# LWR LIGHTWARE

INNOVATIVE. RELIABLE. MADE IN EUROPE.

**USER MANUAL**

**TPN-MMU-X100-20**

**HDMI-OPTN-TX100A**
**HDMI-OPTN-TX200AU2K**
**HDMI-OPTN-RX100A**
**HDMI-OPTN-RX100A-SR**
**HDMI-OPTN-RX100AU2K**
**HDMI-OPTN-RX100AU2K-SR**

**HDMI-TPN-TX107**
**HDMI-TPN-TX107D**
**HDMI-TPN-TX207AU2K**
**HDMI-TPN-TX207DU2K**
**HDMI-TPN-RX107**
**HDMI-TPN-RX107D**
**HDMI-TPN-RX107A-SR**
**HDMI-TPN-RX107D-SR**
**HDMI-TPN-RX107AU2K**
**HDMI-TPN-RX107AU2K-SR**
**HDMI-TPN-RX107DU2K-SR**

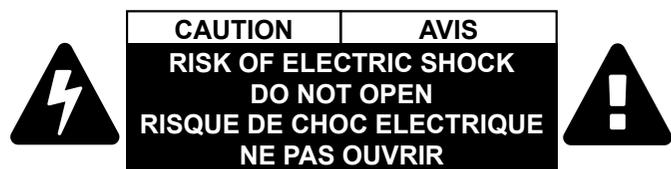AV over IP Multimedia Extenders with Centralized Control System

# Bookmark Page

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# 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.

| CAUTION | AVIS |
|---------|------|
| RISK OF ELECTRIC SHOCK DO NOT OPEN RISQUE DE CHOC ELECTRIQUE NE PAS OUVRIR | |

**WARNING**

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

# Waste Electrical & Electronic Equipment (WEEE)

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

**Caution: Laser product**

CLASS 1
LASER PRODUCT

**CAUTION**

The device contains a BR1632A button battery, which supplies power to the clock when the device is not powered on. Danger of explosion if battery is replaced incorrectly. Replace only with the same or equivalent type.

**WARNING**

Do not ingest the battery, Chemical Burn Hazard. This product contains a coin/button cell battery. If the coin/button cell battery is swallowed, it can cause severe internal burns in just 2 hours, and can lead to death. Keep new and used batteries away from children. If the battery compartment does not close securely, stop using the product and keep it away from children. If you think batteries might have been swallowed or placed inside any part of the body, seek immediate medical attention.

# Common Safety Symbols

| Symbol | Description |
|--------|-------------|
| ⎓ | Direct current |
| ∼ | Alternating current |
| ▣ | Double insulation |
| ⚡ | Caution, possibility of eletric shock |
| ⚠ | Caution |
| ☢ | Laser radiation |

# Table of Contents

## Applied SW/FW/HW Environment

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

| Item | | Version |
|---|---|---|
| **Firmware package** | **TPN-MMU-X100 series** | v1.3.0b6 |
| | **HDMI-TPN series endpoint models** | v2.6.1b1 |
| | **HDMI-OPTN series endpoint models** | |
| | **UCX-TPN series endpoint models** | from v1.13.0b3 |
| **LARA version** | | v2.0.0b27 |
| **Lightware Device Controller (LDC) version** | | v2.22.0b2 |
| **Lightware Device Updater V2 (LDU2) version** | | v2.36.0b8 |

## Document Revision History

| Rev. | Release date | Changes | Editor |
|---|---|---|---|
| v1 | 2026-02-18 | Initial release | Tamas Forgacs |

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# 1

## Introduction

**Thank you for choosing Lightware's TPN-MMU series matrix management units and TPN/OPTN series endpoint devices. In the first chapter we would like to introduce the device by highlighting the most important features in the sections listed below:**

## 1.1. Description

**TPN / OPTN series Endpoints**

The HDMI-TPN series transmitter and receiver devices with SDVoE technology are Lightware's newest development allowing users to extend HDMI 2.0 signals up to 4K60 4:4:4 video resolution from a single source to multiple destinations through 10G Ethernet networks.

Beyond the benefits of sending high-resolution video over long distances, the extenders are also capable of handling various connectivity standards, including a 1G user Ethernet channel over the 10G link, as well as command injection into IR and RS-232.

The additional Gigabit Ethernet port is also a valuable addition, allowing users to connect an additional device to the network directly through the TPN extender. This is particularly useful for controlling external devices like projectors and displays.

HDCP 2.2 and basic EDID management functionality are also among the features offered by these devices, such as their connectivity and easy integration into a wide range of AV operations and with 3rd party devices, such as the Christie Terra projector.

In case of OPTN series we use standard, certificated 10 Gbps SFP+ optical modules which are plug and play, so they are interchangeable by the user. There could be either duplex multimode/singlemode module or bidirectional singlemode module.

When using direct connection in point-to-point mode, both the transmitter and receiver are compatible with Lightware's TPX family of products.

**TPN-MMU-X100 Matrix Management Unit**

The Matrix Management Unit is part of Lightware's new 10Gb AV-over-IP product family, TPN. It's a virtual matrix system that enables seamless switching of audio, video, and USB signals with a delay of less than one frame. The system is designed to be scalable, flexible, and easy to deploy.

The TPN-MMU-X100 has been designed to enable the fastest and simplest configuration of Lightware TPN systems.

The TPN-MMU-X100 runs an SDVoE Control Server instance and exposes a Lightware API on top of it, allowing users to integrate their systems with minimal effort.

The TPN-MMU-X100-20 is the smaller version of the TPN-MMU-X100, recommended for controlling a maximum of 20 endpoints.

With its built-in device discovery feature and professional network management tools, the application ensures that system installation is both fast and error-free.

From the MMU interface, individual endpoints can be easily named, and all Lightware SDVoE-specific settings, including Serial (RS-232) port configuration are accessible from one place.

The system also includes integrated video crosspoint routing (with upcoming USB and audio crosspoint support), making it simple to configure and later modify the connections of audio, USB and video streams between endpoints.

When the Lightware TPN MMU is included in the system:

- All TPN endpoints are automatically detected and managed from a single interface, giving you a centralized control point.
- Configuration takes much less time: you can apply settings to multiple devices at once.
- Crosspoint routing (video, audio and USB signals) is simple and visual. (In the first release, USB and audio will follow the video routing.)
- The MMU connects AV and IT environments, making it easy and secure to deploy the system on both AV and corporate networks.

**Model Denomination**

Number of output port    Dante/AES67 audio output

Networked SDVoE extender              Built-in scaler

## HDMI-TPN-RX107DU2K-SR

HDMI interface    Receiver        KVM extension
                                 with USB 2.0 standard

Model number
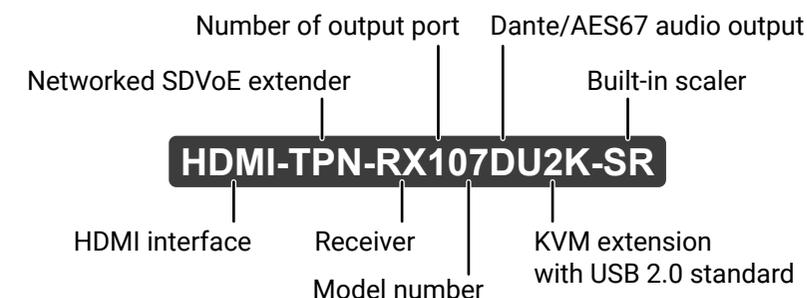
**About the Serial Number**

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

**7A000941** — 6-digit running sequence number

|  | 1: Jan | 4: Apr | 7: Jul | A: Oct |
| Month of the manufacturing: | 2: Feb | 5: May | 8: Aug | B: Nov |
|  | 3: Mar | 6: Jun | 9: Sep | C: Dec |

| Year of the manufacturing: | 7=2017 | A=2020 | D=2023 |
| (3-9, A-Y) | 8=2018 | B=2021 | E=2024 |
|  | 9=2019 | C=2022 | F=2025 |
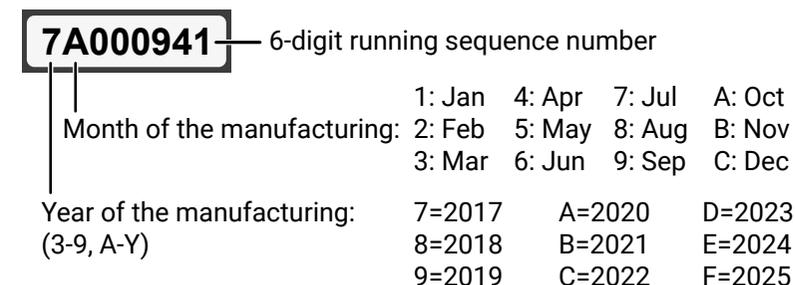
From 1st of October 2024, serial number format of Lightware devices is the following: the first two digits are of the year of manufacture, while the remaining digits make up the running sequence number.

**24200001**

Year of the manufacturing    6-digit running sequence number

## 1.2. Box Contents

**Supplied Accessories**

The following table describes all supplied and optional accessories of the TPN series devices by models. The optional (not-supplied) accessories can be purchased separately; please contact sales@lightware.com.

| | Supplied devices | | Supplied accessories | | | | | Optional accessories | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | TPN-MMU-X100 series matrix management unit | TPN / OPTN series endpoint device | 12V DC adaptor with interchangeable plugs | 48V DC adaptor with interchangeable plugs | Phoenix® Combicon 3-pole connector | Phoenix® Combicon 5-pole connector | Safety & Warranty Info; Quick Start Guide | 12V DC adaptor with interchangeable plugs | Singlemode / multimode SFP+ module | Infrared emitter |
| **TPN-MMU-X100-20** | ✓ | - | - | - | ✓ | - | ✓ | ✓ | - | - |
| **HDMI-TPN-TX107** | - | ✓ | - | ✓ | ✓ | - | ✓ | - | - | ✓ |
| **HDMI-TPN-TX107D** | - | ✓ | ✓ | - | ✓ | - | ✓ | - | - | - |
| **HDMI-TPN-TX207AU2K** | - | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | - | - |
| **HDMI-TPN-TX207DU2K** | - | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | - | - |
| **HDMI-TPN-RX107** | - | ✓ | - | ✓ | ✓ | - | ✓ | - | - | ✓ |
| **HDMI-TPN-RX107D** | - | ✓ | ✓ | - | ✓ | - | ✓ | - | - | - |
| **HDMI-TPN-RX107A-SR** | - | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | - | - |
| **HDMI-TPN-RX107D-SR** | - | ✓ | ✓ | - | ✓ | - | ✓ | - | - | - |
| **HDMI-TPN-RX107AU2K** | - | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | - | - |
| **HDMI-TPN-RX107AU2K-SR** | - | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | - | - |
| **HDMI-TPN-RX107DU2K-SR** | - | ✓ | ✓ | - | ✓ | - | ✓ | - | - | - |
| **HDMI-OPTN-TX100A** | - | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | ✓ | - |
| **HDMI-OPTN-TX200AU2K** | - | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | ✓ | - |
| **HDMI-OPTN-RX100A** | - | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | ✓ | - |
| **HDMI-OPTN-RX100A-SR** | - | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | ✓ | - |
| **HDMI-OPTN-RX100AU2K** | - | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | ✓ | - |
| **HDMI-OPTN-RX100AU2K-SR** | - | ✓ | ✓ | - | ✓ | ✓ | ✓ | - | ✓ | - |

(Row group label: **TPN series Endpoints** for HDMI-TPN rows; **OPTN series Endpoints** for HDMI-OPTN rows)

INFO: 10GbE singlemode/multimode SFP+ modules can be ordered together and even separately for the OPTN endpoint devices. For the details, please contact sales@lightware.com.

INFO: Optional mounting accessories and compatible model list can be found in the Mounting Options - Compatibility Table section.

## 1.3. Model Comparison

### 1.3.1. TPN-MMU Matrix Management Unit

The only available Matrix Management Unit is the **TPN-MMU-X100-20** which is limited to handle **up to 20 endpoints**.

| MMU Model | Supported TPN/OPTN series Endpoint Devices |
|---|---|
| TPN-MMU-X100-20 | up to 20 endpoints |

> **ATTENTION:** TPN/OPTN systems where more than 20 endpoint models are controlled by the MMU, the smooth operation is not guaranteed.

### 1.3.2. Transmitter Endpoints

| | AV interfaces | | | | SDVoE Interface | | Interface ports | | | USB KVM | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | HDMI input | Local HDMI output | Analog audio output | Dante/AES67 output | CATx (TPN) | Fiber optical (OPTN) | Ethernet | RS-232 | Infrared output | USB-C | USB-A |
| HDMI-TPN-TX107 | ✓ | - | - | - | ✓ | - | ✓ (2x) | ✓ | ✓ | - | - |
| HDMI-TPN-TX107D | ✓ | - | - | ✓ | ✓ | - | ✓ (2x) | ✓ | - | - | - |
| HDMI-TPN-TX207AU2K | ✓ | ✓ | ✓ | - | ✓ | - | ✓ (2x) | ✓ | - | ✓ | ✓ (2x) |
| HDMI-TPN-TX207DU2K | ✓ | ✓ | - | ✓ | ✓ | - | ✓ (2x) | ✓ | - | ✓ | ✓ (2x) |
| HDMI-OPTN-TX100A | ✓ | - | ✓ | - | - | ✓ | ✓ (2x) | ✓ | - | - | - |
| HDMI-OPTN-TX200AU2K | ✓ | ✓ | ✓ | - | - | ✓ | ✓ (2x) | ✓ | - | ✓ | ✓ (2x) |

### 1.3.3. Receiver Endpoints

| | AV interfaces | | | SDVoE Interface | | Interface ports | | | USB KVM | Features |
|---|---|---|---|---|---|---|---|---|---|---|
| | HDMI output | Analog audio output | Dante/AES67 output | CATx (TPN) | Fiber optical (OPTN) | Ethernet | RS-232 | Infrared output | USB-A | Integrated scaler |
| HDMI-TPN-RX107 | ✓ | - | - | ✓ | - | ✓ (2x) | ✓ | ✓ | - | - |
| HDMI-TPN-RX107D | ✓ | - | ✓ | ✓ | - | ✓ (2x) | ✓ | - | - | - |
| HDMI-TPN-RX107A-SR | ✓ | ✓ | - | ✓ | - | ✓ (2x) | ✓ | - | - | ✓ |
| HDMI-TPN-RX107D-SR | ✓ | - | ✓ | ✓ | - | ✓ (2x) | ✓ | ✓ | - | ✓ |
| HDMI-TPN-RX107AU2K | ✓ | ✓ | - | ✓ | - | ✓ (2x) | ✓ | - | ✓ (6x) | - |
| HDMI-TPN-RX107AU2K-SR | ✓ | ✓ | - | ✓ | - | ✓ (2x) | ✓ | - | ✓ (6x) | ✓ |
| HDMI-TPN-RX107DU2K-SR | ✓ | - | ✓ | ✓ | - | ✓ (2x) | ✓ | - | ✓ (6x) | ✓ |
| HDMI-OPTN-RX100A | ✓ | ✓ | - | - | ✓ | ✓ (2x) | ✓ | - | - | - |
| HDMI-OPTN-RX100A-SR | ✓ | ✓ | - | - | ✓ | ✓ (2x) | ✓ | - | - | ✓ |
| HDMI-OPTN-RX100AU2K | ✓ | ✓ | - | - | ✓ | ✓ (2x) | ✓ | - | ✓ (6x) | - |
| HDMI-OPTN-RX100AU2K-SR | ✓ | ✓ | - | - | ✓ | ✓ (2x) | ✓ | - | ✓ (6x) | ✓ |

## 1.4. Features

### 1.4.1. List of All Features (In Alphabetic Order)

**4K Support**

Up to HDMI 2.0 4K 2160p@60Hz 4:4:4 video input or 4096x2160@60Hz resolution over a 10 Gigabit network with extra low latency.

**Analog Audio Support**

External analog audio signal can be embedded in the video stream at the Encoder side, and can be de-embedded at the Decoder side.

**Basic IT-security**

These entry-level network security improvements help prevent unauthorized access to the Lightware device; HTTPS/WSS support, basic network authentication.

**Dante® or AES67 Audio De-embedding**

The audio of the HDMI signal can be transmitted as a 2-channel Dante® or AES67 source from the D series models over the dedicated RJ45 connector.

**Dynamic Virtual Matrix**

The Matrix Management Unit (MMU) can build up a dynamic virtual matrix with any number of transmitters and receivers connected in one network. It displays a traditional crosspoint view of the virtual matrix in the LARA software, also displaying the video streams which can be sorted by unique names for the easy recognition.

**Ethernet Based Extender**

The TPN system is Ethernet based, using 10 GbE, IGMPv2, and IPv4 protocols.

**HDCP 2.2 Compliant**

The TPN extenders comply to the HDCP 2.2 standard. HDCP capability on the digital video inputs can be disabled when non-protected content is extended.

**Local Video Output**

User can attach a local monitor to observe the video signal sent through the TPN ports. The resolution and clock frequency are the same as the HDMI inputs, no internal scaling or conversion is applied.

**Seamless Switching (Clean Cut)**

HDMI-TPN-SR and HDMI-OPTN-SR series extenders provide seamless switching (clean cut) technology. Apart from being able to scale the video to the resolution of the connected display, seamless switching provides uninterrupted video output when switching between two streams regardless of the format of the video content. Moreover, switching is instantaneously, thus provides excellent user experience.

**Lightware Rest API**

The switcher can be controlled through standard HTTP(S) requests to ensure the control functions from REST clients or terminal program.

**Open API**

Open-source API technology at the core makes these Lightware products easy to integrate into third-party systems. Every bit of data in Lightware systems is openly available for higher level management and monitoring systems.

**Modular SFP+ Interface**

OPTN series endpoints use standard, certified 10 Gbps SFP+ optical modules, which are plug and play, so they are swappable by the user.

**Powered by LARA**

Future-proof room automation platform for system integrators so they can seamlessly and invisibly support people's collaboration to get the most out of their virtual or in-person meetings.

**Remote Power (PoE)**

The MMU and the endpoint devices fulfill the PoE PD standard (according to IEEE 802.3af) which means they can be powered over the TPN line by a compatible power source equipment.

**Scaling the Output Image**

Video scaling of -SR series receivers is the process of changing the size of a video frame in order to match the native resolution of a display sink. It involves converting the resolution to a higher or lower format, and also a change in aspect ratio; typically from 4:3 to 16:9.

**Serial Data Transmission**

Transparent serial data transmission is available between the endpoints, both transmitter and receiver devices.

**USB KVM Extension Powered by Icron**

KVM extension for USB HID (Human Interface Devices, e.g. webcamera, keyboard, mouse, presenter) and Mass Storage devices (Flash drive, Hard drive).

## 1.5. Application Modes

TPN and OPTN series extender systems have two main application modes:

- **Point-Multipoint Connection** - Virtual AV matrix with several transmitters, receivers, and a Matrix Management Unit (MMU) that controls the AV network.



- **Peer-To-Peer Connection** - Peer-to-peer connection between a transmitter and a receiver endpoint device.

▌ **WARNING! This operation mode is not equal with the TPX point-to-point endpoint mode.**

Fallback to TPX mode ≠ TPN is validated for 1:1 room extension The Fallback to TPX function exists so that a TPN transmitter can:

- detect whether it is connected to a TPX receiver, and
- automatically enable TPX tunneling in mixed environments.

This mechanism ensures interoperability, not a certified "point-to-point extender mode." It was never intended to mean that TPN devices are:

- tested for 1:1 use cases,
- validated for simplified room extension,
- suitable as a replacement for TPX bundles in complex enterprise deployments.



## 1.6. Application Diagrams

### 1.6.1. Huddle Room Application for Small Business
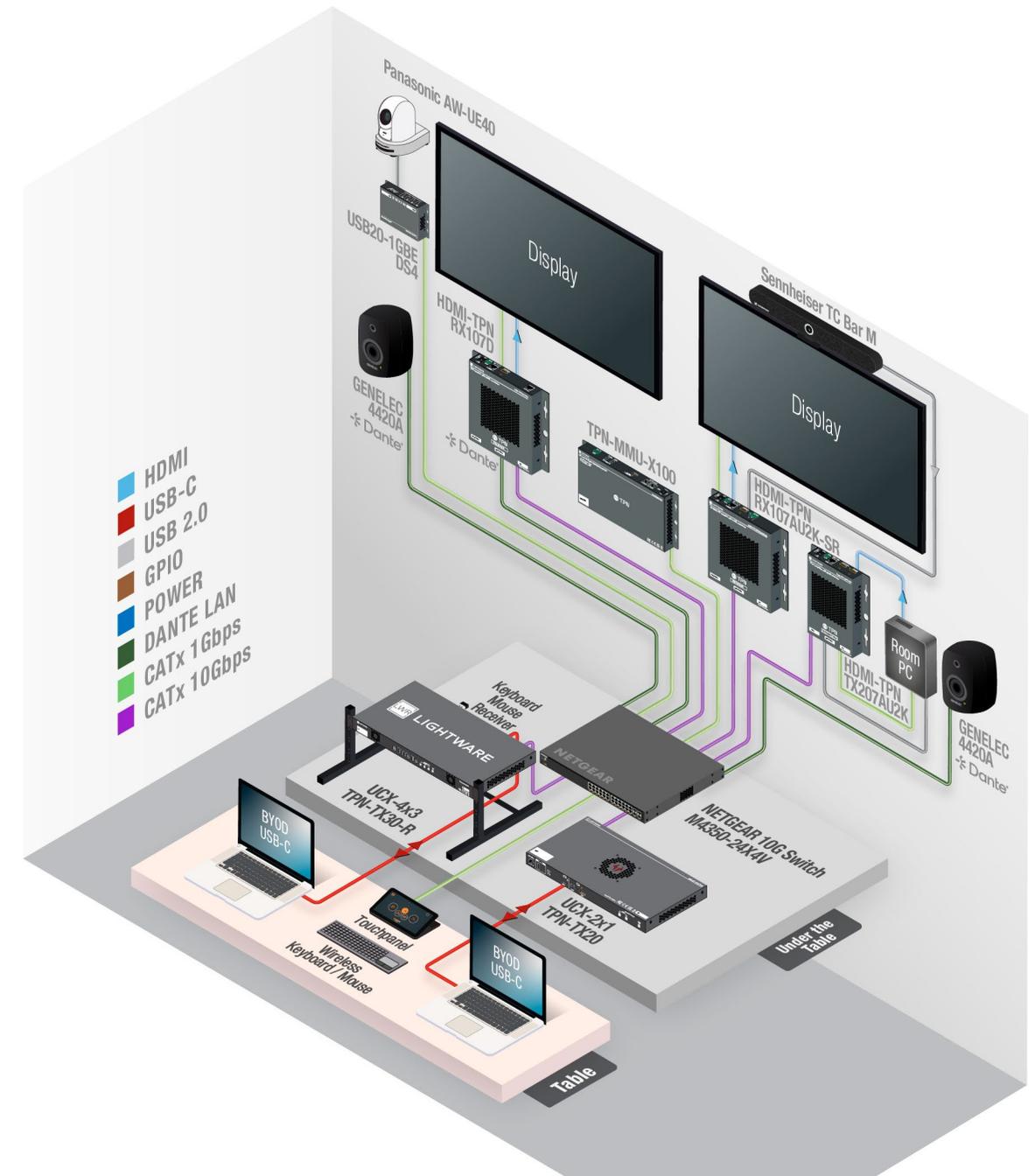
**1.6.2. Corporate Application**
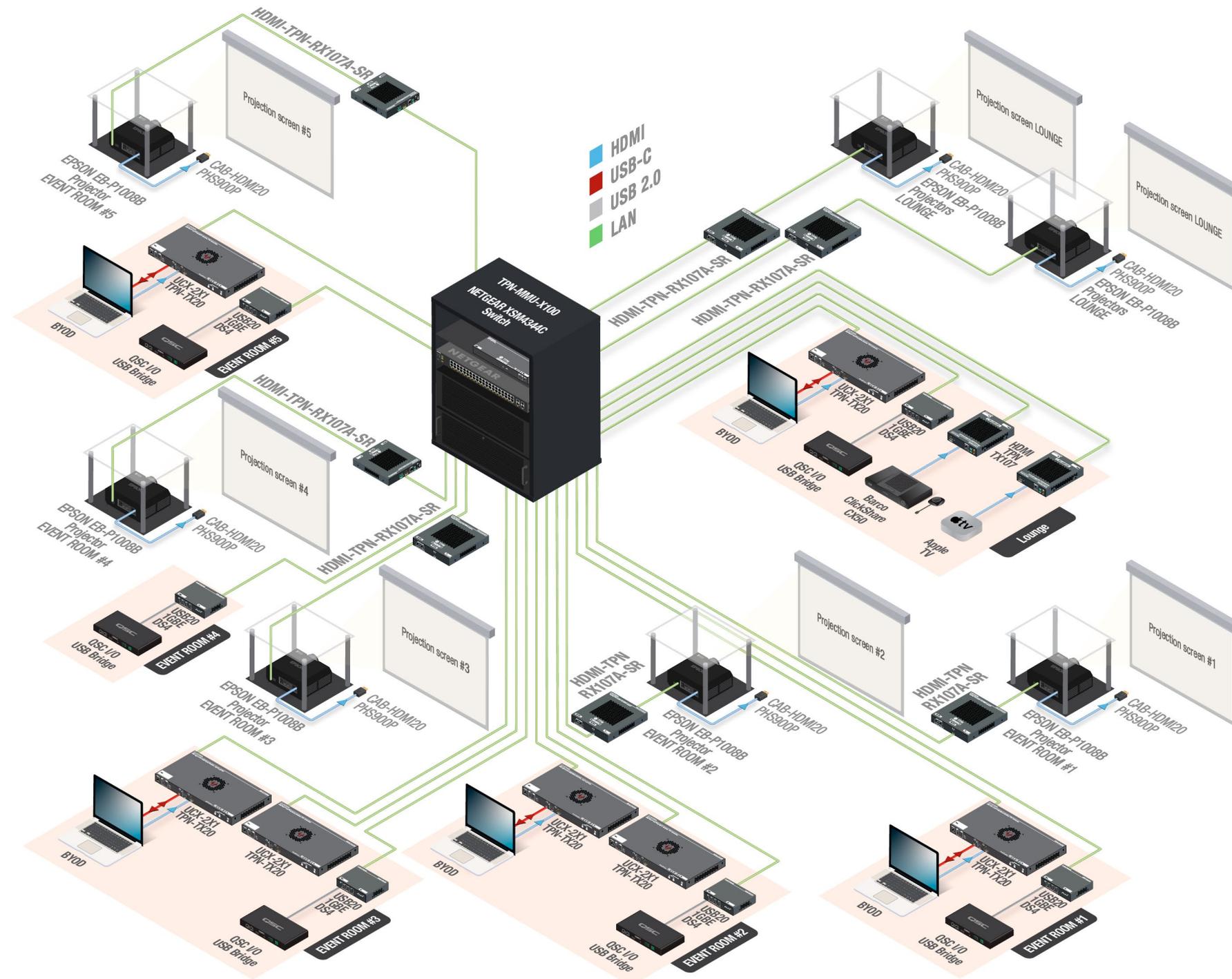
# 2

## Product Overview

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

## 2.1. Front and Rear View - Transmitters

### 2.1.1. HDMI-TPN Transmitters

**HDMI-TPN-TX107**
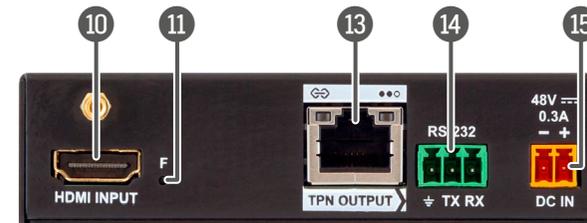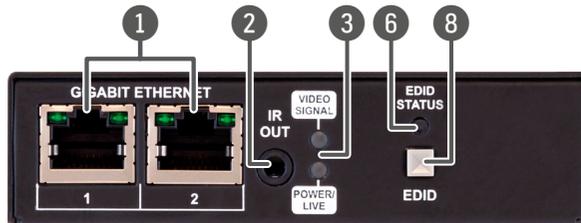


**HDMI-TPN-TX207AU2K**
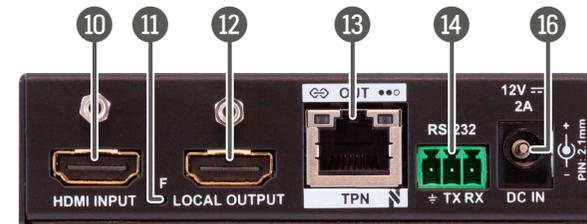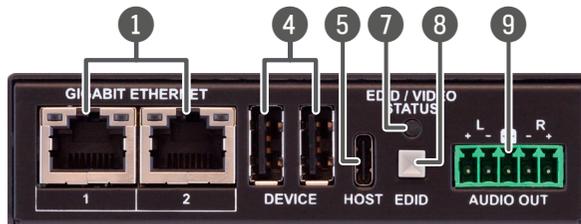


| ① | **Gigabit Ethernet port** | 1GBase-T RJ45 connector for user Ethernet purpose. See more details about the LED operation in the Gigabit Ethernet Status LEDs section. |
|---|---|---|
| ② | **IR out** | TS (3.5mm jack) output connector for an Infrared emitter unit. |
| ③ | **Status LEDs** | The LEDs give immediate feedback about the current status of the extender. See the details in the Device Status LEDs - TPN 107 Series (TPN-107 series) and the Device Status LEDs - TPN AU2K, D, DU2K and SR Series (TPN AU2K series) sections. |
| ④ | **Device USB-A connectors** | USB-A connectors with USB 2.0 support for various types of USB devices. |
| ⑤ | **Host USB-C connector** | USB-C connection between the transmitter and the host computer. The port receives **USB data only**, no AV signal transmission is accepted. It **supports USB 2.0** standard only. |
| ⑥ | **EDID Status LED** | The EDID LED gives immediate feedback about the current status of the EDID emulation. See the details in the Device Status LEDs - TPN 107 Series section. |
| ⑦ | **EDID / Video Status LED** | The EDID LED gives immediate feedback about the current status of the EDID emulation. See the details in the Device Status LEDs - TPN AU2K, D, DU2K and SR Series section. |
| ⑧ | **EDID button** | The EDID handling mode depends on the connection type of the extender. See the details in the EDID Button Function section. |
| ⑨ | **Audio output** | 5-pole Phoenix connector for de-embedding the HDMI audio, which can be transmitted as a 2-channel balanced analog audio signal. |
| ⑩ | **HDMI input** | HDMI input port with HDMI 2.0 support for source devices. |
| ⑪ | **Factory reset button** | Hidden button for setting the device to factory default values. See more details about it in the Factory Reset (F) Button for Endpoints section. |
| ⑫ | **Local HDMI output** | Local HDMI output with the same AV content as the HDMI input. |
| ⑬ | **TPN output** | RJ45 connector for SDVoE output signal transmission. See more details about the connector in the Ethernet Connectors and the TPN Input/Ouput Status LEDs sections. |
| ⑭ | **RS-232 port** | 3-pole Phoenix connector for bi-directional serial communication. See more details about the connector in the RS-232 Connector section. |
| ⑮ | **48V DC input** | 48V DC input connector for local powering. |
| ⑯ | **12V DC input** | 12V DC input locking connector for local powering. |

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

**HDMI-TPN-TX107D**



**HDMI-TPN-TX207DU2K**



| | | |
|---|---|---|
| **1** | **Gigabit Ethernet port** | 1GBase-T RJ45 connector for user Ethernet purpose. See more details about the LED operation in the Gigabit Ethernet Status LEDs section. |
| **2** | **Device USB-A connectors** | USB-A connectors with USB 2.0 support for various types of USB devices. |
| **3** | **Host USB-C connector** | USB-C connection between the transmitter and the host computer. The port receives **USB data only**, no AV signal transmission is accepted. It **supports USB 2.0** standard only. |
| **4** | **EDID / Video Status LED** | The EDID LED gives immediate feedback about the current status of the EDID emulation. See the details in the Device Status LEDs - TPN AU2K, D, DU2K and SR Series section. |
| **5** | **EDID button** | The EDID handling mode depends on the connection type of the extender. See the details in the EDID Button Function section. |
| **6** | **Dante®/AES67 output** | RJ45 connector for transmitting 2-channel Dante® or AES67 digital audio signal. |
| **7** | **HDMI input** | HDMI input port with HDMI 2.0 support for source devices. |
| **8** | **Factory reset button** | Hidden button for setting the device to factory default values. See more details about it in the Factory Reset (F) Button for Endpoints section. |
| **9** | **Local HDMI output** | Local HDMI output with the same AV content as the HDMI input. |
| **10** | **TPN output** | RJ45 connector for SDVoE output signal transmission. See more details about the connector in the Ethernet Connectors and the TPN Input/Ouput Status LEDs sections. |
| **11** | **RS-232 port** | 3-pole Phoenix connector for bi-directional serial communication. See more details about the connector in the RS-232 Connector section. |
| **12** | **12V DC input** | 12V DC input locking connector for local powering. |

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

## 2.1.2. HDMI-OPTN Transmitters

**HDMI-OPTN-TX100A**
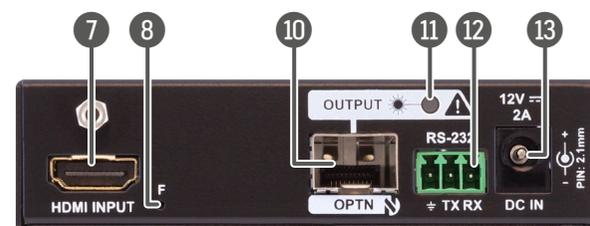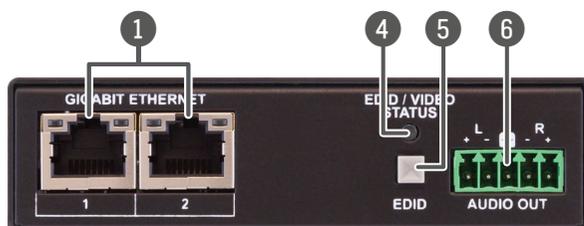


**HDMI-OPTN-TX200AU2K**



| ① | Gigabit Ethernet port | 1GBase-T RJ45 connector for user Ethernet purpose. See more details about the LED operation in the Gigabit Ethernet Status LEDs section. |
|---|---|---|
| ② | Device USB-A connectors | USB-A connectors with USB 2.0 support for various types of USB devices. |
| ③ | Host USB-C connector | USB-C connection between the transmitter and the host computer. The port receives **USB data only**, no AV signal transmission is accepted. It **supports USB 2.0** standard only. |
| ④ | EDID / Video Status LED | The EDID LED gives immediate feedback about the current status of the EDID emulation. See the details in the Device Status LEDs - OPTN Series section. |
| ⑤ | EDID button | The EDID handling mode depends on the connection type of the extender. See the details in the EDID Button Function section. |
| ⑥ | Audio output | 5-pole Phoenix connector for de-embedding the HDMI audio, which can be transmitted as a 2-channel balanced analog audio signal. |
| ⑦ | HDMI input | HDMI input port with HDMI 2.0 support for source devices. |
| ⑧ | Factory reset button | Hidden button for setting the device to factory default values. See more details about it in the Factory Reset (F) Button for Endpoints section. |
| ⑨ | Local HDMI output | Local HDMI output with the same AV content as the HDMI input. |
| ⑩ | SFP+ port slot for OPTN output connection | Optical output port slot for a 10 GbE SFP+ module or a DAC cable. Port can be used for either singlemode or multimode optical connection. |
| ⑪ | OPTN output link LED | The LED gives immediate feedback about the current status of the optical connection. See the details in the Device Status LEDs - OPTN Series section. |
| ⑫ | RS-232 port | 3-pole Phoenix connector for bi-directional serial communication. See more details about the connector in the RS-232 Connector section. |
| ⑬ | 12V DC input | 12V DC input locking connector for local powering. |

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

## 2.2. Front and Rear View - Receivers

### 2.2.1. TPN Non-scaling Receivers
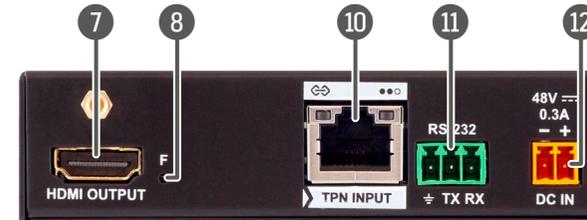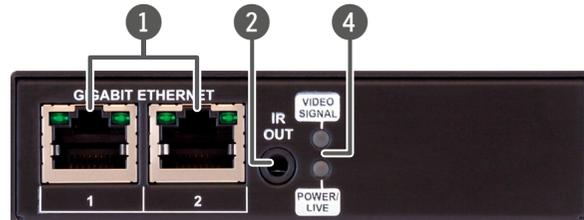
#### HDMI-TPN-RX107



#### HDMI-TPN-RX107AU2K
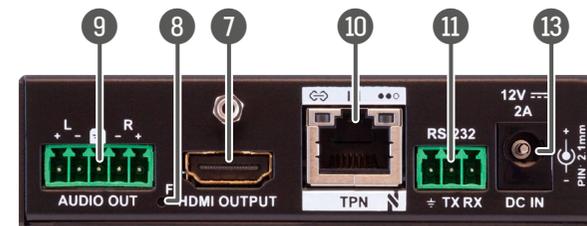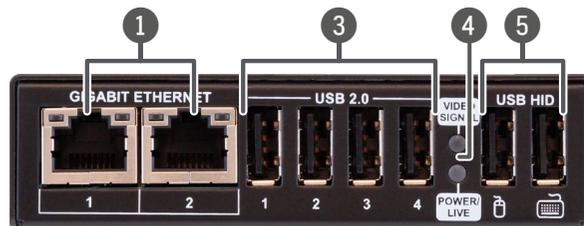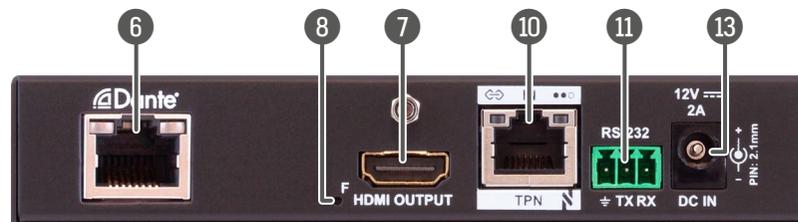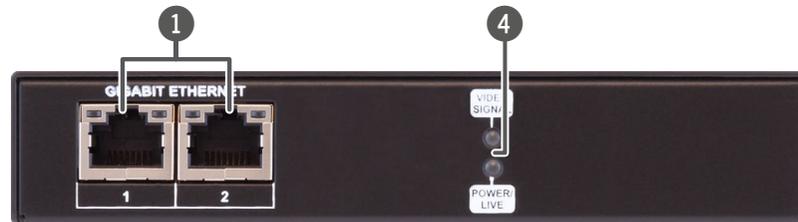


#### HDMI-TPN-RX107D



| | | |
|---|---|---|
| ① | **Gigabit Ethernet port** | 1GBase-T RJ45 connector for user Ethernet purpose. See more details about the LED operation in the Gigabit Ethernet Status LEDs section. |
| ② | **IR out** | TS (3.5mm jack) output connector for an Infrared emitter unit. |
| ③ | **USB 2.0 connectors** | USB-A connectors with USB 2.0 support for various types of USB devices (e.g. webcam, microphone, external storage, etc). The signal is transmitted to the transmitter over the TPN link. |
| ④ | **Status LEDs** | The LEDs give immediate feedback about the current status of the extender. See the details in the Device Status LEDs - TPN 107 Series (TPN-107 series), Device Status LEDs - TPN AU2K, D, DU2K and SR Series (TPN AU2K and SR series) sections. |
| ⑤ | **USB HID connectors** | USB K+M ports for HID-compatible devices (preferably keyboard and mouse). The signal is transmitted to the transmitter over the TPN link. |
| ⑥ | **Dante®/AES67 output** | RJ45 connector for transmitting 2-channel Dante® or AES67 digital audio signal. |
| ⑦ | **HDMI output** | HDMI output port with HDMI 2.0 support for sink devices. |
| ⑧ | **Factory reset button** | Hidden button for setting the device to factory default values. See more details about it in the Factory Reset (F) Button for Endpoints section. |
| ⑨ | **Audio output** | 5-pole Phoenix connector for de-embedding the HDMI audio, which can be transmitted as a 2-channel balanced analog audio signal. |
| ⑩ | **TPN input** | RJ45 connector for SDVoE input signal. See more details about the connector in the Ethernet Connectors and the TPN Input/Ouput Status LEDs sections. |
| ⑪ | **RS-232 port** | 3-pole Phoenix connector for bi-directional serial communication. See more details about the connector in the RS-232 Connector section. |
| ⑫ | **48V DC input** | 48V DC input connector for local powering. |
| ⑬ | **12V DC input** | 12V DC input locking connector for local powering. |

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

## 2.2.2. OPTN Non-scaling Receivers
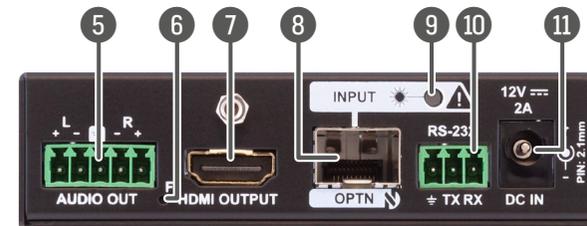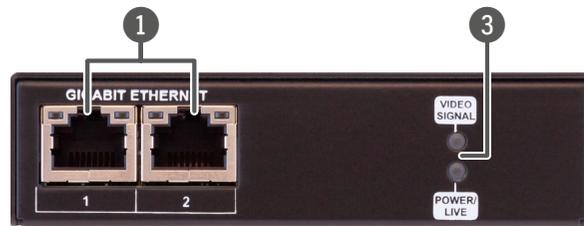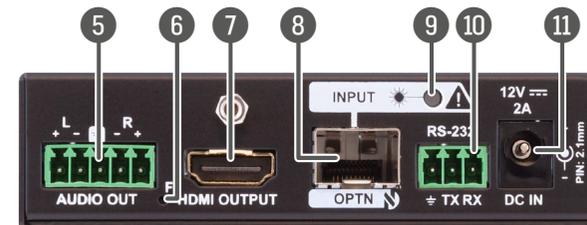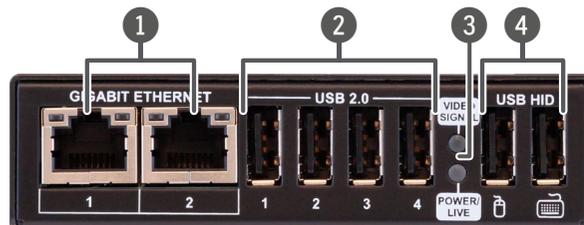
**HDMI-OPTN-RX100A**



**HDMI-OPTN-RX100AU2K**



| ① | **Gigabit Ethernet port** | 1GBase-T RJ45 connector for user Ethernet purpose. See more details about the LED operation in the Gigabit Ethernet Status LEDs section. |
|---|---|---|
| ② | **USB 2.0 connectors** | USB-A connectors with USB 2.0 support for various types of USB devices (e.g. webcam, microphone, external storage, etc). The signal is transmitted to the transmitter over the TPN link. |
| ③ | **Status LEDs** | The LEDs give immediate feedback about the current status of the extender. See the details in the Device Status LEDs - OPTN Series sections. |
| ④ | **USB HID connectors** | USB K+M ports for HID-compatible devices (preferably keyboard and mouse). The signal is transmitted to the transmitter over the TPN link. |
| ⑤ | **HDMI output** | HDMI output port with HDMI 2.0 support for sink devices. |
| ⑥ | **Factory reset button** | Hidden button for setting the device to factory default values. See more details about it in the Factory Reset (F) Button for Endpoints section. |
| ⑦ | **Audio output** | 5-pole Phoenix connector for de-embedding the HDMI audio, which can be transmitted as a 2-channel balanced analog audio signal. |
| ⑧ | **SFP+ port slot for OPTN input connection** | Optical input port slot for a 10 GbE SFP+ module or a DAC cable. The port can be used for either singlemode or multimode optical connection. |
| ⑨ | **OPTN input link LED** | The LED gives immediate feedback about the current status of the optical connection. See the details in the Device Status LEDs - OPTN Series section. |
| ⑩ | **RS-232 port** | 3-pole Phoenix connector for bi-directional serial communication. See more details about the connector in the RS-232 Connector section. |
| ⑪ | **12V DC input** | 12V DC input locking connector for local powering. |

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

## 2.2.3. TPN Scaling Receivers
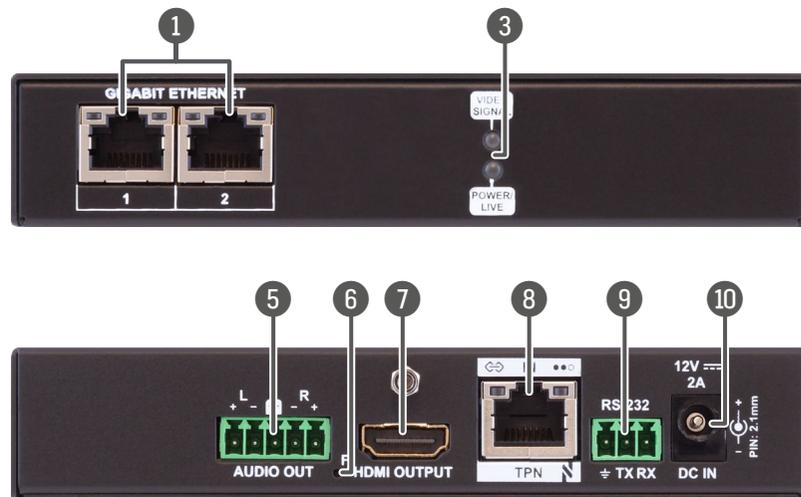
**HDMI-TPN-RX107A-SR**





**HDMI-TPN-RX107AU2K-SR**





| ① | **Gigabit Ethernet port** | 1GBase-T RJ45 connector for user Ethernet purpose. See more details about the LED operation in the Gigabit Ethernet Status LEDs section. |
|---|---|---|
| ② | **USB 2.0 connectors** | USB-A connectors with USB 2.0 support for various types of USB devices (e.g. webcam, microphone, external storage, etc). The signal is transmitted to the transmitter over the TPN link. |
| ③ | **Status LEDs** | The LEDs give immediate feedback about the current status of the extender. See the details in the Device Status LEDs - TPN AU2K, D, DU2K and SR Series section. |
| ④ | **USB HID connectors** | USB K+M ports for HID-compatible devices (preferably keyboard and mouse). The signal is transmitted to the transmitter over the TPN link. |
| ⑤ | **Audio output** | 5-pole Phoenix connector for de-embedding the HDMI audio, which can be transmitted as a 2-channel balanced analog audio signal. |
| ⑥ | **Factory reset button** | Hidden button for setting the device to factory default values. See more details about it in the Factory Reset (F) Button for Endpoints section. |
| ⑦ | **HDMI output** | HDMI output port with HDMI 2.0 support for sink devices. |
| ⑧ | **TPN input** | RJ45 connector for SDVoE input signal. See more details about the connector in the Ethernet Connectors and the TPN Input/Ouput Status LEDs sections. |
| ⑨ | **RS-232 port** | 3-pole Phoenix connector for bi-directional serial communication. See more details about the connector in the RS-232 Connector section. |
| ⑩ | **12V DC input** | 12V DC input locking connector for local powering. |

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

**HDMI-TPN-RX107D-SR**
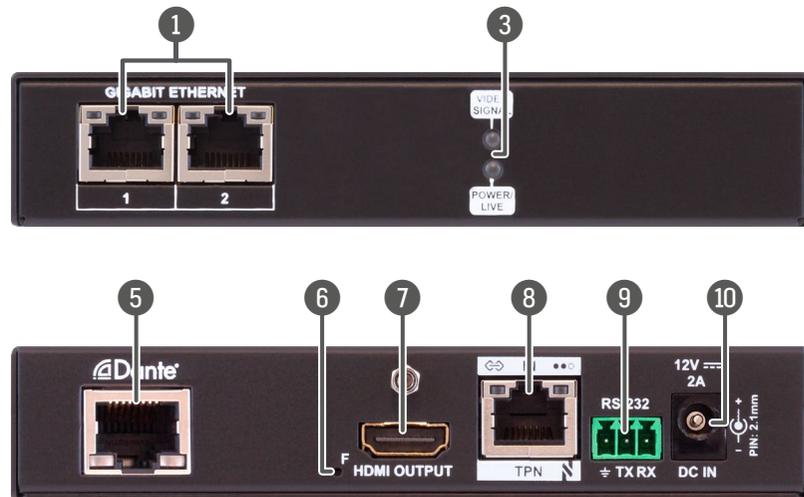


**HDMI-TPN-RX107DU2K-SR**



| | | |
|---|---|---|
| **1** | **Gigabit Ethernet port** | 1GBase-T RJ45 connector for user Ethernet purpose. See more details about the LED operation in the Gigabit Ethernet Status LEDs section. |
| **2** | **USB 2.0 connectors** | USB-A connectors with USB 2.0 support for various types of USB devices (e.g. webcam, microphone, external storage, etc). The signal is transmitted to the transmitter over the TPN link. |
| **3** | **Status LEDs** | The LEDs give immediate feedback about the current status of the extender. See the details in the Device Status LEDs - TPN AU2K, D, DU2K and SR Series section. |
| **4** | **USB HID connectors** | USB K+M ports for HID-compatible devices (preferably keyboard and mouse). The signal is transmitted to the transmitter over the TPN link. |
| **5** | **Dante®/AES67 output** | RJ45 connector for transmitting 2-channel Dante® or AES67 digital audio signal. |
| **6** | **Factory reset button** | Hidden button for setting the device to factory default values. See more details about it in the Factory Reset (F) Button for Endpoints section. |
| **7** | **HDMI output** | HDMI output port with HDMI 2.0 support for sink devices. |
| **8** | **TPN input** | RJ45 connector for SDVoE input signal. See more details about the connector in the Ethernet Connectors and the TPN Input/Ouput Status LEDs sections. |
| **9** | **RS-232 port** | 3-pole Phoenix connector for bi-directional serial communication. See more details about the connector in the RS-232 Connector section. |
| **10** | **12V DC input** | 12V DC input locking connector for local powering. |

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

## 2.2.4. OPTN Scaling Receivers
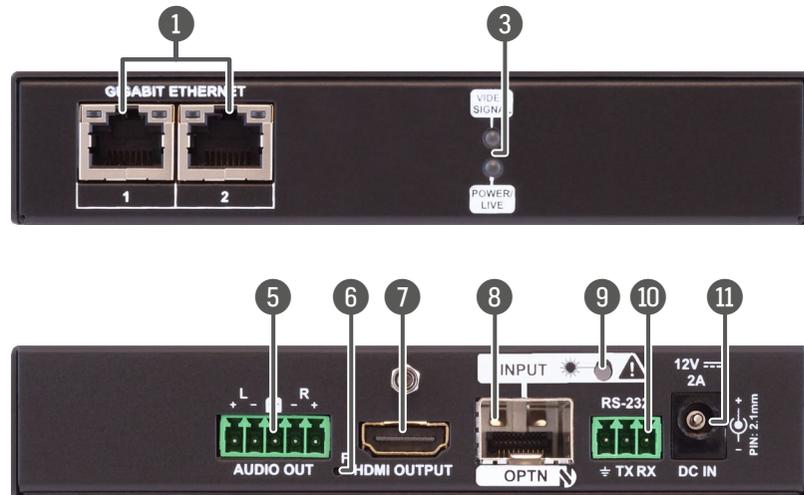
**HDMI-OPTN-RX100A-SR**



**HDMI-OPTN-RX100AU2K-SR**



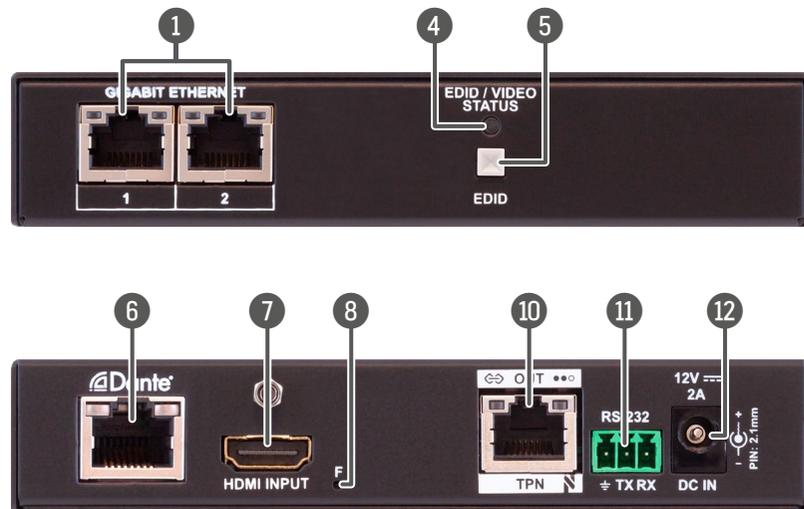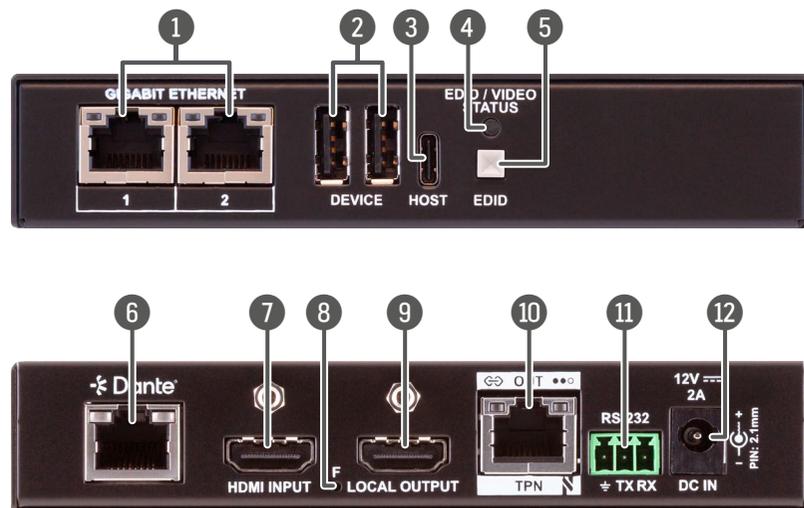| | | |
|---|---|---|
| ① | **Gigabit Ethernet port** | 1GBase-T RJ45 connector for user Ethernet purpose. See more details about the LED operation in the Gigabit Ethernet Status LEDs section. |
| ② | **USB 2.0 connectors** | USB-A connectors with USB 2.0 support for various types of USB devices (e.g. webcam, microphone, external storage, etc). The signal is transmitted to the transmitter over the TPN link. |
| ③ | **Status LEDs** | The LEDs give immediate feedback about the current status of the extender. See the details in the Device Status LEDs - OPTN Series section. |
| ④ | **USB HID connectors** | USB K+M ports for HID-compatible devices (preferably keyboard and mouse). The signal is transmitted to the transmitter over the TPN link. |
| ⑤ | **Audio output** | 5-pole Phoenix connector for de-embedding the HDMI audio, which can be transmitted as a 2-channel balanced analog audio signal. |
| ⑥ | **Factory reset button** | Hidden button for setting the device to factory default values. See more details about it in the Factory Reset (F) Button for Endpoints section. |
| ⑦ | **HDMI output** | HDMI output port with HDMI 2.0 support for sink devices. |
| ⑧ | **SFP+ port slot for OPTN input connection** | Optical input port slot for a 10 GbE SFP+ module or a DAC cable. The port can be used for either singlemode or multimode optical connection. |
| ⑨ | **OPTN input link LED** | The LED gives immediate feedback about the current status of the optical connection. See the details in the Device Status LEDs - OPTN Series section. |
| ⑩ | **RS-232 port** | 3-pole Phoenix connector for bi-directional serial communication. See more details about the connector in the RS-232 Connector section. |
| ⑪ | **12V DC input** | 12V DC input locking connector for local powering. |

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

## 2.3. Front and Rear View - TPN-MMU-X100 series

**Front View**
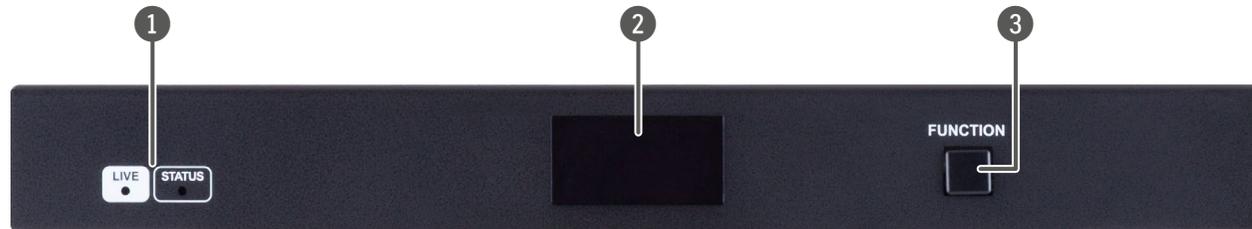


**Rear View**
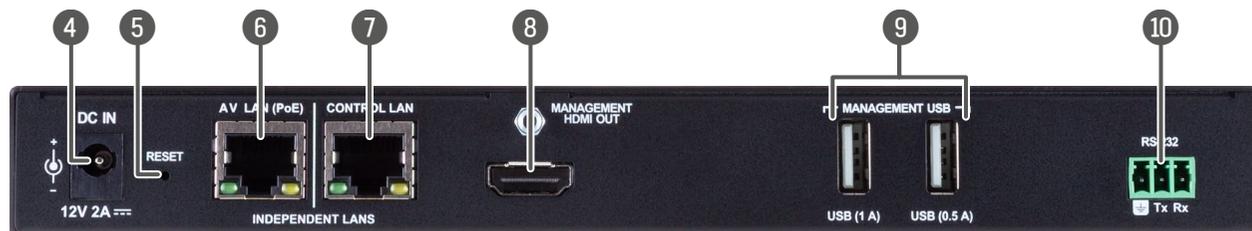


| | | |
|---|---|---|
| **1** | **Device Status LEDs** | The LEDs show the actual status of the device, see the details in the Device Status LED - TPN-MMU-X100-20 section. |
| **2** | **OLED Display** | A screen displaying useful information such as the AV network and Management IP addresses. |
| **3** | **Function Button** | Button for physically controlling the device. For more information, please see the Function Button for MMU section. |
| **4** | **DC 12V Input** | 12V DC input in case of powering locally. |
| **5** | **Reset Button** | Reboots the device or resets factory default values. For more information, see the Reset Button for MMU section. |
| **6** | **AV LAN (PoE) Connector** | Separate 10/100/1000Mbps RJ45 Ethernet connector for endpoint network control. The port fulfills the **PoE PD standard (IEEE802.3af)**, which means the **AV LAN (PoE) port** can receive power over the Ethernet line. |
| **7** | **Control LAN Connector** | Separate 10/100/1000Mbps RJ45 Ethernet connector for management network connection for MMU controlling purpose. |
| **8** | **Management HDMI Output Port** | HDMI connector for control purposes. **This function will be implemented in a later firmware update.** |
| **9** | **USB-A Ports** | USB 2.0 compatible A-type ports for local USB HID and mass storage devices. **This function will be implemented in a later firmware update.** |
| **10** | **RS-232 Port** | 3-pole Phoenix® connector. **This function will be implemented in a later firmware update.** |

**WARNING!** Always use the supplied power supply. Warranty void if damage occurs due to use of a different power source.
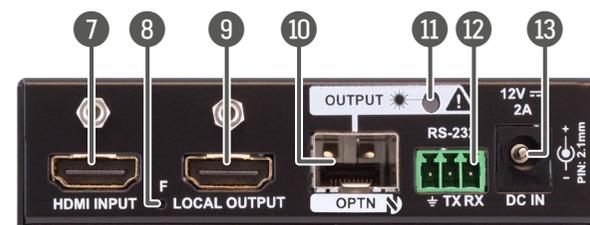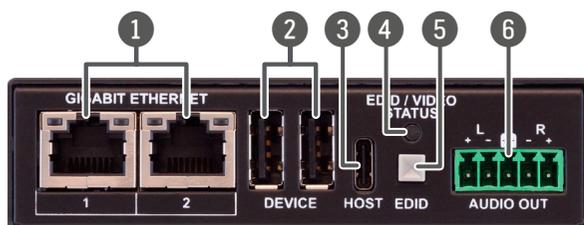
## 2.4. Front and Rear Panel LEDs

### 2.4.1. Device Status LEDs - TPN 107 Series

Affected models:

- HDMI-TPN-TX107
- HDMI-TPN-RX107

| POWER/LIVE | | Transmitter / Receiver |
|---|---|---|
| ○ | off | Device is not powered. |
| ✺ | blinking between 50% and 100% brightness (green) | Device is powered on and operational. |
| **VIDEO SIGNAL** | | **Transmitter / Receiver** |
| ○ | off | No video signal present on the HDMI input (TX) or HDMI output (RX) port. |
| ● | on (green) | Video signal is present on the HDMI input (TX) or HDMI output (RX) port. |
| **EDID STATUS** | | **Transmitter** |
| ● | on (green) | Default EDID is emulated on the HDMI input port. |
| ● | on (yellow) | User EDID is emulated on the HDMI input port. |
| ✺ | blinking (red) | Error occured during the EDID emulation. It may be caused by:<br>▪ EDID emulation cannot be set correctly.<br>▪ Device cannot apply user EDID emulation. |

### 2.4.2. Device Status LEDs - TPN AU2K, D, DU2K and SR Series

Affected models:

- HDMI-TPN-TX207AU2K
- HDMI-TPN-TX107D
- HDMI-TPN-TX207DU2K
- HDMI-TPN-RX107AU2K
- HDMI-TPN-RX107A-SR
- HDMI-TPN-RX107D-SR
- HDMI-TPN-RX107AU2K-SR
- HDMI-TPN-RX107DU2K-SR

| EDID / VIDEO STATUS | | Transmitter |
|---|---|---|
| ○ | off | Device is not powered. |
| ✺ ✺ | blinking (green or yellow) | No video signal present on the HDMI input port. |
| ● | on (green) | Default EDID is emulated on the HDMI input port. |
| ● | on (yellow) | User EDID is emulated on the HDMI input port. |
| ✺ | blinking (red) | Error occured during the EDID emulation. It may be caused by:<br>▪ EDID emulation cannot be set correctly.<br>▪ Device cannot apply user EDID emulation. |
| **POWER/LIVE** | | **Receiver** |
| ○ | off | Device is not powered. |
| ✺ | blinking between 50% and 100% brightness (green) | Device is powered on and operational. |
| **VIDEO SIGNAL** | | **Receiver** |
| ○ | off | No video signal present on the HDMI output port. |
| ● | on (green) | Video signal is present on the HDMI output port. |

### 2.4.3. Device Status LEDs - OPTN Series

Affected models:

- HDMI-OPTN-TX100A
- HDMI-OPTN-TX200AU2K
- HDMI-OPTN-RX100A
- HDMI-OPTN-RX100AU2K
- HDMI-OPTN-RX100A-SR
- HDMI-OPTN-RX100AU2K-SR

| EDID / VIDEO STATUS | | Transmitter |
|---|---|---|
| ⚪ | off | Device is not powered. |
| 🟢🟡 | blinking (green or yellow) | No video signal present on the HDMI input port. |
| 🟢 | on (green) | Default EDID is emulated on the HDMI input port. |
| 🟡 | on (yellow) | User EDID is emulated on the HDMI input port. |
| 🔴 | blinking (red) | Error occured during the EDID emulation. It may be caused by:<br>  ▪ EDID emulation cannot be set correctly.<br>  ▪ Device cannot apply user EDID emulation. |
| **POWER/LIVE** | | **Receiver** |
| ⚪ | off | Device is not powered. |
| 🟢 | blinking between 50% and 100% brightness (green) | Device is powered on and operational. |
| **VIDEO SIGNAL** | | **Receiver** |
| ⚪ | off | No video signal present on the HDMI output port. |
| 🟢 | on (green) | Video signal is present on the HDMI output port. |
| **OPTN INPUT / OUTPUT LINK LED** | | **Transmitter / Receiver** |
| ⚪ | off | Device is not powered or SFP+ transceiver module is not installed. |
| 🔴 | on (red) | Device might emit laser radiation. |
| 🟢 | on (green) | Optical link established. |

### 2.4.4. Device Status LED - TPN-MMU-X100-20

Affected model:

- TPN-MMU-X100-20

| LIVE LED | | MMU |
|---|---|---|
| ⚪ | off | Device is not powered. |
| 🟢 | on (green) | Device is powered. |
| **STATUS LED** | | **MMU** |
| ⚪ | off | Device is not working or partionally functional. |
| 🟢 | blinking between 50% and 100% brightness (green) | Device is operational. |

### 2.4.5. TPN Input/Ouput Status LEDs

Affected models:

- HDMI-TPN-TX107
- HDMI-TPN-TX107D
- HDMI-TPN-TX207DU2K
- HDMI-TPN-RX107
- HDMI-TPN-RX107D
- HDMI-TPN-TX207AU2K
- HDMI-TPN-RX107AU2K
- HDMI-TPN-RX107D-SR
- HDMI-TPN-RX107AU2K-SR
- HDMI-TPN-RX107DU2K-SR

| TPN INPUT/OUTPUT | 🔗 | Transmitter / Receiver |
|---|---|---|
| ⬜ | off | No connection is established between the transmitter and the receiver units. |
| 🟩 | on (green) | Connection is established with 10G / 5G / 2.5G bandwith. |
| **TPN INPUT/OUTPUT** | ●●○ | **Transmitter / Receiver** |
| ⬜ | off | No data transmission on the port. |
| 🟩 | blinking (green) | Data transmission is active. |

**2.4.6. Gigabit Ethernet Status LEDs**

Affected models:

- HDMI-TPN-TX107
- HDMI-TPN-TX107D
- HDMI-TPN-TX207DU2K
- HDMI-TPN-RX107
- HDMI-TPN-RX107D
- HDMI-TPN-TX207AU2K
- HDMI-TPN-RX107AU2K
- HDMI-TPN-RX107A-SR
- HDMI-TPN-RX107D-SR
- HDMI-TPN-RX107AU2K-SR
- HDMI-TPN-RX107DU2K-SR
- HDMI-OPTN-TX100A
- HDMI-OPTN-TX200AU2K
- HDMI-OPTN-RX100A
- HDMI-OPTN-RX100AU2K
- HDMI-OPTN-RX100A-SR
- HDMI-OPTN-RX100AU2K-SR

| GIGABIT ETHERNET - LEFT LED | | Transmitter / Receiver / MMU |
|---|---|---|
| 🟩 | on (green) | Connection is established with 100Mbps bandwith. |
| 🔆 | blinking (green) | Data transmission is active. |
| **GIGABIT ETHERNET - RIGHT LED** | | **Transmitter / Receiver / MMU** |
| 🟩 | on (green) | Connection is established with 1Gbps bandwith. |
| 🔆 | blinking (green) | Data transmission is active. |

**2.4.7. Dante Connector LEDs**

**Version 1**

Affected models:

- HDMI-TPN-TX107D
- HDMI-TPN-TX207DU2K
- HDMI-TPN-RX107D

| LED state | Left LED | Right LED | Function |
|---|---|---|---|
| | Off | Off | No power |
| | Solid green | Solid red | Dante is booting |
| | Blinking green | Solid green | Slave with sync (normal operation) |
| | Blinking green | Blinking green | Clock master (normal operation) |
| | Blinking green | Blinking red | Acquiring clock sync (normal operation) |
| | Alternating red/green | Alternating red/green | Identify (blinking for 6 seconds) |
| | Blinking red | Blinking red | Dante fail safe |
| | Blinking amber | Blinking amber | Device is upgrading |

**Version 2**

Affected models:

- HDMI-TPN-RX107D-SR
- HDMI-TPN-RX107DU2K-SR

| LED state | Left LED | Right LED | Function |
|---|---|---|---|
| | Off | Off | No power |
| | Solid green | Solid red | Dante is booting |
| | Blinking green | Solid green | Slave with sync (normal operation) |
| | Blinking green | Blinking green | Clock master (normal operation) |
| | Blinking green | Blinking red | Acquiring clock sync (normal operation) |
| | Alternating red/green | Alternating red/green | Identify (blinking for 6 seconds) |
| | Blinking red | Blinking red | Dante fail safe |
| | Blinking amber | Blinking amber | Device is upgrading |

## 2.5. Button Functions

### 2.5.1. EDID Button Function

**▌ DIFFERENCE:** The TPN/OPTN series transmitters are the only ones built with EDID button.

The EDID handling mode depends on the connection type of the extender. *#edid*

**Point-to-point connection (TPX mode)**

Two EDID emulation modes can be selected with the EDID button: Default and User.

- **Short press**: switch between default and stored user EDID.
- **Long press**: learn and store EDID from the output of the receiver.

**Point-multipoint connection (TPN mode)**

Two EDID emulation modes can be selected with the button: Default and User.

- Short press: switch between default and stored user EDID.

### 2.5.2. Factory Reset (F) Button for Endpoints

**▌ DIFFERENCE:** The following method is related to the TPN/OPTN series endpoint devices only.

To restore factory default values, do the following steps: *#factory*

**Step 1.** Prepare a thin and long tool (e.g. a pen, toothpick, piece of wire, etc).

**Step 2.** Make sure the device is powered on and operational.

**Step 3.** Press and keep pressing the hidden **F** button using the tool **for 3 seconds**. After 3 seconds the LEDs start blinking faster.

**Step 4.** The LEDs get dark, the device restores the factory default settings and reboots.

### 2.5.3. Function Button for MMU

Pressing the button activates or deactivates the OLED display.

Press and hold for **5 seconds** to configure DHCP on the management network.

### 2.5.4. Reset Button for MMU

**▌ DIFFERENCE:** The following method is related to the TPN-MMU-X100 series matrix management unit only.

To restore factory default values, do the following steps: *#factory*

**Step 1.** Prepare a thin and long tool (e.g. a pen, toothpick, piece of wire, etc).

**Step 2.** Make sure the device is powered on and operational.

**Step 3.** Press and keep pressing the hidden **Reset** button using the tool **for 5 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.

## 2.6. OLED Display of the MMU

TPN-MMU series matrix management units are built with a OLED display on the front panel.

The following information are displayed:

- IP address of the AV LAN (PoE) port:
  - Upper line: DHCP or Static IP address
  - Lower line: Auto IP
- IP address of the Management network (Control LAN port).

```
AV:
10.145.0.14/24
169.254.9.53/16

MANAGEMENT:
192.168.0.156/24
```

# 3

## Installation

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

## 3.1. Mounting Options - Compatibility Table

The following table summarizes the compatiblity of the TPN series devices with the mounting accessories offered by Lightware. The number in the brackets means how many same-size devices can be assembled to the mounting plate. The dimensions are in mm. The following accessories can be ordered separately, please contact sales@lightware.com for the details.

| Dimensions | Model Name | 1U High Rack Shelf | UD Mounting Kit | UD Mounting Kit Double | UD Mounting Plate F110 | UD Mounting Plate F120 | PRC-16-312 rackmount cage |
|---|---|---|---|---|---|---|---|
| 100.4 W x 131.8 D x 26 H | HDMI-TPN-TX107 | ✔ (4x) | ✔ | ✔ (2x) | ✔ | ✔ (2x) | ✖ |
| | HDMI-TPN-RX107 | ✔ (4x) | ✔ | ✔ (2x) | ✔ | ✔ (2x) | ✖ |
| 100.4 W x 151.8 D x 26 H | HDMI-TPN-TX207AU2K | ✔ (4x) | ✔ | ✔ (2x) | ✔ | ✔ (2x) | ✔ (16x) |
| | HDMI-TPN-RX107AU2K | ✔ (4x) | ✔ | ✔ (2x) | ✔ | ✔ (2x) | ✔ (16x) |
| | HDMI-OPTN-TX100A | ✔ (4x) | ✔ | ✔ (2x) | ✔ | ✔ (2x) | ✔ (16x) |
| | HDMI-OPTN-TX200AU2K | ✔ (4x) | ✔ | ✔ (2x) | ✔ | ✔ (2x) | ✔ (16x) |
| | HDMI-OPTN-RX100A | ✔ (4x) | ✔ | ✔ (2x) | ✔ | ✔ (2x) | ✔ (16x) |
| | HDMI-OPTN-RX100AU2K | ✔ (4x) | ✔ | ✔ (2x) | ✔ | ✔ (2x) | ✔ (16x) |

**WARNING! Pay attention to the ventilation holes when designing the system. Top and side ventilation holes must not be covered.**

INFO: See the details about the assembly steps for each models in our Mounting Assembly Guide downloaded from the website.

| Dimensions | Model Name | 1U High Rack Shelf | UD Mounting Kit | UD Mounting Kit Double | UD Mounting Plate F110 | UD Mounting Plate F120 | PRC-16-312 rackmount cage |
|---|---|---|---|---|---|---|---|
| 138 W x 151.8 D x 26 H | HDMI-TPN-TX107D | ✔ (3x) | ✖ | ✖ | ✖ | ✔ | ✖ |
| | HDMI-TPN-TX207DU2K | ✔ (3x) | ✖ | ✖ | ✖ | ✔ | ✖ |
| | HDMI-TPN-RX107D | ✔ (3x) | ✖ | ✖ | ✖ | ✔ | ✖ |
| | HDMI-TPN-RX107A-SR | ✔ (3x) | ✖ | ✖ | ✖ | ✔ | ✖ |
| | HDMI-TPN-RX107D-SR | ✔ (3x) | ✖ | ✖ | ✖ | ✔ | ✖ |
| | HDMI-TPN-RX107AU2K-SR | ✔ (3x) | ✖ | ✖ | ✖ | ✔ | ✖ |
| | HDMI-TPN-RX107DU2K-SR | ✔ (3x) | ✖ | ✖ | ✖ | ✔ | ✖ |
| | HDMI-OPTN-RX100A-SR | ✔ (3x) | ✖ | ✖ | ✖ | ✔ | ✖ |
| | HDMI-OPTN-RX100AU2K-SR | ✔ (3x) | ✖ | ✖ | ✖ | ✔ | ✖ |
| 221 W x 120 D x 26 H | TPN-MMU-X100-20 | ✔ (2x) | ✖ | ✖ | ✖ | ✔ | ✖ |

**WARNING! Pay attention to the ventilation holes when designing the system. Top and side ventilation holes must not be covered.**

INFO: See the details about the assembly steps for each models in our Mounting Assembly Guide downloaded from the website.

## 3.2. Electrical Connections

### 3.2.1. 48V DC Input Connector

HDMI-TPN-TX107 and RX107 extenders are built with 2-pole Phoenix connector for 48V DC 1A power connection.

| Pin nr. | Signal |
|---------|--------|
| 1 | Ground |
| 2 | Power |

*2-pole Phoenix connector and plug pin assignments*

> **WARNING! Always use the supplied 48V power adaptor. Warranty void if damage occurs due to use of a different power source.**

### 3.2.2. DC 12V Input Connector
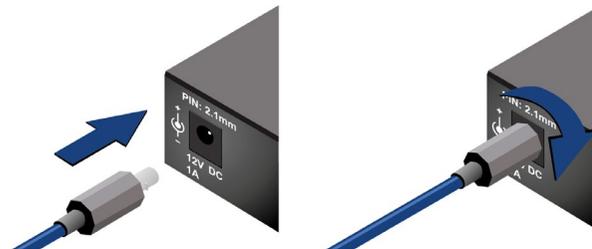
*Locking DC connector*

Do not forget to turn the plug counterclockwise 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.**

### 3.2.3. HDMI Input and Output Ports

The HDMI-TPN series endpoint devices are assembled with standard 19-pole HDMI 2.0 connectors with screw lock for inputs and outputs. Always use 22AWG or higher quality HDMI cables for connecting sources and displays.

### 3.2.4. Analog Stereo Audio

5-pole Phoenix connector is used for balanced analog audio output. Unbalanced audio device can be connected as well. See more details about the balanced and unbalanced output port wiring in the Cable Wiring Guide section.

| Pin nr. | Signal |
|---------|--------|
| 1 | Left+ |
| 2 | Left- |
| 3 | Ground |
| 4 | Right- |
| 5 | Right+ |
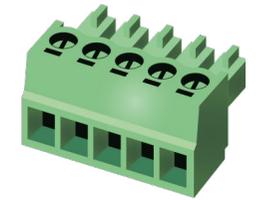
*Analog audio connector and plug pin assignments*

**Compatible Plug Type**

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

### 3.2.5. USB-A Connectors for Endpoints

U2K series endpoint models provide USB-A connectors for supporting KVM functionality supporting HDMI 2.0 standard.

### 3.2.6. USB Type-C for Endpoints

U2K series transmitter models provide a USB Type-C connector for USB connection between the transmitter and the host computer.

> **ATTENTION:** The port receives **USB data only**, no AV signal transmission is accepted. It supports **USB 2.0 standard only**.

### 3.2.7. Ethernet Connectors

> **ATTENTION:** Before the installation of the Ethernet connections please read our **CATx cable recommendations** in the CATx Cable Diagnostics for TPN Endpoints section.

**TPN (SDVoE) Connector**

The TPN series endpoint models provide standard RJ45 connectors for TPN input/output ports. Maximum CATx cable distances can be found in the Maximum Cable Extension section. See Lightware's recommendations for cable types in the CATx Cable Diagnostics for TPN Endpoints section.

**Control LAN, Utility AV LAN, Configurable Ethernet Port**

The TPN series endpoint and the TPN-MMU models contain RJ45 connectors. Endpoint models are built with 10GBase-T AV LAN connection and 1GBase-T Ethernet, MMU is built with 1GBase-T Ethernet/LAN connection for local control functions.

The Ethernet ports can be connected to a LAN hub, switch or router by a CATx cable. Even though both cable types (straight or cross) are supported and handled by the device, the pin assignment below is recommended.

**Dante® RJ45 Connector**

D series extenders provide standard RJ45 connectors for transmitting digital audio signal. See Lightware's recommendations for cable types in the CATx Cable Diagnostics for TPN Endpoints section.

**Wiring of CATx Cables**

Lightware recommends the termination of LAN cables on the basis of TIA/EIA T 568 A or TIA/EIA T 568 B standards.
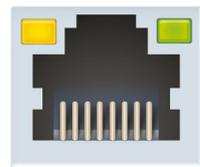
| Pin | TIA/EIA T568A | TIA/EIA T568B |
|-----|---------------|---------------|
| 1 | white/green | white/orange |
| 2 | green | orange |
| 3 | white/orange | white/green |
| 4 | blue | blue |
| 5 | white/blue | white/blue |
| 6 | orange | green |
| 7 | white/brown | white/brown |
| 8 | brown | brown |
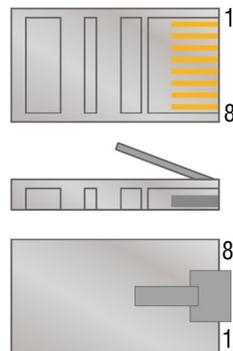
### 3.2.8. RS-232 Connector

All TPN/OPTN series models contain a 3-pole Phoenix connector, which is used for RS-232 serial connection.

| Pin nr. | Signal |
|---------|--------|
| 1 | Ground |
| 2 | TX data |
| 3 | RX data |
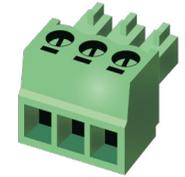
*RS-232 connector pin assignments*

**RS-232 Output Voltage Levels**

- Logic low level: 3V .. 15V
- Logic high level: -15V .. -3V

**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 in the Serial Interface section.

### 3.2.9. IR Output Connector

IR emitter can be connected to the HDMI-TPN-TX107 and RX107 endpoint models with a TS (Tip and Sleeve) connector. It is 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 emitter:

1    2-3

**Emitter – 2-pole TS**

| 1 Tip | +5V |
|-------|-----|
| 2 Ring | |
| 3 Sleeve | Signal (active low) |

*Pin assignment of the 2-pole TS connector*

### 3.2.10. SFP+ Slot

The small form-factor pluggable (**SFP**) is a compact, hot-pluggable optical module transceiver used for both telecommunication and data communication applications. It is a popular industry format jointly developed and supported by many network component vendors. The SFP interface supports data rates up to 1 Gbit/s. *

> DEFINITION: The enhanced small form-factor pluggable (**SFP+**) is an enhanced version of the SFP that supports data rates up to 10 Gbit/s. *

OPTN series endpoint devices contain standard SFP+ slot for the fiber optical connections via SFP+ module or DAC cable. The installed SFP+ module can be singlemode or multimode as well.

| | OPTN endpoint devices |
|---|---|
| **Type of the slot** | SFP+ |
| **Maximum bandwidth per slot** | 10 Gbps |
| **Transmitted signal** | Audio, video, Ethernet, RS-232, Infrared, USB KVM |

For the details about the DAC cable / SFP+ module installation, see the SFP+ Slot section.

#### Maximum Allowed Cable Length

The maximum allowed optical or copper cable length depends of the installed SFP / SFP+ modules. Always check the specification of the optical modules before the fiber optical or copper cabling.

> **ATTENTION:** Always apply equal length copper cables for both SFP+ to RJ45 modules in one endpoint device. Different cable lengths may cause data package loss during the transmission.

* Source: https://en.wikipedia.org/wiki/Small_form-factor_pluggable_transceiver

## 3.3. SFP+ Slot Connection

> **DIFFERENCE:** Only HDMI-OPTN and HDMI-OPTN-SR series endpoint devices are built with SFP+ slot.

> INFO: The SFP+ slots support the Plug and Play connection, which means OPTN devices do not need to be powered off before inserting or removing SFP+ modules or DAC cables.

### 3.3.1. Installation of the SFP+ Module

OPTN series endpoint devices use SFP+ module for the fiber optical connections. The optical module can be changed based on the recent application of the extender: it can be singlemode or multimode, or BiDi module, up to 10 GbE signal transmission.

#### Inserting and Cabling of SFP+ Modules

**Step 1.**   Put up on the handle bar.

**Step 2.**   Connect the module to the SFP+ port slot.

**Step 3.**   Connect the LC connectors to the SFP+ module.

> INFO: The SFP+ modules have a side that clips to the connector on the port of the switch, and is designed to prevent the module from being inserted the wrong way into the port. Do NOT force the module into the port.

#### Removing SFP+ Modules

**Step 1.**   Disconnect the LC connectors from the SFP+ module.

**Step 2.**   Pull down on the handle bar.

**Step 3.**   Gently slide out the SFP+ module from the slot.

### 3.3.2. Installation of DAC Cable

OPTN series endpoints can be connected via DAC (Direct Attach Copper) cables to the network switch. The cable type must support 10 GbE signal transmission.

#### Inserting the DAC Cable

**Step 1.**   Push the plug of the DAC cable to the SFP+ port slot of the transmitter to stop.

**Step 2.**   Push the other plug of the DAC cable to the SFP+ port slot of the receiver to stop.

#### Removing the DAC Cable

Pull the handle bar of the plug and gently slide out the cable from the slot.

> INFO: See more details about the SFP+ interfaces in the SFP+ Slot section.

## 3.4. Connecting Steps

**Schematic Drawing**

The following schematic drawing shows the **point-multipoint connection** between the endpoint devices, the MMU and a network switch; and the **peer-to-peer connection** type between a TPN/OPTN series transmitter and a receiver.

**WARNING! The peer-to-peer connection of the TPN/OPTN endpoint devices is not equal with TPX/OPTX extenders. See more details about it in the Application Modes section.**



**Transmitter Side**

4K PC | 4K TV | Infrared emitter | Media player

HDMI in | USB-C | Local HDMI out | IR out | Audio out | Dante | RS-232

TPN or OPTN series transmitter

Power | USB-A | Ethernet

2x Pendrive

Power adaptor | Pendrive | Ethernet switch

**Receiver Side**

4K projector | Infrared emitter | Media player | Webcam

4x

RS-232 | HDMI out | IR out | Audio out | Dante | USB-A

TPN or OPTN series receiver

Power | USB-A | Ethernet

Power adaptor | Keyboard & mouse | Ethernet switch

**Option 1 - Peer-to-peer connection**

TPN / OPTN

TPN / OPTN | TPN / OPTN

PoE-capable network switch

**Option 2 - Point-multipoint connection**

AV LAN

TPN-MMU-X100 matrix management unit

Power | Control LAN

Power adaptor | Network switch

### Matrix Management Unit (MMU) Side

**AV LAN** — Connect the device to the 10G network switch. The MMU can be powered by the network switch due to **PoE PD** (power delivery) feature. Please check the Powering Options section for the options.

**Control LAN** — Connect the Control LAN port of the MMU to a Local Network Switch to provide management network connection for device configuration and BYOD internet access.

**Power** — Powering on the devices is recommended to do as the final step during the installation. Please check the Powering Options section for the options.

### Transmitter Side

**TPN** — **Option 1 - Point-to-point connection -** Connect a CATx cable between the TPN output port of the transmitter and the TPN input port of the receiver. In this case, the extender operates as a TPX device.

**Option 2 - Point-multipoint connection** - Connect a CATx cable between the TPN output port of the transmitter and the RJ45 port of the 10G network switch.

▌ **WARNING! User Ethernet is also transmitted over the TPN interface, so be sure not to create a network loop.**

**OPTN** — **Option 1 - Point-to-point connection -** Connect singlemode or multimode (depends on the installed SFP+ modules) fiber optical cables or DAC cables between the transmitter and the receiver. In this case, the extender operates as an OPTX device.

**Option 2 - Point-multipoint connection** - Connect singlemode or multimode (depends on the installed SFP+ modules) fiber optical cables or DAC cables between the transmitter and the 10G network switch.

▌ **WARNING! User Ethernet is also transmitted over the OPTN interface, so be sure not to create a network loop.**

**HDMI in** — Connect the source (e.g. media player) to the HDMI input port of the transmitter by an HDMI cable.

**Local HDMI out** — Connect the local sink devices (e.g. 4K TV) to the Local output port by an HDMI cable. The output port is a local loopback port in this case: the same stream received on the input port is transmitted forward.

▌ INFO: The port is available in the TX207AU2K and TX200AU2K models.

### Transmitter Side

**Audio out** — Optionally for analog output: connect an audio device (e.g. media server) to the analog audio output port by an audio cable.

▌ INFO: The port is available in the TX207AU2K, TX100A and TX100AU2K models only.

**Dante** — Optionally for Dante/AES67 output: connect a Dante/AES67 device (e.g. media server) to the Dante output port by a CATx cable.

▌ INFO: The port is available in the TX107D and TX207DU2K models only.

**Ethernet** — Connect the device to a LAN network.

▌ **WARNING! User Ethernet is also transmitted over the TPN/OPTN interfaces, so be sure not to create a network loop.**

**USB-A** — Connect up to two USB 2.0 devices (e.g. pendrive/microphone/webcam/etc) to the Device ports.

▌ INFO: The ports are available in the TX207AU2K and TX200AU2K models.

**USB-C** — Connect the host PC to the Host port by an USB-C cable. The port supports USB 2.0 standard and receives USB data only, no AV transmission allowed.

▌ INFO: The port is available in the TX207AU2K and TX200AU2K models only.

**IR out** — Optionally for Infrared extension: connect an IR emitter to the IR OUT port of the transmitter (command injection is available only with 3rd-party software).

▌ INFO: The port is available in the TX107 model only.

**RS-232** — Optionally for RS-232: connect a device (e.g. media player) to the RS-232 port.

**Power** — Powering on the devices is recommended to do as the final step during the installation. Please check the Powering Options section for the options.

| Receiver Side |
|---|

**TPN**　**Option 1 - Point-to-point connection -** Connect a CATx cable between the TPN output port of the transmitter and the TPN input port of the receiver. In this case, the extender operates as a TPX device.
**Option 2 - Point-multipoint connection** - Connect a CATx cable between the TPN input port of the receiver and the RJ45 port of the 10G network switch.

> **WARNING! User Ethernet is also transmitted over the TPN interface, so be sure not to create a network loop.**

**OPTN**　**Option 1 - Point-to-point connection -** Connect singlemode or multimode (depends on the installed SFP+ modules) fiber optical cables or DAC cables between the transmitter and the receiver. In this case, the extender operates as an OPTX device.

**Option 2 - Point-multipoint connection** - Connect singlemode or multimode (depends on the installed SFP+ modules) fiber optical cables or DAC cables between the receiver and the 10G network switch.

> **WARNING! User Ethernet is also transmitted over the OPTN interface, so be sure not to create a network loop.**

**HDMI out**　Connect the sink (e.g. 4K projector) to the HDMI output port of the receiver by a HDMI cable.

**Audio out**　Optionally for analog output: connect an audio device (e.g. active speakers) to the analog audio output port by an audio cable.

> INFO: The ports are available in the RX107A-SR, RX107AU2K, RX107AU2K-SR, RX100A, RX100AU2K, RX100A-SR and RX100AU2K-SR models.

**Dante**　Optionally for Dante/AES67 output: connect a Dante/AES67 device (e.g. media server) to the Dante output port by a CATx cable.

> INFO: The port is available in the RX107D, RX107D-SR and RX107DU2K-SR models only.

**USB-A**　USB 2.0 ports: connect up to four USB 2.0 devices (e.g. pendrive/microphone/webcam/etc) to the receiver.
USB HID ports: connect up to two USB HID devices to the receiver (preferably mouse and keyboard).

> INFO: The ports are available in the RX107AU2K, RX107AU2K-SR, RX100AU2K and RX100AU2K-SR models.

**Ethernet**　Connect the device to a LAN network.

> **WARNING! User Ethernet is also transmitted over the TPN interface, so be sure not to create a network loop.**

| Receiver Side |
|---|

**IR out**　Optionally for Infrared extension: connect an IR emitter to the IR OUT port of the receiver (command injection is available only with 3rd-party software).

> INFO: The port is available in the RX107 model.

**RS-232**　Optionally for RS-232: connect a device (e.g. 4K projector) to the RS-232 port.

**Power**　Powering on the devices is recommended to do as the final step during the installation. Please check the Powering Options section for the options.

# 3.5. Powering Options

### 3.5.1. Endpoint Devices

The HDMI-TPN series endpoint devices fulfill the **PoE PD standard (IEEE802.3af)**, which means the endpoint device can receive power over the TPN port.

▌ **ATTENTION:** HDMI-TPN series extenders are not able to send remote power to each other.

Affected models:

- HDMI-TPN-TX107
- HDMI-TPN-TX107D
- HDMI-TPN-TX207DU2K
- HDMI-TPN-TX207AU2K
- HDMI-TPN-RX107
- HDMI-TPN-RX107D

- HDMI-TPN-RX107A-SR
- HDMI-TPN-RX107D-SR
- HDMI-TPN-RX107AU2K
- HDMI-TPN-RX107AU2K-SR
- HDMI-TPN-RX107DU2K-SR

The TPN series devices can be powered in any of the following ways:



**Option 1 - Local adaptors for both TX and RX**

CATx (SDVoE)
12V / 48V DC power adaptor
HDMI-TPN series TX
12V / 48V DC power adaptor
HDMI-TPN series RX

**Option 2 - Remote power via network switch**

12V / 48V DC power adaptor
Network switch with PoE capability
CATx (SDVoE)
CATx (SDVoE)
Power receive
Power receive
HDMI-TPN series TX
HDMI-TPN series RX
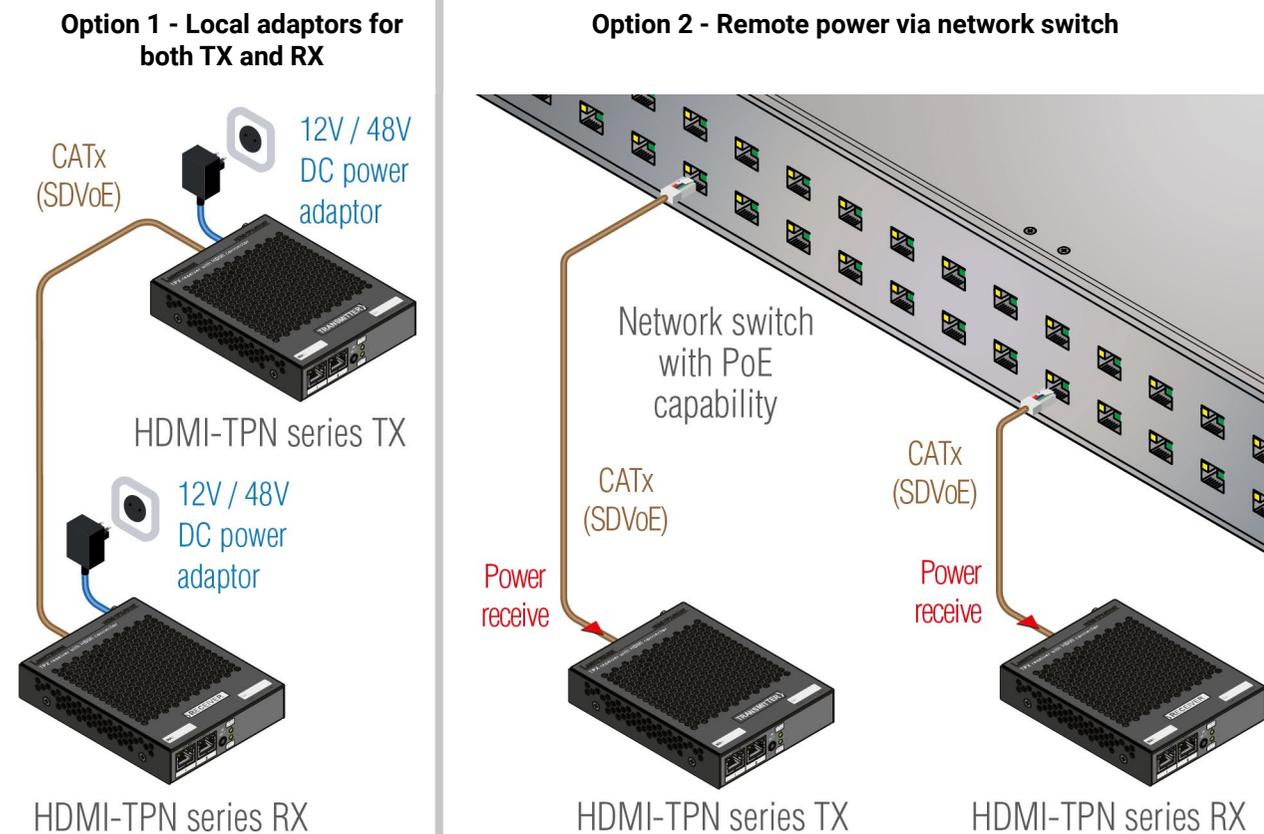
### 3.5.2. Matrix Management Unit (MMU)

The TPN-MMU series matrix management units fulfill the **PoE PD standard (IEEE802.3af)**, which means the **AV LAN (PoE) port** can receive power over the Ethernet line.

▌ **ATTENTION:** TPN-MMU series units are not able to send remote power to each other.

Affected model:

- TPN-MMU-X100-20

The MMU can be powered in any of the following ways:



**Option 1 - Local adaptor**

12V DC power adaptor
TPN-MMU-X100 series

**Option 2 - Remote power via network switch**

CATx
Power receive
Network switch with PoE capability
TPN-MMU-X100 series
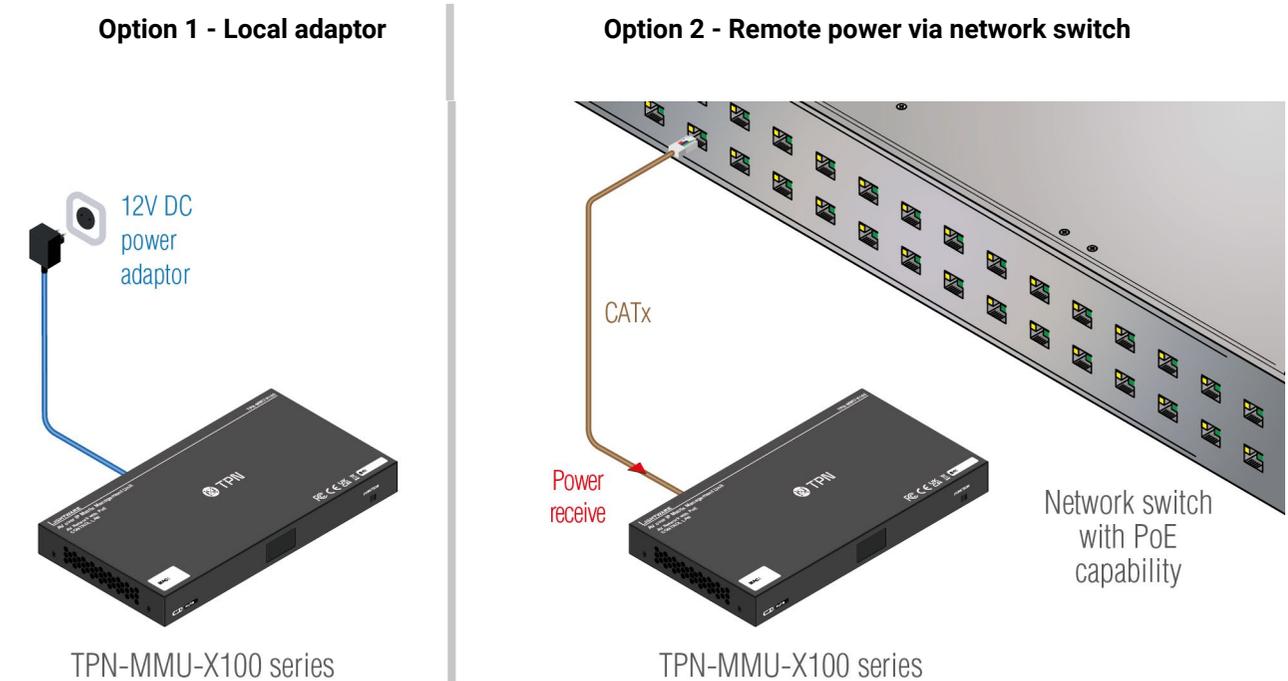
▌ **ATTENTION:** The 12V power adaptor is not supplied to the MMU by default, it can be ordered separately by contacting sales@lightware.com. See more details about it in the Box Contents section.

## 3.6. Ethernet Switch - Detailed Requirements

### 3.6.1. Requirements

In the virtual matrix architecture a third party switch is used to transfer IP packets. In connection with this switch, the following criteria must be met:

- **10 Gbps non-blocking switch** (capable of full bandwidth transmission between all ports)
- Supports Internet Group Management Protocol version 2 (RFC 2236) snooping.
- IPv4 (or Layer 2) Multicast Forwarding based on **IGMP v2 snooping**, with at least **16 addresses available for each endpoint**, e.g. 4096 IPv4 multicast addresses for 256 endpoints.

**Optional, but Highly Recommended Requirements:**

- Supports Link Layer Discovery Protocol (**LLDP**), in order to discover network topology.
- Supports IEEE Std. 802.1Q VLAN tagging.
- Supports IEEE Std. 802.1Q (formerly 802.1p) priority code point (**PCP**), and implements priority based queuing for at least 1 prioritized traffic class. This is required to guarantee uninterrupted media transmission regardless of the user traffic.
- Supports IEEE Std. 802.1s (merged into IEEE Std. 802.1Q-2005) Multiple Spanning Tree Protocol (**MSTP**), in order to detect switching loops in VLAN's.

**ATTENTION:** LLDP settings are basically not required to build up a TPN/OPTN matrix so it is called optional, however, Lightware highly recommends to set them up because LLDP is indispensable in system installation and diagnostics.

### 3.6.2. Network Switch by Lightware

Lightware recommends to use our tested and easy-to-configure 10G non-blocking network switch:

- **TPN-LWS-10G-24X4V-P** - contains a Netgear M4350-24X4V network switch. The device has built-in 'Lightware' network profile what automatically configures the ports to the best fitting settings for TPN AV matrix application.

For more details and ordering information please contact sales@lightware.com.

### 3.6.3. Installation and Network Guide for TPN-OPTN Extenders

For more details about requirements of the network switch please visit our website and download the application notes for TPN/OPTN systems:

https://go.lightware.com/guide-for-TPN-OPTN-extenders

# 4

## CATx Cable Diagnostics for TPN Endpoints

**The chapter summerizes the knowledges and best practices for the TPN CATx cable diagnostics for a better AV network. The following sections can be found in the chapter:**

## 4.1. Bandwidth Requirement of SDVoE Technology

The TPN series transmitter and receiver devices are Lightware's development allowing users to extend HDMI 2.0 signals up to 4K60 4:4:4 video resolution through 10G Ethernet networks.

The following table shows Lightware's HDBaseT™ and AV over IP product lines grouped by required data rate.

| Product Family | Required Data Rate |
|---|---|
| VINX | 1G |
| Gemini (GVN) | 1G |
| TPS (HDBaseT™) | 10G |
| **TPX** | **10G** |
| **TPN** | **10G** |
| UBEX | 10G / 20G |

## 4.2. Maximum Cable Extensions

The maximum applicable cable extension is defined by Semtech, the vendor of the SDVoE technology. Lightware has tested the maximum allowed cable lengths on the TPN endpoint devices.

| Resolution | CATx CAT6a AWG24 |
|---|---|
| All resolutions | 100 m |
| | 328 feet |



Transmitter

*CAT6a AWG24 S/FTP shielded Ethernet cable up to* **100 metres / 328 feet**
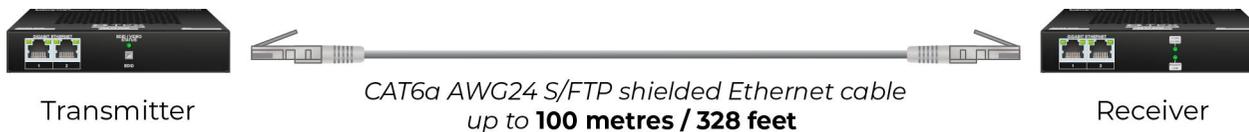
Receiver

## 4.3. Recommended CATx Cable Types

Lightware highly recommends using at least **CAT6a AWG 24 shielded (S/FTP or S/UTP or SF/UTP or SF/FTP)** or higher category **10G** Ethernet cables for the TPX or TPN (SDVoE) connection between the transmitter/receiver and the network switch. Usage of e.g. AWG 28 Ethernet cables may reduce the extension distance significantly.

| UTP Category | Data Rate | Shielded / Unshielded | Protection Type | Applicable for TPX / TPN Systems |
|---|---|---|---|---|
| CAT5 | Up to 100 Mbps | Unshielded | F/UTP U/FTP F/FTP ❌ | ❌ |
| CAT5e | Up to 1 Gbps | Unshielded | | ❌ |
| CAT6 | Up to 10 Gbps | Unshielded | | ❌ |
| CAT6 | Up to 10 Gbps | Shielded | S/FTP S/UTP SF/UTP SF/FTP ✅ | ✅ |
| CAT6a | Up to 10 Gbps | Shielded | | ✅ |
| CAT7 | Up to 10 Gbps | Shielded | | ✅ |
| CAT7a | Up to 10 Gbps | Shielded | | ✅ |

**Recommended CATx Cable Model**

- **Draka MFO 23**
  - CAT7, S/FTP, AWG 23
  - 10GBase-T certified cable
  - HDBase-TTM certified cable
  - datasheet >>here<<

## 4.4. Testing the Reliability of the Cabling

Lightware recommends **testing** the Ethernet cables before the final installation of TPX / TPN systems. One of the best cable testing tools is the **Fluke Cable Tester**, which is used by Lightware as well to ensure our quality standards.

- **Fluke Networks MicroScannerTM Cable / PoE Tester**
  - Recommended for TPX cabling tests
- **Fluke Networks LinkIQ™ Cable+Network Tester**
  - Recommended for TPN cabling tests
- **Fluke Networks Industrial Ethernet DSX CableAnalyzer™ Kit**
  - Recommended for TPX and TPN cabling tests

## 4.5. Keystones

Lightware highly recommends applying a **maximum of two keystones (and cable patches)** - one on the transmitter and one on the receiver side. Applying more than two keystones may cause signal loss or jitter in the transmission, moreover the noise sensitivity of the system may be significantly higher.

All termination styles of keystones are acceptable (punch-down style, toolless, pass-through and coupler). The most important thing is to pay attention to the correct and trustworthy installation of the wires and make sure they do not move while in use.

When a keystone or patch cable is assembled, always make sure that the foil and the shielding are unharmed at the connector ends, otherwise the cable will be very sensitive to signal noises.

CAT6a S/FTP cable assembly

PVC jacket

shielding

foil

**Example**



Patch cable    Keystone #1 ✔      Keystone #2 ✔    Patch cable

Transmitter          Receiver

Keystone #3 ✖
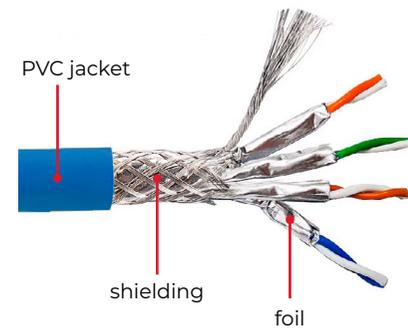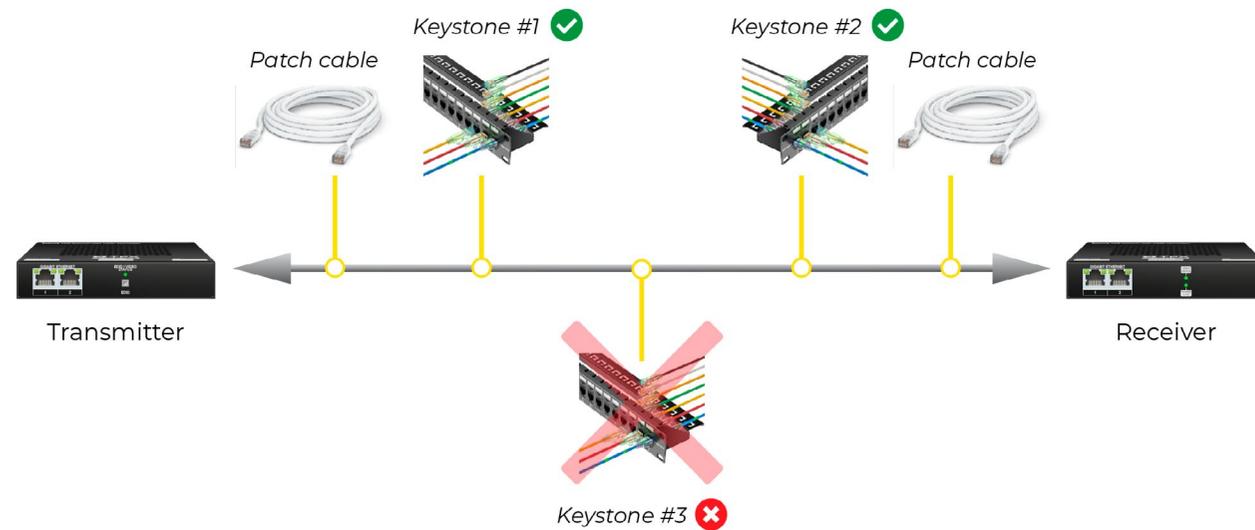
## 4.6. Tips & Tricks for the Best TPX/TPN Experience

Follow these best practices for TPX and TPN systems easily installable and sustainable.

- **Check the cable length** - shall be no longer than 100 m / 328 feet
- **Check the cable type** - minimum requirement is CAT6a, shielded, S/FTP, AWG 24, but better cables result in a more relaible AV network
- **No more than two keystones** - if it must be more than two, make sure the shielding and foiling is unharmed
- **Test the cables for 10G** bandwidth before the installation

# 5

## Device Concept

**The following chapter describes the features of the TPN series devices in point-to-point and also in point-multipoint application modes; and also the special features of the MMU with a few real-life examples.**

## 5.1. The Matrix Management Unit (MMU)

The Matrix Management Unit (MMU) is the brain of TPN system in the point-multipoint (networked) application mode. The MMU builds up the endpoint device with the crosspoint table; controls, manages and supervises the endpoints connected the TPN network.

The TPN system is dynamic, endpoints can be removed and new endpoints can be added to the matrix at any time of the operation.

**Port Diagram**
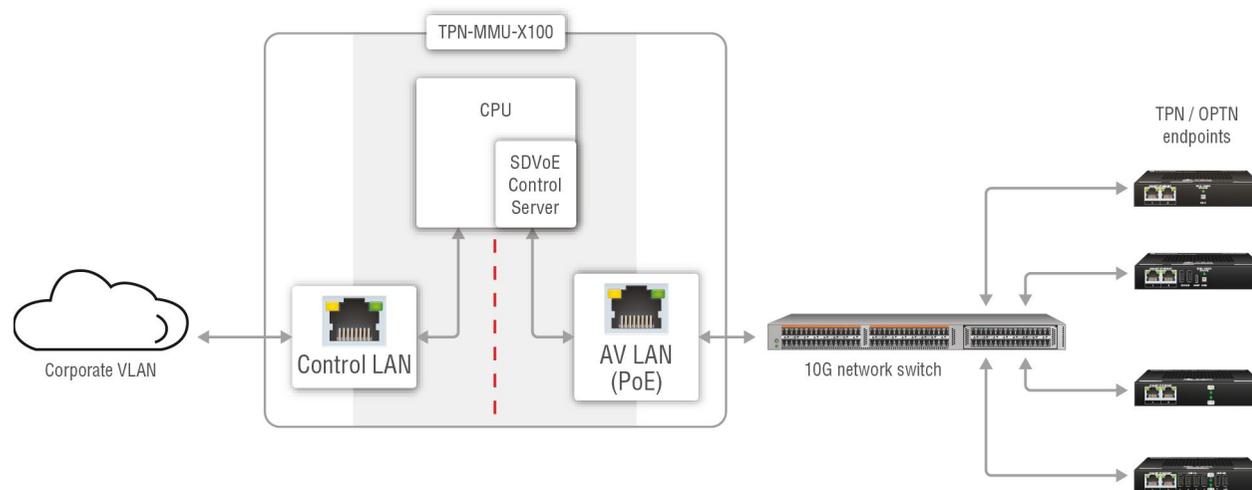


*Port diagram of the TPN-MMU-X100 series matrix management unit*

The TPN-MMU-X100-20 control unit is equipped with two 10/100BaseT Ethernet ports with RJ45 connectors. The ports can be used for controlling and managing the device and accessing and configuring the TPN/OPTN AV network over the LARA modules. The two ports are **physically separated** from each other.

The MMU has built-in **SDVoE Control Server** to discover and supervise the TPN/OPTN AV matrix.

**ATTENTION:** Lightware highly recommends **only one SDVoE Control Server presence** on the network. Two or more servers works from the same configuration files and it may cause control issues e.g. AV crosspointing anomalies.

INFO: The MMU controls the SDVoE network in **transparent mode**, which means if a configuration parameter is changed in the SDVoE Control Server, the MMU applies it automatically.

**Control LAN**

The port is used for connecting to the controller device (e.g. over the corporate VLAN). The Control VLAN port ensures a secure connection between the end user and the AV matrix.

**AV LAN (POE)**

The TPN/OPTN series endpoint devices can be accessed by the AV LAN (POE) port over a 10G network switch.

INFO: The MMU **does not transmit** AV signals.

**The Functions of the MMU:**

- Endpoint and AV signal management:
  - Dynamic endpoint and crosspoint handling
  - Network separation to AV and Management networks
  - IP network management for the endpoint devices
  - Command injection over Ethernet and RS-232 via the endpoints
- Automated control features by LARA
- 7/24 supervising of the SDVoE network

### 5.1.1. Ethernet Control Interface

**Description**

The MMU and the endpoint devices can be controlled over Ethernet interface. The ports are standard RJ45 connectors in the case of endpoint and the MMU as well.

**TPN System Control over Ethernet - Example**
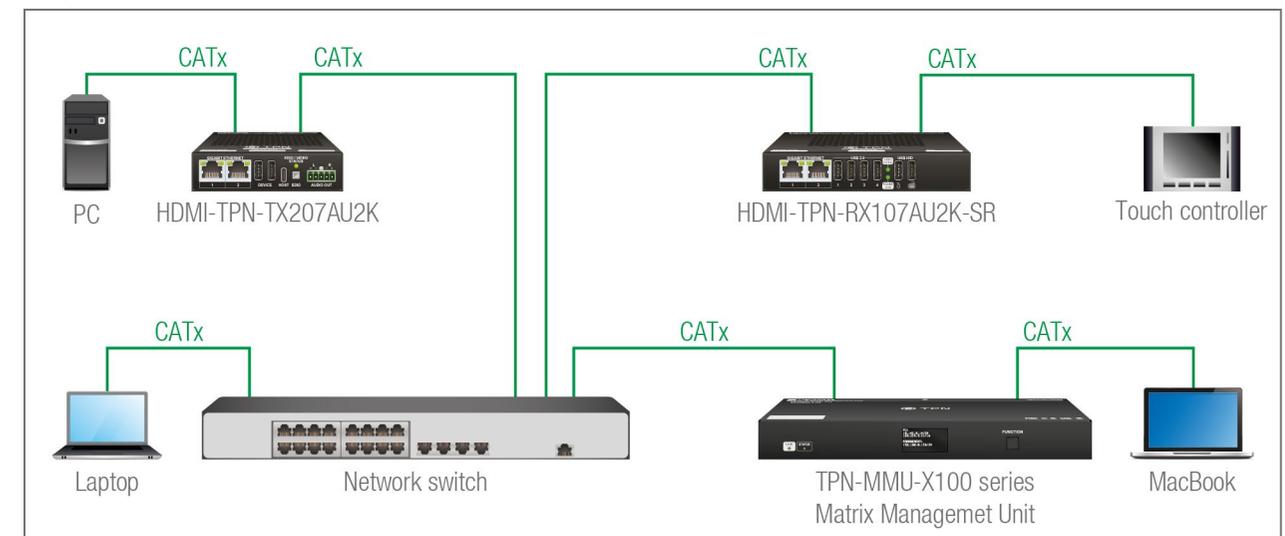


**The Concept**

The matrix has one transmitter and one receiver connected to a network switch and supervised by the MMU. There are four control devices connected to the network: a **PC** to the transmitter, a **touch controller** to the receiver, a **laptop** to the switch, and a **MacBook** to the MMU. It does not matter which device you want to use for controlling, all of them reach the MMU and you can configure the matrix.

## 5.2. Basic Network Security

**DIFFERENCE:** The feature is available only in the **TPN-MMU-X100 series** matrix management unit.

These basic network security improvements help prevent unauthorized access to the TPN-MMU-X100 series:

- **Disable Ethernet Ports**
- **Disable Network Services**
- **Basic Authentication**
- **Encryption (HTTPS, WSS)**

See the **list of reserved ports** of the TPN/OPTN system in the Reserved Ports and Security Options section.

**ATTENTION:** Be careful when combining the security functions; improper settings may cause malfunction.

INFO: The ports are necessary to be passed via a network switch/firewall for proper operation between the device and the softwares.

### 5.2.1. Disable Ethernet Ports

Internal Ethernet connections can be limited by enabling/disabling the Ethernet ports depending on the actual system configuration. Ethernet ports can be disabled in the following ways:

- **LW3 protocol command** - see the details in the Enabling/Disabling Network Service Port section.
- **REST API protocol command** - see the details in the Enabling/Disabling Network Service Port section.

### 5.2.2. HTTP/HTTPS

The MMU provides HTTP/HTTPS server services on its 80 (for HTTP) and 443 (for HTTPS) ports. The following services can be used via HTTP/HTTPS:

- LW3 over WebSocket (WS, WSS) for LW3 protocol or using LDC for device control
- REST API for device control
- Serial message sending with REST API
- Firmware update
- WelcomeScreen image upload
- LARA interface
- Logfiles download from the device

**ATTENTION:** LARA management GUI is only available through HTTPS and it is password-protected.

**Basic Authentication**

Authentication is enabled by default.

TPN-MMU-X100 series units have a **random generated factory default password** applied to the device during the manufacturing process. This unique password will be supplied on a sticker along with the device.

**After a factory reset**, you will need the Username (admin) and the unique generated default password to login. After successfully logging into the device, you will be prompted to change the password.

To limit user access for HTTP/HTTPS server services, basic authentication can be turned on for the ports 80 and 443 separately.

The picture below illustrates the successful authentication process:
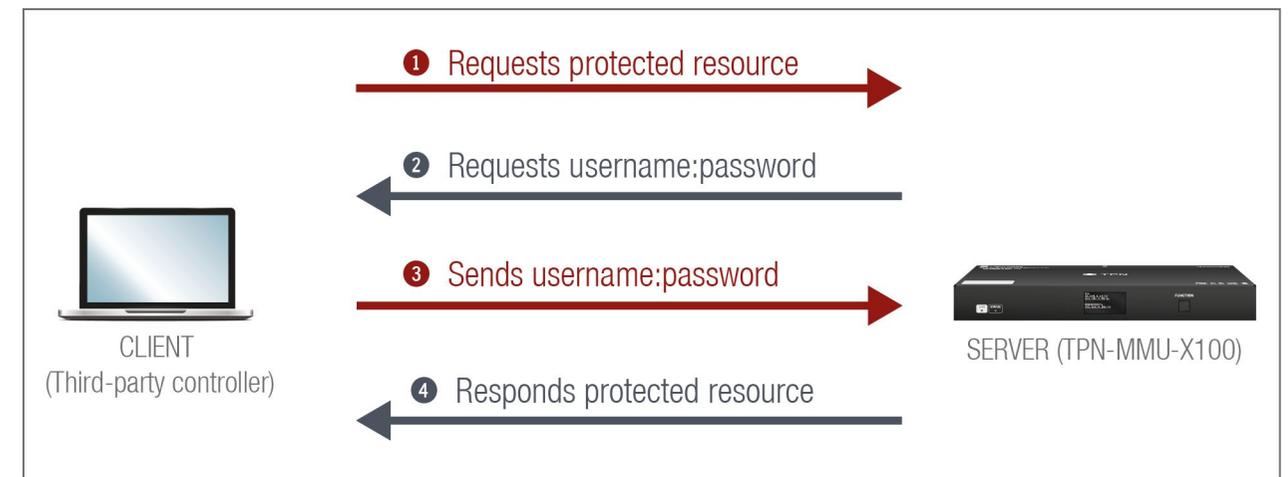


**User**

- The MMU can manage one user (with fixed username: admin) with full access.

**Password**

- For the first time login, as well as after a factory reset, you will be able to log in using the unique generated password specific to your device. After a successful login, you will be prompted to change your password.
- The old password is required when password is changed.
- The password must be at least 10 characters long, and any UTF-8 character is allowed.
- Password history is maintained in the web authentication, not allowing for the last 10 passwords to be set again.
- The device does not store the password string, so it can not be queried.
- The password can be reset by calling factory defaults.

### 5.2.3. Encryption (HTTPS, WSS)

HTTP protocol uses cleartext format for data transport. This method allows a third-party to listen in and eavesdrop on the transferred information.

**HTTP request-response**

To ensure the secure data transmission, the HTTP port (80) can be disabled, and all of the information can be transferred via HTTPS (443 port). HTTPS protocol encrypts the cleartext, so it becomes incomprehensible for a third-party and the data is kept secure.
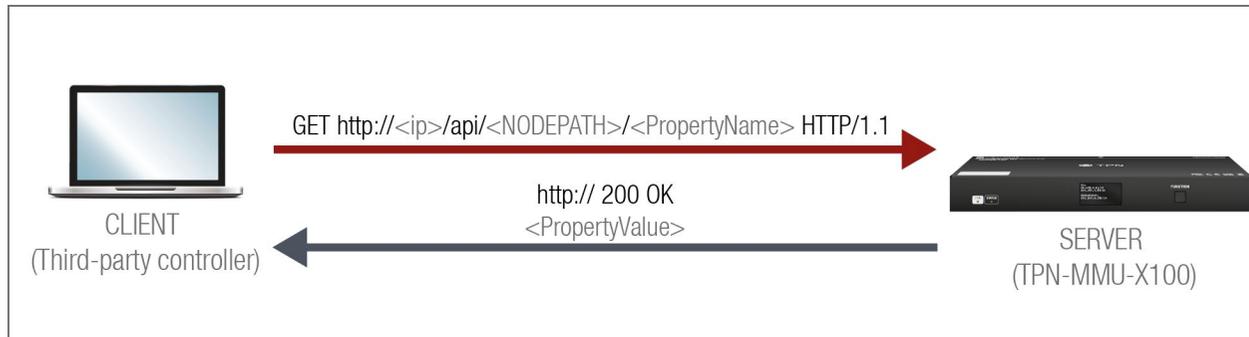


**HTTPS request-response**
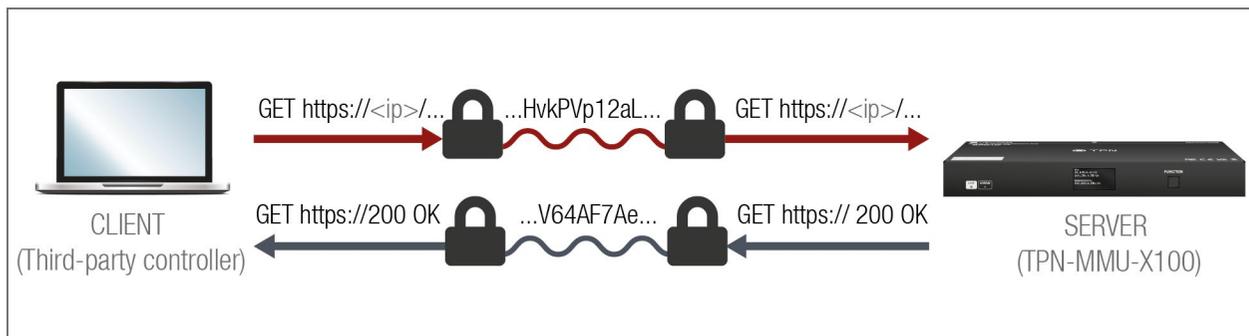


The same services are available on HTTPS as HTTP (for the detailed service list, see the HTTP/HTTPS section).

- The MMU generates a self-signed certificate, so the user does not have to deal with the configuration.
- New certificate is generated after hostname changing or restoring the factory default settings.
- Please ensure proper time and date setting in the MMU, because it affects the self-signed certificate (SSL) generation when using WSS or HTTPS. Improper time and date setting may lead to certificate rejection.

**ATTENTION:** HTTPS does not guarantee that the communication is secure. Make sure that the client communicates with the server directly, without any third-party element in the communication route (Man-in-the-middle attack).

**Basic Security System Example**

To keep the system protected, the unsecured ports should be disabled and data traffic should be managed by secured channels.
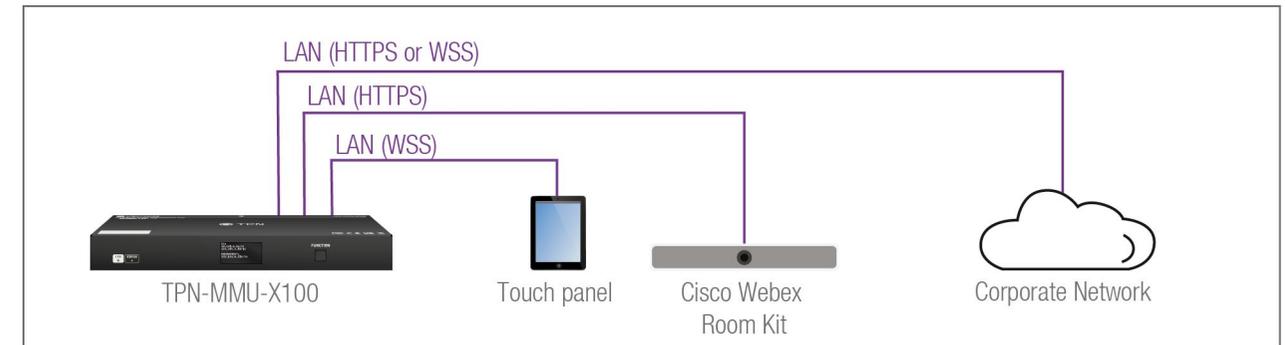


**Step 1.** **Disable the HTTP port (80) and use HTTPS (443) instead.**

The setting is available in the following ways:

- Lightware REST API HTTP posts (see the details in the Enabling/Disabling Network Service Port section).
- LW3 protocol commands (see the details in the Enabling/Disabling Network Service Port section).

**Step 2.** **Set the password and enable the authentication.**

The username is always fix (admin) and the password has to be set before the authentication is enabled. The setting is available in the following way:

- Built-in web (see the details in the Services Tab section)

**Step 3.** **Disable 6107 port, use Lightware REST API HTTPS (443 port) or WSS for LW3 protocol to control the device.**

The setting is available in the following ways:

- Lightware REST API HTTP posts (see the details in the Enabling/Disabling Network Service Port section).
- LW3 protocol commands (see the details in the Enabling/Disabling Network Service Port section).

**Step 4.** **Disable the remaining unsecured Serial over IP ports (8001 and 8002).**

The setting is available in the following ways:

- Lightware REST API HTTP posts (see the details in the Enabling/Disabling Network Service Port section).
- LW3 protocol commands (see the details in the Enabling/Disabling Network Service Port section).

## 5.3. WebSocket Service (WS, WSS)

▎**DIFFERENCE:** The feature is available only in the **TPN-MMU-X100 series** matrix management unit.

The MMU provides WS/WSS services on its 80 (for WS) and 443 (for WSS) ports to control the device with LW3 protocol commands.

The MMU can manage 18 connected clients in total simultaneously for WS (80), WSS (443), and LW3 (6107) ports.

The WebSocket connection is built up by HTTP handshake. After the connection is established, communication switches to a bi-directional WebSocket protocol for LW3 communication.
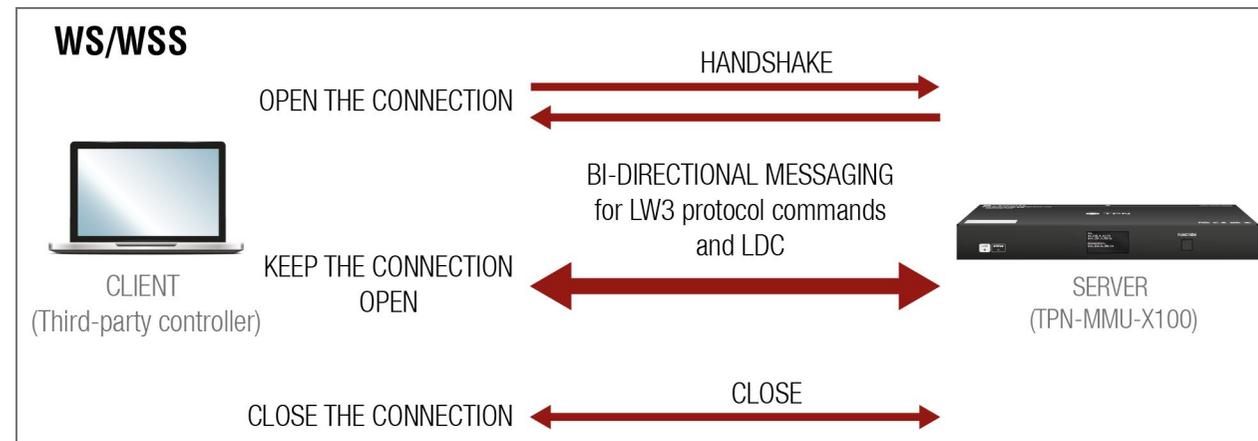


The main difference between HTTP and WS communication process is that HTTP closes the connection between the client and the server after one request-response pair, while WebSocket keeps the connection open. This feature allows real-time communication such as **controlling the device with LW3 protocol commands**. The WS functions are also available via WebSocket Secure (WSS).

## 5.4. AV Interface

The section describes the audio and video routing and features of the various endpoint models of the TPN and OPTN ecosystem.

▎INFO: The MMU **does not transmit** AV signals.

### 5.4.1. Port Diagrams

**HDMI-TPN-TX107**
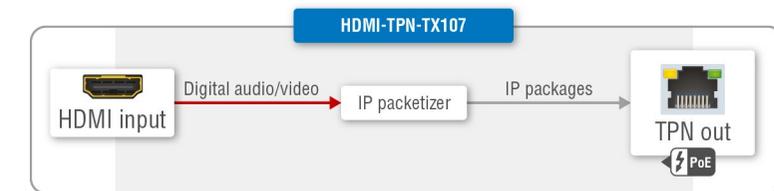


**HDMI-TPN-TX107D**
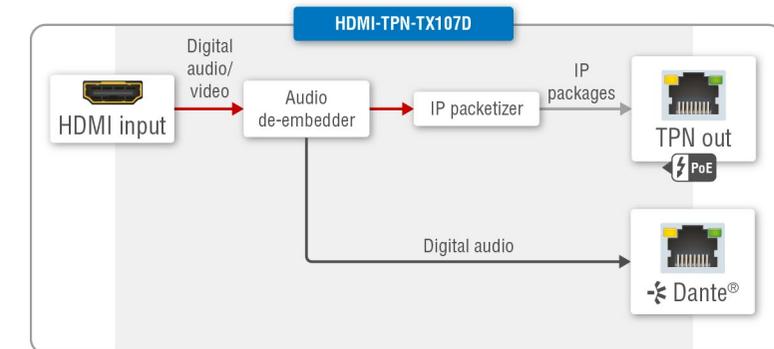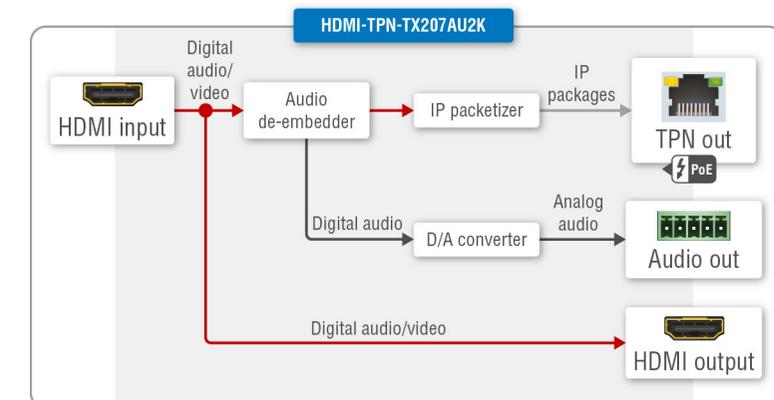


**HDMI-TPN-TX207AU2K**
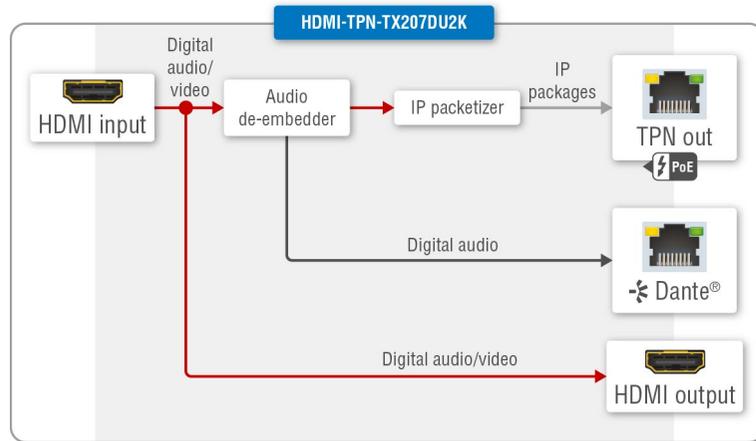
**HDMI-TPN-TX207DU2K**
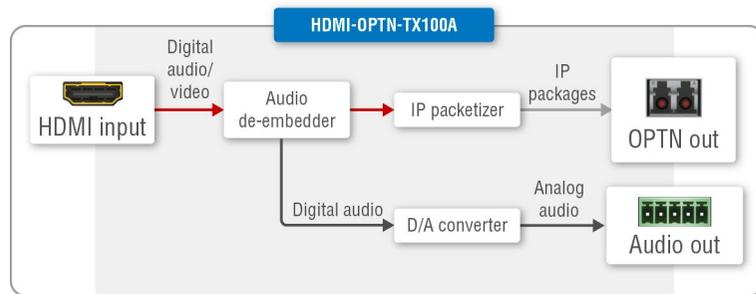


**HDMI-OPTN-TX100A**



**HDMI-OPTN-TX200AU2K**
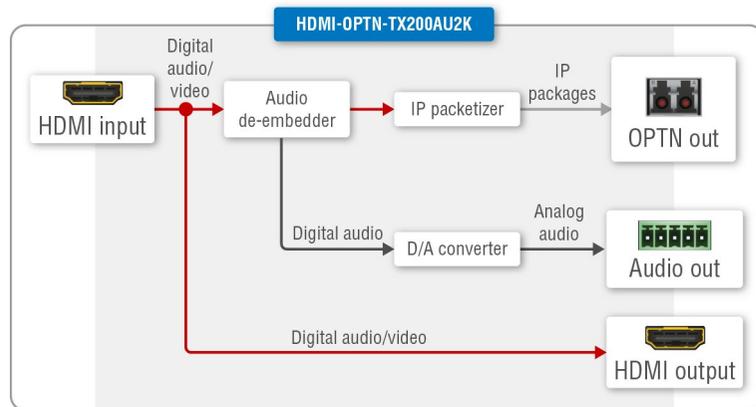


**HDMI-TPN-RX107**
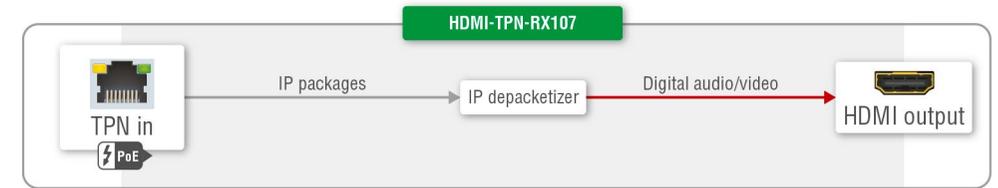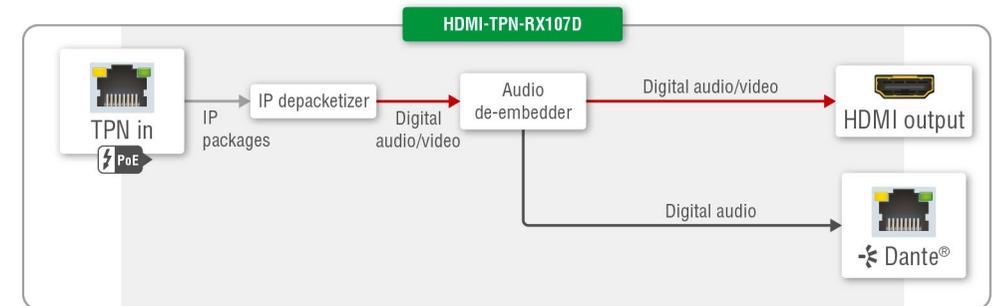


**HDMI-TPN-RX107D**



**HDMI-TPN-RX107A-SR and HDMI-TPN-RX107AU2K-SR**
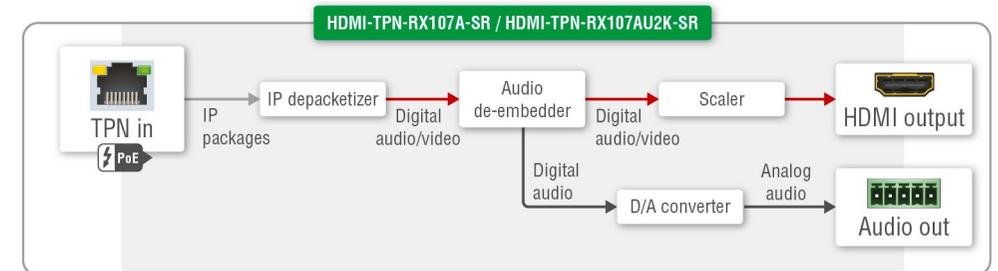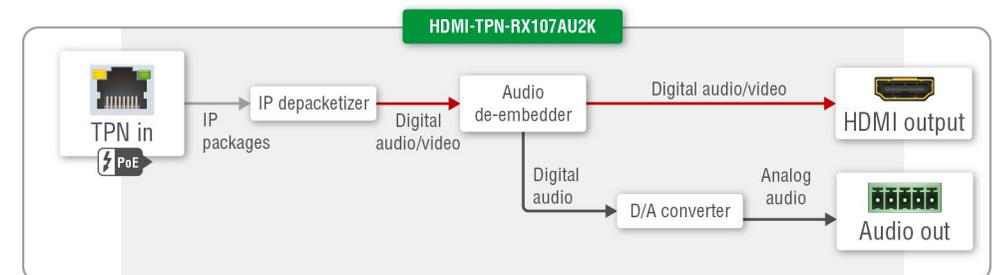


**HDMI-TPN-RX107AU2K**

**HDMI-TPN-RX107D-SR and HDMI-TPN-RX107DU2K-SR**
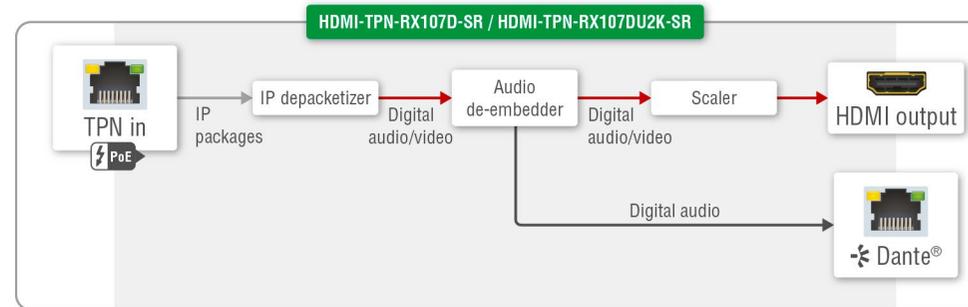


**HDMI-OPTN-RX100A and HDMI-OPTN-RX100AU2K**
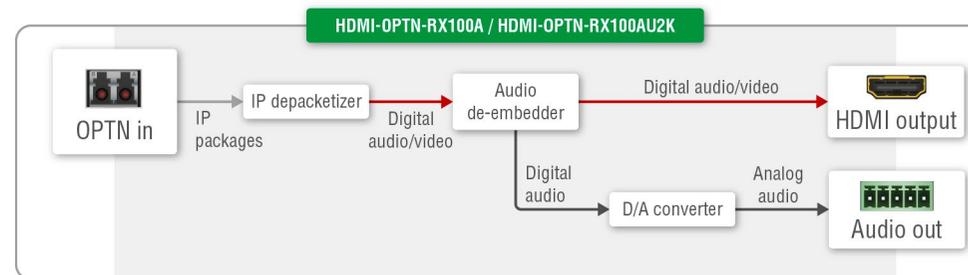


**HDMI-OPTN-RX100A-SR and HDMI-OPTN-RX100AU2K-SR**
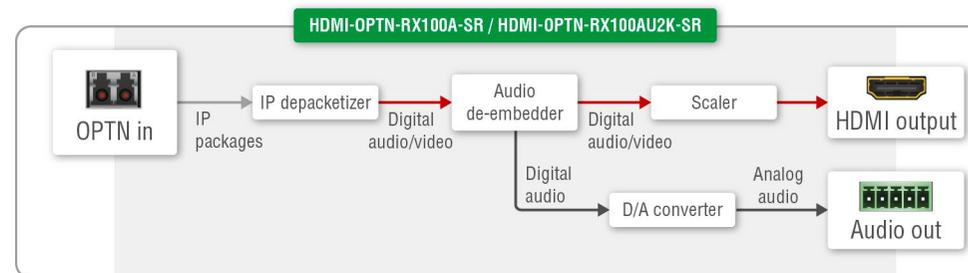


**Description**

The endpoints and the Control Unit are connected to the network switch and these devices together create the TPN / OPTN matrix. The matrix is **dynamic**, which means the newly connected endpoint devices can be discovered by the MMU.

**Transmitters**

The TPN and OPTN series transmitters can receive one HDMI 2.0 audio/video stream **up to 4K@60Hz 4:4:4** resolution from the source devices over the HDMI input port. The signal is transmitted over the TPN or OPTN output port toward the receivers. There is **no signal processing** (scaling, color conversion, etc) available on the transmitter side except the signal compressing, see more details in the Signal Compression by the SDVoE Technology section about it. The **HDMI output port** of the TX207AU2K, TX207DU2K and TX200AU2K models is an **HDMI loop-back port** and can be used as local HDMI output.

The TX207AU2K, TX100A and TX200AU2K models have built with an **analog audio output port**, which de-embeds the audio signal of the HDMI stream and transmits it after the digital-to-analog signal conversion. The port supports 2-channel analog balanced signal with 48 kHz sampling frequency.

The TX107D and TX207DU2K models have built with an **Dante®/AES67 digital audio output port**, which de-embeds the audio signal of the HDMI stream and transmits it toward the audio sink device. The port supports 2-channel PCM signal with 44.1, 48, 88.2 and 96 kHz sampling frequencies.

The TPN output port fulfills the **PoE PD (IEEE802.3af) standard**, which means the device can receive power from the connected remote device (network switch).

▌ **ATTENTION:** The TPN series endpoint devices are not able to send power to each other.

**Receivers**

The TPN and OPTN series receivers can receive one HDMI 2.0 audio/video stream **up to 4K@60Hz 4:4:4** resolution from the transmitter over the TPN input port. The stream is transmitted toward to the sink device over the HDMI output port.

The RX107A-SR, RX207AU2K, RX207AU2K-SR, RX100A and RX100AU2K models are built with an **analog audio output port**, which de-embeds the audio signal of the HDMI stream and transmits it after the digital-to-analog signal conversion. The port supports 2-channel analog balanced signal with 48 kHz sampling frequency.

The RX107D, RX107D-SR and RX107DU2K-SR models have built with an **Dante®/AES67 digital audio output port**, which de-embeds the audio signal of the HDMI stream and transmits it toward the audio sink device. The port supports 2-channel PCM signal with 44.1, 48, 88.2 and 96 kHz sampling frequencies.

The **-SR series receivers** have an **integrated scaler** that can fit the resolution to the connected sink device. These receivers fulfills the **seamless switching** (clean cut) features during the changing of the crosspoint settings.

▌ **ATTENTION:** A hot-plug event triggers EDID-based scaling in the SR series scaling receivers by default operation. See more details about it in the Scaler Operation by Default section.

The TPN input port fulfills the **PoE PD (IEEE802.3af) standard**, which means the device can receive power from the connected remote device (network switch).

▌ **ATTENTION:** The TPN series endpoint devices are not able to send power to each other.

**Matrix Management Unit (MMU)**

The dynamic endpoint discoring, the signal routing (crosspoint settings) and managing the TPN network is the task of the Matrix Management Unit. All endpoint devices are available and configurable via the MMU.

See more details about the TPN/OPTN AV matrix controlling in the Startup of the System chapter.

### 5.4.2. AV Features of the Endpoint Devices

The following comparison table summarizes the audio/video features of the TPN series endpoint devices.

| | SDVoE signal transmission interface | | Video interfaces | | | Audio interfaces | | Features |
|---|---|---|---|---|---|---|---|---|
| | 10GBaseT copper | 10G fiber optical | HDMI input | Local HDMI output | HDMI output | Analog audio output | Dante/AES67 output | Integrated scaler |
| **Transmitters** | | | | | | | | |
| HDMI-TPN-TX107 | ✔ | - | ✔ | - | - | - | - | - |
| HDMI-TPN-TX107D | ✔ | - | ✔ | - | - | - | ✔ | - |
| HDMI-TPN-TX207AU2K | ✔ | - | ✔ | ✔ | - | ✔ | - | - |
| HDMI-TPN-TX207DU2K | ✔ | - | ✔ | ✔ | - | - | ✔ | - |
| HDMI-OPTN-TX100A | - | ✔ | ✔ | - | - | ✔ | - | - |
| HDMI-OPTN-TX200AU2K | - | ✔ | ✔ | ✔ | - | ✔ | - | - |
| **Receivers** | | | | | | | | |
| HDMI-TPN-RX107 | ✔ | - | - | - | ✔ | - | - | - |
| HDMI-TPN-RX107D | ✔ | - | - | - | ✔ | - | ✔ | - |
| HDMI-TPN-RX107A-SR | ✔ | - | - | - | ✔ | ✔ | - | ✔ |
| HDMI-TPN-RX107D-SR | ✔ | - | - | - | ✔ | ✔ | ✔ | ✔ |
| HDMI-TPN-RX107AU2K | ✔ | - | - | - | ✔ | ✔ | - | - |
| HDMI-TPN-RX107AU2K-SR | ✔ | - | - | - | ✔ | ✔ | - | ✔ |
| HDMI-TPN-RX107DU2K-SR | ✔ | - | - | - | ✔ | - | ✔ | ✔ |
| HDMI-OPTN-RX100A | - | ✔ | - | - | ✔ | ✔ | - | - |
| HDMI-OPTN-RX100A-SR | - | ✔ | - | - | ✔ | ✔ | - | ✔ |
| HDMI-OPTN-RX100AU2K | - | ✔ | - | - | ✔ | ✔ | - | - |
| HDMI-OPTN-RX100AU2K-SR | - | ✔ | - | - | ✔ | ✔ | - | ✔ |

### 5.4.3. Signal Compression by the SDVoE Technology

SDVoE technology applies signal compression only if the AV signal is **above HDMI 1.4** standard, and the required bandwidth of the transmission would reach 10 Gbps.

The compression ratio on the TPN / OPTN output ports is **1.4 to 1**.

**ATTENTION:** Lightware highly recommends using **CAT6a AWG24** or higher category 10G Ethernet cables for the TPN (SDVoE) connection between the transmitter/receiver and the network switch. Usage of e.g. AWG28 Ethernet cables may reduce the extension distance significantly.

### 5.4.4. Dante® Audio Interface

**DIFFERENCE:** The following section refers to the TX107D, TX207DU2K, RX107D, RX107D-SR and RX107DU2K-SR models.

The D series models contain a special module that allows the de-embedding of the audio stream from the incoming HDMI signal and transmitting it as a 2-channel Dante® or AES67 source over the dedicated RJ45 connector. *#dante #audio*

**Supported Audio**

| Audio type | Signal support |
|---|---|
| 2-ch LPCM * | supported |
| Multichannel | not supported |
| Compressed DTS/Dolby | not supported |

\* The supported sample rates are 44.1, 48, 88.2 and 96 kHz.

Dante® is a registered trademark of Audinate Pty Ltd.

**Important Notes**

- The AES67 mode is supported which can be set in the Dante® Controller software.
- Multichannel or encoded audio format cannot be de-embedded. In this case, no audio is sent to the Dante® network.

### 5.4.5. Audio Settings

The TPN/OPTN series transmitter devices transmit the embedded HDMI audio signal over the TPN (CATx) or OPTN (fiber optical) interfaces. The receivers accept and transmit it to the sink devices. The **-A series** transmitters and receivers can de-embed the HDMI audio and transmit it as an analog audio signal over the 5-pole Phoenix port.

The audio crosspoint can be set with the following ways:

- using **REST API request**: see the details in the Switching the Audio Stream to One Destination section.
- using **LW3 protocol command**: see the details in the Switching the Audio Stream to One Destination section.

## 5.4.6. Example
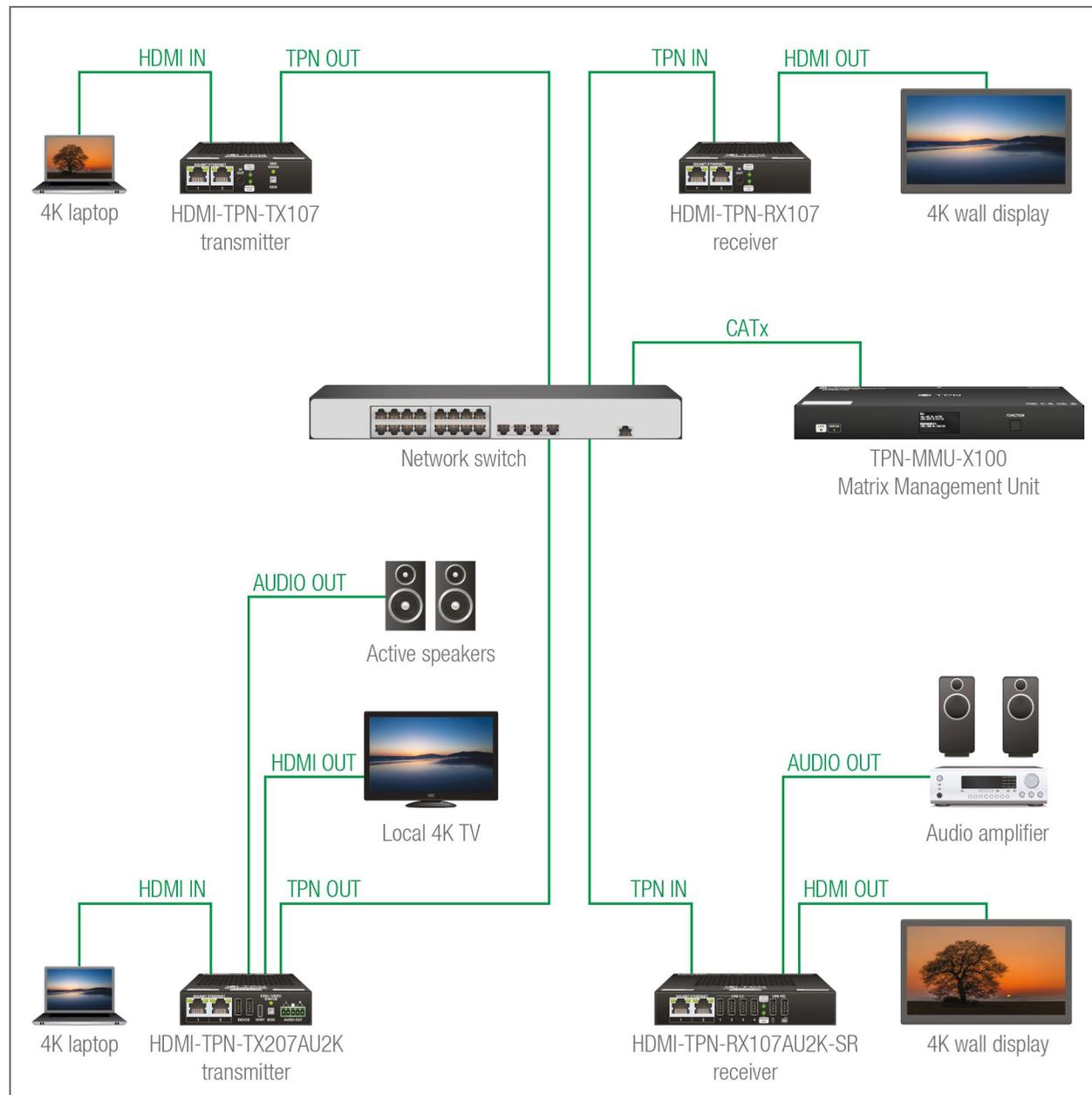


*Example for a 2x2 TPN matrix with an MMU*

**The Concept**

This example shows a 2x2 TPN matrix with a network switch and the MMU in its center. The matrix contains two AV inputs (stream #1 and stream #2), two video outputs (one HDMI output per receiver), a local video output and two analog audio output (one for a transmitter and one for a receiver).

**Crosspoint Settings over GUI**
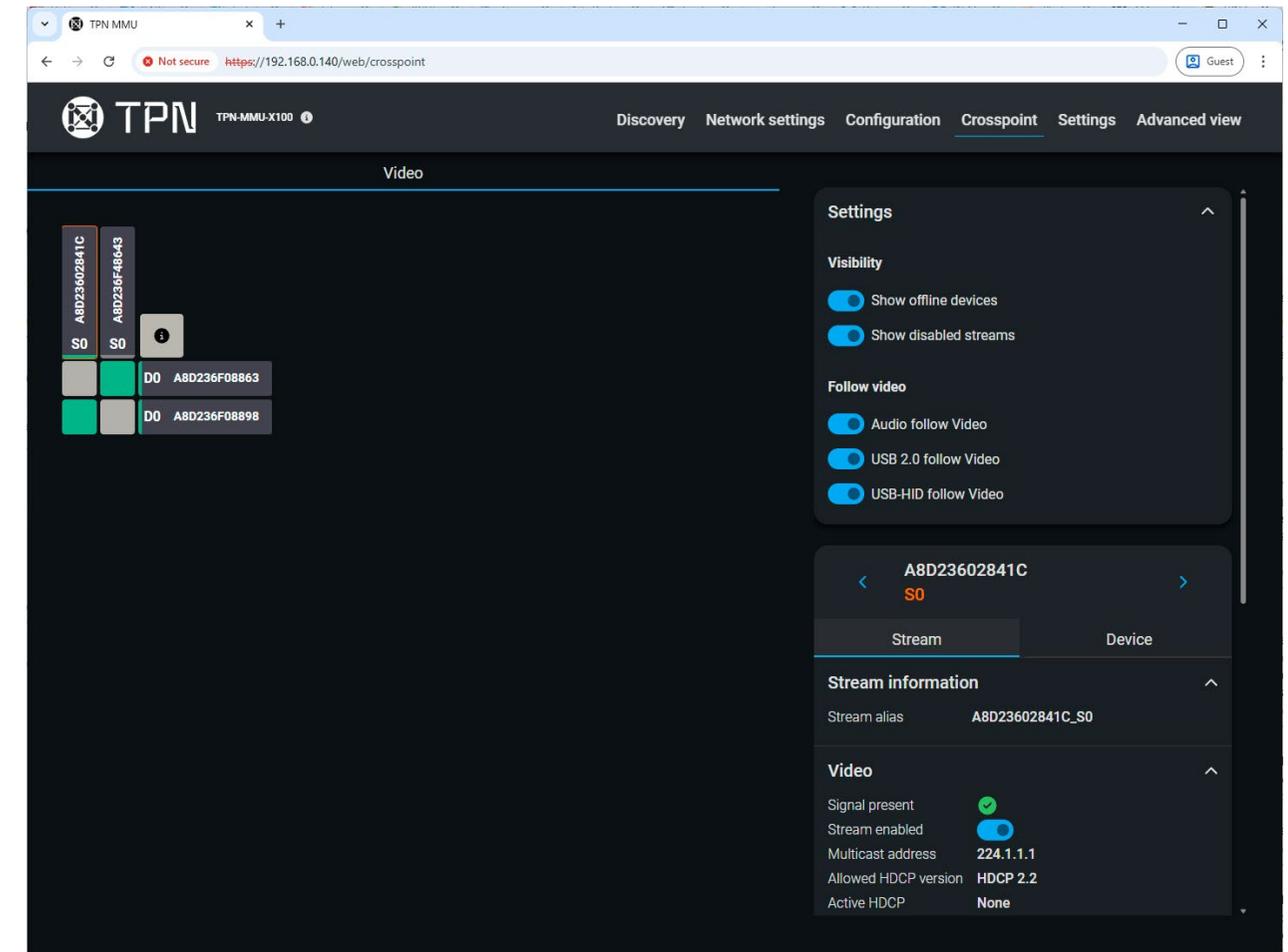


*Crosspoint view for a 2x2 TPN matrix in the built-in web of the MMU*

The crosspoint settings can be easily customized over the built-in web of the MMU. See more details about it the Crosspoint Page section.

The video crosspoint can also be set with the following ways:

- using **REST API request**: see the details in the Video Signal Management Commands section.
- using **LW3 protocol command**: see the details in the Video Signal Management Commands section.

## 5.5. Scaler Function of the Receiver

> **DIFFERENCE:** Only **HDMI-TPN-RX107A-SR**, **HDMI-TPN-RX107D-SR**, **HDMI-TPN-RX107DU2K-SR**, **HDMI-TPN-RX107AU2K-SR**, **HDMI-OPTN-RX100A-SR** and **HDMI-OPTN-RX100AU2K-SR** receiver models have integrated scaler function.

### 5.5.1. Scaling Modes

The -SR receiver models are built with integrated scaler function. Five different scaler operation modes can be selected in the endpoint as following.

**Genlock**

There is no scaling on the output.

- ▪ No frame drop
- ▪ Ultra-low latency
- ▪ No FPS conversion.

> **ATTENTION:** This mode is validated for **up to three network switch hops**.

**Genlock Scaling**

Scaler function is on.

- ▪ The clock frequency of the receiver is syncronized with the transmitter's.
- ▪ No frame drop.
- ▪ Ultra-low latency.
- ▪ No FPS conversion.

> **ATTENTION:** This mode is validated for **up to three network switch hops**.

**Fastswitch**

> INFO: This mode is the default in the receiver.

Scaler function is on, optimized for fast switching between the source streams.

- ▪ The clock frequency can be set by the user.
- ▪ There is no network switch hop limitation.
- ▪ Crosspoint switch can be performed fast.
- ▪ One or two frames delay may happen.

**Wall FS**

Optimized for video wall application. Similar method as the fastswitch scaling.

- ▪ There is no network switch hop limitation.
- ▪ Crosspoint switch can be performed fast.
- ▪ One or two frames delay and tearing effect on the video wall may happen.

**Wall**

Optimized for video wall application. Similar method as the genlock scaling.

- ▪ The clock frequency of the receiver is syncronized with the transmitter's.
- ▪ No frame drop.
- ▪ Ultra-low latency.
- ▪ No FPS conversion.

> **ATTENTION:** This mode is validated for **up to three network switch hops**.

### 5.5.2. The Limitations of the Scaler

**Bandwidth Related Limitations**

The scaler function has bandwidth limitation, which in the practice means that the compression of the original picture is not possible below specific settings. When the scaling is not applicable, the error symptoms could be a flashing screen or displaying a black screen.

The following resolutions **cannot be scaled while keeping the aspect ratio**:

- ▪ **3840x2160** to
  - – 640x480; 800x600; 960x1280; 1024x768; 1050x1400; 1200x1600
- ▪ **4096x2160** to
  - – 1280x768; 1680x1050; 1200x1900

**Color Space / Color Depth Related Limitations**

If the scaler function is enabled in the receiver, the output is always **RGB 8 bit/channel**.

### 5.5.3. Scaler Operation by Default

> **ATTENTION:** The following description is related to **all models of -SR series** scaling receivers.

If a hot-plug event (see examples below) happens with the scaling receiver, the device is restored to EDID-based scaling, therefore the preferred resolution of the sink device is being applied in the scaler. The desired scaler setting is required to set again.

**Hot-plug Event Examples:**

- ▪ restarting of the scaling receiver
- ▪ momentary power outage
- ▪ unplugging and plugging again of the CATx cable in the TPN input port when the receiver is powered remotely (PoE)
- ▪ unplugging and plugging again of the HDMI output cable

**Does not Cause Hot-plug Event:**

- ▪ TPN connection error (e.g. unplugging and plugging again of the CATx cable in the TPN input port if the receiver is **not** powered over the CATx cable (PoE))

### 5.5.4. Example for Video Wall Application
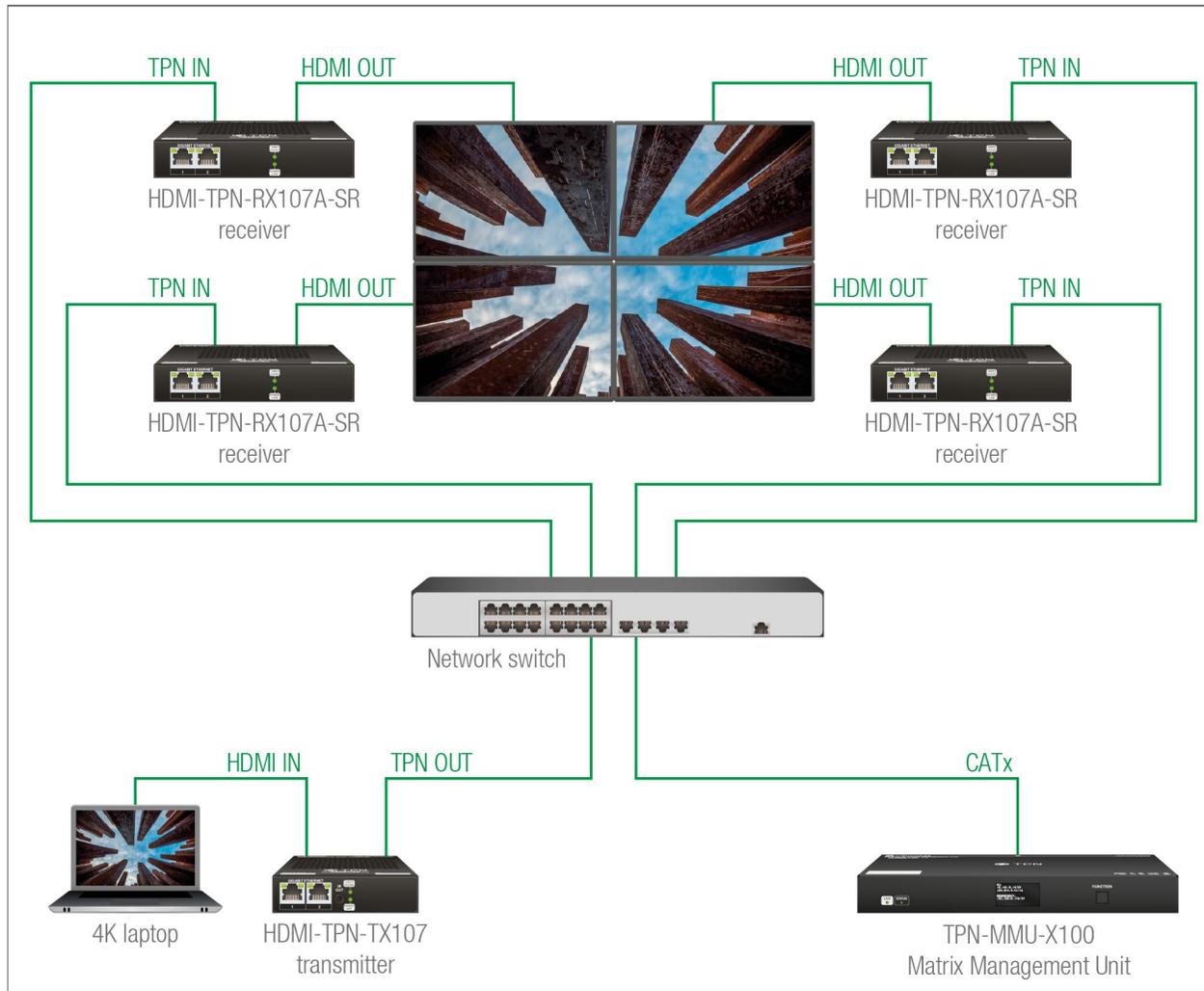


*Installation example for the video wall*

#### The Concept

The example figure shows a 2x2 video wall application with one transmitter and four scaling receivers, and a TPN-MMU-X100 device as a control unit. The recommended scaling modes:

- **Wall** - recommended for a static video wall installation where no or few crosspoint switches are expected on the sink devices.
- **Wall FS** - recommended for dynamic video wall installation where more crosspoint switches are expected.

INFO: MMU will support video wall application in a future firmware update.

## 5.6. Icron USB Interface

**DIFFERENCE:** Only **HDMI-TPN-TX207AU2K**, **HDMI-TPN-RX107AU2K**, **HDMI-TPN-RX107AU2K-SR**, **HDMI-TPN-RX107DU2K-SR**, **HDMI-OPTN-TX200AU2K**, **HDMI-OPTN-RX100AU2K** and **HDMI-OPTN-RX100AU2K-SR** models are built with USB KVM feature.

### 5.6.1. Port Diagram

#### TPN Series Extenders

Affected models:

- HDMI-TPN-TX207AU2K
- HDMI-TPN-TX207DU2K
- HDMI-TPN-RX107AU2K
- HDMI-TPN-RX107AU2K-SR
- HDMI-TPN-RX107DU2K-SR
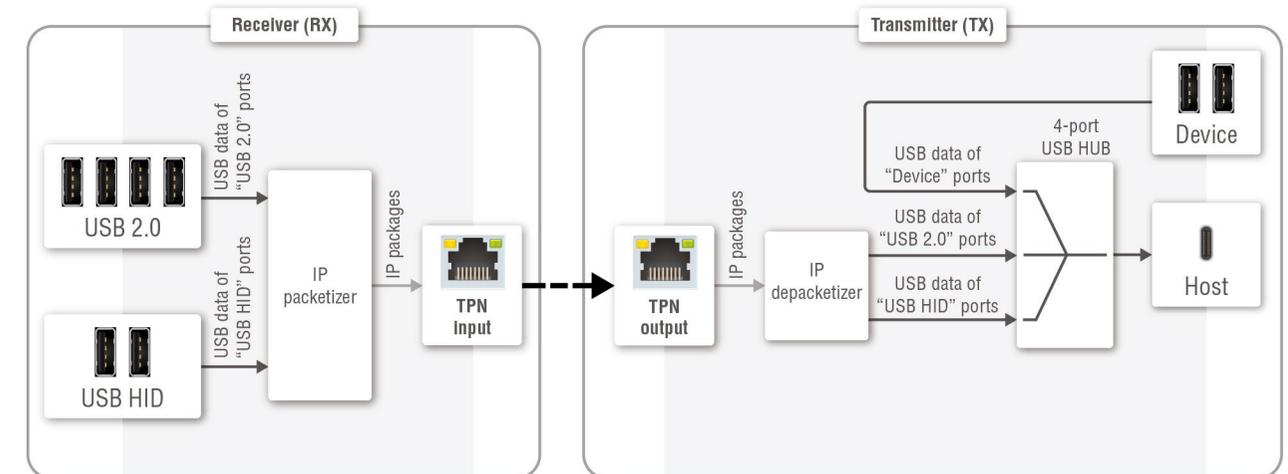


*Port diagram of the USB KVM feature of the TPN TX-RX connection*

**OPTN Series Extenders**

Affected models:

▪ HDMI-OPTN-TX200AU2K
▪ HDMI-OPTN-RX100AU2K
▪ HDMI-OPTN-RX100AU2K-SR
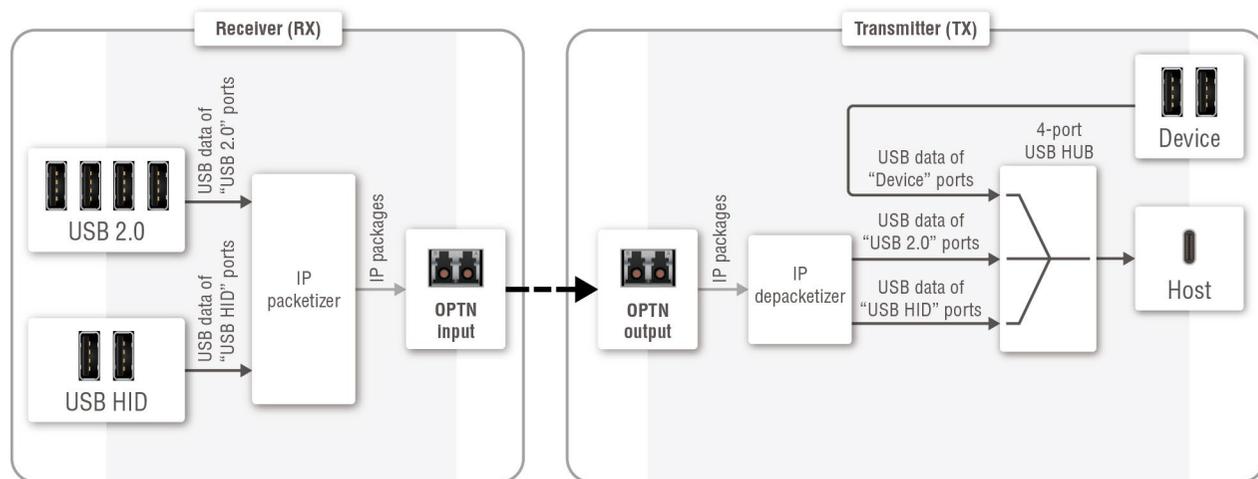


*Port diagram of the USB KVM feature of the OPTN TX-RX connection*

## 5.6.2. USB Configuration

### Receiver (REX) Side

The AU2K series receivers are built with 2 pcs USB-A connectors labeled as **USB HID** for the peripheral devices (preferably keyboard and mouse) and 4 pcs USB-A connectors labeled as **USB 2.0** for USB 2.0 devices (e.g. web camera, microphone, flash drive, mass storage, etc). The USB signal is transmitted to the transmitter over the TPN (CATx) or OPTN (fiber optical) interfaces.

The Icron module of the receiver is also called **REX** - Remote Extender.

### Transmitter (LEX) Side

The AU2K series transmitters are built with 2 pcs USB-A connectors labeled as **Device** for the peripheral devices (preferably keyboard and mouse) and 1 pc USB-C connector labeled as **Host** for the host device (e.g. a computer). The host device can be controlled locally via the Device ports or remotely either via the USB HID ports of the receiver. The USB 2.0 ports of the receiver appear as an external USB device to the host computer.

INFO: The USB-C port receives **USB data only**, no AV signal transmission is accepted. It supports **USB 2.0 standard** only.

The Icron module of the transmitter is also called **LEX** - Local Extender.

**USB Modes**

### SUI / MSA setting:

▪ **SUI** - Simultaneous Users Interaction - this mode is recommended in case of point-multipoint connections (multiple REXes are connected to a single LEX).
▪ **MSA** - Mass Storage Acceleration

### Pairing the Extenders

Two different methods exist for pairing or connecting through a crosspoint a LEX to one or multiple REXs:

▪ using **REST API request** - see the details in the Icron USB KVM Configuration Commands section;
▪ using **LW3 protocol command** - see the details in the Icron USB KVM Configuration Commands section.

### 5.6.3. USB KVM Transmission - Example
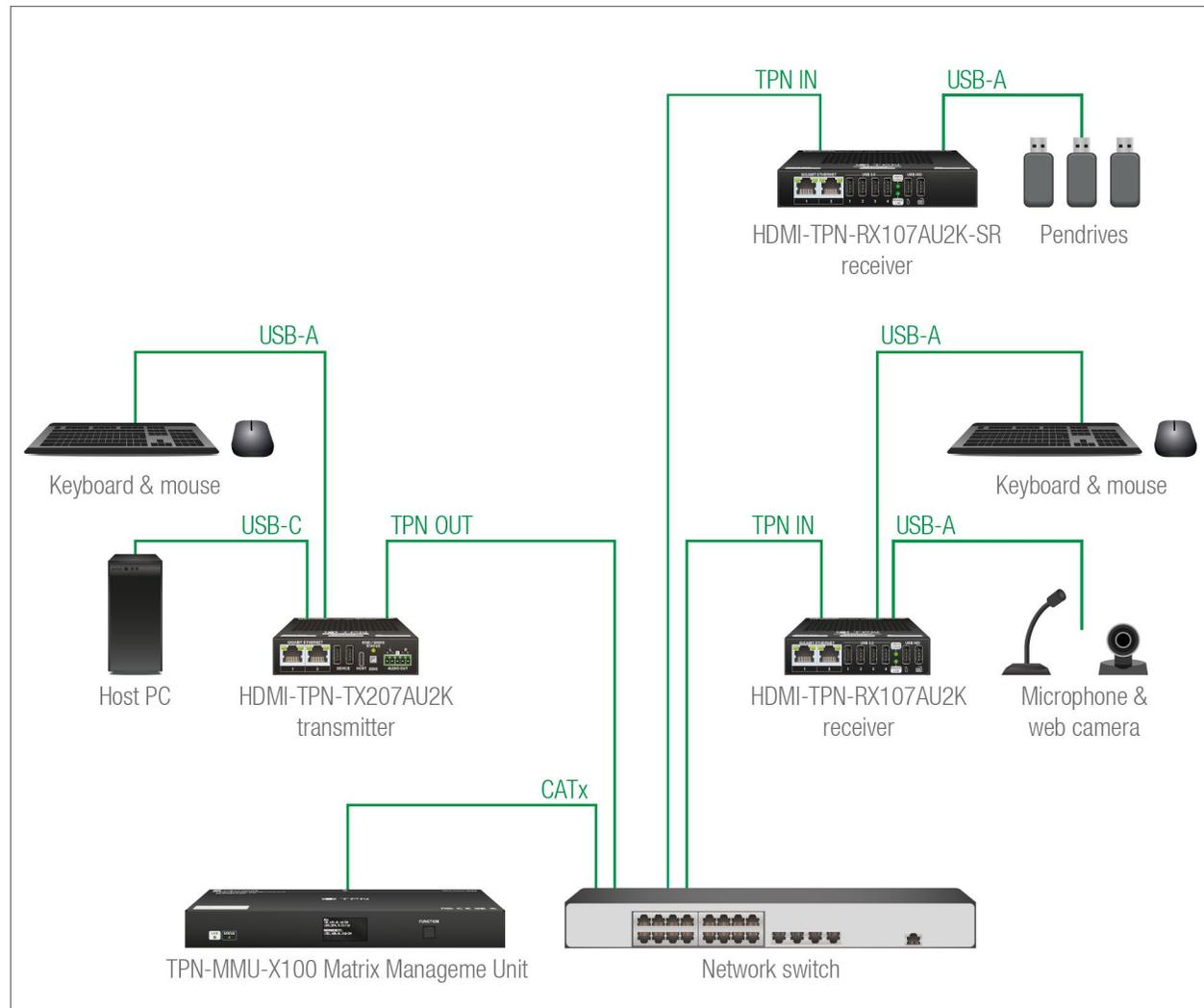


*Example for USB KVM signal transmission*

**The Concept**

The TPN system contains a transmitter (HDMI-TPN-TX207AU2K model as an Icron LEX) that connects to the host PC and a keyboard and a mouse for the local controlling; and the matrix also contains two receivers (as Icron REXs) that can be connected to the transmitter over the TPN interface via the 10G network switch.

The following USB devices are connected to the HDMI-TPN-RX107AU2K receiver:

- ▪ a microphone and a webcamera on the **USB 2.0 ports**;
- ▪ a keyboard and a mouse on the **USB HID ports**.

When the receiver (REX) is paired with the transmitter (LEX), the host computer can be controlled over the remote keyboard and mouse and the USB signal of the webcamera/microphone can be received by the host computer.

The following USB devices are connected to the HDMI-TPN-RX107AU2K-SR receiver:

- ▪ three pendrives on the **USB 2.0 ports**.

When the receiver (REX) is paired with the transmitter (LEX), the host computer detects the remote pendrives as local USB devices.

## 5.7. Serial Interface

This section is about the serial interface of the endpoint device what are used for command injection purpose over the Ethernet network.

**ATTENTION:** The RS-232 port of the endpoint devices cannot be used for controlling the TPN matrix.

INFO: The RS-232 port in the TPN-MMU-X100 series devices will be implemented in a future firmware update.

### 5.7.1. Description

All TPN/OPTN series endpoint models are built with RS-232 ports what can be used for sending serial messages over the Ethernet interface. The command injection feature is available over the MMU.

The serial interface of the endpoint devices can be configured by the following tools:

- **Built-in web** (details: RS-232 Tab);
- **REST API protocol commands** (details: Serial Port Configuration for Endpoints);
- **LW3 protocol commands** (details: Serial Port Configuration for Endpoints).

The serial message sending feature is available with the following tools:

- **Built-in web** (details: RS-232 Tab);
- **REST API protocol commands** (details: Command Injection over Serial Port).

INFO: At recent stage of development the serial message sending is not available over LW3 protocol commands.

### 5.7.2. Port Diagram
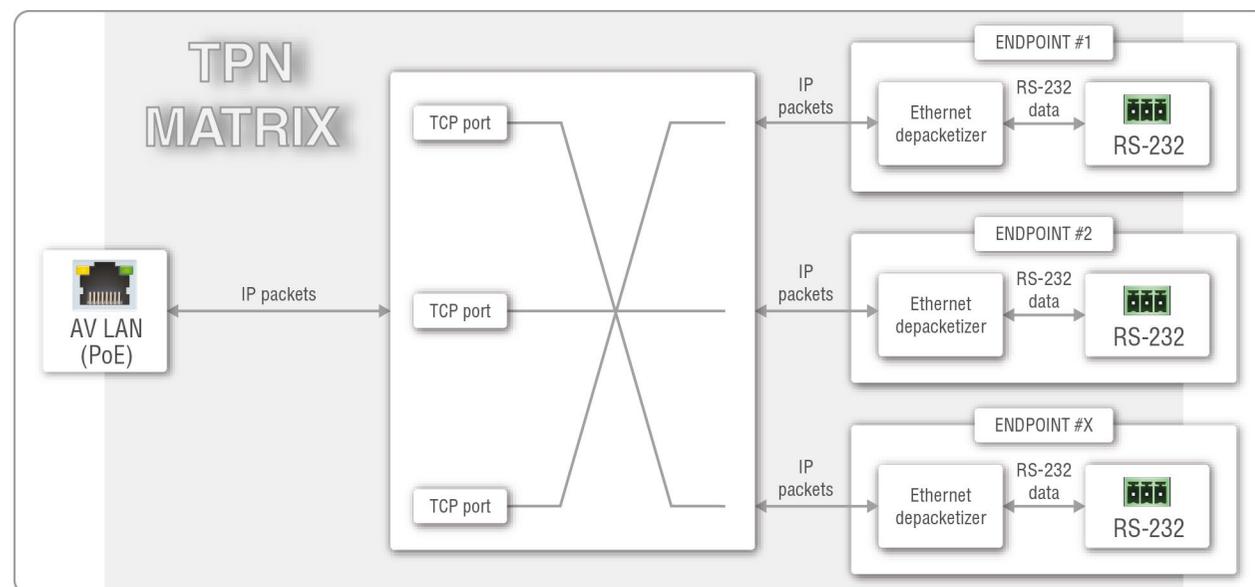


*Port diagram of the TPN matrix serial interface over IP*

**The Concept**

The endpoint devices are connected to the TPN matrix over the network switch via the TPN ports. Serial data communication can be established via the local RS-232 port (3-pole Phoenix connector) of the endpoint devices. Serial messages can be sent over the MMU only.

**Disabling Serial over IP** function disconnects the Serial/TCP converter from the Ethernet layer and the serial data won't be transmitted to the Ethernet network. This setting is available in the **Built-in web** (in the Configuration page, RS-232 Tab), with **REST API protocol command** (Enabling/Disabling Network Service Port) or with **LW3 protocol command** (Enabling/Disabling Network Service Port).

The MMU can manage a maximum of 20 connected clients at the same time for each serial port.

### 5.7.3. Message Sending Function

Message sending function allows RS-232 command sending to a third-party (or a Lightware) device from the extender. Any format is acceptable (text, binary, hexadecimal,etc.), maximum message size is 100Kb. Escaping is unnecessary.

### 5.7.4. Serial Message Sending - Example

**Concept**
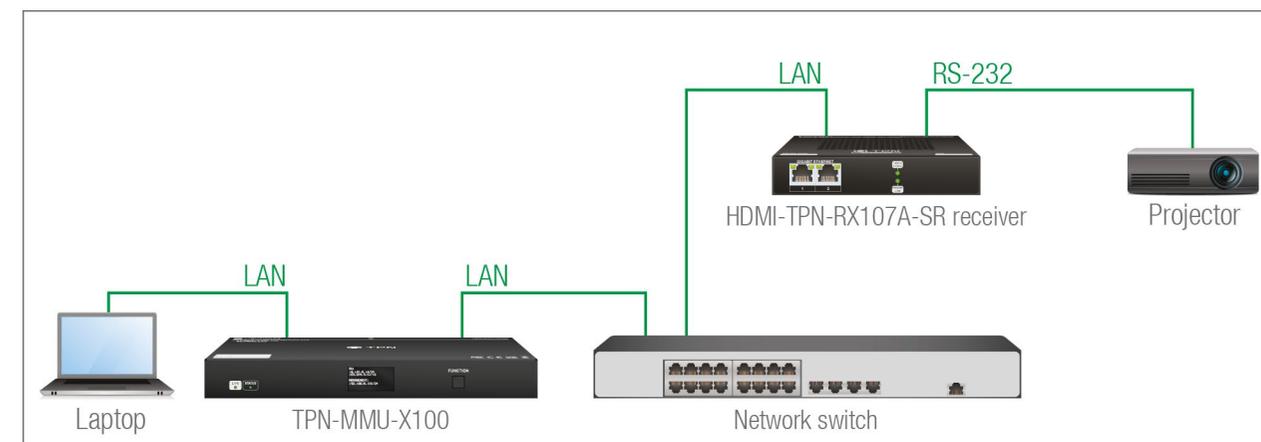


The serial message is sent from the laptop over the MMU. The receiver towards it to the projector over the RS-232 port.

## 5.8. Lightware Advanced Room Automation (LARA)

Lightware Advanced Room Automation (LARA) is a future-proof room automation platform that enables controlling both Lightware and 3rd-party devices in a meeting room area and also accessing remote services over the network. LARA has an easy-to-use graphical interface that allows the integrators to set up and deploy their system and also helps the technicians and IT personnel to check the system status and diagnose possible errors. LARA comes with built-in touchscreen control support, where a fully customizable graphical interface can be provided to literally any modern touchscreen device.

LARA eliminates the need for an external controller unit or PC, as it is embedded into the TPN-MMU-X100 series matrix managent unit. Because of the modular design, the integrators can build their system based on existing modules (drivers, touch screens, services and more) or create their own. Thanks to the approach of open source modules, the integrators can easily modify or extend the existing modules, or use them as a base for their new solutions.

With LARA, integrators can set up the behavior of the meeting room by creating rules and setting various parameters, there is an option to write codes. JavaScript is the most widespread language today, which has a steep learning curve and huge online community. By using the popular NodeJS engine, the integrators can rely on the public NPM repository (http://www.npmjs.org) and use the free packages available there.

We are working hard to release new functionalities regularly and make LARA more and more user-friendly.

### 5.8.1. Dedicated User Manual for LARA

LARA offers an interface, which is available by clicking on the **Help** button near the top right corner. You can find the dedicated user manual (**https://go.lightware.com/lara-pum**) including descriptions, definitions, steps and examples that aid in understanding LARA and learning how to use it.

### 5.8.2. Opening the LARA interface

▌ **ATTENTION:** When connecting to a device, you will need the 443 port for HTTPS connection, and optionally the 6107 port for raw TCP connection and the 80 port for HTTP connection.

**Step 1.** Enable LARA in your device. Navigate to the Settings/Network tab. First set a password for the 'admin' user, then enable LARA via the checkbox.

▌ INFO: As LARA is capable of running NodeJS scripts accessing your network, it is imperative to prevent open access that could be used by a malicious attacker.

**Step 2.** Open LARA in either of the following ways:

– Via the **Open LARA** button under the **System tab** in the built-in website, or

– By typing http**s**://<ip_address>/lara into the address field of your browser. Even though any modern browser should work, we recommend using the **latest** Chrome or Safari versions.

LARA does not run by default, however, once it starts, it will remain running even after resetting the device or closing the browser, until it is stopped by the user. It can be disabled in the LDC software. Please be aware that calling factory reset will erase LARA configurations.

While a graphical interface is available for most of the general functions, LARA offers the option to use it with JavaScript codes for every step and modification for both basic and more advanced task creation. Wizard and JavaScript code usage can easily be combined for maximum efficiency.

### 5.8.3. Running LARA

LARA uses modules and their instances as basic building blocks of a configuration.

**Modules**

Modules are software pieces that give a base to the processes in the LARA interface. There are five module categories available as follows:

▪ **Driver**: a module connected to a certain device in the network
▪ **Logic**: a module for organizing the other modules into a system
▪ **Userpanel**: provides a user interface for the end user (e.g. tabletop control)
▪ **Service**: a module connected to a certain service in the network (e.g. calendar services)

LARA modules have access to the devices' every port, connection interface and the entire parameter library of the LW3 tree.

There are several pre-made modules that can be found in LARA for quick and easy system setup. These modules can be found in the **Browse Modules** menu by clicking on the **Create New** button and choosing one of the options from the **Base modules** drop-down list.

▪ **SDVoE driver** module - for discovering the endpoint devices and supervisoring the matrix.
▪ **Generic LW3 driver** module - for controlling another Lightware device that supports LW3 protocol.
▪ **Generic TCP/IP driver** module - for controlling any device that is available via TCP/IP connection.
▪ **OCS sensor serial message script** module - for sending a serial message to a device (e.g. Display) if the Occupancy Sensor detects a signal.
▪ **Generic REST Client driver** module: universal module for controlling third-party devices over HTTP(S) REST API (PUT, POST, GET, DELETE).
▪ **Signal present serial message script** module - for sending a serial message to a device (e.g. Display) if a video signal is detected on a port.

**Instances**

Modules can be run as instances. Different parameters may be added to different instances for the same module to include every possible process in the desired system.

Instances can communicate with each other using **Events** and **Methods**.

▌ **ATTENTION:** It is currently only possible to run all instances together, or run none of them.

**Events**

Every instance can emit Events when something happens. An event is always momentary, it will be emitted immediately when something triggers it. An event can be used by other logic or user panel instances, or even by the same instance itself.

**Methods**

Methods are software pieces in any instance, which can be invoked (called) to initiate an activity in the associated room equipment.

### Rules

Rules allow setting up processes according to changes in the state of the device. A status change might dispatch an **Event**, which can trigger a rule. The rule will then be able to execute an **Action** according to the triggering Event. When defining a new rule, a triggering Event must be selected. In case of Logic and Userpanel modules any instance can be chosen as the source of the Event. In other cases only the given module's own Events may be selected.

Once an Event has been dispatched that triggered a rule, an Action will be launched. An Action may have an unlimited number of steps defined.

## 5.8.4. Downloading/Uploading a Configuration

The modules, or even the entire configuration can be downloaded to the computer as a .zip file, or a previously saved configuration can be uploaded to a device.

In case of downloading (and later uploading) a configuration of the module, these files are contained within the .zip file.

## 5.8.5. Status Board

The Status board offers real-time information about the connected devices through all running instances as Status Indicators. Such information might include connection status, signal presence, or even parameter status tracking. The indicators may show either static or self-refreshing information based on the current states of the device.
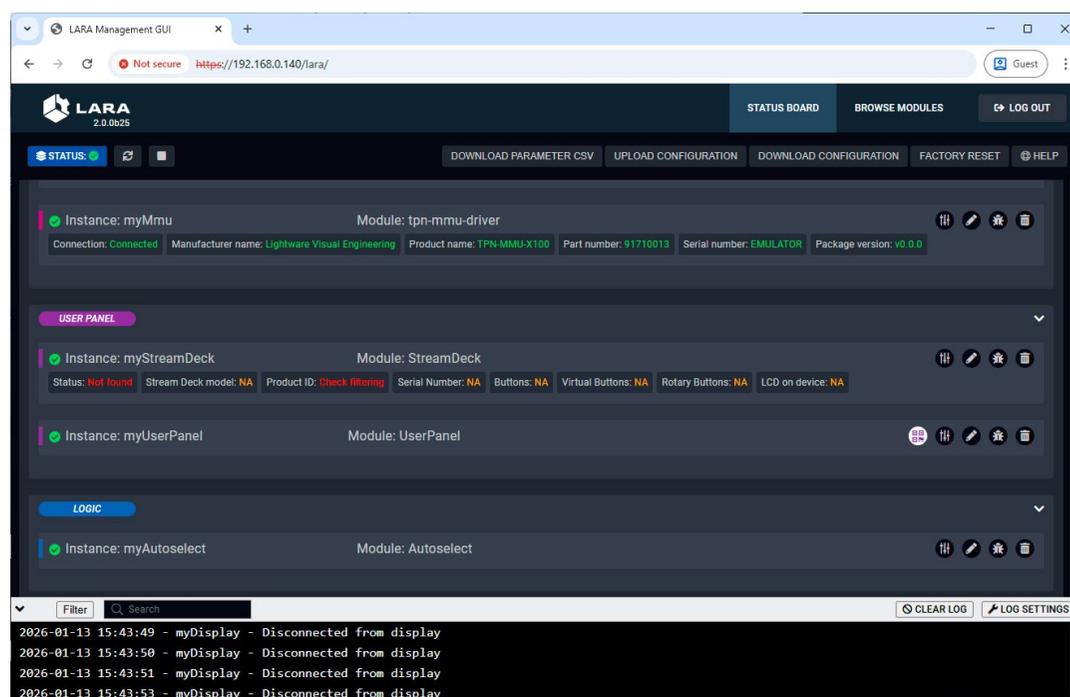


For more information, sample configurations and training materials, please visit the home page of the LARA software.

## 5.8.6. TPN-MMU Driver Module

### Introduction

This Module is for controlling Lightware's TPN-MMU-X100 series matrix management unit with LW3 protocol commands including a few Events and Methods.

### Dashbord Content

The following status indicators are displayed on the Status board in the row of the Instance:

- Connection state of the device
- Manufacturer name
- Product name
- Part number
- Serial number
- Firmware package version



### Defined Parameters

- ipAddress
- portNumber

They can be referred in the JavaScript code as e.g. `params.ipAddress`

### Variables

- **clientConnected**: Indicates whether the LW3 client managed to connect to the desired Lightware device.

### Defined Events

- **connected**: The MMU with the specified ipAddress is connected.
- **disconnected**: The MMU with the specified ipAddress is disconnected.
- **LW3 property changed**: The value of a specific LW3 property is changed to the defined value. `'path'`, `'property'` and `'value'` Parameters are defined in this Event.
- **LW3 GET response received**: A response has been received for a request.
- **signalPresentChanged**: Signal present property has been changed on one of the input/output port of an endpoint device.
- **crosspointChanged**: A crosspoint setting has been changed.

**Defined Methods**

These methods can be used the same way as the ordinary LW3 GET, SET, OPEN, CLOSE and CALL commands.

- **get**: Querying the value of a specific property (with path). `'path'` and `'property'` Parameters are defined in this Method.
- **set**: Setting the value of a specific writable property (with path). `'path'`, `'property'` and `'value'` Parameters are defined in this Method.
- **open**: Subscribing to a specific node. It means that the user will get a notification if the property changes. `'path'` Parameter is defined in this Method.
- **close**: Unsubscribing from a specific node. `'path'` Parameter is defined in this Method.
- **callMethod**: Calling a specific LW3 Method; does not work for an LW3 property. `'path'` and `'Method'` Parameters are defined in this Method (Parameters are optional). Please note that wildchar (*) cannot be used in case of the `'path'` Parameter.
- **getStreams**: Querying the value of the available streams properties in the TPN/OPTN matrix on the network. `'path'` and `'property'` Parameters are defined in this Method.
- **getSignalPresent**: Querying the value of the signal present properties in the endpoint devices. `'path'` and `'property'` Parameters are defined in this Method.
- **switchCrosspoint**: Calling the switch(<source>,<destination>) LW3 method (with path) to change the crosspoint settings. `'path'` and `'Method'` Parameters are defined in this Method (Parameters are optional). Please note that wildchar (*) cannot be used in case of the `'path'` Parameter.

**Defined Rules**

No Rules are defined in this Module.

**Custom Code**

The code of the factory module in JavaScript.

**ATTENTION:** If the GUI tools cannot solve a problem, custom code can be added to the end of the code, but please note that if you upgrade the driver module (blue button) the custom sections will be deleted.

# 6

## Startup of the System

**The following section describes the startup of the TPN matrix system step-by-step from the beginning to the displayed video on the sink devices.**

## 6.1. Installation & Powering

**Required Devices**

The following devices are required for a TPN matrix:

- 10G non-blocking **network switch** (see the detailed requirements in the Ethernet Switch - Detailed Requirements section);
- **TPN-MMU-X100** series matrix management unit;
- **HDMI-TPN**, **HDMI-OPTN** or **UCX-TPN** series endpoint devices (transmitters and reveicers).

**Mounting Options**

> **ATTENTION:** Before mounting the MMU, please **keep a record of the default password** from the sticker on the device's top. It will be necessary for the first login and this password will be restored after a factory reset.

Install the devices to the wished location using the **compatible mounting accessories**. See the compatibility table in the Mounting Options - Compatibility Table section.

**Connecting Steps**

Connect the devices to each other using the required ports. See the detailed instructions in the Connecting Steps section.

**Cabling**

Choice of the **correct cable types** for the application might save the project much unnessesary troubleshooting steps. Please check Lightware's recommendations and advices about this topic in the CATx Cable Diagnostics for TPN Endpoints section.

**Powering On**

As a final step, powering on the devices. TPN-MMU series and TPN/OPTN series endpoint devices fulfill the **PoE PD standard (IEEE802.3af)**, which means the **dedicated AV or Ethernet management port** can receive power over the Ethernet line. See more details in the Powering Options section.

## 6.2. First Login - Default Password Handling

Open a **web browser** and type the following in the address line: (make sure to type **https**):

```
https://<IP_address>
```

> INFO: The IP address can be read out the front panel OLED LCD screen, see more details in the OLED Display of the MMU section.

> TIPS AND TRICKS: The MMU can be discovered by the LDC software, see the details in the Lightware Device Controller (LDC) Support section.

The login page appears what request the Username and the password.

**First Login**

Username: **admin**

> INFO: The username is always 'admin' in the MMU devices and it cannot be changed.

Password: MMU devices have a **random generated factory default password** applied to the device during the manufacturing process. This unique password is supplied on a **sticker** along with the device (on its top).



After the first login with the unique password a **custom user password must be set**. The new password shall fulfill the following criterias:

- at least 10 characters
- no more than 100 characters
- contains only UTF-8 character (letters, numbers and symbols)
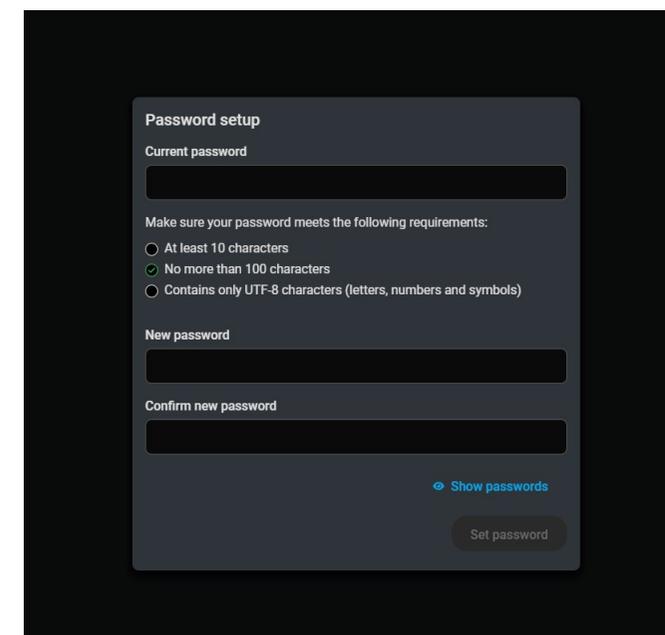


*Password setup page in the MMU*

## 6.3. Network Settings and Configuration

### 6.3.1. Reserved Network Ports

Lightware, SDVoE and Icron services reserves network ports. Please make sure the ports listed here are enabled on the network: Reserved Ports and Security Options.

### 6.3.2. Matrix Management Unit (MMU)

> INFO: The following section is related to the **Control LAN** Ethernet port of the MMU only.

The Control LAN port of the MMU is for connecting and supervising the TPN matrix over the MMU.

The factory default value of the Control LAN port is **DHCP** (dynamic IP address). The actual IP address of the device can be read out from the OLED display on the front panel of the MMU.
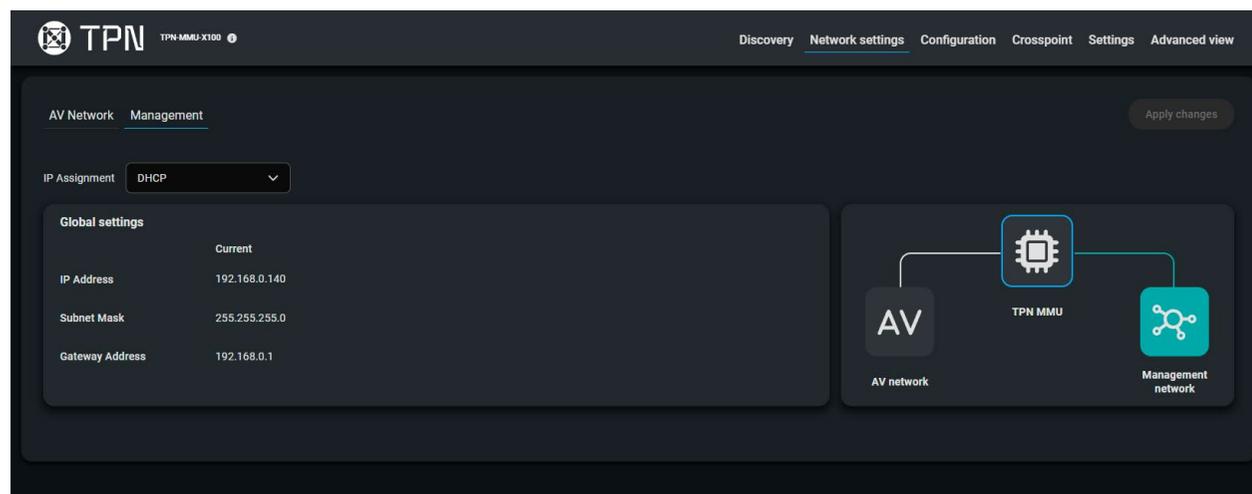


*Network settings - Management tab in the built-in web of the MMU*

Network settings can be changed and static IP address can be set using the following methods:

- via **built-in web**: see the details in the Management Tab section;
- via **REST API requests**: see the details in the Management Network Port Configuration section;
- via **LW3 protocol commands**: see the details in the Management Network Port Configuration section.

> **ATTENTION:** Always be careful when applying static IP address. Incorrect IP address assignment may create network loop or the devices might be unreachable. Lightware recommends using DHCP (dynamic IP address) setting.

> **ATTENTION:** In case of static IP address, please be sure the given IP address is in the same subnet network with the controller device.

### 6.3.3. Endpoint Devices

> INFO: The following section is related to the **AV LAN (PoE)** Ethernet port of the MMU only.

Network settings can be changed and static IP address can be set using the following methods:

- via **built-in web**: see the details in the AV Network Tab section;
- via **REST API requests**: see the details in the Endpoint Network Configuration section;
- via **LW3 protocol commands**: see the details in the Endpoint Network Configuration section.

> TIPS AND TRICKS: Lightware highly recommends using the built-in web to set up endpoint network configuration because the user interface is more intuitive, gives immediate feedback and helps the user with few user-friendly smart solutions.

> **ATTENTION:** Always be careful when applying static IP address. Incorrect IP address assignment may create network loop. Lightware recommends using of DHCP (dynamic IP address) setting.

The AV Network menu supports the configuration of the **AV LAN (PoE)** port of the MMU where the endpoint devices are connected to the TPN matrix.



*Network settings page - AV Network tab in the built in web of the MMU*

IP assignment settings for the endpoint devices:

- **DHCP** (default): dynamic IP addresses will be applied in case of there is a DHCP server on the network. If not, auto IP addresses will be set in the devices.
- **Static IP**: user customizable IP addresses can be set and applied for all endpoint devices in the TPN matrix. See more details about it in the AV Network - Static IP Setting Guide section.

# 6.4. Configuration of the SDVoE Matrix

## 6.4.1. Discovery

TPN-MMU series matrix management unit is able to detect all HDMI-TPN, HDMI-OPTN and UCX-TPN series endpoint devices on network. The discovery tool is available with three different methods:

- via **built-in web**: see the details in the Discover section;
- via **REST API requests**: see the details in the Discovering the Endpoints on the Network section;
- via **LW3 protocol commands**: see the details in the Discovering the Endpoints on the Network section.
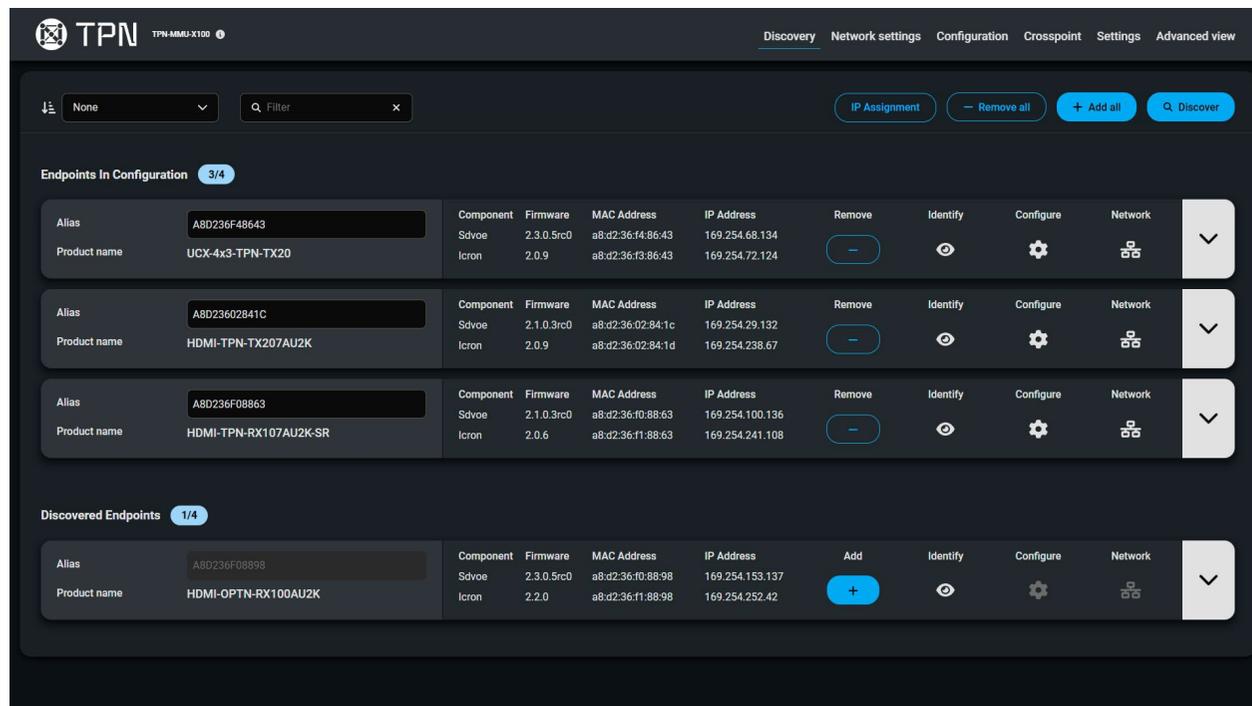


*Discovery page in the built-in web of the MMU*

### Adding or Removing Endpoints

The following ways are avaliable for adding endpoints to the TPN matrix:

- via **built-in web -** use the **Add** or **Add all** buttons: see the details in the Structure of the Discovery Page section;
- via **REST API requests**: see the details in the Adding an Endpoint to the Matrix section;
- via **LW3 protocol commands**: see the details in the Adding an Endpoint to the Matrix section.

## 6.4.2. SDVoE Configuration

### Transmitters (TX)

#### HDCP Settings

HDCP version: it can be **HDCP 1.4**, **HDCP 2.2** or **Off**.

> **ATTENTION:** In case of Taurus UCX TPN endpoints: the allowed HDCP version which is set in the MMU is not copied to the the input port of the Taurus UCX endpoint. It is required to set in the Taurus UCX endpoint device separately.

Available methods:

- via **built-in web**: see the details in the SDVoE Tab section;
- via **REST API requests**: see the details in the HDCP Setting for the Source Stream section;
- via **LW3 protocol commands**: see the details in the HDCP Setting for the Source Stream section.



#### EDID Settings

EDID data can be uploaded to the transmitter by two methods: **command** or **file upload** (accepted file is .edid).

Available methods:

- via **built-in web**: see the details in the SDVoE Tab section;
- via **REST API requests**: see the details in the Uploading EDID Data for the Source section;
- via **LW3 protocol commands**: see the details in the Uploading EDID Data for the Source section.

> **ATTENTION:** In case of Taurus UCX TPN endpoints: **dynamic EDID** must be set on the emulated EDID memory **in the Taurus endpoint**. See more details about the method in the user manual of the device (PDF).
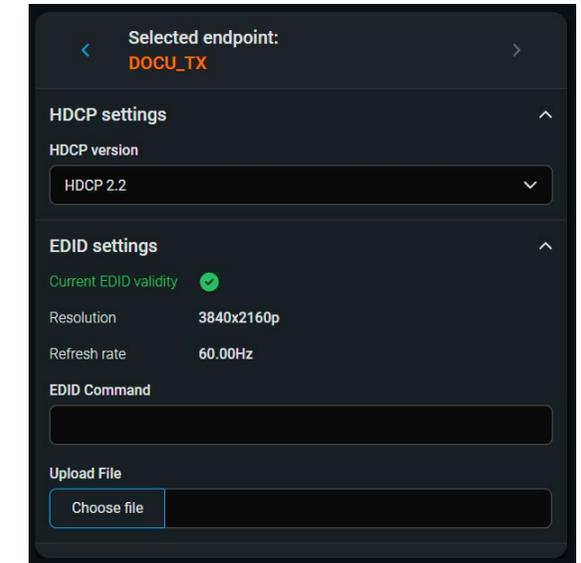
**Receivers (RX)**

**HDCP Settings**

HDCP output mode:

- **FollowSource** - HDCP version is syncronized with the setting of the source.
- **FollowSink (Always Follow)** - HDCP version is always syncronized with the setting of the sink.
- **FollowSink (Follow Once)** - HDCP version is syncronized once with the actual setting of the sink.

Available methods for HDCP mode setting:

- via **built-in web**: see the details in the SDVoE Tab section;
- via **REST API requests**: see the details in the HDCP Setting for the Destination Stream section;
- via **LW3 protocol commands**: see the details in the HDCP Setting for the Destination Stream section.

**EDID Settings**

Information about the current EDID of the TPN port (resolution and refresh rate) and the current EDID data can be downloaded to a file (.edid) by selecting the **Download EDID** button.
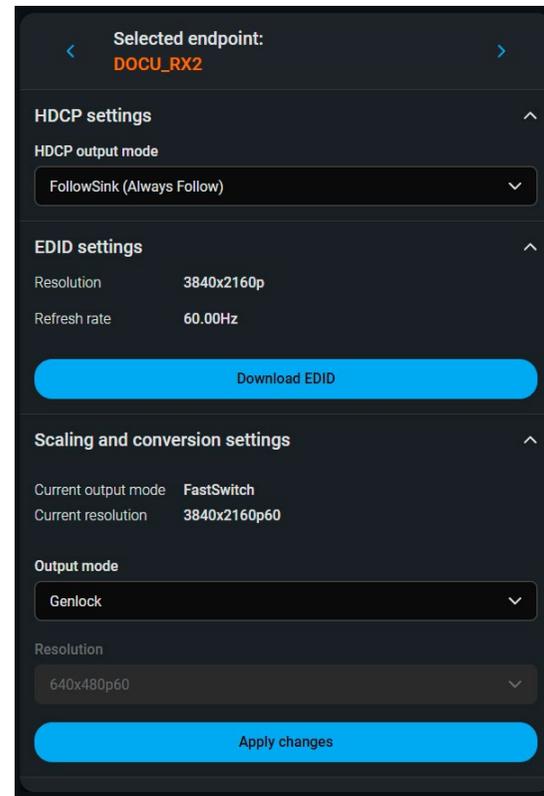
**Scaling and Conversion Settings**

▌ **DIFFERENCE:** The setting is available for **-SR scaling receiver series** models only.

Scaler settings can be customized. Always select the **Apply changes** button to complete and apply the scaler settings. See more details about it in the Scaler Function of the Receiver section.

Available methods:

- via **built-in web**: see the details in the SDVoE Tab section;
- via **REST API requests**: see the details in the Setting the Scaler Mode section;
- via **LW3 protocol commands**: see the details in the Setting the Scaler Mode section.

### 6.4.3. Crosspoint Settings
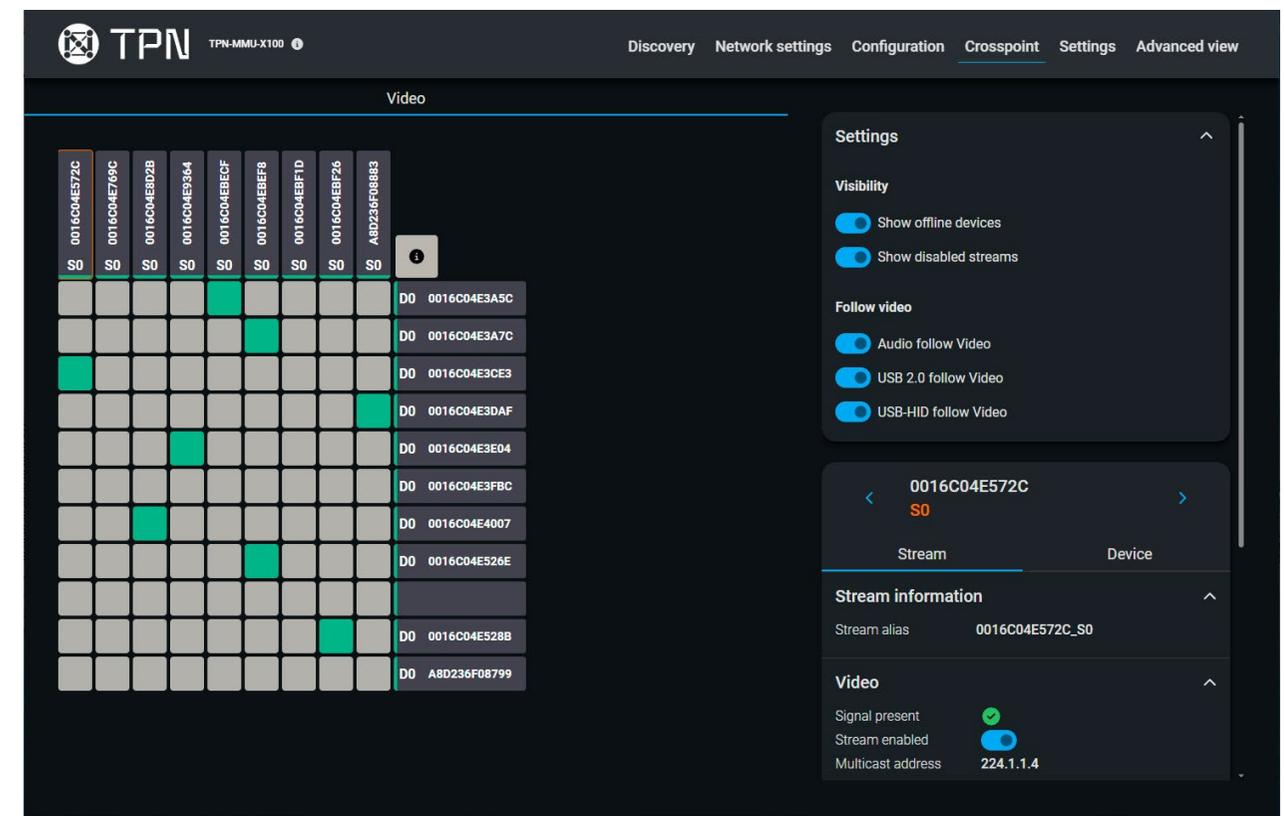


*Crosspoint page in the built-in web of the MMU*

The audio/video crosspoint can be set on this page. Stream visibility can be customized. Audio, Icron USB 2.0 and USB HID signals can be enabled or disabled to follow the video signal.

Available methods:

- via **built-in web**: see the details in the Crosspoint Settings section;
- via **REST API requests**: see the details in the Switching the Video Stream to One Destination section;
- via **LW3 protocol commands**: see the details in the Switching the Video Stream to One Destination section.

# 7

## Software Control - Built-in Web

**The built-in website of the Control Unit allows to connect to and control the device via a web browser.**

## 7.1. Software Control Modes

The device can be controlled in the following ways:

- Using the **built-in web page**,
- Sending **REST API commands** (see the Lightware REST API Reference chapter), or
- Sending **LW3 commands** (see the LW3 Programmer's Reference chapter).

## 7.2. Establishing the Connection

**ATTENTION:** Please be sure that the computer is in the same network as the TPN / OPTN matrix. If the computer has multiple Ethernet connections (for example Wi-Fi and LAN connections are used simultaneously), you will need to know the **IP address** for the one that is used for controlling the MMU. *#builtinweb #web*

**Step 1.** Connect the MMU and the computer either via

- Ethernet, with LAN patch cable, or
- Ethernet, with LAN cross cable.

**Step 2.** Change to the desired IP settings if it needed.

**Step 3.** Type the IP address to the address bar of the web browser and press enter (the factory default is **DHCP**).

## 7.3. Using the Built-in Web

The TPN/OPTN AV matrix can easily be controlled and configured by utilizing the built-in web.

Connecting to the device is possible by typing IP address of the MMU into the URL of the browser.

**System Requirements**

**Operating System:** Microsoft Windows 10 or 11, Apple macOS, Linux distributions.

**Web Browser:** Lightware recommends the following applications: Mozilla Firefox, Google Chrome, Apple Safari.

| Browser | Minimum Version |
|---------|-----------------|
| Chrome | 80+ |
| Edge | 80+ |
| Firefox | 74+ |
| Safari | 13.1+ |
| Opera | 67+ |

**ATTENTION:** MMU's built-in web encounters errors in the latest **Safari 26** web browser.

**ATTENTION:** Please enable the pop-up windows in your browser; certain contents are only displayed in a new window.

INFO: Opera Mini browser is not supported by the MMU's built in web.

## 7.4. Lightware Device Controller (LDC) Support

The Lightware Device Controller (LDC) software is able to discover the TPN-MMU series devices on the network and opens built-in web in the default web browser.

**DIFFERENCE:** The MMU support is available from LDC **v2.22.0b2** version only.

### 7.4.1. Preparation

The Lightware Device Controller (LDC) software can be downloaded from the Lightware's website. See the details about the requirements and installation details in the user manual of the LDC.

### 7.4.2. Device Discovery

Run the controller software; device discovery window appears automatically.
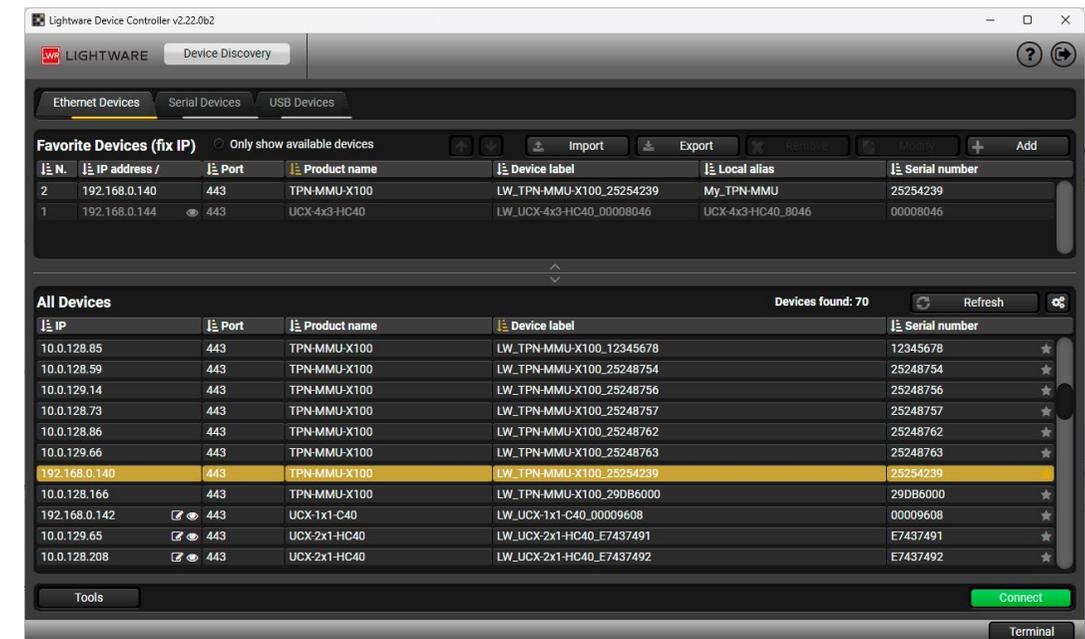


*Device discovery window in the LDC software*

**ATTENTION:** Make sure that **80** and **443** ports are enabled on the network. If not, LDC will not be able to discover the MMU.

The Ethernet tab consists of two lists. **All devices** list contains all Lightware devices that are available in the connected network. However, there is no need to browse all the available devices as you can expand the list of **Favorite devices** with any Lightware device that is connected via Ethernet by any of the following ways:

- Mark the desired device with the ⭐ symbol in the **All Devices** list,
- Press the **Add** button and add the device in the appearing window, or
- **Import** the list of favorite devices that was **exported** previously.

Press on the green **Connect** button to **open the built-in web** of the MMU in the default web browser.

### 7.4.3. Adding the MMU to the Favorite Devices

Press on the ⭐ symbol to add the MMU to the Favorite devices. The MMU can be added as a **web-only device** only. The protocoll can be HTTP or HTTPS.
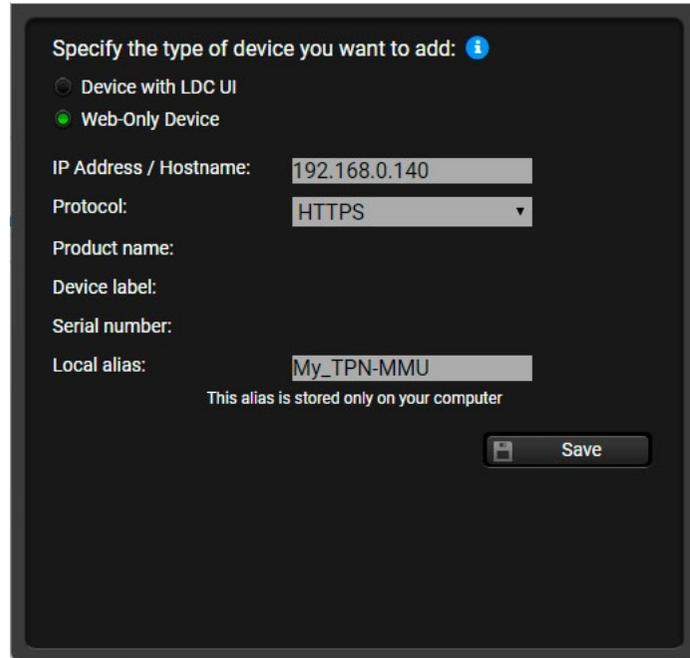


*Adding new Favorite Device window*

## 7.5. First Connection

Open a **web browser** and type the following in the address line: (make sure to type **https**)

```
https://<IP_address>
```

> INFO: The IP address can be read out the front panel OLED LCD screen, see more details in the OLED Display of the MMU section.

> TIPS AND TRICKS: The MMU can be discovered by the LDC software, see the details in the Lightware Device Controller (LDC) Support section.

The login page appears what request the Username and the password.
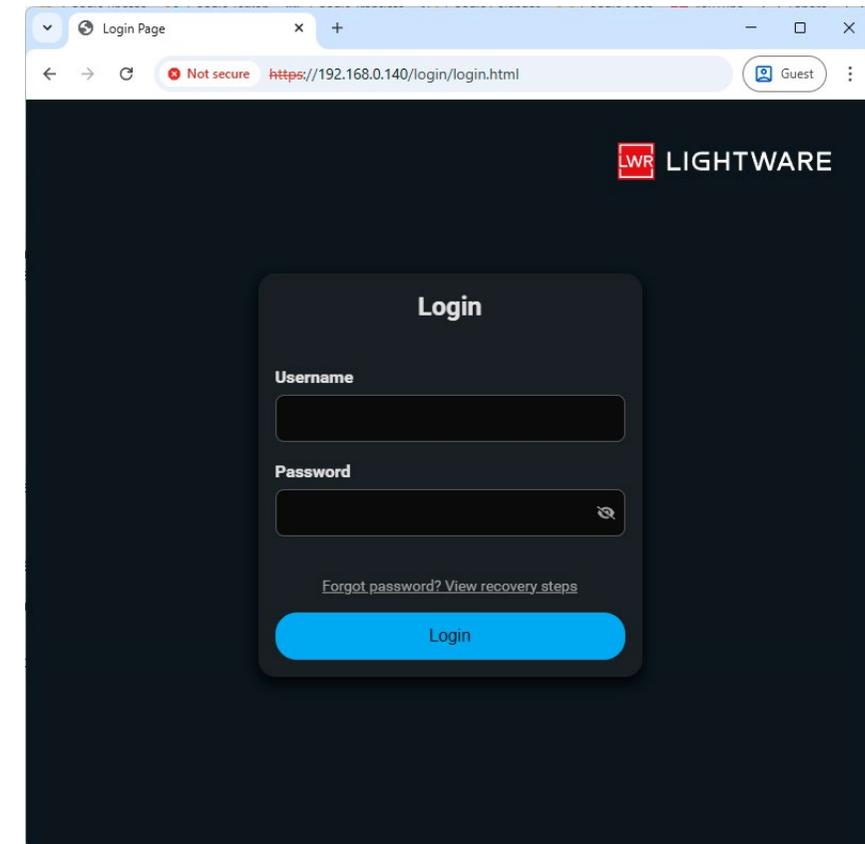


*Login window of the built-in web*

**First Login**

Username: **admin**

> INFO: The username is always 'admin' in the MMU devices and it cannot be changed.

Password: MMU devices have a **random generated factory default password** applied to the device during the manufacturing process. This unique password is supplied on a **sticker** along with the device (on its top).

After the first login with the unique password a custom user password must be set. The new password shall fulfill the following criterias:

- ▪ at least 10 characters
- ▪ no more than 100 characters
- ▪ contains only UTF-8 character (letters, numbers and symbols)



*Password setup page in the MMU*

## 7.6. Discovery Page

### 7.6.1. Discover

After the login the Discovery page appears first. Clicking on the ⊕ **Discover** button finds and lists all available TPN/OPTN series endpoint devices on the network.

Selecting the **IP Assignment** button the IP range can be selected. MMU can obtain IP address from:

- ▪ DHCP, or
- ▪ Static IP range - in this case the static IP addresses and subnet mask shall be provided; or
- ▪ Both DHCP and Static IP range.

> INFO: When the system is configured with a Static IP, the MMU can only operate within a single IP address range. As a result, any devices located in a different IP range will not be discoverable, even though they will still remain in the configuration.
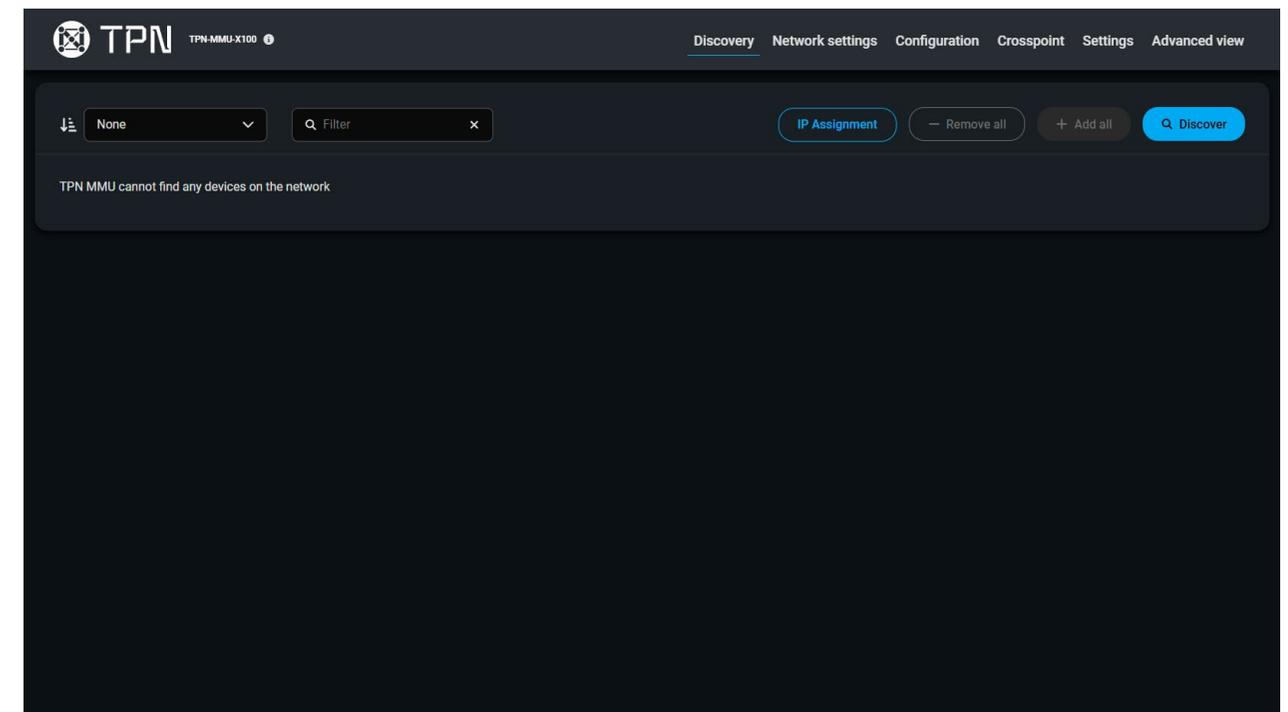


*Discovery page before the first discovery action*

## 7.6.2. Structure of the Discovery Page
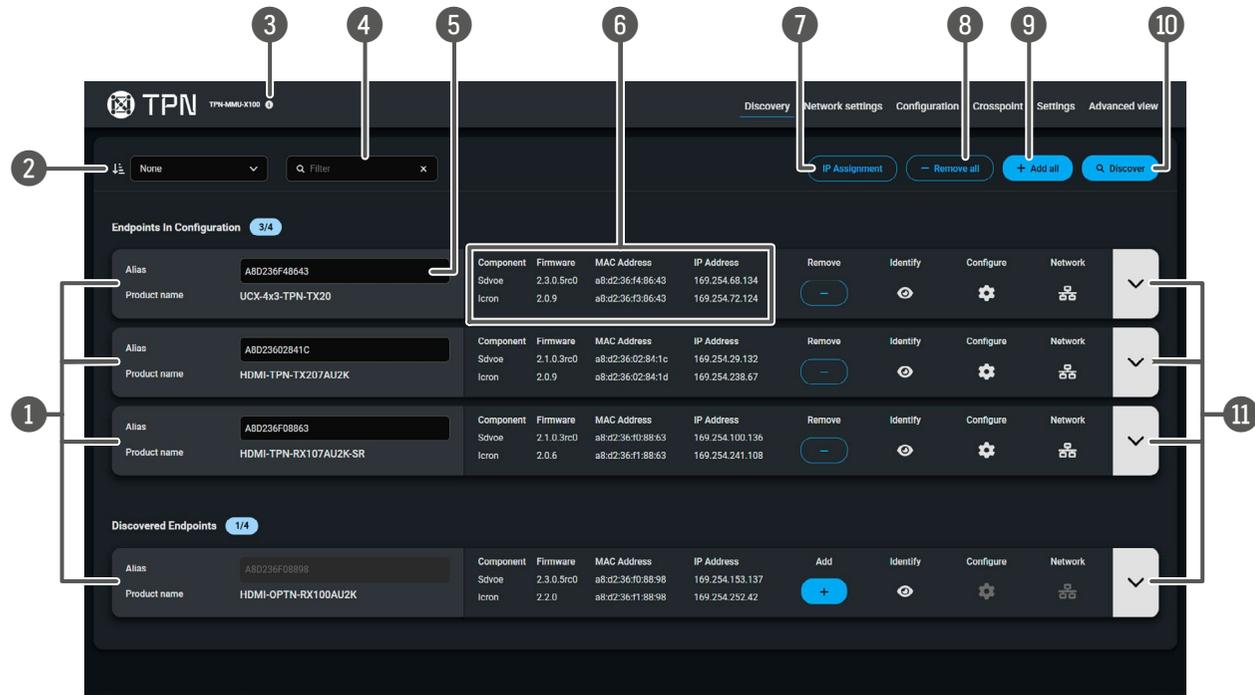


*Discovery page in the built in web of the MMU*

**①**   **Device cards**    Detailed information about the discovered endpoint devices. Each card represents one endpoint device. Learn more about it in the Device Card section.

**②**   **Order of the devices**    Order can be set in the dropdown menu by **alias**, **product name**, or none which means the discovery order.

**③**   **MMU information**    Useful information is available about the MMU: product name, installed firmware package version, part number and the serial number.

**④**   **Filter**    Filtering of the listed devices by product name, alias name, IP address, etc. Start typing the wished keyword and the device list will narrow dynamically.

**⑤**   **Alias**    A unique name can be set by the user for the easier device recognition. The field is editable if the endpoint is added to the TPN matrix only. Letters, numbers and the _ characters are acceptable only.

**⑥**   **Endpoint information**    Firmware version, IP address and MAC address by components (SDVoE and Icron) are displayed on this area.

**⑦**   **IP assignment**    IP ranges can be customized for the device discovery: MMU can obtain IP address from DHCP and custom IP address range. See more details about it below.

**⑧**   **Remove all button**    Pressing the button removes all endpoint devices from the TPN matrix but they still remain in the discovery list.

**⑨**   **Add all button**    Pressing the button adds all endpoint devices to the TPN matrix which are already discovered previously.

**⑩**   **🔍 Discover button**    Discovers all TPN/OPTN series endpoint devices on the network. The discovered range can be fine-tuned by the **IP Assignment** button.

**⑪**   **Dropdown option of the Device cards**    More information and options will be available for the endpoint devices when opens the device card by this button. See more details in the Device Card section..

### Recover Button
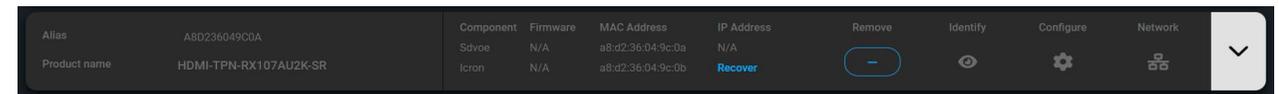


If an U2K series endpoint device (built with Icron module) is discovered by the MMU but IP address cannot assign to, it cannot be added to the TPN matrix. Pressing the **Recover** button restarts the network interface of the Icron and attempts to assign IP address to the module.

### IP Assignment

Clicking on the IP assignment button the user can customize the network range where MMU obtains IP addresses from. Any of the following options or both together can be enabled or disabled:

- **DHCP** - dynamic IP addresses.
- **Static IP** - the static IP address and the subnet mask shall be provided. The given static IP address will the same as set on the AV network port on the AV Network Tab.

> INFO: When the system is configured with a Static IP, the MMU can only operate within a single IP address range. As a result, any devices located in a different IP range will not be discoverable, even though they will still remain in the configuration.
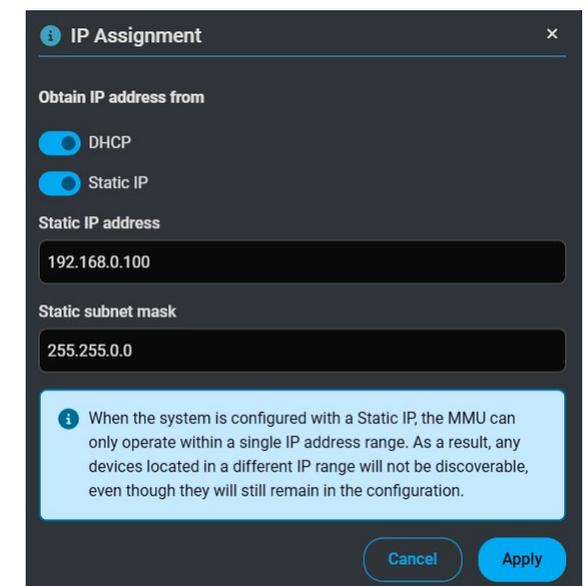
## 7.6.3. Device Card
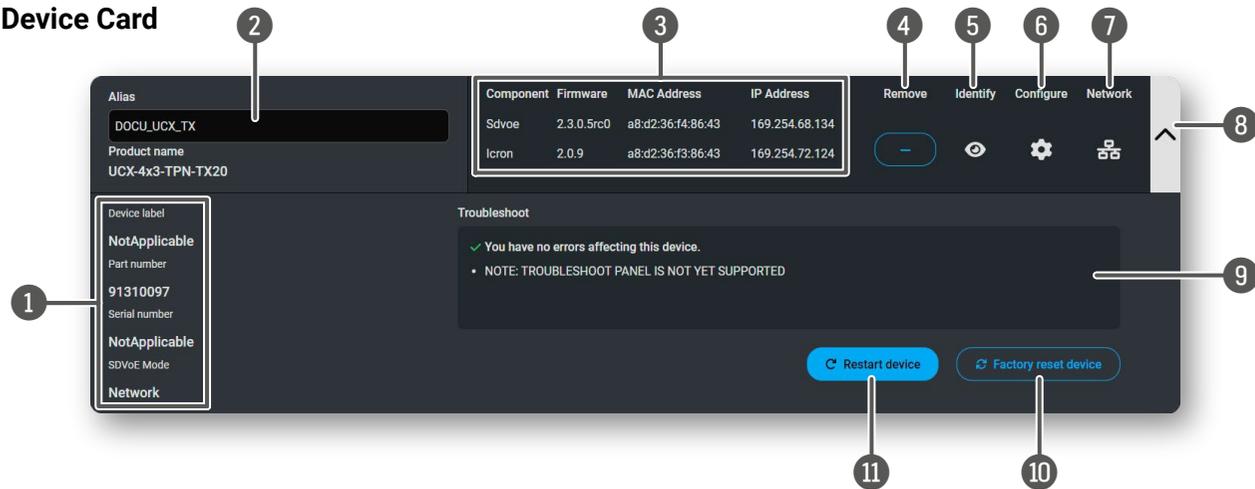


| # | | |
|---|---|---|
| **1** | **Details about the device** | Device label, part number, serial number and other useful information are displayed here. |
| **2** | **Alias** | A unique name can be set by the user for the easier device recognition. The field is editable if the endpoint is added to the TPN matrix only. Letters, numbers and the _ characters are acceptable only. |
| **3** | **Endpoint information** | Firmware version, IP address and MAC address by components (SDVoE and Icron) are displayed on this area. |
| **4** | **Remove button** | Selecting the button results removing the endpoint from the TPN matrix but it still remains in the discovery list. |
| **5** | **Identify button** | It calls the Identify Me feature what results in the blinking of the front panel status LEDs for 10 seconds. This feature can be used to help to identify the device itself in the rack shelf. |
| **6** | **Configure button** | Leads to the Configuration Page (filtered to the recent endpoint device) where SDVoE (e.g. HDCP, EDID and scaler) and RS-232 (serial message sending) related settings can be applied. |
| **7** | **Network button** | Leads to the Network Settings Page (filtered to the recent endpoint device) where the AV network (IP assigment of the endpoint devices) and the Management network (Control LAN port of the MMU) can be customized. |
| **8** | **Dropdown option** | Opening/closing the device card. |
| **9** | **Troubleshoot panel** | The troubleshoot panel is not supported yet. It will be added with a future firmware update. |
| **10** | **Factory reset device button** | The device is restarted, current connections are terminated, and the default settings are restored. See the complete list in the Factory Default Settings section. |
| **11** | **Restart device button** | The MMU can be restarted – the current connections will be terminated. |

## 7.7. Network Settings Page

### 7.7.1. AV Network Tab

The AV Network tab supports the configuration of the **AV LAN (PoE)** port of the MMU where the endpoint devices are connected to the TPN matrix.
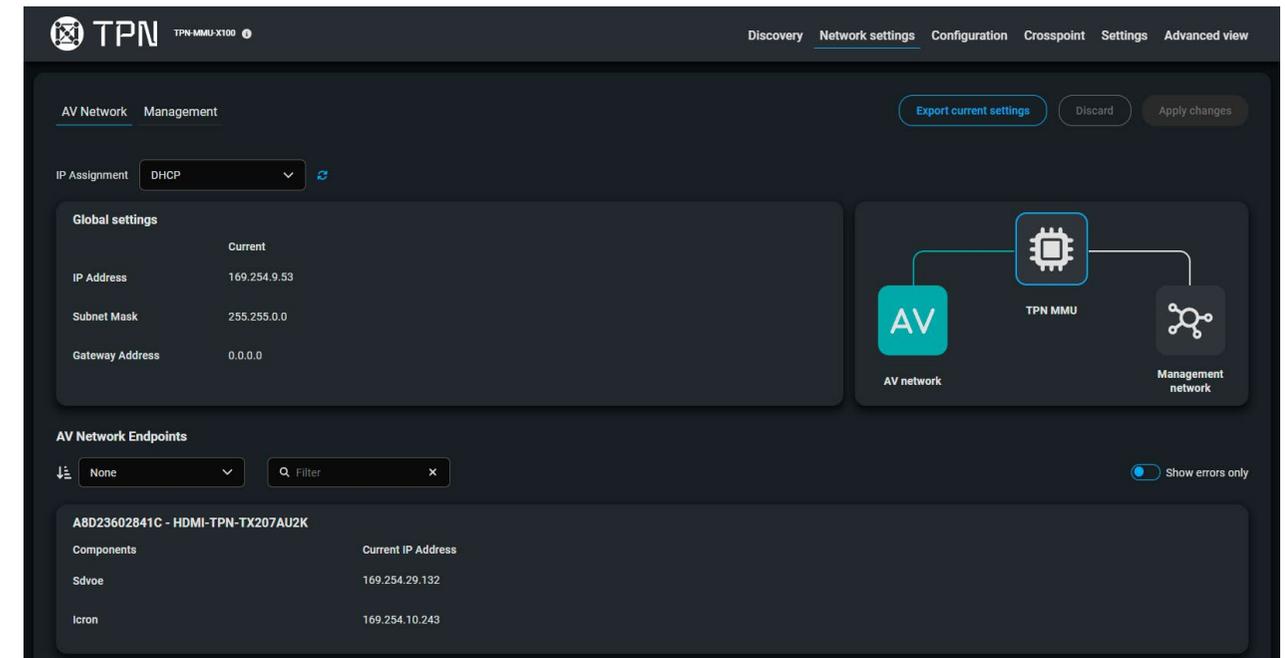


*Network settings page - AV Network tab in the built in web of the MMU*

IP assignment settings for the endpoint devices:

- **DHCP** (default): dynamic IP addresses will be applied if there is a DHCP server on the network. If not, auto IP addresses will be set in the devices.
- **Static IP**: user customizable IP addresses can be set and applied for all endpoint devices in the TPN matrix. See more details about it in the AV Network - Static IP Setting Guide section.

**ATTENTION: Known issue**: when IP settings are changed to static IP and there is an active RS-232 TCP communication, the changing may break it.

**7.7.2. AV Network - Static IP Setting Guide**

▍**ATTENTION:** Always be careful when static IP addresses are set for the endpoint devices. Incorrect IP address assignment may create network loop. Lightware recommends using of DHCP (dynamic IP address) setting.

**Static IP Assignment Steps**

**Step 1.**  Set the IP assignment to Static IP.

**Step 2.**  Set a new IP address, Subnet mask and Gateway address in the **Global Settings** section. Subnet mask and gateway address can be applied for all endpoints with the ↻ button.

▍**ATTENTION:** When a value is filled, always confirm it pressing an **Enter**.

▌INFO: Subnet mask and gateway address cannot be set separately for the endpoints. It can be applied globally for all endpoint devices in the TPN matrix.

**Step 3.**  Select the **Generate Static IP** button.

**Step 4.**  Press **Confirm** to continue.

**Step 5.**  Add the IP address range for the available endpoint devices. If 'From' value is filled, the range is auto-filled with the number of components.

▌INFO: Please note that the SDVoE and Icron interfaces requires separate IP addresses. In case of U2K models (with built-in Icron module) two IP addresses will be assigned per device.
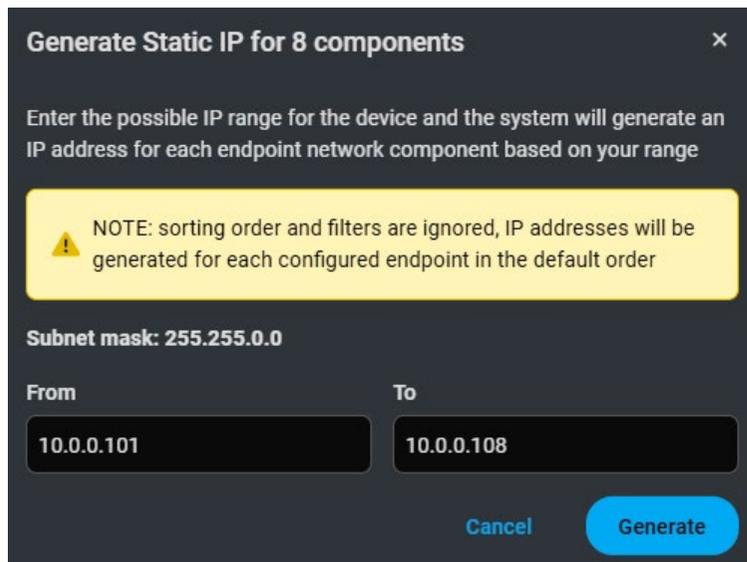


*Generate Static IP tool*

**Step 6.**  Press the **Apply changes** button to apply the new settings.

**Manual Static IP Settings**

The static IP addresses can be set manually as well. Select **Static IP** in the IP assignment menu and a new field (**New IP Address**) appears on the endpoint devices for all network interfaces.
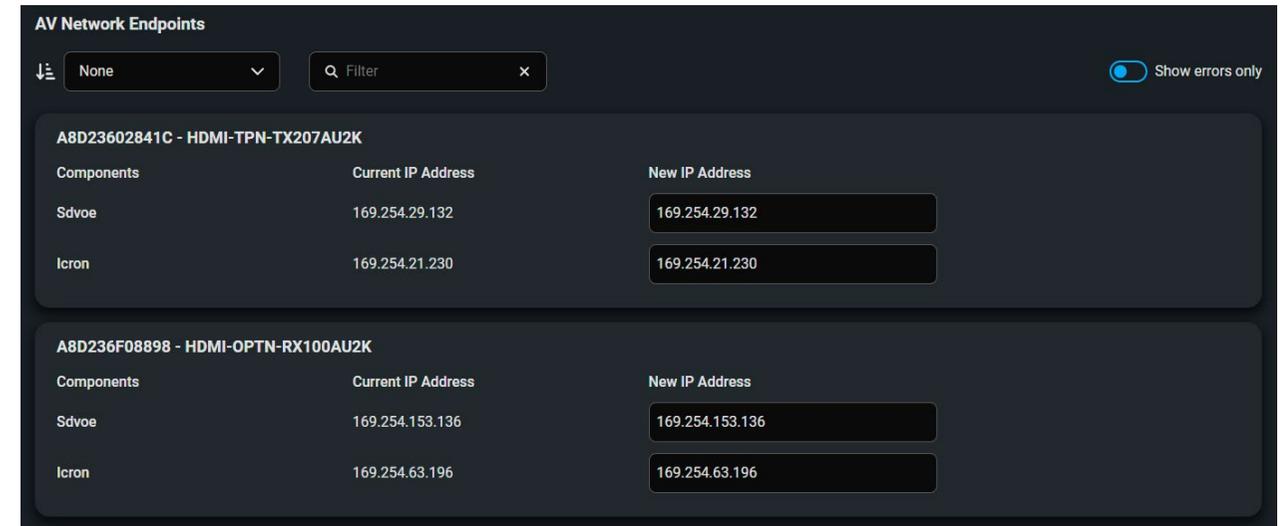


*Static IP address fields on the AV Network tab*

**Legend of the Input Field Colors**

| Field | Color | Explanation |
|---|---|---|
| 169.254.21.230 | grey | The recent IP address of the network interface. |
| 192.168.0.101 ⚠ | yellow | Typed, but not saved IP address. Press an **Enter** to save the typed value. |
| 192.168.0.101 | blue | Staged IP addressed, but not applied yet. Select the **Apply changes** button to apply the new setting. |
| 192.168.0.1222 ⊗ <br> Invalid IP address | red | Error, invalid IP address. |

**IP Validation**

MMU automatically validates the static IP addresses and possible network issues are displayed in error messages on right side of the panel.

**Discard Button**

The Discard button clears the staged values and restores the previous network settings.

**Exporting the Actual Network Configuration**

Select the **Export current settings** button to generate the list of the devices and their network configuration. The output is a .csv file what contains all MAC addresses, IP address, hostnames, etc on the TPN matrix.



| | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Alias | Product Name | Serial Number | Mac Address | IP Address | Subnet Mask | Hostname | IP Acquisition Mode | Gateway Address |
| 2 | TPN-MMU-MANAGEMENT-NETWORK | TPN-MMU-X100 | 25254239 | N/A | 192.168.0.140 | 255.255.255.0 | lightware-25254239 | Dhcp | 192.168.0.1 |
| 3 | TPN-MMU-AV-NETWORK | TPN-MMU-X100 | 25254239 | a8:d2:36:02:92:66 | 10.0.0.100 | 255.255.0.0 | N/A | Static | 0.0.0.0 |
| 4 | DOCU_UCX_TX - Video | UCX-4x3-TPN-TX20 | NotApplicable | a8:d2:36:f4:86:43 | 10.0.0.101 | 255.255.0.0 | N/A | Static | 10.0.0.1 |
| 5 | DOCU_UCX_TX - USB | UCX-4x3-TPN-TX20 | NotApplicable | a8:d2:36:f3:86:43 | 10.0.0.102 | 255.255.0.0 | N/A | Static | 10.0.0.1 |
| 6 | DOCU_RX1 - Video | HDMI-OPTN-RX100AU2K | NotApplicable | a8:d2:36:f0:88:98 | 10.0.0.103 | 255.255.0.0 | N/A | Static | 10.0.0.1 |
| 7 | DOCU_RX1 - USB | HDMI-OPTN-RX100AU2K | NotApplicable | a8:d2:36:f1:88:98 | 10.0.0.104 | 255.255.0.0 | N/A | Static | 10.0.0.1 |
| 8 | DOCU_RX2 - Video | HDMI-TPN-RX107AU2K-SR | NotApplicable | a8:d2:36:f0:88:63 | 10.0.0.105 | 255.255.0.0 | N/A | Static | 10.0.0.1 |
| 9 | DOCU_RX2 - USB | HDMI-TPN-RX107AU2K-SR | NotApplicable | a8:d2:36:f1:88:63 | 10.0.0.106 | 255.255.0.0 | N/A | Static | 10.0.0.1 |
| 10 | DOCU_TX - Video | HDMI-TPN-TX207AU2K | NotApplicable | a8:d2:36:02:84:1c | 10.0.0.107 | 255.255.0.0 | N/A | Static | 10.0.0.1 |
| 11 | DOCU_TX - USB | HDMI-TPN-TX207AU2K | NotApplicable | a8:d2:36:02:84:1d | 10.0.0.108 | 255.255.0.0 | N/A | Static | 10.0.0.1 |

*CSV file with the list of the devices in the TPN matrx*

### 7.7.3. Management Tab

The Management menu supports the configuration of the **Control LAN** port of the MMU where users can connect to the MMU controlling and configuring the TPN matrix.
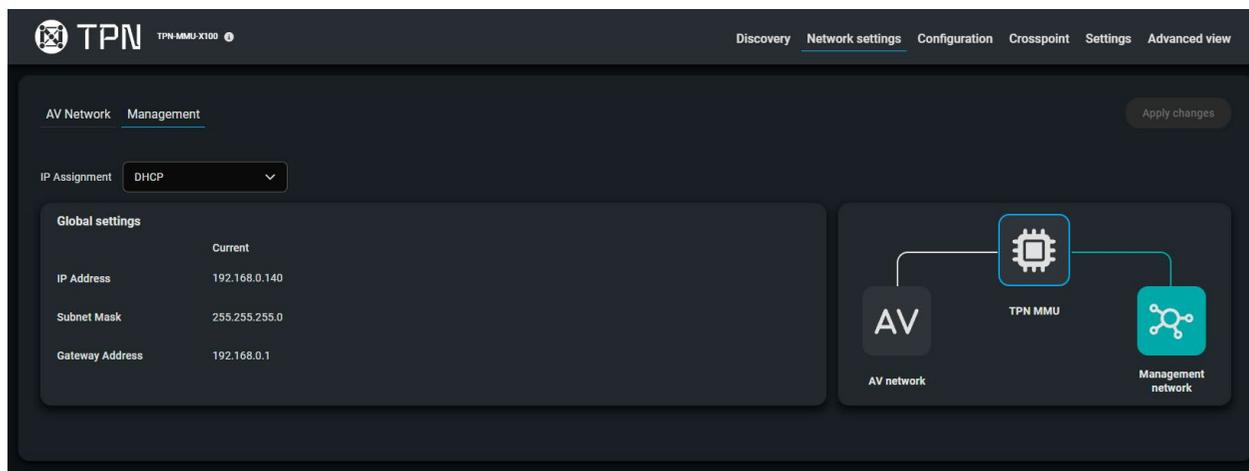


*Network settings page - Management tab in the built in web of the MMU*

IP assignment settings for the Control LAN port:

- **DHCP** (default): dynamic IP address will be applied in case of there is a DHCP server on the network. If not, auto IP address will be set on the port.
- **Static IP**: user customizable IP address can be set and applied on the port. Fill the IP address, Subnet Mask and Gateway address fields and press the the **Apply changes** button to apply the new settings.

**ATTENTION:** When a value is filled, always confirm it pressing an **Enter**.

**ATTENTION: Known issue**: when IP settings are changed to static IP and there is an active RS-232 TCP communication, the changing may break it.

**ATTENTION:** Always be careful when static IP address is set. Incorrect IP address assignment may create network loop. Lightware recommends using of DHCP (dynamic IP address) setting.

## 7.8. Configuration Page

### 7.8.1. SDVoE Tab

SDVoE-based settings can be customized on this tab. Select the wished endpoint device on the left side and the available settings appear on the right panel.
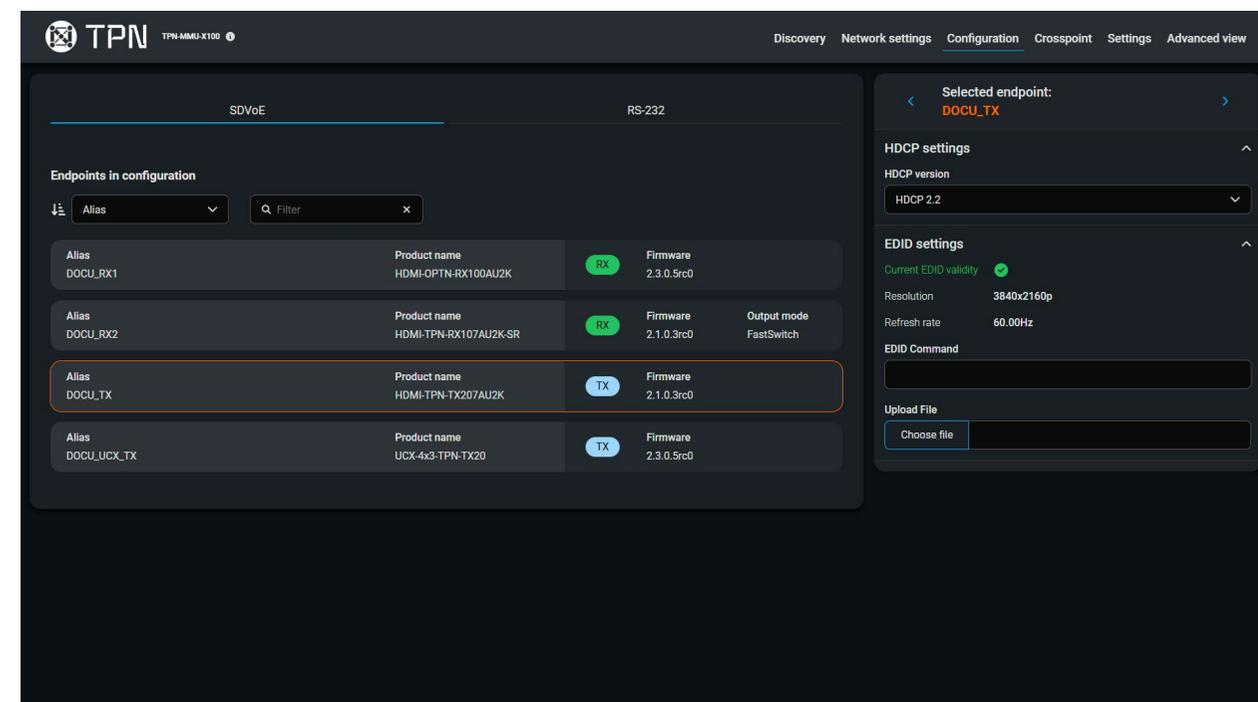


*Configuration page - SDVoE tab in the built in web of the MMU*

**Transmitters (TX)**

**HDCP Settings**

HDCP version: it can be **HDCP 1.4**, **HDCP 2.2** or **Off**.

> **ATTENTION:** In case of Taurus UCX TPN endpoints: the allowed HDCP version which is set in the MMU is not copied to the the input port of the Taurus UCX endpoint.

**EDID Settings**

Information about the current EDID of the TPN port: validation, resolution and refresh rate.

EDID data can be uploaded to the transmitter by two methods: **command** or **file upload** (accepted file is .edid).

> **ATTENTION:** In case of Taurus UCX TPN endpoints: **dynamic EDID** must be set on the emulated EDID memory **in the Taurus endpoint**. See more details about the method in the user manual of the device (PDF).
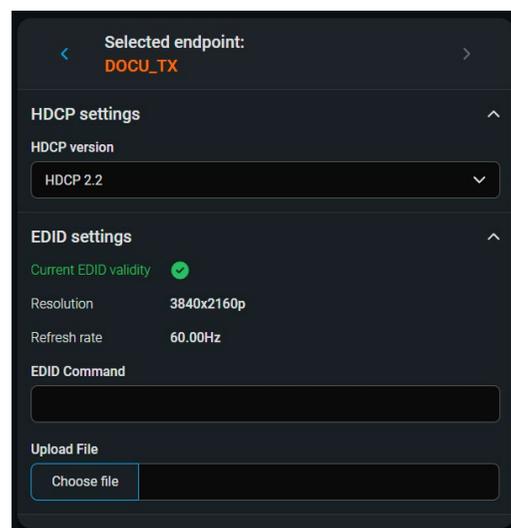
**Receivers (RX)**

**HDCP Settings**

HDCP output mode:

- **FollowSource** - HDCP version is syncronized with the setting of the source.
- **FollowSink (Always Follow)** - HDCP version is always syncronized with the setting of the sink.
- **FollowSink (Follow Once)** - HDCP version is syncronized once with the actual setting of the sink.

> INFO: HDCP output mode settings is available only if the scaling mode is set to Fastswitch or Wall FS.

**EDID Settings**

Information about the current EDID of the TPN port (resolution and refresh rate) and the current EDID data can be downloaded to a file (.edid) by selecting the **Download EDID** button.

**Scaling and Conversion Settings**

> **DIFFERENCE:** The setting is available for **-SR scaling receiver series** only.

Scaler settings can be customized in this panel. Always press the **Apply changes** button to comlete and apply the scaler settings. See more details about it in the Scaler Function of the Receiver section.
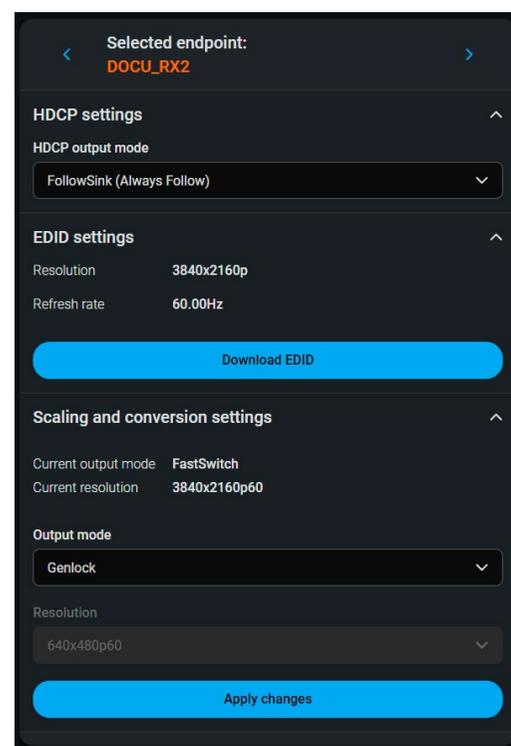
## 7.8.2. RS-232 Tab

The RS-232 port configuration and serial message sending can be applied on the tab. Select the wished endpoint device on the left side and the available settings appear on the right panel.
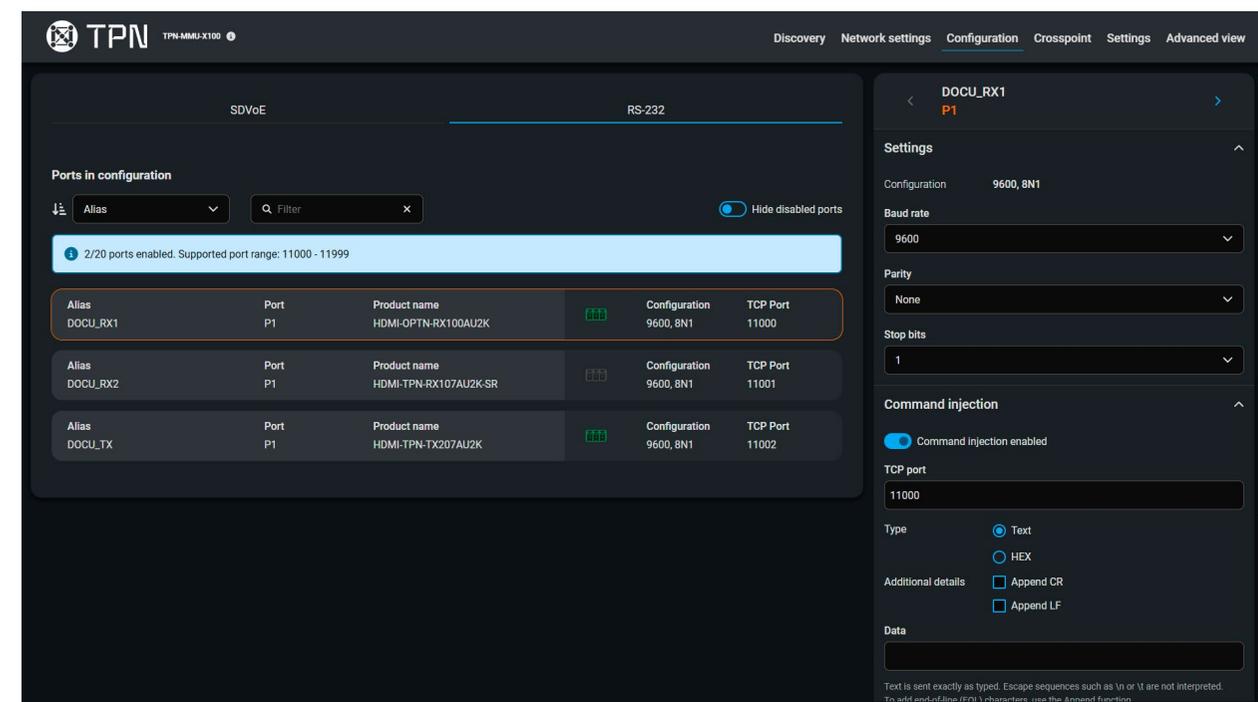


*Configuration page - RS-232 tab in the built in web of the MMU*

**RS-232 Port Settings**

BAUD rate, Parity and Stop bits can be set on the panel.

**Command Injection**

When command injection is enabled, serial message sending could be executable. TCP port is customizable.

**Serial Messaging**

Data type can be **text** or **HEX**, Cr and Lf can be appended.

Notes:

- Text is sent exactly as typed. Escape sequences such as \n or \t are not interpreted.
- To add end-of-line (EOL) characters, use the Append function.
- Inline special characters are not allowed.
- Multi-character inputs (for example \n) are treated as separate characters (\ and n).
- This field allows only printable ASCII characters (codes 0x20-0x7E).

## 7.9. Crosspoint Page

### 7.9.1. Crosspoint Settings
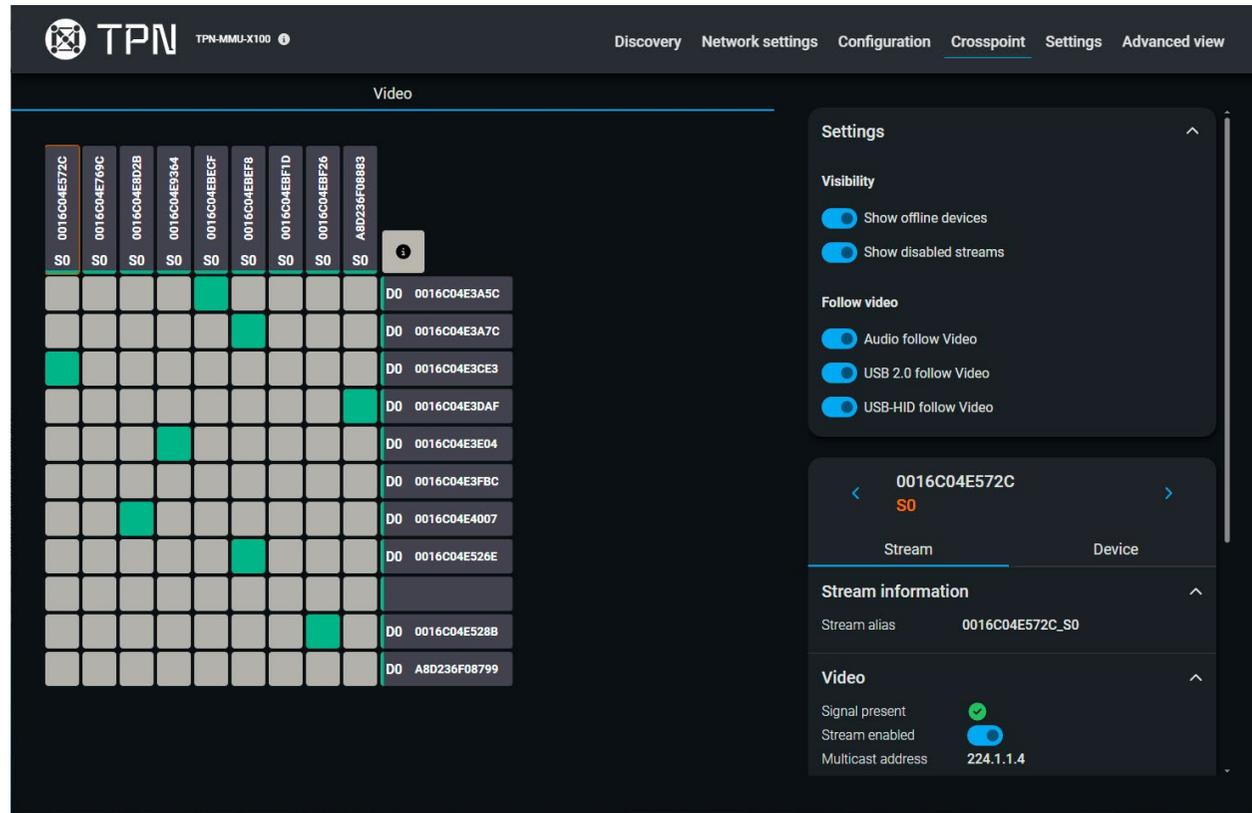


*Crosspoint page in the built in web of the MMU*

The audio/video crosspoint can be set on this page. Stream visibility can be customized. Audio, Icron USB 2.0 and USB HID signals can be enabled or disabled to follow the video signal.

> INFO: There is no different audio, Icron USB 2.0 and USB HID crosspoint table in the built-in web but the independent layers of these signal settings are available over REST API and LW3 command protocol commands:

|  | REST API references | LW3 protocol commands |
|---|---|---|
| **Audio** | Audio Signal Management Commands | Audio Signal Management Commands |
| **Icron USB 2.0** | Icron USB KVM Configuration Commands | Icron USB KVM Configuration Commands |
| **USB HID** | USB HID Configuration Commands | USB HID Configuration Commands |

### 7.9.2. Source Stream Panel

Select a **source stream** (<MAC_address>/<Alias> **S0**) in the crosspoint table to display the source stream panel on the right side. Two tabs appear: **Stream** and **Device**.

**Stream Tab**

Information about the recent video, audio, Icron USB 2.0 and USB signals are displayed on the panel. The source stream can be enabled or disabled.

**Device Tab**

Information about the transmitter are available on the panel, such like device name, IP addresses, MAC addresses and the Icron USB 2.0 module status.
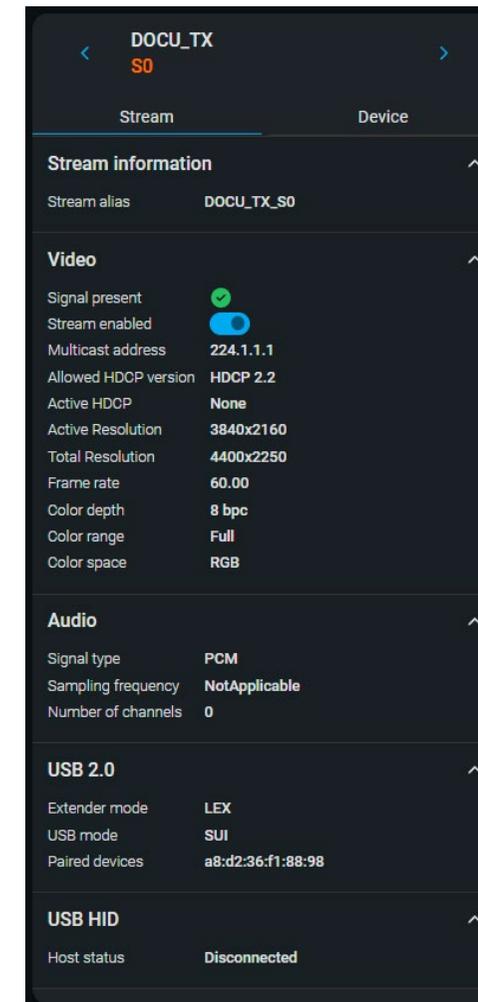


*Source stream panel - Stream tab*



*Source stream panel - Device tab*

### 7.9.3. Destination Stream Panel

Select a **destination stream** (<MAC_address>/<Alias> **D0**) in the crosspoint table to display the destination stream panel on the right side. Two tabs appear: **Stream** and **Device**.

**Stream Tab**

Information about the recent video, audio, Icron USB 2.0 and USB signals are displayed on the panel.

**Device Tab**

Information about the transmitter are available on the panel, such like device name, IP addresses, MAC addresses and the Icron USB 2.0 module status.
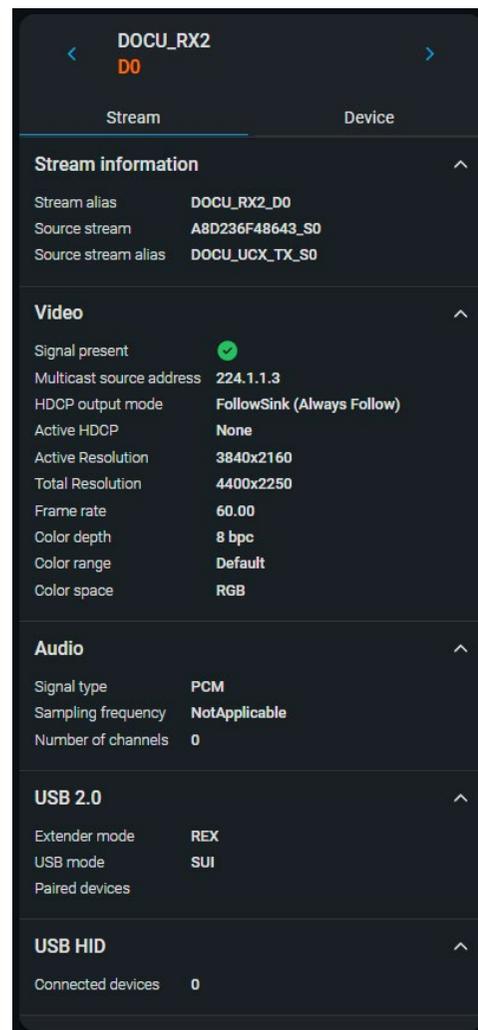


*Source stream panel - Stream tab*
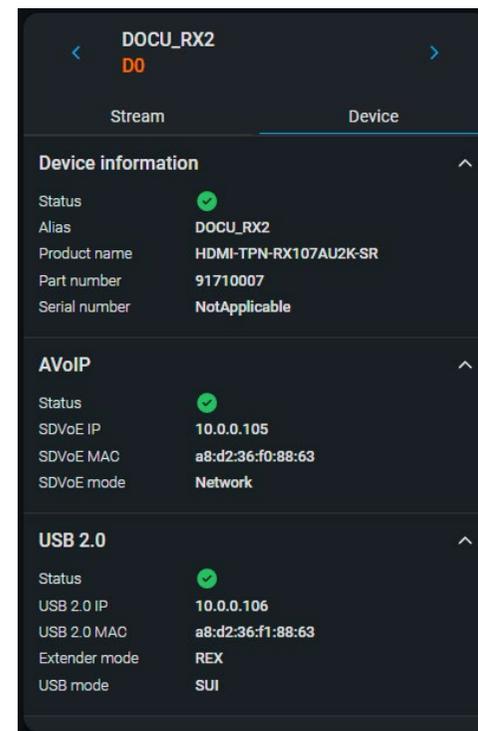


*Source stream panel - Device tab*

## 7.10. Settings Page

The page is dedicated to the system settings of the MMU.

### 7.10.1. Status Tab
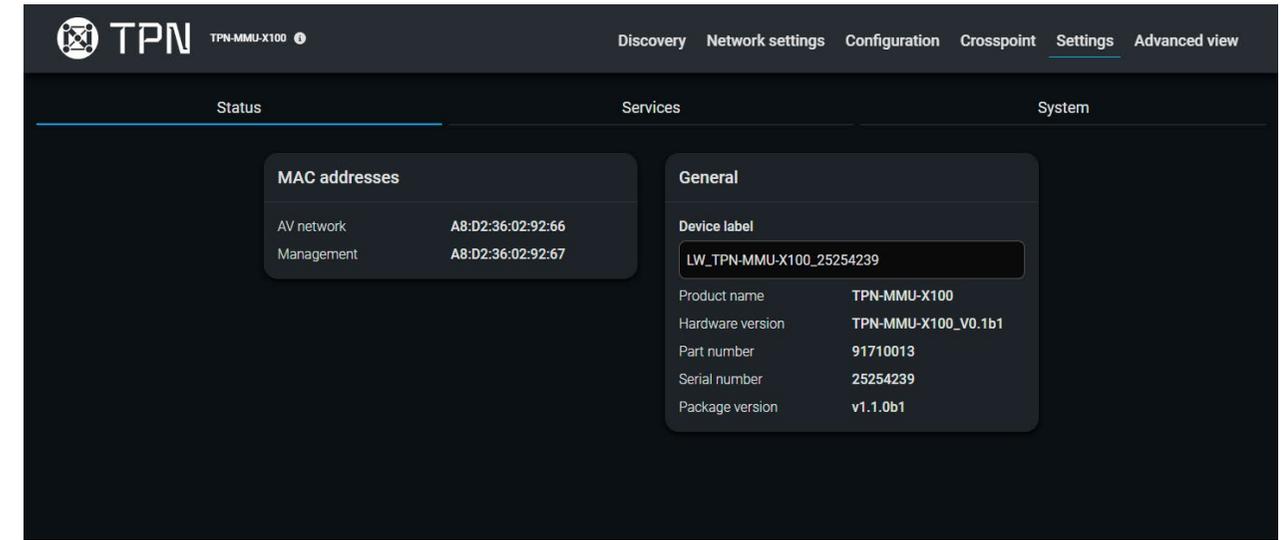


*Settings page - Status Tab in the built in web of the MMU*

General information are displayed on the Status tab, such like:

- MAC addresses;
- **Device label** - it can be customized here. It can be 49 characters long and ASCII characters are allowed. Longer names are truncated.
- Product name;
- Hardware version;
- Part number
- Serial number;
- Firmware package version;

**7.10.2. Services Tab**
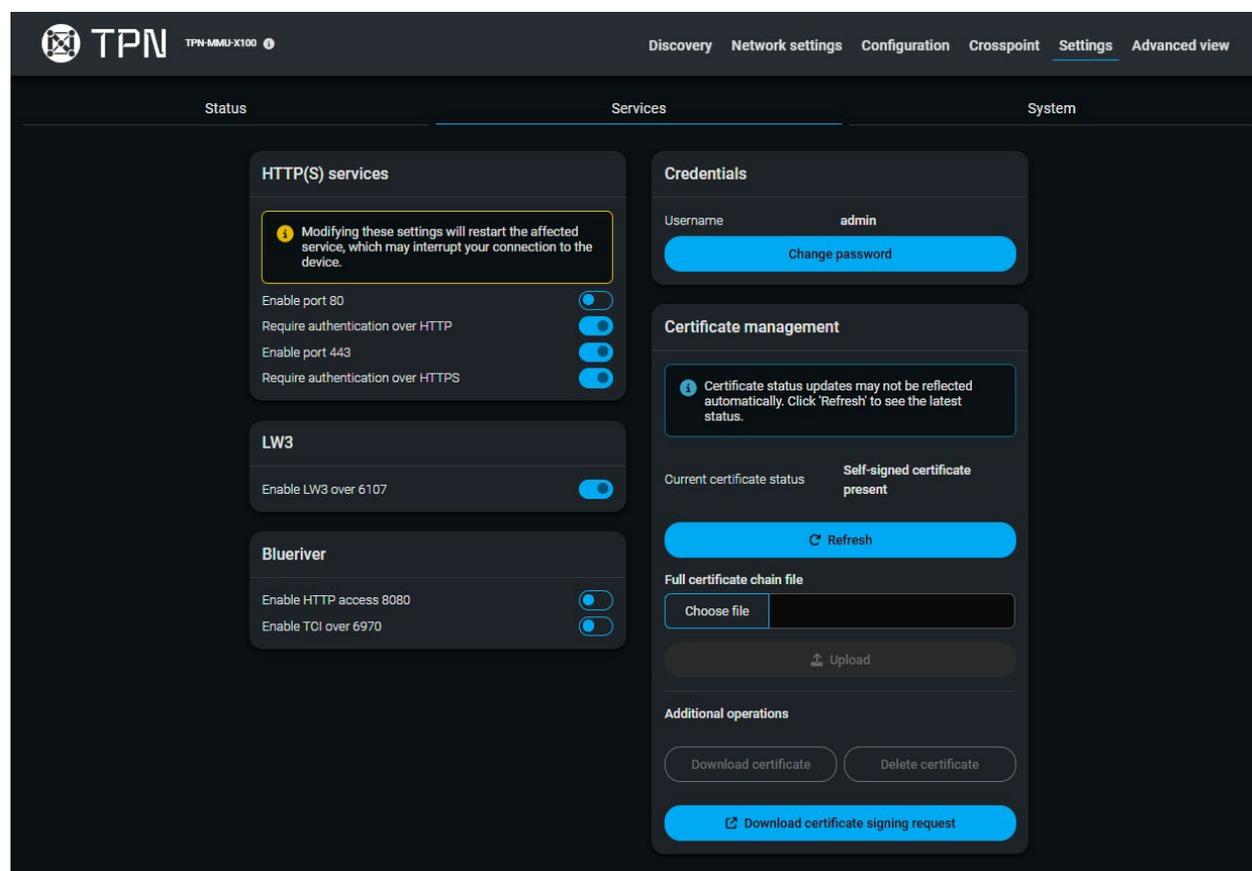


*Settings page - Services Tab in the built in web of the MMU*

The following settings are available on the Services tab:

- **Enable/Disable HTTP(S), LW3 and Blueriver (SDVoE) ports**. Learn more information about the reserved ports for services in the Basic Network Security section, and the list of all reserved ports with details in the Reserved Ports and Security Options section.
- **Changing the password** of the device.
- **Certificate management**: Upload new certificate, download certificate signing request, download actual certificate or delete it.

**7.10.3. System Tab**
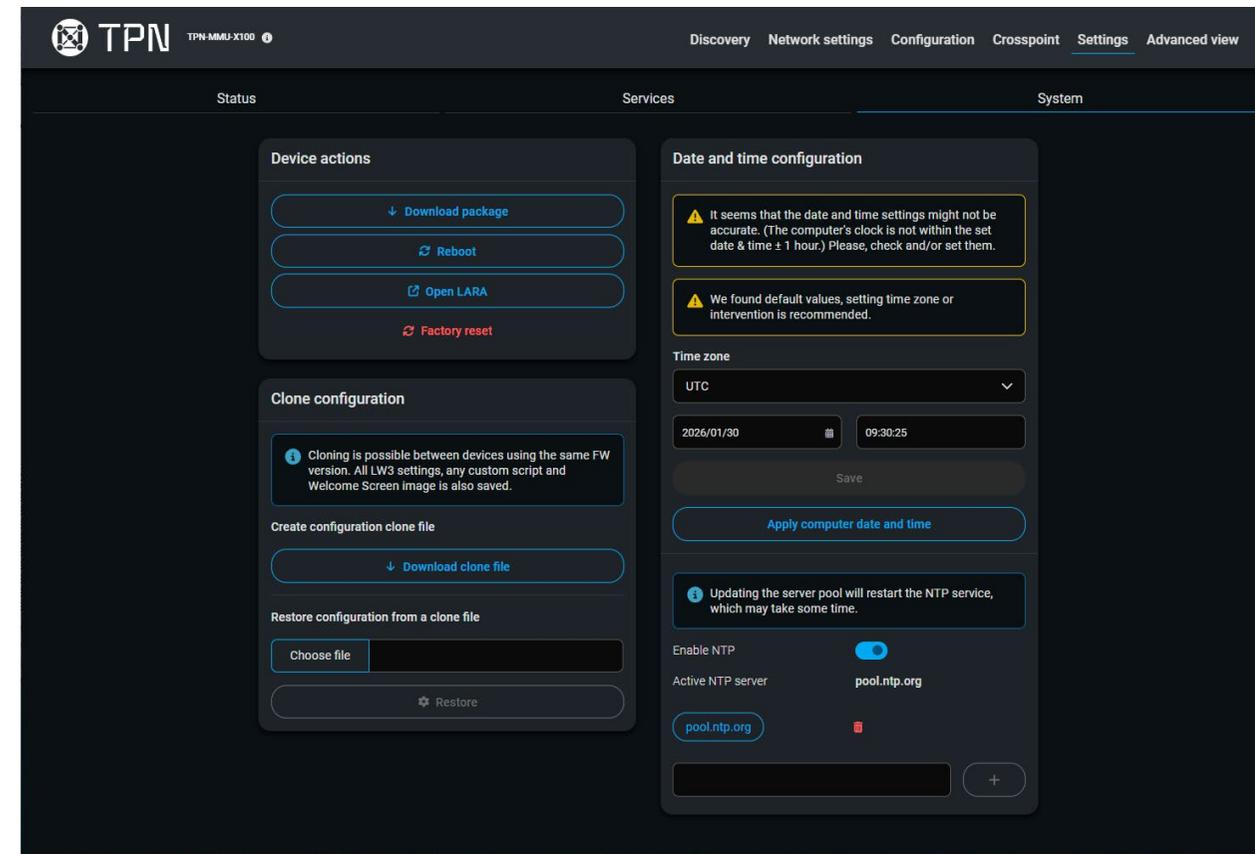


*Settings page - System Tab in the built in web of the MMU*

MMU-related system actions can be performed on this tab.

**Device Actions**

- **↓ Download package** button: pressing the button downloads system logs and configuration files of the MMU for Lightware Support Team. The downloaded file is packed in .tar.gz. Learn more why it is useful in the How to Speed Up the Troubleshooting Process section.
- **⟳ Reboot** button: pressing the button restarts the MMU – the current connections will be terminated.
- **↗ Open LARA** button: pressing the button opens LARA software. See more details about LARA in the Lightware Advanced Room Automation (LARA) section. Learn more about LARA in the dedicated user manual (PDF) of the control software.
- **⟳ Factory reset** button: the device is restarted, current connections are terminated, and the default settings are restored. See the complete list in the Factory Default Settings section.

**Clone Configuration**

- ↓ **Download clone file** button: pressing the button downloads the configuration file (.lcb) contains the actual settings of the MMU. See the detailed list about it in the Content of the Backup File (Clone Configuration) section.
- **Restore configuration from a clone file**: browse the configuration file (.lcb) by the **Choose file** option and press the ⚙ **Restore** button.

**ATTENTION:** All configuration data (including IP addresses) will be **overwritten** by restoring a configuration. See the detailed list about it in the Content of the Backup File (Clone Configuration) section.

**Date and Time Configuration**

The system date and time can be adjusted in the panel. Three different methods are available:

- **Manual**: set the time zone and type the date and time in the fields; and press the **Save** button.

INFO: Pressing the 'Save' button disables the NTP syncronizing setting automatically.

- **Syncronizing with the local PC**: press the **Apply computer date and time** button to syncronize with the controller PC.

INFO: Pressing the 'Apply computer date and time' button disables the NTP syncronizing setting automatically.

- **Enabling NTP** (Network Time Protocol): this is the default setting. The NTP can be enable or disable, new NTP server can be added by the **+** button.

DEFINITION: The Network Time Protocol (NTP) is a networking protocol for clock synchronization between computer systems over packet-switched, variable-latency data networks.

## 7.11. Advanced View (Terminal)
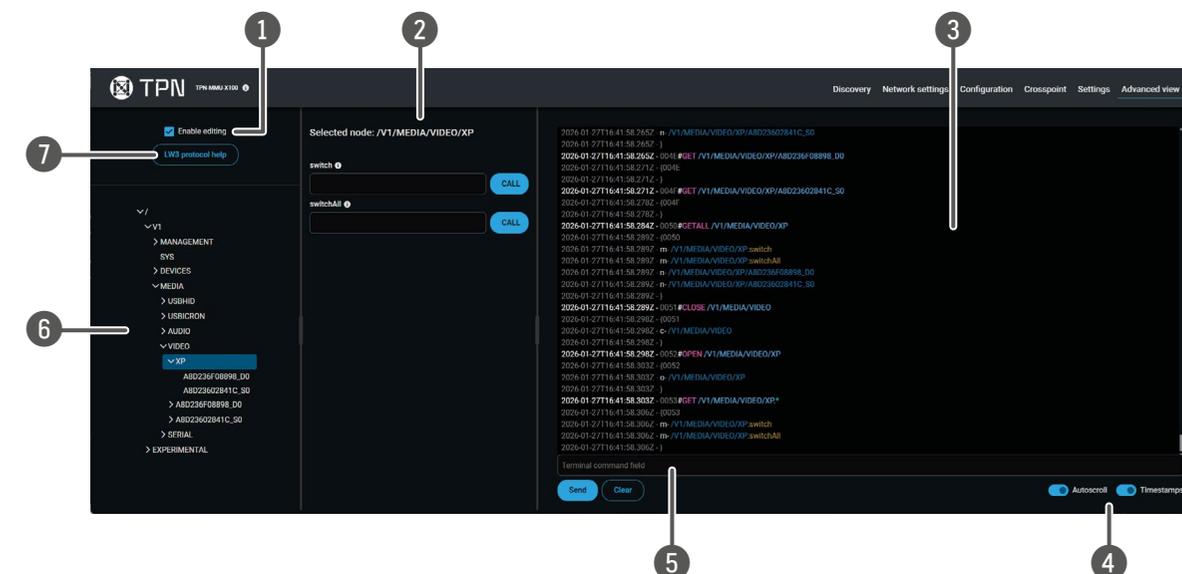


| | | |
|---|---|---|
| **①** | **Edit mode** | The default appearance is the read-only mode. If you want to modify the values or parameters, tick the option. You will be prompted to confirm your selection. |
| **②** | **Node list** | Correspondent parameters and nodes are shown that are connected to 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. |
| **③** | **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 the response. The content of the window can be emptied by the **Clear** button. |
| **④** | **Autoscroll and Timestamp switchers** | If the **Autoscroll** option is ticked, the list is scrolled automatically when a new line is added. If **Timestamp** option is ticked, a timestamp is added to the terminal window view. |
| **⑤** | **Command line** | Type the desired command and execute it by the **Send** button. Clear all current commands and responses in the Terminal window by the **Clear** button. |
| **⑥** | **Protocol tree** | LW3 protocol tree; select an item to see its content. |
| **⑦** | **LW3 protocol help** | Pushing the button results in a help window opening which, describes the most important information about LW3 protocol commands in HTML format. |

# 8

## Lightware REST API Reference

The device can be controlled through standard HTTP(S) requests to ensure the control functions .from a web browser or from a terminal application.

## 8.1. Overview

The Lightware REST API is designed to provide a platform-free interface, where the TPN-MMU-X100 control unit can be controlled by HTTP requests. REST API is a software architectural style based on HTTP protocol, so it can be used via web browser, Node.js and terminal programs.

The TPN-MMU-X100 provides a REST API server where most of the LW3 commands are available (for more details, see the Lightware REST API vs. LW3 Protocol section).

Lightware devices can be controlled with LW3 protocol commands (for more details, see the LW3 Programmer's Reference), LW3 protocol consists of read-only, read-write properties and methods, which operate the same way as REST API GET/POST methods. This is not a new protocol, the LW3 tree structure is available via HTTP(s).

## 8.2. Instructions for the Terminal Application Usage

### 8.2.1. Web Browser Plugins

REST API interface can be easily accessed via a web browser's plugin or using REST API client software, see the example below:
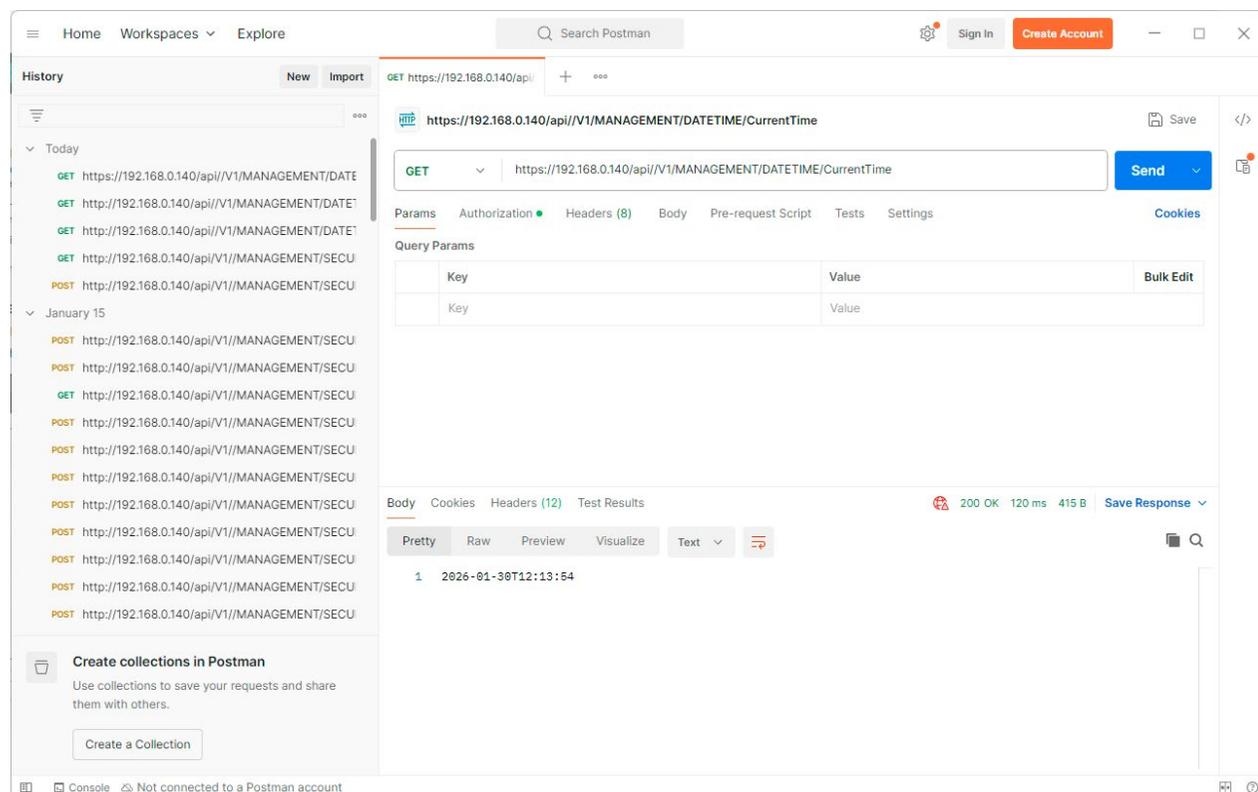


*Postman REST API client*

### 8.2.2. Terminal Application

The REST API requests can be applied to the switcher using a terminal application. You need to install one of them to your control device, for example, Putty, CLI or Curl. *#terminal*

**Curl**

**Curl** is a command line tool that can also connect to the TPN-MMU-X100 series REST SERVER and display communication in a terminal window. It supports data transferring with HTTP and HTTPS standards and handles the basic authentication (username and password) in Windows® and Linux operating systems. Multi-line commands are also accepted, so a script can be stored in a .txt file for future reference.

Check if the Curl package is installed on your system. Type into your console: `curl`. When the answer is `'curl: try 'curl --help' for more information'`, curl is installed.

Some web browser plugins (e.g. REST Client) display the curl version of the sent request.

Once the terminal window is opened, you can enter the commands. Some typical examples are listed in the following section.



*REST API communication in a command line window*

**GET Command  Example**

Query the DHCP state

`curl -i -X GET <ip>/api/<NodePath>/<PropertyName>`

```
C:\Users>curl -i -X GET http://192.168.0.55/api/V1/MANAGEMENT/NETWORK/DhcpEnabled
HTTP/1.1 200 OK
X-Powered-By: Express
Content-Type: application/json; charset=utf-8
Content-Length: 5
ETag: W/"5-fLbvuYullyqbUJDcLlF/4U0SywQ"
Date: Sat, 13 May 2034 13:39:24 GMT
cache-control: max-age=86400,private
Server: lighttpd/1.4.56

true
```

**POST Command Example 1.**

Set the DHCP State

`curl -X POST -i <ip>/api/<NodePath>/<PropertyName> --data <value>`

```
C:\Users>curl -X POST -i http://192.168.0.55/api/V1/MANAGEMENT/NETWORK/DhcpEnabled --data false
HTTP/1.1 200 OK
X-Powered-By: Express
Content-Type: text/html; charset=utf-8
Content-Length: 5
ETag: W/"5-hg914ZeUflab5o9bn2uUeaPo3CI"
Date: Sat, 13 May 2034 13:48:09 GMT
cache-control: max-age=86400,private
Server: lighttpd/1.4.56

false
```

**POST Command Example 2.**

Set OCS Sensor

`curl -X POST -i <ip>/api/<NodePath>/<PropertyName> --data <value>`

```
C:\Users>curl -X POST -i http://192.168.0.55/api/V1/MEDIA/OCS/P1/SensorType --data Active low
HTTP/1.1 200 OK
X-Powered-By: Express
Content-Type: text/plain; charset=utf-8
Content-Length: 2
ETag: W/"2-nOO9QiTIwXgNtWtBJezz8kv3SLc"
Date: Sat, 13 May 2034 14:02:01 GMT
cache-control: max-age=86400,private
Server: lighttpd/1.4.56

Active low
```

**POST Command with Basic Authentication Example**

Set the DHCP State

`curl --user <username>:<password> -X POST -i <ip>/api/<NodePath>/<PropertyName> --data <value>`

```
C:\Users>curl --user admin:pwrd -X POST -H -i http://192.168.0.110/api/V1/MANAGEMENT/NETWORK/
DhcpEnabled --data false

OK
```

**HTTPS Command Example 2.**

Set the DHCP State

`curl -X POST -k -i <ip>/api/<NodePath>/<PropertyName> --data <value>`

```
C:\Users>curl -X POST -k -i https://192.168.0.110/api/V1/MANAGEMENT/NETWORK/DhcpEnabled --data
false
HTTP/1.1 200 OK
X-Powered-By: Express
Content-Type: text/plain; charset=utf-8
Content-Length: 2
ETag: W/"2-nOO9QiTIwXgNtWtBJezz8kv3SLc"
Date: Sun, 28 May 2034 12:28:20 GMT
cache-control: max-age=86400,private
Server: lighttpd/1.4.56

OK
```

## 8.3. Protocol Rules

### 8.3.1. Command Structure Example
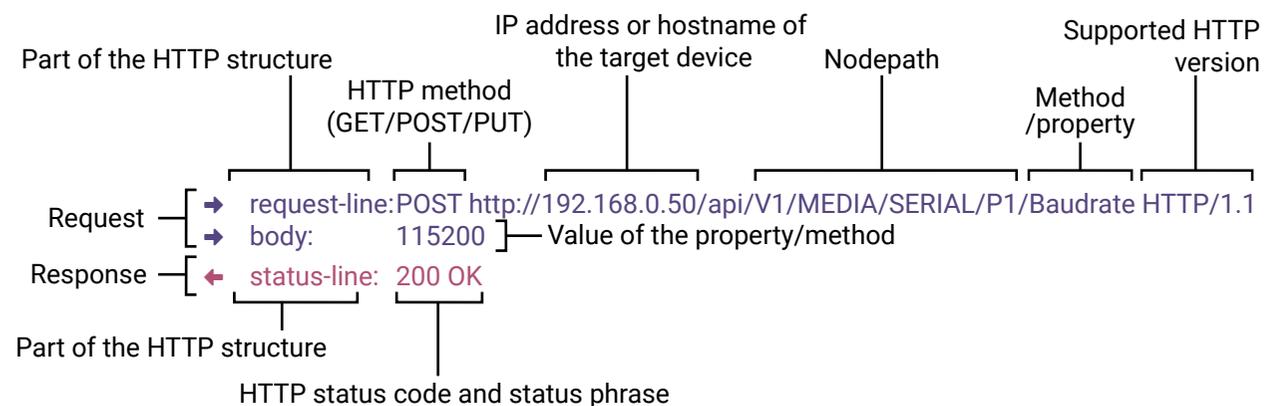


The examples below show how to apply the REST API in different environments:

**Curl in Command Line Terminal**

➔ curl -X POST -i http://192.168.0.50/api/V1/MEDIA/SERIAL/P1/Baudrate --data 115200

**REST API Client in Mozilla**

**Method:** POST
**URL:** http://192.168.0.50/api/V1/MEDIA/SERIAL/P1/Baudrate
**Body content type:** text/plain
**Body:** 115200

### 8.3.2. General Rules

- All names and parameters are case-insensitive.
- The methods, nodes and properties are separated by a slash ('/') character.
- The node name consists of letters of the English alphabet and numbers.
- All properties and methods are available HTTP(S) below /api as an URL.
- The HTTP server is available on port 80, the HTTPS server is available on port 443.
- GET / PUT/ POST methods are supported.
- The request-line contains the IP address (or hostname) and the nodepath.
- Arguments and property values should be given in the HTTP request's body as a plain text.
- REST API - LW3 converter does escaping automatically.
- The node paths describe the exact location of the node, listing each parent node up to the root.
- The supported HTTP protocol: standard
- There is no maxiumum size or character length of the request.

### 8.3.3. Legend for the Control Commands

**Command and Response – Example**

➔ request-line: GET·&lt;ip&gt;/api/V1/MEDIA/GPIO/&lt;port&gt;/Input

⬅ body: &lt;status code&gt;

| Format | Description |
|---|---|
| &lt;ip&gt; | IP address or hostname of the target device |
| &lt;in&gt; | Input port number |
| &lt;out&gt; | Output port number |
| &lt;port&gt; | Input or output port number |
| &lt;loc&gt; | Location number |
| &lt;parameter&gt; | Variable defined and described in the command |
| &lt;expression&gt; | Batched parameters: the underline means that more expressions or parameters can be placed by using a semicolon, e.g. **P1;P3** |
| ➔ | Sent request |
| ⬅ | Received response |
| · | Space character |

Further, not listed &lt;parameters&gt; are defined at each command.

### 8.3.4. Lightware REST API vs. LW3 Protocol

All methods and properties of the LW3 tree structure appear below /api as a HTTP(s) URL. The separator character is always a slash ('/') character instead of point ('.') and colon (':'). The URL is case-insensitive.

**Example**

The LW3 property:
/V1/MEDIA/SERIAL/P1.Configuration

Available in REST API:
192.168.0.1/api/V1/MEDIA/SERIAL/P1/Configuration
192.168.0.1/API/v1/media/serial/p1/configuration

The following features are implemented only in REST API, but not in LW3 protocol:

- Command Injection over Serial Port

The most important commands are listed in this chapter. Other commands can be inferred by the LW3 tree structure, where the read-only (eg. **pr** /V1/MEDIA/DATETIME.CurrentTime) and read-write properties (**pw** /V1/MEDIA/NETWORK.HostName) can be listed. For more details about LW3 tree structure, see the LW3 Programmer's Reference section or the Advanced View (Terminal).

## 8.3.5. Method Types

**GET Method**

GET method can be used to get the value of a property. It works the same way as the LW3 GET command.

**PUT/ POST Method**

In this case, POST and PUT are equivalent, they are for modifying read-write properties and invoking methods. They replace LW3 SET and CALL command.

## 8.3.6. Supported Commands

**Querying property value (GET)**

The requested value is in the body of the response.

| Protocol | Command |
|---|---|
| **REST API** | ➜ request-line:  GET·<ip>/api/<NODEPATH>/<PropertyName> |
| **Example** | ➜ request-line:  GET http://192.168.0.100/api/V1/MEDIA/VIDEO/XP/I2/SignalPresent |
| **LW3** | ▶ GET·/<NODEPATH>.<PropertyName> |
| **Example** | ▶ GET /V1/MEDIA/VIDEO/XP/I2.SignalPresent |

**Setting property value (SET)**

The desired property value should be given as a plain text in the body of the request. The new value is in the body of the response.

| Protocol | Command |
|---|---|
| **REST API** | ➜ request-line:  POST·<ip>/api/<NODEPATH>/<PropertyName><br>➜ body:           <new_value> |
| **Example** | ➜ request-line:  POST http://192.168.0.100/api/V1/MEDIA/VIDEO/XP/I2/Mute<br>➜ body:            false |
| **LW3** | ▶ SET·/<NODEPATH>.<PropertyName>=<new_value> |
| **Example** | ▶ SET /V1/MEDIA/VIDEO/XP/I2.Mute=false |

**Invoking method (CALL)**

The argument should be given in the body of the request.

| Protocol | Command |
|---|---|
| **REST API** | ➜ request-line:  POST·<ip>/api/<NODEPATH>/<methodName><br>➜ body:           <new_value> |
| **Example** | ➜ request-line:  POST http://192.168.0.100/api/V1/MEDIA/VIDEO/XP/switch<br>➜ body: I5:O1 |
| **LW3** | ▶ CALL·/<NODEPATH>:<methodName>(<value>) |
| **Example** | ▶ CALL /V1/MEDIA/VIDEO/XP:switch(I5:O1) |

## 8.3.7. Not Supported Commands

**Querying node (GET)**

| Protocol | Command | Note |
|---|---|---|
| **REST API** | Not supported | 404 error code |
| **LW3** | ▶ GET·/<NODEPATH> | |
| **Example** | ▶ GET /V1/MEDIA/VIDEO | |

**Subscribing to a node (OPEN)**

| Protocol | Command | Note |
|---|---|---|
| **REST API** | Not interpreted | Not supported |
| **LW3** | ▶ OPEN·/<NODEPATH> | |
| **Example** | ▶ OPEN /V1/MEDIA/VIDEO | |

**Unsubscribing from a Node (CLOSE)**

| Protocol | Command | Note |
|---|---|---|
| **REST API** | Not interpreted | Not supported |
| **LW3** | ▶ CLOSE·/<NODEPATH> | |
| **Example** | ▶ CLOSE /V1/MEDIA/VIDEO | |

## 8.3.8. Status Codes, Error Messages

The standard HTTP response codes are defined to supply information about the response and the executed command like:

| Error code | | Description |
|---|---|---|
| 200 | OK | Standard response for successful HTTP request. |
| 401 | Unauthorized | |
| 405 | Method Not Allowed | A request method is not supported for the requested resource. This is the error code when trying to modify a read-only property. |
| 404 | Not Found | Invalid nodepath or property name. |
| 406 | Not Acceptable | LW3 server error response for POST and PUT method, equals the following LW3 error codes:<br>**pE:** an error for the property<br>**mE:** an error for a method |
| 500 | Internal Server Error | All other errors (Lw3ErrorCodes_InternalError). |

## 8.3.9. Polling

Subscription and unsubscription features are not supported, they can be substituted with polling.

## 8.4. REST API Security

The REST API is designed with two security features: **Authentication** and **Encryption.** Both of them are optional and can be used independently of each other.

### 8.4.1. Authentication

Basic access authentication is designed to limit user access for the REST API server. It requires user authentication by using a password (username is fixed). *#authentication #https #security*

Follow the instructions below to set the password:

**Step 1.** Set the password.

➜ request-line: POST·<ip>/api/V1/MANAGEMENT/NETWORK/AUTHENTICATION/setPassword
➜ body: <new_password>

**Step 2.** Enable the basic authentication on the chosen port (HTTP: 80 or HTTPS: 443).

➜ request-line: POST·<ip>/api/V1/MANAGEMENT/NETWORK/SERVICES/HTTP/AuthenticationEnabled
➜ body: true

**Step 3.** Restart network services.

➜ request-line: POST·<ip>/api/V1/MANAGEMENT/NETWORK/SERVICES/HTTP/restart

> **ATTENTION:** The password will not be encrypted by this authentication mode, it remains accessible when the communication happens on HTTP.

For more details, see the Basic Authentication section.

### 8.4.2. Encryption (HTTPS)

There is no encryption when the REST API communication happens via HTTP, because the HTTP protocol is not encrypted. The REST API server is available via HTTPS on the 443 port. To avoid the data interception (e.g. stealing the password) HTTP should be disabled and HTTPS protocol used instead.

> **ATTENTION:** Please ensure proper time and date setting in the MMU, because it affects the self-signed certificate (SSL) generation when using WSS or HTTPS. Improper time and date setting may lead to certificate rejection.

HTTPS does not guarantee that the communication is secure. Make sure that the client communicates with the server directly, without any third-party element in the communication route (Man-in-the-middle attack).

For more details, see the Encryption (HTTPS, WSS) section.

## 8.5. System Commands - MMU

### 8.5.1. Setting the Device Label

**Request and Response** *#devicelabel #label*

➜ request-line: POST·http://<ip>/api/V1/MANAGEMENT/LABEL/DeviceLabel
➜ body: <custom_name>

⬅ status-line: 200·OK
⬅ body: <custom_name>

The Device Label can be 49 characters long and ASCII characters are allowed. Longer names are truncated.

**Example**

➜ request-line: POST http://192.168.0.50/api/V1/MANAGEMENT/LABEL/DeviceLabel
➜ body: TPNMMU

⬅ status-line: 200 OK
⬅ body: TPNMMU

### 8.5.2. Restarting the Device

The MMU can be restarted – the current connections will be terminated.

**Request and Response** *#reboot #restart*

➜ request-line: POST·http://<ip>/api/V1/SYS/restart

> INFO: The body has to be empty, and the content type should be text/plain.

⬅ staus-line: 200 OK

**Example**

➜ request-line: POST http://192.168.0.50/api/V1/SYS/restart
⬅ status-line: 200 OK

### 8.5.3. Restoring the Factory Default Settings

**Request and Response**

➜ request-line: POST·http://<ip>/api/V1/SYS/factoryDefaults

> INFO: The body has to be empty, and the content type should be text/plain.

⬅ status-line: 200 OK

**Example**

➜ request-line: POST http://192.168.0.50/api/V1/SYS/factoryDefaults
⬅ status-line: 200 OK

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

### 8.5.4. Querying the Firmware Package Version

**Request and Response**   *#firmwareversion*

➡️ request-line:    GET·http://\<ip>/api/V1/PackageVersion

⬅️ status-line:    200·OK
⬅️ body:        \<firmware_version>

**Example**

➡️ request-line:    GET http://192.168.0.50/api/V1/PackageVersion

⬅️ status-line:    200 OK
⬅️ body:        v1.0.0b3

### 8.5.5. Querying the Serial Number

**Request and Response**

➡️ request-line:    GET·http://\<ip>/api/V1/SerialNumber

⬅️ status-line:    200·OK
⬅️ body:        \<serial_number>

**Example**

➡️ request-line:    GET http://192.168.0.50/api/V1/SerialNumber

⬅️ status-line:    200 OK
⬅️ body:        25254239

### 8.5.6. Querying the Date and Time of the System

**Request and Response**   *#time*

➡️ request-line:    GET·http://\<ip>/api/V1/MANAGEMENT/DATETIME/CurrentTime

⬅️ status-line:    200·OK
⬅️ body:        \<current_date_and_time>

**Parameters**

\<current_time>: The new time in ISO 8601 date time format (YYYY-MM-DDTHH:MM:SS)

**Example**

➡️ request-line:    GET http://192.168.0.50/api/V1/MANAGEMENT/DATETIME/CurrentTime

⬅️ status-line:    200 OK
⬅️ body:        2026-01-06T13:19:37

### 8.5.7. Setting of the Date and Time Manually

**Request and Response**   *#time*

➡️ request-line:    POST·http://\<ip>/api/V1/MANAGEMENT/DATETIME/setTime
➡️ body:        \<date_time>

⬅️ status-line:    200·OK
⬅️ body:        \<date_time>

**Example**

➡️ request-line:    POST http://192.168.0.50/api/V1/MANAGEMENT/DATETIME/setTime
➡️ body:        2034-05-06T14:47:25

⬅️ status-line:    200 OK
⬅️ body:        2034-05-06T14:47:25

### 8.5.8. Enabling/Disabling NTP

> DEFINITION: The Network Time Protocol (NTP) is a networking protocol for clock synchronization between computer systems over packet-switched, variable-latency data networks.

**Request and Response**   *#ntp*

➡️ request-line:    POST·http://\<ip>/api/V1/MANAGEMENT/DATETIME/NTP/Enabled
➡️ body:        \<logical_value>

⬅️ status-line:    200·OK
⬅️ body:        \<logical_value>

**Parameters**

\<logical_value>: If **true**, the NTP is enabled, if **false**, it is disabled.

**Example**

➡️ request-line:    POST http://192.168.0.50/api/V1/MANAGEMENT/DATETIME/NTP/Enabled
➡️ body:        true

⬅️ status-line:    200 OK
⬅️ body:        true

### 8.5.9. Setting the NTP Server

▌ DEFINITION: The Network Time Protocol (NTP) is a networking protocol for clock synchronization between computer systems over packet-switched, variable-latency data networks.

**Request and Response**    *#ntp*

➡ request-line:   POST·http://\<ip>/api/V1/MANAGEMENT/DATETIME/NTP/ServerPool
➡ body:         \<server_address>

⬅ status-line:   200·OK
⬅ body:         \<server_address>

**Example**

➡ request-line:   POST http://192.168.0.50/api/V1/MANAGEMENT/DATETIME/NTP/ServerPool
➡ body:         pool.ntp.org

⬅ status-line:   200 OK
⬅ body:         pool.ntp.org

## 8.6. Endpoint Management Commands

### 8.6.1. Discovering the Endpoints on the Network

After calling this command the discovered TPN/OPTN series endpoint devices appears under the DEVICES node based on their MAC addresses.

**Request and Response**    *#discover*

➡ request-line:   POST·http://\<ip>/api/V1/DEVICES/discover

⬅ status-line:   200 OK

**Example**

➡ request-line:   POST http://192.168.0.50/api/V1/DEVICES/discover

⬅ status-line:   200 OK

### 8.6.2. Adding an Endpoint to the Matrix

**Request and Response**

➡ request-line:   POST·http://\<ip>/api/V1/DEVICES/\<MAC_address>/addToMainGroup

⬅ status-line:   200 OK

**Parameters**

\<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

➡ request-line:   POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/addToMainGroup

⬅ status-line:   200 OK

### 8.6.3. Removing an Endpoint from the Matrix

**Request and Response**

➡ request-line:   POST·http://\<ip>/api/V1/DEVICES/\<MAC_address>/removeFromConfiguration

⬅ status-line:   200 OK

**Parameters**

\<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

➡ request-line:   POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/removeFromConfiguration

⬅ status-line:   200 OK

### 8.6.4. Identifying an Endpoint

Calling the method results in the blinking of the front panel status LEDs for 10 seconds. This feature can be used to help to identify the device itself in the rack shelf.

**Request and Response**

➡ request-line:   POST·http://\<ip>/api/V1/DEVICES/\<MAC_address>/identifyMe

⬅ status-line:   200 OK

**Parameters**

\<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

➡ request-line:   POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/identifyMe

⬅ status-line:   200 OK

### 8.6.5. Adding Alias Name to an Endpoint

The given alias name helps easily identifying the endpoint on the network and also can be used for AV crosspoint switching as a stream ID.

**Request and Response**

➡ request-line: POST·http://\<ip>/api/V1/DEVICES/\<MAC_address>/Alias
➡ body: \<alias>

⬅ status-line: 200·OK
⬅ body: \<alias>

**Parameters**

\<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

\<alias> It must be non-empty, contain only [ **A-Z**, **0-9**, '_' ], and maximum 32 characters long.

**Example**

➡ request-line: POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/Alias
➡ body: mtr01_tx

⬅ status-line: 200 OK
⬅ body: MTR01_TX

### 8.6.6. Restarting an Endpoint

Calling the method results in the endpoints restarting – the connection with the remote device and the signal transmission will be terminated. After rebooting, the configuration settings are reloaded and the connection with the remote device is established again.

**Request and Response**

➡ request-line: POST·http://\<ip>/api/V1/DEVICES/\<MAC_address>/restart

⬅ status-line: 200 OK

**Parameters**

\<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

➡ request-line: POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/restart

⬅ status-line: 200 OK

### 8.6.7. Restoring the Factory Default Settings on an Endpoint

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

**Request and Response**

➡ request-line: POST·http://\<ip>/api/V1/DEVICES/\<MAC_address>/factoryReset

⬅ status-line: 200 OK

**Parameters**

\<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

➡ request-line: POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/factoryReset

⬅ status-line: 200 OK

## 8.7. Video Signal Management Commands

> INFO: The MMU does not transmit AV signals, only controls the source and destination streams of the endpoint devices in the TPN matrix.

### 8.7.1. Switching the Video Stream to One Destination

> INFO: The audio signal follows the video by default. The independent audio layer can be configured, see the details in the Audio Signal Management Commands section.

**Request and Response**

➡ request-line: POST·http://\<ip>/api/V1/MEDIA/VIDEO/XP/switch
➡ body: \<source_stream>:\<destination_stream>

⬅ status-line: 200 OK
⬅ status-line: \<source_stream>:\<destination_stream>

**Parameters**

\<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

\<destination_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

> TIPS AND TRICKS: Alias name can also be used for source and destination stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

➡ request-line: POST http://192.168.0.50/api/V1/MEDIA/VIDEO/XP/switch
➡ body: MTR01_TX_S0:HALL_RX_D0

⬅ status-line: 200 OK
⬅ status-line: MTR01_TX_S0:HALL_RX_D0

## 8.7.2. Switching the Video Stream to All Destinations

> INFO: The audio signal follows the video by default. The independent audio layer can be configured, see the details in the Audio Signal Management Commands section.

**Request and Response**

➡ request-line:  POST·http://<ip>/api/V1/MEDIA/VIDEO/XP/switchAll
➡ body:              <source_stream>

⬅ status-line:    200 OK
⬅ status-line:    <source_stream>

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

> TIPS AND TRICKS: Alias name can also be used for source stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

➡ request-line:  POST http://192.168.0.50/api/V1/MEDIA/VIDEO/XP/switchAll
➡ body:              A1D236F08864_S0

⬅ status-line:    200 OK
⬅ status-line:    A1D236F08864_S0

## 8.7.3. Enabling/Disabling the Source Stream

**Request and Response**

➡ request-line:  POST·http://<ip>/api/V1/MEDIA/VIDEO/<source_stream>/Enable
➡ body:              <logical_value>

⬅ status-line:    200 OK
⬅ status-line:    <logical_value>

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

<logical_value>: If **true**, the stream is enabled, if **false**, it is disabled.

**Example**

➡ request-line:  POST http://192.168.0.50/api/V1/MEDIA/VIDEO/A8D236F08863_S0/Enable
➡ body:              true

⬅ status-line:    200 OK
⬅ status-line:    true

## 8.7.4. Querying the Parameters of the Video Stream

**Request and Response**

➡ request-line:  GET·http://<ip>/api/V1/MEDIA/VIDEO/<stream_ID>/

⬅ status-line:    200 OK
⬅ status-line:    <parameter_value>

**Parameters**

<stream_ID>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 or _D0 character line as "stream nr 0". Example: A8D236F08863_D0

:

| <parameter> | Parameter description | Value | Value description |
|---|---|---|---|
| SignalPresent | Active signal is present in the stream or not. | **true** | Signal is present. |
| | | **false** | Signal is not present. |
| ActiveResolution | Resolution of the stream. | resolution | Example: 3840x2160 |
| RefreshRate | Image refresh rate of the stream. | refresh rate | Example: 60.00, as 60 Hz |
| ColorDepth | Color depth of the stream | **8 bpc** | 8 bit per channel = 24 bit |
| | | **10 bpc** | 10 bit per channel = 30 bit |
| | | **12 bpc** | 12 bit per channel = 36 bit |
| ColorSpace | Color space of the stream | **RGB** | RGB color space |
| | | **YCbCr 4:4:4** | YCbCr color space, 4:4:4 sampling |
| | | **YCbCr 4:2:2** | YCbCr color space, 4:2:2 sampling |
| | | **YCbCr 4:2:0** | YCbCr color space, 4:2:0 sampling |
| ColorRange | Color range of the stream | **Default** | Default color range |
| | | **Full** | Full color range |
| | | **Limited** | Limited color range |
| StreamAlias | Alias of the stream | alias name | Example: MTR_RX_D0 |
| SourceStream | Source stream ID what is connected to the destination stream | <MAC>_S0 | Example: A8D236F08863_S0 |
| SourceStreamAlias | Alias of the source stream what is connected to the destination stream | <alias>_S0 | Example: MTR_TX_S0 |

**Example**

➡ request-line:  GET http://192.168.0.50/api/V1/MEDIA/VIDEO/A8D236F08863_S0/SignalPresent

⬅ status-line:    200 OK
⬅ status-line:    true

## 8.7.5. HDCP Setting for the Source Stream

HDCP capability can be enabled/disabled on the input ports, thus non-encrypted content can be enforced so that non-HDCP compliant displays can be used. See more information in the HDCP Management section.

**Request and Response**     *#hdcp*

➡ request-line:   POST·http://&lt;ip&gt;/api/V1/MEDIA/VIDEO/&lt;source_stream&gt;/HDCP/AllowedHdcpVersion
➡ body:             &lt;HDCP_encr&gt;

⬅ status-line:    200 OK
⬅ status-line:    &lt;HDCP_encr&gt;

**Parameters**

&lt;source_stream&gt;: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

| Parameter | Parameter description | Value | Value description |
|---|---|---|---|
| &lt;HDCP_encr&gt; | HDCP encryption setting | **off** | HDCP encryption is disabled. |
| | | **HDCP 1.4** | HDCP 1.4 |
| | | **HDCP 2.2** | HDCP 2.2 |

**Example**

➡ request-line:   POST http://192.168.0.50/api/V1/MEDIA/VIDEO/A8D236F08863_S0/HDCP/
                    AllowedHdcpVersion
➡ body:             HDCP 1.4

⬅ status-line:    200 OK
⬅ status-line:    HDCP 1.4

## 8.7.6. HDCP Setting for the Destination Stream

HDCP capability can be set ton the output port, thus non-encrypted content can be transmitted to a non-HDCP compliant display. See more information in the HDCP Management section.

**Request and Response**     *#hdcp*

➡ request-line:   POST·http://&lt;ip&gt;/api/V1/MEDIA/VIDEO/&lt;destination_stream&gt;/HDCP/HdcpOutputMode
➡ body:             &lt;HDCP_auth&gt;

⬅ status-line:    200 OK
⬅ status-line:    &lt;HDCP_auth&gt;

**Parameters**

&lt;destination_stream&gt;: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

| Parameter | Parameter description | Value | Value description |
|---|---|---|---|
| &lt;HDCP_auth&gt; | HDCP authentication setting on the output | **FollowSource** | Output follows the HDCP setting of the source stream. |
| | | **FollowSink (Always Follow)** | Output always follows the HDCP capability of the sink device. |
| | | **FollowSink (Follow Once)** | Output follows the HDCP capability of the sink device. |

**Example**

➡ request-line:   POST http://192.168.0.50/api/V1/MEDIA/VIDEO/A8D236F08863_D0/HDCP/HdcpOutputMode
➡ body:             FollowSink (Always Follow)

⬅ status-line:    200 OK
⬅ status-line:    FollowSink (Always Follow)

## 8.7.7. Querying the EDID Data of the Destination

**Request and Response** *#edid*

➡ request-line: GET·http://<ip>/api/V1/MEDIA/VIDEO/<destination_stream>/EDID/Data

⬅ status-line: 200 OK
⬅ status-line: <EDID_data>

**Parameters**

<destination_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

**Example**

➡ request-line: GET http://192.168.0.50/api/V1/MEDIA/VIDEO/A8D236F08863_D0/EDID/Data

⬅ status-line: 200 OK
⬅ body: 00ffffffffffff0010a6000156 524c420816010380341d780a01c1a057479827124c4c21...

## 8.7.8. Uploading EDID Data for the Source

**Request and Response** *#edid*

➡ request-line: POST·http://<ip>/api/V1/MEDIA/<source_stream>/EDID/setData
➡ body: <EDID_data>

⬅ status-line: 200 OK
⬅ status-line: <EDID_data>

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

**Example**

➡ request-line: POST http://192.168.0.50/api/V1/MEDIA/VIDEO/A8D236F08863_S0/EDID/setData
➡ body: 00ffffffffffff0010a6000156 524c420816010380341d780a01c1a057479827124c4c21...

⬅ status-line: 200 OK
⬅ status-line: 00ffffffffffff0010a6000156 524c420816010380341d780a01c1a057479827124c4c21...

## 8.7.9. Setting the Scaler Mode

> **DIFFERENCE:** Only **HDMI-TPN-RX107A-SR**, **HDMI-TPN-RX107D-SR**, **HDMI-TPN-RX107DU2K-SR**, **HDMI-TPN-RX107AU2K-SR**, **HDMI-OPTN-RX100A-SR** and **HDMI-OPTN-RX100AU2K-SR** receiver models have integrated scaler function.

**Request and Response** *#scaler*

➡ request-line: POST·http://<ip>/api/V1/MEDIA/VIDEO/<destination_stream>/SCALING/StagedDisplayMode
➡ body: <scaler_mode>

⬅ status-line: 200 OK
⬅ status-line: <scaler_mode>

Then

➡ request-line: POST·http://<ip>/api/V1/MEDIA/VIDEO/<destination_stream>/SCALING/applySettings
⬅ status-line: 200 OK

> **ATTENTION:** Calling of applySettings() method is required for applying the setting in the receiver. Before the method the setting in staged only and not applied.

**Parameters**

<destination_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

| Parameter | Parameter description | Value | Value description |
|---|---|---|---|
| <scaler_mode> | HDCP authentication setting on the output | Genlock | See the details about the scaling modes in the Scaling Modes section. |
| | | GenlockScaling | |
| | | FastSwitch | |
| | | FastSwitchCrop | |
| | | FastSwitchStretch | |
| | | GenlockWall | |
| | | FastSwitchWall | |
| | | Multiview | |

**Example**

➡ request-line: POST http://192.168.0.50/api/V1/MEDIA/VIDEO/A8D236F08863_D0/SCALING/StagedDisplayMode
➡ body: FastSwitch

⬅ status-line: 200 OK
⬅ status-line: FastSwitch

Then

➡ request-line: POST http://192.168.0.50/api/V1/MEDIA/VIDEO/A8D236F08863_D0/SCALING/applySettings

⬅ status-line: 200 OK

## 8.7.10. Setting the Scaler Resolution

> **DIFFERENCE:** Only **HDMI-TPN-RX107A-SR**, **HDMI-TPN-RX107D-SR**, **HDMI-TPN-RX107DU2K-SR**, **HDMI-TPN-RX107AU2K-SR**, **HDMI-OPTN-RX100A-SR** and **HDMI-OPTN-RX100AU2K-SR** receiver models have integrated scaler function.

**Request and Response**     *#scaler*

➡ request-line:  POST·http://&lt;ip&gt;/api/V1/MEDIA/VIDEO/&lt;destination_stream&gt;/SCALING/StagedFormatName
➡ body:           &lt;resolution&gt;

⬅ status-line:    200 OK
⬅ status-line:    &lt;resolution&gt;

Then

➡ request-line:  POST·http://&lt;ip&gt;/api/V1/MEDIA/VIDEO/&lt;destination_stream&gt;/SCALING/applySettings

⬅ status-line:    200 OK

> **ATTENTION:** Calling of applySettings() method is required for applying the setting in the receiver. Before the method the setting in staged only and not applied.

**Parameters**

&lt;destination_stream&gt;: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

&lt;resolution&gt;:   The following table lists the supported resolution and refresh rate of the scaler.

| Value | | | |
|---|---|---|---|
| 640x480p60 | 1280x720p50 | 3840x2160p24 | 4096x2160p50 |
| 720x480p60 | 1280x720p60 | 3840x2160p25 | 4096x2160p60 |
| 720x480p60(16:9) | 1920x1080p24 | 3840x2160p30 | 4096x2160p25 |
| 720x576p50 | 1920x1080p25 | 3840x2160p50 | 4096x2160p30 |
| 720x576p50(16:9) | 1920x1080p30 | 3840x2160p60 | 4096x2160p50 |
| 1280x720p24 | 1920x1080p50 | 4096x2160p24 | 4096x2160p60 |
| 1280x720p25 | 1920x1080p60 | 4096x2160p25 | |
| 1280x720p30 | 3840x2160p24 | 4096x2160p30 | |

**Example**

➡ request-line:  POST http://192.168.0.50/api/V1/MEDIA/VIDEO/A8D236F08863_D0/SCALING/StagedFormatName
➡ body:           1920x1080p60

⬅ status-line:    200 OK
⬅ status-line:    1920x1080p60

Then

➡ request-line:  POST http://192.168.0.50/api/V1/MEDIA/VIDEO/A8D236F08863_D0/SCALING/applySettings

⬅ status-line:    200 OK

## 8.8. Audio Signal Management Commands

### 8.8.1. Enabling/Disabling the Audio Follow Video Setting

**Request and Response**     *#audio*

➡ request-line:  POST·http://&lt;ip&gt;/api/V1/MEDIA/AUDIO/XP/FollowVideo
➡ body:           &lt;logical_value&gt;

⬅ status-line:    200 OK
⬅ status-line:    &lt;logical_value&gt;

**Parameters**

&lt;logical_value&gt;: If **true**, the audio signal is switched together with the video signal, if **false**, the independent audio layer can be switched by commands.

**Example**

➡ request-line:  POST http://192.168.0.50/api/V1/MEDIA/AUDIO/XP/FollowVideo
➡ body:           false

⬅ status-line:    200 OK
⬅ status-line:    false

### 8.8.2. Switching the Audio Stream to One Destination

**Request and Response**

➡ request-line:  POST·http://&lt;ip&gt;/api/V1/MEDIA/AUDIO/XP/switch
➡ body:           &lt;source_stream&gt;:&lt;destination_stream&gt;

⬅ status-line:    200 OK
⬅ status-line:    &lt;source_stream&gt;:&lt;destination_stream&gt;

**Parameters**

&lt;source_stream&gt;: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

&lt;destination_stream&gt;: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

> **TIPS AND TRICKS:** Alias name can also be used for source and destination stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

➡ request-line:  POST http://192.168.0.50/api/V1/MEDIA/AUDIO/XP/switch
➡ body:           MTR01_TX_S0:HALL_RX_D0

⬅ status-line:    200 OK
⬅ status-line:    MTR01_TX_S0:HALL_RX_D0

### 8.8.3. Switching the Audio Stream to All Destinations

**Request and Response**

➡ request-line: POST·http://\<ip>/api/V1/MEDIA/AUDIO/XP/switchAll
➡ body: \<source_stream>

⬅ status-line: 200 OK
⬅ status-line: \<source_stream>

**Parameters**

\<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

▍ TIPS AND TRICKS: Alias name can also be used for source stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

➡ request-line: POST http://192.168.0.50/api/V1/MEDIA/AUDIO/XP/switchAll
➡ body: A1D236F08864_S0

⬅ status-line: 200 OK
⬅ status-line: A1D236F08864_S0

### 8.8.4. Enabling/Disabling the Source Stream

**Request and Response**

➡ request-line: POST·http://\<ip>/api/V1/MEDIA/AUDIO/\<source_stream>/Enable
➡ body: \<logical_value>

⬅ status-line: 200 OK
⬅ status-line: \<logical_value>

**Parameters**

\<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

\<logical_value>: If **true**, the stream is enabled, if **false**, it is disabled.

**Example**

➡ request-line: POST http://192.168.0.50/api/V1/MEDIA/AUDIO/A8D236F08863_S0/Enable
➡ body: true

⬅ status-line: 200 OK
⬅ status-line: true

### 8.8.5. Querying the Parameters of the Audio Stream

**Request and Response**

➡ request-line: GET·http://\<ip>/api/V1/MEDIA/AUDIO/\<stream_ID>/\

⬅ status-line: 200 OK
⬅ status-line: \<parameter_value>

**Parameters**

\<stream_ID>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 or _D0 character line as "stream nr 0". Example: A8D236F08863_D0

| \<parameter> | Parameter description | Value | Value description |
|---|---|---|---|
| SignalPresent | Active signal is present in the stream or not. | **true** | Signal is present. |
| | | **false** | Signal is not present. |
| SignalType | Signal type of the stream | **PCM** | PCM |
| | | **HBR** | HBR |
| | | **Other** | Other |
| | | **N/A** | Not applicable |
| SamplingFreq | Audio sampling fequency | | 22.05 kHz, 24 kHz, 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192 kHz, 768 kHz or N/A |
| NumberOfChannels | Number of audio channels. | | |
| SampleSize | The size of each audio sample in bits | | |
| StreamAlias | Alias of the stream | alias name | Example: MTR_RX_D0 |
| SourceStream | Source stream ID what is connected to the destination stream | \<MAC>_S0 | Example: A8D236F08863_S0 |
| SourceStreamAlias | Alias of the source stream what is connected to the destination stream | \<alias>_S0 | Example: MTR_TX_S0 |

**Example**

➡ request-line: GET http://192.168.0.50/api/V1/MEDIA/AUDIO/A8D236F08863_S0/SignalPresent

⬅ status-line: 200 OK
⬅ status-line: true

## 8.9. Management Network Port Configuration

▍ **DIFFERENCE:** The following sections are related to the configuration of the **Control LAN network port** only.

▍ **ATTENTION: Known issue:** when IP settings are changed to static IP and there is an active RS-232 TCP communication, the changing may break it.

### 8.9.1. Setting the DHCP State

▍ **ATTENTION:** When you change a network property, the new value is stored, but the **applySettings** method must always be called to apply the new settings. When two or more network parameters are changed, the **applySettings** method is enough to be called once as a final step.

**Request and Response**    *#dhcp #network #ipaddress*

➜ request-line:  POST·http://<ip>/api/V1/MANAGEMENT/NETWORK/DhcpEnabled
➜ body:        <logical_value>

⬅ status-line:   200 OK
⬅ body:        <logical_value>

**Parameters**

If the <logical_value> parameter is **true**, the current IP address setting is DHCP, if the parameter is **false**, the current IP address is static.

**Example**

➜ request-line:  POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/DhcpEnabled
➜ body:        true

⬅ status-line:   200 OK
⬅ body:        true

➜ request-line:  POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/applySettings

⬅ status-line:   200 OK
⬅ body:        OK

▍ INFO: The **applySettings** method will save and apply the new value and will reboot the network interface.

▍ INFO: The current setting can be queried by using the GET Method.

### 8.9.2. Changing the IP Address (Static)

**Request and Response**

➜ request-line:  POST·http://<ip>/api/V1/MANAGEMENT/NETWORK/StaticIpAddress
➜ body:        <IP_address>

⬅ status-line:   200 OK
⬅ body:        <IP_address>

**Example**

➜ request-line:  POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/StaticIpAddress
➜ body:        192.168.0.104

⬅ status-line:   200 OK
⬅ body:        192.168.0.104

➜ request-line:  POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/applySettings

⬅ status-line:   200 OK
⬅ body:        OK

▍ INFO: The **applySettings** method will save and apply the new value and will reboot the network interface.

▍ INFO: The current setting can be queried by using the GET Method.

### 8.9.3. Changing the Subnet Mask (Static)

**Request and Response**    *#ipaddress*

➜ request-line:  POST·http://<ip>/api/V1/MANAGEMENT/NETWORK/StaticNetworkMask
➜ body:        <netmask>

⬅ status-line:   200 OK
⬅ body:        <netmask>

**Example**

➜ request-line:  POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/StaticNetworkMask
➜ body:        255.255.255.0

⬅ status-line:   200 OK
⬅ body:        255.255.255.0

➜ request-line:  POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/applySettings

⬅ status-line:   200 OK
⬅ body:        OK

▍ INFO: The **applySettings** method will save and apply the new value and will reboot the network interface.

▍ INFO: The current setting can be queried by using the GET Method.

#### 8.9.4. Changing the Gateway Address (Static)

**Request and Response**

➡ request-line:    POST·http://\<ip>/api/V1/MANAGEMENT/NETWORK/StaticGatewayAddress
➡ body:          \<gw_address>

⬅ status-line:    200 OK
⬅ body:          \<gw_address>

**Example**

➡ request-line:    POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/StaticGatewayAddress
➡ body:          192.168.0.1

⬅ status-line:    200 OK
⬅ body:          192.168.0.1

➡ request-line:    POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/applySettings

⬅ status-line:    200 OK
⬅ body:          OK

▌ INFO: The **applySettings** method will save and apply the new value and will reboot the network interface.

▌ INFO: The current setting can be queried by using the GET Method.

#### 8.9.5. Applying Network Settings

**Request and Response**

➡ request-line:    POST·http://\<ip>/api/V1/MANAGEMENT/NETWORK/applySettings

▌ INFO: The body has to be empty, and the content type should be text/plain.

⬅ status-line:    200 OK
⬅ body:          OK

**Example**

➡ request-line:    POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/applySettings

⬅ status-line:    200 OK
⬅ body:          OK

All network settings that were changed are applied and the network interface restarts.

#### 8.9.6. Setting the Hostname

The hostname is a property that can be used instead of the IP address when connecting to the device. If the IP address of the device is changing, the hostname can be used as a fixed property.    *#hostname*

After hostname changing, restarting network services is required. New SSL certificate will be generated.

**Request and Response**

➡ request-line:    POST·http://\<ip>/api/V1/MANAGEMENT/NETWORK/HostName
➡ body:          \<unique_name>

⬅ status-line:    200 OK
⬅ body:          \<unique_name>

**Parameters**

The \<unique_name> can be 1-64 character(s) long and the following are allowed for naming: the elements of the English alphabet and numbers. Hyphen (-) and dot (.) are also accepted, except as last character.

**Example**

➡ request-line:    POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/HostName
➡ body:          room_tx1

⬅ status-line:    200 OK
⬅ body:          ROOM_TX1

## 8.10. Network Security

### 8.10.1. Querying Network Service Port Number

**Request and Response**   *#http #https*

➜ request-line:  GET·http://\<ip\>/api/V1/MANAGEMENT/NETWORK/SERVICES/\<port\>/Port

⬅ status-line:  200·OK
⬅ body:      \<port_num\>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| \<port\> | Port type | HTTP<br>HTTPS<br>LW3<br>BLUERIVER/TCI<br>BLUERIVER/HTTP |
| \<port_num\> | Port number | 80<br>443<br>6107<br>6970<br>8080 |

**Example**

➜ request-line:   GET http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/SERVICES/HTTP/Port

⬅ status-line:   200 OK
⬅ body:       443

### 8.10.2. Enabling/Disabling Network Service Port

**Request and Response**

➜ request-line:  GET·http://\<ip\>/api/V1/MANAGEMENT/NETWORK/SERVICES/\<port\>/Enabled
➜ body:      \<status\>

⬅ status-line:  200 OK
⬅ body:      \<status\>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| \<port\> | Port type | HTTP<br>HTTPS |
| \<status\> | The port is enabled.<br>The port is disabled. | true<br>false |

**Example**

➜ request-line:  POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/SERVICES/HTTP/Enabled
➜ body:      false

⬅ status-line:  200 OK
⬅ body:      false

### 8.10.3. Enabling Authentication

INFO: Set the password before enabling the authentication, because no password is set by default. Restart of the HTTP(S) services is required to apply the authentication settings.

**Request and Response**   *#authentication #security*

➜ request-line:  POST·http://\<ip\>/api/V1/MANAGEMENT/NETWORK/SERVICES/\<port\>/AuthenticationEnabled
➜ body:      \<status\>

⬅ status-line:  200 OK
⬅ body:      \<status\>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| \<port\> | Port type | HTTP<br>HTTPS |
| \<status\> | Authentication enabled<br>Authentication disabled | true<br>false |

**Example**

➜ request-line:  POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/SERVICES/HTTP/AuthenticationEnabled
➜ body:      false

⬅ status-line:  200 OK
⬅ body:      false

## 8.11. Endpoint Network Configuration

The section describes the network configuration for the **SDVoE** and **Icron** interfaces.

> **ATTENTION: Known issue**: when IP settings are changed to static IP and there is an active RS-232 TCP communication, the changing may break it.

> **ATTENTION:** When you change a network property, the new value is stored, but the **applySettings** method must always be called to apply the new settings. When two or more network parameters are changed, the **applySettings** method is enough to be called once as a final step.

### 8.11.1. Setting the DHCP State for SDVoE

**Request and Response**      *#dhcp #network #ipaddress*

➔ request-line:   POST·http://<ip>/api/V1/DEVICES/<MAC_address>/COMPONENTS/SDVOE/NETWORK/
StagedIpAcquisitionMode
➔ body:             <logical_value>

⬅ status-line:     200 OK
⬅ body:             <logical_value>

**Parameters**

<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

If the <logical_value> parameter is **true**, the current IP address setting is DHCP, if the parameter is **false**, the current IP address is static.

**Example**

➔ request-line:   POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/COMPONENTS/SDVOE/
NETWORK/StagedIpAcquisitionMode
➔ body:             true

⬅ status-line:     200 OK
⬅ body:             true

➔ request-line:   POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/applySettings

⬅ status-line:     200 OK
⬅ body:             OK

> INFO: The **applySettings** method will save and apply the new value and will reboot the network interface.

### 8.11.2. Changing the IP Address (Static) for SDVoE

**Request and Response**

➔ request-line:   POST·http://<ip>/api/V1/DEVICES/<MAC_address>/COMPONENTS/SDVOE/NETWORK/
StagedIpAddress
➔ body:             <IP_address>

⬅ status-line:     200 OK
⬅ body:             <IP_address>

**Example**

➔ request-line:   POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/COMPONENTS/SDVOE/
NETWORK/StagedIpAddress
➔ body:             192.168.0.108

⬅ status-line:     200 OK
⬅ body:             192.168.0.108

➔ request-line:   POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/applySettings

⬅ status-line:     200 OK
⬅ body:             OK

> INFO: The **applySettings** method will save and apply the new value and will reboot the network interface.

### 8.11.3. Changing the Subnet Mask (Static) for SDVoE

**Request and Response**

➔ request-line:   POST·http://<ip>/api/V1/DEVICES/<MAC_address>/COMPONENTS/SDVOE/NETWORK/
StagedSubnetMask
➔ body:             <netmask>

⬅ status-line:     200 OK
⬅ body:             <netmask>

**Example**

➔ request-line:   POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/COMPONENTS/SDVOE/
NETWORK/StagedSubnetMask
➔ body:             255.255.255.0

⬅ status-line:     200 OK
⬅ body:             255.255.255.0

➔ request-line:   POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/applySettings

⬅ status-line:     200 OK
⬅ body:             OK

> INFO: The **applySettings** method will save and apply the new value and will reboot the network interface.

## 8.11.4. Changing the Gateway Address (Static) for SDVoE

**Request and Response**

➡ request-line: POST·http://\<ip\>/api/V1/DEVICES/\<MAC_address\>/COMPONENTS/SDVOE/NETWORK/
StagedGatewayAddress
➡ body: \<gw_address\>

⬅ status-line: 200 OK
⬅ body: \<gw_address\>

**Example**

➡ request-line: POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/COMPONENTS/SDVOE/
NETWORK/StagedGatewayAddress
➡ body: 10.0.0.1

⬅ status-line: 200 OK
⬅ body: 10.0.0.1

➡ request-line: POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/applySettings

⬅ status-line: 200 OK
⬅ body: OK

▌ INFO: The **applySettings** method will save and apply the new value and will reboot the network interface.

## 8.11.5. Setting the DHCP State for Icron

**Request and Response**    *#dhcp #network #ipaddress*

➡ request-line: POST·http://\<ip\>/api/V1/DEVICES/\<MAC_address\>/COMPONENTS/ICRON/NETWORK/
StagedIpAcquisitionMode
➡ body: \<logical_value\>

⬅ status-line: 200 OK
⬅ body: \<logical_value\>

**Parameters**

\<MAC_address\>: The MAC address of the selected endpoint device in capital letters and without colons.

If the \<logical_value\> parameter is **true**, the current IP address setting is DHCP, if the parameter is **false**, the current IP address is static.

**Example**

➡ request-line: POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/COMPONENTS/ICRON/
NETWORK/StagedIpAcquisitionMode
➡ body: true

⬅ status-line: 200 OK
⬅ body: true

➡ request-line: POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/applySettings

⬅ status-line: 200 OK
⬅ body: OK

▌ INFO: The **applySettings** method will save and apply the new value and will reboot the network interface.

## 8.11.6. Changing the IP Address (Static) for Icron

**Request and Response**

➜ request-line:   POST·http://\<ip\>/api/V1/DEVICES/\<MAC_address\>/COMPONENTS/ICRON/NETWORK/StagedIpAddress
➜ body:   \<IP_address\>

◀ status-line:   200 OK
◀ body:   \<IP_address\>

**Example**

➜ request-line:   POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/COMPONENTS/SDVOE/NETWORK/StagedIpAddress
➜ body:   192.168.0.108

◀ status-line:   200 OK
◀ body:   192.168.0.108

➜ request-line:   POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/applySettings

◀ status-line:   200 OK
◀ body:   OK

▌ INFO: The **applySettings** method will save and apply the new value and will reboot the network interface.

## 8.11.7. Changing the Subnet Mask (Static) for Icron

**Request and Response**

➜ request-line:   POST·http://\<ip\>/api/V1/DEVICES/\<MAC_address\>/COMPONENTS/ICRON/NETWORK/StagedSubnetMask
➜ body:   \<netmask\>

◀ status-line:   200 OK
◀ body:   \<netmask\>

**Example**

➜ request-line:   POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/COMPONENTS/ICRON/NETWORK/StagedSubnetMask
➜ body:   255.255.255.0

◀ status-line:   200 OK
◀ body:   255.255.255.0

➜ request-line:   POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/applySettings

◀ status-line:   200 OK
◀ body:   OK

▌ INFO: The **applySettings** method will save and apply the new value and will reboot the network interface.

## 8.11.8. Changing the Gateway Address (Static) for Icron

**Request and Response**

➜ request-line:   POST·http://\<ip\>/api/V1/DEVICES/\<MAC_address\>/COMPONENTS/ICRON/NETWORK/StagedGatewayAddress
➜ body:   \<gw_address\>

◀ status-line:   200 OK
◀ body:   \<gw_address\>

**Example**

➜ request-line:   POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/COMPONENTS/ICRON/NETWORK/StagedGatewayAddress
➜ body:   10.0.0.1

◀ status-line:   200 OK
◀ body:   10.0.0.1

➜ request-line:   POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/applySettings

◀ status-line:   200 OK
◀ body:   OK

▌ INFO: The **applySettings** method will save and apply the new value and will reboot the network interface.

## 8.11.9. Applying Network Settings

**Request and Response**

➜ request-line:   POST·http://\<ip\>/api/V1/MANAGEMENT/NETWORK/applySettings
▌ INFO: The body has to be empty, and the content type should be text/plain.

◀ status-line:   200 OK
◀ body:   OK

**Example**

➜ request-line:   POST http://192.168.0.50/api/V1/MANAGEMENT/NETWORK/applySettings

◀ status-line:   200 OK
◀ body:   OK

All network settings that were changed are applied and the network interface restarts.

# 8.12. Serial Port Configuration for Endpoints

## 8.12.1. BAUD Rate Setting

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

➜ request-line:   POST·http://\<ip>/api/V1/MEDIA/SERIAL/\<serial_port>/BaudRate
➜ body:                  \<baudrate>

⬅ status-line:    200 OK
⬅ body:                  \<baudrate>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| \<serial_port> | The MAC address of the selected endpoint device in capital letters and without colons; and an _P1 character line as "port nr 1". | Example: A8D236F08863_P1 |
| \<baudrate> | Baud rate value | **9600, 19200, 38400, 57600, 115200** |

**Example**

➜ request-line:   POST http://192.168.0.50/api/V1/MEDIA/SERIAL/A8D236F08863_P1/BaudRate
➜ body:                  19200

⬅ status-line:    200 OK
⬅ body:                  19200

## 8.12.2. Stop Bits Setting

**Request and Response**

➜ request-line:   POST·http://\<ip>/api/V1/MEDIA/SERIAL/\<serial_port>/StopBits
➜ body:                  \<stopbits>

⬅ status-line:    200 OK
⬅ body:                  \<stopbits>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| \<serial_port> | The MAC address of the selected endpoint device in capital letters and without colons; and an _P1 character line as "port nr 1". | Example: A8D236F08863_P1 |
| \<stopbits> | Stop bit value | **1** or **2** |

**Example**

➜ request-line:   POST http://192.168.0.50/api/V1/MEDIA/SERIAL/A8D236F08863_P1/StopBits
➜ body:                  1

⬅ status-line:    200 OK
⬅ body:                  1

## 8.12.3. Querying Data Bits

**Request and Response**

➜ request-line:   GET·http://\<ip>/api/V1/MEDIA/SERIAL/\<serial_port>/DataBits

⬅ status-line:    200·OK
⬅ body:                  \<databits>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| \<serial_port> | The MAC address of the selected endpoint device in capital letters and without colons; and an _P1 character line as "port nr 1". | Example: A8D236F08863_P1 |
| \<databits> | DataBits value | **8** or **9** |

**Example**

➜ request-line:   GET http://192.168.0.50/api/V1/MEDIA/SERIAL/A8D236F08863_P1/DataBits

⬅ status-line:    200 OK
⬅ body:                  8

## 8.12.4. Parity Setting

**Request and Response**

➜ request-line:   POST·http://\<ip>/api/V1/MEDIA/SERIAL/\<serial_port>/Parity
➜ body:                  \<parity>

⬅ status-line:    200 OK
⬅ body:                  \<parity>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| \<serial_port> | The MAC address of the selected endpoint device in capital letters and without colons; and an _P1 character line as "port nr 1". | Example: A8D236F08863_P1 |
| \<parity> | Parity value | **None**<br>**Odd**<br>**Even** |

**Example**

➜ request-line:   POST http://192.168.0.50/api/V1/MEDIA/SERIAL/A8D236F08863_P1/Parity
➜ body:                  None

⬅ status-line:    200 OK
⬅ body:                  None

### 8.12.5. Querying the Actual Serial Port Configuration

**Request and Response**

➜ request-line:  GET·http://<ip>/api/V1/MEDIA/SERIAL/<serial_port>/Configuration

⬅ status-line:  200·OK
⬅ body:  <serial_config>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| <serial_port> | The MAC address of the selected endpoint device in capital letters without colons and a _P1 character line as "port nr 1". | Example: A8D236F08863_P1 |
| <serial_config> | The recent configuration of the serial port: Baud rate, Databits Parity Stopbits | Example: 9600, 8N1 |

**Example**

➜ request-line:  GET http://192.168.0.50/api/V1/MEDIA/SERIAL/A8D236F08863_P1/Configuration

⬅ status-line:  200 OK
⬅ body:  115200, 8N1

### 8.12.6. Enabling/Disabling the Serial over IP Port

▍ **ATTENTION:** The following property is required to be **enabled** for the RS-232 command injection feature.

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

➜ request-line:  POST·http://<ip>/api/V1/MEDIA/SERIAL/<serial_port>/SERVICE/Enabled
➜ body:  <logical_value>

⬅ status-line:  200 OK
⬅ body:  <logical_value>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| <serial_port> | The MAC address of the selected endpoint device in capital letters without colons and a _P1 character line as "port nr 1". | Example: A8D236F08863_P1 |
| <logical_value> | Service is enabled or disabled | **true** **false** |

**Example**

➜ request-line:  POST http://192.168.0.50/api/V1/MEDIA/SERIAL/A8D236F08863_P1/SERVICE/Enabled
➜ body:  false

⬅ status-line:  200 OK
⬅ body:  false

### 8.12.7. Command Injection over Serial Port

**Request and Response** *#rs232 #rs-232 #serial #commandinjection*

➜ request-line:  POST·http://<ip>/api/V1/DEVICES/<MAC_address>/SERIAL/<port_ID>/SERVICE/send
➜ body:  <data>

⬅ status-line:  200 OK
⬅ body:  <data>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| <MAC_address> | The MAC address of the selected endpoint device in capital letters and without colons. | Example: A8D236F08863 |
| <port_ID> | Serial port ID of the TPN/OPTN series endpoint devices. HDMI-TPN and HDMI-OPTN series models are built with one serial port, UCX series models are usually built with two serial ports. | **P1** **P2** |
| <data> | Control command of the connected source or sink device in ASCII code. | |

**Example**

➜ request-line:  POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/SERIAL/P1/SERVICE/send
➜ body:  02 50 4F 4E 03

⬅ status-line:  200 OK
⬅ body:  02 50 4F 4E 03

## 8.13. USB HID Configuration Commands

> **DIFFERENCE:** Only HDMI-TPN-TX207AU2K, HDMI-TPN-RX107AU2K, HDMI-TPN-RX107AU2K-SR, HDMI-TPN-RX107DU2K-SR, HDMI-OPTN-TX200AU2K, HDMI-OPTN-RX100AU2K and HDMI-OPTN-RX100AU2K-SR models are built with USB HID feature.

### 8.13.1. Enabling/Disabling the Follow Video Setting

**Request and Response**

➡ request-line:  POST·http://\<ip>/api/V1/MEDIA/USBHID/XP/FollowVideo
➡ body:        \<logical_value>

⬅ status-line:   200 OK
⬅ status-line:   \<logical_value>

**Parameters**

\<logical_value>: If **true**, the USB HID signal is switched together with the video signal, if **false**, the independent USB HID layer can be switched by commands.

**Example**

➡ request-line:  POST http://192.168.0.50/api/V1/MEDIA/USBHID/XP/FollowVideo
➡ body:        false

⬅ status-line:   200 OK
⬅ status-line:   false

### 8.13.2. Switching the USB HID Stream to One Destination

**Request and Response**

➡ request-line:  POST·http://\<ip>/api/V1/MEDIA/USBHID/XP/switch
➡ body:        \<source_stream>:\<destination_stream>

⬅ status-line:   200 OK
⬅ status-line:   \<source_stream>:\<destination_stream>

**Parameters**

\<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

\<destination_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

> **TIPS AND TRICKS:** Alias name can also be used for source and destination stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

➡ request-line:  POST http://192.168.0.50/api/V1/MEDIA/USBHID/XP/switch
➡ body:        MTR01_TX_S0:HALL_RX_D0

⬅ status-line:   200 OK
⬅ status-line:   MTR01_TX_S0:HALL_RX_D0

### 8.13.3. Switching the USB HID Stream to All Destinations

**Request and Response**

➡ request-line:  POST·http://\<ip>/api/V1/MEDIA/USBHID/XP/switchAll
➡ body:        \<source_stream>

⬅ status-line:   200 OK
⬅ status-line:   \<source_stream>

**Parameters**

\<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

> **TIPS AND TRICKS:** Alias name can also be used for source stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

➡ request-line:  POST http://192.168.0.50/api/V1/MEDIA/USBHID/XP/switchAll
➡ body:        A1D236F08864_S0

⬅ status-line:   200 OK
⬅ status-line:   A1D236F08864_S0

### 8.13.4. Enabling/Disabling the Source Stream

**Request and Response**

➡ request-line:  POST·http://\<ip>/api/V1/MEDIA/USBHID/\<source_stream>/Enable
➡ body:        \<logical_value>

⬅ status-line:   200 OK
⬅ status-line:   \<logical_value>

**Parameters**

\<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

\<logical_value>: If **true**, the stream is enabled, if **false**, it is disabled.

**Example**

➡ request-line:  POST http://192.168.0.50/api/V1/MEDIA/USBHID/A8D236F08863_S0/Enable
➡ body:        true

⬅ status-line:   200 OK
⬅ status-line:   true

### 8.13.5. Querying the Parameters of the USB HID Signal

**Request and Response**

➜ request-line: GET·http://<ip>/api/V1/MEDIA/USBHID/<stream_ID>/

◄ status-line: 200 OK
◄ status-line: <parameter_value>

**Parameters**

<stream_ID>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 or _D0 character line as "stream nr 0". Example: A8D236F08863_D0

:

| <parameter> | Parameter description | Value | Value description |
|---|---|---|---|
| SignalPresent | Active signal is present in the stream or not. | **true** | Signal is present. |
| | | **false** | Signal is not present. |
| Role | USB HID role of the device. | **Disabled** | USB HID function is disabled. |
| | | **Local** | The USB HID device is in local mode. |
| | | **Remote** | The USB HID device is in remote mode. |
| ConnectedDeviceNumber | Number of connected USB HID devices. | | |
| HostStatus | Actual status of the host device. | **Disconnected** | Host is disconnected. |
| | | **Configuring** | Host is configuring. |
| | | **Connected** | Host is connected. |
| StreamAlias | Alias of the stream | alias name | Example: MTR_RX_D0 |
| SourceStream | Source stream ID what is connected to the destination stream | <MAC>_S0 | Example: A8D236F08863_S0 |
| SourceStreamAlias | Alias of the source stream what is connected to the destination stream | <alias>_S0 | Example: MTR_TX_S0 |

**Example**

➜ request-line: GET http://192.168.0.50/api/V1/MEDIA/USBHID/A8D236F08863_S0/SignalPresent

◄ status-line: 200 OK
◄ status-line: true

## 8.14. Icron USB KVM Configuration Commands

> **DIFFERENCE:** Only HDMI-TPN-TX207AU2K, HDMI-TPN-RX107AU2K, HDMI-TPN-RX107AU2K-SR, HDMI-TPN-RX107DU2K-SR, HDMI-OPTN-TX200AU2K, HDMI-OPTN-RX100AU2K and HDMI-OPTN-RX100AU2K-SR models are built with Icron USB feature.

### 8.14.1. Enabling/Disabling the Follow Video Setting

**Request and Response**

➜ request-line: POST·http://<ip>/api/V1/MEDIA/USBICRON/XP/FollowVideo
➜ body: <logical_value>

◄ status-line: 200 OK
◄ status-line: <logical_value>

**Parameters**

<logical_value>: If **true**, the Icron USB signal is switched together with the video signal, if **false**, the independent Icron USB layer can be switched by commands.

**Example**

➜ request-line: POST http://192.168.0.50/api/V1/MEDIA/USBICRON/XP/FollowVideo
➜ body: false

◄ status-line: 200 OK
◄ status-line: false

### 8.14.2. Switching the Icron USB Stream to One Destination

**Request and Response**

➜ request-line: POST·http://<ip>/api/V1/MEDIA/USBICRON/XP/switch
➜ body: <source_stream>:<destination_stream>

◄ status-line: 200 OK
◄ status-line: <source_stream>:<destination_stream>

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

<destination_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

> **TIPS AND TRICKS:** Alias name can also be used for source and destination stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

➜ request-line: POST http://192.168.0.50/api/V1/MEDIA/USBICRON/XP/switch
➜ body: MTR01_TX_S0:HALL_RX_D0

◄ status-line: 200 OK
◄ status-line: MTR01_TX_S0:HALL_RX_D0

### 8.14.3. Switching the Icron USB Stream to All Destinations

**Request and Response**

➡ request-line:   POST·http://&lt;ip&gt;/api/V1/MEDIA/USBICRON/XP/switchAll
➡ body:            &lt;source_stream&gt;

⬅ status-line:    200 OK
⬅ status-line:    &lt;source_stream&gt;

**Parameters**

&lt;source_stream&gt;: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

▍ TIPS AND TRICKS: Alias name can also be used for source stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

➡ request-line:   POST http://192.168.0.50/api/V1/MEDIA/USBICRON/XP/switchAll
➡ body:            A1D236F08864_S0

⬅ status-line:    200 OK
⬅ status-line:    A1D236F08864_S0

### 8.14.4. Querying the Parameters of the Icron USB Signal

**Request and Response**

➡ request-line:   GET·http://&lt;ip&gt;/api/V1/MEDIA/USBICRON/&lt;stream_ID&gt;/

⬅ status-line:    200 OK
⬅ status-line:    &lt;parameter_value&gt;

**Parameters**

&lt;stream_ID&gt;: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 or _D0 character line as "stream nr 0". Example: A8D236F08863_D0

:

| &lt;parameter&gt; | Parameter description | Value | Value description |
|---|---|---|---|
| SignalPresent | Active signal is present in the stream or not. | **true** | Signal is present. |
| | | **false** | Signal is not present. |
| LinkStatus | Actual status of the Icron connection link. | **NotPaired** | Not paired. |
| | | **Paired** | Paired. |
| | | **Linked** | Linked. |
| DevicePairing | List of MAC addresses of paired devices. | | |
| StreamAlias | Alias of the stream | alias name | Example: MTR_RX_D0 |
| SourceStream | Source stream ID what is connected to the destination stream | &lt;MAC&gt;_S0 | Example: A8D236F08863_S0 |
| SourceStreamAlias | Alias of the source stream what is connected to the destination stream | &lt;alias&gt;_S0 | Example: MTR_TX_S0 |

**Example**

➡ request-line:   GET http://192.168.0.50/api/V1/MEDIA/USBICRON/A8D236F08863_S0/SignalPresent

⬅ status-line:    200 OK
⬅ status-line:    true

## 8.14.5. Querying the MAC Address of the Icron Module

The Icron module has own MAC address what is different from the MAC address of the TPN/OPTN endpoint.

**Request and Response**

➡ request-line:   GET·http://\<ip>/api/V1/DEVICES/\<MAC_address>/COMPONENTS/ICRON/MacAddress

⬅ status-line:   200 OK
⬅ status-line:   \<Icron_MAC_address>

**Parameters**

\<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

\<Icron_MAC_address>: The MAC address of the Icron module.

**Example**

➡ request-line:   GET http://192.168.0.50/api/V1/DEVICES/A8D236F08863/COMPONENTS/ICRON/MacAddress

⬅ status-line:   200 OK
⬅ status-line:   a8:d2:36:f1:88:63

## 8.14.6. Querying the Operation Mode of the Icron Device

**Request and Response**

➡ request-line:   GET·http://\<ip>/api/V1/DEVICES/\<MAC_address>/COMPONENTS/ICRON/Mode

⬅ status-line:   200 OK
⬅ status-line:   \<mode>

**Parameters**

\<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

\<mode>: It can be **LEX** (Local Extender) or **REX** (Remote Extender). See more details about it in the USB Configuration section.

**Example**

➡ request-line:   GET http://192.168.0.50/api/V1/DEVICES/A8D236F08863/COMPONENTS/ICRON/Mode

⬅ status-line:   200 OK
⬅ status-line:   REX

## 8.14.7. Setting the USB Mode of the Icron Device

**Request and Response**

➡ request-line:   POST·http://\<ip>/api/V1/DEVICES/\<MAC_address>/COMPONENTS/ICRON/UsbMode
➡ body:   \<USB_mode>

⬅ status-line:   200 OK
⬅ status-line:   \<USB_mode>

**Parameters**

\<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

\<USB_mode>: It can be **SUI** (Simultaneous Users Interaction) or **MSA** (Mass Storage Acceleration). See more details about it in the USB Configuration section.

**Example**

➡ request-line:   POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/COMPONENTS/ICRON/UsbMode
➡ body:   MSA

⬅ status-line:   200 OK
⬅ status-line:   MSA

## 8.14.8. Removing All Pairings of the Icron Device

**Request and Response**

➡ request-line:   http://\<ip>/api/V1/DEVICES/\<MAC_address>/COMPONENTS/ICRON/removeAllPairings

⬅ status-line:   200 OK

**Parameters**

\<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

➡ request-line:   POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/COMPONENTS/ICRON/removeAllPairings

⬅ status-line:   200 OK

#### 8.14.9. Recovering the Icron Module with DHCP

The command recovers endpoint connection by setting endpoint to use dynamic IP address setting.

**Request and Response**

➡ request-line:  http://\<ip>/api/V1/DEVICES/\<MAC_address>/COMPONENTS/ICRON/recoverWithDhcp

⬅ status-line:  200 OK

**Parameters**

\<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

➡ request-line:  POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/COMPONENTS/ICRON/
recoverWithDhcp

⬅ status-line:  200 OK

#### 8.14.10. Recovering the Icron Module with Static IP Address

The command recovers endpoint connection by setting endpoint to use static IP address setting.

**Request and Response**

➡ request-line:  http://\<ip>/api/V1/DEVICES/\<MAC_address>/COMPONENTS/ICRON/recoverWithStaticIp
➡ body:            \<IP_address>,\<subnet_mask>,\<gateway_address>

⬅ status-line:  200 OK

**Parameters**

\<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

➡ request-line:  POST http://192.168.0.50/api/V1/DEVICES/A8D236F08863/COMPONENTS/ICRON/
recoverWithStaticIp
➡ body:            10.1.128.11,255.255.255.0,10.1.128.1

⬅ status-line:  200 OK

## 8.15. Lightware REST API - Quick Summary

**System Commands - MMU**

### Setting the Device Label

➜ request-line:   POST·http://<ip>/api/V1/MANAGEMENT/LABEL/DeviceLabel
➜ body:          <custom_name>

### Restarting the Device

➜ request-line:   POST·http://<ip>/api/V1/SYS/restart

### Restoring the Factory Default Settings

➜ request-line:   POST·http://<ip>/api/V1/SYS/factoryDefaults

### Querying the Firmware Package Version

➜ request-line:   GET·http://<ip>/api/V1/PackageVersion

### Querying the Serial Number

➜ request-line:   GET·http://<ip>/api/V1/SerialNumber

### Querying the Date and Time of the System

➜ request-line:   GET·http://<ip>/api/V1/MANAGEMENT/DATETIME/CurrentTime

### Setting of the Date and Time Manually

➜ request-line:   POST·http://<ip>/api/V1/MANAGEMENT/DATETIME/setTime
➜ body:          <date_time>

### Enabling/Disabling NTP

➜ request-line:   POST·http://<ip>/api/V1/MANAGEMENT/DATETIME/NTP/Enabled
➜ body:          <logical_value>

### Setting the NTP Server

➜ request-line:   POST·http://<ip>/api/V1/MANAGEMENT/DATETIME/NTP/ServerPool
➜ body:          <server_address>

**Endpoint Management Commands**

### Discovering the Endpoints on the Network

➜ request-line:   POST·http://<ip>/api/V1/DEVICES/discover

### Adding an Endpoint to the Matrix

➜ request-line:   POST·http://<ip>/api/V1/DEVICES/<MAC_address>/addToMainGroup

### Removing an Endpoint from the Matrix

➜ request-line:   POST·http://<ip>/api/V1/DEVICES/<MAC_address>/removeFromConfiguration

### Identifying an Endpoint

➜ request-line:   POST·http://<ip>/api/V1/DEVICES/<MAC_address>/identifyMe

### Adding Alias Name to an Endpoint

➜ request-line:   POST·http://<ip>/api/V1/DEVICES/<MAC_address>/Alias
➜ body:          <alias>

### Restarting an Endpoint

➜ request-line:   POST·http://<ip>/api/V1/DEVICES/<MAC_address>/restart

### Restoring the Factory Default Settings on an Endpoint

➜ request-line:   POST·http://<ip>/api/V1/DEVICES/<MAC_address>/factoryReset

**Video Signal Management Commands**

### Switching the Video Stream to One Destination

➜ request-line:   POST·http://<ip>/api/V1/MEDIA/VIDEO/XP/switch
➜ body:          <source_stream>:<destination_stream>

### Switching the Video Stream to All Destinations

➜ request-line:   POST·http://<ip>/api/V1/MEDIA/VIDEO/XP/switchAll
➜ body:          <source_stream>

### Enabling/Disabling the Source Stream

➜ request-line:   POST·http://<ip>/api/V1/MEDIA/VIDEO/<source_stream>/Enable
➜ body:          <logical_value>

### Querying the Parameters of the Video Stream

➜ request-line:   GET·http://<ip>/api/V1/MEDIA/VIDEO/<stream_ID>/

### HDCP Setting for the Source Stream

➜ request-line:   POST·http://<ip>/api/V1/MEDIA/VIDEO/<source_stream>/HDCP/AllowedHdcpVersion
➜ body:          <HDCP_encr>

### HDCP Setting for the Destination Stream

➜ request-line:   POST·http://<ip>/api/V1/MEDIA/VIDEO/<destination_stream>/HDCP/HdcpOutputMode
➜ body:          <HDCP_auth>

### Querying the EDID Data of the Destination

➜ request-line:   GET·http://<ip>/api/V1/MEDIA/VIDEO/<destination_stream>/EDID/Data

### Uploading EDID Data for the Source

➜ request-line:   POST·http://<ip>/api/V1/MEDIA/<source_stream>/EDID/setData
➜ body:          <EDID_data>

### Setting the Scaler Mode

➜ request-line:   POST·http://<ip>/api/V1/MEDIA/VIDEO/<destination_stream>/SCALING/StagedDisplayMode
➜ body:          <scaler_mode>

Setting the Scaler Resolution

➡ request-line:   POST·http://\<ip\>/api/V1/MEDIA/VIDEO/\<destination_stream\>/SCALING/
StagedFormatName
➡ body:          \<resolution\>

**Audio Signal Management Commands**

Enabling/Disabling the Audio Follow Video Setting

➡ request-line:   POST·http://\<ip\>/api/V1/MEDIA/AUDIO/XP/FollowVideo
➡ body:          \<logical_value\>

Switching the Audio Stream to One Destination

➡ request-line:   POST·http://\<ip\>/api/V1/MEDIA/AUDIO/XP/switch
➡ body:          \<source_stream\>:\<destination_stream\>

Switching the Audio Stream to All Destinations

➡ request-line:   POST·http://\<ip\>/api/V1/MEDIA/AUDIO/XP/switchAll
➡ body:          \<source_stream\>

Enabling/Disabling the Source Stream

➡ request-line:   POST·http://\<ip\>/api/V1/MEDIA/AUDIO/\<source_stream\>/Enable
➡ body:          \<logical_value\>

Querying the Parameters of the Audio Stream

➡ request-line:   GET·http://\<ip\>/api/V1/MEDIA/AUDIO/\<stream_ID\>/\<parameter\>

**Management Network Port Configuration**

Setting the DHCP State

➡ request-line:   POST·http://\<ip\>/api/V1/MANAGEMENT/NETWORK/DhcpEnabled
➡ body:          \<logical_value\>

Changing the IP Address (Static)

➡ request-line:   POST·http://\<ip\>/api/V1/MANAGEMENT/NETWORK/StaticIpAddress
➡ body:          \<IP_address\>

Changing the Subnet Mask (Static)

➡ request-line:   POST·http://\<ip\>/api/V1/MANAGEMENT/NETWORK/StaticNetworkMask
➡ body:          \<netmask\>

Changing the Gateway Address (Static)

➡ request-line:   POST·http://\<ip\>/api/V1/MANAGEMENT/NETWORK/StaticGatewayAddress
➡ body:          \<gw_address\>

Applying Network Settings

➡ request-line:   POST·http://\<ip\>/api/V1/MANAGEMENT/NETWORK/applySettings

Setting the Hostname

➡ request-line:   POST·http://\<ip\>/api/V1/MANAGEMENT/NETWORK/HostName
➡ body:          \<unique_name\>

**Network Security**

Querying Network Service Port Number

➡ request-line:   GET·http://\<ip\>/api/V1/MANAGEMENT/NETWORK/SERVICES/\<port\>/Port

Enabling/Disabling Network Service Port

➡ request-line:   GET·http://\<ip\>/api/V1/MANAGEMENT/NETWORK/SERVICES/\<port\>/Enabled
➡ body:          \<status\>

Enabling Authentication

➡ request-line:   POST·http://\<ip\>/api/V1/MANAGEMENT/NETWORK/SERVICES/\<port\>/
AuthenticationEnabled
➡ body:          \<status\>

**Endpoint Network Configuration**

Setting the DHCP State for SDVoE

➡ request-line:   POST·http://\<ip\>/api/V1/DEVICES/\<MAC_address\>/COMPONENTS/SDVOE/
NETWORK/StagedIpAcquisitionMode
➡ body:          \<logical_value\>

Changing the IP Address (Static) for SDVoE

➡ request-line:   POST·http://\<ip\>/api/V1/DEVICES/\<MAC_address\>/COMPONENTS/SDVOE/
NETWORK/StagedIpAddress
➡ body:          \<IP_address\>

Changing the Subnet Mask (Static) for SDVoE

➡ request-line:   POST·http://\<ip\>/api/V1/DEVICES/\<MAC_address\>/COMPONENTS/SDVOE/
NETWORK/StagedSubnetMask
➡ body:          \<netmask\>

Changing the Gateway Address (Static) for SDVoE

➡ request-line:   POST·http://\<ip\>/api/V1/DEVICES/\<MAC_address\>/COMPONENTS/SDVOE/
NETWORK/StagedGatewayAddress
➡ body:          \<gw_address\>

Setting the DHCP State for Icron

➡ request-line:   POST·http://\<ip\>/api/V1/DEVICES/\<MAC_address\>/COMPONENTS/ICRON/
NETWORK/StagedIpAcquisitionMode
➡ body:          \<logical_value\>

## Changing the IP Address (Static) for Icron

➜ request-line: POST·http://\<ip>/api/V1/DEVICES/\<MAC_address>/COMPONENTS/ICRON/NETWORK/StagedIpAddress
➜ body: \<IP_address>

## Changing the Subnet Mask (Static) for Icron

➜ request-line: POST·http://\<ip>/api/V1/DEVICES/\<MAC_address>/COMPONENTS/ICRON/NETWORK/StagedSubnetMask
➜ body: \<netmask>

## Changing the Gateway Address (Static) for Icron

➜ request-line: POST·http://\<ip>/api/V1/DEVICES/\<MAC_address>/COMPONENTS/ICRON/NETWORK/StagedGatewayAddress
➜ body: \<gw_address>

## Applying Network Settings

➜ request-line: POST·http://\<ip>/api/V1/MANAGEMENT/NETWORK/applySettings

**Serial Port Configuration for Endpoints**

## BAUD Rate Setting

➜ request-line: POST·http://\<ip>/api/V1/MEDIA/SERIAL/\<serial_port>/BaudRate
➜ body: \<baudrate>

## Stop Bits Setting

➜ request-line: POST·http://\<ip>/api/V1/MEDIA/SERIAL/\<serial_port>/StopBits
➜ body: \<stopbits>

## Querying Data Bits

➜ request-line: GET·http://\<ip>/api/V1/MEDIA/SERIAL/\<serial_port>/DataBits

## Parity Setting

➜ request-line: POST·http://\<ip>/api/V1/MEDIA/SERIAL/\<serial_port>/Parity
➜ body: \<parity>

## Querying the Actual Serial Port Configuration

➜ request-line: GET·http://\<ip>/api/V1/MEDIA/SERIAL/\<serial_port>/Configuration

## Enabling/Disabling the Serial over IP Port

➜ request-line: POST·http://\<ip>/api/V1/MEDIA/SERIAL/\<serial_port>/SERVICE/Enabled
➜ body: \<logical_value>

## Command Injection over Serial Port

➜ request-line: POST·http://\<ip>/api/V1/DEVICES/\<MAC_address>/SERIAL/\<port_ID>/SERVICE/send
➜ body: \<data>

**USB HID Configuration Commands**

## Enabling/Disabling the Follow Video Setting

➜ request-line: POST·http://\<ip>/api/V1/MEDIA/USBHID/XP/FollowVideo
➜ body: \<logical_value>

## Switching the USB HID Stream to One Destination

➜ request-line: POST·http://\<ip>/api/V1/MEDIA/USBHID/XP/switch
➜ body: \<source_stream>:\<destination_stream>

## Switching the USB HID Stream to All Destinations

➜ request-line: POST·http://\<ip>/api/V1/MEDIA/USBHID/XP/switchAll
➜ body: \<source_stream>

## Enabling/Disabling the Source Stream

➜ request-line: POST·http://\<ip>/api/V1/MEDIA/USBHID/\<source_stream>/Enable
➜ body: \<logical_value>

## Querying the Parameters of the USB HID Signal

➜ request-line: GET·http://\<ip>/api/V1/MEDIA/USBHID/\<stream_ID>/\

**Icron USB KVM Configuration Commands**

## Enabling/Disabling the Follow Video Setting

➜ request-line: POST·http://\<ip>/api/V1/MEDIA/USBICRON/XP/FollowVideo
➜ body: \<logical_value>

## Switching the Icron USB Stream to One Destination

➜ request-line: POST·http://\<ip>/api/V1/MEDIA/USBICRON/XP/switch
➜ body: \<source_stream>:\<destination_stream>

## Switching the Icron USB Stream to All Destinations

➜ request-line: POST·http://\<ip>/api/V1/MEDIA/USBICRON/XP/switchAll
➜ body: \<source_stream>

## Querying the Parameters of the Icron USB Signal

➜ request-line: GET·http://\<ip>/api/V1/MEDIA/USBICRON/\<stream_ID>/\

## Querying the MAC Address of the Icron Module

➜ request-line: GET·http://\<ip>/api/V1/DEVICES/\<MAC_address>/COMPONENTS/ICRON/MacAddress

## Querying the Operation Mode of the Icron Device

➜ request-line: GET·http://\<ip>/api/V1/DEVICES/\<MAC_address>/COMPONENTS/ICRON/Mode

### Setting the USB Mode of the Icron Device

➜ request-line:   POST·http://\<ip>/api/V1/DEVICES/\<MAC_address>/COMPONENTS/ICRON/UsbMode
➜ body:          \<USB_mode>

### Removing All Pairings of the Icron Device

➜ request-line:   http://\<ip>/api/V1/DEVICES/\<MAC_address>/COMPONENTS/ICRON/removeAllPairings

### Recovering the Icron Module with DHCP

➜ request-line:   http://\<ip>/api/V1/DEVICES/\<MAC_address>/COMPONENTS/ICRON/recoverWithDhcp

### Recovering the Icron Module with Static IP Address

➜ request-line:   http://\<ip>/api/V1/DEVICES/\<MAC_address>/COMPONENTS/ICRON/recoverWithStaticIp
➜ body:          \<IP_address>,\<subnet_mask>,\<gateway_address>

# 9

## LW3 Programmer's Reference

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

## 9.1. Overview

The Lightware Protocol #3 (LW3) is implemented in almost all new Lightware devices (matrix switchers, signal extenders and distribution amplifiers) since 2012. The protocol is ASCII-based and all commands are terminated with a carriage return (Cr, '\r') and line feed (Lf, '\n') pair. It is organized as a tree structure that provides outstanding flexibility and user-friendly handling with 'nodes', 'properties' and 'methods'.

## 9.2. Instructions for the Terminal Application Usage

**Terminal Application**

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

**Establishing Connection**

Follow the steps for establishing connection to the device:

**Step 1.** Connect the MMU to a LAN over Ethernet.

**Step 2.** Open the terminal application (e.g. Putty).

**Step 3.** Add the **IP address** of the MMU (the default is DHCP) and the **port number (6107)**.

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

Once the terminal window is opened, you can enter the LW3 protocol commands, which are listed in the following sections.
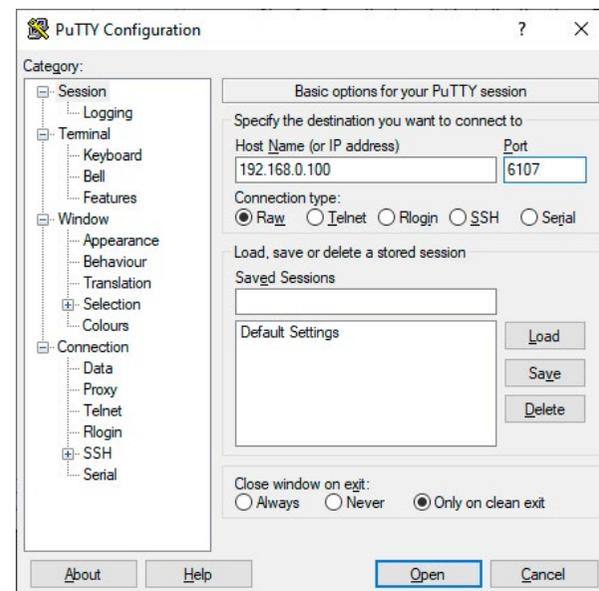
## 9.3. Websocket (WS) or Secured Websocket (WSS) Usage

TPN-MMU-X100 matrix management unit provides WS/WSS services on its 80 (for WS) and 443 (for WSS) ports to control the device with LW3 protocol commands. For more details about the websocket, see the WebSocket Service (WS, WSS) section.

The LW3 node tree is available after opening a session with the device on the following path:

- ws://<ip>/lw3
- wss://<ip>/lw3

**WebSocket Client Application**

**Establishing the Connection**

Follow the steps to establish connection to the switcher:

**Step 1.** Connect the device to a LAN over Ethernet.

**Step 2.** Open the websocket client (e.g. Simple websocket Client).

**Step 3.** Add the **IP address** of the device (default: DHCP): ws://<ip>/lw3 or wss://<ip>/lw3

**Step 4.** Press the open/connect button.

**Step 5.** Once connected, enter a message and press the Send button.

**Step 6.** Press the Close/Disconnect button to end the session.
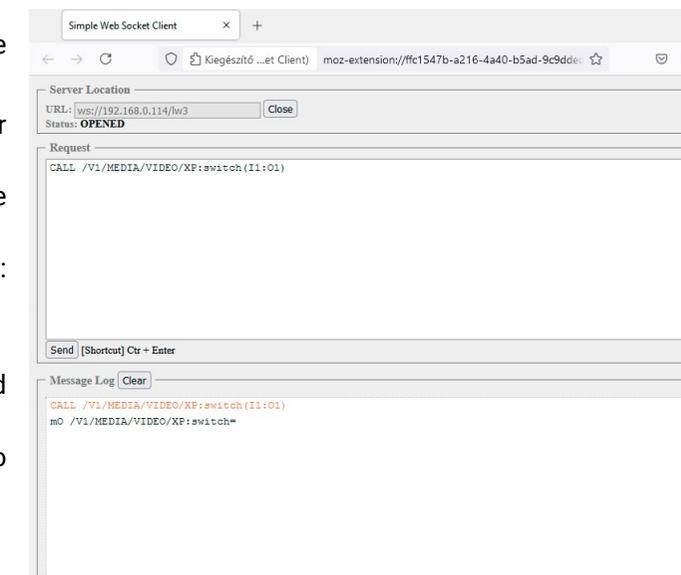
## 9.4. Protocol Rules

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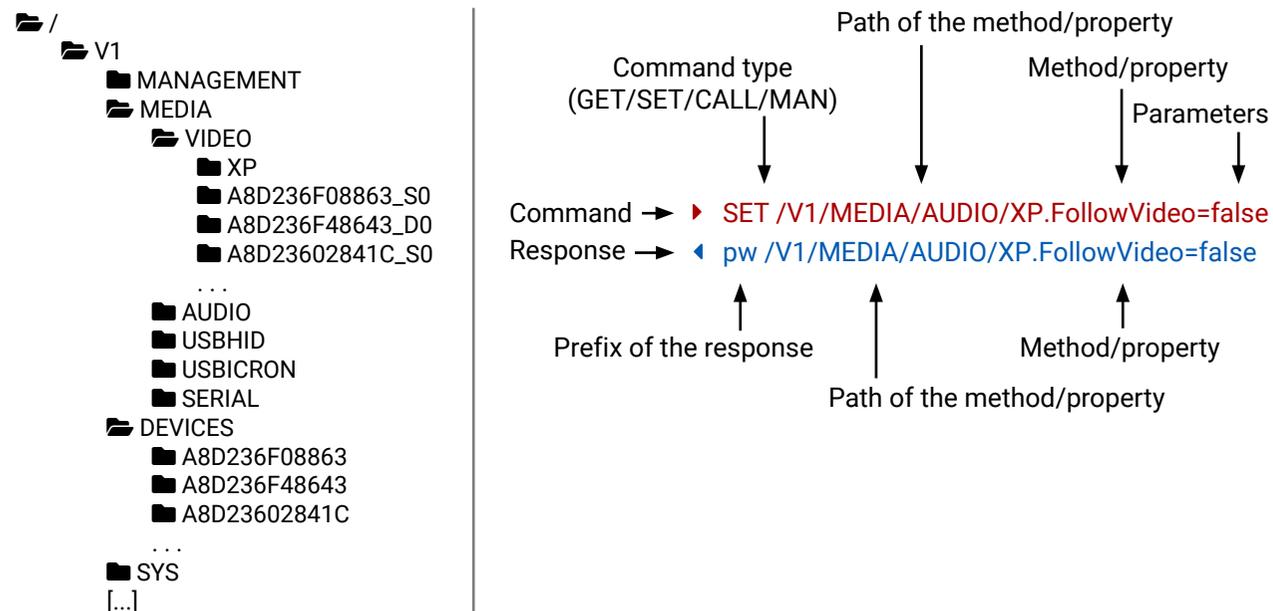


### 9.4.2. General Rules

- All names and parameters are **case-sensitive**.
- The nodes are separated by a slash ('/') character.
- The node name can contain the elements of the English alphabet and numbers.
- Use the **TCP port no. 6107** when using LW3 protocol over Ethernet.
- The 80 port can be used for WS (instead of HTTP)
- The 443 port can be used for WSS (instead of HTTPS)
- When a command is issued by the device, the received response cannot be processed by the CPU.
- The node paths describe the exact location of the node, listing each parent node up to the root.
- The length of a line (command/response, command type / prefix, path, method/property and parameters together) can be max. 800 bytes.
- The command lines have to be closed by Carriage Return and Line Feed (CrLf)
- It can manage 18 connected clients in total simultaneously for WS (80), WSS (443) and LW3 (6107) ports.

### 9.4.3. Legend for the Control Commands

**Command and Response – Example**

▸ GET·/V1/MANAGEMENT/LABEL.DeviceLabel

◂ pr·/V1/MANAGEMENT/LABEL.DeviceLabel=<label>

| Format | Description |
|---|---|
| <in> | Input port number |
| <out> | Output port number |
| <port> | Input or output port number |
| <loc> | Location number |
| <parameter> | Variable defined and described in the command |
| <expression> | Batched parameters: the underline means that more expressions or parameters can be placed by using a semicolon, e.g. **P1;P2** |
| ▸ | Sent command |
| ◂ | Received response |
| · | Space character |

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

### 9.4.4. Command Types

**GET Command**

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

▶ GET /V1.SerialNumber

◀ pr /V1.SerialNumber=87654321

**GETALL Command**

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

▶ GETALL /V1/MEDIA

◀ n- /V1/MEDIA/USBHID

◀ n- /V1/MEDIA/USBICRON

◀ n- /V1/MEDIA/AUDIO

◀ n- /V1/MEDIA/VIDEO

◀ n- /V1/MEDIA/SERIAL

**SET Command**

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

▶ SET /V1/MANAGEMENT/NETWORK.DhcpEnabled=true

◀ pw /V1/MANAGEMENT/NETWORK.DhcpEnabled=true

**CALL Command**

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

▶ CALL /V1/MEDIA/XP.switchAll(MTR_TX1)

◀ mO /V1/MEDIA/XP.switchAll()

**MAN Command**

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

▶ MAN /V1/MEDIA/USBHID/XP:switch

◀ mm /V1/MEDIA/USBHID/XP:switch Switch between two given streams. Format: <SRC_STREAM_ID>:<DEST_STREAM_ID>

### 9.4.5. Prefix Summary

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

The following prefixes are defined in the LW3 protocol:

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

### 9.4.6. Error Messages

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

▶ CALL /V1/MEDIA/USBHID/XP:switch(I1)

◀ mE /V1/MEDIA/USBHID/XP:switch %E004: Invalid value: tpn-mmu-crosspoint: Invalid switch parameters | Switching streams failed!

### 9.4.7. Escaping

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

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

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

## 9.4.8. Signature

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

Each line is terminated with Carriage Return (Cr, '\r') and Line Feed (Lf, '\n') characters. In several cases the number of the lines in the response cannot be determined in advance, e.g. the client intends to receive 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 response to that particular command will also be preceded by the signature, and the corresponding lines will be between brackets:

◀ 4B37#GET /V1/MEDIA
▶ {4B37
▶ n- /V1/MEDIA/USBHID
▶ n- /V1/MEDIA/USBICRON
▶ n- /V1/MEDIA/AUDIO
▶ n- /V1/MEDIA/VIDEO
▶ n- /V1/MEDIA/SERIAL
▶ }

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

## 9.4.9. Subscription

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

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

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

**Subscribe to a Node**

▶ OPEN /V1/MEDIA/SERIAL
◀ o- /V1/MEDIA/SERIAL

**Get the Active Subscriptions**

▶ OPEN
◀ o- /V1/MANAGEMENT/LABEL
◀ o- /V1/MANAGEMENT/NETWORK
◀ o- /V1/MEDIA/USBICRON/XP
◀ o- /V1/MEDIA/AUDIO/XP

**Subscribe to Multiple Nodes**

▶ OPEN /V1/MEDIA/SERIAL/*
◀ o- /V1/MEDIA/SERIAL/*

**Unsubscribe from a Node**

▶ CLOSE /V1/MEDIA/SERIAL
◀ c- /V1/MEDIA/SERIAL

**Unsubscribe from Multiple Nodes**

▶ CLOSE /V1/MEDIA/SERIAL/*
◀ c- /V1/MEDIA/SERIAL/*

## 9.4.10. Notifications about the Changes of the Properties

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

◀ CHG /V1/MEDIA/VIDEO/A8D236F48643_S0.Enabled=false

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

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

▶ OPEN /V1/MEDIA/VIDEO/A8D236F48643_S0
◀ o- /V1/MEDIA/VIDEO/A8D236F48643_S0      **connection #1**
▶ GET /V1/MEDIA/VIDEO/A8D236F48643_S0.Enabled
◀ pw /V1/MEDIA/VIDEO/A8D236F48643_S0.Enabled=true

▶ GET /V1/MEDIA/VIDEO/A8D236F48643_S0.Enabled
◀ pw /V1/MEDIA/VIDEO/A8D236F48643_S0.Enabled=true      **connection #2**
▶ SET /V1/MEDIA/VIDEO/A8D236F48643_S0.Enabled
◀ pw /V1/MEDIA/VIDEO/A8D236F48643_S0.Enabled=false

◀ CHG /V1/MEDIA/VIDEO/A8D236F48643_S0.Enabled=false      **connection #1**

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

## 9.5. System Commands

### 9.5.1. Setting the Device Label

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

- ▶ SET·/V1/MANAGEMENT/LABEL.DeviceLabel=<custom_name>
- ◀ pw·/V1/MANAGEMENT/LABEL.DeviceLabel=<custom_name>

The Device Label can be 49 characters long and ASCII characters are allowed. Longer names are truncated.

**Example**

- ▶ SET /V1/MANAGEMENT/LABEL.DeviceLabel=TPNMMU
- ◀ pw /V1/MANAGEMENT/LABEL.DeviceLabel=TPNMMU

### 9.5.2. Restarting the Device

The MMU can be restarted – the current connections will be terminated.

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

- ▶ CALL·/V1/SYS:restart()
- ◀ mO·/V1/SYS:restart=

**Example**

- ▶ CALL /V1/SYS:restart()
- ◀ mO /V1/SYS:restart=

### 9.5.3. Restoring the Factory Default Settings

**Command and Response**

- ▶ CALL·/V1/SYS:factoryDefaults()
- ◀ mO·/V1/SYS:factoryDefaults=

**Example**

- ▶ CALL /V1/SYS:factoryDefaults()
- ◀ mO /V1/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.    *#factory*

### 9.5.4. Querying the Firmware Package Version

**Command and Response** *#firmwareversion*

- ▶ GET·/V1/MANAGEMENT/UID/PACKAGE.Version
- ◀ pr·/V1/MANAGEMENT/UID/PACKAGE.Version=<firmware_version>

**Example**

- ▶ GET /V1.PackageVersion
- ◀ pr /V1.PackageVersion=1.0.0b3

### 9.5.5. Setting of the Date and Time Manually

**Command and Response** *#time*

- ▶ CALL·/V1/MANAGEMENT/DATETIME:setTime(<date_time>)
- ◀ mO·/V1/MANAGEMENT/DATETIME:setTime=

**Parameters**

<date_time>: The new time in ISO 8601 date time format.

**Example**

- ▶ CALL /V1/MANAGEMENT/DATETIME:setTime(2034-05-06T14:47:25)
- ◀ mO /V1/MANAGEMENT/DATETIME:setTime=

### 9.5.6. Enabling/Disabling NTP

> DEFINITION: The Network Time Protocol (NTP) is a networking protocol for clock synchronization between computer systems over packet-switched, variable-latency data networks.

**Command and Response** *#ntp*

- ▶ SET·/V1/MANAGEMENT/DATETIME/NTP.Enabled=<logical_value>
- ◀ pw·/V1/MANAGEMENT/DATETIME/NTP.Enabled=<logical_value>

**Parameters**

<logical_value>: If **true**, the NTP is enabled, if **false**, it is disabled.

**Example**

- ▶ SET /V1/MANAGEMENT/DATETIME/NTP.Enabled=true
- ◀ pw /V1/MANAGEMENT/DATETIME/NTP.Enabled=true

### 9.5.7. Setting the NTP Server

> DEFINITION: The Network Time Protocol (NTP) is a networking protocol for clock synchronization between computer systems over packet-switched, variable-latency data networks.

**Command and Response** *#ntp*

▸ SET·/V1/MANAGEMENT/DATETIME/NTP.ServerPool=<server_address>

◂ pw·/V1/MANAGEMENT/DATETIME/NTP.ServerPool=<server_address>

**Example**

▸ SET /V1/MANAGEMENT/DATETIME/NTP.ServerPool=pool.ntp.org

◂ pw /V1/MANAGEMENT/DATETIME/NTP.ServerPool=pool.ntp.org

## 9.6. Endpoint Management Commands

### 9.6.1. Discovering the Endpoints on the Network

After calling this command the discovered TPN/OPTN series endpoint devices appears under the DEVICES node based on their MAC addresses.

**Command and Response** *#discover*

▸ CALL·/V1/DEVICES:discover()

◂ mO·/V1/DEVICES:discover=

**Example**

▸ CALL /V1/DEVICES:discover()

◂ mO /V1/DEVICES:discover=

### 9.6.2. Adding an Endpoint to the Matrix

**Command and Response**

▸ CALL·/V1/DEVICES/<MAC_address>:addToMainGroup()

◂ mO·/V1/DEVICES/<MAC_address>:addToMainGroup=

**Parameters**

<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

▸ CALL /V1/DEVICES/A8D236F08863:addToMainGroup()

◂ mO /V1/DEVICES/A8D236F08863:addToMainGroup=

### 9.6.3. Removing an Endpoint from the Matrix

**Command and Response**

▸ CALL·/V1/DEVICES/<MAC_address>:removeFromConfiguration()

◂ mO·/V1/DEVICES/<MAC_address>:removeFromConfiguration=

**Parameters**

<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

▸ CALL /V1/DEVICES/A8D236F08863:removeFromConfiguration()

◂ mO /V1/DEVICES/A8D236F08863:removeFromConfiguration=

### 9.6.4. Identifying an Endpoint

Calling the method results in the blinking of the front panel status LEDs for 10 seconds. This feature can be used to help to identify the device itself in the rack shelf.

**Command and Response**

▸ CALL·/V1/DEVICES/<MAC_address>:identifyMe()

◂ mO·/V1/DEVICES/<MAC_address>:identifyMe=

**Parameters**

<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

▸ CALL /V1/DEVICES/A8D236F08863:identifyMe()

◂ mO /V1/DEVICES/A8D236F08863:identifyMe=

### 9.6.5. Adding Alias Name to an Endpoint

The given alias name helps easily identifying the endpoint on the network and also can be used for AV crosspoint switching as a stream ID.

**Command and Response**

▸ SET·/V1/DEVICES/<MAC_address>.Alias=<alias>

◂ pw·/V1/DEVICES/<MAC_address>.Alias=<alias>

**Parameters**

<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

<alias> It must be non-empty, contain only [ **A-Z**, **0-9**, '_' ], and maximum 32 characters long.

**Example**

▸ SET /V1/DEVICES/A8D236F08863.Alias=mtr01_tx

◂ pw /V1/DEVICES/A8D236F08863.Alias=MTR01_TX

### 9.6.6. Restarting an Endpoint

Calling the method results in the endpoints restarting – the connection with the remote device and the signal transmission will be terminated. After rebooting, the configuration settings are reloaded and the connection with the remote device is established again.

**Command and Response**

▶ CALL·/V1/DEVICES/<MAC_address>:restart()

◀ mO·/V1/DEVICES/<MAC_address>:restart=

**Parameters**

<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

▶ CALL /V1/DEVICES/A8D236F08863:restart()

◀ mO /V1/DEVICES/A8D236F08863:restart=

### 9.6.7. Restoring the Factory Default Settings on an Endpoint

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

**Command and Response**

▶ CALL·/V1/DEVICES/<MAC_address>:factoryReset()

◀ mO·/V1/DEVICES/<MAC_address>:factoryReset=

**Parameters**

<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

▶ CALL /V1/DEVICES/A8D236F08863:factoryReset()

◀ mO /V1/DEVICES/A8D236F08863:factoryReset=

## 9.7. Video Signal Management Commands

█ INFO: The MMU does not transmit AV signals, only controls the source and destination streams of the endpoint devices in the TPN matrix.

### 9.7.1. Switching the Video Stream to One Destination

█ INFO: The audio signal follows the video by default. The independent audio layer can be configured, see the details in the Audio Signal Management Commands section.

**Command and Response**

▶ CALL·/V1/MEDIA/VIDEO/XP:switch(<source_stream>:<destination_stream>)

◀ mO·/V1/MEDIA/VIDEO/XP:switch=

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

<destination_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

█ TIPS AND TRICKS: Alias name can also be used for source and destination stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

▶ CALL /V1/MEDIA/VIDEO/XP:switch(MTR01_TX_S0:HALL_RX_D0)

◀ mO /V1/MEDIA/VIDEO/XP:switch=

### 9.7.2. Switching the Video Stream to All Destinations

█ INFO: The audio signal follows the video by default. The independent audio layer can be configured, see the details in the Audio Signal Management Commands section.

**Command and Response**

▶ CALL·/V1/MEDIA/VIDEO/XP:switchAll(<source_stream>)

◀ mO·/V1/MEDIA/VIDEO/XP:switchAll=

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

█ TIPS AND TRICKS: Alias name can also be used for source stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

▶ CALL /V1/MEDIA/VIDEO/XP:switchAll(MTR01_TX_S0)

◀ mO /V1/MEDIA/VIDEO/XP:switchAll=

### 9.7.3. Querying the Parameters of the Video Stream

This single command queries all parameters of the source/destination video stream.

**Command and Response**

▶ GETALL·/V1/MEDIA/VIDEO/<stream_ID>

◀ pr·/V1/MEDIA/VIDEO/<stream_ID>.<parameter#1>=<parameter_value#1>

◀ pr·/V1/MEDIA/VIDEO/<stream_ID>.<parameter#2>=<parameter_value#2>

◀ . . .

◀ pr·/V1/MEDIA/VIDEO/<stream_ID>.<parameter#X>=<parameter_value#X>

**Parameters**

<stream_ID>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 or _D0 character line as "stream nr 0". Example: A8D236F08863_D0

| <parameter> | Parameter description | <parameter_value> | Value description |
|---|---|---|---|
| SignalPresent | Active signal is present in the stream or not. | **true** | Signal is present. |
| | | **false** | Signal is not present. |
| ActiveResolution | Resolution of the stream. | resolution | Example: 3840x2160 |
| RefreshRate | Image refresh rate of the stream. | refresh rate | Example: 60.00, as 60 Hz |
| ColorDepth | Color depth of the stream | **8 bpc** | 8 bit per channel = 24 bit |
| | | **10 bpc** | 10 bit per channel = 30 bit |
| | | **12 bpc** | 12 bit per channel = 36 bit |
| ColorSpace | Color space of the stream | **RGB** | RGB color space |
| | | **YCbCr 4:4:4** | YCbCr color space, 4:4:4 sampling |
| | | **YCbCr 4:2:2** | YCbCr color space, 4:2:2 sampling |
| | | **YCbCr 4:2:0** | YCbCr color space, 4:2:0 sampling |
| ColorRange | Color range of the stream | **Default** | Default color range |
| | | **Full** | Full color range |
| | | **Limited** | Limited color range |
| StreamAlias | Alias of the stream | alias name | Example: MTR_RX_D0 |
| SourceStream | Source stream ID what is connected to the destination stream | <MAC>_S0 | Example: A8D236F08863_S0 |
| SourceStreamAlias | Alias of the source stream what is connected to the destination stream | <alias>_S0 | Example: MTR_TX_S0 |

**Example**

▶ GETALL /V1/MEDIA/VIDEO/A8D236F08863_D0

◀ pr /V1/MEDIA/VIDEO/A8D236F08863_D0.Active=true

◀ pr /V1/MEDIA/VIDEO/A8D236F08863_D0.SignalPresent=true

◀ pr /V1/MEDIA/VIDEO/A8D236F08863_D0.MulticastSourceAddress=224.1.1.3

◀ pr /V1/MEDIA/VIDEO/A8D236F08863_D0.ActiveResolution=3840x2160

◀ pr /V1/MEDIA/VIDEO/A8D236F08863_D0.TotalResolution=4400x2250

◀ pr /V1/MEDIA/VIDEO/A8D236F08863_D0.RefreshRate=60.00

◀ pr /V1/MEDIA/VIDEO/A8D236F08863_D0.ColorDepth=8 bpc

◀ pr /V1/MEDIA/VIDEO/A8D236F08863_D0.ColorSpace=RGB

◀ pr /V1/MEDIA/VIDEO/A8D236F08863_D0.ColorRange=Default

◀ pr /V1/MEDIA/VIDEO/A8D236F08863_D0.DeviceAlias=DOCU_RX_1

◀ pr /V1/MEDIA/VIDEO/A8D236F08863_D0.StreamAlias=DOCU_RX_1_D0

◀ pr /V1/MEDIA/VIDEO/A8D236F08863_D0.StreamId=D0

◀ pw /V1/MEDIA/VIDEO/A8D236F08863_D0.SourceStream=A8D236F48643_S0

◀ pr /V1/MEDIA/VIDEO/A8D236F08863_D0.SourceStreamAlias=DOCU_UCX_TX_S0

◀ n- /V1/MEDIA/VIDEO/A8D236F08863_D0/HDCP

◀ n- /V1/MEDIA/VIDEO/A8D236F08863_D0/TIMING

◀ n- /V1/MEDIA/VIDEO/A8D236F08863_D0/EDID

◀ n- /V1/MEDIA/VIDEO/A8D236F08863_D0/SCALING

### 9.7.4. Enabling/Disabling the Source Stream

**Command and Response**

▶ SET·/V1/MEDIA/VIDEO/<source_stream>.Enabled=<logical_value>

◀ pw·/V1/MEDIA/VIDEO/<source_stream>.Enabled=<logical_value>

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

<logical_value>: If **true**, the stream is enabled, if **false**, it is disabled.

**Example**

▶ SET /V1/MEDIA/VIDEO/A8D236F08863_S0.Enabled=true

◀ pw /V1/MEDIA/VIDEO/A8D236F08863_S0.Enabled=true

## 9.7.5. HDCP Setting for the Source Stream

HDCP capability can be enabled/disabled on the input ports, thus non-encrypted content can be enforced so that non-HDCP compliant displays can be used. See more information in the HDCP Management section.

**Command and Response** *#hdcp*

▸ SET·/V1/MEDIA/VIDEO/<source_stream>/HDCP.AllowedHdcpVersion=<HDCP_encr>

◂ pw·/V1/MEDIA/VIDEO/<source_stream>/HDCP.AllowedHdcpVersion=<HDCP_encr>

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

| Parameter | Parameter description | Value | Value description |
|---|---|---|---|
| <HDCP_encr> | HDCP encryption setting | **off** | HDCP encryption is disabled. |
| | | **HDCP 1.4** | HDCP 1.4 |
| | | **HDCP 2.2** | HDCP 2.2 |

**Example**

▸ SET /V1/MEDIA/VIDEO/A8D236F08863_S0/HDCP. AllowedHdcpVersion=HDCP 2.2

◂ pw /V1/MEDIA/VIDEO/A8D236F08863_S0/HDCP. AllowedHdcpVersion=HDCP 2.2

## 9.7.6. HDCP Setting for the Destination Stream

HDCP capability can be set ton the output port, thus non-encrypted content can be transmitted to a non-HDCP compliant display. See more information in the HDCP Management section.

**Command and Response** *#hdcp*

▸ SET·/V1/MEDIA/VIDEO/<destination_stream>/HDCP.HdcpOutputMode=<HDCP_auth>

◂ pw·/V1/MEDIA/VIDEO/<destination_stream>/HDCP.HdcpOutputMode=<HDCP_auth>

**Parameters**

<destination_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

| Parameter | Parameter description | Value | Value description |
|---|---|---|---|
| <HDCP_auth> | HDCP authentication setting on the output | **FollowSource** | Output follows the HDCP setting of the source stream. |
| | | **FollowSink (Always Follow)** | Output always follows the HDCP capability of the sink device. |
| | | **FollowSink (Follow Once)** | Output follows the HDCP capability of the sink device. |

**Example**

▸ SET /V1/MEDIA/VIDEO/A8D236F08863_D0/HDCP. HdcpOutputMode=FollowSink (Always Follow)

◂ pw /V1/MEDIA/VIDEO/A8D236F08863_D0/HDCP. HdcpOutputMode=FollowSink (Always Follow)

### 9.7.7. Querying the EDID Data of the Destination

**Command and Response** *#edid*

- ▶ GET·/V1/MEDIA/VIDEO/<destination_stream>/EDID.Data
- ◀ pr·/V1/MEDIA/VIDEO/<destination_stream>/EDID.Data=<EDID_data>

**Parameters**

<destination_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

**Example**

- ▶ SET /V1/MEDIA/VIDEO/A8D236F08863_D0/EDID.Data
- ◀ pw /V1/MEDIA/VIDEO/A8D236F08863_D0/EDID.Data=00ffffffffffff0010a6000156 524c4208160103...

### 9.7.8. Uploading EDID Data for the Source

**Command and Response** *#edid*

- ▶ CALL·/V1/MEDIA/VIDEO/<source_stream>/EDID:setData(<EDID_data>)
- ◀ mO·/V1/MEDIA/VIDEO/<source_stream>/EDID:setData=

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

**Example**

- ▶ CALL /V1/MEDIA/VIDEO/A8D236F08863_S0/EDID:setData(00ffffffffffff0010a6000156 524c420816...)
- ◀ mO /V1/MEDIA/VIDEO/A8D236F08863_S0/EDID:setData=

### 9.7.9. Setting the Scaler Mode

> **DIFFERENCE:** Only **HDMI-TPN-RX107A-SR**, **HDMI-TPN-RX107D-SR**, **HDMI-TPN-RX107DU2K-SR**, **HDMI-TPN-RX107AU2K-SR**, **HDMI-OPTN-RX100A-SR** and **HDMI-OPTN-RX100AU2K-SR** receiver models have integrated scaler function.

**Command and Response** *#scaler*

- ▶ SET·/V1/MEDIA/VIDEO/<destination_stream>/SCALING.StagedDisplayMode=<scaler_mode>
- ◀ pw·/V1/MEDIA/VIDEO/<destination_stream>/SCALING.StagedDisplayMode=<scaler_mode>

Then

- ▶ CALL·/V1/MEDIA/VIDEO/<destination_stream>/SCALING:applySettings()
- ◀ mO·/V1/MEDIA/VIDEO/<destination_stream>/SCALING:applySettings=

> **ATTENTION:** Calling of applySettings() method is required for applying the setting in the receiver. Before the method the setting in staged only and not applied.

**Parameters**

<destination_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

<scaler_mode>:

| Parameter | Parameter description | Value | Value description |
|-----------|----------------------|-------|-------------------|
| <scaler_mode> | HDCP authentication setting on the output | Genlock | See the details about the scaling modes in the Scaling Modes section. |
| | | GenlockScaling | |
| | | FastSwitch | |
| | | FastSwitchCrop | |
| | | FastSwitchStretch | |
| | | GenlockWall | |
| | | FastSwitchWall | |
| | | Multiview | |

**Example**

- ▶ SET /V1/MEDIA/VIDEO/A8D236F08863_D0/SCALING.StagedDisplayMode=FastSwitch
- ◀ pw /V1/MEDIA/VIDEO/A8D236F08863_D0/SCALING.StagedDisplayMode=FastSwitch

Then

- ▶ CALL /V1/MEDIA/VIDEO/A8D236F08863_D0/SCALING:applySettings()
- ◀ mO /V1/MEDIA/VIDEO/A8D236F08863_D0/SCALING:applySettings=

## 9.7.10. Setting the Scaler Resolution

> **DIFFERENCE:** Only **HDMI-TPN-RX107A-SR**, **HDMI-TPN-RX107D-SR**, **HDMI-TPN-RX107DU2K-SR**, **HDMI-TPN-RX107AU2K-SR**, **HDMI-OPTN-RX100A-SR** and **HDMI-OPTN-RX100AU2K-SR** receiver models have integrated scaler function.

**Command and Response** *#scaler*

▶ SET·/V1/MEDIA/VIDEO/<destination_stream>/SCALING.StagedFormatName=<resolution>

◀ pw·/V1/MEDIA/VIDEO/<destination_stream>/SCALING.StagedDisplayMode=<resolution>

Then

▶ CALL·/V1/MEDIA/VIDEO/<destination_stream>/SCALING:applySettings()

◀ mO·/V1/MEDIA/VIDEO/<destination_stream>/SCALING:applySettings=

> **ATTENTION:** Calling of applySettings() method is required for applying the setting in the receiver. Before the method the setting in staged only and not applied.

**Parameters**

<destination_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

<resolution>:   The following table lists the supported resolution and refresh rate of the scaler.

| Value | | | |
|---|---|---|---|
| 640x480p60 | 1280x720p50 | 3840x2160p24 | 4096x2160p50 |
| 720x480p60 | 1280x720p60 | 3840x2160p25 | 4096x2160p60 |
| 720x480p60(16:9) | 1920x1080p24 | 3840x2160p30 | 4096x2160p25 |
| 720x576p50 | 1920x1080p25 | 3840x2160p50 | 4096x2160p30 |
| 720x576p50(16:9) | 1920x1080p30 | 3840x2160p60 | 4096x2160p50 |
| 1280x720p24 | 1920x1080p50 | 4096x2160p24 | 4096x2160p60 |
| 1280x720p25 | 1920x1080p60 | 4096x2160p25 | |
| 1280x720p30 | 3840x2160p24 | 4096x2160p30 | |

**Example**

▶ SET /V1/MEDIA/VIDEO/A8D236F08863_D0/SCALING.StagedFormatName=1920x1080p60

◀ pw /V1/MEDIA/VIDEO/A8D236F08863_D0/SCALING.StagedFormatName=1920x1080p60

Then

▶ CALL /V1/MEDIA/VIDEO/A8D236F08863_D0/SCALING:applySettings()

◀ mO /V1/MEDIA/VIDEO/A8D236F08863_D0/SCALING:applySettings=

## 9.8. Audio Signal Management Commands

### 9.8.1. Enabling/Disabling the Audio Follow Video Setting

**Command and Response** *#audio*

▶ SET·/V1/MEDIA/AUDIO/XP.FollowVideo=<logical_value>

◀ pw·/V1/MEDIA/AUDIO/XP.FollowVideo=<logical_value>

**Parameters**

<logical_value>: If **true**, the audio signal is switched together with the video signal, if **false**, the independent audio layer can be switched by commands.

**Example**

▶ SET /V1/MEDIA/AUDIO/XP.FollowVideo=true

◀ pw /V1/MEDIA/AUDIO/XP.FollowVideo=true

### 9.8.2. Switching the Audio Stream to One Destination

**Command and Response**

▶ CALL·/V1/MEDIA/AUDIO/XP:switch(<source_stream>:<destination_stream>)

◀ mO·/V1/MEDIA/AUDIO/XP:switch=

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

<destination_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

> TIPS AND TRICKS: Alias name can also be used for source and destination stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

▶ CALL /V1/MEDIA/AUDIO/XP:switch(MTR01_TX_S0:HALL_RX_D0)

◀ mO /V1/MEDIA/AUDIO/XP:switch=

### 9.8.3. Switching the Audio Stream to All Destinations

**Command and Response**

▶ CALL·/V1/MEDIA/AUDIO/XP:switchAll(<source_stream>)

◀ mO·/V1/MEDIA/AUDIO/XP:switchAll=

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

> TIPS AND TRICKS: Alias name can also be used for source stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

▶ CALL /V1/MEDIA/AUDIO/XP:switchAll(MTR01_TX_S0)

◀ mO /V1/MEDIA/AUDIO/XP:switchAll=

### 9.8.4. Enabling/Disabling the Source Stream

**Command and Response**

▶ SET·/V1/MEDIA/AUDIO/<source_stream>.Enabled=<logical_value>

◀ pw·/V1/MEDIA/AUDIO/<source_stream>.Enabled=<logical_value>

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

<logical_value>: If **true**, the stream is enabled, if **false**, it is disabled.

**Example**

▶ SET /V1/MEDIA/AUDIO/A8D236F08863_S0.Enabled=true

◀ pw /V1/MEDIA/AUDIO/A8D236F08863_S0.Enabled=true

### 9.8.5. Querying the Parameters of the Audio Stream

This single command queries all parameters of the source/destination video stream.

**Command and Response**

▶ GETALL·/V1/MEDIA/AUDIO/<stream_ID>

◀ pr·/V1/MEDIA/AUDIO/<stream_ID>.<parameter#1>=<parameter_value#1>

◀ pr·/V1/MEDIA/AUDIO/<stream_ID>.<parameter#2>=<parameter_value#2>

◀ . . .

◀ pr·/V1/MEDIA/AUDIO/<stream_ID>.<parameter#X>=<parameter_value#X>

**Parameters**

<stream_ID>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 or _D0 character line as "stream nr 0". Example: A8D236F08863_D0

:

| <parameter> | Parameter description | Value | Value description |
|---|---|---|---|
| SignalPresent | Active signal is present in the stream or not. | **true** | Signal is present. |
| | | **false** | Signal is not present. |
| SignalType | Signal type of the stream | **PCM** | PCM |
| | | **HBR** | HBR |
| | | **Other** | Other |
| | | **N/A** | Not applicable |
| SamplingFreq | Audio sampling fequency | 22.05 kHz, 24 kHz, 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192 kHz, 768 kHz or N/A | |
| NumberOfChannels | Number of audio channels. | | |
| SampleSize | The size of each audio sample in bits | | |
| StreamAlias | Alias of the stream | alias name | Example: MTR_RX_D0 |
| SourceStream | Source stream ID what is connected to the destination stream | <MAC>_S0 | Example: A8D236F08863_S0 |
| SourceStreamAlias | Alias of the source stream what is connected to the destination stream | <alias>_S0 | Example: MTR_TX_S0 |

**Example**

▶ GETALL /V1/MEDIA/AUDIO/A8D236F48643_S0

◀ pr /V1/MEDIA/AUDIO/A8D236F48643_S0.Active=true

◀ pr /V1/MEDIA/AUDIO/A8D236F48643_S0.SignalPresent=false

◀ pw /V1/MEDIA/AUDIO/A8D236F48643_S0.Enabled=true

◀ pr /V1/MEDIA/AUDIO/A8D236F48643_S0.MulticastAddress=224.1.1.4

◀ pr /V1/MEDIA/AUDIO/A8D236F48643_S0.SignalType=PCM

◀ pr /V1/MEDIA/AUDIO/A8D236F48643_S0.SamplingFreq=NotApplicable

◀ pr /V1/MEDIA/AUDIO/A8D236F48643_S0.NumberOfChannels=0

◀ pr /V1/MEDIA/AUDIO/A8D236F48643_S0.ChannelAllocation=0

◀ pr /V1/MEDIA/AUDIO/A8D236F48643_S0.SampleSize=0

◀ pr /V1/MEDIA/AUDIO/A8D236F48643_S0.LevelShiftValue=0

◀ pr /V1/MEDIA/AUDIO/A8D236F48643_S0.LfePlaybackLevel=0

◀ pr /V1/MEDIA/AUDIO/A8D236F48643_S0.IsDownmixInhibited=false

◀ pr /V1/MEDIA/AUDIO/A8D236F48643_S0.DeviceAlias=DOCU_UCX_TX

◀ pr /V1/MEDIA/AUDIO/A8D236F48643_S0.StreamAlias=DOCU_UCX_TX_S0

◀ pr /V1/MEDIA/AUDIO/A8D236F48643_S0.StreamId=S0

## 9.9. Management Network Port Configuration

▌ **DIFFERENCE:** The following sections are related to the configuration of the **Control LAN network port** only.

▌ **ATTENTION: Known issue**: when IP settings are changed to static IP and there is an active RS-232 TCP communication, the changing may break it.

### 9.9.1. Setting the DHCP State

▌ **ATTENTION:** When you change a network property, the new value is stored, but the **applySettings()** method must always be called to apply the new settings. When two or more network parameters are changed, the **applySettings()** method is enough to be called once as a final step; it will reboot the device.

**Command and Response** *#dhcp #network #ipaddress #ethernet*

- ▶ SET·/V1/MANAGEMENT/NETWORK.DhcpEnabled=<dhcp_status>
- ◀ pw·/V1/MANAGEMENT/NETWORK.DhcpEnabled=<dhcp_status>

- ▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()
- ◀ mO·/V1/MANAGEMENT/NETWORK:applySettings=

**Parameters**

If the <dhcp_status> parameter is **true**, the current IP address setting is DHCP, if the parameter is **false**, the current IP address is static.

**Example**

- ▶ SET /V1/MANAGEMENT/NETWORK.DhcpEnabled=true
- ◀ pw /V1/MANAGEMENT/NETWORK.DhcpEnabled=true
- ▶ CALL /V1/MANAGEMENT/NETWORK:applySettings()
- ◀ mO /V1/MANAGEMENT/NETWORK:applySettings

▌ INFO: The **applySettings()** method will save and apply the new value, and will reboot the network interface.

▌ INFO: The current setting can be queried by using the GET Command.

### 9.9.2. Changing the IP Address (Static)

**Command and Response**

- ▶ SET·/V1/MANAGEMENT/NETWORK.StaticIpAddress=<IP_address>
- ◀ pw·/V1/MANAGEMENT/NETWORK.StaticIpAddress=<IP_address>

- ▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()
- ◀ mO·/V1/MANAGEMENT/NETWORK:applySettings=

**Example**

- ▶ SET /V1/MANAGEMENT/NETWORK.StaticIpAddress=192.168.0.85
- ◀ pw /V1/MANAGEMENT/NETWORK.StaticIpAddress=192.168.0.85
- ▶ CALL /V1/MANAGEMENT/NETWORK:applySettings()
- ◀ mO /V1/MANAGEMENT/NETWORK:applySettings

▌ INFO: The **applySettings()** method will save and apply the new value, and will reboot the network interface.

▌ INFO: The current setting can be queried by using the GET Command.

### 9.9.3. Changing the Subnet Mask (Static)

**Command and Response**

- ▶ SET·/V1/MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>
- ◀ pw·/V1/MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>

- ▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()
- ◀ mO·/V1/MANAGEMENT/NETWORK:applySettings=

**Example**

- ▶ SET /V1/MANAGEMENT/NETWORK.StaticNetworkMask=255.255.255.0
- ◀ pw /V1/MANAGEMENT/NETWORK.StaticNetworkMask=255.255.255.0
- ▶ CALL /V1/MANAGEMENT/NETWORK:applySettings()
- ◀ mO /V1/MANAGEMENT/NETWORK:applySettings=

▌ INFO: The **applySettings** method will save and apply the new value, and will reboot the network interface.

▌ INFO: The current setting can be queried by using the GET Command.

## 9.9.4. Changing the Gateway Address (Static)

**Command and Response**

- ▸ SET·/V1/MANAGEMENT/NETWORK.StaticGatewayAddress=<gw_address>
- ◂ pw·/V1/MANAGEMENT/NETWORK.StaticGatewayAddress=<gw_address>
- ▸ CALL·/V1/MANAGEMENT/NETWORK:applySettings()
- ◂ mO·/V1/MANAGEMENT/NETWORK:applySettings=

**Example**

- ▸ SET /V1/MANAGEMENT/NETWORK.StaticGatewayAddress=192.168.0.5
- ◂ pw /V1/MANAGEMENT/NETWORK.StaticGatewayAddress=192.168.0.5
- ▸ CALL /V1/MANAGEMENT/NETWORK:applySettings()
- ◂ mO /V1/MANAGEMENT/NETWORK:applySettings

▌ INFO: The **applySettings** method will save and apply the new value, and will reboot the network interface.

▌ INFO: The current setting can be queried by using the GET Command.

## 9.9.5. Setting the Hostname

The hostname is a property that can be used instead of the IP address when connecting to the device. If the IP address of the device is changing, the hostname can be used as a fixed property.    *#hostname*

**Command and Response**

- ▸ SET·/V1/MANAGEMENT/NETWORK.HostName=<unique_name>
- ◂ pw·/V1/MANAGEMENT/NETWORK.HostName=<unique_name>

**Parameters**

The <unique_name> can be 1-64 character(s) long, and the following are allowed for naming: the elements of the English alphabet and numbers. Hyphen (-) and dot (.) are also accepted, except as last character.

**Example**

- ▸ SET /V1/MANAGEMENT/NETWORK.HostName=ServerRoom_MMU
- ◂ pw /V1/MANAGEMENT/NETWORK.HostName=ServerRoom_MMU

## 9.9.6. Applying Network Settings

**Command and Response**

- ▸ CALL·/V1/MANAGEMENT/NETWORK:applySettings()
- ◂ mO·/V1/MANAGEMENT/NETWORK:applySettings=

**Example**

- ▸ CALL /V1/MANAGEMENT/NETWORK:applySettings()
- ◂ mO /V1/MANAGEMENT/NETWORK:applySettings

▌ INFO: The **applySettings()** method will save and apply the new value, and will reboot the network interface.

## 9.10. Network Security

### 9.10.1. Querying the Service Port Number

**Command and Response**

- ▸ GET·/V1/MANAGEMENT/NETWORK/SERVICES/<port>.Port
- ◂ pr·/V1/MANAGEMENT/NETWORK/SERVICES/<port>.Port=<port_num>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| <port> | Port type | **HTTP** **HTTPS** **LW3** **BLUERIVER/TCI** **BLUERIVER/HTTP** |
| <port_num> | Port number | **80** **443** **6107** **6970** **8080** |

**Example**

- ▸ GET /V1/MANAGEMENT/NETWORK/SERVICES/HTTP.Port
- ◂ pr /V1/MANAGEMENT/NETWORK/SERVICES/HTTP.Port=80

### 9.10.2. Enabling/Disabling Network Service Port

**Command and Response** *#http #https*

- ▸ SET·/V1/MANAGEMENT/NETWORK/SERVICES/<port>.Enabled=<status>
- ◂ pw·/V1/MANAGEMENT/NETWORK/SERVICES/<port>.Enabled=<status>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| <port> | Port type | **HTTP** **HTTPS** |
| <status> | The port is enabled. The port is disabled. | **true** **false** |

**Example**

- ▸ SET /V1/MANAGEMENT/NETWORK/SERVICES/HTTP.Enabled=true
- ◂ pw /V1/MANAGEMENT/NETWORK/SERVICES/HTTP.Enabled=true

### 9.10.3. Enabling Authentication

**Command and Response**

▶ SET·/V1/MANAGEMENT/NETWORK/SERVICES/<port>.AuthenticationEnabled=<status>

◀ pw·/V1/MANAGEMENT/NETWORK/SERVICES/<port>.AuthenticationEnabled=<status>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| <port> | Port type | **HTTP**<br>**HTTPS** |
| <status> | Authentication enabled<br>Authentication disabled | **true**<br>**false** |

**Example**

▶ SET /V1/MANAGEMENT/NETWORK/SERVICES/HTTP.AuthenticationEnabled=true

◀ pw /V1/MANAGEMENT/NETWORK/SERVICES/HTTP.AuthenticationEnabled=true

## 9.11. Endpoint Network Configuration

The section describes the network configuration for the **SDVoE** and **Icron** interfaces.

> **ATTENTION: Known issue**: when IP settings are changed to static IP and there is an active RS-232 TCP communication, the changing may break it.

> **ATTENTION:** When you change a network property, the new value is stored, but the **applySettings** method must always be called to apply the new settings. When two or more network parameters are changed, the **applySettings** method is enough to be called once as a final step.

### 9.11.1. Setting the DHCP State for SDVoE

**Command and Response** *#dhcp #network #ipaddress #ethernet*

▶ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/SDVOE/NETWORK/StagedIpAcquisitionMode=<dhcp_status>

◀ pw·/V1/DEVICES/<MAC_address>/COMPONENTS/SDVOE/NETWORK/StagedIpAcquisitionMode=<dhcp_status>

▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

◀ mO·/V1/MANAGEMENT/NETWORK:applySettings=

**Parameters**

<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

If the <dhcp_status> parameter is **true**, the current IP address setting is DHCP, if the parameter is **false**, the current IP address is static.

**Example**

▶ SET /V1/DEVICES/A8D236F48643/COMPONENTS/SDVOE/NETWORK/StagedIpAcquisitionMode=true

◀ pw /V1/DEVICES/A8D236F48643/COMPONENTS/SDVOE/NETWORK/StagedIpAcquisitionMode=true

▶ CALL /V1/MANAGEMENT/NETWORK:applySettings()

◀ mO /V1/MANAGEMENT/NETWORK:applySettings

> INFO: The **applySettings()** method will save and apply the new value, and will reboot the network interface.

## 9.11.2. Changing the IP Address (Static) for SDVoE

**Command and Response**

▸ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/SDVOE/NETWORK/StagedIpAddress=<IP_address>

◂ pw·/V1/DEVICES/<MAC_address>/COMPONENTS/SDVOE/NETWORK/StagedIpAddress=<IP_address>

▸ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

◂ mO·/V1/MANAGEMENT/NETWORK:applySettings=

**Example**

▸ SET /V1/DEVICES/A8D236F48643/COMPONENTS/SDVOE/NETWORK/StagedIpAddress=192.168.0.85

◂ pw /V1/DEVICES/A8D236F48643/COMPONENTS/SDVOE/NETWORK/StagedIpAddress=192.168.0.85

▸ CALL /V1/MANAGEMENT/NETWORK:applySettings()

◂ mO /V1/MANAGEMENT/NETWORK:applySettings

▎ INFO: The **applySettings()** method will save and apply the new value, and will reboot the network interface.

## 9.11.3. Changing the Subnet Mask (Static) for SDVoE

**Command and Response**

▸ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/SDVOE/NETWORK/StagedSubnetMask=<netmask>

◂ pw·/V1/DEVICES/<MAC_address>/COMPONENTS/SDVOE/NETWORK/StagedSubnetMask=<netmask>

▸ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

◂ mO·/V1/MANAGEMENT/NETWORK:applySettings=

**Example**

▸ SET /V1/DEVICES/A8D236F48643/COMPONENTS/SDVOE/NETWORK/StagedSubnetMask=255.255.0.0

◂ pw /V1/DEVICES/A8D236F48643/COMPONENTS/SDVOE/NETWORK/StagedSubnetMask=255.255.0.0

▸ CALL /V1/MANAGEMENT/NETWORK:applySettings()

◂ mO /V1/MANAGEMENT/NETWORK:applySettings

▎ INFO: The **applySettings()** method will save and apply the new value, and will reboot the network interface.

## 9.11.4. Changing the Gateway Address (Static) for SDVoE

**Command and Response**

▸ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/SDVOE/NETWORK/StagedGatewayAddress=<gw_address>

◂ pw·/V1/DEVICES/<MAC_address>/COMPONENTS/SDVOE/NETWORK/StagedGatewayAddress=<gw_address>

▸ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

◂ mO·/V1/MANAGEMENT/NETWORK:applySettings=

**Example**

▸ SET /V1/DEVICES/A8D236F48643/COMPONENTS/SDVOE/NETWORK/StagedGatewayAddress=10.0.0.1

◂ pw /V1/DEVICES/A8D236F48643/COMPONENTS/SDVOE/NETWORK/StagedGatewayAddress=10.0.0.1

▸ CALL /V1/MANAGEMENT/NETWORK:applySettings()

◂ mO /V1/MANAGEMENT/NETWORK:applySettings

▎ INFO: The **applySettings()** method will save and apply the new value, and will reboot the network interface.

## 9.11.5. Setting the DHCP State for Icron

**Command and Response** *#dhcp #network #ipaddress #ethernet*

▸ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON/NETWORK/StagedIpAcquisitionMode=<dhcp_status>

◂ pw·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON/NETWORK/StagedIpAcquisitionMode=<dhcp_status>

▸ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

◂ mO·/V1/MANAGEMENT/NETWORK:applySettings=

**Parameters**

<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

If the <dhcp_status> parameter is **true**, the current IP address setting is DHCP, if the parameter is **false**, the current IP address is static.

**Example**

▸ SET /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON/NETWORK/StagedIpAcquisitionMode=true

◂ pw /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON/NETWORK/StagedIpAcquisitionMode=true

▸ CALL /V1/MANAGEMENT/NETWORK:applySettings()

◂ mO /V1/MANAGEMENT/NETWORK:applySettings

▎ INFO: The **applySettings()** method will save and apply the new value, and will reboot the network interface.

## 9.11.6. Changing the IP Address (Static) for Icron

**Command and Response**

▶ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON/NETWORK/StagedIpAddress=<IP_address>

◀ pw·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON/NETWORK/StagedIpAddress=<IP_address>

▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

◀ mO·/V1/MANAGEMENT/NETWORK:applySettings=

**Example**

▶ SET /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON/NETWORK/StagedIpAddress=192.168.0.85

◀ pw /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON/NETWORK/StagedIpAddress=192.168.0.85

▶ CALL /V1/MANAGEMENT/NETWORK:applySettings()

◀ mO /V1/MANAGEMENT/NETWORK:applySettings

▮ INFO: The **applySettings()** method will save and apply the new value, and will reboot the network interface.

## 9.11.7. Changing the Subnet Mask (Static) for Icron

**Command and Response**

▶ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON/NETWORK/StagedSubnetMask=<netmask>

◀ pw·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON/NETWORK/StagedSubnetMask=<netmask>

▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

◀ mO·/V1/MANAGEMENT/NETWORK:applySettings=

**Example**

▶ SET /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON/NETWORK/StagedSubnetMask=255.255.0.0

◀ pw /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON/NETWORK/StagedSubnetMask=255.255.0.0

▶ CALL /V1/MANAGEMENT/NETWORK:applySettings()

◀ mO /V1/MANAGEMENT/NETWORK:applySettings

▮ INFO: The **applySettings()** method will save and apply the new value, and will reboot the network interface.

## 9.11.8. Changing the Gateway Address (Static) for Icron

**Command and Response**

▶ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON/NETWORK/StagedGatewayAddress=<gw_address>

◀ pw·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON/NETWORK/StagedGatewayAddress=<gw_address>

▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

◀ mO·/V1/MANAGEMENT/NETWORK:applySettings=

**Example**

▶ SET /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON/NETWORK/StagedGatewayAddress=10.0.0.1

◀ pw /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON/NETWORK/StagedGatewayAddress=10.0.0.1

▶ CALL /V1/MANAGEMENT/NETWORK:applySettings()

◀ mO /V1/MANAGEMENT/NETWORK:applySettings

▮ INFO: The **applySettings()** method will save and apply the new value, and will reboot the network interface.

## 9.11.9. Applying Network Settings

**Command and Response**

▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

◀ mO·/V1/MANAGEMENT/NETWORK:applySettings=

**Example**

▶ CALL /V1/MANAGEMENT/NETWORK:applySettings()

◀ mO /V1/MANAGEMENT/NETWORK:applySettings

▮ INFO: The **applySettings()** method will save and apply the new value, and will reboot the network interface.

## 9.12. Serial Port Configuration for Endpoints

### 9.12.1. BAUD Rate Setting

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

▶ SET·/V1/MEDIA/SERIAL/<serial_port>.BaudRate=<baudrate>

◀ pw·/V1/MEDIA/SERIAL/<serial_port>.BaudRate=<baudrate>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| <serial_port> | The MAC address of the selected endpoint device in capital letters and without colons; and an _P1 character line as "port nr 1". | Example: A8D236F08863_P1 |
| <baudrate> | Baud rate value | **9600, 19200, 38400, 57600, 115200** |

**Example**

▶ SET /V1/MEDIA/SERIAL/A8D236F48643_P1.Baudrate=19200

◀ pw /V1/MEDIA/SERIAL/A8D236F48643_P1.Baudrate=19200

### 9.12.2. Stop Bits Setting

**Command and Response**

▶ SET·/V1/MEDIA/SERIAL/<serial_port>.StopBits=<stopbits>

◀ pw·/V1/MEDIA/SERIAL/<serial_port>.StopBits=<stopbits>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| <serial_port> | The MAC address of the selected endpoint device in capital letters and without colons; and an _P1 character line as "port nr 1". | Example: A8D236F08863_P1 |
| <stopbits> | Stop bit value | **1** or **2** |

**Example**

▶ SET /V1/MEDIA/SERIAL/A8D236F48643_P1.StopBits=1

◀ pw /V1/MEDIA/SERIAL/A8D236F48643_P1.StopBits=1

### 9.12.3. Querying Data Bits

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

▶ GET·/V1/MEDIA/SERIAL/<serial_port>.DataBits

◀ pr·/V1/MEDIA/SERIAL/<serial_port>.DataBits=<databits>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| <serial_port> | The MAC address of the selected endpoint device in capital letters and without colons; and an _P1 character line as "port nr 1". | Example: A8D236F08863_P1 |
| <databits> | DataBits value | **8** or **9** |

**Example**

▶ GET /V1/MEDIA/SERIAL/A8D236F48643_P1.DataBits

◀ pr /V1/MEDIA/SERIAL/A8D236F48643_P1.DataBits=8

### 9.12.4. Parity Setting

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

▶ SET·/V1/MEDIA/SERIAL/<serial_port>.Parity=<parity>

◀ pw·/V1/MEDIA/SERIAL/<serial_port>.Parity=<parity>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| <serial_port> | The MAC address of the selected endpoint device in capital letters and without colons; and an _P1 character line as "port nr 1". | Example: A8D236F08863_P1 |
| <parity> | Parity value | **None** **Odd** **Even** |

**Example**

▶ SET /V1/MEDIA/SERIAL/A8D236F48643_P1.Parity=None

◀ pw /V1/MEDIA/SERIAL/A8D236F48643_P1.Parity=None

## 9.12.5. Querying the Actual Serial Port Configuration

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

▸ GET·/V1/MEDIA/SERIAL/<serial_port>.Configuration

◂ pr·/V1/MEDIA/SERIAL/<serial_port>.Configuration=<serial_config>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| <serial_port> | The MAC address of the selected endpoint device in capital letters and without colons; and an _P1 character line as "port nr 1". | Example: A8D236F08863_P1 |
| <serial_config> | The recent configuration of the serial port: Baud rate, Databits Parity Stopbits | Example: 9600, 8N1 |

**Example**

▸ GET /V1/MEDIA/SERIAL/A8D236F48643_P1.Configuration

◂ pr /V1/MEDIA/SERIAL/A8D236F48643_P1.Configuration=115200, 8N1

## 9.12.6. Enabling/Disabling the Serial over IP Port

▌ **ATTENTION:** The following property is required to be **enabled** for the RS-232 command injection feature.

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

▸ SET·/V1/MEDIA/SERIAL/<serial_port>/SERVICE.Enabled=<logical_value>

◂ pw·/V1/MEDIA/SERIAL/<serial_port>/SERVICE.Enabled=<logical_value>

**Parameters**

| Identifier | Parameter description | Parameter values |
|---|---|---|
| <serial_port> | The MAC address of the selected endpoint device in capital letters and without colons; and an _P1 character line as "port nr 1". | Example: A8D236F08863_P1 |
| <logical_value> | Service is enabled or disabled | **true** **false** |

**Example**

▸ SET /V1/MEDIA/SERIAL/A8D236F48643_P1/SERVICE.Enabled=true

◂ pw /V1/MEDIA/SERIAL/A8D236F48643_P1/SERVICE.Enabled=true

## 9.13. USB HID Configuration Commands

▌ **DIFFERENCE:** Only   **HDMI-TPN-TX207AU2K**,   **HDMI-TPN-RX107AU2K**,   **HDMI-TPN-RX107AU2K-SR**, **HDMI-TPN-RX107DU2K-SR**,   **HDMI-OPTN-TX200AU2K**,   **HDMI-OPTN-RX100AU2K**   and   **HDMI-OPTN-RX100AU2K-SR** models are built with USB HID feature.

### 9.13.1. Enabling/Disabling the Follow Video Setting

**Command and Response** *#usbhid*

▸ SET·/V1/MEDIA/USBHID/XP.FollowVideo=<logical_value>

◂ pw·/V1/MEDIA/USBHID/XP.FollowVideo=<logical_value>

**Parameters**

<logical_value>: If **true**, the USB HID signal is switched together with the video signal, if **false**, the independent audio layer can be switched by commands.

**Example**

▸ SET /V1/MEDIA/USBHID/XP.FollowVideo=true

◂ pw /V1/MEDIA/USBHID/XP.FollowVideo=true

### 9.13.2. Switching the USB HID Stream to One Destination

**Command and Response**

▸ CALL·/V1/MEDIA/USBHID/XP:switch(<source_stream>:<destination_stream>)

◂ mO·/V1/MEDIA/USBHID/XP:switch=

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

<destination_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

▌ TIPS AND TRICKS: Alias name can also be used for source and destination stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

▸ CALL /V1/MEDIA/USBHID/XP:switch(MTR01_TX_S0:HALL_RX_D0)

◂ mO /V1/MEDIA/USBHID/XP:switch=

### 9.13.3. Switching the USB HID Stream to All Destinations

**Command and Response**

▶ CALL·/V1/MEDIA/USBHID/XP:switchAll(<source_stream>)

◀ mO·/V1/MEDIA/USBHID/XP:switchAll=

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

▌ TIPS AND TRICKS: Alias name can also be used for source stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

▶ CALL /V1/MEDIA/USBHID/XP:switchAll(MTR01_TX_S0)

◀ mO /V1/MEDIA/USBHID/XP:switchAll=

### 9.13.4. Enabling/Disabling the Source Stream

**Command and Response**

▶ SET·/V1/MEDIA/USBHID/<source_stream>.Enabled=<logical_value>

◀ pw·/V1/MEDIA/USBHID/<source_stream>.Enabled=<logical_value>

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

<logical_value>: If **true**, the stream is enabled, if **false**, it is disabled.

**Example**

▶ SET /V1/MEDIA/USBHID/A8D236F08863_S0.Enabled=true

◀ pw /V1/MEDIA/USBHID/A8D236F08863_S0.Enabled=true

### 9.13.5. Querying the Parameters of the USB HID Signal

This single command queries all parameters of the source/destination USB HID stream.

**Command and Response**

▶ GETALL·/V1/MEDIA/USBHID/<stream_ID>

◀ pr·/V1/MEDIA/USBHID/<stream_ID>.<parameter#1>=<parameter_value#1>

◀ pr·/V1/MEDIA/USBHID/<stream_ID>.<parameter#2>=<parameter_value#2>

◀ . . .

◀ pr·/V1/MEDIA/USBHID/<stream_ID>.<parameter#X>=<parameter_value#X>

**Parameters**

<stream_ID>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 or _D0 character line as "stream nr 0". Example: A8D236F08863_D0

| <parameter> | Parameter description | Value | Value description |
|---|---|---|---|
| SignalPresent | Active signal is present in the stream or not. | **true** | Signal is present. |
| | | **false** | Signal is not present. |
| Role | USB HID role of the device. | **Disabled** | USB HID function is disabled. |
| | | **Local** | The USB HID device is in local mode. |
| | | **Remote** | The USB HID device is in remote mode. |
| ConnectedDeviceNumber | Number of connected USB HID devices. | | |
| HostStatus | Actual status of the host device. | **Disconnected** | Host is disconnected. |
| | | **Configuring** | Host is configuring. |
| | | **Connected** | Host is connected. |
| StreamAlias | Alias of the stream | alias name | Example: MTR_RX_D0 |
| SourceStream | Source stream ID what is connected to the destination stream | <MAC>_S0 | Example: A8D236F08863_S0 |
| SourceStreamAlias | Alias of the source stream what is connected to the destination stream | <alias>_S0 | Example: MTR_TX_S0 |

**Example**

▶ GETALL /V1/MEDIA/USBHID/A8D23602841C_S0

◀ pr /V1/MEDIA/USBHID/A8D23602841C_S0.Active=true

◀ pr /V1/MEDIA/USBHID/A8D23602841C_S0.SignalPresent=false

◀ pw /V1/MEDIA/USBHID/A8D23602841C_S0.Enabled=true

◀ pr /V1/MEDIA/USBHID/A8D23602841C_S0.MulticastAddress=169.254.100.136

◀ pr /V1/MEDIA/USBHID/A8D23602841C_S0.Role=Local

◀ pr /V1/MEDIA/USBHID/A8D23602841C_S0.HostStatus=Disconnected

◀ pr /V1/MEDIA/USBHID/A8D23602841C_S0.DeviceAlias=DOCU_TX

◀ pr /V1/MEDIA/USBHID/A8D23602841C_S0.StreamAlias=DOCU_TX_S0

◀ pr /V1/MEDIA/USBHID/A8D23602841C_S0.StreamId=S0

## 9.14. Icron USB KVM Configuration Commands

**DIFFERENCE:** Only **HDMI-TPN-TX207AU2K**, **HDMI-TPN-RX107AU2K**, **HDMI-TPN-RX107AU2K-SR**, **HDMI-TPN-RX107DU2K-SR**, **HDMI-OPTN-TX200AU2K**, **HDMI-OPTN-RX100AU2K** and **HDMI-OPTN-RX100AU2K-SR** models are built with Icron USB feature.

### 9.14.1. Enabling/Disabling the Follow Video Setting

**Command and Response** *#icron*

▶ SET·/V1/MEDIA/USBICRON/XP.FollowVideo=<logical_value>

◀ pw·/V1/MEDIA/USBICRON/XP.FollowVideo=<logical_value>

**Parameters**

<logical_value>: If **true**, the Icron USB signal is switched together with the video signal, if **false**, the independent Icron USB layer can be switched by commands.

**Example**

▶ SET /V1/MEDIA/USBICRON/XP.FollowVideo=true

◀ pw /V1/MEDIA/USBICRON/XP.FollowVideo=true

### 9.14.2. Switching the Icron USB Stream to One Destination

**Command and Response**

▶ CALL·/V1/MEDIA/USBICRON/XP:switch(<source_stream>:<destination_stream>)

◀ mO·/V1/MEDIA/USBICRON/XP:switch=

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

<destination_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _D0 character line as "stream nr 0". Example: A8D236F08864_D0

**TIPS AND TRICKS:** Alias name can also be used for source and destination stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

▶ CALL /V1/MEDIA/USBICRON/XP:switch(MTR01_TX_S0:HALL_RX_D0)

◀ mO /V1/MEDIA/USBICRON/XP:switch=

### 9.14.3. Switching the Icron USB Stream to All Destinations

**Command and Response**

▶ CALL·/V1/MEDIA/USBICRON/XP:switchAll(<source_stream>)

◀ mO·/V1/MEDIA/USBICRON/XP:switchAll=

**Parameters**

<source_stream>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 character line as "stream nr 0". Example: A8D236F08863_S0

> TIPS AND TRICKS: Alias name can also be used for source stream ID instead of the MAC address. Example: MTR01_TX_S0

**Example**

▶ CALL /V1/MEDIA/USBICRON/XP:switchAll(MTR01_TX_S0)

◀ mO /V1/MEDIA/USBICRON/XP:switchAll=

### 9.14.4. Querying the Parameters of the Icron USB Signal

**Command and Response**

▶ GETALL·/V1/MEDIA/USBICRON/<stream_ID>

◀ pr·/V1/MEDIA/USBICRON/<stream_ID>.<parameter#1>=<parameter_value#1>

◀ pr·/V1/MEDIA/USBICRON/<stream_ID>.<parameter#2>=<parameter_value#2>

◀ . . .

◀ pr·/V1/MEDIA/USBICRON/<stream_ID>.<parameter#X>=<parameter_value#X>

**Parameters**

<stream_ID>: The MAC address of the selected endpoint device in capital letters and without colons; and an _S0 or _D0 character line as "stream nr 0". Example: A8D236F08863_D0

:

| <parameter> | Parameter description | Value | Value description |
|---|---|---|---|
| SignalPresent | Active signal is present in the stream or not. | **true** | Signal is present. |
| | | **false** | Signal is not present. |
| LinkStatus | Actual status of the Icron connection link. | **NotPaired** | Not paired. |
| | | **Paired** | Paired. |
| | | **Linked** | Linked. |
| DevicePairing | List of MAC addresses of paired devices. | | |
| StreamAlias | Alias of the stream | alias name | Example: MTR_RX_D0 |
| SourceStream | Source stream ID what is connected to the destination stream | <MAC>_S0 | Example: A8D236F08863_S0 |
| SourceStreamAlias | Alias of the source stream what is connected to the destination stream | <alias>_S0 | Example: MTR_TX_S0 |

**Example**

▶ GETALL /V1/MEDIA/USBICRON/A8D236F48643_S0

◀ pr /V1/MEDIA/USBICRON/A8D236F48643_S0.Active=true

◀ pr /V1/MEDIA/USBICRON/A8D236F48643_S0.SignalPresent=true

◀ pr /V1/MEDIA/USBICRON/A8D236F48643_S0.LinkStatus=Paired

◀ pr /V1/MEDIA/USBICRON/A8D236F48643_S0.DevicePairing=a8:d2:36:f1:83:98

◀ pr /V1/MEDIA/USBICRON/A8D236F48643_S0.IpAddress=169.254.72.124

◀ pr /V1/MEDIA/USBICRON/A8D236F48643_S0.DeviceAlias=DOCU_UCX_TX

◀ pr /V1/MEDIA/USBICRON/A8D236F48643_S0.StreamAlias=DOCU_UCX_TX_S0

◀ pr /V1/MEDIA/USBICRON/A8D236F48643_S0.StreamId=S0

### 9.14.5. Querying the MAC Address of the Icron Module

The Icron module has own MAC address what is different from the MAC address of the TPN/OPTN endpoint.

**Command and Response**

▸ GET·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON.MacAddress

◂ pr·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON.MacAddress=<Icron_MAC_address>

**Parameters**

<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

<Icron_MAC_address>: The MAC address of the Icron module.

**Example**

▸ GET /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON.MacAddress

◂ pr /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON.MacAddress=a8:d2:36:f1:88:63

### 9.14.6. Querying the Operation Mode of the Icron Device

**Command and Response**

▸ GET·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON.Mode

◂ pr·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON.Mode=<mode>

**Parameters**

<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

<mode>: It can be **LEX** (Local Extender) or **REX** (Remote Extender). See more details about it in the USB Configuration section.

**Example**

▸ GET /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON.Mode

◂ pr /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON.Mode=REX

### 9.14.7. Setting the USB Mode of the Icron Device

**Command and Response**

▸ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON.UsbMode=<USB_mode>

◂ pw·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON.UsbMode=<USB_mode>

**Parameters**

<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

<USB_mode>: It can be **SUI** (Simultaneous Users Interaction) or **MSA** (Mass Storage Acceleration). See more details about it in the USB Configuration section.

**Example**

▸ SET /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON.UsbMode=MSA

◂ pw /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON.UsbMode=MSA

### 9.14.8. Removing All Pairings of the Icron Device

**Command and Response**

▸ CALL·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON:removeAllPairings()

◂ mO·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON:removeAllPairings=

**Parameters**

<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

▸ CALL /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON:removeAllPairings()

◂ mO /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON:removeAllPairings=

### 9.14.9. Recovering the Icron Module with DHCP

The command recovers endpoint connection by setting endpoint to use dynamic IP address setting.

**Command and Response**

▸ CALL·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON:recoverWithDhcp()

◂ mO·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON:recoverWithDhcp=

**Parameters**

<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

▸ CALL /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON:recoverWithDhcp()

◂ mO /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON:recoverWithDhcp=

### 9.14.10. Recovering the Icron Module with Static IP Address

The command recovers endpoint connection by setting endpoint to use static IP address setting.

**Command and Response**

▸ CALL·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON:recoverWithStaticIp(<IP_address>, <subnet_mask>,<gateway_address>)

◂ mO·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON:recoverWithStaticIp=

**Parameters**

<MAC_address>: The MAC address of the selected endpoint device in capital letters and without colons.

**Example**

▸ CALL /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON:recoverWithStaticIp(10.1.128.11, 255.255.255.0,10.1.128.1)

◂ mO /V1/DEVICES/A8D236F48643/COMPONENTS/ICRON:recoverWithStaticIp=

# 9.15. LW3 Commands - Quick Summary

**System Commands**

Setting the Device Label

▸ SET·/V1/MANAGEMENT/LABEL.DeviceLabel=<custom_name>

Restarting the Device

▸ CALL·/V1/SYS:restart()

Restoring the Factory Default Settings

▸ CALL·/V1/SYS:factoryDefaults()

Querying the Firmware Package Version

▸ GET·/V1/MANAGEMENT/UID/PACKAGE.Version

Setting of the Date and Time Manually

▸ CALL·/V1/MANAGEMENT/DATETIME:setTime(<date_time>)

Enabling/Disabling NTP

▸ SET·/V1/MANAGEMENT/DATETIME/NTP.Enabled=<logical_value>

Setting the NTP Server

▸ SET·/V1/MANAGEMENT/DATETIME/NTP.ServerPool=<server_address>

**Endpoint Management Commands**

Discovering the Endpoints on the Network

▸ CALL·/V1/DEVICES:discover()

Adding an Endpoint to the Matrix

▸ CALL·/V1/DEVICES/<MAC_address>:addToMainGroup()

Removing an Endpoint from the Matrix

▸ CALL·/V1/DEVICES/<MAC_address>:removeFromConfiguration()

Identifying an Endpoint

▸ CALL·/V1/DEVICES/<MAC_address>:identifyMe()

Adding Alias Name to an Endpoint

▸ SET·/V1/DEVICES/<MAC_address>.Alias=<alias>

Restarting an Endpoint

▸ CALL·/V1/DEVICES/<MAC_address>:restart()

Restoring the Factory Default Settings on an Endpoint

▸ CALL·/V1/DEVICES/<MAC_address>:factoryReset()

**Video Signal Management Commands**

Switching the Video Stream to One Destination

▸ CALL·/V1/MEDIA/VIDEO/XP:switch(<source_stream>:<destination_stream>)

Switching the Video Stream to All Destinations

▸ CALL·/V1/MEDIA/VIDEO/XP:switchAll(<source_stream>)

Querying the Parameters of the Video Stream

▸ GETALL·/V1/MEDIA/VIDEO/<stream_ID>

Enabling/Disabling the Source Stream

▸ SET·/V1/MEDIA/VIDEO/<source_stream>.Enabled=<logical_value>

HDCP Setting for the Source Stream

▸ SET·/V1/MEDIA/VIDEO/<source_stream>/HDCP.AllowedHdcpVersion=<HDCP_encr>

HDCP Setting for the Destination Stream

▸ SET·/V1/MEDIA/VIDEO/<destination_stream>/HDCP.HdcpOutputMode=<HDCP_auth>

Querying the EDID Data of the Destination

▸ GET·/V1/MEDIA/VIDEO/<destination_stream>/EDID.Data

Uploading EDID Data for the Source

▸ CALL·/V1/MEDIA/VIDEO/<source_stream>/EDID:setData(<EDID_data>)

Setting the Scaler Mode

▸ SET·/V1/MEDIA/VIDEO/<destination_stream>/SCALING.StagedDisplayMode=<scaler_mode>

▸ CALL·/V1/MEDIA/VIDEO/<destination_stream>/SCALING:applySettings()

Setting the Scaler Resolution

▸ SET·/V1/MEDIA/VIDEO/<destination_stream>/SCALING.StagedFormatName=<resolution>

▸ CALL·/V1/MEDIA/VIDEO/<destination_stream>/SCALING:applySettings()

**Audio Signal Management Commands**

Enabling/Disabling the Audio Follow Video Setting

▶ SET·/V1/MEDIA/AUDIO/XP.FollowVideo=<logical_value>

Switching the Audio Stream to One Destination

▶ CALL·/V1/MEDIA/AUDIO/XP:switch(<source_stream>:<destination_stream>)

Switching the Audio Stream to All Destinations

▶ CALL·/V1/MEDIA/AUDIO/XP:switchAll(<source_stream>)

Enabling/Disabling the Source Stream

▶ SET·/V1/MEDIA/AUDIO/<source_stream>.Enabled=<logical_value>

Querying the Parameters of the Audio Stream

▶ GETALL·/V1/MEDIA/AUDIO/<stream_ID>

**Management Network Port Configuration**

Setting the DHCP State

▶ SET·/V1/MANAGEMENT/NETWORK.DhcpEnabled=<dhcp_status>
▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

Changing the IP Address (Static)

▶ SET·/V1/MANAGEMENT/NETWORK.StaticIpAddress=<IP_address>
▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

Changing the Subnet Mask (Static)

▶ SET·/V1/MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>
▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

Changing the Gateway Address (Static)

▶ SET·/V1/MANAGEMENT/NETWORK.StaticGatewayAddress=<gw_address>
▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

Setting the Hostname

▶ SET·/V1/MANAGEMENT/NETWORK.HostName=<unique_name>

Applying Network Settings

▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

**Network Security**

Querying the Service Port Number

▶ GET·/V1/MANAGEMENT/NETWORK/SERVICES/<port>.Port

Enabling/Disabling Network Service Port

▶ SET·/V1/MANAGEMENT/NETWORK/SERVICES/<port>.Enabled=<status>

Enabling Authentication

▶ SET·/V1/MANAGEMENT/NETWORK/SERVICES/<port>.AuthenticationEnabled=<status>

**Endpoint Network Configuration**

Setting the DHCP State for SDVoE

▶ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/SDVOE/NETWORK/StagedIpAcquisitionMode=<dhcp_status>
▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

Changing the IP Address (Static) for SDVoE

▶ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/SDVOE/NETWORK/StagedIpAddress=<IP_address>
▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

Changing the Subnet Mask (Static) for SDVoE

▶ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/SDVOE/NETWORK/StagedSubnetMask=<netmask>
▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

Changing the Gateway Address (Static) for SDVoE

▶ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/SDVOE/NETWORK/StagedGatewayAddress=<gw_address>
▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

Setting the DHCP State for Icron

▶ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON/NETWORK/StagedIpAcquisitionMode=<dhcp_status>
▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

Changing the IP Address (Static) for Icron

▶ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON/NETWORK/StagedIpAddress=<IP_address>
▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

Changing the Subnet Mask (Static) for Icron

▶ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON/NETWORK/StagedSubnetMask=<netmask>
▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

Changing the Gateway Address (Static) for Icron

▶ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON/NETWORK/StagedGatewayAddress=<gw_address>
▶ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

Applying Network Settings

▸ CALL·/V1/MANAGEMENT/NETWORK:applySettings()

**Serial Port Configuration for Endpoints**

BAUD Rate Setting

▸ SET·/V1/MEDIA/SERIAL/<serial_port>.BaudRate=<baudrate>

Stop Bits Setting

▸ SET·/V1/MEDIA/SERIAL/<serial_port>.StopBits=<stopbits>

Querying Data Bits

▸ GET·/V1/MEDIA/SERIAL/<serial_port>.DataBits

Parity Setting

▸ SET·/V1/MEDIA/SERIAL/<serial_port>.Parity=<parity>

Querying the Actual Serial Port Configuration

▸ GET·/V1/MEDIA/SERIAL/<serial_port>.Configuration

Enabling/Disabling the Serial over IP Port

▸ SET·/V1/MEDIA/SERIAL/<serial_port>/SERVICE.Enabled=<logical_value>

**USB HID Configuration Commands**

Enabling/Disabling the Follow Video Setting

▸ SET·/V1/MEDIA/USBHID/XP.FollowVideo=<logical_value>

Switching the USB HID Stream to One Destination

▸ CALL·/V1/MEDIA/USBHID/XP:switch(<source_stream>:<destination_stream>)

Switching the USB HID Stream to All Destinations

▸ CALL·/V1/MEDIA/USBHID/XP:switchAll(<source_stream>)

Enabling/Disabling the Source Stream

▸ SET·/V1/MEDIA/USBHID/<source_stream>.Enabled=<logical_value>

Querying the Parameters of the USB HID Signal

▸ GETALL·/V1/MEDIA/USBHID/<stream_ID>

**Icron USB KVM Configuration Commands**

Enabling/Disabling the Follow Video Setting

▸ SET·/V1/MEDIA/USBICRON/XP.FollowVideo=<logical_value>

Switching the Icron USB Stream to One Destination

▸ CALL·/V1/MEDIA/USBICRON/XP:switch(<source_stream>:<destination_stream>)

Switching the Icron USB Stream to All Destinations

▸ CALL·/V1/MEDIA/USBICRON/XP:switchAll(<source_stream>)

Querying the Parameters of the Icron USB Signal

▸ GETALL·/V1/MEDIA/USBICRON/<stream_ID>

Querying the MAC Address of the Icron Module

▸ GET·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON.MacAddress

Querying the Operation Mode of the Icron Device

▸ GET·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON.Mode

Setting the USB Mode of the Icron Device

▸ SET·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON.UsbMode=<USB_mode>

Removing All Pairings of the Icron Device

▸ CALL·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON:removeAllPairings()

Recovering the Icron Module with DHCP

▸ CALL·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON:recoverWithDhcp()

Recovering the Icron Module with Static IP Address

▸ CALL·/V1/DEVICES/<MAC_address>/COMPONENTS/ICRON:recoverWithStaticIp(<IP_address>,<subnet_mask>,<gateway_address>)

# 10

## Firmware Update

This chapter is meant to help customers perform firmware updates on our products by giving a few tips on how to start and by explaining the features of the Lightware Device Updater v2 (LDU2) software. The latest software and firmware pack can be downloaded from www.lightware.com.

> **ATTENTION:** While the firmware is being updated, the normal operation mode is suspended, as the device is switched to bootload mode. Signal processing is not performed. Do not interrupt the firmware update. If any problem occurs, reboot the device and restart the process.

## 10.1. Introduction

Lightware Device Updater v2 (LDU2) software is the second generation of the LFP-based (Lightware Firmware Package) firmware update process. *#update #firmwareupdate*

## 10.2. Preparation

LDU2

Most Lightware devices can be controlled over several interfaces (e.g. Ethernet, USB, RS-232). But the firmware can be updated usually over one dedicated interface, which is the Ethernet in most cases.

If you want to update the firmware of one or more devices, you need the following:

- **LFP2 file**,
- **LDU2 software** installed on your PC or Mac.

Both can be downloaded from www.lightware.com.

Optionally, you can download the **release notes** file in HTML format.

### 10.2.1. Reserved Ports of the SDVoE Control Server

If the BlueRiver AV Manager and the SDVoE Control Server is installed once, the following ports are reserved by the software:

| Protocol | Port Number | Description |
|----------|-------------|-------------|
| TCP | 5920 | BlueRiver AV Manager Service |
| TCP | 5936 | BlueRiver AV Manager SDVoE API Service |
| TCP | 20020 | TCI API |
| TCP | 5148 | BlueRiver AV Manager |

> **ATTENTION:** If the following ports are opened, the LDU2 **cannot discover** the TPN/OPTN series devices. Lightware recommends stopping these services until the firmware updating is completed.
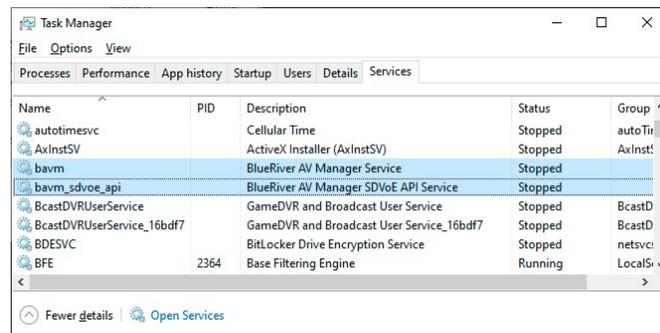


### 10.2.2. About the Firmware Package (LFP2 File)

All the necessary tools and binary files are packed into the LFP2 package file. You only need this file to do the update on your device.

- This allows the use of the same LFP2 package for different devices.
- The package contains all the necessary components, binary, and other files.
- The release notes is included in the LFP2 file, and is displayed in the window where you select the firmware package file in LDU2.

> **INFO:** The size of the LFP2 file is more than 200 MB due to the components of the package. That is not a fault: the Device runs an embedded Linux inside that is necessary for the complex functions and features of the device.

### 10.2.3. LDU2 Installation

> **ATTENTION:** Minimum system requirement: 2 GB RAM. The minimum display resolution is 1600x900.

> **INFO:** The Windows and the Mac applications have the same look and functionality.

Download the software from www.lightware.com.

#### Installation in case of Windows OS

Run the installer. If the User Account Control displays a pop-up message, click **Yes**.
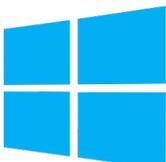
#### Installation Modes

| Normal install | Snapshot install |
|----------------|------------------|
| Available for Windows, macOS and Linux | Available for Windows |
| The installer can update only this instance | Cannot be updated |
| One updateable instance may exist for all users | Many different versions can be installed for all users |

> **ATTENTION:** Using the default Normal install is highly recommended.

> **INFO:** If you have a previously installed version, you will be prompted to remove the old version before installing the new one.

#### Installation in case of macOS

Mount the DMG file by double clicking on it, and drag the LDU2 icon over the Applications icon to copy the program into the Applications folder. If you want to copy LDU2 into another location, just drag the icon over the desired folder.

> **ATTENTION:** Please check the firewall settings on the macOS device. LDC needs to be added to the exeptions of the blocked softwares for the proper operation.

> **INFO:** This type of installer is equal with the **Normal install** of Windows.

#### Installation in case of Linux

**Step 1.** Download the **archive file** (tar.gz) from www.lightware.com and unpack it to a temp folder.

**Step 2.** Run the **install_ldu2.sh** file in the temp folder. The script will install LDU2 into the following folder: HOME/.local/share/lightware/ldu2.

**Step 3.** The folder above will contain this file: **LightwareDeviceUpdaterV2.sh,** which can be used to start LDU2.

## 10.3. Running the Software

You have two options:

- **Starting the LDU2** by double-clicking on the shortcut/program file, or
- Double-clicking on an **LFP2 file**.

#### LDU2 Auto-Update

At startup, the software checks if a newer version is available on the web.

#### Main Screen

When the software is started by the shortcut, the device discovery screen appears. Press the **Discover devices** button to start finding the Lightware devices:

DISCOVER DEVICES
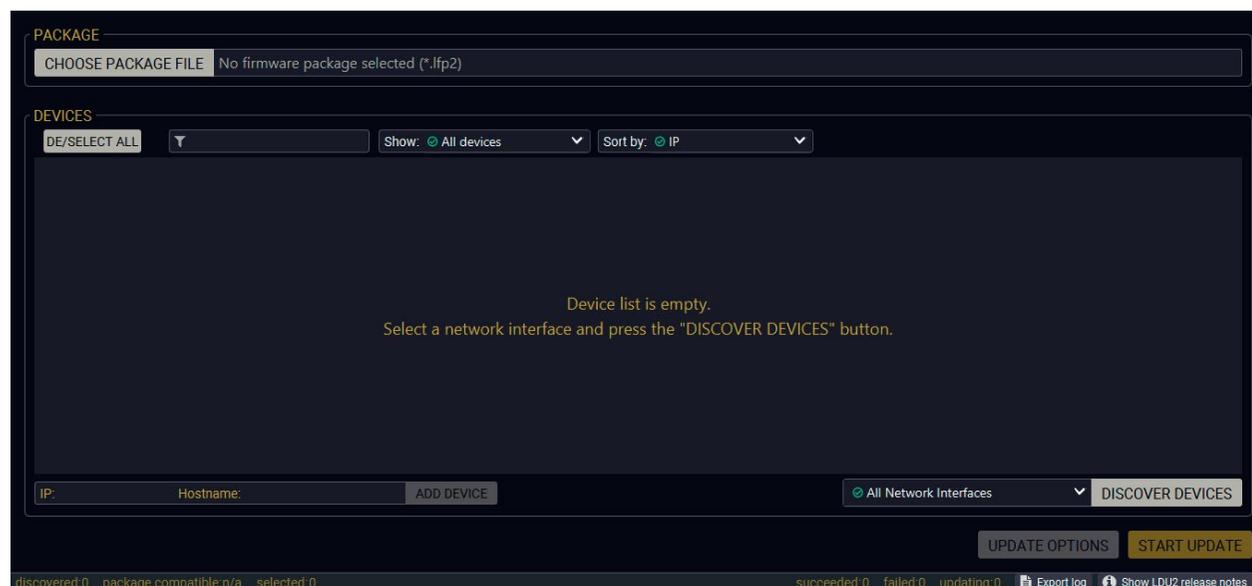
If you start the software by double-clicking on the LFP2 file, the firmware will be loaded. Press the **Discover devices** button; all the devices will be listed that are compatible with the selected firmware pack.

INFO: If you press the **Choose package file** button, the release notes of the LFP2 file will be displayed in the right panel; see the Step 1. Select the Firmware Package section.

#### Device List

When the discovery has completed, the devices available on the network are listed in the application.

If the desired device is not discovered, you can add it by typing the IP address or the host name in the dedicated field and pressing the **Add device** button.

**ATTENTION:** If the device cannot be added by the hostname, please use the IP address.

#### Legend of the Icons

| | | |
|---|---|---|
| ✎ | **IP address editor** | The IP address of the device can be changed in the pop-up window. |
| ◉ | **Identify me** | Clicking on the icon results in the front panel LEDs blinking for 10 seconds, which helps to identify the device phisically. |
| ★ | **Favorite device** | The device has been marked, thus the IP address is stored. When a device is connected with that IP address, the star will be highlighted in that line. |
| ⓘ | **Further information available** | Device is unreachable. Change the IP address by pressing the **IP address editor** icon or use the front panel buttons (if available). |
| 🛠 | **Service mode** | The device is in bootload mode. Backup and restore cannot be performed in this case. |

## 10.4. The Updating Steps

> **ATTENTION:** While the firmware is being updated, the normal operation mode is suspended, as the device is switched to bootload mode. Signal processing is not performed. Do not interrupt the firmware update. If any problem occurs, reboot the unit and restart the process.

**Keeping the Configuration Settings**

By default, device configuration settings are restored when firmware update is finished. If factory reset has been chosen in the parameters window, all device settings will be erased. In the case of factory reset, you can save the settings of the device in the Lightware Device Controller (LDC) software and restore it later.

The following flow steps demonstrate how this function works in the background.

**Step 1. Create a backup**

The current configuration of the device is being saved into a configuration backup file on your computer.

**Step 2. Start the Update**

The device reboots and starts in bootload mode (firmware update mode).

**Step 3. Upgrade**

The CPU firmware is changed to the new one.

**Step 4. Factory reset**

All configuration settings are restored to the factory default values.

**Step 5. Conversion / Restore**

The firmware package checks the backup data before the restoration procedure, and if it is necessary, a conversion is applied to avoid incompatibility problems between the firmware versions. All configuration settings are restored to the device after the conversion.

**If the factory default option is selected in the Parameters window, the conversion / restore procedure will not be performed!**

**Step 6. Finish**

Once the firmware update procedure is finished, the device reboots and is ready to use.

## 10.5. Updating Via GUI - TPN/OPTN series Endpoints

**Step 1. Select the Firmware Package**

Click on the **Choose Firmware Package** button and navigate to the location where the LFP2 file of the MMU is saved. When you click on the name of package, the preview of the release notes is displayed on the right side.
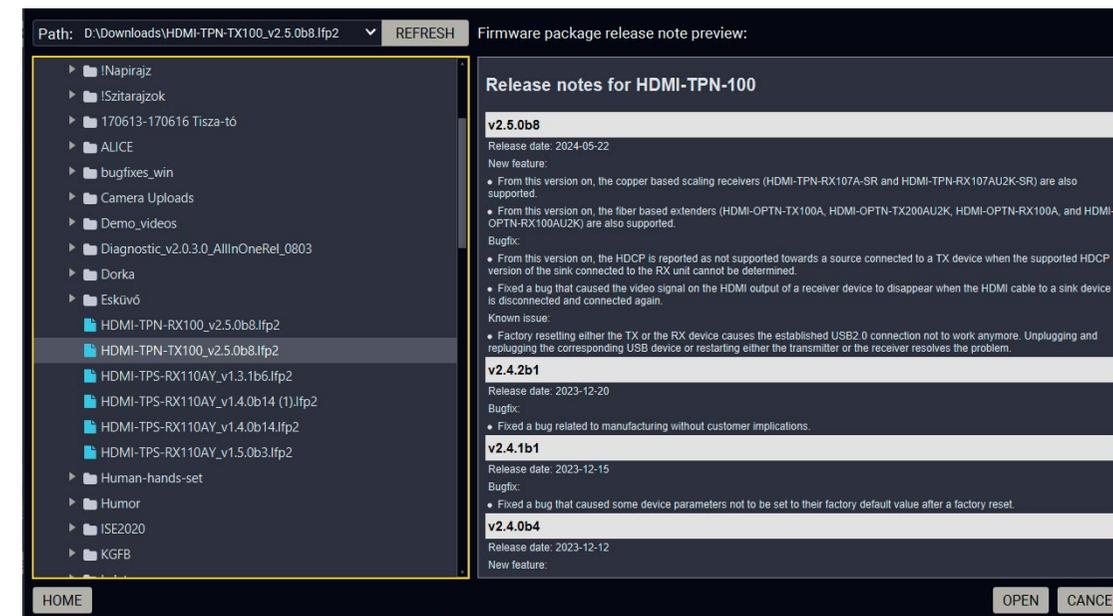


*Firmware file browser and the release notes window*

After the package file is loaded, the list is filtered to show compatible devices only. The current firmware version of the device is highlighted in orange if it is different from the version of the package loaded.
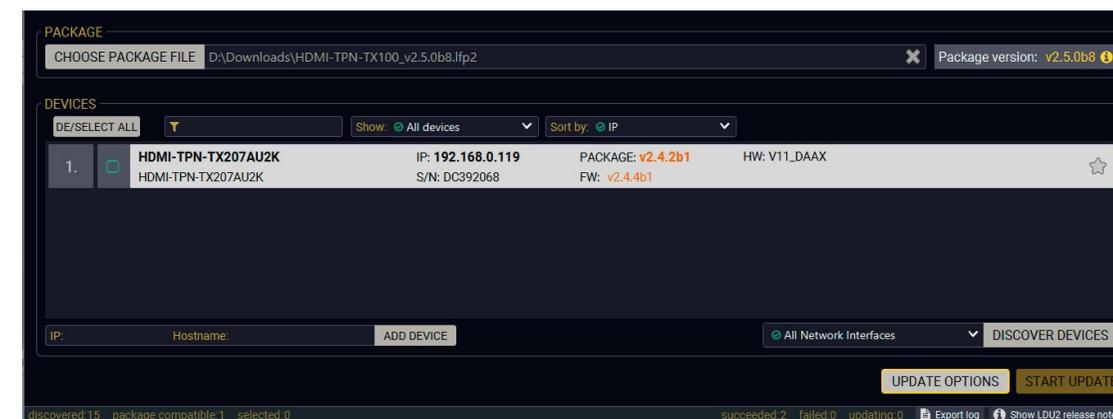


*Filtered device list based on the selected firmware package*

**Step 2. Select the Device for Updating**

Pick the device(s) for updating. The selected line will be highlighted in green.
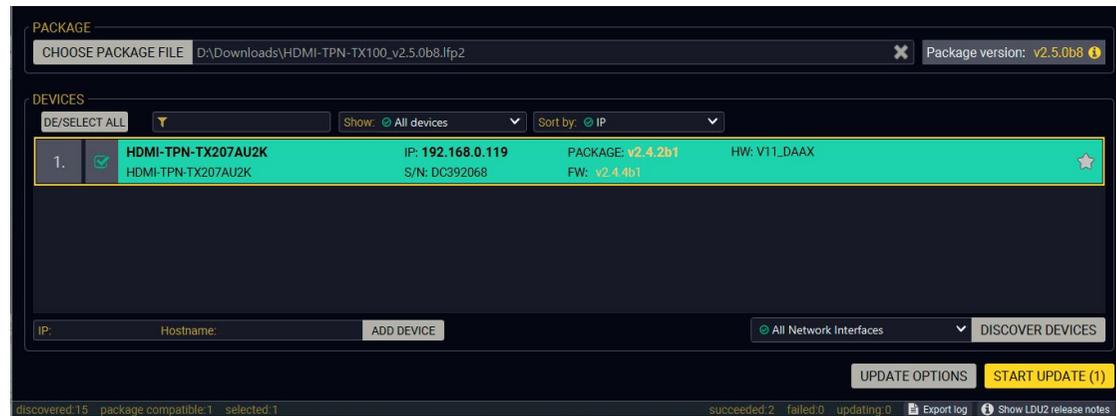


*The unit is selected for updating*

**Step 3. Check the Update Options.**

**ATTENTION:** The default settings in the Parameters window should be fine for most cases. Please do not modify them if it is not necessary.

Click on the **Parameters** button to configure the firmware update.

UPDATE OPTIONS
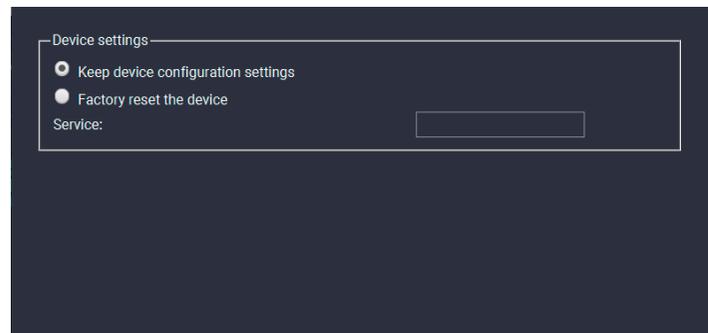


*Parameters menu for the endpoint devices*

**Device Configuration Settings**

- **Keep the configuration settings**: the configuration settings of the endpoint will be restored after the firmware update.
- **Factory reset the device**: if it is checked, all user settings and parameters will be cleared and the factory default settings will be applied to the device when the update is done.

Press the **Apply** button to finish the Update Options.

**Start the Update and Wait until It is Finished.**

Click on the **Start Update** button to start the procedure.

The status is shown in percent in the right side of the device line and the status of all of the procedures is shown in the lower light green progress bar.
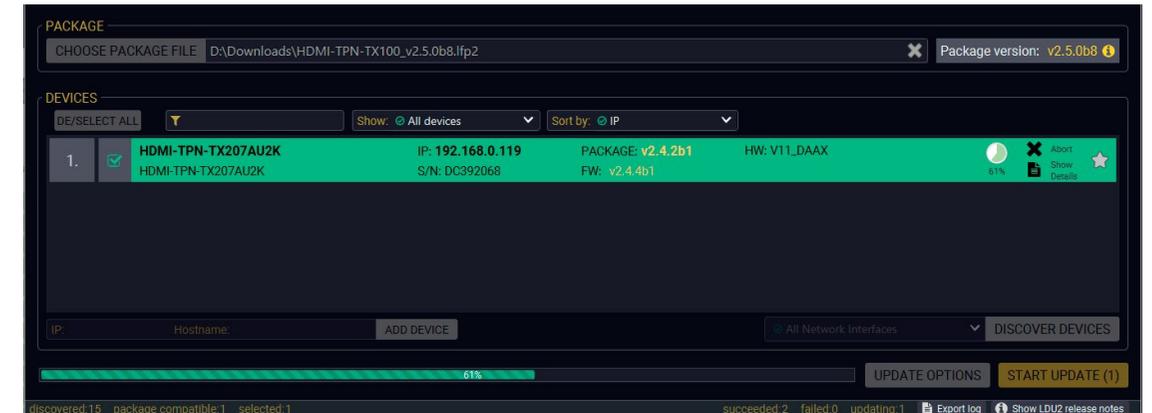


*Firmware update is in progress*

INFO: The device might reboot several times during the firmware update procedure.

**Step 5. Wait until the Unit Reboots with the New Firmware.**

Once the firmware update procedure is completed, the unit reboots with the new firmware.
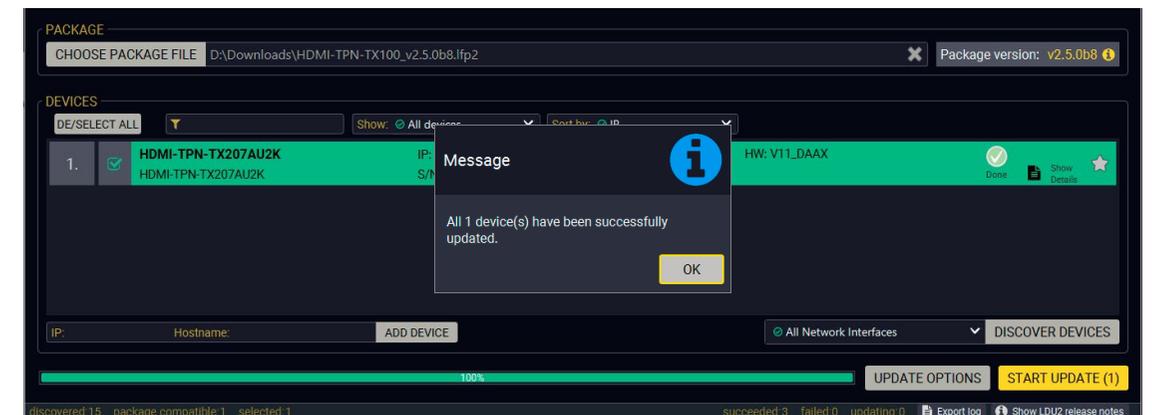


*Firmware update procedure is done*

## 10.6. Command Line Interface (CLI)

> **DIFFERENCE:** The Command Line Interface is available from LDU2 v2.9.0b9.

The CLI of the LDU2 software is a simple tool for creating scriptable device updates without the need of human interactions. It allows batch updating just like in case of GUI usage.

### 10.6.1. How to Run

#### Running under Windows® OS

The installer of LDU2 puts the following file into the installation folder:

`LightwareDeviceUpdaterV2_CLI.cmd`

CLI is available via this file, the exe is not suitable for that purpose. Open a command line window to execute or test the features directly.

**Step 1.** Open an Explorer window where the cmd file is located, the default is:
`c:\Program Files (x86)\Lightware\Lightware Device Updater V2\LightwareDeviceUpdaterV2_CLI.cmd`.

**Step 2.** Click on the address line (highlighted in blue in the picture), type `cmd.exe` and press enter. The command interpreter window of Windows is opened at the path of the LDU2 install folder.
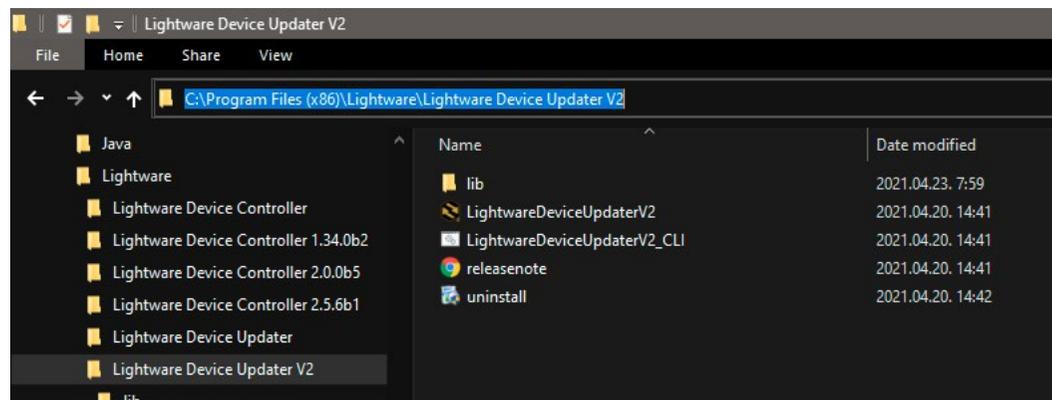


**Step 3.** Now you can use the `LightwareDeviceUpdaterV2_CLI.cmd` file with the commands and options, which are described in the coming sections:

#### Running under Linux

The Command Line Interface under Linux Operating Systems can be run by the following:

`LightwareDeviceUpdaterV2.sh`.

Running an update:

```
bash LightwareDeviceUpdaterV2.sh update --ip 172.24.5.27 --package ~/Downloads/taurus_
v1.3.3b3.lfp2
```

The commands and options are the same under Windows® and Linux, too. The following sections contain examples with **LightwareDeviceUpdaterV2_CLI.cmd**.

### 10.6.2. How to Use

#### Command Structure

The commands can be run over CLI in the following way:

`LightwareDeviceUpdaterV2_CLI.cmd [command] [options]`

`[Command]`: a certain command described in the coming sections; only one command can be run at a time

`[Options]`: mandatory and/or optional parameters of the command, if any. Optional parameters have a default value, which can be found at each affected command. You only have to define the parameter if you want to apply a different value. The **order of the options** is arbitrary.

#### Important Notes

- CLI is **case-sensitive** (including commands, options and other parameters).
- There is **no limit** regarding the number of the devices to update. At most 20 devices are updated simoultaneously, when one of them is finished, the following (21st) will be started automatically.
- If an update is failed, the IP address of the affected device(s) are listed at the end.

## 10.7. CLI Commands

> INFO: The commands and options described in the following sections are the same under Windows® and Linux, too. The examples contain **LightwareDeviceUpdaterV2_CLI.cmd**.

#### About the Examples

- Sent command is in **blue**, response is in **grey**.
- If the response in practice is **longer than listed** in the example, this symbol can be seen: [...].

### 10.7.1. Help

The defined commands and options can be listed by the **help** command.

#### Command

`LightwareDeviceUpdaterV2_CLI.cmd help`

#### Example

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd
help

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\
ldu2.jar help
Command line usage:
    Win: LightwareDeviceUpdaterV2_CLI.cmd [command] [options]
    Linux: LightwareDeviceUpdaterV2.sh [command] [options]

    Commands:
        * help
        * version
        * update
        * deviceInfo
        * restore
        * packageOptions
[...]
```

### 10.7.2. LDU2 Version

The response shows the version of the LDU2 and the version of the Script API (the Application Programming Interface that is used by the LDU2 and the script).

**Command**

```
LightwareDeviceUpdaterV2_CLI.cmd version
```

**Example**

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd
version

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\
ldu2.jar version
LDU2 version: 2.10.0b6
Script API version: 1.3.10
```

### 10.7.3. Check For New LDU2 Version

The following command can be used to check if an update of LDU2 is available. This is just a request, since the CLI is not suitable for handling the complete installer of the software.

**Command**

```
LightwareDeviceUpdaterV2_CLI.cmd checkForUpdates
```

**Example 1**

```
c:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd
checkForUpdates

c:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\
ldu2.jar checkForUpdates
Current LDU2 version: 2.10.0b6
LDU2 is up-to-date
```

**Example 2**

```
c:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd
checkForUpdates

c:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\
ldu2.jar checkForUpdates
Current LDU2 version: 2.9.1b1
New version is available online: 2.10.0b6
Download URL: http://update.lightware.hu/ldu2/lwr/v2.10.0b6/install_LDU2_v2.10.0b6.exe
```

### 10.7.4. Device Info

The most important information about the selected device is displayed; see the example for more details.

**Command**

```
LightwareDeviceUpdaterV2_CLI.cmd deviceInfo [options]
```

**Options**

| Option | Description | Required? |
|--------|-------------|-----------|
| -i or --ip | List of IP addresses of devices to be updated | one of them is mandatory |
| -n or --hostName | List of host names of devices to be updated | |
| -v or --packageVersion | Shows installed package version only | optional |

**Example 1**

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd
deviceInfo --ip 192.168.0.100

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\
ldu2.jar deviceInfo --ip 192.168.0.100
Product name:    TPN-MMU-X100
IP address:      192.168.1.19
Serial number:   00007316
MAC address:     a8:d2:36:F0:73:16
Part number:     91310078
Device label:    LW_TPN-MMU-X100_00007316
Package version: v1.3.3b3
CPU FW version:  v1.3.3b3
HW version:      V10_KAK1
Operation mode:  Application mode
```

**Example 2**

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd
deviceInfo --ip 192.168.1.7 --packageVersion

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\
ldu2.jar deviceInfo --ip 192.168.0.100 --packageVersion
v1.3.3b3
```

## 10.7.5. Update

This command can be used to update the firmware of the devices.

**Command**

```
LightwareDeviceUpdaterV2_CLI.cmd update [options]
```

**Options**

| Option | Description | Required? |
|---|---|---|
| -p or --package | The path of the firmware package file | yes |
| -i or --ip | List of IP addresses of devices to be updated | one of them is mandatory |
| -n or --hostName | List of host names of devices to be updated | |
| -r or --reportProgress | Report update progress in percentage form. Default: false | optional |
| Package-specific options | Certain LFP2 packages have features that can be applied at this command; see the Package Options section. | optional |

**ATTENTION:** The configuration is restored automatically if the factory default option is not applied in the **update** command. In that case, there is no need to run the **restore** command after the update.

**Example**

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd
update --ip 192.168.1.19 --package C:\Firmwares\taurus_v1.3.3b3.lfp2 --reportProgress

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\ldu2.
jar update --ip 192.168.1.19 --package C:\Firmwares\taurus_v1.3.3b3.lfp2 --reportProgress
[2022-02-11 11:22:52.820] [ INFO] [         main] - Device IPs: [192.168.1.19]
[2022-02-11 11:22:58.317] [ INFO] [         main] - All selected devices are available over
the network.
[2022-02-11 11:23:01.308] [ INFO] [         main] - All the selected devices are compatible
with the specified package.
[2022-02-11 11:23:04.356] [ INFO] [    192.168.1.19] - Taurus UCX update process started
[2022-02-11 11:23:04.496] [ INFO] [    192.168.1.19] - Update API version: 1.0
[2022-02-11 11:23:04.525] [ INFO] [    192.168.1.19] - Update parameters: deviceIp:
192.168.1.19, factoryDefault: false
[2022-02-11 11:23:04.556] [ INFO] [    192.168.1.19] - Update protocol: http://
[2022-02-11 11:23:04.558] [ INFO] [    192.168.1.19] - Authentication type: NONE
[2022-02-11 11:23:04.737] [ INFO] [    192.168.1.19] - Device info: Product name: TPN-MMU-X100,
Device label: LW_TPN-MMU-X100_00007316, Serial number: 00007316, Mac address: a8:d2:36:F0:73:16,
Ip address: 192.168.1.19, Host name: , Package version: v1.3.3b3, Part number: 91310078, Hw
version: V10_KAK1
[2022-02-11 11:23:04.753] [ INFO] [    192.168.1.19] - Uploading firmware package.
[2022-02-11 11:32:54.050] [ INFO] [ProgressReporter] - Progress: 13%
[2022-02-11 11:32:59.056] [ INFO] [ProgressReporter] - Progress: 19%
[2022-02-11 11:33:04.060] [ INFO] [ProgressReporter] - Progress: 25%
[2022-02-11 11:33:09.067] [ INFO] [ProgressReporter] - Progress: 32%
[2022-02-11 11:33:14.079] [ INFO] [ProgressReporter] - Progress: 38%
[2022-02-11 11:33:19.091] [ INFO] [ProgressReporter] - Progress: 40%
[2022-02-11 11:33:24.098] [ INFO] [ProgressReporter] - Progress: 43%
[2022-02-11 11:33:29.112] [ INFO] [ProgressReporter] - Progress: 46%
[2022-02-11 11:33:34.122] [ INFO] [ProgressReporter] - Progress: 49%
```

```
[2022-02-11 11:33:39.133] [ INFO] [ProgressReporter] - Progress: 52%
[2022-02-11 11:33:44.135] [ INFO] [ProgressReporter] - Progress: 55%
[2022-02-11 11:33:49.138] [ INFO] [ProgressReporter] - Progress: 58%
[2022-02-11 11:33:54.144] [ INFO] [ProgressReporter] - Progress: 61%
[2022-02-11 11:33:59.154] [ INFO] [ProgressReporter] - Progress: 64%
[2022-02-11 11:34:04.168] [ INFO] [ProgressReporter] - Progress: 67%
[2022-02-11 11:34:09.169] [ INFO] [ProgressReporter] - Progress: 70%
[2022-02-11 11:25:01.556] [ INFO] [    192.168.1.19] - Package upload finished.
[2022-02-11 11:25:01.611] [ INFO] [    192.168.1.19] - Starting internal update process. Device
is about to reboot.
[2022-02-11 11:25:01.645] [ INFO] [    192.168.1.19] - Package file has been uploaded
successfully.

The device will now update itself, which may take tens of minutes.

LDU2 is now disconnecting from the device. Please wait until the device finishes the update.
[2022-02-11 11:25:01.646] [ INFO] [    192.168.1.19] - Done

All 1 update(s) finished successfully.
```

The lines containing "ProgressReporter" can be enabled optionally. If it is enabled, the current state is displayed every 5 seconds.

**ATTENTION:** As the example shows the firmware update progress is not finished at the "Done" line, but the firmware package is uploaded into the device. The device will run the update progress internally.

## 10.7.6. Package Options

Shows package-specific update options.

**Command**

```
LightwareDeviceUpdaterV2_CLI.cmd packageOptions [options]
```

**Options**

| Option | Description | Required? |
|---|---|---|
| -p or --package | The path of the firmware package file | yes |

**Example**

```
c:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd
packageOptions --package f:\!!!LIGHTWARE\firmware\taurus_v1.3.3b3.lfp2

Login options:
        --user : HTTP(s) basic authentication user (Default: empty string)
        --pw : HTTP(s) basic authentication password (Default: empty string)
```

A package option example can be seen in the following section.

### 10.7.7. Complex Example

The following options applied:
- Firmware is updated
- Authentication is enabled

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd
update --ip 192.168.1.19 --package C:\Firmwares\taurus_v1.3.3b3.lfp2 --user admin --pw 12345
--reportProgress

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\
ldu2.jar update --ip 192.168.1.19 --package C:\Firmwares\taurus_v1.3.3b3.lfp2 --user admin --pw
12345 --reportProgress
[2022-02-11 11:32:40.831] [ INFO] [           main] - Device IPs: [192.168.1.19]
[2022-02-11 11:32:46.096] [ INFO] [           main] - All selected devices are available over
the network.
[2022-02-11 11:32:49.035] [ INFO] [           main] - All the selected devices are compatible
with the specified package.
[2022-02-11 11:32:51.994] [ INFO] [    192.168.1.19] - Taurus UCX update process started
[2022-02-11 11:32:52.087] [ INFO] [    192.168.1.19] - Update API version: 1.0
[2022-02-11 11:32:52.138] [ INFO] [    192.168.1.19] - Update parameters: deviceIp:
192.168.1.19, factoryDefault: false
[2022-02-11 11:32:52.189] [ INFO] [    192.168.1.19] - Update protocol: http://
[2022-02-11 11:32:52.189] [ INFO] [    192.168.1.19] - Authentication type: BASIC
[2022-02-11 11:32:52.359] [ INFO] [    192.168.1.19] - Device info: Product name: TPN-MMU-X100,
Device label: LW_TPN-MMU-X100_00007316, Serial number: 00007316, Mac address: a8:d2:36:F0:73:16,
Ip address: 192.168.1.19, Host name: , Package version: v1.3.3b3, Part number: 91310078, Hw
version: V10_KAK1
[2022-02-11 11:32:52.374] [ INFO] [    192.168.1.19] - Uploading firmware package.
[2022-02-11 11:32:54.050] [ INFO] [ProgressReporter] - Progress: 13%
[2022-02-11 11:32:59.056] [ INFO] [ProgressReporter] - Progress: 19%
[2022-02-11 11:33:04.060] [ INFO] [ProgressReporter] - Progress: 25%
[2022-02-11 11:33:09.067] [ INFO] [ProgressReporter] - Progress: 32%
[2022-02-11 11:33:14.079] [ INFO] [ProgressReporter] - Progress: 38%
[2022-02-11 11:33:19.091] [ INFO] [ProgressReporter] - Progress: 40%
[2022-02-11 11:33:24.098] [ INFO] [ProgressReporter] - Progress: 43%
[2022-02-11 11:33:29.112] [ INFO] [ProgressReporter] - Progress: 46%
[2022-02-11 11:33:34.122] [ INFO] [ProgressReporter] - Progress: 49%
[2022-02-11 11:33:39.133] [ INFO] [ProgressReporter] - Progress: 52%
[2022-02-11 11:33:44.135] [ INFO] [ProgressReporter] - Progress: 55%
[2022-02-11 11:33:49.138] [ INFO] [ProgressReporter] - Progress: 58%
[2022-02-11 11:33:54.144] [ INFO] [ProgressReporter] - Progress: 61%
[2022-02-11 11:33:59.154] [ INFO] [ProgressReporter] - Progress: 64%
[2022-02-11 11:34:04.168] [ INFO] [ProgressReporter] - Progress: 67%
[2022-02-11 11:34:09.169] [ INFO] [ProgressReporter] - Progress: 70%
[2022-02-11 11:34:52.599] [ INFO] [    192.168.1.19] - Package upload finished.
[2022-02-11 11:34:52.683] [ INFO] [    192.168.1.19] - Starting internal update process. Device
is about to reboot.
[2022-02-11 11:34:52.710] [ INFO] [    192.168.1.19] - Package file has been uploaded
successfully.

The device will now update itself, which may take tens of minutes.

LDU2 is now disconnecting from the device. Please wait until the device finishes the update.
[2022-02-11 11:34:52.712] [ INFO] [    192.168.1.19] - Done

All 1 update(s) finished successfully.
```

### 10.7.8. Exit Codes

There is a return value in all cases when a command run is finished. Currently, three codes are defined:

| Code | Displayed text | Description |
|------|----------------|-------------|
| 0 | N/A | The update performed successfully |
| 1 | Update error (ErrorCode:1) | The error happened during the update |
| 2 | CLI error (ErrorCode:2) | The error happened before starting the update |

The error line contains further information about the error.

**Querying the Exit Code under Windows®**

```
c:\Program Files (x86)\Lightware\Lightware Device Updater V2\echo %errorlevel%
0
```

**Querying the Exit Code under Linux**

```
echo $?
0
```

If this value is queried after the update and it is 0, the update performed successfully.

## 10.8. If the Update is not successful

- Restart the process and try the update again.
- If the device cannot be switched to bootload (firmware update) mode, you can do that manually as written in the User manual of the device. Please note that backup and restore cannot be performed in this case.
- If the backup cannot be created for some reason, you will get a message whether to continue the process without backup or stop the update. A root cause can be that the desired device is already in bootload (firmware update) mode, thus the normal operation mode is suspended and backup cannot be made.

If an update is not successful, the **Export log** button becomes red. If you press the button, you can download the log file as a ZIP package, which can be sent to Lightware Support if needed. The log files contain useful information about the circumstances to find the root cause.  *#bootload*

# 11

## 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. The following sections are available in the chapter:

## 11.1. Use Cases

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 and Rear Panel LEDs section.

**Legend**

🔌  Link to connections/cabling section.

🖳  Link to device operation section.

🌐  Link to Built-in web section.

{/}  Link to REST API section.

LW3  Link to LW3 protocol commands section.

| Symptom | Root cause | Action | Refer to |
|---|---|---|---|
| **Audio / Video signal** | | | |
| **No picture on the video output** | Device or devices are not powered properly | Check the endpoints, the MMU, the network switch, and the other devices if they are properly powered; try to unplug and reconnect them. | 🔌 3.2 |
| | Cable connection problem | Cables must fit very well, check all the connectors (HDMI and CATx/optical/DAC cables). | 🔌 3.2 🔌 3.3 |
| | Optical cable became contaminated | Use special fiber optical cable cleaning equipment to clean it carefully. | |
| | Incorrect settings are applied in the network switch | Check the configuration settings of the network switch. See more typical switch related issues on the next page. | 🖳 3.6 |
| | Singlemode-multimode SFP / SFP+ module pairs | Check the installed SFP / SFP+ modules and install multimode or singlemode modules by pairs only. | 🔌 3.3 |
| | SFP module is installed instead of SFP+ module | Install SFP+ transceiver module to the SFP+ port | 🔌 3.3 |
| | Incompatible SFP+ modules are in the endpoint and the network switch | Check the compatibility of the installed SFP+ modules: singlemode / multimode pairs, parameters of the modules | 🔌 3.3 |
| **Picture is jittering/noisy (in case of TPN endpoint)** | Incorrect CATx cable type / length is used | Check Lightware's recommendations for CATx cable types and maximum extension length | 🔌 4 |

| Symptom | Root cause | Action | Refer to |
|---|---|---|---|
| **Network - MMU** | | | |
| **No LAN connection can be established** | Incorrect IP address is set (fix IP) | Use dynamic IP address by enabling DHCP option. | 🌐 7.7 {/} 8.9.1 LW3 9.9.1 |
| | IP address conflict | Check the IP address of the other devices, too. | |
| **Network switch related issues \*** | | | |
| **Bandwidth problem on the network with a single 4K60 stream** | All streams are transmitted to all outputs because IGMPv2 snooping is not enabled. | Enable IGMPv2 snooping. | 🖳 3.6 |
| **Black stripes in the picture** | IGMPv2 snooping is not enabled. | Enable IGMPv2 snooping. | 🖳 3.6 |
| | Optical cable became contaminated. | Use special fiber optical cable cleaning equipment to clean it carefully. | |
| | Cable connection problem. | Cables must fit very well, check all the connectors (video, CATx and optical/DAC cables). | 🔌 3.2.3 🔌 3.2.5 🔌 3.3 |

\* For more details about the configuration steps of the network switch with real-life examples, please visit our website and download the application notes for TPN / OPTN systems:

https://go.lightware.com/guide-for-TPN-OPTN-extenders

| Symptom | Root cause | Action | Refer to |
|---|---|---|---|
| **RS-232 signal - Endpoints** | | | |
| **Connected serial device does not respond** | Cable connection problem | Check the connectors to fit well; check the wiring of the plugs. | 🔌 3.2.8 🔌 13.7.1 |
| | Serial port parameters mismatch with the connected device's ones | Check the settings of the serial port of the endpoints. | 🌐 7.8.2 {/} 8.12 LW3 9.12 |
| **USB HID - Endpoints** | | | |
| **No signal between the USB HID devices** | USB HID devices are not paired | Pair the devices. | {/} 8.13.2 LW3 9.13.2 |

| Symptom | Root cause | Action | Refer to |
|---|---|---|---|
| **Icron USB KVM - Endpoints** ||||
| **No IP address is assigned to the Icron module** | Icron module is not responding | Restart the interface and restore it to DHCP or static IP address | 🌐 7.6.2<br>{/} 8.14.9<br>{/} 8.14.10<br>LW3 9.14.9<br>LW3 9.14.10 |
| **No connection between the LEX and REX devices** | Icron modules are not paired | Pair the devices. | {/} 8.14.2<br>LW3 9.14.2 |
| **Miscellaneous** ||||
| **I cannot find my endpoint device in the server room** | All AV boxes and gadgets look the same. | Use the "Identify Me" feature. | 🌐 7.6.3<br>{/} 8.6.4<br>LW3 9.6.4 |

## 11.2. 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.
- 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 a file and send it 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 (for example: "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 this information to the Lightware Support Team (support@lightware.com) to speed up the troubleshooting process.
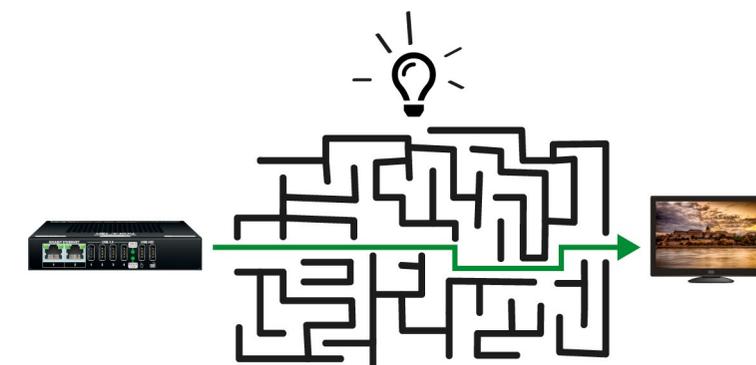
# 12

## Technologies

**The following sections contain descriptions and useful technical information on how the devices work in the background. The content is based on experiences and cases we met in practice. These sections help to understand features and technical standards like the following:**

## 12.1. EDID Management

### 12.1.1. 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.
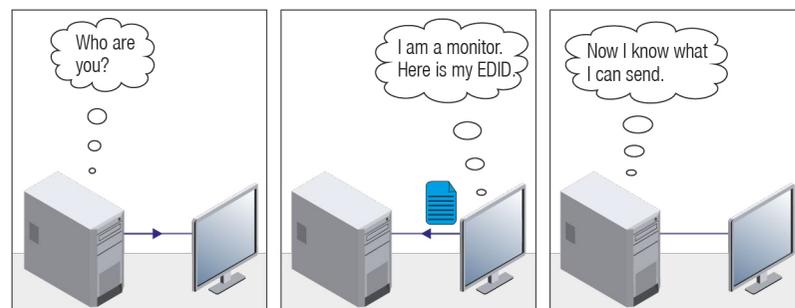


*EDID Communication*

Most DVI computer displays have a 128-byte long EDID structure. However, Digital Televisions and HDMI capable displays may have another 128 bytes, which is called E-EDID and defined is 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 the EDID has been changed. You need to restart your source to make it read out the EDID again.

### 12.1.2. 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. The 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 is 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 that 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. The EDID can be changed even if a source is connected to the input and powered ON.

INFO: When the 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.

## 12.2. AV Over IP

**Basics**

Beside the traditional AV matrix switchers and extenders, the video over IP or networked AV system is the biggest leading technology in the AV industry. The spreading of the technology speeds up the general increasing of the use of the IT-related devices and equipment all around the world - from the offices to the homes.

The main difference compared to the traditional AV technologies is the method of the signal transmission: the networked AV transmitter/encoder devices convert the video signal to TCP/IP packets and transfer them to the receivers/decoders. The interface of the transmission can be CATx or fiber optical cable, depending on the signal bandwidth and the distance between the source and sink devices.

**What is TCP/IP?**

DEFINITION: TCP/IP, or the Transmission Control Protocol/Internet Protocol, is a suite of communication protocols used to interconnect network devices on the Internet or in a private network.

TCP/IP specifies how data is exchanged over the network by providing end-to-end communications that identify how it should be broken into packets, addressed, transmitted, routed and received at the destination. TCP/IP requires little central management, and it is designed to make networks reliable, with the ability to recover automatically from the failure of any device on the network.

The two main protocols in the Internet protocol suite serve specific functions. TCP defines how applications can create channels of communication across a network. It also manages how a message is assembled into smaller packets before they are then transmitted over the Internet and reassembled in the right order at the destination address.

IP defines how to address and route each packet to make sure it reaches the right destination. Each gateway computer on the network checks this IP address to determine where to forward the message.

## 12.3. 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 matrix 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.

### 12.3.1. 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. Even though 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.

### 12.3.2. Disable Unnecessary Encryption

**HDCP Compliant Sink**

All the devices are HDCP-compliant, no manual setting is required, both protected and unprotected contents are transmitted and displayed on the sink.



**Not HDCP-compliant Sink 1.**

Not-HDCP compliant sink is connected to the 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 screen is shown. 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 with an HDCP-capable one.

### 12.3.3. HDCP 2.2

HDCP 2.2 is the latest evolution of copy protection. It is designed to create a secure connection between a source and a display. The 2.x version of HDCP is not a continuation of HDCPv1, and is rather a completely different link protection. One of the main differences is the number of the allowed devices within a closed AV system: HDCP 2.2 allows 32 devices (HDCP 1.4 allows 128 devices). A further limit is that up to four level is allowed, which means the protected signal can be transmitted over at most four repeater/matrix/switcher devices. HDCP content protection is activated only if an active video stream is transmitted from the source to the display. The encryption is not activated without a video signal.

HDCP 2.2 standard allows the application of a previous version of HDCP (e.g. HDCP 1.4) between the source and the display if the source device allows it. According to the standard, if the image content is protected with HDCP, the highest supported content protection level has to be applied. However, if the highest level of protection is not justified by the source content, the level may be decreased to avoid compatibility problems; this case is determined by the source.

**HDCP 2.2 Source and HDCP 1.4 Sink**

In this case the signal of an HDCP 2.2 compliant source is switched to an HDCP 1.4 compliant sink device. The signal is encrypted with HDCP 2.2 on the input and encrypted with HDCP 1.4 on the output of the Lightware device. A lower level of encryption may be applied only if the source device/content allows it - according to the HDCP standard. In this case, the HDCP setting on the input port has to be set to HDCP 1.4 and Depends on input on the output port.



**HDCP 1.4 Source and HDCP 2.2 Sink**

The example below is the reversal of the previous case. An HDCP 1.4 compliant source sends a signal with HDCP 1.4 encryption. The signal is switched to an HDCP v2.2 compliant sink device. In this case, the outgoing signal has to be encrypted with the highest supported encryption level towards the sink, as the Lightware device and the sink are both HDCP 2.2 compliant. The HDCP 2.2 standard does not allow keeping the original HDCP 1.4 encryption level on the output.



**What Kind of Signal Will be on the Output of the Lightware Device?**

See the table below that summarizes the possible cases:

| Incoming Signal | HDCP 1.4 Compatible Sink on the Output | HDCP 2.2. Compatible Sink on the Output |
|---|---|---|
| HDCP 1.4 | HDCP 1.4 | HDCP 2.2 |
| HDCP 2.2 (convertable)* | HDCP 1.4 | HDCP 2.2 |
| HDCP 2.2 (not convertable)** | Red screen | HDCP 2.2 |

* Stream type 0: the video stream allows the conversion of the signal to apply a lower level of encryption.

** Stream type 1: the video stream does not allow the conversion of the signal.

## 12.3.4. HDCP 2.2

HDCP 2.2 is the latest evolution of copy protection. It is designed to create a secure connection between a source and a display. The 2.x version of HDCP is not a continuation of HDCP 1, and is rather a completely different link protection. One of the main differences is the number of the allowed devices within a closed AV system: HDCP 2.2 allows 32 devices (HDCP 1.4 allows 128 devices). Further limit is that up to four level is allowed, which means the protected signal can be transmitted over at most four repeater/matrix/switcher device. HDCP content protection is activated only if an active video stream is transmitted from the source to the display. The encryption is not activated without a video signal.

HDCP 2.2 standard allows to apply a previous version of HDCP (e.g. HDCP v1.4) between the source and the display if the source device allows it. According to the standard, if the image content is protected with HDCP, the highest supported content protection level has to be applied. However, if the highest level of protection is not justified by the source content, the level may be decreased to avoid compatibility problems; this case is determined by the source.

**HDCP 2.2 Source and HDCP 1.4 Sink**

In this case the signal of an HDCP 2.2 compliant source is switched to an HDCP v1.4 compliant sink device. The signal is encrypted with HDCP 2.2 on the input and encrypted with HDCP v1.4 on the output of the Lightware device. A lower level of encryption may be applied only if the source device/content allows it - according to the HDCP standard. In this case the HDCP setting on the input port has to be set to HDCP 1.4 and Depends on input on the output port.

HDCP 2.2 → HDCP 1.4

HDCP 2.2
Compliant source

Standalone device
or Extender units

HDCP 1.4
Compliant sink

**HDCP 1.4 Source and HDCP 2.2 Sink**

The example below is the reversal of the previous case. An HDCP 1.4 compliant source sends a signal with HDCP 1.4 encryption. The signal is switched to an HDCP 2.2 compliant sink device. In this case the outgoing signal has to be encrypted with the highest supported encryption level towards the sink, as the Lightware device and the sink are both HDCP 2.2 compliant. The HDCP 2.2 standard does not allow keeping the original HDCP 1.4 encryption level on the output.

HDCP 1.4 → HDCP 2.2

HDCP 1.4
Compliant source

Standalone device
or Extender units

HDCP 2.2
Compliant sink

**What Kind of Signal Will be on the Output of the Lightware Device?**

See the table below summarizing the possible cases:

| Incoming Signal | HDCP 1.4 Compatible Sink on the Output | HDCP 2.2. Compatible Sink on the Output |
|---|---|---|
| HDCP 1.4 | HDCP 1.4 | HDCP 2.2 |
| HDCP 2.2 (convertable)* | HDCP 1.4 | HDCP 2.2 |
| HDCP 2.2 (not convertable)* | Black screen | HDCP 2.2 |

\* Stream type 0: the video stream allows to convert the signal to apply a lower level of encryption.

\*\* Stream type 1: the video stream does not allow to convert the signal.

## 12.4. Pixel Accurate Reclocking

Signal reclocking is an essential procedure in digital signal transmission. After passing the reclocking circuit, the signal becomes stable, jitter-free, and can be transmitted over more equipment like processors or event controllers. Without reclocking, sparkles, noise, and jaggies appear on the image.

Lightware's sophisticated Pixel Accurate Reclocking technology fixes more problems than general TMDS reclocking. It removes not only intra-pair skew, but inter-pair skew as well. The Pixel Accurate Reclocking circuit eliminates the following errors:

### Intra-pair skew

Skew between the + and - wires within a differential wire pair (e.g. Data2- and Data2+). It's caused by different wire lengths or slightly different wire construction (impedance mismatch) in the DVI cable. It results in jitter.



Intra-pair skew
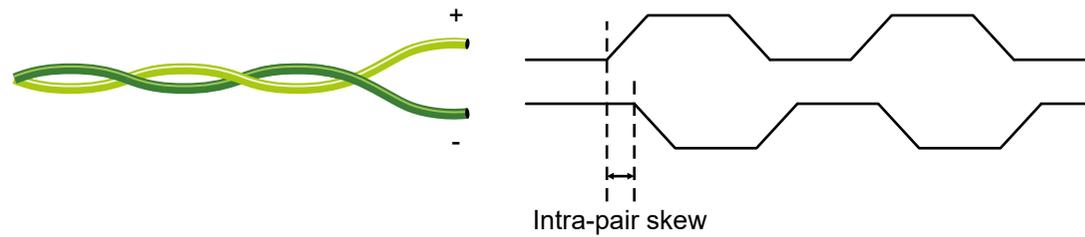
### Inter-pair skew

Skew between two differential wire pairs in a cable. It is caused by different wire pair lengths or different number of twists in the DVI cable. Too much inter-pair skew results in color shift in the picture or sync loss.



Inter-pair skew
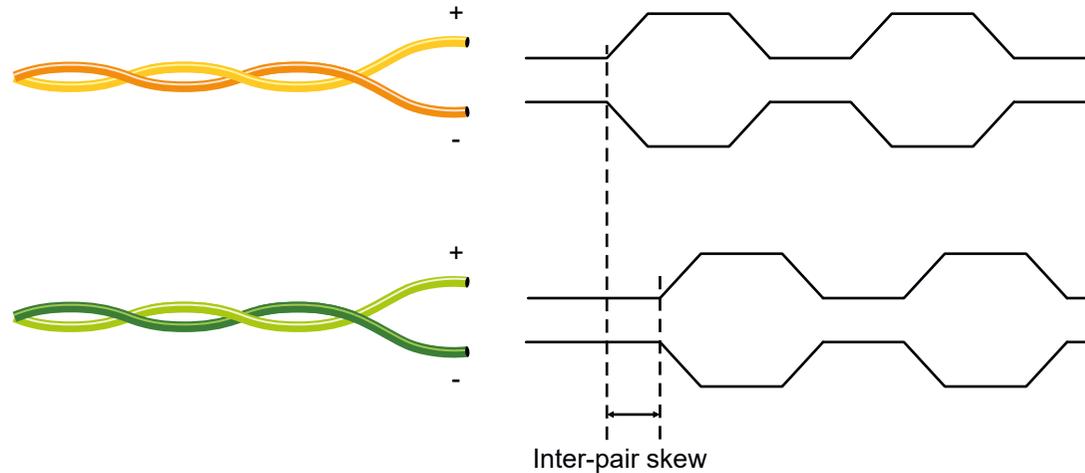
### Jitter

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.
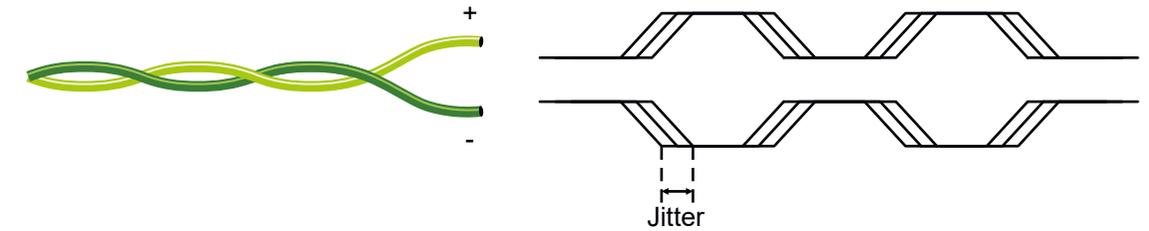


Jitter

### 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.



Noise
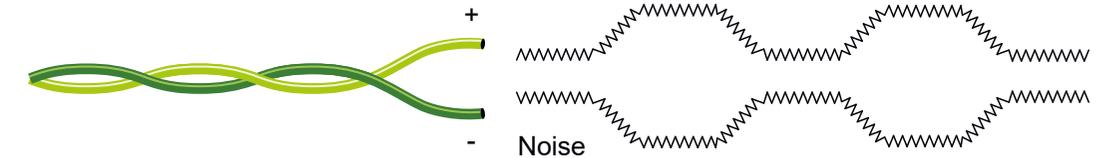
# 13

## Appendix

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

## 13.1. Specification

▌ INFO: Specificatios are subject to change without notice.

### 13.1.1. TPN-MMU-X100 series

#### General

| Compliance | CE, UKCA |
|---|---|
| EMC (emission) | EN 55032:2015+A1:2020 |
| EMC (immunity) | EN 55035:2017+A11:2020 |
| RoHS | EN 63000:2018 |
| Electrical safety | EN 62368-1:2020 |
| Laser safety | EN 60825-1:2014+A11:2021 |
| Warranty | 3 years |
| Operating temperature | 0° to +45˚C (+32° to +113˚F) |
| Operating humidity | 10% to 90%, non-condensing |
| Cooling | Passive |

#### Power

| Supported power source | 100-240 V AC; 50/60 Hz |
|---|---|
| Supplied power | 12V DC, 2A DC |
| AC power plug | Interchangable (EU, UK, JP/US, AUS/NZ) |
| DC power plug | Locking DC connector (2.1/5.5 mm pin) |
| Battery cell type | BR1632A |
| Power over Ethernet  (PoE) | 48V DC via RJ45 connector (IEEE802.3af) |
| Power consumption (max, measured) | 4 W |
| Heat dissipation (max) | 14 BTU/h |

#### Enclosure

| Enclosure Material | 1 mm steel |
|---|---|
| Dimensions in mm | 221W x 120D x 26H |
| Dimensions in inch | 8.7W x 4.14D x 1.02H |
| Weight (GVN-MMU-X100) | 698 g (1.54 lb) |
| Weight (GVN-HDMI-TX210AP, -DNT) | 692 g (1.53 lb) |
| Weight (GVN-HDMI-RX110AP, -DNT) | 694 g (1.53 lb) |

#### Video Output

##### HDMI Output Port

▌ INFO: The support of the port is reserved for future development.

| Connector type | 19-pole HDMI type A receptacle |
|---|---|
| AV standard | DVI 1.0, HDMI 1.4, HDMI 2.0 |
| HDCP Compliance |  HDCP 2.2 |
| Color space | RGB, YCbCr |
| Supported resolutions at 8 bits/color | up to 3840x2160@60Hz (4:4:4) or 3840x2160@60Hz (4:2:0), 1920x1080@60Hz (4:4:4) or 4096x2160@60Hz (4:2:0) up to 12 bits/color |
| Audio formats | Embedded LPCM, Dolby Digital 5.1 ch, Dolby Digital Plus, Dolby Digital Pro-Logic, Dolby TrueHD, DTS:X, Dolby Atmos, DTS 5.1 ch, DTS 96/24, DTS-ES Discrete, DTS-ES Matrix, DTS-HD High Resolution Audio, DTS-HD Master Audio |

#### Control Ports

##### Ethernet Port - AV LAN (PoE)

| Connector type | RJ45 female connector |
|---|---|
| Ethernet data rate | 1 Gigabit, full duplex with autodetect |
| Power over Ethernet (PoE, IEEE802.3af) | Yes |

##### Ethernet Port - Control LAN

| Connector type | RJ45 female connector |
|---|---|
| Ethernet data rate | 1 Gigabit, full duplex with autodetect |
| Power over Ethernet (PoE, IEEE802.3af) | No |

##### USB Ports

▌ INFO: The support of the ports is reserved for future development.

| Connector type | USB Type-A receptacle |
|---|---|
| Number of ports | 2 |
| USB compliance | USB 2.0 |
| Maximum current supplement of the ports | 5V, 1A / 5V, 0.5A |

**RS-232 Port**

> INFO: The support of the port is reserved for future development.

| 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 |

## 13.1.2. HDMI-TPN Series Transmitters

Affected models:

- HDMI-TPN-TX107
- HDMI-TPN-TX107D
- HDMI-TPN-TX207AU2K
- HDMI-TPN-TX207DU2K

**General**

| Compliance | CE, UKCA |
|---|---|
| EMC (emission) | EN 55032:2015+A1:2020 |
| EMC (immunity) | EN 55035:2017+A11:2020 |
| RoHS | EN 63000:2018 |
| Electrical safety | EN 62368-1:2024 |
| Laser safety | EN 60825-1:2014+A11:2021 |
| Warranty | 3 years |
| Cooling | Passive |
| Operating temperature | 0 to +50˚C (+32 to +122˚F) |
| Storage temperature | -40° to +85˚C (-40° to +185˚F) |
| Operating humidity | 10% to 90%, non-condensing |

**Power**

| Power supply option | External power adaptor |
|---|---|
| Supported power source | 100-240 V AC; 50/60 Hz |

**HDMI-TPN-TX107**

| Supplied power | 48V DC, 0.3A |
|---|---|
| AC power plug | Interchangable (EU, UK, JP/US, AUS/NZ) |
| DC power plug | 2-pole Phoenix® plug |
| Power consumption | 11.4 W |
| Heat dissipation | 38.9 BTU/h |

**HDMI-TPN-TX207AU2K and HDMI-TPN-TX107D**

| Supplied power | 12V DC, 2A |
|---|---|
| AC power plug | Interchangable (EU, UK, JP/US, AUS/NZ) |
| DC power plug | Locking DC connector (2.1 mm pin) |
| Power consumption | 18 W |
| Heat dissipation | 61.4 BTU/h |

**Enclosure**

**HDMI-TPN-TX107**

| Rack mountable | Yes, with mounting accessories, check the Mounting Options - Compatibility Table |
|---|---|
| Enclosure material | 1 mm steel |
| Dimensions in mm | 100.4 W x 131.8 D x 26 H |
| Dimensions in inch | 3.95 W x 5.19 D x 1 H |
| Weight | 476 g (1.05 lbs) |

**HDMI-TPN-TX107D**

| Rack mountable | Yes, with mounting accessories, check the Mounting Options - Compatibility Table |
|---|---|
| Enclosure material | 1 mm steel |
| Dimensions in mm | 138 W x 151.8 D x 26 H |
| Dimensions in inch | 5.43 W x 5.97 D x 1 H |
| Weight | 604 g (1.33 lbs) |

**HDMI-TPN-TX207AU2K / HDMI-TPN-TX207DU2K**

| Rack mountable | Yes, with mounting accessories, check the Mounting Options - Compatibility Table |
|---|---|
| Enclosure material | 1 mm steel |
| Dimensions in mm | 100.4 W x 151.8 D x 26 H |
| Dimensions in inch | 3.95 W x 5.97 D x 1 H |
| Weight | 528 g (1.16 lbs) |

## Video Input

### HDMI Input

| Connector type | 19-pole HDMI Type A receptacle |
|---|---|
| Standard | DVI 1.0, HDMI 1.4, HDMI 2.0 |
| Supported resolutions at 8 bits/color * | up to 4096x2160@60Hz (4:4:4) or up to 3840x2160@60Hz (4:4:4) |
| Audio formats | 8 channel PCM Dolby Digital, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos DTS, DTS-HD Master Audio 7.1, WMA Pro |
| CEC support | Transparent |

## Video Outputs

### TPN Output

| Connector type | RJ45 female connector |
|---|---|
| Power over Ethernet | PoE PD (IEEE802.3af) |
| Data rate | 10GBase-T |
| Compliance | SDVoE |
| HDCP compliance | HDCP 2.2 |
| Transferred signals | Video, Audio, RS-232, Infrared, Ethernet, CEC |
| Color space | RGB, YCbCr |
| Video latency | 0 frame (five lines/ under 8ms) |
| Compression ratio | 1.4 to 1 ** |
| Supported resolutions at 8 bits/color * | up to 4096x2160@60Hz (4:4:4) or up to 3840x2160@60Hz (4:4:4) |
| Audio formats | 8 channel PCM Dolby Digital, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos DTS, DTS-HD Master Audio 7.1, WMA Pro |

## HDMI Output

| Connector type | 19-pole HDMI Type A receptacle |
|---|---|
| Standard | DVI 1.0, HDMI 1.4, HDMI 2.0 |
| Supported resolutions at 8 bits/color * | up to 4096x2160@60Hz (4:4:4) or up to 3840x2160@60Hz (4:4:4) |
| Audio formats | 8 channel PCM Dolby Digital, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos DTS, DTS-HD Master Audio 7.1, WMA Pro |
| CEC support | Transparent |

* All standard VESA, CEA and other custom resolutions up to 600MHz (HDMI 2.0) are supported.

** Compression is applied only if the AV signal exceeds the maximum bandwidth offered by the HDMI1.4 specification.

## Audio Port

### Analog Audio Output

▍ **DIFFERENCE:** Only for HDMI-TPN-TX207AU2K model.

| Audio port connector | 5-pole Phoenix connector |
|---|---|
| Number of ports | 1 |
| Audio formats | 2-channel PCM |
| Signal transmission | Balanced signal |
| Sampling frequency | 48 kHz |

### Dante®/AES67 Output Port

▍ **DIFFERENCE:** Only for HDMI-TPN-TX107D and HDMI-TPN-TX207DU2K models.

| Number of ports | 1 |
|---|---|
| Connector type | RJ45 female connector |
| Audio formats | Dante® or AES67 |
| Supported channels | 2-channel stereo |
| Sampling rates | 44.1, 48, 88.2, 96 kHz |

**Control Ports**

### Ethernet Port

| | |
|---|---|
| Connector type | RJ45 female connector |
| Number of connectors per unit | 2 |
| Ethernet data rate | 1GBase-T, full duplex with autodetect |
| Power over Ethernet | Not supported |

### RS-232 Serial Port

| | |
|---|---|
| Connector type | 3-pole Phoenix® connector |
| Baud rates | between 9600 and 115200 baud |
| Data bits | 8 |
| Parity | None / Odd / Even |
| Stop bits | 1  / 2 |
| Output voltage: Low level | 3 - 15V |
| Output voltage: High level | -15V - 3V |

### Infrared Output Port

▌ **DIFFERENCE:** Only for HDMI-TPN-TX107 model.

| | |
|---|---|
| Connector type | 3.5mm TRS (approx. 1/8" jack |
| Output signal | Modulated (38kHz) |
| Operation mode | Command injection (only with 3rd-party software) |

**USB Ports**

▌ **DIFFERENCE:** Only for HDMI-TPN-TX207AU2K and HDMI-TPN-TX207DU2K models.

### USB-C port

| | |
|---|---|
| Connector type | USB Type-C receptacle |
| Number of connectors per unit | 1 |
| USB compliance | USB 2.0 |
| Accepted signal | USB data only |

### USB-A port

| | |
|---|---|
| Connector type | USB Type-A receptacle |
| Number of connectors per unit | 2 |
| USB compliance | USB 2.0 |
| Power supplement of all ports | 5V, 1.4A |
| Max current supplement per USB-A port | 1A |

## 13.1.3. HDMI-OPTN Series Transmitters

Affected models:

- HDMI-OPTN-TX100A
- HDMI-OPTN-TX200AU2K

**General**

| | |
|---|---|
| Compliance | CE, UKCA |
| EMC (emission) | EN 55032:2015+A1:2020 |
| EMC (immunity) | EN 55035:2017+A11:2020 |
| RoHS | EN 63000:2018 |
| Electrical safety | EN 62368-1:2024 |
| Laser safety | EN 60825-1:2014+A11:2021 |
| Warranty | 3 years |
| Cooling | Passive |
| Operating temperature | 0 to +50˚C (+32 to +122˚F) |
| Storage temperature | -40° to +85˚C (-40° to +185˚F) |
| Operating humidity | 10% to 90%, non-condensing |

**Power**

| | |
|---|---|
| Power supply option | External power adaptor |
| Supported power source | 100-240 V AC; 50/60 Hz |
| Supplied power | 12V DC, 2A |
| AC power plug | Interchangable (EU, UK, JP/US, AUS/NZ) |
| DC power plug | Locking DC connector (2.1 mm pin) |
| Power consumption | 6.7 W |
| Heat dissipation | 22.9 BTU/h |

**Enclosure**

| | |
|---|---|
| Rack mountable | Yes, with mounting accessories, check the Mounting Options - Compatibility Table |
| Enclosure material | 1 mm steel |
| Dimensions in mm | 100.4 W x 151.8 D x 26 H |
| Dimensions in inch | 3.95 W x 5.97 D x 1 H |
| Weight | 476 g (1.05 lbs) |

**Video Input**

### HDMI Input

| Connector type | 19-pole HDMI Type A receptacle |
|---|---|
| Standard | DVI 1.0, HDMI 1.4, HDMI 2.0 |
| Supported resolutions at 8 bits/color * | up to 4096x2160@60Hz (4:4:4) or up to 3840x2160@60Hz (4:4:4) |
| Audio formats | 8 channel PCM Dolby Digital, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos DTS, DTS-HD Master Audio 7.1, WMA Pro |
| CEC support | Transparent |

**Video Outputs**

### OPTN Output

| Connector type | SFP+ port slot |
|---|---|
| Data rate | Up to 10Gbps |
| Accepted interfaces | 10G SFP+ optical transceiver modules 10G DAC cables |
| Compliance | SDVoE |
| HDCP compliance | HDCP 2.2 |
| Transferred signals | Video, Audio, RS-232, Infrared, Ethernet, CEC |
| Color space | RGB, YCbCr |
| Video latency | 0 frame (five lines/ under 8ms) |
| Compression ratio | 1.4 to 1 ** |
| Supported resolutions at 8 bits/color * | up to 4096x2160@60Hz (4:4:4) or up to 3840x2160@60Hz (4:4:4) |
| Audio formats | 8 channel PCM Dolby Digital, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos DTS, DTS-HD Master Audio 7.1, WMA Pro |

* All standard VESA, CEA and other custom resolutions up to 600MHz (HDMI 2.0) are supported.

** Compression is applied only if the AV signal exceeds the maximum bandwidth offered by the HDMI1.4 specification.

### HDMI Output

| Connector type | 19-pole HDMI Type A receptacle |
|---|---|
| Standard | DVI 1.0, HDMI 1.4, HDMI 2.0 |
| Supported resolutions at 8 bits/color * | up to 4096x2160@60Hz (4:4:4) or up to 3840x2160@60Hz (4:4:4) |
| Audio formats | 8 channel PCM Dolby Digital, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos DTS, DTS-HD Master Audio 7.1, WMA Pro |
| CEC support | Transparent |

* All standard VESA, CEA and other custom resolutions up to 600MHz (HDMI 2.0) are supported.

**Audio Port**

### Analog Audio Output

| Audio port connector | 5-pole Phoenix connector |
|---|---|
| Number of ports | 1 |
| Audio formats | 2-channel PCM |
| Signal transmission | Balanced signal |
| Sampling frequency | 48 kHz |

**Control Ports**

### Ethernet Port

| Connector type | RJ45 female connector |
|---|---|
| Number of connectors per unit | 2 |
| Ethernet data rate | 1GBase-T, full duplex with autodetect |
| Power over Ethernet | Not supported |

### RS-232 Serial Port

| Connector type | 3-pole Phoenix® connector |
|---|---|
| Baud rates | between 9600 and 115200 baud |
| Data bits | 8 |
| Parity | None / Odd / Even |
| Stop bits | 1 / 2 |
| Output voltage: Low level | 3 - 15V |
| Output voltage: High level | -15V - 3V |

**USB Ports**

> **DIFFERENCE:** Only for HDMI-OPTN-TX200AU2K model.

**USB-C port**

| Connector type | USB Type-C receptacle |
|---|---|
| Number of connectors per unit | 1 |
| USB compliance | USB 2.0 |
| Accepted signal | USB data only |

**USB-A port**

| Connector type | USB Type-A receptacle |
|---|---|
| Number of connectors per unit | 2 |
| USB compliance | USB 2.0 |
| Power supplement of all ports | 5V, 1.4A |
| Max current supplement per USB-A port | 1A |

## 13.1.4. HDMI-TPN Series Non-Scaling Receivers

Affected models:

- HDMI-TPN-RX107
- HDMI-TPN-RX107D
- HDMI-TPN-RX107AU2K

**General**

| Compliance | CE, UKCA |
|---|---|
| EMC (emission) | EN 55032:2015+A1:2020 |
| EMC (immunity) | EN 55035:2017+A11:2020 |
| RoHS | EN 63000:2018 |
| Electrical safety | EN 62368-1:2024 |
| Laser safety | EN 60825-1:2014+A11:2021 |
| Warranty | 3 years |
| Cooling | Passive |
| Operating temperature | 0 to +50˚C (+32 to +122˚F) |
| Storage temperature | -40° to +85˚C (-40° to +185˚F) |
| Operating humidity | 10% to 90%, non-condensing |

**Power**

| Power supply option | External power adaptor |
|---|---|
| Supported power source | 100-240 V AC; 50/60 Hz |

### HDMI-TPN-RX107

| Supplied power | 48V DC, 0.3A |
|---|---|
| AC power plug | Interchangable (EU, UK, JP/US, AUS/NZ) |
| DC power plug | 2-pole Phoenix® plug |
| Power consumption | 12.8 W |
| Heat dissipation | 43.7 BTU/h |

### HDMI-TPN-RX107AU2K and HDMI-TPN-RX107D

| Supplied power | 12V DC, 2A |
|---|---|
| AC power plug | Interchangable (EU, UK, JP/US, AUS/NZ) |
| DC power plug | Locking DC connector (2.1 mm pin) |
| Power consumption | 22 W |
| Heat dissipation | 75.1 BTU/h |

**Enclosure**

### HDMI-TPN-RX107

| Rack mountable | Yes, with mounting accessories, check the Mounting Options - Compatibility Table |
|---|---|
| Enclosure material | 1 mm steel |
| Dimensions in mm | 100.4 W x 131.8 D x 26 H |
| Dimensions in inch | 3.95 W x 5.19 D x 1 H |
| Weight | 476 g (1.05 lbs) |

### HDMI-TPN-RX107D

| Rack mountable | Yes, with mounting accessories, check the Mounting Options - Compatibility Table |
|---|---|
| Enclosure material | 1 mm steel |
| Dimensions in mm | 138 W x 151.8 D x 26 H |
| Dimensions in inch | 5.43 W x 5.97 D x 1 H |
| Weight | 604 g (1.33 lbs) |

**HDMI-TPN-RX107AU2K**

| Rack mountable | Yes, with mounting accessories, check the Mounting Options - Compatibility Table |
|---|---|
| Enclosure material | 1 mm steel |
| Dimensions in mm | 100.4 W x 151.8 D x 26 H |
| Dimensions in inch | 3.95 W x 5.97 D x 1 H |
| Weight | 538 g (1.19 lbs) |

### Video Input

#### TPN Input

| Connector type | RJ45 female connector |
|---|---|
| Power over Ethernet | PoE PD (IEEE802.3af) |
| Data rate | 10GBase-T |
| Compliance | SDVoE |
| HDCP compliance | HDCP 2.2 |
| Transferred signals | Video, Audio, RS-232, Infrared, Ethernet, CEC |
| Color space | RGB, YCbCr |
| Video latency | 0 frame (five lines/ under 8ms) |
| Compression ratio | 1.4 to 1 ** |
| Supported resolutions at 8 bits/color * | up to 4096x2160@60Hz (4:4:4) or up to 3840x2160@60Hz (4:4:4) |
| Audio formats | 8 channel PCM Dolby Digital, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos DTS, DTS-HD Master Audio 7.1, WMA Pro |

### Video Output

#### HDMI Output

| Connector type | 19-pole HDMI Type A receptacle |
|---|---|
| Standard | DVI 1.0, HDMI 1.4, HDMI 2.0 |
| Supported resolutions at 8 bits/color * | up to 4096x2160@60Hz (4:4:4) or up to 3840x2160@60Hz (4:4:4) |
| Audio formats | 8 channel PCM Dolby Digital, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos DTS, DTS-HD Master Audio 7.1, WMA Pro |
| CEC support | Transparent |

* All standard VESA, CEA and other custom resolutions up to 600MHz (HDMI 2.0) are supported.

** Compression is applied only if the AV signal exceeds the maximum bandwidth offered by the HDMI1.4 specification.

### Audio Port

▎ **DIFFERENCE:** Only for HDMI-TPN-RX107AU2K model.

#### Analog Audio Output

| Audio port connector | 5-pole Phoenix connector |
|---|---|
| Number of ports | 1 |
| Audio formats | 2-channel PCM |
| Signal transmission | Balanced signal |
| Sampling frequency | 48 kHz |

#### Dante®/AES67 Output Port

▎ **DIFFERENCE:** Only for HDMI-TPN-RX107D model.

| Number of ports | 1 |
|---|---|
| Connector type | RJ45 female connector |
| Audio formats | Dante® or AES67 |
| Supported channels | 2-channel stereo |
| Sampling rates | 44.1, 48, 88.2, 96 kHz |

**Control Ports**

### Ethernet Port

| Connector type | RJ45 female connector |
|---|---|
| Number of connectors per unit | 2 |
| Ethernet data rate | 1GBase-T, full duplex with autodetect |
| Power over Ethernet | Not supported |

### RS-232 Serial Port

| Connector type | 3-pole Phoenix® connector |
|---|---|
| Baud rates | between 9600 and 115200 baud |
| Data bits | 8 |
| Parity | None / Odd / Even |
| Stop bits | 1 / 2 |
| Output voltage: Low level | 3 - 15V |
| Output voltage: High level | -15V - 3V |

### Infrared Output Port

▌ **DIFFERENCE:** Only for HDMI-TPN-RX107 model.

| Connector type | 3.5mm TRS (approx. 1/8" jack |
|---|---|
| Output signal | Modulated (38kHz) |
| Operation mode | Command injection (only with 3rd-party software) |

**USB Ports**

▌ **DIFFERENCE:** Only for HDMI-TPN-RX107AU2K model.

### USB-A port

| Connector type | USB Type-A receptacle |
|---|---|
| Number of connectors per unit | 6 |
| USB compliance | USB 2.0 |
| Power supplement of USB 2.0 ports | 5V, 1.7A |
| Power supplement of USB HID ports | 5V, 0.3A |
| Max current supplement per USB-A port | 1A |

## 13.1.5. HDMI-TPN Series Scaling Receivers

Affected models:

- HDMI-TPN-RX107A-SR
- HDMI-TPN-RX107D-SR
- HDMI-TPN-RX107AU2K-SR
- HDMI-TPN-RX107DU2K-SR

**General**

| Compliance | CE, UKCA |
|---|---|
| EMC (emission) | EN 55032:2015+A1:2020 |
| EMC (immunity) | EN 55035:2017+A11:2020 |
| RoHS | EN 63000:2018 |
| Electrical safety | EN 62368-1:2024 |
| Laser safety | EN 60825-1:2014+A11:2021 |
| Warranty | 3 years |
| Cooling | Passive |
| Operating temperature | 0 to +50˚C (+32 to +122˚F) |
| Storage temperature | -40° to +85˚C (-40° to +185˚F) |
| Operating humidity | 10% to 90%, non-condensing |

**Power**

| Power supply option | External power adaptor |
|---|---|
| Supported power source | 100-240 V AC; 50/60 Hz |
| Supplied power | 12V DC, 2A |
| AC power plug | Interchangable (EU, UK, JP/US, AUS/NZ) |
| DC power plug | Locking DC connector (2.1 mm pin) |
| Power consumption | 22 W |
| Heat dissipation | 75.1 BTU/h |

**Enclosure**

### HDMI-TPN-RX107A-SR and HDMI-TPN-RX107D-SR

| Rack mountable | Yes, with mounting accessories, check the Mounting Options - Compatibility Table |
|---|---|
| Enclosure material | 1 mm steel |
| Dimensions in mm | 138 W x 151.8 D x 26 H |
| Dimensions in inch | 5.43 W x 5.97 D x 1 H |
| Weight | 604 g (1.33 lbs) |

### HDMI-TPN-RX107AU2K-SR and HDMI-TPN-RX107DU2K-SR

| Rack mountable | Yes, with mounting accessories, check the Mounting Options - Compatibility Table |
|---|---|
| Enclosure material | 1 mm steel |
| Dimensions in mm | 138 W x 151.8 D x 26 H |
| Dimensions in inch | 5.43 W x 5.97 D x 1 H |
| Weight | 646 g (1.42 lbs) |

**Video Input**

### TPN Input

| Connector type | RJ45 female connector |
|---|---|
| Power over Ethernet | PoE PD (IEEE802.3af) |
| Data rate | 10GBase-T |
| Compliance | SDVoE |
| HDCP compliance | HDCP 2.2 |
| Transferred signals | Video, Audio, RS-232, Infrared, Ethernet, CEC |
| Color space | RGB, YCbCr |
| Video latency | 0 frame (five lines/ under 8ms) |
| Compression ratio | 1.4 to 1 ** |
| Supported resolutions at 8 bits/color * | up to 4096x2160@60Hz (4:4:4) or up to 3840x2160@60Hz (4:4:4) |
| Audio formats | 8 channel PCM<br>Dolby Digital, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos<br>DTS, DTS-HD Master Audio 7.1, WMA Pro |

* All standard VESA, CEA and other custom resolutions up to 600MHz (HDMI 2.0) are supported.

** Compression is applied only if the AV signal exceeds the maximum bandwidth offered by the HDMI1.4 specification.

**Video Output**

### HDMI Output

| Connector type | 19-pole HDMI Type A receptacle |
|---|---|
| Standard | DVI 1.0, HDMI 1.4, HDMI 2.0 |
| Supported resolutions at 8 bits/color * | up to 4096x2160@60Hz (4:4:4) or up to 3840x2160@60Hz (4:4:4) |
| Audio formats | 8 channel PCM<br>Dolby Digital, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos<br>DTS, DTS-HD Master Audio 7.1, WMA Pro |
| CEC support | Transparent |

**Audio Port**

### Analog Audio Output

**DIFFERENCE:** Only for HDMI-TPN-RX107A-SR and HDMI-TPN-RX107AU2K-SR models.

| Audio port connector | 5-pole Phoenix connector |
|---|---|
| Number of ports | 1 |
| Audio formats | 2-channel PCM |
| Signal transmission | Balanced signal |
| Sampling frequency | 48 kHz |

### Dante®/AES67 Output Port

**DIFFERENCE:** Only for HDMI-TPN-RX107D-SR and HDMI-TPN-RX107DU2K-SR models.

| Number of ports | 1 |
|---|---|
| Connector type | RJ45 female connector |
| Audio formats | Dante® or AES67 |
| Supported channels | 2-channel stereo |
| Sampling rates | 44.1, 48, 88.2, 96 kHz |

**Control Ports**

### Ethernet Port

| Connector type | RJ45 female connector |
|---|---|
| Number of connectors per unit | 2 |
| Ethernet data rate | 1GBase-T, full duplex with autodetect |
| Power over Ethernet | Not supported |

**RS-232 Serial Port**

| Connector type | 3-pole Phoenix® connector |
|---|---|
| Baud rates | between 9600 and 115200 baud |
| Data bits | 8 |
| Parity | None / Odd / Even |
| Stop bits | 1  / 2 |
| Output voltage: Low level | 3 - 15V |
| Output voltage: High level | -15V - 3V |

**USB Ports**

▌ **DIFFERENCE:** Only for HDMI-TPN-RX107AU2K-SR and HDMI-TPN-RX107DU2K-SR models.

**USB-A port**

| Connector type | USB Type-A receptacle |
|---|---|
| Number of connectors per unit | 6 |
| USB compliance | USB 2.0 |
| Power supplement of USB 2.0 ports | 5V, 1.7A |
| Power supplement of USB HID ports | 5V, 0.3A |
| Max current supplement per USB-A port | 1A |

## 13.1.6. HDMI-OPTN Series Non-Scaling Receivers

Affected models:
- HDMI-OPTN-RX100A
- HDMI-OPTN-RX100AU2K

**General**

| Compliance | CE, UKCA |
|---|---|
| EMC (emission) | EN 55032:2015+A1:2020 |
| EMC (immunity) | EN 55035:2017+A11:2020 |
| RoHS | EN 63000:2018 |
| Electrical safety | EN 62368-1:2024 |
| Laser safety | EN 60825-1:2014+A11:2021 |
| Warranty | 3 years |
| Cooling | Passive |
| Operating temperature | 0 to +50˚C (+32 to +122˚F) |
| Storage temperature | -40° to +85˚C (-40° to +185˚F) |
| Operating humidity | 10% to 90%, non-condensing |

**Power**

| Power supply option | External power adaptor |
|---|---|
| Supported power source | 100-240 V AC; 50/60 Hz |
| Supplied power | 12V DC, 2A |
| AC power plug | Interchangable (EU, UK, JP/US, AUS/NZ) |
| DC power plug | Locking DC connector (2.1 mm pin) |
| Power consumption | 7.3 W |
| Heat dissipation | 24.9 BTU/h |

**Enclosure**

| Rack mountable | Yes, with mounting accessories, check the Mounting Options - Compatibility Table |
|---|---|
| Enclosure material | 1 mm steel |
| Dimensions in mm | 100.4 W x 151.8 D x 26 H |
| Dimensions in inch | 3.95 W x 5.97 D x 1 H |
| Weight | 476 g (1.05 lbs) |

**Video Input**

**OPTN Input**

| Connector type | SFP+ port slot |
|---|---|
| Data rate | Up to 10Gbps |
| Accepted interfaces | 10G SFP+ optical transceiver modules<br>10G DAC cables |
| Compliance | SDVoE |
| HDCP compliance | HDCP 2.2 |
| Transferred signals | Video, Audio, RS-232, Infrared, Ethernet, CEC |
| Color space | RGB, YCbCr |
| Video latency | 0 frame (five lines/ under 8ms) |
| Compression ratio | 1.4 to 1 ** |
| Supported resolutions at 8 bits/color * | up to 4096x2160@60Hz (4:4:4) or<br>up to 3840x2160@60Hz (4:4:4) |
| Audio formats | 8 channel PCM<br>Dolby Digital, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos<br>DTS, DTS-HD Master Audio 7.1, WMA Pro |

\* All standard VESA, CEA and other custom resolutions up to 600MHz (HDMI 2.0) are supported.

\*\* Compression is applied only if the AV signal exceeds the maximum bandwidth offered by the HDMI1.4 specification.

### Video Output

#### HDMI Output

| Connector type | 19-pole HDMI Type A receptacle |
|---|---|
| Standard | DVI 1.0, HDMI 1.4, HDMI 2.0 |
| Supported resolutions at 8 bits/color * | up to 4096x2160@60Hz (4:4:4) or up to 3840x2160@60Hz (4:4:4) |
| Audio formats | 8 channel PCM Dolby Digital, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos DTS, DTS-HD Master Audio 7.1, WMA Pro |
| CEC support | Transparent |

* All standard VESA, CEA and other custom resolutions up to 600MHz (HDMI 2.0) are supported.

### Audio Port

#### Analog Audio Output

| Audio port connector | 5-pole Phoenix connector |
|---|---|
| Number of ports | 1 |
| Audio formats | 2-channel PCM |
| Signal transmission | Balanced signal |
| Sampling frequency | 48 kHz |

### Control Ports

#### Ethernet Port

| Connector type | RJ45 female connector |
|---|---|
| Number of connectors per unit | 2 |
| Ethernet data rate | 1GBase-T, full duplex with autodetect |
| Power over Ethernet | Not supported |

#### RS-232 Serial Port

| Connector type | 3-pole Phoenix® connector |
|---|---|
| Baud rates | between 9600 and 115200 baud |
| Data bits | 8 |
| Parity | None / Odd / Even |
| Stop bits | 1  / 2 |
| Output voltage: Low level | 3 - 15V |
| Output voltage: High level | -15V - 3V |

### USB Ports

> **DIFFERENCE:** Only for HDMI-TPN-RX107AU2K-SR model.

#### USB-A port

| Connector type | USB Type-A receptacle |
|---|---|
| Number of connectors per unit | 6 |
| USB compliance | USB 2.0 |
| Power supplement of USB 2.0 ports | 5V, 1.7A |
| Power supplement of USB HID ports | 5V, 0.3A |
| Max current supplement per USB-A port | 1A |

## 13.1.7. HDMI-OPTN Series Scaling Receivers

Affected models:

- HDMI-OPTN-RX100A-SR
- HDMI-OPTN-RX100AU2K-SR

### General

| Compliance | CE, UKCA |
|---|---|
| EMC (emission) | EN 55032:2015+A1:2020 |
| EMC (immunity) | EN 55035:2017+A11:2020 |
| RoHS | EN 63000:2018 |
| Electrical safety | EN 62368-1:2024 |
| Laser safety | EN 60825-1:2014+A11:2021 |
| Warranty | 3 years |
| Cooling | Passive |
| Operating temperature | 0 to +50°C (+32 to +122°F) |
| Storage temperature | -40° to +85°C (-40° to +185°F) |
| Operating humidity | 10% to 90%, non-condensing |

### Power

| Power supply option | External power adaptor |
|---|---|
| Supported power source | 100-240 V AC; 50/60 Hz |
| Supplied power | 12V DC, 2A |
| AC power plug | Interchangable (EU, UK, JP/US, AUS/NZ) |
| DC power plug | Locking DC connector (2.1 mm pin) |
| Power consumption | 13 W |
| Heat dissipation | 44.4 BTU/h |

**Enclosure**

### HDMI-OPTN-RX100A-SR

| Rack mountable | Yes, with mounting accessories, check the Mounting Options - Compatibility Table |
|---|---|
| Enclosure material | 1 mm steel |
| Dimensions in mm | 138 W x 151.8 D x 26 H |
| Dimensions in inch | 5.43 W x 5.97 D x 1 H |
| Weight | 604 g (1.33 lbs) |

### HDMI-OPTN-RX100AU2K-SR

| Rack mountable | Yes, with mounting accessories, check the Mounting Options - Compatibility Table |
|---|---|
| Enclosure material | 1 mm steel |
| Dimensions in mm | 138 W x 151.8 D x 26 H |
| Dimensions in inch | 5.43 W x 5.97 D x 1 H |
| Weight | 646 g (1.42 lbs) |

**Video Input**

### OPTN Input

| Connector type | SFP+ port slot |
|---|---|
| Data rate | Up to 10Gbps |
| Accepted interfaces | 10G SFP+ optical transceiver modules 10G DAC cables |
| Compliance | SDVoE |
| HDCP compliance | HDCP 2.2 |
| Transferred signals | Video, Audio, RS-232, Infrared, Ethernet, CEC |
| Color space | RGB, YCbCr |
| Video latency | 0 frame (five lines/ under 8ms) |
| Compression ratio | 1.4 to 1 ** |
| Supported resolutions at 8 bits/color * | up to 4096x2160@60Hz (4:4:4) or up to 3840x2160@60Hz (4:4:4) |
| Audio formats | 8 channel PCM Dolby Digital, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos DTS, DTS-HD Master Audio 7.1, WMA Pro |

\* All standard VESA, CEA and other custom resolutions up to 600MHz (HDMI 2.0) are supported.

\*\* Compression is applied only if the AV signal exceeds the maximum bandwidth offered by the HDMI 1.4 specification.

**Video Output**

### HDMI Output

| Connector type | 19-pole HDMI Type A receptacle |
|---|---|
| Standard | DVI 1.0, HDMI 1.4, HDMI 2.0 |
| Supported resolutions at 8 bits/color * | up to 4096x2160@60Hz (4:4:4) or up to 3840x2160@60Hz (4:4:4) |
| Audio formats | 8 channel PCM Dolby Digital, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos DTS, DTS-HD Master Audio 7.1, WMA Pro |
| CEC support | Transparent |

**Audio Port**

### Analog Audio Output

| Audio port connector | 5-pole Phoenix connector |
|---|---|
| Number of ports | 1 |
| Audio formats | 2-channel PCM |
| Signal transmission | Balanced signal |
| Sampling frequency | 48 kHz |

**Control Ports**

### Ethernet Port

| Connector type | RJ45 female connector |
|---|---|
| Number of connectors per unit | 2 |
| Ethernet data rate | 1GBase-T, full duplex with autodetect |
| Power over Ethernet | Not supported |

### RS-232 Serial Port

| Connector type | 3-pole Phoenix® connector |
|---|---|
| Baud rates | between 9600 and 115200 baud |
| Data bits | 8 |
| Parity | None / Odd / Even |
| Stop bits | 1 / 2 |
| Output voltage: Low level | 3 - 15V |
| Output voltage: High level | -15V - 3V |

**USB Ports**

▌ **DIFFERENCE:** Only for HDMI-OPTN-RX100AU2K-SR model.

**USB-A port**

| Connector type | USB Type-A receptacle |
|---|---|
| Number of connectors per unit | 6 |
| USB compliance | USB 2.0 |
| Power supplement of USB 2.0 ports | 5V, 1.7A |
| Power supplement of USB HID ports | 5V, 0.3A |
| Max current supplement per USB-A port | 1A |

## 13.2. Maximum Cable Extension

### 13.2.1. CATx Cable Extension for TPN Endpoints

Lightware highly recommends using **CAT6a AWG24** or higher category 10G Ethernet cables for the TPN (SDVoE) connection between the transmitter/receiver and the network switch. Usage of e.g. AWG28 Ethernet cables may reduce the extension distance significantly.

| Resolution | CATx |
|---|---|
| | **CAT6a AWG24** |
| All resolutions | 100 m |

### 13.2.2. Fiber Optical Extension for OPTN Endpoints

The maximum fiber cable extension of the OPTN series endpoint devices depend on the installed SFP+ module. Always read the specification of the module.

| Multimode fiber optical cables | | | | Singlemode fiber optical cables | |
|---|---|---|---|---|---|
| **OM1**<br>**(62.5/125)** | **OM2**<br>**(50/125)** | **OM3**<br>**(50/125)** | **OM4**<br>**(50/125)** | **OS1**<br>**(62.5/125)** | **OS2**<br>**(50/125)** |
| Not supported | | 300 m | 400 m | 2000 m | 10000 m |

## 13.3. Factory Default Settings

**TPN-MMU-X100 series**

| Parameter | Value |
|---|---|
| **Network settings** | |
| Factory default IP address mode | DHCP<br>(if there is no DHCP server on the network, auto IP address wiil be set) |
| Hostname | lightware-<serial_number> |
| LW3 protocol | enabled |
| HTTP | disabled |
| HTTPS | enabled |
| HTTP authentication | enabled |
| HTTPS authentication | enabled |
| BlueRiver TCI port | disabled |
| BlueRiver HTTP port | disabled |
| Authentication setting (user/password) | admin/<not set> |
| Applied and reserved ports | Reserved Ports and Security Options |
| Device label | LW_<product_name>_<serial_number> |
| Login credentials | admin / default password<br>Details: First Login - Default Password Handling |

**TPN/OPTN series Endpoint Devices**

| Parameter | Value |
|---|---|
| **Network settings** | |
| Factory default IP address mode | DHCP<br>(if there is no DHCP server on the network, auto IP address will be set) |
| Applied and reserved ports | Reserved Ports and Security Options |
| **RS-232 settings** | |
| Baud rate | 9600 |
| Data bits | 8 |
| Parity | None |
| Stop bits | 1 |
| **Icron settings (only for U2K models)** | |
| USB mode | SUI |

## 13.4. Content of the Backup File (Clone Configuration)

The backup file contains numerous settings and parameters saved from the device. When the file is uploaded to a device, the following will be overwritten:

| **Network settings** |
|---|
| IP address settings, Static IP addresses |
| HTTP/HTTPS port status, HTTP/HTTPS authentication status |
| BlueRiver service settings |
| Authentication (password) |
| **AV matrix configuration** |
| All SDVoE and Icron parameters about the endpoint devices in the matrix |
| **LARA configuration** |
| All drivers, instances, parameters, configuration settings and data |
| **Further settings** |
| Time and date settings |

▎ INFO: See more details about the configuration cloning in the System Tab section.

## 13.5. Reserved Ports and Security Options

The following table summarizes the ports, protocols, features and the security options.

| Port number | Protocol | Function | Affected device | | Affected software | Port disable option | Encryption | Authentication | Other features |
|---|---|---|---|---|---|---|---|---|---|
| | | | MMU | Endpoints | | | | | |
| 80 | TCP | HTTP port (LW3 over WS, REST API, LARA user panels) | ✔ | ✘ | LDC, LDU2 | ✔ | ✘ | ✔ | Firmware update, Welcome Screen image upload, Log files, User Scripts Serial messaging |
| 443 | TCP | HTTPS port (LW3 over WSS, REST API, LARA management GUI) | ✔ | ✘ | LDC, LDU2 | ✔ | ✔ | ✔ | |
| 6107 | TCP | LW3 protocol | ✔ | ✘ | LDC | ✔ | ✘ | ✔ | |
| 69 | UDP | Firmware update TFTP | ✔ | ✘ | LDU2 | ✘ | ✘ | ✘ | |
| 49990 | UDP | | ✔ | ✘ | | ✘ | ✘ | ✘ | |
| 49995 | UDP | | ✔ | ✘ | | ✘ | ✘ | ✘ | |
| 10004 | UDP | | ✘ | ✔ | | ✘ | ✘ | ✘ | |
| 8001, 8002 | TCP | Serial over IP (RS-232) | ✔ | ✘ | - | ✔ | ✘ | ✘ | |
| 6108 | TCP | Lightware Multicast Device Management (LMDM) | ✔ | ✔ | - | ✘ | ✘ | ✘ | |
| 6970 | TCP | TCI API protocol | ✔ | ✘ | BlueRiver Control Server | ✘ | ✘ | ✘ | |
| 8080 | TCP | REST API and websocket | ✔ | ✘ | | ✘ | ✘ | ✘ | |
| 230.76.87.82:37422 | UDP | Lightware Multicast Device Protocol (LMDP) | ✘ | ✔ | - | ✘ | ✘ | ✘ | |
| 10001, 10002, 10003, 10004 | UDP | Serial / Infrared messages between the endpoints and MMU | ✔ | ✔ | - | ✘ | ✘ | ✘ | |
| 6137, 6971 | UDP | USB 2.0 discovery | ✘ | ✔ | - | ✘ | ✘ | ✘ | |
| 6973 | UDP | USB KVM connection between the AU2K series endpoints | ✘ | ✔ | - | ✘ | ✘ | ✘ | |
| 6969 | UDP | Communication between the API server and the endpoints | ✔ | ✔ | - | ✘ | ✘ | ✘ | |
| 224.0.1.188:1900 | UDP | SSDP messaging between the BlueRiver SDP and the endpoint devices | ✘ | ✔ | - | ✘ | ✘ | ✘ | |
| 224.0.0.251: 5353 | UDP | mDNS /Bonjour (Device Discovery) | ✔ | ✔ | LDC, LDU2 | ✘ | ✘ | ✘ | |
| 230.76.87.82: 37421 | UDP | Remote IP | ✔ | ✔ | LDC, LDU2 | ✘ | ✘ | ✘ | |

INFO: The ports are necessary to be passed via a network switch/firewall for proper operation between the device and the softwares.

INFO: The **AU2K** endpoint models are built with two separated network boards with **two MAC addresses** and two IP addresses. In case of dynamic IP address (DHCP) setting, one device will reserve two different IP addresses.

## 13.6. Mechanical Drawings

### 13.6.1. HDMI-TPN-107 Series Endpoint Devices

The following drawings present the physical dimensions of the HDMI-TPN-107 series endpoints. Dimensions are in mm.

**Affected models:**

▪ HDMI-TPN-TX107, -RX107



*Front*

*Rear*

*Top*

*Bottom*

M3 thread

*Side*

### 13.6.2. HDMI-AU2K Series Endpoint Devices

The following drawings present the physical dimensions of the HDMI-AU2K series endpoints. Dimensions are in mm.

**Affected models:**

▪ HDMI-TPN-TX207AU2K, -RX107AU2K
▪ HDMI-OPTN-TX100A, -RX100A, -TX200AU2K, -RX100AU2K



*Front*

*Rear*

*Top*

*Bottom*

M3 thread

*Side*

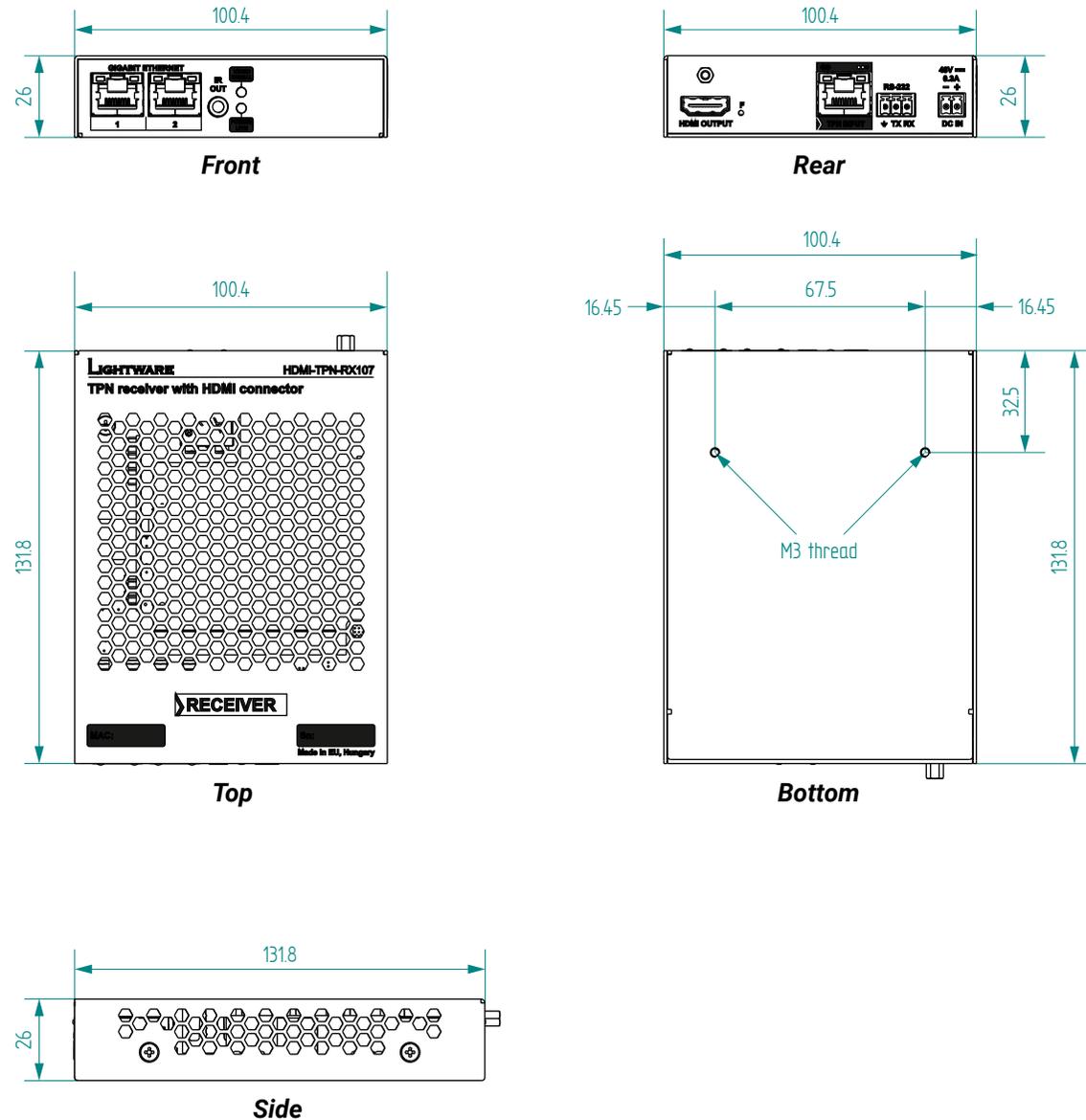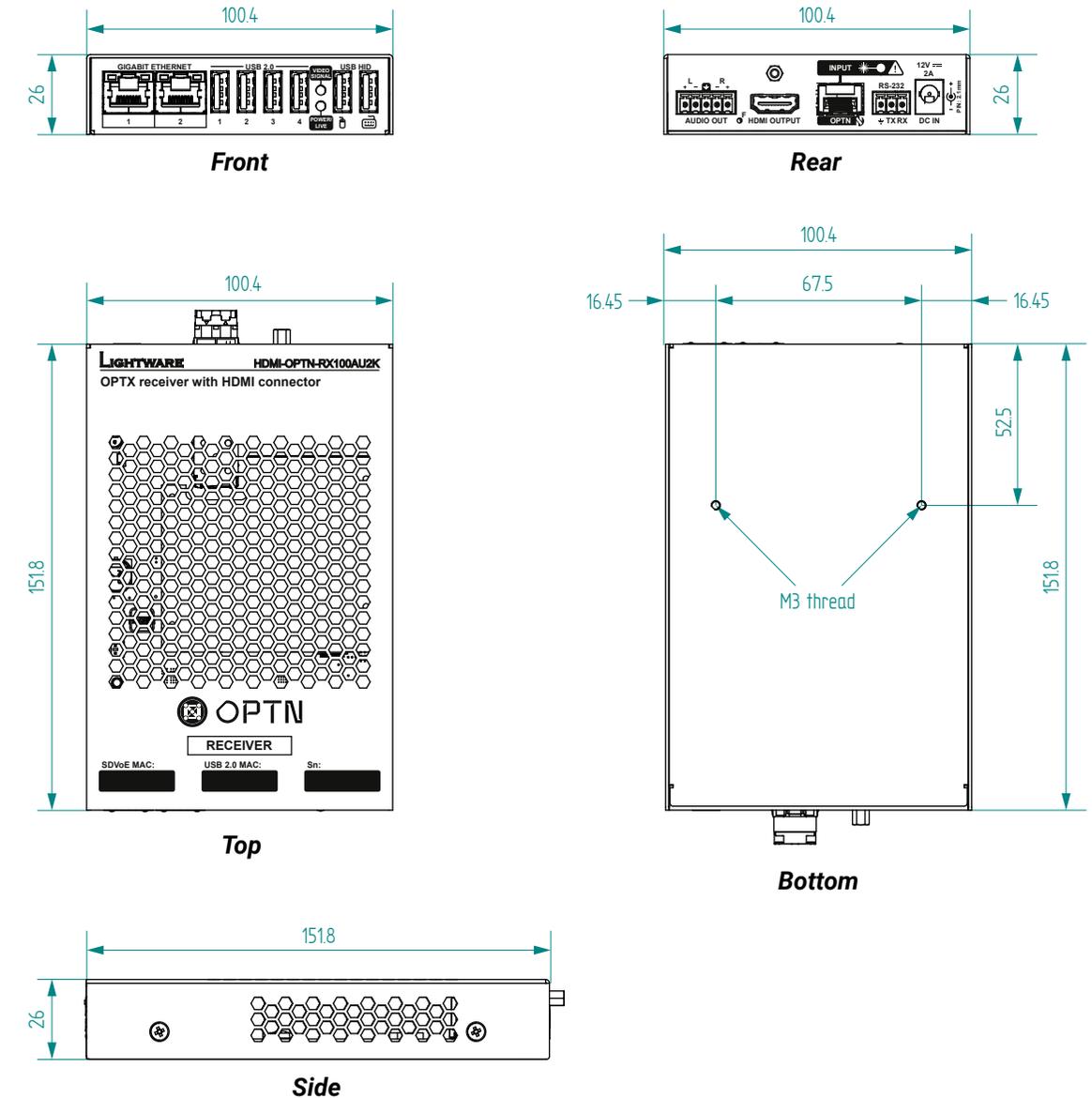### 13.6.3. HDMI-TPN-SR Series Endpoint Devices

The following drawings present the physical dimensions of the HDMI-TPN-SR and HDMI-OPTN-SR series endpoints. Dimensions are in mm.

**Affected models:**

- HDMI-TPN-RX107A-SR, HDMI-TPN-RX107AU2K-SR
- HDMI-TPN-TX207DU2K, HDMI-TPN-RX107D-SR, HDMI-TPN-RX107DU2K-SR
- HDMI-OPTN-RX100A-SR, HDMI-OPTN-RX100AU2K-SR



*Front*

*Rear*

*Top*

*Bottom*

*Side*
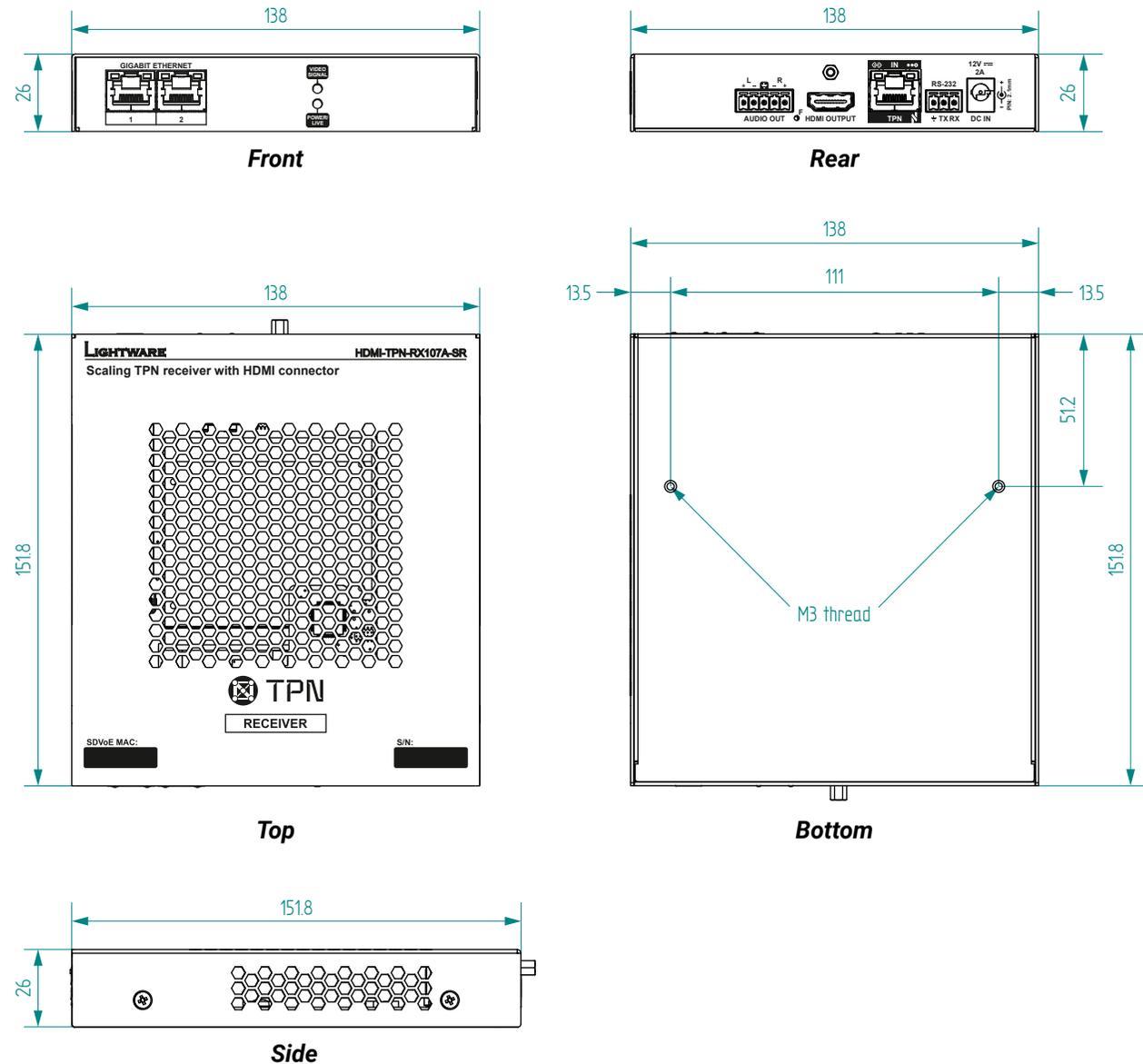
### 13.6.4. TPN-MMU

The following drawings present the physical dimensions of the TPN-MMU series matrix management units. Dimensions are in mm.
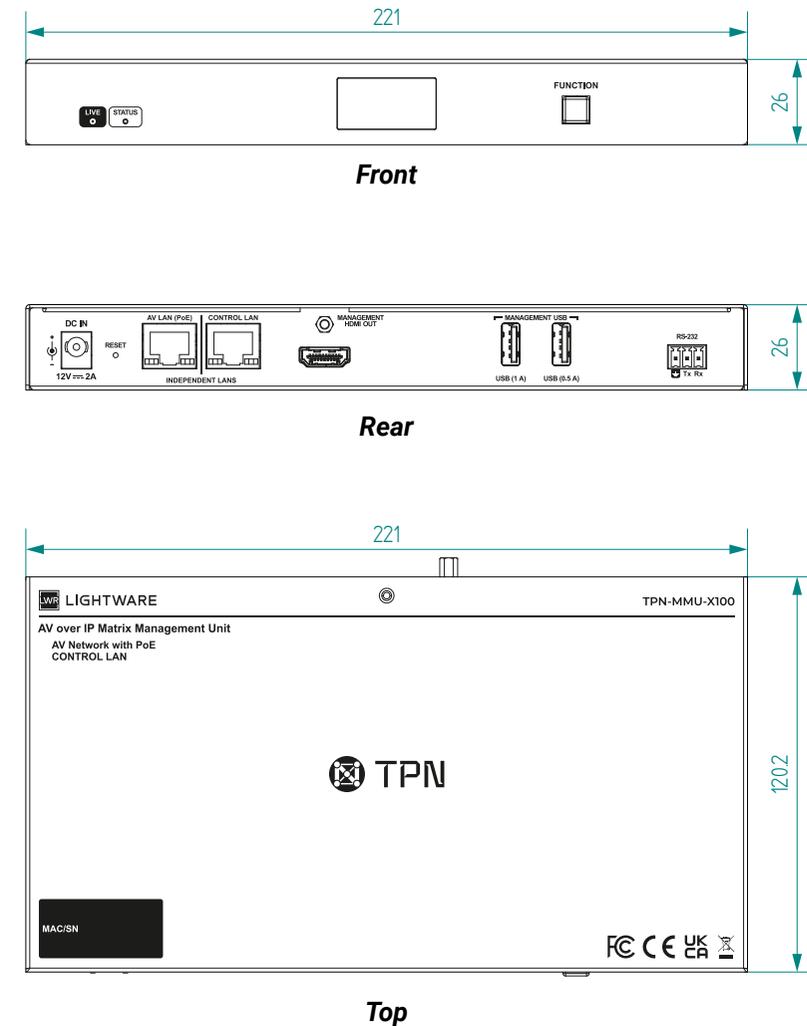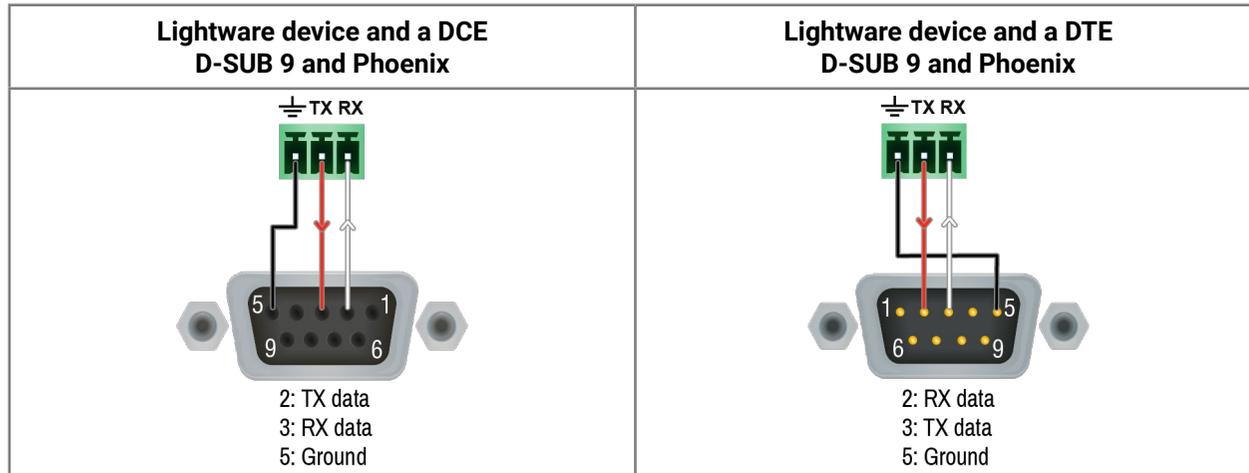
**Affected models:**

- TPN-MMU-X100
- TPN-MMU-X100-20



*Front*

*Rear*

*Top*

# 13.7. Cable Wiring Guide

## 13.7.1. Serial Ports

The device is built with a 3-pole Phoenix connector. See the examples below of connecting to a DCE (Data Circuit-terminating Equipment) or a DTE (Data Terminal Equipment) type device:

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

## 13.7.2. Audio Ports

Inputs and outputs of audio devices are symmetric or asymmetric. The main advantage of the symmetric lines is the better protection against the noise, therefore they are widely used in the professional audio industry. Symmetric audio is most often referred to as balanced audio, as opposed to asymmetric, which is referred to as unbalanced audio. Ligthware products are usually built with 5-pole Phoenix connectors, so we would like to help users assembling their own audio cables. See the most common cases below.

**ATTENTION:** Symmetric and asymmetric lines can be linked with passive accessories (e.g. special cables), but in this case half of the line level is lost.

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

**ATTENTION:** Never join the phase-inverted (negative, cold or -) poles (either right and left) to the ground or to each other on the output side, as this can damage the unit.

INFO: Use a galvanic isolation in case of a ground loop.

**The Pinout of the 5-pole Phoenix Connector**



| Pin nr. | Signal |
|---|---|
| 1 | Left+ |
| 2 | Left- |
| 3 | Ground |
| 4 | Right- |
| 5 | Right+ |
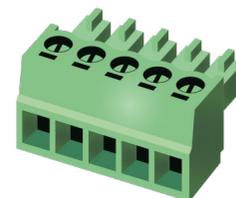
Compatible Plug Type: Phoenix® Combicon series (3.5mm pitch, 5-pole), type: MC 1.5/5-ST-3.5.

**From Balanced Output to Unbalanced Input**

| Phoenix - 2 x 6.3 (1/4") TS | Phoenix - 2 x RCA | Phoenix - 3.5 (1/8") TRS |
|---|---|---|
|  |  |  |
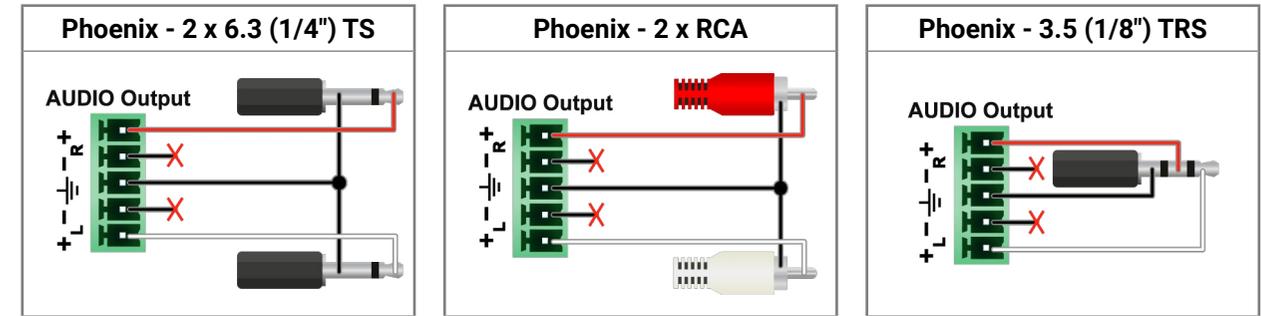
**From Balanced Output to Balanced Input**

| Phoenix - 2 x 6.3 (1/4") TRS | Phoenix - 2 x XLR |
|---|---|
|  |  |

## 13.8. Release Notes of the Firmware Packages

### 13.8.1. Endpoint Firmware Packages

Affected endpoint models:

- HDMI-TPN-TX107
- HDMI-TPN-TX107D
- HDMI-TPN-RX107
- HDMI-TPN-RX107D
- HDMI-TPN-TX207AU2K
- HDMI-TPN-TX207DU2K
- HDMI-TPN-RX107AU2K
- HDMI-TPN-RX107A-SR
- HDMI-TPN-RX107D-SR
- HDMI-TPN-RX107AU2K-SR
- HDMI-TPN-RX107DU2K-SR
- HDMI-OPTN-TX100A
- HDMI-OPTN-RX100A
- HDMI-OPTN-RX100A-SR
- HDMI-OPTN-TX200AU2K
- HDMI-OPTN-RX100AU2K
- HDMI-OPTN-RX100AU2K-SR

**v2.6.1b1**

Release date: 2025-09-15

**New feature:**
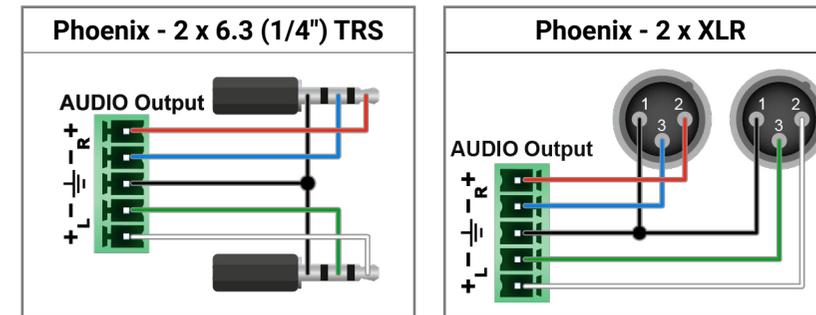
- From this version on, extenders with Dante audio capabilities are also supported: HDMI-TPN-TX107D, HDMI-TPN-RX107D, HDMI-TPN-RX107D-SR, HDMI-TPN-RX107DU2K-SR, HDMI-TPN-TX207DU2K.

**Bugfix:**

- HDMI stream starts with every BlueRiver control server version.
- TX-RX communication failures are fixed by AVX FW updated to 2.3.0.5
- AUDIOMUTE LW2 command only accepts valid arguments.

**v2.5.2b1**

Release date: 2024-11-19

**New feature:**

- From this version on, the fiber based scaling receivers (HDMI-OPTN-RX100A-SR and HDMI-OPTN-RX100AU2K-SR) are also supported.

**Bugfix:**

- Improved on the quality of the link between the TX and the RX devices. This has a positive effect both on the RS232 and the Ethernet communication.

**Known issue:**

- When a scaling receiver is connected to a transmitter in point-to-point mode, the image output may become unstable if, the receiver is in fast switch mode and the embedded audio is set to 192 kHz and 24-bit.
- Factory resetting the RX device causes the established USB KVM connection not to work anymore. Restarting either the transmitter or the receiver resolves the problem.

**v2.5.0b8**

Release date: 2024-05-22

**New feature:**

- From this version on, the copper based scaling receivers (HDMI-TPN-RX107A-SR and HDMI-TPN-RX107AU2K-SR) are also supported.
- From this version on, the fiber based extenders (HDMI-OPTN-TX100A, HDMI-OPTN-TX200AU2K, HDMI-OPTN-RX100A, and HDMI-OPTN-RX100AU2K) are also supported.

**Bugfix:**

- From this version on, the HDCP is reported as not supported towards a source connected to a TX device when the supported HDCP version of the sink connected to the RX unit cannot be determined.
- Fixed a bug that caused the video signal on the HDMI output of a receiver device to disappear when the HDMI cable to a sink device is disconnected and connected again.

**Known issue:**

- Factory resetting either the TX or the RX device causes the established USB2.0 connection not to work anymore. Unplugging and replugging the corresponding USB device or restarting either the transmitter or the receiver resolves the problem.

**v2.4.2b1**

Release date: 2023-12-20

**Bugfix:**

- Manufacturing support

**v2.4.1b1**

Release date: 2023-12-15

**Bugfix:**

- Fixed a bug that caused some device parameters not to be set to their factory default value after a factory reset.

**v2.4.0b4**

Release date: 2023-12-12

**New feature:**

▪ From this version on, the product variants with USB2.0 transmission capabilities (HDMI-TPN-TX207AU2K and HDMI-TPN-RX107AU2K) are supported.

**Bugfix:**

▪ Fixed a bug that caused the Ethernet extension through the transmitter-receiver pair to be interrupted when there was a transition between HDMI1.4 and HDMI2.0 video signals on the transmitter input.
▪ Fixed a bug that caused a video with color depth of 10 or 12 bit/component to be converted to 8 bit/component.
▪ Fixed a bug that caused a 422 10bit input signals to be converted to 422 8bit during transmission.
▪ Fixed a bug that caused the de-embedded audio to be muted on the analog audio output when a dispay with DVI EDID is connected to the local output of the transmitter device.
▪ Fixed a bug that resulted in muted audio on the analog output after a factory reset (e.g. during firmware upgrade).

**Known issue:**

▪ A clicking sound can be heard in the analog audio output when the audio content in the incoming HDMI stream changes from compressed audio to uncompressed audio or vice versa.
▪ After a factory reset not all parameters are set to their factory default value.

**v2.1.0b2**

Release date: 2023-05-26

**Known issue:**

▪ When the HDMI AUDIO is re-embedded in the output HDMI stream on a HDMI-TPN-RX107 receiver, a switch to a new source with different HDMI AUDIO sampling frequency might result in a flickering of the video content.
▪ Currently, only the HF-VSIF is passed through the TPN transmitter and receiver pair. As a result, HDR10 and Dolby Vision is currently not supported.

## 13.8.2. TPN-MMU-X100 series Firmware Packages

Affected model:

▪ TPN-MMU-X100-20

**v1.3.0b6**

Release date: 2026-02-18

**New feature:**

▪ TPN-MMU-X100-20 Initial Release v1.3.0
▪ Blue River Integration - Blue River server accessible through MMU via LW3 API
▪ Video configuration: HDCP management - EDID management - Scaling settings
▪ Automatic device discovery of the Lightware TPN devices (UCX-TPN, HDMI-TPN, HDMI-OPTN product families)
▪ Network Management feature: All devices and interfaces - IP address assignment - IP conflict and subnet consistency monitoring - Exportable network device list
▪ Media Control: Video switching - Audio follows video - USB follows video - USB-HID follows video
▪ Device Management - Alias assignment (Device naming) - Add/remove devices to/from configuration - Device restart and factory reset - RS232 configuration - RS232 command injection

**Known issue:**

▪ TPX Devices Appearing in Crosspoint View - TPX devices are discoverable, configurable, and appear in the crosspoint view of the MMU. While this may be useful for device configuration purposes, TPX devices are not intended to be used in crosspoint switching operations and their presence in the crosspoint view may cause confusion. - Workaround: Do not add TPX devices to the active configuration if crosspoint switching is required.
▪ Alias Disappearing After Multiple Discoveries - In the built-in web interface, after performing multiple discovery actions, the Alias name of the endpoint device may disappear from the crosspoint table. - Workaround: Restarting the MMU restores the alias name.
▪ Safari 26 Compatibility Issue (Safari Bug) - The MMU\u2019s built-in web interface may encounter errors when accessed using Safari version 26. This issue is related to a known Apple Safari 26 browser bug. - Workaround: Please use an alternative web browser.
▪ IP Conflict Handling - In case of an IP conflict, devices may become unresponsive and the conflict may not be automatically resolved. - Workaround: Switch between static IP and DHCP settings manually to restore operation.
▪ RS-232 Injection Communication Loss After Network Change - After modifying the network configuration (e.g., switching to static IP) on the TPN-MMU, RS-232 injection over TCP communication stops working. - Workaround: Disable the related TCP ports before performing network configuration changes.

- EDID Validity Status on UCX-TPN Transmitters - The current EDID validity status is always displayed as \u201cInvalid\u201d when using UCX-TPN series transmitters. Please note that the default UCX EDID is a special EDID implementation and functions properly despite the displayed invalid status. This is a display issue only and does not affect normal operation. No functional impact on video transmission is expected.
- Session Expiration Handling - When the session management timeout expires, the application does not automatically redirect the user to the login page. Instead, the user becomes blocked. Workaround: Manually refresh the page to be redirected to the login screen.
- FastSwitchCrop and FastSwitchStretch HDCP Output Mode Error - In FastSwitchCrop and FastSwitchStretch video processing modes, the HDCP Output Mode dropdown menu appears; however, changing its value results in an error. - Workaround: If changing the HDCP Output Mode is required, please use FastSwitch mode.
- NTP Issue with Multiple Ethernet Connections - NTP (Network Time Protocol) does not function properly when both Ethernet connections (AV LAN (PoE) and Control LAN) are active simultaneously. - Workaround: Set the date and time manually.

### v1.0.0b3

Release date: 2025-12-17

**New feature:**

- The Blue River server is accessible through the MMU by LW3 API. - Discovery: Finding and mapping LWR / SDVoE / SDVoE Icron devices - Device Settings: Alias assignment, adding/removing devices to/from configuration, restarting/factory resetting devices, RS232 settings / RS232 command injection, SDVoE-related settings including HDCP, EDID, and Scaling - Network Settings: Default network separation, network page showing all devices and their interfaces, IP assignment, IP conflict/subnet consistency monitoring, exportable network list (Alias \u2013 IP \u2013 MAC \u2013 Hostname) - Video switching, Follow Audio and USB-USB-HID will follow the video - Default password for TPN-MMU - LARA

## 13.8.3. Known Issues

The firmware package of the MMU contains a few known issues and limitations which are going to be fixed in a future firmware release.

### TPX Devices Appearing in Crosspoint View

TPX devices are discoverable, configurable, and appear in the crosspoint view of the MMU. While this may be useful for device configuration purposes, TPX devices are not intended to be used in crosspoint switching operations and their presence in the crosspoint view may cause confusion.

Workaround: Do not add TPX devices to the active configuration if crosspoint switching is required.

### Alias Disappearing After Multiple Discoveries

In the built-in web interface, after performing multiple discovery actions, the Alias name of the endpoint device may disappear from the crosspoint table.

Workaround: Restarting the MMU restores the alias name.

### EDID Validity Status on UCX-TPN Transmitters

The current EDID validity status is always displayed as "Invalid" when using UCX-TPN series transmitters. Please note that the default UCX EDID is a special EDID implementation and functions properly despite the displayed invalid status. This is a display issue only and does not affect normal operation. No functional impact on video transmission is expected.

### Safari 26 Compatibility Issue (Apple Bug)

The MMU's built-in web interface may encounter errors when accessed using Safari version 26. This issue is related to a known Apple Safari 26 browser bug.

Workaround: Please use an alternative web browser.

### IP Conflict Handling

In case of an IP conflict, devices may become unresponsive and the conflict may not be automatically resolved.

Workaround: Switch between static IP and DHCP settings manually to restore operation.

### FastSwitchCrop and FastSwitchStretch HDCP Output Mode Error

In FastSwitchCrop and FastSwitchStretch video processing modes, the HDCP Output Mode dropdown menu appears; however, changing its value results in an error.

Workaround: If changing the HDCP Output Mode is required, please use FastSwitch mode.

### RS-232 Injection Communication Loss After Network Change

After modifying the network configuration (e.g., switching to static IP) on the TPN-MMU, RS-232 injection over TCP communication stops working.

Workaround: Disable the related TCP ports before performing network configuration changes.

### NTP Issue with Multiple Ethernet Connection

NTP (Network Time Protocol) does not function properly when both Ethernet connections (AV LAN (PoE) and Control LAN) are active simultaneously.

Workaround: Set the date and time manually.

### Session Expiration Handling

When the session management timeout expires, the application does not automatically redirect the user to the login page. Instead, the user becomes blocked.

Workaround: Manually refresh the page to be redirected to the login screen.

## 13.9. Hashtag Keyword List

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

The format of the keywords is the following:

#<keyword>

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

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

**Example**

*#dhcp*

This keyword is placed at the DHCP (dynamic IP address) setting in the front panel operation, the Lightware Device Controller (LDC) and the LW3 programmer's reference section.

The following list contains all hashtag keywords placed in the document with a short description belonging to them. The list is in **alphabetical order** by the hashtag keywords.

| Hashtag Keyword ↓₂ | Description |
|---|---|
| *#8021x* | 802.1X configuration |
| *#advancedview* | Advanced view window |
| *#audio* | Audio related settings |
| *#authentication* | Basic authentication settings for MMU |
| *#backup* | Configuration cloning (backup) |
| *#bootload* | Bootload mode setting |
| *#builtinweb* | Built-in web for MMU |
| *#certificate* | Certificate management |
| *#configurationcloning* | Configuration cloning (backup) |
| *#crosspoint* | Crosspoint switch setting |
| *#darkmode* | Dark mode setting |
| *#date* | Date setting in the MMU |
| *#devicelabel* | Device label |
| *#dhcp* | Dynamic IP address (DHCP) setting |
| *#edid* | EDID related settings |
| *#endpointmanagement* | Endpoint management for the MMU |
| *#ethernet* | Ethernet port settings |

| Hashtag Keyword ↓₂ | Description |
|---|---|
| *#factory* | Factory default settings |
| *#firmwareupdate* | Firmware updating |
| *#firmwareversion* | Firmware version query |
| *#gpio* | GPIO related settings |
| *#hdcp* | HDCP-encryption related setting |
| *#health* | System monitoring (health) related information |
| *#hostname* | Host name setting for MMU |
| *#icron* | USB KVM related settings |
| *#identifyme* | Identify me (identify the device) feature |
| *#ipaddress* | IP address related settings |
| *#kvm* | USB KVM related settings |
| *#label* | Device label |
| *#lara* | LARA configuration |
| *#link* | SFP+ link related information |
| *#log* | System log |
| *#mac* | MAC address query |
| *#message* | Message sending via communication ports |
| *#network* | Network (IP address) related settings |
| *#new* | New feature/function of the product |
| *#ntp* | NTP (Network Time Protocol) settings |
| *#ocs* | Occupancy sensor related settings |
| *#pairing* | Icron USB KVM device pairing |
| *#password* | Password setting |
| *#portstatus* | Source/destination port status query |
| *#reboot* | Restarting the device |
| *#restart* | Restarting the device |
| *#rs232* | RS-232 related settings |
| *#rs-232* | RS-232 related settings |
| *#scaler* | Scaler related settings |
| *#security* | Basic IT security related settings for MMU |
| *#serial* | RS-232 related settings |

| Hashtag Keyword ↓ᵃ/z | Description |
|---|---|
| #status | Status query |
| #switch | Crosspoint switch setting |
| #systemmonitor | System monitoring (health) related information |
| #terminal | Advanced view window |
| #time | Time setting in the MMU |
| #update | Firmware updating |
| #uplink | SFP+ link related information |
| #usbkvm | USB KVM related settings |
| #web | Built-in web for MMU |

## 13.10. Further Document Information

**Symbol Legend**

The following symbols and markings are used in the document:

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

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

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

▌ INFO: A notice, which contains additional information. Procedure can be successful without reading it.

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

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

**Navigation Buttons**

| **Buttons in the PDF version** | | **Buttons in the HTML version** | |
|---|---|---|---|
| 🏠 | Navigate to the **Table of Contents**. | ☰ | Open the main **Table of Contents**. |
| ◀◀ | Go back to the **previous page**. If you clicked on a link previously, you can go back to the source page by pressing the button. | 🏠 | Navigate to the **Online User Manuals** webpage. |
| ▦ | Navigate to the **Bookmark page**. | ▦ | Navigate to the **Bookmark page** in this User Manual. |
| 🌐 | Visit www.lightware.com. | 📄 | Download the **PDF version** of the User Manual. |

**About Printing**

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

① ② ③

- Page size: A4
- Output size: Fit to page or Match page size
- Orientation: Landscape
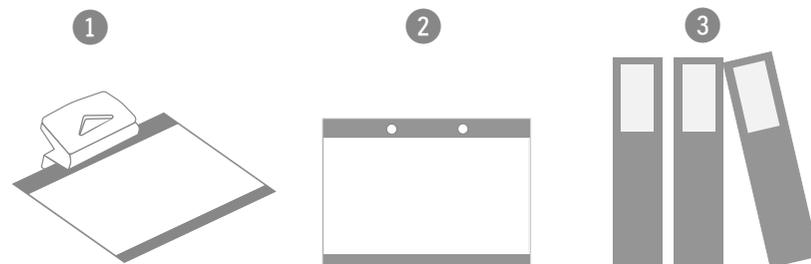
▌ TIPS AND TRICKS: Thanks to the size of the original page, a border around the content (gray on the second picture below) makes it possible to organize the pages better. After punching holes in the printed pages, they can easily be placed into a ring folder.

## 13.11. Limited Warranty Statement

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

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

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

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

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

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

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

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

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

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

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

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

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