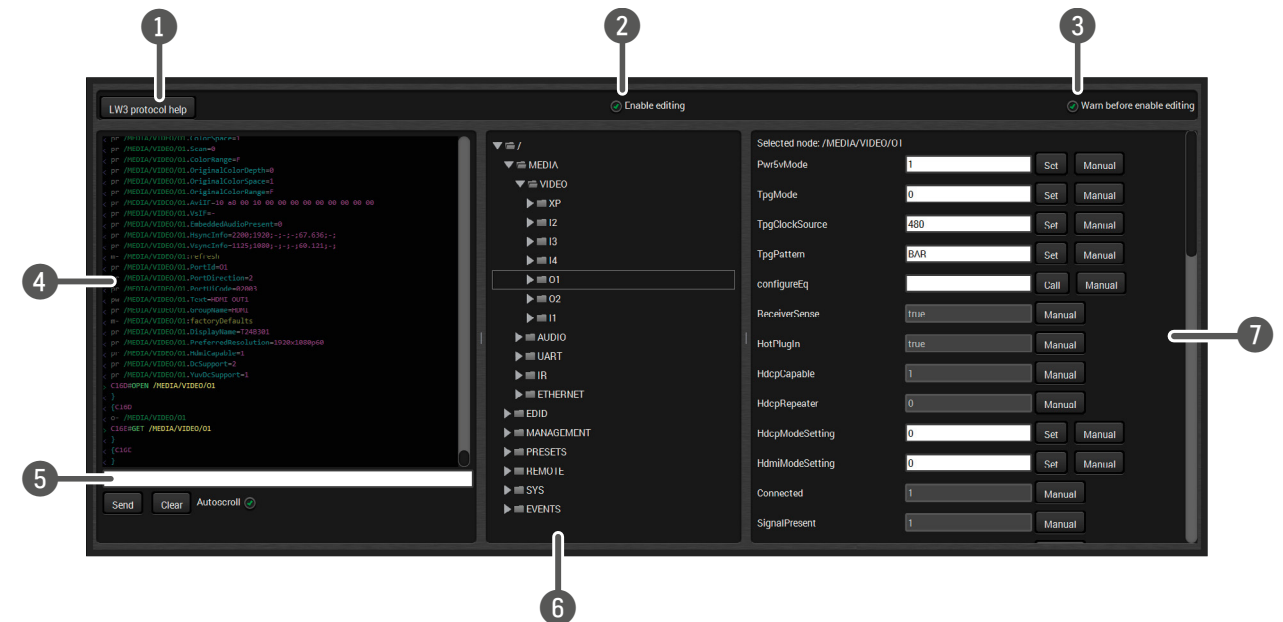
Slot ID	Configuration Name	Protection
Slot 1	Preset_0720	Not protected
Slot 2	backup_0125	Protected
Slot 3	<Empty slot>	Not protected
Slot 4	<Empty slot>	Not protected

Buttons: Apply, Save, Save as protected, Delete, Upload, Download

You can save presets as not protected with using **Save** button and as protected with using the **Save as protected** button. Restoring a preset select on the slot of the desired backup and click on the **Apply** button. You can save presets from a file from your local computer clicking on the **Upload** button and you can also save a preset from the device's memory to a backup file with using the **Download** button. If you do not need a saved preset any more, select it and click on the **Delete** button.

WARNING! Loading factory default settings will erase all presets which has been saved in the device memory!

5.11. Advanced View Window



- LW3 protocol help** Pushing the button results a help window opening which describes the most important information about LW3 protocol commands in HTML format.
- 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.
- Warning mode** If this pipe checked in, a warning window pops up when you enable Edit mode.
- 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.
- Command line** Type the desired command and execute it by the **Send** button. Clear all current commands and responses in the Terminal window by the **Clear** button.
- Protocol tree** LW3 protocol tree; select an item to see its content.
- Node list** Correspondent parameters and nodes are shown which are connected to the selected item in the protocol tree.
 - Manual button:** Manual (short description) of the node can be called and displayed in the terminal window.
 - Set button:** Saves the value/parameter typed in the textbox.
 - Call button:** Calls the method, e.g. reloads factory default settings.

6

LW2 Programmers' Reference

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

- ▶ [LW2 PROTOCOL DESCRIPTION](#)
- ▶ [GENERAL LW2 COMMANDS](#)
- ▶ [A/V PORT SETTINGS](#)
- ▶ [NETWORK CONFIGURATION](#)
- ▶ [LW2 COMMANDS – QUICK SUMMARY](#)

6.1. LW2 Protocol Description

The device accepts commands surrounded by curly brackets - {} - and responds data surrounded by round brackets - () - only if a command was successfully executed.

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 ² >	Input number in 2 digit ASCII format (01, 02, 10, 12 etc.)
<out ² >	Output number in 2 digit ASCII format (01, 02, 10, 12 etc.)
<loc>	Location number in 1, 2 or 3 digit ASCII format
<id>	id number in 1 or 2 digit ASCII format
<id ² >	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

6.2. General LW2 Commands

6.2.1. View Product Type

Description: The device responds its name.

Format	Example
Command {} Response (I:<PRODUCT_TYPE>)CrLf	→ {} ← (I:MMX4x2-HT200)

Explanation: The connected device is a MMX4x2-HT200.

Legend: <PRODUCT_TYPE> shows type.

6.2.2. Query Control Protocol

Description: The device can be controlled with different control protocols. This command queries the active protocol of the currently used control interface.

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

Explanation: The device communicates with LW2 protocol.

6.2.3. View Firmware Version of the CPU

Description: View the CPU firmware revision.

Format	Example
Command {F} Response (FW:<FW_VER><s>)CrLf	→ {f} ← (FW:1.2.0b3)

Legend: <FW_VER> is the firmware version. It is followed by <s> string which may indicate special versions.

6.2.4. Connection Test

Description: Simple test to see if the connection is established successfully.

Format	Example
Command {PING} Response (PONG!)CrLf	→ {ping} ← (PONG!)

6.2.5. View Serial Number

Description: The device responds its 8-digit serial number.

Format	Example
Command {S} Response (SN:<SERIAL_N>)CrLf	→ {s} ← (SN:5A004254)

6.2.6. Compile Time

Description: Returns the date, when the CPU firmware was compiled.

Format	Example
Command {CT} Response (Complied: <DATE&TIME>)CrLf	→ {ct} ← (Compiled: Sep 30 2016 14:07:56)

6.2.7. View Installed Board

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

Format	Example
Command {IS} Response (SL#●●●<MB_DESC>)CrLf (SL●END)CrLf	→ {is} ← (SL# 0 MMX4x2-HT200 V12_DAA0) ← (SL END)

Explanation: The device reports its motherboard (slot 0).

6.2.8. View Firmware for All Controllers

Description: Shows the firmware versions of all installed controllers.

Format	Example
Command {FC} Response (CF●<DESC>)CrLf (CF●<DESC>)CrLf ... (CF END)CrLf	→ {fc} ← (CF MMX4x2-HT200 1.2.0b3) ← (SL END)

Explanation: The device has one control panel.

6.2.9. Restart the Device

Description: The device can be restarted without unplugging power.

Format	Example
Command {RST} Response	→ {rst}

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

6.2.10. Query Health Status

Description: Internal voltages and measured temperature values are shown.

Format	Example
Command {ST} Response (ST●<DESC>)CrLf	→ {st} ← (ST CPU 12.16V 5.03V 3.30V 3.33V 3.37V 1.30V 1.86V 1.00V 53.22C 53.26C)

6.2.11. Restore Factory Default Settings

Description: Settings can be reset to factory default values as follows:

Format	Example
Command {FACTORY=ALL} Response (FACTORY ALL...)CrLf	→ {factory=all} ← (FACTORY ALL...)

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

6.3. A/V Port Settings

6.3.1. Switch an Input to the Outputs

Following commands with <A/V/AV> option can take effect in multiple layers, according to their parameters. Depending on 'A' or 'V' it can change only the Audio or only the Video layer; or 'AV' changes both.

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

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

Format	Example
Command {<in>@<out>●<layer>} Response (O<out>²●<in>²●<layer>)CrLf	→ {2@1 AV} ← (001 I02 AV)

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

Legend:

<layer>	Layer
A	Audio layer
V	Video layer
AV (or nothing)	Audio & Video layer

<out>: O1-O2 output port.

<in>: I1...I4 input ports.

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

ATTENTION! Analog video inputs does not contain embedded audio. If you use the AV option in case of VGA input (I1) the audio will be switched to the analog audio input 1 (I1) and in case of DVI-A input (I5) the audio will be switched to the analog audio input 2 (I5).

6.3.2. Mute Output

Description: Mute output <out>. The output signal is turned off.

Format	Example
Command {#<out>●<layer>} Response (1MT<out>²●<layer>)CrLf	→ {#1 A} ← (1MT01 A)

Explanation: O1 audio port is muted.

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.

6.3.3. Unmute Output

Description: Unmute output <out>.

Format	Example
Command {+<out>●<layer>} Response (0MT<out>²●<layer>)CrLf	→ {+1 V} ← (0MT01 V)

Explanation: O1 video port is unmuted.

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.

6.3.4. Lock Output

Description: Lock an output port. Output's state cannot be changed until unlocking.

Format	Example
Command {#<out>●<layer>} Response (1LO<out>²●<layer>)CrLf	→ {#>1 A} ← (1LO01 A)

Explanation: O1 audio output port is locked.

6.3.5. Unlock Output

Description: Unlock an output port. The connection on output can be changed.

Format	Example
Command {+<out>●<layer>} Response (0LO<out>²●<layer>)CrLf	→ {+<1 V} ← (0LO01 V)

Explanation: O1 video output port is unlocked.

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

6.3.6. View Connection State on the Output

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

Format	Example
Command {VC<layer>} Response (ALL<layer>●<001>●<002>)CrLf	→ {VC AV} ← (ALLV 01 02) ← (ALLA 02 02 02)

Legend: 001 shows the corresponding output's connection state.

<layer>	Layer
A	Audio layer
V	Video layer
AV *	Audio & Video layer

* AV is not used in the response. When AV is typed in the commands, the response will result two lines, one for the Video and one for the Audio port states.

State letters:

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

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

6.3.7. View Crosspoint Size

Description: Shows the physical crosspoint size.

Format	Example
Command {getsize●<layer>} Response (SIZE=<size>●<layer>)CrLf	→ {GETSIZE AV} ← (SIZE=4x2 V) ← (SIZE=3x3 A)

Legend:

<size>: <number of inputs>x<number of outputs>
<layer>: See details in the previous section.

Explanation: The device reports that it has a video crosspoint with 4 inputs and 2 outputs and an audio crosspoint with 3 inputs and 3 outputs.

6.3.8. Change Video Autoselect Mode

Description: The autoselect mode of the video outputs can be changed.

Format	Example
Command {AS_V<out>=<state>;<mode>} Response (AS_V<out>=<state>;<mode>)CrLf	→ {as_v1=E;P} ← (AS_V1=E;P) ← (AS_V2=E;P)

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

Letter	<state>
F	First detect mode
P	Priority detect mode
L	Last detect mode

Letter	<mode>
E	Autoselect mode is enabled
D	Autoselect mode is disabled

Explanation: The Autoselect mode of video output 1 and output 2 is enabled and set to Priority mode.

INFO: The Autoselect mode can be queried by typing the "as_v<out>=?" command.

6.3.9. Change Audio Autoselect Mode

Description: The autoselect mode of the audio outputs can be changed.

Format	Example
Command {AS_A<out>=<state>;<mode>} Response (AS_A<out>=<state>;<mode>)CrLf	→ {as_a1=E;P} ← (AS_A1=E;P) ← (AS_A2=E;P)

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

Letter	<state>
F	First detect mode
P	Priority detect mode
L	Last detect mode

Letter	<mode>
E	Autoselect mode is enabled
D	Autoselect mode is disabled

Explanation: The Autoselect mode of audio output 1 and output 2 is enabled and set to Priority mode.

INFO: The Autoselect mode can be queried by typing the "as_v<out>=?" command.

6.3.10. Change the Video Input Priorities

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

Format	Example
Command {PRIO_V<out>=<in ¹ _prio>;<in ² _prio>;...;<in ⁿ _prio>} Response (PRIO_V<out>=<in ¹ _prio>;<in ² _prio>;...;<in ⁿ _prio>)CrLf	→ {prio_v1=1;0;2;3} ← (PRIO_V1=1;0;2;3)

Legend:

<out>: The output port number: V1/V2.
<in¹_prio>...<inⁿ_prio>: Priority number of the input ports. See more details about port numbering in the [Input/Output Port Numbering](#) section.

Explanation: Input 2 has the highest priority (0), Input 1 has the second highest (1). Input 4 has the lowest priority (3).

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

INFO: The video priorities can be queried by typing the “prio_v<out>=?” command.

6.3.11. Change the Audio Input Priorities

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

Format	Example
Command {PRIO_A<out>=<in ¹ _prio>;<in ² _prio>;...;<in ⁿ _prio>} Response (PRIO_A<out>=<in ¹ _prio>;<in ² _prio>;...;<in ⁿ _prio>)CrLf	→ {prio_a1=1;0;2} ← (PRIO_A1=1;0;2)

Legend:

<out>: The output port number: A1/A2.
<in¹_prio>...<inⁿ_prio>: Priority number of the input ports. See more details about port numbering in the [Input/Output Port Numbering](#) section.

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

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

INFO: The audio priorities can be queried by typing the “prio_a<out>=?” command.

6.4. Network Configuration

6.4.1. Query the Current IP Status

Description: IP address settings can be queried as follows.

Format	Example
Command {IP_STAT=?} Response (IP_STAT=<type>;<ip_address>;<subnet_mask>;<gateway_addr>)CrLf	→ {ip_stat=?} ← (IP_STAT=0;192.168.0.100;255.255.255.0;192.168.0.1)

Legend:

<type>: 0 = static IP; 1 = DHCP.
<ip_addr>: IP address (four decimal octets separated by dots).
<subnet_mask>: Subnet mask (four decimal octets separated by dots).
<gateway_addr>: Gateway address (four decimal octets separated by dots).

Explanation: The device has a static (fix) IP address: 192.168.0.95; the subnet mask is 255.255.255.0, the gateway address is 192.168.0.1.

6.4.2. Set the IP Address

Description: IP address can be set as follows.

Format	Example
Command {IP_ADDRESS=<type>;<ip_address>} Response (IP_ADDRESS=<type>;<ip_address>)CrLf	→ {ip_address=0;192.168.0.110} ← (IP_ADDRESS=0;192.168.0.110;)

Legend:

<type>: 0 = static IP; 1 = DHCP

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

6.4.3. Set the Subnet Mask

Description: Subnet mask can be set as follows.

Format	Example
Command {IP_NETMASK=<subnet_mask>} Response (IP_NETMASK=<subnet_mask>)CrLf	→ {ip_netmask=255.255.255.0} ← (IP_NETMASK=255.255.255.0)

Legend: <subnet_mask>: Four decimal octets separated by dots.

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

6.4.4. Set the Gateway Address

Description: Gateway address can be set as follows.

Format	Example
Command {IP_GATEWAY=<gateway_addr>} Response (IP_GATEWAY=<gateway_addr>)CrLf	→ {ip_gateway=192.168.0.50} ← (IP_GATEWAY=192.168.0.50)

Legend: <gateway_addr>: Four decimal octets separated by dots.

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

6.4.5. Apply Network Settings

Description: Apply the network settings and restart the network interface.

Format	Example
Command {ip_apply} Response (IP_APPLY)CrLf	→ {ip_apply} ← (IP_APPLY)

6.5. LW2 Commands – Quick Summary

General LW2 Commands

Operation	See in section	Command
View Product Type	6.2.1	{I}
Query Control Protocol	6.2.2	{P_?}
View Firmware Version of the CPU	6.2.3	{F}
Connection Test	6.2.4	{PING}
View Serial Number	6.2.5	{S}
Compile Time	6.2.6	{CT}
View Installed Board	6.2.7	{IS}
View Firmware for All Controllers	6.2.8	{FC}
Restart the Device	6.2.9	{RST}
Query Health Status	6.2.10	{ST}
Restore Factory Default Settings	6.2.11	{FACTORY=ALL}

A/V Port Settings

Operation	See in section	Command
Switch an Input to the Outputs	6.3.1	{<in>@<out>●<layer>}
Mute Output	6.3.2	{#<out>●<layer>}
Unmute Output	6.3.3	{+<out>●<layer>}
Lock Output	6.3.4	{#><out>●<layer>}
Unlock Output	6.3.5	{+<out>●<layer>}
View Connection State on the Output	6.3.6	{VC●<layer>}
View Crosspoint Size	6.3.7	{GETSIZE●<layer>}
Change Video Autoselect Mode	6.3.8	{AS_V<out>=<state>;<mode>;<no_signal>}
Change Audio Autoselect Mode	6.3.9	{AS_A<out>=<state>;<mode>;<no_signal>}
Change the Video Input Priorities	6.3.10	{PRIO_V<out>=<in ₁ _prio>;...;<in _n _prio>}
Change the Audio Input Priorities	6.3.11	{PRIO_A<out>=<in ₁ _prio>;...;<in _n _prio>}

Network Configuration

Operation	See in section	Command
Query the Current IP Status	6.4.1	{IP_STAT=?}
Set the IP Address	6.4.2	{IP_ADDRESS=<type>;IP_ADDRESS}
Set the Subnet Mask	6.4.3	{IP_NETMASK=<subnet_mask>}
Set the Gateway Address	6.4.4	{IP_GATEWAY=<gateway_address>}
Apply Network Settings	6.4.5	{IP_APPLY}

7

LW3 Programmers' Reference

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

- ▶ OVERVIEW
- ▶ THE TREE STRUCTURE OF THE MATRIX
- ▶ LW3 COMMANDS
- ▶ FORMAL DEFINITIONS
- ▶ SYSTEM COMMANDS
- ▶ VIDEO PORT SETTINGS
- ▶ AUDIO PORT SETTINGS FOR FIRMWARE V1.2.0
- ▶ AUDIO PORT SETTINGS FOR FIRMWARE V1.1.0
- ▶ NETWORK CONFIGURATION
- ▶ RS-232 PORT CONFIGURATION
- ▶ SENDING MESSAGE VIA THE COMMUNICATION PORTS
- ▶ INFRARED PORT CONFIGURATION
- ▶ EDID MANAGEMENT
- ▶ LW3 COMMANDS - QUICK SUMMARY

7.1. Overview

Lightware 3 (LW3) protocol is used by the 25G hybrid matrix, the MODEX family and the new series of Lightware TPS and OPT products, including the MMX4x2 series matrix. The protocol (LW3) 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 for implementing a human readable, but programmatically still ease to parse, which is suitable for different products with a different feature list.

In order to implement a flexible, easy-to-use protocol that is straightforward to adapt to new devices and provides outstanding scalability and sustainability, we decided to organize all settings, parameters and properties of the device to a tree structure with 'nodes', 'properties' and 'methods'.

7.1.1. Elements of the Tree Structure

ATTENTION! All names and values are case-sensitive. The space character is replaced by the '•' character in the elements and commands descriptions.

7.1.1.1. Node

- The basic building block of the tree structure is the 'node'.
- The node can have multiple child nodes, but only one parent.
- The tree has only one root the 'root node'.
- The leaves of the tree are also nodes, which do not have child nodes.
- The nodes are separated by a slash ('/') character.
- All the slashes are 'right slashes', no backslash is used.
- The identifier of the root node is a slash ('/')
- The node name can contain the elements of the English alphabet and numbers.
- Recommended convention for case sensitivity:
 - Fix nodes (that cannot be altered) are capitalized.
 - User created nodes can contain both lowercase and capital letters, no restrictions.
- The path of a node has to contain all parent nodes from the root node.

Format: (the root node): nX•/

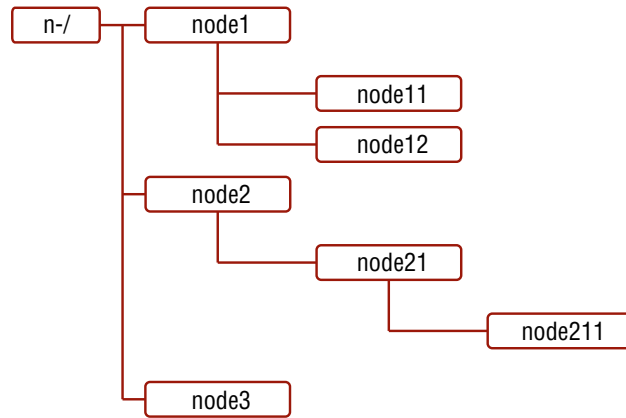
Path: nX•/[nodeName]/[nodeName]/[nodeName]

Legend:

n:	node
'X' can be:	
':':	default for a node.
'm':	this is a manual for the node.
'E':	this is an error message for the node.
's':	this is a symlink node.
'v':	this node has virtual children.
'r':	this is a remote node.

INFO: All parent nodes must be listed in the path of a node.

Following example presents the structure of the tree traversal:



Tree structure of the nodes

Path of the nodes:

```

n- /node1
n- /node1/node11
n- /node1/node12
n- /node2
n- /node2/node21
n- /node2/node21/node211
n- /node3
  
```

7.1.1.2. Property

The 'property' in the LW3 protocol is basically a leaf, which has a well-defined value.

- A property has a value.
- A property cannot have child nodes or child properties. It is always a leaf.
- A node can have any number of properties (may not have any).
- A property is referenced with a dot ('.') after the node name.
- The properties' name can contain the elements of the English alphabet, numbers and underscore ('_') character.
- By convention, properties are beginning with a capital letter, all other characters are lowercase ones. In the case of compound words, all words are beginning with a capital letter (CamelCase).
- The value of the property can contain any readable ASCII character.
- A property can be read-only or read/write.

Format: pX●/[nodeName].[propertyName]=[propertyValue]

Legend:

p: property
 'X' can be:
 'r': if the property is read-only.
 'w': if the property is readable, writable.
 'm': the manual of the property.
 'E': error message for the property.
 'v': virtual node property: contains a node path to a node which will be linked to the property's parent node.

Example:

The following two ones are read-only properties:

```

p●/node1/node12.ReadOnlyProperty=value1
p●/.DeviceName=25G Hybrid Device
  
```

The following two ones are read-write properties:

```

pw●/node1/node12.ReadWriteProperty=value2
pw●/.DeviceNickName=John
  
```

7.1.1.3. Method

The 'method' in the LW3 protocol is also a leaf. It cannot have a value, such as the properties, but it can be invoked with a parameter with the help of a special 'CALL' command.

- A method cannot have child nodes or child methods. It is always a leaf.
- A node can have any number of methods (may not have any).
- A method is referenced with a colon (':') after the node.
- The methods' name can contain the elements of the English alphabet, numbers and underscore ('_') character.
- By convention, methods are beginning with lowercase letter. In case of compound words, the very first letter is lowercase, and the first letter of each other words are capitalized (lowerCamelCase).
- The parameter of the method can contain any readable ASCII character.
- The method always has a return 'state' if the method could be executed. The state could be either 'OK' or 'FAILED'.
- The method does not necessarily have a return 'value'. If it does, it can contain additional information, which is always specific to the current case (the return value can specify why the execution failed).
- When the method cannot be executed (e.g. the parameter list is illegal), there is an error message.

Format: mX●/[nodeName]:[methodName]=[returnValue]

Legend:

m: method
 'X' can be:
 'O': when the execution of the method was successful (OK).
 'F': when the execution of the method failed.
 'm': the manual of the method.
 'E': error message for the method.

Example:

```

mO●/node1/node12:method1
mO●/MEDIA/VIDEO/XP:switch
mE●%E001:Syntax error
mm●/MEDIA/VIDEO/XP:lockSource:Lock one or more source ports
  
```

7.1.2. Escaping

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 followings: \ { } # % () \r \n \t

Example:

The original text: John•(Doe).•#3:•5%2=1•node1\node11

The escaped text: John•\ (Doe\).•\#3:•5\%2=1•node1\\node11

7.1.3. Error Messages

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

Format: XE•[primitive]•%EYYY:•[Error message]

Legend:

'X' can be:

'-': syntax error. Cannot parse the command at all.

'n': node error.

'p': property error.

'm': method error.

YYY: error code, which can be one of the followings:

YYY: error code	Name	Default text
000	Lw3ErrorCodes_None	
001	Lw3ErrorCodes_Syntax	Syntax error
002	Lw3ErrorCodes_NotFound	Not found
003	Lw3ErrorCodes_AlreadyExists	Already exists
004	Lw3ErrorCodes_InvalidValue	Invalid value
005	Lw3ErrorCodes_IllegalParamCount	Illegal parameter count
006	Lw3ErrorCodes_IllegalOperation	Illegal operation
007	Lw3ErrorCodes_AccessDenied	Access denied
008	Lw3ErrorCodes_Timeout	Timeout
009	Lw3ErrorCodes_CommandTooLong	Command too long
010	Lw3ErrorCodes_InternalError	Internal error
011	Lw3ErrorCodes_NotImplemented	Not implemented

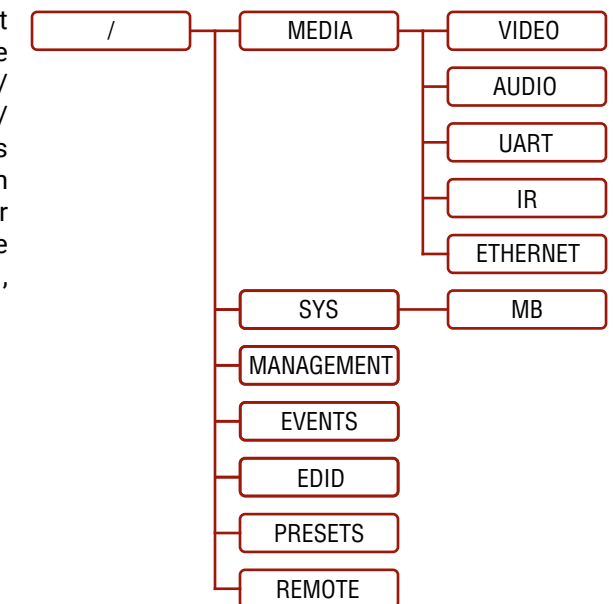
7.1.4. Prefix Summary

The following prefixes are defined in the LW3 protocol:

'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,
'pm':	a manual for the property,
'm-':	a method,
'mO':	a response after a success method execution,
'mF':	a response after a failed method execution,
'mE':	an error for a method,
'mm':	a manual for a method.

7.2. The Tree Structure of the Matrix

The /MEDIA node is used by the LDC to connect input ports to output ports on different layers. Each subnode of /MEDIA is representing a layer, e.g. video (/MEDIA/VIDEO), audio (/MEDIA/AUDIO) or RS-232 (/MEDIA/UART). Each layer has a crosspoint to define connections between the ports associated with the layer, all of them are represented by a specific node. E.g. the video layer node is /MEDIA/VIDEO: under the video layer node, the video crosspoint node (XP) and the video ports (I1, O1, ...) are located.



INFO: The tree structure is available in the Advanced view of LDC, see the [Advanced View Window](#) section.

7.3. LW3 Commands

7.3.1. 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.

The Response Format

The first two characters of a response unambiguously identify the type of the element that the response line concerns. The first character is the type of the element (node, property or method), the second is for miscellaneous information (e.g. read/write rights).

The defined prefixes are:

'n-':	node
'pr':	property - only readable
'pw':	property - writable, readable
'm-':	method executable

After the prefix, the response contains the full path of the node, property or method after a space character.

Get All Children of a Node

Get all of the child nodes of a parent node, with one GET command.

Command format: GET●[nodePath]

Response format: n-●[nodePath]

Example:

```
> GET /MEDIA
< n- /MEDIA/VIDEO
< n- /MEDIA/AUDIO
< n- /MEDIA/UART
< n- /MEDIA/IR
< n- /MEDIA/ETHERNET
```

Get All Properties and Methods of a Node

Get all properties and methods of a node, with one GET command and asterisk character.

Command format: GET●[nodePath].*

Response format: (for properties)

pX●[nodePath].[propertyName]=[parameter]

Legend:

X can be:	
'r':	read-only
'w':	read-write

Response format: (for methods)

m-●[nodePath]:[methodName]

Example:

```
> GET /EDID.*
< pr /EDID.EdidStatus=F47:E1;F47:E2;F47:E3;F47:E4
< m- /EDID:switch
< m- /EDID:switchAll
< m- /EDID:copy
< m- /EDID:delete
< m- /EDID:reset
```

Get All Child Nodes, Properties and Methods of a Node

Get all child nodes, properties and methods of a node with one command, without using a wild card.

Command format: GETALL●[nodePath]

Response format: (for nodes)

n-●[nodePath]

Response format: (for properties)

pX●[nodePath].[propertyName]=[parameter]

Legend:

X can be:	
'r':	read-only
'w':	read-write

Response format: (for methods)

m-●[nodePath]:[methodName]

Example:

```
> GETALL /EDID
< n- /EDID/F
< n- /EDID/D
< n- /EDID/U
< n- /EDID/E
< pr /EDID.EdidStatus=F47:E1;F47:E2;F47:E3;F47:E4
< m- /EDID:switch
< m- /EDID:switchAll
< m- /EDID:copy
< m- /EDID:delete
< m- /EDID:reset
```

7.3.2. Set Command

The setter command can be used to modify the value of a property.

Command format: SET●[nodePath].[propertyName]=[newPropertyValue]

Response format:

The response for setting a property to a new value is the same as the response for the 'GET' command. The value in the response is the new value if the execution of the 'SET' command was successful, otherwise the unmodified 'old value' with an error message.

pw●[nodePath].[propertyName]=[newPropertyValue]

Example:

```
> SET /SYS/MB/RS232.Rs232Mode=1
< pw /SYS/MB/RS232.Rs232Mode=1
```

Error response format:

If there were errors during setting a property, an error message follows the unmodified property value.

pE●[nodePath].[propertyName]=[unmodifiedValue]●%EXXX:Error message

Legend: XXX: error number.

Examples:

```
> SET /SYS/MB/RS232/LOCAL.Rs232Mode=11
< pE /SYS/MB/RS232/LOCAL.Rs232Mode %E004:Invalid value
```

```
> SET /SYS/MB/RS232/LOCAL.ActiveProtocol=LW3
< pE %E004:Writing read-only property
```

7.3.3. Invocation

A method can be invoked with the help of the 'CALL' command.

Command format: CALL●[nodePath]:[methodName]([parameter])

Response format:

The response for a method execution is a state and a value. The state is mandatory and always defined if the method could be executed. It can be either a success or a failure. The value is optional and it can contain additional information, such as the reason why the state is a failure or a specific value when the state is success that the client can process. It is also possible to get an error message when the method could not be executed – e.g. the parameter was illegal - and hence not even the state of the execution could be specified.

mX●[nodePath]:[methodName]=Y

Legend:

X can be:

'O':	if the execution is successful.
'F':	if the execution is failed, but the method could be executed.
'E':	if the method could not be executed: e.g. illegal parameter count.

Y can be:

- The return value of the method if any.
- It is valid that a method does not have any return value. In this case, the equal sign ('=') can be omitted.

Example:

```
> CALL /EDID:switch(D1:E1)
< mO /EDID:switch
```

Error response format:

If there were errors during the execution, an error message is received, which follows the method name.

mE●[nodePath]:[methodName]●%EXXX:Error message

Example:

```
> CALL /EDID:switch(D1:R1)
< mE %E001:Syntax error
```

7.3.4. Manual

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

Command format:

for nodes: MAN●[nodePath]
for property: MAN●[nodePath].[propertyName]
for method: MAN●[nodePath]:[methodName]

Response format:

The human readable manual is separated by a space (' ') character from the primitives.

for nodes: nm●[nodePath]●Human readable manual
for property: pm●[nodePath].[propertyName]●Human readable manual
for method: mm●[nodePath]:[methodName]●Human readable manual

Example: (for a property)

```
> MAN /SYS/MB/RS232/LOCAL.ActiveProtocol
< pm /SYS/MB/RS232/LOCAL.ActiveProtocol ["LW2" | "LW3"] Active Protocol
```

Example: (for a method)

```
> MAN /SYS/MB/RS232/LOCAL:factoryDefaults
< mm /SYS/MB/RS232/LOCAL:factoryDefaults [] Restore factory default settings
```

7.3.5. Signature

For some command, the response can contain multiple lines. Each line is terminated with a 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 is intended waiting for 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 signature is a four digit long hexadecimal value that can be optionally placed before every command. In that case, the response to that particular command will also be preceded by the signature, and the corresponding lines will be between brackets.

Command format: XXXX#[command]

Legend: xxxx: 4-digit long hexadecimal value.

Response format:

```
{XXXX
[command lines]
}
```

Example:

```
> 1103#GET /MEDIA/UART.*
< {1103
< pr /MEDIA/UART.PortCount=2
< pr /MEDIA/UART.PortUI=P1:01209;P2:12224
< pr /MEDIA/UART.P1=LOCAL
< pr /MEDIA/UART.P2=TPS
< }
```

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

7.3.6. Subscription

A user can subscribe to any node. Subscribe to a node means that the user will get a notification if any of the properties of the node is changed. These notifications are asynchronous messages - such as the ones described above - and hence, they are useful to keep the client application up-to-date, without receiving any unwanted information. 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 closing a connection the subscribe command has to be sent in order to get the notifications of the changes on that connection.

Subscribe to a Node

Command format: OPEN●[nodePath]

Response format: o-●[nodePath]

Example:

```
> OPEN /MEDIA/VIDEO
< o- /MEDIA/VIDEO
```

Subscribe to Multiple Nodes

In order to subscribe to multiple nodes, the asterisk wild card can be used.

Command format: OPEN●[nodePath]/*

Response format: o-●[nodePath]/*

Example:

```
> OPEN /MEDIA/VIDEO/*
< o- /MEDIA/VIDEO/*
```

Get the Active Subscriptions for the Current Connection**Command format:** OPEN**Response format:** o-●[nodePath]**Example:**

```
> OPEN
< o- /MEDIA/VIDEO
< o- /EDID
< o- /LOG
```

Unsubscribe from a Node**Command format:** CLOSE●[nodePath]**Response format:** c-●[nodePath]**Example:**

```
> CLOSE /MEDIA/VIDEO
< c- /MEDIA/VIDEO
```

Unsubscribe from Multiple Nodes**Command format:** CLOSE●[nodePath]/***Response format:** c-●[nodePath]/***Example:**

```
> CLOSE /MEDIA/VIDEO/*
< c- /MEDIA/VIDEO/*
```

7.3.7. Notifications about the Changes of the Properties

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

Format: CHG●[nodePath].[propertyName]=[newPropertyValue]**Example:**

```
< CHG /EDID.EdidStatus=F48:E1;F49:E2;F48:E3;F48:E4
```

A Short Example of How to Use the Subscription

In the following, an example is presented, how the subscriptions are working and how to use them. In the example, 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.

```

Connection #1 > OPEN /MEDIA/VIDEO/XP
               < o- /MEDIA/VIDEO/XP
               > GET /MEDIA/VIDEO/XP.DestinationConnectionList
               < pr /MEDIA/VIDEO/XP.DestinationConnectionList=I1;I1
               > GET /MEDIA/VIDEO/XP.DestinationConnectionList
Connection #2 < pr /MEDIA/VIDEO/XP.DestinationConnectionList=I1;I1
               > CALL /MEDIA/VIDEO/XP:switch(I1:O1)
               < mO /MEDIA/VIDEO/XP:switch
Connection #1 < CHG /MEDIA/VIDEO/XP.DestinationConnectionList=I1;I1

```

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

7.4. Formal Definitions

Method parameters and property values are specified in a modified version of Backus Naur Form (BNF). The syntax is the following:

"literal"	literals are quoted
<expression1> <expression2>	vertical bars denote alternatives
[<expression>]	expressions in square brackets are optional
<number>*<expression>	expression is repeated at least <number> times
*<expression>	<number> may be omitted, in this case number defaults to 0
<number>*<expression>	expressions in curly brackets are repeated exactly <number> times
In	Input port number
Om	Output port number

7.5. System Commands

7.5.1. Set the Device Label

INFO: The device label can be changed to a custom text in the [Status](#) tab of the LDC software.

Command format: SET●/MANAGEMENT/UID/DeviceLabel=<Custom_name>

Response format: pw●/MANAGEMENT/UID/DeviceLabel=<Custom_name>

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

Example:

```
> SET /MANAGEMENT/UID.DeviceLabel=4x2_Conference1
< pw /MANAGEMENT/UID.DeviceLabel=4x2_Conference1
```

7.5.2. Query the Firmware Version

Command format: GET●/SYS/MB.FirmwareVersion

Response format: pr●/SYS/MB.FirmwareVersion=<firmware_version>

```
> GET /SYS/MB.FirmwareVersion
< pr /SYS/MB.FirmwareVersion=1.2.0b3
```

7.5.3. Control Lock

Enable/disable the operation of the front panel buttons.

Command format: SET●/MANAGEMENT/UI.ControlLock=0|1|2

Response format: pw●/MANAGEMENT/UI.ControlLock= 0|1|2

Parameters:

.ControlLock	0	1	2
	Unlocked	Locked	Force locked
Control lock mode	The front panel buttons are unlocked.	The front panel buttons are locked but can be unlocked by button combination. See the details in the Control Lock section.	The front panel buttons are locked and cannot be unlocked by button combination, only in LDC (on the Status tab) or using LW3 command.

Example:

```
> SET /MANAGEMENT/UI.ControlLock=1
< pw /MANAGEMENT/UI.ControlLock=1
```

7.5.4. Identify the Device

Calling the method results the blinking of the status LEDs for 10 seconds. The feature helps to identify the device itself in the rack shelf.

Command format: CALL●/MANAGEMENT/UI:identifyMe()

Response format: mO●/MANAGEMENT/UI:identifyMe=

Example:

```
> CALL /MANAGEMENT/UI:identifyMe()
< mO /MANAGEMENT/UI/identifyMe
```

7.5.5. Resetting the Device

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

Command format: CALL●/SYS:reset()

Response format: mO●/SYS:reset=

Example:

```
> CALL /SYS:reset()
< mO /SYS:reset=
```

7.5.6. Restore the Factory Default Settings

Command format: CALL●/SYS:factoryDefaults()

Response format: 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.

7.6. Video Port Settings

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

7.6.1. Query the Status of Source Port

Command format: GET●/MEDIA/VIDEO/XP.SourcePortStatus

Response format: pr●/MEDIA/VIDEO/XP.SourcePortStatus=[<I₁>;...;<I_n>]

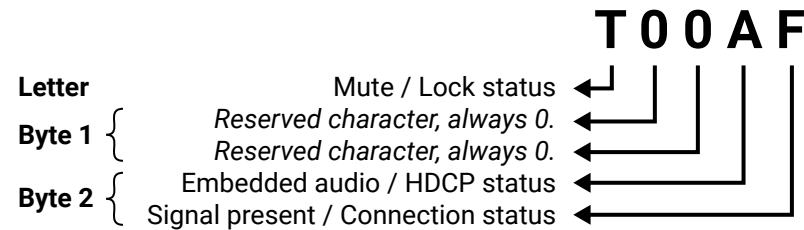
The response contains 5 ASCII characters for each port. The first character indicates the mute/lock state, the next four characters represent a 2-byte HEX code showing the current state of the input ports.

Example:

```
> GET /MEDIA/VIDEO/XP.SourcePortStatus
< pr /MEDIA/VIDEO/XP.SourcePortStatus=T00AF;T00AF;T000A;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	Embedded audio status	HDCP status	Signal present status	Connection status
00					Unknown			
01					Reserved			
10	Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	No signal	Not connected
11					Embedded audio presents	Encrypted	Signal presents	Connected

Example and Explanation (for input 1, T00AF):

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

The Most Common Received Port Status Responses

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

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

T00AB	T	0		0		A		B	
	Unlocked, Unmuted	00	00	00	00	10	10	10	11
	Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	No signal	Connected	

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

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

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

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

7.6.2. Query the Status of Destination Port

Command format: GET●/MEDIA/VIDEO/XP.DestinationPortStatus

Response format: pr●/MEDIA/VIDEO/XP.DestinationPortStatus=[<O₁>;<O₂>]

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 ports.

Example:

```
> GET /MEDIA/VIDEO/XP.DestinationPortStatus
< pr /MEDIA/VIDEO/XP.DestinationPortStatus=M00BF;T00EF
```

Legend: See at previous section.

Example and Explanation (for output 1, M00BF):

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

7.6.3. Query the Video Crosspoint Setting

Command format: GET●/MEDIA/VIDEO/XP.DestinationConnectionList

Response format: pr●/MEDIA/VIDEO/XP.DestinationConnectionList=<I₁>;...;<I_n>

Legend:

<I_n>: Video input port number

Example:

```
> GET /MEDIA/VIDEO/XP.DestinationConnectionList
< pr /MEDIA/VIDEO/XP.DestinationConnectionList=I1;I3
```

Explanation: I1 input port is connected to the O1 output port, I3 input port is connected to the O2 output port.

7.6.4. Switching Video Input

Command format: CALL●/MEDIA/VIDEO/XP:switch(<I_n>;<O_m>)

Response format: mO●/MEDIA/VIDEO/XP:switch

Example:

```
> CALL /MEDIA/VIDEO/XP:switch(I2:O1)
< mO /MEDIA/VIDEO/XP:switch
```

Explanation: I2 port is connected to O1 port.

7.6.5. Query the Video Autoselect Settings

Command format: GET●/MEDIA/VIDEO/XP.DestinationPortAutoselect

Response format: pr●/MEDIA/VIDEO/XP.DestinationPortAutoselect=<O_n_set>

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

Legend:

<O_n_set> Two-letter code of the Autoselect settings:

Letter	Explanation	
1 st letter	E:	Autoselect is enabled .
	D:	Autoselect is disabled .
2 nd letter	F:	First detect mode: the first active video input is selected.
	P:	Priority detect mode: always the highest priority active video input will be selected.
	L:	Last detect mode: always the last attached input is switched to the output automatically.

Example:

```
> GET /MEDIA/VIDEO/XP.DestinationPortAutoselect
< pr /MEDIA/VIDEO/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 format: CALL●/MEDIA/VIDEO/XP:setDestinationPortAutoselect(<O_n>;<O_n_set>)

Response format: mO●/MEDIA/VIDEO/XP:setDestinationPortAutoselect

Legend: see previous section.

Example1:

```
> CALL /MEDIA/VIDEO/XP:setDestinationPortAutoselect(O1:EPM)
< mO /MEDIA/VIDEO/XP:setDestinationPortAutoselect
```

Explanation1: 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).

Example2:

```
> CALL /MEDIA/VIDEO/XP:setDestinationPortAutoselect(O1:D)
< mO /MEDIA/VIDEO/XP:setDestinationPortAutoselect
```

Explanation2: The setting is changed to "DPM": Autoselect is disabled (D). The other settings remain unchanged.

7.6.7. Query the Input Port Priority

Command format: GET●/MEDIA/VIDEO/XP.PortPriorityList

Response format: pr●/MEDIA/VIDEO/XP.PortPriorityList=<O_n_list>

The response shows the priority of each output one after another. The priority number can be from 0 to 3; 0 is the highest- and 3 is the lowest priority.

Legend:

<O_n_list> The input port priority order of the given output port: <I₁>,<I₂>,...,<I_m>

Example:

```
> GET /MEDIA/VIDEO/XP.PortPriorityList
< pr /MEDIA/VIDEO/XP.PortPriorityList=0,1,2,3;0,1,2,3
```

Explanation:

Priority	0	1	...	x
Video input port	I1	I2	...	I _m

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 format: CALL●/MEDIA/VIDEO/XP:setAutoselectionPriority(<I_n>(<O_m>):<prio>)

Response format: mO●/MEDIA/VIDEO/XP:setAutoselectionPriority

Legend:

<prio>: Priority number from 0 to 3, equal numbers are allowed.

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

Example:

```
> CALL /MEDIA/VIDEO/XP:setAutoselectionPriority(I1\ (01)\ :3;I2\ (01)\ :3)
< mO /MEDIA/VIDEO/XP:setAutoselectionPriority
```

Explanation:

The priority number of input 1 and Input 2 has been set to 3 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 an Input Port

Command format: CALL●/MEDIA/VIDEO/XP:muteSource(<I_n>)

Response format: mO●/MEDIA/VIDEO/XP:muteSource

Example:

```
> CALL /MEDIA/VIDEO/XP:muteSource(I1)
< mO /MEDIA/VIDEO/XP:muteSource
```

7.6.10. Unmute an Input Port

Command format: CALL●/MEDIA/VIDEO/XP:unmuteSource(<I_n>)

Response format: mO●/MEDIA/VIDEO/XP:unmuteSource

Example:

```
> CALL /MEDIA/VIDEO/XP:unmuteSource(I1)
< mO /MEDIA/VIDEO/XP:unmuteSource
```

7.6.11. Lock an Input Port

Command format: CALL●/MEDIA/VIDEO/XP:lockSource(<I_n>)

Response format: mO●/MEDIA/VIDEO/XP:lockSource

Example:

```
> CALL /MEDIA/VIDEO/XP:lockSource(I1)
< mO /MEDIA/VIDEO/XP:lockSource
```

7.6.12. Unlock an Input Port

Command format: CALL●/MEDIA/VIDEO/XP:unlockSource(<I_n>)

Response format: mO●/MEDIA/VIDEO/XP:unlockSource

Example:

```
> CALL /MEDIA/VIDEO/XP:unlockSource(I1)
< mO /MEDIA/VIDEO/XP:unlockSource
```

7.6.13. Mute an Output Port

Command format: CALL●/MEDIA/VIDEO/XP:muteDestination(<O_n>)

Response format: mO●/MEDIA/VIDEO/XP:muteDestination

Example:

```
> CALL /MEDIA/VIDEO/XP:muteDestination(01)
< mO /MEDIA/VIDEO/XP:muteDestination
```

7.6.14. Unmute an Output Port

Command format: CALL●/MEDIA/VIDEO/XP:unmuteDestination(<O_n>)

Response format: mO●/MEDIA/VIDEO/XP:unmuteDestination

Example:

```
> CALL /MEDIA/VIDEO/XP:unmuteDestination(01)
< m0 /MEDIA/VIDEO/XP:unmuteDestination
```

7.6.15. Lock an Output Port

Command format: CALL●/MEDIA/VIDEO/XP:lockDestination(<O_n>)

Response format: mO●/MEDIA/VIDEO/XP:lockDestination

Example:

```
> CALL /MEDIA/VIDEO/XP:lockDestination(01)
< m0 /MEDIA/VIDEO/XP:lockDestination
```

7.6.16. Unlock an Output Port

Command format: CALL●/MEDIA/VIDEO/XP:unlockDestination(<O_n>)

Response format: mO●/MEDIA/VIDEO/XP:unlockDestination

Example:

```
> CALL /MEDIA/VIDEO/XP:unlockDestination(01)
< m0 /MEDIA/VIDEO/XP:unlockDestination
```

7.6.17. HDCP Setting (Input Port)

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

Command format: SET●/MEDIA/VIDEO/<I_n>.HdcpEnable=true|false

Response format: pw●/MEDIA/VIDEO/<I_n>.HdcpEnable=true|false

Example:

```
> SET /MEDIA/VIDEO/I2.HdcpEnable=true
< pw /MEDIA/VIDEO/I2.HdcpEnable=true
```

7.6.18. HDCP Setting (Output Port)

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

Command format: SET●/MEDIA/VIDEO/<O_n>.HdcpModeSetting=0|1

Response format: pw●/MEDIA/VIDEO/<O_n>.HdcpModeSetting=0|1

Parameters:

.HdcpModeSetting	0	1
HDCP mode	Auto	Always

Example:

```
> SET /MEDIA/VIDEO/01.HdcpModeSetting=0
< pw /MEDIA/VIDEO/01.HdcpModeSetting=0
```

7.6.19. Test Pattern Generator

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

ATTENTION! The Mode can be set individually on each port, but the Clock source and the Pattern settings are common on the optical and HDMI output ports (O1 and O2).

Test Pattern Generator Mode Setting:

Command format: SET●/MEDIA/VIDEO/<O_n>.TpgMode=0|1|2

Response format: pw●/MEDIA/VIDEO/<O_n>.TpgMode=0|1|2

Parameters:

.TpgMode	0	1	2
Test pattern generator mode	Disabled The test pattern is not displayed on the output	Enabled The test pattern is displayed on the output	No signal mode The test pattern is displayed if there is no signal on the output port

Example:

```
> SET /MEDIA/VIDEO/01.TpgMode=2
< pw /MEDIA/VIDEO/01.TpgMode=2
```

Clock Source – The Clock Frequency of the Test Pattern

Command format: SET●/MEDIA/VIDEO/<O_n>.TpgClockSource=480|576|EXT

Response format: pw●/MEDIA/VIDEO/<O_n>.TpgClockSource=480|576|EXT

Parameters:

.TpgClockSource	480	576	EXT
Clock frequency	480p	576p	External clock (from actual TMDS source)

Example:

```
> SET /MEDIA/VIDEO/01.TpgClockSource=576
< pw /MEDIA/VIDEO/01.TpgClockSource=576
```

Test Pattern

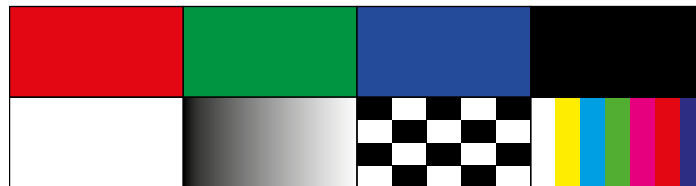
Command format: SET●/MEDIA/VIDEO/<O_n>.TpgPattern=<pattern>

Response format: pw●/MEDIA/VIDEO/<O_n>.TpgPattern=<pattern>

Parameters:

<pattern>	RED	GREEN	BLUE	BLACK	WHITE	RAMP	CHESS	BAR	CYCLE
-----------	-----	-------	------	-------	-------	------	-------	-----	-------

Cycle setting means all the patterns are changed sequentially approx. in every 2 seconds.



Example:

```
> SET /MEDIA/VIDEO/01.TpgPattern=GREEN
< pw /MEDIA/VIDEO/01.TpgPattern=GREEN
```

7.6.20. HDMI Mode Settings (Output Port)

Command format: SET●/MEDIA/VIDEO/<O_n>.HdmiModeSetting=0|1|2

Response format: pw●/MEDIA/VIDEO/<O_n>.HdmiModeSetting=0|1|2

Parameters:

.HdmiModeSetting	0	1	2
HDMI mode	Auto	DVI	HDMI

Example:

```
> SET /MEDIA/VIDEO/01.HdmiModeSetting=2
< pw /MEDIA/VIDEO/01.HdmiModeSetting=2
```

7.6.21. Query the Recent TPS Mode

INFO: Only MMX4x2-HT200 model has TPS input port.

Command format: GET●/REMOTE/S_n.tpsMode

Response format: pr●/REMOTE/S_n.tpsMode=A|H|L|1|2

Parameters:

.tpsMode	A	H	L	1	2
TPS mode	Auto	HDBaseT	Long reach	LPPF1	LPPF2

Example:

```
> GET /REMOTE/S1.tpsMode
< pr /REMOTE/S1.tpsMode=H
```

See more information about TPS modes in the [TPS Interface](#) section.

7.6.22. TPS Mode Settings

INFO: Only MMX4x2-HT200 model has TPS input port.

Command format: SET●/REMOTE/S_n.tpsModeSetting=A|H|L|1|2

Response format: pw●/REMOTE/S_n.tpsModeSetting=A|H|L|1|2

Parameters: See at previous section.

Example:

```
> SET /REMOTE/S1.tpsModeSetting=A
< pw /REMOTE/S1.tpsModeSetting=A
```

7.7. Audio Port Settings for Firmware v1.2.0

ATTENTION! The audio port setting commands depend on the installed firmware version of the device. If your device is installed with firmware v1.1.0, see the [Audio Port Settings for Firmware v1.1.0](#) section. The following LW3 commands are related to firmware v1.2.0. To query the firmware version of your device, see the [Query the Firmware Version](#) section. You can find the complete list of the changes in the [LW3 Command Changes in Firmware v1.2.0](#) section.

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

7.7.1. Query the Status of Source Port

Command format: GET●/MEDIA/AUDIO/XP.SourcePortStatus

Response format: pr●/MEDIA/AUDIO/XP.SourcePortStatus=[<A₁>;...;<A_n>]

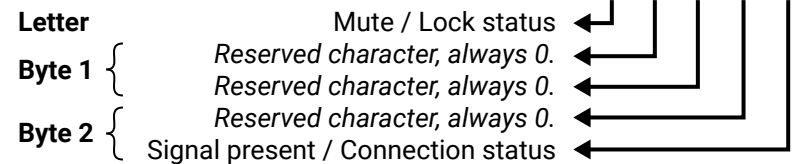
The response contains 5 ASCII characters for each port. The first character indicates the mute/lock state, the next four characters represent a 2-byte HEX code showing the current state of the input ports.

Example:

```
> GET /MEDIA/AUDIO/XP.SourcePortStatus
< pr /MEDIA/AUDIO/XP.SourcePortStatus=T000C;T0008;M000F
```

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
00							Unknown	
01							Reserved	
10	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	No signal	Not connected
11							Signal presents	Connected

Example and Explanation (for input 3, M000F):

M	0		0		0		F	
Unlocked, Muted	00	00	00	00	00	00	11	11
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Signal presents	Connected

The Most Common Received Port Status Responses

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

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

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

Only for A1 and A2 logical audio ports: If the character 5 is C (11 00) which means signal is present but the cable connection status is unknown - the explanation is a logical port has no pin which can indicate the connection status so this is always unknown. When the character 5 is 8 (10 00), that means there is no signal on the port.

T0008	T	0		0		0		8	
Unlocked, Unmuted	00	00	00	00	00	00	00	10	00
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	No signal	Unknown

T000C	T	0		0		0		C	
Unlocked, Unmuted	00	00	00	00	00	00	00	11	00
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Signal presents	Unknown

7.7.2. Query the Status of Destination Port

Command format: GET●/MEDIA/AUDIO/XP.DestinationPortStatus

Response format: pr●/MEDIA/AUDIO/XP.DestinationPortStatus=[<O₁>;<O₂>]

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;T000F;M000F
```

Legend: See at previous section.

Example and Explanation (for output 2, M000F):

M	0		0		0		F	
Unlocked, Muted	00	00	00	00	00	00	11	11
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Signal presents	Connected

7.7.3. Query the Audio Crosspoint Setting

Command format: GET●/MEDIA/AUDIO/XP.DestinationConnectionList

Response format: pr●/MEDIA/AUDIO/XP.DestinationConnectionList=<A₁>;...;<A_n>

Legend:

<A_n>: Audio input port number

Example:

```
> GET /MEDIA/AUDIO/XP.DestinationConnectionList
< pr /MEDIA/AUDIO/XP.DestinationConnectionList=A1;A2;A2
```

Explanation: A1 input port is connected to the O1 output port, A2 input port is connected to the O1 and O2 output ports.

7.7.4. Switching Audio Input

Command format: CALL●/MEDIA/AUDIO/XP:switch(<A_n>;<O_m>)

Response format: mO●/MEDIA/AUDIO/XP:switch

Example:

```
> CALL /MEDIA/AUDIO/XP:switch(A2:O1)
< mO /MEDIA/AUDIO/XP:switch
```

Explanation: A2 port is connected to O1 port.

7.7.5. Query the Audio Autoselect Settings

Command format: GET●/MEDIA/AUDIO/XP.DestinationPortAutoselect

Response format: pr●/MEDIA/AUDIO/XP.DestinationPortAutoselect=<O_n_set>

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

Legend: <O_n_set> Two-letter code of the Autoselect settings:

Letter	Explanation	
1 st letter	E:	Autoselect is enabled .
	D:	Autoselect is disabled .
2 nd letter	F:	First detect mode: the first active audio input is selected.
	P:	Priority detect mode: always the highest priority active audio input will be selected.
	L:	Last detect mode: always the last attached input is switched to the output automatically.
	S:	Static mode: 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.

7.7.6. Change the Autoselect Mode

Command format: CALL●/MEDIA/AUDIO/XP:setDestinationPortAutoselect(<O_n>;<O_n_set>)

Response format: mO●/MEDIA/AUDIO/XP:setDestinationPortAutoselect

Legend: See at previous section.

Example1:

```
> CALL /MEDIA/AUDIO/XP:setDestinationPortAutoselect(O1:EPM)
< mO /MEDIA/AUDIO/XP:setDestinationPortAutoselect
```

Explanation1: 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).

Example2:

```
> CALL /MEDIA/AUDIO/XP:setDestinationPortAutoselect(O1:D)
< mO /MEDIA/AUDIO/XP:setDestinationPortAutoselect
```

Explanation2: 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.

7.7.7. Query the Input Port Priority

Command format: GET●/MEDIA/AUDIO/XP.PortPriorityList

Response format: pr●/MEDIA/AUDIO/XP.PortPriorityList=<O_n_list>

The response shows the priority of each output one after another. The priority number can be from 0 to 2; 0 is the highest- and 2 is the lowest priority.

Legend:

<O_n_list> The input port priority order of the given output port: <A₁>;<A₂>;<A₃>

Example:

```
> GET /MEDIA/AUDIO/XP.PortPriorityList
< pr /MEDIA/AUDIO/XP.PortPriorityList=0,1,2;0,1,2;0,1,2
```

Explanation:

Priority	0	1	2
Video input port	A1	A2	A3

Highest priority is assigned to A1 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.

7.7.8. Change the Input Port Priority

Command format: CALL●/MEDIA/AUDIO/XP:setAutoselectionPriority(<A_n>(<O_m>):<prio>)

Response format: mO●/MEDIA/AUDIO/XP:setAutoselectionPriority

Legend:

<prio>: Priority number from 0 to 2, equal numbers are allowed.

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

Example:

```
> CALL /MEDIA/VIDEO/XP:setAutoselectionPriority(A1\ (01\) :2;A2\ (01\) :2)
< mO /MEDIA/VIDEO/XP:setAutoselectionPriority
```

Explanation:

The priority number of input 1 (A1) and Input 2 (A2) has been set to 2 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.

7.7.9. Mute an Audio Input

Command format: CALL●/MEDIA/AUDIO/XP:muteSource(<A_n>)

Response format: mO●/MEDIA/AUDIO/XP:muteSource

Example:

```
> CALL /MEDIA/AUDIO/XP:muteSource(A1)
< mO /MEDIA/AUDIO/XP:muteSource
```

7.7.10. Unmute an Audio Input

Command format: CALL●/MEDIA/AUDIO/XP:unmuteSource(<A_n>)

Response format: mO●/MEDIA/AUDIO/XP:unmuteSource

Example:

```
> CALL /MEDIA/AUDIO/XP:unmuteSource(A1)
< mO /MEDIA/AUDIO/XP:unmuteSource
```

7.7.11. Lock an Input Port

Command format: CALL●/MEDIA/AUDIO/XP:lockSource(<A_n>)

Response format: mO●/MEDIA/AUDIO/XP:lockSource

Example:

```
> CALL /MEDIA/AUDIO/XP:lockSource(A1)
< mO /MEDIA/AUDIO/XP:lockSource
```

7.7.12. Unlock an Input Port

Command format: CALL●/MEDIA/AUDIO/XP:unlockSource(<A_n>)

Response format: mO●/MEDIA/AUDIO/XP:unlockSource

Example:

```
> CALL /MEDIA/AUDIO/XP:unlockSource(A1)
< mO /MEDIA/AUDIO/XP:unlockSource
```

7.7.13. Mute an Audio Output Port

Command format: CALL●/MEDIA/AUDIO/XP:muteDestination(<O_n>)

Response format: mO●/MEDIA/AUDIO/XP:muteDestination

Example:

```
> CALL /MEDIA/AUDIO/XP:muteDestination(01)
< mO /MEDIA/AUDIO/XP:muteDestination
```


7.7.14. Unmute an Audio Output Port**Command format:** CALL●/MEDIA/AUDIO/XP:unmuteDestination(<O_n>)**Response format:** mO●/MEDIA/AUDIO/XP:unmuteDestination**Example:**

```
> CALL /MEDIA/AUDIO/XP:unmuteDestination(01)
< mO /MEDIA/AUDIO/XP:unmuteDestination
```

7.7.15. Lock an Audio Output Port**Command format:** CALL●/MEDIA/AUDIO/XP:lockDestination(<O_n>)**Response format:** mO●/MEDIA/AUDIO/XP:lockDestination**Example:**

```
> CALL /MEDIA/AUDIO/XP:lockDestination(01)
< mO /MEDIA/AUDIO/XP:lockDestination
```

7.7.16. Unlock an Audio Output Port**Command format:** CALL●/MEDIA/AUDIO/XP:unlockDestination(<O_n>)**Response format:** mO●/MEDIA/AUDIO/XP:unlockDestination**Example:**

```
> CALL /MEDIA/AUDIO/XP:unlockDestination(01)
< mO /MEDIA/AUDIO/XP:unlockDestination
```

7.7.17. Analog Audio Input Level Settings**Gain****Command format:** SET●/MEDIA/AUDIO/<A_n>.Gain=<level>**Response format:** pw●/MEDIA/AUDIO/<A_n>.Gain=<level>**Parameters:**

<level> Sets the input gain between -12 dB and 6 dB in step of 3 dB. The value is rounded down if necessary to match the step value.

Example:

```
> SET /MEDIA/AUDIO/A3.Gain=3
< pw /MEDIA/AUDIO/A3.Gain=3.00
```

7.7.18. Analog Audio Output Level Settings**Volume (dB)****Command format:** SET●/MEDIA/AUDIO/<O_n>.VolumedB=<level>**Response format:** pw●/MEDIA/AUDIO/<O_n>.VolumedB=<level>**Parameters:**

<level> Sets the output volume (attenuation) between -57 dB and 0 dB in step of -0.375 dB. The value is rounded up if necessary to match with the step value.

Example:

```
> SET /MEDIA/AUDIO/O3.VolumedB=-15
< pw /MEDIA/AUDIO/O3.VolumedB=-15.00
```

Volume (Percent)**Command format:** SET●/MEDIA/AUDIO/<O_n>.VolumePercent=<percent>**Response format:** pw●/MEDIA/AUDIO/<O_n>.VolumePercent=<percent>**Parameters:**

<percent> Sets the output volume (attenuation) between 100% and 0%, in step of 1%. The value is rounded up if necessary to match with the step value.

Example:

```
> SET /MEDIA/AUDIO/O3.VolumePercent=50
< pw /MEDIA/AUDIO/O3.VolumePercent=50.00
```

Balance**Command format:** SET●/MEDIA/AUDIO/<O_n>.Balance=<level>**Response format:** pw●/MEDIA/AUDIO/<O_n>.Balance=<level>**Parameters:**

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

Example:

```
> SET /MEDIA/AUDIO/O3.Balance=0
< pw /MEDIA/AUDIO/O3.Balance=0
```

7.7.19. Analog Audio Output Level Settings by Steps

Volume in dB

Command format: CALL●/MEDIA/AUDIO/<O_n>:stepVolumedB=<step>

Response format: m0●/MEDIA/AUDIO/<O_n>:stepVolumedB=<step>

Parameters:

<step> Volume is increased or decreased with the given value in dB.

Example:

```
> CALL /MEDIA/AUDIO/03:stepVolumedB(-1)
< m0 /MEDIA/AUDIO/03:stepVolumedB
```

Explanation:

The volume is decreased with 1 dB, the current volume is -1.95 dB which means 77.84% in percent.

Volume in Percent

Command format: CALL●/MEDIA/AUDIO/<O_n>:stepVolumePercent=<step>

Response format: m0●/MEDIA/AUDIO/<O_n>:stepVolumePercent=<step>

Parameters:

<step> Volume is increased or decreased with the given value in percent.

Example:

```
> CALL /MEDIA/AUDIO/03:stepVolumePercent(5)
< m0 /MEDIA/AUDIO/03:stepVolumePercent
```

Explanation:

The volume is increased with 5%, the current volume is -1.52 dB which means 82.84% in percent.

7.8. Audio Port Settings for Firmware v1.1.0

ATTENTION! The audio port setting commands depend on the installed firmware version of the device. If your device is installed with firmware v1.2.0, see the [Audio Port Settings for Firmware v1.2.0](#) section. The following LW3 commands are related to firmware v1.1.0. To query the firmware version of your device, see the [Query the Firmware Version](#) section. You can find the complete list of the changes in the [LW3 Command Changes in Firmware v1.2.0](#) section.

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

7.8.1. Set Audio Source of HDMI Output 1

The HDMI out 1 port can transmit the original embedded audio line or the analog audio from the analog audio input line.

Command format: SET●/SYS/MB/LEGACYAUDIOXP.EmbedAudioInputToHdmiOut1=true|false

Response format: pw●/SYS/MB/LEGACYAUDIOXP.EmbedAudioInputToHdmiOut1=true|false

Parameters:

.EmbedAudioInputToHdmiOut1	true	false
Audio source of HDMI out 1 (O1)	Analog audio line from input port I5 is embedded to O1	Original embedded HDMI audio is transmitted to O1

Example:

```
> SET /SYS/MB/LEGACYAUDIOXP.EmbedAudioInputToHdmiOut1=false
< pw /SYS/MB/LEGACYAUDIOXP.EmbedAudioInputToHdmiOut1=false
```

Explanation: HDMI out 1 trasmits the original audio line of HDMI signal from the selected input port.

7.8.2. Set Audio Source of HDMI Output 2

The HDMI out 2 port can transmit the original embedded audio line or the analog audio from the analog audio input line.

Command format: SET●/SYS/MB/LEGACYAUDIOXP.EmbedAudioInputToHdmiOut2=true|false

Response format: pw●/SYS/MB/LEGACYAUDIOXP.EmbedAudioInputToHdmiOut2=true|false

Parameters:

.EmbedAudioInputToHdmiOut2	true	false
Audio source of HDMI out 2 (O2)	Analog audio line from input port I5 is embedded to O2	Original embedded HDMI audio is transmitted to O2

Example:

```
> SET /SYS/MB/LEGACYAUDIOXP.EmbedAudioInputToHdmiOut2=true
< pw /SYS/MB/LEGACYAUDIOXP.EmbedAudioInputToHdmiOut2=true
```

Explanation: HDMI out 2 trasmits the analog audio signal from input port I5 which is embedded to the HDMI signal.

7.8.3. Set Audio Source of Analog Audio Output

The Analog audio out port can transmit the the analog audio from the analog audio input line or the de-embedded audio from the HDMI out 2.

Command format: SET●/SYS/MB/LEGACYAUDIOXP.EnableAnalogPassthrough=true|false

Response format: pw●/SYS/MB/LEGACYAUDIOXP.EnableAnalogPassthrough=true|false

Parameters:

.EnableAnalogPassthrough	true	false
Audio source of Analog audio out (O3)	Analog audio of Analog audio input is transmitted to Analog audio out	HDMI audio of HDMI out 2 is de-embedded to Analog Audio out

Example:

```
> SET /SYS/MB/LEGACYAUDIOXP.EnableAnalogPassthrough=false
< pw /SYS/MB/LEGACYAUDIOXP.EnableAnalogPassthrough=false
```

Explanation:

The digital audio which is selected to HDMI out 2 is de-embedded and transmitted to the Analog audio out port.

7.8.4. Mute/Unmute Analog Audio Input

Command format: SET●/MEDIA/AUDIO/<I_n>.Mute=true|false

Response format: pw●/MEDIA/AUDIO/<I_n>.Mute=true|false

Example:

```
> SET /MEDIA/AUDIO/I5.Mute=false
< pw /MEDIA/AUDIO/I5.Mute=false
```

7.8.5. Mute/Unmute Analog Audio Output

Command format: SET●/MEDIA/AUDIO/<O_n>.Mute=true|false

Response format: pw●/MEDIA/AUDIO/<O_n>.Mute=true|false

Example:

```
> SET /MEDIA/AUDIO/O3.Mute=false
< pw /MEDIA/AUDIO/O3.Mute=false
```

7.8.6. Analog Audio Input Level Settings

Volume (dB)

Command format: SET●/MEDIA/AUDIO/<I_n>.VolumedB=<level>

Response format: pw●/MEDIA/AUDIO/<I_n>.VolumedB=<level>

Parameters:

<level> Sets the input volume (attenuation) between -95.625 dB and 0 dB in step of -0.375 dB. The value is rounded up if necessary to match with the step value.

Example:

```
> SET /MEDIA/AUDIO/I5.VolumedB=-15
< pw /MEDIA/AUDIO/I5.VolumedB=-15.00
```

Volume (Percent)

Command format: SET●/MEDIA/AUDIO/<I_n>.VolumePercent=<percent>

Response format: pw●/MEDIA/AUDIO/<I_n>.VolumePercent=<percent>

Parameters:

<percent> Sets the output volume (attenuation) between 100% and 0%, in step of 1%. The value is rounded up if necessary to match with the step value.

Example:

```
> SET /MEDIA/AUDIO/I5.VolumePercent=50
< pw /MEDIA/AUDIO/I5.VolumePercent=50.00
```

Balance

Command format: SET●/MEDIA/AUDIO/<I_n>.Balance=<level>

Response format: pw●/MEDIA/AUDIO/<I_n>.Balance=<level>

Parameters:

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

Example:

```
> SET /MEDIA/AUDIO/I5.Balance=10
< pw /MEDIA/AUDIO/I5.Balance=10
```

Gain

Command format: SET●/MEDIA/AUDIO/<I_n>.Gain=<level>

Response format: pw●/MEDIA/AUDIO/<I_n>.Gain=<level>

Parameters:

<level> Sets the input gain between -12 dB and 6 dB in step of 3 dB. The value is rounded down if necessary to match the step value.

Example:

```
> SET /MEDIA/AUDIO/I5.Gain=3
< pw /MEDIA/AUDIO/I5.Gain=3.00
```

7.8.7. Analog Audio Input Level Settings by Steps**Volume in dB**

Command format: CALL●/MEDIA/AUDIO/<I_n>:stepVolumedB=<step>

Response format: m0●/MEDIA/AUDIO/<I_n>:stepVolumedB=<step>

Parameters:

<step> Volume is increased or decreased with the given value in dB.

Example:

```
> CALL /MEDIA/AUDIO/I5:stepVolumedB(-1)
< m0 /MEDIA/AUDIO/I5:stepVolumedB
```

Explanation: The volume is decreased with 1 dB, the current volume is -1 dB which means 91.21% in percent.

Volume in Percent

Command format: CALL●/MEDIA/AUDIO/<I_n>:stepVolumePercent=<step>

Response format: m0●/MEDIA/AUDIO/<I_n>:stepVolumePercent=<step>

Parameters:

<step> Volume is increased or decreased with the given value in percent.

Example:

```
> CALL /MEDIA/AUDIO/I5:stepVolumePercent(5)
< m0 /MEDIA/AUDIO/I5:stepVolumePercent
```

Explanation: The volume is increased with 5%, the current volume is -0.83 dB which means 95% in percent.

Balance

Command format: CALL●/MEDIA/AUDIO/<I_n>.stepBalance=<step>

Response format: m0●/MEDIA/AUDIO/<I_n>:stepBalance=<step>

Parameters:

<step> Balance is shifted to left or right depends on the given value. -100 means left balance, 100 means right balance, step is 1. Center is 0 (default).

Example:

```
> CALL /MEDIA/AUDIO/I5:stepBalance(1)
< m0 /MEDIA/AUDIO/I5:stepBalance
```

Explanation: The balance is shifted to right with 1 step.

7.8.8. Analog Audio Output Level Settings**Volume (dB)**

Command format: SET●/MEDIA/AUDIO/<O_n>.VolumedB=<level>

Response format: pw●/MEDIA/AUDIO/<O_n>.VolumedB=<level>

Parameters:

<level> Sets the output volume (attenuation) between -57 dB and 0 dB in step of -0.375 dB. The value is rounded up if necessary to match with the step value.

Example:

```
> SET /MEDIA/AUDIO/O3.VolumedB=-15
< pw /MEDIA/AUDIO/O3.VolumedB=-15.00
```

Volume (Percent)

Command format: SET●/MEDIA/AUDIO/<O_n>.VolumePercent=<percent>

Response format: pw●/MEDIA/AUDIO/<O_n>.VolumePercent=<percent>

Parameters:

<percent> Sets the output volume (attenuation) between 100% and 0%, in step of 1%. The value is rounded up if necessary to match with the step value.

Example:

```
> SET /MEDIA/AUDIO/O3.VolumePercent=50
< pw /MEDIA/AUDIO/O3.VolumePercent=50.00
```

Balance**Command format:** SET●/MEDIA/AUDIO/<O_n>.Balance=<level>**Response format:** pw●/MEDIA/AUDIO/<O_n>.Balance=<level>**Parameters:**

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

Example:

```
> SET /MEDIA/AUDIO/03.Balance=0
< pw /MEDIA/AUDIO/03.Balance=0
```

7.8.9. Analog Audio Output Level Settings by Steps**Volume in dB****Command format:** CALL●/MEDIA/AUDIO/<O_n>:stepVolumedB=<step>**Response format:** m0●/MEDIA/AUDIO/<O_n>:stepVolumedB=<step>**Parameters:**

<step> Volume is increased or decreased with the given value in dB.

Example:

```
> CALL /MEDIA/AUDIO/03:stepVolumedB(-1)
< m0 /MEDIA/AUDIO/03:stepVolumedB
```

Explanation:

The volume is decreased with 1 dB, the current volume is -1.95 dB which means 77.84% in percent.

Volume in Percent**Command format:** CALL●/MEDIA/AUDIO/<O_n>:stepVolumePercent=<step>**Response format:** m0●/MEDIA/AUDIO/<O_n>:stepVolumePercent=<step>**Parameters:**

<step> Volume is increased or decreased with the given value in percent.

Example:

```
> CALL /MEDIA/AUDIO/03:stepVolumePercent(5)
< m0 /MEDIA/AUDIO/03:stepVolumePercent
```

Explanation:

The volume is increased with 5%, the current volume is -1.52 dB which means 82.84% in percent.

7.9. Network Configuration**7.9.1. Query the DHCP State****Command format:** GET●/MANAGEMENT/NETWORK.DhcpEnabled**Response format:** pw●/MANAGEMENT/NETWORK.DhcpEnabled=true|false**Example:**

```
> GET /MANAGEMENT/NETWORK.DhcpEnabled
< pw /MANAGEMENT/NETWORK.DhcpEnabled=true
```

7.9.2. Change the DHCP State**Command format:** SET●/MANAGEMENT/NETWORK.DhcpEnabled=true|false**Response format:** pw●/MANAGEMENT/NETWORK.DhcpEnabled=true|false**Example:**

```
> SET /MANAGEMENT/NETWORK.DhcpEnabled=false
< pw /MANAGEMENT/NETWORK.DhcpEnabled=false
```

7.9.3. Query the IP Address**Command format:** GET●/MANAGEMENT/NETWORK.IpAddress**Response format:** pr●/MANAGEMENT/NETWORK.IpAddress=<IP_Address>**Example:**

```
> GET /MANAGEMENT/NETWORK.IpAddress
< pr /MANAGEMENT/NETWORK.IpAddress=192.168.0.100
```

7.9.4. Change the IP Address (Static)**Command format:** SET●/MANAGEMENT/NETWORK.StaticIpAddress=<IP_address>**Response format:** pw●/MANAGEMENT/NETWORK.StaticIpAddress=<IP_address>**Example:**

```
> SET /MANAGEMENT/NETWORK.StaticIpAddress=192.168.0.85
< pw /MANAGEMENT/NETWORK.StaticIpAddress=192.168.0.85
```

7.9.5. Query the Subnet Mask

Command format: GET●/MANAGEMENT/NETWORK.NetworkMask

Response format: pr●/MANAGEMENT/NETWORK.NetworkMask=<netmask>

Example:

```
> GET /MANAGEMENT/NETWORK.NetworkMask
< pr /MANAGEMENT/NETWORK.NetworkMask=255.255.255.0
```

7.9.6. Change the Subnet Mask (Static)

Command format: SET●/MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>

Response format: pw●/MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>

Example:

```
> SET /MANAGEMENT/NETWORK.StaticNetworkMask=255.255.255.0
< pw /MANAGEMENT/NETWORK.StaticNetworkMask=255.255.255.0
```

7.9.7. Query the Gateway Address

Command format: GET●/MANAGEMENT/NETWORK.GatewayAddress

Response format: pr●/MANAGEMENT/NETWORK.GatewayAddress=<gw_address>

Example:

```
> GET /MANAGEMENT/NETWORK.GatewayAddress
< pr /MANAGEMENT/NETWORK.GatewayAddress=192.168.0.1
```

7.9.8. Change the Gateway Address (Static)

Command format: SET●/MANAGEMENT/NETWORK.StaticGatewayAddress=<gw_address>

Response format: pw●/MANAGEMENT/NETWORK.StaticGatewayAddress=<gw_address>

Example:

```
> SET /MANAGEMENT/NETWORK.StaticGatewayAddress=192.168.0.5
< pw /MANAGEMENT/NETWORK.StaticGatewayAddress=192.168.0.5
```

7.9.9. Apply Network Settings

Command format: CALL●/MANAGEMENT/NETWORK:ApplySettings()

Response format: m0●/MANAGEMENT/NETWORK:ApplySettings

Example:

```
> CALL /MANAGEMENT/NETWORK:ApplySettings()
< m0 /MANAGEMENT/NETWORK:ApplySettings
```

Explanation: all network settings which are changed have been applied and network interface restarts.

7.10. RS-232 Port Configuration

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

INFO: Only MMX4x2-HT200 model has TPS serial link.

7.10.1. Protocol Setting

Command format: SET●/MEDIA/UART/<P_n>.ControlProtocol=0|1

Response format: pw●/MEDIA/UART/<P_n>.ControlProtocol=0|1

Parameters:

.ControlProtocol	0	1
RS-232 protocol mode	LW2	LW3

Example:

```
> SET /MEDIA/UART/P1.ControlProtocol=1
< pw /MEDIA/UART/P1.ControlProtocol=1
```

7.10.2. BAUD Rate Setting

Command format: SET●/MEDIA/UART/<P_n>.Baudrate=0|1|2|3|4|5|6|7

Response format: pw●/MEDIA/UART/<P_n>.Baudrate=0|1|2|3|4|5|6|7

Parameters:

.Baudrate	0	1	2	3	4	5	6	7
BAUD rate value	4800	7200	9600	14400	19200	38400	57600	115200

Example:

```
> SET /MEDIA/UART/P1.Baudrate=2
< pw /MEDIA/UART/P1.Baudrate=2
```

7.10.3. Databit Setting

Command format: SET●/MEDIA/UART/<P_n>.DataBits=8|9

Response format: pw●/MEDIA/UART/<P_n>.DataBits=8|9

Example:

```
> SET /MEDIA/UART/P1.DataBits=8
< pw /MEDIA/UART/P1.DataBits=8
```

7.10.4. Stopbits Setting

Command format: SET●/MEDIA/UART/<P_n>.StopBits=0|1|2

Response format: pw●/MEDIA/UART/<P_n>.StopBits=0|1|2

Parameters:

.StopBits	0	1	2
Stopbit value	1	1,5	2

Example:

```
> SET /MEDIA/UART/P1.StopBits=0
< pw /MEDIA/UART/P1.StopBits=0
```

7.10.5. Parity Setting

Command format: SET●/MEDIA/UART/<P_n>.Parity=0|1|2

Response format: pw●/MEDIA/UART/<P_n>.Parity=0|1|2

Parameters:

.Parity	0	1	2
Parity setting	no parity	odd	even

Example:

```
> SET /MEDIA/UART/P1.Parity=0
< pw /MEDIA/UART/P1.Parity=0
```

7.10.6. RS-232 Operation Mode

Command format: SET●/MEDIA/UART/<P_n>.Rs232Mode=0|1|2

Response format: pw●/MEDIA/UART/<P_n>.Rs232Mode=0|1|2

Parameters:

.Rs232Mode	0	1	2
RS-232 operation mode	Pass-through	Control	Command injection

Example:

```
> SET /MEDIA/UART/P1.Rs232Mode=1
< pw /MEDIA/UART/P1.Rs232Mode=1
```

Command Injection Mode

Command format: SET●/MEDIA/UART/<P_n>.CommandInjectionEnable=true|false

Response format: pw●/MEDIA/UART/<P_n>.CommandInjectionEnable=true|false

Example:

```
> SET /MEDIA/UART/P1.CommandInjectionEnable=true
< pw /MEDIA/UART/P1.CommandInjectionEnable=true
```

ATTENTION! The Command injection status is stored in another read-only property: /MEDIA/UART/<P_n>.CommandInjectionStatus.

7.11. Sending Message via the Communication Ports

7.11.1. Sending Message via TCP Port

The device can be used for sending a message to a certain IP:port address. The three different commands allow controlling the connected (third-party) devices.

Sending TCP Message

The command is for sending a command messages in ASCII-format with an option for escaping special characters.

Command format: CALL●/MEDIA/ETHERNET:tcpMessage(<IP_address>:<port_no>=<message>)

Response format: mO●/MEDIA/ETHERNET:tcpMessage

Example:

```
> CALL /MEDIA/ETHERNET:tcpMessage(192.168.0.20:5555=PWR0\x0d\x0a)
< mO /MEDIA/ETHERNET:tcpMessage
```

Escaping in the Message

When commands need to be separated by <CR><LF> characters to be recognized by the controlled device, then they need to be escaped. You can use the following format for escaping:

<command₁><\x0d\x0a><command₂><\x0d\x0a>...<command_n><\x0d\x0a>

Sending Text Message

The command is for sending a text message in ASCII-format.

INFO: Escaping will not be processed using the **tcpText** command.

Command format: CALL●/MEDIA/ETHERNET:tcpText(<IP_address>:<port_no>=<message>)

Response format: mO●/MEDIA/ETHERNET:tcpText

Example:

```
> CALL /MEDIA/ETHERNET:tcpText(192.168.0.20:5555=pwr_on)
< mO /MEDIA/ETHERNET:tcpText
```

Sending Binary Message

The command is for sending a binary message in HEX format.

INFO: Escaping will not be processed using the **tcpBinary** command.

Command format: CALL●/MEDIA/ETHERNET:tcpBinary(<IP_address>:<port_no>=<message>)

Response format: mO●/MEDIA/ETHERNET:tcpBinary

Example:

```
> CALL /MEDIA/ETHERNET:tcpBinary(192.168.0.20:5555=0100000061620000cdcc2c40)
< mO /MEDIA/ETHERNET:tcpBinary
```

7.11.2. Sending Message via UDP Port

The device can be used for sending a message to a certain IP:port address. The three different commands allow controlling the connected (third-party) devices.

Sending UDP Message

The command is for sending a command messages in ASCII-format with an option for escaping special characters.

Command format: CALL●/MEDIA/ETHERNET:udpMessage(<IP_address>:<port_no>=<message>)

Response format: mO●/MEDIA/ETHERNET:udpMessage

Example:

```
> CALL /MEDIA/ETHERNET:udpMessage(192.168.0.20:5555=PWR0\x0d\x0a)
< mO /MEDIA/ETHERNET:udpMessage
```

Escaping in the Message

When commands need to be separated by <CR><LF> characters to be recognized by the controlled device, then they need to be escaped. You can use the following format for escaping:

<command₁><\x0d\x0a><command₂><\x0d\x0a>...<command_n><\x0d\x0a>

Sending Text Message

The command is for sending a text message in ASCII-format.

INFO: Escaping will not be processed using the **udpText** command.

Command format: CALL●/MEDIA/ETHERNET:udpText(<IP_address>:<port_no>=<message>)

Response format: mO●/MEDIA/ETHERNET:udpText

Example:

```
> CALL /MEDIA/ETHERNET:udpText(192.168.0.20:5555=pwr_on)
< mO /MEDIA/ETHERNET:udpText
```

Sending Binary Message

The command is for sending a binary message in HEX format.

INFO: Escaping will not be processed using the **udpBinary** command.

Command format: CALL●/MEDIA/ETHERNET:udpBinary(<IP_address>:<port_no>=<message>)

Response format: mO●/MEDIA/ETHERNET:udpBinary

Example:

```
> CALL /MEDIA/ETHERNET:udpBinary(192.168.0.20:5555=0100000061620000cdcc2c40)
< mO /MEDIA/ETHERNET:udpBinary
```

7.11.3. Sending Message via an RS-232 Port

The RS-232 ports can be used for sending a command message to a device which can be controlled over serial port. Both local RS-232 and extended link RS-232 ports can be used. The three different commands allow to use different message formats.

Sending Message

The command is for sending a command messages in ASCII-format with an option for escaping special characters.

Command format: CALL●/MEDIA/UART/<P_n>:sendMessage(<message>)

Response format: mO●/MEDIA/UART/<P_n>:sendMessage

Example:

```
> CALL /MEDIA/UART/P1:sendMessage(PWR0\x0d\x0a)
< mO /MEDIA/UART/P1:sendMessage
```

Escaping in the Message

When commands need to be separated by <CR><LF> characters to be recognized by the controlled device, then they need to be escaped. You can use the following format for escaping:

<command₁><\x0d\x0a><command₂><\x0d\x0a>...<command_n><\x0d\x0a>

Sending Text Message

The command is for sending a text message in ASCII-format.

INFO: Escaping will not be processed using the **sendText** command.

Command format: CALL●/MEDIA/UART/<P_n>:sendText(<message>)

Response format: mO●/MEDIA/UART/<P_n>:sendText

Example:

```
> CALL /MEDIA/UART/P2:sendText(pwr_on)
< mO /MEDIA/UART/P2:sendText
```


Sending Binary Message

The command is for sending a binary message in HEX format.

INFO: Escaping will not be processed using the `sendBinaryMessage` command.

Command format: CALL●/MEDIA/UART/<P_n>.sendBinaryMessage(<message>)

Response format: mO●/MEDIA/UART/<P_n>:sendBinaryMessage

Example:

```
> CALL /MEDIA/UART/P1.sendBinaryMessage(0100000061620000cdcc2c40)
< mO /MEDIA/UART/P1:sendBinaryMessage
```

7.12. Infrared Port Configuration

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

INFO: Only MMX4x2-HT200 model has TPS IR link.

7.12.1. Enable Command Injection Mode

Command format: SET●/MEDIA/IR/<SID_n>.CommandInjectionEnable=true|false

Response format: pw●/MEDIA/IR/<SID_n>.CommandInjectionEnable=true|false

Example:

```
> SET /MEDIA/IR/S1.CommandInjectionEnable=true
< pw /MEDIA/IR/S1.CommandInjectionEnable=true
```

7.12.2. Change Command Injection Port Number

Command format: SET●/MEDIA/IR/<SID_n>.CommandInjectionPort=<port_no>

Response format: pw●/MEDIA/IR/<SID_n>.CommandInjectionPort=<port_no>

Example:

```
> SET /MEDIA/IR/S1.CommandInjectionPort=9001
< pw /MEDIA/IR/S1.CommandInjectionPort=9001
```

7.12.3. Enable/Disable Output Signal Modulation

Command format: SET●/MEDIA/IR/<D_n>.EnableModulation=true|false

Response format: pw●/MEDIA/IR/<D_n>.EnableModulation=true|false

Example:

```
> SET /MEDIA/IR/D2.EnableModulation=false
< pw /MEDIA/IR/D2.EnableModulation=false
```

Explanation:

Signal modulation is turned off on TPS IR output line (D2).

INFO: The default setting value is "true" (enabled).

7.13. EDID Management

7.13.1. Query the Emulated EDIDs

Command format: GET●/EDID.EdidStatus

Response format: pr●/EDID.EdidStatus=<E_{loc}>:<E₁>;<E_{loc}>:<E₂>;...;<E_{loc}>:<E_n>

Example:

```
> GET /EDID.EdidStatus
< pr /EDID.EdidStatus=D1:E1
```

Explanation:

Emulated EDID memory for input port is listed with the EDID number that is currently emulated on the input.

7.13.2. Query the Validity of a Dynamic EDID

Command format: GET●/EDID/D/D_n.Validity

Response format: pr●/EDID/D/D_n.Validity=true|false

Example:

```
> GET /EDID/D/D1.Validity
< pr /EDID/D/D1.Validity=true
```

Explanation:

The 'Validity' property is true, valid EDID is stored in D1 memory place.

7.13.3. Query the Preferred Resolution of a User EDID

Command format: GET●/EDID/U/U_n.PreferredResolution

Response format: pr●/EDID/U/U_n.PreferredResolution=<preferred_resolution>

Example:

```
> GET /EDID/U/U2.PreferredResolution
< pr /EDID/U/U2.PreferredResolution=1920x1080p60.00Hz
```

INFO: Use the "Manufacturer" property to query the manufacturer and the "MonitorName" property to query the name of the monitor.

7.13.4. Emulating an EDID to an Input Port

Command format: CALL●/EDID:switch(<source>:<destination>)

Response format: mO●/EDID:switch

Example:

```
> CALL /EDID:switch(F49:E2)
< mO /EDID:switch
```

Legend:

<source>: Source EDID memory place: Factory / User / Dynamic.
<destination>: The emulated EDID memory of the desired input port.

7.13.5. Copy an EDID to User Memory

Command format: CALL●/EDID:copy(<D_n>|<E_n>|<F_n>|<U_n>:<U_m>)

Response format: mO●/EDID:copy

Example:

```
> CALL /EDID:copy(D1:U1)
< mO /EDID:copy
```

Explanation:

The EDID of the last connected sink of D1 (Output 1) has been copied to U1.

7.13.6. Deleting an EDID from User Memory

Command format: CALL●/EDID:delete(<U_n>)

Response format: mO●/EDID:delete

Example:

```
> CALL /EDID:delete(U1)
< mO /EDID:delete
```

7.13.7. Resetting the Emulated EDIDs

Command format: CALL●/EDID:reset()

Response format: mO●/EDID:reset

Example:

```
> CALL /EDID:reset()
< mO /EDID:reset
```

Explanation: Calling this method switches all emulated EDIDs to factory default one. See the table in the [Factory EDID List](#) section.

7.14. LW3 Commands - Quick Summary

System Commands

Operation / Path	
7.5.1	Set the Device Label /MANAGEMENT/UI.DeviceLabel
7.5.2	Query the Firmware Version /SYS/MB.FirmwareVersion
7.5.3	Control Lock /MANAGEMENT/UI.ControlLock
7.5.4	Identify the Device /MANAGEMENT/UI.identifyMe
7.5.5	Resetting the Device /SYS:reset()
7.5.6	Restore the Factory Default Settings /SYS:factoryDefaults()

Video Port Settings

Operation / Path	
7.6.1	Query the Status of Source Port /MEDIA/VIDEO/XP.SourcePortStatus
7.6.2	Query the Status of Destination Port /MEDIA/VIDEO/XP.DestinationPortStatus
7.6.3	Query the Video Crosspoint Setting /MEDIA/VIDEO/XP.DestinationConnectionList
7.6.4	Switching Video Input /MEDIA/VIDEO/XP:switch(<input>:<output>)
7.6.5	Query the Video Autoselect Settings /MEDIA/VIDEO/XP.DestinationPortAutoselect
7.6.6	Change the Autoselect Mode /MEDIA/VIDEO/XP:setDestinationPortAutoselect(<output>:<output_set>)
7.6.7	Query the Input Port Priority /MEDIA/VIDEO/XP.PortPriorityList

Operation / Path	
7.6.8	Change the Input Port Priority /MEDIA/VIDEO/XP:setAutoselectionPriority(<input>(<output>):<prio>)
7.6.9	Mute an Input Port /MEDIA/VIDEO/XP:muteSource(<input>)
7.6.10	Unmute an Input Port /MEDIA/VIDEO/XP:unmuteSource(<input>)
7.6.11	Unmute an Input Port /MEDIA/VIDEO/XP:lockSource(<input>)
7.6.12	Unlock an Input Port /MEDIA/VIDEO/XP:unlockSource(<input>)
7.6.13	Mute an Output Port /MEDIA/VIDEO/XP:muteDestination(<output>)
7.6.14	Unmute an Output Port /MEDIA/VIDEO/XP:unmuteDestination(<output>)
7.6.15	Lock an Output Port /MEDIA/VIDEO/XP:lockDestination(<output>)
7.6.16	Unlock an OutputPort /MEDIA/VIDEO/XP:unlockDestination(<output>)
7.6.17	HDCP Setting (Input Port) /MEDIA/VIDEO/<input>.HdcpEnable
7.6.18	HDCP Setting (Output Port) /MEDIA/VIDEO/<output>.HdcpModeSetting
7.6.19	Test Pattern Generator /MEDIA/VIDEO/<output>.TpgMode TpgClockSource TpgPattern
7.6.20	HDMI Mode Settings (Output Port) /MEDIA/VIDEO/<output>.HdmiModeSetting
7.6.21	Query the Recent TPS Mode /REMOTE/S1.tpsMode
7.6.22	TPS Mode Settings /REMOTE/S1.tpsModeSetting

Audio Port Settings for Firmware v1.2.0

Operation / Path	
7.7.1	Query the Status of Source Port
	/MEDIA/AUDIO/XP.SourcePortStatus
7.7.2	Query the Status of Destination Port
	/MEDIA/AUDIO/XP.DestinationPortStatus
7.7.3	Query the Audio Crosspoint Setting
	/MEDIA/AUDIO/XP.DestinationConnectionList
7.7.4	Switching Audio Input
	/MEDIA/AUDIO/XP:switch(<input>:<output>)
7.7.5	Query the Audio Autoselect Settings
	/MEDIA/AUDIO/XP.DestinationPortAutoselect
7.7.6	Change the Autoselect Mode
	/MEDIA/AUDIO/XP:setDestinationPortAutoselect(<output>:<output_set>)
7.7.7	Query the Input Port Priority
	/MEDIA/AUDIO/XP.PortPriorityList
7.7.8	Change the Input Port Priority
	/MEDIA/AUDIO/XP:setAutoselectionPriority(<input>(<output>):<prio>)
7.7.9	Mute an Audio Input
	/MEDIA/AUDIO/XP:muteSource(<input>)
7.7.10	Unmute an Audio Input
	/MEDIA/AUDIO/XP:unmuteSource(<input>)
7.7.11	Lock an Input Port
	/MEDIA/AUDIO/XP:lockSource(<input>)
7.7.12	Unlock an Input Port
	/MEDIA/AUDIO/XP:unlockSource(<input>)
7.7.13	Mute an Audio Output Port
	/MEDIA/AUDIO/XP:muteDestination(<output>)
7.7.14	Unmute an Audio Output Port
	/MEDIA/AUDIO/XP:unmuteDestination(<output>)
7.7.15	Lock an Audio Output Port
	/MEDIA/AUDIO/XP:lockDestination(<output>)

Operation / Path	
7.7.16	Unlock an Audio Output Port
	/MEDIA/AUDIO/XP:unlockDestination(<output>)
7.7.17	Analog Audio Input Level Settings
	/MEDIA/AUDIO/<input>.Gain
7.7.18	Analog Audio Output Level Settings
	/MEDIA/AUDIO/<output>.VolumedB VolumePercent Balance
7.7.19	Analog Audio Output Level Settings by Steps
	/MEDIA/AUDIO/<output>.stepVolumedB stepVolumePercent

Audio Port Settings for Firmware v1.1.0

Operation / Path	
7.8.1	Set Audio Source of HDMI Output 1
	/SYS/MB/LEGACYAUDIOXP.EmbedAudioInputToHdmiOut1
7.8.2	Set Audio Source of HDMI Output 2
	/SYS/MB/LEGACYAUDIOXP.EmbedAudioInputToHdmiOut2
7.8.3	Set Audio Source of Analog Audio Output
	/SYS/MB/LEGACYAUDIOXP.EnableAnalogPassthrough
7.8.4	Mute/Unmute Analog Audio Input
	/MEDIA/AUDIO/<input>.Mute
7.8.5	Mute/Unmute Analog Audio Output
	/MEDIA/AUDIO/<output>.Mute
7.8.6	Analog Audio Input Level Settings
	/MEDIA/AUDIO/<input>.VolumedB VolumePercent Balance Gain
7.8.7	Analog Audio Input Level Settings by Steps
	/MEDIA/AUDIO/<input>.stepVolumedB stepVolumePercent stepBalance
7.8.8	Analog Audio Output Level Settings
	/MEDIA/AUDIO/<output>.VolumedB VolumePercent Balance
7.8.9	Analog Audio Output Level Settings by Steps
	/MEDIA/AUDIO/<output>.stepVolumedB stepVolumePercent

Network Configuration

Operation / Path	
7.9.1	Query the DHCP State
	/MANAGEMENT/NETWORK.DhcpEnabled
7.9.2	Change the DHCP State
	/MANAGEMENT/NETWORK.DhcpEnabled
7.9.3	Query the IP Address
	/MANAGEMENT/NETWORK.IpAddress
7.9.4	Change the IP Address (Static)
	/MANAGEMENT/NETWORK.StaticIpAddress
7.9.5	Query the Subnet Mask
	MANAGEMENT/NETWORK.NetworkMask
7.9.6	Change the Subnet Mask (Static)
	/MANAGEMENT/NETWORK.StaticNetworkMask
7.9.7	Query the Gateway Address
	/MANAGEMENT/NETWORK.GatewayAddress
7.9.8	Change the Gateway Address (Static)
	/MANAGEMENT/NETWORK.StaticGatewayAddress
7.9.9	Apply Network Settings
	/MANAGEMENT/NETWORK:ApplySettings()

RS-232 Port Configuration

Operation / Path	
7.10.1	Protocol Setting
	/MEDIA/UART/<port_no>.ControlProtocol
7.10.2	BAUD Rate Setting
	/MEDIA/UART/<port_no>.Baudrate
7.10.3	Databit Setting
	/MEDIA/UART/<port_no>.DataBits
7.10.4	Stopbits Setting
	/MEDIA/UART/<port_no>.StopBits

Operation / Path	
7.10.5	Parity Setting
	/MEDIA/UART/<port_no>.Parity
7.10.6	RS-232 Operation Mode
	/MEDIA/UART/<port_no>.Rs232Mode

Sending Message via the Communication Ports

Operation / Path	
7.11.1	Sending Message via TCP Port
	/MEDIA/ETHERNET.tcpText tcpMessage tcpBinary
7.11.2	Sending Message via UDP Port
	/MEDIA/ETHERNET.udpText udpMessage udpBinary
7.11.3	Sending Message via an RS-232 Port
	/MEDIA/UART/<port_no>.sendText sendMessage sendBinaryMessage

Infrared Port Configuration

Operation / Path	
7.12.1	Enable Command Injection Mode
	/MEDIA/IR/<port_no>.CommandInjectionEnable
7.12.2	Change Command Injection Port Number
	/MEDIA/IR/<port_no>.CommandInjectionPort
7.12.3	Enable/Disable Output Signal Modulation
	/MEDIA/IR/<port_no>.EnableModulation

EDID Management

Operation / Path	
7.13.1	Query the Emulated EDIDs
	/EDID.EdidStatus
7.13.2	Query the Validity of a Dynamic EDID
	/EDID/D/<dynamic_edid_memory>.Validity
7.13.3	Query the Preferred Resolution of a User EDID
	/EDID/U/<user_edid_memory>.PreferredResolution
7.13.4	Emulating an EDID to an Input Port
	/EDID:switch(<source>:<destination>)
7.13.5	Copy an EDID to User Memory
	/EDID:copy(<source>:<destination>)
7.13.6	Deleting an EDID from User Memory
	/EDID:delete(<user_edid_memory>)
7.13.7	Resetting the Emulated EDIDs
	/EDID:reset()

8

Firmware Upgrade

The receiver can be upgraded by using Lightware Device Updater (LDU) software via Ethernet. The firmware pack with the necessary components (*.lfp file) for your specific product, the LDU application, and the User's manual can be downloaded from the Support page of our website www.lightware.com.

- ▶ [ABOUT THE FIRMWARE PACKAGE \(LFP FILE\)](#)
- ▶ [SHORT INSTRUCTIONS](#)
- ▶ [INSTALL AND UPGRADE](#)
- ▶ [DETAILED INSTRUCTIONS](#)
- ▶ [KEEPING THE CONFIGURATION SETTINGS](#)
- ▶ [REMOTE FIRMWARE UPGRADE OF CONNECTED LIGHTWARE DEVICES](#)

WARNING! Firmware upgrade from v1.1.0 to v1.2.0 affects the LW3 commands which results some nodes will be deleted and added new ones. See the entire list in the [LW3 Command Changes in Firmware v1.2.0](#) section.

ATTENTION! While the firmware is being upgraded, the normal operation mode is suspended as the matrix is switched to bootload mode. Signal processing is not performed. Do not interrupt the firmware upgrade. If any problem occurs, reboot the receiver and restart the process.

ATTENTION! The firmware upgrade process has an effect on the configuration and the settings of the device. For more details, please see the [Keeping the Configuration Settings](#) section before the upgrade.

8.1. About the Firmware Package (LFP File)

The firmware files are packed in an LFP package. You need only this file to do the upgrade on your device.

- The package contains all the necessary components, binary, and other files; You do not have to get further files.
- There is a descriptor file in the package that contains each firmware with version number and a list showing the compatible devices. The descriptor is displayed after loaded the LFP file in the LDU.

8.2. Short Instructions

- Step 1.** Get the firmware pack and the Lightware Device Updater (LDU) application.
- Step 2.** Install the LDU application.
- Step 3.** Establish the connection between the computer and the device(s).
- Step 4.** Start the LDU and follow the instructions shown on the screen.

8.3. Install and Upgrade

Installation for Windows OS

INFO: The application can be installed under Windows XP or above. Run the installer. If the User Account Control drops a pop-up message click **Yes**. During the installation you will be prompted to select the type of the installation.

Normal install	Snapshot install
Available for Windows and Mac OS X	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 install types


ATTENTION! Using the Normal install as the default value is highly recommended.

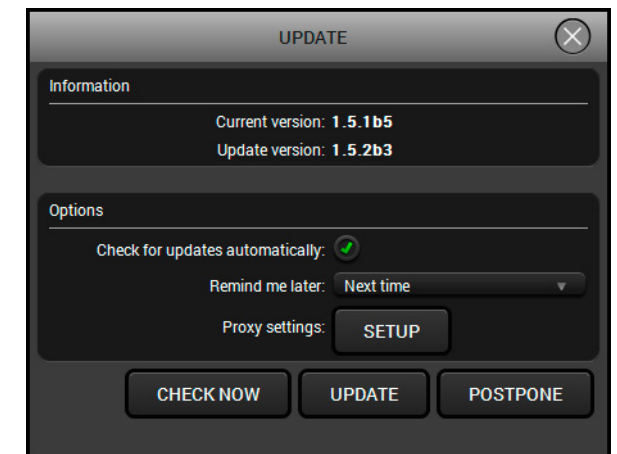
Installation for Mac OS X

INFO After the installation the Windows and the Mac application has the same look and functionality. This type of the installer is equal with the Normal install in case of Windows and results an updateable version with the same attributes.

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

LDU Upgrade

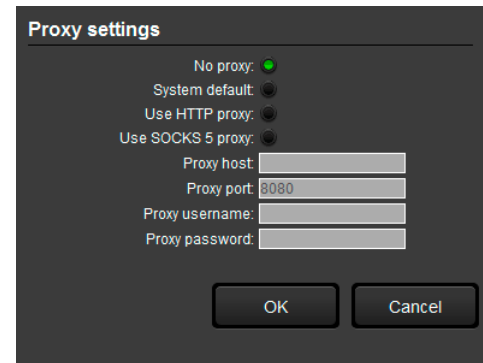
Step 1. Run the application. In the welcome screen click on the  button in the top right corner; the About window will appear. Click on the **Check now** button. The program checks the available updates on Lightware website and shows its version.



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

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

Step 3. Press the **Update** button to download the new version; the installer will start.



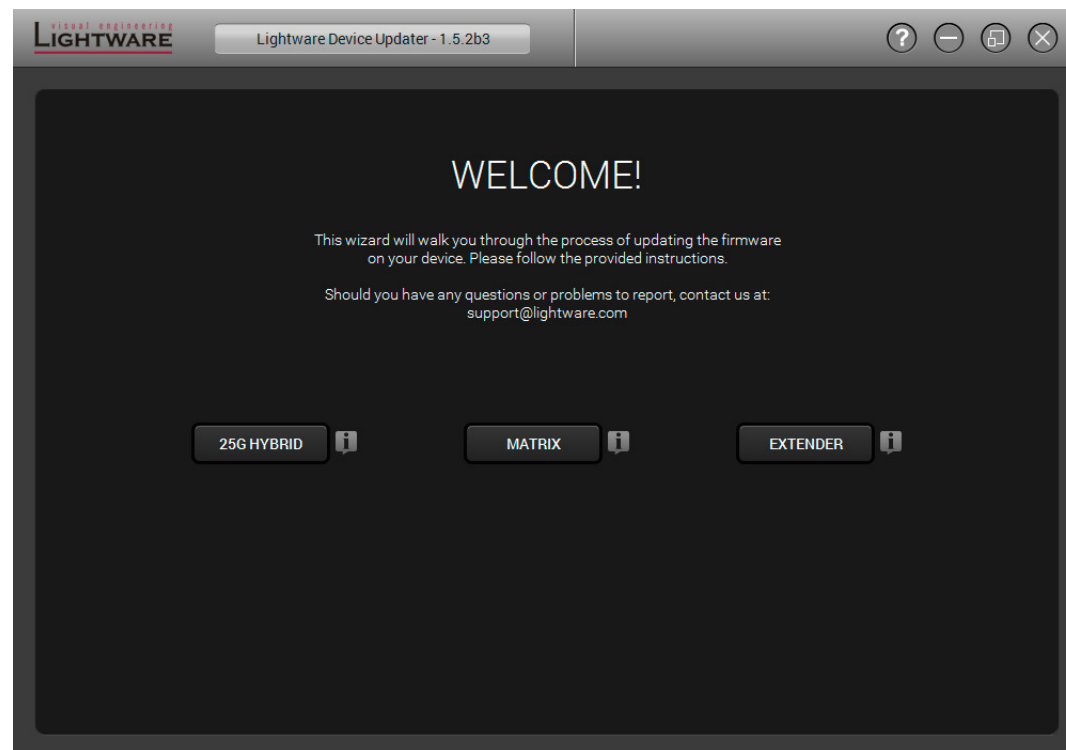
8.4. Detailed Instructions

8.4.1. Establish the Connection

Make sure that the computer and the device are connected via an Ethernet cable and the connection is established between them.

8.4.2. Start the LDU and Follow the Instructions

After launching LDU the welcome screen will appear:

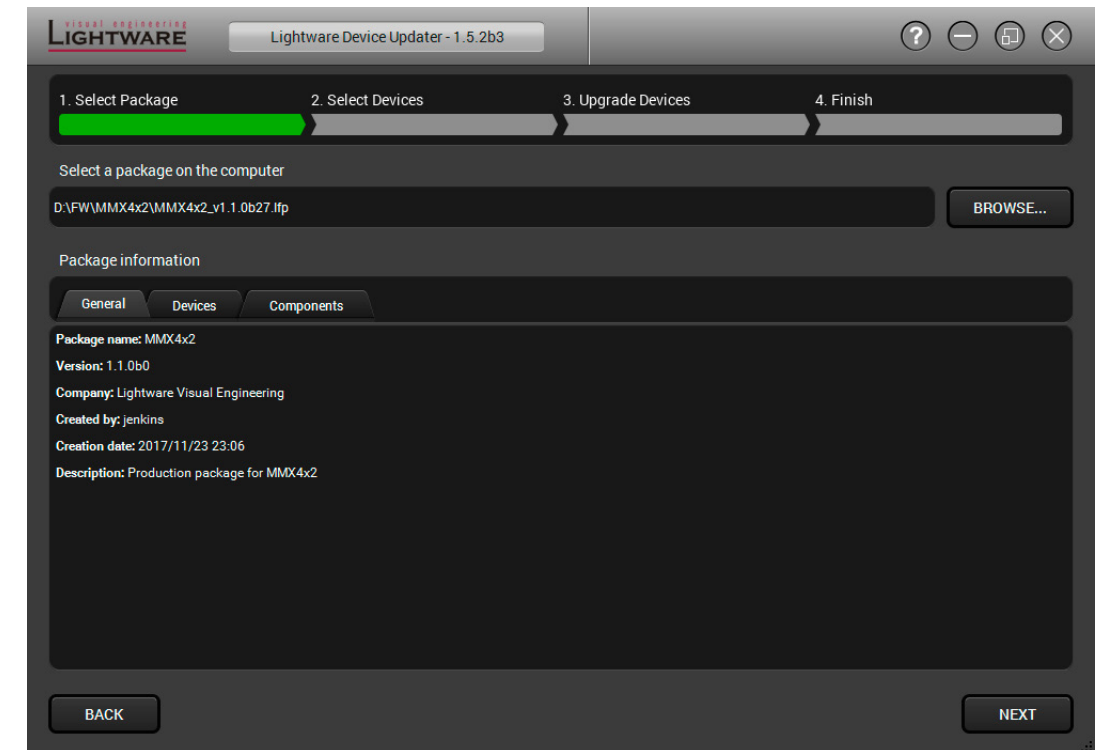


Pressing the **i** button a list will appear showing the supported devices:

Click on the **Matrix** button on the main screen.

Step 1. Select the package.

Click on the Browse button and select the ".lfp" file that will be used for the upgrade.

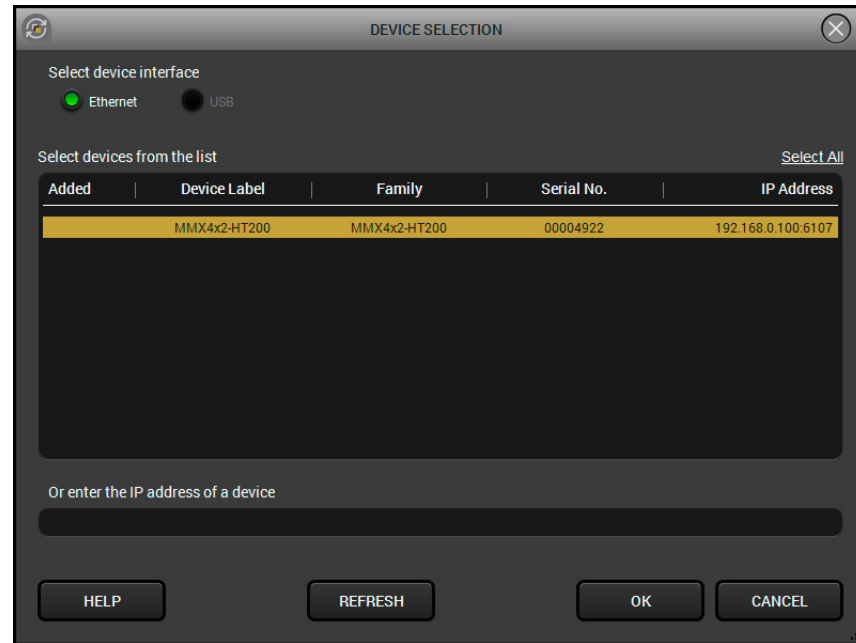


Package information is displayed:

- **General** version info, creation date, short description,
- **Devices** which are compatible with the firmware,
- **Components** in the package with release notes.

Click on the **Next** button and follow the instructions.

TIPS AND TRICKS: Files with ".lfp" extension are associated to LDU during installation. If you double click on the ".lfp" file, the application is launched, the package is loaded automatically and above screen is shown.

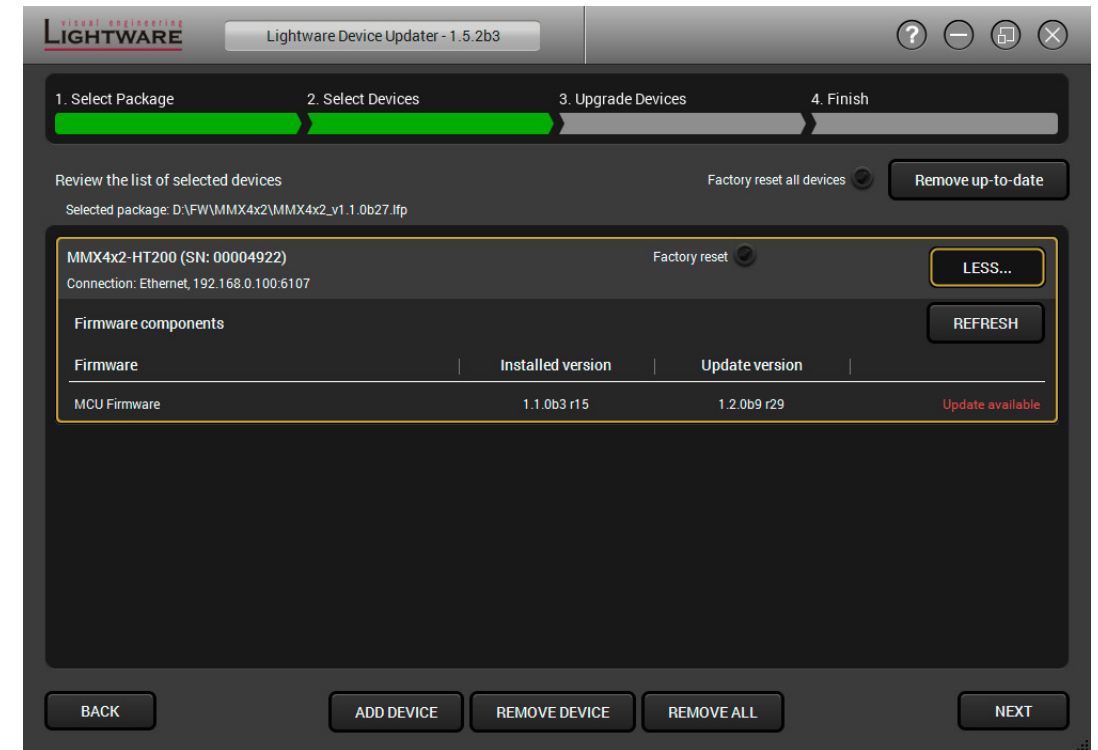
Step 2. Select device.

The following step is to select the desired device(s). The available and supported devices are searched and listed automatically. If the desired device is not listed, update the list by clicking the **Refresh** button. Select the desired devices: highlight them with a **yellow cursor**, then click **OK**.

A tick mark can be seen in the **Added** column if the device was added by the user previously.

Firmware Components

The firmware components of the selected devices are listed on the following screen: installed and update versions. (Update version will be uploaded to the device.)



Add a device by clicking on the **Add device** button. The previous screen will be shown; select the desired device(s) and click on **OK**.

Remove a device by selecting it (highlight with yellow) and click on **Remove device** button, or click on **Remove all** button to empty the list.

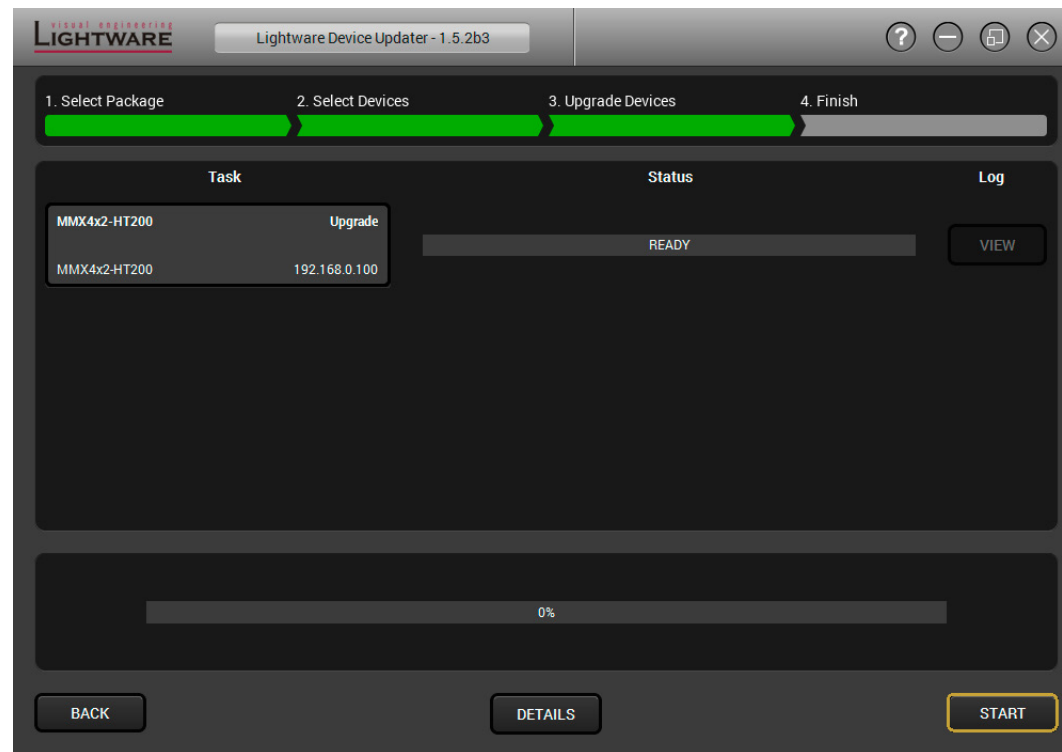
Enabling **Factory reset** will perform factory default values for all settings in the device. Three different status can exist:

- **Enabled by user:** all settings will set to factory default values.
- **Disabled by user:** your settings will be saved and restored after upgrading.
- **Enabled by default and not changeable by user:** firmware upgrade must perform a factory reset to apply all changes coming with the new firmware version.

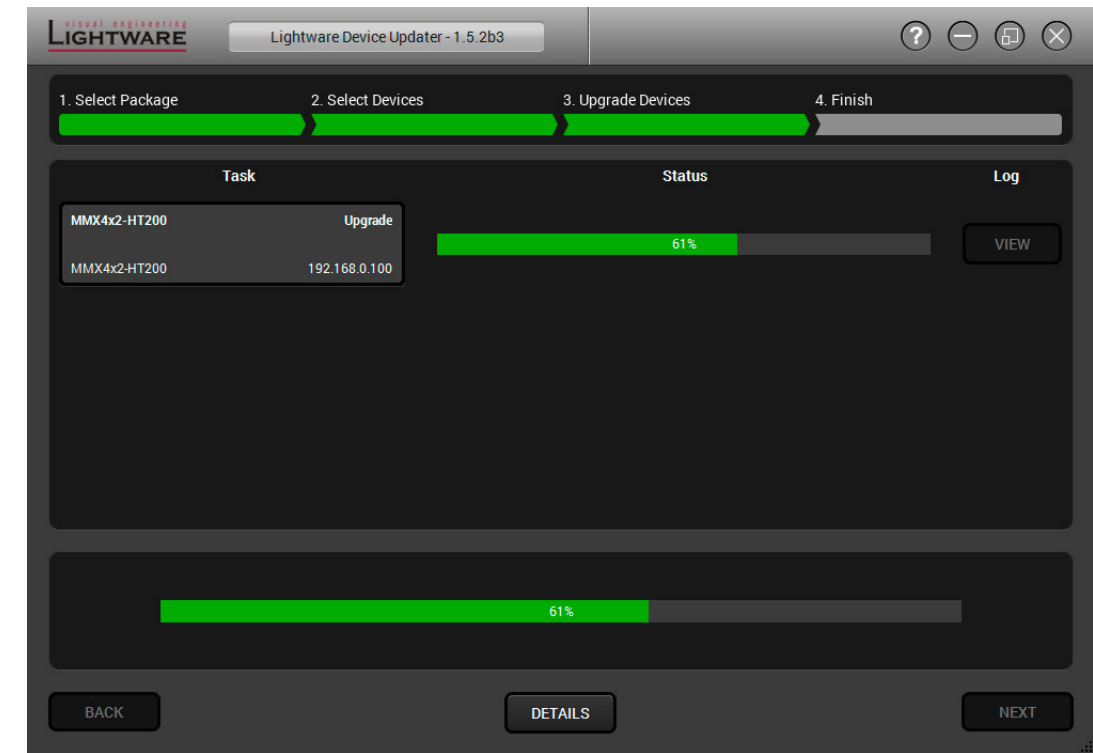
Click on the **Next** button to continue.

Step 3. Upgrade the device.

Click on the **Start** button to continue.



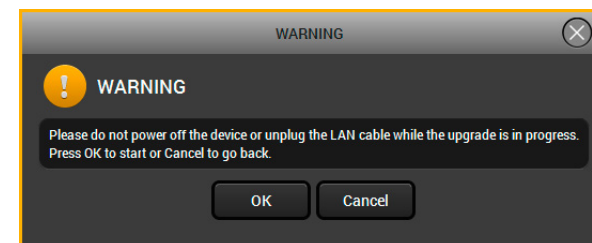
When you confirmed the warnings, the upgrade process starts automatically.



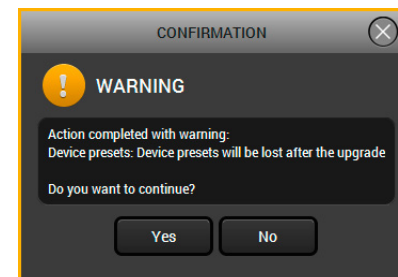
Details button opens a new window where the process is logged – see below.

Two warning windows will pop up before starting upgrading the device:

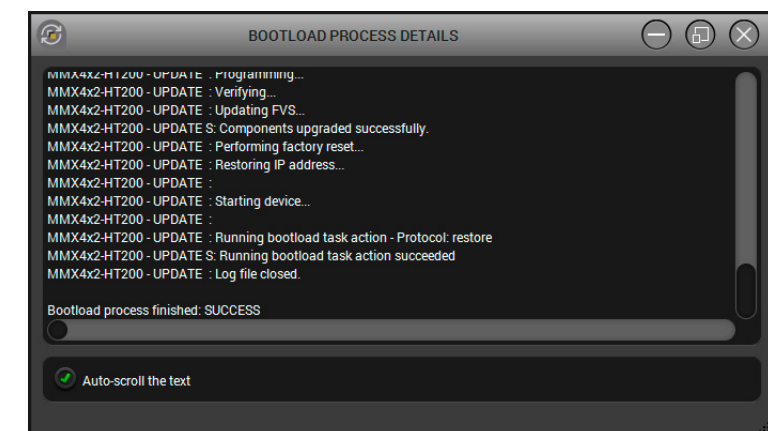
- Do not unplug the power cable and the LAN cable while the upgrade is in progress. Click **OK** to continue.



- Please note the device presets will be lost after the firmware upgrade. If you want to continue the procedure, click **Yes**.

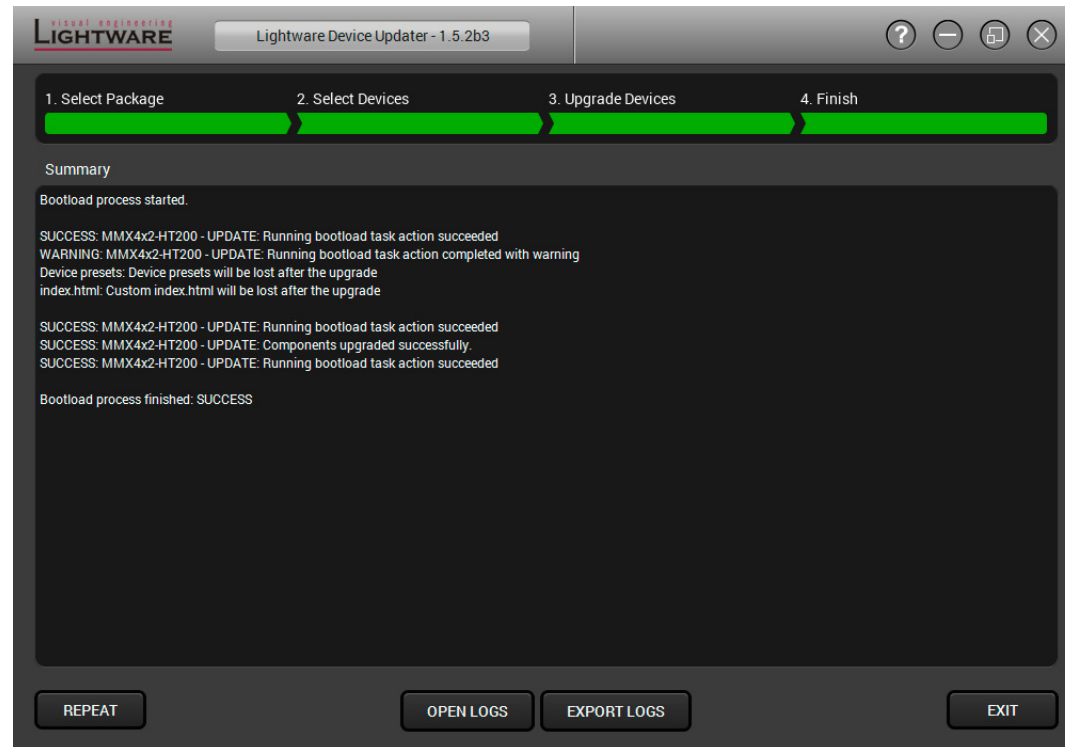


You can save the device presets to an offline file as well. See more details about the backups in the [Configuration Cloning \(Backup Tab\)](#) section.



Step 4. Finish.

If the upgrade of a device is finished, the log can be opened by the **View** button on the right. When all the tasks are finished, a window appears. Click **OK** to close and **Next** to display the summary page.



Repeat button starts the process again with the selected device(s).

Open logs button opens the temporary folder where the logs can be found.

Export logs by saving the files as a zipped file.

Press **Exit** to close the program.

If the upgrade failed, the progress bar of the device is changed to red; restart the device(s) and repeat the process.

8.5. Keeping the Configuration Settings

User can keep all configuration settings and restore to the device after firmware upgrading or can choose to perform a factory reset – it means all settings will be erased in the device. In case of factory reset you can save the settings of the device and restore it later. For the detailed information about saved data refer to the [Content of Backup File](#) section.

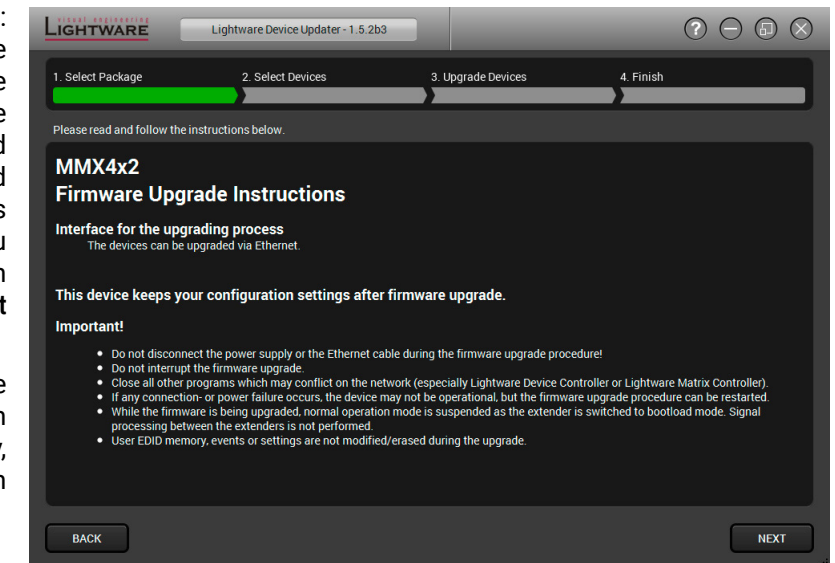
The following flow chart demonstrates how this function works in the background.



Flow chart of firmware upgrade

The details about the procedure: when firmware upgrade starts, the first step is making a backup of the settings of the device. The firmware package checks the backup data and if it is needed, a conversion is applied to avoid incompatibility problems between the firmware versions. If you do not want to keep configuration settings, you can set the **Factory reset** option enabled.

The instruction in the firmware package of the device will inform you about this function availability, reading it is highly recommended in every case.



Instructions page in the firmware package

ATTENTION! In specific cases restoring cannot be applied fully and certain settings are not copied back to the device. If a warning message appears, user can get back the original data from the backup. Logs of the upgrade procedure contain all backup data, it can be exported at the end of the upgrade procedure. In case of any question, please contact support@lightware.com.

ATTENTION! In certain cases, the new firmware version requires setting all parameters to set factory defaults. In this case, the "Factory reset" option is enabled by default and not changeable by the user, see details in the [Firmware Components](#) section.

ATTENTION! The feature is only supported by LDU version 1.3.0 and above.

8.6. Remote Firmware Upgrade of Connected Lightware Devices

ATTENTION! The feature is available for MMX4x2-HT200 only.

Firmware of Lightware devices can be upgraded via another connected Lightware device without removing the device from the system. It means user does not have to connect directly to the upgradable device, it can be reached and flashed through other devices. It's a more comfortable way to keep up-to-date your Lightware devices.



There are two types of remote upgrading:

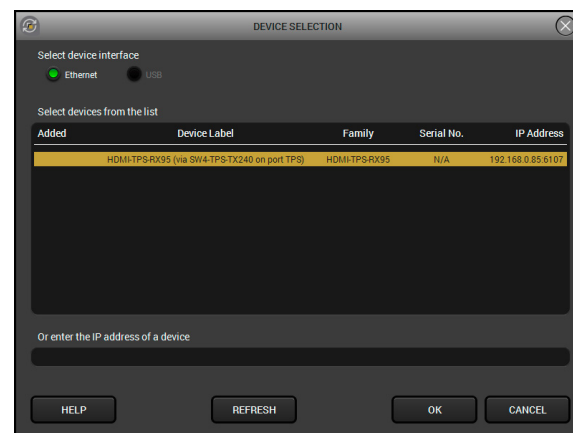
Extended Upgrade

- Intelligent devices can be upgraded via another intelligent or basic device via TPS or OPTS/OPTM link.
- For example, MMX4x2-HT200 matrix can be upgraded via MMX6x2-HT series matrix or a HDMI-TPS-TX95 extender.

Hosted Upgrade

- Basic devices can be upgraded only via an intelligent device via TPS link.
- For example, TPS 95 series extenders can be upgraded via MMX6x2-HT series matrix or the MMX4x2-HT200 matrix.
- In case of hosted upgrade, the procedure is almost the same as described in Firmware upgrade – [Detailed Instructions](#). The only difference is that the host device's name, and IP address appears beside the name of the device to be upgraded.

ATTENTION! During hosted upgrade the host device turned to bootload mode when the extender is upgraded. During the upgrade normal operation mode is suspended. When the upgrade is successfully finished, the normal operation mode is restored.








Remote device in the device selection window

9




















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 device operation section.
-  Link to LDC software section.
-  Link to LW2 protocol commands section.
-  Link to LW3 protocol commands section.

9.1. 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 [Front Panel LEDs](#) and [Rear Panel LEDs](#) sections.

Symptom	Root cause	Action	Refer to
Video signal			
No picture on the video output	Device or devices are not powered properly	Check the matrix and the other devices if they are properly powered; try to unplug and reconnect them.	 3.3.1
	Cable connection problem	Cables must fit very well, check all the connectors (video and TPS cables).	 3.3
	No incoming signal	If the SIGNAL LED of the input port does not light, no signal is present. Check the source device(s) and the HDMI/CATx cable(s).	 3.3
	TPS mode problem	Check the actual TPS mode and the selected modes of the extenders.	 5.4.1  7.6.21
	Not the proper video port is the active one	Check the video crosspoint settings.	 4.1.2  5.3  6.3.6  7.6.3
	The output is muted	Check the mute state of output port.	 5.4.3  6.3.6  7.6.2
	Display is not able to receive the video format	Check the emulated EDID; select another (e.g. emulate the EDID of the display on the input port).	 5.6  7.13
	HDCP is disabled	Enable HDCP on the input and output port.	 5.4  7.6.17  7.6.18
Not the desired picture displayed on the video output	Video output is set to test pattern (no sync screen) statically	Check Test Pattern settings in the HDMI output properties.	 5.5.3  7.6.19
	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.	
	Not the proper audio port is the active one	Check the audio crosspoint settings.	 5.3  6.3.6  7.7.3
	Input port is muted	Check the input port properties.	 5.4  6.3.6  7.7.1
	Output port is muted	Check the output port properties.	 5.4  6.3.6  7.7.2
	Analog audio volume is set low	Check the Analog audio output port settings (volume).	 5.4.7  7.7.18  7.7.19
HDMI output signal contains no audio	HDMI mode was set to DVI	Check the properties of the output port and set to HDMI or Auto.	 5.4.3  7.6.20
	DVI EDID is emulated	Check the EDID and select and HDMI EDID to emulate.	 5.6  7.13
RS-232 signal			
Connected serial device does not respond	Cable connection problem	Check the connectors to fit well; check the wiring of the plugs.	 3.3.7
	RS-232 settings are different	Check the port settings of the transmitter and/or the matrix and the connected serial device(s). Pay attention to Link and/or Local ports.	 5.7.1  7.10
	RS-232 mode is not right	Check the RS-232 mode settings (control, command injection, or disconnected)	 5.7.1  7.10.6
	Messaging via serial port is not working	Check the serial messaging rules and/or apply escaping in the message.	 7.11.3

Symptom	Root cause	Action	Refer to
Network			
No LAN connection can be established	Incorrect IP address is set (fix IP)	Use dynamic IP address by enabling DHCP option.	 4.3.1  5.9.2  6.4.2  7.9.2
		Restore the factory default settings (with fix IP).	 4.3.2  5.9.4  6.2.11  7.5.6
	IP address conflict	Check the IP address of the other devices, too.	
	TCP/IP or UDP messaging via LAN port is not working	Check the TCP/IP / UDP messaging rules and/or apply escaping in the message.	 7.11.1  7.11.2
Miscellaneous			
Front panel buttons are out of operation	The buttons are locked	Disable control lock.	 4.3.3  5.9.1  7.5.3
Error messages received always	Different protocol is set	Check the port protocol settings (LW2 / LW3) and use the proper protocol commands.	 5.7.1  7.10.1

9.2. How to Speed Up the Troubleshooting Process

Lightware's technical support team is always working hard to provide the fastest support possible. Our team's response time is one of the best in the industry and in the toughest of cases we can directly consult with the hardware or software engineer who designed the product to get the information from the most reliable source.

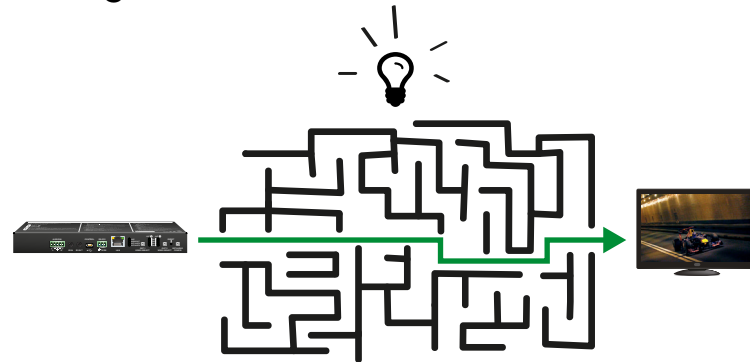
However, the troubleshooting process can be even faster... with your help.

There are certain pieces of information that push us in the right direction to finding the root cause of the problem. If we receive most of this information in the first e-mail or it is gathered at the time when you call us, then there is a pretty high chance that we will be able to respond with the final solution right away.

This information is the following:

- Schematic (a pdf version is preferred, but a hand drawing is sufficient).
- Serial number(s) of the device(s) (it is either printed somewhere on the box or you can query it in the Device Controller software or on the built-in website).
- Firmware versions of the devices (please note that there may be multiple CPUs or controllers in the device and we need to know all of their firmware versions, a screenshot is the best option).
- Cable lengths and types (in our experience, it's usually the cable).
- Patch panels, gender changers or anything else in the signal path that can affect the transmission.
- Signal type (resolution, refresh rate, color space, deep color).
- Emulated EDID(s) (please save them as file and send them to us).
- Actions to take in order to re-create the problem (if we cannot reproduce the problem, it is hard for us to find the cause).
- Photo or video about the problem ('image noise' can mean many different things, it's better if we see it too).
- Error logs from the Device Controller software.
- In the case of Event Manager issue the event file and/or backup file from the Device Controller software.

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



10

Technologies

The following sections contain descriptions and useful technical information how the devices work in the background. The content is based on experiences and cases we met in the practice. These sections help to understand features and technical standards like the followings:

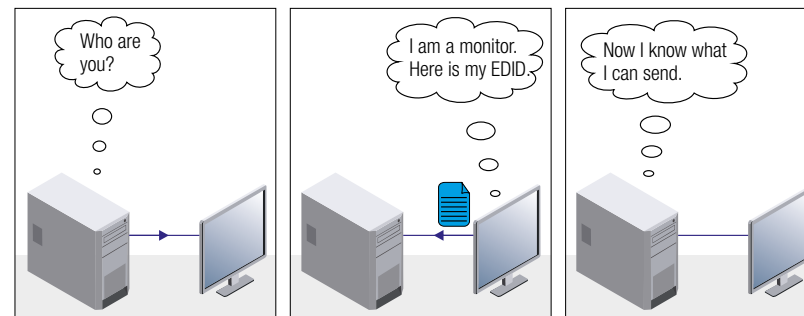
- ▶ EDID MANAGEMENT
- ▶ HDCP MANAGEMENT
- ▶ PIXEL ACCURATE RECLOCKING

10.1. EDID Management

10.1.1. 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.

10.1.2. 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.

10.2. HDCP Management

Lightware Visual Engineering is a legal HDCP adopter. Several functions have been developed which helps to solve HDCP related problems. Complex AV systems often have both HDCP and non-HDCP components. The receiver allows transmitting HDCP encrypted and unencrypted signals. The devices will be still HDCP compliant as they will never output an encrypted signal to a non-HDCP compliant display device. If an encrypted signal is switched to a non-compliant output, a red screen alert or muted screen will appear.

10.2.1. Protected and Unprotected Content

Many video sources send HDCP protected signal if they detect that the sink is HDCP capable – even if the content is not copyrighted. This can cause trouble if an HDCP capable device is connected between the source and the display. In this case, the content cannot be viewed on non-HDCP capable displays and interfaces like event controllers. Rental and staging technicians often complain about certain laptops, which are always sending HDCP encrypted signals if the receiver device (display, matrix router, etc.) reports HDCP compliancy. However, HDCP encryption is not required all the time e.g. computer desktop image, certain laptops still do that.

To avoid unnecessary HDCP encryption, Lightware introduced the HDCP enabling/disabling function: the HDCP capability can be disabled in the Lightware device. If HDCP is disabled, the connected source will detect that the sink is not HDCP capable, and turn off authentication.

10.2.2. Disable Unnecessary Encryption

HDCP Compliant Sink



All the devices are HDCP-compliant, no manual setting is required, both protected and unprotected contents are transmitted and displayed on the sink.

Not HDCP-compliant Sink 1.



Non-HDCP compliant sink is connected to the matrix. Some sources (e.g. computers) always send HDCP encrypted signals if the receiver device reports HDCP compliancy, however, HDCP encryption is not required all the time (e.g. computer desktop image). If HDCP is enabled in the matrix, the image will not be displayed on the sink.

Setting the HDCP parameter to Auto on the output port and disable HDCP on the input port, the transmitted signal will not be encrypted if the content is not protected. Thus, non-HDCP compliant sinks will display non-encrypted signal.

Not HDCP-compliant Sink 2.



The layout is the same as in the previous case: non-HDCP compliant display device is connected to the matrix but the source would send protected content with encryption. If HDCP is enabled on the input port of the matrix, the source will send encrypted signal. The sink is not HDCP compliant, thus, it will not display the video signal (but blank/red/muted/etc. screen). If HDCP is disabled on the input port of the matrix, the source will not send the signal. The solution is to replace the display device to an HDCP-capable one.

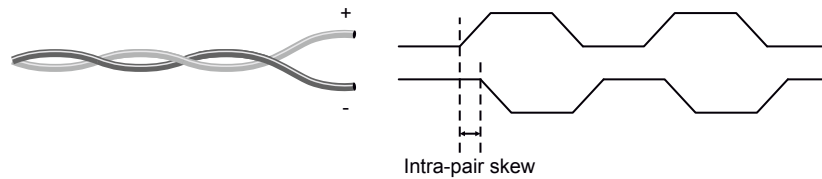
10.3. Pixel Accurate Reclocking

Signal reclocking is an essential important 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:

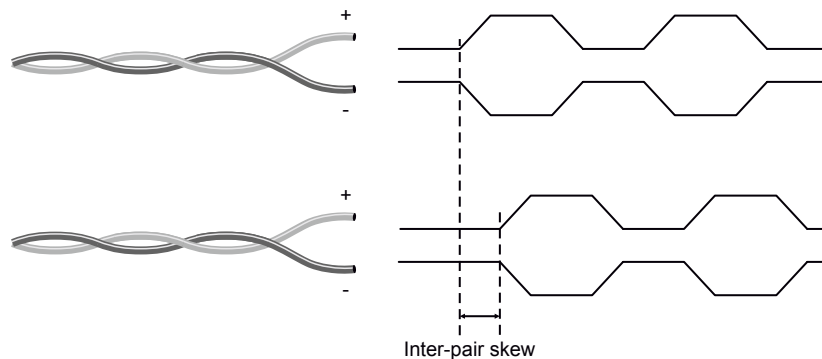
Intra-pair skew

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 DVI cable. It results in jitter.



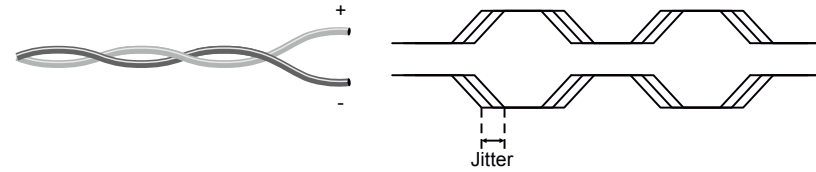
Inter-pair skew

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 color shift in the picture or sync loss.



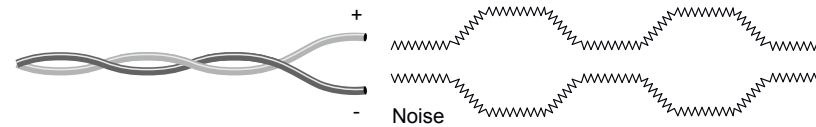
Jitter

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.



11

Appendix

Tables, drawings, guides, and technical details as follows:

- ▶ [SPECIFICATION](#)
- ▶ [FACTORY DEFAULT SETTINGS](#)
- ▶ [CONTENT OF BACKUP FILE](#)
- ▶ [INPUT/OUTPUT PORT NUMBERING](#)
- ▶ [MAXIMUM EXTENSION DISTANCES](#)
- ▶ [MECHANICAL DRAWINGS](#)
- ▶ [AUDIO CABLE WIRING GUIDE](#)
- ▶ [FACTORY EDID LIST](#)
- ▶ [LW3 COMMAND CHANGES IN FIRMWARE V1.2.0](#)
- ▶ [FURTHER INFORMATION](#)

11.1. Specification

General

Compliance	CE
EMC compliance (emission)	IEC/EN 55032:2015
EMC compliance (immunity)	IEC/EN 55024:2011
Warranty	3 years
Cooling	Passive
Operating temperature	0 to +50°C (+32 to +122°F)
Operating humidity	10% to 90%, non-condensing

Power

Power supply	External power adaptor
Power adaptor	In 100-240 V AC 50/60 Hz, Out 12V DC, 2 A
Power connector	Locking DC connector (2.1 mm pin)
Power consumption (MMX4x2-HDMI)	4 W (typ)
Power consumption (MMX4x2-HT200)	10 W (typ)

Enclosure

Rack mountable	Yes
Material	1 mm steel
Dimensions in mm	221W x 100.4D x 26H
Dimensions in inch	8.7 W x 3.95 D x 1.02 H
Weight	625 g

Audio/Video Ports

HDCP compliant	Yes, HDCP 1.4
----------------------	---------------

TPS Input Port (MMX4x2-HT200)

TPS port connector type	RJ45 connector
Compliance	HDBaseT™
Transferred signals (TPS)	Video, Audio, RS-232, Infrared, Ethernet
Max. video resolutions	1600x1200@60 Hz, 36 bit
.....	1920x1080@120 Hz, 24 bit
.....	3840x2160@30 Hz, 24 bit

Audio formats	8 channel PCM
.....	Dolby TrueHD
.....	DTS-HD Master Audio 7.1
Reclocking	Pixel Accurate Reclocking
HDCP compliant	Yes
Power over Ethernet (PoE)	Not supported

HDMI Input Ports

HDMI port connector type	19-pole HDMI Type A receptacle
Standard	DVI 1.0, HDMI 1.4
Max. video resolutions	1600x1200@60 Hz, 36 bit
.....	1920x1080@120 Hz, 24 bit
.....	3840x2160@30 Hz, 24 bit
Audio formats	8 channel PCM, Dolby TrueHD
.....	DTS-HD Master Audio 7.1
Reclocking	Pixel Accurate Reclocking

HDMI Output Ports

HDMI port connector type	19-pole HDMI Type A receptacle
Standard	DVI 1.0, HDMI 1.4
Max. video resolutions	1600x1200@60 Hz, 36 bit
.....	1920x1080@120 Hz, 24 bit
.....	3840x2160@30 Hz, 24 bit
Audio formats	8 channel PCM, Dolby TrueHD
.....	DTS-HD Master Audio 7.1
Reclocking	Pixel Accurate Reclocking

Analog Audio Ports

Analog Audio Input Port

Audio port connector	5-pole Phoenix connector
Signal transmission	Balanced and unbalanced audio
Gain	-12 - 6 dB

Analog Audio Output Port

Audio port connector..... 5-pole Phoenix connector
 Signal transmission Balanced and unbalanced audio
 Volume.....-57 – 0 dB

Control Ports**RS-232 Control**

Serial port connector 3-pole Phoenix connector
 Available Baud rates between 4800 and 115200
 Available Data bits 8 or 9
 Available Parity..... None / Odd / Even
 Available Stop bits 1 / 1.5 / 2

USB Control

USB connector USB mini B type
 USB 2.0 compliance..... Yes

Infrared Control

Number of IR ports 2 (1x RX, 1x TX)
 Connector type..... 3.5mm TRS (approx. 1/8" jack)

Ethernet

Connector type..... Locking RJ45
 Ethernet data rate 10/100Base-T, full duplex with autodetect
 Power over Ethernet (PoE) Not supported

11.2. Factory Default Settings

Parameter	Setting/Value
Video crosspoint settings	
O1 (HDMI out 1) - MMX4x2-HDMI	I1 (HDMI in 1)
O1 (HDMI out 1) - MMX4x2-HT200	I1 (TPS in 1)
O2 (HDMI out 2) - for both models	I2 (HDMI in 2)
Audio crosspoint settings	
O1 (HDMI out 1)	A1 (original HDMI embedded audio)
O1 (HDMI out 1)	A2 (original HDMI embedded audio)
O3 (Audio out)	A3 (analog audio input)
Video input port settings	
TPS mode *	Auto
HDCP	Enabled
Test pattern mode	Disabled
Test pattern clock source	480p
Test pattern	Bar
Video output port settings	
Autoselect feature	Disabled
Autoselect mode	Priority detect
Signal type	Auto
HDCP mode	Auto
Power 5V mode	Always on
Emulated EDID on all four inputs	Factory #47: Universal HDMI PCM
Analog audio input port settings	
Volume	0.00 dB (100%)
Balance	0 (center)
Gain	0.00 dB
Analog audio output port settings	
Volume	0.00 dB (100%)
Balance	0 (center)

Parameter	Setting/Value
Network settings	
IP address	192.168.0.100
Subnet mask	255.255.255.0
Static gateway	192.168.0.1
DHCP	Disabled
LW2 port number	10001
LW3 port number	6107
HTTP port number	80
TPS Ethernet status	Enabled
RS-232 settings	
Control protocol	LW2
Baud rate	57600
Databits	8
Parity	No
Stopbits	1
Operation mode (Link and Local)	Control
Command injection port nr. - Local	8001
Command injection port nr. - TPS *	8002
IR port settings	
Command injection status	Enabled
Comm. inj. input port nr. - Local	9001
Comm. inj. input port nr. - TPS *	9002
Comm. inj. output port nr. - Local	9003
Comm. inj. output port nr. - TPS *	9003
Miscellaneous	
Unique port names	Cleared
Unique device label	Cleared
User EDIDs	Not cleared
Events	Cleared
IR codes	Cleared
Presets	Cleared
Unprotected backups	Cleared
Protected backups	Not cleared

* Only in case of MMX4x2-HT200 model.

11.3. Content of Backup File

The backup file contains numerous settings and parameters saved from the device. When the file is uploaded to a device, the followings will be overwritten:

Audio / Video crosspoint settings	
Mute status, Lock status, Switch state	
Autoselect mode, Port priority	
TPS / HDMI input ports	
Video port name, Audio port name, HDCP setting	
HDMI output ports	
Port name, HDCP mode, HDMI mode, Power +5V mode	
Test pattern mode, clock source, and type	
Audio port name, Audio output enabled, S/PDIF mode	
Analog audio input port	
Port name, Volume, Balance, Gain	
Analog audio output port	
Port name, Volume, Balance	
Local and TPS serial port	
RS-232 mode, Control protocol, Baud rate, Data bits, Stop bits, Parity	
Port name and CI (Command Injection) port number	
Local and TPS IR port	
Port status (enable / disable), Code length, Repetition code, Enable modulation	
Input port name, Output port name	
CI status (enable / disable), CI port number	
Saved IR codes, names	
Network settings	
DHCP status (enable / disable)	
Static IP address, Network mask, Gateway address	
Further settings	
Control lock status, Device label	
User EDID data (U1-U14), Emulated EDIDs by ports	
Presets (1-4)	
Event manager: settings of all Events (E1-E100)	

11.4. Input/Output Port Numbering

11.4.1. MMX4x2-HDMI

Audio/Video Ports

	Port name	Video port nr. (LW2)	Video port nr. (LW3)	Audio port nr. (LW2)	Audio port nr. (LW3)	
					Till fw v1.1.0	From fw v1.2.0
Inputs	HDMI in 1	1	I1	1	I1	A1 / A2 (depends on the selected video output)
	HDMI in 2	2	I2	2	I2	
	HDMI in 3	3	I3	3	I3	
	HDMI in 4	4	I4	4	I4	
	Analog audio in	-	-	5	I5	A3
Outputs	HDMI out 1	1	O1	1	O1	O1
	HDMI out 2	2	O2	2	O2	O2
	Analog audio out	-	-	3	O3	O3

IR and RS-232 Ports

Port name	Port nr. (LW3)
Local IR input	S1
Local IR output	D1

Port name	Port nr. (LW3)
Local serial port	P1

11.4.2. MMX4x2-HT200

Audio/Video Ports

	Port name	Video port nr. (LW2)	Video port nr. (LW3)	Audio port nr. (LW2)	Audio port nr. (LW3)	
					Till fw v1.1.0	From fw v1.2.0
Inputs	TPS in 1	1	I1	1	I1	A1 / A2 (depends on the selected HDMI output)
	HDMI in 2	2	I2	2	I2	
	HDMI in 3	3	I3	3	I3	
	HDMI in 4	4	I4	4	I4	
	Analog audio in	-	-	5	I5	A3
Outputs	HDMI out 1	1	O1	1	O1	O1
	HDMI out 2	2	O2	2	O2	O2
	Analog audio out	-	-	3	O3	O3

IR and RS-232 Ports

Port name	Port nr. (LW3)
Local IR input	S1
Local IR output	D1
TPS IR input	S2
TPS IR output	D2

Port name	Port nr. (LW3)
Local serial port	P1
TPS serial link	P2

11.5. Maximum Extension Distances

ATTENTION! The following data concern for the TPS connections and can be applied for the MMX4x2-HT200 model only.

Resolution	Pixel clock rate	Cable lengths (Auto / Longreach TPS mode)		
		CAT5e AWG24	CAT7 AWG26**	CAT7 AWG23
1024x768@60Hz	65 MHz	100 m / 130 m*	90 m / 120 m*	120 m / 170 m*
1280x720p@60Hz	73.8 MHz	100 m / 130 m*	90 m / 120 m*	120 m / 170 m*
1920x1080p@60Hz / 24bpp	148.5 MHz	100 m / 130 m*	90 m / 120 m*	120 m / 170 m*
1920x1200@60Hz	152.9 MHz	100 m / NA	90 m / NA	120 m / NA
1600x1200@60Hz	162 MHz	100 m / NA	90 m / NA	120 m / NA
1920x1080@60Hz / 36bpp	223.6 MHz	70 m / NA	70 m / NA	100 m / NA
3840x2160@30Hz UHD	297 MHz	70 m / NA	70 m / NA	100 m / NA
4096x2160@30Hz 4K	297 MHz	70 m / NA	70 m / NA	100 m / NA

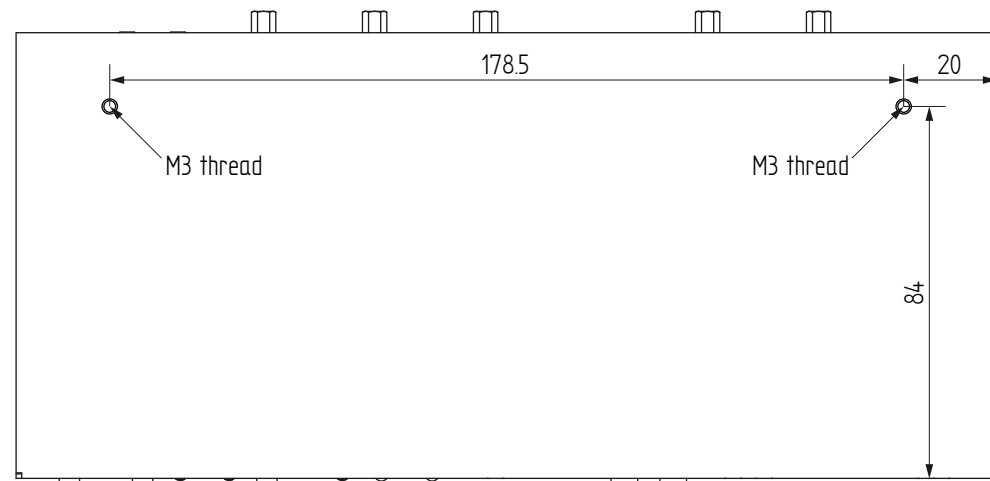
* With Long reach operation mode which supports pixel clock frequencies up to 148.5 MHz.

** When remote powering is used with AWG26 cables, distances are 20% shorter.

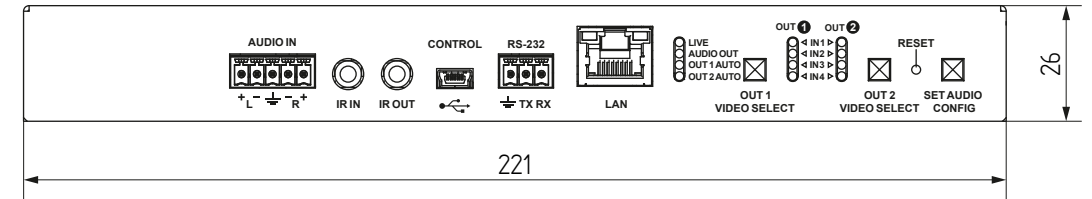
11.6. Mechanical Drawings

MMX4x2-HT200 can be seen in the pictures, but the dimensions are the same for both models Dimensions are in mm.

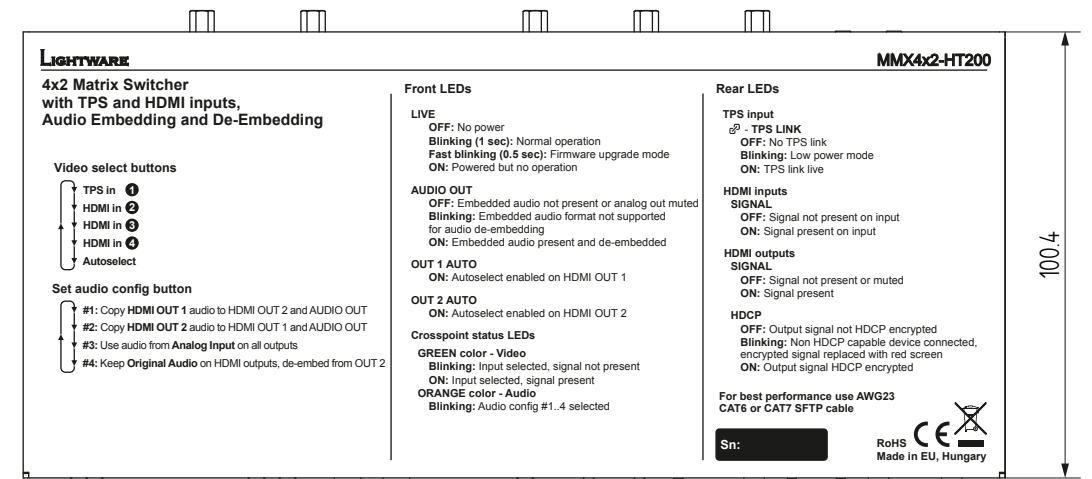
Bottom View



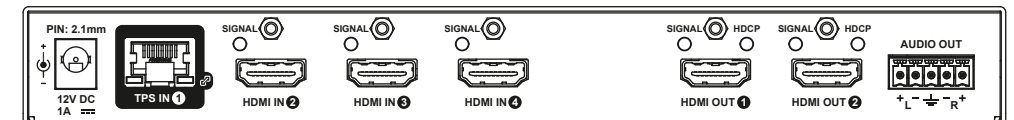
Front View



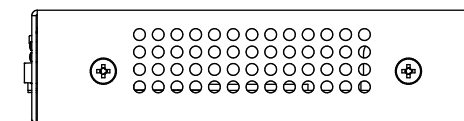
Top View



Rear View



Side View



11.7. Audio 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. Lightware 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.

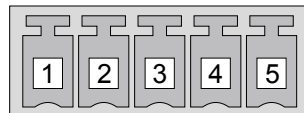
ATTENTION! Symmetric and asymmetric lines can be linked with passive accessories (e.g. special cables), but in this case half of the line level is lost.

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.

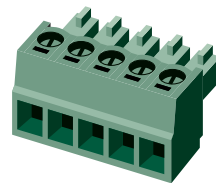
ATTENTION! Never join the phase-inverted (negative, cold or -) poles (either right and left) to the ground or to each other on the output side, as this can damage the unit.

INFO: Use a galvanic isolation in case of a ground loop.

The Pinout of the 5-pole Phoenix Connector



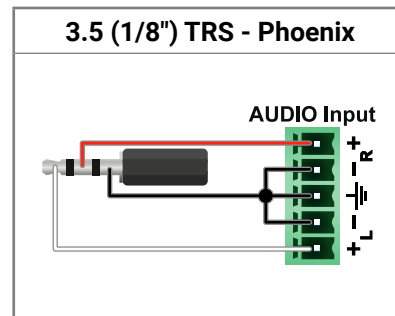
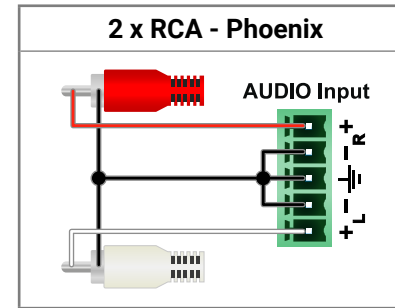
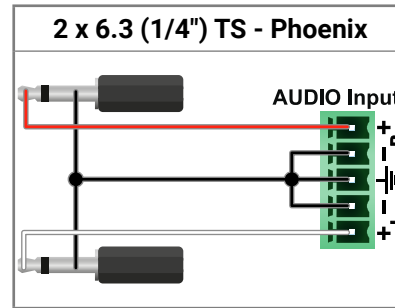
Pin nr.	Signal
1	Left+
2	Left-
3	Ground
4	Right-
5	Right+



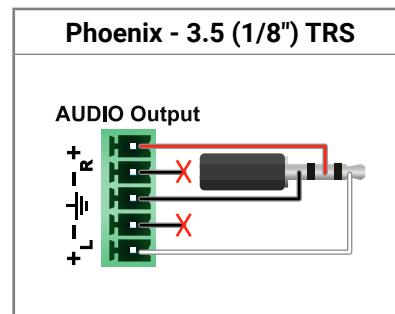
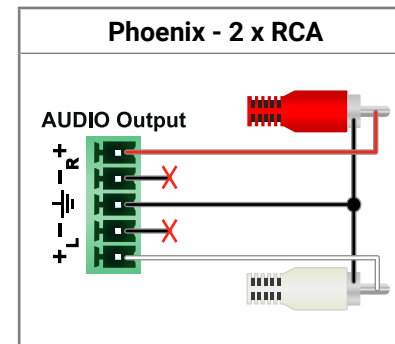
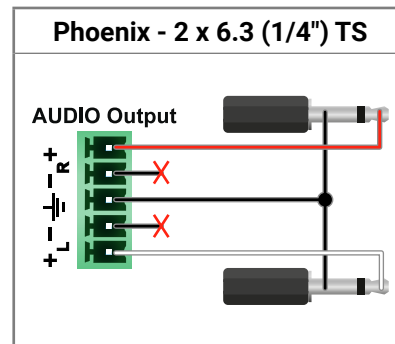
Compatible Plug Type

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

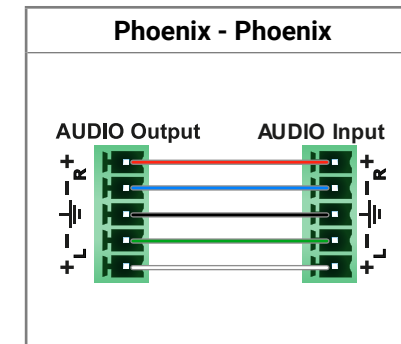
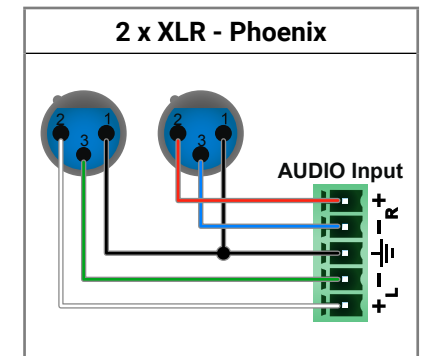
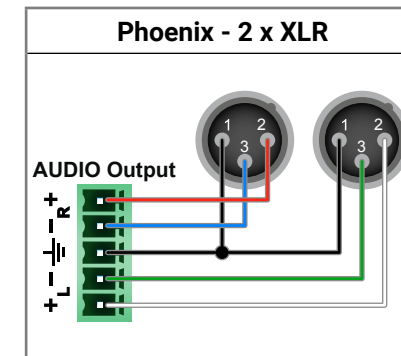
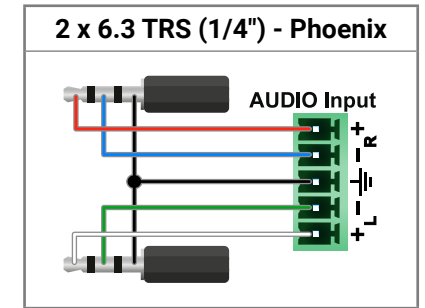
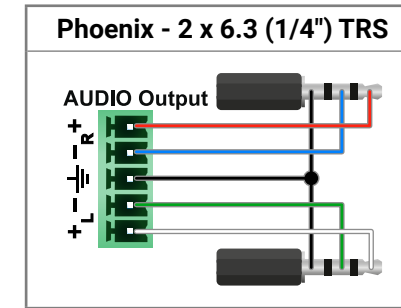
From Unbalanced Output to Balanced Input



From Balanced Output to Unbalanced Input



From Balanced Output to Balanced Input



11.8. Factory EDID List

Mem.	Resolution				Type	Mem.	Resolution				Type
F1	640 x	480	@ 60.00	Hz	D	F34	720 x	576	@ 50.00	Hz	H
F2	848 x	480	@ 60.00	Hz	D	F35	1280 x	720	@ 50.00	Hz	H
F3	800 x	600	@ 60.32	Hz	D	F36	1280 x	720	@ 60.00	Hz	H
F4	1024 x	768	@ 60.00	Hz	D	F37	1920 x	1080i	@ 50.04	Hz	H
F5	1280 x	768	@ 50.00	Hz	D	F38	1920 x	1080i	@ 50.00	Hz	H
F6	1280 x	768	@ 59.94	Hz	D	F39	1920 x	1080i	@ 60.05	Hz	H
F7	1280 x	768	@ 75.00	Hz	D	F40	1920 x	1080i	@ 60.05	Hz	H
F8	1360 x	768	@ 60.02	Hz	D	F41	1920 x	1080	@ 24.00	Hz	H
F9	1280 x	1024	@ 50.00	Hz	D	F42	1920 x	1080	@ 25.00	Hz	H
F10	1280 x	1024	@ 60.02	Hz	D	F43	1920 x	1080	@ 30.00	Hz	H
F11	1280 x	1024	@ 75.02	Hz	D	F44	1920 x	1080	@ 50.00	Hz	H
F12	1400 x	1050	@ 50.00	Hz	D	F45	1920 x	1080	@ 60.00	Hz	H
F13	1400 x	1050	@ 60.00	Hz	D	F46	1920 x	1080	@ 60.00	Hz	H
F14	1400 x	1050	@ 75.00	Hz	D	F47	Universal_HDMI_PCM				H
F15	1680 x	1050	@ 60.00	Hz	D	F48	Universal_HDMI_ALL				H
F16	1920 x	1080	@ 50.00	Hz	D	F49	Universal_HDMI_DC				H
F17	1920 x	1080	@ 60.00	Hz	D	F50-F89	Reserved				
F18	2048 x	1080	@ 50.00	Hz	D	F90	1920 x	2160	@ 59.99	Hz	D
F19	2048 x	1080	@ 60.00	Hz	D	F91	1024 x	2400	@ 60.01	Hz	D
F20	1600 x	1200	@ 50.00	Hz	D	F92-F93	Reserved				
F21	1600 x	1200	@ 60.00	Hz	D	F94	2048 x	1536	@ 60.00	Hz	D
F22	1920 x	1200	@ 50.00	Hz	D	F95	Reserved				
F23	1920 x	1200	@ 59.56	Hz	D	F96	2560 x	1600	@ 59.86	Hz	D
F24	2048 x	1200	@ 59.96	Hz	D	F97	3840 x	2400	@ 24.00	Hz	D
F25-F28	Reserved					F98	1280 x	720	@ 60.00	Hz	H3D
F29	Universal_DVI				D	F99	1920 x	1080	@ 60.00	Hz	H3D
F30	1440 x	480i	@ 60.05	Hz	H	F100	1024 x	768	@ 60.00	Hz	H
F31	1440 x	576i	@ 50.08	Hz	H	F101	1280 x	1024	@ 50.00	Hz	H
F32	640 x	480	@ 59.95	Hz	H	F102	1280 x	1024	@ 60.02	Hz	H
F33	720 x	480	@ 59.94	Hz	H	F103	1280 x	1024	@ 75.02	Hz	H

Mem.	Resolution				Type	Mem.	Resolution				Type
F104	1600 x	1200	@ 50.00	Hz	H						
F105	1600 x	1200	@ 60.00	Hz	H						
F106	1920 x	1200	@ 59.56	Hz	H						
F107	2560 x	1440	@ 59.95	Hz	H						
F108	2560 x	1600	@ 59.86	Hz	H						
F109	3840 x	2400	@ 24.00	Hz	H						
F110	3840 x	2160	@ 24.00	Hz	H						
F111	3840 x	2160	@ 25.00	Hz	H						
F112	3840 x	2160	@ 30.00	Hz	H						
F113-F117	Reserved										
F118	Universal_4K_PCM				H4K						
F119	Universal_4K_ALL				H4K						
F120	3840 x	2160	@ 60.00	Hz	H4K						

Legend

Type	Description
D	DVI EDID
H	HDMI EDID
A	Analog EDID
DL	Dual-Link DVI EDID
H3D	HDMI EDID with 3D support
H4K	HDMI EDID with 4K resolution support

11.9. LW3 Command Changes in Firmware v1.2.0

If your MMX4x2 series matrix is built in to an A/V system and controlled by a system controller over LW3 commands, please note that the audio LW3 paths and nodes are changed in the firmware v1.2.0. The following tables summarizes the more important changes by categories.

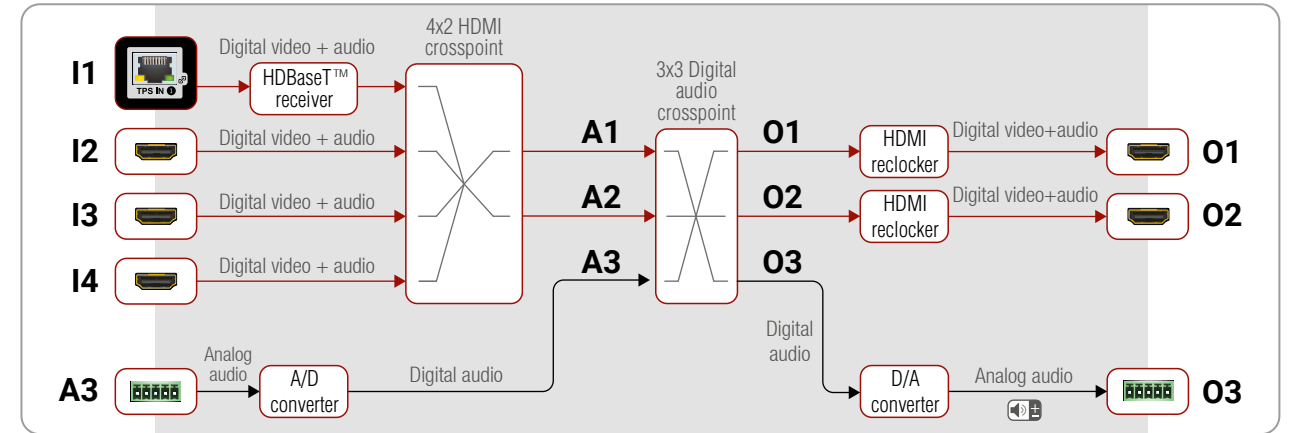
The installed firmware version of the device can be seen in LDC software on the [Status](#) tab or can be queried by LW2 (see the [View Firmware Version of the CPU](#) section) or LW3 (see the [Query the Firmware Version](#) section) protocol commands.

Paths

Description	Ceased Path (till firmware v1.1.0)	New Path (from firmware v1.2.0)
TPS input 1 / HDMI input 1	/MEDIA/AUDIO/I1	/MEDIA/AUDIO/A1 or /MEDIA/AUDIO/A2 <small>(depends on the selected video output)</small>
HDMI input port 2	/MEDIA/AUDIO/I2	
HDMI input port 3	/MEDIA/AUDIO/I3	
HDMI input port 4	/MEDIA/AUDIO/I4	
Analog audio input	/MEDIA/AUDIO/I5	/MEDIA/AUDIO/A3
Audio crosspoint	-	/MEDIA/AUDIO/XP

Commands

Description	Ceased Command (till firmware v1.1.0)	New Command (from firmware v1.2.0)
Embed analog audio input to O1	SET /SYS/MB/LEGACYAUDIOXP.EmbedAudioInputToHdmiOut1=true	CALL /MEDIA/AUDIO/XP:switch(A3:O1)
Transmit original HDMI audio on O1	SET /SYS/MB/LEGACYAUDIOXP.EmbedAudioInputToHdmiOut1=false	CALL /MEDIA/AUDIO/XP:switch(A1:O1)
Embed analog audio input to O2	SET /SYS/MB/LEGACYAUDIOXP.EmbedAudioInputToHdmiOut2=true	CALL /MEDIA/AUDIO/XP:switch(A3:O2)
Transmit original HDMI audio on O2	SET /SYS/MB/LEGACYAUDIOXP.EmbedAudioInputToHdmiOut2=false	CALL /MEDIA/AUDIO/XP:switch(A2:O2)
Transmit analog audio input to analog audio output	SET /SYS/MB/LEGACYAUDIOXP.EnableAnalogPassthrough=true	CALL /MEDIA/AUDIO/XP:switch(A3:O3)
De-embed HDMI audio of O2 to analog audio out	SET /SYS/MB/LEGACYAUDIOXP.EnableAnalogPassthrough=false	CALL /MEDIA/AUDIO/XP:switch(A2:O3)
Mute analog audio input	SET /MEDIA/AUDIO/I5.Mute=true	CALL /MEDIA/AUDIO/XP:muteSource(A3)
Unmute analog audio input	SET /MEDIA/AUDIO/I5.Mute=false	CALL /MEDIA/AUDIO/XP:unmuteSource(A3)
Mute analog audio output	SET /MEDIA/AUDIO/O3.Mute=true	CALL /MEDIA/AUDIO/XP:muteDestination(O3)
Unmute analog audio output	SET /MEDIA/AUDIO/O3.Mute=false	CALL /MEDIA/AUDIO/XP:unmuteDestination(O3)
Set gain on analog audio input	SET /MEDIA/AUDIO/I5.Gain=<value>	SET /MEDIA/AUDIO/A3.Gain=<value>



Port diagram of MMX4x2-HT200 for firmware v1.2.0

11.10. 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 products warranty period.

Document Revision History

Rev.	Release date	Changes	Editor
1.0	14-02-2017	Initial version	Tamas Forgacs
2.0	01-12-2017	New document format, major updates for firmware v1.2.0, updated LDC and LW3 prog. ref. chapters	Tamas Forgacs
2.1	10-05-2018	Minor corrections	Tamas Forgacs
2.2	31-10-2018	1080p120 Hz signal support info added.	Laszlo Zsedenyi

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