Matrix Application Mode

UBEX-MMU-X200
UBEX-PRO20-HDMI-F100
UBEX-PRO20-HDMI-F110
UBEX-PRO20-HDMI-F120
UBEX-PRO20-HDMI-R100 2xMM-2xDUO
UBEX-PRO20-HDMI-R100 2xMM-QUAD
UBEX-PRO20-HDMI-R100 2xSM-2xDUO
UBEX-PRO20-HDMI-R100 2xSM-QUAD
UBEX-PRO20-HDMI-R100 2xSM-BiDi-DUO

AV Over IP Multimedia Extender
Important Safety Instructions

Class I apparatus construction.

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

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

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

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

Ventilation

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

WARNING

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

Waste Electrical & Electronic Equipment WEEE

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

Caution: Laser product

Common Safety Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
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<tbody>
<tr>
<td>✋</td>
<td>Alternating current</td>
</tr>
<tr>
<td>☑</td>
<td>Protective conductor terminal</td>
</tr>
<tr>
<td>⚠️</td>
<td>Caution, possibility of electric shock</td>
</tr>
<tr>
<td>⚠️</td>
<td>Caution</td>
</tr>
<tr>
<td>☑️</td>
<td>Laser radiation</td>
</tr>
</tbody>
</table>
Symbol Legend

The following symbols and markings are used in the document:

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

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

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

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

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

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

Navigation Buttons

- Go back to the previous page. If you clicked on a link previously, you can go back to the source page by clicking the button.
- Navigate to the Table of Contents.
- Step back one page.
- Step forward to the next page.

Document Information

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

<table>
<thead>
<tr>
<th>Item</th>
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<tr>
<td>UBEX-MMU-X200</td>
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About Printing

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

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- 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 (grey 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.

Document revision: v2.5
Release date: 23-09-2022
Editor: Tamas Forgacs
The side and bottom color of the pages indicates the related application mode of the device. See the difference in the Application Modes section.

This document is about the Matrix application mode only. The user's manual of the UBEX Extender mode can be downloaded from the following link: https://lightware.com/media/lightware/filedownloader/file/User-Manual/UBEX_Extender_UsersManual.pdf

The UBEX F-series endpoint devices can be ordered with various colored front panels, but the transmitter is always red, the receiver is always yellow, and the transceiver is always white in this manual for the sake of simplicity.

For the available colors of the front panel, please contact sales@lightware.com.

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

The format of the keywords is the following:

`#<keyword>`

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

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

Example

`#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.

See the list of all hashtag keywords of the document in the Hashtag Keyword List section, and it is highlighted with claret in the table of contents of the document.

An assorted link collection can be found at the end of this user's manual. The Quick Link Collection helps to find the related section for your current activity. The collection is grouped by topic category and within that is in alphabetical order.

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1. Introduction

Thank you for choosing Lightware's UBEX families extender. In the first chapter we would like to introduce the device, highlighting the most important features in the following sections:

- Description
- Box Contents
- Endpoint Model Comparison
- Features
- Application Modes
- Typical Applications
1.1. Description

Lightware’s one of the most visionary development project is the UBEX (Ultra Bandwidth Extender) product family. UBEX is a fiber-optical, scaling AV-Over-IP system that allows uncompressed 4K@60Hz 4:4:4 signal extension with latency-free multistreaming, designed to use in a 10G Ethernet network. UBEX operates with zero frame latency, provides seamless switching and lossless reproduction of source signals of up to 4K60Hz 4:4:4, without artifacts. Uncompressed 4K60Hz 4:4:4 data transmission, or visually lossless compression at higher data rates.

It has standard, 10 Gbps SFP+ optical modules installed, which are field exchangeable by the user. UBEX can transfer two video signals over a single 10G link with minimal compression, which requires half the router size compared to the needs of similar, 10G IP based architectures. With a 20G configuration, UBEX can transfer 4K@60Hz 4:4:4 over two links uncompressed. The maximum reachable distance is ranging between 400 m and 80 km, depending on the type of singlemode or multimode SFP+ optical modules installed in the device. The UBEX design also favors dual-screen applications, as a single UBEX device can handle 2x HDMI 2.0 video ports. For video signals that can be transferred within the 10G speed limit of a single optical fiber, a video signal redundancy feature is available employing the second optical fiber channel.

The R-type UBEX product variant is specifically designed to withstand the daily wear and tear impacts of dynamic, Rental&Staging type of applications. The devices share the features of the standard UBEX–PRO20–HDMI–F100 model, with additional features and changes in build and dimensions. UBEX is available with numerous add-ons, providing audio breakaway signal management, K+M, IR, RS-232 and Gigabit Ethernet control.

The internal power source of UBEX has Medical (60601) and ITE (60950) grade classifications for maximum reliability.

Matrix Management Unit

UBEX-MMU-X200 is a Matrix Management Unit (MMU) for the UBEX AV-Over-IP optical extender product line. With a standard Ethernet switch installed as a crosspoint, a virtual matrix can be created with UBEX devices connected to the IP network as input and output endpoints. The virtual matrix established requires to be managed and controlled by the MMU also connected to the Ethernet switch.

The MMU builds and constantly updates a database of the UBEX endpoints connected, displaying a traditional crosspoint view of the virtual matrix in the Lightware Device Controller (LDC) software, also displaying connected, but inactive units.

Users connect and communicate directly with the MMU in matrix mode, and MMU connects to and relays communication to the endpoint UBEX units.

The MMU displays information about endpoints and the overall virtual AV network, backup and restore functions are also provided to save and load the configuration. The MMU also manages the firmware updates of the connected endpoint UBEX devices, if it is possible to initiate an update of the firmware on all UBEX units present in the network. Based on the communication with the UBEX endpoints, the MMU manages and supervises bandwidth use efficiency.

The Video Wall Wizard for UBEX features quick video wall installation with bezel adjustment and cropping, includes options for various layouts within the video wall matrix, and also allows zones for smart management.

Model Denomination

<table>
<thead>
<tr>
<th>Ultra Bandwidth Extender</th>
<th>HDMI interface</th>
<th>Model number</th>
</tr>
</thead>
<tbody>
<tr>
<td>UBEX-PRO20-HDMI-F120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ProLine product category</td>
<td>Fiber (SFP+) interface</td>
<td>20 Gbit/s signal transmission</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ultra Bandwidth Extender</th>
<th>HDMI interface</th>
<th>Model number</th>
<th>Neutrik opticalCON QUAD connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>UBEX-PRO20-HDMI-R100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ProLine product category</td>
<td>R-series model</td>
<td>2x10G multimode fiber optical interface</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultra Bandwidth Extender</td>
<td></td>
<td>Model number</td>
<td></td>
</tr>
<tr>
<td>UBEX-MMU-X200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Matrix Management Unit</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

Year of the manufacturing: 7=2017 8=2018 9=2019 A=2020 D=2023
B=2021 E=2024 C=2022 F=2025
### 1.2. Box Contents

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

<table>
<thead>
<tr>
<th>Supplied devices</th>
<th>Supplied accessories</th>
<th>Optional accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F-series endpoint device</strong></td>
<td><strong>R-series endpoint device</strong></td>
<td><strong>Matrix Management Unit</strong></td>
</tr>
<tr>
<td>UBEX-PRO20-HDMI-F100</td>
<td>✔</td>
<td>-</td>
</tr>
<tr>
<td>UBEX-PRO20-HDMI-F110</td>
<td>✔</td>
<td>-</td>
</tr>
<tr>
<td>UBEX-PRO20-HDMI-F120</td>
<td>✔</td>
<td>-</td>
</tr>
<tr>
<td>UBEX-PRO20-HDMI-R100 2xMM-2xDUO</td>
<td>-</td>
<td>✔</td>
</tr>
<tr>
<td>UBEX-PRO20-HDMI-R100 2xSM-2xDUO</td>
<td>-</td>
<td>✔</td>
</tr>
<tr>
<td>UBEX-PRO20-HDMI-R100 2xMM-QUAD</td>
<td>-</td>
<td>✔</td>
</tr>
<tr>
<td>UBEX-PRO20-HDMI-R100 2xSM-QUAD</td>
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<td>UBEX-PRO20-HDMI-R100 2xSM-BiDi-DUO</td>
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<td>✔</td>
</tr>
<tr>
<td>UBEX-MMU-X200</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

INFO: 10GbE singlemode/multimode SFP+ modules and 10 GbE SFP+ to RJ45 modules can be ordered together and even separately for the F-series endpoint devices. Endpoint & SFP+ module packages are tested together. For the details, please contact sales@lightware.com.
### 1.3. Endpoint Model Comparison

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

<table>
<thead>
<tr>
<th>Power connector</th>
<th>AV transmission interface</th>
<th>Video ports</th>
<th>Audio ports</th>
<th>Ethernet</th>
<th>Interface ports</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Multimode</td>
<td>Singlemode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Neutrik powerCON</td>
<td>Neutrik opticalCON DUO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TRUE1</td>
<td>Neutrik opticalCON QUAD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SFP+ slots</td>
<td>Neutrik opticalCON DUO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2x)</td>
<td>(2x)</td>
<td></td>
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<tr>
<td></td>
<td>(2x)</td>
<td>(2x)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Applied models</th>
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<th></th>
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</thead>
<tbody>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>UBEX-PRO20-HDMI-F110</td>
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<td>✓</td>
<td>✓</td>
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<td>✓ (3x)</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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</table>

<table>
<thead>
<tr>
<th>Rental models</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>UBEX-PRO20-HDMI-R100 2xMM-2xDUO</td>
<td>✓</td>
<td>✓</td>
<td>✓ (2x)</td>
<td>✓</td>
<td>✓ (1x)</td>
</tr>
<tr>
<td>UBEX-PRO20-HDMI-R100 2xMM-QUAD</td>
<td>✓</td>
<td>✓</td>
<td>✓ (1x)</td>
<td>✓ (2x)</td>
<td>✓</td>
</tr>
<tr>
<td>UBEX-PRO20-HDMI-R100 2xSM-2xDUO</td>
<td>✓</td>
<td>✓</td>
<td>✓ (2x)</td>
<td>✓</td>
<td>✓ (1x)</td>
</tr>
<tr>
<td>UBEX-PRO20-HDMI-R100 2xSM-QUAD</td>
<td>✓</td>
<td>✓</td>
<td>✓ (2x)</td>
<td>✓ (2x)</td>
<td>✓</td>
</tr>
</tbody>
</table>

* The HDMI input and output ports of the R-series endpoint models have flange mounting option.
1. Introduction

1.4. Features

For UBEX-MMU-X200

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

**Video Wall Application**
The UBEX devices can be arranged to a Video wall up to 8x4 (column x row) display devices. The displayed video can be the same on each display, one image enlarged to all the sinks, or the mixture of these. More different layout can be defined for the same video wall.

**Signal Bandwidth Management**
The Matrix Management Unit can prioritize the video streams by the signal bandwidth. The priority order is specified by the user based on the current application.

**Global Diagnostic Statistics**
The Matrix Management Unit collects data about the actual health and link status of all connected endpoint devices. User can always check the current state of the UBEX matrix in the Lightware Device Controller software or in the built-in web page of the MMU.

**Centralized Firmware Update**
The easiest way to keep your UBEX matrix up to date. The firmware package of all endpoint models are built in the MMU and the update procedure is executed automatically for the endpoints which are in the matrix.

**Expandable Matrix**
Get what you need. The UBEX matrix is starting from 16 endpoint devices and it can be expanded to 50, 100, 150 endpoints or unlimited by purchasing endpoint licenses for the MMU.

**Built-in Web Page**
Easy access from a web browser to control and configure the Matrix Management Unit and the UBEX matrix.

For All UBEX Endpoint Models

**Uncompressed 4K Support**
Up to HDMI 2.0 4K 2160p@60Hz 4:4:4 video input or 4096x2160@60Hz resolution over a 20 Gigabit network with extra low latency.

- **Ethernet Based Extender**
The UBEX system is Ethernet based, using 10 GbE, IGMPv2, and IPv4 protocols.
- **Pixel Accurate Reclocking**
  Each output has a clean, jitter free signal, eliminating signal instability and distortion caused by long cables or connector reflections.
- **HDCP 2.2 compliant**
The UBEX extenders comply to the HDCP 2.2 standard. HDCP capability on the digital video inputs can be disabled when non-protected content is extended.
- **Frame Detector and Signal Analysis**
The exact video and audio signal format can be determined such as timing, frequencies, scan mode, HDCP encryption, color range, color space and audio sample rate.
- **Scaling the Output Image**
  Video scaling 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.
- **Changeable Operation Mode**
  UBEX endpoint devices can be configured as transmitter, receiver, or transceiver in few simple steps by the user anytime.
- **Frame Rate Converter**
  Frame rate conversion is available for the UBEX endpoints in transmitter, receiver, and transceiver operation modes as well. The most frequently used refresh rates can be forced on both inputs or outputs.
- **Seamless Switching (Clean Cut)**
  UBEX series extenders provide seamless switching (clean cut) technology, which is the capability to deliver consistent performance and reliability. The advantage of the technology is that various environments with different video sources and displays will not impact signal loss.
- **Multi Stream**
  UBEX endpoint devices are able to simultaneously transmit two video streams with embedded audio via the SFP+ interface.
- **Stream Copy**
  UBEX endpoint devices are able to copy the stream of the HDMI out 1 to the HDMI out 2 port. This is the COPY function. The function is available in receiver and transceiver operation modes.
1. Introduction

**Color Space Conversion**
Color space of the output video can be changed based on the type of the display device.

**Wide Range of Audio Format Support**
Endpoint devices support the most of known audio signal formats, including HBR audio like Dolby TrueHD, Dolby Atmos and DTS-HD Master Audio 7.1.

**Local Video Output**
User can attach a local monitor to observe the video signal sent through the SFP+ ports. The resolution and clock frequency are the same with the HDMI inputs, no internal scaling or conversion is applied. The function is available in transmitter and transceiver operation modes.

**Local Video Input**
User can attach local source devices to the input ports of the UBEX receiver. The streams with the received resolution and clock frequency are transmitted on the output ports and no internal scaling or color conversion is applied. The function is available in receiver operation mode.

**Modular SFP+ Interface**
UBEX series extenders use standard, certificated 10 Gbps SFP+ optical modules, which are plug and play, so they are swappable by the user.

**Silent Operation**
The optimized fan operation allows installing the endpoint device to places where minimum sound emission is required.

**Dark Mode**
Rental application requires this function, which keeps the LCD screen and the LEDs unlit to hide the device during the event.

**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.

**Only for UBEX-PRO20-HDMI-F110 and UBEX-PRO20-HDMI-F120 Models**

- **Audio Embedder and De-embedder Function**
The analog audio can be embedded to HDMI outputs and embedded audio can be routed to the analog audio output in transmitter, receiver, and transceiver operation modes as well.

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

- **Infrared Interface**
Infrared (IR) is a wireless technology used for device communication over short ranges. Infrared is commonly used for remote control based applications. Third-party control systems may send IR control commands to endpoints, turning them on and off or switching their inputs.

**Only for UBEX-PRO20-HDMI-F120 Model**

- **USB K+M Extension**
K+M extension for USB HID (Human Interface Devices, e.g. keyboard, mouse, presenter).

**Only for the UBEX-PRO20-HDMI-R100 Series Models**

- **Mounting Threads**
Mounting threads on top and one side for the R-series models to conform strict installation safety regulations.
1.5. Application Modes

UBEX extender system has two main application modes: #applicationmode

- **Extender Mode** - Point-to-point connection between a transmitter and a receiver, or between two transceiver endpoint devices. The user's manual of the UBEX Extender mode can be downloaded from the following link: #extendermode
  

- **Matrix Mode** - Virtual AV matrix with more transmitters, receivers, transceivers, and a Matrix Management Unit (MMU) that controls the AV network. This document is about the Matrix mode only. #matrixmode

INFO: The Extender or Matrix mode is set automatically in the endpoint device. If the device detects direct connection with another endpoint device at the other side of the connection, the mode is set to Extender mode; if the MMU connects to the device, the mode is set to Matrix mode.

The two modes bring different functionality and control methods for the endpoint and the MMU devices. The following settings are available in the MMU only in case the Matrix mode:

- Operation mode setting (transmitter / receiver / transceiver configuration for the endpoints)
- All network-related settings, e.g. DHCP setting, static IP address, etc.
- All HDMI port settings for the inputs and outputs
- EDID settings
- Reloading factory defaults
- Centralized firmware update method for the endpoint devices

ATTENTION! Switching between the Extender and Matrix mode changes the LCD menu structure and the LW3 command protocol tree of the endpoint device. It happens because of the control settings listed above transfer between the endpoints and the MMU.

1.6. Typical Applications

1.6.1. System Design Studio

**Application diagram of Matrix mode - System design studio**

Description

The UBEX matrix has 16 pcs transmitters (UBEX-PRO20-HDMI-F120, TX mode) and 8 pcs receivers (UBEX-PRO20-HDMI-F120, RX mode).

Each transmitter is connected to a dual head 4K rack PC and transmits two streams together. The transmitted HDMI streams can be a 4K UHD 60 Hz 4:4:4 and a 4K UHD 30 Hz 4:4:4, or two 4K 60 Hz 4:2:2. The transmitters receive an analog audio signal as well, it is also transmitted beside the HDMI streams and can be selected to any or all ports of the receivers.

Each receiver has two 4K-ready video sink devices and a symmetrical analog audio sink device.

The matrix is supervised by the UBEX Matrix Management Unit (MMU) which is controlled by a PC. All endpoint devices and the MMU are connected to a 96-port 10G Layer 3 network switch.

**Endpoint License**

This configuration requires UBEX-MMU-X200-50 license which makes available to claim up to 50 endpoint devices.
1. Introduction

1.6.2. Corporate Application

Description

The UBEX matrix has more UBEX-PRO20-HDMI-F120 endpoint devices which can be in transmitter, receiver, or transceiver operation modes. The matrix is supervised by the UBEX Matrix Management Unit (MMU) which is controlled by a PC. All endpoint devices and the MMU are connected to three stacked 96-port 10G Layer 3 network switches. The transmitters can be connected to a single laptop or a dual head 4K rack PC and transmitting two streams together. The receivers can be connected to one or two sink devices belongs to the required application. The transceivers can be connected to a source and a sink device together. The source stream is extended to another transceiver or receiver, the destination stream which is received from another UBEX extender is displayed on the sink device. The transmitted HDMI streams can be a 4K UHD 60 Hz 4:4:4 and a 4K UHD 30 Hz 4:4:4, or two 4K 60 Hz 4:2:2 in the case of the transmitters. Thanks to the 20G full-duplex SFP+ interface the transceiver has no bandwidth limitation on the input and output sides either. The transceivers are able to receive and transmit 2x 4K60 Hz 4:4:4 24 bit streams.

Endpoint License

This configuration requires UBEX-MMU-X200-150 license which makes available to claim up to 150 endpoint devices.
1.6.3. Video Wall Application

Description

The UBEX matrix contains two transmitters and two receivers (UBEX-PRO20-HDMI-F100 endpoint models).

The matrix is supervised by the UBEX Matrix Management Unit (MMU) which is controlled by a PC. All endpoint devices and the MMU are connected to a 16-port 10G Layer 3 network switch.

Two receivers are connected to four wall-mounted displays in a 2x2 video wall application. The source streams are from four different source devices (PC, Blu-ray player, 4K media player, and laptop) and transmitted by the two UBEX transmitters.

The video wall may have more different layouts and a layout may be divided into more zones. See more details about video wall feature in the Video Wall section.

The UBEX matrix is controlled by a RAP-B511-EU-K room automation panel which can send LW3 protocol commands to the MMU over Ethernet. The control buttons of the RAP panel can be programmed for the best available supervising of the video wall, for example changing the layout of the wall, or crosspoint changing for each zones, etc.

INFO: RAP-B511 series devices can be ordered separately for the UBEX matrix. For the details please contact sales@lightware.com.

Endpoint License

This configuration does not require endpoint license. The MMU is limited to claim up to 16 endpoint devices.
1.6.4. Live Event with Dual Scaler Application

Description
This UBEX matrix has two transmitters (a UBEX-PRO20-HDMI-F120 and a UBEX-PRO20-HDMI-R100 models) and two receivers (UBEX-PRO20-HDMI-F120 models) which are connected to a 16-port 10G managed network switch and supervised by the UBEX-MMU-X200 Matrix Management Unit.

The sources are a dual head 4K PC in the rack room which provides two streams (3840x2160p60 and 2560x1440p60) and a stage camera which provides an 1080p stream from the field.

The stream of the stage camera is transmitted to the LED wall behind the band in 4K60 resolution and the same stream can be seen in the backstage on a 1080p monitor. Both of them are coming from the two output ports of the UBEX receiver.

The audio of the concert is provided by the UBEX receiver in the front of house: the analog audio output transmits the audio stream for the active speakers and the singer’s microphone is plugged to the analog audio input port.

The show can be supervised and controlled from the front of house and the backstage either thanks to the USB K+M extension of the UBEX endpoint devices.

Endpoint License
This configuration does not require endpoint license. The MMU is limited to claim up to 16 endpoint devices.
Product Overview

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

- **Front and Rear View - F-series Endpoint Devices**
- **Front and Rear View - R-series Endpoint Devices**
- **Front and Rear View - UBEX-MMU-X200**
- **Overview of the UBEX Endpoint Port Features**
2. Product Overview

2.1. Front and Rear View - F-series Endpoint Devices

2.1.1. Front View

All Models

1. Status LEDs
   The LEDs give immediate feedback about the current status of the endpoint device. See the details about the operation of the LEDs in the Status LEDs section (on the right side).

2. LCD screen
   LCD screen showing the most important settings and parameters in the front panel menu. The available settings and information depends on the current application mode. See the details in the Front Panel LCD Menu Operation - Endpoints chapter.

3. Jog dial control knob
   Easy setting and menu navigation by the jog dial control. Keep dialing and clicking while getting feedback on the LCD. The operation of the jog dial control knob can be disabled by the control lock feature. The function can be enabled using the following methods:
   - Lightware Device Controller (LDC) software / Built-in website - see the details in the Health Status Tab section;
   - LW3 protocol command - see the details in the Control Lock section.

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

Status LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>Status</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIVE</td>
<td>blinking</td>
<td>The device is powered and ready to use.</td>
</tr>
<tr>
<td>LIVE</td>
<td>off</td>
<td>The device is not powered or out of operation.</td>
</tr>
<tr>
<td>STATUS</td>
<td>on</td>
<td>All measured temperature and voltage values are within the limits.</td>
</tr>
<tr>
<td>STATUS</td>
<td>blinking</td>
<td>Measured temperature or voltage value is out of the limits.</td>
</tr>
<tr>
<td>STATUS</td>
<td>off</td>
<td>The device is not powered or out of operation.</td>
</tr>
<tr>
<td>LINK OK</td>
<td>on</td>
<td>The connection is established on the fiber optical links and the Link Aggregation is working.</td>
</tr>
<tr>
<td>LINK OK</td>
<td>blinking</td>
<td>The connection is established on the fiber optical links and LACP detection period is active.</td>
</tr>
<tr>
<td>LINK OK</td>
<td>off</td>
<td>No connection is established on one of the fiber optical links.</td>
</tr>
<tr>
<td>MMU AVAILABLE</td>
<td>on</td>
<td>Matrix mode is active; the communication is live between the endpoint and the Matrix Management Unit (MMU).</td>
</tr>
<tr>
<td>MMU AVAILABLE</td>
<td>blinking</td>
<td>Matrix mode is active; no communication between the endpoint and the MMU.</td>
</tr>
<tr>
<td>MMU AVAILABLE</td>
<td>off</td>
<td>Extender mode is active; no communication between the endpoint and the MMU.</td>
</tr>
</tbody>
</table>

Dark Mode

Rental application requires this function, which keeps the LCD screen and the LEDs unlit to hide the device during the event. The function can be enabled via the following methods:

- Front panel LCD menu - see the details in the Front Panel section;
- Lightware Device Controller (LDC) software / Built-in website - see the details in the Health Status Tab section;
- LW3 protocol command - see the details in the Dark Mode Setting section.
2.1.2. Rear View

UBEX-PRO20-HDMI-F100

UBEX-PRO20-HDMI-F110

UBEX-PRO20-HDMI-F120

5 AC connector

6 Ethernet connectors

7 HDMI input ports

8 HDMI output ports

9 SFP+ port slots

10 RS-232 connector

11 Infrared connectors

12 Analog audio output port

13 Analog audio input port

14 USB-A ports

15 USB-B port

- HDMI input ports with HDMI 2.0 support for the source devices. When the device is configured as a receiver, the ports operate as local HDMI inputs. The HDMI in 1 port cannot accept AV signal when the device is configured as transceiver. See more details about the HDMI interface in the Video Interface section.

- HDMI output ports with HDMI 2.0 support for sink devices. When the device is configured as transmitter, the both ports operate as local HDMI outputs. When the device is configured as transceiver, the HDMI out 2 port operates as a local HDMI output. The HDMI out 2 port is able to copy the signal of the HDMI in 1 port when the device is configured as receiver or transceiver. See more details about the HDMI interface in the Video Interface section.

- SFP+ port slots for 2x 10 GbE SFP+ modules or 2x 10 GbE DAC cables. Ports can be used for either singlemode or multimode fiber optical connections. See more details about the SFP+ interface in the SFP / SFP+ Interfaces section.

- RS-232 connector: 3-pole Phoenix connector for serial communication. See more details about the pin assignment in the RS-232 Connector section, about the cable wiring in the Serial Ports section, and the concept of the operation in the Serial Interface section.

- Infrared connectors: 3-pole TRS connector, also known as 3.5 mm (1/8”) jack plug for optional IR detector (IR IN) and emitter (IR OUT) connection. See more details about the pin assignment in the IR Connector section, and about the concept of the operation in the Infrared Interface section.

- Analog audio output port: 5-pole Phoenix connector for balanced analog audio output. The port is available in all operation modes (TX/RX/TRX). See more details about the pin assignment in the Symmetrical Analog Stereo Audio Connector section, about the cable wiring in the Audio Ports section, and about the analog audio interface in the Audio Interface section.

- Analog audio input port: 5-pole Phoenix connector for balanced analog audio input. The port is available in all operation modes (TX/RX/TRX). See more details about the pin assignment in the Symmetrical Analog Stereo Audio Connector section, about the cable wiring in the Audio Ports section, and about the analog audio interface in the Audio Interface section.

- USB-A ports: Two USB-A ports for connecting HID devices (keyboard, mouse, pointer, etc) for USB K+M extension. The port is available in all operation modes (TX/RX/TRX). See more details about the K+M feature in the USB K+M Interface section.

- USB-B port: USB-B port for connecting the host device (e.g. computer) for USB K+M extension. The port is available in all operation modes (TX/RX/TRX). See more details about the K+M feature in the USB K+M Interface section.

- AC connector: Standard IEC connector accepting 100-240 V, 50 or 60 Hz. See more details about it in the AC Power Connection section.

- Ethernet connectors: Standard locking RJ45 connectors for 1 Gbps Ethernet connections to control the device, for user Ethernet access, and firmware update purpose. See the details about the cable wiring in the Ethernet Connectors section and the concept of the operation in the Ethernet Interface section.
2. Product Overview

2.2. Front and Rear View - R-series Endpoint Devices

2.2.1. Front View

All Models

1. Mounting ears
   Durable mounting ears on both sides of the device for the easy mounting in the case of rental or staging application. The ears serve more purposes, see the details in the Mounting Options - R-series Endpoint Devices section.

2. Status LEDs
   The LEDs give immediate feedback about the current status of the endpoint device. See the details about the operation of the LEDs in the Status LEDs section (on the right side).

3. LCD screen
   LCD screen showing the most important settings and parameters in the front panel menu. The available settings and information depends on the current application mode. See the details in the Front Panel LCD Menu Operation - Endpoints chapter.

4. Jog dial control knob
   Easy setting and menu navigation by the jog dial control. Keep dialing and clicking while getting feedback on the LCD.
   The operation of the jog dial control knob can be disabled by the control lock feature. The function can be enabled using the following methods:
   - Lightware Device Controller (LDC) software / Built-in website - see the details in the Health Status Tab section;
   - LW3 protocol command - see the details in the Dark Mode Setting section.

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

---

Status LEDs

<table>
<thead>
<tr>
<th>LIVE</th>
<th>Transmitter / Receiver / Transceiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>✚ blinking</td>
<td>The device is powered and ready to use.</td>
</tr>
<tr>
<td>✗ off</td>
<td>The device is not powered or out of operation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATUS</th>
<th>Transmitter / Receiver / Transceiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>✚ on</td>
<td>All measured temperature and voltage values are within the limits.</td>
</tr>
<tr>
<td>✚ blinking</td>
<td>Measured temperature or voltage value is out of the limits.</td>
</tr>
<tr>
<td>✗ off</td>
<td>The device is not powered or out of operation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LINK OK</th>
<th>Transmitter / Receiver / Transceiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>✚ on</td>
<td>The connection is established on the fiber optical links and the Link Aggregation is working.</td>
</tr>
<tr>
<td>✚ blinking</td>
<td>The connection is established on the fiber optical links and LACP detection period is active.</td>
</tr>
<tr>
<td>✗ off</td>
<td>No connection is established on one of the fiber optical links.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MMU AVAILABLE</th>
<th>Transmitter / Receiver / Transceiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>✚ on</td>
<td>Matrix mode is active; the communication is live between the endpoint and the Matrix Management Unit (MMU).</td>
</tr>
<tr>
<td>✚ blinking</td>
<td>Matrix mode is active; no communication between the endpoint and the MMU.</td>
</tr>
<tr>
<td>✗ off</td>
<td>Extender mode is active; no communication between the endpoint and the MMU.</td>
</tr>
</tbody>
</table>

---

Dark Mode

Rental application requires this function, which keeps the LCD screen and the LEDs unlit to hide the device during the event. The function can be enabled via the following methods:

- Front panel LCD menu - see the details in the Front Panel section;
- Lightware Device Controller (LDC) software / Built-in website - see the details in the Health Status Tab section;
- LW3 protocol command - see the details in the Dark Mode Setting section.
2.2.2. Rear View

UBEX-PRO20-HDMI-R100 2xMM-QUAD and 2xSM-QUAD

UBEX-PRO20-HDMI-R100 2xSM-BiDi-DUO

UBEX-PRO20-HDMI-R100 2xMM-2xDUO and 2xSM-2xDUO

Neutrik powerCON AC connector
Neutrik powerCON TRUE1 NAC3MPX-WOT connector accepting 100-240 V, 50 or 60 Hz. See more details about it in the AC Power Connection section.

Neutrik etherCON Ethernet connectors
Neutrik etherCON NE8FDV-YK looking RJ45 connectors for 1 Gbps Ethernet connections to control the device, for user Ethernet access, and firmware update purpose. See the details about the cable wiring in the Ethernet Connectors section and the concept of the operation in the Ethernet Interface section.

HDMI input ports with flange
HDMI input ports with HDMI 2.0 support for the source devices. When the device is configured as a receiver, the ports operate as local HDMI inputs. The HDMI in 1 port cannot accept AV signal when the device is configured as transceiver. See more details about the HDMI interface in the Video Interface section.

HDMI output ports with flange
HDMI output ports with HDMI 2.0 support for sink devices. When the device is configured as transmitter, the both ports operate as local HDMI outputs. When the device is configured as transceiver, the HDMI out 2 port operates as a local HDMI output. The HDMI out 2 port is able to copy the signal of the HDMI in 1 port when the device is configured as receiver or transceiver. See more details about the HDMI interface in the Video Interface section.

Neutrik opticalCON QUAD optical connector
Neutrik opticalCON QUAD NO4FDW-A singlemode or multimode fiber optical connector for AV signal transmission.
- 2xMM-QUAD: supports multimode cable connection.
- 2xSM-QUAD: supports singlemode cable connection.
See more details about it in the Neutrik opticalCON Connectors section.

Neutrik opticalCON DUO BiDi optical connector
Neutrik opticalCON DUO NO2-4FDW-A singlemode fiber optical connector with BiDi support for AV signal transmission. See more details about it in the Neutrik opticalCON Connectors section.
The connector does not support the Neutrik opticalCON crossed fiber wiring (A-A; B-B) cable. Please use standard (A-B) cable only.

Neutrik opticalCON DUO optical connector
2x Neutrik opticalCON DUO NO2-4FDW-A singlemode or multimode fiber optical connectors for AV signal transmission.
- 2xMM-2xDUO: supports multimode cable connection.
- 2xSM-2xDUO: supports singlemode cable connection.
See more details about it in the Neutrik opticalCON Connectors section.

See more details about the fiber optical connectors in the Neutrik opticalCON Connectors section and about the connection possibilities / connector pin layouts in the Connection between the Switch and R-series Endpoints section.
2.3. Front and Rear View - UBEX-MMU-X200

2.3.1. Front View

1. Control Ethernet port 1
   Front panel RJ45 connector for control and firmware update purpose. The port supports 100 Mbps Ethernet connection, auto-negotiation, and auto-MDI/MDIX. See the details about the cable wiring in the Ethernet Connectors section and the concept of the operation in the Ethernet Interface section.

2. Status LEDs
   The LEDs give immediate feedback about the recent status of the device. See the details about the operation of the LEDs in the Status LEDs section below.

3. LCD screen
   LCD screen showing the most important settings and parameters in the front panel menu. See the details the LCD menu operation in the Front Panel LCD Menu Operation - MMU chapter.

4. Jog dial control knob
   Easy setting and menu navigation by the jog dial control. Keep dial and click while getting feedback on the LCD. See the details the LCD menu operation in the Front Panel LCD Menu Operation - MMU chapter.

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

6. USB connector
   Function will be added by future firmware update.

Status LEDs

<table>
<thead>
<tr>
<th>LIVE</th>
<th>POWER</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Blinking" /></td>
<td><img src="image" alt="On" /></td>
</tr>
<tr>
<td><img src="image" alt="On" /></td>
<td><img src="image" alt="Off" /></td>
</tr>
<tr>
<td><img src="image" alt="Off" /></td>
<td><img src="image" alt="On" /></td>
</tr>
<tr>
<td><img src="image" alt="Off" /></td>
<td><img src="image" alt="Off" /></td>
</tr>
</tbody>
</table>

2.3.2. Rear View

1. RS-232 connectors
   2 pcs 3-pole Phoenix connectors for serial communication. The connectors are for controlling the device and connection with third-party system controllers. See more details about the pin assignment in the RS-232 Connector section, about the cable wiring in the Serial Ports section, and the concept of the operation in the Serial Interface section.

2. Control Ethernet port 2
   Rear panel RJ45 connector for control and firmware update purpose. The port supports 1 Gbps Ethernet connection, auto-negotiation, and auto-MDI/MDIX. See the details about the cable wiring in the Ethernet Connectors section and the concept of the operation in the Ethernet Interface section.

3. Ethernet port for UBEX network
   RJ45 connector with 1 GbE support for connection to the UBEX network. Connect the MMU and the L3 network switch by a CATx cable via the connector. See the details about the cable wiring in the Ethernet Connectors section. Use one of the UBEX network connectors (RJ45 or SFP) only in the same time to avoid the network loop.

4. SFP slot for 1 GbE SFP module for UBEX network
   Optical port slots for an 1 GbE SFP module for connection to the UBEX network. Connect the MMU and the L3 network switch by LC fiber optical cable or DAC cable. Ports can be used for either singlemode or multimode fiber optical connections. See more details about the SFP interface in the SFP / SFP+ Interfaces section. Use one of the UBEX network connectors (RJ45 or SFP) only in the same time to avoid the network loop.

5. AC connector
   Standard IEC connector accepting 100-240 V, 50 or 60 Hz. See more details about it in the AC Power Connection section.
2.4. Overview of the UBEX Endpoint Port Features

The following section describes the main features of the UBEX endpoint devices by the interface ports.

2.4.1. F-series Endpoint Devices

HDMI in 1
TX Function: HDMI input port
Features: scaler, frame rate converter, color space conversion, color range, HDCP, stream identification, Frame Detector.
- Concept: Transmitter Mode

RX Function: Local HDMI input port
Features: HDCP, Frame Detector.
- Concept: Receiver Mode

TRX Function: HDMI input port
Features: scaler, frame rate converter, color space conversion, color range, HDCP, stream identification, Frame Detector.
- Concept: Transceiver Mode

The HDMI in 1 input port cannot accept video signal when the device is configured as a transceiver.

HDMI in 2
TX Function: HDMI input port
Features: scaler, frame rate converter, color space conversion, color range, HDCP, stream identification, Frame Detector.
- Concept: Transmitter Mode

RX Function: Local HDMI input port
Features: HDCP, Frame Detector.
- Concept: Receiver Mode

TRX Function: HDMI input port
Features: scaler, frame rate converter, color space conversion, color range, HDCP, stream identification, Frame Detector.
- Concept: Transceiver Mode

Analog Audio Input
- Concept: Audio Interface
- LDC settings: Analog Audio Source Port Properties Window
- LW3 prog. ref.: Analog Audio Port Settings

Analog Audio Output
- Concept: Audio Interface
- LDC settings: Analog Audio Destination Port Properties Window
- LW3 prog. ref.: Analog Audio Port Settings

USB KVM
- Concept: USB K+M Interface
- LDC settings: Crosspoint Menu - USB Layer
- LW3 prog. ref.: USB K+M Settings

Ethernet
- Concept: Control Features
- LDC settings: Ethernet Tab
- LW3 prog. ref.: Ethernet Port Configuration - Endpoint Devices / Message Sending via Communication Ports

RS-232
- Concept: Serial Interface
- LDC settings: RS-232 Tab
- LW3 prog. ref.: Serial Port Configuration - Endpoint Devices / Message Sending via Communication Ports

HDMI out 1
TX Function: HDMI output port
Features: HDCP, Frame Detector.
- Concept: Transmitter Mode

RX Function: HDMI output port
Features: scaler, frame rate converter, color space conversion, color range, HDCP, stream identification, Frame Detector.
- Concept: Receiver Mode

TRX Function: HDMI output port
Features: scaler, frame rate converter, color space conversion, color range, HDCP, stream identification, Frame Detector.
- Concept: Transceiver Mode

Analog Audio Input
- Concept: Audio Interface
- LDC settings: Analog Audio Source Port Properties Window
- LW3 prog. ref.: Analog Audio Port Settings

Analog Audio Output
- Concept: Audio Interface
- LDC settings: Analog Audio Destination Port Properties Window
- LW3 prog. ref.: Analog Audio Port Settings

INFRARED INPUT AND OUTPUT
- Concept: Infrared Interface
- LDC settings: Infra Tab
- LW3 prog. ref.: Infrared Port Configuration - Endpoint Devices / Message Sending via Communication Ports

2x 10GbE SFP+ Slots
- Concept: SFP+ Interface for the Endpoints
- LDC settings: Link Status Tab
- LW3 prog. ref.: SFP+ Module Information
2.4.2. R-series Endpoint Devices

**HDMI in 2**
- **TX**: Function: HDMI input port
  - Features: scaler; frame rate converter, color space conversion, color range, HDCP, stream identification, Frame Detector.
  - Concept: Transmitter Mode
- **RX**: Function: Local HDMI input port
  - Features: HDCP, Frame Detector.
  - Concept: Receiver Mode
- **TRX**: Function: HDMI input port
  - Features: scaler; frame rate converter, color space conversion, color range, HDCP, stream identification, Frame Detector.
  - Concept: Transceiver Mode

**HDMI in 1**
- **TX**: Function: HDMI input port
  - Features: scaler; frame rate converter, color space conversion, color range, HDCP, stream identification, Frame Detector.
  - Concept: Transmitter Mode
- **RX**: Function: Local HDMI input port
  - Features: HDCP, Frame Detector.
  - Concept: Receiver Mode
- **TRX**: Function: HDMI input port
  - The HDMI in 1 input port cannot accept video signal when the device is configured as a transceiver.

**2x 10GbE NEUTRIK FIBER OPTICAL CONNECTORS**
- **TX**: Function: Local HDMI output port
  - Features: HDCP, Frame Detector.
  - Concept: Transmitter Mode
- **RX**: Function: HDMI output port
  - Features: scaler; frame rate converter, color space conversion, color range, HDCP, stream identification, Frame Detector.
  - Concept: Receiver Mode
- **TRX**: Function: HDMI output port
  - Features: scaler; frame rate converter, color space conversion, color range, HDCP, stream identification, Frame Detector.
  - Concept: Transceiver Mode

**ETHERNET**
- **Concept: Control Features**
- **Connector types and description: Ethernet Connectors**
- **LDC settings: Ethernet Tab**
- **LW3 prog. ref.: Ethernet Port Configuration - Endpoint**
This chapter is about the operating of the Matrix Management Unit, describing the functions that are available by the front panel controls:

- INTRODUCTION
- SYSTEM SETTINGS MENU
3.1. Introduction

3.1.1. Menu Navigation

The front panel has a color LCD that shows the most important settings and parameters structured in a menu. The jog dial control knob can be used to navigate between the menu items or change the value of a parameter. The knob can be turned and clicked to enter a menu or edit/set a parameter.

3.1.2. Parameter Selection

The blue colored line means the selected menu/parameter, the green one means the current setting.

TIPS AND TRICKS: The faster you rotate the jog dial, the faster the parameter list is scrolled.

3.2. System Settings Menu

System related settings are available in the menu - network and time/date settings.

3.2.1. Network

The parameters of the network connection can be set in this submenu. The first three lines (IP, Subnet, and Gateway parameters) show the current settings. If the DHCP option is disabled, three more parameters are listed which can be set for a static IP address:

- Static IP
- Static Subnet
- Static Gateway

ATTENTION! If you change the network settings, always press the Save option under Network menu (not only in the submenu of the parameter) to apply the new settings.

#network #dhcp #ipaddress

3.2.2. Time and Date

The internal clock and date that is used for logging events can be set in this submenu.

Time format: HH:MM:SS
Date format: YYYY-MM-DD

TIPS AND TRICKS: The time and date can be set easily in the built-in web or in the Lightware Device Controller software manually or by synchronizing with the local computer. See the details in the System Tab section.

3.2.3. Display Brightness

The brightness of the LCD can be set from 1 to 10 on a scale. Use the jog dial control knob to set the brightness lower or higher.

3.2.4. Restore Factory Defaults

Selecting this submenu results the factory default settings being reloading after a reboot. See the entire list of restored settings for the Matrix Management Unit in the UBEX-MMU-X200 section.

#factory
4. Front Panel LCD Menu Operation - Endpoints

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

- The Tree Structure of the LCD Menu
- Introduction
- Home Screen
- Ports Menu - Transmitter Operation Mode
- Ports Menu - Receiver Operation Mode
- Ports Menu - Transceiver Operation Mode
- EDID Menu
- KM Menu
- System Status Menu
- System Settings Menu
4. Front Panel LCD Menu Operation - Endpoints

### MATRIX APPLICATION MODE

- **Applied endpoint firmware package**: v2.4.1
- **Applied MMU firmware package**: v1.7.1
- **LDC software**: v2.6.2b3

#### 4.1. The Tree Structure of the LCD Menu

**TX** (Transmitter)

**HOME SCREEN**

- **MAIN MENU**
  - **Ports**
    - TX I1
      - HDMI input
      - Stream output
    - TX I2
      - HDMI input
      - Stream output
    - TX O1
    - TX O2
  - **EDID**
    - View
      - Factory EDIDs
      - Last attached EDIDs
      - User EDIDs
    - Emulated EDIDs
  - **KM**
    - U1
    - D1
    - D2
  - **System status**
    - Device info
    - Link status
    - SFP+ #1
    - SFP+ #2
    - Bonding state
  - **Operation**
    - Temperatures
    - Voltages
  - **System settings**
    - Network
    - Application mode
    - Front panel
    - Restart device
    - Bootload mode

**RX** (Receiver)

**HOME SCREEN**

- **MAIN MENU**
  - **Ports**
    - RX O1
      - Stream input
      - HDMI output
      - Source Mux
    - RX O2
      - Stream input
      - HDMI output
      - Source Mux
    - RX I1
    - RX I2
  - **EDID**
    - View
      - Factory EDIDs
      - Last attached EDIDs
      - User EDIDs
  - **KM**
    - U1
    - D1
    - D2
  - **System status**
    - Device info
    - Link status
    - SFP+ #1
    - SFP+ #2
    - Bonding state
  - **Operation**
    - Temperatures
    - Voltages
  - **System settings**
    - Network
    - Application mode
    - Front panel
    - Restart device
    - Bootload mode

**TRX** (Transceiver)

**HOME SCREEN**

- **MAIN MENU**
  - **Ports**
    - TRX I2
      - HDMI input
      - Stream output
    - TX O1
      - Stream input
      - HDMI output
    - TRX O2
      - HDMI output
      - Source Mux
    - TRX O1
      - Stream output
      - HDMI output
    - Source Mux
  - **EDID**
    - View
      - Factory EDIDs
      - Last attached EDIDs
      - User EDIDs
    - Emulated EDIDs
  - **KM**
    - U1
    - D1
    - D2
  - **System status**
    - Device info
    - Link status
    - SFP+ #1
    - SFP+ #2
    - Bonding state
  - **Operation**
    - Temperatures
    - Voltages
  - **System settings**
    - Network
    - Application mode
    - Front panel
    - Restart device
    - Bootload mode
4.2. Introduction

4.2.1. Menu Navigation

The front panel has a color LCD that shows the most important settings and parameters structured in a menu. The jog dial control knob can be used to navigate between the menu items or change the value of a parameter. The knob can be turned and clicked to enter a menu or edit/set a parameter.

*TIPS AND TRICKS:* The faster you rotate the jog dial, the faster the parameter list is scrolled.

4.2.2. Operation Mode Visualization

The current operation mode of the UBEX endpoint is displayed with two methods on the LCD screen for the easier recognition:

- The color of the header is *blue* for the transmitter, *white* for the receiver, and *black with a white stripe* for the transceiver;
- There is a *TX*, *RX*, or *TRX* label in the main menu of the menu structure.

4.2.3. Parameter Selection

The *blue* colored line means the selected menu/parameter, the *green* one means the current setting.

4.3. Home Screen

The current status of the input and output ports of the device is summarized on the Home screen. The device label (which can be modified by the user) and the operation mode is displayed in the top row.

The device label can be modified via the following methods:

- *Using the Lightware Device Controller (LDC) software* - see the details in the Device Information (for TX and TRX operation modes) and in the Device Information (RX and TRX operation modes) sections.
- *Using LW3 protocol command* - see the details in the Set the Device Label section.

The icons display information about the port and the incoming/transmitted signals.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Icon is blue (inactive)</th>
<th>Icon is white (active)</th>
</tr>
</thead>
<tbody>
<tr>
<td>🔄</td>
<td>Sink is not connected</td>
<td>Sink is connected</td>
</tr>
<tr>
<td>🔒</td>
<td>Signal is not present</td>
<td>Signal is present</td>
</tr>
<tr>
<td>🔒</td>
<td>Signal is not encrypted with HDCP</td>
<td>Signal is encrypted with HDCP</td>
</tr>
<tr>
<td>🔊</td>
<td>No audio signal in the video stream</td>
<td>Audio is embedded in the video stream</td>
</tr>
</tbody>
</table>

Take any action (turning or pressing) with the jog dial control knob to enter the **Main menu**.
4.4. Ports Menu - Transmitter Operation Mode

The most important status information of the HDMI input and local output ports are available in the Ports menu.

Select the desired input or output port and enter to see the submenus.

4.4.1. TX I1 and TX I2 Ports

**HDMI Input**

Information about the HDMI inputs are displayed:

- +5V present
- Signal present
- Active resolution
- Total resolution
- Color space

**Stream Output**

Information about the streams coming from the HDMI inputs are displayed:

- Signal present
- Active resolution
- Total resolution
- Color space

4.4.2. TX O1 and TX O2 Ports

The following information is displayed for both local output ports:

- Hotplug detect
- Signal present
- Active resolution
- Total resolution
- Color space

4.5. Ports Menu - Receiver Operation Mode

The most important status information of the HDMI output ports are available in the Ports menu.

Select the desired output port and enter to see the submenus.

4.5.1. RX HDMI Output 1 and 2 Ports

**Stream Input**

The following information is related to the video stream coming from the TX input ports:

- Signal present
- Active resolution
- Total resolution
- Color space

**HDMI Output**

The following information is displayed in the case of both output ports of the receiver:

- Hotplug detect
- Signal present
- Active resolution
- Total resolution
- Color space

**Source Mux**

The source multiplexer (Source MUX) makes routing several different source signals to the HDMI output ports available. See more details about this function in the Receiver Mode section.

- **Stream (D1) / Stream (D2)** - The signal source of the output port is the stream coming from the remote device.
- **Loopback (I1) / Loopback (I2)** - The signal source of the output port is the stream of the local input port of the receiver.
- **Copy (O1)** - The device is able to copy the signal of the HDMI out 1 port. This is the COPY function.

**INFO:** The Copy function is available only on the HDMI out 2 (TX O2) port.

4.5.2. RX I1 and RX I2 Ports

The following information is displayed for both local input ports:

The HDCP setting and information about the HDMI inputs are displayed:

- +5V present
- Signal present
- Active resolution
- Total resolution
- Color space
4.6. Ports Menu - Transceiver Operation Mode

The most important settings and status information of the HDMI input 1 and the HDMI output ports are available in the Ports menu.

Select the desired output port and enter to see the submenus.

4.6.1. TRX I2 Port

HDMI Input

Information about the HDMI input 2 port are displayed:
- +5V present
- Signal present
- Active resolution
- Total resolution
- Color space

Stream Output

The following information is related to the video stream that is sent toward the remote TRX endpoint:
- Signal present
- Active resolution
- Total resolution
- Color space

4.6.2. TRX O1 Port

Stream Input

The following information is related to the video stream coming from the input port of the remote TRX endpoint:
- Signal present
- Active resolution
- Total resolution
- Color space

HDMI Output

The following information are displayed for the HDMI output 2 port of the transceiver:
- Hotplug detect
- Signal present
- Active resolution
- Total resolution
- Color space

4.6.3. TRX O2 Port

The following information is displayed for the local output port:
- Hotplug detect
- Signal present
- Active resolution
- Total resolution
- Color space

Source Mux

The source multiplexer (Source MUX) makes routing several different source signals to the HDMI out 2 port available. See more details about this function in the Transceiver Mode section.

- Loopback (I2) - The signal source of the output port is the stream of the HDMI in 2 port of the transceiver.
- Copy (O1) - The device is able to copy the signal of the HDMI out 1 port. This is the COPY function.

4.7. EDID Menu

Reduced Advanced EDID Management is available in the front panel LCD menu, which allows for an EDID to be viewed. See more information about EDID technology in the EDID Management section. The EDID memory structure of the device can be found in the Advanced EDID Management section.

4.7.1. View

Select the desired EDID memory block: Factory EDIDs, Last Attached EDIDs, User EDIDs, or Emulated EDIDs (only in case of the transmitter). Select the Name item and press the knob. Use the jog dial to step between the EDIDs. The following information can be checked:
- Preferred Resolution
- Monitor Name
- Audio Info
4.8. KM Menu

DIFFERENCE: Only UBEX-PRO20-HDMI-F120 model is built with USB K+M ports.

The most important settings and status information of the USB K+M function are displayed in the menu. Three submenus are under the KM menu: U1, D1 and D2. The following table describes the meaning of these ports:

<table>
<thead>
<tr>
<th>USB Port</th>
<th>Physical port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1</td>
<td>USB-B</td>
<td>U as Upstream</td>
</tr>
<tr>
<td>D1</td>
<td>USB-A (right (M) side)</td>
<td>D1 as Downstream 1</td>
</tr>
<tr>
<td>D2</td>
<td>USB-A (left (K) side)</td>
<td>D2 as Downstream 2</td>
</tr>
</tbody>
</table>

4.8.1. U1

Available Information:
- Device State
- VBus Present

4.8.2. D1 and D2

Available Information:
- Device Present
- Interface Classes
- Device Class
- Product Name
- Manufacturer
- Enumeration State
- Composite Capability

4.9. System Status Menu

The most important status information is displayed about the endpoint in the menu.

Device Info

Hardware- and software-related information is listed in the submenu, e.g. device label - this is a user defined unique name, which can be set in the LDC software (see the details in the Status Tab section) or with LW3 protocol command (see the details in the Set the Device Label section), and serial number, firmware version, etc.

Link Status

The current status of the optical or DAC connection, advanced information about the installed SFP+ modules, and the bonding state are available under the menu.

Operation

The uptime and the operation time can be read out from the menu.

Temperatures

The recent temperature of the CPU, the system, and the FPGA are displayed in the menu.

ATTENTION! If the front panel Status LED blinks, check the temperatures under this menu and ensure the correct air flow for the device.

Voltages

The recent voltages of the device are displayed in the menu.

WARNING! If the front panel Status LED blinks, power off the device immediately.
4.10. System Settings Menu

System related settings are available in the menu, e.g. application mode changing (from matrix mode to extender mode), front panel settings, reset the device, etc.

4.10.1. Network

The MAC address of the device can be read out in the menu.

4.10.2. Application Mode

The current application mode (Extender or Matrix) is displayed in this submenu. For more details about the two modes, see the Application Modes section.

**ATTENTION!** The application change is not allowed when the endpoint device is connected to the MMU.

Follow the steps to change the application mode to Extender mode:

**Step 1.** Navigate to the System Settings / Application Mode submenu.

**Step 2.** Select the Switch Mode... option.

**Step 3.** Confirm the selection, press the Yes.

**Step 4.** The endpoint changes the application mode to Extender immediately.

#applicationmode #extendermode #matrixmode

4.10.3. Front Panel

Display Backlight

The brightness of the LCD can be set from 1 to 10 on a scale.

Dark Mode

The dark mode feature can be enabled or disabled. It keeps the LCD screen and the LEDs unlit to hide the device during an event when the mode is enabled.

#darkmode

Rotary Direction

The rotary direction of the jog dial control knob can be set in two ways: CW Down (clockwise down) or CCW Down (counter clockwise down).

#rotary #jogdial

4.10.4. Restart Device

This setting makes it possible to restart the device. It results in a reboot only and DOES NOT reload the factory default settings.

#restart #reboot

4.10.5. Bootload Mode

Special function for entering the firmware update mode (bootload mode).

#bootload
5. Installation

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

- Mounting Options - F-series Endpoint Devices
- Mounting Options - R-series Endpoint Devices
- Rack Shelf Mounting - MMU
- Electrical Connections
- Connections
- SFP / SFP+ Slot Connection
- Fiber Optical Cable Connections
- Copper Cable Connections
- Connection between the Switch and R-series Endpoints
- Ethernet Switch - Detailed Requirements
- Ethernet Switch Configuration
- Startup of the System
5.1. Mounting Options - F-series Endpoint Devices

Devices can be mounted in several ways, depending on the application. Besides using with rack shelf, a mounting bracket is available, which offers easy mounting on truss systems with standard clamps. The bracket can also be used for building the unit into the furniture:

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

**Attention!** Pay attention to the ventilation holes when designing the system, especially when the extender is built into/under furniture. Front and rear ventilation holes must not be covered. If a UBEX device is installed in a closed space, the designer shall provide satisfactory ventilation to prevent excessive heat build-up inside.

**Info:** The endpoint device is half-rack sized.

To order mounting accessories, please contact sales@lightware.com.

### 5.1.1. Mounting Bracket V2

Mounting bracket V2 gives an opportunity to mount the device to any furniture surface. Fasten the bracket on the side of the unit with the provided screws, and fasten it to a stand / board / truss / furniture.

**Warning!** M3x6 size is the longest allowed screw for fixing the ears to the housing. Using different (e.g. longer) ones may cause damage to the device.

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

**Fixing the Bracket to the Device**

Fasten the mounting bracket on the side of the unit with the provided screws (4 pcs M3 screws per Mounting bracket V2).

**Warning!** Pay attention to the ventilation holes when designing the system. Front and rear ventilation holes must not be covered.

### 5.1.2. Rack Shelf Mounting

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

**Warning!** Pay attention to the ventilation holes when designing the system. Front and rear ventilation holes must not be covered.

**Info:** The screws for the rack frame are not supplied with the device.
5.2. Mounting Options - R-series Endpoint Devices

UBEX R-series endpoint devices can be mounted in several ways, depending on the application. They can be mounted into the rack in pairs, or can be used standalone. Rack ears also serve easy handling and bump protection, and there are mounting threads on top and one side to conform strict installation safety regulations.

**ATTENTION!** To ensure the correct ventilation and avoid overheating, leave enough free space in front of and behind of the appliance and keep the ventilation holes free.

5.2.1. Truss Mounting

There are mounting threads on top and on one side for safe and secure installation. Rigging the handles with a safety wire rope is highly recommended for safety reasons.

To order mounting accessories, please contact sales@lightware.com. (Truss clamp and safety wire rope are not available for sales.)

5.2.2. Standard Rack Installation with Two Units

Rack mounting kit includes all necessary accessories for standard rack installation:

- 2 pcs rack ears (PN: 52400959 (2x)),
- 12 pcs. black, M4x8mm hexagon socket countersunk head screws.

Rack mounting kit is not supplied with the product, it can be purchased separately, please contact sales@lightware.com.

**Step 1.** Take two devices directly next to each other.

**Step 2.** Two mounting holes on the front ears and two on the back of the chassis is for fastening the two units to each other with 2x 2 pcs M4x8 mm screws. This way you get a one-rack wide and 1U high device.
5. Installation

**ATTENTION!** Take care of the mounting direction of the screws!

**Front side**

- Screw from the left
- Threaded hole on this side

**Rear side**

- Threaded hole on this side
- Screw from the right

**Mounting direction of the screws**

**Step 3.** Take the rack ears on the left and right side of the extender pair as shown in the picture. Insert the screws into the holes and fix the front ears to the devices.

**Step 4.** As a final step, mount the unit in the rack.

**ATTENTION!** Always use all four screws for fixing the rack ears to the rack rail. Choose properly sized screws for mounting. Keep a minimum of two threads left after the nut screw.

**Assembly of the mounting ears**

**Mounting the rack ears to the rack rail**
5.2.3. Standard Rack Installation with One Unit

Lightware provides a rack installation possibility for only one R100 unit with a standard and an extended rack ears. The rack mounting kit includes all necessary accessories for standard rack installation:

- 2 pcs rack ears (PN: 52400959 (1x) and 55450168 (1x)),
- 8 pcs black, M4x8mm hexagon socket countersunk head screws.

Rack mounting kit is not supplied with the product, it can be purchased separately, please contact sales@lightware.com.

**Step 1.** Take the rack ears on the left and right side of the extender pair as shown in the picture. Insert the screws into the holes and fix the front ears to the devices.

**Step 2.** As a final step, mount the unit in the rack.

**ATTENTION!** Always use all four screws for fixing the rack ears to the rack rail. Choose properly sized screws for mounting. Keep a minimum of two threads left after the nut screw.
5.3. Rack Shelf Mounting - MMU

Two rack ears are supplied with the product, which are fixed on left and right side with 2x 4 pcs M4 screws. The default position allows mounting the device as a standard rack unit installation.

WARNING! M4x8 size is the longest allowed screw for fixing the ears to the housing. Using different (e.g. longer) ones may cause damage to the device.

WARNING! Pay attention to the ventilation holes when designing the system. Front and rear ventilation holes must not be covered.

INFO: The screws for the rack frame are not supplied to the device.

INFO: The device is rack sized and 1U high.

5.4. Electrical Connections

The following sections describe all possible electrical connections of the UBEX endpoint and MMU devices.

5.4.1. SFP / SFP+ Slots

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.*

UBEX F-series endpoint devices and the Matrix Management Unit contain standard 1x SFP (in the case of the MMU) and 2x SFP+ (in the case of the endpoint devices) slots for the fiber optical connections via SFP / SFP+ modules or DAC cables. The installed SFP / SFP+ modules can be singlemode or multimode as well.

<table>
<thead>
<tr>
<th>F-series endpoint devices</th>
<th>MMU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of slots</td>
<td>2</td>
</tr>
<tr>
<td>Type of the slot</td>
<td>SFP+</td>
</tr>
<tr>
<td>Maximum bandwidth per slot</td>
<td>10 Gbps</td>
</tr>
<tr>
<td>Transmitted signal</td>
<td>Audio, video, Ethernet, RS-232, Infrared, USB K+M</td>
</tr>
</tbody>
</table>

For the details about the DAC cable / SFP+ module installation, see the SFP / SFP+ Slot Connection 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 lost during the transmission.


5.4.2. AC Power Connection

Standard IEC IEC Connector

UBEX F-series endpoint devices and the Matrix Management Unit contain standard IEC power connector and work with 100 to 240 Volts AC, 50 Hz or 60 Hz power sources.

Connect the power cord to the AC input connector; the extender is immediately powered on.
Neutrik powerCON TRUE1 Connector
UBEX R-series endpoint devices contain Neutrik powerCON TRUE1 NAC3MPX-WOT power connector and work with 100 to 240 Volts AC, 50 Hz or 60 Hz power sources.
Connect the Neutrik powerCON to the AC input connector; the extender is immediately powered on.
See the details about the assembly instructions for the Neutrik powerCON TRUE1 cables on the website of the vendor:
https://www.neutrik.com/en/product/nac3mx-w-top

5.4.3. Symmetrical Analog Stereo Audio Connector
5-pole Phoenix connector is used for balanced analog audio (line in/out). Unbalanced audio signals can be connected as well. For asymmetrical output, connect only + and ground. For asymmetrical input connect + and ground to the source and connect – to the ground.
Compatible Plug Type
Phoenix® Combicon series (3.5mm pitch), type: MC 1.5/5-ST-3.5.

5.4.4. USB-A Connectors
UBEX-PRO20-HDMI-F120 endpoint model provides USB-A connectors for supporting K+M functionality. The device has 2 pieces of USB 2.0 A-type connectors.
ATTENTION! The USB K+M function supports emulated (composite) mode only. It means in the practice the perfect usage of special keyboard/mouse buttons (e.g. multimedia keyboards and touchpads) are not guaranteed because of the limitation of the emulated mode technology. Lightware recommends usage of ordinary keyboards built up to 104/105 keys and ordinary mice.

5.4.5. USB-B Connector
UBEX-PRO20-HDMI-F120 endpoint model provides a USB-B connector for supporting K+M functionality. The device has 1x USB 2.0 B-type connector.

INFO: The USB control function of the MMU will be added by future firmware update.

5.4.6. RS-232 Connector
UBEX-PRO20-HDMI-F110 / F120 endpoint models and the Matrix Management Unit contains a 3-pole Phoenix connector, which is used for RS-232 serial connection.

Compatible Plug Type
Phoenix® Combicon series (3.5mm pitch, 3-pole), type: MC 1.5/3-ST-3.5.
You can find help for the correct wiring in the Serial Ports section.
You can find more information about serial interface in the Serial Interface section.

5.4.7. USB Mini-B Connector
UBEX series devices provide standard USB 2.0 mini B-type connector for software control and firmware update purpose.

INFO: The USB control function of the MMU will be added by future firmware update.

5.4.8. IR Connector
IR detector and IR emitter can be connected to the endpoint device with TRS (Tip, Ring, and Sleeve) connectors. They are also known as (3.5 mm or approx. 1/8”) audio jack, phone jack, phone plug, and mini-jack plug. The pin assignments are the following for the detector and the emitter:

INFO: Ring pole of the emitter is optional. If your IR emitter has three-pole TRS plug, then the Ring and the Sleeve are the same signal (Output -).
You can find more information about IR interface in the Infrared Interface section.
5.4.9. HDMI Connector

The endpoint device provides standard 19-pole HDMI connector for inputs and outputs with HDMI 2.0 support. Always use high quality HDMI cable for connecting sources and displays. See more details about the AV interfaces in the Video Interface and the Audio Interface sections.

5.4.10. Ethernet Connectors

Standard RJ45 Connector

UBEX F-series endpoint devices and the Matrix Management Unit provide standard RJ45 connectors for LAN and user Ethernet access. Always use high quality Ethernet cable.

Neutrik etherCON Connector

UBEX R-series endpoint devices provide Neutrik etherCON NE8FDV-YK connector for LAN and user Ethernet access.

**ATTENTION!** The connector does not work with CAT6 cable connector (NE8MC6-MO) and NKE6S* cables.

Wiring of LAN Cables

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

<table>
<thead>
<tr>
<th>Pin</th>
<th>TIA/EIA T568A Wire color</th>
<th>TIA/EIA T568B Wire color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>white/green</td>
<td>white/orange</td>
</tr>
<tr>
<td>2</td>
<td>green</td>
<td>orange</td>
</tr>
<tr>
<td>3</td>
<td>white/orange</td>
<td>white/green</td>
</tr>
<tr>
<td>4</td>
<td>blue</td>
<td>blue</td>
</tr>
<tr>
<td>5</td>
<td>white/blue</td>
<td>white/blue</td>
</tr>
<tr>
<td>6</td>
<td>orange</td>
<td>green</td>
</tr>
<tr>
<td>7</td>
<td>white/brown</td>
<td>white/brown</td>
</tr>
<tr>
<td>8</td>
<td>brown</td>
<td>brown</td>
</tr>
</tbody>
</table>

**Warning!** Never connect non-assembled CATx cable to the port while the unit is powered, it may damage the device.

5.4.11. Neutrik opticalCON Connectors

UBEX R-series endpoint devices are built with singlemode or multimode Neutrik opticalCON connectors.

<table>
<thead>
<tr>
<th>Number of connectors</th>
<th>Connector drawing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td><img src="image1" alt="Connector drawing" /></td>
</tr>
<tr>
<td>2</td>
<td><img src="image2" alt="Connector drawing" /></td>
</tr>
<tr>
<td>1</td>
<td><img src="image3" alt="Connector drawing" /></td>
</tr>
<tr>
<td>1</td>
<td><img src="image4" alt="Connector drawing" /></td>
</tr>
<tr>
<td>1</td>
<td><img src="image5" alt="Connector drawing" /></td>
</tr>
</tbody>
</table>

**Type of the SFP+ module inside the enclosure**

<table>
<thead>
<tr>
<th>Connector type</th>
<th>Module A: 1x Finisar FTLX2072D027</th>
<th>Module B: 1x Finisar FTLX2072D033</th>
</tr>
</thead>
<tbody>
<tr>
<td>2x Finisar FTLX8574D3BCL</td>
<td>2x Finisar FTLX1475D3BCL</td>
<td>2x Finisar FTLX8574D3BCL</td>
</tr>
</tbody>
</table>

**Mode**

<table>
<thead>
<tr>
<th>Connector type</th>
<th>Multimode</th>
<th>Singlemode</th>
<th>Singlemode</th>
<th>Multimode</th>
<th>Singlemode</th>
</tr>
</thead>
<tbody>
<tr>
<td>2x Finisar FTLX8574D3BCL</td>
<td>2x Finisar FTLX1475D3BCL</td>
<td>2x Finisar FTLX8574D3BCL</td>
<td>2x Finisar FTLX1475D3BCL</td>
<td>2x Finisar FTLX8574D3BCL</td>
<td>2x Finisar FTLX1475D3BCL</td>
</tr>
</tbody>
</table>

**Supported cable**

<table>
<thead>
<tr>
<th>Connector type</th>
<th>LC, Neutrik opticalCON DUO</th>
<th>LC, Neutrik opticalCON DUO</th>
<th>LC, Neutrik opticalCON DUO</th>
<th>Neutrik opticalCON QUAD</th>
<th>Neutrik opticalCON QUAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2x Finisar FTLX8574D3BCL</td>
<td>2x Finisar FTLX1475D3BCL</td>
<td>2x Finisar FTLX8574D3BCL</td>
<td>2x Finisar FTLX1475D3BCL</td>
<td>2x Finisar FTLX8574D3BCL</td>
<td>2x Finisar FTLX1475D3BCL</td>
</tr>
</tbody>
</table>

**Number of required optical cables for 20GbE**

<table>
<thead>
<tr>
<th>Connector type</th>
<th>2x Neutrik opticalCON DUO / 4x LC simplex / 2x LC duplex</th>
<th>1x Neutrik opticalCON DUO / 2x LC simplex</th>
<th>1x Neutrik opticalCON QUAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2x Finisar FTLX8574D3BCL</td>
<td>2x Finisar FTLX1475D3BCL</td>
<td>2x Finisar FTLX8574D3BCL</td>
<td>2x Finisar FTLX1475D3BCL</td>
</tr>
</tbody>
</table>

**ATTENTION!** The 2xSM-Bidi-DUO model does not support the Neutrik opticalCON DUO crossed fiber wiring (A-A; B-B) cables. Please use standard (A-B) cable only.

See the details about the maximum fiber cable extensions in the R-series Endpoints section.

See more details about the cabling between the Neutrik optical connectors and the SFP+ modules installed in a F-series endpoint or a network switch in the Connection between the Switch and R-series Endpoints section.
5.5. Connections

5.5.1. F-series Endpoints - Transmitter Operation Mode

Connections for the F120 model in transmitter operation mode

Changing the Operation Mode

The operation mode of the UBEX endpoint device can be changed using the following methods.

Before connecting the device to the network and the MMU:
- via front panel LCD menu;

After connecting the device to the network and the MMU:
- via Lightware Device Controller (LDC) software - see the details in the Device Map section;
- via LW3 protocol command - see the details in the Set the Operation Mode section.

For all F-series models

- Connect singlemode or multimode (depends on the installed SFP+ modules) fiber optical cables or DAC cables between the transmitter and the Layer 3 (L3) network switch. The Matrix Mode is detected and applied automatically in the device once the MMU claims the endpoint.

For F110 and F120 models only

- Connect an audio sink device (e.g. active speakers) to the audio output connector.
- Connect a power adaptor to the AC input on the transmitter first, then to the AC power socket.

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

INFO: The HDMI output ports can be used as local output ports only when the device is configured as transmitter.
5.5.2. F-series Endpoints - Receiver Operation Mode

Changing the Operation Mode
The operation mode of the UBEX endpoint device can be changed using the following methods.

Before connecting the device to the network and the MMU:
• via front panel LCD menu;

After connecting the device to the network and the MMU:
• via Lightware Device Controller (LDC) software - see the details in the Device Map section;
• via LW3 protocol command - see the details in the Set the Operation Mode section.

Connections for the F120 model in receiver operation mode

Connect singlemode or multimode (depends on the installed SFP+ modules) fiber optical cables or DAC cables between the receiver and the Layer 3 (L3) network switch. The Matrix Mode is detected and applied automatically in the device once the MMU claims the endpoint.

OPT
DAC
FOR ALL F-SERIES MODELS
Connect singlemode or multimode (depends on the installed SFP+ modules) fiber optical cables or DAC cables between the receiver and the Layer 3 (L3) network switch. The Matrix Mode is detected and applied automatically in the device once the MMU claims the endpoint.

OPT
DAC
FOR F120 MODELS ONLY
Optionally connect the receiver to a LAN in order to control the device.

USB-B
USB-A
FOR F110-F120 MODELS ONLY
Optionally for USB HID extension: connect the receiver to the computer by the USB-B cable.

FOR F120 MODELS ONLY
Optionally for USB HID extension: connect the receiver to the computer by the USB-B cable.

INFO: The HDMI input ports can be used as local input ports only when the device is configured as receiver.

WARNING! User Ethernet is also transmitted over the SFP+ interface, so be sure not to create a network loop.
5.5.3. F-series Endpoints - Transceiver Operation Mode

Connections for the F120 model in transceiver operation mode

Changing the Operation Mode

The operation mode of the UBEX endpoint device can be changed using the following methods.

Before connecting the device to the network and the MMU:
- via front panel LCD menu;

After connecting the device to the network and the MMU:
- via Lightware Device Controller (LDC) software - see the details in the Device Map section;
- via LW3 protocol command - see the details in the Set the Operation Mode section.

For all F-series models
- Connect singlemode or multimode (depends on the installed SFP+ modules) fiber optical cables or DAC cables between the transceiver and the Layer 3 (L3) network switch. The Matrix Mode is detected and applied automatically in the device once the MMU claims the endpoint.

For F110 and F120 models only
- Connect an audio source (e.g. media player) to the audio input connector.
- Connect an audio sink device (e.g. audio amplifier) to the audio output connector.
- Optionally for RS-232 extension: connect the controlled unit (e.g. 4K TV) to the RS-232 port of the device with a serial cable.

For F120 model only
- Connect singlemode or multimode (directly on the SFP+ module) fiber optical cables between the transceiver and Layer 3 network switch.

USB-B
- Optionally for USB HID extension: connect the transceiver to the computer by the USB-B cable.

USB-A
- Optionally for USB HID extension: connect the USB HID devices to the transceiver (preferably mouse and keyboard).

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

INFO: The HDMI input 1 port cannot accept AV signal when the device is configured as transceiver.
5.5.4. R-series Endpoints - Transmitter Operation Mode

2xMM-2xDUO and 2xSM-2xDUO

Connect the source devices (e.g., PC, Blu-ray player) using the HDMI input 1 and 2 ports by HDMI cables.

Connect the local sink devices (e.g., monitor, 4K TV) to the HDMI output 1 and 2 ports by HDMI cables. The ports transmit the original streams of the HDMI input ports.

Optionally connect the transmitter to a LAN in order to control the device.

Connect the power adaptor to the AC input on the transmitter first, then to the AC power socket.

For all R-series models:

2xMM-2xDUO

Connect the device and the L3 network switch by 2 pcs multimode Neutrik opticalCON DUO or 4 pcs multimode LC fiber optical cables.*

2xMM-QUAD

Connect the device and the L3 network switch by a multimode Neutrik opticalCON QUAD fiber optical cable.*

2xSM-2xDUO

Connect the device and the L3 network switch by 2 pcs singlemode Neutrik opticalCON DUO or 4 pcs singlemode LC fiber optical cables.*

2xSM-QUAD

Connect the device and the L3 network switch by a singlemode Neutrik opticalCON QUAD fiber optical cable.*

2xSM-BiDi-DUO

Connect the device and the L3 network switch by a singlemode Neutrik opticalCON DUO BiDi or 2 pcs singlemode LC fiber optical cables. *The connector does not support the Neutrik opticalCON cross cable. Please use standard cable only.

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

INFO: The HDMI output ports can be used as local output ports only when the device is configured as transmitter.

* You can find more information about the cabling between the switch the R-series endpoint devices in the Connection between the Switch and R-series Endpoints section.
5.5.5. R-series Endpoints - Receiver Operation Mode

2xMM-2xDUO and 2xSM-2xDUO

Connect the local source devices (e.g., PC, Blu-ray player) using the HDMI input 1 and 2 ports by HDMI cables.

Connect the sink devices (e.g., monitor, projector) to the HDMI output 1 and 2 ports by HDMI cables.

Optionally connect the receiver to a LAN in order to control the device.

Connect the power adaptor to the AC input on the receiver first, then to the AC power socket.

For all R-series models:

- **2xMM-2xDUO**
  - Connect the device and the L3 network switch by 2 pcs multimode Neutrik opticalCON DUO or 4 pcs multimode LC fiber optical cables. *

- **2xMM-QUAD**
  - Connect the device and the L3 network switch by a multimode Neutrik opticalCON QUAD fiber optical cable. *

- **2xSM-2xDUO**
  - Connect the device and the L3 network switch by 2 pcs singlemode Neutrik opticalCON DUO or 4 pcs singlemode LC fiber optical cables. *

- **2xSM-QUAD**
  - Connect the device and the L3 network switch by a singlemode Neutrik opticalCON QUAD fiber optical cable. *

- **2xSM-BiDi-DUO**
  - Connect the device and the L3 network switch by a singlemode Neutrik opticalCON DUO BiDi or 2 pcs singlemode LC fiber optical cables. *The connector does not support the Neutrik opticalCON cross cable. Please use standard cable only.

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

**INFO:** The HDMI input ports can be used as local input ports only when the device is configured as receiver.

* You can find more information about the cabling between the switch the R-series endpoint devices in the Connection between the Switch and R-series Endpoints section.
5. Installation

5.5.6. R-series Endpoints - Transceiver Operation Mode

2xMM-2xDUO and 2xSM-2xDUO

- **HDMI in**
  - Connect the source device (e.g. PC) using the HDMI input 2 port by an HDMI cable.

- **HDMI out**
  - Connect a sink device (e.g. monitor) to the HDMI output 1 port by an HDMI cable.

- **Local HDMI out**
  - Connect a local sink device (e.g. 4K TV) to the HDMI output 2 port by an HDMI cable. The port transmits the original stream of the HDMI in 2 port.

- **Ethernet**
  - Optionally connect the transceiver to a LAN in order to control the device.

- **Power**
  - Connect the power adaptor to the AC input on the transceiver first, then to the AC power socket.

2xMM-QUAD and 2xSM-QUAD

- **OPT DUO**
  - Connect the device and the L3 network switch by 2 pcs multimode Neutrik opticalCON DUO or 4 pcs multimode LC fiber optical cables. *

- **OPT QUAD**
  - Connect the device and the L3 network switch by a multimode Neutrik opticalCON QUAD fiber optical cable. *

2xSM-BiDi-DUO

- **OPT BiDi DUO**
  - Connect the device and the L3 network switch by a singlemode Neutrik opticalCON DUO BiDi or 2 pcs singlemode LC fiber optical cables. * The connector does not support the Neutrik opticalCON cross cable. Please use standard cable only.

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

**INFO:** The HDMI input 1 port cannot accept AV signal when the device is configured as transceiver.

* You can find more information about the cabling between the switch the R-series endpoint devices in the Connection between the Switch and R-series Endpoints section.
5.5.7. Matrix Management Unit (MMU)

Two possibilities are available to connect the MMU to the Layer 3 (L3) network switch:

- **via Ethernet:** use the CATx port of the UBEX Network for the Ethernet connection between the devices, OR
- **via SFP port:**
  - use a singlemode or multimode (depends on the installed SFP (not SFP+) modules) fiber optical cables or DAC cables between the MMU and the Layer 3 (L3) network switch.
  - use CATx cable between the MMU and the Layer 3 (L3) network switch when RJ45 SFP (not SFP+) module is installed to the slot.

**Connecting to the LAN network:**

Connect a controller device (e.g. PC, laptop) to the MMU with a CATx cable for the connection to the LAN network.

**Connecting to third-party devices:**

Optionally connect third-party controller devices (e.g. system controller, touch controller) with a serial cable via the RS-232 1 and 2 connectors.

**Power:**

Connect the power adaptor to the AC input on the MMU first, then to the AC power socket.

**ATTENTION!** Pay attention that the rear panel Ethernet connector supports 1 Gbps, the front panel Ethernet connector supports 100 Mbps Ethernet connection.

**INFO:** The USB control function will be added by future firmware update.
5.6. SFP / SFP+ Slot Connection

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

5.6.1. Installation of SFP / SFP+ Modules

Endpoint Devices

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

INFO: It is recommended to install 2x 10 GbE SFP+ modules per endpoint in the case of HDMI 2.0 (4K@60 Hz 4:4:4) signal transmission.

Matrix Management Unit

The UBEX-MMU-X200 Matrix Management Unit has one SFP module slot for the fiber optical connection via the network switch.

ATTENTION! The SFP port slot can handle SFP module up to 1 GbE support.

Inserting and Cabling of SFP / SFP+ Modules

Step 1. Put up on the handle bar.
Step 2. Connect the module to the to one of the SFP / SFP+ port slot.
Step 3. Connect the LC connectors / RJ45 Ethernet cables to the SFP / SFP+ modules.

INFO: The SFP / 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 module into the port.

Removing SFP / SFP+ Modules

Step 1. Disconnect the LC connectors / RJ45 Ethernet cables from the SFP / SFP+ module.
Step 2. Pull down on the handle bar.
Step 3. Gently slide out the SFP / SFP+ module from the slot.

5.6.2. Installation of DAC Cables

Endpoint Devices

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

INFO: It is recommended to install 2x 10 GbE DAC cables in the case of HDMI 2.0 (4K@60 Hz 4:4:4) signal transmission.

Matrix Management Unit

The UBEX-MMU-X200 Matrix Management Unit can be connected via DAC (Direct Attach Copper) cables to the network switch.

ATTENTION! The SFP port slot can handle SFP module up to 1 GbE support.

Inserting the DAC Cables

Step 1. Push the plug of the DAC cable to one of the SFP / SFP+ port slot of the transmitter to stop.
Step 2. Push the other plug of the DAC cable to one of the SFP / SFP+ port slot of the receiver to stop.

Removing the DAC Cables

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

INFO: See more details about the SFP / SFP+ interfaces in the SFP / SFP+ Interfaces section.
5.7. Fiber Optical Cable Connections

The section describes how to connect the fiber optical cables between two SFP+ modules or between two Neutrik opticalCON connectors in case of F and R-series endpoint devices.

5.7.1. Connection between SFP+ Modules

Affected models:
- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110
- UBEX-PRO20-HDMI-F120

Connect multimode or singlemode fiber optical cables with LC simplex connectors to the SFP+ modules like in the illustration on the right.

**ATTENTION!** Always check the direction of the optical signal. The TX port of the module is highlighted with an arrow pointing outward from the device, the RX port of the module is highlighted with another arrow pointing inward to the device.

5.7.2. Connection between BiDi (Bidirectional) SFP+ Modules

Affected models:
- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110
- UBEX-PRO20-HDMI-F120

Connect multimode or singlemode fiber optical cables with LC simplex connectors to the BiDi SFP+ modules like in the illustration on the right.

**ATTENTION!** The Module A must be connected to the Module B. Always check the wavelength of the BiDi modules. If the wavelengths are different, the cabling might be also different and the modules shall be connected across.

5.7.3. Connection between Neutrik opticalCON DUO Connectors

Affected models:
- UBEX-PRO20-HDMI-R100 2xMM-2xDUO
- UBEX-PRO20-HDMI-R100 2xSM-2xDUO

Connect multimode or singlemode fiber optical cables with LC simplex connectors to the Neutrik opticalCON DUO connectors like in the illustration on the right.

**ATTENTION!** Always check the direction of the optical signal. The Port A must be connected to the Port B.

5.7.4. Connection between Neutrik opticalCON DUO BiDi Connectors

Affected model:
- UBEX-PRO20-HDMI-R100 2xSM-BiDi-DUO

Connect multimode or singlemode fiber optical cables with LC simplex connectors to the Neutrik opticalCON DUO connectors like in the illustration on the right.

**ATTENTION!** Always check the direction of the optical signal. The Port A must be connected to the Port B.

5.8. Copper Cable Connections

The section describes how to connect the CATx copper Ethernet cables between two SFP+ to RJ45 modules in case of F-series endpoint devices.

Affected models:
- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110
- UBEX-PRO20-HDMI-F120

Connect CAT6A or CAT7 (AWG24 or higher category) 10G Ethernet cable to the SFP+ to RJ45 modules.

**ATTENTION!** Always apply equal length copper cables for both SFP+ to RJ45 modules in case of 20G signal transmission. Different cable lengths may cause data package loss.

INFO: In case of SFP+ to RJ45 module installation, the endpoint device sets the cooling fans to (minimum) 2500 rpm automatically.

TIPS AND TRICKS: AWG number shows the quality of the copper cable. The number is smaller, the quality of the cable is better and its resistance is even smaller. Smaller resistance makes possible applying longer cable.
5.9. Connection between the Switch and R-series Endpoints

L3 network switches are built with SFP+ slots, the R-series devices are built with Neutrik opticalCON DUO and QUAD fiber optical connections. This section is about how to establish connection between the switch and the R-series endpoint devices over the different type of connectors.

5.9.1. SFP+ to Neutrik opticalCON DUO

This method is working with the following endpoint models:

- UBEX-PRO20-HDMI-R100 2xMM-2xDUO
- UBEX-PRO20-HDMI-R100 2xSM-2xDUO

Connecting Steps

**Step 1.** Insert 2 pcs of 10GbE singlemode/multimode SFP+ transceiver modules to the SFP+ slots of the network switch.

**Step 2.** You need 2 pcs singlemode/multimode Neutrik opticalCON DUO series connectors and 2 pcs of singlemode/multimode fiber optical patch cables with LC duplex connectors. Connect the SFP+ modules and the back of the Neutrik opticalCON DUO connector by the patch cables (a standard LC duplex connector can be found on the back of the Neutrik opticalCON DUO connector).

**TIPS AND TRICKS:** Extra Neutrik connectors can be assembled to a blank 1U high rack shelf which can make the mounting of the connection and the cabling easier.

**Step 3.** Establish connection between the additional Neutrik opticalCON DUO connectors and the R100 endpoint device using 2 pcs of singlemode/multimode Neutrik opticalCON DUO series cables. The following figure shows the correct cabling layout of optical connectors on the R100 endpoint device:

![Layout of the 2xMM-2xDUO / 2xSM-2xDUO models (rear view)](image)

**ATTENTION!** Always be sure that the fiber optical mode of the entire fiber optical equipment (SFP+ modules, LC patch cables, Neutrik connectors, and cables) and R100 endpoint device is the same. Connecting to the 2xMM-2xDUO model requires **multimode** equipment, connecting to the 2xSM-2xDUO model requires **singlemode** equipment.

5.9.2. SFP+ to Neutrik opticalCON QUAD

This method is working with the following endpoint models:

- UBEX-PRO20-HDMI-R100 2xMM-QUAD
- UBEX-PRO20-HDMI-R100 2xSM-QUAD

Connecting Steps

**Step 1.** Insert 2 pcs of 10GbE singlemode/multimode SFP+ transceiver modules to the SFP+ slots of the network switch.

**Step 2.** You need a singlemode/multimode Neutrik opticalCON QUAD series connector and 2 pcs of singlemode/multimode fiber optical patch cables with LC duplex connectors. Connect the SFP+ modules and the back of the Neutrik opticalCON QUAD connector by the patch cables (2 pcs of standard LC duplex connectors can be found on the back of the Neutrik opticalCON QUAD connector).

**TIPS AND TRICKS:** Extra Neutrik connectors can be assembled to a blank 1U high rack shelf which can make the mounting of the connection and the cabling easier.

**Step 3.** Establish connection between the additional Neutrik opticalCON QUAD connector and the R100 endpoint device using a singlemode/multimode Neutrik opticalCON QUAD series cable. The following figure shows the correct cabling layout of the extra QUAD optical connector (the back of the extra connector can be seen on the right).
5. Installation

ATTENTION! Always be sure that the fiber optical mode of the entire fiber optical equipment (SFP+ modules, LC patch cables, Neutrik connectors, and cables) and R100 endpoint device is the same. Connecting to the 2xSM-QUAD model requires multimode equipment, connecting to the 2xQM-QUAD model requires singlemode equipment.

**Required fiber optical equipment for connecting the network switch and an R100 QUAD endpoint device**

INFO: This method does not work in the case of using DAC cables in the network switch.

5.9.3. SFP+ BiDi to Neutrik opticalCON DUO BiDi

This method is working with the following endpoint model:

- UBEX-PRO20-HDMI-R100 2xSM-BiDi-DUO

**Connecting Steps**

**Step 1.** Insert 2 pcs of 10GbE singlemode SFP+ BiDi transceiver modules to the SFP+ slots of the network switch.

**Step 2.** You need a singlemode/multimode Neutrik opticalCON DUO BiDi connector and 2 pcs of singlemode/multimode fiber optical patch cables with LC simplex connectors. Connect the SFP+ modules and the back of the Neutrik opticalCON DUO connector by the patch cables (a standard LC duplex connector can be found on the back of the Neutrik opticalCON DUO connector).

**TIPS AND TRICKS:** Extra Neutrik connectors can be assembled to a blank 1U high rack shelf which can make the mounting of the connection and the cabling easier.

**INFO:** This method does not work in the case of using DAC cables in the network switch.

**SFP+ modules behind the Neutrik opticalCON DUO connector**

<table>
<thead>
<tr>
<th>Channel</th>
<th>Type of the SFP+ module</th>
<th>Wavelength</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Finisar FTLX2072D327</td>
<td>input: 1331 nm; output: 1271 nm</td>
</tr>
<tr>
<td>B</td>
<td>Finisar FTLX2072D333</td>
<td>input: 1271 nm; output: 1331 nm</td>
</tr>
</tbody>
</table>

**ATTENTION!** The 2xSM-BiDi-DUO model does not support the Neutrik opticalCON DUO cross cables. Please use standard cables only.

**ATTENTION!** Always be sure that the fiber optical mode of the entire fiber optical equipment (SFP+ modules, LC patch cables, Neutrik connectors, and cables) and R100 endpoint device is the same. Connecting to the 2xSM-BiDi-DUO model requires singlemode equipment.

**INFO:** This method does not work in the case of using DAC cables in the network switch.
5.10. Ethernet Switch - Detailed 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 IEEE Std. 802.3ad-2000 Link Aggregation Control Protocol, with Link Aggregation Groups for each endpoint.
- 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.
- Supports IEEE Std. 802.1Q VLAN tagging: 1 VLAN reserved for UBEX control and media transmission, other(s) available for user traffic.

Optional Requirements:

- 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 Link Layer Discovery Protocol (LLDP), in order to discover network topology.
- 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.

5.11. Ethernet Switch Configuration

**ATTENTION!** The UBEX extenders do not support jumbo/giant frames.

5.11.1. Link Aggregation (LAG)

**DEFINITION:** The Link Aggregation Group (LAG) applies to various methods of combining (aggregating) multiple network connections in parallel in order to increase throughput beyond what a single connection could sustain.

Create Link Aggregation Groups (LAG’s)/EtherChannels etc. for each port pair that is used for 20 GbE transmission (LAG is not necessary for the ports which are used for 10 GbE transmission). The bonding mode is dynamic: 802.3-ad LACP has to be enabled for each group.

5.11.2. VLAN

**DEFINITION:** A virtual LAN (VLAN) is any broadcast domain that is partitioned and isolated in a computer network at the data link layer (OSI layer 2). LAN is the abbreviation for local area network and in this context, virtual refers to a physical object recreated and altered by additional logic.

The UBEX network uses 802.1Q tagged frames with the VLAN ID of 286. This VLAN has to be available from each LAG, with tagged frames. The LAG’s have to be in trunk mode (multiple VLAN’s are available on UBEX devices, other VLAN’s may be used with tagged or untagged frames).

The port where the MMU is connected is also a trunk port.

5.11.3. IGMPv2

**DEFINITION:** IGMP snooping is the process of listening to Internet Group Management Protocol network traffic. The feature allows a network switch to listen in on the IGMP conversation between hosts and routers.

IGMPv2 snooping has to be enabled for each LAG in this VLAN.

5.11.4. Optional Configuration

Enable Link Layer Discovery Protocol (LLDP) on all ports to access topology information in order to speed up your installation process.

5.11.5. Installation and Network Setup Guide for UBEX

For more details about the configuration steps of the network switch, real-life examples and useful practices please visit our website and download the application notes for UBEX:


5.11.6. System Design Guide for UBEX

Please check our documentation about the UBEX AV system design. This guide summarizes the network switches of the market and collects the required accessories and costs incurred.

5.12. Startup of the System

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

**ATTENTION!** Before powering on the system, please check the Connections section to be sure all installation steps are met with the connection requirements.

5.12.1. Switch on the Devices

Power on the network switch, the MMU, all the transmitters and the receivers, the source, and the sink devices as well.

INFO: UBEX endpoints and the MMU do a self-test during the booting procedure. After it is done, the last configuration is loaded automatically.

5.12.2. Configure the Operation Mode

All endpoint devices are manufactured as transmitter (TX) by default. Set up the operation mode for the endpoints to be used as receivers or transceivers with the adequate method:

- **Before** connecting the device to the UBEX matrix - use the Front panel LCD menu (System settings / Operation mode submenu).
- **After** connecting the device to the UBEX matrix - use the Lightware Device Controller software. See the details in the Device Map section.

5.12.3. Connect to the Matrix Management Unit

Establish the connection between the Matrix Management Unit (MMU) and the controller device. There is three way to connect to the MMU:

- **LAN** (Control Ethernet 1 and 2 ports; or via the network switch)
- **Serial communication** (RS-232 1 and 2 ports)

**ATTENTION!** User Ethernet is also transmitted over the SFP+ interface, so be sure not to make a network loop.

INFO: The USB control interface is under development.

**INFO:** In the case of LAN connection: it does not matter that you connect to the MMU or an endpoint device - finally you will control the MMU in both cases.

**Network Settings**

Check the network settings of the MMU. You can find the factory default settings of the device in the UBEX-MMU-X200 section. The network settings can be changed using the following method:

- via LDC software, in the Device discovery window - see the details in the Establishing Connection section.

**Lightware Device Controller Software**

All required settings can be done by control software, the Lightware Device Controller (LDC). See all the details about it in the Software Control - Lightware Device Controller chapter.

---

**Discovering the MMU**

**Step 1.** Open the LDC software. The Device discovery window will launch automatically to discover all available Lightware devices on the network where the controller device is connected to.

**Step 2.** Select the MMU (UBEX-MMU-X200) and click on the green Connect button.

**TIPS AND TRICKS:** When the device discovery found your device but you cannot connect to it, you can set the required IP address by clicking the pencil icon.

5.12.4. Check the Signal Status

The Crosspoint menu in the LDC software displays all important information about your UBEX matrix. For more detailed information, see the Crosspoint Menu - Video Layer section.
5. Installation

Source (Input Stream of a Transmitter or Transceiver) Side

Check the HDMI signal status on the source ports - if the signal status indicator is green, the signal is present; if it is grey, there is no incoming signal on the port.

Destination (Output Port of a Receiver or Transceiver) Side

Check the HDMI signal status on the destination ports - if the signal status indicator is green, the signal is present; if it is grey, there is no transmitted signal on the port.

5.12.5. Customize the View of the Matrix

If not all input / output ports of the endpoints are used in your matrix, you can hide the unused ones. Click on the unused source / destination port. Select the Stream tab and remove the tick in the Enabled option. The disabled sources / destinations can be hidden when you disable the Show Disabled Streams option.

5.12.6. Give Unique Names for the Sources and Destinations

INFO: You can find more details about the stream and device naming in the Default Naming of the Devices and the Streams section.

The default name of the streams are generated from the MAC address of the device and a port number of the endpoint. The better recognition of the streams might be helped to give unique names.

**Naming of the Streams**

Click on the source / destination port where the stream is transmitted / received. Select the Stream tab and find the Stream name field and type a unique name which can describe the stream well, for example: Intro_4K.

Give names to the Source and Destination sides either, it will help a lot of the setting the crosspoint states later.

TIPS AND TRICKS: The stream names are searchable with the Search Field.

**Naming of the Endpoint Devices**

Click on the source / destination port where the device is. It does not matter you select the 01 or 02 port. Select the Device tab and find the Device label field and type a unique name which can describe the device well, for example: RX2_MeetingRoom.

Give names to the Source and Destination sides either, it will help a lot of the re-order the endpoints in the Device map.

TIPS AND TRICKS: If you are not sure which is your selected device physically, use the Identify unit function. Clicking on the button results the blinking of the front panel status LEDs for 10 seconds.

TIPS AND TRICKS: The device labels are searchable with the Search Field.

5.12.7. Add Tags to the Video Streams

More tags can be attached to the streams and devices for the effective searchability.

Click on the source / destination port where the stream is transmitted / received. Select the Stream tab and find the Tags section and type a custom text which can describe more streams well, for example: Edited_by_Eric, and add it to the affected streams.

INFO: The following information are automatically added to the tags: stream name, device label, logical device ID.

TIPS AND TRICKS: The tags are searchable with the Search Field.

5.12.8. Customize the Order of the Endpoints

INFO: You can find more details about the default port numbering in the Default Naming of the Devices and the Streams section.

The default order of the endpoints is generated by the MMU based on the discovery order of the units - independently of the operation mode. This order can be customized in the Device map tool.

Clicking on the button results the blinking of the front panel status LEDs for 10 seconds.

TIPS AND TRICKS: The device labels are searchable with the Search Field.

Click on the Device map button, the tool opens in a new window. The order of the devices can be changed easily using drag and drop method by the mouse. See more details about it in the Device Map section.
5.12.9. Set the Video Crosspoint State

Set the connections between the stream sources and the destination ports.

Move the cursor of the mouse above the desired crosspoint. You can check your selection in the Highlighted Streams section. Click on the selected crosspoint to set up the connection.

5.12.10. Set the Source MUX Settings

DEFINITION: The source multiplexer (Source MUX) makes routing several different source signals to the HDMI output ports available. The setting is available only on the output ports of the receiver and transceiver operation modes. Different types of sources are available for the different output ports.

Click on the left side of the output port tile to access the MUX settings. The available options are the following:

Receiver (UBEX RX) Side

For HDMI out 1
- Stream - The source signal is the stream received via the SFP+ links from the remote endpoint device;
- HDMI in 1 - The source signal is the stream received via the local HDMI in 1 port.

For HDMI out 2
- Stream - The source signal is the stream received via the SFP+ links from the remote endpoint device;
- HDMI in 2 - The source signal is the stream received via the local HDMI in 2 port.
- Copy - The receiver is able to copy the signal of the HDMI out 1 port. This is the COPY function.

Transceiver (UBEX TRX) Side

For HDMI out 2
- HDMI in 2 - The source signal is the stream received via the local HDMI in 2 port.
- Copy - The receiver is able to copy the signal of the HDMI out 1 port. This is the COPY function.

ATTENTION! If the selected source is the local input port or the copy of the HDMI out 1, the output is still selectable as a destination in the global crosspoint table. It means the crosspoint setting is not forbidden for the selected output and it is still included in the bandwidth calculation. When the sum of the two incoming streams exceeds the bandwidth limit, the signal transmission can be denied on the HDMI out 2 port even if the incoming stream of the HDMI out 1 is not used. The solution of this limitation is disabling of the unused destination port.

Appeareance of the Destination Tile

When the selected source is the local input port or the copy of the HDMI out 1, the destination port tiles and the crosspoint tile appear as the following:

5.12.11. Check the Signal Bandwidth Status

Check the signal bandwidth and the bandwidth limit status indicator. When the bandwidth limit is exceeded, the source/destination port tiles and the crosspoint tile appear as the following:

Bandwidth Limitation
If an endpoint exceeds bandwidth limit, the MMU disable the stream of HDMI in 2 of the transmitter automatically. The stream of HDMI in 1 is transmitted continuously.

Solution
More possible solutions can be applied to avoid the bandwidth limitation:
- Enable the scaler / FRC on the HDMI inputs of the transmitter;
- Apply the color space conversion on the stream source(s).
- In the case of 10 GbE link (only one SFP+ module / DAC cable is installed in the SFP+ ports) upgrade the bandwidth performance of the endpoint to 20 GbE.

5.12.12. Set the HDCP Settings

Check the HDCP settings both on the sources and destinations. For more details about HDCP technology see the HDCP Management section.

- Click on the source port properties panels on the transmitter side and select the Port tab. Check the HDCP enable setting. Put a tick to enable HDCP capability on the port.
- Click on the destination port properties panels on the receiver side and select the Port tab. Check the HDCP mode setting.

INFO: UBEX extenders always authenticate the highest version of HDCP-encryption and cannot force the lower version.
5.12.13. Emulate the Correct EDID

Emulate the right EDID to the HDMI input ports of the transmitter. The EDID must be set according to the desired resolution/refresh rate of the stream.

INFO: You can find detailed information about the EDID Management menu of the LDC software in the EDID Management Menu section; about the technology in general, please read the EDID Management section.

Navigate to the EDID Management in the LDC software. Set the right side of the panel to the Emulated EDIDs, and set the left panel to the Factory EDIDs. See the entire list of the pre-installed factory EDIDs in the Factory EDID List section.

Example

For HDMI in 1 (1/01)

In our example the incoming signal on the HDMI in 1 port is 4K UHD 60 Hz (3840x2160p@60Hz 4:4:4).
Select the F137 memory address on the left side and also select the E101 EDID memory slot on the Emulated side. Click on the Transfer button (the arrow in the middle) to emulate the selected EDID.

For HDMI in 2 (1/02)

In our example the HDMI in 2 port receives 1080p60 Hz signal (1920x1080p@60Hz).
Select the F49 memory track on the left side and also select the E102 EDID memory slot on the Emulated side. Click on the Transfer button (the arrow in the middle) to emulate the selected EDID.

5.12.14. Set the Scalers

Set up the scalers for the best user experience. The forced resolution and refresh rate are recommended to fit the supported resolution/refresh rate of the sink device.

DIFFERENCE: The receiver is built with scaler function on both HDMI output ports and the transceiver is built with scaler function on the HDMI in 2 port from firmware version v2.1.0. These ports have FRC and CSC functions only in case of previous firmware versions.

DIFFERENCE: The transmitter is built with scaler function on both HDMI input ports from firmware version v2.4.1. HDMI in 2 port has FRC and CSC functions only in case of previous firmware versions.

Scaler - Example

In our example the sink device is a 4K-ready monitor and we have to display a 4K60 Hz video on it. The signal is transmitted on the HDMI out 1 port of the UBEX receiver.
Click on the desired destination port and select the Port tab. Set the Scaling Mode setting to EDID based, which means the receiver reads out the EDID of the sink device and scales the image to that. In our example it is 3840x2160p60. Set the Image position to Fit, the Color space conversion to YCbCr 4:4:4.

INFO: For the video wall installation you can find a detailed tutorial in the Video Wall Setup section.
5.12.15. Set the Audio Crosspoint State

Set up the audio crosspoint settings. Navigate to the Crosspoint menu and select the Audio layer. Digital and analog audio source streams are also selectable in the case of UBEX-PRO20-HDMI-F110 and UBEX-PRO20-HDMI-F120 endpoint devices. All audio streams can be selected to all outputs.

Audio crosspoint menu in the LDC

See more details about the audio crosspoint settings in LDC in the Crosspoint Menu - Audio Layer section.

DIFFERENCE: HBR audio formats are supported from LDC version v2.5.8b2, endpoint firmware version v2.0.0 and MMU firmware version v1.4.0 only. If the embedded audio signal is HBR and an HBR audio not supported error message is received during the new crosspoint setting, please update the control software to the latest one. See more information about the updating procedure in the Install and Update section.

5.12.16. Set the Parameters of the Audio Streams

Set up and customize the analog and digital audio streams. Select the desired source or destination port and check the following settings / parameters:

- Set a unique stream name;
- Check the audio signal status;
- Check the enable/disable status of the stream;
- Set tags for the stream;
- In case of analog signal adjust the volume, balance, gain settings.

TIPS AND TRICKS: The stream names, tags, and device labels are searchable with the Search Field.
5.12.17. Checkpoints for the Seamless Switching

UBEX series extenders provide seamless switching (clean cut) technology, which is the capability to deliver consistent performance and reliability. The advantage of the technology is that various environments with different video sources and displays will not impact signal loss.

For the best available user experience, please check the following settings being completed to fulfill the requirements of the seamless switching:

- **Emulate the correct EDID**: emulate the right EDID to the HDMI input ports of the transmitter/transceiver. The EDID must be set according to the desired resolution / refresh rate of the stream. For example, emulate the F135 factory EDID track (4096x2160@24Hz 2chLPCM) for a 4096x2160@24Hz resolution.

- **Set the scaler**: set the scaler on the output ports of the receiver or transceiver. The forced resolution and refresh rate are recommended to fit the supported resolution / refresh rate of the sink device. For example, if the preferred resolution of the sink device is 3840x2160@60Hz, apply the following settings in the scaler:
  - Scaling mode: Forced resolution or EDID based
  - Forced resolution: 3840x2160p60
  - Image position: Fit

- **Set the HDCP**: check the HDCP settings both on the input and output ports.
  - Inputs: tick the HDCP enable setting to *enable*.
  - Outputs: if the types of the sink devices are different, set the HDCP mode to *Forced HDCP 2.2 Type 1* (the sink device must support the HDCP 2.2 Type 1).

- **Set the color space**: set the color space (RGB / YCbCr) and the sampling rate (4:4:4 / 4:2:2) to the same value for all sink devices in case of the color space of the signal sources being different.

- **Set the color range**: if the color ranges of the signal source devices are different, this setting helps adjusting between the different types. Lightware recommends the following settings for the color range:
  - If the color range of the signal source devices are the same: set to *No conversion* (default).
  - If the color range of the signal source devices are different: set to *Full range* or *Limited range*, depending on the received source signals.
The following chapter describes the features of the device with a few real-life examples. The topics what are described:

- The Matrix Management Unit (MMU)
- Control Features
- Video Interface
- Video Wall
- Audio Interface
- Serial Interface
- Infrared Interface
- USB K+M Interface
- SFP / SFP+ Interfaces
- Redundant 10G Link Channels
- Further Built-in Features
- Software Control Modes
6.1. The Matrix Management Unit (MMU)

The Matrix Management Unit (MMU) is the brain of UBEX system in the case of Matrix mode. The MMU builds up the crosspoints; controls, manages, and supervises the endpoints connected the UBEX network. When the endpoint devices are connected to the network and they are claimed by the MMU, the UBEX matrix became one entity which is managed by the MMU.

6.1.1. Port Diagram

Port diagram of the Matrix Management Unit

The UBEX-MMU-X200 can receive control signals from the two serial ports (RS-232 1 and 2), and the two Ethernet ports (Control Ethernet 1 and 2).

ATTENTION! The Control Ethernet 1 port (on the front panel) supports 100 Mbps Ethernet only. The Control Ethernet 2 port (on the rear panel) supports the 1 Gbps Ethernet connection.

INFO: The MMU does not transmit HDMI signals.

The CPU forwards the RS-232 and Ethernet signals to the SFP and CATx ports and after a TCP/IP converting transmits it to UBEX endpoints.

6.1.2. Endpoint License

Description

The Endpoint License for Matrix Management Unit means the number of endpoint devices which are able to be claimed by the MMU is limited. The default value of the limition is 16. The number of claimable UBEX endpoint devices can be expanded by the user. The following table shows the available endpoint licenses:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UBEX-MMU-X200-16</td>
<td>UBEX-MMU-X200 limited to 16 endpoints. This is default value of the MMU, no license is applied on the device.</td>
</tr>
<tr>
<td>UBEX-MMU-X200-50</td>
<td>UBEX-MMU-X200 limited to 50 endpoints.</td>
</tr>
<tr>
<td>UBEX-MMU-X200-100</td>
<td>UBEX-MMU-X200 limited to 100 endpoints.</td>
</tr>
<tr>
<td>UBEX-MMU-X200-150</td>
<td>UBEX-MMU-X200 limited to 150 endpoints.</td>
</tr>
<tr>
<td>UBEX-MMU-X200</td>
<td>UBEX-MMU-X200 has no endpoint limitation by software.</td>
</tr>
</tbody>
</table>

Upgrading a level |
Upgrading to unlimited level |

INFO: The MMU can be upgraded by purchasing one of the listed license. For more details, please contact sales@lightware.com.
Features and Properties of the Endpoint Licenses

▪ The MMU can be upgraded to higher level anytime.
▪ One license can be applied for one MMU.
▪ The licenses do not expire (the time of the usage is unlimited for all level of licenses).
▪ The endpoint devices are able to be claimed as much as the limition of the recent license is. For example, if the matrix installed with 18 endpoints, but the MMU has a Level 1 license with 16-endpoint limitation, 2 of the 18 endpoint devices will not be claimed.
▪ The MMU reboots after a new license is applied or a license is removed.
▪ If the license is removed, but more than 16 endpoint devices have already been claimed by the MMU, the already claimed endpoint devices remain a part of the UBEX matrix. The only restriction is that claiming new devices is not allowed until a valid license is applied.

6.2. Control Features
The following sections are about how to control the endpoint devices and the Matrix Management Unit by a computer or any third-party controller.

INFO: It does not matter which device (the MMU directly or any endpoints) you want to use establishing connection with the UBEX matrix, you will reach the MMU finally.

The following interfaces can be used to control the matrix:

<table>
<thead>
<tr>
<th>Interface</th>
<th>MMU</th>
<th>Endpoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet Interface</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Serial Interface</td>
<td>✔</td>
<td>✗</td>
</tr>
</tbody>
</table>

ATTENTION! The RS-232 port of the F110 and F120 endpoint models can be used for controlling third-party devices only.

INFO: The USB control interface for the MMU will be added by a future firmware update.

6.2.1. Ethernet Interface

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

ATTENTION! When you connect to an endpoint, you reach the MMU from the control point of view. The control commands and settings are done in the MMU finally.

The matrix can be configured with the following tools:
▪ Lightware Device Controller (LDC) software (details: Software Control - Lightware Device Controller);
▪ LW3 protocol commands (details: Programmer's Reference).

Bandwidth Differences between the Ethernet Connectors
The rear side Ethernet connector has 1 Gbps bandwidth capability, the front side Ethernet connector is limited to 100 Mbps.

ATTENTION! Pay attention to the configuration of the port of the network switch where the Ethernet control port of the MMU is connected to.
Matrix Control over Ethernet - Example

The Concept
The matrix has one transmitter and one receiver connected to an L3 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.

6.2.2. Serial Interface

This section is about the serial interface of the MMU.

ATTENTION! The RS-232 port of the endpoint devices cannot be used for controlling the UBEX matrix.

Description
The Matrix Management Unit contains 2 pieces of 3-pole Phoenix connectors for serial communication. The interface can be used for controlling the MMU or the matrix.

The matrix can be configured with the following tools:
- Lightware Device Controller (LDC) software (details: Software Control - Lightware Device Controller);

Matrix Control over RS-232 - Example

The Concept
The endpoint devices are connected to the UBEX matrix over the network switch via the optical ports. The MMU is controlled by the system controller over the serial interface by LW3 protocol commands. All AV related actions are available with LW3 protocol, e.g. crosspoint switching, EDID management, scaling, etc.
6.3. Video Interface

6.3.1. Transmitter Mode

Port Diagram

The port diagram is valid for the following UBEX endpoint models:

- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110
- UBEX-PRO20-HDMI-F120
- UBEX-PRO20-HDMI-R100 series

HDMI Input Modes

The transmitter can receive HDMI video streams from two HDMI 2.0 input ports. The signals can be up to 4K@60 Hz 4:4:4 in the case of both inputs. The video streams of the HDMI inputs can be processed in the video processors. The processor of the HDMI in 1 and 2 have video scaler, frame rate converter (FRC), and color space converter (CSC) functions.

**DIFFERENCE:** The transmitter is built with scaler function on both HDMI input ports from firmware version v2.4.1. The HDMI in 2 port has FRC and CSC functions only in case of previous firmware versions.

The scaler, frame rate converter, and color space converter settings are available in the LDC software (see the details in the Video Source Port Properties Window or in the Stream Properties Panels section).

HDMI Output Modes

The HDMI output ports of the transmitter are HDMI loop-back ports and can be used as local HDMI outputs. The HDMI output 1 transmits the signal of the HDMI input 1 port, the HDMI output 2 transmits the signal of the HDMI input 2 port.

Fiber Optical Interface

After the Ethernet packetizing, the two video streams are transmitted to the remote endpoint device via the fiber optical ports.

Summary Tables

<table>
<thead>
<tr>
<th>HDMI INPUTS</th>
<th>HDMI input 1</th>
<th>HDMI input 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accepted signal</td>
<td>up to 4K@60 4:4:4</td>
<td>up to 4K@60 4:4:4</td>
</tr>
<tr>
<td>Scaler</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Frame rate converter (FRC)</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Color space converter (CSC)</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HDMI OUTPUTS</th>
<th>HDMI output 1</th>
<th>HDMI output 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output signal</td>
<td>up to 4K@60 4:4:4</td>
<td>up to 4K@60 4:4:4</td>
</tr>
<tr>
<td>Signal source</td>
<td>HDMI input 1</td>
<td>HDMI input 2</td>
</tr>
</tbody>
</table>
6.3.2. Receiver Mode

Port Diagram

The port diagram is valid for the following UBEX endpoint models:
- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110
- UBEX-PRO20-HDMI-F120
- UBEX-PRO20-HDMI-R100 series

Fiber Optical Interface

The receiver can receive two HDMI video streams via the fiber optical input ports.

HDMI Output Modes

The receiver can transmit HDMI video streams on two HDMI 2.0 output ports. The signal can be up to 4K@60 Hz 4:4:4 in the case of both outputs. The streams received from the remote endpoint device can be routed to any HDMI outputs of receiver, e.g. the stream from the TX - HDMI in 1 can be switched to the RX - HDMI out 1 or 2, or both ones.

The streams can be processed in the video processors. The processor of the HDMI out 1 and 2 have video scaler, frame rate converter (FRC), and color space converter (CSC) functions.

DIFFERERENCE: The receiver is built with scaler function on both HDMI output ports from firmware version v2.1.0. The HDMI out 2 port has FRC and CSC functions only in case of previous firmware versions.

The scaler, frame rate converter, and color space converter settings are available in the LDC software (see the details in the Video Destination Port Properties Window or in the HDMI Output Ports section).

Source Multiplexer (MUX)

The source multiplexer (Source MUX) makes routing several different source signals to the HDMI output ports available. The type of sources is different for the two outputs.

HDMI out 1
- Able to accept signal up to 4K@60 4:4:4 resolution via the SFP+ links from the remote endpoint device;
- Able to accept signal up to 4K@60 4:4:4 resolution via the local HDMI in 1 port.

HDMI out 2
- Able to accept signal up to 4K@60 4:4:4 resolution via the SFP+ links from the remote endpoint device;
- Able to accept signal up to 4K@60 4:4:4 resolution via the local HDMI in 2 port;
- Able to copy the signal of the HDMI out 1 port up to 4K@60 4:4:4 resolution. This is the COPY function.

ATTENTION! If the selected source is the local input port or the copy of the HDMI out 1, the output is still selectable as a destination in the global crosspoint table. It means the crosspoint setting is not forbidden for the selected output and it is still included in the bandwidth calculation. When the sum of the two incoming streams exceeds the bandwidth limit, the signal transmission can be denied on the HDMI out 2 port even if the incoming stream of the HDMI out 1 is not used. The solution of this limitation is disabling of the unused destination port.

HDMI Input Modes

The HDMI input ports of the receiver operate as local HDMI inputs. The stream cannot be affected by any video processing.

Summary Tables
6.3.3. Transceiver Mode

Port Diagram
The port diagram is valid for the following UBEX endpoint models:
- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110
- UBEX-PRO20-HDMI-F120
- UBEX-PRO20-HDMI-R100 series

Video port diagram of the F100 / F110 / F120 / R100 transceiver

Fiber Optical Interface
The transceiver is able to send and receive HDMI video streams together at the same time over the fiber optical links.

HDMI Input Modes
The transceiver can receive one HDMI video stream from the HDMI in 2 input port. The signal can be up to 4K@60 Hz 4:4:4. The video stream can be processed in the video processor. The processor of the HDMI in 2 has video scaler, frame rate converter (FRC), and color space converter (CSC) functions. The video processor settings are available in the LCD software (see the details in the Video Source Port Properties Window or in the Source Stream Panel section).

ATTENTION! The HDMI in 1 input port cannot accept video signal.

HDMI Output Modes
The transceiver can transmit HDMI video streams on two HDMI 2.0 output ports. The signal can be up to 4K@60 Hz 4:4:4 in the case of both outputs.

The HDMI out 1 transmits the HDMI signal coming from the remote UBEX endpoint. The video stream can be processed in the video processor (it contains scaler, frame rate converter (FRC) and color space converter (CSC) functions). The video processor settings are available in the LCD software (see the details in the Video Destination Port Properties Window or in the HDMI Out 1 Panel section).

In default state, the HDMI out 2 transmits the HDMI signal coming from the HDMI in 1 input port so it operates as a local output port. The stream cannot be affected by any video processing.

Source Multiplexer (MUX)
The source multiplexer (Source MUX) makes routing several different source signals to the HDMI output 2 port available.

HDMI out 2
- Able to accept signal up to 4K@60 4:4:4 resolution via the local HDMI in 2 port;
- Able to copy the signal of the HDMI out 1 port up to 4K@60 4:4:4 resolution. This is the COPY function.

ATTENTION! If the selected source is the local input port or the copy of the HDMI out 1, the output is still selectable as a destination in the global crosspoint table. It means the crosspoint setting is not forbidden for the selected output and it is still included in the bandwidth calculation. When the sum of the two incoming streams exceeds the bandwidth limit, the signal transmission can be denied on the HDMI out 2 port even if the incoming stream of the HDMI out 1 is not used. The solution of this limitation is disabling of the unused destination port.

Summary Tables

<table>
<thead>
<tr>
<th>HDMI INPUTS</th>
<th>HDMI input 1</th>
<th>HDMI input 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accepted signal</td>
<td>✔</td>
<td>up to 4K@60 4:4:4</td>
</tr>
<tr>
<td>Scaler</td>
<td>-</td>
<td>✔</td>
</tr>
<tr>
<td>Frame rate converter (FRC)</td>
<td>-</td>
<td>✔</td>
</tr>
<tr>
<td>Color space converter (CSC)</td>
<td>-</td>
<td>✔</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HDMI OUTPUTS</th>
<th>HDMI output 1</th>
<th>HDMI output 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output signal</td>
<td>up to 4K@60 4:4:4</td>
<td>up to 4K@60 4:4:4</td>
</tr>
<tr>
<td>Signal source</td>
<td>Input port of the remote device</td>
<td>MUX Copy of the HDMI output 1</td>
</tr>
<tr>
<td>Scaler</td>
<td>✔</td>
<td>-</td>
</tr>
<tr>
<td>Frame rate converter (FRC)</td>
<td>✔</td>
<td>-</td>
</tr>
<tr>
<td>Color space converter (CSC)</td>
<td>✔</td>
<td>-</td>
</tr>
</tbody>
</table>
6.3.4. Bandwidth Limitation

Two video streams can be transmitted at the same time from an endpoint device up to 20 Gbps bandwidth. When the bandwidth limit is exceeded, the priority of the streams is the following:

**Transmitter Side**

The stream of the HDMI in 1 has the higher priority and the stream of the HDMI in 2 will not be transmitted until the bandwidth limit problem is solved (the parameters of the video are still received by the receiver). In that case the stream tile of the disabled stream becomes amber in the LDC software.

<table>
<thead>
<tr>
<th>HDMI in 1</th>
<th>HDMI in 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Status</strong></td>
<td><strong>Stream tile (LDC)</strong></td>
</tr>
<tr>
<td>Enabled</td>
<td>1/01</td>
</tr>
</tbody>
</table>

**Receiver Side**

The switched stream of the HDMI out 1 has the higher priority and the stream of the HDMI out 2 is going to be disabled (the parameters of the video are still received). In that case the stream tile of the disabled stream becomes amber in the LDC software.

<table>
<thead>
<tr>
<th>HDMI out 1</th>
<th>HDMI out 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Status</strong></td>
<td><strong>Stream tile (LDC)</strong></td>
</tr>
<tr>
<td>Enabled</td>
<td>1/01</td>
</tr>
</tbody>
</table>

**Transceiver Side**

Thanks to the 20G full-duplex SFP+ interface, the transceiver has no bandwidth limitation on the input and output sides either. The device is able to receive and transmit 2x 4K60 Hz 4:4:4 24bit streams on the HDMI input and output ports either.

<table>
<thead>
<tr>
<th>HDMI out 1</th>
<th>HDMI in 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Status</strong></td>
<td><strong>Stream tile (LDC)</strong></td>
</tr>
<tr>
<td>Enabled</td>
<td>1/01</td>
</tr>
</tbody>
</table>

INFO: You can find the bandwidth requirements of each resolution in the Bandwidth Requirements of the Resolutions section.

6.3.5. The Difference between the Image Positions of the Scaler

The following section helps to understand how the image position settings of the scaler works. Three different image positions are available: **stretch**, **fit**, and **center**.

**DIFFERENCE:** The receiver is built with scaler function on both HDMI output ports and the transceiver is built with scaler function on the HDMI in 2 port from firmware version v2.1.0. The HDMI out 2 port has FRC and CSC functions only in case of previous firmware versions.

**DIFFERENCE:** The transmitter is built with scaler function on both HDMI input ports from firmware version v2.4.1. The HDMI in 2 port has FRC and CSC functions only in case of previous firmware versions.

The aspect ratio of the original stream and the sink device are different in the following examples.

**Stretch**

The aspect ratio of the stream is distorted because it is adjusted to the aspect ratio of the sink.

**Fit**

The picture is adjusted to the resolution of the sink and the aspect ratio of the stream is kept, thus the whole picture will be displayed without cropping. The scaler fills the extra image part with black pixels.

**Center**

The scaler crops the center part of the stream with the resolution of the sink.
6.3.6. Timing Modes

Technical Background

UBEX receivers and transceivers provide two different timing modes on the HDMI outputs:

- **Free run**: the receiver generates nominal clock frequency, which is not bonded to the source. It means TBC (time base correction) is applied in the stream, which may cause frame repetition/drop between minimum 1 and maximum 2 frames value. The seamless stream switching is available in this mode only.

- **Source locked**: time stamps are transmitted with the stream from the source, and the receiver can generate accurate clock frequency; in this way the latency within one frame (up to 16 lines) can be guaranteed. This mode is ideal for the video walls where the extra low latency is the most important requirement.

The setting is available in the LDC software (see the details in the Port Information section) and by LW3 protocol commands (see the details in the Timing Mode Setting section).

Application of Timing Mode Settings - Example

The Concept

The stream of the PC is selected on all four outputs of the UBEX receivers. The playing of the stream is at the Frame #4 at this moment.

The HDMI output ports of the upper UBEX receiver are set to **source locked** so the video stream is generated in the receiver, which does not engage any delay compared to the original stream.

The HDMI output ports of the lower UBEX receiver are set to **free run**. The differences between the actual content of the connected monitors might be noticeable.
6.3.7. HDMI Signal Transmission - Example

The Concept

This example shows a 4x4 UBEX matrix with an L3 network switch and the MMU in its center. The matrix contains 4 inputs (Stream #1..4) and 4 outputs (2x 1 HDMI output per transceiver and 2 pcs HDMI outputs of the receiver). The MMU builds up the crosspoints and controls the AV system.

Crosspoint Settings

The best overview of the crosspoint settings is available in the Lightware Device Controller software. The following description based on the software.

INFO: See the comprehensive description of the LDC software in the Software Control - Lightware Device Controller chapter.

The upper tiles mean the inputs (Stream #1..4), the tiles on the right side mean the outputs (HDMI out 1 and 2 of the receivers). The naming is the following:

- **Sources**: 1/02, where the 1 is the UBEX transceiver #1 (the first endpoint which is joined to the network and added by the MMU), the 02 is the Stream #1 on the HDMI in 2 port.
- **Destinations**: 4/02, where the 4 is the UBEX receiver (the fourth endpoint which is joined to the network and added by the MMU), the 02 is the HDMI out 2 port of the receiver.

The tile means a denied connection (only for transceivers). The explanation is the input port of the transceiver cannot be selected to the output port of the same transceiver.

Port Numbering

The following table shows which port ID belongs to the HDMI ports.

<table>
<thead>
<tr>
<th>UBEX Endpoint</th>
<th>HDMI Port</th>
<th>Stream</th>
<th>Port ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>UBEX transceiver #1</td>
<td>HDMI IN 2</td>
<td>Stream #1</td>
<td>1/02</td>
</tr>
<tr>
<td></td>
<td>HDMI OUT 1</td>
<td>-</td>
<td>1/01</td>
</tr>
<tr>
<td>UBEX transceiver #2</td>
<td>HDMI IN 2</td>
<td>Stream #2</td>
<td>2/02</td>
</tr>
<tr>
<td></td>
<td>HDMI OUT 1</td>
<td>-</td>
<td>2/01</td>
</tr>
<tr>
<td>UBEX transmitter</td>
<td>HDMI IN 1</td>
<td>Stream #3</td>
<td>3/01</td>
</tr>
<tr>
<td></td>
<td>HDMI IN 2</td>
<td>Stream #4</td>
<td>3/02</td>
</tr>
<tr>
<td>UBEX receiver</td>
<td>HDMI OUT 1</td>
<td>-</td>
<td>4/01</td>
</tr>
<tr>
<td></td>
<td>HDMI OUT 2</td>
<td>-</td>
<td>4/02</td>
</tr>
</tbody>
</table>

MATRIX APPLICATION MODE

Applied endpoint firmware package: v2.4.1 | Applied MMU firmware package: v1.7.1 | LDC software: v2.6.2b3


MATRIX APPLICATION MODE

Applied endpoint firmware package: v2.4.1 | Applied MMU firmware package: v1.7.1 | LDC software: v2.6.2b3

Crosspoint Possibilities

The following table shows the available crosspoint possibilities:

<table>
<thead>
<tr>
<th>Crosspoint possibilities of the video streams for the UBEX matrix</th>
<th>Destinations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TRX #1</td>
</tr>
<tr>
<td>1/01</td>
<td>2/01</td>
</tr>
<tr>
<td>4K TV</td>
<td>4K TV</td>
</tr>
</tbody>
</table>

Summary: The video streams of the transmitters can be selected to all sink devices. The video stream of a transceiver is not selectable to the output of the same transceiver.

Stream Identifying Tools

User can add a unique name and additionally tags can be attached to the stream. In this way the streams become searchable easily.

The following settings help the user to handle the streams in a bigger matrix:

- **Stream name**: a unique name given by the user, like "The Mill";
- **Tags**: more tags can be attached to the stream to help identifying it. You can search for words and LDC shows the hits.
  - The first three outlined tags are fixed: the stream name, MAC address, and the logical device ID; these ones cannot be removed from the tags.
  - The following tags are freely configurable by the user. The following characters are allowed when naming: Letters (A-Z) and (a-z), numbers (0-9), and any special characters, except semicolon (;).

Stream Search

Use the Search field to find any stream on the network. You can search in the Sources, in the Destinations, or Both. Start typing in the field the LDC lists the hits and narrows it during the typing. See the details in the Search Field section.

Scaling Options

If a 4K60 stream is switched to a HD3 monitor, it cannot display the high-resolution video. The solution is to scale the stream to lower resolution which can be supported by the sink device. Two options are available:

- The stream is re-scaled on the source (TX) side - in this case the stream is transmitted with HD resolution to the receiver, additionally you can optimize the network bandwidth usage as well.
- The stream is re-scaled on the destination (RX or TRX) side - the original 4K60 signal is transmitted to the receiver and it is re-scaled on the output port.

Device Map

The default order of the endpoint devices can be reconfigured easily using drag & drop method with the Device map tool.

The intelligent search tool in the device map makes possible to find the desired endpoint device and handle a bigger matrix effectively.

The current operation mode (transmitter, receiver, or transceiver) can also be changed in the Device map.

See the details about the tool in the Device Map section.
6.4. Video Wall

6.4.1. Description

The UBEX matrix has built-in video wall feature which can be configured countless ways. The main properties of the video wall:

▪ Handles up to 8x4 (column x row) display devices;
▪ More different layouts for the same video wall;
▪ Zones within the video wall;
▪ Easily applicable display bezel and gap correction;
▪ Works in receiver and transceiver operation modes as well;
▪ Interactive GUI in the LDC software for the easier handling;
▪ Easily applicable display bezel and gap correction;
▪ Works in receiver and transceiver operation modes as well;
▪ Interactive GUI in the LDC software for the easier handling;

DIFFERENCE: The receiver is built with scaler function on both HDMI output ports from firmware version v2.1.0. Both HDMI out 1 and 2 ports of the receiver can participate in the video wall.

6.4.2. Layouts and Zones

More different layouts can be defined within a video wall installation. The layouts contain one or more zones where different sized video walls can be displayed. The different zones can display different source streams.

You can find a detailed tutorial how to create video walls, layouts, and define zones in the Video Wall Setup section.

The following figures show some examples for the usage of the layouts and the zones. The size of the video wall is always 4x4 in our example.

The Default Layout

When a video wall is created, the default layout contains one zone only (Zone 0) which includes all displays in the video wall showing one stream.

Layout with Four Zones

The next layout example contains four zones which displays four different source streams. Each zones have four display devices.
6. UBEX Concept


Matrix Application Mode

Applied endpoint firmware package: v2.4.1 | Applied MMU firmware package: v1.7.1 | LDC software: v2.6.2b3

6.4.3. Identifying of the Display/Zone

The UBEX video wall system has a feature to help identifying a display device or a zone physically. When you need to see quickly which display or zone you want to configure actually, this feature generates 10 test colors on the display device(s) for 10 seconds.

Example for Identifying a Display

Example for Identifying a Zone

The Identify display/zone feature is available:

▪ in the Lightware Device Controller (LDC) software - see the details in the Managing of the Layout and Zones section.

▪ with LW3 protocol commands - see the details in the Identify the Zone section.

6.4.4. Software Control Modes of the Video Wall

Video walls can be defined and supervised by two software control methods:

▪ Lightware Device Controller (LDC) / Built-in Website - see the details in the Video Wall Setup section.

▪ LW3 protocol commands - see the details in the Video Wall Configuration section.
6. Audio Interface

6.1. Transmitter Mode - F100 / R100 Models

**Port Diagram**

The port diagram is valid for the following UBEX endpoint model:
- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-R100 series

**Description**

The transmitter receives HDMI audio signals via the two HDMI input ports. The audio streams are transmitted toward the remote endpoint device over the SFP+ links. The two source streams can be selected to any output port on the destination side. The crosspoint settings are supervised by the MMU.

The HDMI output ports of the transmitter are HDMI loop-back ports and can be used as local HDMI outputs.

6.2. Receiver Mode - F100 / R100 Models

**Port Diagram**

The port diagram is valid for the following UBEX endpoint model:
- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-R100 series

**Description**

The receiver receives two HDMI audio streams via the SFP+ links. The streams can be selected to any HDMI output ports, the crosspoint settings are available in the MMU.

**Source Multiplexer (MUX)**

INFO: The source MUX function can be set on the video side only in the Lightware Device Controller (LDC) software, and using LW3 protocol commands as well.

The source multiplexer (Source MUX) makes routing several different source signals to the HDMI output ports available. The type of sources is different by the two outputs.

- **HDMI out 1**
  - Able to accept audio signal *via the SFP+ links* from the remote endpoint device;
  - Able to accept audio signal *via the local HDMI in 1 port*.

- **HDMI out 2**
  - Able to accept audio signal *via the SFP+ links* from the remote endpoint device;
  - Able to accept audio signal *via the local HDMI in 2 port*;
  - Able to *copy the signal of the HDMI out 1 port*. This is the COPY function.

**HDMI Input Modes**

The HDMI input ports of the receiver operate as local HDMI inputs.
6.5.3. Transceiver Mode - F100 / R100 Models

Port Diagram

The port diagram is valid for the following UBEX endpoint model:
- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-R100 series

Audio port diagram of the F100 transceiver

Description

The transceiver receives one HDMI audio stream via the SFP+ links and transmitting on the HDMI out 1 port. The source signal can be any audio streams from the source side, the crosspoint settings are supervised by the MMU.

The transceiver receives an HDMI audio signal via the HDMI input 2 port. The audio stream is transmitted toward the destination side over the SFP+ links. The crosspoint settings are supervised by the MMU.

The local HDMI output port (HDMI out 2) is HDMI loop-back port and source is always the HDMI in 2 port.

The HDMI input 1 port of the transceiver cannot accept audio signals due to software limitation.

Source Multiplexer (MUX)

INFO: The source MUX function can be set on the video side only in the Lightware Device Controller (LDC) software, and using LW3 protocol commands as well.

The source multiplexer (Source MUX) makes routing several different source signals to the HDMI output 2 port available.

HDMI out 2
- Able to accept audio signal via the local HDMI in 2 port;
- Able to copy the signal of the HDMI out 1 port. This is the COPY function.

6.5.4. Transmitter Mode - F110 / F120 Models

Port Diagram

The port diagram is valid for the following UBEX endpoint model:
- UBEX-PRO20-HDMI-F110
- UBEX-PRO20-HDMI-F120

Audio port diagram of the F110 / F120 transmitter

Description

The device is built with a 4:1 digital audio switch, which has four inputs: the de-embedded digital audio streams of the HDMI in 1 and 2; the analog audio of the analog audio input port; and the return audio channel received from the connected endpoint device over the SFP+ ports. The selected audio stream can be switched to the analog audio output port after a digital/analog conversion (D/A converter).

The audio streams of the HDMI in 1, HDMI in 2, and the analog audio in ports are transmitted via the SFP+ output ports. The HDMI out 1 and 2 ports are local output ports, they transmit the audio streams of the HDMI in 1 and 2 ports directly.

Signal Support of the Analog Audio Output

The UBEX-PRO20-HDMI-F110 and F120 endpoint models convert the uncompressed stereo audio stream to analog audio. The analog audio output port supports PCM audio format up to 48 kHz.

ATTENTION! If unsupported audio signal is selected to the analog audio output, the port will be muted automatically. The current status of the port can be queried by an LW3 protocol command, see the details in the Query the Status of the Analog Audio Output section.
6.5.5. Receiver Mode - F110 / F120 Models

Port Diagram

The port diagram is valid for the following UBEX endpoint model:

- UBEX-PRO20-HDMI-F110
- UBEX-PRO20-HDMI-F120

Description

The device is built with a 4x3 digital audio crosspoint, which has four inputs: three digital audio streams are received from the SFP+ links, the fourth input is the stream of the analog audio in port. The audio streams can be selected to the HDMI out 1 and 2, and the analog audio out ports.

The stream of the analog audio in port is transmitted over the SFP+ links.

The HDMI input ports do not accept signals when the device is configured as receiver.

Source Multiplexer (MUX)

INFO: The source MUX function can be set on the video side only in the Lightware Device Controller (LDC) software, and using LW3 protocol commands as well.

The source multiplexer (Source MUX) makes routing several different source signals to the HDMI output ports available. The type of sources is different by the two outputs.

HDMI out 1

- Able to accept audio signal via the SFP+ links from the remote endpoint device;
- Able to accept audio signal via the local HDMI in 1 port.

HDMI out 2

- Able to accept audio signal via the SFP+ links from the remote endpoint device;
- Able to accept audio signal resolution via the local HDMI in 2 port;
- Able to copy the signal of the HDMI out 1 port. This is the COPY function.

HDMI Input Modes

The HDMI input ports of the receiver operate as local HDMI inputs.

Signal Support of the Analog Audio Output

The UBEX-PRO20-HDMI-F110 and F120 endpoint models convert the uncompressed stereo audio stream to analog audio. The analog audio output port supports PCM audio format up to 48 kHz.

ATTENTION! If unsupported audio signal is selected to the analog audio output, the port will be muted automatically. The current status of the port can be queried by an LW3 protocol command, see the details in the Query the Status of the Analog Audio Output section.
6.5.6. Transceiver Mode - F110 / F120 Models

Port Diagram

The port diagram is valid for the following UBEX endpoint model:
- UBEX-PRO20-HDMI-F110
- UBEX-PRO20-HDMI-F120

Description

The device is built with a 4x2 digital audio crosspoint, which has four inputs: two of them are received on the SFP+ links; the stream of the analog audio in, and the stream of the HDMI in 2 port. Any audio can be selected to the HDMI out 1 and the analog audio out ports.

The audio streams of the HDMI in 2 and the analog audio in ports are transmitted via the SFP+ output ports. The HDMI out 2 port is a local output port, it transmits the audio stream of the HDMI in 2 port directly.

The HDMI input 1 port does not accept signal when the device is configured as transceiver.

Source Multiplexer (MUX)

INFO: The source MUX function can be set on the video side only in the Lightware Device Controller (LDC) software, and using LW3 protocol commands as well.

The source multiplexer (Source MUX) makes routing several different source signals to the HDMI output 2 port available.

HDMI out 2
- Able to accept audio signal via the local HDMI in 2 port;
- Able to copy the signal of the HDMI out 1 port. This is the COPY function.

Signal Support of the Analog Audio Output

The UBEX-PRO20-HDMI-F110 and F120 endpoint models convert the uncompressed stereo audio stream to analog audio. The analog audio output port supports PCM audio format up to 48 kHz.

ATTENTION! If unsupported audio signal is selected to the analog audio output, the port will be muted automatically. The current status of the port can be queried by an LW3 protocol command, see the details in the Query the Status of the Analog Audio Output section.
6.5.7. Audio Signal Transmission - Example

The Concept

This example shows a 6x6 audio matrix with an L3 network switch and the MMU in its center. The matrix contains 6 inputs (1..6, mixed digital and analog audio streams) and 6 outputs (mixed digital and analog sink devices). The MMU builds up the crosspoints and controls the AV system.

The following table shows the available crosspoint possibilities:

<table>
<thead>
<tr>
<th>Crosspoint possibilities of the audio streams for the UBEX matrix</th>
<th>Sink devices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TRX</td>
</tr>
<tr>
<td>Sources</td>
<td>Active</td>
</tr>
<tr>
<td>PC</td>
<td>speakers</td>
</tr>
<tr>
<td>Media player</td>
<td>#3</td>
</tr>
<tr>
<td>Laptop</td>
<td>#4</td>
</tr>
<tr>
<td>PC</td>
<td>#5</td>
</tr>
<tr>
<td>Media player</td>
<td>#6</td>
</tr>
</tbody>
</table>

Summary: All audio streams of the source devices can be selected to all sink devices except the local HDMI outputs of the transmitter, which can be always selected to the inputs; and the local HDMI inputs of the receiver, which can be always selected to the outputs.
6.6. Serial Interface

This section is about the serial interface of the endpoint device.

**DIFFERENCE:** Only the UBEX-PRO20-HDMI-F110 and F120 models are built with serial interface port.

6.6.1. Technical Background

Port Diagram

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**The Concept**

The endpoint device uses command injection, which means in the practice it works as a TCP/IP -> RS-232 converter so the TCP/IP data signal is converted to RS-232 data. The serial message is sent over the Ethernet interface. A TCP port in the MMU addresses an RS-232 port in the endpoint device. The user can set which TCP port is ordered to the required RS-232 port.

**INFO:** It does not matter which device of the Ethernet interface (the MMU directly or any endpoints) you want to use establishing connection with the UBEX matrix, you will reach the MMU finally.

**Setting up the TCP Ports of the Serial Interface**

The default starting port number is 8000 and increases with one until the number of the RS-232 ports in the matrix. If these TCP ports are reserved in the network, the port numbers can be changed in LDC (see the details in the RS-232 Tab section) or using LW3 protocol command (see the details in the Command Injection TCP Port Setting section).

**TIPS AND TRICKS:** The TCP ports can be remapped with a single LW3 protocol command, see the details in the Remap the Command Injection TCP ports section.

---

6.6.2. RS-232 Signal Transmission – Example

**The Concept**

The devices which are connected via RS-232 (4K TV, projector, audio amplifier) are controlled with serial messages which are sent over Ethernet interface. All Ethernet devices can send messages to all controlled devices. Up to three Ethernet devices can be connected per endpoints.

You can send serial messages using two methods:

- **Lightware Device Controller (LDC) / Built-in Website** - see the details in the RS-232 Tab section;
- **LW3 protocol commands** - see the details in the Message Sending via Communication Ports section.
6.7. Infrared Interface

This section is about the Infrared interface of the endpoint device.

DIFFERENCE: Only the UBEX-PRO20-HDMI-F110 and F120 models have built with IR interface ports.

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

6.7.1. Technical Background

Port Diagram

The endpoint device uses command injection, which means in the practice it works as a TCP/IP -> Infrared converter, so the TCP/IP data signal is converted to Infrared code. The IR message is sent over the Ethernet interface. A TCP port in the MMU is addressed an Infrared output port in the endpoint device. The user can set which TCP port is ordered to the required Infrared output port.

INFO: It does not matter which device of the Ethernet interface (the MMU directly or any endpoints) you want to use establishing connection with the UBEX matrix, you will reach the MMU finally.

Setting up the TCP Ports of the IR Interface

The default starting port number is 9000 and increases with one until the number of the IR ports in the matrix. If these TCP ports are reserved in the network, the port numbers can be changed in LDC (see the details in the Infra Tab section) or using LW3 protocol command (see the details in the Message Sending via Communication Ports section).

6.7.2. Infrared Signal Transmission – Example

The devices which have built-in IR detector (4K TV, audio amplifier) are controlled with Infrared messages which are sent over Ethernet interface. All Ethernet devices can send messages to all controlled devices. Up to three Ethernet devices can be connected per endpoints.

You can send IR messages using two methods:

- LW3 protocol commands - see the details in the Message Sending via Communication Ports section.
- L3 switch
6.8. USB K+M Interface

DIFFERENCE: Only UBEX-PRO20-HDMI-F120 endpoint model is built with USB K+M ports.

6.8.1. Technical Background

Port Diagram

The Concept

All controller (keyboard & mouse) and controlled (PC, workstation, etc) devices can be connected to each other using the K+M crosspoint in the UBEX matrix. It is also possible to connect the controlled and the controller devices which are plugged into the same F120 endpoint.

The USB K+M function supports emulated (composite) mode only. It means in the practice the perfect usage of special keyboard/mouse buttons (e.g. multimedia keyboards and touchpads) are not guaranteed because of the limitation of the emulated mode technology. Lightware recommends usage of ordinary keyboards built up to 104/105 keys and ordinary mice.

ATTENTION! Webcamearas and other high bandwidth demand devices are not supported by the USB ports.

INFO: F120 model allows to connect USB HUB to the USB-A (K+M) ports. It gives an opportunity to make more USB HID device connections. Please note that information about the connected USB HID devices cannot be read out by the extender via the USB HUB.

INFO: Both types of USB ports (USB-A and USB-B) are working in all endpoint operation modes (TX, RX and TRX) as well.

INFO: Point-to-point connections are supported only. No point-multipoint connections are allowed recently.

6.8.2. USB K+M Extension - Example

The Concept

Both endpoint devices in the UBEX matrix have controller (keyboard & mouse) and controlled (Workstation and PC) devices. All USB host and HID devices can be connected to each other using the K+M crosspoint.

The USB K+M properties and the crosspoint settings can be set using two methods:

▪ Lightware Device Controller (LDC / Built-in Website - see the details in the Crosspoint Menu - USB Layer section;
▪ LW3 protocol commands - see the details in the USB K+M Settings section.
6.9. SFP / SFP+ Interfaces

Definitions

DEFINITION: SFP: the small form-factor pluggable (SFP) is a compact, hot-pluggable optical module transceiver used for both telecommunication and data communications applications. It is a popular industry format jointly developed and supported by many network component vendors. *

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

ATTENTION! The MMU accepts SFP modules only because of the hardware limitation of the SFP slot.

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

6.9.1. SFP+ Interface for the Endpoints

The endpoint devices are built with 2x 10 GbE SFP+ ports to transmit the video streams between the receiver and the transmitter.

The following methods can be applied to connect the endpoint devices to the network switch:

- 2x SFP+ transceiver module up to 10Gbps bandwidth/module. The modules can be singlemode or multimode, built with LC duplex connectors or BiDi modules; or SFP+ to RJ45 modules with copper solution. The maximum allowed fiber optical cable length depends on the installed SFP+ modules. Always check the specification of the module.
- 2x 10 GbE DAC cable

ATTENTION! Always apply equal length copper cables for both SFP+ to RJ45 modules in case of 20G signal transmission. Different cable lengths may cause data package loss. See more information about the applicable cable lengths and types in the Maximum Cable Extensions section.

INFO: The maximum available bandwidth with the endpoint device is 20 Gbps, which requires 2x 10 GbE SFP+ module or DAC cable to install. If one 10 GbE SFP+ module or DAC cable is installed only, but the signal is 4K@60 Hz (which requires 14 Gbps to transmit), the signal transmission will be disabled.

INFO: For more details of the installation steps of SFP+ modules see the SFP / SFP+ Slot Connection section.

INFO: In case of SFP+ to RJ45 module installation, the endpoint device sets the cooling fans to (minimum) 2500 rpm automatically.

6.9.2. SFP Interface for the MMU

The UBEX-MMU-X200 matrix management unit has one 1 GbE SFP module slot for the fiber optical connection via the network switch.

The following methods can be applied to connect the MMU to the switch:

- 1x SFP transceiver module up to 1 Gbps bandwidth. The module can be singlemode or multimode, built with LC duplex connectors or BiDi modules. The maximum allowed fiber optical cable length depends on the installed SFP modules. Always check the specification of the module.
- 1x 1 GbE DAC cable

INFO: For more details of the installation steps of SFP modules see the SFP / SFP+ Slot Connection section.

6.10. Redundant 10G Link Channels

The UBEX F-series and R-series endpoint models are built with two equivalent 10 GbE Ethernet channels, which are based on a redundant operating principle. It means both 10 GbE Ethernet connections are able to take the place of the other one in case of a connection loss. For example, if one of the two SFP+ modules is pulled out during the operation, the AV transmission keeps going.

ATTENTION! The optical connection redundancy is available only in case of one or two HDMI signals where the sum of the required bandwidth is not greater than 10 Gb/s. Please check the Bandwidth Requirements of the Resolutions section for the details.

INFO: If two HDMI signals are transmitted where the sum of the bandwidth is greater than 10 Gb/s, there are limitations in the signal transmission on both the transmitter and the receiver side. See more details about it in the Bandwidth Limitation section.

INFO: Redundancy is available in case of fiber optical and copper (RJ45) connections as well.
6.11. Further Built-in Features

6.11.1. UBEX Matrix Database Backup and Restore

The UBEX matrix cloning is a simple method to save the database of the matrix and the configuration settings of the MMU to a backup file. This file can be saved to your computer and can be restored to the MMU later. See more information about the content of the backup file in the Content of Backup File section. You can find more information about the backup procedure in the System Tab section.

6.11.2. Advanced EDID Management

Factory Preset EDIDs

The factory EDIDs (F1-F144) are factory preprogrammed and cannot be modified. These are the most common signal formats. They are specially provided to force the graphic cards to output only the exact pixel resolution and refresh rate.

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

Sources and Destinations

The EDID memory consists of four parts:

- **Factory EDID** list shows the pre-programmed EDIDs (F1-F144).
- **Dynamic EDID** list shows the sinks connected to the device's outputs (D). The unit stores the last display devices' EDID on either output, so there is an EDID shown even if there is no display device attached to the output port at the moment.
- **User memory** locations (U1 – U64) can be used to save custom EDIDs.
- **Emulated EDID** list shows the currently emulated EDID for the inputs (E). The source column displays the memory location that the current EDID was routed from.

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

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

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

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

6.11.3. Centralized Firmware Update

The firmware update of the connected endpoint devices can be made and supervised by the MMU. You just need to select the updateable devices and one click only for the procedure starting. This method is the most easiest way to keep your UBEX matrix up to date and get the latest features.

**ATTENTION!** The centralized firmware update feature is available from MMU firmware v1.1.0 and endpoint firmware v1.3.1.

See the details about this feature in the Endpoint Update - Centralized Firmware Update section.

6.12. Software Control Modes

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

- **Lightware Device Controller (LDC)** - you can connect to the UBEX matrix via our control software using Ethernet interface and control or configure the matrix as you wish. For the details see the Software Control - Lightware Device Controller chapter.
- **Built-in website of the MMU** - you can connect to the UBEX matrix via a web browser application using Ethernet interface and control or configure the matrix as you wish. For the details, see the Software Control - Built-in Web chapter.
- **LW3 protocol commands**: you can configure the matrix by using the full-range command set of LW3 protocol. For more details, see the Programmer's Reference chapter.
7. Software Control - Built-in Web

The built-in website of the Matrix Management Unit allows to connect to and control the UBEX matrix via a web browser. The range of the controlling features are the same as in the case of Software Control - Lightware Device Controller.

- Establishing the Connection
- The Layout of the Built-in Web
7. Software Control - Built-in Web

MATRIX APPLICATION MODE

Applied endpoint firmware package: v2.4.1 | Applied MMU firmware package: v1.7.1 | LDC software: v2.6.2b3

System Requirements

Operating System: Microsoft Windows 10, Apple macOS, Linux.
Web Browser: Mozilla Firefox, Google Chrome, Apple Safari.

ATTENTION! The EDID export function works only in Windows and macOS operating systems under Mozilla Firefox or Google Chrome web browsers.

7.1. Establishing the Connection

ATTENTION! Please be sure that the computer is in the same network as the UBEX 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.

Step 1. Connect the matrix 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 address is 192.168.0.100).

7.2. The Layout of the Built-in Web

The built-in web page allows the same controlling functions which are available via the Lightware Device Controller. Select a menu item on the left side; the default screen is the Crosspoint menu. See the detailed control features in the Software Control - Lightware Device Controller chapter.

ATTENTION! Please enable the pop-up windows in your browser; certain contents are only displayed in a new window.
The device can be controlled by a computer through Ethernet interface with the Lightware Device Controller (LDC). The software can be installed on a Windows PC or macOS. The application and the User's Manual can be downloaded from www.lightware.com.

8.1. Install and Update
INFO: After the installation the Windows and the macOS application has the same look and functionality.

Minimum System Requirement
- RAM: 1 GB
- Minimum display resolution: 1280x720

Installation for Windows OS
Run the installer. If the User Account Control drops a pop-up message, click Yes.
During the installation you will be prompted to select the type of the installation: normal and the snapshot install:

<table>
<thead>
<tr>
<th>Normal install</th>
<th>Snapshot install</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available for Windows and macOS</td>
<td>Available for Windows</td>
</tr>
<tr>
<td>The installer can update only this instance</td>
<td>Cannot be updated</td>
</tr>
<tr>
<td>Only one updateable instance can exist for all users</td>
<td>More than one different version can be installed for all users</td>
</tr>
</tbody>
</table>

Comparison of installation types
ATTENTION! Using the Normal install as the default choice is highly recommended.

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

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

Updating of LDC
Step 1. Run the application.
The Device Discovery window appears automatically, and the program checks the available updates on Lightware’s website and opens the update window if LDC updates are found.
The current and the update version number can be seen at the top of the window, and they are shown in this window even with the snapshot install.
The Update window can also be opened by clicking on the About 🌐 icon and the Update button.

Step 2. Set the desired update setting in the Options section.
- If you do not want to check for the updates automatically, uncheck the circle that contains the green tick.
- If you want to postpone the update, a reminder can be set with different delays from the drop down list.
- If the proxy settings traverse the update process, set the proper values, then click on the OK button.

Step 3. Click on the Download update button to start the updating.
The updates can be checked manually by clicking on the Check now button.

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

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

Connecting to a Device with Static IP Address
Format: LightwareDeviceController -i <IP_address>:<port>
Example: LightwareDeviceController -i 192.168.0.20:6107
The LDC is connected to a device with the indicated static IP address directly; the Device Discovery window is not displayed. When the port number is not set, the default port is used: 10001 (LW2 protocol - not supported by the UBEX extenders). For LW3 devices, use the 6107 port number.

Adjusting the Zoom
The window can be zoomed to a specific value to fit to the resolution of the desktop (higher/lower). ‘1’ is the default value (100%).
Format: LightwareDeviceController -z <magnifying_value>
Example: LightwareDeviceController -z 1.2
ATTENTION! The last set value is stored and applied when LDC is started without a parameter.
8.3. Establishing Connection

Step 1. Connect the device to a computer via the following methods:
- Ethernet - in the case of the MMU, the network switch, or any endpoint device;
- RS-232 - in the case of the MMU only.

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

Step 3. Select the UBEX-MMU-X200 device from the discovered Ethernet devices or Serial devices; when the device is connected through RS-232 click on the Query button next to the desired serial port to display the name of the device and the serial number. Double click on the device name or select the device and click on the green Connect button.

Change IP Address

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

Import/Export the List of Favorite Devices

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

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

ATTENTION! The devices set with static (fix) IP address only can be saved as favorite device.

Once the device is set as favorite, the star icon will be highlighted with yellow and the device will be displayed between the Favorite Devices (fix IP) window section.
8.4. Crosspoint Menu - Video Layer

8.4.1. Grid View

The concept

The Crosspoint menu displays the UBEX matrix in grid layout with all sources (the input ports of the transmitters / transceivers) and destinations (the output ports of the receivers / transceivers). Clicking on a source or destination panel, the properties and settings of the selected item appear on the right side. Clicking on the icon, the properties section opens in a new window. The selected source/destination and crosspoint are framed with orange.

Legend of the Crosspoint Menu

1. Device Discovery
   - Clicking on the button results in returning to the Device Discovery window. The connection with the current device will be terminated.

2. Main menu
   - The available menu items (Crosspoint Menu - Video Layer, EDID Management Menu, Control Menu, Settings menu, and Video Wall Setup) are displayed. The crosspoint can be displayed in Grid view and Tile view. The Device Map, MMU Settings, and the Terminal Window are available under the Settings menu.

Navigation buttons

Clicking on the navigation buttons shows the available sources/destinations and crosspoints which cannot be displayed within the recent window size. The icon resets the grid to the default view.

Device label of the MMU

The device label of the MMU is displayed here. It can be modified by the user to any unique name by clicking on the icon. The device label can be 39 characters long and ASCII characters are allowed. Longer names will be truncated.

Auto VW layout activation switcher

Auto Video Wall layout activation switcher, see the details in the Crosspoint Menu with Video Wall section.

Audio follows video switcher

The explanation of the two available options is the following:

- **Enabled**: the audio stream follows the video stream when the video crosspoint is changed. Aside from this the audio streams can be switched separately from the video streams on the Audio crosspoint tab.
- **Disabled**: switching of a video stream does not affect the audio crosspoint state.

Layer tabs

The video and the audio crosspoint panel can be selected on the tabs.

Source streams

Each tile represents a stream coming from one of the input ports of the transmitter or transceiver. See the explanation of the source numbering in the Source and Destination Numbering section.

Connections

The crosspoint connections can be selected in this table.

Destination streams

Each tile represents an output port of a receiver or transceiver. See the explanation of the destination numbering in the Source and Destination Numbering section.

Properties window

The properties, available settings, and status information of the selected source or destination are displayed in this section. Three tabs are available: Stream, Port, and Device. Clicking on the icon, the properties section opens in a new window. See more details about the source ports in the Video Source Port Properties Window section and about the destination ports in the Video Destination Port Properties Window section.

Search field

Streams, ports, and devices can be searched in the field. See the details in the Search Field section.

Selected / Highlighted streams

Showing the currently selected connections. Move the cursor above the desired crosspoint and the names of the source and destination are displayed in the field.

Show Inactive UBEXes / Disabled Streams switchers

When they are enabled, the inactive devices / disabled streams are shown in the crosspoint table. When they are disabled, the inactive devices / disabled streams are hidden.
8.4.2. Tile View

The tile view of the UBEX matrix is suitable to review the entire AV system with the details as well. The tiles represent input or output ports and additionally show the most important port and signal information. Thus, the user can check the status of many ports at the same time.

Legend of the Crosspoint Menu

1. Device Discovery
   - Clicking on the button results in returning to the Device Discovery window. The connection with the current device will be terminated.

2. Main menu
   - The available menu items (Crosspoint Menu - Video Layer, EDID Management Menu, Control Menu, Settings menu, and Video Wall Setup) are displayed. The crosspoint can be displayed in Grid view and Tile view. The Device Map, MMU Settings and the Terminal Window are available under the Settings menu.

3. Navigation buttons
   - Clicking on the navigation buttons shows the available sources/destinations and crosspoints which cannot be displayed within the recent window size.

4. Device field
   - Streams, ports, and devices can be searched in the field. See the details in the Search Field section.

5. Device label of the MMU
   - The device label of the MMU is displayed here. It can be modified by the user to any unique name by clicking on the icon. The device label can be 39 characters long and ASCII characters are allowed. Longer names will be truncated.

6. Layer tabs
   - The video and the audio crosspoint panel can be selected on the tabs.

7. Connections menu
   - The meanings of the icons are the following:
     - Connections menu button: Clicking on the icon expands the connection menu. See the detailed setting descriptions in the Connections Menu section on the next page.
     - Input switch mode: The mode can also be named as Input priority-mode: an input port has to be selected at first then the connected output ports are shown. Thus, the output ports connected to the input port can be changed.
     - Output switch mode: This mode can also be named as Output priority-mode: an output port has to be selected at first then connected input port is shown. Thus, the output port connected to the input port can be changed.
     - View mode: This mode was designed to display the crosspoint state of a selected and its connected port(s). Crosspoint settings cannot be changed in View mode but port settings are available.

8. Source streams
   - Each tile represents a stream coming from one of the input ports of the transmitter or transceiver. See the explanation of the source numbering in the Source and Destination Numbering section.

9. Destination streams
   - Each tile represents an output port of a receiver or transceiver. See the explanation of the destination numbering in the Source and Destination Numbering section.

10. Action buttons
    - Action buttons:
      - Take - Autotake - Cancel buttons: selecting between the two input/output switching modes: the Take Mode and Autotake Mode.
      - Parameters button: clicking on the button opens the properties window of the selected source or destination. See more details about the source ports in the Video Source Port Properties Window section and about the destination ports in the Video Destination Port Properties Window section.
Port Tiles

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

1. Port name
2. Tile icon
   - The icon can be changed under the Source/Destination properties window - Stream information section (it is available by clicking on the Parameters button).
3. Hotplug state
   - Source/sink is connected.
   - Source/sink is not connected.
4. HDCP state
   - The signal is encrypted with HDCP 2.2.
   - The signal is encrypted with HDCP 1.4.
   - The sink device is not compatible with the current HDCP version.
   - Signal is not HDCP-encrypted.
5. Bandwidth of the stream
6. Resolution / refresh rate of the stream
7. Signal present indicator
   - If turquoise, signal is present, if grey, signal is not present.
8. Logical Device ID / Input/output port number

Connections Menu

Clicking on the icon expands the Connections menu and more options and settings become available.

Switch Modes
- Input Switch
- Output Switch
- View Mode
  - Show Connected Only: when a source or destination stream is selected, only the connected streams are displayed on the other panel.

Display Modes
- Show inactive UBEXes: when enabled, the inactive devices are shown in the crosspoint table. When it is disabled, the inactive devices are hidden.
- Show Disabled Streams: when enabled, the disabled streams are shown in the crosspoint table. When it is disabled, the disabled streams are hidden.
- Group by UBEXes: the streams belong to one endpoint device are framed with white.
- Audio Follows Video: The explanation of the two available options are the following:
  - Enabled: the audio stream follows the video stream when the video crosspoint is changed. Aside from this the audio streams can be switched separately from the video streams on the audio crosspoint tab.
  - Disabled: switching of a video stream does not effect the audio crosspoint state.
- Auto WV layout activation: the explanation of the two available options are the following:
  - Enabled: the video wall layout becomes active suddenly when the crosspoint setting is changed in it.
  - Disabled: switching of a source stream does not effect the video wall layout activation.

Connections
- Selected Port: the currently selected source or destination stream.
- Connected Ports: the streams are listed which are connected to the selected source or destination stream.
Switching Operations

Take Mode

If the Autotake button is grey colored the Take mode is active. In Take mode any crosspoint change – connecting/disconnecting ports to/from the previously selected port – is executed only after pressing the Take button. Following steps describe the process of the switching:

**Input switching in Take mode**

1. Press the desired Input switch or Output switch button to select the switching mode.
2. Select the desired port; it will be highlighted with orange color and displayed also in the Selected port section on the left.
3. Connected ports are highlighted with white color and displayed also in the Connected ports section on the left.
4. Create the desired crosspoint settings by selecting/deselecting the ports; they will start to blink.
5. Press the Take button to execute changes or Cancel to discard.

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

---

Autotake Mode

If the Autotake button is yellow colored, the Autotake mode is active. In this mode, any crosspoint change – connecting/disconnecting ports to/from the previously selected port – is executed immediately after pressing the port button. Following steps describe the process of the switching:

**Output switching in Autotake mode**

1. Press the desired Input switch or Output switch button to select switching mode.
2. Select the desired port; it will be highlighted with orange color and displayed also in the Selected port section on the left.
3. Connected ports are highlighted with white color and displayed also in the Connected ports section on the left.
4. Create the desired crosspoint settings by selecting/deselecting the ports; the changes are executed immediately.

**INFO:** Autotake mode remains active until it is switched off. Selecting another view mode or menu item does not effect the Take/Autotake mode state.
8.5. Crosspoint Menu - Audio Layer

DIFFERENCE: HBR audio formats are supported from LDC version v2.5.8b2, endpoint firmware version v2.0.0 and MMU firmware version v1.4.0 only. If the embedded audio signal is HBR and an HBR audio not supported error message received during the new crosspoint setting, please update the control software to the latest one. See more information about the updating procedure in the Install and Update section.

8.5.1. Grid View

The grid view of the crosspoint menu - Audio layer in Matrix mode

The operation of the Audio layer in grid view is basically the same as the Crosspoint Menu - Video Layer. Clicking on the source or the destination port the properties panel opens on the right side - all audio related information and options are available here. Tags are also attached to the audio stream. See the details about the available settings in the Audio Port Properties Windows section.

INFO: When the Audio follows video setting is enabled, the tags which are added to the video stream will be copied to the audio stream as well.

8.5.2. Tile View

The tile view of the crosspoint menu - Audio layer in Matrix mode

Two options are available switching the audio crosspoint settings:
- Audio follows video: when the Audio follows video setting is enabled, the audio stream follows the video stream when the video crosspoint is changed. Aside from this the audio streams can be switched separately from the video streams on the Audio crosspoint tab.
- Free audio crosspoint settings: when the Audio follows video setting is disabled, switching of a video stream does not effect the audio crosspoint state.

Source and destination port properties are available by clicking on the Parameters button. Switching between the inputs and outputs has two available options: the Take Mode and Autotake Mode, the working methods are the same like in the Tile View of the Video layer.

Clicking on the Parameters button opens the properties of the selected source or destination stream. See the details about the available settings in the Audio Port Properties Windows section.
8.6. Crosspoint Menu - USB Layer

DIFFERENCE: Only UBEX-PRO20-HDMI-F120 endpoint model is built with USB K+M ports. #km #usbkm

8.6.1. Grid View

The grid view of the crosspoint menu - USB layer in Matrix mode

The operation of the USB layer in grid view is basically the same as the Crosspoint Menu - Video Layer. Clicking on the source or the destination port the properties panel opens on the right side - all USB K+M related information and options are available here.

INFO: Local control is also possible which means the controlled and the controller devices are plugged into the same F120 endpoint. For example, user can switch 1/01 source to 1/01 destination for the local USB K+M control.

INFO: Point-to-point connections are supported only. No point-multipoint connections are allowed recently.

8.6.2. Tile View

The tile view of the crosspoint menu - USB layer in Matrix mode

Source and destination port properties are available by clicking on the Parameters button. Switching between the inputs and outputs has two available options: the Take Mode and Autotake Mode, the working methods are the same like in the Tile View of the Video layer.

Clicking on the Parameters button opens the properties of the selected source or destination stream.
8.7. Search Field

8.7.1. The Concept

The Search feature helps to customize the list of the devices in the UBEX matrix due to the user friendly overview. If you want to find a stream or a source / destination device, do the following steps:

Step 1. Select the type of your search in the list: Source / Destination / Both.

INFO: The Both category means searching the words which are tagged to a Source and a Destination also.

Step 2. Type the name of stream or device. The hints will be appeared in the list.

Step 3. Select the desired tag / stream name / device name. The crosspoint table will be filtered to the ports containing the searched text.

Step 4. More key words can be added to the query for the best search efficiency. The query can be saved with the Add This Query button.

ATTENTION! The saved queries will be cleared after closing the LDC application.

8.7.2. Application Areas of the Search Field

The Search field is available where the streams and ports can get unique name and tags can be attached to them. These are:

▪ Video crosspoint - Grid view / Tile view
  – Video streams
  – Video ports
  – Endpoint Devices

▪ Audio crosspoint - Grid view / Tile view
  – Audio streams
  – Audio ports
  – Endpoint Devices

▪ Control menu - Ethernet
  – Ethernet ports
  – Endpoint devices

▪ Control menu - RS-232
  – RS-232 ports
  – Endpoint devices

INFO: The search field can be used for searching in the selected layer only. For example searching in the video crosspoint menu will not find the RS-232 ports.
8.8. Default Naming / Numbering Explanation

The following section explains the default numbering of the sources/destinations and the default stream names of the endpoint devices.

8.8.1. Source and Destination Numbering

The source and destination ID contains two numbers: the logical device ID (it can be changed by the user) and the port number (it is fixed).

Logical device ID: It is created by the MMU based on the discovery order of the endpoints - independently of the operation mode. The first discovered endpoint gets the 1, the second one gets the 2, and so on.

INFO: The logical device ID can be reconfigured by the Device map feature. See the details in the Device Map section.

Input/output port number:

▪ Transmitter (source): the stream of HDMI in 1 port is the 01, the stream of HDMI in 2 port is the 02;
▪ Receiver (destination): the HDMI out 1 port is the 01, the HDMI out 2 port is the 02;
▪ Transceiver (source and destination): the stream of HDMI in 2 port is the 02 on the source side, the HDMI out 1 port is the 01 on the destination side.

8.8.2. Default Naming of the Devices and the Streams

Device Name

The default name (label) of the device is the MAC address. It can be changed freely in the Device label field by the user.

Stream Name

The default name of the stream is calculated from the MAC address and the port number of the endpoint device where the stream is transmitted from. The MAC address and the port number is separated by a dot character.

Example: A8:D2:36:F0:00:33.S1

The green characters are the MAC address of the device, the red characters are the input port number. The stream name can be changed freely in the Stream name field by the user.

8.9. Video Source Port Properties Window

Clicking on a source port the properties panel opens on the right side. Clicking on the icon the properties section opens in new window.

8.9.1. Stream Information

The most important information and settings of the stream are available in the Stream information section.

Settings

▪ Stream naming:
▪ Enabled: when it is checked in, the stream is enabled; if it is not, the stream is muted.
▪ Tile icon: choose an icon which is the most suitable with the source/destination device connected to the endpoint.
▪ Identify Stream / Identify Display, #identifystream #identifydisplay
8. Software Control - Lightware Device Controller

8.9.2. Port Information

The most important information and settings of the input port are available in the Port information section.

Settings

- HDCP setting (Enable / Disable) #hdcp

Signal Info

All important audio and video information (e.g. HDCP status, resolution, total size, pixel clock, color space, embedded audio information, etc.) are available in the signal info section.

Emulated EDID

EDID-related information is displayed in the section.

Tools

- Frame Detector - The tool displays the frame information of the original stream coming from the input port before a possible rescaling / frame rate conversion.

8.9.3. Device Information

The most important information and settings of the transmitter are available in the Device information section.

Settings

- Device label: the default label is the MAC address of the device but it can be changed to any unique name. #label #devicelabel
- MAC address;
- Operation mode: showing the current operation mode, it can be transmitter, receiver or transceiver. The operation mode can be changed in the Device Map.
- Dark mode: the dark mode feature can be enabled or disabled. It keeps the LCD screen and the LEDs unlit to hide the device during an event when the settings is enabled. #darkmode
- Identify unit: Clicking on the button makes the four front panel LEDs blink in green for 10 seconds. The feature helps to identify the device itself in the rack shelf or on the desk. #identifyme
- Device properties: Clicking on the button opens the properties windows of the endpoint device. See the details:
  - For Transmitter (TX) operation mode in the Transmitter Operation Mode section.
  - For Transceiver (TRX) operation mode in the Transceiver Operation Mode section.
- Restart unit: clicking on the button makes rebooting the device (the same as disconnecting from the power source and reconnecting again).
- Update firmware: clicking on the button makes launching the firmware update of the endpoint device by the MMU. See more details about it in the Endpoint Update - Centralized Firmware Update section.
8.10. Video Destination Port Properties Window

Clicking on a destination port the properties panel opens on the right side. Clicking on the icon the properties section opens in new window.

![Video destination port properties window](image)

### 8.10.1. Stream Information

The most important information and settings of the stream are available in the Stream information section.

**Settings**

- **Stream naming**: when it is checked in, the stream is transmitted to the receiver; if it is not, the stream is muted.
- **Stream source**: information about the currently connected stream and the ID of the source device.
- **Disconnect stream**: clicking on the button results the source stream is disconnected from the output port.
- **Tile icon**: choose an icon which is the most suitable with the source/destination device connected to the endpoint.

**Tags**

Unique and configurable tags can be attached to the stream for the best identification. The tags are searchable in the Search Field.

**Signal Info**

All important information (resolution, pixel clock, color space, e.g.) are available in the signal info section. The **signal bandwidth** and the **bandwidth limit reached** indicator are also can be checked in this panel.

**Related Audio Info**

Information (presence, audio type, sampling frequency) of the embedded audio is available in the related audio info section.

**Tools**

- **Frame Detector**: The tool displays the frame information of the original stream coming from the connected source stream before a possible rescaling / frame rate conversion.

### 8.10.2. Port Information

The most important information and settings of the input port are available in the Port information section.

**Port Selector**

INFO: The port selector menu is available for receiver operation mode only.

The two output ports which belong to the same endpoint device can be selected in the Port selector menu. Because of the Source MUX settings it may happen that the selected destination stream is connected to none of the output ports because the source stream is the local input port or the copy of the HDMI out 1. The video settings and the port/signal information are still available with the port selector menu.

DEFINITION: The source multiplexer (Source MUX) makes routing several different source signals to the HDMI output ports available. See more details about this function in the Receiver Mode and Transceiver Mode sections.
Settings

- **HDCP mode**: HDCP
  - Depends on input: the level and version of HDCP-encryption depends on the source device;
  - Maximum possible: the output ports set the maximum HDCP-encryption level that can be accepted by the connected sink device.
  - Forced HDCP 2.2 Type 1: the output ports always force HDCP 2.2 Type 1. If the sink device supports this HDCP-encryption level, the signal will be encrypted with HDCP 2.2 Type 0/1. The signal will be encrypted with HDCP 2.2 Type 1 when the source and the sink both support this HDCP-encryption level.

- **Power 5V mode**: (Auto / Always on / Always off);
- **Timing mode**: (Free run / Source locked);

**ATTENTION!** When the Source locked mode setting was unsuccessful and the port uses Free run mode as fallback, an icon appears beside the settings. It may be caused by that the scaler / FRC setting is not in Pass-through mode or the resolution of the source stream is not the same as the destination stream's one.

- **Port source**: the source multiplexer (Source MUX) makes routing several different source signals to the HDMI output ports available. See more details about this function in the **Receiver Mode** and **Transceiver Mode** sections. The available options: #mux #stereo #mix
  - From link stream (D1) / From link stream (D2) - the signal source of the output port is the stream coming from the remote device.
  - From local HDMI input 1 (I1) / From local HDMI input 1 (I2) - the signal source of the output port is the stream of the local input port of the receiver.
  - Copy of HDMI out 1 (O1) - the device is able to copy the signal of the HDMI out 1 port to the HDMI out 2. This is the COPY function.

- **Identify Stream** / **Identify Display**: #identifystream #identifydisplay

**Scaler / Frame Rate Converter Settings**

- **Scaling mode / Output resolution mode**: #scaler #fr
  - Passthrough: the scaler is in pass-through mode.
  - Forced resolution: the scaling is active, the selected value in the forced resolution option will be applied to the video signal.
  - EDID based: the scaler forces the resolution that is read out from the EDID of the connected sink device.

- **Fixed resolution**: list of the available resolutions with refresh rate values. The selected one will be applied to the video signal. See the available resolutions in the **Resolutions of the Scaler** section.

- **EDID based resolution**: the resolution that is read out from the EDID of the connected sink device.

- **Image position** (Stretch / Fit / Center);

**DIFFERENCE**: The receiver is built with scaler function on both HDMI output ports from firmware version v2.1.0.

- **INFO**: The image position setting (Scaler) is available at the HDMI out 1 port only when the endpoint is in transceiver (TRX) operation mode.

- **Color space conversion** (No conversion / RGB / YCbCr 4:4:4 / YCbCr 4:2:2);
- **Color range** (No conversion / Full range / Limited range);
- **No Sync Screen (Test Pattern)**: #nospop #nosyncscreen
- **Signal freeze button**: the signal freezes at the last video frame on the sink device (the sink may show a broken frame too): #freeze

**Status / Signal Info**

All important information (e.g. hotplug detect, HDCP status, resolution, total size, pixel clock, color space, etc.) are available in the status and signal info sections.

**Display Info**

All related information about the sink device connected to the output port.

**Tools**

- **Frame Detector** - The tool displays the frame information of the transmitted stream after a possible rescaling / frame rate conversion.

8.10.3. Device Information

The most important information and settings of the transmitter are available in the Device Information section.

**Settings**

- **Device label**: the default label is the MAC address of the device but it can be changed to any unique name. #label #devicelabel
- **MAC address**;
- **Operation mode**: showing the current operation mode, it can be transmitter, receiver or transceiver. The operation mode can be changed in the **Device Map**.
- **Dark mode**: the dark mode feature can be enabled or disabled. It keeps the LCD screen and the LEDs unlit to hide the device during an event when the settings is enabled. #darkmode
- **Identify unit**: Clicking on the button makes the four front panel LEDs blink in green for 10 seconds. The feature helps to identify the device itself in the rack shelf or on the desk. #identifyunit
- **Device properties**: Clicking on the button opens the properties windows of the endpoint device. See the details:
  - For Receiver (RX) operation mode in the **Receiver Operation Mode** section.
  - For Transceiver (TRX) operation mode in the **Transceiver Operation Mode** section.
- **Restart unit**: clicking on the button makes rebooting the device (the same as disconnecting from the power source and reconnecting again). #reboot #restart
- **Update firmware**: clicking on the button makes launching the firmware update of the endpoint device by the MMU. See more details about it in the **Endpoint Update - Centralized Firmware Update** section.
8.11. Audio Port Properties Windows

8.11.1. HDMI Source / HDMI Destination Port Properties Window

Clicking on an HDMI audio source or destination port the properties panel opens on the right side. Clicking on the icon the properties section opens in new window.

HDMI audio source port properties window

The most important signal information is available on the panel. #audio

Settings and Tools

- **Stream naming:**
- **Enabled:** when it is checked in, the stream is transmitted to the receiver; if it is not, the stream is muted.
- **Disconnect stream** (only for the destination streams): clicking on the button results the source stream is disconnected from the output port.
- **Tags:** unique and configurable tags can be attached to the stream for the best identification. The tags are searchable in the Search Field.
- **Dark mode:** the dark mode feature can be enabled or disabled. It keeps the LCD screen and the LEDs unlit to hide the device during an event when the settings is enabled.
- **Identify unit:** Clicking on the button makes the four front panel LEDs blink in green for 10 seconds. The feature helps to identify the device itself in the rack shelf or on the desk.
- **Device properties:** Clicking on the button opens the properties windows of the endpoint device.
- **Restart unit:** clicking on the button makes rebooting the device (the same as disconnecting from the power source and reconnecting again).

8.11.2. Analog Audio Source Port Properties Window

Clicking on an analog audio source port the properties panel opens on the right side. Clicking on the icon the properties section opens in new window.

Analog audio source port properties window

The most important signal information is available on the panel. #analgiaudio #volume #balance #gain

Settings and Tools

- **Stream naming:**
- **Enabled:** when it is checked in, the stream is transmitted to the receiver; if it is not, the stream is muted.
- **Tags:** unique and configurable tags can be attached to the stream for the best identification. The tags are searchable in the Search Field.
- **Volume:** sets the input volume (attenuation) between 0% (-95.62 dB) and 100% (0 dB). Clicking on the icon results in -1%, the icon results in +1% in the volume setting. The default value is 100%.
- **Balance:** sets the balance between -100 (total left) and 100 (total right). Clicking on the icon results in -1, the icon results in +1 in the balance setting. The default value is 0 (center).
- **Gain:** sets the gain between -12 dB and 35 dB. Clicking on the icon results in -1 dB, the icon results in +1 dB in the gain setting. The default value is 0 dB.
- **Dark mode:** the dark mode feature can be enabled or disabled. It keeps the LCD screen and the LEDs unlit to hide the device during an event when the settings is enabled.
- **Identify unit:** Clicking on the button makes the four front panel LEDs blink in green for 10 seconds. The feature helps to identify the device itself in the rack shelf or on the desk.
- **Device properties:** Clicking on the button opens the properties windows of the endpoint device.
- **Restart unit:** clicking on the button makes rebooting the device (the same as disconnecting from the power source and reconnecting again).
8.11.3. Analog Audio Destination Port Properties Window

Clicking on an analog audio destination port the properties panel opens on the right side. Clicking on the icon the properties section opens in new window.

![Analog audio destination port properties window](image)

The most important signal information is available on the panel.

Settings and Tools

- **Stream naming:**
  - **Enabled:** when it is checked in, the stream is transmitted to the receiver; if it is not, the stream is muted.
  - **Disconnect stream:** clicking on the button results the source stream is disconnected from the output port.
  - **Tags:** unique and configurable tags can be attached to the stream for the best identification. The tags are searchable in the Search Field.
  - **Volume:** sets the input volume (attenuation) between 0% (-95.62 dB) and 100% (0 dB). Clicking on the icon results in -1%, the icon results in +1% in the volume setting. The default value is 100%.
  - **Balance:** sets the balance between -100 (total left) and 100 (total right). Clicking on the icon results in -1, the icon results in +1 in the balance setting. The default value is 0 (center).
  - **Mute:** enable or disable the muting of the output port.
  - **Dark mode:** the dark mode feature can be enabled or disabled. It keeps the LCD screen and the LEDs unlit to hide the device during an event when the settings is enabled.
  - **Identify unit:** Clicking on the button makes the four front panel LEDs blink in green for 10 seconds. The feature helps to identify the device itself in the rack shelf or on the desk.
  - **Device properties:** clicking on the button opens the properties windows of the endpoint device.
  - **Restart unit:** clicking on the button makes rebooting the device (the same as disconnecting from the power source and reconnecting again).

8.12. Device Properties Windows

Port Tiles

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

- **Bandwidth of the stream**
  - Embedded audio presence
    - Embedded audio is present.
    - Embedded audio is not present.
  - HDCP state
    - 2.2. The signal is encrypted with HDCP 2.2.
    - 1.4. The signal is encrypted with HDCP 1.4.
    - The sink device is not compatible with the current HDCP version.
    - Signal is not HDCP-encrypted.
  - +5V / Hotplug state
    - Source/sink is connected.
    - Source/sink is not connected.
  - Source multiplexer (MUX) selector
    - The selected source is the Stream (coming from the SFP+ ports).
    - The selected source is the local HDMI input port.
    - The selected source is the copy of the HDMI out 1 port.
    - Selectable source signal
  - Source multiplexer (MUX) expandable menu
    - Clicking here results opening the MUX menu with the selectable source signals of the output port.

8.12.1. Transmitter Operation Mode

HDMI Input Ports

Clicking on the HDMI input 1 or 2 port icon results opens the Port properties. The most important signal information and settings are available from the panel.

Available Settings and Tools

- **HDCP setting** (Enable / Disable); \#hdcp
- **Frame Detector** - The tool displays the frame information of the original stream coming from the input port before a possible rescaling / frame rate conversion.

HDMI Output Ports

INFO: The properties panel belongs to the local HDMI outputs of the transmitter.

Clicking on the HDMI output 1 or 2 port icon results in opens the Port properties. The most important signal and display information and settings are available from the panel.

Available Settings and Tools

- **HDCP mode**: \#hdcp
  - Depends on input: the level and version of HDCP-encryption depends on the source device;
  - Maximum possible: the output ports set the maximum HDCP-encryption level that can be accepted by the connected sink device;
  - Forced HDCP 2.2 Type 1: the output ports always force HDCP 2.2 Type 1. If the sink device supports this HDCP-encryption level, the signal will be encrypted with HDCP 2.2 Type 0/1. The signal will be encrypted with HDCP 2.2 Type 1 when the source and the sink both support this HDCP-encryption level.
- **Power 5V mode** (Auto / Always on / Always off); \#power5v
- **Frame Detector** - The tool displays the frame information of the original stream coming from the input port before a possible rescaling / frame rate conversion.
Stream Properties Panels

Clicking on the Stream 1 or Stream 2 panels open the properties of the video input streams. The most important signal information and settings are available from the panel.

**Settings**

- **Stream naming**
- **Enabled**: when it is checked in, the stream is enabled; if it is not, the stream is muted.
- **Tile icon**: choose an icon which is the most suitable with the source/destination device connected to the endpoint.
- **Identify Stream / Identify Display**

**Scaler Settings**

- **Scaling mode**:
  - Passthrough: the scaler is in pass-through mode.
  - Forced resolution: the scaling is active, the selected value in the forced resolution option will be applied to the video signal.
- **Forced resolution**: list of the available resolutions with refresh rate values. The selected one will be applied to the video signal. See the available resolutions in the **Resolutions of the Scaler** section.
- **Image position** (Stretch / Fit / Center)

**DIFFERENCE:** The transmitter is built with scaler function on HDMI input 2 port from firmware version v2.4.1. The Image position setting on this port is a read-only parameter and fixed as **Center** in case of previous firmware versions. *(new)*

- **Color space conversion** (No conversion / RGB / YCbCr 4:4:4 / YCbCr 4:2:2).
- **Color range** (No conversion / Full range / Limited range);
- **No Sync Screen (Test Pattern)**.

**Tags**

Unique and configurable tags can be attached to the stream for the best identification. The tags are searchable in the Search Field.

**Signal Info**

All important information (resolution, pixel clock, color space, e.g.) are available in the signal info section. The **signal bandwidth** and the **bandwidth limit reached** indicators can also be checked in this panel.

**Related Audio Info**

Information (presence, audio type, sampling frequency) of the embedded audio is available in the related audio info section.

**Tools**

- **Frame Detector** - The tool displays the frame information of the original stream coming from the input port before a possible rescaling / frame rate conversion.

**SFP+ Link Panels**

Clicking on the SFP+ Link 1 or 2 panel opens the properties of the SFP+ connections. The most important signal information and the parameters of the SFP are available from the panel.

**ATTENTION!** If the 🎮 icon appears, that means incompatible optical transceiver module is installed to the endpoint device (SFP optical module (1 GbE) instead of SFP+ module (10 GbE)).
Link Aggregation Status Indicator

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Icon]</td>
<td>SFP+ connection is established successfully and the link aggregation is working successfully.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>No connection is established between the SFP+ links.</td>
</tr>
</tbody>
</table>

INFO: You can find possible causes and solution suggestions in the Troubleshooting chapter in the case of no connection or link aggregation problems.

Analog Audio Input Port Properties Panel

**DIFFERENCE:** Only the UBEX-PRO20-HDMI-F110 and F120 models are built with analog audio input port. Clicking on the Analog in panel opens the properties of the port properties. The most important signal information and settings are available from the panel.

- **#analogaudio #volume #balance #gain**

Endpoint tab of the Device properties window - Transmitter - Analog audio input port properties

Settings and Tools

- **Stream naming**:
- **Volume**: sets the input volume (attenuation) between 0% (-95.62 dB) and 100% (0 dB). Clicking on the ![Icon] results in -1%, the ![Icon] results in +1% in the volume setting. The default value is 100%.
- **Balance**: sets the balance between -100 (total left) and 100 (total right). Clicking on the ![Icon] results in -1, the ![Icon] results in +1 in the balance setting. The default value is 0 (center).
- **Gain**: sets the gain between -12 dB and 35 dB. Clicking on the ![Icon] results in -1 dB, the ![Icon] results in +1 dB in the gain setting. The default value is 0 dB.
Analog Audio Output Port Properties Panel

**DIFFERENCE:** Only the UBEX-PRO20-HDMI-F110 and F120 models are built with analog audio output port.

Clicking on the Analog out panel opens the properties of the port properties. The most important signal information and settings are available from the panel.

**Endpoint tab of the Device properties window - Transmitter - Analog audio output port properties**

**Settings and Tools**

- **Stream naming:**
- **Volume:** sets the input volume (attenuation) between 0% (-95.62 dB) and 100% (0 dB). Clicking on the icon results in -1%, the icon results in +1% in the volume setting. The default value is 100%.
- **Balance:** sets the balance between -100 (total left) and 100 (total right). Clicking on the icon results in -1, the icon results in +1 in the balance setting. The default value is 0 (center).
- **Mute:** enable or disable the muting of the output port.

**Settings Menu**

Clicking on the Settings menu opens the settings panel of the endpoint.

**Settings tab of the Device properties window - Transmitter - Status tab**

**Status Tab**

All important information are available about the transmitter, e.g. the MAC address of device, firmware versions, system uptime, voltages, and temperatures.

**Network Tab**

**ATTENTION!** The network settings will be applied when the device is set to Extender mode. There is no public IP address of the endpoint device when it is in Matrix mode.

IP address and DHCP settings can be set on this tab. Always press the **Apply settings** button to save changes.

Factory defaults settings can be recalled with a dedicated button. See the factory default settings of the endpoint device in the **Factory Default Settings** section.

# MATRIX APPLICATION MODE

Applied endpoint firmware package: v2.4.1 | Applied MMU firmware package: v1.7.1 | LDC software: v2.6.2b3

8.12.2. Receiver Operation Mode

Stream Properties Panels

Clicking on the Stream 1 or Stream 2 panels opens the properties of the video streams. The most important signal information and settings are available from the panel.

---

### Settings tab of the Device properties window -Transmitter - Front panel tab

The following settings can be set under the Front panel tab:

- **LCD Brightness**: the brightness of the LCD can be set from 1 to 10 on a scale.
- **Lock front panel**: the operation of the jog dial control knob can be locked. The settings can be unlocked only by the LCD software or by an LW3 protocol command (see the details in the Control Lock section).
- **Rotary direction**: the rotary direction of the jog dial control knob can be set in two ways:
  - Clockwise
  - Counter-clockwise
- **Dark mode**: the dark mode feature can be enabled or disabled. It keeps the LCD screen and the LEDs unlit to hide the device during an event when the settings is enabled. 

---

### Endpoint tab of the Device properties window - Receiver - Stream Properties

Settings

- **Stream naming**;
- **Enabled**: when it is checked in, the stream is transmitted to the receiver; if it is not, the stream is muted.
- **Stream source**: information about the currently connected stream and the ID of the source device.
- **Disconnect stream**: clicking on the button results the source stream is disconnected from the output port.
- **Tile icon**: choose an icon which is the most suitable with the source/destination device connected to the endpoint.

Tags

Unique and configurable tags can be attached to the stream for the best identification. The tags are searchable in the Search Field. #streamenable #tag
Signal Info
All important information (resolution, pixel clock, color space, e.g.) are available in the signal info section. The signal bandwidth and the bandwidth limit reached indicators can also be checked in this panel.

Related Audio Info
Information (presence, audio type, sampling frequency) of the embedded audio is available in the related audio info section.

Tools
- Frame Detector - The tool displays the frame information of the transmitted stream after a possible rescaling / frame rate conversion.

HDMI Output Ports
Clicking on the HDMI out 1 or 2 panels opens the properties of the output ports. The most important signal information and settings are available from the panel.

Source MUX Selector
The source multiplexer (Source MUX) makes routing several different source signals to the HDMI output ports available. See more details about this function in the Receiver Mode section.

ATTENTION! The audio crosspoint settings always follow the source MUX settings of the video layer and the MUX settings cannot be set in the audio layer.

TIPS AND TRICKS: The source of the output port can also be selected without expanding the MUX menu.

HDMI Out 1
- Stream - The signal source of the output port is the stream coming from the remote device.
- HDMI in 1 - The signal source of the output port is the stream of the local input port of the receiver. The HDMI in 1 port panel will be available when selecting this option.

HDMI Out 2
- Stream - The signal source of the output port is the stream coming from the remote device.
- HDMI in 2 - The signal source of the output port is the stream of the local input port of the receiver. The HDMI in 2 port panel will be available when selecting this option.
- Copy - The device is able to copy the signal of the HDMI out 1 port. This is the COPY function.

INFO: The Copy function is available only on the HDMI out 2 port.
8. Software Control - Lightware Device Controller

### Settings

- **HDCP mode**: 
  - Depends on input: the level and version of HDCP-encryption depends on the source device;
  - Maximum possible: the output ports set the maximum HDCP-encryption level that can be accepted by the connected sink device.
  - Forced HDCP 2.2 Type 1: the output ports always force HDCP 2.2 Type 1. If the sink device supports this HDCP-encryption level, the signal will be encrypted with HDCP 2.2 Type 0/1. The signal will be encrypted with HDCP 2.2 Type 1 when the source and the sink both support this HDCP-encryption level.

- **Power 5V mode**: (Auto / Always on / Always off); 
- **Timing mode**: (Free run / Source locked);

**ATTENTION!** When the Source locked mode setting was unsuccessful and the port uses Free run mode as fallback, an icon appears beside the settings. It may be caused by that the scaler / FRC setting is not in Pass-through mode or the resolution of the source stream is not the same as the destination stream's one.

- **Identify Stream / Identify Display**: #identifystream #identifydisplay

### Scaler Settings

**DIFFERENCE:** The receiver is built with scaler function on both HDMI output ports from firmware version v2.1.0. The image position setting on this port is a read-only parameter and fixed as Center in case of previous firmware versions.

- **Scaling mode**: 
  - Pass-through: the scaler is in pass-through mode.
  - Forced resolution: the scaling is active, the selected value in the forced resolution option will be applied to the video signal;
  - EDID based: the scaler forces the resolution that is read out from the EDID of the connected sink device.

- **Forced resolution**: list of the available resolutions with refresh rate values. The selected one will be applied to the video signal. See the available resolutions in the Resolutions of the Scaler section.

- **Image position**: (Stretch / Fit / Center);

- **Color space conversion**: (No conversion / RGB / YCbCr 4:4:4 / YCbCr 4:2:2);

- **Color range**: (No conversion / Full range / Limited range);

- **No Sync Screen**: (Test Pattern);

- **Signal freeze button**: the signal freezes at the last video frame on the sink device (the sink may show a broken frame too).

### Display Info

All important information about the sink device connected to the output port.

### Tools

- **Frame Detector** - The tool displays the frame information of the transmitted stream after a possible rescaling / frame rate conversion.

### HDMI Input Ports

**INFO:** The properties panel appears only in case of the selected source MUX settings is the HDMI in 1 or 2 for the HDMI output ports.

**INFO:** The properties panel belongs to the local HDMI inputs of the receiver. Clicking on the HDMI input 1 or 2 port icon results opens the Port properties. The most important signal information and settings are available from the panel.

---

Applied endpoint firmware package: v2.4.1 | Applied MMU firmware package: v1.7.1 | LDC software: v2.6.2b3
SFP+ Link Panels

Clicking on the SFP+ Link 1 or 2 panel opens the properties of the SFP+ connections. The most important signal information and the parameters of the SFP are available from the panel. #sfp

ATTENTION! If the icon appears, that means incompatible optical transceiver module is installed to the endpoint device (SFP optical module (1 GbE) instead of SFP+ module (10 GbE)).

Link Aggregation Status Indicator

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Diagram of SFP+ connection established successfully" /></td>
<td>SFP+ connection is established successfully and the link aggregation is working successfully.</td>
</tr>
<tr>
<td><img src="image" alt="Diagram of no connection between SFP+ links" /></td>
<td>No connection is established between the SFP+ links.</td>
</tr>
</tbody>
</table>

INFO: You can find possible causes and solution suggestions in the Troubleshooting chapter in the case of no connection or link aggregation problems.

Analog Audio Input Port Properties Panel

DIFFERENCE: Only the UBEX-PRO20-HDMI-F110 and F120 models are built with analog audio input port. Clicking on the Analog in panel opens the properties of the port properties. The most important signal information and settings are available from the panel. #analogaudio #volume #balance #gain

Endpoint tab of the Device properties window - Receiver - Analog audio input port properties

Settings and Tools

- **Stream naming:**
- **Volume:** sets the input volume (attenuation) between 0% (-95.62 dB) and 100% (0 dB). Clicking on the icon results in -1%, the icon results in +1% in the volume setting. The default value is 100%.
- **Balance:** sets the balance between -100 (total left) and 100 (total right). Clicking on the icon results in -1, the icon results in +1 in the balance setting. The default value is 0 (center).
- **Gain:** sets the gain between -12 dB and 35 dB. Clicking on the icon results in -1 dB, the icon results in +1 dB in the gain setting. The default value is 0 dB.

ATTENTION! The audio crosspoint settings always follow the source MUX settings of the video layer and the MUX settings cannot be set in the audio layer.
**Matrix Application Mode**

**Applied endpoint firmware package**: v2.4.1

**Applied MMU firmware package**: v1.7.1

**LDC software**: v2.6.2b3

---

**Analog Audio Output Port Properties Panel**

**DIFFERENCE**: Only the UBEX-PRO20-HDMI-F110 and F120 models are built with analog audio output port. Clicking on the Analog out panel opens the properties of the port properties. The most important signal information and settings are available from the panel.

- **#analogaudio**
- **#volume**
- **#balance**
- **#mute**
- **#unmute**

---

**Endpoint tab of the Device properties window - Receiver - Analog audio output port properties**

**Settings and Tools**

- **Stream naming**;
- **Volume**: sets the input volume (attenuation) between 0% (-95.62 dB) and 100% (0 dB). Clicking on the icon results in -1%, the icon results in +1% in the volume setting. The default value is 100%.
- **Balance**: sets the balance between -100 (total left) and 100 (total right). Clicking on the icon results in -1, the icon results in +1 in the balance setting. The default value is 0 (center).
- **Mute**: enable or disable the muting of the output port.

---

**ATTENTION!** The audio crosspoint settings always follow the source MUX settings of the video layer and the MUX settings cannot be set in the audio layer.

---

**Settings Tab**

Clicking on the Settings menu opens the settings panel of the endpoint.

**Settings tab of the Device properties window - Receiver - Network tab**

**Status Tab**

All important information are available about the receiver, e.g. the MAC address of device, firmware versions, system uptime, voltages, and temperatures.

**Network Tab**

**ATTENTION!** The network settings will be applied when the device is set to Extender mode. There is no public IP address of the endpoint device when it is in Matrix mode.

IP address and DHCP settings can be set on this tab. Always press the Apply settings button to save changes.

Factory defaults settings can be recalled with a dedicated button. See the factory default settings of the endpoint device in the *Factory Default Settings* section.
8. Software Control - Lightware Device Controller

8.12.3. Transceiver Operation Mode

HDMI Out 1 Panel

Clicking on the HDMI out 1 panel opens the properties of the output port. The most important signal information and settings are available from the panel.

---

Settings tab of the Device properties window - Receiver - Front panel tab

The following settings can be set under the Front panel tab:

- **LCD Brightness** - the brightness of the LCD can be set from 1 to 10 on a scale.
- **Lock front panel** - the operation of the jog dial control knob can be locked. The settings can be unlocked only by the LCD software or by an LW3 protocol command (see the details in the Control Lock section).
- **Rotary direction** - the rotary direction of the jog dial control knob can be set in two ways:
  - Clockwise
  - Counter-clockwise
- **Dark mode** - the dark mode feature can be enabled or disabled. It keeps the LCD screen and the LEDs unlit to hide the device during an event when the settings is enabled.

---

Endpoint tab of the Device properties window - Transceiver - Output port properties
Settings

- **HDCP mode**: `#hdcp`
  - Depends on input: the level and version of HDCP-encryption depends on the source device;
  - Maximum possible: the output ports set the maximum HDCP-encryption level that can be accepted by the connected sink device.
  - Forced HDCP 2.2 Type 1: the output ports always force HDCP 2.2 Type 1. If the sink device supports this HDCP-encryption level, the signal will be encrypted with HDCP 2.2 Type 0/1. The signal will be encrypted with HDCP 2.2 Type 1 when the source and the sink both support this HDCP-encryption level.

- **Power 5V mode** (Auto / Always on / Always off); `#power5v`

- **Timing mode** (Free run / Source locked); `#timingmode #freerun #sourcelocked`

ATTENTION! When the Source locked mode setting was unsuccessful and the port uses Free run mode as fallback, an icon appears beside the settings. It may be caused by that the scaler / FRC setting is not in Pass-through mode or the resolution of the source stream is not the same as the destination stream’s one.

- **Identify Stream / Identify Display**: `#identifystream #identifydisplay`

Scaler Settings

- **Scaling mode**:
  - Passthrough: the scaler is in pass-through mode.
  - Forced resolution: the scaling is active, the selected value in the forced resolution option will be applied to the video signal;
  - EDID based: the scaler forces the resolution that is read out from the EDID of the connected sink device.

- **Forced resolution**: list of the available resolutions with refresh rate values. The selected one will be applied to the video signal. See the available resolutions in the Resolutions of the Scaler section.

- **EDID based resolution**: the resolution that is read out from the EDID of the connected sink device.

- **Image position** (Stretch / Fit / Center);

- **Color space conversion** (No conversion / RGB / YCbCr 4:4:4 / YCbCr 4:2:2);

- **Color range** (No conversion / Full range / Limited range);

- **No Sync Screen (Test Pattern)**;

- **Signal freeze button**: the signal freezes at the last video frame on the sink device (the sink may show a broken frame too).

Status / Signal Info

All important information (e.g. hotplug detect, HDCP status, resolution, total size, pixel clock, color space, e.g.) are available in the status and signal info sections.

Display Info

All related information about the sink device connected to the output port.

Tools

- **Frame Detector**: The tool displays the frame information of the transmitted stream after a possible rescaling / frame rate conversion.

Destination Stream Panel

Clicking on the destination stream panel opens the properties of the stream. The most important signal information and settings are available from the panel.

![Endpoint tab of the Device properties window - Transceiver - Destination stream properties](image)

Settings

- **Stream naming**;
- **Enabled**: when it is checked in, the stream is transmitted to the receiver; if it is not, the stream is muted.
- **Stream source**: information about the currently connected stream and the ID of the source device.
- **Disconnect stream**: clicking on the button results the source stream is disconnected from the output port.
- **Tile icon**: choose an icon which is the most suitable with the source/destination device connected to the endpoint.
Tags
Unique and configurable tags can be attached to the stream for the best identification. The tags are searchable in the Search Field.

Signal Info
All important information (resolution, pixel clock, color space, e.g.) are available in the signal info section. The signal bandwidth and the bandwidth limit reached indicators can also be checked in this panel.

Related Audio Info
Information (presence, audio type, sampling frequency) of the embedded audio is available in the related audio info section.

Tools
- Frame Detector - The tool displays the frame information of the transmitted stream after a possible rescaling / frame rate conversion.

HDMI In 2 Panel
Clicking on the HDMI in 2 panel opens the properties of the input port. The most important signal information and settings are available from the panel.

Available Settings and Tools
- HDCP setting (Enable / Disable)
- Frame Detector - The tool displays the frame information of the original stream coming from the input port before a possible rescaling / frame rate conversion.

HDMI Output Port
INFO: The properties panel belongs to the local HDMI output of the transceiver.
Clicking on the HDMI output 2 port icon results in opens the Port properties. The most important signal and display information and settings are available from the panel.

Endpoint tab of the Device properties window - Transceiver - Input port properties

Endpoint tab of the Device properties window - Transceiver - Local output port properties
Source MUX Selector

The source multiplexer (Source MUX) makes routing several different source signals to the HDMI output ports available. See more details about this function in the Transceiver Mode section.

Click on the MUX menu to expand the source MUX selector.

ATTENTION! The audio crosspoint settings always follow the source MUX settings of the video layer and the MUX settings cannot be set in the audio layer.

TIPS AND TRICKS: The source of the output port can also be selected without expanding the MUX menu.

HDMI Out 2

- HDMI in 2: The signal source of the local output port is the stream of the local input port of the transceiver.
- Copy: The device is able to copy the signal of the HDMI out 1 port. This is the COPY function.

Available Settings and Tools

- HDCP mode: #hdcp
  - Depends on input: the level and version of HDCP-encryption depends on the source device;
  - Maximum possible: the output ports set the maximum HDCP-encryption level that can be accepted by the connected sink device.
  - Forced HDCP 2.2 Type 1: the output ports always force HDCP 2.2 Type 1. If the sink device supports this HDCP-encryption level, the signal will be encrypted with HDCP 2.2 Type 0/1. The signal will be encrypted with HDCP 2.2 Type 1 when the source and the sink both support this HDCP-encryption level.
- Power 5V mode (Auto / Always on / Always off): #power5v
- Frame Detector: The tool displays the frame information of the original stream coming from the input port before a possible rescaling / frame rate conversion.

Source Stream Panel

Clicking on the source stream panel opens the properties of the stream. The most important signal information and settings are available from the panel.

Endpoint tab of the Device properties window - Transceiver - Source stream properties

Settings

- Stream naming:
- Enabled: when it is checked in, the stream is enabled; if it is not, the stream is muted.
- Tile Icon: choose an icon which is the most suitable with the source/destination device connected to the endpoint.
- Identify Stream / Identify Display: #identifystream #identifydisplay

Tags

Unique and configurable tags can be attached to the stream for the best identification. The tags are searchable in the Search Field.

#streamable #tag

MATRIX APPLICATION MODE

Applied endpoint firmware package: v2.4.1 | Applied MMU firmware package: v1.7.1 | LDC software: v2.6.2b3

Scaler Settings

DIFFERENCE: The transceiver is built with scaler function on HDMI input 2 port from firmware version v2.1.0.
The port has FRC and CSC settings only in case of previous firmwares.

- Scaling mode:
  - Passthrough: the scaler is in pass-through mode.
  - Forced resolution: the scaling is active, the selected value in the forced resolution option will be applied to the video signal;
- Forced resolution: list of the available resolutions with refresh rate values. The selected one will be applied to the video signal. See the available resolutions in the Resolutions of the Scaler section.
- Image position (Stretch / Fit / Center)
- Color space conversion (No conversion / RGB / YCbCr 4:4:4 / YCbCr 4:2:2).
- Color range (No conversion / Full range / Limited range);
- No Sync Screen (Test Pattern).

Signal Info

All important information (resolution, pixel clock, color space, e.g.) are available in the signal info section. The signal bandwidth and the bandwidth limit reached indicators can also be checked in this panel.

Related Audio Info

Information (presence, audio type, sampling frequency) of the embedded audio is available in the related audio info section.

Tools

- Frame Detector - The tool displays the frame information of the original stream coming from the input port before a possible rescaling / frame rate conversion.

SFP+ Link Panels

Clicking on the SFP+ Link 1 or 2 panel opens the properties of the SFP+ connections. The most important signal information and the parameters of the SFP are available from the panel.

**ATTENTION!** If the icon appears, that means incompatible optical transceiver module is installed to the endpoint device (SFP optical module (1 GbE) instead of SFP+ module (10 GbE).

Link Aggregation Status Indicator

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Icon]</td>
<td>SFP+ connection is established successfully and the link aggregation is working successfully.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>No connection is established between the SFP+ links.</td>
</tr>
</tbody>
</table>

INFO: You can find possible causes and solution suggestions in the Troubleshooting chapter in the case of no connection or link aggregation problems.
Analog Audio Input Port Properties Panel

DIFFERENCE: Only the UBEX-PRO20-HDMI-F110 and F120 models are built with analog audio input port. Clicking on the Analog in panel opens the properties of the port properties. The most important signal information and settings are available from the panel. #analogaudio #volume #balance #gain

Settings and Tools
- **Stream naming:**
- **Volume:** sets the input volume (attenuation) between 0% (-95.62 dB) and 100% (0 dB). Clicking on the icon results in -1%, the icon results in +1% in the volume setting. The default value is 100%.
- **Balance:** sets the balance between -100 (total left) and 100 (total right). Clicking on the icon results in -1, the icon results in +1 in the balance setting. The default value is 0 (center).
- **Gain:** sets the gain between -12 dB and 35 dB. Clicking on the icon results in -1 dB, the icon results in +1 dB in the gain setting. The default value is 0 dB.

ATTENTION! The audio crosspoint settings always follow the source MUX settings of the video layer and the MUX settings cannot be set in the audio layer.

Analog Audio Output Port Properties Panel

DIFFERENCE: Only the UBEX-PRO20-HDMI-F110 and F120 models are built with analog audio output port. Clicking on the Analog out panel opens the properties of the port properties. The most important signal information and settings are available from the panel. #analogaudio #volume #balance #mute #unmute

Settings and Tools
- **Stream naming:**
- **Volume:** sets the input volume (attenuation) between 0% (-95.62 dB) and 100% (0 dB). Clicking on the icon results in -1%, the icon results in +1% in the volume setting. The default value is 100%.
- **Balance:** sets the balance between -100 (total left) and 100 (total right). Clicking on the icon results in -1, the icon results in +1 in the balance setting. The default value is 0 (center).
- **Mute:** enable or disable the muting of the output port.

ATTENTION! The audio crosspoint settings always follow the source MUX settings of the video layer and the MUX settings cannot be set in the audio layer.
Settings Tab

Clicking on the Settings menu opens the settings panel of the endpoint.

**Settings tab of the Device properties window - Transceiver - Status tab**

**Status Tab**

All important information are available about the transceiver, e.g. the MAC address of device, firmware versions, system uptime, voltages, and temperatures.

Network Tab

ATTENTION! The network settings will be applied when the device is set to Extender mode. There is no public IP address of the endpoint device when it is in Matrix mode.

IP address and DHCP settings can be set on this tab. Always press the Apply settings button to save changes.

Factory defaults settings can be recalled with a dedicated button. See the factory default settings of the endpoint device in the Factory Default Settings section.
8. Software Control - Lightware Device Controller

8.1. MATRIX APPLICATION MODE

Applied endpoint firmware package: v2.4.1 | Applied MMU firmware package: v1.7.1 | LDC software: v2.6.2b3

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8.13. Diagnostic Tools

8.13.1. Frame Detector

The ports can show detailed information about the signal like blanking intervals and active video resolution. This feature can be used for troubleshooting if compatibility problems occur during system installation. To access this function, open the port properties window and click on the Frame detector button.

![Frame detector window](image)

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

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

---

Front Panel Tab

The following settings can be set under the Front panel tab:

- **LCD Brightness** - the brightness of the LCD can be set from 1 to 10 on a scale.
- **Lock front panel** - the operation of the jog dial control knob can be locked. The settings can be unlocked only by the LCD software or by an LW3 protocol command (see the details in the Control Lock section).
- **Rotary direction** - the rotary direction of the jog dial control knob can be set in two ways:
  - Clockwise
  - Counter-clockwise
- **Dark mode** - the dark mode feature can be enabled or disabled. It keeps the LCD screen and the LEDs unlit to hide the device during an event when the settings is enabled.
8.13.2. No Sync Screen (Test Pattern)
The No sync screen feature generates an image that can be displayed when there is no incoming signal on the port. The following settings can be set for the Test Pattern function:

Mode
- **Always on**: the video output port always transmits the test pattern.
- **Auto**: the video output port transmits the test pattern if there is no incoming signal on the selected input port.
- **Always off**: the test pattern function is disabled, the video output port transmits the video signal of the selected input port.
- **Freeze**: the signal freezes at the last video frame on the sink device (the sink may show a broken frame too).

Color
Three ways are available to set the no sync screen color:
- Click on the predefined color;
- Use the sliders;
- Type the RGB code of the color.

When the desired color is selected, press the **Set color** button to store.

Port Tile
The port tile of the HDMI outputs displays when No sync screen mode is active.

INFO: No sync screen will be active in the case of connected sink device to the output port only.

8.13.3. Identify Stream / Identify Display
Clicking on the Identify Stream / Identify Display button generates 10 test colors on the display device for 10 seconds. The feature helps to identify the stream and the screen itself physically.

The order of the generated colors

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

Control Buttons
- **EXPORT**: Exporting an EDID (save to a file)
- **IMPORT**: Importing an EDID (load from a file)
- **DELETE SELECTED**: Deleting EDID (from User memory)
- **INFO**: Display EDID Summary window
- **EDIT**: Opening Advanced EDID Editor with the selected EDID
- **CREATE**: Opening Easy EDID Creator
- **TRANSFER**: Transfer button: executing EDID emulation or copying
- **SELECT ALL**: Selecting all memory places in the right panel
- **SELECT NONE**: Selecting none of the memory places in the right panel
8.14.1. EDID Operations

Changing Emulated EDID

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

Learning an EDID

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

Exporting an EDID

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

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

Importing an EDID

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

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

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

Deleting EDID(s)

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

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

8.14.2. Editing an EDID

Select an EDID from Source panel and press the Edit button to display the Advanced EDID Editor window. The editor can read and write all descriptors that are defined in the standards, including the additional CEA extensions. Any EDID from the device's memory or a saved EDID file can be loaded into the editor. The software resolves the raw EDID and displays it as readable information to the user. All descriptors can be edited and saved in an EDID file, or uploaded to the User memory. For more details about EDID Editor, please visit our website (https://lightware.com/pub/media/lightware/filedownloader/file/Application-Note/EDID_Editor_Application_Notes.pdf) and download the EDID Editor user's manual.
8.14.3. Creating an EDID - Easy EDID Creator

Since the above mentioned Advanced EDID Editor needs more detailed knowledge about EDID, Lightware introduced a wizard-like interface for fast and easy EDID creation. With Easy EDID Creator it is possible to create custom EDIDs in four simple steps. By clicking on the Create button below the Source panel, Easy EDID Creator is opened in a new window.

![EDID Creator window](image)

8.14.4. EDID Summary Window

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

![EDID summary window](image)
8.15. Control Menu

The Ethernet control ports, the RS-232 port and the Infrared ports can be configured in the Control menu.

8.15.1. Ethernet Tab

Clicking on the Ethernet port icon results opening the Port properties. The most important information and settings are available on the panel.

Switchers
- Show Inactive UBEXes: when it is enabled, the inactive endpoints appear in the list.
- Show Disabled Ports: when it is enabled, the disabled ports appear in the list.
- Group by UBEXes: when it is enabled, the ports belonging to one endpoint device are arranged to one group for the better overseeing.

Available settings and tools
- Port naming;
- Enable/disable the port;
- Mode (Auto negotiation / 10Mbps half-duplex / 10Mbps full-duplex / 100Mbps half-duplex / 100Mbps full-duplex / 1000Mbps full-duplex);
- Reloading factory default settings for the selected port.
- Tile icon: choose an icon which is the most suitable with the device connected to the endpoint.
- Tags: unique and configurable tags can be attached to the stream for the best identification. The tags are searchable in the Search Field.

8.15.2. RS-232 Tab

DIFFERENCE: Only the UBEX-PRO20-HDMI-F110 and F120 models are built with serial interface port.

Clicking on the RS-232 port icon results opening the Port properties. The most important information and settings are available on the panel.

Switchers
- Show Inactive UBEXes: when it is enabled, the inactive endpoints appear in the list.
- Show Disabled Ports: when it is enabled, the disabled ports appear in the list.
- Group by UBEXes: when it is enabled, the ports belonging to one endpoint device are arranged to one group for the better overseeing.

Available settings and tools
- Port naming;
- Baud rate (4800 / 7200 / 9600 / 14400 / 19200 / 38400 / 57600 / 115200);
- Databits (read-only parameter, the value is 8);
- Parity (None / Odd / Even);
- Stop bits (1 / 1.5 / 2);
- Tile icon: choose an icon which is the most suitable with the device connected to the endpoint.
- Tags: unique and configurable tags can be attached to the stream for the best identification. The tags are searchable in the Search Field.
- Enable command injection (enable / disable);
- TCP port number;
- Send message field;
- Reloading factory default settings for the selected port.

### 8. Sending Message via RS-232 Interface

The **Send message** is for sending a command message in ASCII-format. This method allows escaping the control characters. #message

#### Escaping the Control Characters

**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.

The message 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 given character (like in C language).

Control characters are the following: `\` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` `{` ```

**Example**

The original message: `Set\(01\)`

The escaped message: `Set\\(01\\)`

The case above is a typical example: the UBEX endpoint device is directed to send out a message over one of its ports. The round brackets in the message are escaped.

**Using Hexadecimal Codes**

Hexadecimal codes can be inserted in the ASCII message when using:

- **Message:** `C0\x0D`
- `\x` indicates that the following is a hexadecimal code.
- `0D` is the hexadecimal code (Carriage Return).

See more serial message sending methods using LW3 protocol commands in the [Sending a Text (ASCII-format) via Serial Port](#), [Sending a Binary Message (HEX-format) via Serial Port](#), and the [Sending a Message (ASCII-format) via Serial Port](#) sections.

### 8.15.3. Infra Tab

**DIFFERENCE:** Only the UBEX-PRO20-HDMI-F110 and F120 models are built with Infrared interface ports.

Clicking on an Infra port icon results opening the Port properties. The most important settings are available on the panel. #infra #ir #message

**Infra tab in the Control menu**

#### Available settings and tools:

- Port naming;
- Enable/disable the port;
- Command injection port;
- Enable command Injection (enable / disable);
- **Send message** (for IR out ports only): sending pronto hex message in little-endian format on the Infra output port.

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

**INFO:** You can send pronto hex message in [big-endian format](#) as well, using LW3 protocol command. See the details in the [Sending Hex Codes in Big-endian Format via IR Port](#) section.
8.16.  Device Map

Clicking on the Settings / Device map submenu opens the Device map function window. The order list of the discovered transmitters and receivers can be changed to a custom list. The new order is saved in the MMU, the last applied order list will be loaded next time in the case of restarting the matrix. #devicemap

Switchers
- Show Double Grid: when it is enabled, the device list is duplicated for the better overseeing.
- Show Inactive Devices: when it is enabled, the currently inactive endpoints appear in the list.

8.16.1.  The Steps of the Reorder

TIPS AND TRICKS: It is recommended to change the name of the devices to unique ones before the re-order process, it can help a lot to find the desired device in the matrix. See the details about the device renaming in the Device Information section for the source side and the Device Information section for the Destination side.

Step 1. Select the tile of the desired endpoint device by clicking with the left button of the mouse.
Step 2. Drag and drop the tile to the desired place.
Step 3. Select the Apply Changes button and confirm the selection.

TIPS AND TRICKS: You can use the Identify unit button to find the selected endpoint physically. The feature makes the four front panel LEDs blink in green for 10 seconds.

8.16.2.  Tools in the Device Map

Operation Mode Changing

The operation mode (transmitter / receiver / transceiver) can be changed in the device map window. #operationmode #transmitter #receiver #transceiver #tx #rx #trx

Step 1. Select the tile of the desired endpoint device by clicking with the left button of the mouse.
Step 2. Select the desired operation mode (transmitter / receiver / transceiver) in the General info / Operation mode menu.
Step 3. Select the Apply Changes button and confirm the selection.
Step 4. The change will be applied after rebooting the endpoint.

ATTENTION! This operation always requires rebooting the endpoint device.

ATTENTION! Always check the cabling of the HDMI input / output ports before changing of the operation mode.

Identify Unit

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

Restart Unit

Clicking on the button makes restarting the selected endpoint device (the same method as unplugging and reconnecting the power source). #restart #reboot

Factory Defaults

Factory defaults settings of the MMU can be recalled with a dedicated button. See the factory default values in the UBEX-MMU-X200 section. #factory

Update Firmware

See more details about it in the Update Firmware section.

Searching a Device

TIPS AND TRICKS: It is recommended to change the name of the devices to unique ones before the searching, it can help a lot to find the desired device in the matrix. See the details about the device renaming in the Device Information section for the source side and the Device Information section for the Destination side.

The endpoint devices can be searched in the device map list. Click in the search field and type the device name. The tiles with the matching names will be highlighted with orange. #search
8.17. MMU Settings

8.17.1. Status Tab

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

8.17.2. Network Tab

Static IP address and DHCP (dynamic IP address) settings can be set on this tab. Always press the Apply settings button to save changes.

Factory defaults settings of the MMU can be recalled with a dedicated button. See the factory default values in the UBEX-MMU-X200 section.
8.17.3. System Log Tab

System log tab in the MMU settings menu

All UBEX matrix related notifications are listed in the System log tab which are grouped in four categories: info, notice, warning, and error. The categories are summarized on the right side of the tab in the Summary section. The list can be customized by the Column Switchers by turning on or off the following columns: Time, Level, Identification, and Message.

All system log tracks can be saved to the control computer with the Export full system log button. INFO: Please always download the system logs and send to the Lightware Support Team (support@lightware.com) for the most effective collaboration in the case of a troubleshooting issue.

8.17.4. License Tab

DIFFERENCE: License handling is available for MMU part number 91810015 and from firmware version v1.7.0 only.

License tab in the MMU settings menu

The Matrix Management Unit can claim up to 16 endpoint devices by default. The number of claimable endpoints can be expanded by endpoint license. See more details about license types in the Endpoint License section.

The License tab shows the details and status of the active license of the MMU and provides interface managing the endpoint licenses.
Uploading of a License

When a new endpoint license is purchased for the MMU, Lightware sends an encrypted file which makes available to extend your UBEX matrix. To activate the license, please follow the steps:

**Step 1.** Click on the **Select License** button.
**Step 2.** Browse the license file what you received from Lightware.
**Step 3.** Confirm the license choice by clicking on the **OK** button.

**ATTENTION!** The MMU must apply a quick reset to complete applying of the new license.

**Step 4.** Confirm to restart the MMU to apply the new license.
**Step 5.** After the device reboots, the new license is activated on the MMU and ready to claim new endpoint devices on the network.

Removing the License

**ATTENTION!** When an active license is applied in the Matrix Management Unit, it must be removed before a new license is uploaded.

**Step 1.** Click on the **Remove** button.
**Step 2.** Confirm your choice by clicking on the **OK** button.

**ATTENTION!** The MMU must apply a quick reset to complete the removing process.

**Step 3.** Confirm to restart the MMU to apply the new setting.

Troubleshooting

If you experience any problem with the endpoint license handling of the MMU, please read the possible root causes in the **Use Cases** section.

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8.17.5. System Tab

The following functions are available under System tab:

- **Factory defaults** - recalling factory defaults settings and values for the MMU. All factory default settings are listed in the UBEX-MMU-X200 section. #factory
- **Download backup and diagnostics** - saving the configuration backup file and the diagnostic information of the device. See the contents of the backup file in the **Content of Backup File** section. #backup
- **Reboot device**
  - **Quick reset:** the controller software of the MMU reboots, but the hardware of the unit does not reboot. #softreset
  - **Reboot:** the MMU reboots, it is the same like disconnecting the power source and reconnecting again. #reboot #restart #reset

**INFO:** The video signal transmission is not affected by any kind of rebooting of the MMU.

- **Restore system settings** - select a backup file of the MMU on your computer and select the **Restore** button to load it. The configuration settings saved in the file are applied immediately.
- **Date / time settings** - two options are available to set the date and time:
  - **Set current date / time** - system time can be set manually or can be synchronized with your control device, #time #date
  - **NTP settings:** an NTP server address can be set and enable/disable the service to synchronize the date and time, #ntp

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

8.18.1. Link Status Tab

The actual link, connection and signal bandwidth status of the UBEX matrix can be overviewed in the Link Status tab. The details of the listed information are the following:

1. **Action buttons**
   - **Identify the device**: clicking on the icon makes the four front panel LEDs blink in green for 10 seconds. The feature helps to identify the device itself in the rack shelf.
   - **Restart the device**: clicking on the icon makes restarting the endpoint.

2. **Logical device ID (endpoint number)**
   - Logical device ID means the MMU assigns a number to the endpoints ordered by the discovery. For example the first endpoint gets the 1 (appears as X1), the second one the 2 (appears as X2).
   - The listed endpoint devices can be sorted by clicking on the icon.

3. **Device name**
   - The name of device which is composed of the UBEX word and the last six characters of the MAC address.
   - The listed endpoint devices can be sorted by clicking on the icon.

4. **Operation Mode**
   - The current operation mode of the endpoint device (transmitter / receiver / transceiver).
   - The operation mode can be changed in the drop-down menu. This operation requires restarting the device.

5. **Label**
   - The device label of the endpoint. It can be changed by clicking on the icon. See the details in the Device Information section in case of the TX or TRX operation modes and in the Device Information section in case of RX or TRX operation modes.
   - The listed endpoint devices can be sorted by clicking on the icon.

6. **Aggregated BW**
   - The aggregated bandwidth which are used by the endpoint device. It can be 10.00 Gbps (in case of only one SFP+ port is used) or 20.00 Gbps (in case of both SFP+ ports are used).

7. **TX BW**
   - The current bandwidth of the transmitted AV signal grouped by the SFP+ ports.

8. **RX BW**
   - The current bandwidth of the received AV signal grouped by the SFP+ ports.

9. **FCS Error**
   - Frame check sequence error. If the icon appears, there are FCS errors in the connection. See the possible solutions for the problem in the Troubleshooting chapter.

10. **Signal Quality**
    - The meter shows the current signal quality in percent.

11. **Uptime**
    - Uptime of the link connection.

12. **LLDP Neighbor System**
    - The type of the L3 network switch where the endpoint device is connected to.

13. **LLDP Neighbor Port**
    - The ID number and the MAC address of the port in the network switch.

14. **Link Type**
    - The SFP+ interface between the endpoint and the network switch.

15. **Filters**
    - Applying filters help to find the required endpoint devices for checking in case of a larger UBEX matrix. The function contains the following filter categories:
      - **Operation Mode**
        - Transmitters
        - Receivers
        - Transceivers
      - **Aggregated Bandwidth**
        - Offline
        - 10G
        - 20G
      - **FCS Errors**
        - FCS Errors
        - No FCS Errors
8.18.2. Health Status Tab

The actual temperature, voltage, fan, dark mode and control lock status of the endpoint devices can be overviewed in the Link Status tab. The details of the listed information are the following:

1. **Action buttons**
   - **Identify the device**: clicking on the icon makes the four front panel LEDs blink in green for 10 seconds. The feature helps to identify the device itself in the rack shelf.
   - **Restart the device**: clicking on the icon makes restarting the endpoint.

2. **Logical device ID (endpoint number)**
   Logical device ID means the MMU assigns a number to the endpoints ordered by the discovery. For example the first endpoint gets the 1 (appears as X1), the second one the 2 (appears as X2).
   The listed endpoint devices can be sorted by clicking on the icon.

3. **Device name**
   The name of device which is composed of the UBEX word and the last six characters of the MAC address.
   The listed endpoint devices can be sorted by clicking on the icon.

4. **Operation Mode**
   The current operation mode of the endpoint device (transmitter / receiver / transceiver). The operation mode can be changed in the drop-down menu. This operation requires restarting the device.

5. **Label**
   The device label. It can be changed by the user. See the details in the Device Information section in case of the TX or TRX operation modes and in the Device Information section in case of RX or TRX operation modes.
   The listed endpoint devices can be sorted by clicking on the icon.

6. **Aggregated BW**
   The aggregated bandwidth which are used by the endpoint device. It can be 10.00 Gbps (in case of only one SFP+ port is used) or 20.00 Gbps (in case of both SFP+ ports are used).

7. **System Temperature**
   System temperature of the endpoint device displayed in Celsius degrees.
   The values are the following:
   - Under 84 °C - OK
   - Between 85 °C and 89 °C - Warning
   - Above 90 °C - Error

8. **Voltage**
   Voltage status. Three possible values can be displayed: OK; Warning; Error. In case ERROR value please power off the device immediately.

9. **Fan #1 / Fan #2**
   Actual RPM (revolution per minute) value of the fan #1 and #2.

10. **Uptime**
    Uptime of the endpoint device.

11. **Dark Mode**
    The dark mode feature can be enabled or disabled. It keeps the LCD screen and the LEDs unlit to hide the device during an event when the mode is enabled.

12. **Control Lock**
    Enable/disable the operation of the jog dial control knob.

13. **Filters**
    Applying filters help to find the required endpoint devices for checking in case of a larger UBEX matrix. The function contains the following filter categories:
    - **Operation Mode**
      - Transmitters
      - Receivers
      - Transceivers
    - **Aggregated Bandwidth**
      - Offline
      - 10G
      - 20G
8.18.3. Update Firmware

The centralized firmware update method for the connected endpoint devices is the most comfortable way to keep your devices up to date. The selected units can be updated together, the procedure is supervised by the MMU, no user interaction is needed. During the firmware update, the AV transmission continues smoothly in the unselected endpoint devices.

**ATTENTION!** The centralized firmware update feature is working from the installed MMU firmware v1.1.0 and endpoint firmware v1.3.1 and available for the later firmware package versions. The endpoint firmware packages till v1.3.1 can be installed with LDU2 software - see the details in the Endpoint Update - Manual Method section.

**DIFFERENCE:** Lightware highly recommends using the same and cohesive firmware versions on the UBEX extenders and the MMU. Connection between extenders installed with different versions might cause unexpected performance failures. See the list of cohesive endpoint and MMU firmware versions in the Endpoint Firmware Packages in the MMU section.

See the details about this feature and the steps of the update in the Endpoint Update - Centralized Firmware Update section.

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8.19. Terminal Window

Select the Settings / Terminal menu to open the Terminal window. #terminal #advancedview

1. 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.

2. Edit mode
   - The default appearance is the read-only mode. If you want to modify the values or parameters, tick the option. You will be prompted to confirm your selection.

3. Warning mode
   - If this is checked, a warning window pops up when you enable Edit mode.

4. Node list
   - Correspondent parameters and nodes are shown that are connected to the selected item in the protocol tree.

5. Manual button: Manual (short description) of the node can be called and displayed in the terminal window.

6. Set button: Saves the value/parameter typed in the textbox.

7. Call button: Calls the method, e.g. reloads factory default settings.

8. Protocol tree
   - LW3 protocol tree; select an item to see its content.

9. 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.

10. 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. If the Autoscroll option is ticked, the list is scrolled automatically when a new line is added.
8.20. Video Wall Setup

The UBEX devices can be arranged to a video wall in Matrix mode. This section is about the UBEX video wall, including a step-by-step tutorial to create a new wall, and the handling of the system in the Lightware Device Controller (LDC) software.

8.20.1. Tutorial - Creating a New Video Wall

Navigate to the Video Wall Setup menu. The default state is the empty window (no video wall is defined).

**Step 1.** Click on the Create New Video Wall button. A wizard pops up where you can add the size of the wall. Click on the upper left corner of the wall at first, then click on the lower right. A unique name can be added in the Video wall name field, the default for the first one is VIDEOWALL1. Click on the Create button when ready. A 3x3 wall is created in our example.

**INFO:** The UBEX video wall system supports the display devices up to 8x4 (column x row).

**Step 2.** The next step is adding the destination devices to the wall where the content will be displayed. The available destination streams appear on the lower left side of the window. Click on a destination stream to see its tags. You can search between the destination streams using the Search streams field. The tags are also searchable. Clicking on the icon launch the Identify Stream / Identify Display feature. Drag and drop the destination streams to assign them to the wall. If a stream has been assigned to the wall, it will disappear from the list.

The video wall size can be changed by clicking on the Change video wall size button.

**Step 3.** Complete the video wall. Click in the (Activate) icon next to of the name of the video wall. When the icon changes to and the name changes to white, the video wall becomes active.
8.2. Advanced Settings and Display Parameters

For editing the Advanced Settings and the Display parameters, click on the (Edit) icon next to of the name of the video wall. When the icon changes to and the name changes to orange, the video wall is in edit mode.

Advanced Settings

Clicking on the Advanced settings button results opening the advanced settings of the video wall.

- **Video wall name**;
- **Change background color**: when no zone(s) are defined for a new layout, the color which is set here will appear on the display devices. The working method is the same with the No Sync Screen (Test Pattern) function.

Output Settings

- **Timing mode** (Free run / Source locked): see the more details about it in the Timing Modes section. The recommended setting is the Source locked.
- **Scaling mode**:
  - Passthrough: the scaler is in pass-through mode.
  - Forced resolution: the scaling is active, the selected value in the forced resolution option will be applied to the video signal;
  - EDID based: the scaler forces the resolution that is read out from the EDID of the connected sink device.
- **Forced resolution**: list of the available resolutions with refresh rate values. The selected one will be applied to the video signal. See the available resolutions in the Resolutions of the Scaler section.
- **Image position** (Stretch / Fit / Center);
- **Color space conversion** (No conversion / RGB / YCbCr 4:4:4 / YCbCr 4:2:2);

Status

- **Video wall size**;
- **Display count**;

Display Parameters

Clicking on the Display parameters button results opening the display parameter window where you can customize parameters of the display devices installed in the video wall.

- **Display Size**
  - The width and the height of the display in mm.

- **Bezel Settings**
  - The size of the top, bottom, left, and right bezels in mm.

- **Gap Settings**
  - The size of the gap between the displays in mm.
  - When it is completed, click on the Save parameters button.

8.2.3. Tutorial - Defining New Layouts and Zones

More different layouts can be defined for the same video wall.

When a new video wall is created, the default layout (LAYOUT0) is also created which has only one zone (ZONE0). It contains all destination streams connected to the video wall. This section about how to create a new layout and customize it for your current installation.

Step 1.

Click on the (Edit) icon next to of the name of the video wall. When the icon changes to and the name changes to orange, the video wall is in edit mode.

Step 2.

Click on the icon in the Added layouts section to add a new layout to the video wall. The schematic view of the video wall appears on the top.
Step 3. Add a unique name for the layout in the Layout name field, the default name is LAYOUT1. The next step is defining the zones where the contents will be displayed.

Step 4. Click on the Add Zone button. Click on the upper left corner of the zone at first, then click on the lower right. A unique name can be added in the Zone name field, the default for the first one is ZONE1.

Define all zones on the video wall. In our example three zones are created by the following way:

ZONE1: R1 C1, R1 C2, R2 C1, R2 C2;
ZONE2: R1 C3, R2 C2;
ZONE3: R3 C1, R3 C2, R3 C3.

Legend: R1 C3 = Display in the Row 1 and Column 3.

The picture below shows all the defined zones:

Step 5. Click on the Save layout button to complete the new layout.

Step 6. Complete the video wall. Click on the (Activate) icon next to of the name of the video wall. When the icon changes to and the name changes to white, the video wall with the new layout becomes active.

Step 7. Click on the (Activate) icon next to of the name of the layout. The green icon means the currently active layout.

8.20.4. Managing of the Layout and Zones

The new layout can be deleted by clicking on the (Delete) icon next to the name of the layout in the Available video walls section.

All zones can be deleted by clicking on the Clear All Zones button. Each zone can be deleted by clicking on the (Delete) icon in the zone section. in the Available video walls section.

The zone can be identified by clicking on the (Identify zone) icon. See the details about in the Identify Stream / Identify Display section.
8.20.5. Crosspoint Menu with Video Wall

**Grid View**

Navigate to the Crosspoint menu - Grid View to select a source stream for the video wall.

---

**Legend of the Crosspoint Menu**

1. **Auto VW layout activation switcher**
   - The explanation of the two available options are the following:
     - **Enabled**: the video wall layout becomes active suddenly when the crosspoint setting is changed in it.
     - **Disabled**: switching of a source stream does not effect the video wall layout activation.

2. **Non-video wall area**
   - Source streams, destination streams, and the crosspoint connections which are not the part of the video wall.

3. **Video wall - Layout0**
   - Video wall area, Layout0 (the default layout of the video wall). Clicking on the Zone tile (on the Destination stream side) opens the Zone Properties Window on the right side. The layout is not active currently.

4. **Video wall - Layout1**
   - Video wall area, Layout1 (the layout which is created by the user). Clicking on one of the Zone tiles (on the Destination stream side) opens the Zone Properties Window on the right side. This layout is the active one.

5. **Properties window**
   - The properties, available settings, and status information of the selected zone are displayed in this section. Three tabs are available: Zone, Layout, and Video wall. Clicking on the icon the properties section opens in new window.

---

**Tile View**

Navigate to the Crosspoint menu - Tile View to select a source stream for the video wall.

---

**Legend of the Crosspoint Menu**

1. **Source streams**
   - Each tile represents a stream coming from one of the input ports of the transmitter or transceiver. Each of them can be selected as a video source for one of the video wall zones.

2. **Destination streams - non-video wall area**
   - Destination streams which are not the part of the video wall.

3. **Video wall - Layout0**
   - Video wall area, Layout0 (the default layout of the video wall). Selecting the Zone tile and clicking to the Parameters button opens the Zone Properties Window. The layout is not active currently.

4. **Video wall - Layout1**
   - Video wall area, Layout1 (the layout which is created by the user). Selecting one of the Zone tiles and clicking to the Parameters button opens the Zone Properties Window. This layout is the active one (highlighted with orange).

See the detailed information about the tile view of the crosspoint in the Tile View section.
8.20.6. Zone Properties Window

Zone Information

The most important information and settings of the stream are available in the Zone information section.

Settings

- **Zone naming**
- **Change background color**: when no signal / no source stream is set for the zone, the color which is set here will appear on the display devices. The working method is the same with the No Sync Screen (Test Pattern) function.
- **Identify Zone**: see the details about this feature in the Identify Stream / Identify Display section.

Tags

Unique and configurable tags can be attached to the stream for the best identification. The tags are searchable in the Search Field. #tag

Status

All important information (streams enabled, signal present, HDCP status e.g.) are available in the status section. The Zone layout and the Source stream are also can be checked in this panel.

Layout Information

The most important information and settings of the input port are available in the Port information section.

Settings

- **Zone naming**
- **Layout state** (active / inactive);
- **Activate layout**: clicking on the button makes the current layout to active on the video wall;

Status

- **Layout drawing**.

Video Wall Information

Settings

- **Video wall naming**
- **Change background color**: when no signal / no source stream is set for the video wall, the color which is set here will appear on the display devices. The working method is the same with the No Sync Screen (Test Pattern) function.
- **Identify Zone**: see the details about this feature in the Identify Stream / Identify Display section.

Output Settings

- **Timing mode** (Free run / Source locked): see more details about it in the Timing Modes section.
- **Scalmode**: #frc
  - **Passthrough**: the scaler is in pass-through mode.
  - **Forced resolution**: the scaling is active, the selected value in the forced resolution option will be applied to the video signal;
  - **EDID based**: the scaler forces the resolution that is read out from the EDID of the connected sink device.
- **Scale to**: list of the available resolutions with refresh rate values. The selected one will be applied to the video signal. See the available resolutions in the Resolutions of the Scaler section.
- **Color space conversion** (No conversion / RGB / YCbCr 4:4:4 / YCbCr 4:2:2); #csc #colorspace

Status

- **Video wall size**;
- **Display count**.
Programmer's Reference

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

- Overview
- Instructions for the Terminal Application Usage
- Protocol Rules
- The Tree Structure of the UBEX Matrix
- System Commands - MMU
- System Commands - Endpoints
- Endpoint Management Commands
- Video Crosspoint Settings
  - Video Stream Settings - Source (Input) Side
  - Video Stream Settings - Destination (Output) Side
- Video Wall Configuration
- Audio Crosspoint Settings
- Audio Stream Settings
- Analog Audio Port Settings
- EDID Management
- System Monitoring Commands
- SFP+ Module Information
- Network Configuration - MMU
- Ethernet Port Configuration - Endpoint
- Serial Port Configuration - MMU
- Serial Port Configuration - Endpoint Devices
- Infrared Port Configuration - Endpoint Devices
- Message Sending via Communication Ports
- USB K+M Settings
- License Handling
- Centralized Firmware Update
- LW3 Protocol Commands - Quick Summary
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’. The Terminal Window of the Lightware Device Controller software is the perfect tool for browsing and learning how the LW3 protocol can be used in practice.

9.2. Instructions for the Terminal Application Usage

Terminal Application

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

Establishing Connection

Follow the steps for establishing connection to the device:

Step 1. Connect the MMU to a LAN over Ethernet (see the details in the Matrix Management Unit (MMU) section).

Step 2. Open the terminal application (e.g. Putty).

Step 3. Add the IP address of the MMU (the default is 192.168.0.100) 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.

LW3 protocol command communication in a terminal window

9.3. Protocol Rules

9.3.1. LW3 Tree Structure and Command Structure (Examples)

9.3.2. General Rules

- All names and parameters are case-sensitive.
- The nodes are separated by a slash (‘/’) character.
- The node names are comprised of the elements of the English alphabet and numbers.
- Use the TCP port no. 6107 when using LW3 protocol over Ethernet.
- 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).
9.3.3. Command Types

**GET command**

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

- GET /SerialNumber
- pr /SerialNumber=87654321

**GETALL command**

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

- GETALL /SYS
- n- /SYS/EB
- n- /SYS/ECU
- n- /SYS/ENDPOINTS
- m- /SYS/factoryDefaults
- m- /SYS/softReset
- m- /SYS/reset

**SET command**

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

- SET /MEDIA/STREAMS/VIDEO/S301.SourceName=My4K60Video
- pw /MEDIA/STREAMS/VIDEO/S301.SourceName=My4K60Video

**CALL command**

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

- CALL /MEDIA/XP/VIDEO:switch(S101:D102)
- mO /MEDIA/XP/VIDEO:switch

**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 /MEDIA/STREAMS/VIDEO/D201/PORT.Output5vMode
- pm /MEDIA/STREAMS/VIDEO/D201/PORT.Output5vMode ["Auto" | "AlwaysOn" | "AlwaysOff"]

9.3.4. Prefix Summary

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Description</th>
<th>Prefix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-</td>
<td>a node</td>
<td>pm</td>
<td>a manual for the property</td>
</tr>
<tr>
<td>nE</td>
<td>an error for a node</td>
<td>m-</td>
<td>a method</td>
</tr>
<tr>
<td>nm</td>
<td>a manual for a node</td>
<td>mO</td>
<td>a response after a successful method execution</td>
</tr>
<tr>
<td>pr</td>
<td>a read-only property</td>
<td>mF</td>
<td>a response after a failed method execution</td>
</tr>
<tr>
<td>pw</td>
<td>read-write property</td>
<td>mE</td>
<td>an error for a method</td>
</tr>
<tr>
<td>pE</td>
<td>an error for the property</td>
<td>mm</td>
<td>a manual for a method</td>
</tr>
</tbody>
</table>

9.3.5. Error Messages

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

- CALL /MEDIA/XP/VIDEO:switch(SA:D1)
  - mE /MEDIA/XP/VIDEO:switch %E004:Invalid value

9.3.6. Escaping

**DEFINITION:** An escape sequence is a sequence of characters that does not represent itself when used inside a character or string literal, but is translated into another character or a sequence of characters. Property values and method parameters can contain characters that are used as control characters in the protocol. They must be escaped. The escape character is the backslash (\), and escaping means injecting a backslash before the character that should be escaped (like in C language).

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

The original message: CALL /MEDIA/CONTROL/UART/P101/PORT:sendMessage(Set(01))
The escaped message: CALL /MEDIA/CONTROL/UART/P101/PORT:sendMessage(Set\(01\))
9.3.7. Signature

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

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

- 1700#GET /MEDIA/EDID.*
- {1700}
- m- /EDID:copy
- m- /EDID:delete
- m- /EDID:reset
- m- /EDID:switch
- m- /EDID:switchAll

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

9.3.8. Subscription

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

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

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

**Subscribe to a Node**
- OPEN /MEDIA/XP/VIDEO
- o- /MEDIA/XP/VIDEO

**Get the Active Subscriptions**
- OPEN /MANAGEMENT/LABEL
- o- /MANAGEMENT/LABEL
- GET /MANAGEMENT/LABEL.DeviceLabel

**Subscribe to Multiple Nodes**
- OPEN /MEDIA/XP/VIDEO/*
- o- /MEDIA/XP/VIDEO/*

**Unsubscribe from a Node**
- CLOSE /MEDIA/XP/VIDEO
- c- /MEDIA/XP/VIDEO

**Unsubscribe from Multiple Nodes**
- CLOSE /MEDIA/XP/VIDEO/*
- c- /MEDIA/XP/VIDEO/*

9.3.9. Notifications about the Changes of the Properties

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

- CHG /MEDIA/XP/VIDEO.SourcePortCount=10

**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.

**Connection #1**
- OPEN /MANAGEMENT/LABEL
- o- /MANAGEMENT/LABEL
- GET /MANAGEMENT/LABEL.DeviceLabel
- pm /MANAGEMENT/LABEL.DeviceLabel=UBEX-MMU-X200
- GET /MANAGEMENT/LABEL.DeviceLabel
- pm /MANAGEMENT/LABEL.DeviceLabel=UBEX-MMU-X200
- SET /MANAGEMENT/LABEL.DeviceLabel=MU_ServerRoom
- pw /MANAGEMENT/LABEL.DeviceLabel=MU_ServerRoom
- CHG /MANAGEMENT/LABEL.DeviceLabel=MU_ServerRoom

**Connection #2**

**Explanation:** 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.

9.3.10. Legend for the Control Commands

<table>
<thead>
<tr>
<th>Format</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;in&gt;</td>
<td>Stream source ID</td>
</tr>
<tr>
<td>&lt;out&gt;</td>
<td>Output port ID</td>
</tr>
<tr>
<td>&lt;port&gt;</td>
<td>Interface port ID</td>
</tr>
<tr>
<td>&lt;parameter&gt;</td>
<td>Specific property defined and described in the command</td>
</tr>
<tr>
<td>&lt;expression&gt;</td>
<td>Batched argument: the underline means that more expressions or parameters can be placed using a semicolon, e.g. <strong>S101;S102;S401</strong> or <strong>S101:D301;S302:D201</strong></td>
</tr>
<tr>
<td>&lt;UBEX_EP&gt;</td>
<td>UBEX endpoint ID, e.g. <strong>UBEXF254D9</strong></td>
</tr>
<tr>
<td>&lt;dev_ID&gt;</td>
<td>Logical device ID of the UBEX endpoint</td>
</tr>
<tr>
<td>&lt;link&gt;</td>
<td>SFP+ link number</td>
</tr>
</tbody>
</table>
- Sent command
- Received response
- Space character
- Separator line (“or” character)
9.4. The Tree Structure of the UBEX Matrix

When the UBEX matrix builds up and starts to operate, the individual endpoints and the MMU cease to be individual devices, but the whole system becomes one big tree structure including all UBEX devices which are the part of the matrix.

When you connect one of endpoints you always will reach the LW3 tree of the MMU. The endpoints can be controlled over the MMU only.

9.4.1. The Tree Structure of the MMU

When the UBEX matrix builds up and starts to operate, the individual endpoints and the MMU cease to be individual devices, but the whole system becomes one big tree structure including all UBEX devices which are the part of the matrix.

When you connect one of endpoints you always will reach the LW3 tree of the MMU. The endpoints can be controlled over the MMU only.

9.4.2. Endpoint ID Calculation

The endpoint devices of the matrix are listed under the /SYS/ENDPOINTS node by the MAC address. The formula is the following:

```
MAC address of the endpoint The last 6 characters of the MAC address Endpoint node under /SYS
```

A8:D2:36:00:39:A1 0039A1 UBEX0039A1

Where the path of a LW3 command/method/etc contains a UBEX endpoint, the following parameter refers to it: `<UBEX_EP>`

9.4.3. Stream ID Calculation

All endpoint devices which are connected to the UBEX matrix got a logical device ID generated by the MMU.

**DEFINITION:** Logical device ID means the MMU assigns a number to the endpoints ordered by the discovery. For example the first endpoint gets the 1 (appears as X1 under the DEVICE_MAP), the second one the 2 (appears as X2).

The stream ID is based on the logical device ID. The registered endpoint can be transmitter, receiver, or transceiver. All transmitters have two inputs, all receivers have two outputs, and all transceivers have one input and one output. The first discovered endpoint gets the X1 logical device ID, the HDMI port 1 of the endpoint is always the 01 number, the HDMI port 2 is always the 02 number. If the endpoint has input port (TX / TRX), it is signed with `S` as Source, if it has output port (RX / TRX), it is signed with `D` as Destination. The formula is the following:

```
<Port_type><Logical_device_ID><Port_number>
```

Two endpoint devices cannot be assigned to the same logical device ID. The number is always calculated for the endpoints independently from the operation mode.

INFO: The logical device ID (and the order of the endpoints) can be changed by the LDC software (see the details in the Device Map section) or by LW3 protocol command (see the details in the Assigning an Endpoint to a Logical Device ID section).

INFO: The operation mode (TX, RX, or TRX) can be changed for any endpoint. See the related LW3 protocol command in the Set the Operation Mode section.

**Example**

The following table helps to clear up the calculation of the stream ID:

<table>
<thead>
<tr>
<th>Operation mode</th>
<th>Port number</th>
<th>Stream ID</th>
<th>Discovery order</th>
</tr>
</thead>
<tbody>
<tr>
<td>TX</td>
<td>HDMI in 1</td>
<td>S101</td>
<td>1.</td>
</tr>
<tr>
<td></td>
<td>HDMI in 2</td>
<td>S102</td>
<td></td>
</tr>
<tr>
<td>RX</td>
<td>HDMI out 1</td>
<td>D201</td>
<td>2.</td>
</tr>
<tr>
<td></td>
<td>HDMI out 2</td>
<td>D202</td>
<td></td>
</tr>
<tr>
<td>TRX</td>
<td>HDMI in 2</td>
<td>S302</td>
<td>3.</td>
</tr>
<tr>
<td></td>
<td>HDMI out 1</td>
<td>D301</td>
<td></td>
</tr>
</tbody>
</table>

Examples and explanations for stream IDs
9.5. System Commands - MMU

9.5.1. Set the Device Label

INFO: The device label can be changed to a custom text in the Status Tab of the LDC software. This property can be changed to a custom text. The default format of the device label is the following: LW_<product_name>_<serial_no>

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

Command and Response #label #de

```
set /MANAGEMENT/LABEL.DeviceLabel=<custom_name>
pw /MANAGEMENT/LABEL.DeviceLabel=<custom_name>
```

Example
```
set /MANAGEMENT/LABEL.DeviceLabel=MMU_ServerRoom
pw /MANAGEMENT/LABEL.DeviceLabel=MMU_ServerRoom
```

9.5.2. Query the Product Name

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

Command and Response

```
get ./ProductName
pr ./ProductName=<Product_name>
```

Example
```
get ./ProductName
pr ./ProductName=UBEX-MMU-X200
```

9.5.3. Query the Firmware Package Version

Command and Response #firmwar eversion

```
get ./MANAGEMENT/UID/PACKAGE.Version
pr ./MANAGEMENT/UID/PACKAGE.Version=<firmware_version>
```

Example
```
get ./MANAGEMENT/UID/PACKAGE.Version
pr ./MANAGEMENT/UID/PACKAGE.Version=v1.3.0b6
```

9.5.4. Query the Date and Time of the System

The query returns with the current date and time which is set in the MMU. The format is based on the ISO 8601 standard.

Command and Response #time #date

```
get /MANAGEMENT/DATETIME.CurrentTime
pr /MANAGEMENT/DATETIME.CurrentTime=<date_time>
```

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;date_time&gt;</td>
<td>Current date and time</td>
<td>YYYY-MM-DDTHH:MM:SS</td>
</tr>
</tbody>
</table>

Example
```
get /MANAGEMENT/DATETIME.CurrentTime
pr /MANAGEMENT/DATETIME.CurrentTime=2019-11-30T06:23:37
```

9.5.5. Setting of the Date and Time Manually

The date and time format is based on the ISO 8601 standard.

Command and Response

```
call ./MANAGEMENT/DATETIME:setTime=<date_time>
pw ./MANAGEMENT/DATETIME:setTime
```

Parameters

See at the previous section.

Example
```
call ./MANAGEMENT/DATETIME:setTime=2021-12-24T20:00:15
pw ./MANAGEMENT/DATETIME:setTime
```

9.5.6. 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 /MANAGEMENT/DATETIME.NtpServerAddress=<server_address>
pw /MANAGEMENT/DATETIME.NtpServerAddress=<server_address>
```

Example
```
set /MANAGEMENT/DATETIME.NtpServerAddress=pool.ntp.org
pw /MANAGEMENT/DATETIME.NtpServerAddress=pool.ntp.org
```

Applied endpoint firmware package: v2.4.1 | Applied MMU firmware package: v1.7.1 | LDC software: v2.6.2b3
9.5.7. Enable/Disable 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**
- `SET /MANAGEMENT/DATETIME.EnableNtp=<logical_value>
- `pw /MANAGEMENT/DATETIME.EnableNtp=<logical_value>

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;logical_value&gt;</code></td>
<td>NTP service is enabled or disabled.</td>
<td><code>true</code></td>
<td>NTP is enabled.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><code>false</code></td>
<td>NTP is disabled.</td>
</tr>
</tbody>
</table>

**Example**
- `SET /MANAGEMENT/DATETIME.EnableNtp=true`
- `pw /MANAGEMENT/DATETIME.EnableNtp=true`

9.5.8. Setting the Brightness of the LCD Screen

**Command and Response**
- `SET /SYS/CECU/LCD.Brightness=<parameter>
- `pw /SYS/CECU/LCD.Brightness=<parameter>

**Parameters**

The `<parameter>` of display brightness can be set between 0 and 10 values.

**Example**
- `SET /SYS/CECU/LCD.Brightness=5`
- `pw /SYS/CECU/LCD.Brightness=5`

9.5.9. Software Resetting the Device

The core application of the Matrix Management Unit can be restarted.

**INFO:** The video signal transmission is not affected by the software resetting of the MMU.

**Command and Response**
- `CALL /SYS:softReset()`
- `mO /SYS:softReset`

**Example**
- `CALL /SYS:softReset()`
- `mO /SYS:softReset`

9.5.10. Rebooting the Device

The Matrix Management Unit can be restarted – the current connections will be terminated.

**INFO:** The video signal transmission is not affected by the rebooting of the MMU.

**Command and Response**
- `CALL /SYS:reset()`
- `mO /SYS:reset`

**Example**
- `CALL /SYS:reset()`
- `mO /SYS:reset`

9.5.11. Restore the Factory Default Settings

The device is restarted, current connections are terminated, and the default settings are restored. See the complete list in the UBEX-MMU-X200 section.
9.6. System Commands - Endpoints

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;UBEX_EP&gt;</td>
<td>UBEX endpoint ID</td>
<td>UBEX=last_6_characters_of_the_MAC_address</td>
</tr>
</tbody>
</table>

9.6.1. Set the Device Label

INFO: The device label can be changed to a custom text in the LDC software. See the details about the device renaming in the Device Information section for the source side and the Device Information section for the Destination side.

This property can be changed to a custom text. The default format of the device label is the following: LW_<product_name>_<serial_no>

The Device Label can be 64 characters long and ASCII characters are allowed. Longer names will be truncated.

Command and Response

<table>
<thead>
<tr>
<th>label #device_label</th>
</tr>
</thead>
<tbody>
<tr>
<td>SET /SYS/ENDPOINTS/&lt;UBEX_EP&gt;.DeviceLabel=&lt;custom_name&gt;</td>
</tr>
<tr>
<td>pw /SYS/ENDPOINTS/&lt;UBEX_EP&gt;.DeviceLabel=&lt;custom_name&gt;</td>
</tr>
</tbody>
</table>

Example

- SET /SYS/ENDPOINTS/UBEX0039A1.DeviceLabel=UBEX_RX_Theater
- pw /SYS/ENDPOINTS/UBEX0039A1.DeviceLabel=UBEX_RX_Theater

9.6.2. Query the Product Name

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

Command and Response

<table>
<thead>
<tr>
<th>#device_label</th>
</tr>
</thead>
<tbody>
<tr>
<td>GET /SYS/ENDPOINTS/&lt;UBEX_EP&gt;.ProductName</td>
</tr>
<tr>
<td>pr /SYS/ENDPOINTS/&lt;UBEX_EP&gt;.ProductName=&lt;Product_name&gt;</td>
</tr>
</tbody>
</table>

Example

- GET /SYS/ENDPOINTS/UBEX0039A1.ProductName
- pr /SYS/ENDPOINTS/UBEX0039A1.ProductName=UBEX-PRO20-HDMI-F110

9.6.3. Query the Operation Mode

Command and Response

<table>
<thead>
<tr>
<th>#operationmode #transmitter #receiver #transceiver #tx #rx #trx</th>
</tr>
</thead>
<tbody>
<tr>
<td>GET /SYS/ENDPOINTS/&lt;UBEX_EP&gt;.OperationMode</td>
</tr>
<tr>
<td>pw /SYS/ENDPOINTS/&lt;UBEX_EP&gt;.OperationMode=&lt;operation_mode&gt;</td>
</tr>
</tbody>
</table>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;operation_mode&gt;</td>
<td>The operation mode of the endpoint device</td>
<td>Transmitter</td>
<td>The endpoint device operates as a Transmitter. See the details in the Transmitter Mode section.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Receiver</td>
<td>The endpoint device operates as a Receiver. See the details in the Receiver Mode section.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transceiver</td>
<td>The endpoint device operates as a Transceiver. See the details in the Transceiver Mode section.</td>
</tr>
</tbody>
</table>

Example

- GET /SYS/ENDPOINTS/UBEX0039A1.OperationMode
- pw /SYS/ENDPOINTS/UBEX0039A1.OperationMode=Transceiver
9.6.4. Set the Operation Mode

**ATTENTION!** This operation always requires rebooting the endpoint device.

INFO: The setting is stored in the MMU.

The operation mode (transmitter, receiver, or transceiver) of the device can be changed based on the required application.

**Command and Response**

```
SET/SYS/ENDPOINTS/<UBEX_EP>.OperationMode=<operation_mode>
pw/SYS/ENDPOINTS/<UBEX_EP>.OperationMode=<operation_mode>
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
<th>Value Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;operation_mode&gt;</td>
<td>The operation mode of the endpoint device</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmitter</td>
<td>The endpoint device is set to Transmitter. See the details in the Transmitter Mode section.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receiver</td>
<td>The endpoint device is set to Receiver. See the details in the Receiver Mode section.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transceiver</td>
<td>The endpoint device is set to Transceiver. See the details in the Transceiver Mode section.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Example**

```
SET /SYS/ENDPOINTS/UBEX0039A1.OperationMode=Receiver
pw /SYS/ENDPOINTS/UBEX0039A1.OperationMode=Receiver
```

9.6.5. Query the MAC Address of the Device

**Command and Response**

```
GET/SYS/ENDPOINTS/<UBEX_EP>.MacAddress
pr/SYS/ENDPOINTS/<UBEX_EP>.MacAddress=<MAC_address>
```

**Example**

```
GET /SYS/ENDPOINTS/UBEX0039A1.MacAddress
pr /SYS/ENDPOINTS/UBEX0039A1.MacAddress=A8:D2:36:00:39:DA
```

9.6.6. Query the Firmware Package Version

**Command and Response**

```
#firmwareversion
```

**Example**

```
GET /SYS/ENDPOINTS/UBEX0039A1.PackageVersion
pr /SYS/ENDPOINTS/UBEX0039A1.PackageVersion=v1.5.0b8
```

9.6.7. Identify the Device

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**

```
#identifyme
CALL/SYS/ENDPOINTS/<UBEX_EP>:identifyMe()
mO/SYS/ENDPOINTS/<UBEX_EP>:identifyMe
```

**Example**

```
CALL /SYS/ENDPOINTS/UBEX0039A1:identifyMe()
mO /SYS/ENDPOINTS/UBEX0039A1:identifyMe
```

9.6.8. Control Lock

Enable/disable the operation of the jog dial control knob.

**Command and Response**

```
#controllock
SET/SYS/ENDPOINTS/<UBEX_EP>/SETTINGS/UI.ControlLock=<parameter>
pw/SYS/ENDPOINTS/<UBEX_EP>/SETTINGS/UI.ControlLock=<parameter>
```

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;parameter&gt;</td>
<td>Lock/unlock of the jog dial control knob</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

INFO: There is no difference between the 1 and 2 mode from the operation's point of view.

**Example**

```
SET /SYS/ENDPOINTS/UBEX0039A1/SETTINGS/UI.ControlLock=1
pw /SYS/ENDPOINTS/UBEX0039A1/SETTINGS/UI.ControlLock=1
```
9.6.9. Dark Mode Setting

Rental application requires this function, which keeps the LCD screen and the LEDs unlit to hide the device during an event.

Command and Response

```
#darkmode
```

```
SET /SYS/ENDPOINTS/<UBEX_EP>/SETTINGS/UI/DARKMODE.DarkModeEnable=<logical_value>
pw /SYS/ENDPOINTS/<UBEX_EP>/SETTINGS/UI/DARKMODE.DarkModeEnable=<logical_value>
```

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;logical_value&gt;</td>
<td>Enable or disable the dark mode feature</td>
<td>true</td>
<td>Dark mode will be enabled after the delay time expired (see next section).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>false</td>
<td>Dark mode is disabled.</td>
</tr>
</tbody>
</table>

**Example**

```
SET /SYS/ENDPOINTS/UBEX0039A1/SETTINGS/UI/DARKMODE.DarkModeEnable=true
```

9.6.10. Dark Mode Delay Setting

When the dark mode feature is enabled (see the previous section), it will be launched after the delay time expired.

Command and Response

```
SET /SYS/ENDPOINTS/<UBEX_EP>/SETTINGS/UI/DARKMODE.DarkModeDelay=<second>
pw /SYS/ENDPOINTS/<UBEX_EP>/SETTINGS/UI/DARKMODE.DarkModeDelay=<second>
```

**Example**

```
SET /SYS/ENDPOINTS/UBEX0039A1/SETTINGS/UI/DARKMODE.DarkModeDelay=10
```

9.6.11. Setting the Rotary Direction of the Jog Dial Knob

Command and Response

```
#rotary #jogdial
```

```
SET /SYS/ENDPOINTS/<UBEX_EP>/SETTINGS/UI.RotaryDirection=<parameter>
pw /SYS/ENDPOINTS/<UBEX_EP>/SETTINGS/UI.RotaryDirection=<parameter>
```

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;parameter&gt;</td>
<td>Rotary direction of the jog dial control knob</td>
<td>0</td>
<td>The rotary direction of down is clockwise (CW).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>The rotary direction of down is counter clockwise (CCW).</td>
</tr>
</tbody>
</table>

**Example**

```
SET /SYS/ENDPOINTS/UBEX0039A1/SETTINGS/UI.RotaryDirection=1
```

9.6.12. Setting the Brightness of the LCD Screen

Command and Response

```
SET /SYS/ENDPOINTS/<UBEX_EP>/SETTINGS/UI.DisplayBrightness=<parameter>
pw /SYS/ENDPOINTS/<UBEX_EP>/SETTINGS/UI.DisplayBrightness=<parameter>
```

```
```

**Parameters**

The <parameter> of display brightness can be set between 0 and 10 values.

**Example**

```
SET /SYS/ENDPOINTS/UBEX0039A1/SETTINGS/UI.DisplayBrightness=5
```

9.6.13. Bootload Mode Setting

The device can be set to bootloader (service / firmware update) mode. The AV signal transmission is terminated in this mode.

Command and Response

```
#bootload
```

```
CALL /SYS/ENDPOINTS/<UBEX_EP>/bootload()
mO /SYS/ENDPOINTS/<UBEX_EP>/bootload
```

**Example**

```
CALL /SYS/ENDPOINTS/UBEX0039A1.bootload()
mO /SYS/ENDPOINTS/UBEX0039A1.bootload
```

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 /SYS/ENDPOINTS/<UBEX_EP>:reset()
- m0 /SYS/ENDPOINTS/<UBEX_EP>:reset

Example

- CALL /SYS/ENDPOINTS/UBEX0039A1:reset()
- m0 /SYS/ENDPOINTS/UBEX0039A1:reset

9.6.15. Restore the Factory Default Settings

Command and Response

- CALL /SYS/ENDPOINTS/<UBEX_EP>:factoryDefaults()
- m0 /SYS/ENDPOINTS/<UBEX_EP>:factoryDefaults

Example

- CALL /SYS/ENDPOINTS/UBEX0039A1:factoryDefaults()
- m0 /SYS/ENDPOINTS/UBEX0039A1: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.

9.7. Endpoint Management Commands

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;UBEX_EP&gt;</td>
<td>UBEX endpoint ID</td>
<td>UBEX&lt;last_6_characters_of_the_MAC_address&gt;</td>
</tr>
</tbody>
</table>

#### 9.7.1. Query the Number of Registered Endpoints

The query returns with the number of registered endpoints (transmitters, receivers, and transceivers together) in the UBEX matrix. This number contains all endpoints which had been registered once by the MMU.

Command and Response

- GET /SYS/ENDPOINTS.RegisteredEndpoints
- pr /SYS/ENDPOINTS.RegisteredEndpoints=<number>

Example

- GET /SYS/ENDPOINTS.RegisteredEndpoints
- pr /SYS/ENDPOINTS.RegisteredEndpoints=45

#### 9.7.2. Query the Number of Connected Endpoints

The query returns with the number of the currently connected endpoints (transmitters, receivers, and transceivers together) in the UBEX matrix.

Command and Response

- GET /SYS/ENDPOINTS.ConnectedEndpoints
- pr /SYS/ENDPOINTS.ConnectedEndpoints=<number>

Example

- GET /SYS/ENDPOINTS.ConnectedEndpoints
- pr /SYS/ENDPOINTS.ConnectedEndpoints=44

#### 9.7.3. Query the Number of Registered Transmitters

The query returns with the number of registered transmitters in the UBEX matrix. This number contains all transmitters which had been registered once by the MMU.

Command and Response

- GET /SYS/ENDPOINTS.RegisteredTxEndpoints
- pr /SYS/ENDPOINTS.RegisteredTxEndpoints=<number>

Example

- GET /SYS/ENDPOINTS.RegisteredTxEndpoints
- pr /SYS/ENDPOINTS.RegisteredTxEndpoints=16
9.7.4. Query the Number of Connected Transmitters

The query returns with the number of the currently connected transmitters in the UBEX matrix.

Command and Response

- GET /SYS/ENDPOINTS.ConnectedTxEndpoints
- pr /SYS/ENDPOINTS.ConnectedTxEndpoints=<number>

Example

- GET /SYS/ENDPOINTS.ConnectedTxEndpoints
- pr /SYS/ENDPOINTS.ConnectedTxEndpoints=13

9.7.5. Query the Number of Registered Receivers

The query returns with the number of registered receivers in the UBEX matrix. This number contains all receivers which had been registered once by the MMU.

Command and Response

- GET /SYS/ENDPOINTS.RegisteredRxEndpoints
- pr /SYS/ENDPOINTS.RegisteredRxEndpoints=<number>

Example

- GET /SYS/ENDPOINTS.RegisteredRxEndpoints
- pr /SYS/ENDPOINTS.RegisteredRxEndpoints=28

9.7.6. Query the Number of Connected Receivers

The query returns with the number of the currently connected receivers in the UBEX matrix.

Command and Response

- GET /SYS/ENDPOINTS.ConnectedRxEndpoints
- pr /SYS/ENDPOINTS.ConnectedRxEndpoints=<number>

Example

- GET /SYS/ENDPOINTS.ConnectedRxEndpoints
- pr /SYS/ENDPOINTS.ConnectedRxEndpoints=25

9.7.7. Query the Number of Registered Transceivers

The query returns with the number of registered transceivers in the UBEX matrix. This number contains all receivers which had been registered once by the MMU.

Command and Response

- GET /SYS/ENDPOINTS.RegisteredTrxEndpoints
- pr /SYS/ENDPOINTS.RegisteredTrxEndpoints=<number>

Example

- GET /SYS/ENDPOINTS.RegisteredTrxEndpoints
- pr /SYS/ENDPOINTS.RegisteredTrxEndpoints=28

9.7.8. Query the Number of Connected Transceivers

The query returns with the number of the currently connected transceivers in the UBEX matrix.

Command and Response

- GET /SYS/ENDPOINTS.ConnectedTrxEndpoints
- pr /SYS/ENDPOINTS.ConnectedTrxEndpoints=<number>

Example

- GET /SYS/ENDPOINTS.ConnectedTrxEndpoints
- pr /SYS/ENDPOINTS.ConnectedTrxEndpoints=25

9.7.9. Query the Connection Status of an Endpoint

Command and Response

- GET /SYS/ENDPOINTS/<UBEX_EP>.ConnectionStatus
- pr /SYS/ENDPOINTS/<UBEX_EP>.ConnectionStatus=<status>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;status&gt;</td>
<td>Connection status of the selected endpoint</td>
<td></td>
<td>Offline: The device powered off or not connected to the UBEX matrix.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Connecting: The device is establishing connection to the UBEX matrix.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Online: The device is powered on and ready to use in the UBEX matrix.</td>
</tr>
</tbody>
</table>

Example

- GET /SYS/ENDPOINTS/UBEX0039A1.ConnectionStatus
- pr /SYS/ENDPOINTS/UBEX0039A1.ConnectionStatus=Online
9.7.10. Query the Claiming Status of an Endpoint

Command and Response

GET /SYS/ENDPOINTS/<UBEX_EP>.ClaimingStatus
pr /SYS/ENDPOINTS/<UBEX_EP>.ClaimingStatus=<status>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;status&gt;</td>
<td>Claiming status of the selected endpoint</td>
<td>Unclaiming</td>
<td>The device is under the unclaiming procedure, it can be after the running of the unclaimEndpoint() or unclaimAllEndpoint() commands typically.</td>
</tr>
<tr>
<td></td>
<td>Claiming</td>
<td></td>
<td>The device is under the claiming procedure.</td>
</tr>
<tr>
<td></td>
<td>Reclaiming</td>
<td></td>
<td>The device is under the reclaiming procedure, it can be after operation mode changing typically.</td>
</tr>
<tr>
<td></td>
<td>Restoring</td>
<td></td>
<td>The device is under the restoring procedure, it can be during rebooting of a claimed endpoint device.</td>
</tr>
<tr>
<td></td>
<td>Claimed</td>
<td></td>
<td>The device is claimed by the MMU and ready to use in the UBEX matrix.</td>
</tr>
</tbody>
</table>

Example

GET /SYS/ENDPOINTS/UBEX0039A1.ClaimingStatus
pr /SYS/ENDPOINTS/UBEX0039A1.ClaimingStatus=Claimed

9.7.11. Unclaiming an Endpoint

The command makes the selected endpoint to be unclaimed from the UBEX matrix.

Command and Response

CALL /SYS/ENDPOINTS:unclaimEndpoint(<UBEX_EP>)
m0 /SYS/ENDPOINTS:unclaimEndpoint

Example

CALL /SYS/ENDPOINTS:unclaimEndpoint(UBEX0039A1)
m0 /SYS/ENDPOINTS:unclaimEndpoint

9.7.12. Unclaiming All Endpoints

The command makes all endpoints to be unclaimed from the UBEX matrix.

Command and Response

CALL /SYS/ENDPOINTS:unclaimAllEndpoint()
m0 /SYS/ENDPOINTS:unclaimAllEndpoint

Example

CALL /SYS/ENDPOINTS:unclaimAllEndpoint()
m0 /SYS/ENDPOINTS:unclaimAllEndpoint

9.7.13. Query the Number of the Mapped Endpoints

The query returns the number of mapped endpoint which got a logical device ID. This number is equal with the result of the Query the Number of Registered Endpoints.

Command and Response

GET /MEDIA/DEVICEMAP:MappedEndpointCount
pr /MEDIA/DEVICEMAP:MappedEndpointCount=<number>

Example

GET /MEDIA/DEVICEMAP:MappedEndpointCount
pr /MEDIA/DEVICEMAP:MappedEndpointCount=45

9.7.14. Query the Endpoint ID of a Logical Device ID

The query returns with the UBEX endpoint ID assigned to the selected logical device ID.

Command and Response

GET /MEDIA/DEVICEMAP:<logical_device_ID>
pr /MEDIA/DEVICEMAP:<logical_device_ID>=<UBEX_EP>

Example

GET /MEDIA/DEVICEMAP:X1
pr /MEDIA/DEVICEMAP:X1=UBEX0039A1
9.7.15. Assigning an Endpoint to a Logical Device ID

Calling the method results the selected endpoint can be assigned to the desired logical device ID. This method is equal to the endpoint re-ordering in the Device Map of the Lightware Device Controller (LDC) software.

**Command and Response**

```
#devicemap
CALL /MEDI A/DEVICEMAP:assign(logical_device_ID:<UBEX_EP>)
```

**Example**

```
CALL /MEDI A/DEVICEMAP:assign(X3:UBEX0039A1;X1:UBEX003958)
```

9.8. Video Crosspoint Settings

**Parameters**

<table>
<thead>
<tr>
<th>#switch #crosspoint</th>
<th>Parameter</th>
<th>Description</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;in&gt;</td>
<td>Input stream coming from the TX / TRX</td>
<td>S&lt;logical_device_ID&gt;&lt;stream_nr&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;out&gt;</td>
<td>Output port of the RX / TRX</td>
<td>O&lt;logical_device_ID&gt;&lt;out_port_nr&gt;</td>
<td></td>
</tr>
</tbody>
</table>

9.8.1. Switching the Video Stream to One Destination

**Command and Response**

```
CALL /MEDI A/XP/VIDEO:switch(<in>:<out>)
```

**Example**

```
CALL /MEDI A/XP/VIDEO:switch(S501:D302;S102:D102)
```

9.8.2. Switching a Video Stream to All Destinations

The selected video stream is switched to all outputs.

**Command and Response**

```
CALL /MEDI A/XP/VIDEO:switchAll(<in>)
```

**Example**

```
CALL /MEDI A/XP/VIDEO:switchAll(S101)
```

9.8.3. Query the Status of All Video Ports

The query returns with all information about the source streams and the destinations. The respond contains the following information: 

- Enable/disable status
- Signal presence
- Crosspoint status (which stream is connected to the destination port)
- Bandwidth information
- Source/destination names, tags
- Device tags
- Resolution, refresh rate
- HDCP information
- Locking status

**Command and Response**

```
GET /MEDIA/XP/VIDEO/*.*
```

**Example**

```
GET /MEDIA/XP/VIDEO/*.*
```

9.8.4. Query the Number of the Source Ports

The query returns with the number of all source (input) ports including the disabled ones.

**Command and Response**

```
GET /MEDIA/XP/VIDEO.SourcePortCount
```

**Example**

```
GET /MEDIA/XP/VIDEO.SourcePortCount
```

9.8.5. Query the Number of the Destination Ports

The query returns with the number of all destination (output) ports including the disabled ones.

**Command and Response**

```
GET /MEDIA/XP/VIDEO.DestinationPortCount
```

**Example**

```
GET /MEDIA/XP/VIDEO.DestinationPortCount
```

9.8.6. Query the Number of the Source Ports

The query returns with the number of all source (input) ports including the disabled ones.

**Command and Response**

```
GET /MEDIA/XP/VIDEO.SourcePortCount
```

**Example**

```
GET /MEDIA/XP/VIDEO.SourcePortCount
```

9.8.7. Query the Number of the Destination Ports

The query returns with the number of all destination (output) ports including the disabled ones.

**Command and Response**

```
GET /MEDIA/XP/VIDEO.DestinationPortCount
```

**Example**

```
GET /MEDIA/XP/VIDEO.DestinationPortCount
```
9.9. Video Stream Settings - Source (Input) Side

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;in&gt;</td>
<td>Input stream coming from the TX / TRX</td>
<td>$\langle$logical_devide_ID$\rangle$&lt;stream_nr&gt;</td>
</tr>
</tbody>
</table>

9.9.1. Query the Name of the Stream

INFO: The default name of the stream is the MAC address of the endpoint device and the stream number separated by a dot. Example: A8:D2:36:F0:00:35.S1

Command and Response

- GET/MEDIA/STREAMS/VIDEO/<in>.SourceName
- pw/MEDIA/STREAMS/VIDEO/<in>.SourceName=<name>

Example

- GET /MEDIA/STREAMS/VIDEO/S2301.SourceName
- pw /MEDIA/STREAMS/VIDEO/S2301.SourceName=Casablanca

9.9.2. Setting the Name of the Stream

Command and Response

- SET/MEDIA/STREAMS/VIDEO/<in>.SourceName=<name>
- pw/MEDIA/STREAMS/VIDEO/<in>.SourceName=<name>

Example

- SET /MEDIA/STREAMS/VIDEO/S102.SourceName=MyLittlePony_S01E01
- pw /MEDIA/STREAMS/VIDEO/S102.SourceName=MyLittlePony_S01E01

9.9.3. Query the Tags of the Stream

The query returns with the tags which are added by the user.

Command and Response

- GET/MEDIA/STREAMS/VIDEO/<in>.Tags
- pw/MEDIA/STREAMS/VIDEO/<in>.Tags=<tag>

Example

- GET /MEDIA/STREAMS/VIDEO/S102.Tags
- pw /MEDIA/STREAMS/VIDEO/S102.Tags=4K60;movie;Die_Hard_2

#tag

9.9.4. Adding Tags to the Stream

The following characters are allowed in the <tag> parameter: non-capital letters (a-z), capital letters (A-Z), numbers (0-9), and special characters (~ _ : / ? @ $ & ( ) + = *).

Command and Response

- CALL/MEDIA/STREAMS/VIDEO/<in>:addTags(<tag>)
- m0/MEDIA/STREAMS/VIDEO/<in>:addTags=

Example

- CALL /MEDIA/STREAMS/VIDEO/S401:addTags(4K30;intro)
- m0 /MEDIA/STREAMS/VIDEO/S401:addTags=

9.9.5. Deleting Tags of the Stream

Command and Response

- CALL/MEDIA/STREAMS/VIDEO/<in>:removeTags(<tag>)
- m0/MEDIA/STREAMS/VIDEO/<in>:removeTags=

Example

- CALL /MEDIA/STREAMS/VIDEO/S101:removeTags(cartoon;1080p)
- m0 /MEDIA/STREAMS/VIDEO/S101:removeTags=

9.9.6. Deleting All Tags of the Stream

Command and Response

- CALL/MEDIA/STREAMS/VIDEO/<in>:removeAllTags()
- m0/MEDIA/STREAMS/VIDEO/<in>:removeAllTags=

Example

- CALL /MEDIA/STREAMS/VIDEO/S101:removeAllTags()
- m0 /MEDIA/STREAMS/VIDEO/S101:removeAllTags=

9.9.7. Query All Tags of the Device

The query returns with all the tags which belongs to the device. One tag is always reserved for the MAC address of the endpoint.

Command and Response

- GET/MEDIA/STREAMS/VIDEO/<in>.DeviceTags
- pw/MEDIA/STREAMS/VIDEO/<in>.DeviceTags=<tag>

Example

- GET /MEDIA/STREAMS/VIDEO/S201.DeviceTags
- pw /MEDIA/STREAMS/VIDEO/S201.DeviceTags=Intro;A8:D2:36:F0:00:35;TX_MeetingRoom;
9.9.8. Enable/Disable the Stream

**Command and Response** #streamenable

- `SET /MEDIA/STREAMS/VIDEO/<in>/STREAM.Enabled=<logical_value>`
- `pw /MEDIA/STREAMS/VIDEO/<in>/STREAM.Enabled=<logical_value>`

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;logical_value&gt;</td>
<td>The stream is unmuted or muted.</td>
<td>true</td>
<td>The stream is enabled (unmuted).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>false</td>
<td>The stream is disabled (muted).</td>
</tr>
</tbody>
</table>

**Example**

- `SET /MEDIA/STREAMS/VIDEO/S101/STREAM.Enabled=true`
- `pw /MEDIA/STREAMS/VIDEO/S101/STREAM.Enabled=true`

9.9.9. Identify the Stream

Calling the method generates 10 test colors on the display device for 10 seconds. The feature helps to identify the stream and the screen itself physically.

**Command and Response** #identifystream

- `CALL /MEDIA/STREAMS/VIDEO/<in>/STREAM:identify()`
- `mO /MEDIA/STREAMS/VIDEO/<in>/STREAM:identify`

**Example**

- `CALL /MEDIA/STREAMS/VIDEO/S101/STREAM:identify()`
- `mO /MEDIA/STREAMS/VIDEO/S101/STREAM:identify`

**Explanation**

- Color #1: Red
- Color #2: Green
- Color #3: Yellow
- Color #4: Blue
- Color #5: Pink
- Color #6: Cyan
- Color #7: Light
- Color #8: Dark blue
- Color #9: Purple
- Color #10: Turquoise

9.9.10. Resolution Setting

The resolution that is set here will be enforced only if the `ResolutionMode` is set to `Forced`. See the details about the Resolution Mode Setting in the next section.

**Command and Response**

- `SET /MEDIA/STREAMS/VIDEO/<in>/STREAM.ResolutionSetting=<resolution>`
- `pw /MEDIA/STREAMS/VIDEO/<in>/STREAM.ResolutionSetting=<resolution>`

**Example**

- `SET /MEDIA/STREAMS/VIDEO/S601/STREAM.ResolutionSetting=1600x1200p60`
- `pw /MEDIA/STREAMS/VIDEO/S601/STREAM.ResolutionSetting=1600x1200p60`

**INFO:** The entire list of available resolutions can be found in the Resolutions of the Scaler section.

9.9.11. Resolution Mode Setting

**Command and Response**

- `SET /MEDIA/STREAMS/VIDEO/<in>/STREAM.ResolutionMode=<resolution_mode>`
- `pw /MEDIA/STREAMS/VIDEO/<in>/STREAM.ResolutionMode=<resolution_mode>`

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;resolution_mode&gt;</td>
<td>Resolution mode setting</td>
<td>Pass</td>
<td>Pass-through mode - the original stream is transmitted.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Forced</td>
<td>The device forces the resolution set in the <code>ResolutionSetting</code> for the stream and transmits it to the destination side.</td>
</tr>
</tbody>
</table>

**Example**

- `SET /MEDIA/STREAMS/VIDEO/S302/STREAM.ResolutionMode=Forced`
- `pw /MEDIA/STREAMS/VIDEO/S302/STREAM.ResolutionMode=Forced`

The resolution that is set here will be enforced only if the ResolutionMode is set to Forced. See the details about the Resolution Mode Setting in the previous section.

DIFFERENCE: The transceiver is built with scaler function on HDMI input 2 port from firmware version v2.1.0.

DIFFERENCE: The transmitter is built with scaler function on both HDMI input ports from firmware version v2.4.1. The scaler setting is not available on the HDMI in 2 (I2) port in case of previous firmware versions.

Command and Response

- SET/MEDIA/STREAMS/VIDEO/<in>/STREAM.ImagePosition=<image_position>
- pw/MEDIA/STREAMS/VIDEO/<in>/STREAM.ImagePosition=<image_position>

Parameters

The <image_position> can be set to Center, Stretch or Fit.

Example

- SET /MEDIA/STREAMS/VIDEO/S101/STREAM.ImagePosition=Stretch
- pw /MEDIA/STREAMS/VIDEO/S101/STREAM.ImagePosition=Stretch

9.9.13. Color Space Converter Setting

Command and Response

- SET/MEDIA/STREAMS/VIDEO/<in>/STREAM.ColorSpaceSetting=<color_space>
- pw/MEDIA/STREAMS/VIDEO/<in>/STREAM.ColorSpaceSetting=<color_space>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;color_space&gt;</td>
<td>Color space setting</td>
<td>Pass</td>
<td>Pass-through mode - the original color space of the stream is transmitted to the sink device.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RGB</td>
<td>Forced RGB color space.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>YCbCr 4:4:4</td>
<td>Forced YCbCr 4:4:4 color space.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>YCbCr 4:2:2</td>
<td>Forced YCbCr 4:2:2 color space.</td>
</tr>
</tbody>
</table>

Example

- SET /MEDIA/STREAMS/VIDEO/S101/STREAM.ColorSpaceSetting=YCbCr 4:4:4
- pw /MEDIA/STREAMS/VIDEO/S101/STREAM.ColorSpaceSetting=YCbCr 4:4:4


Command and Response

- SET/MEDIA/STREAMS/VIDEO/<in>/STREAM.ColorRangeSetting=<color_range>
- pw/MEDIA/STREAMS/VIDEO/<in>/STREAM.ColorRangeSetting=<color_range>

Parameters

- Pass: No color range conversion
- Full: Full color range
- Limited: Limited color range

Example

- SET /MEDIA/STREAMS/VIDEO/S101/STREAM.ColorRangeSetting=Full
- pw /MEDIA/STREAMS/VIDEO/S101/STREAM.ColorRangeSetting=Full

9.9.15. Query the Timing Mode

The query returns with the current status of the timing mode. See more details about it in the Timing Modes section.

ATTENTION! The timing mode can be changed in the destination stream side (the output ports of the receiver or transceiver) only. See the related LW3 protocol command in the Timing Mode Setting section.

Command and Response

- GET/MEDIA/STREAMS/VIDEO/<in>/STREAM.TimingMode
- pw/MEDIA/STREAMS/VIDEO/<in>/STREAM.TimingMode=<timing_mode>

Parameters

The <timing_mode> can be Freerun or SourceLocked.

Example

- GET /MEDIA/STREAMS/VIDEO/S101/STREAM.TimingMode
- pw /MEDIA/STREAMS/VIDEO/S101/STREAM.TimingMode=SourceLocked
9.16. HDCP Setting

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•/MEDIA/STREAMS/VIDEO/<in>/PORT.HdcpEnable=<logical_value>
```

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;logical_value&gt;</td>
<td>HDCP enable/disable setting</td>
<td>true</td>
<td>HDCP authentication is enabled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>false</td>
<td>HDCP authentication is disabled</td>
</tr>
</tbody>
</table>

Example

```
SET /MEDIA/STREAMS/VIDEO/S101/PORT.HdcpEnable=true
```

9.10. Video Stream Settings - Destination (Output) Side

Parameters

```
Parameter | Description | Formula
-----------|-------------|-----------------
<out>      | Output port of the RX / TRX | D<logical_device_ID><out_port_nr>
```

9.10.1. Query the Name of the Destination

INFO: The default name of the output port is the MAC address of the endpoint device and the output port number separated by a dot. Example: A8:D2:36:F0:00:04.D2

Command and Response

```
GET•/MEDIA/STREAMS/VIDEO/<out>.DestinationName
```

Example

```
GET /MEDIA/STREAMS/VIDEO/S101.DestinationName
```

9.10.2. Setting the Name of the Destination

Command and Response

```
SET•/MEDIA/STREAMS/VIDEO/<out>.DestinationName=<name>
pw•/MEDIA/STREAMS/VIDEO/<out>.DestinationName=<name>
```

Example

```
SET /MEDIA/STREAMS/VIDEO/D702.DestinationName=Theater1
pw /MEDIA/STREAMS/VIDEO/D702.DestinationName=Theater1
```

9.10.3. Query the Tags of the Destination

Command and Response

```
#tag
```

```
GET•/MEDIA/STREAMS/VIDEO/<out>.Tags
```

Example

```
GET /MEDIA/STREAMS/VIDEO/D102.Tags
```

9.10.4. Adding Tags to the Destination

The following characters are allowed in the <tag> parameter: non-capital letters (a-z), capital letters (A-Z), numbers (0-9), and special characters (- _ ~ : / ? # @ ! $ & ( ) + = *).

Command and Response

```
CALL•/MEDIA/STREAMS/VIDEO/<out>:addTags(<tag>)
mO•/MEDIA/STREAMS/VIDEO/<out>:addTags=<tag>
```

Example

```
CALL /MEDIA/STREAMS/VIDEO/D401:addTags(4K30;intro)
mO /MEDIA/STREAMS/VIDEO/D401:addTags=
```

9.10.5. Deleting Tags of the Destination

Command and Response

```
CALL•/MEDIA/STREAMS/VIDEO/<out>:removeTags(<tag>)
mO•/MEDIA/STREAMS/VIDEO/<out>:removeTags=
```

Example

```
CALL /MEDIA/STREAMS/VIDEO/D401:removeTags(cartoon;1080p)
mO /MEDIA/STREAMS/VIDEO/D401:removeTags=
```
9.10.6. Deleting All Tags of the Destination

Command and Response

- CALL /MEDIA/STREAMS/VIDEO/<out>:removeAllTags()
- mO /MEDIA/STREAMS/VIDEO/<out>:removeAllTags

Example

- CALL /MEDIA/STREAMS/VIDEO/D101:removeAllTags()
- mO /MEDIA/STREAMS/VIDEO/D101:removeAllTags

9.10.7. Query All the Tags of the Device

The query returns with all the tags which belongs to the device. One tag is always reserved for the MAC address of the endpoint.

Command and Response

- GET /MEDIA/STREAMS/VIDEO/<out>:DeviceTags
- pr /MEDIA/STREAMS/VIDEO/<out>:DeviceTags=<tag>

Example

- GET /MEDIA/STREAMS/VIDEO/D201:DeviceTags
- pr /MEDIA/STREAMS/VIDEO/D201.DeviceTags=RX_MeetingRoom;A8:D2:36:F0:00:34;4K60;#2

9.10.8. Enable/Disable the Stream

Command and Response

- SET /MEDIA/STREAMS/VIDEO/<out>/STREAM.Enabled=<logical_value>
- pw /MEDIA/STREAMS/VIDEO/<out>/STREAM.Enabled=<logical_value>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;logical_value&gt;</td>
<td>The stream is unmuted or muted.</td>
<td>true</td>
<td>The stream is enabled (unmuted).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>false</td>
<td>The stream is disabled (muted).</td>
</tr>
</tbody>
</table>

Example

- SET /MEDIA/STREAMS/VIDEO/D101/STREAM.Enabled=true
- pw /MEDIA/STREAMS/VIDEO/D101/STREAM.Enabled=true

9.10.9. Resolution Setting

The resolution that is set here will be enforced only if the ResolutionMode is set to Forced. See the details about the Resolution Mode Setting in the next section.

Command and Response

- SET /MEDIA/STREAMS/VIDEO/<out>/PORT.ResolutionSetting=<resolution>
- pw /MEDIA/STREAMS/VIDEO/<out>/PORT.ResolutionSetting=<resolution>

Example

- SET /MEDIA/STREAMS/VIDEO/D601/PORT.ResolutionSetting=3840x2160p60
- pw /MEDIA/STREAMS/VIDEO/D601/PORT.ResolutionSetting=3840x2160p60

INFO: The entire list of available resolutions can be found in the Resolutions of the Scaler section.

9.10.10. Resolution Mode Setting

Command and Response

- SET /MEDIA/STREAMS/VIDEO/<out>/PORT.ResolutionMode=<resolution_mode>
- pw /MEDIA/STREAMS/VIDEO/<out>/PORT.ResolutionMode=<resolution_mode>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;resolution_mode&gt;</td>
<td>Resolution mode setting</td>
<td>Pass</td>
<td>Pass-through mode - the original stream is transmitted to the sink device.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Forced</td>
<td>The endpoint device forces the resolution set in the ResolutionSetting for the stream and transmits it to the sink device.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EdidBased</td>
<td>The endpoint device forces the resolution that is read out from the EDID of the connected sink device.</td>
</tr>
</tbody>
</table>

Example

- SET /MEDIA/STREAMS/VIDEO/D302/PORT.ResolutionMode= Forced
- pw /MEDIA/STREAMS/VIDEO/D302/PORT.ResolutionMode= Forced
9.10.11. Query the EDID Based Resolution

Command and Response

GET /MEDIA/STREAMS/VIDEO/ OUT /PORT.EdidBasedResolution
pr /MEDIA/STREAMS/VIDEO/ OUT /PORT.EdidBasedResolution=<resolution>

Example

GET /MEDIA/STREAMS/VIDEO/D301/PORT.EdidBasedResolution
pr /MEDIA/STREAMS/VIDEO/D301/PORT.EdidBasedResolution=3840x2160p60


The resolution that is set here will be enforced only if the ResolutionMode is set to Forced. See the details about the Resolution Mode Setting in the previous section.

DIFFERENCE: The receiver is built with scaler function on both HDMI output ports from firmware version v2.1.0. The Image position setting is not available on HDMI output 2 in case of previous firmware versions.

Command and Response #scaler #fr:

SET /MEDIA/STREAMS/VIDEO/ OUT /PORT.ImagePosition=<image_position>
pr /MEDIA/STREAMS/VIDEO/ OUT /PORT.ImagePosition=<image_position>

Parameters

The <image_position> can be set to Center, Stretch, or Fit.

Example

SET /MEDIA/STREAMS/VIDEO/D101/PORT.ImagePosition=Fit
pr /MEDIA/STREAMS/VIDEO/D101/PORT.ImagePosition=Fit

9.10.13. Color Space Converter Setting

Command and Response #csc #colorspace

SET /MEDIA/STREAMS/VIDEO/ OUT /PORT.ColorSpaceSetting=<color_space>
pr /MEDIA/STREAMS/VIDEO/ OUT /PORT.ColorSpaceSetting=<color_space>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;color_space&gt;</td>
<td>Color space setting</td>
<td>Pass</td>
<td>Pass-through mode - the original color space of the stream is transmitted to the sink device.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RGB</td>
<td>Forced RGB color space.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>YCbCr 4:4:4</td>
<td>Forced YCbCr 4:4:4 color space.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>YCbCr 4:2:2</td>
<td>Forced YCbCr 4:2:2 color space.</td>
</tr>
</tbody>
</table>

Example

SET /MEDIA/STREAMS/VIDEO/D101/PORT.ColorSpaceSetting=RGB
pr /MEDIA/STREAMS/VIDEO/D101/PORT.ColorSpaceSetting=RGB


Command and Response #colorrange

SET /MEDIA/STREAMS/VIDEO/ OUT /PORT.ColorRangeSetting=<color_range>
pr /MEDIA/STREAMS/VIDEO/ OUT /PORT.ColorRangeSetting=<color_range>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;color_range&gt;</td>
<td>Color range setting</td>
<td>Pass</td>
<td>No color range conversion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Full</td>
<td>Full color range</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Limited</td>
<td>Limited color range</td>
</tr>
</tbody>
</table>

Example

SET /MEDIA/STREAMS/VIDEO/D101/PORT.ColorRangeSetting=Limited
pr /MEDIA/STREAMS/VIDEO/D101/PORT.ColorRangeSetting=Limited
9.10.15. Query the Timing Mode

The query returns with the current status of the timing mode. See more details about it in the Timing Modes section.

Command and Response

GET /MEDIA/STREAMS/VIDEO/out/PORT.TimingMode

Parameters

The `<timing_mode>` can be Freerun or SourceLocked.

Example

GET /MEDIA/STREAMS/VIDEO/D101/STREAM.TimingMode=SourceLocked

9.10.16. Timing Mode Setting

The timing mode is set with the following command. See more details about it in the Timing Modes section.

Command and Response

SET /MEDIA/STREAMS/VIDEO/out/PORT.TimingModeSetting=<timing_mode>

Parameters

The `<timing_mode>` can be set to Freerun or SourceLocked.

Example

SET /MEDIA/STREAMS/VIDEO/D202/PORT.TimingModeSetting=SourceLocked

9.10.17. No Sync Screen (Test Pattern) Mode

The No sync screen feature generates an image that can be displayed when no incoming signal on the port. The following method turns on or off the Test Pattern function:

Command and Response

#testpattern #nosyncscreen #freeze

Parameters

Parameter | Parameter description | Value | Value description
---|---|---|---
<nosync_mode> | Test pattern mode setting | AlwaysOff | The test pattern is not displayed on the output.
| | NoSignal | The test pattern is displayed if there is no video is received on the output port.
| | AlwaysOn | The test pattern is displayed on the output even if there is an incoming signal.
| | Freeze | The signal freezes at the last video frame on the sink device (the sink may show a broken frame too).

Example

SET /MEDIA/STREAMS/VIDEO/D1002/PORT.NoSyncMode=NoSignal

9.10.18. No Sync Screen (Test Pattern) Color Setting

The No sync screen feature generates an image that can be displayed when there is no incoming signal on the port. The following method sets the displayed color defined in RGB code.

Command and Response

SET /MEDIA/STREAMS/VIDEO/out/PORT.NoSyncColor=<RGB_code>

Example

SET /MEDIA/STREAMS/VIDEO/D901/PORT.NoSyncColor=128,128,128
9.10.19. Enable Signal Freeze

The signal freezes at the last video frame on the sink device (the sink may show a broken frame too).

**Command and Response**

```
#freeze
```

```
CALL /MEDIA/STREAMS/VIDEO/<out>/PORT:freezeSignal()
```

```
mO /MEDIA/STREAMS/VIDEO/<out>/PORT:freezeSignal
```

**Example**

```
CALL /MEDIA/STREAMS/VIDEO/D901/PORT:freezeSignal()
```

```
mO /MEDIA/STREAMS/VIDEO/D901/PORT:freezeSignal
```

9.10.20. Disable Signal Freeze

The signal freezes at the last video frame on the sink device (the sink may show a broken frame too).

**Command and Response**

```
#unfreeze
```

```
CALL /MEDIA/STREAMS/VIDEO/<out>/PORT:unfreezeSignal()
```

```
mO /MEDIA/STREAMS/VIDEO/<out>/PORT:unfreezeSignal
```

**Example**

```
CALL /MEDIA/STREAMS/VIDEO/D901/PORT:unfreezeSignal()
```

```
mO /MEDIA/STREAMS/VIDEO/D901/PORT:unfreezeSignal
```

9.10.21. Identify the Display

Calling the method generates 10 test colors on the display device for 10 seconds. The feature helps to identify the stream and the screen itself physically.

**Command and Response**

```
#identifydisplay
```

```
CALL /MEDIA/STREAMS/VIDEO/<out>/PORT:identify()
```

```
mO /MEDIA/STREAMS/VIDEO/<out>/PORT:identify=
```

**Example**

```
CALL /MEDIA/STREAMS/VIDEO/D101/PORT:identify()
```

```
mO /MEDIA/STREAMS/VIDEO/D101/PORT:identify=
```

**Explanation**

![Test Colors](image)
9.10.22. HDCP Setting

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

**Command and Response**

```
#hdcp
```

- SET /MEDIA/STREAMS/VIDEO/<out>/PORT.HdcpMode=<HDCP_mode>
- pw /MEDIA/STREAMS/VIDEO/<out>/PORT.HdcpMode=<HDCP_mode>

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;HDCP_mode&gt;</td>
<td>HDCP mode</td>
<td>Auto</td>
<td>The level of the HDCP-encryption depends on the input.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Always</td>
<td>The output ports set the maximum HDCP-encryption level that can be accepted by the connected sink device.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AlwaysType1</td>
<td>The output ports always force HDCP 2.2 Type 1. If the sink device supports this HDCP-encryption level, the signal will be encrypted with HDCP 2.2 Type 0/1. The signal will be encrypted with HDCP 2.2 Type 1 when the source and the sink both support this HDCP-encryption level.</td>
</tr>
</tbody>
</table>

**Example**

- SET /MEDIA/STREAMS/VIDEO/D101/PORT.HdcpMode=Always
- pw /MEDIA/STREAMS/VIDEO/D101/PORT.HdcpMode=Always

9.10.23. Query the Source MUX Options

The source multiplexer (Source MUX) makes routing several different source signals to the HDMI output ports available. See more details about this function in the Receiver Mode and the Transceiver Mode sections.

The query responds the available source signals for the selected output port.

**Command and Response**

```
#mux #sourcemux
```

- GET /MEDIA/STREAMS/VIDEO/<out>/PORT.SourceMuxOptions
- pw /MEDIA/STREAMS/VIDEO/<out>/PORT.SourceMuxOptions=<mux_options>

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;mux_options&gt;</td>
<td>The available sources for the output port</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Only for HDMI out 1 port: the source stream coming from the connected remote device is selectable for the output port.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D2</td>
<td>Only for HDMI out 2 port: the source stream coming from the connected remote device is selectable for the output port.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I1</td>
<td>Only for HDMI out 1 port: the stream of the HDMI in 1 local input port is selectable for the output port.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I2</td>
<td>Only for HDMI out 2 port: the stream of the HDMI in 2 local input port is selectable for the output port.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O1</td>
<td>Only for HDMI out 2 port: The copy of the stream of HDMI out 1 is selectable for the output port.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Example**

- GET /MEDIA/STREAMS/VIDEO/D102/PORT.SourceMuxOptions
- pw /MEDIA/STREAMS/VIDEO/D102/PORT.SourceMuxOptions=D2;I2;O1
9.10.24. Source MUX Setting

The command sets the source signal for the output port. Query the available options with the command described in the previous section.

ATTENTION! If the selected source is the I1/I2 local input port or the copy of the O1, the output is still selectable as a destination in the global crosspoint table. It means the crosspoint setting is not forbidden for the selected output. As the priority of the incoming stream is higher than the local input ports and the copy function, the signal transmission can be denied on the port if the bandwidth limit is exceeded. The solution for this limitation is disabling of the unused destination port, see the details in the Enable/Disable the Stream section.

Command and Response

```
#mux #sourceMUX
```

```
<in>
 PORT.SourceMux=<destination|in|out>
```

Example

```
SET /MEDIA/STREAMS/VIDEO/D101/PORT.SourceMux=I1
```

9.11. Video Wall Configuration

9.11.1. The Tree Structure of the Video Wall

General Description

The path of the video wall related methods and properties is `/MEDIA/VIDEOWALLS`. The video wall is an umbrella term, a wall has layout(s) and a layout has zone(s). The display devices can be attached to the zones.

When the first wall is created, the VIDEOWALL1 path including all required methods and properties are created automatically.

The VIDEOWALL# contains the following paths: /LAYOUTS, /ASSIGNS, /DISPLAYS, and /SETTINGS.

Video Wall

The video wall can handle up to 8x4 (column x row) display devices. Up to 20 video walls can be created, up to 9 layouts per video wall, and up to 9 zones per layout.

The video wall has two states: Active of Inactive. The wall can be edited in Inactive state only.

Layouts

A video wall would have more different layouts which are freely configurable by the user except the first layout (LAYOUT0) which is created automatically. The LAYOUT0 contains one zone only (ZONE0) which includes all display devices in the video wall showing one stream.

New layouts (LAYOUT1, LAYOUT2, etc) can be added to the video wall which may contain more zones.

Zones

The layout contains zones which own the display devices. One zone represents a stream on the video wall. All zones have a unique ID which contains information about the video wall, layout, and the zone. For example: Z321, Z as Zone, 3 as Video Wall 3, 2 as Layout 2, and 1 as Zone 1. The ID of the default ZONE0 is Z100.

Displays

The advanced display device parameters can be found under the /DISPLAYS path. The width, height, bezel sizes, and gap sizes can be customized with the right command.
9.11.2. Creating Video Wall

Command and Response
```bash
#videowall #vw
```

- CALL /MEDIA/VIDEOWALLS:createGridVideoWall(<video_wall_parameters>)
- mO /MEDIA/VIDEOWALLS:createGridVideoWall=

Parameters

The `<video_wall_parameters>` includes the following order of settings:

- `<video_wall_ID>`
- `<column_number>`
- `<row_number>`
- `<horizontal_size>`
- `<vertical_size>`
- `<top_bezel_size>`
- `<bottom_bezel_size>`
- `<left_bezel_size>`
- `<right_bezel_size>`
- `<horizontal_gap_size>`
- `<vertical_gap_size>`

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;video_wall_ID&gt;</code></td>
<td>The ID of the video wall. The rule is the following: the ID of the first video wall must be VIDEOWALL1, the next one is VIDEOWALL2, and so on.</td>
</tr>
<tr>
<td><code>&lt;column_number&gt;</code></td>
<td>Total number of columns.</td>
</tr>
<tr>
<td><code>&lt;row_number&gt;</code></td>
<td>Total number of rows.</td>
</tr>
<tr>
<td><code>&lt;horizontal_size&gt;</code></td>
<td>The width of the screen (display area) in mm.</td>
</tr>
<tr>
<td><code>&lt;vertical_size&gt;</code></td>
<td>The height of the screen (display area) in mm.</td>
</tr>
<tr>
<td><code>&lt;top_bezel_size&gt;</code></td>
<td>Top bezel of the sink device in mm.</td>
</tr>
<tr>
<td><code>&lt;bottom_bezel_size&gt;</code></td>
<td>Bottom bezel of the sink device in mm.</td>
</tr>
<tr>
<td><code>&lt;left_bezel_size&gt;</code></td>
<td>Left bezel of the sink device in mm.</td>
</tr>
<tr>
<td><code>&lt;right_bezel_size&gt;</code></td>
<td>Right bezel of the sink device in mm.</td>
</tr>
<tr>
<td><code>&lt;horizontal_gap_size&gt;</code></td>
<td>Horizontal gap between the sink devices in mm.</td>
</tr>
<tr>
<td><code>&lt;vertical_gap_size&gt;</code></td>
<td>Vertical gap between the sink devices in mm.</td>
</tr>
</tbody>
</table>

Example

- CALL /MEDIA/VIDEOWALLS:createGridVideoWall(VIDEOWALL1;3;2;500;300;10;10;10;10;0;0)
- mO /MEDIA/VIDEOWALLS:createGridVideoWall=

Explanation

A 3x2 video wall is created where the size of the displays are 500x300 mm, the bezels are 10 mm on all four sides and there is no gap between the displays.

9.11.3. Delete a Video Wall

Command and Response
```bash
CALL /MEDIA/VIDEOWALLS:deleteGridVideoWall(<video_wall_ID>)
```

mO /MEDIA/VIDEOWALLS:deleteGridVideoWall=

Parameters

See the details in the Creating Video Wall section.

Example

- CALL /MEDIA/VIDEOWALLS:deleteGridVideoWall(VIDEOWALL2)
- mO /MEDIA/VIDEOWALLS:deleteGridVideoWall=

9.11.4. Setting the Name of the Video Wall

Command and Response
```bash
SET /MEDIA/VIDEOWALLS/<video_wall_ID>.Name=<name>
```

pw /MEDIA/VIDEOWALLS/<video_wall_ID>.Name=<name>

Parameters

See the details for the `<video_wall_ID>` parameter in the Creating Video Wall section.

The following characters are allowed in the `<name>` parameter: non-capital letters (a-z), capital letters (A-Z), numbers (0-9), and special characters ( -_.@#$%^&*)..

Example

- SET /MEDIA/VIDEOWALLS/VIDEOWALL1.Name(My_video_wall)
- pw MEDIA/VIDEOWALLS/VIDEOWALL1.Name(My_video_wall)

9.11.5. Querying the Size of the Video Wall

Command and Response
```bash
GET /MEDIA/VIDEOWALLS/<video_wall_ID>.Size
```

pw /MEDIA/VIDEOWALLS/<video_wall_ID>.Size=<size>

Example

- GET /MEDIA/VIDEOWALLS/VIDEOWALL1.Size
- pw MEDIA/VIDEOWALLS/VIDEOWALL1.Size=5x3

Explanation

The video wall contains 5 columns and 3 rows.
9.11.6. Modifying the Size of the Video Wall

**Command and Response**
- `CALL / MEDIA / VIDEOWALLS/<video_wall_ID>: modifyVideoWallSize(<column_number>; <row_number>)`
- `mO / MEDIA / VIDEOWALLS/<video_wall_ID>: modifyVideoWallSize`

**Parameters**
See the details in the Creating Video Wall section.

**Example**
- `CALL / MEDIA / VIDEOWALLS/VIDEOWALL1: modifyVideoWallSize(4;3)`
- `mO MEDIA / VIDEOWALLS/VIDEOWALL1: modifyVideoWallSize`

9.11.7. Assign Outputs to the Video Wall

**Command and Response**
- `CALL / MEDIA / VIDEOWALLS/<video_wall_ID>/ASSIGNS: assignOutput(<display_ID>; <out>)`
- `mO / MEDIA / VIDEOWALLS/<video_wall_ID>/ASSIGNS: assignOutput`

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;display_ID&gt;</td>
<td>The ID of the display device in the wall.</td>
<td>R&lt;row_number&gt;C&lt;column_number&gt;</td>
</tr>
<tr>
<td>&lt;out&gt;</td>
<td>HDMI output 1 port of the RX / TRX</td>
<td>D&lt;logical_device_ID&gt;&lt;out_port_nr&gt;</td>
</tr>
</tbody>
</table>

The following figure shows the values of the `<display_ID>` parameter in an 8x4 video wall.

![Video Wall Diagram]

**Example**
- `CALL / MEDIA / VIDEOWALLS/VIDEOWALL1/ASSIGNS: assignOutput(R1C1:D101; R1C2:D201)`
- `mO MEDIA / VIDEOWALLS/VIDEOWALL1/ASSIGNS: assignOutput`

9.11.8. Unassign Outputs

**Command and Response**
- `CALL / MEDIA / VIDEOWALLS/<video_wall_ID>/ASSIGNS: unassignOutput(<display_ID>)`
- `mO / MEDIA / VIDEOWALLS/<video_wall_ID>/ASSIGNS: unassignOutput`

**Parameters**
See the details in the Assign Outputs to the Video Wall section.

**Example**
- `CALL / MEDIA / VIDEOWALLS/VIDEOWALL1/ASSIGNS: unassignOutput(R1C1; R1C2)`
- `mO MEDIA / VIDEOWALLS/VIDEOWALL1/ASSIGNS: unassignOutput`

9.11.9. Unassign All Outputs

**Command and Response**
- `CALL / MEDIA / VIDEOWALLS/<video_wall_ID>/ASSIGNS: unassignAllOutput()`
- `mO / MEDIA / VIDEOWALLS/<video_wall_ID>/ASSIGNS: unassignAllOutput`

**Example**
- `CALL / MEDIA / VIDEOWALLS/VIDEOWALL1/ASSIGNS: unassignAllOutput()`
- `mO MEDIA / VIDEOWALLS/VIDEOWALL1/ASSIGNS: unassignAllOutput`

9.11.10. Querying an Output Assignment

**Command and Response**
- `GET / MEDIA / VIDEOWALLS/ASSIGNS/<video_wall_ID>:.<<display_ID>><out>`
- `pr / MEDIA / VIDEOWALLS/ASSIGNS/<video_wall_ID>:.<<display_ID>><out>`

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;video_wall_ID&gt;</td>
<td>The ID of the video wall.</td>
<td>VIDEO_WALL&lt;number&gt;</td>
</tr>
<tr>
<td>&lt;display_ID&gt;</td>
<td>The ID of the display device in the wall.</td>
<td>R&lt;row_number&gt;C&lt;column_number&gt;</td>
</tr>
<tr>
<td>&lt;out&gt;</td>
<td>HDMI output 1 port of the RX / TRX</td>
<td>D&lt;logical_device_ID&gt;&lt;out_port_nr&gt;</td>
</tr>
</tbody>
</table>

**Example**
- `GET / MEDIA / VIDEOWALLS/VIDEOWALL1/ASSIGNS.R1C1`
- `pr MEDIA / VIDEOWALLS/VIDEOWALL1/ASSIGNS.R1C1=D101`

**Explanation**
The R1C1 sink device displays the stream coming from the D101 output port.
9.11.11. Setting the Background Color of the Video Wall

The video wall background generates a whole-colored image which can be displayed when there is no incoming signal on the video wall or the display devices are not attached to a zone yet. The following method sets the displayed color defined in RGB code.

**Command and Response**

- `SE T•/MEDIA/VIDEOWALLS/<video_wall_ID>/SETTINGS.BackgroundColor=<RGB_code>
- `pw•/MEDIA/VIDEOWALLS/<video_wall_ID>/SETTINGS.BackgroundColor=<RGB_code>

**Example**

- SET /MEDIA/VIDEOWALLS/VIDEOWALL1/SETTINGS.BackgroundColor=128;128;128
- `pw /MEDIA/VIDEOWALLS/VIDEOWALL1/SETTINGS.BackgroundColor=128;128;128

9.11.12. Timing Mode Setting

The timing mode is set with the following command. See more details about it in the Timing Modes section.

**Command and Response**

- `SE T•/MEDIA/VIDEOWALLS/<video_wall_ID>/SETTINGS.TimingMode=<timing_mode>
- `pw•/MEDIA/VIDEOWALLS/<video_wall_ID>/SETTINGS.TimingMode=<timing_mode>

**Parameters**

The `<timing_mode>` can be set to `Freerun` or `SourceLocked`.

**Example**

- SET /MEDIA/VIDEOWALLS/VIDEOWALL1/SETTINGS.TimingMode=SourceLocked
- `pw /MEDIA/VIDEOWALLS/VIDEOWALL1/SETTINGS.TimingMode=SourceLocked

9.11.13. Color Space Converter Setting

**Command and Response**

- `#csc #colorspace

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;color_space&gt;</code></td>
<td>Color space setting</td>
<td>Pass</td>
<td>Pass-through mode - the original color space of the stream is transmitted to the sink device.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RGB</td>
<td>Forced RGB color space.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>YCbCr 4:4:4</td>
<td>Forced YCbCr 4:4:4 color space.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>YCbCr 4:2:2</td>
<td>Forced YCbCr 4:2:2 color space.</td>
</tr>
</tbody>
</table>

**Example**

- SET /MEDIA/VIDEOWALLS/VIDEOWALL1/SETTINGS.ColorSpaceSetting=RGB
- `pw /MEDIA/VIDEOWALLS/VIDEOWALL1/SETTINGS.ColorSpaceSetting=RGB


**Command and Response**

- `#scaler #fr c

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;resolution_mode&gt;</code></td>
<td>Resolution mode setting</td>
<td>Pass</td>
<td>Pass-through mode - the original stream is transmitted to the sink device.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Forced</td>
<td>The endpoint device forces the resolution set in the ResolutionSetting for the stream and transmits it to the sink device.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EdidBased</td>
<td>The endpoint device forces the resolution that is read out from the EDID of the connected sink device.</td>
</tr>
</tbody>
</table>

**Example**

- SET /MEDIA/VIDEOWALLS/VIDEOWALL1/SETTINGS.ResolutionMode=EdidBased
- `pw /MEDIA/VIDEOWALLS/VIDEOWALL1/SETTINGS.ResolutionMode=EdidBased
9.11.15. Resolution Setting

The resolution that is set here will be enforced only if the ResolutionMode is set to Forc

Command and Response

SET /MEDIA/VIDEOWALLS/<video_wall_ID>/SETTINGS.ResolutionSetting=<resolution>

pw /MEDIA/VIDEOWALLS/<video_wall_ID>/SETTINGS.ResolutionSetting=<resolution>

Example

SET /MEDIA/VIDEOWALLS/VIDEOWALL1/SETTINGS.ResolutionSetting=1920x1080p60

pw /MEDIA/VIDEOWALLS/VIDEOWALL1/SETTINGS.ResolutionSetting=1920x1080p60

INFO: The entire list of available resolutions can be found in the Resolutions of the Scaler section.

9.11.16. No Sync Screen Setting

Enables or disables the BackgroundColor with the set color of the video wall or the active zone when the wall is in edit state. See the setting of the color in the Setting the Background Color of the Video Wall section.

Command and Response

SET /MEDIA/VIDEOWALLS/<video_wall_ID>/SETTINGS.ForceNoSyncScreen=<logical_value>

pw /MEDIA/VIDEOWALLS/<video_wall_ID>/SETTINGS.ForceNoSyncScreen=<logical_value>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;logical_value&gt;</td>
<td>Enables or disables the BackgroundColor with the set color of the video wall or the active zone when the wall is in edit state.</td>
<td>true</td>
<td>Shows the color which are set in the BackgroundColor property.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>false</td>
<td>Shows the active video stream.</td>
</tr>
</tbody>
</table>

Example

SET /MEDIA/VIDEOWALLS/VIDEOWALL1/SETTINGS.ForceNoSyncScreen=true

pw /MEDIA/VIDEOWALLS/VIDEOWALL1/SETTINGS.ForceNoSyncScreen=true

9.11.17. Query the Display Parameters

The query returns with the set parameters of all display devices in the video wall. These parameters are set originally when the video wall is created - see the details in the Creating Video Wall section.

Command and Response

GET /MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS.All

pw /MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS.All=<display_parameters>

Parameters

The <display_parameters> includes the following order of settings:

<horizontal_size>;<vertical_size>;<top_bezel_size>;<bottom_bezel_size>;<left_bezel_size>;<right_bezel_size>;<horizontal_gap_size>;<vertical_gap_size>

Example

GET /MEDIA/VIDEOWALLS/VIDEOWALL1/DISPLAYS.All

pw /MEDIA/VIDEOWALLS/VIDEOWALL1/DISPLAYS.All=500;300;10;10;10;10;0;0

9.11.18. Change the Width of the Display

Command and Response

SET /MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.Width=<horizontal_size>

pw /MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.Width=<horizontal_size>

Example

SET /MEDIA/VIDEOWALLS/VIDEOWALL1/DISPLAYS/ALL.Width=657

pw /MEDIA/VIDEOWALLS/VIDEOWALL1/DISPLAYS/ALL.Width=657
9.11.19. Change the Height of the Display

Command and Response

- Set MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.Height=<vertical_size>
- pw MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.Height=<vertical_size>

Example
- Set /MEDIA/VIDEOWALLS/VIDEO WALL1/DISPLAYS/ALL.Height=333
- pw /MEDIA/VIDEOWALLS/VIDEO WALL1/DISPLAYS/ALL.Height=333

9.11.20. Change the Top Bezel Size of the Display

Command and Response

- Set MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.TopBezelSize=<top_bezel_size>
- pw MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.TopBezelSize=<top_bezel_size>

Example
- Set /MEDIA/VIDEOWALLS/VIDEO WALL1/DISPLAYS/ALL.TopBezelSize=5
- pw /MEDIA/VIDEOWALLS/VIDEO WALL1/DISPLAYS/ALL.TopBezelSize=5

9.11.21. Change the Bottom Bezel Size of the Display

Command and Response

- Set MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.BottomBezelSize=<bottom_bezel_size>
- pw MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.BottomBezelSize=<bottom_bezel_size>

Example
- Set /MEDIA/VIDEOWALLS/VIDEO WALL1/DISPLAYS/ALL.BottomBezelSize=5
- pw /MEDIA/VIDEOWALLS/VIDEO WALL1/DISPLAYS/ALL.BottomBezelSize=5

9.11.22. Change the Left Bezel Size of the Display

Command and Response

- Set MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.LeftBezelSize=<left_bezel_size>
- pw MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.LeftBezelSize=<left_bezel_size>

Example
- Set /MEDIA/VIDEOWALLS/VIDEO WALL1/DISPLAYS/ALL.LeftBezelSize=5
- pw /MEDIA/VIDEOWALLS/VIDEO WALL1/DISPLAYS/ALL.LeftBezelSize=5

9.11.23. Change the Right Bezel Size of the Display

Command and Response

- Set MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.RightBezelSize=<right_bezel_size>
- pw MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.RightBezelSize=<right_bezel_size>

Example
- Set /MEDIA/VIDEOWALLS/VIDEO WALL1/DISPLAYS/ALL.RightBezelSize=5
- pw /MEDIA/VIDEOWALLS/VIDEO WALL1/DISPLAYS/ALL.RightBezelSize=5

9.11.24. Change the Horizontal Gap Size

Command and Response

- Set MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.HorizontalGapSize=<horizontal_gap_size>
- pw MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.HorizontalGapSize=<horizontal_gap_size>

Example
- Set /MEDIA/VIDEOWALLS/VIDEO WALL1/DISPLAYS/ALL.HorizontalGapSize=1
- pw /MEDIA/VIDEOWALLS/VIDEO WALL1/DISPLAYS/ALL.HorizontalGapSize=1

9.11.25. Change the Vertical Gap Size

Command and Response

- Set MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.VerticalGapSize=<vertical_gap_size>
- pw MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.VerticalGapSize=<vertical_gap_size>

Example
- Set /MEDIA/VIDEOWALLS/VIDEO WALL1/DISPLAYS/ALL.VerticalGapSize=1
- pw /MEDIA/VIDEOWALLS/VIDEO WALL1/DISPLAYS/ALL.VerticalGapSize=1
9.11.26. Querying the State of the Video Wall

Activity state of the video wall. The wall can be edited in Inactive state only.

Command and Response
- GET/MEDIA/VIDEOWALLS/<video_wall_ID>.State
- pr/MEDIA/VIDEOWALLS/<video_wall_ID>.State=<state>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;state&gt;</td>
<td>Activity state of the video wall</td>
<td>Active</td>
<td>The video wall is active.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inactive</td>
<td>The video wall is inactive and configurable.</td>
</tr>
</tbody>
</table>

Example
- SET /MEDIA/VIDEOWALLS/VIDEOWALL1.State
- pw/MEDIA/VIDEOWALLS/VIDEOWALL1.State=Inactive

9.11.27. Setting the State of the Video Wall

Setting of the activity state. The video wall can be edited in Inactive state only.

Command and Response
- CALL/MEDIA/VIDEOWALLS/<video_wall_ID>:setState(<state>)
- mO/MEDIA/VIDEOWALLS/<video_wall_ID>:setState

Parameters

See the details in the previous section.

Example
- CALL /MEDIA/VIDEOWALLS/VIDEOWALL1:setState=Active
- mO /MEDIA/VIDEOWALLS/VIDEOWALL1:setState

9.11.28. Identify the Video Wall

Calling the method generates 10 test colors on the display devices for 10 seconds. The feature helps to identify the video wall physically.

Command and Response
- CALL/MEDIA/VIDEOWALLS/<video_wall_ID>:identifyVideoWall()
- mO/MEDIA/VIDEOWALLS/<video_wall_ID>:identifyVideoWall

Example
- CALL /MEDIA/VIDEOWALLS/VIDEOWALL1:identifyVideoWall()
- mO /MEDIA/VIDEOWALLS/VIDEOWALL1:identifyVideoWall

Explanation
9.11.29. Creating a New Layout

INFO: When a new video wall is created, a default layout (LAYOUT0) is also defined automatically. The default layout cannot be deleted (only with deleting the video wall together) and has one zone only (ZONE0) which contains all display devices in the video wall.

Command and Response

#layout

CALL /MEDI A/VIDEOWALLS/<video_wall_ID>/LAYOUTS:createLayout(<layout_ID>;<name>)

Example

CALL /MEDI A/VIDEOWALLS/VIDEOWALL1/LAYOUTS:createLayout(LAYOUT1;My_Layout)

9.11.30. Deleting a Layout

Command and Response

CALL /MEDI A/VIDEOWALLS/<video_wall_ID>/LAYOUTS:deleteLayout(<layout_ID>)

Example

CALL /MEDI A/VIDEOWALLS/VIDEOWALL1/LAYOUTS:deleteLayout(LAYOUT1)

9.11.31. Deleting All Layouts

Command and Response

CALL /MEDI A/VIDEOWALLS/<video_wall_ID>/LAYOUTS:deleteAllLayout()

Example

CALL /MEDI A/VIDEOWALLS/VIDEOWALL1/LAYOUTS:deleteAllLayout()

9.11.32. Querying the Active Layout

Command and Response

GET /MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS.activeLayout

Example

GET /MEDIA/VIDEOWALLS/VIDEOWALL1/LAYOUTS.activeLayout=LAYOUT0

9.11.33. Activate Layout

Command and Response

CALL /MEDI A/VIDEOWALLS/<video_wall_ID>/LAYOUTS:activateLayout(<layout_ID>)

Example

CALL /MEDI A/VIDEOWALLS/VIDEOWALL1/LAYOUTS:activateLayout(LAYOUT1)

9.11.34. Setting the Name of the Layout

Command and Response

SET /MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>.Name=<name>

Parameters

The following characters are allowed in the <name> parameter: non-capital letters (a-z), capital letters (A-Z), numbers (0-9), and special characters (~ ^ _ - : / @ $ & * ( ) + = *).

Example

SET /MEDIA/VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1.Name=My_Layout

Applied endpoint firmware package: v2.4.1 | Applied MMU firmware package: v1.7.1 | LDC software: v2.6.2b3
9.11.35. Identify the Layout

Calling the method generates 10 test colors on the display devices for 10 seconds. The feature helps to identify the layout physically.

Command and Response

- CALL /MEDI /VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>:identifyLayout()
- mO /MEDI /VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>:identifyLayout

Example

- CALL /MEDI /VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1:identifyLayout()
- mO /MEDI /VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1:identifyLayout

Explanation

![Colors used for identifying layout](Image)

9.11.36. Creating Zone

A layout can contain more zones where the displayed source stream are different.

Command and Response

- CALL /MEDI /VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>:createZone(<zone_ID>;<display_ID>)
- mO /MEDI /VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>:createZone

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;zone_ID&gt;</td>
<td>The ID of the zone</td>
<td>ZONE:&lt;number&gt;</td>
</tr>
<tr>
<td>&lt;display_ID&gt;</td>
<td>The ID of the display device in the wall.</td>
<td>R:&lt;row_number&gt;C:&lt;column_number&gt;</td>
</tr>
</tbody>
</table>

The following figure shows the values of the <display_ID> parameter in an 8x4 video wall.

![8x4 video wall layout](Image)

Example

- CALL /MEDI /VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1:createZone(ZONE1;R1C1;R1C2;R1C3)
- mO /MEDI /VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1:createZone
9.11.37. Deleting a Zone

Command and Response

- CALL /MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>:deleteZone(<zone_ID>)
- mO /MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>:deleteZone= 

Example

- CALL /MEDIA/VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1:deleteZone(ZONE1)
- mO /MEDIA/VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1:deleteZone=

9.11.38. Deleting All Zones

Command and Response

- CALL /MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>:deleteAllZone()
- mO /MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>:deleteAllZone=

Example

- CALL /MEDIA/VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1:deleteAllZone()
- mO /MEDIA/VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1:deleteAllZone=

9.11.39. Setting the Name of the Zone

Command and Response

- SET /MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>.Name=<name>
- pw /MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>.Name=<name>

Example

- SET /MEDIA/VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1/ZONE1.Name=Big_Zone
- pw /MEDIA/VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1/ZONE1.Name=Big_Zone

9.11.40. Querying the Size of the Zone

Command and Response

- GET /MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>.ZoneSize
- pr /MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>.ZoneSize=<size>

Example

- GET /MEDIA/VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1/ZONE1.ZoneSize
- pr /MEDIA/VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1/ZONE1.ZoneSize=1x3

Explanation

The ZONE1 zone contains 1 column and 3 rows.

9.11.41. Identify the Zone

Calling the method generates 10 test colors on the display devices for 10 seconds. The feature helps to identify the zone physically.

Command and Response

- CALL /MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>:identifyZone()
- mO /MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>:identifyZone

Example

- CALL /MEDIA/VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1/ZONE1:identifyZone()
- mO /MEDIA/VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1/ZONE1:identifyZone

Explanation

9.11.42. Setting the Background Color of the Zone

The zone background generates an whole-colored image which can be displayed when there is no incoming signal on the zone. The following method sets the displayed color defined in RGB code.

Command and Response

- SET /MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>.BackgroundColor=<RGB_code>
- pw /MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>.BackgroundColor=<RGB_code>

Example

- SET /MEDIA/VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1/ZONE1.BackgroundColor=128;128;128
- pw /MEDIA/VIDEOWALLS/VIDEOWALL1/LAYOUTS/LAYOUT1/ZONE1.BackgroundColor=128;128;128
9.11.43. Assign Display to the Zone

**Command and Response**

- CALL•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1:assignDisplay(<display_ID>)
- mO•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1:assignDisplay

**Example**

Calling the command/assignDisplay(R1C1;R2C1)

9.11.44. Unassign Display from the Zone

**Command and Response**

- CALL•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1:unassignDisplay(<display_ID>)
- mO•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1:unassignDisplay

**Example**

Calling the command/unassignDisplay(R1C1;R2C1)

9.11.45. Unassign All Displays from the Zone

**Command and Response**

- CALL•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1:unassignAllDisplay()
- mO•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1:unassignAllDisplay

**Example**

Calling the command/unassignAllDisplay()

9.11.46. Query the Tags of the Zone

The query returns with the tags which are added by the user.

**Command and Response**

- GET•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1.Tags
- pr•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1.Tags=<tag>

**Example**

Getting the tags/VIDEOWALL1/LAYOUTS/LAYOUT1/ZONE1.Tags=1080p;intro

9.11.47. Adding Tags to the Zone

The following characters are allowed in the <tag> parameter: non-capital letters (a-z), capital letters (A-Z), numbers (0-9), and special characters (- _ ~ / \ # $ @ & ( ) + *).

**Command and Response**

- CALL•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1:addTags(<tag>)
- mO•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1:addTags

**Example**

Calling the command/VIDEOWALL1/LAYOUTS/LAYOUT1/ZONE1:addTags(1080p;intro)

9.11.48. Deleting Tags of the Zone

**Command and Response**

- CALL•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1:removeTags(<tag>)
- mO•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1:removeTags

**Example**

Calling the command/VIDEOWALL1/LAYOUTS/LAYOUT1/ZONE1:removeTags(cartoon;1080p)

9.11.49. Deleting All Tags of the Zone

**Command and Response**

- CALL•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1:removeAllTags()
- mO•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1:removeAllTags

**Example**

Calling the command/VIDEOWALL1/LAYOUTS/LAYOUT1/ZONE1:removeAllTags()

9.11.50. Query the Static Tags of the Zone

The query returns with all the tags which belong to the video wall. These tags are reserved.

**Command and Response**

- GET•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1.StaticTags
- pr•/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/ZONE1.StaticTags=<tag>

**Example**

Getting the static tags/VIDEOWALL1/LAYOUTS/LAYOUT1/ZONE1.StaticTags=VideoWall1;Z121
9.11.51. Switching the Video Stream to the Video Wall Zone

Command and Response #switch #crosspoint

- CALL/MEDIA/XP/VIDEO:switch(<in>:<zone_ID>)
- mO/MEDIA/XP/VIDEO:switch

Example
- CALL/MEDIA/XP/VIDEO:switch(S501:Z111;S101:Z112;S302:Z113)
- mO/MEDIA/XP/VIDEO:switch

9.12. Audio Crosspoint Settings

<table>
<thead>
<tr>
<th>Parameters</th>
<th>#audio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
<td>Description</td>
</tr>
<tr>
<td>&lt;in&gt;</td>
<td>Audio stream source ID</td>
</tr>
<tr>
<td>&lt;out&gt;</td>
<td>Audio destination ID</td>
</tr>
</tbody>
</table>

9.12.1. Query the Status of All Audio Ports

The query returns with all information about the source streams and the destinations. The respond contains the following information:

- Enable/disable status
- Signal presence
- Crosspoint status (which stream is connected to the destination port)
- Source/destination names, tags
- Device tags
- Locking status

Command and Response

- GET/MEDIA/XP/AUDIO/*/.*
- pr/MEDIA/XP/AUDIO/*/*

9.12.2. Switching the Audio Stream to One Destination

Command and Response

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

Example
- CALL/MEDIA/XP/AUDIO:switch(S501:D302;S101:D301)
- mO/MEDIA/XP/AUDIO:switch

9.12.3. Switching an Audio Stream to All Destinations

The selected audio stream is switched to all outputs.

Command and Response

- CALL/MEDIA/XP/AUDIO:switchAll(<in>)
- mO/MEDIA/XP/AUDIO:switchAll

Example
- CALL/MEDIA/XP/AUDIO:switchAll(S101)
- mO/MEDIA/XP/AUDIO:switchAll

9.12.4. Query the Number of the Source Ports

The query returns with the number of all source (input) ports including the disabled ones.

Command and Response

- GET/MEDIA/XP/AUDIO.SourcePortCount
- pr/MEDIA/XP/AUDIO.SourcePortCount=<number>

Example
- GET/MEDIA/XP/AUDIO.SourcePortCount
- pr/MEDIA/XP/AUDIO.SourcePortCount=36

9.12.5. Query the Number of the Destination Ports

The query returns with the number of all destination (output) ports including the disabled ones.

Command and Response

- GET/MEDIA/XP/AUDIO.DestinationPortCount
- pr/MEDIA/XP/AUDIO.DestinationPortCount=<number>

Example
- GET/MEDIA/XP/AUDIO.DestinationPortCount
- pr/MEDIA/XP/AUDIO.DestinationPortCount=36
9.13. Audio Stream Settings

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;in&gt;</td>
<td>Audio stream source ID</td>
<td>$&lt;\text{logical}_\text{device}_\text{ID}&gt;&lt;\text{stream}_\text{nr}&gt;$</td>
</tr>
<tr>
<td>&lt;out&gt;</td>
<td>Audio destination ID</td>
<td>$D&lt;\text{logical}_\text{device}_\text{ID}&gt;&lt;\text{out}_\text{port}_\text{nr}&gt;$</td>
</tr>
</tbody>
</table>

9.13.1. Enable/Disable the Audio Stream Source

Command and Response

- #streamenable
- GET /MEDIA/STREAMS/AUDIO/<in>/STREAM.Enabled=<logical_value>
- pw /MEDIA/STREAMS/AUDIO/<in>/STREAM.Enabled=<logical_value>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;logical_value&gt;</td>
<td>The audio stream is unmuted or muted.</td>
<td>true</td>
<td>The audio stream is enabled (unmuted).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>false</td>
<td>The audio stream is disabled (muted).</td>
</tr>
</tbody>
</table>

Example

- SET /MEDIA/STREAMS/AUDIO/I101/STREAM.Enabled=true
- pw /MEDIA/STREAMS/AUDIO/I101/STREAM.Enabled=true

9.13.2. Enable/Disable the Audio Stream Destination

Command and Response

- SET /MEDIA/STREAMS/AUDIO/<out>/STREAM.Enabled=<logical_value>
- pw /MEDIA/STREAMS/AUDIO/<out>/STREAM.Enabled=<logical_value>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;logical_value&gt;</td>
<td>The audio stream is unmuted or muted.</td>
<td>true</td>
<td>The audio stream is enabled (unmuted).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>false</td>
<td>The audio stream is disabled (muted).</td>
</tr>
</tbody>
</table>

Example

- SET /MEDIA/STREAMS/AUDIO/O101/STREAM.Enabled=true
- pw /MEDIA/STREAMS/AUDIO/O101/STREAM.Enabled=true

9.13.3. Query the Name of the Stream

INFO: The default name of the stream is the MAC address of the endpoint device and the stream number separated by a dot. Example: A8:D2:36:F0:00:03.S1

Command and Response

- GET /MEDIA/STREAMS/AUDIO/<in>/SourceName
- pw /MEDIA/STREAMS/AUDIO/<in>/SourceName=<name>

Example

- GET /MEDIA/STREAMS/AUDIO/S2301.SourceName
- pw /MEDIA/STREAMS/AUDIO/S2301.SourceName=Black_Sabbath-Heaven_and_Hell

9.13.4. Setting the Name of the Stream

Command and Response

- SET /MEDIA/STREAMS/AUDIO/<in>/SourceName=<name>
- pw /MEDIA/STREAMS/AUDIO/<in>/SourceName=<name>

Example

- SET /MEDIA/STREAMS/AUDIO/S102.SourceName=Celine_Dion-My_Heart_Will_Go_On
- pw /MEDIA/STREAMS/AUDIO/S102.SourceName=Celine_Dion-My_Heart_Will_Go_On

9.13.5. Query the Name of the Destination

INFO: The default name of the destination is the MAC address of the endpoint device and the port number separated by a dot. Example: A8:D2:36:F0:00:03.D1

Command and Response

- GET /MEDIA/STREAMS/AUDIO/<out>.DestinationName
- pw /MEDIA/STREAMS/AUDIO/<out>.DestinationName=<name>

Example

- GET /MEDIA/STREAMS/AUDIO/D2301.DestinationName
- pw /MEDIA/STREAMS/AUDIO/D2301.DestinationName=Audio_amplifier

9.13.6. Setting the Name of the Destination

Command and Response

- SET /MEDIA/STREAMS/AUDIO/<out>.DestinationName=<name>
- pw /MEDIA/STREAMS/AUDIO/<out>.DestinationName=<name>

Example

- SET /MEDIA/STREAMS/AUDIO/D102.DestinationName=My_small_black_speakers
- pw /MEDIA/STREAMS/AUDIO/D102.DestinationName=My_small_black_speakers
9.13.7. Query the Tags of the Stream/Destination

The query returns with the tags which are added by the user.

Command and Response #tag

- GET /MEDIA/STREAMS/AUDIO/<in|out>.Tags
- pr /MEDIA/STREAMS/AUDIO/<in|out>.Tags=<tag>

Example
- GET /MEDIA/STREAMS/AUDIO/S102.Tags
- pr /MEDIA/STREAMS/AUDIO/S102.Tags=PCM:soundtrack;Die_Hard_2

9.13.8. Adding Tags to the Stream/Destination

The following characters are allowed in the <tag> parameter: non-capital letters (a-z), capital letters (A-Z),
numbers (0-9), and special characters ( - _ ~ : / ? # @ ! $ ( ) + = * ).

Command and Response

- CALL /MEDIA/STREAMS/AUDIO/<in|out>:addTags(<tag>)
- mO /MEDIA/STREAMS/AUDIO/<in|out>:addTags=<tag>

Example
- CALL /MEDIA/STREAMS/AUDIO/S401:addTags(intro;chillout)
- mO /MEDIA/STREAMS/AUDIO/S401:addTags=intro;chillout

9.13.9. Deleting Tags of the Stream

Command and Response

- CALL /MEDIA/STREAMS/AUDIO/<in|out>:removeTags(<tag>)
- mO /MEDIA/STREAMS/AUDIO/<in|out>:removeTags=<tag>

Example
- CALL /MEDIA/STREAMS/AUDIO/D101:removeTags(speakers;meeting_room)
- mO /MEDIA/STREAMS/AUDIO/D101:removeTags=speakers;meeting_room

9.13.10. Deleting All Tags of the Stream

Command and Response

- CALL /MEDIA/STREAMS/AUDIO/<in|out>:removeAllTags()
- mO /MEDIA/STREAMS/AUDIO/<in|out>:removeAllTags=

Example
- CALL /MEDIA/STREAMS/AUDIO/D101:removeAllTags()
- mO /MEDIA/STREAMS/AUDIO/D101:removeAllTags=

9.13.11. Query All Tags of the Device

The query returns with all the tags which belongs to the device. One tag is always reserved for the MAC
address of the endpoint.

Command and Response

- GET /MEDIA/STREAMS/AUDIO/<in|out>.DeviceTags
- pr /MEDIA/STREAMS/AUDIO/<in|out>.DeviceTags=<tag>

Example
- GET /MEDIA/STREAMS/AUDIO/S201.DeviceTags
- pr /MEDIA/STREAMS/AUDIO/S201.DeviceTags=intro;A8:D2:36:F0:00:35;TX_MeetingRoom;#2


DIFFERENCE: Only the UBE-PRO20-HDMI-F110 endpoint model is built with analog audio input and
output ports.


Command and Response #analogaudio #volume

- SET /MEDIA/STREAMS/AUDIO/<in|out>/Port.VolumeDB=<volume>
- pw /MEDIA/STREAMS/AUDIO/<in|out>/Port.VolumeDB=<volume>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;volume&gt;</td>
<td>Sets the input volume (attenuation) between -95.62 dB and 0 dB.</td>
</tr>
</tbody>
</table>

Example
- SET /MEDIA/STREAMS/AUDIO/S103/PORT.VolumeDB=-15
- pw /MEDIA/STREAMS/AUDIO/S103/PORT=-15.00

9.14.2. Setting the Volume in Percent

Command and Response

- SET /MEDIA/STREAMS/AUDIO/<in|out>/PORT.VolumePercent=<percent>
- pw /MEDIA/STREAMS/AUDIO/<in|out>/PORT.VolumePercent=<percent>

Example
- SET /MEDIA/STREAMS/AUDIO/D103/PORT.VolumePercent=15
- pw /MEDIA/STREAMS/AUDIO/D103/PORT=15.000

9.14.3. Setting the Output Volume in Percent

Command and Response

- SET /MEDIA/STREAMS/AUDIO/<in|out>/PORT.VolumePercent=<percent>
- pw /MEDIA/STREAMS/AUDIO/<in|out>/PORT.VolumePercent=<percent>

Example
- SET /MEDIA/STREAMS/AUDIO/D103/PORT.VolumePercent=50
- pw /MEDIA/STREAMS/AUDIO/D103/PORT.VolumePercent=50.00
9.14.3. Setting the Balance

Command and Response

- SET /MEDIA/STREAMS/AUDIO/</in>|<out>/PORT.Balance=<balance>
- pw /MEDIA/STREAMS/AUDIO/</in>|<out>/PORT.Balance=<balance>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;balance&gt;</td>
<td>Sets the balance; -100 means left balance, +100 means right balance, step is 1. Center is 0 (default).</td>
</tr>
</tbody>
</table>

Example

- SET /MEDIA/STREAMS/AUDIO/D103/PORT.Balance=+25
- pw /MEDIA/STREAMS/AUDIO/D103/PORT.Balance=+25

9.14.4. Setting the Gain

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

Command and Response

- SET /MEDIA/STREAMS/AUDIO/</in>/PORT.Gain=<gain>
- pw /MEDIA/STREAMS/AUDIO/</in>/PORT.Gain=<gain>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;gain&gt;</td>
<td>Sets the input gain between -12 dB and 35 dB.</td>
</tr>
</tbody>
</table>

Example

- SET /MEDIA/STREAMS/AUDIO/S103/PORT.Gain=4
- pw /MEDIA/STREAMS/AUDIO/S103/PORT.Gain=4

9.14.5. Mute/Unmute the Analog Audio Output Port

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

Command and Response

- SET /MEDIA/STREAMS/AUDIO/</out>/PORT.Mute=<logical_value>
- pw /MEDIA/STREAMS/AUDIO/</out>/PORT.Mute=<logical_value>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;logical_value&gt;</td>
<td>The port is muted or unmuted.</td>
<td>true</td>
<td>The port is muted.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>false</td>
<td>The port is unmuted.</td>
</tr>
</tbody>
</table>

Example

- SET /MEDIA/STREAMS/AUDIO/D103/PORT.Mute=true
- pw /MEDIA/STREAMS/AUDIO/D103/PORT.Mute=true
9.15. EDID Management

INFO: The detailed description of the parameters in the EDID management section (E, D, U, F) can be found in the Advanced EDID Management section.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;emulated&gt;</td>
<td>The emulated EDID memory of the desired input port. Example: E1.</td>
</tr>
<tr>
<td>&lt;dynamic&gt;</td>
<td>Dynamic EDID memory index. Example: D1</td>
</tr>
<tr>
<td>&lt;user&gt;</td>
<td>User EDID memory index. Example: U1</td>
</tr>
<tr>
<td>&lt;factory&gt;</td>
<td>Factory EDID memory index. Example: F1</td>
</tr>
</tbody>
</table>

9.15.1. Query the Validity of a Dynamic EDID

Command and Response

- GET /MEDIA/EDID/D/<dynamic>\[Validity\]
- pr /MEDIA/EDID/D/<dynamic>\[Validity\]=<logical_value>

Parameters

The `<logical_value>` can be true or false.

Example

- GET /MEDIA/EDID/D/D1.Validity
- pr /MEDIA/EDID/D/D1.Validity=true

If the 'Validity' property is true then a valid EDID is stored in D1 memory place.

9.15.2. Query the Preferred Resolution of an EDID

Command and Response

- GET /MEDIA/EDID/U|F|D|E/<user|factory|dynamic|emulated>.PreferredResolution
- pr /MEDIA/EDID/U|F|D|E/<user|factory|dynamic|emulated>.PreferredResolution=<resolution>

Example

- GET /MEDIA/EDID/U/U2.PreferredResolution
- pr /MEDIA/EDID/U/U2.PreferredResolution=4096x2160p60.00Hz

9.15.3. Emulating an EDID on an Input Port

Command and Response

- CALL /MEDIA/EDID:switch(<user|factory|dynamic|emulated>)
- mO /MEDIA/EDID:switch=

Example

- CALL /MEDIA/EDID:switch(F49;E201;F137;E302)
- mO /MEDIA/EDID:switch

9.15.4. Emulating an EDID on All Input Ports

Command and Response

- CALL /MEDIA/EDID:switchAll(<user|factory|dynamic>)
- mO /MEDIA/EDID:switchAll=

Example

- CALL /MEDIA/EDID:switchAll(F147)
- mO /MEDIA/EDID:switchAll=

9.15.5. Copy an EDID to User Memory

Command and Response

- CALL /MEDIA/EDID:copy(<user|factory|dynamic|emulated>:<user>)
- mO /MEDIA/EDID:copy

Example

- CALL /MEDIA/EDID:copy(D801:U3;F147:U4)
- mO /MEDIA/EDID:copy

The EDID of the last connected sink of D801 is copied to U3, the F147 factory EDID is copied to U4.

9.15.6. Deleting an EDID from User Memory

Command and Response

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

Example

- CALL /MEDIA/EDID:delete(U1)
- mO /MEDIA/EDID:delete=
9.15.7. Resetting the Emulated EDIDs

Command and Response

- CALL /MEDIA/EDID:reset()
- mO /MEDIA/EDID:reset=

Example

- CALL /MEDIA/EDID:reset()
- mO /MEDIA/EDID:reset=

Calling this method switches all emulated EDIDs to factory default ones. See the table in the Factory EDID List section.

9.16. System Monitoring Commands

9.16.1. Query Connected Device Presence

Connected property indicates that a cable or a device is connected to the input or output port.

Command and Response

- GET /MEDIA/STREAMS/VIDEO/<inout>/PORT.Connected
- pr /MEDIA/STREAMS/VIDEO/<inout>/PORT.Connected=<parameter>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;parameter&gt;</td>
<td>Connected device or cable indicator</td>
<td>0</td>
<td>Not present</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Present</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Example

- GET /MEDIA/STREAMS/VIDEO/S101/PORT.Connected
- pr /MEDIA/STREAMS/VIDEO/S101/PORT.Connected=1

9.16.2. Query Video Signal Presence on a Port

SignalPresent property indicates valid signal present on the port.

Command and Response

- GET /MEDIA/STREAMS/VIDEO/<inout>/PORT.SignalPresent
- pr /MEDIA/STREAMS/VIDEO/<inout>/PORT.SignalPresent=<parameter>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;parameter&gt;</td>
<td>Signal present indicator</td>
<td>0</td>
<td>Not present</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Present</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Example

- GET /MEDIA/STREAMS/VIDEO/D101/PORT.SignalPresent
- pr /MEDIA/STREAMS/VIDEO/D101/PORT.SignalPresent=1

9.16.3. Query Video Signal Presence in a Stream

SignalPresent property indicates valid signal present in the stream.

Command and Response

- GET /MEDIA/STREAMS/VIDEO/<inout>/STREAM.SignalPresent
- pr /MEDIA/STREAMS/VIDEO/<inout>/STREAM.SignalPresent=<parameter>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;parameter&gt;</td>
<td>Signal present indicator</td>
<td>0</td>
<td>Not present</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Present</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Example

- GET /MEDIA/STREAMS/VIDEO/D101/STREAM.SignalPresent
- pr /MEDIA/STREAMS/VIDEO/D101/STREAM.SignalPresent=1
9.16.4. Query Embedded Audio Presence

EmbeddedAudioPresent property indicates that embedded audio is present in the video stream.

Command and Response

GET /MEDIA/STREAMS/VIDEO/<in|out>/STREAM.EmbeddedAudioPresent
pr /MEDIA/STREAMS/VIDEO/<in|out>/STREAM.EmbeddedAudioPresent=<parameter>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embedded audio presence indicator</td>
<td>0</td>
<td>Not present</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Present</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>Unknown</td>
<td></td>
</tr>
</tbody>
</table>

Example

GET /MEDIA/STREAMS/VIDEO/S101/STREAM.EmbeddedAudioPresent
pr /MEDIA/STREAMS/VIDEO/S101/STREAM.EmbeddedAudioPresent=1

9.16.5. Query the Signal Type

SignalType property provides the type of the video signal.

Command and Response

GET /MEDIA/STREAMS/VIDEO/<in|out>/STREAM.SignalType
pr / MEDIA/STREAMS/VIDEO/<in|out>/STREAM.SignalType=<signal_type>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal type</td>
<td>0</td>
<td>DVI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>HDMI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>Unknown</td>
<td></td>
</tr>
</tbody>
</table>

Example

GET /MEDIA/STREAMS/VIDEO/D101/STREAM.SignalType
pr /MEDIA/STREAMS/VIDEO/D101/STREAM.SignalType=1

9.16.6. Query the Original Resolution of the Stream Source

The query returns with the resolution of the original incoming stream on the transmitter.

Command and Response

GET /MEDIA/STREAMS/VIDEO/<in>/PORT.Resolution
pr /MEDIA/STREAMS/VIDEO/<in>/PORT.Resolution=<resolution>

Example

GET /MEDIA/STREAMS/VIDEO/S101/PORT.Resolution
pr /MEDIA/STREAMS/VIDEO/S101/PORT.Resolution=3840x2160p60

9.16.7. Query the Modified Resolution of the Stream Source

The query returns with the current resolution of the incoming stream on the transmitter which contains the possible signal modification by the scaler or FRC.

Command and Response

GET /MEDIA/STREAMS/VIDEO/<in>/STREAM.Resolution
pr /MEDIA/STREAMS/VIDEO/<in>/STREAM.Resolution=<resolution>

Example

GET /MEDIA/STREAMS/VIDEO/I102/STREAM.Resolution
pr /MEDIA/STREAMS/VIDEO/I102/STREAM.Resolution=3840x2160p30

9.16.8. Query the Original Resolution of the Stream Destination

The query returns with the resolution of the original incoming stream on the receiver.

Command and Response

GET /MEDIA/STREAMS/VIDEO/<out>/STREAM.Resolution
pr /MEDIA/STREAMS/VIDEO/<out>/STREAM.Resolution=<resolution>

Example

GET /MEDIA/STREAMS/VIDEO/D101/STREAM.Resolution
pr /MEDIA/STREAMS/VIDEO/D101/STREAM.Resolution=3840x2160p60
9.16.9. Query the Modified Resolution of the Stream Destination

The query returns with the current resolution of the outgoing stream on the receiver which contains the possible signal modification by the scaler or FRC.

**Command and Response**
- GET /MEDIA/STREAMS/VIDEO/\{out\}/PORT.Resolution
- pr /MEDIA/STREAMS/VIDEO/\{out\}/PORT.Resolution=\{resolution\}

**Example**
- GET /MEDIA/STREAMS/VIDEO/D102/PORT.Resolution
- pr /MEDIA/STREAMS/VIDEO/D102/PORT.Resolution=3840x2160p30

9.16.10. Query the Bandwidth of the Stream

Bandwidth property provides the required Ethernet bandwidth of the stream.

**Command and Response**
- GET /MEDIA/STREAMS/VIDEO/\{in\}/STREAM.Bandwidth
- pr /MEDIA/STREAMS/VIDEO/\{in\}/STREAM.Bandwidth=\{bandwidth\}

**Example**
- GET /MEDIA/STREAMS/VIDEO/S102/STREAM.Bandwidth
- pr /MEDIA/STREAMS/VIDEO/S102/STREAM.Bandwidth=13.15

The bandwidth is in Gigabit/sec.

9.16.11. Query the Control Module of the Stream Destination

The query returns with the control owner of the stream destination which means that the output port is controlled by the crosspoint or it is the part of a video wall.

**Command and Response**
- GET /MEDIA/XP/VIDEO/\{out\}/.OwnedBy
- pr /MEDIA/XP/VIDEO/\{out\}/.OwnedBy=\{control_module\}

**Parameters**
- The \{control_module\} can be Crosspoint or the video wall ID.

**Example**
- GET /MEDIA/XP/VIDEO/D101/.OwnedBy
- pr /MEDIA/XP/VIDEO/D101/.OwnedBy=Videowall1

9.16.12. Query the Bandwidth Limitation Indicator

BandwidthLimitExceeded property indicates the signal bandwidth limit has been exceeded and the stream is disabled.

**Command and Response**
- GET /MEDIA/STREAMS/VIDEO/\{in\}|\{out\}/STREAM.BandwidthLimitExceeded
- pr /MEDIA/STREAMS/VIDEO/\{in\}|\{out\}/STREAM.BandwidthLimitExceeded=\{logical_value\}

**Parameters**
- \{logical_value\} Bandwidth limit has been exceeded or not.
  - true The bandwidth of the Ethernet connection does NOT allow to send/receive the stream.
  - false The bandwidth of the Ethernet connection allows to send/receive the stream.

**Example**
- GET /MEDIA/STREAMS/VIDEO/S102/STREAM.BandwidthLimitExceeded
- pr /MEDIA/STREAMS/VIDEO/S102/STREAM.BandwidthLimitExceeded=false

9.16.13. Query the Status of the Analog Audio Output

MuteStatus property indicates the current status of the analog audio output port.

**DIFFERENCE:** Only UBEX-PRO20-HDMI-F110 and F120 endpoint models are built with analog audio output port.

**Command and Response**
- GET /MEDIA/STREAMS/AUDIO/\{out\}/Port.MuteStatus
- pr /MEDIA/STREAMS/AUDIO/\{out\}/Port.MuteStatus=\{status\}

**Parameters**
- \{status\} Status of the analog audio output
  - nosignal No signal is transmitted on the port.
  - unmuted The port is unmuted.
  - muted The port is muted.
  - muted (unsupported) The port is muted because the incoming signal is unsupported.
    - Supported signal type: PCM, up to 48 kHz.
  - disrupted The audio signal is disrupted due to Ethernet packet loss.

**Example**
- GET /MEDIA/STREAMS/AUDIO/D103/PORT.MuteStatus
- pr /MEDIA/STREAMS/AUDIO/D103/PORT.MuteStatus=unmuted
9.16.14. Query the Health Status of a Selected Endpoint

The query returns with all health related information about the selected endpoint device.

**Command and Response**

- GETALL /SYS/ENDPOINTS/<UBEX_EP>/STATUS/HEALTH
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/HEALTH.OverallHealthState=<status>
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/HEALTH.TemperatureState=<status>
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/HEALTH.VoltageState=<status>
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/HEALTH.VeryHighTemperatureOperation=<logical_value>
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/HEALTH.UpTime=<second>
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/HEALTH.SystemTemperature=<temperature>
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/HEALTH.Fan1=<fan_status>
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/HEALTH.Fan2=<fan_status>

**Example**

- GETALL /SYS/ENDPOINTS/UBEX0039A1/STATUS/HEALTH
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/HEALTH.OverallHealthState=OK
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/HEALTH.TemperatureState=OK
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/HEALTH.VoltageState=OK
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/HEALTH.VeryHighTemperatureOperation=1
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/HEALTH.UpTime=9948
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/HEALTH.SystemTemperature=79 C, 0;85; 0;89;26;82;
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/HEALTH.Fan1=0;2;818
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/HEALTH.Fan2=0;2;886

9.16.15. Query the Link Status of a Selected Endpoint

The query returns with all SFP+ link related information about the selected endpoint device.

**Command and Response**

- GETALL /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>.LinkState=<status>
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>.TxBandwidth=<bandwidth>
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>.RxBandwidth=<bandwidth>
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>.UpTime=<second>
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>.SignalQuality=<percent>

**Example**

- GETALL /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1.LinkState=Up
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1.TxBandwidth=7.90
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1.RxBandwidth=0.00
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1.UpTime=807
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1.PacketErrorRatio=0.00
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1.SignalQuality=100
9.17. SFP+ Module Information

The section is about the installed SFP+ module / DAC cable of the endpoint devices.

9.17.1. Query the Vendor

Querying of the vendor of the installed SFP+ module.

Command and Response

- GET /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>/SFP.VendorName
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>/SFP.VendorName=<vendor_name>

Example

- GET /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1/SFP.VendorName
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1/SFP.VendorName=FINISAR CORP.

9.17.2. Query the Part Number

Querying of the part number of the installed SFP+ module.

Command and Response

- GET /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>/SFP.PartNumber
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>/SFP.PartNumber=<partnumber>

Example

- GET /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1/SFP.PartNumber
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1/SFP.PartNumber=FTLX1471D3BCL

9.17.3. Query the Compliance

Querying of the standard compliance of the installed SFP+ module.

Command and Response

- GET /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>/SFP.Compliance
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>/SFP.Compliance=<compliance>

Example

- GET /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1/SFP.Compliance
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1/SFP.Compliance=10G BASE-LR

9.17.4. Query the Maximum Allowed Cable Length

Querying of the maximum allowed cable length of the installed SFP+ module. The parameter is in meters.

Command and Response

- GET /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>/SFP.MaxLinkLength
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>/SFP.MaxLinkLength=<length>

Example

- GET /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1/SFP.MaxLinkLength
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1/SFP.MaxLinkLength=10000

9.17.5. Query the Type of the Module

Querying of the type (singlemode, multimode, passive DAC, etc.) of the installed SFP+ module.

Command and Response

- GET /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>/SFP.Type
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>/SFP.Type=<type>

Example

- GET /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1/SFP.Type
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1/SFP.Type=Singlemode

9.17.6. Query the Compatibility of the Module

The query returns with the compatibility of the installed transceiver module. If it is false, the installed module may be SFP module (with 1 GbE signal transmission) instead of SFP+ module (with 10 GbE signal transmission).

Command and Response

- GET /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>/SFP.Compatible
- pr /SYS/ENDPOINTS/<UBEX_EP>/STATUS/UPLINK/<link>/SFP.Compatible=<logical_value>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;logical_value&gt;</td>
<td>Compatibility of the module</td>
<td>true</td>
<td>The installed SFP+ module is compatible with the endpoint device.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>false</td>
<td>The installed module is not compatible. Possible root cause can be that the module is SFP instead of SFP+.</td>
</tr>
</tbody>
</table>

Example

- GET /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1/SFP.Compatible
- pr /SYS/ENDPOINTS/UBEX0039A1/STATUS/UPLINK/LINK1/SFP.Compatible=true
9.18. Network Configuration - MMU

ATTENTION! Calling the `ApplySettings` method after the network setting is always required. See the details of the method in the `Apply Network Settings` section.

9.18.1. Query the DHCP State

Command and Response

- GET /MANAGEMENT/NETWORK.DhcpEnabled
- `pw /MANAGEMENT/NETWORK.DhcpEnabled=<logical_value>`

Parameters

The `<logical_value>` can be true or false.

Example

- GET /MANAGEMENT/NETWORK.DhcpEnabled
- `pw /MANAGEMENT/NETWORK.DhcpEnabled=true`

9.18.2. Change the DHCP State

Command and Response

- SET /MANAGEMENT/NETWORK.DhcpEnabled=<logical_value>
- `pw /MANAGEMENT/NETWORK.DhcpEnabled=<logical_value>`

Parameters

The `<logical_value>` can be set to true or false.

Example

- SET /MANAGEMENT/NETWORK.DhcpEnabled=false
- `pw /MANAGEMENT/NETWORK.DhcpEnabled=false`

9.18.3. Query the IP Address

Command and Response

- GET /MANAGEMENT/NETWORK.IpAddress
- `pr /MANAGEMENT/NETWORK.IpAddress=<IP_Address>`

Example

- GET /MANAGEMENT/NETWORK.IpAddress
- `pr /MANAGEMENT/NETWORK.IpAddress=192.168.0.100`

#network #dhcp #ipaddress

9.18.4. Change the IP Address (Static)

Command and Response

- SET /MANAGEMENT/NETWORK.StaticIpAddress=<IP_address>
- `pw /MANAGEMENT/NETWORK.StaticIpAddress=<IP_address>`

Example

- SET /MANAGEMENT/NETWORK.StaticIpAddress=192.168.0.85
- `pw /MANAGEMENT/NETWORK.StaticIpAddress=192.168.0.85`

9.18.5. Query the Subnet Mask

Command and Response

- GET /MANAGEMENT/NETWORK.NetworkMask
- `pr /MANAGEMENT/NETWORK.NetworkMask=<netmask>`

Example

- GET /MANAGEMENT/NETWORK.NetworkMask
- `pr /MANAGEMENT/NETWORK.NetworkMask=255.255.255.0`

9.18.6. Change the Subnet Mask (Static)

Command and Response

- SET /MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>
- `pw /MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>`

Example

- SET /MANAGEMENT/NETWORK.StaticNetworkMask=255.255.255.0
- `pw /MANAGEMENT/NETWORK.StaticNetworkMask=255.255.255.0`

9.18.7. Query the Gateway Address

Command and Response

- GET /MANAGEMENT/NETWORK.GatewayAddress
- `pr /MANAGEMENT/NETWORK.GatewayAddress=<gw_address>`

Example

- GET /MANAGEMENT/NETWORK.GatewayAddress
- `pr /MANAGEMENT/NETWORK.GatewayAddress=192.168.0.1`
9.18.8. Change the Gateway Address (Static)

Command and Response

- SET/MANAGEMENT NETWORK StaticGatewayAddress=<gw_address>
- pw/MANAGEMENT NETWORK StaticGatewayAddress=<gw_address>

Example

- SET /MANAGEMENT/NETWORK.StaticGatewayAddress=192.168.0.1
- pw /MANAGEMENT/NETWORK.StaticGatewayAddress=192.168.0.1

9.18.9. Apply Network Settings

Command and Response

- CALL/MANAGEMENT NETWORK:ApplySettings()
- m0/MANAGEMENT NETWORK:ApplySettings

Example

- CALL /MANAGEMENT/NETWORK:ApplySettings()
- m0 /MANAGEMENT/NETWORK:ApplySettings

All changed network settings are applied and the control network interface is going to be restarted.

9.19. Ethernet Port Configuration - Endpoint

9.19.1. Enabling the Port

Command and Response

- SET/MEDIA CONTROL ETHERNET/<port>/PORT.Enabled=<logical_value>
- pw/MEDIA CONTROL ETHERNET/<port>/PORT.Enabled=<logical_value>

Parameters

- The <logical_value> can be true or false.

Example

- SET /MEDIA/CONTROL/ETHERNET/P101/PORT.Enabled=true
- pw /MEDIA/CONTROL/ETHERNET/P101/PORT.Enabled=true

9.19.2. Ethernet Mode Setting

Command and Response

- SET/MEDIA/CONTROL/ETHERNET/<port>/PORT.Mode=<mode>
- pw/MEDIA/CONTROL/ETHERNET/<port>/PORT.Mode=<mode>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;mode&gt;</td>
<td>Setting of autonegotiation or manual speed and duplexity</td>
<td>0</td>
<td>Autonegotiation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>10Mbps half-duplex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>10Mbps full-duplex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>100Mbps half-duplex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>100Mbps full-duplex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>1000Mbps full-duplex</td>
</tr>
</tbody>
</table>

Example

- SET /MEDIA/CONTROL/ETHERNET/P102/PORT.Mode=0
- pw /MEDIA/CONTROL/ETHERNET/P102/PORT.Mode=0

9.19.3. Setting the Name of the Port

Command and Response

- SET/MEDIA/CONTROL/ETHERNET/<port>/Name=<name>
- pw/MEDIA/CONTROL/ETHERNET/<port>/Name=<name>

Example

- SET /MEDIA/CONTROL/ETHERNET/P103.Name=My_PC
- pw /MEDIA/CONTROL/ETHERNET/P103.Name=My_PC

9.19.4. Query the Tags of the Port

The query returns with the tags which are added by the user.

Command and Response

- GET/MEDIA/CONTROL/ETHERNET/<port>.Tags
- pr/MEDIA/CONTROL/ETHERNET/<port>.Tags=<tag>

Example

- GET /MEDIA/CONTROL/ETHERNET/P101.Tags
- pr /MEDIA/CONTROL/ETHERNET/P101.Tags=PC;100Mbps
9.19.5. Adding Tags to the Port

The following characters are allowed in the <tag> parameter: non-capital letters (a-z), capital letters (A-Z), numbers (0-9), and special characters (- _ ~ / ? [] @ ! $ & ( ) + = *).

Command and Response

- CALL /MEDIA/CONTROL/ETHERNET/<port>:addTags(<tag>)
- mO /MEDIA/CONTROL/ETHERNET/<port>:addTags

Example

- CALL /MEDIA/CONTROL/ETHERNET/P102.addTags(laptop;1gbps)
- mO /MEDIA/CONTROL/ETHERNET/P102.addTags

9.19.6. Deleting Tags of the Port

Command and Response

- CALL /MEDIA/CONTROL/ETHERNET/<port>:removeTags(<tag>)
- mO /MEDIA/CONTROL/ETHERNET/<port>:removeTags

Example

- CALL /MEDIA/CONTROL/ETHERNET/P103:removeTags(macbook;meeting_room)
- mO /MEDIA/CONTROL/ETHERNET/P103:removeTags

9.19.7. Deleting All Tags of the Port

Command and Response

- CALL /MEDIA/CONTROL/ETHERNET/<port>:removeAllTags()
- mO /MEDIA/CONTROL/ETHERNET/<port>:removeAllTags

Example

- CALL /MEDIA/CONTROL/ETHERNET/P101:removeAllTags()
- mO /MEDIA/CONTROL/ETHERNET/P101:removeAllTags

9.19.8. Query All Tags of the Device

The query returns with all the tags which belongs to the device. One tag is always reserved for the MAC address of the endpoint.

Command and Response

- GET /MEDIA/CONTROL/ETHERNET/<port>:DeviceTags
- pr /MEDIA/CONTROL/ETHERNET/<port>:DeviceTags=<tag>

Example

- GET /MEDIA/CONTROL/ETHERNET/P101.DeviceTags
- pr /MEDIA/CONTROL/ETHERNET/P101.DeviceTags=Laptop:A8:D2:36:F0:00:35;TX_MeetingRoom;#2

9.20. Serial Port Configuration - MMU

INFO: The serial port numbering can be found in the Control Port Numbering of the MMU section.

9.20.1. BAUD Rate Setting

Command and Response

- SET /MANAGEMENT/CONTROL/SERIAL/<port>.Baudrate=<baudrate>
- pw /MANAGEMENT/CONTROL/SERIAL/<port>.Baudrate=<baudrate>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;number&gt;</td>
<td>Baud rate value</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1800</td>
<td>1800</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2400</td>
<td>2400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4800</td>
<td>4800</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9600</td>
<td>9600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19200</td>
<td>19200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>38400</td>
<td>38400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>57600</td>
<td>57600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>115200</td>
<td>115200</td>
</tr>
</tbody>
</table>

Example

- SET /MANAGEMENT/CONTROL/SERIAL/P2.Baudrate=9600
- pw /MANAGEMENT/CONTROL/SERIAL/P2.Baudrate=9600

#rs232 #rs-232 #serial
9.20.2. Databits Setting

Command and Response
- SET•/MANAGEMENT/CONTROL/SERIAL/<port>.DataBits=<databits>
- pw•/MANAGEMENT/CONTROL/SERIAL/<port>.DataBits=<databits>

Parameters
The <databits> of the selected port can be set to the following values: 7, 8.

Example
- SET /MANAGEMENT/CONTROL/SERIAL/P1.DataBits=8
- pw /MANAGEMENT/CONTROL/SERIAL/P1.DataBits=8

9.20.3. Stopbits Setting

Command and Response
- SET•/MANAGEMENT/CONTROL/SERIAL/<port>.StopBits=<stopbits>
- pw•/MANAGEMENT/CONTROL/SERIAL/<port>.StopBits=<stopbits>

Parameters
The <stopbits> of the selected port can be set to the following values: 1, 2.

Example
- SET /MANAGEMENT/CONTROL/SERIAL/P1.StopBits=2
- pw /MANAGEMENT/CONTROL/SERIAL/P1.StopBits=2

9.20.4. Parity Setting

Command and Response
- SET•/MANAGEMENT/CONTROL/SERIAL/<port>.Parity=<parity>
- pw•/MANAGEMENT/CONTROL/SERIAL/<port>.Parity=<parity>

Parameters
The <parity> of the selected port can be set to the following values: None, Odd, Even, Mark, Space.

Example
- SET /MANAGEMENT/CONTROL/SERIAL/P1.Parity=Even
- pw /MANAGEMENT/CONTROL/SERIAL/P1.Parity=Even

9.20.5. Enabling the Port

Command and Response
- SET•/MANAGEMENT/CONTROL/SERIAL/<port>.Enabled=<logical_value>
- pw•/MANAGEMENT/CONTROL/SERIAL/<port>.Enabled=<logical_value>

Parameters
The <logical_value> can be true or false.

Example
- SET /MANAGEMENT/CONTROL/SERIAL/P1.Enabled=true
- pw /MANAGEMENT/CONTROL/SERIAL/P1.Enabled=true

9.21. Serial Port Configuration - Endpoint Devices

DIFFERENCE: Only UBEX-PRO20-HDMI-F110 and F120 endpoint models are built with RS-232 port.

9.21.1. BAUD Rate Setting

Command and Response
- SET•/MEDIA/CONTROL/UART/<port>/PORT.Baudrate=<number>
- pw•/MEDIA/CONTROL/UART/<port>/PORT.Baudrate=<number>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;number&gt;</td>
<td>Baud rate value</td>
<td>0</td>
<td>4800</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>7200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>9600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>14400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>19200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>38400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>57600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>115200</td>
</tr>
</tbody>
</table>

Example
- SET /MEDIA/CONTROL/UART/P101/PORT.Baudrate=7
- pw /MEDIA/CONTROL/UART/P101/PORT.Baudrate=7

#rs232 #rs-232 #serial
9.21.2. Stopbits Setting

Command and Response

- SET/MEDIA/CONTROL/UART/<port>/PORT.StopBits=<number>
- pw/MEDIA/CONTROL/UART/<port>/PORT.StopBits=<number>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;number&gt;</td>
<td>Stop bits value</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>1,5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Example

- SET /MEDIA/CONTROL/UART/P101/PORT.StopBits=0
- pw /MEDIA/CONTROL/UART/P101/PORT.StopBits=0

9.21.3. Parity Setting

Command and Response

- SET/MEDIA/CONTROL/UART/<port>/PORT.Parity=<number>
- pw/MEDIA/CONTROL/UART/<port>/PORT.Parity=<number>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;number&gt;</td>
<td>Parity value</td>
<td>0</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Odd</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Even</td>
</tr>
</tbody>
</table>

Example

- SET /MEDIA/CONTROL/UART/P101/PORT.Parity=0
- pw /MEDIA/CONTROL/UART/P101/PORT.Parity=0

9.21.4. Command Injection TCP Port Setting

Command and Response

- SET/MEDIA/CONTROL/UART/<port>.ServerPort=<port>
- pw/MEDIA/CONTROL/UART/<port>.ServerPort=<port>

Example

- SET /MEDIA/CONTROL/UART/P101.ServerPort=8004
- pw /MEDIA/CONTROL/UART/P101.ServerPort=8004

9.21.5. Remap the Command Injection TCP ports

The default TCP port number is 8001 for all RS-232 ports. Calling the method results remapping the TCP port numbers. It requires a start number, the step is 1.

Command and Response

- CALL/MEDIA/CONTROL/UART:remapPorts(<start_number>)
- m0/MEDIA/CONTROL/UART:remapPorts()

Parameters

The <start_number> is the first non-reserved TCP port number which will be set for the first RS-232 port. This number increases with the number of the RS-232 ports in the UBEX matrix, the step is 1.

Example

- CALL /MEDIA/CONTROL/UART:remapPorts(9000)
- m0 /MEDIA/CONTROL/UART:remapPorts()

Explanation

In the case of three connected F110 endpoint models the TCP port of the first one will be 9000, the second one is 9001, the third one is 9002.

9.21.6. Query the Current Configuration

Command and Response

- GET/MEDIA/CONTROL/UART/<port>.Rs232Configuration
- pw/MEDIA/CONTROL/UART/<port>.Rs232Configuration=<configuration>

Example

- GET /MEDIA/CONTROL/UART/P101.Rs232Configuration
- pw /MEDIA/CONTROL/UART/P101.Rs232Configuration=57600, 8N1

Explanation

BAUD rate is 57600, databits are 8, the parity is N as none, the stopbits are 1.
9.21.7. Enabling the Port

Command and Response
- SET/MEDIA/CONTROL/UART/<port>.Enable=<logical_value>
- pw/MEDIA/CONTROL/UART/<port>.Enable=<logical_value>

Parameters
The <logical_value> can be true or false.

Example
- SET /MEDIA/CONTROL/UART/P101.Enable=true
- pw /MEDIA/CONTROL/UART/P101.Enable=true

9.21.8. Setting the Name of the Port

Command and Response
- SET/MEDIA/CONTROL/UART/<port>.Name=<name>
- pw/MEDIA/CONTROL/UART/<port>.Name=<name>

Example
- SET /MEDIA/CONTROL/UART/P101.Name=Ceiling_Projector
- pw /MEDIA/CONTROL/UART/P101.Name=Ceiling_Projector

9.21.9. Query the Tags of the Port

The query returns with the tags which are added by the user.

Command and Response
- GET/MEDIA/CONTROL/UART/<port>.Tags
- pr/MEDIA/CONTROL/UART/<port>.Tags=<tag>

Example
- GET /MEDIA/CONTROL/UART/P101.Tags
- pr /MEDIA/CONTROL/UART/P101.Tags=4KTV;Phoenix;DSUB

9.21.10. Adding Tags to the Port

The following characters are allowed in the <tag> parameter: non-capital letters (a-z), capital letters (A-Z), numbers (0-9), and special characters ( -_.~?:/\@!#$%^&*).

Command and Response
- CALL/MEDIA/CONTROL/UART/<port>:addTags(<tag>)
- m0/MEDIA/CONTROL/UART/<port>:addTags=

Example
- CALL /MEDIA/CONTROL/UART/P101:addTags(projector;dsub)
- m0 /MEDIA/CONTROL/UART/P101:addTags=

9.21.11. Deleting Tags of the Port

Command and Response
- CALL/MEDIA/CONTROL/UART/<port>:removeTags(<tag>)
- m0/MEDIA/CONTROL/UART/<port>:removeTags=

Example
- CALL /MEDIA/CONTROL/UART/P101:removeTags(controlroom;media_player)
- m0 /MEDIA/CONTROL/UART/P101:removeTags=

9.21.12. Deleting All Tags of the Port

Command and Response
- CALL/MEDIA/CONTROL/UART/<port>:removeAllTags()
- m0/MEDIA/CONTROL/UART/<port>:removeAllTags=

Example
- CALL /MEDIA/CONTROL/UART/P101:removeAllTags()
- m0 /MEDIA/CONTROL/UART/P101:removeAllTags=

9.21.13. Query All Tags of the Device

The query returns with all the tags which belongs to the device. One tag is always reserved for the MAC address of the endpoint.

Command and Response
- GET/MEDIA/CONTROL/UART/<port>:DeviceTags
- pr/MEDIA/CONTROL/UART/<port>:DeviceTags=<tag>

Example
- GET /MEDIA/CONTROL/UART/P101.DeviceTags
- pr /MEDIA/CONTROL/UART/P101.DeviceTags=Projector:A8:D2:FD:00:35;RX_MeetingRoom;#2
9.22. Infrared Port Configuration - Endpoint Devices

DIFFERENCE: Only the UBEX-PR020-HDMI-F110 and F120 endpoint models are built with IR input/output ports.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>#in</th>
<th>#ir</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#in</td>
<td>IR input port, example: S101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#out</td>
<td>IR output port, example: D101</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9.22.1. Enable/Disable the Port

Command and Response

- SET /MEDIA/CONTROL/IR/<in|out>.Enabled=<logical_value>
- pw /MEDIA/CONTROL/IR/<in|out>.Enabled=<logical_value>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#logical_value</td>
<td>Port enable/disable setting</td>
<td>true</td>
<td>The port is enabled.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>false</td>
<td>The port is disabled.</td>
</tr>
</tbody>
</table>

Example

- SET /MEDIA/CONTROL/IR/S101.Enable=true
- pw /MEDIA/CONTROL/IR/S101.Enable=true

9.22.2. Setting the Name of the Input Port

Command and Response

- SET /MEDIA/CONTROL/IR/<in>.SourceName=<name>
- pw /MEDIA/CONTROL/IR/<in>.SourceName=<name>

Example

- SET /MEDIA/CONTROL/IR/S101.SourceName=Emitter_TV
- pw /MEDIA/CONTROL/IR/S101.SourceName=Emitter_TV

9.22.3. Setting the Name of the Output Port

Command and Response

- SET /MEDIA/CONTROL/IR/<out>.DestinationName=<name>
- pw /MEDIA/CONTROL/IR/<out>.DestinationName=<name>

Example

- SET /MEDIA/CONTROL/IR/D101.DestinationName=Detector_MeetingRoom1
- pw /MEDIA/CONTROL/IR/D101.DestinationName=Detector_MeetingRoom1

9.22.4. Change Command Injection Port Number

Command and Response

- SET /MEDIA/CONTROL/IR/<in|out>.ServerPort=<port_no>
- pw /MEDIA/CONTROL/IR/<in|out>.ServerPort=<port_no>

Example

- SET /MEDIA/CONTROL/IR/D101.CommandInjectionPort=9001
- pw /MEDIA/CONTROL/IR/D101.CommandInjectionPort=9001

9.22.5. Enable/Disable Output Signal Modulation

Command and Response

- SET /MEDIA/CONTROL/IR/<out>/PORT.EnableModulation=<logical_value>
- pw /MEDIA/CONTROL/IR/<out>/PORT.EnableModulation=<logical_value>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#logical_value</td>
<td>Signal modulation enable/disable setting</td>
<td>true</td>
<td>The signal modulation is enabled.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>false</td>
<td>The signal modulation is disabled.</td>
</tr>
</tbody>
</table>

Example

- SET /MEDIA/CONTROL/IR/D101.PORT.EnableModulation=true
- pw /MEDIA/CONTROL/IR/D101(PORT.EnableModulation=true

INFO: The default setting value is true (enabled).
9.22.6. Query the Tags of the Port

The query returns with the tags which are added by the user.

Command and Response 
```tag
GET /MEDIA/CONTROL/IR/<in|out>/Tags
```

Example
```tag
GET /MEDIA/CONTROL/IR/S101.Tags
```

9.22.7. Adding Tags to the Port

The following characters are allowed in the `<tag>` parameter: non-capital letters (a-z), capital letters (A-Z), numbers (0-9), and special characters (- _ ~ : / ? # @ \[ \] @ ! $ & ( ) + = *).

Command and Response 
```tag
CALL /MEDIA/CONTROL/IR/<in|out>/addTags(<tag>)
```

Example
```tag
CALL /MEDIA/CONTROL/IR/S101.addTags(projector;detector)
```

9.22.8. Deleting Tags of the Port

Command and Response 
```tag
CALL /MEDIA/CONTROL/IR/<in|out>/removeTags(<tag>)
```

Example
```tag
CALL /MEDIA/CONTROL/IR/S101.removeTags(controlroom;media_player)
```

9.22.9. Deleting All Tags of the Port

Command and Response 
```tag
CALL /MEDIA/CONTROL/IR/<in|out>/removeAllTags()
```

Example
```tag
CALL /MEDIA/CONTROL/IR/S101.removeAllTags()
```

9.22.10. Query All Tags of the Device

The query returns with all the tags which belongs to the device. One tag is always reserved for the MAC address of the endpoint.

Command and Response 
```tag
GET /MEDIA/CONTROL/IR/<in|out>/DeviceTags
```

Example
```tag
GET /MEDIA/CONTROL/IR/S101.DeviceTags
```

9.23. Message Sending via Communication Ports

ATTENTION! The message sending via serial port can be applied in the endpoint devices only. It does not work with the MMU.

DIFFERENCE: Only the UBEX-PRO20-HDMI-F110 and F120 endpoint models are built with RS-232 and Infrared interface ports.

9.23.1. Sending a Text (ASCII-format) via Serial Port

The command is for sending a command message in ASCII-format. This method does not allow sending message with control and non-printable characters.

Command and Response 
```tag
CALL /MEDIA/CONTROL/UART/<port>/PORT:sendText(<message>)
```

Example
```tag
CALL /MEDIA/CONTROL/UART/P101/PORT:sendText(open)
```

The 'open' text is sent out via the P1 serial port.

#message
9.23.2. Sending a Binary Message (HEX-format) via Serial Port

The command is for sending a command message in Hexadecimal-format. This method does not require escaping the control and non-printable characters.

**Command and Response**

- CALL/MEDIA/CONTROL/UART/<port>/PORT:sendBinaryMessage(<message>)
- mO/MEDIA/CONTROL/UART/<port>/PORT:sendBinaryMessage

**Example**

- CALL/MEDIA/CONTROL/UART/P101/PORT:sendBinaryMessage(433030)
- mO/MEDIA/CONTROL/UART/P101/PORT:sendBinaryMessage

The ’433030’ binary message (’C00’ in ASCII format) is sent out via the P1 serial port.

9.23.3. Sending a Message (ASCII-format) via Serial Port

The command is for sending a command message in ASCII-format. This method allows escaping the control characters, see the Escaping section.

**Command and Response**

- CALL/MEDIA/CONTROL/UART/<port>/PORT:sendMessage(<message>)
- mO/MEDIA/CONTROL/UART/<port>/PORT:sendMessage

**Example**

- CALL/MEDIA/CONTROL/UART/P101/PORT:sendMessage(PWR0)
- mO/MEDIA/CONTROL/UART/P101/PORT:sendMessage

The ’PWR0’ message is sent out via the P1 serial port.

**Escaping in the Message**

When commands need to be separated by <CR><LF> characters to be recognized by the controlled device, then they need to be escaped. You can use the following format for escaping:

```<command1><\x0d><\x0a><command2><\x0d><\x0a>...<commandn><\x0d><\x0a>```
  

9. Programmer's Reference


9.24. USB K+M Settings

9.23.5. Sending Hex Codes in Big-endian Format via IR Port


DIFFERENCE:
Only UBEX-PRO20-HDMI-F120 model is built with USB K+M ports. #km #usbkm

Command and Response
ç CALL·/MEDIA/CONTROL/IR/<out>/PORT:sendProntoHexBigEndian(<hex_code>)
æ mO·/MEDIA/CONTROL/IR/<out>/PORT:sendProntoHexBigEndian

Parameters
Parameter

APPLICATION

MODE

Parameters

MATRIX

192

Parameter

Parameter description

Parameter values

<hex_code>

Accepts a maximum of 765-character-long code
Pronto hex format code in hexadecimal format (0-9; A-F; a-f) without space
character in big-endian system.

INFO: This command can send exactly one pronto hex message. The header of the IR code contains the
length of the whole code in hexa format. If the code is deficient or duplicated, it causes syntax error.
Example

Parameter description

<e>

Emulated (source; USB-A) port of the endpoint, example: E101

<r>

Receiver (destination; USB-B) port of the endpoint, example: R201

9.24.1. Query the Number of Emulated USB Ports
The query returns with the number of emulated USB-A ports in the UBEX matrix.
INFO: The F120 model is built with two pieces USB-A ports per endpoint device but the respond of this
query means the number of F120 devices which has USB-A ports. The two USB-A ports count as one.
Command and Response

ç CALL /MEDIA/CONTROL/IR/D101/PORT:sendProntoHexBigEndian(0000006d0025000300a900a80015
003f0015003f0015003f00150015001500150015001500150015001500150015003f0015003f00150
03f00150015001500150015001500150015001500150015003f0015003f0015 003f00150015001500
150015001500150015001500150015001 500150015001500150015003f0015003f0015003f001500
3f0015 003f0015070200a900a80015001500150e6e)
æ mO //MEDIA/CONTROL/IR/D101/PORT:sendProntoHexBigEndian
Learning Raw IR Code with a Terminal Program

ç GET·/MEDIA/XP/KM.SourcePortCount
æ pr·/MEDIA/XP/KM.SourcePortCount=<number>
Example
ç GET /MEDIA/XP/KM.SourcePortCount
æ pr /MEDIA/XP/KM.SourcePortCount=10

9.24.2. Query the Number of Destination USB Ports

Step 1. Connect to the endpoint device with a terminal program.
Step 2. Push the desired button of the remote control to scan the raw IR code.
Step 3. Remove all the non-hexadecimal characters (e.g. spaces, h characters etc.) from the code.

The query returns with the number of receiver (destination) USB-B ports in the UBEX matrix.
Command and Response
ç GET·/MEDIA/XP/KM.DestinationPortCount
æ pr·/MEDIA/XP/KM.DestinationPortCount=<number>

The pronto hex code that is learned by a Lightware device is big-endian format.

Example
ç GET /MEDIA/XP/KM.DestinationPortCount
æ pr /MEDIA/XP/KM.DestinationPortCount=10

Applied endpoint firmware package: v2.4.1

|

Applied MMU firmware package: v1.7.1

|

LDC software: v2.6.2b3


9.24.3. Switching the Emulated Port to One Destination

**Command and Response**

- CALL /MEDIA/XP/KM:switch(<e>:<r>)
- mO /MEDIA/XP/KM:switch

**Example**

- CALL /MEDIA/XP/KM:switch(E101:R501)
- mO /MEDIA/XP/KM:switch

9.24.4. Switching an Emulated Port to All Destination

The keyboard & mouse connected to the selected endpoint device is switched to all controlled devices.

**Command and Response**

- CALL /MEDIA/XP/KM:switchAll(<e>)
- mO /MEDIA/XP/KM:switchAll

**Example**

- CALL /MEDIA/XP/KM:switchAll(E301)
- mO /MEDIA/XP/KM:switchAll

9.24.5. Switching the Local Emulated Port to the Local Destination

It is possible to connect the local controlled device with the local keyboard & mouse plugged in the same endpoint. For this purpose you can use the same switch() command filling it with the same source and destination port number.

**Command and Response**

- CALL /MEDIA/XP/KM:switch(<eN>:<rN>)
- mO /MEDIA/XP/KM:switch

**Example**

- CALL /MEDIA/XP/KM:switch(E101:R101)
- mO /MEDIA/XP/KM:switch

9.24.6. Query the Name of the Emulated USB Port

INFO: The default name of the emulated (source) port is the MAC address of the endpoint device and the port number separated by a dot. Example: A8:D2:36:F0:00:03.E1

**Command and Response**

- GET /MEDIA/STREAMS/KM/<e>.EmulatedName
- pw /MEDIA/STREAMS/KM/<e>.EmulatedName=<name>

**Example**

- GET /MEDIA/STREAMS/KM/E101.EmulatedName
- pw /MEDIA/STREAMS/KM/E101.EmulatedName=Hall

9.24.7. Setting the Name of the Emulated USB Port

**Command and Response**

- SET /MEDIA/STREAMS/KM/<e>.EmulatedName=<name>

**Example**

- SET /MEDIA/STREAMS/KM/E101.EmulatedName=Reception

9.24.8. Query the Name of the Destination USB Port

INFO: The default name of the receiver (destination) port is the MAC address of the endpoint device and the port number separated by a dot. Example: A8:D2:36:F0:00:03.R1

**Command and Response**

- GET /MEDIA/STREAMS/KM/<r>.ReceiverName
- pw /MEDIA/STREAMS/KM/<r>.ReceiverName=<name>

**Example**

- GET /MEDIA/STREAMS/KM/R101.ReceiverName
- pw /MEDIA/STREAMS/KM/R101.ReceiverName=ControlRoom

9.24.9. Setting the Name of the Destination USB Port

**Command and Response**

- SET /MEDIA/STREAMS/KM/<r>.ReceiverName=<name>

**Example**

- SET /MEDIA/STREAMS/KM/R101.ReceiverName=ServerRoom
9.24.10. Query the Tags of the USB Ports

The query returns with the tags which are added by the user.

Command and Response #tag

- GET/MEDIA/STREAMS/KM/<el>.Tags
- pr/MEDIA/STREAMS/KM/<el>.Tags=<tag>

Example

- GET /MEDIA/STREAMS/KM/E101.Tags
- pr /MEDIA/STREAMS/KM/E101.Tags=My_keyboard

9.24.11. Adding Tags to the USB Ports

The following characters are allowed in the <tag> parameter: non-capital letters (a-z), capital letters (A-Z), numbers (0-9), and special characters (- _ ~ : / ? # \ [ ] @ ! $ & ( ) + = * ).

Command and Response

- CALL/MEDIA/STREAMS/KM/<el>:addTags(<tag>)
- mO/MEDIA/STREAMS/KM/<el>:addTags

Example

- CALL /MEDIA/STREAMS/KM/R101:addTags(4K_PC)
- mO /MEDIA/STREAMS/KM/R101:addTags

9.24.12. Deleting Tags of the USB Ports

Command and Response

- CALL/MEDIA/STREAMS/KM/<el>:removeTags(<tag>)
- mO/MEDIA/STREAMS/KM/<el>:removeTags

Example

- CALL /MEDIA/STREAMS/KM/E101:removeTags(wireless_mouse)
- mO /MEDIA/STREAMS/KM/E101:removeTags

9.24.13. Deleting All Tags of the USB Ports

Command and Response

- CALL/MEDIA/STREAMS/KM/<el>:removeAllTags()
- mO/MEDIA/STREAMS/KM/<el>:removeAllTags

Example

- CALL /MEDIA/STREAMS/KM/R101:removeAllTags()
- mO /MEDIA/STREAMS/KM/R101:removeAllTags


The query returns with all the tags which belongs to the device. One tag is always reserved for the MAC address of the endpoint.

Command and Response

- GET/MEDIA/STREAMS/KM/<el>.DeviceTags
- pr/MEDIA/STREAMS/KM/<el>.DeviceTags=<tag>

Example

- GET /MEDIA/STREAMS/KM/E101.DeviceTags
- pr /MEDIA/STREAMS/KM/E101.DeviceTags=A8:D2:36:F0:00:36;RX_MeetingRoom;#4

9.25. License Handling

DIFFERENCE: License handling is available for MMU part number 91810015 and from firmware version v1.7.0 only.

INFO: Adding of a new endpoint license can be done in the Lightware Device Controller software only. See more details in the License Tab section.

9.25.1. Querying the Name of the License

Command and Response

- GET /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.Name
- pr /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.Name=<name>

Example

- GET /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.Name
- pr /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.Name=UBEX-MMU Endpoint support (100)

9.25.2. Querying the Description of the License

Command and Response

- GET /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.Description
- pr /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.Description=<description>

Example

- GET /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.Description
- pr /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.Description=Allows claiming up to 100 UBEX endpoints

#license
9.25.3. Querying the Endpoint Limitation

Command and Response

- GET /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.EndpointLimit
- pr /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.EndpointLimit=<number>

Example

- GET /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.EndpointLimit
- pr /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.EndpointLimit=100

9.25.4. Querying the Status of the License

Command and Response

- GET /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.Status
- pr /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.Status=<status>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;status&gt;</td>
<td>The recent status of the endpoint license</td>
<td>OK</td>
<td>The endpoint license is accepted and it is active now.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Invalid</td>
<td>Invalid license.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BadSerial</td>
<td>The serial number of the MMU and the endpoint license does not match. Please try to claim an endpoint license which belongs to the recent MMU.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unsupported</td>
<td>The file is unsupported.</td>
</tr>
</tbody>
</table>

Example

- GET /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.Status
- pr /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.Status=OK

9.25.5. Removing the License

Command and Response

- CALL /MANAGEMENT/LICENSE/ENDPOINT_LIMIT:remove()
- m0 /MANAGEMENT/LICENSE/ENDPOINT_LIMIT:remove

Example

- CALL /MANAGEMENT/LICENSE/ENDPOINT_LIMIT:remove()
- m0 /MANAGEMENT/LICENSE/ENDPOINT_LIMIT:remove


ATTENTION! The centralized firmware update feature is working from the installed MMU firmware v1.1.0 and endpoint firmware v1.3.1 and available for the later firmware package versions. The endpoint firmware packages till v1.3.1 can be installed with LDU2 software - see the details in the Endpoint Update - Manual Method section.

DIFFERENCE: Lightware highly recommends using the same and cohesive firmware versions on the UBEX extenders and the MMU. Connection between extenders installed with different versions might cause unexpected performance failures. See the list of cohesive endpoint and MMU firmware versions in the Endpoint Firmware Packages in the MMU section.

See the details about this feature and the steps of the update with the Lightware Device Controller (LDC) software in the Endpoint Update - Centralized Firmware Update section.

Based on the centralized firmware update method the firmware package of the Matrix Management Unit (MMU) contains the firmware packages of the endpoint devices either. Thus, the firmware packages are released in pairs which are developed and tested together. See the table which version of endpoint firmware belongs the firmware package of the MMU in the Endpoint Firmware Packages in the MMU section.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;UBEX_EP&gt;</td>
<td>UBEX endpoint ID</td>
<td>UBEX&lt;last_6_characters_of_the_MAC_address&gt;</td>
</tr>
</tbody>
</table>

9.26.1. Query the Status of Firmware Update

Command and Response

- GET /SYS/ENDPOINTS/<UBEX_EP>.FirmwareUpdateStatus
- pr /SYS/ENDPOINTS/<UBEX_EP>.FirmwareUpdateStatus=<status>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;status&gt;</td>
<td>The firmware update status of the connected endpoint devices</td>
<td>N/A</td>
<td>The status is unknown. Please check the claiming status of the endpoint, see the details in the Query the Claiming Status of an Endpoint section.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UpToDate</td>
<td>The firmware of the device is up to date.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OutOfDate</td>
<td>The firmware of the device is out of date.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UpdateInProgress</td>
<td>The firmware update is in progress.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UpdateCancelled</td>
<td>The firmware update procedure is cancelled.</td>
</tr>
</tbody>
</table>
9.26.5. Restarting the Firmware Update Procedure
Calling the method results the restarting the firmware update procedure on the selected endpoint devices.

Command and Response
- CALL /SYS/ENDPOINTS:/startFirmwareUpdate()<UBEX_EP>
- mO /SYS/ENDPOINTS:/startFirmwareUpdate

Example
- CALL /SYS/ENDPOINTS:/startFirmwareUpdate(UBEX0039A1,UBEX0039A6)
- mO /SYS/ENDPOINTS:/startFirmwareUpdate

9.26.6. Query the Firmware Update Progress
The query returns with the last message of the firmware update procedure which can give additional information about the update process.

Command and Response
- GET /SYS/ENDPOINTS:/FirmwareUpdateProgress
- pr /SYS/ENDPOINTS:/FirmwareUpdateProgress=<status>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;status&gt;</td>
<td>Periodic progress update about the update process</td>
<td>E</td>
<td>Erasing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P</td>
<td>Programming</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V</td>
<td>Verifying</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
<td>Done</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T</td>
<td>Total</td>
</tr>
</tbody>
</table>

Example
- GET /SYS/ENDPOINTS:/FirmwareUpdateProgress(UBEX0039A1,UBEX0039A6)
- pr /SYS/ENDPOINTS:/FirmwareUpdateProgress=V

9.26.7. Query the Last Message of the Firmware Update
The query returns with the last message of the firmware update procedure which can give additional information about the update process.

Command and Response
- GET /SYS/ENDPOINTS:/FirmwareUpdateLastMessage
- pr /SYS/ENDPOINTS:/FirmwareUpdateLastMessage=<message>

Example
- GET /SYS/ENDPOINTS:/FirmwareUpdateLastMessage(UBEX0039A1,UBEX0039A6)
- pr /SYS/ENDPOINTS:/FirmwareUpdateLastMessage=

Example

---

Applied endpoint firmware package: v2.4.1  |  Applied MMU firmware package: v1.7.1  |  LDC software: v2.6.2b3

Trigger full claiming of endpoint in case of unsupported firmware version.

Command and Response

- SET/SYS/ENDPOINTS/<UBEX_EP>.AllowUnsupportedFirmware=<logical_value>
- pw/SYS/ENDPOINTS/<UBEX_EP>.AllowUnsupportedFirmware=<logical_value>

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Value</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;logical_value&gt;</td>
<td>Trigger full claiming of endpoint in case of unsupported firmware version.</td>
<td>true</td>
<td>Allowing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>false</td>
<td>Not allowing</td>
</tr>
</tbody>
</table>

Example

- GET /SYS/ENDPOINTS/UBEX0039A1.AllowUnsupportedFirmware=true
- pr /SYS/ENDPOINTS/UBEX0039A1.AllowUnsupportedFirmware=true
### 9.27. LW3 Protocol Commands - Quick Summary

#### System Commands - MMU

<table>
<thead>
<tr>
<th>Command</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set the Device Label</td>
<td><code>SET/+/MANAGEMENT/LABEL.DeviceLabel=&lt;custom_name&gt;</code></td>
</tr>
<tr>
<td>Query the Product Name</td>
<td><code>GET/+/ProductName</code></td>
</tr>
<tr>
<td>Query the Firmware Package Version</td>
<td><code>GET/+/MANAGEMENT/JUID/PACKAGE.Version</code></td>
</tr>
<tr>
<td>Query the Date and Time of the System</td>
<td><code>GET/+/MANAGEMENT/DATETIME.CurrentTime</code></td>
</tr>
<tr>
<td>Setting of the Date and Time Manually</td>
<td><code>CALL/+/MANAGEMENT/DATETIME:currentTime=&lt;date_time&gt;</code></td>
</tr>
<tr>
<td>Setting the NTP Server</td>
<td><code>SET/+/MANAGEMENT/DATETIME.NtpServerAddress=&lt;server_address&gt;</code></td>
</tr>
<tr>
<td>Enable/Disable NTP</td>
<td><code>SET/+/MANAGEMENT/DATETIME.EnableNtp=&lt;logical_value&gt;</code></td>
</tr>
<tr>
<td>Setting the Brightness of the LCD Screen</td>
<td><code>SET/+/SYS/CECU/LCD.Brightness=&lt;parameter&gt;</code></td>
</tr>
<tr>
<td>Software Resetting the Device</td>
<td><code>CALL/+/SYS:softReset()</code></td>
</tr>
<tr>
<td>Rebooting the Device</td>
<td><code>CALL/+/SYS:reset()</code></td>
</tr>
<tr>
<td>Restore the Factory Default Settings</td>
<td><code>CALL/+/SYS:factoryDefaults()</code></td>
</tr>
</tbody>
</table>

#### System Commands - Endpoints

<table>
<thead>
<tr>
<th>Command</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set the Device Label</td>
<td><code>SET/+/SYS/ENDPOINTS/&lt;UBEX_EP&gt;./DeviceLabel=&lt;custom_name&gt;</code></td>
</tr>
<tr>
<td>Query the Product Name</td>
<td><code>GET/+/SYS/ENDPOINTS/&lt;UBEX_EP&gt;./ProductName</code></td>
</tr>
<tr>
<td>Query the Operation Mode</td>
<td><code>GET/+/SYS/ENDPOINTS/&lt;UBEX_EP&gt;./OperationMode</code></td>
</tr>
</tbody>
</table>

#### Endpoint Management Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query the Number of Registered Endpoints</td>
<td><code>GET/+/SYS/ENDPOINTS.RegisteredEndpoints</code></td>
</tr>
<tr>
<td>Query the Number of Connected Endpoints</td>
<td><code>GET/+/SYS/ENDPOINTS.ConnectedEndpoints</code></td>
</tr>
<tr>
<td>Query the Number of Registered Transmitters</td>
<td><code>GET/+/SYS/ENDPOINTS.RegisteredTxEndpoints</code></td>
</tr>
</tbody>
</table>
Query the Number of Connected Transmitters
- GET/SYS/ENDPOINTS.ConnectedTxEndpoints

Query the Number of Registered Receivers
- GET/SYS/ENDPOINTS.RegisteredRxEndpoints

Query the Number of Connected Receivers
- GET/SYS/ENDPOINTS.ConnectedRxEndpoints

Query the Number of Registered Transceivers
- GET/SYS/ENDPOINTS.RegisteredTrxEndpoints

Query the Connection Status of an Endpoint
- GET/SYS/ENDPOINTS/<UBEX_EP>.ConnectionStatus

Query the Claiming Status of an Endpoint
- GET/SYS/ENDPOINTS/<UBEX_EP>.ClaimingStatus

Unclaiming an Endpoint
- CALL/SYS/ENDPOINTS:unclaimEndpoint(<UBEX_EP>)

Unclaiming All Endpoints
- CALL/SYS/ENDPOINTS:unclaimAllEndpoint()

Query the Number of the Mapped Endpoints
- GET/MEDIA/DEVICEMAP.MappedEndpointCount

Query the Endpoint ID of a Logical Device ID
- GET/MEDIA/DEVICEMAP.<logical_device_ID>

Assigning an Endpoint to a Logical Device ID
- CALL/MEDIA/DEVICEMAP:assign(logical_device_ID:<UBEX_EP>)

Video Crosspoint Settings

Switching the Video Stream to One Destination
- CALL/MEDIA/XP/VIDEO:switch(<in>:<out>)

Switching a Video Stream to All Destinations
- CALL/MEDIA/XP/VIDEO:switchAll(<in>)

Query the Status of All Video Ports
- GET/MEDIA/XP/VIDEO/**
**Video Stream Settings - Destination (Output) Side**

**Color Range Setting**
- SET+/MEDIA/STREAMS/VIDEO/<in>/STREAM.ColorRangeSetting=<color_range>

**Query the Timing Mode**
- GET+/MEDIA/STREAMS/VIDEO/<in>/STREAM.TimingMode

**HDCP Setting**
- SET+/MEDIA/STREAMS/VIDEO/<in>/PORT.HdcpEnable=<logical_value>

---

**Video Wall Configuration**

**The Tree Structure of the Video Wall**

**Creating Video Wall**
- CALL+/MEDIA/VIDEOWALLS:createGridVideoWall(<video_wall_parameters>)

**Delete a Video Wall**
- CALL+/MEDIA/VIDEOWALLS:deleteGridVideoWall(<video_wall_ID>)
## Setting the Name of the Video Wall

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>.Name=<name>`

## Querying the Size of the Video Wall

- `GET/MEDIA/VIDEOWALLS/<video_wall_ID>.Size`

## Modifying the Size of the Video Wall

- `CALL/MEDIA/VIDEOWALLS/<video_wall_ID>:modifyVideoWallSize(<column_number>;<row_number>)`

## Assign Outputs to the Video Wall

- `CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/ASSIGNS:assignOutput(<display_ID>:<out>)`

## Unassign Outputs

- `CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/ASSIGNS:unassignOutput(<display_ID>)`

## Unassign All Outputs

- `CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/ASSIGNS:unassignAllOutput()`

## Setting the Background Color of the Video Wall

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>/SETTINGS.BackgroundColor=<RGB_code>`

## Timing Mode Setting

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>/SETTINGS.TimingMode=<timing_mode>`

## Color Space Converter Setting

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>/SETTINGS.ColorSpaceSetting=<color_space>`

## Resolution Mode Setting

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>/SETTINGS.ResolutionMode=<resolution_mode>`

## Resolution Setting

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>/SETTINGS.ResolutionSetting=<resolution>`

## No Sync Screen Setting

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>/SETTINGS.ForceNoSyncScreen=<logical_value>`

## Querying the Display Parameters

- `GET/MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS.All`

## Change the Width of the Display

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.Width=<horizontal_size>`

## Change the Height of the Display

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.Height=<vertical_size>`

## Change the Top Bezel Size of the Display

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.TopBezelSize=<top_bezel_size>`

## Change the Bottom Bezel Size of the Display

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.BottomBezelSize=<bottom_bezel_size>`

## Change the Left Bezel Size of the Display

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.LeftBezelSize=<left_bezel_size>`

## Change the Right Bezel Size of the Display

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.RightBezelSize=<right_bezel_size>`

## Change the Horizontal Gap Size

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.HorizontalGapSize=<horizontal_gap_size>`

## Change the Vertical Gap Size

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>/DISPLAYS/ALL.VerticalGapSize=<vertical_gap_size>`

## Querying the State of the Video Wall

- `GET/MEDIA/VIDEOWALLS/<video_wall_ID>.State`

## Setting the State of the Video Wall

- `CALL/MEDIA/VIDEOWALLS/<video_wall_ID>:setState(<state>)`

## Identify the Video Wall

- `CALL/MEDIA/VIDEOWALLS/<video_wall_ID>:identifyVideoWall()`

## Creating a New Layout

- `CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS:createLayout(<layout_ID>;<name>)`

## Deleting a Layout

- `CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS:deleteLayout(<layout_ID>)`

## Deleting All Layouts

- `CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS:deleteAllLayout()`

## Querying the Active Layout

- `GET/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS.activeLayout`

## Activate Layout

- `CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS.activateLayout(<layout_ID>)`

## Setting the Name of the Layout

- `SET/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>.Name=<name>`
Identify the Layout
- CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>:identifyLayout()

Creating Zone
- CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>:createZone(<zone_ID>;<display_ID>)

Deleting a Zone
- CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>:deleteZone(<zone_ID>)

Deleting All Zones
- CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>:deleteAllZone()

Setting the Name of the Zone
- SET/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>.Name=<name>

Querying the Size of the Zone
- GET/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>.ZoneSize

Identify the Zone
- CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>:identifyZone()

Setting the Background Color of the Zone
- SET/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>.BackgroundColor=<RGB_code>

Assign Display to the Zone
- CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>:assignDisplay(<display_ID>)

Unassign Display from the Zone
- CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>:unassignDisplay(<display_ID>)

Unassign All Displays from the Zone
- CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>:unassignAllDisplay()

Query the Tags of the Zone
- GET/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>.Tags

Adding Tags to the Zone
- CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>:addTags(<tag>)

Deleting Tags of the Zone
- CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>:removeTags(<tag>)

Deleting All Tags of the Zone
- CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>:removeAllTags()

Deleting All Tags of the Zone
- CALL/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>:removeAllTags()

Query the Static Tags of the Zone
- GET/MEDIA/VIDEOWALLS/<video_wall_ID>/LAYOUTS/<layout_ID>/<zone_ID>.StaticTags

Switching the Video Stream to the Video Wall Zone
- CALL/MEDIA/XP/VIDEO:switch(<in>;<zone_ID>)

Audio Crosspoint Settings

Query the Status of All Audio Ports
- GET/MEDIA/XP/AUDIO/*.*

Switching the Audio Stream to One Destination
- CALL/MEDIA/XP/AUDIO:switch(<in>:<out>)

Switching an Audio Stream to All Destinations
- CALL/MEDIA/XP/AUDIO:switchAll(<in>)

Query the Number of the Source Ports
- GET/MEDIA/XP/AUDIO.SourcePortCount

Query the Number of the Destination Ports
- GET/MEDIA/XP/AUDIO.DestinationPortCount

Audio Stream Settings

Enable/Disable the Audio Stream Source
- SET/MEDIA/STREAMS/AUDIO/<in>/STREAM.Enabled=<logical_value>

Enable/Disable the Audio Stream Destination
- SET/MEDIA/STREAMS/AUDIO/<out>/STREAM.Enabled=<logical_value>

Query the Name of the Stream
- GET/MEDIA/STREAMS/AUDIO/<in>.SourceName

Setting the Name of the Stream
- SET/MEDIA/STREAMS/AUDIO/<in>.SourceName=<name>

Query the Name of the Destination
- GET/MEDIA/STREAMS/AUDIO/<out>.DestinationName

Setting the Name of the Destination
- SET/MEDIA/STREAMS/AUDIO/<out>.DestinationName=<name>

Query the Tags of the Stream/Destination
- GET/MEDIA/STREAMS/AUDIO/<in|out>.Tags
### Adding Tags to the Stream/Destination

- `CALL•/MEDIA/STREAMS/AUDIO/<in|out>:addTags(<tag>)`

### Deleting Tags of the Stream

- `CALL•/MEDIA/STREAMS/AUDIO/<in|out>:removeTags(<tag>)`

### Deleting All Tags of the Stream

- `CALL•/MEDIA/STREAMS/AUDIO/<in|out>:removeAllTags()`

### Query All Tags of the Device

- `GET•/MEDIA/STREAMS/AUDIO/<in|out>.DeviceTags`

### Analog Audio Port Settings

#### Setting the Volume in dB

- `SET•/MEDIA/STREAMS/AUDIO/<in|out>/Port.VolumedB=<volume>`

#### Setting the Volume in Percent

- `SET•/MEDIA/STREAMS/AUDIO/<in|out>/PORT.VolumePercent=<percent>`

#### Setting the Balance

- `SET•/MEDIA/STREAMS/AUDIO/<in|out>/PORT.Balance=<balance>`

#### Setting the Gain

- `SET•/MEDIA/STREAMS/AUDIO/<in|out>/PORT.Gain=<gain>`

#### Mute/Unmute the Analog Audio Output Port

- `SET•/MEDIA/STREAMS/AUDIO/<in|out>/PORT.Mute=<logical_value>`

### EDID Management

#### Query the Validity of a Dynamic EDID

- `GET•/MEDIA/EDID/D/<dynamich>Validity`

#### Query the Preferred Resolution of an EDID

- `GET•/MEDIA/EDID/UIF/D/E/<user|factory|dynamic|emulated>.PreferredResolution`

#### Emulating an EDID on an Input Port

- `CALL•/MEDIA/EDID:switch(<user|factory|dynamic|emulated>)`

#### Emulating an EDID on All Input Ports

- `CALL•/MEDIA/EDID:switchAll(<user|factory|dynamic>)`

#### Copy an EDID to User Memory

- `CALL•/MEDIA/EDID:copy(<user|factory|dynamic|emulated>)`

#### Deleting an EDID from User Memory

- `CALL•/MEDIA/EDID:delete(<user>)`

#### Resetting the Emulated EDIDs

- `CALL•/MEDIA/EDID:reset()`

### System Monitoring Commands

#### Query Connected Device Presence

- `GET•/MEDIA/STREAMS/VIDEO/<in|out>/PORT.Connected`

#### Query Video Signal Presence on a Port

- `GET•/MEDIA/STREAMS/VIDEO/<in|out>/PORT.SignalPresent`

#### Query Video Signal Presence in a Stream

- `GET•/MEDIA/STREAMS/VIDEO/<in|out>/STREAM.SignalPresent`

#### Query Embedded Audio Presence

- `GET•/MEDIA/STREAMS/VIDEO/<in|out>/STREAM.EmbeddedAudioPresent`

#### Query the Signal Type

- `GET•/MEDIA/STREAMS/VIDEO/<in|out>/STREAM.SignalType`

#### Query the Original Resolution of the Stream Source

- `GET•/MEDIA/STREAMS/VIDEO/<in>/PORT.Resolution`

#### Query the Modified Resolution of the Stream Source

- `GET•/MEDIA/STREAMS/VIDEO/<in>/STREAM.Resolution`

#### Query the Original Resolution of the Stream Destination

- `GET•/MEDIA/STREAMS/VIDEO/<out>/STREAM.Resolution`

#### Query the Modified Resolution of the Stream Destination

- `GET•/MEDIA/STREAMS/VIDEO/<out>/PORT.Resolution`

#### Query the Bandwidth of the Stream

- `GET•/MEDIA/STREAMS/VIDEO/<in|out>/STREAM.Bandwidth`

#### Query the Control Module of the Stream Destination

- `GET•/MEDIA/XP/VIDEO/<out>/OwnedBy`

#### Query the Bandwidth Limitation Indicator

- `GET•/MEDIA/STREAMS/VIDEO/<in|out>/STREAM.BandwidthLimitExceeded`

#### Query the Status of the Analog Audio Output

- `GET•/MEDIA/STREAMS/AUDIO/<out>/Port.MuteStatus`
Query the Health Status of a Selected Endpoint

GETALL/SYS/ENDPOINTS/UBEX_EP/STATUS/HEALTH

Query the Link Status of a Selected Endpoint

GETALL/SYS/ENDPOINTS/UBEX_EP/STATUS/UPLINK

SFP+ Module Information

Query the Vendor

GET/SYS/ENDPOINTS/UBEX_EP/STATUS/UPLINK/SFP.VendorName

Query the Part Number

GET/SYS/ENDPOINTS/UBEX_EP/STATUS/UPLINK/SFP.PartNumber

Query the Compliance

GET/SYS/ENDPOINTS/UBEX_EP/STATUS/UPLINK/SFP.Compliance

Query the Maximum Allowed Cable Length

GET/SYS/ENDPOINTS/UBEX_EP/STATUS/UPLINK/SFP.MaxLinkLength

Query the Type of the Module

GET/SYS/ENDPOINTS/UBEX_EP/STATUS/UPLINK/SFP.Type

Query the Compatibility of the Module

GET/SYS/ENDPOINTS/UBEX_EP/STATUS/UPLINK/SFP.Compatible

Network Configuration - MMU

Query the DHCP State

GET/MANAGEMENT/NETWORK.DhcpEnabled

Change the DHCP State

SET/MANAGEMENT/NETWORK.DhcpEnabled=<logical_value>

Query the IP Address

GET/MANAGEMENT/NETWORK.IpAddress

Change the IP Address (Static)

SET/MANAGEMENT/NETWORK.StaticIpAddress=<IP_address>

Query the Subnet Mask

GET/MANAGEMENT/NETWORK.NetworkMask

Change the Subnet Mask (Static)

SET/MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>

Query the Gateway Address

GET/MANAGEMENT/NETWORK.GatewayAddress

Change the Gateway Address (Static)

SET/MANAGEMENT/NETWORK.StaticGatewayAddress=<gw_address>

Apply Network Settings

CALL/MANAGEMENT/NETWORK.ApplySettings()

Ethernet Port Configuration - Endpoint

Enabling the Port

SET/MEDIA/CONTROL/ETHERNET/<port>/PORT.Enabled=<logical_value>

Ethernet Mode Setting

SET/MEDIA/CONTROL/ETHERNET/<port>/PORT.Mode=<mode>

Setting the Name of the Port

SET/MEDIA/CONTROL/ETHERNET/<port>.Name=<name>

Query the Tags of the Port

GET/MEDIA/CONTROL/ETHERNET/<port>.Tags

Adding Tags to the Port

CALL/MEDIA/CONTROL/ETHERNET/<port>:addTags(<tag>)

Deleting Tags of the Port

CALL/MEDIA/CONTROL/ETHERNET/<port>:removeTags(<tag>)

Deleting All Tags of the Port

CALL/MEDIA/CONTROL/ETHERNET/<port>:removeAllTags()

Query All Tags of the Device

GET/MEDIA/CONTROL/ETHERNET/<port>.DeviceTags

Serial Port Configuration - MMU

BAUD Rate Setting

SET/MANAGEMENT/CONTROL/SERIAL/<port>.Baudrate=<baudrate>

Databits Setting

SET/MANAGEMENT/CONTROL/SERIAL/<port>.DataBits=<databits>

Stopbits Setting

SET/MANAGEMENT/CONTROL/SERIAL/<port>.StopBits=<stopbits>

Parity Setting

SET/MANAGEMENT/CONTROL/SERIAL/<port>.Parity=<parity>

Enabling the Port

SET/MANAGEMENT/CONTROL/SERIAL/<port>.Enabled=<logical_value>
Serial Port Configuration - Endpoint Devices

- **BAUD Rate Setting**
  - SET+/MEDIA/CONTROL/UART/<port>/PORT.Baudrate=<number>

- **Stopbits Setting**
  - SET+/MEDIA/CONTROL/UART/<port>/PORT.StopBits=<number>

- **Parity Setting**
  - SET+/MEDIA/CONTROL/UART/<port>/PORT.Parity=<number>

- **Command Injection TCP Port Setting**
  - SET+/MEDIA/CONTROL/UART/<port>/PORT.ServerPort=<port>

- **Remap the Command Injection TCP ports**
  - CALL+/MEDIA/CONTROL/UART:remapPorts(<start_number>)

- **Query the Current Configuration**
  - GET+/MEDIA/CONTROL/UART/<port>.Rs232Configuration

- **Enabling the Port**
  - SET+/MEDIA/CONTROL/UART/<port>/PORT.Enable=<logical_value>

- **Setting the Name of the Port**
  - SET+/MEDIA/CONTROL/UART/<port>/PORT.Name=<name>

- **Query the Tags of the Port**
  - GET+/MEDIA/CONTROL/UART/<port>.Tags

- **Adding Tags to the Port**
  - CALL+/MEDIA/CONTROL/UART/<port>:addTags(<tag>)

- **Deleting Tags of the Port**
  - CALL+/MEDIA/CONTROL/UART/<port>:removeTags(<tag>)

- **Deleting All Tags of the Port**
  - CALL+/MEDIA/CONTROL/UART/<port>:removeAllTags()

- **Query All Tags of the Device**
  - GET+/MEDIA/CONTROL/UART/.DeviceTags

Infrared Port Configuration - Endpoint Devices

- **Enable/Disable the Port**
  - SET+/MEDIA/CONTROL/IR/<in|out>.Enabled=<logical_value>

- **Setting the Name of the Input Port**
  - SET+/MEDIA/CONTROL/IR/<in>.SourceName=<name>

- **Setting the Name of the Output Port**
  - SET+/MEDIA/CONTROL/IR/<out>.DestinationName=<name>

- **Change Command Injection Port Number**
  - SET+/MEDIA/CONTROL/IR/<in|out>.ServerPort=<port_no>

- **Enable/Disable Output Signal Modulation**
  - SET+/MEDIA/CONTROL/IR/<out>/PORT.EnableModulation=<logical_value>

- **Query the Tags of the Port**
  - GET+/MEDIA/CONTROL/IR/<in|out>.Tags

- **Adding Tags to the Port**
  - CALL+/MEDIA/CONTROL/IR/<in|out>:addTags(<tag>)

- **Deleting Tags of the Port**
  - CALL+/MEDIA/CONTROL/IR/<in|out>:removeTags(<tag>)

- **Deleting All Tags of the Port**
  - CALL+/MEDIA/CONTROL/IR/<in|out>:removeAllTags()

- **Query All Tags of the Device**
  - GET+/MEDIA/CONTROL/IR/.DeviceTags

Message Sending via Communication Ports

- **Sending a Text (ASCII-format) via Serial Port**
  - CALL+/MEDIA/CONTROL/UART/<port>/PORT:sendText(<message>)

- **Sending a Binary Message (HEX-format) via Serial Port**
  - CALL+/MEDIA/CONTROL/UART/<port>/PORT:sendBinaryMessage(<message>)

- **Sending a Message (ASCII-format) via Serial Port**
  - CALL+/MEDIA/CONTROL/UART/<port>/PORT:sendMessage(<message>)

- **Sending Hex Codes in Little-endian Format via IR Port**
  - CALL+/MEDIA/CONTROL/IR/<out>/PORT:sendProntoHex(<hex_code>)

- **Sending Hex Codes in Big-endian Format via IR Port**
  - CALL+/MEDIA/CONTROL/IR/<out>/PORT:sendProntoHexBigEndian(<hex_code>)
### USB K+M Settings

**Query the Number of Emulated USB Ports**
- `GET /MEDIA/XP/KM.SourcePortCount`

**Query the Number of Destination USB Ports**
- `GET /MEDIA/XP/KM.DestinationPortCount`

**Switching the Emulated Port to One Destination**
- `CALL /MEDIA/XP/KM:switch(<e>)`

**Switching an Emulated Port to All Destination**
- `CALL /MEDIA/XP/KM:switchAll(<e>)`

**Switching the Local Emulated Port to the Local Destination**
- `CALL /MEDIA/XP/KM:switch(<eN>:<rN>)`

**Query the Name of the Emulated USB Port**
- `GET /MEDIA/STREAMS/KM/<e>.EmulatedName`

**Setting the Name of the Emulated USB Port**
- `SET /MEDIA/STREAMS/KM/<e>.EmulatedName=<name>`

**Query the Name of the Destination USB Port**
- `GET /MEDIA/STREAMS/KM/<r>.ReceiverName`

**Setting the Name of the Destination USB Port**
- `SET /MEDIA/STREAMS/KM/<r>.ReceiverName=<name>`

**Query the Tags of the USB Ports**
- `GET /MEDIA/STREAMS/KM/<e|r>.Tags`

**Adding Tags to the USB Ports**
- `CALL /MEDIA/STREAMS/KM/<e|r>:addTags(<tag>)`

**Deleting Tags of the USB Ports**
- `CALL /MEDIA/STREAMS/KM/<e|r>:removeTags(<tag>)`

**Deleting All Tags of the USB Ports**
- `CALL /MEDIA/STREAMS/KM/<e|r>:removeAllTags()`

**Query All Tags of the Device**
- `GET /MEDIA/STREAMS/KM/<e|r>.DeviceTags`

### License Handling

**Querying the Name of the License**
- `GET /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.Name`

**Querying the Description of the License**
- `GET /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.Description`

**Querying the Endpoint Limitation**
- `GET /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.EndPointLimit`

**Querying the Status of the License**
- `GET /MANAGEMENT/LICENSE/ENDPOINT_LIMIT.Status`

**Removing the License**
- `CALL /MANAGEMENT/LICENSE/ENDPOINT_LIMIT:remove()`

### Centralized Firmware Update

**Querying the Status of Firmware Update**
- `GET /SYS/ENDPOINTS/<UBEX_EP>.FirmwareUpdateStatus`

**Querying the Installed Firmware Package Version**

**Launching the Firmware Update Procedure**
- `CALL /SYS/ENDPOINTS/<UBEX_EP>:startFirmwareUpdate()`

**Cancellation of the Firmware Update Procedure**
- `CALL /SYS/ENDPOINTS:cancelFirmwareUpdate(<UBEX_EP>)`

**Restarting the Firmware Update Procedure**
- `CALL /SYS/ENDPOINTS:restartFirmwareUpdate(<UBEX_EP>)`

**Querying the Firmware Update Progress**
- `GET /SYS/ENDPOINTS/<UBEX_EP>.FirmwareUpdateProgress`

**Querying the Last Message of the Firmware Update**
- `GET /SYS/ENDPOINTS/<UBEX_EP>.FirmwareUpdateLastMessage`

**Allowing Unsupported Firmware Packages**
- `SET /SYS/ENDPOINTS/<UBEX_EP>.AllowUnsupportedFirmware=<logical_value>`
10. Firmware Update

The Matrix Management Unit (MMU) can be updated by using Lightware Device Updater v2 (LDU2) software via Ethernet. The firmware pack with the necessary components (*.lfp2 file) for your specific product, and the LDU2 application can be downloaded from the Support page of our website www.lightware.com.

- Preparation
- Running the Software
- The Updating Steps
- Updating via GUI - MMU
- Endpoint Update - Centralized Firmware Update
- Endpoint Update - Manual Method
- Command Line Interface (CLI)
- CLI Commands
- If the Update is not successful
10. Firmware Update

**ATTENTION!** The firmware update process has an effect on the configuration and the settings of the device. For more details, please see the Keeping the Configuration Settings section before the update.

**DIFFERENCE:** Lightware highly recommends using the same and cohesive firmware versions on the UBEX extenders and the MMU. Connection between extenders installed with different versions might cause unexpected performance failures. See the list of cohesive endpoint and MMU firmware versions in the Endpoint Firmware Packages in the MMU section.

10.1. Preparation

Most Lightware devices can be controlled over several interfaces (e.g. Ethernet, USB, RS-232). But the firmware can usually be updated 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**, installed on your PC or Mac.
- **LDU2 software** installed on your PC or Mac.

Both can be downloaded from [www.lightware.com/downloads](http://www.lightware.com/downloads).

Optionally, you can download the release notes file in HTML format.

10.1.1. About the Firmware Package (LFP2 File)

All the necessary tools and binary files are packed into the LFP2 package file. You need only 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, which is displayed in the window where you select the firmware package file in LDU2.

10.1.2. LDU2 Installation

**ATTENTION!** Minimum system requirement: 2 GB RAM. The minimum screen resolution is 1600x900.

**ATTENTION!** Certain ports are used for the communication in the background; please check the list in the Applied Ports (Network Settings) section.

INFO: The Windows, Mac and Linux application has the same look and functionality.

Download the software from [www.lightware.com/downloads](http://www.lightware.com/downloads).

### Installation in case of Windows OS

Run the installer. If the User Account Control displays a pop-up message, click Yes.

#### Installation Modes

<table>
<thead>
<tr>
<th>Normal install</th>
<th>Snapshot install</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available for Windows, macOS and Linux</td>
<td>Available for Windows only</td>
</tr>
<tr>
<td>The installer can update only this instance</td>
<td>Cannot be updated</td>
</tr>
<tr>
<td>One updateable instance may exist for all users</td>
<td>Many different versions can be installed for all users</td>
</tr>
</tbody>
</table>

**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 exceptions of the blocked software for the proper operation.

INFO: This type of installer is equal to the Normal install of Windows.

#### Installation in case of Linux

1. Download the archive file (tar.gz) from [www.lightware.com](http://www.lightware.com) and unpack it to a temp folder.
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.
3. The folder above will contain this file: LightwareDeviceUpdaterV2.sh that can be used to start LDU2.
10.2. Running the Software

**ATTENTION!** The computer that runs LDU2 and the target device (that will be updated) must be in the same subnet. The update cannot be performed behind a firewall or gateway.

You have two options:
- Starting the LDU2 by double-clicking on the shortcut/program file, or
- Double-clicking on an LFP2 file.

10.2.1. LDU2 Interfaces

The software can be used over:
- The Graphical User Interface (GUI), or by
- The Command Line Interface (CLI).

**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:

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.
10. Firmware Update

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 physically.
- **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).
- **Cleartext login enabled** The password-protection is enabled. You have to enter the password to perform the firmware update in the Parameters window or in the appearing window in the beginning of the update.
- **Service mode** The device is in bootload mode. Backup and restore cannot be performed in this case.

10.3. 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 software and restore it later.

The following flow chart demonstrates how this function works in the background.

1. Create a backup
   - The current configuration of the device is being saved into a configuration backup file on your computer.
2. Start the Update
   - The device reboots and starts in bootload mode (firmware update mode).
3. Update
   - The CPU firmware is changed to the new one.
4. Factory reset
   - All configuration settings are restored to the factory default values.
5. Conversion / Restore
   - The firmware package checks the backup data before the restore 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!
6. Finish
   - Once the firmware update procedure is finished, the device reboots and is ready to use.
10.4. Updating via GUI - MMU

The following instructions belong to the UBEX-MMU-X200 Matrix Management Unit only. For the updating of the endpoint devices see the Endpoint Update - Centralized Firmware Update / Endpoint Update - Manual Method section.

10.4.1. Establish Connection

Make sure that the computer and the device are connected over Ethernet and the connection is established between them.

10.4.2. Start the LDU2 Application and Follow the Steps

The Steps of the Update in Quick Summary:

Step 1. Select the firmware package file.
Step 2. Select the unit for updating.
Step 3. Check the update parameters.
Step 4. Start the update and wait until it is finished.
Step 5. Wait until the unit reboots with the new firmware.

Update Steps

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.

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.

Step 2. Select the unit for updating.

Pick the MMU(s) for updating. The selected line will be highlighted in green.
10. Firmware Update

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 Update Options button to configure the firmware update.

**Backup Folder**

Set the path of the device configuration backup file which is created automatically. The default path is USER_HOME/.ldu2/backup.

**Restore Device Configuration**

When it is enabled, the configuration settings of the MMU will be restored after the update. Enabled by default.

**Factory Default**

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. See the whole list of factory default settings of the MMU in the UBEX-MMU-X200 section.

Once the parameters are set, click on the **Apply** button to save the settings.

Step 4. Start the update and wait until it is finished.

ATTENTION! After updating the MMU cannot be downgraded to versions prior to v1.2.0.

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**

ATTENTION! While the firmware is being updated, the normal operation mode is suspended as the MMU is switched to bootload mode. Do not interrupt the firmware update. If any problem occurs, reboot the device and restart the process.

INFO: The device might reboot several times during the firmware update procedure.

INFO: The percent counter can be changed to “Waiting for device” description in few times during the update. In this case the MMU performs internal procedures and it is the part of the normal operation.

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**
10.5. Endpoint Update - Centralized Firmware Update

The following instructions belong to the endpoint devices (UBEX-PRO20-HDMI-F100 / F110 / F120 / R100 series) only. For the updating of the MMU see the Updating via GUI - MMU section.

ATTENTION! The centralized firmware update feature is working from the installed MMU firmware v1.1.0 and endpoint firmware v1.3.1 and available for the later firmware package versions. The endpoint firmware packages till v1.3.1 can be installed with LDU2 software - see the details in the Endpoint Update - Manual Method section.

DIFFERENCE: Lightware highly recommends using the same and cohesive firmware versions on the UBEX extenders and the MMU. Connection between extenders installed with different versions might cause unexpected performance failures. See the list of cohesive endpoint and MMU firmware versions in the Endpoint Firmware Packages in the MMU section.

10.5.1. Description

The centralized firmware update method for the connected endpoint devices is the most comfortable way to keep your devices up to date. The selected units can be updated together, the procedure is supervised by the MMU, no user interaction is needed. During the firmware update, the AV transmission continues smoothly in the unselected endpoint devices.

10.5.2. Technical Background

The centralized firmware update for the endpoint devices is launched and controlled by the user and supervised by the MMU. The firmware package of the endpoint devices is built in the firmware package of the MMU which is installed when the MMU is updated. It follows that the firmware package versions of the endpoints and the MMU are linked - see the list of the coupled firmware package versions in the Endpoint Firmware Packages in the MMU section. No LDU2 software and MMU firmware package is necessary for the centralized firmware update method. The greatest advantage of the linked firmware packages is that they are developed and tested together for the best user experience.

When the firmware update is launched, the selected endpoint devices are set to bootload (firmware update) mode. The MMU sends the firmware package to the endpoints in multicast messages and repeats it until all selected endpoints confirm the new firmware version.

INFO: The centralized firmware update method requires the same network switch configuration requirements as the AV signal transmission. See the details in the Ethernet Switch Configuration section.

The update procedure can be launched by two ways as following:

- via Lightware Device Controller (LDC) software - see the detailed instructions in the Centralized Firmware Update - Detailed Instructions section (on the next page);
- via LW3 protocol commands - see the detailed instructions in the Centralized Firmware Update section.

What If the MMU is Down during the Firmware Update?

The MMU and the updated endpoint devices communicate with each other in the entire time of the firmware update. The MMU checks the status of all updating endpoints and streams the endpoint firmware package on the network until all endpoints responds the completed status and to be claimed successfully. If the connection is lost by the MMU with the endpoints for some reason, the update procedure will be restarted automatically on the endpoints which has not sent ‘completed’ status when the MMU is live on the network again.

What If the Firmware Update is Failed on an Endpoint Device?

The endpoint device cannot be harmed in the case of firmware update failure. The procedure can be repeated/restarted anytime when it is necessary.
10.5.3. Centralized Firmware Update - Detailed Instructions

Preparing the Update

Step 1. Open the Lightware Device Controller (LDC) software.
Step 2. Establish connection with the MMU.
Step 3. Navigate to the Settings / System Monitor / Update Firmware menu.

The Layout of the Update Firmware Menu

- **Show detailed status switcher**: The explanation of the two available options is the following:
  - **Enabled**: the last text message of the firmware update status is displayed in the Firmware Status column.
  - **Disabled**: the recent status of the firmware update is displayed in percent.

- **Filters**: The list of the endpoint devices can be filtered, see the details in the Filters section (on the right side).

- **Factory defaults button**: Clicking on the button results applying factory default settings on the selected endpoint devices. See the details about the applied settings in the Factory Default Settings section.

- **Reset button**: Clicking on the button results restarting the selected endpoint devices.

- **Identify me button**: Clicking on the button causes the four front panel LEDs blink in green for 10 seconds. The feature helps to identify the device itself in the rack shelf.

- **Update firmware button**: Clicking on the button results starting the firmware update procedure on the selected endpoint devices with the package version displayed in the Endpoint Package Version.

- **Endpoint device selectors**: Clicking on the squares the endpoint devices will be selected for firmware update, identify me function, resetting or factory defaults setting. Clicking on square next to the header results selecting all devices in the list.

- **Header**: The header of the endpoint list. Clicking on the ⬇️ icon sorts the list based on the category of the column (e.g. ID, operation mode, label, etc).

- **Endpoint firmware package version**: The firmware package version of the endpoint is displayed here which is built in the MMU. This version will be applied on the endpoint devices after the centralized firmware update is completed.

**Filters**

Applying filters help to find the required endpoint devices for updating in case of a larger UBEX matrix. The function contains the following filter categories:

- **Device**:
  - UBEX-PRO20-HDMI-F100
  - UBEX-PRO20-HDMI-F110
  - UBEX-PRO20-HDMI-F120
  - UBEX-PRO20-HDMI-R100

- **Operation Mode**:
  - Transmitters
  - Receivers
  - Transceivers

- **Connection Status**:
  - Online
  - Offline

- **Firmware Status**:
  - Up-to-date
  - Out of date
  - Update in progress
Update Steps

**Step 1. Select the units for updating.**

Pick the endpoint devices for updating by clicking on the endpoint device selector squares on the left side. Clicking on square next to the header results selecting all devices in the list. The selected line will be highlighted in green.

![Image of Firmware Update interface](image1.png)

**The units are selected for updating**

**Step 2. Start the update and wait until it is finished.**

Click on the **Update Firmware** button to start the procedure. At first a warning message pops up.

**ATTENTION!** The update is not backward compatible with the version running on some endpoints. After updating these endpoints cannot be downgraded to versions prior to v1.4.0.

Select **Yes** if you want to continue the update procedure.

![Image of Firmware Update interface](image2.png)

**Pop-up message**

After selecting Yes, the update procedure starts immediately. The actual status of each endpoints is shown in percent under the **Firmware Status** section. Clicking on the **Show detailed status** the last received text based message is shown.

![Image of Firmware Update interface](image3.png)

**Firmware update is in progress**

- **INFO:** The devices might reboot several times during the firmware update procedure.
- **INFO:** The percent counter can be changed to "Waiting for device" description in few times during the update. In this case the endpoint device performs internal procedures and it is the part of the normal operation.
10. Firmware Update

Step 3. Wait until the units reboot with the new firmware.
Once the firmware update procedure is completed, the units reboot with the new firmware.

INFO: The reclaiming procedure of the MMU takes a while, the “Up to date” firmware status may delayed a little bit because of this.

10.6. Endpoint Update - Manual Method
The following instructions belong to the endpoint devices (UBEX-PRO20-HDMI-F100 / F110 / F120 / R100 series) only. For the updating of the MMU see the Updating via GUI - MMU section.

ATTENTION! This update is not backward compatible with the version running on some endpoints. After updating these endpoints cannot be downgraded to versions prior to v1.4.0.

DIFFERENCE: Lightware highly recommends using the same and cohesive firmware versions on the UBEX extenders and the MMU. Connection between extenders installed with different versions might cause unexpected performance failures. See the list of cohesive endpoint and MMU firmware versions in the Endpoint Firmware Packages in the MMU section.

The Steps of the Preparing in Quick Summary
The endpoint devices are required to be prepared before the firmware updating. The steps are the following:

Step 1. Connect all endpoint devices and the MMU to the L3 network switch.
Step 2. Connect the controller device installed with the LDU2 software to the matrix.
Step 3. Set the IP addresses of the endpoint devices via LDC software or LW3 protocol commands.
Step 4. Set all endpoints to bootload (service / firmware update) mode via front panel LCD menu or using LW3 protocol commands.

The Steps of the Update in Quick Summary:

Step 1. Select the firmware package file.
Step 2. Select the units for updating.
Step 3. Check the update parameters.
Step 4. Start the update and wait until it is finished.
Step 5. Wait until the units reboot with the new firmware.

10.6.1. The Steps of the Preparing - Detailed Instructions
Step 1 - Connect All Endpoint Devices and the MMU to the L3 Network Switch.
See more details about it in the Connections section.

Step 2 - Connect the Controller Device Installed with the LDU2 Software to the Matrix.
The connection can be established via the network switch or the MMU as well. Do not connect the controller device to any endpoint.
Step 3 - Set the IP Addresses of the Endpoint Devices.

Two possible methods are for completing it:

- via Lightware Device Controller (LDC) software;
- via using LW3 protocol commands.

Via LDC Software / Built-in Web

Connect to the MMU using one of the following methods:

- Launch the Lightware Device Controller (LDC) software and select the UBEX-MMU-X200 device in the Device Discovery window. Connect to the MMU by clicking on the Connect button. See more details in the Establishing Connection section.
- Open a web browser application and enter the IP address of the MMU. See more details in the Software Control - Built-in Web chapter.

Select a source or destination stream in the crosspoint area to open the properties section in the right side. Navigate to the Device tab and select the Device Properties button to open the device properties window.

ATTENTION! Always click on the Apply Changes button before closing the Device properties window.

Via Using LW3 Protocol Commands

Connect to the MMU using a terminal application (e.g. Putty) or use the built-in Terminal of the LDC software / Built-in web. See more details in the Terminal Window section.

Type the following commands for enabling dynamic IP address (DHCP):

```plaintext
SET /MEDIA/DEVICEMAP/<logical_device_ID>/MNT/MANAGEMENT/NETWORK.DhcpEnabled=true
CALL /MEDIA/DEVICEMAP/<logical_device_ID>/MNT/MANAGEMENT/NETWORK:applySettings()
```

The `<logical_device_ID>` is the ID of the endpoint device, for example: X1, X2, X3, etc.

Example:

```plaintext
SET /MEDIA/DEVICEMAP/X1/MNT/MANAGEMENT/NETWORK.DhcpEnabled=true
CALL /MEDIA/DEVICEMAP/X1/MNT/MANAGEMENT/NETWORK:applySettings()
```

Repeat the procedure with all endpoint devices which are wanted to be updated.

ATTENTION! Make sure that all endpoint devices have different static IP addresses or the dynamic IP address (DHCP) is enabled in them to avoid the IP conflict.

Repeat the procedure with all endpoint devices which are wanted to be updated.
Type the following commands for setting a static IP address:

- `SET /MEDIA/DEVICEMAP/<logical_device_ID>/MNT/MANAGEMENT/NETWORK.StaticIpAddress=<IP>
- `CALL /MEDIA/DEVICEMAP/<logical_device_ID>/MNT/MANAGEMENT/NETWORK.applySettings()`

The `<logical_device_ID>` parameter is the ID of the endpoint device, for example: X1, X2, X3, etc. The `<IP>` parameter is the IP address which are wanted to be set on the endpoint device.

Example:

- `SET /MEDIA/DEVICEMAP/X1/MNT/MANAGEMENT/NETWORK.StaticIpAddress=192.168.0.53`
- `CALL /MEDIA/DEVICEMAP/X1/MNT/MANAGEMENT/NETWORK.applySettings()`

**ATTENTION!** Make sure that all endpoint devices have different static IP addresses or the dynamic IP address (DHCP) is enabled in them to avoid the IP conflict.

Repeat the procedure with all endpoint devices which are wanted to be updated.

### Step 4 - Set All Endpoints to Bootload (Service / Firmware Update) Mode.

Two possible methods are for completing it:

- via using LW3 protocol commands;
- via front panel LCD menu.

#### Via Using LW3 Protocol Commands

Connect to the MMU using a terminal application (e.g. Putty) or use the built-in Terminal of the LDC software / Built-in web. See more details in the Terminal Window section.

Type the following commands to set the device to bootload mode:

- `CALL /MEDIA/DEVICEMAP/<logical_device_ID>:bootload()`

The `<logical_device_ID>` parameter is the ID of the endpoint device, for example: X1, X2, X3, etc. The `<IP>` parameter is the IP address which are wanted to be set on the endpoint device.

The device reboots and starts in bootload (service / firmware update) mode.

Example:

- `CALL /MEDIA/DEVICEMAP/X1:bootload()`

Repeat the procedure with all endpoint devices which are wanted to be updated.

#### Via Front Panel LCD Menu

Navigate to the System settings menu and select the Bootload mode option. Select Yes at the confirmation. The device reboots and starts in bootload (service / firmware update) mode.

### 10.6.2. Start the LDU2 Application and Follow the Steps

#### Discovering the Devices

After launching LDU2 the device discovery an empty window appears. Click on the Discover Devices button to start finding the Lightware devices on the network.
Device List

When the discovery has completed, the devices available on the network are listed in the application.

Update Steps

Step 1. Select the firmware package.

Click on the Select Firmware Package button and navigate to the location where the LFP2 file of the UBEX endpoint is saved. When you click on the name of package, the preview of the release notes are displayed on the right side.

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 the front panel LEDs blink for 10 seconds which helps to identify the device physically.
- **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 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 bootloader mode. Backup and restore cannot be performed in this case.

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
10. Firmware Update

Step 2. Select the units for updating.

Pick the devices for updating. The selected lines will be highlighted in green.

Step 3. Check the update parameters.

Click on the Parameters button to configure the firmware update.

**Application Mode**

The application mode (Extender or Matrix mode) of the current UBEX system can be selected in this section. Select the Matrix mode.

Click on the Apply button to save the settings.

Step 4. 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 procedures in the lower light green progress bar.

**ATTENTION!** This update is not backward compatible with the version running on some endpoints. After updating these endpoints cannot be downgraded to versions prior to v1.4.0.

INFO: The devices might reboot several times during the firmware update procedure.

Step 5. Wait until the units reboot with the new firmware.

Once the firmware update procedure is completed, the units reboot with the new firmware.
10.7. 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 with the same features that are available in case of GUI usage.

10.7.1. 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 with 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/ubex_v2.1.0b3.lfp2

The commands and options are the same under Windows® and Linux, too. Following sections contain examples with LightwareDeviceUpdaterV2_CLI.cmd.

10.7.2. 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 simultaneously, 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.

10.8. 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: [...].

10.8.1. 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

Command line usage:

C:\Program Files (x86)\Lightware\Lightware Device Updater V2\lib\bin\java.exe -jar lib\ldu2.jar help

Commands:

▪ help
▪ version
▪ update
▪ deviceInfo
▪ restore
▪ packageOptions

[...]
10.8.2. 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
```

10.8.3. 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: 2.9.1b1
```

```
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: v2.9.2b2
Download URL: http://update.lightware.hu/ldu2/lwr/v2.9.2b2/install_LDU2_v2.9.2b2.exe
```

10.8.4. 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**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Required?</th>
</tr>
</thead>
<tbody>
<tr>
<td>-i or --ip</td>
<td>List of IP addresses of devices to be updated</td>
<td>one of them is mandatory</td>
</tr>
<tr>
<td>-n or --hostName</td>
<td>List of host names of devices to be updated</td>
<td></td>
</tr>
<tr>
<td>-v or --packageVersion</td>
<td>Shows installed package version only</td>
<td>optional</td>
</tr>
</tbody>
</table>

**Example 1**

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2\LightwareDeviceUpdaterV2_CLI.cmd deviceInfo --ip 192.168.1.12
C:\Program Files (x86)\Lightware\Lightware Device Updater V2\lib\jre\bin\java.exe -jar lib\ldu2.jar deviceInfo --ip 192.168.1.12
```

```
Product name:    UBEX-PRO20-HDMI-F100
IP address:      192.168.1.12
Serial number:   00002263
MAC address:     a8:d2:36:ff:22:63
Part number:     91540065
Device label:    123
Package version: v1.3.0b6
CPU FW version:  v1.3.0b3
HW version:      V12_KAAB
Operation mode:  Application mode
```

**Example 2**

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2\LightwareDeviceUpdaterV2_CLI.cmd deviceInfo --ip 192.168.1.12 --packageVersion
C:\Program Files (x86)\Lightware\Lightware Device Updater V2\lib\jre\bin\java.exe -jar lib\ldu2.jar deviceInfo --ip 192.168.1.12 --packageVersion
```

```
Download URL: http://update.lightware.hu/ldu2/lwr/v2.9.2b2/install_LDU2_v2.9.2b2.exe
```

Applied endpoint firmware package: v2.4.1  |  Applied MMU firmware package: v1.7.1  |  LCD software: v2.6.2b3
10.8.5. Update
This command can be used to update the firmware of the devices.

Command
LightwareDeviceUpdaterV2_CLI.cmd update [options]

Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Required?</th>
</tr>
</thead>
<tbody>
<tr>
<td>-p or --package</td>
<td>The path of the firmware package file</td>
<td>yes</td>
</tr>
<tr>
<td>-i or --ip</td>
<td>List of IP addresses of devices to be updated</td>
<td>one of them is mandatory</td>
</tr>
<tr>
<td>-h or --hostName</td>
<td>List of host names of devices to be updated</td>
<td></td>
</tr>
<tr>
<td>-b or --backupFolder</td>
<td>Folder to create device configuration backup at.</td>
<td>optional</td>
</tr>
<tr>
<td>-f or --factoryDefault</td>
<td>Apply factory reset during device update. Default: false</td>
<td>optional</td>
</tr>
<tr>
<td>-r or --reportProgress</td>
<td>Report update progress in percentage form. Default: false</td>
<td>optional</td>
</tr>
</tbody>
</table>

Package-specific options
Certain LFP2 packages have features that can be applied at this command; see the Package Options section.

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 192.168.1.12 --package C:\Firmwares\ubex_v2.1.0b3.lfp2 --reportProgress

INFO: The firmware package checks the backup data before the restore procedure and if it is necessary, a conversion is applied to avoid incompatibility problems between the firmware versions. In that case, two backup files are created: the original and a new one with "_converted" suffix. Using the last one for restoring is recommended.

The lines containing "ProgressReporter" can be enabled optionally. If it is enabled, the current state is displayed every 5 seconds.

10.8.6. Restore
Restores device configuration from a backup file.

TIPS AND TRICKS: This command can be used for uploading a configuration to numerous devices (aka Configuration cloning by CLI).

Command
LightwareDeviceUpdaterV2_CLI.cmd restore [options]

Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Required?</th>
</tr>
</thead>
<tbody>
<tr>
<td>-i or --ip</td>
<td>List of IP addresses of devices to be updated</td>
<td>one of them is mandatory</td>
</tr>
<tr>
<td>-h or --hostName</td>
<td>List of host names of devices to be updated</td>
<td></td>
</tr>
<tr>
<td>-b or --backupFile</td>
<td>The path of the configuration backup file</td>
<td>yes</td>
</tr>
<tr>
<td>-k or --keepOriginalIpn</td>
<td>Do not override the network settings of the device with the ones in the backup file. It comes in handy when multiple devices' configuration is being restored from a single backup file. Default: false</td>
<td>optional</td>
</tr>
</tbody>
</table>

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 restore --ip 192.168.1.12 --backupFile C:\mybackup.lw3 --keepOriginalIpn

INFO: The firmware package checks the backup data before the restore procedure and if it is necessary, a conversion is applied to avoid incompatibility problems between the firmware versions. In that case, two backup files are created: the original and a new one with "_converted" suffix. Using the last one for restoring is recommended.
10.8.7. Package Options

Shows package-specific update options.

**Command**

```
LightwareDeviceUpdaterV2_CLI.cmd packageOptions [options]
```

**Options**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Required?</th>
</tr>
</thead>
<tbody>
<tr>
<td>-p or --package</td>
<td>The path of the firmware package file</td>
<td>yes</td>
</tr>
</tbody>
</table>

**Example**

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2\LightwareDeviceUpdaterV2_CLI.cmd packageOptions
--package c:\Firmwares\ubex_v2.1.0b3.lfp2
```

**Backup and restore options:**

- `--skipPresetsAtRestore` : if true, device presets will not be restored. (Default: false)
- `--uploadDefaultMiniWeb` : if true and no custom miniweb is present on the device, the default built-in miniweb will be uploaded to the device. (Default: false)

**Test options:**

- `--test` : if true, no update will be performed, communication with the device will be tested. (Default: false)

Package option example can be seen in the following section.

10.8.8. Complex Examples

The following options applied:

- Firmware is updated
- Factory default settings restored

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2\LightwareDeviceUpdaterV2_CLI.cmd update --ip 192.168.1.12 --factoryDefault --package c:\Firmwares\ubex_v2.1.0b3.lfp2
```

Backup and restore options:

- `--skipPresetsAtRestore` : if true, device presets will not be restored. (Default: false)
- `--uploadDefaultMiniWeb` : if true and no custom miniweb is present on the device, the default built-in miniweb will be uploaded to the device. (Default: false)

Test options:

- `--test` : if true, no update will be performed, communication with the device will be tested. (Default: false)

Package option example can be seen in the following section.
10.8.9. Exit Codes

There is a return value in all cases, when a command run is finished. Currently, three codes are defined:

<table>
<thead>
<tr>
<th>Code</th>
<th>Displayed text</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>N/A</td>
<td>The update performed successfully</td>
</tr>
<tr>
<td>1</td>
<td>Update error (ErrorCode:1)</td>
<td>The error happened during the update</td>
</tr>
<tr>
<td>2</td>
<td>CLI error (ErrorCode:2)</td>
<td>The error happened before starting the update</td>
</tr>
</tbody>
</table>

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 $?
```

If this value is queried after the update and it is 0, the update performed successfully.

10.9. If the Update is not successful

- Restart the process and try the update again.
- If the device cannot be switched to bootloader (firmware update) mode, you can do that manually as written in the User's 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 to continue the process without backup or stop the update. A root cause can be that the desired device is already in bootloader (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.
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.

- Link to connections/cabling section.
- Link to device operation section.
- Link to LDC software section.
- Link to LW3 protocol commands section.

The following sections are available in the chapter:

- **Use Cases**
- **How to Speed Up the Troubleshooting Process**
11. Troubleshooting

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 View - F-series Endpoint Devices or Front and Rear View - R-series Endpoint Devices sections for the endpoint devices and to the Front and Rear View - UBEX-MMU-X200 section for the MMU.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Root cause</th>
<th>Action</th>
<th>Refer to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video signal</td>
<td>No picture on the video output</td>
<td>Device or devices are not powered properly</td>
<td>Check the endpoints, the MMU, the network switch, and the other devices if they are properly powered, try to unplug and reconnect them.</td>
</tr>
<tr>
<td></td>
<td>Cable connection problem</td>
<td>Cables must fit very well, check all the connectors (HDMI and optical/DAC cables).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Optical cable became contaminated</td>
<td>Use special fiber optical cable cleaning equipment to clean it carefully.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incorrect settings are applied in the network switch</td>
<td>Check the configuration settings of the network switch. See more typical switch related issues on the next page.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Singlemode-multimode SFP / SFP+ module pairs</td>
<td>Check the installed SFP / SFP+ modules and install multimode or singlemode modules by pairs only.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SFP module is installed instead of SFP+ module</td>
<td>Install SFP+ transceiver module to the SFP+ port</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incorrect optical cabling of the SFP+ modules or Neutrik opticalCON connectors</td>
<td>Check the cabling of the modules or connectors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incompatible SFP+ modules are in the endpoint and the network switch</td>
<td>Check the compatibility of the installed SFP+ modules: singlemode / multimode pairs, parameters of the modules</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Different lengths of copper cables are applied for the SFP+ to RJ45 modules</td>
<td>Install equal lengths for both copper Ethernet cables</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not the proper video stream is the active one</td>
<td>Check the crosspoint state which video stream switched to the current output.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Root cause</th>
<th>Action</th>
<th>Refer to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video signal</td>
<td>No picture on the video output</td>
<td>Video stream is disabled</td>
<td>Enable the source stream.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output port is disabled</td>
<td>Enable the destination stream.</td>
</tr>
<tr>
<td></td>
<td>Display is not able to receive the video format</td>
<td>Check the emulated EDID; select another (e.g. emulate the EDID of the display on the input port).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Display is not able to display the video format</td>
<td>Scale the stream on HDMI in 1 and 2 ports of the transmitter or HDMI in 2 port of the transceiver to the resolution and refresh rate of the sink device.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Display is not able to display the video format</td>
<td>Scale the stream on the HDMI out 1 port of the receiver or HDMI out 2 port of the transceiver to the resolution and refresh rate of the sink device.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HDPC is disabled (TX)</td>
<td>Enable HDCP on the TX input ports.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HDPC is disabled (RX)</td>
<td>Enable HDCP on the RX output ports.</td>
<td></td>
</tr>
<tr>
<td>Not the desired picture displayed on the video output</td>
<td>Video output is set to test pattern (no sync screen) statically (RX)</td>
<td>Check No sync screen settings in the HDMI output properties (RX).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Video stream is switched to another output</td>
<td>Check the crosspoint state.</td>
<td></td>
</tr>
<tr>
<td>Colors of the video is incorrect</td>
<td>Incorrect color space setting is active (TX)</td>
<td>Check the color space settings on the TX side.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incorrect color space setting is active (RX)</td>
<td>Check the color space settings on the RX side.</td>
<td></td>
</tr>
<tr>
<td>Source locked mode cannot be set</td>
<td>The resolution of the source stream and the sink device are not the same</td>
<td>Set the scaler to passthrough mode or set the forced resolution to the same as the source stream's one.</td>
<td></td>
</tr>
<tr>
<td>Symptom</td>
<td>Root cause</td>
<td>Action</td>
<td>Refer to</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
<td>--------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>Audio signal</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No audio is present on output</td>
<td>Source audio volume is low or muted</td>
<td>Check the audio settings of the source.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The incoming audio signal is unsupported</td>
<td>Query the status of the audio output port and select a supported signal source</td>
<td>8.11.3 9.14.5</td>
</tr>
<tr>
<td></td>
<td>The analog audio output port is muted</td>
<td>Check the analog audio output port properties</td>
<td>8.11.2 9.14.1 9.14.2</td>
</tr>
<tr>
<td></td>
<td>Volume of the analog audio port is set low</td>
<td>Check the analog audio input/output port properties</td>
<td></td>
</tr>
<tr>
<td>HDMI output signal contains no audio</td>
<td>DVI EDID is emulated</td>
<td>Check the EDID and select and HDMI EDID to emulate (the setting is available in the transmitter side).</td>
<td>8.14.1 9.15</td>
</tr>
<tr>
<td>Not the desired audio can be heard on the output</td>
<td>Audio stream is switched to another output</td>
<td>Check the audio crosspoint settings.</td>
<td>8.4 9.12.1</td>
</tr>
<tr>
<td>LDC returns with ‘HBR audio not supported’ error message</td>
<td>Currently installed LDC and firmware versions does not support HBR audio</td>
<td>Update LDC, endpoint and MMU firmwares to the latest released version</td>
<td>8.1</td>
</tr>
</tbody>
</table>

**Network switch related issues** *

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Root cause</th>
<th>Action</th>
<th>Refer to</th>
</tr>
</thead>
<tbody>
<tr>
<td>No picture on the video output</td>
<td>Link aggregation is not set in the switch.</td>
<td>Create Link Aggregation Groups (LAG’s)/EtherChannels etc. for each port pair that is used.</td>
<td>5.11.1</td>
</tr>
<tr>
<td>The picture is always dropped</td>
<td>VLAN tagging is not set.</td>
<td>Set the 286 VLAN ID and add all LAGs to this VLAN.</td>
<td>5.11.2</td>
</tr>
<tr>
<td>Bandwidth problem on the network with a single 4K60 stream</td>
<td>All streams are transmitted to all outputs because IGMPv2 snooping in not enabled.</td>
<td>Enable IGMPv2 snooping.</td>
<td>5.11.3</td>
</tr>
<tr>
<td>All streams are transmitted except the 4K60 one</td>
<td>One of the 10G link cables is connected to another LAG.</td>
<td>Check the LLDP and the status of the LAGs.</td>
<td>5.11.4</td>
</tr>
</tbody>
</table>

* 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 UBEX: [https://lightware.com/media/lightware/filedownloader/file/Support-Guide/Installation_and_Network_Setup_Guide_for_UBEX.pdf](https://lightware.com/media/lightware/filedownloader/file/Support-Guide/Installation_and_Network_Setup_Guide_for_UBEX.pdf)
11. Troubleshooting

### RS-232 Signal - Endpoints

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Root cause</th>
<th>Action</th>
<th>Refer to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connected serial device does not respond</td>
<td>Cable connection problem</td>
<td>Check the connectors to fit well; check the wiring of the plugs.</td>
<td>5.4.6</td>
</tr>
<tr>
<td></td>
<td>RS-232 settings are different</td>
<td>Check the port settings of the endpoint and the connected serial device</td>
<td>8.15.2</td>
</tr>
<tr>
<td></td>
<td>Messaging via serial port is not working</td>
<td>Check the serial messaging rules and/or apply escaping in the message.</td>
<td>8.15.2</td>
</tr>
</tbody>
</table>

### RS-232 Signal - MMU

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Root cause</th>
<th>Action</th>
<th>Refer to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connected serial device does not respond</td>
<td>Cable connection problem</td>
<td>Check the connectors to fit well; check the wiring of the plugs.</td>
<td>5.4.6</td>
</tr>
<tr>
<td></td>
<td>RS-232 settings are different</td>
<td>Check the port settings of the MMU and the connected serial device.</td>
<td>14.13.1</td>
</tr>
</tbody>
</table>

### USB K+M

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Root cause</th>
<th>Action</th>
<th>Refer to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not all keyboard/mouse keys are working with K+M</td>
<td>Special function keys may not be supported in emulated mode</td>
<td>Usage of ordinary keyboards built up to 104/105 keys and ordinary mice is recommended.</td>
<td>5.4.4</td>
</tr>
</tbody>
</table>

### Miscellaneous

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Root cause</th>
<th>Action</th>
<th>Refer to</th>
</tr>
</thead>
<tbody>
<tr>
<td>I cannot find my endpoint device in the server room</td>
<td>All AV boxes and gadgets look the same.</td>
<td>Use the &quot;Identify Me&quot; feature.</td>
<td>8.9.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8.10.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9.6.7</td>
</tr>
</tbody>
</table>

### 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 (in our experience, it's usually the cable).
- Patch panels, gender changers or anything else in the signal path that can affect the transmission.
- Signal type (resolution, refresh rate, color space, deep color).
- Emulated EDID(s) (please save them as 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 (‘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:

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

Common Problems Related to EDID

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

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

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

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

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. DVI standard uses EDID data structure to identify the monitor type and capabilities. Most DVI sources (VGA cards, set top boxes, etc.) will output DVI signal after accepting the connected sink’s EDID information. In the case of EDID readout failure or missing EDID, the source will not output DVI video signal.

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

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

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

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

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

12.2. HDCP Management

Lightware Visual Engineering is a legal HDCP adopter. Several functions have been developed that help 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 still be 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.

12.2.1. Protected and Unprotected Content

Many video sources send HDCP protected signal if they detect that the sink is HDCP capable — even if the content is not copyrighted. This can cause trouble if an HDCP capable device is connected between the source and the display. In this case, the content cannot be viewed on non-HDCP capable displays and interfaces like event controllers. Rental and staging technicians often complain about certain laptops, which are always sending HDCP encrypted signals if the receiver device (display, matrix router, etc.) reports HDCP compliancy. 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.

12.2.2. Disable Unnecessary Encryption

**HDCP Compliant Sink**

Not HDCP-compliant Sink 1.

Non-HDCP compliant sink is connected to the endpoints. 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 endpoint, 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 endpoints but the source would send protected content with encryption. If HDCP is enabled on the input port of the endpoint, the source will send encrypted signal. The sink is not HDCP compliant, thus, it will not display the video signal (but blank/red/muted/etc. screen). If HDCP is disabled on the input port of the transmitter, the source will not send the signal. The solution is to replace the display device to an HDCP-capable one.

All the devices are HDCP-compliant, no manual setting is required, both protected and unprotected contents are transmitted and displayed on the sink.
12.2.3. HDCP v2.2

HDCP v2.2 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 v1, and is rather a completely different link protection. One of the main differences is the number of the allowed devices within a closed A/V system: HDCP v2.2 allows 32 devices (HDCP v1.4 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 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 v2.2 standard allows the application of 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 v2.2 Source and HDCP v1.4 Sink

In this case the signal of an HDCP v2.2 compliant source is switched to an HDCP v1.4 compliant sink device. The signal is encrypted with HDCP v2.2 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.

What Kind of Signal Will be on the Output of the Lightware Device?

See below table that summarizes the possible cases:

<table>
<thead>
<tr>
<th>Incoming Signal</th>
<th>HDCP v1.4 Compatible Sink on the Output</th>
<th>HDCP v2.2. Compatible Sink on the Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDCP v1.4</td>
<td>HDCP v1.4</td>
<td>HDCP v2.2</td>
</tr>
<tr>
<td>HDCP v2.2 (convertible)*</td>
<td>HDCP v1.4</td>
<td>HDCP v2.2</td>
</tr>
<tr>
<td>HDCP v2.2 (not convertible)*</td>
<td>Black screen</td>
<td>HDCP v2.2</td>
</tr>
</tbody>
</table>

* Stream type 0: the video stream allows the conversion of the signal to apply a lower level of encryption.
** Stream type 1 (High-value content): the video stream does not allow the conversion of the signal.
12.3. Pixel Accurate Reclocking

Signal reclocking is an essential procedure in digital signal transmission. After passing the reclocking circuit, the signal becomes stable, jitter-free, and can be transmitted over more equipment like processors, or event controllers. Without reclocking, sparkles, noise, and jaggies appear on the image.

Lightware's sophisticated Pixel Accurate Reclocking technology fixes more problems than general TMDS reclocking. It removes not only intra-pair skew, but inter-pair skew as well. The Pixel Accurate Reclocking circuit eliminates the following errors:

**Intra-pair skew**

Skew between the + and - wires within a differential wire pair (e.g. Data2- and Data2+). It’s caused by different wire lengths or slightly different wire construction (impedance mismatch) in DVI cable. It results in jitter.

**Inter-pair skew**

Skew between two differential wire pairs in a cable. It is caused by different wire pair lengths or different number of twists in the DVI cable. Too much inter-pair skew results in color shift in the picture or sync loss.

**Jitter**

Signal instability in the time domain. The time difference between two signal transitions should be a fixed value, but noise and other effects cause variations.

**Noise**

Electromagnetic interference between other electronic devices such as mobile phones, motors, etc. and the DVI cable are coupled onto the signal. Too much noise results in increased jitter.
12.4. AV Over IP

12.4.1. Basics

Besides the traditional AV matrix switches and extenders, the AV over IP or networked AV system is the biggest leading technology in the AV industry. The spreading of the technology speeds up the general increase of the usage 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.

12.4.2. 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.

* Source: https://searchnetworking.techtarget.com/definition/TCP-IP

12.4.3. Link Aggregation Protocol

The UBEX endpoints use Link Aggregation Control Protocol (LACP) to share the signal bandwidth of the streams equally between the two the SFP+ ports.

DEFINITION: The Link Aggregation Group (LAG) applies to various methods of combining (aggregating) multiple network connections in parallel in order to increase throughput beyond what a single connection could sustain.

The measurement of the bandwidth can happen via/using two different methods on the two interfaces:

- HDMI pipes: the peak bandwidth is measured, which is the summary of the video burst (horizontal (H) blanking and vertical (V) blanking).
- SFP+ links: the average bandwidth is measured.

12.4.4. Multicast DNS (mDNS) Protocol

The multicast DNS (mDNS - (multicast Domain Name System) protocol resolves host names to IP addresses within small networks that do not include a local name server. It is a zero-configuration service, using essentially the same programming interfaces, packet formats and operating semantics as the unicast Domain Name System (DNS).

The primary benefits of using mDNS is that it requires little or no administration to set up. Unless the network is specifically configured to not allow mDNS, UBEX sources will be discovered. This format works when no infrastructure is present, and can span infrastructure failures.

* Source: https://en.wikipedia.org/wiki/Multicast_DNS
13 Assembly Guides

This chapter contains step-by-step assembly guides for the UBEX series devices like the following:

- Front Plate Exchange for F-series Endpoint Devices
- SFP+ Module Changing in R-series Endpoints
- Air Filter Foam Changing in R-series Endpoints
- Hidden USB Connector for Debug Purpose
13. Front Plate Exchange for F-series Endpoint Devices

The section is about the assembling of the UBEX F-series endpoint devices that contains detailed step-by-step guides and the tool requirements.

Affected Models

The front plate can be changed on the following endpoint models:
- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110
- UBEX-PRO20-HDMI-F120

13.1. Tool Requirements

- Plastic spudger tool
- 1.3 mm hex wrench (Allen) key
- PZ1 screwdriver

13.1.2. The Steps of the Front Plate Exchange

Removal of the Front Plate

Step 1. Remove the rubber ring carefully from the jog dial knob using the plastic spudger tool.

Step 2. Find the screw in the side of the jog dial knob and use a 1.3 mm hexagon (Allen) wrench key to loosen it.

Step 3. Pull down the jog dial knob from the holder.

Step 4. Remove all six screws from the front plate using the PZ1 screwdriver.
**Step 5.** Remove the front plate from the chassis.

**Step 6.** Push out the *four light pipes* from the front plate starting from the rear side of the plate.

**Insertion of the New Front Plate**

**Step 1.** Insert the *four light pipes* to the new front plate starting from the front side of the plate. Take care of the direction of the light pipes.

**Step 2.** Place the front plate on the chassis.
Step 3. Fasten all six screws on the front plate using the PZ1 screwdriver.

Step 4. Insert the jog dial knob to the holder so that the fixing screw hole shall be over the flat part of the holder.

Step 5. Find the screw in the side of the jog dial knob and use a 1.3 mm hexagon (Allen) wrench key to fasten it.

Step 6. Place the rubber ring carefully on the jog dial knob.
13.2. SFP+ Module Changing in R-series Endpoints

The R-series endpoint devices are built with pre-installed SFP+ modules inside the enclosure. The modules can be changed by the user in a few simple steps.

WARNING! Lightware highly recommends that the following operations to be done in ESD (Electrostatic Discharge) protected environment.

Affected Models

- UBEX-PRO20-HDMI-R100 series

SFP+ Modules inside the Enclosure

<table>
<thead>
<tr>
<th>Type of the SFP+ module</th>
<th>Number of modules</th>
<th>Optical Mode</th>
<th>Wavelength</th>
</tr>
</thead>
<tbody>
<tr>
<td>2xMM-2xDUO</td>
<td>Finisar FTLX8574D3BCL</td>
<td>2</td>
<td>Multimode 850 nm</td>
</tr>
<tr>
<td>2xMM-QUAD</td>
<td>Finisar FTLX8574D3BCL</td>
<td>2</td>
<td>Multimode 850 nm</td>
</tr>
<tr>
<td>2xSM-2xDUO</td>
<td>Finisar FTLX1475D3BCL</td>
<td>2</td>
<td>Singlemode 1310 nm</td>
</tr>
<tr>
<td>2xSM-QUAD</td>
<td>Finisar FTLX1475D3BCL</td>
<td>2</td>
<td>Singlemode 1310 nm</td>
</tr>
<tr>
<td>2xSM-BiDi-DUO</td>
<td>Module A: Finisar FTLX2072D327</td>
<td>1</td>
<td>Singlemode in: 1331 nm out: 1271 nm</td>
</tr>
<tr>
<td></td>
<td>Module B: Finisar FTLX2072D333</td>
<td>1</td>
<td>Singlemode in: 1271 nm out: 1331 nm</td>
</tr>
</tbody>
</table>

Removal of the Original SFP+ Modules

Step 1. Disconnect the device from the power source.

WARNING! Never disassemble the device when it is connected to the power source. The unit is built with open frame power supply module, touching it when the device is under power is dangerous.

Step 2. Remove five screws with a PZ1 screwdriver from the left side of the device (highlighted below with green).

Step 3. Remove five screws from the right side of the device (highlighted below with green).

Step 4. Remove all five screws from the top cover of the device (highlighted below with green).

Step 5. Remove the top cover cautiously. Push the cover backwards a little, then remove it upwards.

ATTENTION! The protective ground cable is connected to the top cover. Be sure that the connection is not harmed when removing the cover.
13. Assembly Guides

**R-series endpoint device - top view in disassembled state**

Step 6. Disconnect the LC patch cable connectors 1 2 from the SFP+ modules 3.
Step 7. Pull down on the handle bar of the modules 3.
Step 8. Gently slide out the SFP+ modules 3 from the slot.

**Installation of the New SFP+ Modules**

**ATTENTION!** Always be sure of the optical mode of the new modules. 2xMM-2xDUO / 2xMM-QUAD models support **multimode**, 2xSM-2xDUO / 2xSM-QUAD / 2xSM-BiDi-DUO support **singlemode** SFP+ modules only.

Step 1. Put up on the handle bar of the new modules 3.
Step 2. Connect the modules 3 to the SFP+ port slots.
Step 3. Connect the LC patch cable connectors 1 2 to the SFP+ modules.

**ATTENTION!** Always be sure of the optical mode of the patch cables. Multimode SFP+ modules support **multimode**, singlemode SFP+ modules support **singlemode** optical cables only.

Step 4. Place back the top cover cautiously.
Step 5. Screw back all 15 screws to the top, left, and right side of the cover plate of the device.

**WARNING!** Be careful when removing and installing the patch cables and the SFP+ modules. Harming the HDMI board 4 and the motherboard 5 may cause unusable device and will void the warranty.

13.3. Air Filter Foam Changing in R-series Endpoints

The R-series endpoint devices are built with an exchangeable air filter foam in front of the fans that can be easily removed for cleaning or changing.

**Affected Models**
- UBEX-PRO20-HDMI-R100 series

**Removal of the Air Filter**

Step 1. Disconnect the device from the power source.

**WARNING!** Never remove the air filter when it is connected to the power source. The cooling fans behind the foam are in operation when the device is on, touching the spinning parts may cause injury.

Step 2. Remove the air filter foam by fingers or using a forceps or clamp.

**Parameters of the Foam**
- Size (in mm): 86W x 40H x 8D
- Material: 25ppi polyurethane air filter foam

**Installation of the Air Filter**

Place the cleaned or new air filter foam in front of the cooling fans. Take care that all corners of the foam are inside the air filter slot.
13.4. Hidden USB Connector for Debug Purpose

**Affected Models**

- UBEX-PRO20-HDMI-F100, -F110, -F120
- UBEX-PRO20-HDMI-R100 series

UBEX endpoints are built with a standard USB 2.0 mini B-type connector which is hidden under the jog dial control knob.

**ATTENTION!** The USB connector is for debug purpose. Please use it only if the Lightware Support requests it.

Follow the steps to reach the hidden USB connector:

**Step 1.** Remove the rubber ring from the jog dial knob.

**Step 2.** Find the screw in the side of the jog dial knob and use a [hexagon (Allen) key wrench size 1.3mm](#) to loosen it.

**Step 3.** Pull down the jog dial knob from the holder.

**Step 4.** The USB mini connector is available now.

![Image of the hidden USB connector](image-url)
14. Appendix

Appendix

Tables, drawings, guides, technical details, hashtag keyword list and the Quick Link Collection as follows:

- Specification
- Applied Ports (Network Settings)
- Factory Default Settings
- Content of Backup File
- Control Port Numbering of the MMU
- Endpoint Port Numbering (Stream ID Calculation)
- Release Notes of the Firmware Packages
- Resolutions of the Scaler
- Factory EDID List
- Mechanical Drawings
- Maximum Cable Extensions
- Bandwidth Requirements of the Resolutions
- Cable Wiring Guide
- Quick Link Collection
- Hashtag Keyword List
- Further Information
14.1. Specification

14.1.1. UBEX-PRO20-HDMI-F100

General

Compliance .............................................................................................................. CE, UKCA
EMC (emission) ...................................................................................................... IEC/EN 55032:2015
EMC (immunity) .................................................................................................. IEC/EN 55035:2017
RoHS ...................................................................................................................... EN 63000:2018
Electrical safety .................................................................................................... IEC/EN 62368-1:2014
TEMPEST SDIP-27 Level B certification ................................................................. Available upon request
Warranty .................................................................................................................. 3 years

Cooling ..................................................................................................................... 2x built-in fans
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 Supply

AC power connector .......................................................................................... IEC C14 receptacle
Medical compliance ........................................................................................... IEC 60601-1:2015
ITE compliance ................................................................................................... IEC 60950-1:2005
Power source ........................................................................................................ IEC 100-230 V AC, 50/60 Hz
Heat dissipation .................................................................................................. 68.9 BTU/h (min), 82.6 BTU/h (max)

Power Consumption *

<table>
<thead>
<tr>
<th>Transmitted AV signals</th>
<th>Transmitter (TX) operation mode</th>
<th>Receiver (RX) operation mode</th>
<th>Transceiver (TRX) operation mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>4K60</td>
<td>21.1 W</td>
<td>21.4 W</td>
<td>-</td>
</tr>
<tr>
<td>4K30</td>
<td>20.3 W</td>
<td>20.2 W</td>
<td>-</td>
</tr>
<tr>
<td>4K30 + 4K30</td>
<td>22.9 W</td>
<td>20.9 W</td>
<td>21.9 W</td>
</tr>
<tr>
<td>4K60 + 1080p60</td>
<td>24.2 W</td>
<td>21.4 W</td>
<td>22.8 W</td>
</tr>
<tr>
<td>4K60 + 4K30</td>
<td>22.1 W</td>
<td>21.1 W</td>
<td>21.6 W</td>
</tr>
</tbody>
</table>

* Usage of SFP+ to RJ45 modules might increase these values with 3 W approximately.

Enclosure

Rack mountable ..................................................................................................... Yes, with 1U high rack shelf
Material ................................................................................................................ 1 mm steel
Dimensions (mm/inch) .......................................................................................... 221 W x 230 D x 42.5 H / 8.7 W x 9 D x 1.6 H
Weight ..................................................................................................................... 2077 g (4.57 lbs)

Video Inputs

HDMI Input

Connector type ...................................................................................................... 19-pole HDMI Type A receptacle
Number of ports ................................................................................................... 2
Standard ................................................................................................................ DVI 1.0, HDMI 2.0
Supported resolutions at 10 bits/color * ............................................................. up to 4096x2160@60Hz (4:4:4) or 4096x2160@60Hz (4:2:2)
......................................................................................................................... up to 3840x2160@60Hz (4:4:4) or 3840x2160@60Hz (4:2:2)
......................................................................................................................... 1920x1080@60Hz (4:4:4) up to 10 bits/color
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.

Video Outputs

HDMI Output

Connector type ...................................................................................................... 19-pole HDMI Type A receptacle
Number of ports ................................................................................................... 2
Standard ................................................................................................................ DVI 1.0, HDMI 2.0
Supported resolutions at 10 bits/color * ............................................................. up to 4096x2160@60Hz (4:4:4) or 4096x2160@60Hz (4:2:2)
......................................................................................................................... up to 3840x2160@60Hz (4:4:4) or 3840x2160@60Hz (4:2:2)
......................................................................................................................... 1920x1080@60Hz (4:4:4) up to 10 bits/color
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.
**SFP+ Port Slots**

- **Number of ports**: 2
- **Supported data rate**: up to 10 Gbps
- **Accepted interfaces**: 10G SFP+ optical transceiver modules, DAC cables

**Control Ports**

- **Number of ports**: 2
- **Connector type**: Locking RJ45 female
- **Ethernet data rate**: 1000Base-T, full duplex with autodetect
- **Power over Ethernet (PoE)**: Not supported

**14.1.2. UBX-PRO20-HDMI-F110**

**General**

- **Compliance**: CE, UKCA
- **EMC (emission)**: IEC/EN 55032:2015
- **EMC (immunity)**: IEC/EN 55035:2017
- **RoHS**: EN 63000:2018
- **Electrical safety**: IEC/EN 62368-1:2014
- **Warranty**: 3 years
- **Cooling**: 2x built-in fans
- **Operating temperature**: -40°C to +95°C (+32 to +203°F)
- **Storage temperature**: -40°C to +85°C (-40°C to +185°F)
- **Operating humidity**: up to 90%, non-condensing

**Power Supply**

- **AC power connector**: IEC C14 receptacle
- **Medical compliance**: IEC 60601-1-2015
- **ITE compliance**: IEC 60950-1:2005
- **Power source**: IEC 100-230 V AC, 50/60 Hz
- **Heat dissipation**: 68.9 BTU/h (min), 82.6 BTU/h (max)

**Video Inputs**

- **Supported resolutions at 10 bits/color**:
  - 1920x1080@60Hz (4:4:4) up to 3840x2160@60Hz (4:2:2)
- **Audio formats**: DTS, DTS-HD Master Audio 7.1, WMA Pro
- **Transmitted AV signals Transmitter (TX) operation mode**
  - 4K60: 21.1 W
  - 4K30: 20.3 W
  - 4K30 + 4K30: 22.9 W
  - 4K60 + 1080p60: 24.2 W
  - 4K60 + 4K30: 22.1 W

**Transmitted AV signals Receiver (RX) operation mode**

- 4K60: 21.4 W
- 4K30: 20.2 W
- 4K30 + 4K30: 20.9 W
- 4K60 + 1080p60: 21.6 W
- 4K60 + 4K30: 21.9 W

**Power Consumption**

* Usage of SFP+ to RJ45 modules might increase these values with 3 W approximately.

**Enclosure**

- **Material**: IEC 100-230 V AC, 50/60 Hz
- **Dimensions (mm/\text{inch})**: 221W x 230D x 42.5H / 8.7W x 9D x 1.6 H
- **Weight**: CE, UKCA

**Applied endpoint firmware package**: v2.4.1
**Applied MMU firmware package**: v1.7.1
**LDC software**: v2.6.2b3

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**Applied endpoint firmware package**: v2.4.1
**Applied MMU firmware package**: v1.7.1
**LDC software**: v2.6.2b3
Video Outputs

HDMI Output

Connector type ................................................................. 19-pole HDMI Type A receptacle
Number of ports ................................................................. 2
Standard .................................................................................. DVI 1.0, HDMI 2.0
Supported resolutions at 10 bits/color* .................. up to 4096x2160@60Hz (4:4:4) or 4096x2160@60Hz (4:2:2)
.................................................................................. up to 3840x2160@60Hz (4:4:4) or 3840x2160@60Hz (4:2:2)
.................................................................................. 1920x1080@60Hz (4:4:4) up to 10 bits/color
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.

SFP+ Port Slots

Number of ports ................................................................. 2
Supported data rate ............................................................. up to 10 Gbps
Accepted interfaces .......................................................... 10G SFP+ optical transceiver modules
.................................................................................. DAC cables

Audio Ports

Analog Audio Input

Audio port connector .................................................. 5-pole Phoenix connector
Audio formats ................................................................. 2-channel PCM
Sampling frequency .......................................................... 48 kHz
Maximum input level .................................................. +4 dBu @ 0 dB Gain
Nominal Differential Output Level ....................................... +4 dBu @ 0 dB Gain
Nominal Differential Output Level ....................................... +7 dBu @ 3 dB Gain

Control Ports

Ethernet Port

Number of ports ................................................................. 3
Connector type ................................................................. Locking RJ45 female
Ethernet data rate ............................................................ 1000Base-T, full duplex with autodetect
Power over Ethernet (PoE) ................................................ Not supported
RS-232 Serial Port

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

Infrared Port

Input connector type ....................................................... 3.5 mm TRS (approx. 1/8” jack)
Output connector type .................................................... 3.5 mm TS (approx. 1/8” jack)
Input carrier frequency ...................................................... 38 kHz
Output signal ................................................................. modulated (38kHz) / not modulated (baseband)
14.1.3. UBEX-PRO20-HDMI-F120

General

Compliance .................................................................................................................. CE, UKCA
EMC (emission) ........................................................................................................... IEC/EN 55032:2015
EMC (immunity) ........................................................................................................ IEC/EN 55035:2017
RoHS ............................................................................................................................ EN 63000:2018
Electrical safety .......................................................................................................... IEC/EN 62368-1:2014
Warranty .................................................................................................................... 3 years

Cooling .......................................................................................................................... 2x built-in fans
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 Supply

AC power connector ................................................................................................... IEC C14 receptacle
Medical compliance .................................................................................................. IEC 60601-1:2015
ITE compliance .......................................................................................................... IEC 60950-1:2005
Power source ............................................................................................................ IEC 100-230 V AC, 50/60 Hz
Heat dissipation ....................................................................................................... 68.9 BTU/h (min), 82.6 BTU/h (max)

Power Consumption *

<table>
<thead>
<tr>
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<th>Transmitter (TX) operation mode</th>
<th>Receiver (RX) operation mode</th>
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</tr>
</thead>
<tbody>
<tr>
<td>4K60</td>
<td>21.1 W</td>
<td>21.4 W</td>
<td>-</td>
</tr>
<tr>
<td>4K30</td>
<td>20.3 W</td>
<td>20.2 W</td>
<td>-</td>
</tr>
<tr>
<td>4K30 + 4K30</td>
<td>22.9 W</td>
<td>20.9 W</td>
<td>21.9 W</td>
</tr>
<tr>
<td>4K60 + 1080p60</td>
<td>24.2 W</td>
<td>21.4 W</td>
<td>22.8 W</td>
</tr>
<tr>
<td>4K60 + 4K30</td>
<td>22.1 W</td>
<td>21.1 W</td>
<td>21.6 W</td>
</tr>
</tbody>
</table>

* Usage of SFP+ to RJ45 modules might increase these values with 3 W approximately.

Enclosure

Rack mountable ........................................................................................................ Yes, with 1U high rack shelf
Material .................................................................................................................... 1 mm steel
Dimensions (mm/inch) ............................................................................................ 221W x 230D x 42.5H / 8.7W x 9D x 1.6 H
Weight ..................................................................................................................... 2128 g (4.69 lbs)

Video Inputs

HDMI Input

Connector type .......................................................................................................... 19-pole HDMI Type A receptacle
Number of ports ...................................................................................................... 2
Standard .................................................................................................................... DVI 1.0, HDMI 2.0
Supported resolutions at 10 bits/color * ................................................................ up to 4096x2160@60Hz (4:4:4) or 4096x2160@60Hz (4:2:2)
.......................................................................................................................... up to 3840x2160@60Hz (4:4:4) or 3840x2160@60Hz (4:2:2)
.......................................................................................................................... 1920x1080@60Hz (4:4:4) up to 10 bits/color
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 600Hz (HDMI 2.0) are supported.

Video Outputs

HDMI Output

Connector type .......................................................................................................... 19-pole HDMI Type A receptacle
Number of ports ...................................................................................................... 2
Standard .................................................................................................................... DVI 1.0, HDMI 2.0
Supported resolutions at 10 bits/color * ............................................................. up to 4096x2160@60Hz (4:4:4) or 4096x2160@60Hz (4:2:2)
.......................................................................................................................... up to 3840x2160@60Hz (4:4:4) or 3840x2160@60Hz (4:2:2)
.......................................................................................................................... 1920x1080@60Hz (4:4:4) up to 10 bits/color
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 600Hz (HDMI 2.0) are supported.
### SFP+ Port Slots
Number of ports: 2  
Supported data rate: up to 10 Gbps  
Accepted interfaces: 10G SFP+ optical transceiver modules and DAC cables

### Audio Ports
#### Analog Audio Input
Audio port connector: 5-pole Phoenix connector  
Audio formats: 2-channel PCM  
Sampling frequency: 48 kHz  
Maximum input level: +0 dBu, 0.77 Vrms, 2.19 Vpp  
Signal transmission: Balanced / unbalanced signal  
Volume range: -95 to 0 dB  
Balance: -100 to 100 (0° center)  
Gain: -12 to 35 dB

#### Analog Audio Output
Audio port connector: 5-pole Phoenix connector  
Audio formats: 2-channel PCM  
Sampling frequency: 48 kHz  
Volume range: -57 to 0 dB  
Balance: -100 to 100 (0° center)  
Nominal Differential Output Level: +4 dBu @ 0 dB Gain  
Nominal Differential Output Level: +7 dBu @ 3 dB Gain

### Control Ports
#### Ethernet Port
Number of ports: 3  
Connector type: Locking RJ45 female  
Ethernet data rate: 1000Base-T, full duplex with autodetect  
Power over Ethernet (PoE): Not supported

### RS-232 Serial Port
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

### Infrared Port
Input connector type: 3.5 mm TRS (approx. 1/8" jack)  
Output connector type: 3.5 mm TS (approx. 1/8" jack)  
Input carrier frequency: 38 kHz  
Output signal: modulated (38kHz) / not modulated (baseband)

### USB-A Ports
Connector type: USB A-type receptacle  
Number of ports: 2  
USB compliance: USB 2.0  
Device class: HID

### USB-B Port
Connector type: USB B-type receptacle  
Number of ports: 1  
USB compliance: USB 2.0  
Device class: HID

### UBEX-PRO20-HDMI-R100 series

#### General
Compliance: CE, UKCA  
EMC (immunity): IEC/EN 55035:2017  
RoHS: EN 63000-2018  
Warranty: 3 years  
Cooling: 2x built-in fans
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 Supply**
AC power connector ......................................................... Neutrik powerCON TRUE1 NAC3MPX-WOT receptacle
Medical compliance ......................................................... IEC 60601-1:2015
ITE compliance ............................................................... IEC 60950-1:2005
Power source ................................................................. IEC 100-230 V AC, 50/60 Hz
Heat dissipation ............................................................. 68.9 BTU/h (min), 82.6 BTU/h (max)

**Power Consumption**

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<td>4K30 + 4K30</td>
<td>22.9 W</td>
<td>20.9 W</td>
<td>21.9 W</td>
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<tr>
<td>4K60 + 1080p60</td>
<td>24.2 W</td>
<td>21.4 W</td>
<td>22.8 W</td>
</tr>
<tr>
<td>4K60 + 4K30</td>
<td>22.1 W</td>
<td>21.1 W</td>
<td>21.6 W</td>
</tr>
</tbody>
</table>

**Enclosure**
Rack mountable .......................................................... Yes
Material ........................................................................ 1 mm steel
Dimensions (mm/inch) .................................................. 221W x 364D x 42.5H / 8.7W x 14.3D x 1.6H
Weight ...................................................................... 2077 g (4.57 lbs)

**Video Inputs**

**HDMI Input**
Connector type .......................................................... 19-pole HDMI Type A receptacle
Number of ports .......................................................... 2
Standard ................................................................. DVI 1.0, HDMI 2.0
Supported resolutions at 10 bits/color * .................. up to 4096x2160@60Hz (4:4:4) or 4096x2160@60Hz (4:2:2)
........................................................................... up to 3840x2160@60Hz (4:4:4) or 3840x2160@60Hz (4:2:2)
........................................................................... 1920x1080@60Hz (4:4:4) up to 10 bits/color
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.

**Fiber Optical Ports**
2xMM-2xDUO
Number of ports .......................................................... 2
Connector type .......................................................... Neutrik opticalCON DUO NO2-4FDW-A
SFP+ modules in the enclosure ..................................... 2x Finisar FTLX8574D3BCL
Optical mode ............................................................ Multimode
Wavelength ............................................................... 850 nm

2xSM-2xDUO
Number of ports .......................................................... 2
Connector type .......................................................... Neutrik opticalCON DUO NO2-4FDW-A
SFP+ modules in the enclosure ..................................... 2x Finisar FTLX1475D3BCL
Optical mode ............................................................ Singlemode
Wavelength ............................................................... 1310 nm

---

Applied endpoint firmware package: v2.4.1 | Applied MMU firmware package: v1.7.1 | LDC software: v2.6.2b3
### 2xMM-QUAD

Number of ports ................................................................. 1
Connector type ................................................................. Neutrik opticalCON QUAD NO4FDW-A
SFP+ modules in the enclosure ................................................ 2x Finisar FTLX8574D3BCL
Optical mode ........................................................................ Multimode
Wavelength ........................................................................ 850 nm

### 2xSM-QUAD

Number of ports ................................................................. 1
Connector type ................................................................. Neutrik opticalCON QUAD NO4FDW-A
SFP+ modules in the enclosure ................................................ 2x Finisar FTLX1475D3BCL
Optical mode ........................................................................ Singlemode
Wavelength ........................................................................ 1310 nm

### 2xSM-BIDI-DUO

Number of ports ................................................................. 1
Connector type ................................................................. Neutrik opticalCON DUO NO2-4FDW-A
SFP+ modules in the enclosure ................................................ 1x Finisar FTLX2072D327
Optical mode ........................................................................ Singlemode
Wavelength ........................................................................ 1271 nm, 1331 nm

### Control Ports

**Ethernet Port**
- Connector type ................................................................. Neutrik etherCON NE8FDV-YK
- Number of ports - 2xMM-2xDUO / 2xSM-2xDUO: ......................................................... 1
- Number of ports - 2xMM-QUAD / 2xSM-QUAD / 2xSM-BIDI-DUO: ............................ 2
- Ethernet data rate ................................................................. 1000Base-T, full duplex with autodetect
- Power over Ethernet (PoE) .............................................................. Not supported

### 14.1.5. UBEX-MMU-X200

#### General
- Compliance ........................................................................ CE, UKCA
- EMC (emission) ................................................................. IEC EN 55032:2015
- EMC (immunity) ................................................................. IEC EN 55035:2017
- RoHS ............................................................................... EN 63000:2018
- 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
- AC power connector ........................................................ IEC C14 receptacle
- Power source ..................................................................... IEC 100-230 V AC, 50/60 Hz
- Power consumption ......................................................... 3 W
- Heat dissipation ................................................................ 10.2 BTU/h

#### Enclosure
- Rack mountable ................................................................ Yes
- Material ........................................................................... 1 mm steel
- Dimensions in mm ............................................................. 482W x 150D x 43.9H
- Weight ............................................................................... 1897 g (4,18 lbs)

#### Control Ports for UBEX Network

**SFP Port Slot**
- Supported data rate ............................................................. up to 1 Gbps
- Accepted interfaces ............................................................. SFP optical transceiver module
- DAC cable ...........................................................................
14.2. Applied Ports (Network Settings)

The following ports are necessary to pass via a network switch/firewall for a proper working between the device and the softwares:

<table>
<thead>
<tr>
<th>Purpose/function</th>
<th>Affected software</th>
<th>Protocol</th>
<th>Port nr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firmware update TFTP</td>
<td>LDU2</td>
<td>UDP</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UDP</td>
<td>50000</td>
</tr>
<tr>
<td>Device Discovery</td>
<td>LDC</td>
<td>UDP</td>
<td>234.0.0.251:5353</td>
</tr>
<tr>
<td>Remote IP</td>
<td>LDC</td>
<td>UDP</td>
<td>230.76.87.82:37421</td>
</tr>
<tr>
<td>LW3 protocol</td>
<td>-</td>
<td>TCP</td>
<td>6107</td>
</tr>
<tr>
<td>HTTP port</td>
<td>-</td>
<td>TCP</td>
<td>80</td>
</tr>
<tr>
<td>RS-232 command injection</td>
<td>-</td>
<td>TCP</td>
<td>8001, 8002</td>
</tr>
<tr>
<td>IR command injection</td>
<td>-</td>
<td>TCP</td>
<td>9001, 9002, 9003, 9004</td>
</tr>
</tbody>
</table>
### 14.3. Factory Default Settings

#### 14.3.1. UBEX-PRO20-HDMI-F100 / R100 series

<table>
<thead>
<tr>
<th>Parameter</th>
<th>General settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device label (F100)</td>
<td>UBEX-PRO20-HDMI-F100</td>
</tr>
<tr>
<td>Device label (R100 series)</td>
<td>UBEX-PRO20-HDMI-R100 &lt;variant&gt;</td>
</tr>
<tr>
<td>Operation mode</td>
<td>Keeps the current operation mode</td>
</tr>
<tr>
<td>Display backlight</td>
<td>10</td>
</tr>
<tr>
<td>Jog dial rotary direction</td>
<td>Clockwise (CW down)</td>
</tr>
<tr>
<td>Video input port settings</td>
<td>(TX - HDMI in 1 and 2 / TRX - HDMI in 2)</td>
</tr>
<tr>
<td>HDCP authentication</td>
<td>Enabled</td>
</tr>
<tr>
<td>Stream enable</td>
<td>Enabled</td>
</tr>
<tr>
<td>Emulated EDID on the inputs</td>
<td>Dynamic</td>
</tr>
<tr>
<td>Video output port settings</td>
<td>(RX - HDMI out 1 and 2 / TRX - HDMI out 1)</td>
</tr>
<tr>
<td>HDCP mode</td>
<td>Depends on input (Auto)</td>
</tr>
<tr>
<td>Power 5V mode</td>
<td>Always on</td>
</tr>
<tr>
<td>Timing mode</td>
<td>Free run</td>
</tr>
<tr>
<td>No sync screen mode</td>
<td>Always off</td>
</tr>
<tr>
<td>No sync screen color</td>
<td>R: 128, G: 128, B: 128 (grey)</td>
</tr>
<tr>
<td>Local video input port settings</td>
<td>(RX - HDMI in 1 and 2)</td>
</tr>
<tr>
<td>HDCP authentication</td>
<td>Enabled</td>
</tr>
<tr>
<td>Emulated EDID on the inputs</td>
<td>Dynamic</td>
</tr>
<tr>
<td>Local video output port settings</td>
<td>(TX - HDMI out 1 and 2)</td>
</tr>
<tr>
<td>HDCP mode</td>
<td>Auto</td>
</tr>
<tr>
<td>Power 5V mode</td>
<td>Always on</td>
</tr>
<tr>
<td>No sync screen mode</td>
<td>Always off</td>
</tr>
<tr>
<td>No sync screen color</td>
<td>R: 128, G: 128, B: 128 (grey)</td>
</tr>
<tr>
<td>Source MUX settings</td>
<td></td>
</tr>
<tr>
<td>RX - HDMI out 1</td>
<td>Stream (D1)</td>
</tr>
<tr>
<td>RX - HDMI out 2</td>
<td>Stream (D2)</td>
</tr>
<tr>
<td>TRX - HDMI out 2</td>
<td>HDMI in 2 (I2)</td>
</tr>
<tr>
<td>Scaler settings</td>
<td>(TX - HDMI in 1 and 2 / RX - HDMI out 1 and 2 / TRX - HDMI in 2 and HDMI out 1)</td>
</tr>
<tr>
<td>Scaler enable</td>
<td>Disabled (Passthrough mode)</td>
</tr>
<tr>
<td>Scale to</td>
<td>1920x1080p60</td>
</tr>
<tr>
<td>Image position</td>
<td>Fit</td>
</tr>
<tr>
<td>Color space conversion (CSC)</td>
<td>No conversion</td>
</tr>
<tr>
<td>Color range</td>
<td>No conversion</td>
</tr>
<tr>
<td>Network settings</td>
<td></td>
</tr>
<tr>
<td>Static IP address - TX mode</td>
<td>192.168.0.101</td>
</tr>
<tr>
<td>Static IP address - RX mode</td>
<td>192.168.0.102</td>
</tr>
<tr>
<td>Static IP address - TRX mode</td>
<td>192.168.0.101</td>
</tr>
<tr>
<td>DHCP (dynamic IP address)</td>
<td>Disabled</td>
</tr>
<tr>
<td>Subnet mask</td>
<td>255.255.255.0</td>
</tr>
<tr>
<td>Static gateway</td>
<td>192.168.0.1</td>
</tr>
<tr>
<td>LW3 port number</td>
<td>6107</td>
</tr>
<tr>
<td>HTTP port number</td>
<td>80</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
</tr>
<tr>
<td>Application mode</td>
<td>Auto</td>
</tr>
<tr>
<td>Dark mode</td>
<td>Disabled</td>
</tr>
<tr>
<td>Control lock</td>
<td>Disabled</td>
</tr>
<tr>
<td>Unique port names</td>
<td>Cleared</td>
</tr>
<tr>
<td>Unique device label</td>
<td>Cleared</td>
</tr>
<tr>
<td>User EDIDs</td>
<td>Not cleared</td>
</tr>
</tbody>
</table>
14.3.2. UBEX-PRO20-HDMI-F110 / F120

### General settings
- **Device label**: UBEX-PRO20-HDMI-F110
- **Operation mode**: Keeps the current operation mode
- **Display backlight**: 10
- **Jog dial rotary direction**: Clockwise (CW down)

### Video input port settings
- (TX - HDMI in 1 and 2 / TRX - HDMI in 2)
  - **HDCP authentication**: Enabled
  - **Stream enable**: Enabled
  - **Emulated EDID on the inputs**: Dynamic

### Video output port settings
- (RX - HDMI out 1 and 2 / TRX - HDMI out 1)
  - **HDCP mode**: Depends on input (Auto)
  - **Power 5V mode**: Always on
  - **Timing mode**: Free run
  - **No sync screen mode**: Always off
  - **No sync screen color**: R: 128, G: 128, B: 128 (grey)

### Local video input port settings
- (RX - HDMI in 1 and 2)
  - **HDCP authentication**: Enabled
  - **Emulated EDID on the inputs**: Dynamic

### Local video output port settings
- (TX - HDMI out 1 and 2 / TRX - HDMI out 2)
  - **HDCP mode**: Auto
  - **Power 5V mode**: Always on
  - **No sync screen mode**: Always off
  - **No sync screen color**: R: 128, G: 128, B: 128 (grey)

### Scaler settings
- (TX - HDMI in 1 and 2 / RX - HDMI out 1 and 2 / TRX - HDMI in 2 and HDMI out 1)
  - **Scaler enable**: Disabled (Pass-through mode)
  - **Scale to**: 1920x1080p60
  - **Image position**: Fit
  - **Color space conversion (CSC)**: No conversion
  - **Color range**: No conversion

### Source MUX settings
- **RX - HDMI out 1**: Stream (D1)
- **RX - HDMI out 2**: Stream (D2)
- **TRX - HDMI out 2**: HDMI in 2 (I2)

### Analog audio input port properties
- **Volume**: 0.00 dB (100%)
- **Gain**: 0.00 dB

### Analog audio output port properties
- **Volume**: 0.00 dB (100%)
- **Gain**: 0.00 dB

### Network settings
- **Static IP address - TX mode**: 192.168.0.101
- **Static IP address - RX mode**: 192.168.0.102
- **Static IP address - TRX mode**: 192.168.0.101
- **DHCP (dynamic IP address)**: Disabled
- **Subnet mask**: 255.255.255.0
- **Static gateway**: 192.168.0.1
- **LW3 port number**: 6107
- **HTTP port number**: 80

### RS-232 port settings
- **Operation mode**: Command injection
- **TCP port**: 8001
- **Configuration**: 57600 BAUD 8N1

### Miscellaneous
- **Application mode**: Auto
- **Dark mode**: Disabled
- **Control lock**: Disabled
- **Unique port names**: Cleared
- **Unique device label**: Cleared
- **User EDIDs**: Not cleared
14.3.3. UBEX-MMU-X200

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting/Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network settings</td>
<td></td>
</tr>
<tr>
<td>IP address</td>
<td>192.168.0.100</td>
</tr>
<tr>
<td>Subnet mask</td>
<td>255.255.255.0</td>
</tr>
<tr>
<td>Static gateway</td>
<td>192.168.0.1</td>
</tr>
<tr>
<td>DHCP</td>
<td>Disabled</td>
</tr>
<tr>
<td>LW3 port number</td>
<td>6107</td>
</tr>
<tr>
<td>RS-232 port configuration</td>
<td>BAUD 115200 8N1</td>
</tr>
<tr>
<td>UBEX matrix</td>
<td></td>
</tr>
<tr>
<td>Database of claimed endpoints;</td>
<td></td>
</tr>
<tr>
<td>Crosspoint settings;</td>
<td></td>
</tr>
<tr>
<td>Stream names;</td>
<td></td>
</tr>
<tr>
<td>Device names;</td>
<td></td>
</tr>
<tr>
<td>Tags;</td>
<td></td>
</tr>
<tr>
<td>Port properties;</td>
<td></td>
</tr>
<tr>
<td>Scaler / FRC / CSC / Color range settings;</td>
<td></td>
</tr>
<tr>
<td>Video wall configuration.</td>
<td></td>
</tr>
<tr>
<td>Endpoint license</td>
<td>Not cleared</td>
</tr>
</tbody>
</table>

14.4. Content of Backup File

The backup file contains numerous settings and parameters saved from the device. When the file is uploaded to a device, the following will be overwritten.

INFO: The configuration settings of the endpoint devices are stored in the MMU in Matrix application mode.

For the procedure of the backup and restore function, see the details in the System Tab section.

14.5. Control Port Numbering of the MMU

<table>
<thead>
<tr>
<th>Description</th>
<th>Port number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial control ports</td>
<td></td>
</tr>
<tr>
<td>RS-232 1</td>
<td>P1</td>
</tr>
<tr>
<td>RS-232 2</td>
<td>P2</td>
</tr>
</tbody>
</table>

Applied endpoint firmware package: v2.4.1 | Applied MMU firmware package: v1.7.1 | LDC software: v2.6.2b3
14.6. Endpoint Port Numbering (Stream ID Calculation)

All endpoint devices which are connected to the UBEX matrix got a logical device ID generated by the MMU.

**DEFINITION:** Logical device ID means the MMU assigns a number to the endpoints ordered by the discovery.

The stream ID is based on the logical device ID. The registered endpoint can be transmitter, receiver, or transceiver. All transmitters have two inputs, all receivers have two outputs, and all transceivers have one input and one output. The first discovered endpoint gets the X1 logical device ID, the HDMI port 1 of the endpoint is always the 01 number, the HDMI port 2 is always the 02 number. If the endpoint has input port (TX / TRX), it is signed with S as Source, if it has output port (RX / TRX), it is signed with D as Destination. The formula of the stream ID is the following:

```
<Port_type><Logical_device_ID><Port_number>
```

Two endpoint devices cannot be assigned to the same logical device ID. The number is always calculated for the endpoints independently from the operation mode.

**INFO:** The logical device ID (and the order of the endpoints) can be changed by the LDC software (see the details in the Device Map section) or by LW3 protocol command (see the details in the Assigning an Endpoint to a Logical Device ID section).

**Example**

The following table helps to clear up the calculation of the stream ID:

<table>
<thead>
<tr>
<th>Operation mode</th>
<th>Port number</th>
<th>Stream ID</th>
<th>Discovery order</th>
</tr>
</thead>
<tbody>
<tr>
<td>TX</td>
<td>HDMI in 1</td>
<td>S101</td>
<td>1.</td>
</tr>
<tr>
<td></td>
<td>HDMI in 2</td>
<td>S102</td>
<td></td>
</tr>
<tr>
<td>RX</td>
<td>HDMI out 1</td>
<td>D201</td>
<td>2.</td>
</tr>
<tr>
<td></td>
<td>HDMI out 2</td>
<td>D202</td>
<td></td>
</tr>
<tr>
<td>TRX</td>
<td>HDMI in 2</td>
<td>S302</td>
<td>3.</td>
</tr>
<tr>
<td></td>
<td>HDMI out 1</td>
<td>D301</td>
<td></td>
</tr>
</tbody>
</table>

---

14.7. Release Notes of the Firmware Packages

14.7.1. Endpoint Series

Valid for the following models:
- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110
- UBEX-PRO20-HDMI-F120
- UBEX-PRO20-HDMI-R100 series

**v2.4.1b13**

Release date: 2022-09-13

**New feature:**
- We fixed some known issue in the firmware of the portprocessor, like random black screen on the output after rebooting.
- Added the scaler function for the second video pipe in transmitter mode.

**Bugfix:**
- We fixed the random initialization issue of video pipe at some resolutions (e.g. 2912x2184p60).

---

**v2.3.3b10**

Release date: 2022-07-25

**New feature:**
- Incompatibility issue with newer version of AVI info frame is fixed. AVI info frame version 4 is converted to version 2.

---

**v2.3.2b4**

Release date: 2022-06-16

**New feature:**
- Fixed the RJ45 converter module test issue of the EOL T (production).

**Bugfix:**
- Some resolutions (e.g. 2080x2184p60) didn't work properly, so we improved our bandwidth calculation algorithm and fixed this issue.

---

**v2.3.1b1**

Release date: 2022-02-11

**Bugfix:**
- Fixed an End-of-Line Test (EOLT) reboot issue.
### v2.3.0b1
Release date: 2022-02-09

**New feature:**
- USB KM (HID devices such as keyboard, mouse) extension added to the firmware. Only the F120 hardware version and currently only the emulated transmission mode are supported.
- Support for the "SFP+ to RJ45" converter module has been added to the firmware. In this case, the minimum fan speed is 2500 rpm.

### v2.1.0b3
Release date: 2021-09-01

**New feature:**
- The scaling module was also added to the second video pipe in receiver mode. Both outputs of UBEX receivers are scalable.
- The scaling module was also added to the input video pipe in transceiver mode. Both input and output of UBEX transceivers are scalable.

### v2.0.0b6
Release date: 2021-06-18

**New feature:**
- Added HBR audio support
- Replaced HDMI IP core and driver
- Fixed sync polarity handling

**Bugfix:**
- Fixed glitches with Channel Status display in audio nodes
- Fixed frame detector values for 4:2:0 signals
- Fixed reliability issues with audio signal type detection and pass-through
- Fixed LW3 error with SFP Compatible property when not seated

### v1.5.5b3
Release date: 2020-12-17

**Bugfix:**
- Fixed 4:2:2 10-bit video transmission
- Fixed issues with 2.1 or more audio channels

### v1.5.4b1
Release date: 2020-10-07

**Bugfix:**
- Fixed the video timing and audio bug.
• Added support for automatic video freeze on signal loss as a NoSync option
• Added copy feature to TRX mode
• Added support for manual video freeze
• Added support for Dark Mode
• Updated video processing latency calculations (fixes tearing and flickering issues in some setups)
• Added processing latency property to video pipes
• Added support for altering Color Range
• Added overall Health Status properties

Bugfix:
• SCDC registers are only modified, if the connected display supports this protocol.
• 4k60 resolution was not transmitted to displays, which were 4k60 capable, but did not report SCDC capability in EDID, such as LG27UD58. Fixed.
• Fixed video tearing when converting between 60 and 24 Hz
• Fixed a glitch with EDID caching
• Fixed a glitch with HDMI outputs after operation mode change (TX/RX/TRX)
• Fixed a glitch with TMDS clocks between 310 and 340 MHz (e.g. 3440x1440p60)
• Fixed artifacts with video wall at 4K60
• Fixed HDMI audio node 'Connected' state
• Improved support for newer SFP+ standards (OM3/OM4 and copper lengths)
• Fixed a glitch that could cause an additional delay of one frame

v1.4.2b4
Release date: 2020-01-30

New feature:
• Added option to force HDCP 2.2 Type 1 Content on outputs

Bugfix:
• Fixed glitches with settings storage and factory defaults restoration
• Improved support for updating devices that are already in service mode

v1.4.1b2
Release date: 2019-12-03

Bugfix:
• Fixed a glitch with input scaler configuration storage
• Optimized runtime memory usage

Addendum

v1.4.0b4
Release date: 2019-11-27

New feature:
• Added check to refuse downgrading to earlier versions

Bugfix:
• Added file system in order to cope with bad NAND flash blocks
• Improved stability for multicast update

v1.3.2b2
Release date: 2019-08-14

New feature:
• Fixed issues with using the 10.0.0.0/8 IP range for control

v1.3.1b5
Release date: 2019-07-02

New feature:
• Added support for No Sync Screen generation on TX/TRX sources (for network diagnostics)
• Added support for LDC Orientation Preference setting
• Improved LLDP support (reporting operation mode and package version)
• Added identify() method to S and O nodes
• Fixed channel status data for analog audio inputs
• Refined fan control (silent operation)
• Added support for R100 part numbers
• Added support for IR in F110
• Added support for centralized firmware update

Bugfix:
• Fixed a glitch with some 10G switches not switching streams automatically

Known issue:
• Video output is unstable when scaling a pre-cropped image to 4K@60
New feature:
- Added support for Transceiver mode
- Added support for scaling to the default resolution of the attached display (EDID-based scaling)
- Added support for F110 variant (analog audio in/out, RS-232)
- Added support for upgrading endpoints in matrix mode with LDU2

Bugfix:
- Signal properties are reported on unconnected outputs as well
- All RX/TX mode related settings are cleared when operation mode is changed
- Fixed issues with fan control
- Added support for LW3 configuration backup and restore
- Fixed issue with color space conversion for DVI inputs
- Fixed a glitch with updating dynamic EDIDs
- Improved stability of the embedded bootloader

Bugfix:
- Signal properties are reported on unconnected outputs as well
- All RX/TX mode related settings are cleared when operation mode is changed
- Fixed issues with fan control
- Added support for LW3 configuration backup and restore
- Fixed issue with color space conversion for DVI inputs
- Fixed a glitch with updating dynamic EDIDs
- Improved stability of the embedded bootloader

New feature:
- Source locked mode is now supported.
- Scaling and frame rate conversion are also supported on transmitter side.
- The frame rate converter and scaler modules support image cropping in case of downscaling in center image position.
- 12-bit deep color HDMI signals can be transmitted in 10 bit mode.

Bugfix:
- 4K60 4:4:4 and 4K30 4:4:4 signals can be passed through at the same time.
- SCDC registers are only modified, if the connected display supports this protocol.

New feature:
- 12-bit deep color HDMI signals can be transmitted in 10 bit mode.

Bugfix:
- 4K60 4:4:4 and 4K30 4:4:4 signals can be passed through at the same time.
- SCDC registers are only modified, if the connected display supports this protocol.

New feature:
- Incompatibility issue with newer version of AVI info frame is fixed. AVI info frame version 4 is converted to version 2.
- We fixed some known issue in the firmware of the portprocessor, like random black screen on the output after rebooting.
- Added the scaler function for the second video pipe in transmitter mode.
- Added new version of endpoint firmware (v2.4.1) and embedded web (v2.6.0).

Bugfix:
- We fixed the random initialization issue of video pipe at some resolutions (e.g. 2912x2184p60).
v1.7.0b8
Release date: 2022-07-01

New feature:
- Fixed the RJ45 converter module test issue of the EOLT (production).
- Endpoint limitation has been introduced in the MMU produced with a new part number in order to provide smaller and cheaper systems to customers; a new license allows upgrading the endpoint limitation even in the field.

Bugfix:
- Fixed the regression error of the optical connection of the MMU (1G SFP interface).
- Fixed the regression error of the RS-232 interface of the MMU.

Endpoint (v2.3.2b4)

New feature:
- Fixed the RJ45 converter module test issue of the EOLT (production).

Bugfix:
- Some resolutions (e.g. 2080x2184p60) didn’t work properly, so we improved our bandwidth calculation algorithm and fixed this issue.

v1.6.2b2
Release date: 2022-05-03

Bugfix:
- Some resolutions (e.g. 2080x2184p60) didn’t work properly, so we improved our bandwidth calculation algorithm and fixed this issue.

v1.6.1b1
Release date: 2022-02-11

Endpoint (v2.3.1b1)

Bugfix:
- Fixed an End-of-Line Test (EOLT) reboot issue.

v1.6.0b10
Release date: 2022-02-09

New feature:
- USB KM (HID devices such as keyboard, mouse) extension added to the firmware. Only the F120 hardware version and currently only the emulated transmission mode are supported.
- USB KM (HID devices such as keyboard, mouse) layer added to the firmware. Only the F120 hardware version and currently only the emulated transmission mode are supported. Seamless switching is supported. Only point to point connections are possible.
- Support for the “SFP+ to RJ45” converter module has been added to the firmware. In this case, the minimum fan speed is 2500 rpm.

New feature:
- Added new version of endpoint firmware (v2.1.0) and embedded web (v2.3.0).
- Changed the frame rate converter section of the scaler in TRX mode on the GUI.
- Changed the frame rate converter section of the scaler in RX mode on the GUI.

Bugfix:
- Bugfix for Edit Videowall button.
- Crosspoint state recovery process failure bugfix.

v1.4.0b2
Release date: 2021-06-18

New feature:
- Added new version of endpoint firmware (v2.0.0).

Endpoint (v2.0.0b6)

New feature:
- Added HBR audio support
- Replaced HDMI IP core and driver
- Fixed sync polarity handling

Bugfix:
- Fixed glitches with Channel Status display in audio nodes
- Fixed frame detector values for 4:2:0 signals
- Fixed reliability issues with audio signal type detection and pass-through
- Fixed LW3 error with SFP Compatible property when not seated
<table>
<thead>
<tr>
<th>Version</th>
<th>Release date</th>
<th>New feature</th>
<th>Bugfix</th>
</tr>
</thead>
</table>
| v1.3.4b1 | 2020-12-17   | - Added new version of endpoint firmware (v1.5.5). | - Fixed 4:2:2 10-bit video transmission  
|          |              |    | - Fixed issues with 2.1 or more audio channels |
| v1.3.3b2 | 2020-11-03   | - UBEX System Configurator updated to the latest version, v1.0.1b1.  
|          |              | - Added new version of endpoint firmware (v1.5.2).  
|          |              | - Added new version of embedded web (v2.1.0).  
|          |              | - Added new version of endpoint firmware (v1.5.4b1).  
|          |              |    | - Async Command resender queue implemented to ensure the failed commands resend.  
|          |              |    | - We have updated the factory EDID list. |
| v1.3.0b6 | 2020-05-13   | - Support video freeze function.  
|          |              | - Support the dark mode function in the endpoints.  
|          |              | - Support the HDCP 2.2 Type 1 forcing function in the endpoints.  
|          |              | - The LLDP information of endpoints added to log.  
|          |              | - Copy function (RX, TRX) and local inputs in RX added.  
|          |              | - Added new Endpoint firmware (v1.5.0) and new embedded web (v2.0.0) |

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**Endpoint (v1.5.2b1)**  
**Bugfix:**  
- Fixed a compatibility issue with older LDU2 releases  
- Fixed reliability problems with the HTTP server component  
- Fixed an issue with pre-v1.4.0 migration support  
- Fixed flash storage support that caused boot loops on some devices  

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**Endpoint (v1.5.1b1)**  
**Bugfix:**  
- Fixed a bug with IR reception  

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**Endpoint (v1.5.0b8)**  
**New feature:**  
- Extended Identify Me feature to RJ45 ports  
- Added support for cropper on secondary video pipe  
- Added Compatible property to SFP nodes  
- Added home screen to LCD menu  
- Added local input loopback and copy features to RX mode  
- Added support for automatic video freeze on signal loss as a NoSync option  
- Added copy feature to TRX mode  
- Added support for manual video freeze
• Added support for Dark Mode
• Updated video processing latency calculations (fixes tearing and flickering issues in some setups)
• Added processing latency property to video pipes
• Added support for altering Color Range
• Added overall Health Status properties

**Bugfix:**
• Fixed video tearing when converting between 60 and 24 Hz
• Fixed a glitch with EDID caching
• Fixed a glitch with HDMI outputs after operation mode change (TX/RX/TRX)
• Fixed a glitch with TMDS clocks between 310 and 340 MHz (e.g. 3440x1440p60)
• Fixed artifacts with video wall at 4K60
• Fixed HDMI audio node 'Connected' state
• Improved support for newer SFP+ standards (OM3/OM4 and copper lengths)
• Fixed a glitch that could cause an additional delay of one frame

**v1.2.2b1**
Release date: 2020-01-30

**New feature:**
• Added new version of Endpoint's firmware (v1.4.2b4)
• The embedded web supports to force HDCP 2.2 Type 1 Content on outputs.

**Endpoint (v1.4.2b4)**

**New feature:**
• Added option to force HDCP 2.2 Type 1 Content on outputs

**Bugfix:**
• Fixed glitches with settings storage and factory defaults restoration
• Improved support for updating devices that are already in service mode

**v1.2.1b1**
Release date: 2019-12-04

**Bugfix:**
• Added new version of Endpoint’s firmware (v1.4.1b2)
### v1.1.0b10
Release date: 2019-07-02

**New feature:**
- Grid Video Wall is implemented.
- Centralized System Update is available - The Firmware update of the Endpoints are managed by the MMU.
- Adding support of Rental Endpoints.
- Command injection to IR endpoint ports is available.

**Bugfix:**
- Adding missing 4K EDIDs (F146 - F148) to the Factory EDID list.
- Fixing RemoteIP problem by implementing periodic membership report to multicast groups.
- Fixing crash caused by TcpTunnel in debug mode.

### v1.0.6b10
Release date: 2019-05-03

**New feature:**
- Supports UBEX-PRO20G-HDMI-F110 endpoints (Analog audio input and output, RS-232)
- Supports TRX2 mode for UBEX-PRO20G-HDMI-F100 and UBEX-PRO20G-HDMI-F110 endpoints
- Video and Audio cross-point Tile View
- Redesigned device properties
- Supports configuration and tagging of RS-232 and Ethernet endpoint ports
- Command injection to RS-232 endpoint ports is available
- NTP client is available

**Bugfix:**
- General improvements on stability

### v1.0.4b1
Release date: 2018-11-20

**Bugfix:**
- Fixed configuration loss during backup-restore and firmware update. This issue was only present in package version 1.0.3b1. Please be sure to store a backup of your configuration before upgrading from v1.0.3b1 to v1.0.4b1. Upgrades from other versions are not affected.

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### v1.0.3b1
Release date: 2018-11-09

**Bugfix:**
- Fixed a bug that caused the MMU not being able to reload the configurations for the endpoints with 918200## part number after the reset of the MMU.

### v1.0.2b1
Release date: 2018-09-25

**Bugfix:**
- LCD re-initialization issue is fixed.

### v1.0.1b5
Release date: 2018-09-25

**New feature:**
- Basic LCD menu is available to set Network settings and reset the Ubex MMU to factory defaults.
- System log viewer is available in the built-in web control software.
- The MMU built-in web control software is available.

### v1.0.0b6
Release date: 2018-07-05

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Applied endpoint firmware package: v2.4.1  |  Applied MMU firmware package: v1.7.1  |  LDC software: v2.6.2b3
14.7.3. Known Issues

The firmware package of the UBEX endpoint devices contains a few known issues and limitations which are going to be fixed in the next firmware release.

**Endpoint Firmware Package v2.4.1**

- 12-bit deep color HDMI signals cannot be transmitted, black image is displayed on the sink device
- 4:2:0 sampling is supported on the input and output ports in pass-through mode only
- The configuration restore procedure works on the same type of operation modes only

**Endpoint Firmware Package v1.4.0**

- Some video process related settings (e.g. scaler, CSC, etc) are not restored on the TX/TRX input ports after restarting the device. Please update your device to the latest firmware package.

**MMU Firmware Package v1.7.1**

The firmware package of the UBEX-MMU-X200 Matrix Management Unit contains a few known issues and limitations which are going to be fixed in the next firmware release.

- Only basic bandwidth management is supported. (HDMI1 channel has high priority, if bandwidth limit is exceeded by HDMI1 and HDMI2 streams, HDMI2 is not transmitted or received.)
- LW2 simple protocol is not supported, it is recommended to use LW3 protocol to control the MMU.
- Video and Audio cross-point mute and lock functions are not available.
- Control USB is not supported, it is recommended to control the MMU through the Control Ethernet Interface.
- Only one MMU per network is supported.
- In video wall setups, upscaling is not fully supported. (e.g.: 4K video content displayed on a 2-by-2 video wall where the resolution of the displays is 4K).
- Handling of video walls is limited in tile view, it is recommended to use the grid view for video walls.

14.7.4. Endpoint Firmware Packages in the MMU

Based on the centralized firmware update method the firmware package of the Matrix Management Unit (MMU) contains the firmware packages of the endpoint devices either. Thus, the firmware packages are released in pairs which are developed and tested together. The following table shows which version of endpoint firmware belongs the firmware package of the MMU.

<table>
<thead>
<tr>
<th>Release date</th>
<th>MMU firmware package version</th>
<th>Endpoint series firmware package version</th>
</tr>
</thead>
<tbody>
<tr>
<td>02-07-2019</td>
<td>v1.1.0</td>
<td>v1.3.1</td>
</tr>
<tr>
<td>16-09-2019</td>
<td>v1.1.1</td>
<td>v1.3.2</td>
</tr>
<tr>
<td>27-11-2019</td>
<td>v1.2.0</td>
<td>v1.4.0</td>
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<td>04-12-2019</td>
<td>v1.2.1</td>
<td>v1.4.1</td>
</tr>
<tr>
<td>30-01-2020</td>
<td>v1.2.2</td>
<td>v1.4.2</td>
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<tr>
<td>13-05-2020</td>
<td>v1.3.0</td>
<td>v1.5.0</td>
</tr>
<tr>
<td>03-06-2020</td>
<td>v1.3.1</td>
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<td>03-11-2020</td>
<td>v1.3.3</td>
<td>v1.5.4</td>
</tr>
<tr>
<td>17-12-2020</td>
<td>v1.3.4</td>
<td>v1.5.5</td>
</tr>
<tr>
<td>18-06-2021</td>
<td>v1.4.0</td>
<td>v2.0.0</td>
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<tr>
<td>02-09-2021</td>
<td>v1.5.0</td>
<td>v2.1.0</td>
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</tr>
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<td>v1.6.1</td>
<td>v2.3.1</td>
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<td>01-07-2022</td>
<td>v1.7.0</td>
<td>v2.3.2</td>
</tr>
<tr>
<td>15-09-2022</td>
<td>v1.7.1</td>
<td>v2.4.1</td>
</tr>
</tbody>
</table>
### 14.8. Resolutions of the Scaler

The following list contains the resolutions and refresh rates that can be forced on the scaler for the sink device.

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>640 x 480</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>720 x 480</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>720 x 576</td>
<td>@ 50 Hz</td>
</tr>
<tr>
<td>800 x 600</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>848 x 480</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>1024 x 768</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>1280 x 720</td>
<td>@ 50 Hz</td>
</tr>
<tr>
<td>1280 x 720</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>1280 x 768</td>
<td>@ 50 Hz</td>
</tr>
<tr>
<td>1280 x 768</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>1280 x 768</td>
<td>@ 75 Hz</td>
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<tr>
<td>1280 x 800</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>1280 x 1024</td>
<td>@ 50 Hz</td>
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<tr>
<td>1280 x 1024</td>
<td>@ 60 Hz</td>
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<tr>
<td>1280 x 1024</td>
<td>@ 75 Hz</td>
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<tr>
<td>1360 x 768</td>
<td>@ 60 Hz</td>
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<tr>
<td>1366 x 768</td>
<td>@ 60 Hz</td>
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<tr>
<td>1400 x 1050</td>
<td>@ 50 Hz</td>
</tr>
<tr>
<td>1400 x 1050</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>1400 x 1050</td>
<td>@ 75 Hz</td>
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<tr>
<td>1440 x 900</td>
<td>@ 60 Hz</td>
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<tr>
<td>1440 x 1080</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>1600 x 900</td>
<td>@ 60 Hz</td>
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<tr>
<td>1600 x 1200</td>
<td>@ 50 Hz</td>
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<tr>
<td>1600 x 1200</td>
<td>@ 60 Hz</td>
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<tr>
<td>1920 x 1080</td>
<td>@ 24 Hz</td>
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<tr>
<td>1920 x 1080</td>
<td>@ 25 Hz</td>
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<tr>
<td>1920 x 1080</td>
<td>@ 30 Hz</td>
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<tr>
<td>1920 x 1080</td>
<td>@ 50 Hz</td>
</tr>
<tr>
<td>1920 x 1080</td>
<td>@ 60 Hz</td>
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<tr>
<td>1920 x 1080</td>
<td>@ 59 Hz</td>
</tr>
<tr>
<td>1920 x 1200</td>
<td>@ 50 Hz</td>
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<tr>
<td>1920 x 1200</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>2048 x 1080</td>
<td>@ 50 Hz</td>
</tr>
<tr>
<td>2048 x 1080</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>2048 x 1200</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>2080 x 2184</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>2560 x 1080</td>
<td>@ 60 Hz</td>
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<tr>
<td>2560 x 1440</td>
<td>@ 60 Hz</td>
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<tr>
<td>2560 x 1600</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>2560 x 2048</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>2912 x 2184</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>3440 x 1440</td>
<td>@ 24 Hz</td>
</tr>
<tr>
<td>3440 x 1440</td>
<td>@ 25 Hz</td>
</tr>
<tr>
<td>3440 x 1440</td>
<td>@ 30 Hz</td>
</tr>
<tr>
<td>3840 x 2160</td>
<td>@ 24 Hz</td>
</tr>
<tr>
<td>3840 x 2160</td>
<td>@ 25 Hz</td>
</tr>
<tr>
<td>3840 x 2160</td>
<td>@ 30 Hz</td>
</tr>
<tr>
<td>3840 x 2160</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>3840 x 2400</td>
<td>@ 24 Hz</td>
</tr>
<tr>
<td>3840 x 2400</td>
<td>@ 30 Hz</td>
</tr>
<tr>
<td>3840 x 2400</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>3840 x 2400</td>
<td>@ 60 Hz</td>
</tr>
<tr>
<td>4096 x 2160</td>
<td>@ 24 Hz</td>
</tr>
<tr>
<td>4096 x 2160</td>
<td>@ 25 Hz</td>
</tr>
<tr>
<td>4096 x 2160</td>
<td>@ 30 Hz</td>
</tr>
<tr>
<td>4096 x 2160</td>
<td>@ 50 Hz</td>
</tr>
<tr>
<td>4096 x 2160</td>
<td>@ 60 Hz</td>
</tr>
</tbody>
</table>
14.9. Factory EDID List

<table>
<thead>
<tr>
<th>Mem.</th>
<th>Resolution</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>640 x 480p @ 60.0 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F2</td>
<td>848 x 480p @ 60.0 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F3</td>
<td>800 x 600p @ 60.32 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F4</td>
<td>1024 x 768p @ 60.0 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F5</td>
<td>1280 x 768p @ 50.0 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F6</td>
<td>1280 x 768p @ 59.94 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F7</td>
<td>1280 x 768p @ 75.0 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F8</td>
<td>1360 x 768p @ 60.02 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F9</td>
<td>1280 x 1024p @ 50.0 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F10</td>
<td>1280 x 1024p @ 60.02 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F11</td>
<td>1280 x 1024p @ 75.02 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F12</td>
<td>1400 x 1050p @ 50.0 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F13</td>
<td>1400 x 1050p @ 60.0 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F14</td>
<td>1400 x 1050p @ 75.0 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F15</td>
<td>1680 x 1050p @ 60.0 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F16</td>
<td>1920 x 1080p @ 50.0 Hz</td>
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<td>F17</td>
<td>1920 x 1080p @ 60.0 Hz</td>
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<td>2048 x 1080p @ 60.0 Hz</td>
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<td>F20</td>
<td>2048 x 1080p @ 60.0 Hz</td>
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<td>F21</td>
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<tr>
<td>F22</td>
<td>1920 x 1200p @ 50.0 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F23</td>
<td>1920 x 1200p @ 59.56 Hz</td>
<td>D</td>
</tr>
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<td>F24</td>
<td>2048 x 1200p @ 59.96 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F25-F28</td>
<td>Reserved</td>
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<td>F29</td>
<td>1920 x 1080p @ 60.0 Hz</td>
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<tr>
<td>F30-F31</td>
<td>Reserved</td>
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<td>F32</td>
<td>640 x 480p @ 59.95 Hz</td>
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</tr>
<tr>
<td>F33</td>
<td>720 x 480p @ 59.94 Hz</td>
<td>H</td>
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<tr>
<td>F34</td>
<td>720 x 576p @ 50.0 Hz</td>
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<td>1280 x 720p @ 50.0 Hz</td>
<td>H</td>
</tr>
<tr>
<td>F36</td>
<td>1280 x 720p @ 60.0 Hz</td>
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</tr>
<tr>
<td>F37-F40</td>
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<td>F49</td>
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<td>1024 x 2400p @ 60.01 Hz</td>
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<td>1920 x 2400p @ 59.97 Hz</td>
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<td>2048 x 2400p @ 59.98 Hz</td>
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<tr>
<td>F94</td>
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<td>D</td>
</tr>
<tr>
<td>F95</td>
<td>2048 x 1536p @ 75.0 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F96</td>
<td>2560 x 1600p @ 59.86 Hz</td>
<td>D</td>
</tr>
<tr>
<td>F97</td>
<td>3840 x 2400p @ 24.0 Hz</td>
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</tr>
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</tr>
<tr>
<td>F103</td>
<td>1280 x 1024p @ 75.02 Hz</td>
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<td>F104</td>
<td>1600 x 1200p @ 50.0 Hz</td>
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<tr>
<td>F105</td>
<td>1600 x 1200p @ 60.0 Hz</td>
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<td>F107</td>
<td>2560 x 1440p @ 59.95 Hz</td>
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<td>F108</td>
<td>2560 x 1600p @ 59.86 Hz</td>
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<td>F109</td>
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</tr>
<tr>
<td>F126</td>
<td>1600 x 900p @ 59.98 Hz</td>
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</tr>
<tr>
<td>F127</td>
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<td>F128</td>
<td>2560 x 1080p @ 60.0 Hz</td>
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</tr>
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<td>F129</td>
<td>3440 x 1440p @ 24.99 Hz</td>
<td>H</td>
</tr>
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<td>F130</td>
<td>3440 x 1440p @ 29.99 Hz</td>
<td>H</td>
</tr>
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<td>4096 x 2160p @ 60.0 Hz</td>
<td>H</td>
</tr>
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<td>F134</td>
<td>3440 x 1440p @ 23.99 Hz</td>
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<td>F135</td>
<td>4096 x 2160p @ 24.0 Hz</td>
<td>H</td>
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<td>F136</td>
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</tr>
<tr>
<td>F140</td>
<td>3840 x 2160p @ 60.0 Hz</td>
<td>H</td>
</tr>
</tbody>
</table>

Legend
- D: DVI EDID
- H: HDMI EDID
- U: Universal EDID, supporting many standard resolutions:
  - F28: Universal EDID for DVI signals (no audio support).
  - F47: HDMI EDID supporting PCM audio.
  - F48: HDMI EDID supporting all type of audio.
  - F49: HDMI EDID supporting all type of audio and deep color.
  - F128: HDMI EDID supporting PCM audio and 4K@30 Hz signals.
  - F129: HDMI EDID supporting all type of audio and 4K@30 Hz signals.

Please note that minor changes in the factory EDID list may be applied in further firmware versions.
14.10. Mechanical Drawings

14.10.1. UBEX F-series Endpoint Devices

The following drawings present the physical dimensions of the UBEX F-series endpoints. Dimensions are in mm.

**Affected models:**
- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110
- UBEX-PRO20-HDMI-F120

**Front View**

**Side View**

**Bottom View**
### 14.10.2. UBEX R-series Endpoint Devices

The following drawings present the physical dimensions of the UBEX R-series endpoints. Dimensions are in mm.

**Affected models:**
- UBEX-PRO20-HDMI-R100 2xMM-2xDUO
- UBEX-PRO20-HDMI-R100 2xMM-QUAD
- UBEX-PRO20-HDMI-R100 2xSM-2xDUO
- UBEX-PRO20-HDMI-R100 2xSM-QUAD
- UBEX-PRO20-HDMI-R100 2xSM-BiDi-DUO

**Front View**

![Front View Diagram]

**Side View**

![Side View Diagram]

**Top View**

![Top View Diagram]
14.10.3. UBEX-MMU-X200

The following drawings present the physical dimensions of the Matrix Management Unit. Dimensions are in mm.

Affected model:
- UBEX-MMU-X200

Front View (1:1)

Top View (1:1)

Side View (2:1)

14.11. Maximum Cable Extensions

14.11.1. F-series Endpoints / MMU

The maximum fiber cable extension of the F-series endpoint devices and the MMU depends on the installed SFP / SFP+ modules. Always read the specification of the modules.

10GBASE-T SFP+ Copper RJ45 Modules

F-series endpoint devices can be installed with 10GBASE-T SFP+ to RJ45 modules. Lightware recommends FS 10GBASE-T SFP+ Copper RJ-45 (Juniper Networks EX-SFP-10GE-T Compatible) transceiver module which is able to apply up to 80 meters cable extension in case of CAT6A or CAT7 cable types.

**ATTENTION!** Always apply equal length copper cables for both SFP+ to RJ45 modules in case of 20G signal transmission. Different cable lengths may cause data package loss.

**TIPS AND TRICKS:** AWG number shows the quality of the copper cable. The number is smaller, the quality of the cable is better and its resistance is even smaller. Smaller resistance makes possible applying longer cable.

14.11.2. R-series Endpoint

The R-series endpoint devices are built with pre-installed SFP+ modules inside the enclosure. The maximum fiber cable extension depends on the modules. The SFP+ modules can be changed by the user, see the details in the SFP+ Module Changing in R-series Endpoints section.

2xMM-2xDUO / 2xMM-QUAD

<table>
<thead>
<tr>
<th>Multimode fiber optical cables</th>
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</thead>
<tbody>
<tr>
<td>OM1 (62.5/125)</td>
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<tr>
<td>Not supported</td>
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</tbody>
</table>

2xSM-2xDUO / 2xSM-QUAD / 2xSM-BiDi-DUO

<table>
<thead>
<tr>
<th>Singlemode fiber optical cables</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS1 (62.5/125)</td>
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<td>2000 m</td>
</tr>
</tbody>
</table>

The following table contains the bandwidth requirement when transmitting one or two AV signals together. The table is grouped by resolution, color space, and color depth. The values are in Gbps.

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<thead>
<tr>
<th>No signal</th>
<th>1280x720p60 (720p)</th>
<th>1920x1080p60 (1080p)</th>
<th>3840x2160p30 (4K UHD 30)</th>
<th>4096x2160p30 (4K30)</th>
<th>3840x2160p60 (4K UHD 60)</th>
<th>4096x2160p60 (4K60)</th>
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<tr>
<td>Stream 1</td>
<td>YCbCr 4:2:2</td>
<td>RGB / YCbCr 4:4:4</td>
<td>YCbCr 4:2:2</td>
<td>RGB / YCbCr 4:4:4</td>
<td>YCbCr 4:2:2</td>
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<td>8 bit/ch</td>
<td>8 bit/ch</td>
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<td>5.26</td>
<td>9.56</td>
<td>13.86</td>
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<th>RGB / YCbCr 4:4:4</th>
<th>YCbCr 4:2:2</th>
<th>RGB / YCbCr 4:4:4</th>
<th>YCbCr 4:2:2</th>
<th>RGB / YCbCr 4:4:4</th>
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<tr>
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<th>1920x1080p60 (1080p)</th>
<th>3840x2160p30 (4K UHD 30)</th>
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<td>18.63</td>
<td>19.35</td>
<td>20.43</td>
<td>23.55</td>
</tr>
</tbody>
</table>

**Legend:**
- **< 10 Gbps** 1 pc SFP+ module is enough for the transmission.
- **< 20 Gbps** 2 pcs SFP+ modules are required for the transmission.
- **> 20 Gbps** The transmission is not possible with 2 pcs SFP+ modules.
14.13. Cable Wiring Guide

Inputs and outputs of audio devices are symmetric or asymmetric. The main advantage of the symmetric lines is the better protection against 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. Lighthware 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.

14.13.1. Serial Ports

The device is built with 3-pole Phoenix connector. See the examples below of connecting to a DCE (Data Circuit-terminating Equipment) or a DTE (Data Terminal Equipment) type device:

<table>
<thead>
<tr>
<th>Lightware device and a DCE</th>
<th>Lightware device and a DTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-SUB 9 and Phoenix</td>
<td>D-SUB 9 and Phoenix</td>
</tr>
<tr>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
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<td>TX RX</td>
<td>TX RX</td>
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<tr>
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<td>2: RX data</td>
</tr>
<tr>
<td>3: RX data</td>
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<tr>
<td>5: Ground</td>
<td>5: Ground</td>
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14.13.2. Audio Ports

The Pinout of the 5-pole Phoenix Connector

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<tr>
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<td>3</td>
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<td>4</td>
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</tr>
<tr>
<td>5</td>
<td>Right+</td>
</tr>
</tbody>
</table>

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

What do you want to do? The following link collection helps to find the related section for your current activity. The collection is grouped by topic category and within that is in alphabetical order.

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<tr>
<td>Identify the device (TX/TRX)</td>
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| Scaler - Image position | - | 8.10.2 | 9.10.12 |
| Scaler - Forced resolution | - | 8.10.2 | 9.10.9 |
| Scaler - Scaling mode | - | 8.10.2 | 9.10.10 |
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| Tags - Delete all the tags | - | 8.10.1 | 9.10.6 |
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<td>Display parameters - bottom bezel size change</td>
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14. Appendix

14.15. Hashtag Keyword List

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

The format of the keywords is the following:

```
#<keyword>
```

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

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

Example

`#dhcp`

This keyword is placed at the DHCP (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.

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<td>#audio</td>
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<td>#csc</td>
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<td>Device label</td>
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<td>Hashtag Keyword</td>
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14.16. Further Information

Limited Warranty Statement

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

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

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

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

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

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

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

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

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

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

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

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

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

<table>
<thead>
<tr>
<th>Rev.</th>
<th>Release date</th>
<th>Changes</th>
<th>Editor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>12-06-2018</td>
<td>Initial version</td>
<td>Tamas Forgacs</td>
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<tr>
<td>2.4</td>
<td>26-07-2022</td>
<td>Endpoint license handling in the UBEX-MMU-X200; major bugfixes on SFP+ BiDi wavelength values</td>
<td>Tamas Forgacs</td>
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<tr>
<td>2.5</td>
<td>23-09-2022</td>
<td>Added scaler function on the HDMI input 2 port in transmitter operation mode; changes in the Box contents section</td>
<td>Tamas Forgacs</td>
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</tbody>
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