visual engineering
LIGHTWARE

User's Manual

UBEX-PRO20-HDMI-F100
UBEX-PRO20-HDMI-F110
UBEX-MMU-X200

AV Over IP Multimedia Extender

Important Safety Instructions

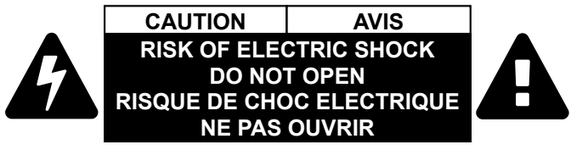
Class I apparatus construction.

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, let the ventilation holes free and never block or bypass the ventilators (if any).

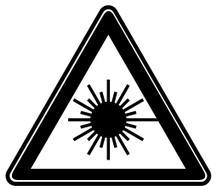
WARNING

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

Waste Electrical & Electronic Equipment WEEE

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

Caution: Laser product



Common Safety Symbols

Symbol	Description
	Alternating current
	Protective conductor terminal
	Caution, possibility of electric shock
	Caution
	Laser radiation

Symbol Legend

The following symbols and markings are used in the document:

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

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

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

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

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

Navigation Buttons

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

Navigate to the Table of Contents.

Step back one page.

Step forward to the next page.

Device Legend

The endpoint devices can be ordered with various colored front panel 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.

Transmitter

Receiver

Transceiver

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

Document Information

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

Item		Version
Lightware Device Controller (LDC) software		1.29.0b1
Lightware Device Updater V2 (LDU2) software		1.2.3b3
Firmware package	UBEX-PRO20-HDMI-F100	1.3.0
	UBEX-PRO20-HDMI-F110	1.3.0
	UBEX-MMU-X200	1.0.6
Hardware	UBEX-PRO20-HDMI-F100	1.2
	UBEX-PRO20-HDMI-F110	1.3
	UBEX-MMU-X200	1.0

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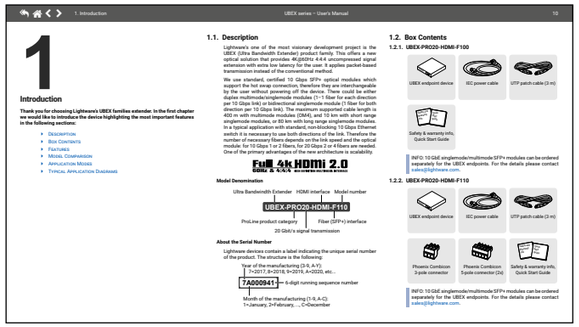
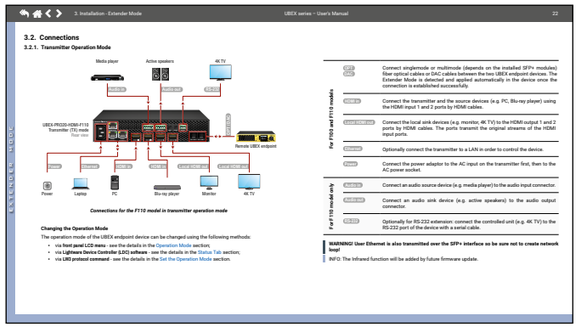
Page Legend

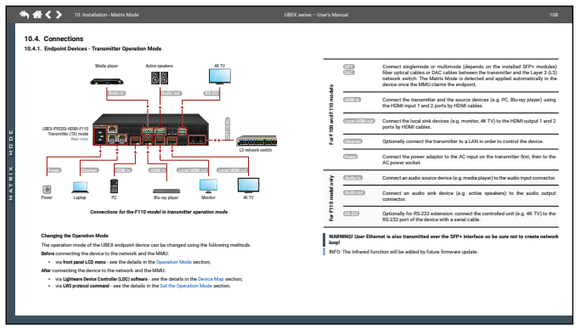
The **side color** of the pages indicates the related application mode of the device. If the page is no color-filled, the chapter is about general information for both Extender and Matrix modes.



Sample page of a general chapter



Sample page for Extender mode



Sample page for Matrix mode

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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
- Features
- Model Comparison
- Application Modes
- Typical Application Diagrams

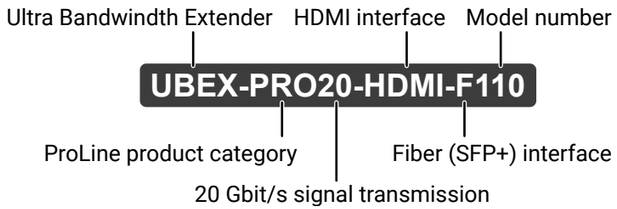
1.1. Description

Lightware's one of the most visionary development project is the UBEX (Ultra Bandwidth Extender) product family. This offers a new optical solution that provides 4K@60Hz 4:4:4 uncompressed signal extension with extra low latency for the user. It applies packet-based transmission instead of the conventional method.

We use standard, certified 10 Gbps SFP+ optical modules which support the hot swap connection, therefore they are interchangeable by the user without powering off the device. There could be either duplex multimode/singlemode modules (1–1 fiber for each direction per 10 Gbps link) or bidirectional singlemode module (1 fiber for both direction per 10 Gbps link). The maximum supported cable length is 400 m with multimode modules (OM4), and 10 km with short range singlemode modules, or 80 km with long range singlemode modules. In a typical application with standard, non-blocking 10 Gbps Ethernet switch it is necessary to use both directions of the link. Therefore the number of necessary fibers depends on the link speed and the optical module: for 10 Gbps 1 or 2 fibers, for 20 Gbps 2 or 4 fibers are needed. One of the primary advantages of the new architecture is scalability.

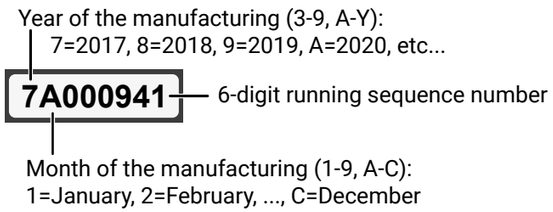
Full 4k HDMI 2.0
60Hz & 4:4:4 HIGH DEFINITION MULTIMEDIA INTERFACE

Model Denomination



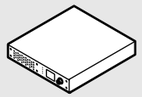
About the Serial Number

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



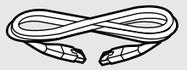
1.2. Box Contents

1.2.1. UBEX-PRO20-HDMI-F100



UBEX endpoint device

IEC power cable

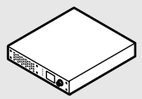


UTP patch cable (3 m)

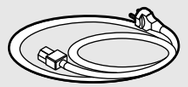
Safety & warranty info, Quick Start Guide

> INFO: 10 GbE singlemode/multimode SFP+ modules can be ordered separately for the UBEX endpoints. For the details please contact sales@lightware.com.

1.2.2. UBEX-PRO20-HDMI-F110



UBEX endpoint device



IEC power cable

UTP patch cable (3 m)

Phoenix Combicon 3-pole connector

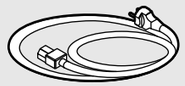
Phoenix Combicon 5-pole connector (2x)

Safety & warranty info, Quick Start Guide

> INFO: 10 GbE singlemode/multimode SFP+ modules can be ordered separately for the UBEX endpoints. For the details please contact sales@lightware.com.

1.2.3. UBEX-MMU-X200

UBEX-MMU-X200 device



IEC power cable

UTP patch cable (3 m) (2x)

Phoenix® Combicon 3-pole connector (2x)

Safety & warranty info, Quick Start Guide

INFO: 1 GbE singlemode/multimode SFP modules can be ordered separately for the MMU. For the details please contact sales@lightware.com.

1.3. Features

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.

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.

HDCP 2.2 compliant

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

Changeable Operation Mode

UBEX endpoint devices can be configured as transmitter, receiver, or transceiver in few simple step by the user anytime.

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.

Frame Rate Converter

Frame rate conversion is available for the UBEX endpoints in transmitter, receiver, and transceiver operation modes either. The most frequently used refresh rates can be forced on both inputs or outputs.

Multi stream

UBEX endpoint devices are able to simultaneously transmit two video streams with embedded audio via the SFP+ interface.

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.

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.

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.

Color Space Conversion

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

RS-232 Interface

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

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.

Built-in Web Page

Easy access from a web browser to control and configure the Matrix Management Unit and the UBEX matrix.

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.

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.

1.4. 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:

	AV transmission interface	Video ports		Audio ports		Interface ports		
	20 GbE data transmission over SFP+ ports	2x HDMI inputs	2x HDMI outputs	Analog audio input	Analog audio output	Ethernet	Infra *	RS-232
UBEX-PRO20-HDMI-F100	✓	✓	✓	-	-	✓ (2x)	-	-
UBEX-PRO20-HDMI-F110	✓	✓	✓	✓	✓	✓ (3x)	✓	✓

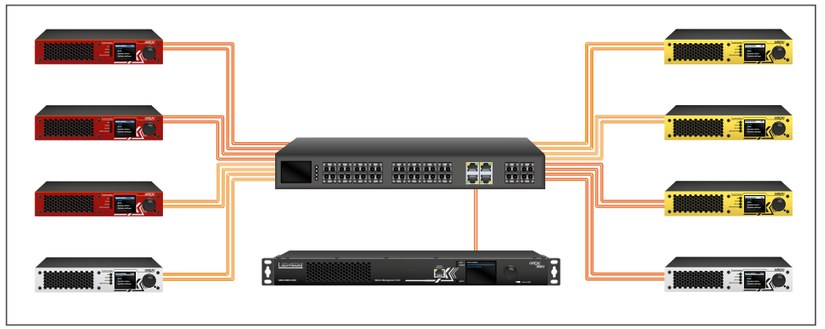
* Infrared function will be added by future firmware update.

1.5. Application Modes

UBEX extender system has two main application modes:

- **EXTENDER MODE** - Point-to-point connection between a transmitter and a receiver, or between two transceiver endpoint devices;

- **MATRIX MODE** - Virtual AV matrix with more transmitters, receivers, transceivers, and a Matrix Management Unit (MMU) which controls the AV network.



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.

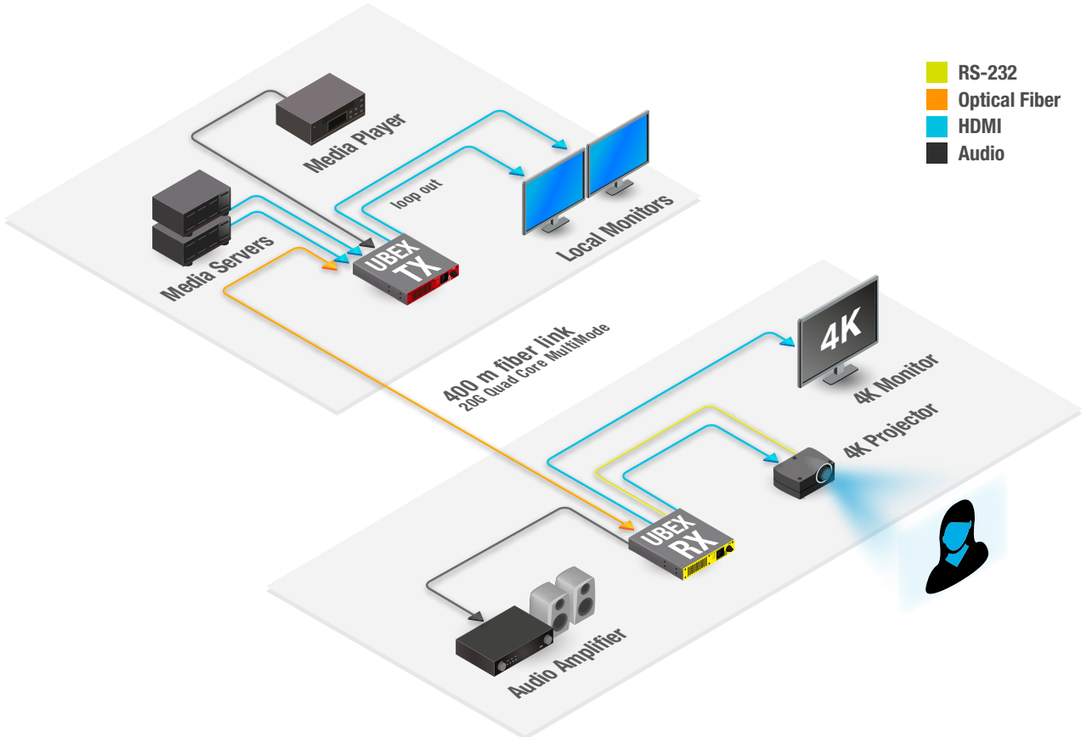
The two modes bring different functionality and control methods for the endpoint and the MMU devices. The following settings are available in the MMU only in case the Matrix mode:

- 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

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 Application Diagrams

1.6.1. Extender Mode - TX-RX Pair



Application diagram of Extender mode - TX-RX pair

Description

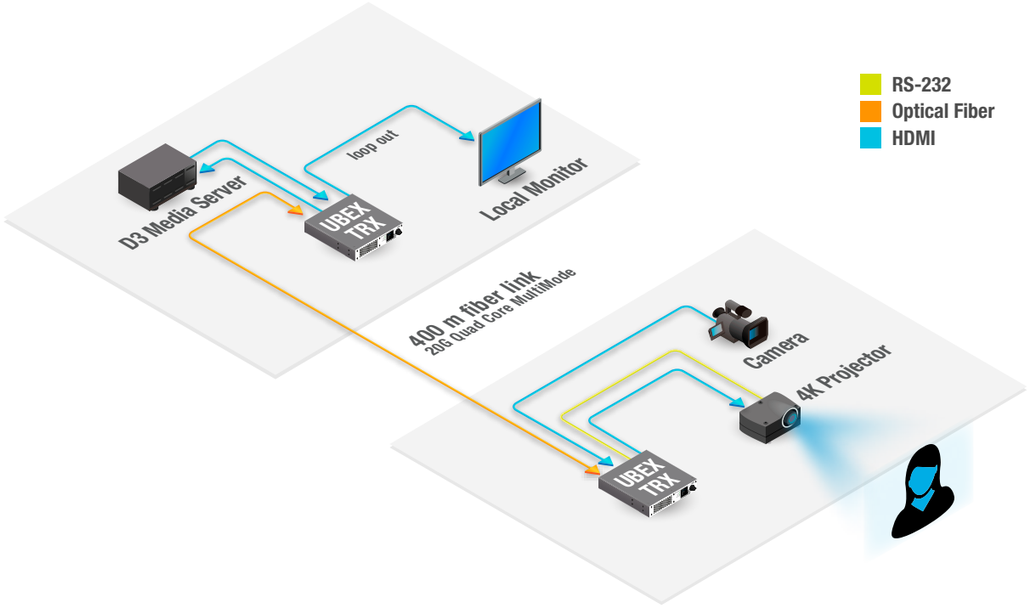
The UBEX transmitter (UBEX-PRO20-HDMI-F110, TX operation mode) has two video source devices (media servers) and an audio source device (media player). The streams can be checked on the local monitors connected to the transmitter.

The UBEX receiver (UBEX-PRO20-HDMI-F110, RX operation mode) has two video sink devices (a 4K projector and a 4K monitor) and an analog audio sink device (audio amplifier).

The 4K projector is controlled via RS-232 interface by the UBEX receiver.

The UBEX extender pair is able to transmit 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 streams.

1.6.2. Extender Mode - TRX-TRX Pair



Application diagram of Extender mode - TRX-TRX pair

Description

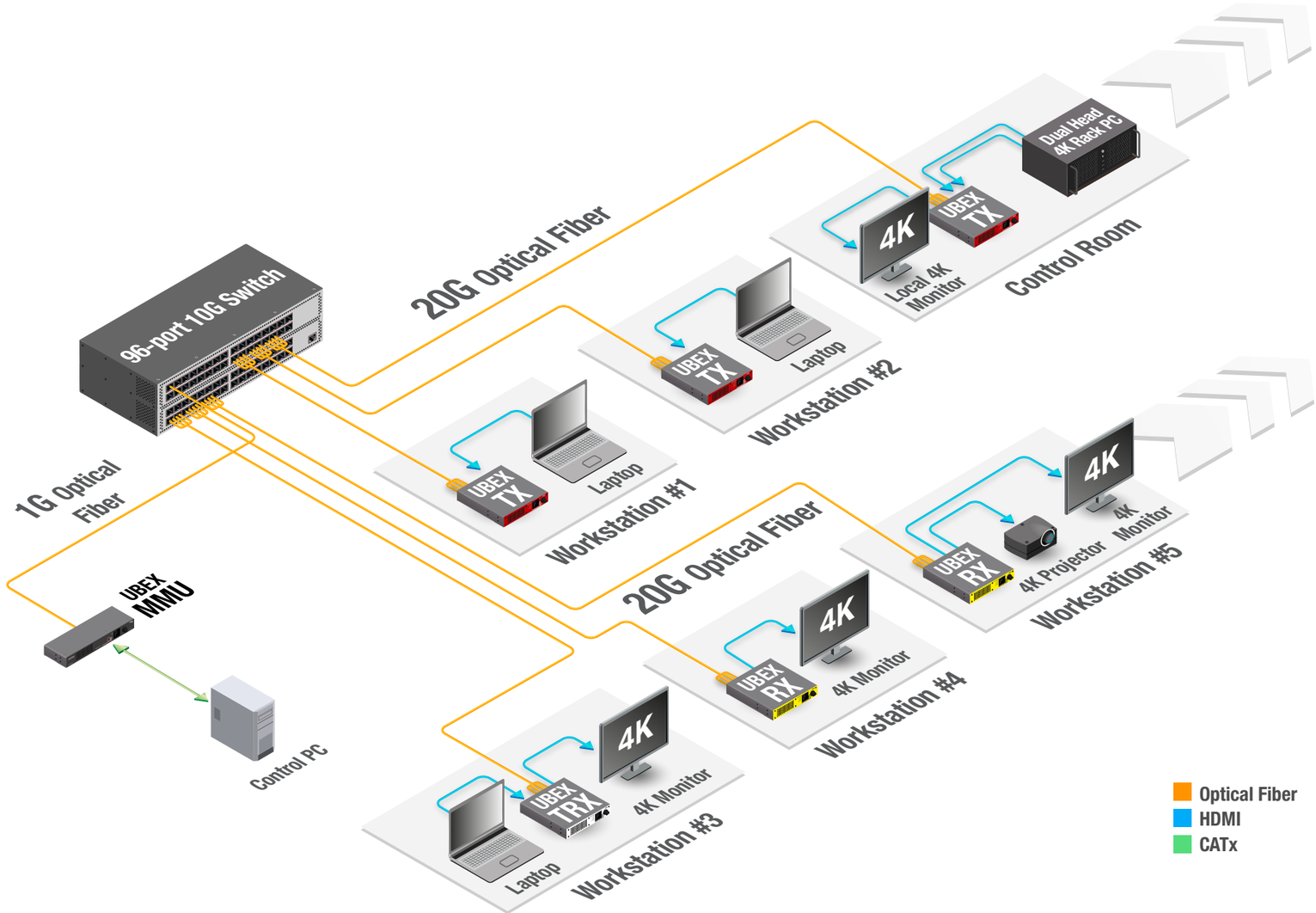
Two UBEX transceivers are connected each other via 400 m fiber optical cables.

The UBEX-PRO20-HDMI-F100 transceiver connects to a D3 media server which is the source and the sink device together. The incoming stream can be checked locally on the local monitor.

The UBEX-PRO20-HDMI-F110 transceiver has a source device (camera) and a sink device (4K projector). The projector is controlled via RS-232 interface by the extender.

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 24 bit streams.

1.6.3. Matrix Mode - Corporate Application



Application diagram of Matrix mode - Corporate application

Description

The UBEX matrix has more endpoint devices which can be UBEX-PRO20-HDMI-F100 and UBEX-PRO20-HDMI-F110 models variously and they 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 a 96-port 10G Layer 3 network switch.

The transmitters can be connected to a single laptop or a dual head 4K rack PC and transmitting two streams together.

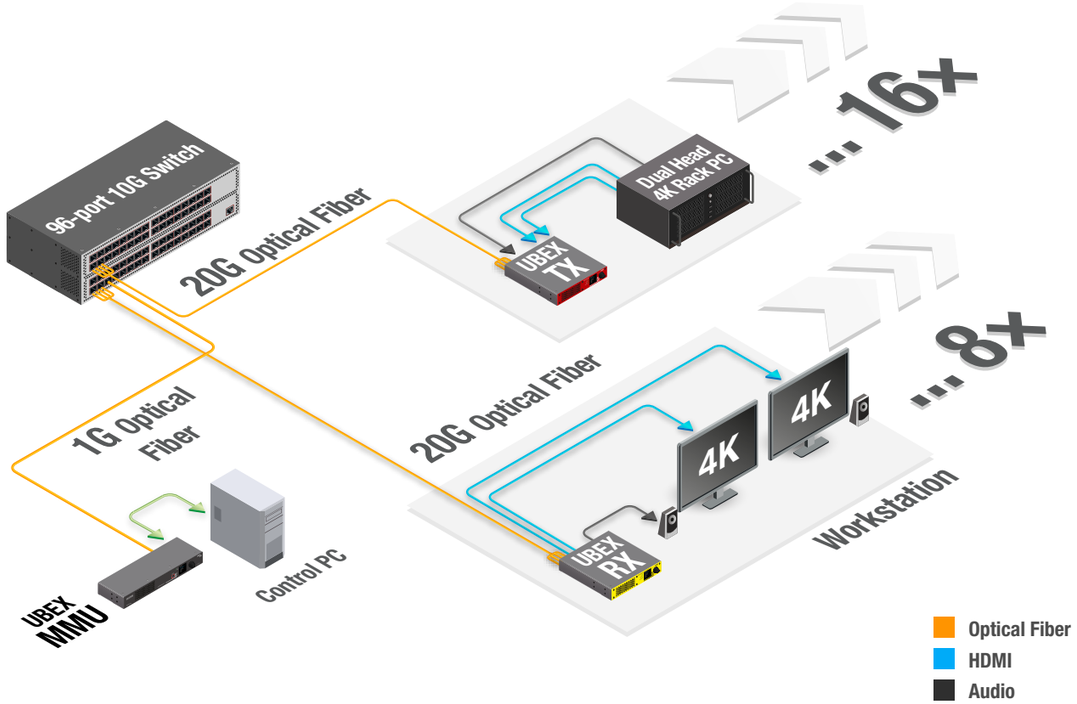
The receivers can be connected to one or two sink devices belongs to the required application.

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.

1.6.4. Matrix Mode - System Design Studio



Application diagram of Matrix mode - System design studio

Description

The UBEX matrix has 16 pcs transmitters (UBEX-PRO20-HDMI-F110, TX mode) and 8 pcs receivers (UBEX-PRO20-HDMI-F110, 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.

2

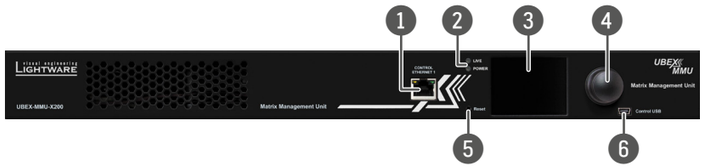
Product Overview

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

- Front and Rear View - UBEX-MMU-X200
- Front and Rear View - UBEX Endpoint Devices
- Electrical Connections

2.1. Front and Rear View - UBEX-MMU-X200

Front View



Rear View

1 **Control Ethernet port 1** — Front panel RJ45 connector for control and firmware upgrade purpose. The port supports 100 Mbps Ethernet connection, auto-negotiation, and auto-MDI/MDIX.

2 **Status LEDs** — The LEDs give immediate feedback about the recent status of the device.

3 **LCD screen** — LCD screen showing the most important settings and parameters in the front panel menu.

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.

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.

7 **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.

8 **Control Ethernet port 2** — Rear panel RJ45 connector for control and firmware upgrade purpose. The port supports 1 Gbps Ethernet connection, auto-negotiation, and auto-MDI/MDIX.

9 **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.
Use one of the UBEX network connectors (RJ45 or SFP) only in the same time to avoid the network loop!

10 **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.
Use one of the UBEX network connectors (RJ45 or SFP) only in the same time to avoid the network loop!

11 **AC connector** — Standard IEC connector accepting 100-240 V, 50 or 60 Hz.

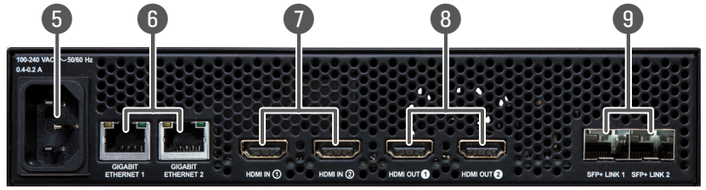
Status LEDs

LIVE		
	blinking	The device operates normally, the core software is running.
	on	Device initialization is in progress.
	off	The device is not powered or out of operation.
POWER		
	on	The device is powered and ready to use.
	off	The device is not powered or out of operation.

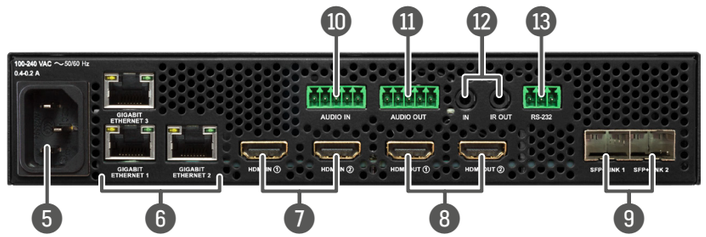
2.2. Front and Rear View - UBEX Endpoint Devices

Front View - All Models

Rear View - UBEX-PRO20-HDMI-F100



Rear View - UBEX-PRO20-HDMI-F110



1	**Status LEDs**	The LEDs give immediate feedback about the current status of the endpoint device. See the details in the Status LEDs section on the right side of this page.
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.
3	**Jog dial control knob**	Easy setting and menu navigation by the jog dial control. Keep dialing and click while getting feedback on the LCD.
4	**Reset button**	Reboots the device (the same as disconnecting from the power source and reconnecting again).
5	**AC connector**	Standard IEC connector accepting 100-240 V, 50 or 60 Hz.
6	**Ethernet connectors**	Standard locking RJ45 connectors for 1 Gbps Ethernet connections to control the device, for user Ethernet access, and firmware upgrade purpose.
7	**HDMI input ports**	HDMI input ports with HDMI 2.0 support for the source devices (only for transmitter and transceiver operation modes).
8	**HDMI output ports**	HDMI output ports with HDMI 2.0 support for sink devices. When the device is configured as a transmitter or transceiver, the ports operate as local HDMI outputs.
9	**SFP+ port slots**	Optical 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.
10	**Audio input port**	5-pole Phoenix connector for balanced analog audio input. The port is available in all operation modes (TX/RX/TRX).
11	**Audio output port**	5-pole Phoenix connector for balanced analog audio output. The port is available in all operation modes (TX/RX/TRX).
12	**Infrared connectors**	Function will be added by future firmware update.
13	**RS-232 connector**	3-pole Phoenix connector for serial communication.

Status LEDs

LIVE		Transmitter / Receiver / Transceiver
blinking		The device is powered and ready to use.
off		The device is not powered or out of operation.
STATUS		**Transmitter / Receiver / Transceiver**
on		All measured temperature and voltage values are within the limits.
blinking		Measured temperature or voltage value is out of the limits.
off		The device is not powered or out of operation.
LINK OK		**Transmitter / Receiver / Transceiver**
on		The connection is established on SFP+ LINK 1 and 2 and the Link Aggregation is working.
blinking		The connection is established on SFP+ LINK 1 and 2 and LACP detection period is active.
off		No connection is established on one of the SFP+ links.
MMU AVAILABLE		**Transmitter / Receiver / Transceiver**
on		Matrix mode is active; the communication is live between the endpoint and the Matrix Management Unit (MMU).
blinking		Matrix mode is active; no communication between the endpoint and the MMU.
off		Extender mode is active; no communication between the endpoint and the MMU.

2.3. Electrical Connections

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

2.3.1. SFP / SFP+ Slots

DEFINITION: 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. *

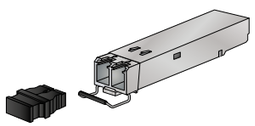
UBEX endpoint devices and the Matrix Management Unit contain standard 1x SFP (in the case of the MMU) and 2x SFP+ (in the case of the endpoint devices) slots for the fiber optical connections via SFP / SFP+ modules or DAC cables. The installed SFP / SFP+ modules can be singlemode or multimode as well.

	Endpoint devices	MMU
Number of slots	2	1
Type of the slot	SFP+	SFP
Maximum bandwidth per slot	10 Gbps	1 Gbps
Transmitted signal	Audio, video, Ethernet, RS-232	Ethernet only

For the details about the DAC cable / SFP+ module installation see the SFP+ Slot Connection section for the Extender mode and the SFP / SFP+ Slot Connection section for the Matrix mode.

Maximum Allowed Optical Cable Length

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



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

2.3.2. AC Power Connection

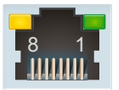
UBEX endpoint devices and the Matrix Management Unit contain standard IEC power connector and works with 100 to 240 Volts AC, 50 Hz or 60 Hz power sources.

Connect the power cord to the AC input connector; the extender is immediately powered on. After the booting procedure the last configuration is loaded automatically.

2.3.3. 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.

2.3.4. Ethernet Connector



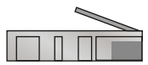
UBEX endpoint devices and the Matrix Management Unit provide standard RJ45 connectors for LAN and user Ethernet access. Always use high quality Ethernet cable.

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.

Top

Bottom



Side

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

Wiring of LAN cables by types

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

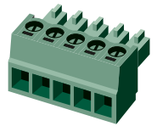
2.3.5. Symmetrical Analog Stereo Audio Connector

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.

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



5-pole Phoenix connector pin assignments

See more information about the most common audio cable wiring modes in Audio Cable Wiring Guide section.

You can find more information about audio embedding and de-embedding functions in the Audio Interface section.

2.3.6. RS-232 Connector

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

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

RS-232 connector pin assignments

Compatible Plug Type

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

You can find help for the correct wiring in the Cable Wiring Guide for Serial Data Transmission section.

You can find more information about serial interface in the Serial Interface section.

2.3.7. USB Mini-B Connector

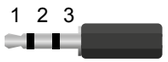
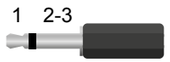
UBEX series devices provide standard USB 2.0 mini B-type connector for software control and firmware upgrade purpose.

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

2.3.8. IR Connector

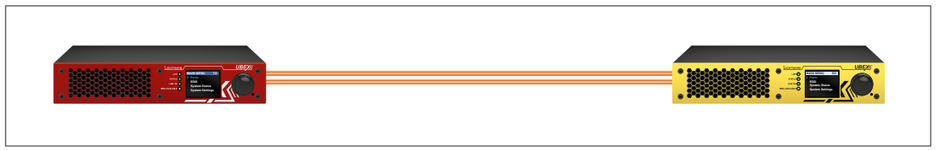
INFO: The Infrared function will be added by future firmware update.

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

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

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

Extender Mode



The following chapters are related to the Extender mode.

Extender mode = Point-to-point connection between a transmitter and a receiver, or between two transceivers.

For the Matrix mode see the Matrix Mode chapters.

3

Installation - Extender Mode

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

- Mounting Options
- Connections
- SFP+ Slot Connection
- Startup of the System

3.1. Mounting Options

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 be also used for building the unit into the furniture:

Mounting bracket V2

1U high rack shelf

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.

3.1.1. Mounting Bracket V2

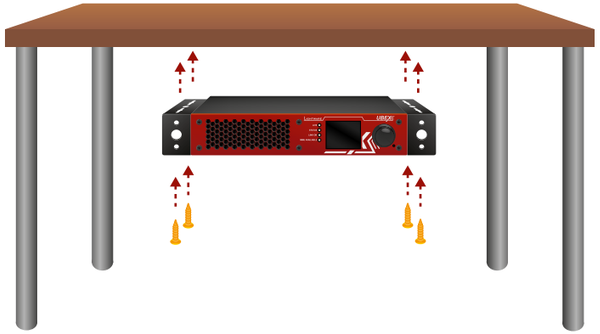
Mounting bracket V2 gives an opportunity to mount the device to any furniture surface. Fasten the bracket on the side of the unit with the provided screws and fasten it to a stand / board / truss / furniture.

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! 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.

Furniture Mounting

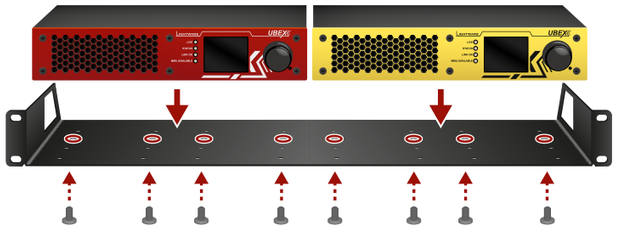


WARNING! Pay attention to the ventilation holes when designing the system. Front and rear ventilation holes must not be covered.

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

3.1.2. Rack Shelf Mounting

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



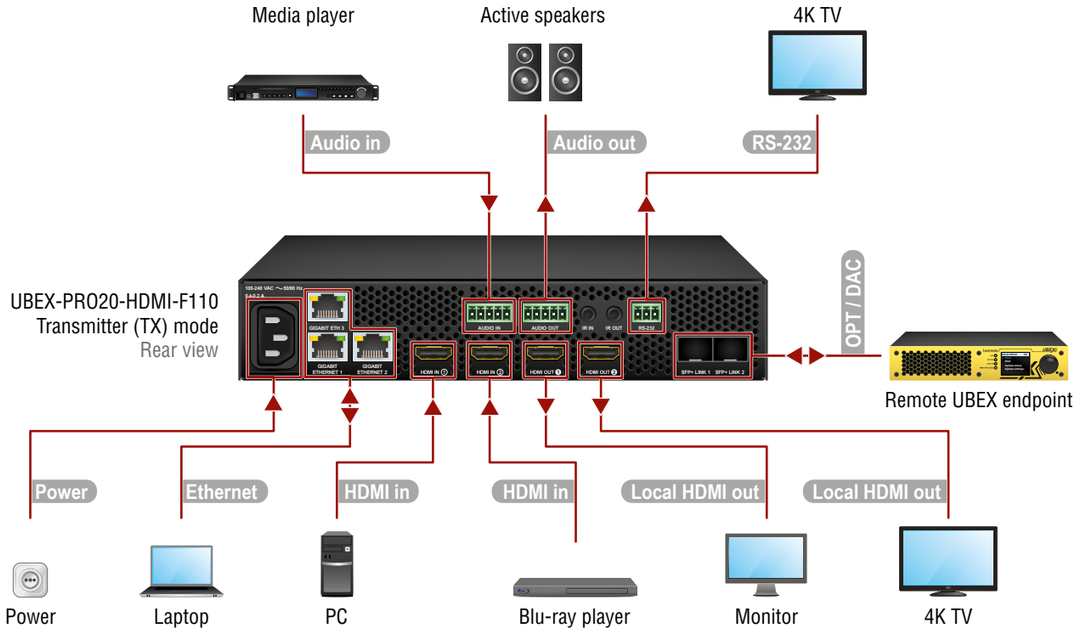
1U high rack shelf provides mounting holes for fastening two half-rack or four quarter-rack sized units. Pocket sized devices can also be fastened on the self.

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.

3.2. Connections

3.2.1. Transmitter Operation Mode



Connections for the F110 model in transmitter operation mode

Changing the Operation Mode

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

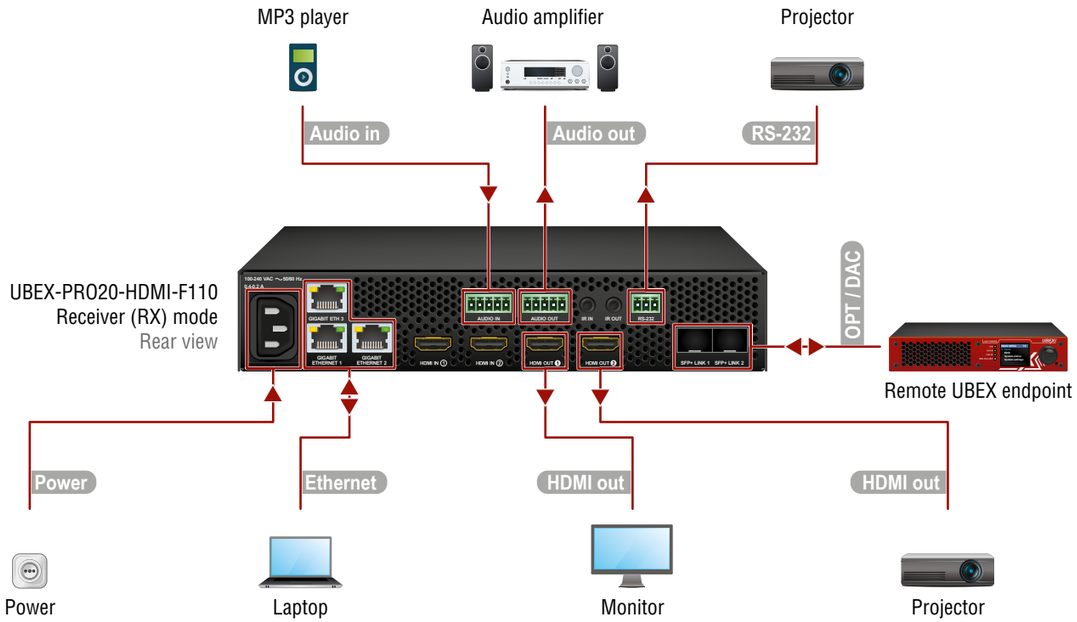
- via **front panel LCD menu** - see the details in the Operation Mode section;
- via **Lightware Device Controller (LDC) software** - see the details in the Status Tab section;
- via **LW3 protocol command** - see the details in the Set the Operation Mode section.

For F100 and F110 models	OPT DAC	Connect singlemode or multimode (depends on the installed SFP+ modules) fiber optical cables or DAC cables between the two UBEX endpoint devices. The Extender Mode is detected and applied automatically in the device once the connection is established successfully.
	HDMI in	Connect the transmitter and the source devices (e.g. PC, Blu-ray player) using the HDMI input 1 and 2 ports by HDMI cables.
	Local HDMI out	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.
	Ethernet	Optionally connect the transmitter to a LAN in order to control the device.
	Power	Connect the power adaptor to the AC input on the transmitter first, then to the AC power socket.
For F110 model only	Audio in	Connect an audio source device (e.g. media player) to the audio input connector.
	Audio out	Connect an audio sink device (e.g. active speakers) to the audio output connector.
	RS-232	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.

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

INFO: The Infrared function will be added by future firmware update.

3.2.2. Receiver Operation Mode



Connections for the F110 model in receiver operation mode

Changing the Operation Mode

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

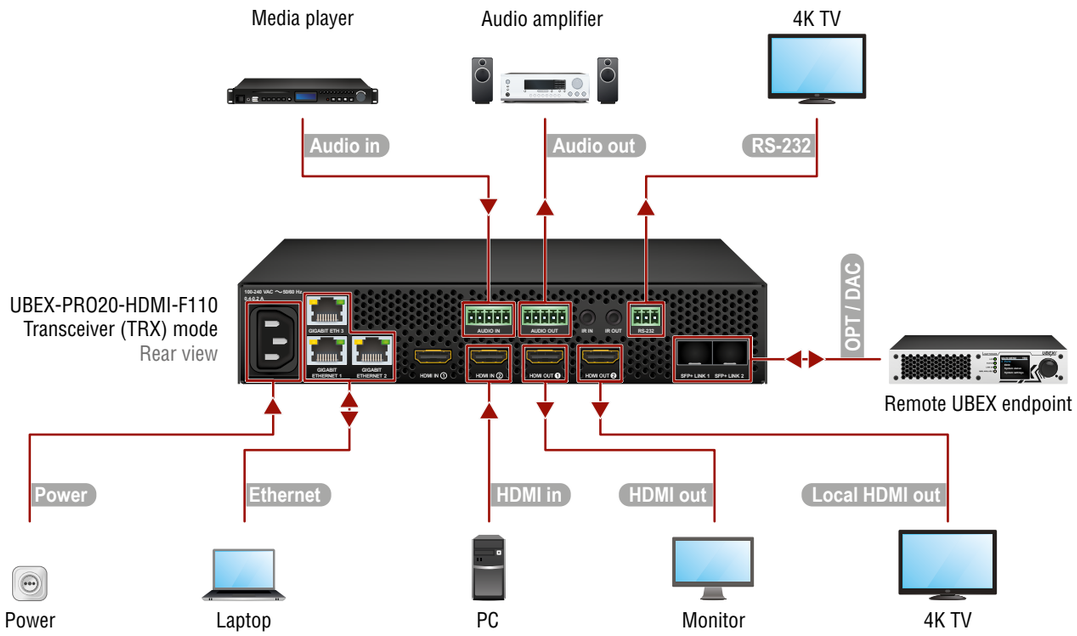
- via **front panel LCD menu** - see the details in the Operation Mode section;
- via **Lightware Device Controller (LDC) software** - see the details in the Status Tab section;
- via **LW3 protocol command** - see the details in the Set the Operation Mode section.

For F100 and F110 models	OPT DAC	Connect singlemode or multimode (depends on the installed SFP+ modules) fiber optical cables or DAC cables between the two UBEX endpoint devices. The Extender Mode is detected and applied automatically in the device once the connection is established successfully.
	HDMI out	Connect the sink devices (e.g. monitor, projector) to the HDMI output 1 and 2 ports by HDMI cables.
	Ethernet	Optionally connect the receiver to a LAN in order to control the device.
	Power	Connect the power adaptor to the AC input on the receiver first, then to the AC power socket.
For F110 model only	Audio in	Connect an audio source device (e.g. MP3 player) to the audio input connector.
	Audio out	Connect an audio sink device (e.g. audio amplifier) to the audio output connector.
	RS-232	Optionally for RS-232 extension: connect the controlled unit (e.g. projector) to the RS-232 port of the device with a serial cable.

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

INFO: The Infrared function will be added by future firmware update.

3.2.3. Transceiver Operation Mode



Connections for the F110 model in transceiver operation mode

Changing the Operation Mode

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

- via **front panel LCD menu** - see the details in the Operation Mode section;
- via **Lightware Device Controller (LDC) software** - see the details in the Status Tab section;
- via **LW3 protocol command** - see the details in the Set the Operation Mode section.

For F100 and F110 models	OPT DAC	Connect singlemode or multimode (depends on the installed SFP+ modules) fiber optical cables or DAC cables between the two UBEX endpoint devices. The Extender Mode is detected and applied automatically in the device once the connection is established successfully.
	HDMI in	Connect the transceiver and 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 transmit 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.
For F110 model only	Audio in	Connect an audio source (e.g. media player) to the audio input connector.
	Audio out	Connect an audio sink device (e.g. audio amplifier) to the audio output connector.
	RS-232	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.

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

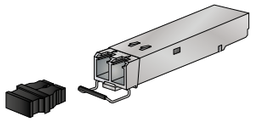
INFO: The Infrared function will be added by future firmware update.

3.3. SFP+ Slot Connection

INFO: The SFP+ slots support the hot swap connection - the endpoint devices do not need to be powered off before inserting or removing SFP+ modules or DAC cables.

3.3.1. Installation of SFP+ Modules

UBEX endpoint devices use SFP+ modules for the fiber optical connections. The optical modules can be changed based on the current 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.

Inserting and Cabling of SFP+ Modules

Step 1. Put up on the handle bar.

Step 2. Connect the module to the to one of the SFP+ port slot.

Step 3. Connect the LC connectors to the SFP+ modules.

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

Removing SFP+ Modules

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

Step 2. Pull down on the handle bar.

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

3.3.2. Installation of DAC Cables

UBEX endpoint devices can be connected via DAC (Direct Attach Copper) cables as well. 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.

Inserting the DAC Cables

Step 1. Push the plug of the DAC cable to one of the SFP+ port slot of the local endpoint to stop.

Step 2. Push the other plug of the DAC cable to one of the SFP+ port slot of remote endpoint to stop.

Removing the DAC Cables

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

3.4. Startup of the System

The following section describes the startup of the UBEX extender 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.

3.4.1. Switch on the Devices

Power on the UBEX endpoints, the source, and the sink devices connected to the extenders.

INFO: After the booting procedure of the UBEX extenders, the last configuration is loaded automatically.

3.4.2. Configure the Operation Mode

All endpoint devices are manufactured as transmitter (TX) by default. Set up the **operation mode** for the endpoints using as receivers or transceivers with the **Front panel LCD menu**. See the details in the Operation Mode section.

3.4.3. Establish the Connection with the UBEX Extenders

Establish the connection between one of the UBEX extenders and the controller device via LAN network. It is highly recommended to connect one of the extenders due to the following reasons:

- The two UBEX endpoints are visible for each others in the case of correct SFP+ link connection.
- User Ethernet is also transmitted over the SFP+ interface so be sure not to create network loop!

Network Settings

Check the network settings of the UBEX extenders. You can find the factory default settings of the endpoint in the Factory Default Settings section. The network settings can be changed using two different methods:

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

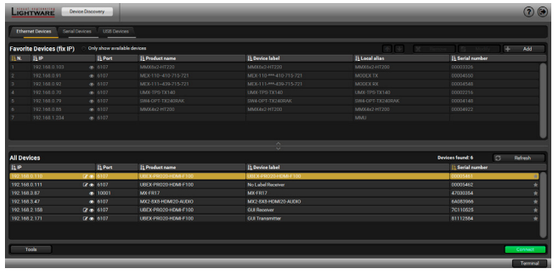
Lightware Device Controller Software

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

Discovering the Device

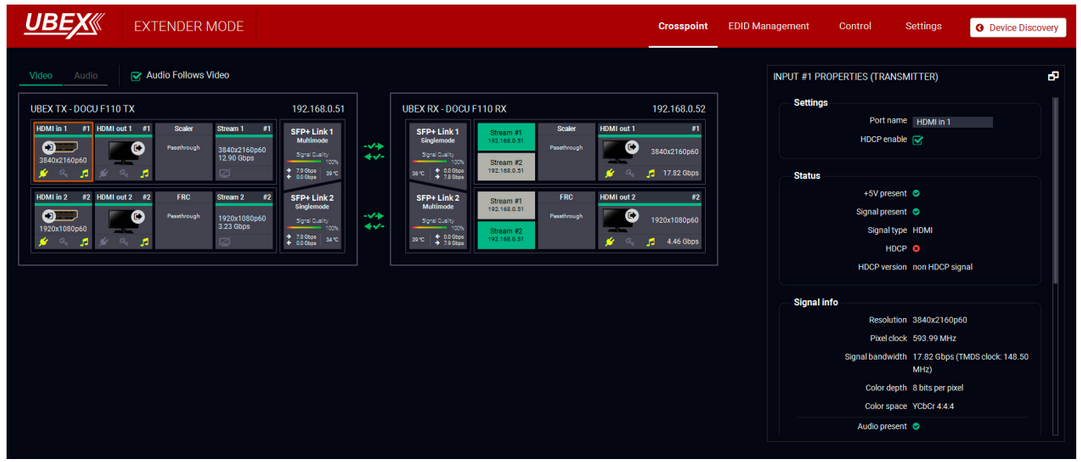
Step 1. Open the LDC software. The **Device discovery** window will launch automatically to discover all available Lightware devices on the network where the controller device is connected to.

Step 2. Select the endpoint device which you want to connect to and click on the green **Connect** button.



3.4.4. Check the Signal Status

The **Crosspoint menu** in the LDC software displays all important information about the incoming, transmitting, and outgoing HDMI signals. For more detailed information see the Video Crosspoint Menu section.



The video crosspoint menu in the LDC software for TX-RX pair

Transmitter (UBEX TX) Side

Step 1. Check the HDMI signal status on the **HDMI in 1 and 2 input ports** - if the **signal status indicator** is green, the signal is present; if it is grey, there is no incoming signal on the port.

Step 2. Check the HDMI signal status on the **HDMI out 1 and 2 local output ports** - if the **signal status indicator** is green, the signal is present and sink device is connected; if it is grey, no transmitted signal on the port.

Step 3. Check the video streams in the **Stream 1 and 2 panels** - if the **signal status indicator** is green, the signal is present; if it is grey, there is no incoming signal on the port. Also check the **enable status** of the stream on the stream settings panel.

Receiver (UBEX RX) Side

Step 1. Check the **Stream switcher** - the desired stream is switched to the HDMI output port.

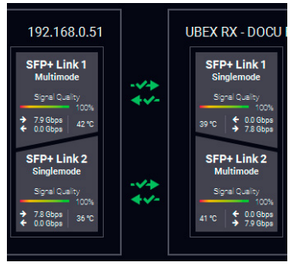
Step 2. Check the HDMI signal status on the **HDMI out 1 and 2 output ports** - if the **signal status indicator** is green, the signal is present and sink device is connected; if it is grey, no transmitted signal on the port.

Transceiver (UBEX TRX) Side

Step 1. Check the HDMI signal status on the **HDMI in 2 input port** - if the **signal status indicator** is green, the signal is present; if it is grey, there is no incoming signal on the port.

Step 2. Check the HDMI signal status on the **HDMI out 1 output port** - if the **signal status indicator** is green, the signal is present and sink device is connected; if it is grey, no transmitted signal on the port.

SFP+ Links



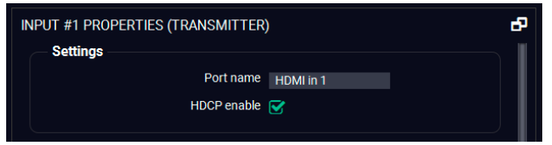
Check the connection status of the SFP+ links:

- **Green arrows** mean connection is established and TCP/IP packages are transmitted successfully.
- **Amber arrows** mean connection is established but error happened during the transmission of the TCP/IP packages - check the SFP+ connection.
- **Red arrows** mean no connection is established between the endpoint devices.

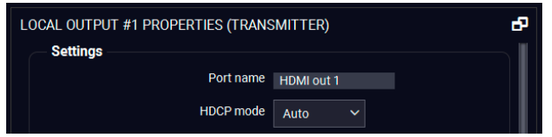
3.4.5. Set the HDCP Settings

Check the HDCP settings either on the input and output ports. For more details about the HDCP technology see the HDCP Management section.

- Open the HDMI in 1 and 2 port properties panel on the transmitter or transceiver side and check the **HDCP enable** setting. Put a tick to enable HDCP capability on the port.



- Open the HDMI out 1 and 2 local output port properties panels on the transmitter or transceiver side and check the **HDCP mode** setting.



- Open the HDMI out 1 and 2 output port properties panels on the receiver or transceiver side and check the **HDCP mode** setting.

> INFO: UBEX extenders always authenticate the highest version of HDCP-encryption and cannot force the lower version.

3.4.6. 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.

> 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** menu in the LDC software. Select the **Emulated** EDIDs on the right side panel, and select **Factory** EDIDs on the left side panel. See the entire list of the pre-installed factory EDIDs in the Factory EDID List section.

Example

For HDMI in 1

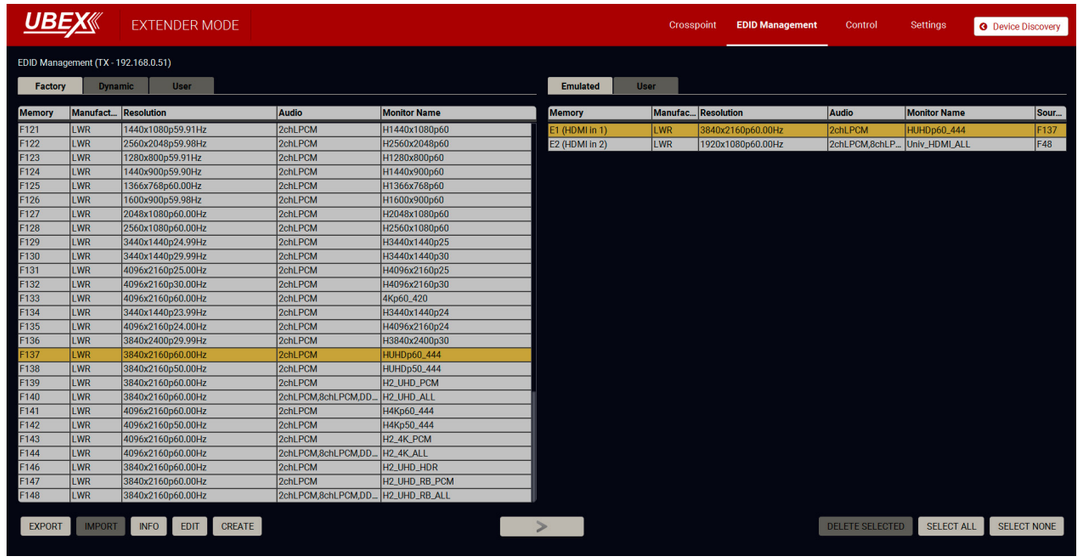
In our example the incoming signal on the HDMI in 1 port is 4K UHD 60 Hz (3840x2160p@60Hz 4:4:4).

Select the F137 memory address on the left side and also select the E1 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

In our example the HDMI in 2 port receives 1080p60 Hz signal (1920x1080p@60Hz).

Select the F48 memory track on the left side and also select the E2 EDID memory slot on the Emulated side. Click on the **Transfer** button (the arrow in the middle) to emulate the selected EDID.



EDID Management menu in the LDC

> TIPS AND TRICKS: If there is no pre-installed factory EDID in the list which can fit with your system, a new EDID can be created via the EDID Creator wizard. See more details about it in the Creating an EDID - Easy EDID Creator section.

3.4.7. Set the Scaler and the Frame Rate Converter

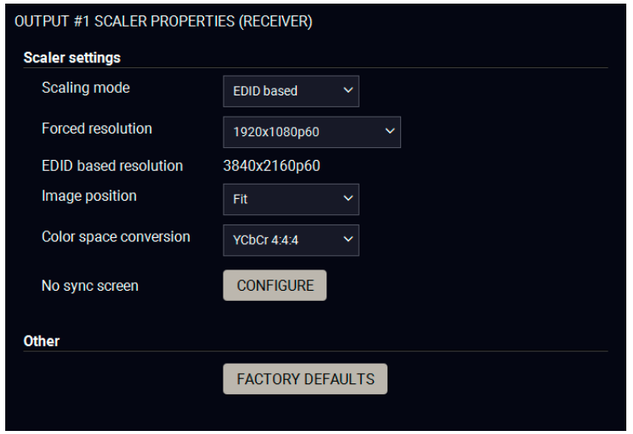
Set up the scaler and the frame rate converter (FRC) for the best user experience. The forced resolution and refresh rate are recommended to fit the supported resolution / refresh rate of the sink device.

> **ATTENTION!** Both input and output ports have FRC and CSC functions but the scaler is available for the HDMI in 1 and HDMI out 1 ports only.

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.

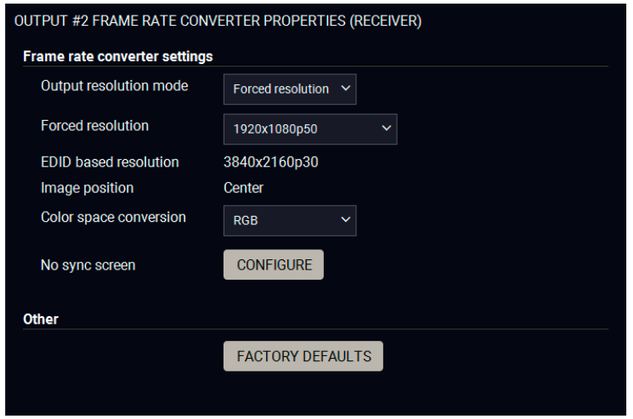
Navigate to the **Crosspoint menu - Video tab** and select the **Scaler** panel on the receiver side. Set the Scaling Mode setting to **EDID based** which means the receiver read out the EDID of the sink device and scaling the image to that. In our example it is **3840x2160p60**.Set the Image position to **Fit**, the Color space conversion to **YCbCr 4:4:4**.



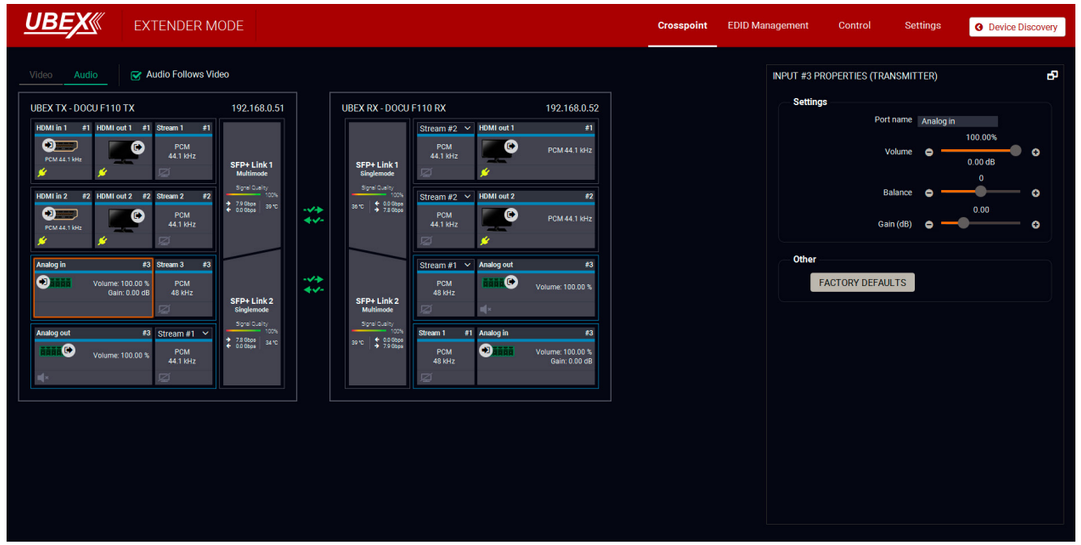
Frame Rate Converter - Example

In our example the other sink device is a full HD monitor with 50 Hz refresh rate and we have to display a 1080p60 Hz video on that. The signal is transmitted on the HDMI out 2 port of the UBEX receiver.

Navigate to the **Crosspoint menu - Video tab** and select the **FRC** panel on the receiver side. Set the Output resolution mode to **Forced resolution**, the Forced resolution to **1920x1080p50**, the Color space conversion to **RGB**.



3.4.8. Set the Audio Streams



The audio crosspoint menu in the LDC software for an F110 TX-RX pair

Crosspoint Settings

Set up the audio crosspoint settings. Digital and analog audio source streams are also selectable in the case of UBEX-PRO20-HDMI-F110 endpoint device. All audio streams can be selected to all outputs.

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

Analog Audio Settings

Set the volume and the balance for the analog audio input and output ports. You can also set the gain for input port. The output can be muted or unmuted.

See more details about these settings in the Properties Windows - Audio Layer section.

4

UBEX Concept - Extender Mode

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

- Video Interface
- Audio Interface
- Ethernet Control Interface
- Serial Interface
- SFP+ Interface
- Further Built-in Features
- Software Control Modes

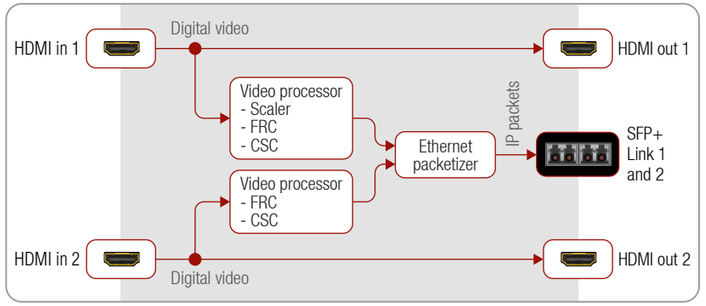
4.1. Video Interface

4.1.1. Transmitter Mode

Port Diagram

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

- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110



Video port diagram of the F100/F110 transmitter

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 has **video scaler, frame rate converter (FRC)**, and **color space converter (CSC)** functions. The processor of the HDMI in 2 has **frame rate converter** and **color space converter** functions.

The scaler settings are available in the LCD menu (see the details in the TX HDMI Input 1 and 2 Ports section) and in the LDC software (see the details in the Scaler Panel - Input Side (TX Mode) section); the frame rate converter settings (FRC) are available in the LCD menu (see the details in the TX HDMI Input 1 and 2 Ports section) and in the LDC software (see the details in the FRC - Input Side (TX/TRX Modes) 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.

SFP+ Interface

After the Ethernet packetizing the two video streams are transmitted to the remote endpoint device via the SFP+ ports.

Summary Tables

HDMI INPUTS		
	HDMI input 1	**HDMI input 2**
Accepted signal	up to 4K@60 4:4:4	up to 4K@60 4:4:4
Scaler	✓	-
Frame rate converter (FRC)	✓	✓
Color space converter (CSC)	✓	✓

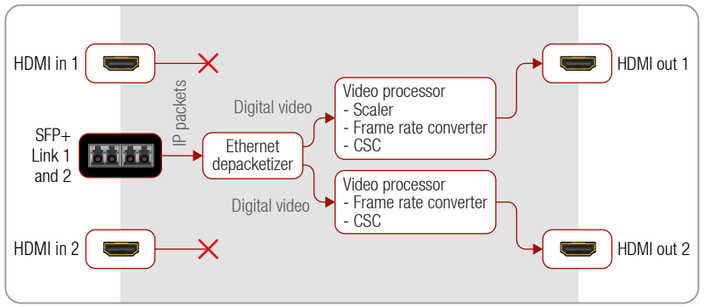
HDMI OUTPUTS		
	HDMI output 1	**HDMI output 2**
Output signal	up to 4K@60 4:4:4	up to 4K@60 4:4:4
Signal source	HDMI in 1	HDMI in 2

4.1.2. Receiver Mode

Port Diagram

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

- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110



Video port diagram of the F100/F110 receiver

SFP+ Interface

The receiver can receive two HDMI video streams via the SFP+ input ports (SFP+ Link 1 and 2).

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 either.

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

The scaler settings are available in the LCD menu (see the details in the RX HDMI Output 1 and 2 Ports section) and in the LDC software (see the details in the Scaler Panel - Output Side (RX/TRX Modes) section); the frame rate converter settings (FRC) are available in the LCD menu (see the details in the RX HDMI Output 1 and 2 Ports section) and in the LDC software (see the details in the FRC - Output Side (RX Mode) section).

HDMI Input Modes

The HDMI input ports of the receiver cannot accept video signals due to software limitation.

Summary Tables

HDMI INPUTS		
	HDMI input 1	**HDMI input 2**
Accepted signal	⛔	⛔

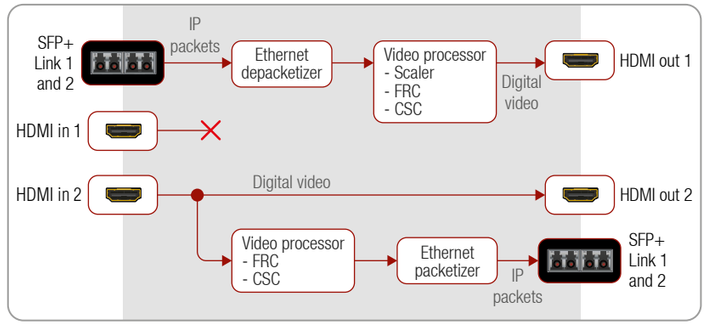
HDMI OUTPUTS		
	HDMI output 1	**HDMI output 2**
Output signal	up to 4K@60 4:4:4	up to 4K@60 4:4:4
Signal source	Selected input port of the remote device	Selected input port of the remote device
Scaler	✓	-
Frame rate converter (FRC)	✓	✓
Color space converter (CSC)	✓	✓

4.1.3. Transceiver Mode

Port Diagram

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

- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110



Video port diagram of the F100/F110 transceiver

SFP+ Interface

The transceiver is able to send and receive HDMI video streams together in the same time over the SFP+ 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 (it contains **frame rate converter (FRC)** and **color space converter (CSC)** functions). The video processor settings are available in the LCD menu (see the details in the Local TRX I2 Port section) and in the LDC software (see the details in the FRC - Input Side (TX/TRX Modes) section).

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 menu (see the details in the Local TRX O1 Port section) and in the LDC software (see the details in the Scaler Panel - Output Side (RX/TRX Modes) section).

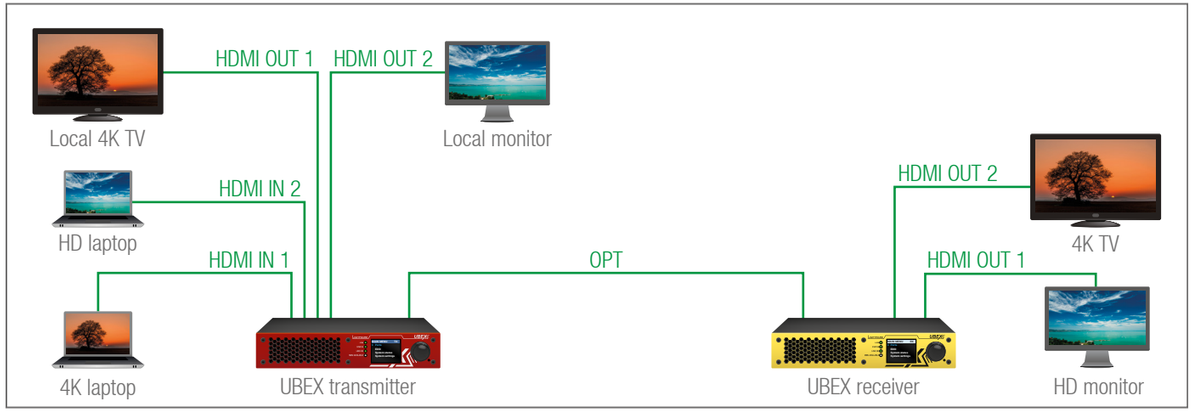
The HDMI out 2 transmits the HDMI signal coming from the HDMI in 1 input port so it operates as a local output port. The stream cannot be affected by any video processing.

Summary Tables

HDMI INPUTS		
	HDMI input 1	**HDMI input 2**
Accepted signal	⛔	up to 4K@60 4:4:4
Scaler	-	-
Frame rate converter (FRC)	-	✓
Color space converter (CSC)	-	✓

HDMI OUTPUTS		
	HDMI output 1	**HDMI output 2**
Output signal	up to 4K@60 4:4:4	up to 4K@60 4:4:4
Signal source	Input port of the remote device	HDMI in 2
Scaler	✓	-
Frame rate converter (FRC)	✓	-
Color space converter (CSC)	✓	-

4.1.4. HDMI Signal Transmission - Example for TX-RX Pair



The Concept

Two source devices are connected to the UBEX transmitter: a 4K laptop built with a 4K graphic card (output signal: 4K60) and an HD laptop (output signal: 1080p60). Two sink devices are also connected to the local output ports of the transmitter: a local 4K TV and a local monitor.

The two streams from the 4K laptop and the HD laptop are transmitted to the UBEX receiver via the fiber optical line.

The receiver transmits the streams toward two source devices: a 4K TV and a full HD (1080p) monitor.

Available Crosspoint Settings

		Transmitter		Receiver	
		HDMI out 1 Local 4K TV	**HDMI out 2** Local monitor	**HDMI out 1** HD monitor	**HDMI out 2** 4K TV
Transmitter	**HDMI in 1** 4K laptop	✓	-	✓	✓
	HDMI in 2 HD laptop	-	✓	✓	✓

The local output ports of the transmitter are fixed: the HDMI out 1 transmits the HDMI in 1 stream, the HDMI out 2 transmits the HDMI in 2 stream.

The streams coming from the transmitter can be switched between the two output ports of the receiver. For example the HDMI in 1 stream can be switched to the HDMI out 1 and out 2 as well.

Scaling Options

If the stream of the 4K laptop is switched to the HD monitor on the HDMI out 1, it cannot display the high-resolution video. The solution is the stream transmitted on the HDMI out 1 can be scaled for the sink device which supports lower resolutions only. For example the 4K60 video is scaled to 1080p60 and the stream can be displayed on the HD monitor as well.

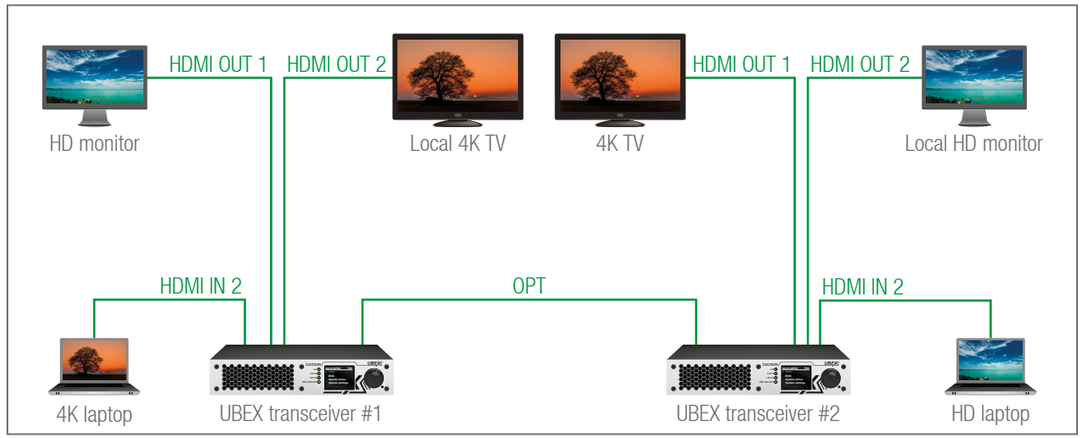
The scaler is available on the receiver and transmitter side either. The stream of the HDMI in 1 can be re-scaled and the transmitter transmits the optimized stream toward the receiver.

ATTENTION! The local outputs of the transmitter always display the received original video streams and cannot be scaled.

Lightware Device Controller (LDC)

The crosspoint settings are available in LCD menu of the device (see the details in the RX HDMI Output 1 and 2 Ports section) and in LDC software (see the details in the Video Crosspoint Menu section).

4.1.5. HDMI Signal Transmission - Example for TRX-TRX Pair



The Concept

Two source devices are installed in the system: a 4K laptop connected the TRX #1, and a HD laptop connected to the TRX #2. The stream of the 4K laptop is sent to the HDMI out 1 port of the TRX #2 (4K TV) and also transmitted to the local output port of the TRX #1 (Local 4K TV). The stream of the HD laptop is sent to the HDMI out 1 port of the TRX #1 (HD monitor) and also transmitted to the local output port of the TRX #2 (Local HD monitor).

Available HDMI Signal Routing

			Destinations			
			Transceiver #1		Transceiver #2	
			HDMI out 1 HD monitor	HDMI out 2 Local 4K TV	HDMI out 1 4K TV	HDMI out 2 Local HD monitor
Sources	TRX #1	HDMI in 2 4K laptop	-	✓	✓	-
	TRX #2	HDMI in 2 HD laptop	✓	-	-	✓

Explanation

The input of the Transceiver #1 is displayed on the local HDMI output (HDMI out 2) and the output of the Transceiver #2 (HDMI out 1), and the input of the Transceiver #2 is displayed on the local HDMI output (HDMI out 2) and the output of the Transceiver #1 (HDMI out 1).

4.1.6. Timing Modes

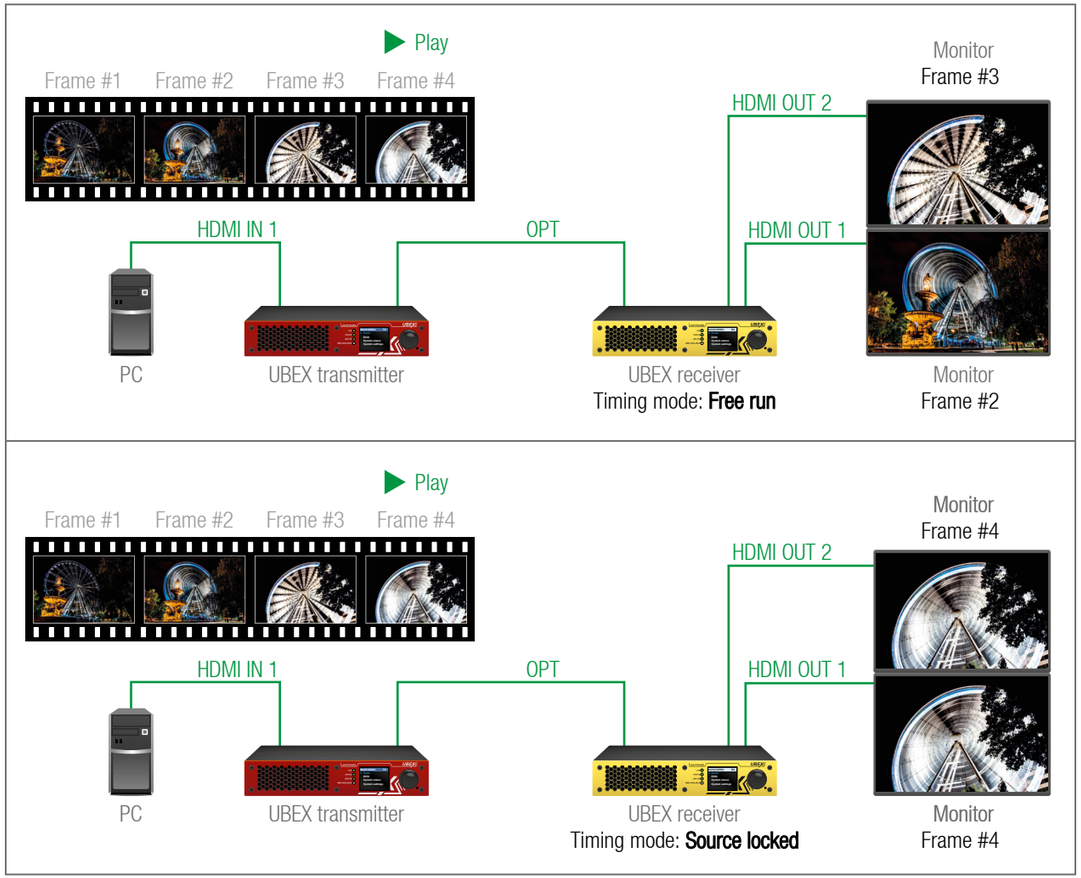
Technical Background

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 HDMI Output Ports (RX/TRX Modes) section) and by LW3 protocol commands (see the details in the Timing Mode Setting section).

Application of Timing Mode Settings - Example



The Concept

The two PCs play the same content and the playing time is in the same moment (Frame #4) in both cases.

The HDMI output ports of the upper UBEX receiver are set to **free run**. The differences between the actual content of the connected monitors might be noticeable.

The HDMI output ports of the lower 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.

4.1.7. Bandwidth Limitation

The UBEX endpoints can transmit two video streams at the same time 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 is still received by the receiver). In that case the stream tile of the disabled stream become amber in the LDC software.

Transmitter side	HDMI in 1		HDMI in 2	
	Status	Stream tile (LDC)	Status	Stream tile (LDC)
	Enabled	Stream 1	Disabled	Stream 2

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 is still received). In that case the stream tile of the disabled stream become amber in the LDC software.

Receiver side	HDMI out 1		HDMI out 2	
	Status	Stream tile (LDC)	Status	Stream tile (LDC)
	Enabled	Stream 1	Disabled	Stream 2

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 both HDMI ports.

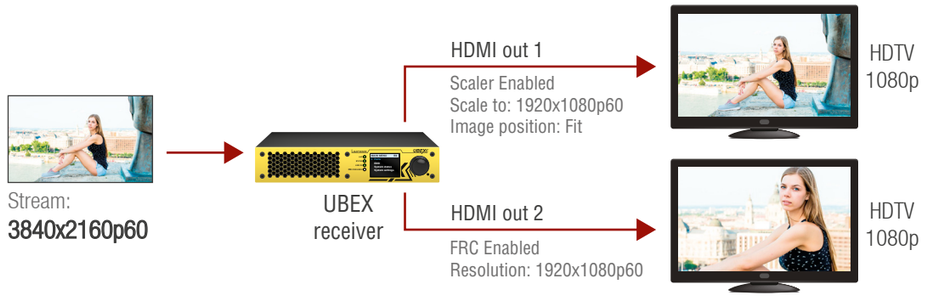
Transceiver side	HDMI in 2		HDMI out 1	
	Status	Stream tile (LDC)	Status	Stream tile (LDC)
	Enabled	Stream 1	Enabled	Stream 1

INFO: You can find the bandwidth requirements belong to each resolutions in the Required Bandwidth of the Resolutions section.

4.1.8. The Difference between the Scaler and the FRC - Example

The following example helps to understand how works the scaler and the frame rate converter and describes the differences between them.

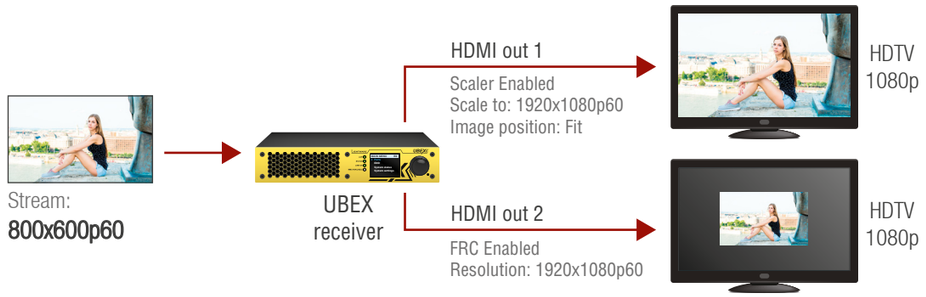
Example for Downscaling



When the resolution of the stream is bigger than the supported resolution of the sink devices:

- **HDMI out 1**: set the scaler for the supported resolution to fit the stream to the sink device.
- **HDMI out 2**: the frame rate converter crops the center part with 1080p resolution from the picture.

Example for Upscaling



When the resolution of the stream is smaller than the supported resolution of the sink devices:

- **HDMI out 1**: set the scaler for the supported resolution and it fits the stream for the sink device.
- **HDMI out 2**: the frame rate converter fills the extra image part with black pixels.

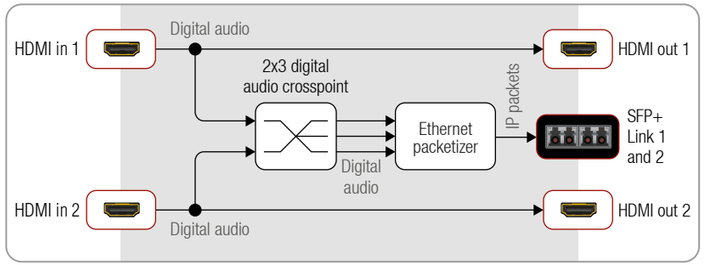
4.2. Audio Interface

4.2.1. Transmitter Mode - F100 Model

Port Diagram

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

- UBEX-PRO20-HDMI-F100



Audio port diagram of the F100 transmitter in connection with an F110 endpoint

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 remote endpoint side. The crosspoint setting is available in the transmitter as well.

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

Connection with an F110 Endpoint Device

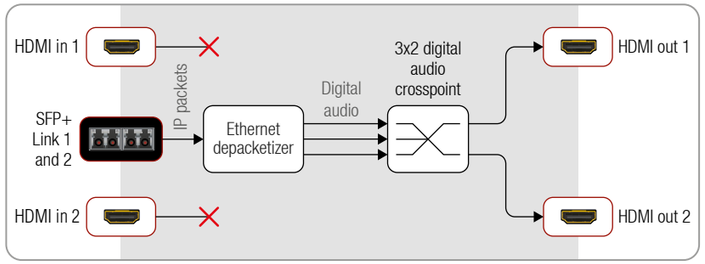
When the F100 transmitter connects to an F110 endpoint device, the number of audio outputs expands to three due to the analog audio output port on the remote side. In this case the digital audio crosspoint changes to 2x3 (2 inputs and 3 outputs).

4.2.2. Receiver Mode - F100 Model

Port Diagram

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

- UBEX-PRO20-HDMI-F100



Audio port diagram of the F100 receiver in connection with an F110 endpoint

Description

The receiver can receive two HDMI audio streams via the SFP+ links. The streams can be selected to any HDMI output ports, the crosspoint setting is available in the receiver as well.

The HDMI input ports of the receiver cannot accept audio signals due to software limitation.

Connection with an F110 Endpoint Device

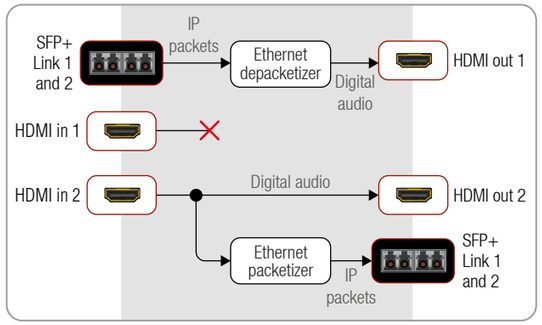
When the F100 receiver connects to an F110 endpoint device, the number of audio inputs expands to three due to the analog audio input stream received via the SFP+ links. In this case the digital audio crosspoint changes to 3x2 (3 inputs and 2 outputs).

4.2.3. Transceiver Mode - F100 Model

Port Diagram

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

- UBEX-PRO20-HDMI-F100



Description

The transceiver can receive an HDMI audio stream via the SFP+ links and transmitting on the HDMI out 1 port.

The transceiver receives an HDMI audio signal via the HDMI input 2 port. The audio stream is transmitted toward the remote endpoint device over the SFP+ links.

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.

Connection with an F110 Endpoint Device

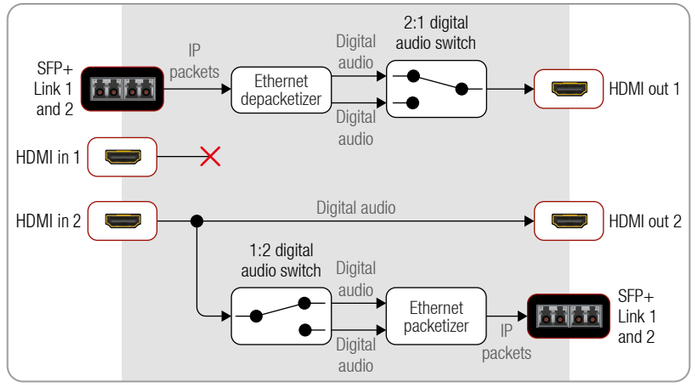
When the F100 transceiver connects to an F110 endpoint device, the port diagram changes due to the expanded audio possibilities.

Input Side

The number of audio inputs expands to two due to the analog audio input stream received via the SFP+ links.

Output Side

The number of audio outputs expands to two due to the analog audio output port on the remote endpoint. The crosspoint setting is available in the local transceiver as well.



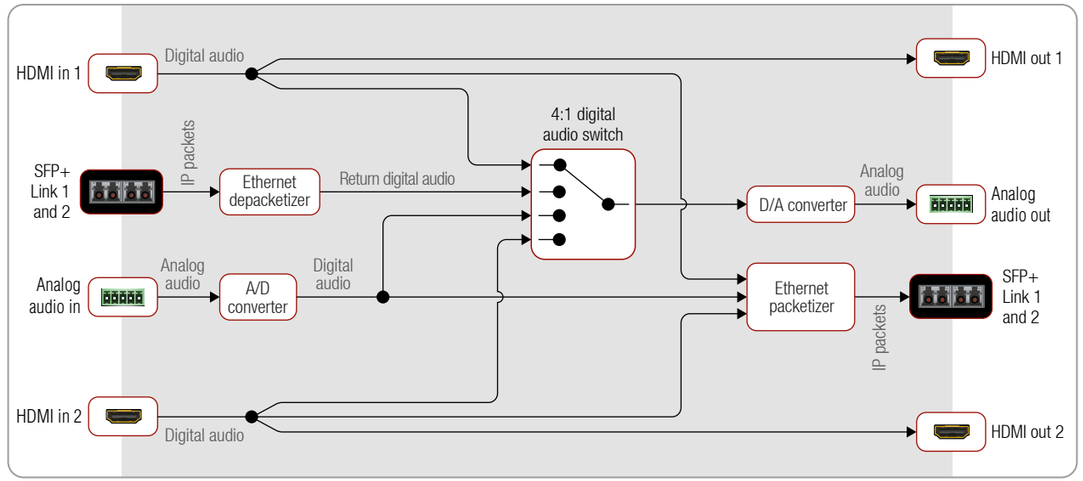
Audio port diagram of the F100 transceiver in connection with an F110 endpoint

4.2.4. Transmitter Mode - F110 Model

Port Diagram

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

- UBEX-PRO20-HDMI-F110



Audio port diagram of the F110 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 remote endpoint device over the SFP+ ports. The selected audio stream can be switched to the analog audio out 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 toward the remote endpoint device.

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 endpoint model converts the **uncompressed stereo audio** stream to analog audio. The analog audio output port supports **PCM audio format up to 48 kHz**.

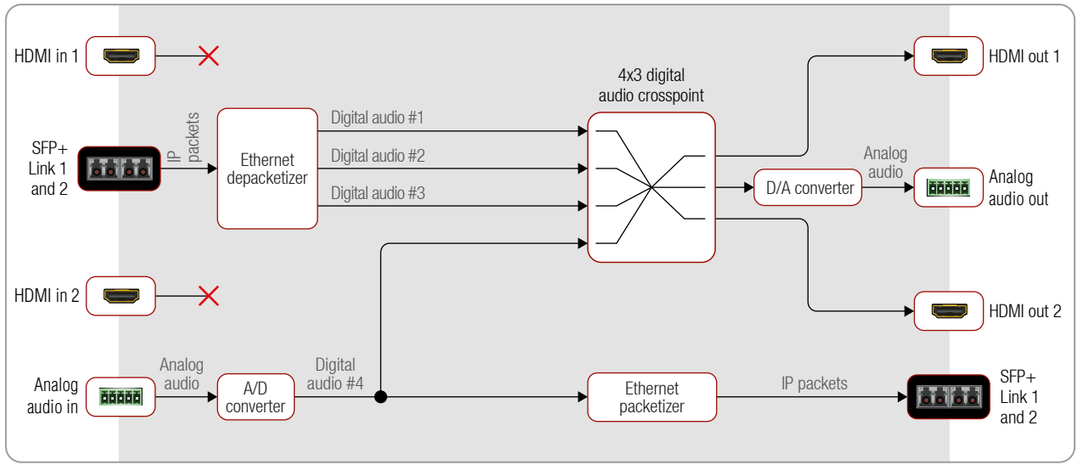
> **ATTENTION!** If unsupported audio signal is selected to the analog audio output, the port will be muted automatically. The current status of the port can be queried by an LW3 protocol command, see the details in the Query the Status of the Analog Audio Output section.

4.2.5. Receiver Mode - F110 Model

Port Diagram

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

- UBEX-PRO20-HDMI-F110



Port diagram of the F110 receiver

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 toward the remote endpoint device over the SFP+ links.

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

Signal Support of the Analog Audio Output

The UBEX-PRO20-HDMI-F110 endpoint model converts the **uncompressed stereo audio** stream to analog audio. The analog audio output port supports **PCM audio format up to 48 kHz**.

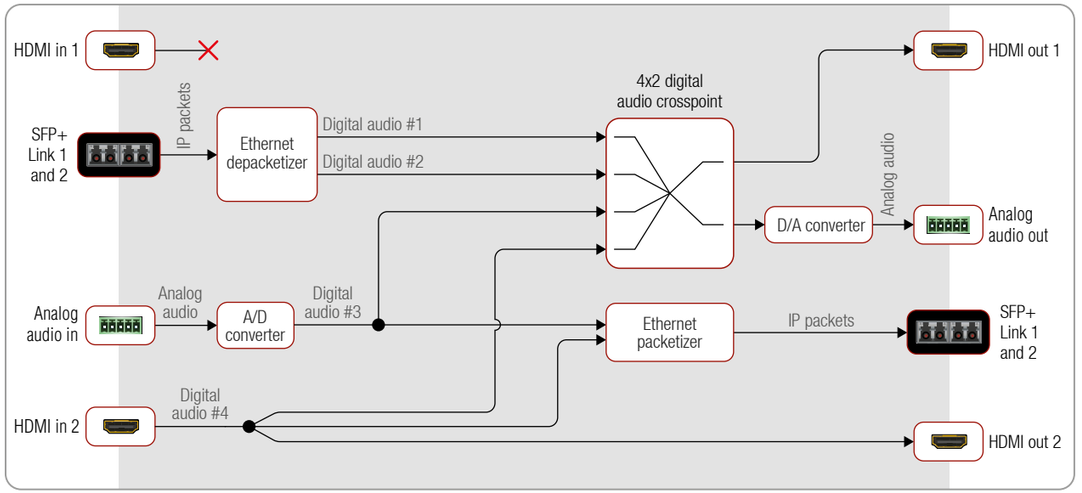
> **ATTENTION!** If unsupported audio signal is selected to the analog audio output, the port will be muted automatically. The current status of the port can be queried by an LW3 protocol command, see the details in the Query the Status of the Analog Audio Output section.

4.2.6. Transceiver Mode - F110 Model

Port Diagram

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

- UBEX-PRO20-HDMI-F110



Port diagram of the F110 transceiver

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 toward the remote endpoint device.

The HDMI out 2 port is a local output port, it transmits the audio stream of the HDMI in 2 port directly.

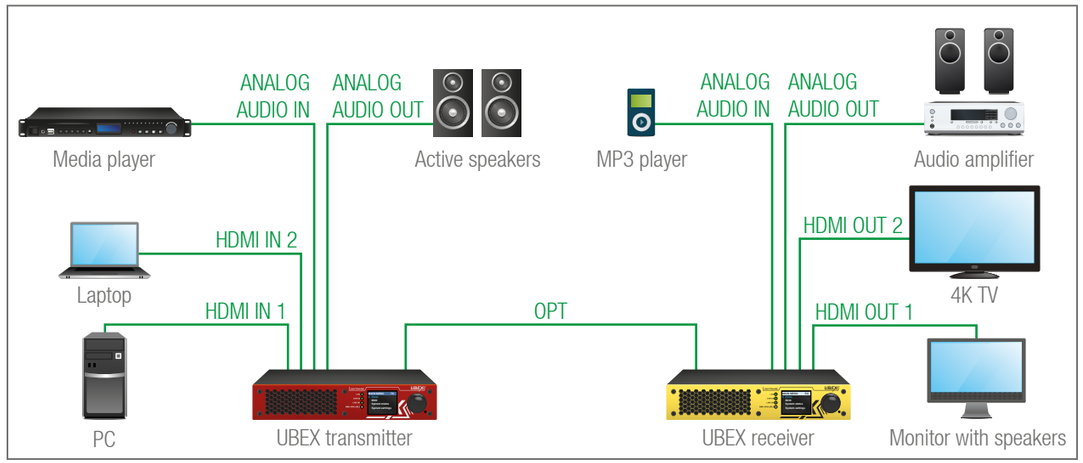
The HDMI input 1 port does not accept signal when the device is configured as transceiver.

Signal Support of the Analog Audio Output

The UBEX-PRO20-HDMI-F110 endpoint model converts 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.

4.2.7. Audio Signal Transmission - Example for TX-RX Pair



The Concept

Three source devices are connected to the F110 transmitter: a PC and a laptop on the HDMI input ports; and a media player on the analog audio input port. A sink device is also connected to the transmitter: active speakers on the analog audio output port.

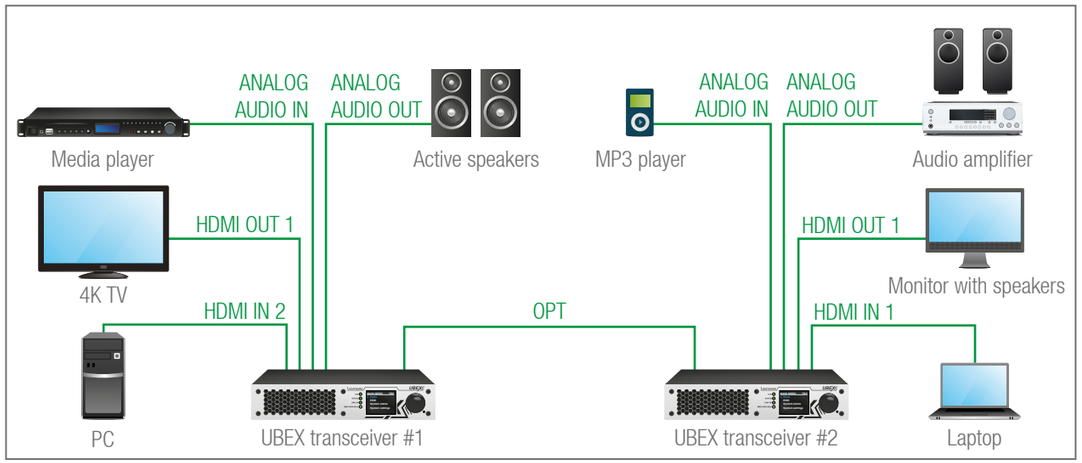
The F110 receiver has three sink devices: a monitor with speakers and a 4K TV on the HDMI output ports; and an audio amplifier on the analog audio output port. A source device is also connected to the receiver: an MP3 player on the analog audio output port.

The following chart shows all audio stream selection possibilities:

Crosspoint possibilites of the audio streams for UBEX			Sink devices			
			TX	RX		
			Active speakers	Monitor with speakers	4K TV	Audio amplifier
Sources	TX	PC	✓	✓	✓	✓
		Laptop	✓	✓	✓	✓
		Media player	✓	✓	✓	✓
	RX	MP3 player	✓	✓	✓	✓

Summary: All audio streams of the source devices can be selected to all sink devices except the TX local HDMI outputs which are always transmitted the audio signals of the TX inputs.

4.2.8. Audio Signal Transmission - Example for TRX-TRX Pair



The Concept

Two source devices are connected to the F110 transceiver #1: a PC on the HDMI input 2 port; and a media player on the analog audio input port. Two sink devices are also connected to the endpoint: a 4K TV on the HDMI output 1 port; and active speakers on the analog audio output port.

The configuration of the F110 transceiver is similar. Two source devices are connected: a laptop on the HDMI input 2 port; and an MP3 player on the analog audio input port. Two sink devices are also connected to the endpoint: a monitor with speakers on the HDMI output 1 port; and audio ampliflier on the analog audio output port.

The following chart shows all audio stream selection possibilities:

Crosspoint possibilites of the audio streams for UBEX			Sink devices			
			Transceiver #1		Transceiver #2	
			4K TV	Active speakers	Monitor with speakers	Audio amplifier
Sources	TRX #1	PC	✓	✓	✓	✓
		Media player	✓	✓	✓	✓
	TRX #2	Laptop	✓	✓	✓	✓
		MP3 player	✓	✓	✓	✓

Summary: All audio streams of the source devices can be selected to all sink devices except the local HDMI outputs which are always transmitted the audio signals of the inputs.

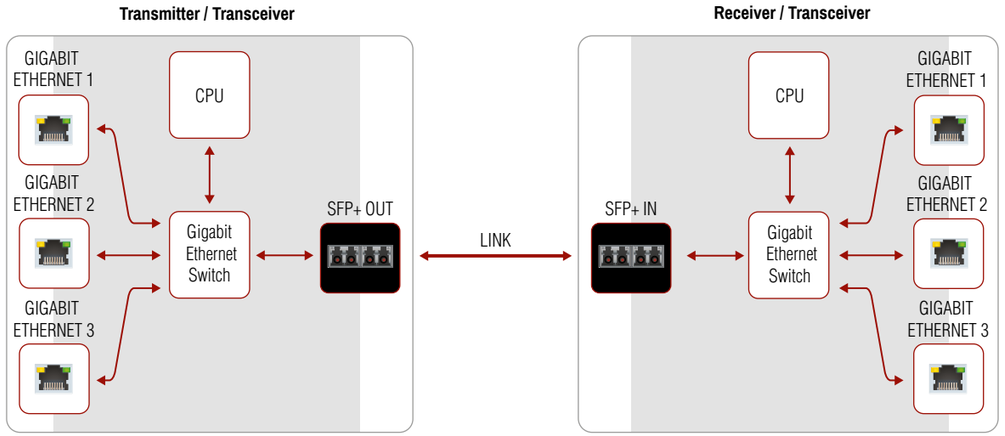
4.3. Ethernet Control Interface

The endpoint device can be controlled via Ethernet port. This interface supports any third-party system controller with LW3 command protocol. The interface can be used to configure the device with Lightware Device Controller and establish the connection to Lightware Device Updater software and perform firmware upgrade.

Two Ethernet connectors provide a wide range of application possibilities:

- Control the device
- Firmware upgrade
- Create a local network
- Daisy chain connection

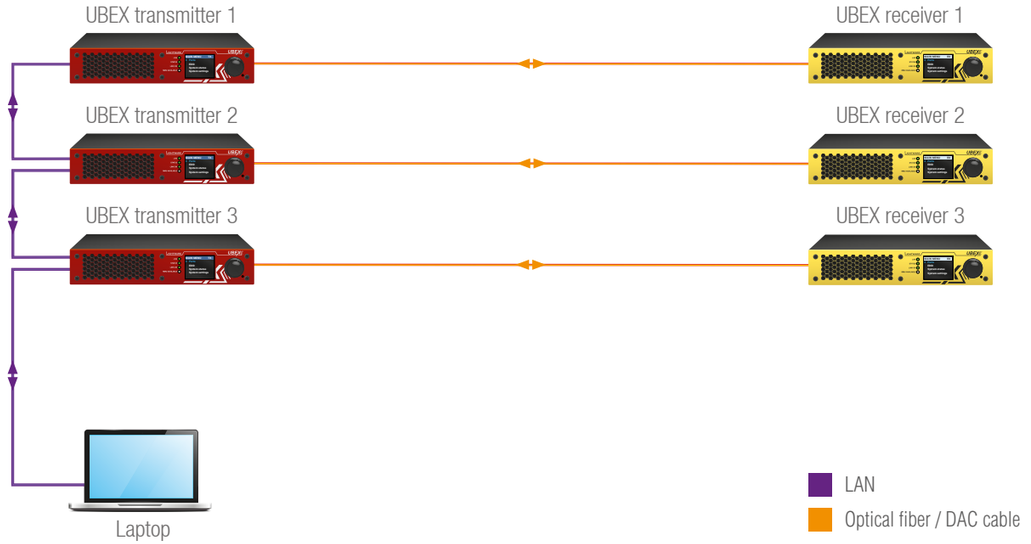
Port Diagram



Port diagram of the Ethernet interface for the F110 model

INFO: The F100 endpoint model has 2 pcs, the F110 endpoint model is built with 3 pcs Gigabit Ethernet ports.

Ethernet Interface - Example



The **transmitters** are connected to each other via LAN, the **receivers** connected to the **transmitters** via optical fiber or DAC cables.

This way the **laptop** can control the system with Ethernet commands:

- UBEX transmitter (1-3.).
- UBEX receiver (1-3.).

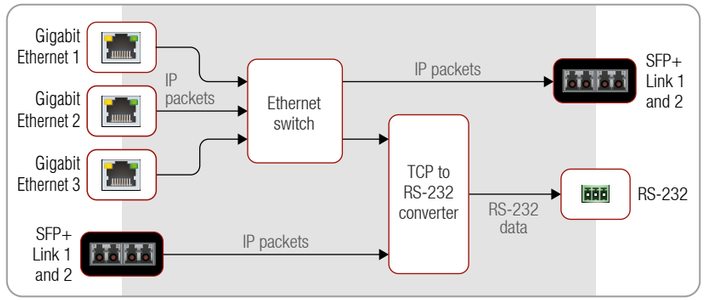
ATTENTION! When one of the extender is in firmware upgrade mode, the Ethernet communication will be lost during the upgrade procedure.

4.4. Serial Interface

ATTENTION! Only the UBEX-PRO20-HDMI-F110 model has built with serial interface port.

4.4.1. Technical Background

Port Diagram

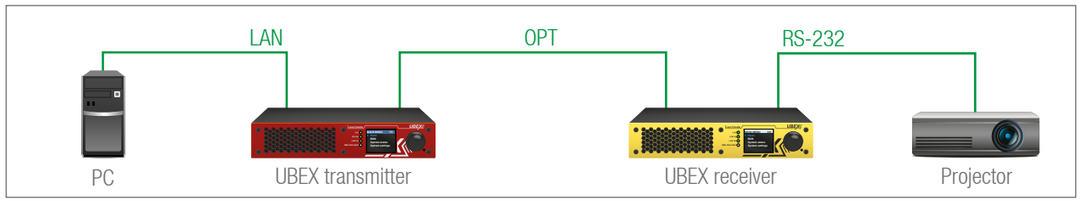


Port diagram of the serial interface

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 (via the Gigabit Ethernet 1-3 ports) which addresses the local or the remote RS-232 port. TCP/IP port numbers are defined for the serial ports for this purpose. E.g. the default Command Injection port number of the local RS-232 port is 8001. If data is coming from the SFP+links which addresses to the port no. 8001, it will be transmitted to the Tx pin of the local RS-232 port.

4.4.2. RS-232 Signal Transmission – Example



The Concept

The projector which are connected to the UBEX receiver is controlled with RS-232 messages which are sent from the PC connected to the UBEX transmitter. You can send serial messages using two methods:

- **Lightware Device Controller (LDC)** - see the details in the RS-232 Tab section;
- **LW3 protocol commands** - see the details in the Message Sending via RS-232 Serial Port section.

4.5. SFP+ Interface

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

The following methods can be applied to connect the endpoint devices to each other:

- 2x SFP+ transceiver modules up to 10Gbps bandwidth/modules. The modules 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.
- 2x 10GbE DAC cables

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 is installed only but the signal is 4K@60 Hz (which requires 14 Gbps to transmit), the signal transmission will be disabled. See more details about it in the Bandwidth Limitation section.

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

4.6. Further Built-in Features

4.6.1. Device Cloning – Configuration Backup and Restore

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

See more information about the settings in the Configuration Cloning (Backup Tab) section.

4.6.2. Advanced EDID Management

Factory Preset EDIDs

The factory EDIDs (F1-F148) are factory preprogrammed and cannot be modified. These are the most common signal formats. They are specially provided to force graphic cards to output only the exact pixel resolution and refresh rate.

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

Sources and Destinations

The EDID memory consists of four parts:

- **Factory EDID** list shows the pre-programmed EDIDs (F1-F148).
- **Dynamic EDID** list shows the sink connected to the device's outputs (D1-D4). 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 – U12) can be used to save custom EDIDs.
- **Emulated EDID** list shows the currently emulated EDID for the inputs (E1-E2). The source column displays the memory location that the current EDID was routed from.

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

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

- **Static EDID emulation**: an EDID from the Factory or User EDID list is selected. Thus, the Emulated EDID remains the same until the user emulates another EDID.
- **Dynamic EDID emulation**: it can be enabled by selecting D1-D4 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.

4.7. 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 device via our control software using Ethernet interface and control or configure the device as you wish. For the details see the Lightware Device Controller - Extender Mode chapter.
- **LW3 protocol commands**: you can configure the device by using the full-range command set of LW3 protocol. For more details see the Programmers' Reference - Extender Mode chapter.

5

Front Panel LCD Menu Operations - Extender Mode

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

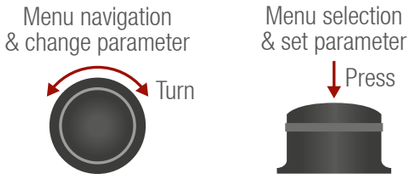
- Introduction
- The Tree Structure of the LCD Menu
- Ports Menu - Transmitter Mode
- Ports Menu - Receiver Mode
- Ports Menu - Transceiver Mode
- EDID Menu
- System Status Menu
- System Settings Menu

5.1. Introduction

5.1.1. 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 pressed to enter a menu or edit/set a parameter.

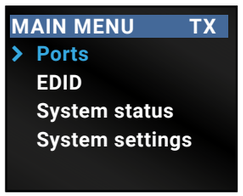
> TIPS AND TRICKS: The faster you rotate the jog dial, the faster the parameter list is scrolled.



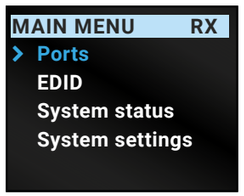
5.1.2. Operation Mode Visualization

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

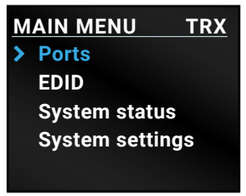
- The color of the header is **blue** for the transmitter, **white** for the receiver, and **black with a white stripe** for the transceiver;
- There is a TX, RX, or TRX label in the main menu of the menu structure.



Main menu of the transmitter



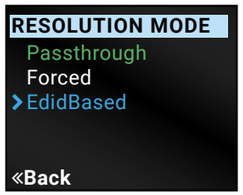
Main menu of the receiver



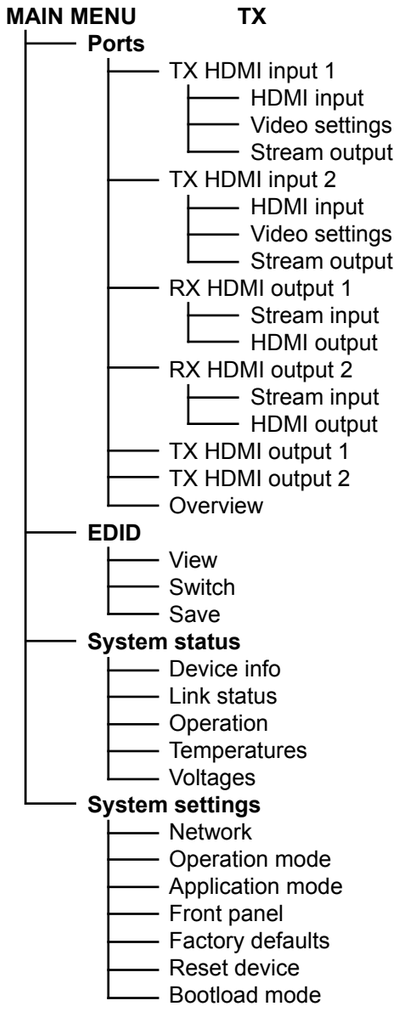
Main menu of the transceiver

5.1.3. Parameter Selection

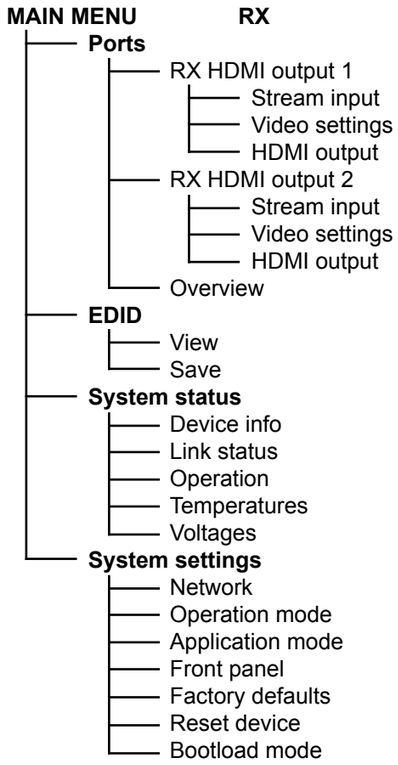
The **blue** colored line means the selected menu/parameter, the **green** one means the current setting.



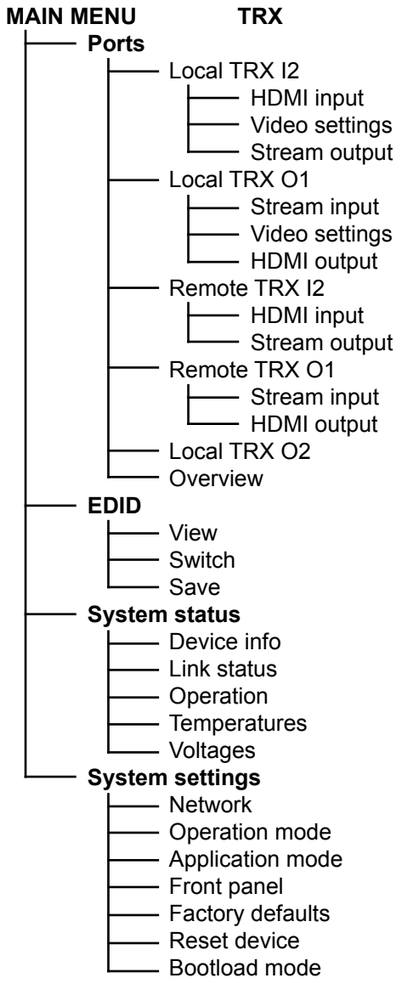
5.2. The Tree Structure of the LCD Menu



The tree structure of the transmitter mode

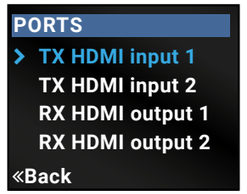


The tree structure of the receiver mode



The tree structure of the transceiver mode

5.3. Ports Menu - Transmitter Mode



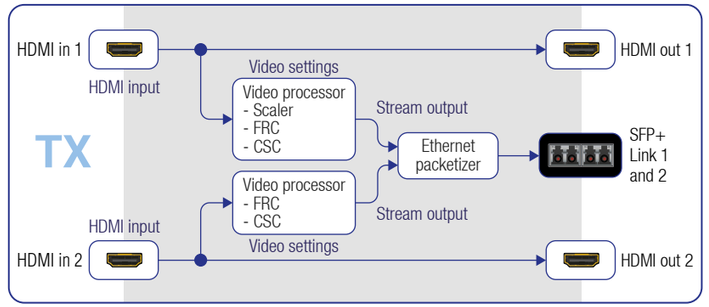
The most important settings and status information of the HDMI ports are available in the Ports menu.

The four local HDMI ports and the two remote HDMI ports are listed in the Ports menu of the transmitter:

Local ports	Remote ports (RX side)
TX HDMI input 1	RX HDMI output 1
TX HDMI input 2	RX HDMI output 2
TX HDMI output 1	
TX HDMI output 2	

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

The following port diagrams help to identify and navigate to the desired submenu:



Port diagram - Transmitter mode

5.3.1. TX HDMI Input 1 and 2 Ports

HDMI Input

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

- **HDCP enable** - Enabled / Disabled
- +5V present
- Signal present
- Active resolution
- Total resolution
- Color space

Video Settings

The following settings can be set in the case of both input ports:

- **Resolution mode**
  - Passthrough: pass-through mode; the original resolution of the stream is transmitted.
  - Forced: the resolution which is set in the Resolution setting menu is forced.
- **Resolution setting** - select a resolution to force from the pre-installed list. The entire list can be found in the Resolutions of the Scaler / FRC section.
- **Image position** - Center / Fit / Stretch

INFO: The Image position setting on the HDMI IN 2 port is a read-only parameter and fixed as "Center".

- **Color space** - Passthrough / Force RGB / Force YCbCr 4:4:4 / Force YCbCr 4:2:2

Stream Output

The following settings and information are related to the video stream sent toward the remote RX endpoint:

- **Stream enable** - Enabled / Disabled
- Signal present
- Active resolution
- Total resolution
- Color space

5.3.2. RX HDMI Output 1 and 2 Ports

INFO: The following port status information and settings are related to the remote output ports of the receiver.

Stream Input

The following information is displayed in the case of both streams transmitted to the receiver:

- **Stream source** - Stream 1 / Stream 2
  - The source stream of HDMI outputs in the receiver can be switched in this submenu.
- 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

5.3.3. TX HDMI Output 1 and 2 Ports

The following information is displayed for both local output ports:

- **HDCP mode** - Auto / Always
- **Output 5V mode** - Always on / Auto / Always off
- Hotplug detect
- Signal present
- Active resolution
- Total resolution
- Color space

5.3.4. Overview

The current status of the input and output ports is summarized in the Overview menu. The icons display information about the port and the incoming/transmitted signals.

TIPS AND TRICKS: Press enter on the selected port for the settings and detailed status information.

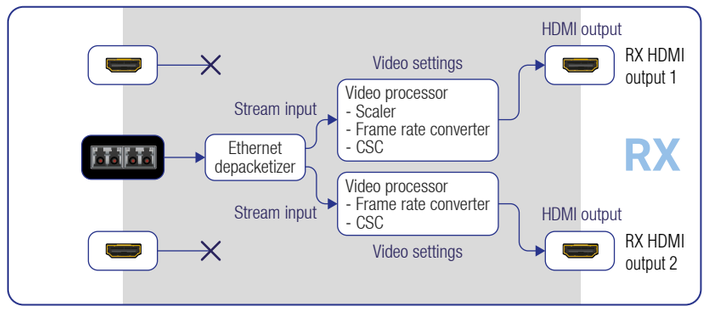
Icon	Icon is blue (inactive)	Icon is white (active)
	Sink is **not** connected	Sink is connected
	Signal is **not** present	Signal is present
	Signal is **not** encrypted with HDCP	Signal is encrypted with HDCP
	No audio signal in the video stream	Audio is embedded in the video stream

5.4. Ports Menu - Receiver Mode

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

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

The following port diagrams help to identify and navigate to the desired submenu:



Port diagram - Receiver mode

5.4.1. RX HDMI Output 1 and 2 Ports

Stream Input

The following settings and information are related to the video stream coming from the TX input ports:

- **Stream enable** - Enabled / Disabled
- Signal present
- Active resolution
- Total resolution
- Color space

Video Settings

The following settings can be set in the case of both output ports:

- **Resolution mode**
  - Passthrough: pass-through mode; the original resolution of the stream is transmitted.
  - Forced: the resolution which is set in the Resolution setting menu is forced.
  - EdidBased: the resolution which is read out from the EDID of the connected sink device is forced.
- **Resolution setting** - select a resolution to force from the pre-installed list. The entire list can be found in the Resolutions of the Scaler / FRC section.
- **Image position** - Center / Fit / Stretch

INFO: The Image position setting on the HDMI OUT 2 port is a read-only parameter and fixed as "Center".

- **Color space** - Passthrough / Force RGB / Force YCbCr 4:4:4 / Force YCbCr 4:2:2
- **No Sync mode** - the No sync mode feature generates an image which can be displayed when there is no incoming signal on the port. The following settings can be set for the Test Pattern function:
  - **Always off** - the test pattern function is disabled, the video output port transmits the video signal of the selected input port.
  - **No signal mode** - the video output port transmits the test pattern if there is no incoming signal on the selected input port.
  - **Always on** - the video output port always transmits the test pattern.

HDMI Output

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

- **HDCP mode** - Auto / Always
- **Output 5V mode** - Always on / Auto / Always off
- Hotplug detect
- Signal present
- Active resolution
- Total resolution
- Color space

5.4.2. Overview

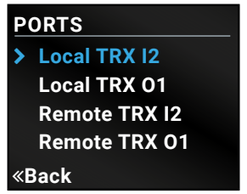
The current status of the output ports is summarized in the Overview menu. The icons display information about the port and the transmitted signals.

TIPS AND TRICKS: Press enter on the selected port for the settings and detailed status information.

Icon	Icon is blue (inactive)	Icon is white (active)
	Sink is **not** connected	Sink is connected
	Signal is **not** present	Signal is present
	Signal is **not** encrypted with HDCP	Signal is encrypted with HDCP
	No audio signal in the video stream	Audio is embedded in the video stream

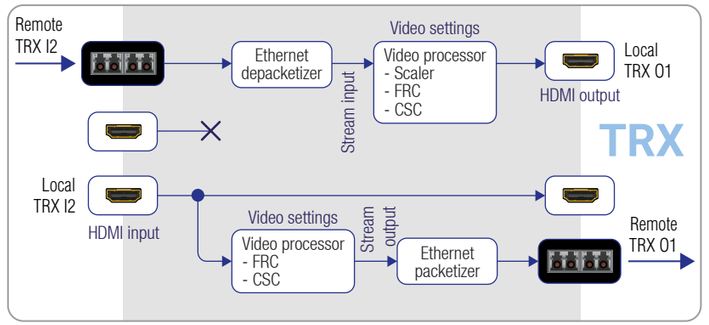
5.5. Ports Menu - Transceiver Mode

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.

The following port diagrams help to identify and navigate to the desired submenu:



Port diagram - Transceiver mode

5.5.1. Local TRX I2 Port

HDMI Input

The HDCP setting and information about the HDMI input 1 port are displayed:

- **HDCP enable** - Enabled / Disabled
- +5V present
- Signal present
- Active resolution
- Total resolution
- Color space

Video Settings

The following settings can be set for the stream of the HDMI input 2 port:

- **Resolution mode**
  - Passthrough: pass-through mode; the original resolution of the stream is transmitted.
  - Forced: the resolution which is set in the Resolution setting menu is forced.
- **Resolution setting** - select a resolution to force from the pre-installed list. The entire list can be found in the Resolutions of the Scaler / FRC section.
- Image Position - Center
- **Color space** - Passthrough / Force RGB / Force YCbCr 4:4:4 / Force YCbCr 4:2:2

Stream Output

The following settings and information is related to the video stream which is sent toward the remote TRX endpoint:

- **Stream enable** - Enabled / Disabled
- Signal present
- Active resolution
- Total resolution
- Color space

5.5.2. Local TRX O1 Port

Stream Input

The following settings and information are related to the video stream coming from the input port of the remote TRX endpoint:

- **Stream enable** - Enabled / Disabled
- Signal present
- Active resolution
- Total resolution
- Color space

Video Settings

The following settings can be set for the stream of the HDMI output 1 port:

- **Resolution mode**
  - Passthrough: pass-through mode; the original resolution of the stream is transmitted.
  - Forced: the resolution which is set in the Resolution setting menu is forced.
  - EdidBased: the resolution which is read out from the EDID of the connected sink device is forced.
- **Resolution setting** - select a resolution to force from the pre-installed list. The entire list can be found in the Resolutions of the Scaler / FRC section.
- **Image position** - Center / Fit / Stretch
- **Color space** - Passthrough / Force RGB / Force YCbCr 4:4:4 / Force YCbCr 4:2:2
- **No sync mode** - the No sync mode feature generates an image which can be displayed when there is no incoming signal on the port. The following settings can be set for the Test Pattern function:
  - **Always off** - the test pattern function is disabled, the video output port transmits the video signal of the selected input port.
  - **No signal mode** - the video output port transmits the test pattern if there is no incoming signal on the selected input port.
  - **Always on** - the video output port always transmits the test pattern.

HDMI Output

The following information are displayed for the HDMI output 2 port of the transceiver:

- **HDCP mode** - Auto / Always
- **Output 5V mode** - Always on / Auto / Always off
- Hotplug detect
- Signal present
- Active resolution
- Total resolution
- Color space

5.5.3. Remote TRX I2 Port

The following information is related for the HDMI input port of the connected remote transceiver.

HDMI Input

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

Stream Output

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

5.5.4. Remote TRX O1 Port

The following information is related for the HDMI output port of the connected remote transceiver.

Stream Input

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

HDMI Output

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

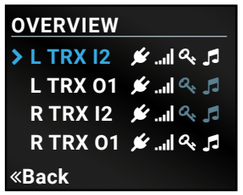
5.5.5. Local TRX O2 Port

The following information is displayed for the local output port:

- **HDCP mode** - Auto / Always
- **Output 5V mode** - Always on / Auto / Always off
- Hotplug detect
- Signal present
- Active resolution
- Total resolution
- Color space

5.5.6. Overview

The current status of the local and remote input/output ports is summarized in the Overview menu. The icons display information about the port and the transmitted signals.



TIPS AND TRICKS: Press enter on the selected port for the settings and detailed status information.

Icon	Icon is blue (inactive)	Icon is white (active)
	Sink is **not** connected	Sink is connected
	Signal is **not** present	Signal is present
	Signal is **not** encrypted with HDCP	Signal is encrypted with HDCP
	No audio signal in the video stream	Audio is embedded in the video stream

5.6. EDID Menu

Advanced EDID Management is available in the front panel LCD menu which allows to view an EDID, switch, or save it to the User EDID memory. See more information about EDID technology in EDID Management section. The EDID memory structure of the device can be found in Advanced EDID Management section.

5.6.1. 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

5.6.2. Switch

INFO: The Switch menu is available in the Transmitter mode only.

The submenu looks similar as the View submenu but in this case, the Destination is also listed. To change an EDID do the following steps:

Step 1. Navigate to the **EDID / Switch** submenu.

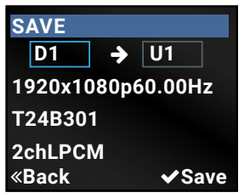
Step 2. Select the **Source** EDID item and press the knob. Use the jog dial to select the desired EDID (F1-F144, U1-U12, or D1-D4) and press the knob.

Step 3. Select the **Destination** item and press the knob. Use the jog dial to select the desired EDID memory (E1-E2, All) and press the knob.

Step 4. Navigate to the **Switch** option and press the knob.

5.6.3. Save

The EDID of a connected sink can be saved to the User EDID memory as follows:



Step 1. Navigate to the **EDID / Save** submenu.

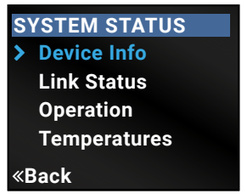
Step 2. Select the **Source** EDID item and press the knob. Use the jog dial to select the desired EDID (D1-D4) and press the knob.

Step 3. Select the **Destination** item and press the knob. Use the jog dial to select the desired EDID memory (U1-U12) and press the knob.

Step 4. Navigate to the **Save** option and press the knob.

5.7. System Status Menu

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



Device Info

Hardware- and software-related information are 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.

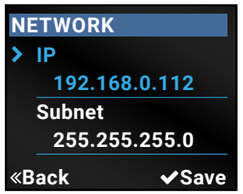
WARNING! If the front panel Status LED blinks, power off the device immediately.

5.8. System Settings Menu

System related settings are available in the menu, e.g. network settings, operation mode (TX / RX / TRX), reloading the factory default values, etc.

5.8.1. 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:

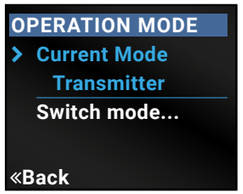


- Static IP,
- Static subnet,
- Static gateway.

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.

5.8.2. Operation Mode

The operation mode - the unit works as a transmitter or receiver - can be set in the submenu.



Follow the steps to change the operation mode:

Step 1. Navigate to the **System settings** / **Operation mode** submenu.

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

Step 3. Select the required mode: **Transmitter**, **Receiver**, or **Transceiver**.

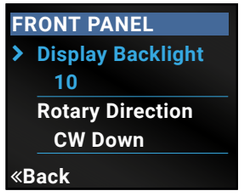
Step 4. Confirm the selection, press the **Yes**.

Step 5. Wait until the device resets and reboots. After booting up the unit works in the selected mode.

5.8.3. 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.

5.8.4. Front Panel



Display Backlight

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

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).

5.8.5. Factory Defaults

Selecting the submenu results in the factory default settings are reloaded to device after a reboot. See the entire list of restored settings for the endpoint device in the Factory Default Settings section.

5.8.6. Reset Device

There is a possibility to reset the device. it results in a reboot only and DOES NOT reload the factory default settings.

5.8.7. Bootload Mode

Special function for entering the firmware upgrade mode (bootload mode). See more details about the firmware upgrade procedure in the Firmware Upgrade - Extender Mode chapter.

Setting Back the Device to Normal Operation

Press the jog dial control knob for **3 seconds** for setting back the device to normal operation mode.

6

Lightware Device Controller - Extender Mode

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.

- Install and Upgrade
- Running the LDC
- Establishing the Connection
- Video Crosspoint Menu
- Properties Windows - Video Layer
- Audio Crosspoint Menu
- Properties Windows - Audio Layer
- Diagnostic Tools
- EDID Management Menu
- Control Menu
- Settings Menu
- Configuration Cloning (Backup Tab)
- Terminal Window

6.1. Install and Upgrade

INFO: After the installation, the Windows and the macOS application has the same look and functionality.

Installation for Windows OS

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

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

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

Comparison of installation types

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

Installation for macOS

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

Upgrading of LDC

Step 1. Run the application.

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

The current and the update version 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 the **About icon** ⓘ and the **Update** button.

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

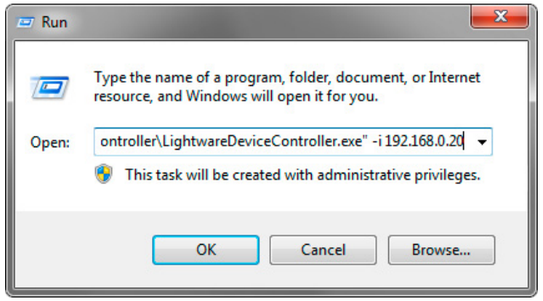
- If you do not want to check for the updates automatically, uncheck **the circle**, which contains the green tick.
- If you want to postpone the update, a reminder can be set with different delays from the **drop down list**.
- If the proxy settings traverse the update process, set the proper values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

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

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

6.2. Running the LDC

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



Run window in the Windows 7 operating system

Connecting to a Device with Static IP Address

Format: `LightwareDeviceController -i <IP_address>:<port>`

Example: `LightwareDeviceController -i 192.168.0.20:6107`

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

6.3. Establishing the Connection

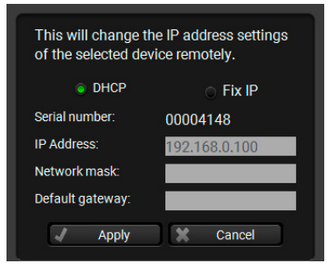
Step 1. Connect the device to a computer via Ethernet.

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

Change IP Address

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

You can see the new settings only in this window.

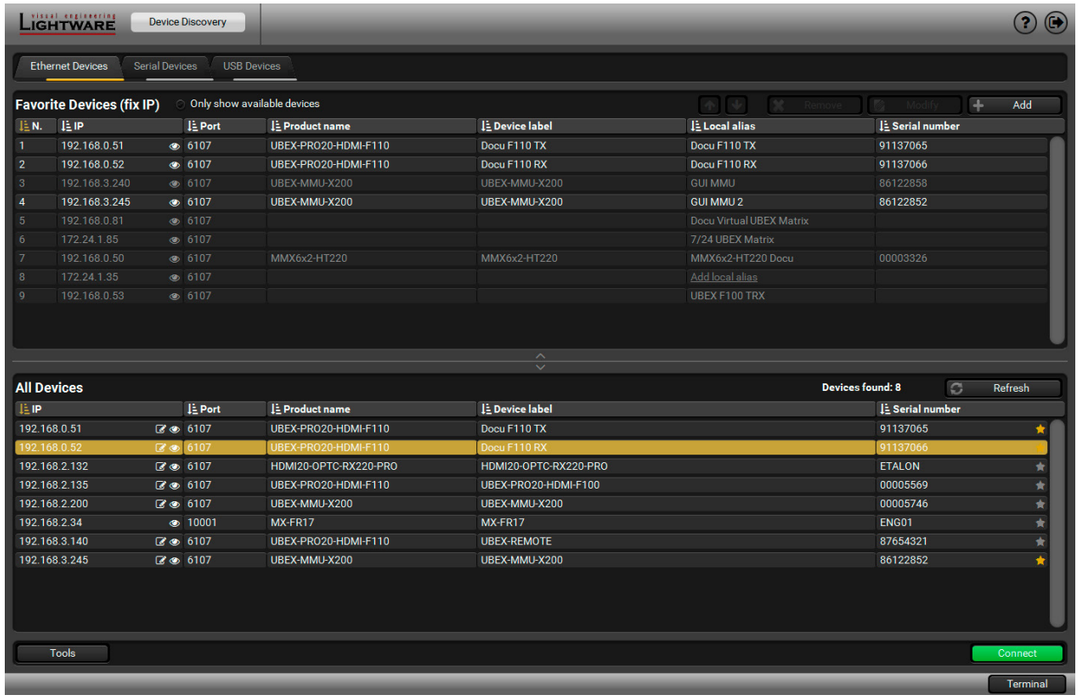


Identifying the Device

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

Device Discovery Window

Select the device in the Device discovery window and click on the green **Connect** button.



Device discovery window in LDC

Favorite Devices (fix IP)

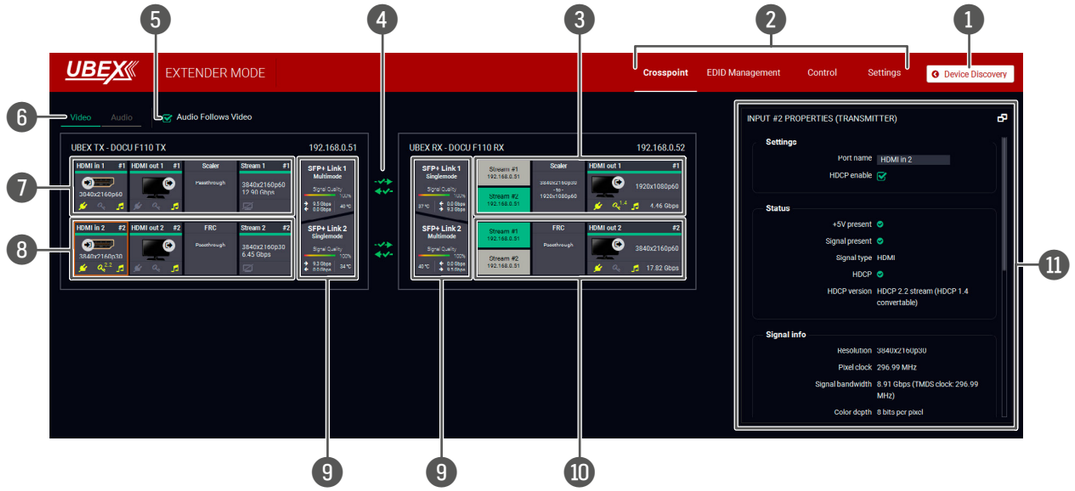
Clicking on the grey star icon beside of the discovered devices the most used units can be saved to the Favorite devices.

> **ATTENTION!** Only the devices set with static (fix) IP address 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.

6.4. Video Crosspoint Menu

6.4.1. Transmitter-Receiver Pair



The Concept

The Crosspoint menu displays the UBEX **Transmitter** (left side) and the **Receiver** (in the middle) connected to each other. Clicking on a port or feature panel the **Properties** of the selected item appears on the right side.

Legend of the Video 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**, **EDID Management**, **Control**, and **Settings**) are displayed. The **Terminal windows** are available under the Settings menu.

3 **RX - HDMI out 1 port** — Section of the HDMI out 1 port of the UBEX receiver. Available panels:

- **Stream switcher**: select the source signal for the output port; Stream #1 is the signal of the HDMI in 1 port, Stream #2 is the signal of the HDMI in 2 port of the transmitter. See the tile legend in the Stream Switcher / Stream Tiles section.
- **Scaler**: settings of the scaler for the output port. See the details in the Scaler Panel - Output Side (RX/TRX Modes) section.
- **HDMI out 1**: the port properties of the HDMI out 1 port. See the details in the HDMI Output Ports (RX/TRX Modes) section.

4 **Link aggregation status indicator** — Indicates the current status of the SFP+ links. See the details about the icons in the Link Aggregation Status Indicator section.

5 **Audio follows video switcher**

- **Enabled**: the audio stream follows the video stream when the video crosspoint is changed. Beside of 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.

6 **Layer tabs** — The **video** and the **audio** crosspoint panel can be selected on the tabs.

7 **TX - HDMI in 1 and local HDMI out 1 ports** — Section of the HDMI in 1 / out 1 ports of the UBEX transmitter. Available panels:

- **HDMI in 1**: the port properties of the HDMI in 1 port. See the details in the HDMI Input Ports (TX/TRX Modes) section.
- **HDMI out 1**: the port properties of the local HDMI out 1 port. See the details in the Local HDMI Output Ports (TX/TRX Modes) section.
- **Scaler**: settings of the scaler for the output port. See the details in the Scaler Panel - Input Side (TX Mode) section.
- **Stream 1**: the properties of the Stream #1. See the details in the Stream Properties Panels (TX/TRX Modes) section.

8 **TX - HDMI in 2 and local HDMI out 2 ports** — Section of the HDMI in 2 / out 2 ports of the UBEX transmitter. Available panels:

- **HDMI in 2**: the port properties of the HDMI in 2 port. See the details in the HDMI Input Ports (TX/TRX Modes) section.
- **HDMI out 2**: the port properties of the local HDMI out 2 port. See the details in the Local HDMI Output Ports (TX/TRX Modes) section.
- **FRC**: settings of the frame rate converter for the output port. See the details in the FRC - Input Side (TX/TRX Modes) section.
- **Stream 2**: the properties of the Stream #2. See the details in the Stream Properties Panels (TX/TRX Modes) section.

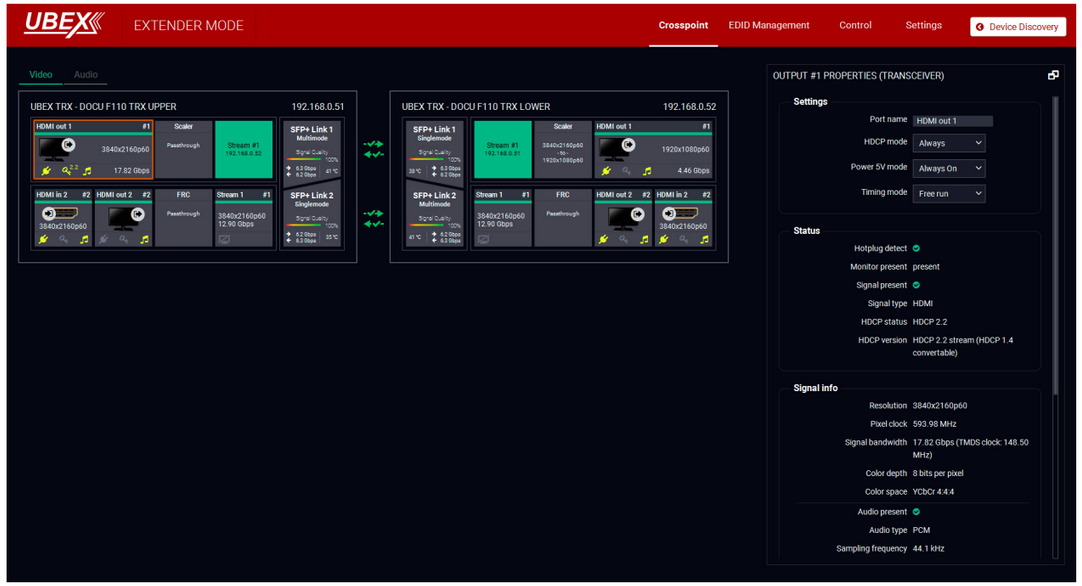
9 **SFP+ ports** — Status information and parameters of the SFP+ Link 1 and 2 of the transmitter and the receiver.

10 **RX - HDMI out 2 port** — Section of the HDMI out 2 port of the UBEX receiver. Available panels:

- **Stream switcher**: select the source signal for the output port; Stream #1 is the signal of the HDMI in 1 port, Stream #2 is the signal of the HDMI in 2 port of the transmitter. See the tile legend in the Stream Switcher / Stream Tiles section.
- **FRC**: settings of the frame rate converter for the output port. See the details in the FRC - Output Side (RX Mode) section.
- **HDMI out 2**: the port properties of the HDMI out 2 port. See the details in the HDMI Output Ports (RX/TRX Modes) section.

11 **Properties window** — The properties, available settings, and status information of the selected panel are displayed in this section. Clicking on the icon the properties section opens in new window.

6.4.2. Transceiver-Transceiver Pair



Video crosspoint menu - TRX-TRX pair in Extender mode

The Concept

The concept of the crosspoint menu in the case of a transceiver-transceiver pair is similar than the transmitter-receiver pair. The GUI displays the UBEX **Transceiver #1** (left side) and the **Transceiver #2** (in the middle) connected to each other. Clicking on a port or feature panel the **Properties** of the selected item appears on the right side.

Streams

Each transceiver transmits one HDMI signal (up to 4K60 4:4:4 30 bit) to the remote device and receives one HDMI signal (up to 4K60 4:4:4 30 bit) from the remote device. The name of both streams are Stream #1, but the Stream tile displays the IP address of the source device for the easier identification.

See the legend of the tiles in the Stream Switcher / Stream Tiles section.

> INFO: 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 both HDMI ports.

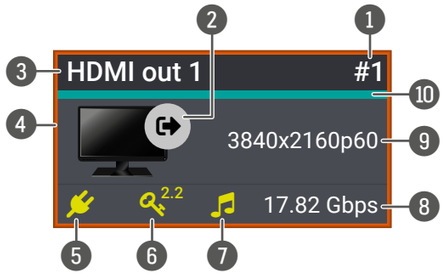
Properties Windows

The details of the properties, available settings, and status information of the selected panels are available in the Properties Windows - Video Layer section.

Clicking on the icon the properties section opens in new window.

6.4.3. Port Tiles

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

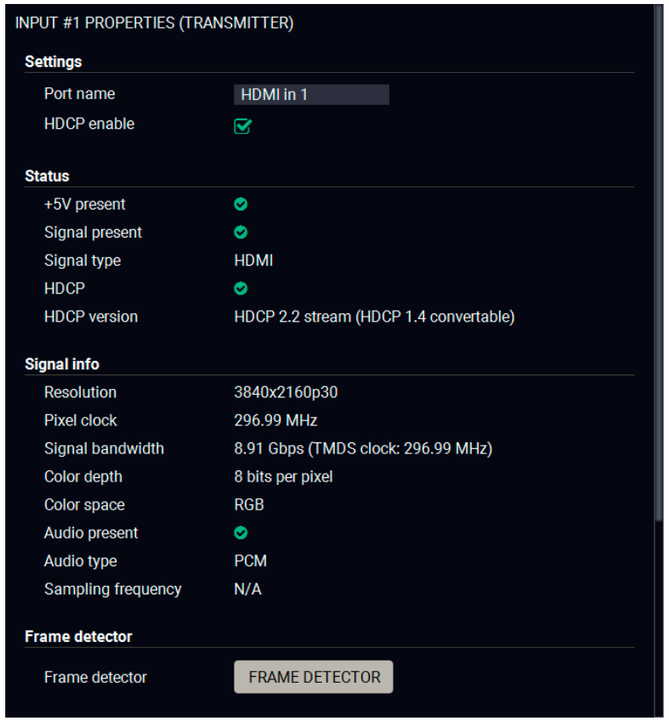


1. **Port ID**
2. **Input / output indicator**
   - Input port (signal source)
   - Output port (destination)
3. **Port name**
4. **Selected port indicator**
   If the frame is orange, the properties panel of the port is displayed.
5. **+5V / Hotplug state**
   - Source/sink is connected.
   - Source/sink is not connected.
6. **HDCP state**
   - 2.2 Signal is encrypted with HDCP 2.2.
   - 1.4 Signal is encrypted with HDCP 1.4.
   - The sink device is not compatible with the current HDCP version.
   - Signal is not HDCP-encrypted.
7. **Embedded audio presence**
   - Embedded audio is present.
   - Embedded audio is not present.
8. **Bandwidth of the stream**
9. **Resolution / refresh rate of the stream**
10. **Signal present indicator**
    If turquoise, signal is present, if grey, signal is not present.

6.5. Properties Windows - Video Layer

6.5.1. HDMI Input Ports (TX/TRX Modes)

Clicking on the HDMI input 1 or 2 port icon results opening the Port properties. The most important signal information and settings are available on the panel:



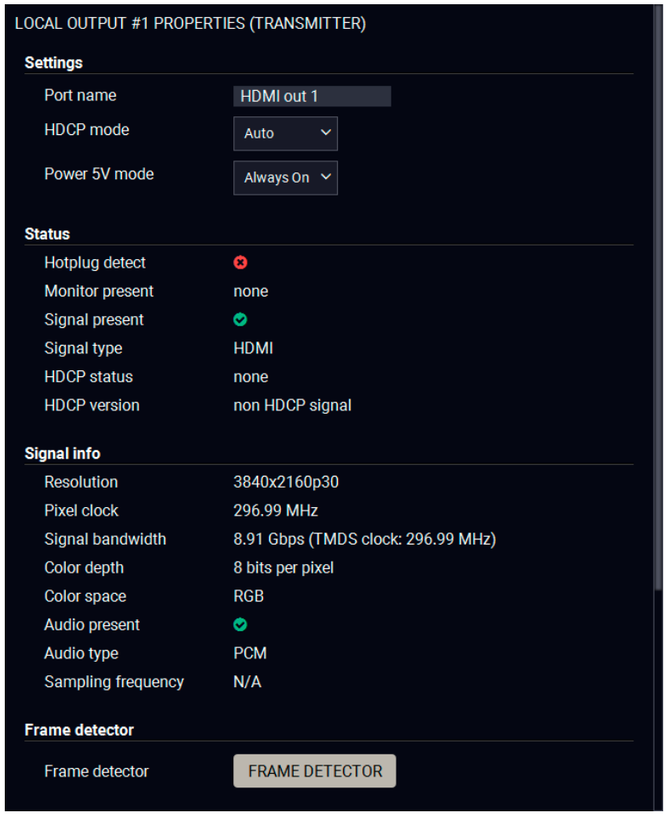
Port properties window of the HDMI in 1 (TX)

Available settings and tools:

- Port naming;
- **HDCP setting** (Enable / Disable);
- Frame Detector;
- **Reloading factory default settings** for the selected port.

6.5.2. Local HDMI Output Ports (TX/TRX Modes)

Clicking on the HDMI output 1 or 2 port icon results in opening the Port properties. The most important signal and display information and settings are available on the panel:



Port properties window of the HDMI out 1 (TX)

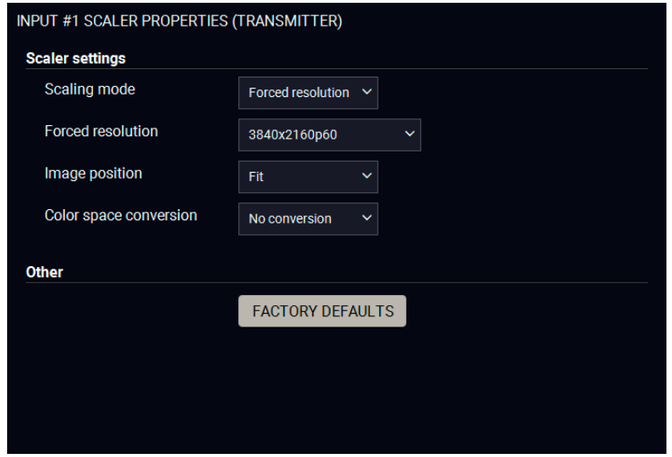
Available settings and tools:

- Port naming;
- **HDCP mode** (Auto / Always);
- **Power 5V mode** (Auto / Always on / Always off);
- Frame Detector;
- **Reloading factory default settings** for the selected port.

6.5.3. Scaler Panel - Input Side (TX Mode)

Clicking on the Scaler panel on the HDMI input 1 of the transmitter opens the Scaler properties. This feature allows to rescale the incoming stream to other resolution and refresh rate and fit to the sink device.

The most important signal and display information and settings are available on the panel.



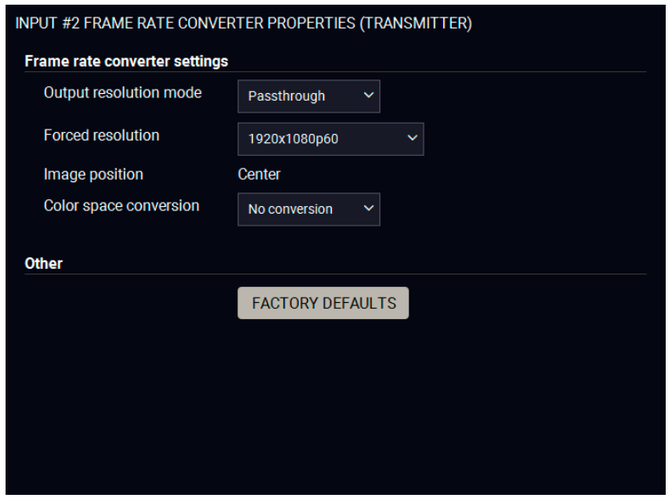
Scaler panel for the HDMI in 1 (TX)

Available settings and tools:

- **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 on the video signal;
- **Forced resolution**: list of the available resolutions with refresh rate values. The selected one will be applied on the video signal. See the available resolution in the Resolutions of the Scaler / FRC section.
- **Image position** (Stretch / Fit / Center)
- **Color space conversion** (No conversion / RGB / YUV 4:4:4 / YUV 4:2:2);
- **Reloading factory default settings** for the selected port.

6.5.4. FRC - Input Side (TX/TRX Modes)

Clicking on the FRC (Frame Rate Converter) panel on the HDMI input 2 of the transmitter/transceiver opens the properties of the Frame rate converter.



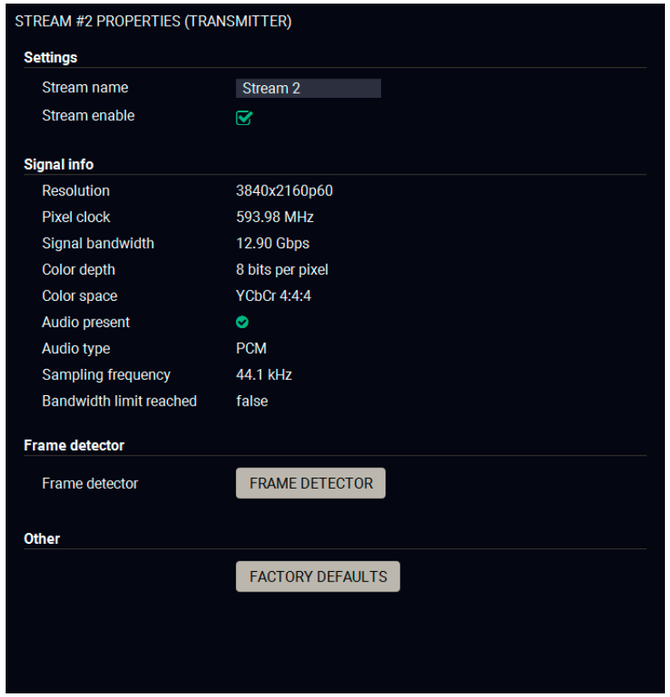
FRC panel for the HDMI in 2 (TX)

Available settings and tools:

- **Output resolution mode**
  - Passthrough: the FRC is in pass-through mode.
  - Forced resolution: the FRC is active, the selected value in the forced resolution option will be applied on the video signal;
- **Forced resolution**: list of the available resolutions with refresh rate values. The selected one will be applied on the display device. See the available resolution in the Resolutions of the Scaler / FRC section.
- **Color space conversion** (No conversion / RGB / YUV 4:4:4 / YUV 4:2:2);
- **Reloading factory default settings** for the selected port.

6.5.5. Stream Properties Panels (TX/TRX Modes)

Clicking on the Stream 1 or Stream 2 panels on the transmitter/ transceiver opens the properties of the video input streams. The most important signal information and settings are available on the panel.



Stream 2 properties panel (TX)

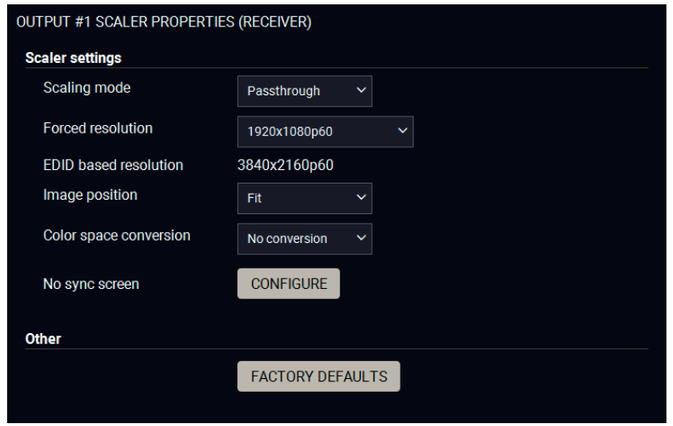
Available settings and tools:

- Stream naming;
- **Stream enable**: when it is checked in, the stream is transmitted to the receiver; if it is not, the stream is muted.
- Frame Detector;
- **Reloading factory default settings** for the selected port.

6.5.6. Scaler Panel - Output Side (RX/TRX Modes)

Clicking on the Scaler panel on the HDMI output 1 of the receiver/ transceiver opens the Scaler properties. This feature allows to rescale the incoming stream to other resolution and refresh rate and fit to the sink device.

The most important signal and display information and settings are available on the panel.



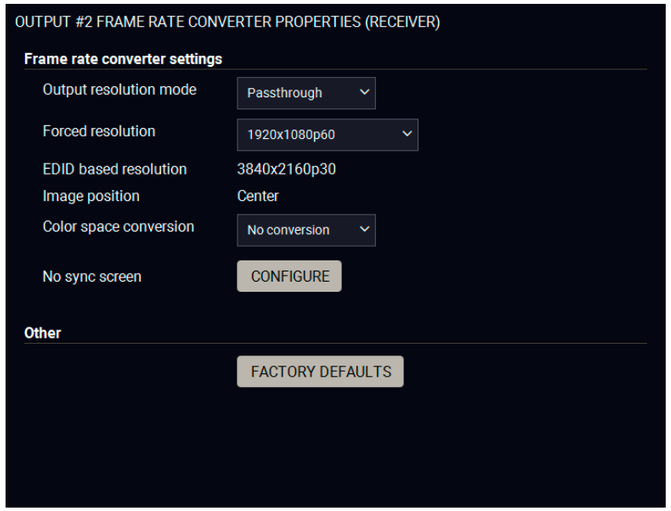
Scaler panel for the HDMI out 1 (RX)

Available settings and tools:

- **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 on the video signal;
  - EDID based: the scaler forces the resolution which 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 on the video signal. See the available resolution in the Resolutions of the Scaler / FRC section.
- **Image position** (Stretch / Fit / Center)
- **Color space conversion** (No conversion / RGB / YUV 4:4:4 / YUV 4:2:2);
- No Sync Screen (Test Pattern) settings;
- **Reloading factory default settings** for the selected port.

6.5.7. FRC - Output Side (RX Mode)

Clicking on the FRC (Frame Rate Converter) panel on the HDMI output 2 of the receiver opens the properties of the Frame rate converter.



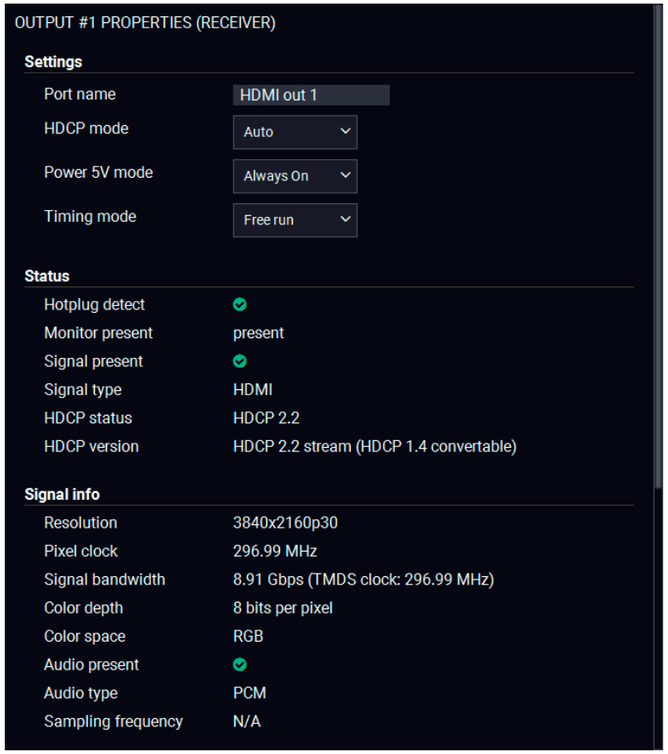
FRC panel for the HDMI out 2 (RX)

Available settings and tools:

- **Output resolution mode**
  - Passthrough: the FRC is in pass-through mode.
  - Forced resolution: the FRC is active, the selected value in the forced resolution option will be applied on the video signal;
  - EDID based: the FRC forces the resolution which 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 on the display device. See the available resolution in the Resolutions of the Scaler / FRC section.
- **Color space conversion** (No conversion / RGB / YUV 4:4:4 / YUV 4:2:2);
- No Sync Screen (Test Pattern) settings;
- **Reloading factory default settings** for the selected port.

6.5.8. HDMI Output Ports (RX/TRX Modes)

Clicking on the HDMI output 1 or 2 port icon results opening the Port properties. The most important signal and display information and settings are available on the panel:



Port properties window of the HDMI out 1 (RX)

Available settings and tools:

- Port naming;
- **HDCP mode** (Auto / Always);
- **Power 5V mode** (Auto / Always on / Always off);
- **Timing mode** (Free run / Source locked).
- Frame Detector;
- **Reloading factory default settings** for the selected port.

6.5.9. SFP+ Link Panels (TX/RX/TRX Modes)

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+ transceiver module or DAC cable are available on the panel.

SFP+ Link 1 properties panel (TX)

6.5.10. Stream Switcher / Stream Tiles

The incoming streams from the transmitter can be routed to the HDMI output 1 and/or 2 ports of the receiver.

Legend of the Stream Tiles

Tile	Selected	Signal present	Stream enabled	SFP+ link bandwidth
Stream 1	⊗	⊗	N/A	N/A
	Signal is not present and stream is not selected.			
Stream 1	✓	⊗	N/A	N/A
	Signal is not present but stream is selected.			
Stream 1	⊗	N/A	⊗	N/A
	The stream is disabled and not selected.			
Stream 1	✓	N/A	⊗	N/A
	The stream is disabled but selected.			
Stream 1	⊗	✓	✓	⊗
	Signal is present, stream is enabled, but bandwidth is not enough for the transmission.			
Stream 1	✓	✓	✓	⊗
	Signal is present, stream is selected and enabled, but bandwidth is not enough for the transmission.			
Stream 1	✓	✓	✓	✓
	Signal is present, stream is selected, and the bandwidth is OK.			

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 is installed only but the signal is 4K@60 Hz (which requires ~14 Gbps to transmit), the stream tile will be yellow.

INFO: When the signal bandwidth limit is exceeded, the stream of the HDMI in 1 on the TX side and the stream of the HDMI out 1 on the RX side will be enabled at the expense of the HDMI in 2 / HDMI out 2. See more information in the Bandwidth Limitation section.

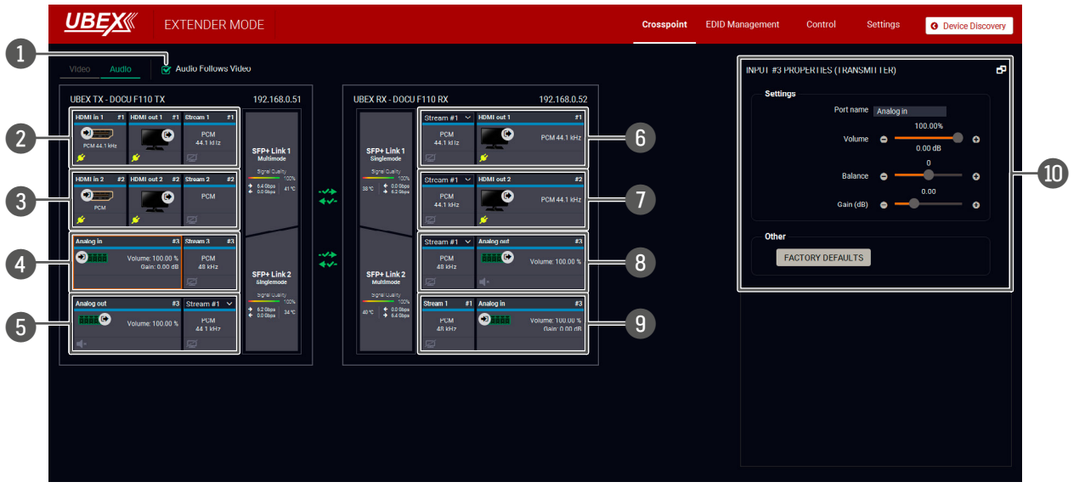
INFO: You can find the bandwidth requirements belong to each resolutions in the Required Bandwidth of the Resolutions section.

6.5.11. Link Aggregation Status Indicator

Icon	Description
	SFP+ connection is established successfully and the link aggregation is working successfully.
	Waiting for the link aggregation.
	No connection is established between the SFP+ links.

INFO: You can find possible causes and solution suggestions in the Troubleshooting - Extender Mode chapter in the case of no connection or link aggregation problems.

6.6. Audio Crosspoint Menu



Crosspoint menu - Audio layer for Extender mode

The Concept

The Crosspoint menu displays the UBEX **Transmitter** (left side) and the **Receiver** (in the middle) connected to each other. Clicking on a port or feature panel the **Properties** of the selected item appear on the right side. The selected port or feature panel is highlighted with orange.

Legend of the Audio Crosspoint Menu

1 **Audio follows video switcher**
- **Enabled**: the audio stream follows the video stream when the video crosspoint is changed. Beside of 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.

2 **TX - HDMI in 1 and local HDMI out 1 ports**

Section of the HDMI in 1 / out 1 ports of the UBEX transmitter. Available panels:
- **HDMI in 1**: the audio port properties of the HDMI in 1 port.
- **HDMI out 1**: the port properties of the local HDMI out 1 port.
- **Stream 1**: the properties of the Stream 1 of the transmitter.

3 **TX - HDMI in 2 and local HDMI out 2 ports**

Section of the HDMI in 2 / out 2 ports of the UBEX transmitter. Available panels:
- **HDMI in 2**: the audio port properties of the HDMI in 2 port.
- **HDMI out 2**: the port properties of the local HDMI out 2 port.
- **Stream 2**: the properties of the Stream 2 of the transmitter.

4 **TX - Analog audio input port**

Section of the analog audio input port of the UBEX transmitter. Available panels:
- **Analog in**: the port properties of the analog audio input port of the transmitter. See the details in the Analog Audio Input Port section.
- **Stream 3**: the properties of the Stream 3 of the transmitter.

5 **TX - Analog audio output port**

Section of the analog audio output port of the UBEX transmitter. Available panels:
- **Analog out**: the port properties of the analog audio output port of the transmitter. See the details in the Analog Audio Output Port section.
- **Stream switcher**: select the source signal for the output port. See the details in the Stream Switcher section.

6 **RX - HDMI out 1 port**

Section of the HDMI out 1 port of the UBEX receiver. Available panels:
- **Stream switcher**: select the source signal for the output port. See the details in the Stream Switcher section.
- **HDMI out 1**: the port properties of the HDMI out 1 port.

7 **RX - HDMI out 2 port**

Section of the HDMI out 2 port of the UBEX receiver. Available panels:
- **Stream switcher**: select the source signal for the output port. See the details in the Stream Switcher section.
- **HDMI out 2**: the port properties of the HDMI out 2 port.

8 **RX - Analog audio output port**

Section of the analog audio output port of the UBEX receiver. Available panels:
- **Stream switcher**: select the source signal for the output port. See the details in the Stream Switcher section.
- **Analog out**: the port properties of the analog audio output port of the receiver. See the details in the Analog Audio Output Port section.

9 **RX - Analog audio input port**

Section of the analog audio input port of the UBEX receiver. Available panels:
- **Stream 1**: the properties of the Stream 1 of the receiver.
- **Analog in**: the port properties of the analog audio input port of the receiver. See the details in the Analog Audio Input Port section.

10 **Properties window**

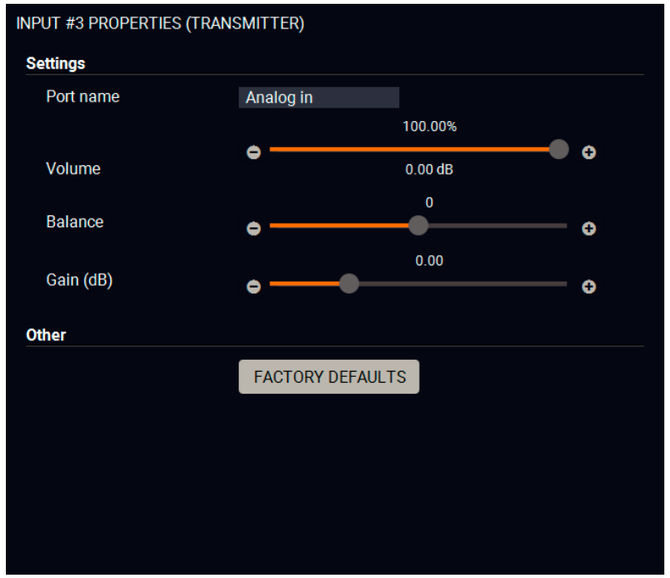
The properties, available settings, and status information of the selected panel are displayed in this section. Clicking on the icon the properties section opens in new window.

ATTENTION! Only the UBEX-PRO20-HDMI-F110 model is built with analog audio input and output ports.

6.7. Properties Windows - Audio Layer

6.7.1. Analog Audio Input Port

Clicking on the **Analog in** port icon of the transmitter, receiver, or transceiver results opening the Port properties. The most important signal and display information and settings are available on the panel:



Port properties window of the Analog in (TX)

Available settings and tools:

- Port naming;
- **Volume**: sets the input volume (attenuation) between 0% (-95.62 dB) and 100% (0 dB). Clicking on the ⊖ icon results -1%, the ⊕ icon results +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 -1, the ⊕ icon results +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 -1 dB, the ⊕ icon results +1 dB in the gain setting. The default value is 0 dB.
- **Reloading factory default settings** for the selected port.

6.7.2. Analog Audio Output Port

Clicking on the **Analog out** port icon of the transmitter, receiver, or transceiver results opening the Port properties. The most important signal and display information and settings are available on the panel:

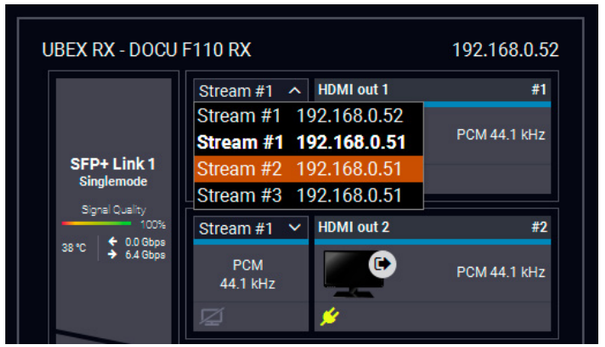
Port properties window of the Analog out (RX)

Available settings and tools:

- Port naming;
- **Volume**: sets the input volume (attenuation) between 0% (-95.62 dB) and 100% (0 dB). Clicking on the ⊖ icon results -1%, the ⊕ icon results +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 -1, the ⊕ icon results +1 in the balance setting. The default value is 0 (center).
- **Mute**: enable or disable the muting of the output port.
- **Reloading factory default settings** for the selected port.

6.7.3. Stream Switcher

Clinking on the drop-down menu of the output port (any HDMI and analog output ports) the source stream of the port can be selected.



The stream switcher drop-down menu of the HDMI out 1 (RX)

Four source streams are available for all output ports. The highlighted one is the selected stream. The naming is the following: **Stream #1..3**; and the **IP address** of the source device.

Streams - TX-RX Pair

The Stream #1 and #2 are always the digital audio stream of the HDMI in 1 and 2 ports of the transmitter. The Stream #3 is always the audio stream of the analog audio input port of the transmitter or the receiver.

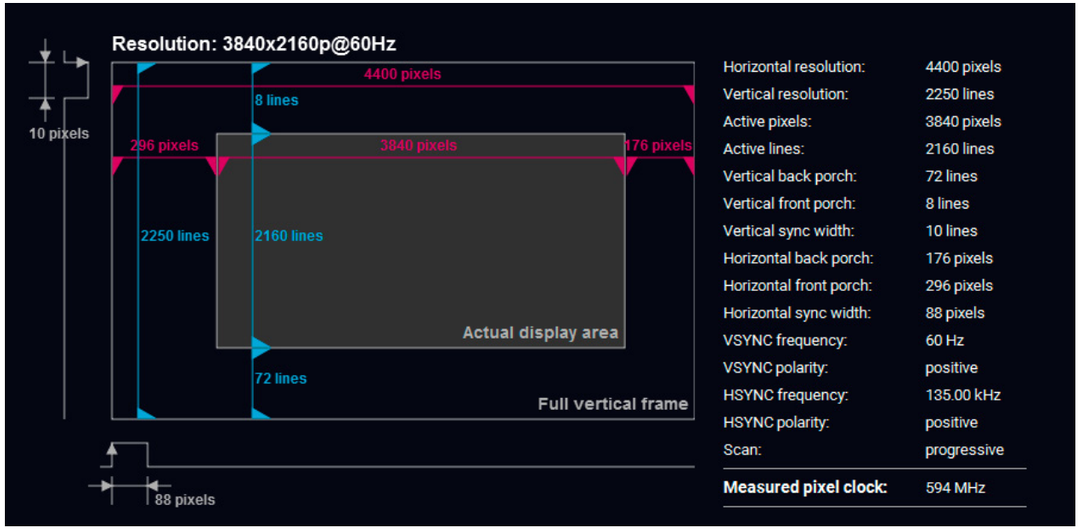
Streams - TRX-TRX Pair

The Stream #1 is always the digital audio stream of the HDMI in 2 port of the transceiver, the Stream #2 is always the audio stream of the analog audio input port of the transceiver.

6.8. Diagnostic Tools

6.8.1. 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 **Frame detector** button.



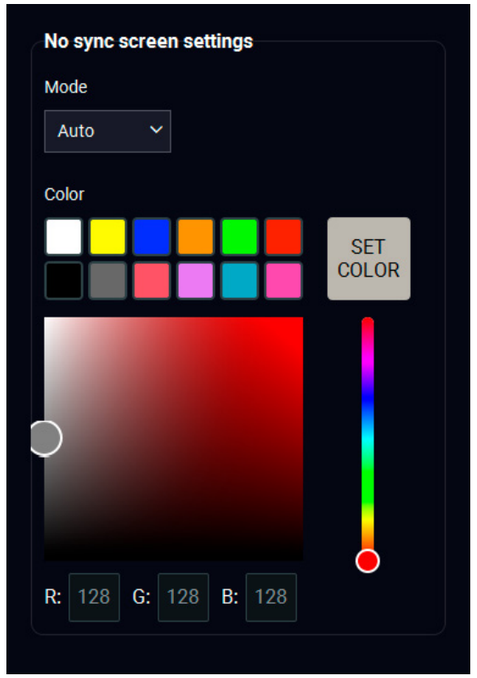
Frame detector window

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). 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.

6.8.2. No Sync Screen (Test Pattern)

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



Mode

- **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.

Color

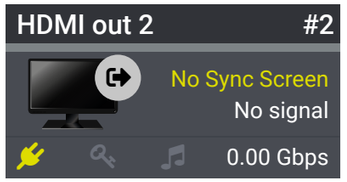
Three ways are available to set the no sync screen color:

- 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

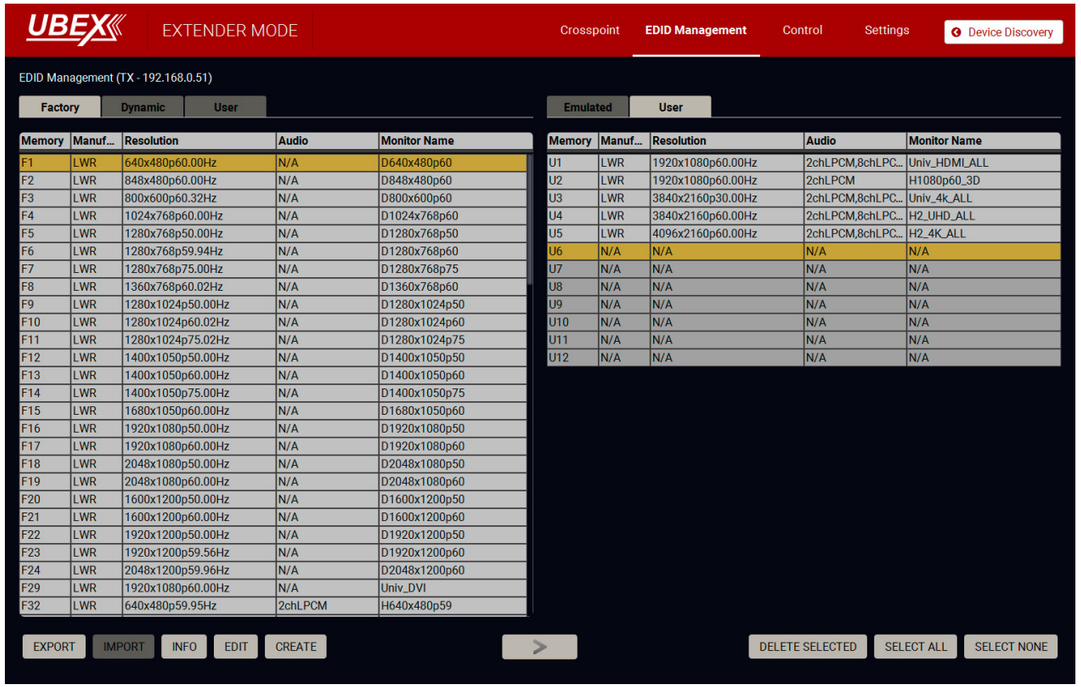
The port tile of the HDMI outputs displays when No sync screen mode is active.



> INFO: No sync screen will be active in the case of connected sink device to the output port only.

6.9. 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.



EDID Management menu

Control Buttons

EXPORT	Exporting an EDID (save to a file)	>	Transfer button: executing EDID emulation or copying
IMPORT	Importing an EDID (load from a file)	DELETE SELECTED	Deleting EDID (from User memory)
INFO	Display EDID Summary window	SELECT ALL	Selecting all memory places in the right panel
EDIT	Opening Advanced EDID Editor with the selected EDID	SELECT NONE	Selecting none of the memory places in the right panel
CREATE	Opening Easy EDID Creator		

6.9.1. 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

EXPORT

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

IMPORT

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)

DELETE SELECTED

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

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

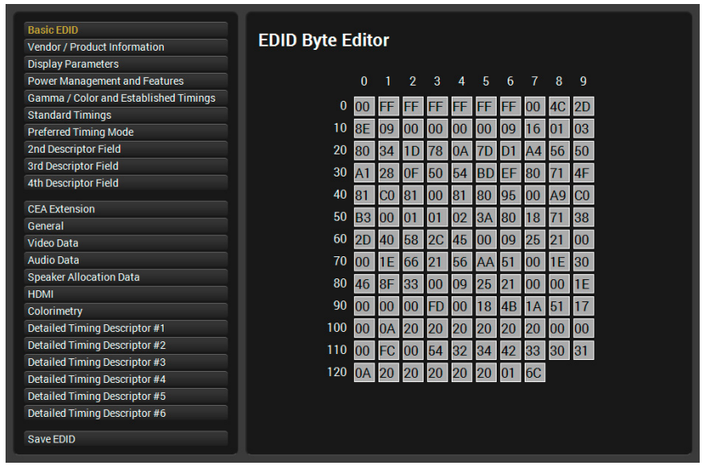
Step 2. Select the desired **memory** slot(s); one or more can be selected (“Select All” and “Select None” buttons can be used). The EDID(s) will be highlighted with yellow.

Step 3. Press the **Delete selected** button to delete the EDID(s).

6.9.2. Editing an EDID

EDIT

Select an EDID from Source panel and press Edit button to display Advanced EDID Editor window. The editor can read and write all descriptors, which are defined in the standards, including the additional CEA extensions. Any EDID from the device's memory or a saved EDID file can be loaded into the editor. The software resolves the raw EDID and displays it as readable information to the user. All descriptors can be edited, and saved in an EDID file, or uploaded to the User memory.

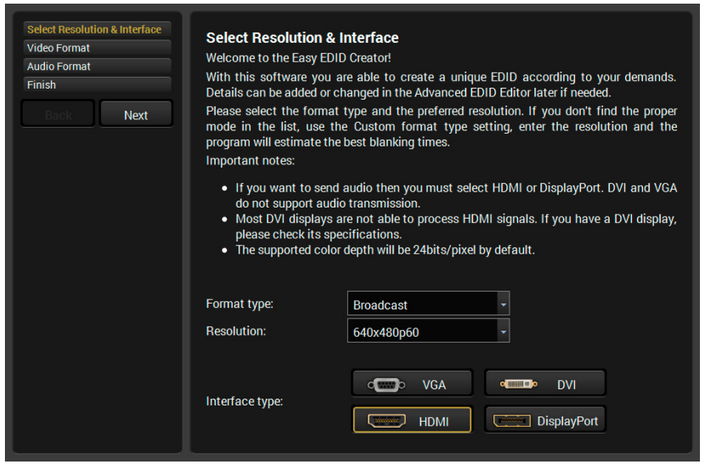


EDID Editor window

6.9.3. Creating an EDID - Easy EDID Creator

CREATE

Since 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 Source panel, **Easy EDID Creator** is opened in a new window.

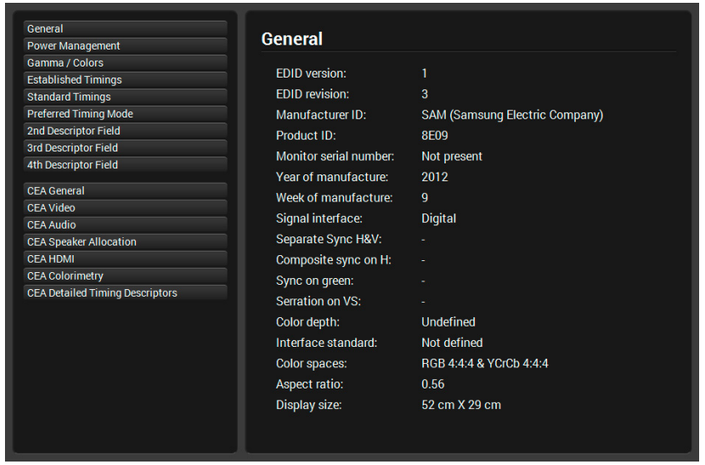


EDID Creator window

6.9.4. EDID Summary Window

INFO

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



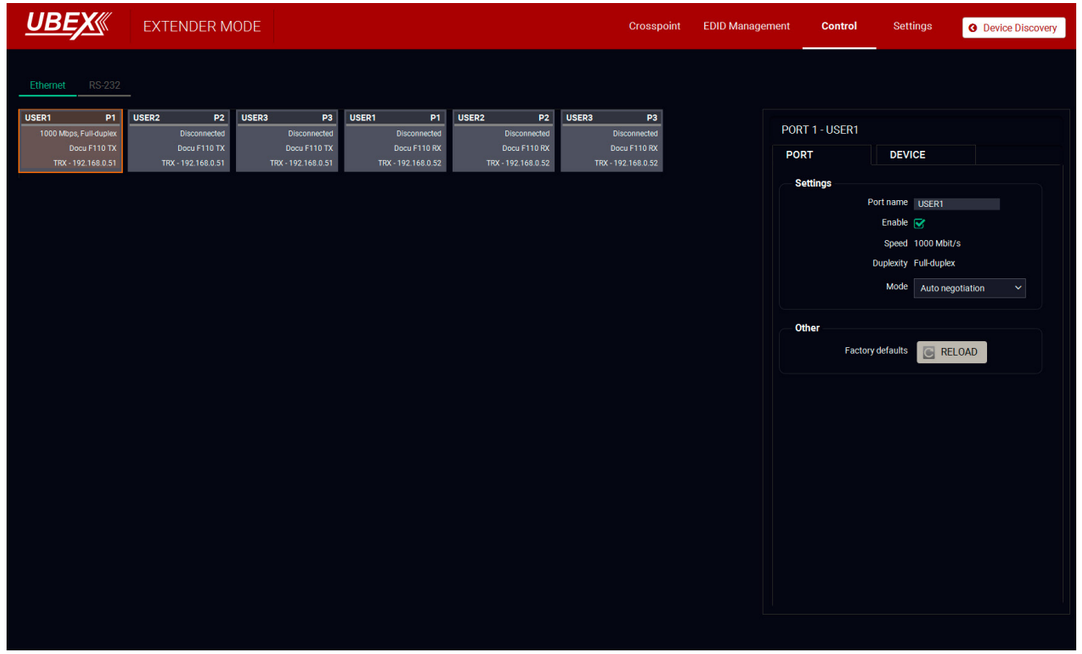
EDID summary window

6.10. Control Menu

The Ethernet control ports and the RS-232 port (only for the UBEX-PRO20-HDMI-F110) can be configured in the Control menu.

6.10.1. Ethernet Tab

Clicking on the Ethernet port icon results opening the Port properties. The most important information and settings are available on the panel.



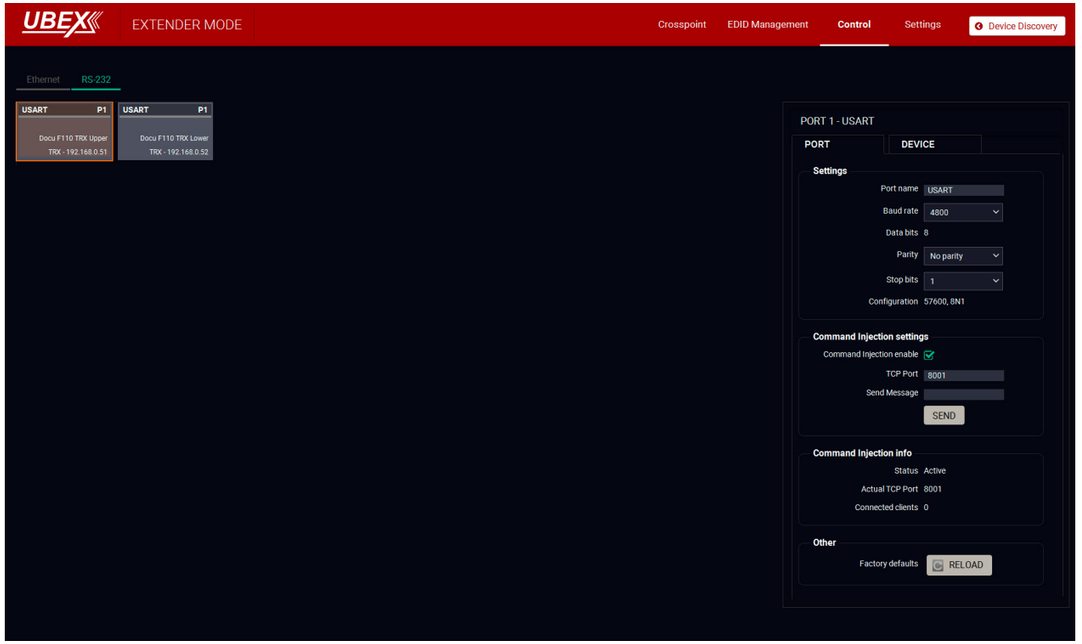
Ethernet tab in the Control menu

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.

6.10.2. RS-232 Tab

Clicking on the RS-232 port icon results opening the Port properties. The most important information and settings are available on the panel.

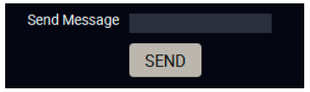


RS-232 tab in the Control menu

Available settings and tools:

- Port naming;
- **Baud rate** (4800 / 7200 / 9600 / 14400 / 19200 / 38400 / 57600 / 115200);
- Data bits (read-only parameter);
- **Parity** (None / Odd / Even);
- **Stop bits** (1 / 1.5 / 2);
- **Command Injection enable** (enable / disable);
- **TCP port number**;
- **Send message** field - see more details about it in the Sending Message via RS-232 Interface section (next page);
- **Reloading factory default settings** for the selected port.

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.

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

A typical usage when a message is sent and it contains such a character that must be escaped.

Example

The original message: `Set(01)`

The escaped message: `Set\(01\)`

The above case is a typical example: the UBEX endpoint device is directed to send out a message over one of its port. The round brackets in the message are escaped.

Using Hexadecimal Codes

Hexadecimal codes can be inserted in the ASCII message when using:

Message: `C00\x0D`

- **C00**: the message.
- **\x**: indicates that the following is a hexadecimal code.
- **0D**: the hexadecimal code (Carriage Return).

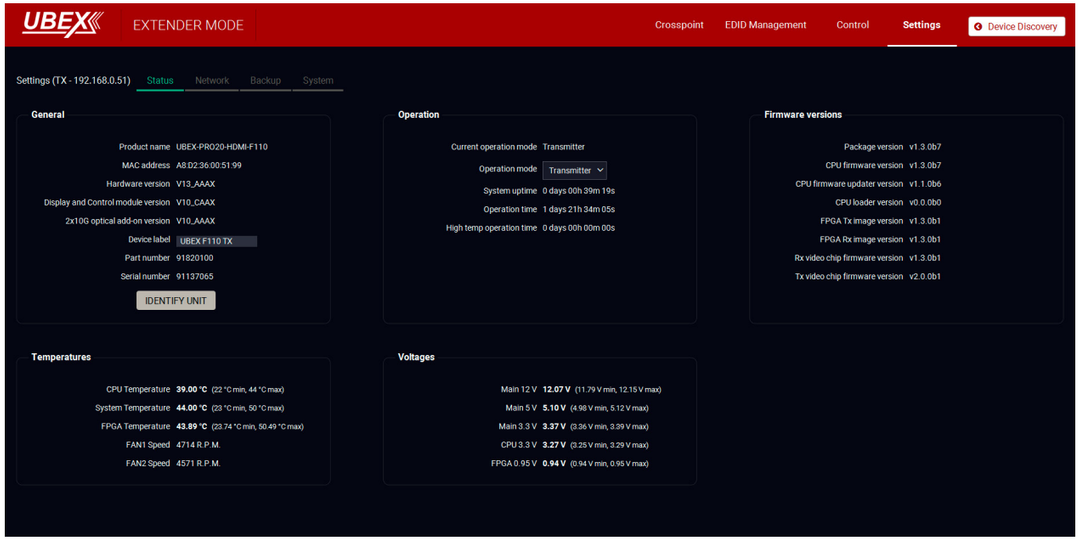
See more serial message sending method using LW3 protocol commands in the Sending a Text (ASCII-format) via Serial Port, Sending a Binary Message (HEX-format) via Serial Port, and Sending a Message (ASCII-format) via Serial Port sections.

6.11. Settings Menu

INFO: The Settings menu is available for the transmitter, receiver, and the transceiver separately. You can choose which device you want to configure.

INFO: The available settings are the same for all operation modes.

6.11.1. Status Tab



Status tab in the Settings menu (TX)

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

Operation Mode

The operation mode - the unit works as a transmitter or receiver - can be set on the Status tab. Follow the steps to change the current operation mode:

Step 1. Select the desired **Operation mode** (Transmitter / Receiver / Transceiver mode).

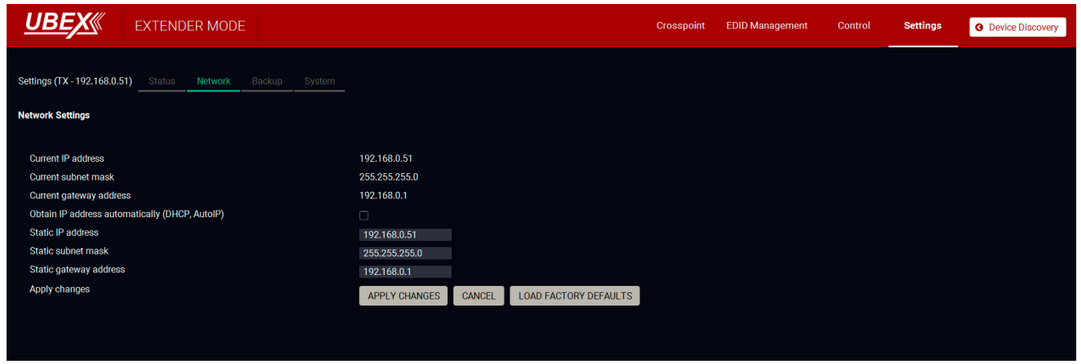
Step 2. Confirm your selection, press **OK**.

Step 3. Wait until the device reboots. After booting up the endpoint operates in the selected operation mode.

Identify the Unit

Clicking on the **Identify unit** 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.

6.11.2. Network Tab

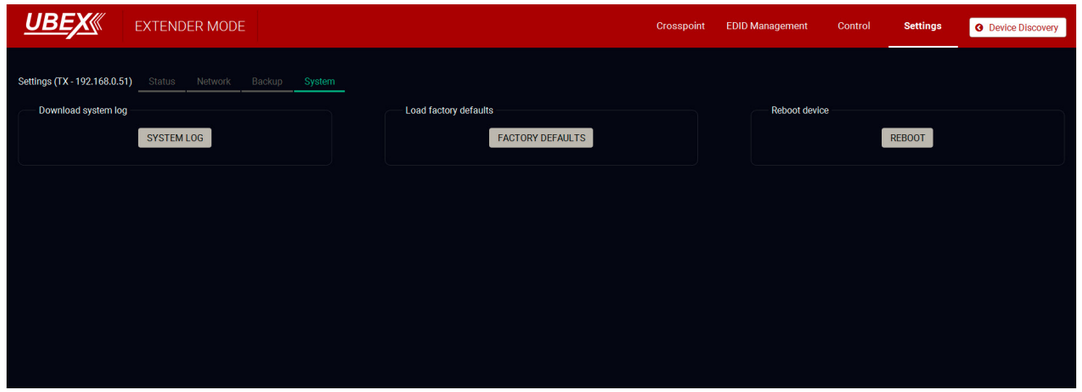


Network tab in the Settings menu

IP address and DHCP settings can be set on this tab. Always press the **Apply settings** button to save changes.

Factory defaults settings can be recalled with a dedicated button. See the factory default settings of the endpoint device in the Factory Default Settings section.

6.11.3. System Tab

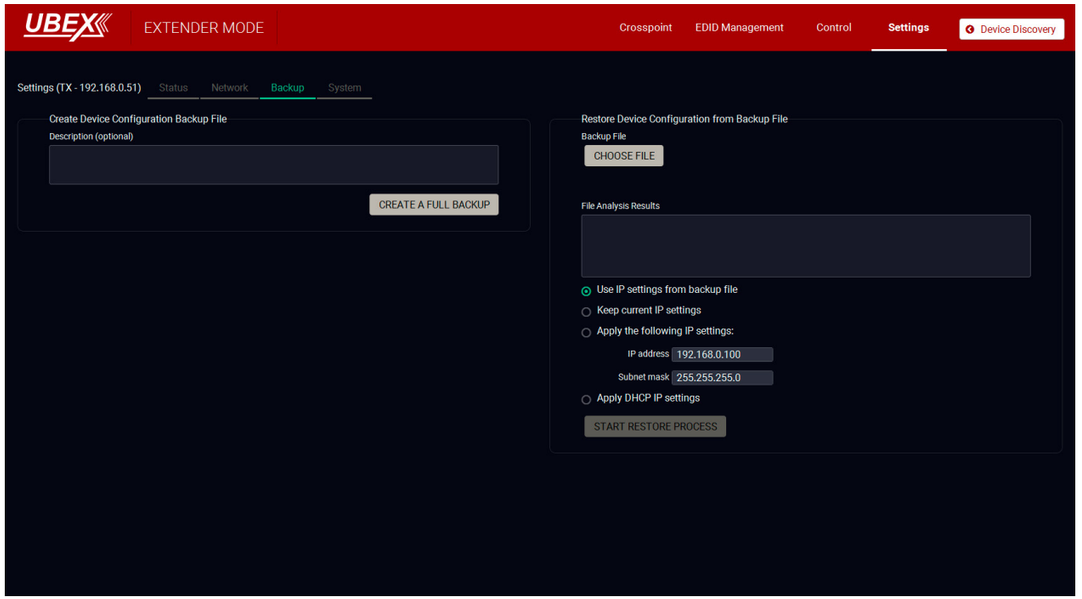


System tab in the Settings menu

Three functions are available under System tab:

- **System log** - saving the file of the device.
- **Factory defaults** - recalling factory defaults settings and values. All factory default settings f the endpoint device are listed in the Factory Default Settings section.
- **Reboot** - rebooting the system.

6.12. Configuration Cloning (Backup Tab)



Backup tab

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

6.12.1. Cloning Steps in a Nutshell

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

Step 1. Configure one device with all your desired settings with the LDC software.

Step 2. Backup the full configuration file to your computer.

Step 3. If needed, make some modifications to the configuration file using a text editor (e.g. Notepad). E.g. modifying the static IP address is needed when DHCP is not used.

Step 4. Connect to the other device which has to be configured and upload (restore) your configuration file.

Step 5. Done! You can have as many entirely identical, customized devices as you like.

6.12.2. Save the Settings of the Device (Backup)

Step 1. Apply the desired settings in the device (port parameters, crosspoint, etc.)

Step 2. Select the **Settings** / **Backup** tab from the menu.

Step 3. Write a short **description** in the text box on the left (optional).

Step 4. Press the **Create a full backup** button. You will be prompted to save the file to the computer. The default file name is the following:

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

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

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

About the Backup File

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

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

See the entire list of saved data in the Content of Backup File section.

6.12.3. Upload the Settings to a Device (Restore)

> **WARNING! The configuration file is compatible with the same operation mode which is in the file. The file of a transmitter can be restored to a transmitter, the file of a receiver can be restored to a receiver, and the file of a transceiver can be restored to a transceiver only!**

> **WARNING! Please note that the settings will be permanently overwritten with the restored parameters in the device. Recovery of the original settings is not possible.**

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

The Restoring Process

Step 1. Select the **Settings** / **Backup** tab from the menu.

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

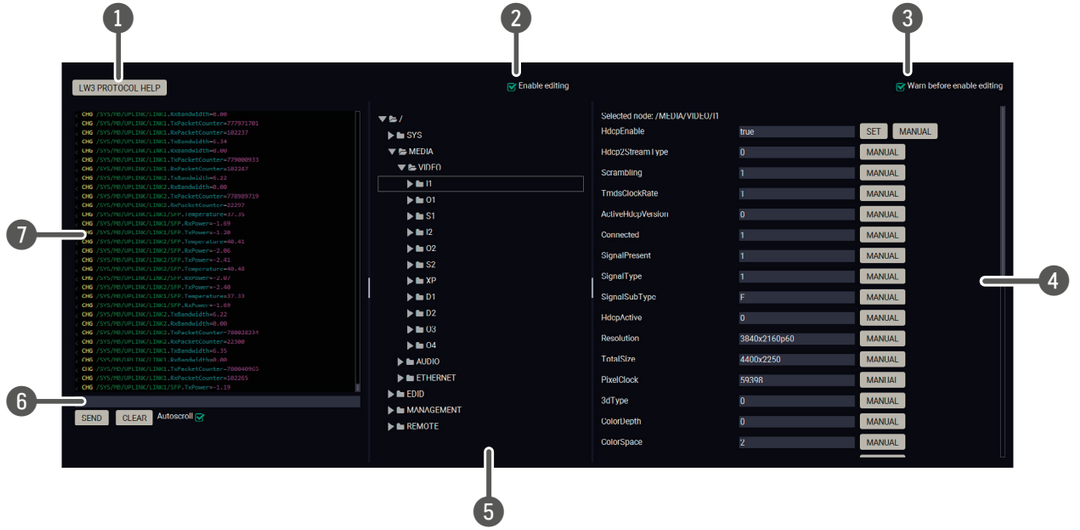
Step 3. The file is checked and the result will be displayed in the textbox below. If the file is correct, the settings can be restored.

Step 4. Choose the **IP settings** what you want to use after backup. You can apply settings from the backup file, keep actual settings, set it manually in a dialog box or apply DHCP.

Step 5. Press the **Start restore process** button and click on the **Yes** button when asked.

Step 6. Reboot the device to apply the network settings after finishing.

6.13. Terminal Window



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

7

Programmers' Reference - Extender Mode

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.

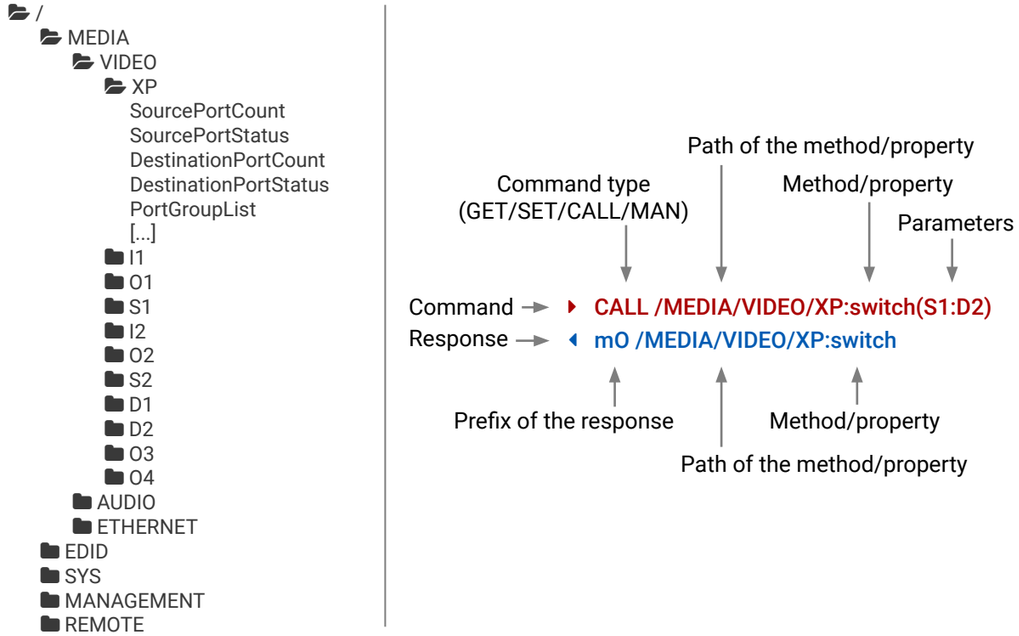
- Overview
- Protocol Rules
- System Commands
- Video Port Settings - Transmitter Mode
- Video Port Settings - Receiver Mode
- Video Port Settings - Transceiver Mode
- Audio Port Settings
- Analog Audio Port Settings
- System Monitoring Commands
- SFP+ Module Information
- EDID Management
- Network Configuration
- RS-232 Port Configuration
- Message Sending via RS-232 Serial Port
- LW3 Protocol Commands - Quick Summary

7.1. Overview

The Lightware Protocol #3 (LW3) is implemented in almost all new Lightware devices (matrix switchers, signal extenders and distribution amplifiers) since 2012. The protocol is ASCII-based and all commands are terminated with a carriage return (Cr, '\r') and line feed (Lf, '\n') pair. It is organized as a tree structure that provides outstanding flexibility and user-friendly handling with 'nodes', 'properties' and 'methods'. The 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.

7.2. Protocol Rules

7.2.1. LW3 Tree Structure and Command Structure (Examples)



7.2.2. 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.

7.2.3. 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 /EDID
- n- /EDID/F
- n- /EDID/D
- n- /EDID/U
- n- /EDID/E
- pr /EDID.EdidStatus=D3:E1;D3:E2
- m- /EDID:copy
- m- /EDID:delete
- m- /EDID:reset
- m- /EDID:switch
- m- /EDID:switchAll

SET command

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

- SET /MEDIA/VIDEO/O1.HdcpMode=Always
- pw /MEDIA/VIDEO/O1.HdcpMode=Always

CALL command

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

- CALL /MEDIA/VIDEO/XP:switch(S1:D1)
- mO /MEDIA/VIDEO/XP:switch

MAN command

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

- MAN /MEDIA/VIDEO/O1.Output5vMode
- pm /MEDIA/VIDEO/O1.Output5vMode ["Auto" | "AlwaysOn" | "AlwaysOff"]

7.2.4. Prefix Summary

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

The following prefixes are defined in the LW3 protocol:

Prefix	Description
n-	a node
nE	an error for a node
nm	a manual for a node
ns	a child node of a node
pr	a read-only property
pw	read-write property
pE	an error for the property

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

7.2.5. Error Messages

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

- CALL /MEDIA/VIDEO/XP:switch(SA:D1)
- mE /MEDIA/VIDEO/XP:switch %E004:Invalid value

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

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

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

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

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

- 1700#GET /EDID.*
- {1700
- pr /EDID.EdidStatus=F89:E1;D1:E2
- m- /EDID:copy
- m- /EDID:delete
- m- /EDID:reset
- m- /EDID:switch
- m- /EDID:switchAll
- }

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

7.2.8. 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/VIDEO
- o- /MEDIA/VIDEO

Get the Active Subscriptions

- OPEN
- o- /MEDIA/VIDEO
- o- /EDID
- o- /DISCOVERY

Subscribe to Multiple Nodes

- OPEN /MEDIA/VIDEO/*
- o- /MEDIA/VIDEO/*

Unsubscribe from a Node

- CLOSE /MEDIA/VIDEO
- c- /MEDIA/VIDEO

Unsubscribe from Multiple Nodes

- CLOSE /MEDIA/VIDEO/*
- c- /MEDIA/VIDEO/*

7.2.9. Notifications about the Changes of the Properties

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

- CHG /EDID.EdidStatus=F48:E1

A Short Example of How to Use the Subscription

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

- OPEN /MANAGEMENT/LABEL
- o- /MANAGEMENT/LABEL
- GET /MANAGEMENT/LABEL.DeviceLabel
- pm /MANAGEMENT/LABEL.DeviceLabel=UBEX-PRO20-HDMI-F110

Connection #1

- GET /MANAGEMENT/LABEL.DeviceLabel
- pm /MANAGEMENT/LABEL.DeviceLabel=UBEX-PRO20-HDMI-F110
- SET /MANAGEMENT/LABEL.DeviceLabel=TX_ServerRoom
- pw /MANAGEMENT/LABEL.DeviceLabel=TX_ServerRoom

Connection #2

- CHG /MANAGEMENT/LABEL.DeviceLabel=TX_ServerRoom → **Connection #1**

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

7.2.10. Legend for the Control Commands

Format	Description
<in>	Input port number
<out>	Output port number
<source>	Source stream ID
<destination>	Destination stream ID
<link>	SFP+ link number
<port>	Interface port number
<parameter>	Variable, which is defined and described in the command.
<expression>	Batched argument: the underline means that more expressions or parameters can be placed using a semicolon, e.g. **S1;S2** or **S1:D2;S2:D1**
▸	Sent command
◂	Received response
•	Space character
|	Separator line ("or" character)

7.3. System Commands

7.3.1. Set the Device Label

INFO: The device label can be changed to a custom text in the Status Tab of the LDC software.

Command and Response

- SET•/MANAGEMENT/LABEL.DeviceLabel=<Custom_name>
- pw•/MANAGEMENT/LABEL.DeviceLabel=<Custom_name>

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

Example

- SET /MANAGEMENT/LABEL.DeviceLabel=UBEX-RX_Conference
- pw /MANAGEMENT/LABEL.DeviceLabel=UBEX-RX_Conference

7.3.2. Querying 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-PRO20-HDMI-F110

7.3.3. Query the Firmware Package Version

Command and Response

- GET•/MANAGEMENT/UID/PACKAGE.Version
- pr•/MANAGEMENT/UID/PACKAGE.Version =<firmware_version>

Example

- GET /MANAGEMENT/UID/PACKAGE.Version
- pr /MANAGEMENT/UID/PACKAGE.Version=v1.3.0b10

7.3.4. Display Custom Text on the LCD

Calling the method makes a custom message display on the LCD screen for 5 seconds. This feature can be used to help to identify the device itself in the rack shelf.

ATTENTION! Applying of escaping is required in this method. See the details about it in the Escaping section.

INFO: The following characters are not allowed in the <text> parameter: ( ) { } # % \\ \r \n \t

Command and Response

- CALL•/MANAGEMENT/UI:displayMessage(<text>)
- mO•/MANAGEMENT/UI:displayMessage

Example

- CALL /MANAGEMENT/UI:displayMessage(I'm here!)
- mO /MANAGEMENT/UI:displayMessage

7.3.5. Display Custom Color on the LCD

Calling the method makes a custom color on the LCD screen until withdrawal. This feature can be used to help to identify the device itself in the rack shelf.

Command and Response

- CALL•/MANAGEMENT/UI:testDisplay(<mode>,<hex_code>)
- mO•/MANAGEMENT/UI:testDisplay

Parameters

Identifier	Parameter description	Value	Explanation
<mode>	Enable or disable the feature	**0**	The feature is disabled.
		1	The feature is enabled.
<hex_code>	6 character long hexadecimal RGB color code	**RGB color code**	RGB color code

Example

- CALL /MANAGEMENT/UI:testDisplay(1,FFFF00)
- mO /MANAGEMENT/UI:testDisplay

Explanation

The LCD screen displays whole colored yellow.

7.3.6. Identify the Device

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

Command and Response

- CALL•/MANAGEMENT/UI:identifyMe()
- mO•/MANAGEMENT/UI:identifyMe

Example

- CALL /MANAGEMENT/UI:identifyMe()
- mO /MANAGEMENT/UI:identifyMe

7.3.7. Query the Operation Mode

Command and Response

- GET•/SYS/MB.OperationMode
- pr•/SYS/MB.OperationMode=<operation_mode>

Parameters

Identifier	Parameter description	Value	Explanation
<operation_mode>	The operation mode of the endpoint device	**Transmitter**	The endpoint device operates as a **Transmitter**. See the details in the Transmitter Mode section.
		Receiver	The endpoint device operates as a **Receiver**. See the details in the Receiver Mode section.
		Transceiver	The endpoint device operates as a **Transceiver**. See the details in the Transceiver Mode section.

Example

- GET /SYS/MB.OperationMode
- pr /SYS/MB.OperationMode=Transceiver

7.3.8. Set the Operation Mode

ATTENTION! This operation always requires rebooting the device.

The operation mode (transmitter, receiver, or transceiver) of the device can be changed based on the required application.

Command and Response

- CALL•/SYS/MB.setOperationModeAndReset=<operation_mode>
- mO•/SYS/MB.setOperationModeAndReset=<operation_mode>

Parameters

Identifier	Parameter description	Value	Explanation
<operation_mode>	The operation mode of the endpoint device	**Transmitter**	The endpoint device is set to **Transmitter** operation mode. See the details in the Transmitter Mode section.
		Receiver	The endpoint device is set to **Receiver** operation mode. See the details in the Receiver Mode section.
		Transceiver	The endpoint device is set to **Transceiver** operation mode. See the details in the Transceiver Mode section.

Example

- CALL /SYS/MB.setOperationModeAndReset=Transmitter
- mO /SYS/MB.setOperationModeAndReset=Transmitter

7.3.9. Query the Application Mode

The application mode of the device can be Extender or Matrix. See the details about the two modes in the Application Modes section.

Command and Response

- GET•/SYS/MB.ApplicationMode
- pr•/SYS/MB.ApplicationMode=<application_mode>

Parameters

Identifier	Parameter description	Value	Explanation
<application_mode>	The application mode of the endpoint device.	**Extender**	The endpoint device is in Extender mode.
		Matrix	The endpoint device is in Matrix mode.

Example

- GET /SYS/MB.ApplicationMode
- pr /SYS/MB.ApplicationMode=Extender

7.3.10. Application Mode Selection

INFO: See the details about the two modes in the Application Modes section.

INFO: The **Auto** mode is the recommended application mode setting.

Command and Response

- SET•/SYS/MB.ApplicationModeSelection=<application_mode>
- pw•/SYS/MB.ApplicationModeSelection=<application_mode>

Parameters

Identifier	Parameter description	Value	Explanation
<application_mode>	The application mode of the endpoint device.	**Auto**	The endpoint device detects the application mode automatically based on the connected remote device.
		Extender	The endpoint device is forced to be in Extender mode.
		Matrix	The endpoint device is forced to be in Matrix mode.

Example

- SET /SYS/MB.ApplicationModeSelection=Auto
- pw /SYS/MB.ApplicationModeSelection=Auto

7.3.11. Setting the Rotary Direction of the Jog Dial Knob

Command and Response

- SET•/MANAGEMENT/UI.RotaryDirection=<parameter>
- pw•/MANAGEMENT/UI.RotaryDirection=<parameter>

Parameters

Identifier	Parameter description	Value	Explanation
<parameter>	Rotary direction of the jog dial control knob	**0**	The rotary direction of down is clockwise (CW).
		1	The rotary direction of down is counter clockwise (CCW).

Example

- SET /MANAGEMENT/UI.RotaryDirection=1
- pw /MANAGEMENT/UI.RotaryDirection=1

7.3.12. Setting the Brightness of the LCD Screen

Command and Response

- SET•/MANAGEMENT/UI.DisplayBrightness=<parameter>
- pw•/MANAGEMENT/UI.DisplayBrightness=<parameter>

Parameters

The <parameter> of display brightness can be set between 0 and 10 values.

Example

- SET /MANAGEMENT/UI.DisplayBrightness=5
- pw /MANAGEMENT/UI.DisplayBrightness=5

7.3.13. Control Lock

Enable/disable the operation of the jog dial control knob.

Command and Response

- SET•/MANAGEMENT/UI.ControlLock=<parameter>
- pw•/MANAGEMENT/UI.ControlLock=<parameter>

Parameters

Identifier	Parameter description	Value	Explanation
<parameter>	Lock/unlock of the jog dial control knob	**0**	The jog dial control knob is **unlocked**.
		1	The jog dial control knob is **locked**.

Example

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

7.3.14. Restarting the Device

Calling the method results the endpoint restarts – 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:reset()
- mO•/SYS:reset=

Example

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

7.3.15. Restore the Factory Default Settings

Command and Response

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

Example

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

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

7.4. Video Port Settings - Transmitter Mode

INFO: Video port numbering can be found in the Input/Output Port Numbering section.

7.4.1. Query the Status of Source Port

Command and Response

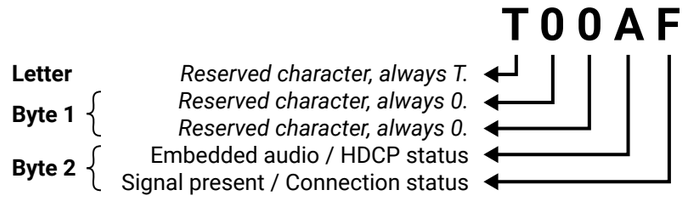
- GET•/MEDIA/VIDEO/XP.SourcePortStatus
- pr•/MEDIA/VIDEO/XP.SourcePortStatus=<in_status>;...;<in_status>

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

Example

- GET /MEDIA/VIDEO/XP.SourcePortStatus
- pr /MEDIA/VIDEO/XP.SourcePortStatus=T00AF;T00EF

Legend



Example and Explanation (for input 1, T00AF)

	Byte 1				Byte 2			
	Character 2		Character 3		Character 4		Character 5	
	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0
	Reserved	**Reserved**	**Reserved**	**Reserved**	**Embedded audio status**	**HDCP status**	**Signal present status**	**Connection status**
0 0	Reserved	Reserved	Reserved	Reserved	Unknown			
0 1					Reserved			
1 0					No embedded audio	Not encrypted	No signal	Not connected
1 1					Embedded audio presents	Encrypted	Signal presents	Connected

T	**0**		**0**		**A**		**F**	
Reserved	0 0	0 0	0 0	0 0	1 0	1 0	1 1	1 1
	Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	Signal presents	Connected

The Most Common Received Port Status Responses

T000A	**T**	**0**		**0**		**0**		**A**	
	Reserved	0 0	0 0	0 0	0 0	0 0	0 0	1 0	1 0
		Reserved	Reserved	Reserved	Reserved	Unknown	Unknown	No signal	Not connected
T00AA	**T**	**0**		**0**		**A**		**A**	
	Reserved	0 0	0 0	0 0	0 0	1 0	1 0	1 0	1 0
		Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	No signal	Not connected
T00AB	**T**	**0**		**0**		**A**		**B**	
	Reserved	0 0	0 0	0 0	0 0	1 0	1 0	1 0	1 1
		Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	No signal	Connected
T00AF	**T**	**0**		**0**		**A**		**F**	
	Reserved	0 0	0 0	0 0	0 0	1 0	1 0	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	Signal presents	Connected
T00EF	**T**	**0**		**0**		**E**		**F**	
	Reserved	0 0	0 0	0 0	0 0	1 1	1 0	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	Embedded audio presents	Not encrypted	Signal presents	Connected
T00BF	**T**	**0**		**0**		**B**		**F**	
	Reserved	0 0	0 0	0 0	0 0	1 0	1 1	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	No embedded audio	Encrypted	Signal presents	Connected
T00FF	**T**	**0**		**0**		**F**		**F**	
	Reserved	0 0	0 0	0 0	0 0	1 1	1 1	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	Embedded audio presents	Encrypted	Signal presents	Connected

7.4.2. Query the Status of Destination Port

Command and Response

- GET•/MEDIA/VIDEO/XP.DestinationPortStatus
- pr•/MEDIA/VIDEO/XP.DestinationPortStatus=<out_status>;...;<out_status>

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

Legend

See at previous section.

Example

- GET /MEDIA/VIDEO/XP.DestinationPortStatus
- pr /MEDIA/VIDEO/XP.DestinationPortStatus=T00BF;T00EF

Example and Explanation (for output 1, T00BF)

T	0		0		B		F	
Reserved	0 0	0 0	0 0	0 0	1 0	1 1	1 1	1 1
	Reserved	Reserved	Reserved	Reserved	No embedded audio	Encrypted	Signal presents	Connected

7.4.3. Query the Video Crosspoint Setting

Displays the current crosspoint setting which stream is transmitted to the output ports of the receiver.

Command and Response

- GET•/MEDIA/VIDEO/XP.DestinationConnectionList
- pr•/MEDIA/VIDEO/XP.DestinationConnectionList=<source>;<source>

Example

- GET /MEDIA/VIDEO/XP.DestinationConnectionList
- pr /MEDIA/VIDEO/XP.DestinationConnectionList=S1;S2

S1 stream from input 1 is connected to the D1 sink, S2 stream from input 2 is connected to the D2 sink.

7.4.4. Switching the Stream

Command and Response

- CALL•/MEDIA/VIDEO/XP:switch(<source>:<destination>)
- mO•/MEDIA/VIDEO/XP:switch

Example

- CALL /MEDIA/VIDEO/XP:switch(S2:D1)
- mO /MEDIA/VIDEO/XP:switch

S2 stream is switched to D1 sink (O1 output port).

7.4.5. Enable/Disable the Stream

Command and Response

- SET•/MEDIA/VIDEO/<source>.Enabled=<logical_value>
- pw•/MEDIA/VIDEO/<source>.Enabled=<logical_value>

Parameters

Identifier	Parameter description	Value	Explanation
<logical_value>	The stream is unmuted or muted.	**true**	The stream is enabled (unmuted).
		false	The stream is disabled (muted).

Example

- SET /MEDIA/VIDEO/S1.Enabled=true
- pw /MEDIA/VIDEO/S1.Enabled=true

7.4.6. Resolution Setting

The resolution which is set here will be enforced only on case of the *ResolutionMode* is set to **Forced**. See the details about the Resolution Mode Setting in the next section.

Command and Response

- SET•/MEDIA/VIDEO/<source>.ResolutionSetting=<resolution>
- pw•/MEDIA/VIDEO/<source>.ResolutionSetting=<resolution>

Example

- SET /MEDIA/VIDEO/S2.ResolutionSetting=1600x1200p60
- pw /MEDIA/VIDEO/S2.ResolutionSetting=1600x1200p60

INFO: The entire list of available resolutions can be found in the Resolutions of the Scaler / FRC section.

7.4.7. Resolution Mode Setting

Command and Response

- SET•/MEDIA/VIDEO/<source>.ResolutionMode=<resolution_mode>
- pw•/MEDIA/VIDEO/<source>.ResolutionMode=<resolution_mode>

Parameters

Identifier	Parameter description	Value	Explanation
<resolution_mode>	Resolution mode setting	**Pass**	Pass-through mode - the original stream is transmitted to the receiver.
		Forced	The transmitter forces the resolution set in the *ResolutionSetting* for the stream and transmits it to the receiver.

Example

- SET /MEDIA/VIDEO/S1.ResolutionMode=Forced
- pw /MEDIA/VIDEO/S1.ResolutionMode=Forced

7.4.8. Scaler - Image Position Setting

The image position setting which is set here will be enforced only in case of the *ResolutionMode* is set to **Forced**. See the details about the Resolution Mode Setting in the previous section.

ATTENTION! The scaler settings are available for the stream of the HDMI input 1 port only. HDMI input 2 will always center the input image on the output image of enforced resolution.

Command and Response

- SET•/MEDIA/VIDEO/<source>.ImagePosition=<image_position>
- pw•/MEDIA/VIDEO/<source>.ImagePosition=<image_position>

Parameters

The <image_position> can be set to **Center, Stretch,** or **Fit**.

Example

- SET /MEDIA/VIDEO/S1.ImagePosition=Fit
- pw /MEDIA/VIDEO/S1.ImagePosition=Fit

7.4.9. Color Space Converter Setting

Command and Response

- SET•/MEDIA/VIDEO/<source>.ColorSpaceSetting=<color_space>
- pw•/MEDIA/VIDEO/<source>.ColorSpaceSetting=<color_space>

Parameters

Identifier	Parameter description	Value	Explanation
<color_space>	Color space setting	**Pass**	Pass-through mode - the original color space of the stream is transmitted to the sink device.
		RGB	Forced RGB color space.
		YCbCr 4:4:4	Forced YCbCr 4:4:4 color space.
		YCbCr 4:2:2	Forced YCbCr 4:2:2 color space.

Example

- SET /MEDIA/VIDEO/S2.ColorSpaceSetting=YCbCr 4:4:4
- pw /MEDIA/VIDEO/S2.ColorSpaceSetting=YCbCr 4:4:4

7.4.10. 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 output ports of the receiver/transceiver only.

Command and Response

- GET•/MEDIA/VIDEO/<source>.TimingMode
- pr•/MEDIA/VIDEO/<source>.TimingMode=<timing_mode>

Parameters

The <timing_mode> can be **Freerun** or **SourceLocked**.

Example

- GET /MEDIA/VIDEO/S1.TimingMode
- pr /MEDIA/VIDEO/S1.TimingMode=SourceLocked

7.4.11. HDCP Setting (Input Port)

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

- SET•/MEDIA/VIDEO/<in>.HdcpEnable=<logical_value>
- pw•/MEDIA/VIDEO/<in>.HdcpEnable=<logical_value>

Parameters

The <logical_value> can be set to **true** or **false**.

Example

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

7.4.12. HDCP Setting (Output Port)

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

Command and Response

- SET•/MEDIA/VIDEO/<out>.HdcpMode=<HDCP_mode>
- pw•/MEDIA/VIDEO/<out>.HdcpMode=<HDCP_mode>

Parameters

The <HDCP_mode> can be set to **Auto** or **Always**.

Example

- SET /MEDIA/VIDEO/O1.HdcpMode=Always
- pw /MEDIA/VIDEO/O1.HdcpMode=Always

7.5. Video Port Settings - Receiver Mode

INFO: Video port numbering can be found in the Input/Output Port Numbering section.

7.5.1. Query the Status of Source Port

Command and Response

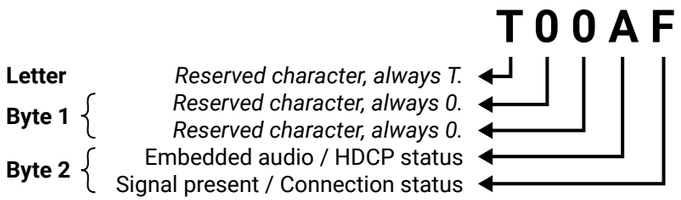
- GET•/MEDIA/VIDEO/XP.SourcePortStatus
- pr•/MEDIA/VIDEO/XP.SourcePortStatus=<out_status>;...;<out_status>

The response contains 5 ASCII characters for each port. The first character is reserved, the next four characters represent a 2-byte HEX code showing the current state of the input ports of the connected device.

Example

- GET /MEDIA/VIDEO/XP.SourcePortStatus
- pr /MEDIA/VIDEO/XP.SourcePortStatus=T00AF;T00EF

Legend



Example and Explanation (for input 1, T00AF)

	Byte 1				Byte 2			
	Character 2		Character 3		Character 4		Character 5	
	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0
	Reserved	**Reserved**	**Reserved**	**Reserved**	**Embedded audio status**	**HDCP status**	**Signal present status**	**Connection status**
0 0	Reserved	Reserved	Reserved	Reserved	Unknown			
0 1					Reserved			
1 0					No embedded audio	Not encrypted	No signal	Not connected
1 1					Embedded audio presents	Encrypted	Signal presents	Connected

T	0		0		A		F	
Reserved	0 0	0 0	0 0	0 0	1 0	1 0	1 1	1 1
	Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	Signal presents	Connected

The Most Common Received Port Status Responses

T000A	T	0		0		0		A	
	Reserved	0 0	0 0	0 0	0 0	0 0	0 0	1 0	1 0
		Reserved	Reserved	Reserved	Reserved	Unknown	Unknown	No signal	Not connected

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

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

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

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

T00BF	T	0		0		B		F	
	Reserved	0 0	0 0	0 0	0 0	1 0	1 1	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	No embedded audio	Encrypted	Signal presents	Connected

T00FF	T	0		0		F		F	
	Reserved	0 0	0 0	0 0	0 0	1 1	1 1	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	Embedded audio presents	Encrypted	Signal presents	Connected

7.5.2. Query the Status of Destination Port

Command and Response

- GET•/MEDIA/VIDEO/XP.DestinationPortStatus
- pr•/MEDIA/VIDEO/XP.DestinationPortStatus=<out_status>;...;<out_status>

The response contains 5 ASCII characters for each port. The first character is reserved, the next four characters represent a 2-byte HEX code showing the current state of the output ports.

Example

- GET /MEDIA/VIDEO/XP.DestinationPortStatus
- pr /MEDIA/VIDEO/XP.DestinationPortStatus=T00BF;T00EF

Example and Explanation (for output 1, T00BF)

T	0		0		B		F	
Reserved	0 0	0 0	0 0	0 0	1 0	1 1	1 1	1 1
	Reserved	Reserved	Reserved	Reserved	No embedded audio	Encrypted	Signal presents	Connected

7.5.3. Query the Video Crosspoint Setting

Displays the current crosspoint setting which stream is transmitted to the output ports of the receiver.

Command and Response

- GET•/MEDIA/VIDEO/XP.DestinationConnectionList
- pr•/MEDIA/VIDEO/XP.DestinationConnectionList=<source>;<source>

Example

- GET /MEDIA/VIDEO/XP.DestinationConnectionList
- pr /MEDIA/VIDEO/XP.DestinationConnectionList=S1;S2

S1 stream from input 1 is connected to the D1 sink, S2 stream from input 2 is connected to the D2 sink.

7.5.4. Switching the Stream

Command and Response

- CALL•/MEDIA/VIDEO/XP:switch(<source>:<destination>)
- mO•/MEDIA/VIDEO/XP:switch

Example

- CALL /MEDIA/VIDEO/XP:switch(S2:D1)
- mO /MEDIA/VIDEO/XP:switch

S2 stream is switched to D1 sink (O1 output port).

7.5.5. Enable/Disable the Stream

Command and Response

- SET•/MEDIA/VIDEO/<destination>.Enabled=<logical_value>
- pw•/MEDIA/VIDEO/<destination>.Enabled=<logical_value>

Parameters

Identifier	Parameter description	Value	Explanation
<logical_value>	The stream is unmuted or muted.	**true**	The stream is enabled (unmuted).
		false	The stream is disabled (muted).

Example

- SET /MEDIA/VIDEO/D1.Enabled=true
- pw /MEDIA/VIDEO/D1.Enabled=true

7.5.6. Resolution Mode Setting

Command and Response

- SET•/MEDIA/VIDEO/<out>.ResolutionMode=<resolution_mode>
- pw•/MEDIA/VIDEO/<out>.ResolutionMode=<resolution_mode>

Parameters

Identifier	Parameter description	Value	Explanation
<resolution_mode>	Resolution mode setting	**Pass**	Pass-through mode - the original stream is transmitted to the sink device.
		Forced	The receiver forces the resolution set in the *ResolutionSetting* for the stream and transmits it to the sink device.
		EdidBased	The receiver forces the resolution which is read out from the EDID of the connected sink device. The resolution can be queried from a property - see the details in the next section.

Example

- SET /MEDIA/VIDEO/O1.ResolutionMode=Forced
- pw /MEDIA/VIDEO/O1.ResolutionMode=Forced

7.5.7. Query the EDID Based Resolution

Command and Response

- GET•/MEDIA/VIDEO/<out>.EdidBasedResolution
- pr•/MEDIA/VIDEO/<out>.EdidBasedResolution=<resolution>

Example

- GET /MEDIA/VIDEO/O1.EdidBasedResolution
- pr /MEDIA/VIDEO/O1.EdidBasedResolution=3840x2160p60

7.5.8. Resolution Setting

The resolution which are set here will be enforced only in case of the *ResolutionMode* is set to **Forced**. See the details about the Resolution Mode Setting in the previous section.

Command and Response

- SET•/MEDIA/VIDEO/<out>.ResolutionSetting=<resolution>
- pw•/MEDIA/VIDEO/<out>.ResolutionSetting=<resolution>

Example

- SET /MEDIA/VIDEO/O2.ResolutionSetting=1600x1200p60
- pw /MEDIA/VIDEO/O2.ResolutionSetting=1600x1200p60

INFO: The entire list of available resolutions can be find in the Resolutions of the Scaler / FRC section.

7.5.9. Scaler - Image Position Setting

The image position setting which is set here will be enforced only in case of the *ResolutionMode* is set to **Forced**. See the details about it in the Resolution Mode Setting section.

ATTENTION! The scaler setting is available for the stream of the HDMI output 1 port only. HDMI output 2 will always center the input image on the output image of enforced resolution.

Command and Response

- SET•/MEDIA/VIDEO/<out>.ImagePosition=<image_position>
- pw•/MEDIA/VIDEO/<out>.ImagePosition=<image_position>

Parameters

The <image_position> can be set to **Center, Stretch,** or **Fit**.

Example

- SET /MEDIA/VIDEO/O1.ImagePosition=Stretch
- pw /MEDIA/VIDEO/O1.ImagePosition=Stretch

7.5.10. Color Space Converter Setting

Command and Response

- SET•/MEDIA/VIDEO/<out>.ColorSpaceSetting=<color_space>
- pw•/MEDIA/VIDEO/<out>.ColorSpaceSetting=<color_space>

Parameters

Identifier	Parameter description	Value	Explanation
<color_space>	Color space setting	**Pass**	Pass-through mode - the original color space of the stream is transmitted to the sink device.
		RGB	Forced RGB color space.
		YCbCr 4:4:4	Forced YCbCr 4:4:4 color space.
		YCbCr 4:2:2	Forced YCbCr 4:2:2 color space.

Example

- SET /MEDIA/VIDEO/O2.ColorSpaceSetting=YCbCr 4:4:4
- pw /MEDIA/VIDEO/O2.ColorSpaceSetting=YCbCr 4:4:4

7.5.11. 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/VIDEO/<out>.TimingMode
- pr•/MEDIA/VIDEO/<out>.TimingMode=<timing_mode>

Parameters

The <timing_mode> can be **Freerun** or **SourceLocked**.

Example

- GET /MEDIA/VIDEO/O1.TimingMode=SourceLocked
- pr /MEDIA/VIDEO/O1.TimingMode=SourceLocked

7.5.12. 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

- SET•/MEDIA/VIDEO/<out>.TimingModeSetting=<timing_mode>
- pw•/MEDIA/VIDEO/<out>.TimingModeSetting=<timing_mode>

Parameters

The <timing_mode> can be set to **Freerun** or **SourceLocked**.

Example

- SET /MEDIA/VIDEO/O2.TimingModeSetting=SourceLocked
- pw /MEDIA/VIDEO/O2.TimingModeSetting=SourceLocked

7.5.13. No Sync Screen (Test Pattern) Mode

The No sync screen feature generates an image which can be displayed when there is no incoming signal on the port. The following method turns on or off the Test Pattern function.

Command and Response

- SET•/MEDIA/VIDEO/<out>.NoSyncMode=<nosync_mode>
- pw•/MEDIA/VIDEO/<out>. NoSyncMode=<nosync_mode>

Parameters

Identifier	Parameter description	Value	Explanation
<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 there is an incoming signal.

Example

- SET /MEDIA/VIDEO/O1.NoSyncMode=NoSignal
- pw /MEDIA/VIDEO/O1.NoSyncMode=NoSignal

7.5.14. No Sync Screen (Test Pattern) Color Setting

The No sync screen feature generates an image which 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/VIDEO/<out>.NoSyncColor=<RGB_code>
- pw•/MEDIA/VIDEO/<out>. NoSyncColor=<RGB_code>

Example

- SET /MEDIA/VIDEO/O1.NoSyncColor=128,128,128
- pw /MEDIA/VIDEO/O1.NoSyncColor=128,128,128

7.5.15. 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

- SET•/MEDIA/VIDEO/<out>.HdcpMode=<HDCP_mode>
- pw•/MEDIA/VIDEO/<out>.HdcpMode=<HDCP_mode>

Parameters

The <HDCP_mode> can be set to **Auto** or **Always**.

Example

- SET /MEDIA/VIDEO/O1.HdcpMode=Always
- pw /MEDIA/VIDEO/O1.HdcpMode=Always

7.6. Video Port Settings - Transceiver Mode

INFO: Video port numbering can be found in the Input/Output Port Numbering section.

7.6.1. Query the Status of Source Port

Command and Response

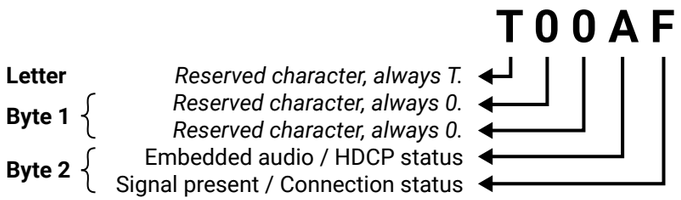
- GET•/MEDIA/VIDEO/XP.SourcePortStatus
- pr•/MEDIA/VIDEO/XP.SourcePortStatus=<in_status>;...;<in_status>

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

Example

- GET /MEDIA/VIDEO/XP.SourcePortStatus
- pr /MEDIA/VIDEO/XP.SourcePortStatus=T00AF;T00EF

Legend



Example and Explanation (for input 1, T00AF)

	Byte 1				Byte 2			
	Character 2		Character 3		Character 4		Character 5	
	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0
	Reserved	**Reserved**	**Reserved**	**Reserved**	**Embedded audio status**	**HDCP status**	**Signal present status**	**Connection status**
0 0	Reserved	Reserved	Reserved	Reserved	Unknown			
0 1					Reserved			
1 0					No embedded audio	Not encrypted	No signal	Not connected
1 1					Embedded audio presents	Encrypted	Signal presents	Connected

T	0		0		A		F	
Reserved	0 0	0 0	0 0	0 0	1 0	1 0	1 1	1 1
	Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	Signal presents	Connected

The Most Common Received Port Status Responses

	T	0		0		0		A	
T000A	Reserved	0 0	0 0	0 0	0 0	0 0	0 0	1 0	1 0
		Reserved	Reserved	Reserved	Reserved	Unknown	Unknown	No signal	Not connected

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

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

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

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

	T	0		0		B		F	
T00BF	Reserved	0 0	0 0	0 0	0 0	1 0	1 1	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	No embedded audio	Encrypted	Signal presents	Connected

	T	0		0		F		F	
T00FF	Reserved	0 0	0 0	0 0	0 0	1 1	1 1	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	Embedded audio presents	Encrypted	Signal presents	Connected

7.6.2. Query the Status of Destination Port

Command and Response

- GET•/MEDIA/VIDEO/XP.DestinationPortStatus
- pr•/MEDIA/VIDEO/XP.DestinationPortStatus=<out_status>;...;<out_status>

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

Legend

See at previous section.

Example

- GET /MEDIA/VIDEO/XP.DestinationPortStatus
- pr /MEDIA/VIDEO/XP.DestinationPortStatus=T00BF;T00EF

Example and Explanation (for output 1, T00BF)

T	0		0		B		F	
Reserved	0 0	0 0	0 0	0 0	1 0	1 1	1 1	1 1
	Reserved	Reserved	Reserved	Reserved	No embedded audio	Encrypted	Signal presents	Connected

7.6.3. Enable/Disable the Stream

Command and Response

- SET•/MEDIA/VIDEO/<source>.Enabled=<logical_value>
- pw•/MEDIA/VIDEO/<source>.Enabled=<logical_value>

Parameters

Identifier	Parameter description	Value	Explanation
<logical_value>	The stream is unmuted or muted.	**true**	The stream is enabled (unmuted).
		false	The stream is disabled (muted).

Example

- SET /MEDIA/VIDEO/S1.Enabled=true
- pw /MEDIA/VIDEO/S1.Enabled=true

7.6.4. Resolution Mode Setting - Input Side

Command and Response

- SET•/MEDIA/VIDEO/<source>.ResolutionMode=<resolution_mode>
- pw•/MEDIA/VIDEO/<source>.ResolutionMode=<resolution_mode>

Parameters

Identifier	Parameter description	Value	Explanation
<resolution_mode>	Resolution mode setting	**Pass**	Pass-through mode - the original stream is transmitted.
		Forced	The transceiver forces the resolution set in the *ResolutionSetting* for the stream.

Example

- SET /MEDIA/VIDEO/S1.ResolutionMode=Forced
- pw /MEDIA/VIDEO/S1.ResolutionMode=Forced

7.6.5. Resolution Mode Setting - Output Side

Command and Response

- SET•/MEDIA/VIDEO/<out>.ResolutionMode=<resolution_mode>
- pw•/MEDIA/VIDEO/<out>.ResolutionMode=<resolution_mode>

Parameters

Identifier	Parameter description	Value	Explanation
<resolution_mode>	Resolution mode setting	**Pass**	Pass-through mode - the original stream is transmitted to the sink device.
		Forced	The transceiver forces the resolution set in the *ResolutionSetting* for the stream and transmits it to the sink device.
		EdidBased	The transceiver forces the resolution which is read out from the EDID of the connected sink device. The resolution can be queried from a property - see the details in the next section.

Example

- SET /MEDIA/VIDEO/O1.ResolutionMode=EdidBased
- pw /MEDIA/VIDEO/O1.ResolutionMode=EdidBased

7.6.6. Query the EDID Based Resolution

Command and Response

- GET•/MEDIA/VIDEO/<out>.EdidBasedResolution
- pr•/MEDIA/VIDEO/<out>.EdidBasedResolution=<resolution>

Example

- GET /MEDIA/VIDEO/O1.EdidBasedResolution
- pr /MEDIA/VIDEO/O1.EdidBasedResolution=3840x2160p60

7.6.7. Resolution Setting

The resolution which are set here will be enforced only in case of the *ResolutionMode* is set to **Forced**. See the details about the Resolution Mode Setting in the previous sections.

Command and Response

- SET•/MEDIA/VIDEO/<source|out>.ResolutionSetting=<resolution>
- pw•/MEDIA/VIDEO/<source|out>.ResolutionSetting=<resolution>

Example

- SET /MEDIA/VIDEO/O1.ResolutionSetting=1600x1200p60
- pw /MEDIA/VIDEO/O1.ResolutionSetting=1600x1200p60

INFO: The entire list of available resolutions can be found in the Resolutions of the Scaler / FRC section.

7.6.8. Scaler - Image Position Setting

The image position setting which is set here will be enforced only in case of the *ResolutionMode* is set to **Forced**.

ATTENTION! The scaler setting is available for the stream of the HDMI output 1 port only.

Command and Response

- SET•/MEDIA/VIDEO/<out>.ImagePosition=<image_position>
- pw•/MEDIA/VIDEO/<out>.ImagePosition=<image_position>

Parameters

The <image_position> can be set to **Center, Stretch,** or **Fit**.

Example

- SET /MEDIA/VIDEO/O1.ImagePosition=Stretch
- pw /MEDIA/VIDEO/O1.ImagePosition=Stretch

7.6.9. Color Space Converter Setting

Command and Response

- SET•/MEDIA/VIDEO/<source|out>.ColorSpaceSetting=<color_space>
- pw•/MEDIA/VIDEO/<source|out>.ColorSpaceSetting=<color_space>

Parameters

Identifier	Parameter description	Value	Explanation
<color_space>	Color space setting	**Pass**	Pass-through mode - the original color space of the stream is transmitted to the sink device.
		RGB	Forced RGB color space.
		YCbCr 4:4:4	Forced YCbCr 4:4:4 color space.
		YCbCr 4:2:2	Forced YCbCr 4:2:2 color space.

Example

- SET /MEDIA/VIDEO/O1.ColorSpaceSetting=YCbCr 4:4:4
- pw /MEDIA/VIDEO/O1.ColorSpaceSetting=YCbCr 4:4:4

7.6.10. 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 receiver only. See the related LW3 protocol command in the Timing Mode Setting section.

Command and Response

- GET•/MEDIA/VIDEO/<source|out>.TimingMode
- pr•/MEDIA/VIDEO/<source|out>.TimingMode=<timing_mode>

Parameters

The <timing_mode> can be **Freerun** or **SourceLocked**.

Example

- GET /MEDIA/VIDEO/S1.TimingMode
- pr /MEDIA/VIDEO/S1.TimingMode=SourceLocked

7.6.11. Timing Mode Setting

The timing mode is set with the following command. See more details about it in the Timing Modes section.

INFO: The timing mode setting is available for the stream of the HDMI output 1 port only.

Command and Response

- SET•/MEDIA/VIDEO/<out>.TimingModeSetting=<timing_mode>
- pw•/MEDIA/VIDEO/<out>.TimingModeSetting=<timing_mode>

Parameters

The <timing_mode> can be set to **Freerun** or **SourceLocked**.

Example

- SET /MEDIA/VIDEO/O1.TimingModeSetting=SourceLocked
- pw /MEDIA/VIDEO/O1.TimingModeSetting=SourceLocked

7.6.12. No Sync Screen (Test Pattern) Mode

The No sync screen feature generates an image which can be displayed when there is no incoming signal on the port. The following method turns on or off the Test Pattern function.

INFO: The no sync screen setting is available for the stream of the HDMI output 1 port only.

Command and Response

- SET•/MEDIA/VIDEO/<out>.NoSyncMode=<nosync_mode>
- pw•/MEDIA/VIDEO/<out>. NoSyncMode=<nosync_mode>

Parameters

Identifier	Parameter description	Value	Explanation
<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 there is an incoming signal.

Example

- SET /MEDIA/VIDEO/O1.NoSyncMode=NoSignal
- pw /MEDIA/VIDEO/O1.NoSyncMode=NoSignal

7.6.13. No Sync Screen (Test Pattern) Color Setting

The No sync screen feature generates an image which can be displayed when there is no incoming signal on the port. The following method sets the displayed color defined in RGB code.

INFO: The no sync screen setting is available for the stream of the HDMI output 1 port only.

Command and Response

- SET•/MEDIA/VIDEO/<out>.NoSyncColor=<RGB_code>
- pw•/MEDIA/VIDEO/<out>. NoSyncColor=<RGB_code>

Example

- SET /MEDIA/VIDEO/O1.NoSyncColor=128,128,128
- pw /MEDIA/VIDEO/O1.NoSyncColor=128,128,128

7.6.14. HDCP Setting (Input Port)

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

- SET•/MEDIA/VIDEO/<in>.HdcpEnable=<logical_value>
- pw•/MEDIA/VIDEO/<in>.HdcpEnable=<logical_value>

Parameters

The <logical_value> can be set to **true** or **false**.

Example

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

7.6.15. HDCP Setting (Output Port)

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

Command and Response

- SET•/MEDIA/VIDEO/<out>.HdcpMode=<HDCP_mode>
- pw•/MEDIA/VIDEO/<out>.HdcpMode=<HDCP_mode>

Parameters

The <HDCP_mode> can be set to **Auto** or **Always**.

Example

- SET /MEDIA/VIDEO/O1.HdcpMode=Always
- pw /MEDIA/VIDEO/O1.HdcpMode=Always

7.7. Audio Port Settings

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

7.7.1. Query the Status of Source Port

Command and Response

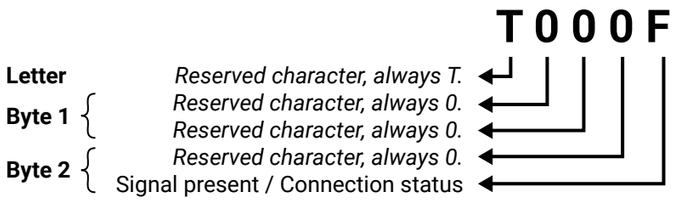
- GET•/MEDIA/AUDIO/XP.SourcePortStatus
- pr•/MEDIA/AUDIO/XP.SourcePortStatus=<in_status>;...;<in_status>

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

Example

- GET /MEDIA/AUDIO/XP.SourcePortStatus
- pr /MEDIA/AUDIO/XP.SourcePortStatus=T000F;T000B;T000A;T000F

Legend



Example and Explanation (for input 1, T000F)

	Byte 1				Byte 2			
	Character 2		Character 3		Character 4		Character 5	
	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0
	Reserved	**Reserved**	**Reserved**	**Reserved**	**Reserved**	**Reserved**	**Signal present status**	**Connection status**
0 0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Unknown	
0 1							Reserved	
1 0							No signal	Not connected
1 1							Signal presents	Connected

T	0		0		0		F	
Reserved	0 0	0 0	0 0	0 0	0 0	0 0	1 1	1 1
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Signal presents	Connected

The Most Common Received Port Status Responses

T0000	T	0		0		0		0	
	Reserved	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
		Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Unknown	Unknown

T0008	T	0		0		0		8	
	Reserved	0 0	0 0	0 0	0 0	0 0	0 0	1 0	0 0
		Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	No signal	Unknown

T000A	T	0		0		0		A	
	Reserved	0 0	0 0	0 0	0 0	0 0	0 0	1 0	1 0
		Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	No signal	Not connected

T000B	T	0		0		0		B	
	Reserved	0 0	0 0	0 0	0 0	0 0	0 0	1 0	1 1
		Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	No signal	Connected

T000C	T	0		0		0		C	
	Reserved	0 0	0 0	0 0	0 0	0 0	0 0	1 1	0 0
		Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Signal presents	Unknown

T000F	T	0		0		0		F	
	Reserved	0 0	0 0	0 0	0 0	0 0	0 0	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Signal presents	Connected

7.7.2. Query the Status of Destination Port

Command and Response

- GET•/MEDIA/AUDIO/XP.DestinationPortStatus
- pr•/MEDIA/AUDIO/XP.DestinationPortStatus=<out_status>;...;<out_status>

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

Legend

See at previous section.

Example

- GET /MEDIA/AUDIO/XP.DestinationPortStatus
- pr /MEDIA/AUDIO/XP.DestinationPortStatus=T000F;T000A;T000B;T000C

Example and Explanation (for output 1, T000F)

T	0		0		0		F	
Reserved	0 0	0 0	0 0	0 0	0 0	0 0	1 1	1 1
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Signal presents	Connected

7.7.3. Query the Audio Crosspoint Setting

Displays the current crosspoint setting which audio stream is transmitted to the output ports of the device.

Command and Response

- GET•/MEDIA/AUDIO/XP.DestinationConnectionList
- pr•/MEDIA/AUDIO/XP.DestinationConnectionList=<source>;<source>

Example

- GET /MEDIA/AUDIO/XP.DestinationConnectionList
- pr /MEDIA/AUDIO/XP.DestinationConnectionList=S1;S2;S4;S4

S1 stream from input 1 is connected to the D1 sink, S2 stream from input 2 is connected to the D2 sink, S4 from the input 4 is connected to the D3 and D4 sinks.

7.7.4. Audio Stream Switching

Command and Response

- CALL•/MEDIA/AUDIO/XP:switch(<source>:<destination>)
- mO•/MEDIA/AUDIO/XP:switch

Example

- CALL /MEDIA/AUDIO/XP:switch(S2:D1)
- mO /MEDIA/AUDIO/XP:switch

S2 stream audio is switched to D1 port.

7.7.5. Enable/Disable the Audio Stream

Command and Response

- SET•/MEDIA/AUDIO/<source|destination>.Enabled=true|false
- pw•/MEDIA/AUDIO/<source|destination>.Enabled=true|false

Example

- SET /MEDIA/AUDIO/S1.Enabled=true
- pw /MEDIA/AUDIO/S1.Enabled=true

7.8. Analog Audio Port Settings

ATTENTION! Only the UBEX-PRO20-HDMI-F110 model is built with analog audio input and output ports.

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

7.8.1. Setting the Volume in dB

Command and Response

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

Parameters

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

Example

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

7.8.2. Setting the Volume in Percent

Command and Response

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

Example

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

7.8.3. Setting the Balance

Command and Response

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

Parameters

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

Example

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

7.8.4. Setting the Gain

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

Command and Response

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

Parameters

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

Example

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

7.8.5. Mute/Unmute the Analog Audio Output Port

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

Command and Response

- SET•/MEDIA/AUDIO/<out>.Mute=<logical_value>
- pw•/MEDIA/AUDIO/<out>.Mute=<logical_value>

Parameters

Identifier	Parameter description	Value	Explanation
<logical_value>	The port is muted or unmuted.	**true**	The port is muted.
		false	The port is unmuted.

Example

- SET /MEDIA/AUDIO/O3.Mute=false
- pw /MEDIA/AUDIO/O3.Mute=false

7.9. System Monitoring Commands

INFO: The following commands are independent of the current operation mode, they work in Transmitter, Receiver, and Transceiver modes either.

7.9.1. Query Connected Device Presence

Connected property indicates that cable or device is connected to the port.

Command and Response

- GET•/MEDIA/VIDEO/<in|out>.Connected
- pr•/MEDIA/VIDEO/<in|out>.Connected=<parameter>

Parameters

Identifier	Parameter description	Value	Explanation
<parameter>	Connected device or cable indicator	**0**	Connected
		1	Not connected
		F	Unknown

Example

- GET /MEDIA/VIDEO/I1.Connected
- pr /MEDIA/VIDEO/I1.Connected=1

7.9.2. Query Video Signal Presence

SignalPresent property indicates valid signal present on the port.

Command and Response

- GET•/MEDIA/VIDEO/<in|out|source|destination>.SignalPresent
- pr•/MEDIA/VIDEO/<in|out|source|destination>.SignalPresent=<parameter>

Parameters

Identifier	Parameter description	Value	Explanation
<parameter>	Signal present indicator	**0**	Not present
		1	Present
		F	Unknown

Example

- GET /MEDIA/VIDEO/I1.SignalPresent
- pr /MEDIA/VIDEO/I1.SignalPresent=1

7.9.3. Query Embedded Audio Presence

EmbeddedAudioPresent property indicates that embedded audio is present in the video stream.

Command and Response

- GET•/MEDIA/VIDEO/<in|out|source|destination>.EmbeddedAudioPresent
- pr•/MEDIA/VIDEO/<in|out|source|destination>.EmbeddedAudioPresent=<parameter>

Parameters

Identifier	Parameter description	Value	Explanation
<parameter>	Signal present indicator	**0**	Not present
		1	Present
		F	Unknown

Example

- GET /MEDIA/VIDEO/I1.EmbeddedAudioPresent
- pr /MEDIA/VIDEO/I1.EmbeddedAudioPresent=1

7.9.4. Query the Status of the Analog Audio Output

MuteStatus property indicates the current status of the analog audio output port.

ATTENTION! Only the UBEX-PRO20-HDMI-F110 model is built with analog audio output port.

Command and Response

- GET•/MEDIA/AUDIO/<out>.MuteStatus
- pr•/MEDIA/VIDEO/<out>.MuteStatus=<status>

Parameters

Identifier	Parameter description	Value	Explanation
<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/AUDIO/O3.MuteStatus
- pr /MEDIA/AUDIO/O3.MuteStatus=unmuted

7.9.5. Query the Signal Type

SignalType property provides the type of the video signal.

Command and Response

- GET•/MEDIA/VIDEO/<source|destination>.SignalType
- pr•/MEDIA/VIDEO/<source|destination>.SignalType=<signal_type>

Parameters

Identifier	Parameter description	Value	Explanation
<signal_type>	Signal type	**0**	DVI
		1	HDMI
		F	Unknown

Example

- GET /MEDIA/VIDEO/S1.SignalType
- pr /MEDIA/VIDEO/S1.SignalType=1

7.9.6. Query the Resolution of the Stream

Command and Response

- GET•/MEDIA/VIDEO/<source|destination>.Resolution
- pr•/MEDIA/VIDEO/<source|destination>.Resolution=<resolution>

Example

- GET /MEDIA/VIDEO/S1.Resolution
- pr /MEDIA/VIDEO/S1.Resolution=3840x2160p60

7.9.7. Query the Bandwidth of the Stream

Bandwidth property provides the required Ethernet bandwidth of the stream.

Command and Response

- GET•/MEDIA/VIDEO/<source|destination>.Bandwidth
- pr•/MEDIA/VIDEO/<source|destination>.Bandwidth=<bandwidth>

Example

- GET /MEDIA/VIDEO/S1.Bandwidth
- pr /MEDIA/VIDEO/S1.Bandwidth=13.15

The bandwidth is in Gigabit/sec.

7.9.8. 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/VIDEO/<source|destination>.BandwidthLimitExceeded
- pr•/MEDIA/VIDEO/<source|destination>.BandwidthLimitExceeded=<logical_value>

Parameters

Identifier	Parameter description	Value	Explanation
<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/VIDEO/S1.BandwidthLimitExceeded
- pr /MEDIA/VIDEO/S1.BandwidthLimitExceeded=false

7.9.9. Query the Link Aggregation Status

Querying of the recent status of the link aggregation between the SFP+ links.

Command and Response

- GET•/SYS/MB/UPLINK/<link>.LinkState
- pr•/SYS/MB/UPLINK/<link>.LinkState=<link_state>

Parameters

Identifier	Parameter description	Value	Explanation
<link_state>	Status of the link aggregation between the SFP+ links	**Down**	The transmit and receive path of the 10 Gbps Ethernet link is not in operation.
		WaitingForAggregation	The SFP+ link is waiting for the aggregation.
		Up	The transmit and receive path of the 10 Gbps Ethernet link on both local and remote side is fully operational.

Example

- GET /SYS/MB/UPLINK/LINK1.LinkState
- pr /SYS/MB/UPLINK/LINK1.LinkState=Up

7.10. SFP+ Module Information

7.10.1. Query the Vendor

Querying of the vendor of the installed SFP+ module.

Command and Response

- GET•/SYS/MB/UPLINK/<link>/SFP.VendorName
- pr•/SYS/MB/UPLINK/<link>/SFP.VendorName=<vendor_name>

Example

- GET /SYS/MB/UPLINK/LINK1/SFP.VendorName
- pr /SYS/MB/UPLINK/LINK1/SFP.VendorName=FINISAR CORP.

7.10.2. Query the Part Number

Querying of the part number of the installed SFP+ module.

Command and Response

- GET•/SYS/MB/UPLINK/<link>/SFP.PartNumber
- pr•/SYS/MB/UPLINK/<link>/SFP.PartNumber=<partnumber>

Example

- GET /SYS/MB/UPLINK/LINK1/SFP.PartNumber
- pr /SYS/MB/UPLINK/LINK1/SFP.PartNumber=FTLX1471D3BCL

7.10.3. Query the Compliance

Querying of the standard compliance of the installed SFP+ module.

Command and Response

- GET•/SYS/MB/UPLINK/<link>/SFP.Compliance
- pr•/SYS/MB/UPLINK/<link>/SFP.Compliance=<compliance>

Example

- GET /SYS/MB/UPLINK/LINK1/SFP.Compliance
- pr /SYS/MB/UPLINK/LINK1/SFP.Compliance=10G BASE-LR

7.10.4. Query the Maximum Allowed Cable Length

Querying of the maximum allowed cable length of the installed SFP+ module. The parameter is in meter.

Command and Response

- GET•/SYS/MB/UPLINK/<link>/SFP.MaxLinkLength
- pr•/SYS/MB/UPLINK/<link>/SFP.MaxLinkLength=<length>

Example

- GET /SYS/MB/UPLINK/LINK1/SFP.MaxLinkLength
- pr /SYS/MB/UPLINK/LINK1/SFP.MaxLinkLength=10000

7.10.5. 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/MB/UPLINK/<link>/SFP.Type
- pr•/SYS/MB/UPLINK/<link>/SFP.Type=<type>

Example

- GET /SYS/MB/UPLINK/LINK1/SFP.Type
- pr /SYS/MB/UPLINK/LINK1/SFP.Type=Singlemode

7.11. 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.

Parameters

Parameter	Description
<emulated>	The emulated EDID memory of the desired input port. Example: E1.
<dynamic>	Dynamic EDID memory index. Example: D1
<user>	User EDID memory index. Example: U1
<factory>	Factory EDID memory index. Example: F1

7.11.1. Query the Emulated EDIDs

Command and Response

- GET•/EDID.EdidStatus
- pr•/EDID.EdidStatus=<dynamic|user|factory>:<emulated>;<dynamic|user|factory>:<emulated>

Example

- GET /EDID.EdidStatus
- pr /EDID.EdidStatus=D3:E1;F48:E2

Emulated EDID slots are listed with the type and number of the EDID assigned to it. E.g. D3:E1 means that the 3rd dynamic EDID is emulated on port 1; F48:E2 means that the 48th FACTORY EDID is emulated on port 2 etc.

7.11.2. Query the Validity of a Dynamic EDID

Command and Response

- GET•/EDID/D/<dynamic>.Validity
- pr•/EDID/D/<dynamic>.Validity=<logical_value>

Parameters

The <logical_value> can be **true** or **false**.

Example

- GET /EDID/D/D1.Validity
- pr /EDID/D/D1.Validity=true

The 'Validity' property is true then a valid EDID is stored in D1 memory place.

7.11.3. Query the Preferred Resolution of a User EDID

Command and Response

- GET•/EDID/U/<user>.PreferredResolution
- pr•/EDID/U/<user>.PreferredResolution=<resolution>

Example

- GET /EDID/U/U2.PreferredResolution
- pr /EDID/U/U2.PreferredResolution=1920x1080p60.00Hz

7.11.4. Emulating an EDID on an Input Port

Command and Response

- CALL•/EDID:switch(<dynamic|user|factory>:<emulated>)
- mO•/EDID:switch

Example

- CALL /EDID:switch(F49:E1;U3:E2)
- mO /EDID:switch

7.11.5. Copy an EDID to User Memory

Command and Response

- CALL•/EDID:copy(<dynamic|emulated|factory|user>:<user>)
- mO•/EDID:copy

Example

- CALL /EDID:copy(D1:U1;F148:U2)
- mO /EDID:copy

The EDID of the last connected sink of D1 (Output 1) is copied to U1, the F148 factory EDID is copied to U2.

7.11.6. Deleting an EDID from User Memory

Command and Response

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

Example

- CALL /EDID:delete(U1;U5)
- mO /EDID:delete

7.11.7. Resetting the Emulated EDIDs

Command and Response

- CALL•/EDID:reset()
- mO•/EDID:reset

Example

- CALL /EDID:reset()
- mO /EDID:reset

Calling this method switches all emulated EDIDs to factory default one. See the table in the Factory EDID List section.

7.12. Network Configuration

> **ATTENTION!** Calling the ApplySettings() method after the network setting is always required. See the details in the Apply Network Settings section.

7.12.1. 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

7.12.2. 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

7.12.3. 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

7.12.4. 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

7.12.5. 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

7.12.6. 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

7.12.7. 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

7.12.8. 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

7.12.9. Apply Network Settings

Command and Response

- CALL•/MANAGEMENT/NETWORK:ApplySettings()
- mO•/MANAGEMENT/NETWORK:ApplySettings

Example

- CALL /MANAGEMENT/NETWORK:ApplySettings()
- mO /MANAGEMENT/NETWORK:ApplySettings

7.12.10. Query the IP Address of the Remote Endpoint

Querying of the IP address of the connected transmitter or receiver.

Command and Response

- GET•/REMOTE.RemoteIpAddress
- pr•/REMOTE.RemoteIpAddress=<IP_Address>

Example

- GET /REMOTE.RemoteIpAddress
- pr /REMOTE.RemoteIpAddress=192.168.0.111

7.13. RS-232 Port Configuration

ATTENTION! Only the UBEX-PRO20-HDMI-F110 model has built with serial interface port.

7.13.1. Query the Current Configuration

Command and Response

- GET•/MEDIA/UART/<port>.Rs232Configuration
- pr•/MEDIA/UART/<port>.Rs232Configuration=<configuration>

Example

- GET /MEDIA/UART/P1.Rs232Configuration
- pr /MEDIA/UART/P1.Rs232Configuration=57600, 8N1

Explanation

BAUD rate is *57600*, databits are *8*, the parity is N as *none*, the stopbits are *1*.

7.13.2. BAUD Rate Setting

Command and Response

- SET•/MEDIA/UART/<port>.Baudrate=<number>
- pw•/MEDIA/UART/<port>.Baudrate=<number>

Parameters

Identifier	Parameter description	Value	Explanation
<number>	Baud rate value	**0**	4800
		1	7200
		2	9600
		3	14400
		4	19200
		5	38400
		6	57600
		7	115200

Example

- SET /MEDIA/UART/P1.Baudrate=7
- pw /MEDIA/UART/P1.Baudrate=7

7.13.3. Parity Setting

Command and Response

- SET•/MEDIA/UART/<port>.Parity=<number>
- pw•/MEDIA/UART/<port>.Parity=<number>

Parameters

Identifier	Parameter description	Value	Explanation
<number>	Parity value	**0**	None
		1	Odd
		2	Even

Example

- SET /MEDIA/UART/P1.Parity=0
- pw /MEDIA/UART/P1.Parity=0

7.13.4. Stopbits Setting

Command and Response

- SET•/MEDIA/UART/<port>.StopBits=<number>
- pw•/MEDIA/UART/<port>.StopBits=<number>

Parameters

Identifier	Parameter description	Value	Explanation
<number>	Stop bits value	**0**	1
		1	1,5
		2	2

Example

- SET /MEDIA/UART/P1.StopBits=0
- pw /MEDIA/UART/P1.StopBits=0

7.13.5. Databits Setting

Command and Response

- SET•/MEDIA/UART/<port>.DataBits=<number>
- pw•/MEDIA/UART/<port>.DataBits=<number>

Parameters

Identifier	Parameter description	Value	Explanation
<number>	Databits value	**8**	8 databits
		9	9 databits

Example

- SET /MEDIA/UART/P1.DataBits=8
- pw /MEDIA/UART/P1.DataBits=8

7.13.6. Command Injection TCP Port Setting

Command and Response

- SET•/MEDIA/UART/<port>.CommandInjectionPort=<port>
- pw•/MEDIA/UART/<port>.CommandInjectionPort=<port>

Example

- SET /MEDIA/UART/P1.CommandInjectionPort=8001
- pw /MEDIA/UART/P1.CommandInjectionPort=8001

7.14. Message Sending via RS-232 Serial Port

ATTENTION! Only the UBEX-PRO20-HDMI-F110 model has built with serial interface port.

7.14.1. Sending a Text (ASCII-format) via Serial Port

The command is for sending a command message in ASCII-format. This method **does not allow** escaping the control characters.

Command and Response

- CALL•/MEDIA/UART/<port>:sendText(<message>)
- mO•/MEDIA/UART/<port>:sendText

Example

- CALL /MEDIA/UART/P1:sendText(open)
- mO /MEDIA/UART/P1:sendText

The 'open' text is sent out via the P1 serial port.

7.14.2. Sending a Binary Message (HEX-format) via Serial Port

The command is for sending a command message in Hexadecimal-format. This method **does not allow** escaping the control characters.

Command and Response

- CALL•/MEDIA/UART/<port>:sendBinaryMessage(<message>)
- mO•/MEDIA/UART/<port>:sendBinaryMessage

Example

- CALL /MEDIA/UART/P1:sendBinaryMessage(433030)
- mO /MEDIA/UART/P1:sendBinaryMessage

The '433030' binary message ('C00' in ASCII format) is sent out via the P1 serial port.

7.14.3. 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/UART/<port>:sendMessage(<message>)
- mO•/MEDIA/UART/<port>:sendMessage

Example

- CALL /MEDIA/UART/P1:sendMessage(PWR0)
- mO /MEDIA/UART/P1: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> charaters to be recognized by the controlled device, then they need to be escaped. You can use the following format for escaping:

<command><\x0d\x0a><command><\x0d\x0a>...<command><\x0d\x0a>

7.15. LW3 Protocol Commands - Quick Summary

System Commands

Set the Device Label

- SET•/MANAGEMENT/LABEL.DeviceLabel=<Custom_name>

Querying the Product Name

- GET•/.ProductName

Query the Firmware Package Version

- GET•/MANAGEMENT/UID/PACKAGE.Version

Display Custom Text on the LCD

- CALL•/MANAGEMENT/UI:displayMessage(<text>)

Display Custom Color on the LCD

- CALL•/MANAGEMENT/UI:testDisplay(<mode>,<hex_code>)

Identify the Device

- CALL•/MANAGEMENT/UI:identifyMe()

Query the Operation Mode

- GET•/SYS/MB.OperationMode

Set the Operation Mode

- CALL•/SYS/MB.setOperationModeAndReset=<operation_mode>

Query the Application Mode

- GET•/SYS/MB.ApplicationMode

Application Mode Selection

- SET•/SYS/MB.ApplicationModeSelection=<application_mode>

Setting the Rotary Direction of the Jog Dial Knob

- SET•/MANAGEMENT/UI.RotaryDirection=<parameter>

Setting the Brightness of the LCD Screen

- SET•/MANAGEMENT/UI.DisplayBrightness=<parameter>

Control Lock

- SET•/MANAGEMENT/UI.ControlLock=<parameter>

Restarting the Device

- CALL•/SYS:reset()

Restore the Factory Default Settings

- CALL•/SYS:factoryDefaults()

Video Port Settings - Transmitter Mode

Query the Status of Source Port

- GET•/MEDIA/VIDEO/XP.SourcePortStatus

Query the Status of Destination Port

- GET•/MEDIA/VIDEO/XP.DestinationPortStatus

Query the Video Crosspoint Setting

- GET•/MEDIA/VIDEO/XP.DestinationConnectionList

Switching the Stream

- CALL•/MEDIA/VIDEO/XP:switch(<source>:<destination>)

Enable/Disable the Stream

- SET•/MEDIA/VIDEO/<source>.Enabled=<logical_value>

Resolution Setting

- SET•/MEDIA/VIDEO/<source>.ResolutionSetting=<resolution>

Resolution Mode Setting

- SET•/MEDIA/VIDEO/<source>.ResolutionMode=<resolution_mode>

Scaler - Image Position Setting

- SET•/MEDIA/VIDEO/<source>.ImagePosition=<image_position>

Color Space Converter Setting

- SET•/MEDIA/VIDEO/<source>.ColorSpaceSetting=<color_space>

Query the Timing Mode

- GET•/MEDIA/VIDEO/<source>.TimingMode

HDCP Setting (Input Port)

- SET•/MEDIA/VIDEO/<in>.HdcpEnable=<logical_value>

HDCP Setting (Output Port)

- SET•/MEDIA/VIDEO/<out>.HdcpMode=<HDCP_mode>

Video Port Settings - Receiver Mode

Query the Status of Source Port
- GET•/MEDIA/VIDEO/XP.SourcePortStatus

Query the Status of Destination Port
- GET•/MEDIA/VIDEO/XP.DestinationPortStatus

Query the Video Crosspoint Setting
- GET•/MEDIA/VIDEO/XP.DestinationConnectionList

Switching the Stream
- CALL•/MEDIA/VIDEO/XP:switch(<source>:<destination>)

Enable/Disable the Stream
- SET•/MEDIA/VIDEO/<destination>.Enabled=<logical_value>

Resolution Mode Setting
- SET•/MEDIA/VIDEO/<out>.ResolutionMode=<resolution_mode>

Query the EDID Based Resolution
- GET•/MEDIA/VIDEO/<out>.EdidBasedResolution

Resolution Setting
- SET•/MEDIA/VIDEO/<out>.ResolutionSetting=<resolution>

Scaler - Image Position Setting
- SET•/MEDIA/VIDEO/<out>.ImagePosition=<image_position>

Color Space Converter Setting
- SET•/MEDIA/VIDEO/<out>.ColorSpaceSetting=<color_space>

Query the Timing Mode
- GET•/MEDIA/VIDEO/<out>.TimingMode

Timing Mode Setting
- SET•/MEDIA/VIDEO/<out>.TimingModeSetting=<timing_mode>

No Sync Screen (Test Pattern) Mode
- SET•/MEDIA/VIDEO/<out>.NoSyncMode=<nosync_mode>

No Sync Screen (Test Pattern) Color Setting
- SET•/MEDIA/VIDEO/<out>.NoSyncColor=<RGB_code>

HDCP Setting
- SET•/MEDIA/VIDEO/<out>.HdcpMode=<HDCP_mode>

Video Port Settings - Transceiver Mode

Query the Status of Source Port
- GET•/MEDIA/VIDEO/XP.SourcePortStatus

Query the Status of Destination Port
- GET•/MEDIA/VIDEO/XP.DestinationPortStatus

Enable/Disable the Stream
- SET•/MEDIA/VIDEO/<source>.Enabled=<logical_value>

Resolution Mode Setting - Input Side
- SET•/MEDIA/VIDEO/<source>.ResolutionMode=<resolution_mode>

Resolution Mode Setting - Output Side
- SET•/MEDIA/VIDEO/<out>.ResolutionMode=<resolution_mode>

Query the EDID Based Resolution
- GET•/MEDIA/VIDEO/<out>.EdidBasedResolution

Resolution Setting
- SET•/MEDIA/VIDEO/<source|out>.ResolutionSetting=<resolution>

Scaler - Image Position Setting
- SET•/MEDIA/VIDEO/<out>.ImagePosition=<image_position>

Color Space Converter Setting
- SET•/MEDIA/VIDEO/<source|out>.ColorSpaceSetting=<color_space>

Query the Timing Mode
- GET•/MEDIA/VIDEO/<source|out>.TimingMode

Timing Mode Setting
- SET•/MEDIA/VIDEO/<out>.TimingModeSetting=<timing_mode>

No Sync Screen (Test Pattern) Mode
- SET•/MEDIA/VIDEO/<out>.NoSyncMode=<nosync_mode>

No Sync Screen (Test Pattern) Color Setting
- SET•/MEDIA/VIDEO/<out>.NoSyncColor=<RGB_code>

HDCP Setting (Input Port)
- SET•/MEDIA/VIDEO/<in>.HdcpEnable=<logical_value>

HDCP Setting (Output Port)
- SET•/MEDIA/VIDEO/<out>.HdcpMode=<HDCP_mode>

Audio Port Settings

Query the Status of Source Port
- GET•/MEDIA/AUDIO/XP.SourcePortStatus

Query the Status of Destination Port
- GET•/MEDIA/AUDIO/XP.DestinationPortStatus

Query the Audio Crosspoint Setting
- GET•/MEDIA/AUDIO/XP.DestinationConnectionList

Audio Stream Switching
- CALL•/MEDIA/AUDIO/XP:switch(<source>:<destination>)

Enable/Disable the Audio Stream
- SET•/MEDIA/AUDIO/<source|destination>.Enabled=true|false

Analog Audio Port Settings

Setting the Volume in dB
- SET•/MEDIA/AUDIO/<in|out>.VolumedB=<volume>

Setting the Volume in Percent
- SET•/MEDIA/AUDIO/<in|out>.VolumePercent=<percent>

Setting the Balance
- SET•/MEDIA/AUDIO/<in|out>.Balance=<balance>

Setting the Gain
- SET•/MEDIA/AUDIO/<in>.Gain=<gain>

Mute/Unmute the Analog Audio Output Port
- SET•/MEDIA/AUDIO/<out>.Mute=<logical_value>

System Monitoring Commands

Query Connected Device Presence
- GET•/MEDIA/VIDEO/<in|out>.Connected

Query Video Signal Presence
- GET•/MEDIA/VIDEO/<in|out|source|destination>.SignalPresent

Query Embedded Audio Presence
- GET•/MEDIA/VIDEO/<in|out|source|destination>.EmbeddedAudioPresent

Query the Status of the Analog Audio Output
- GET•/MEDIA/AUDIO/<out>.MuteStatus

Query the Signal Type
- GET•/MEDIA/VIDEO/<source|destination>.SignalType

Query the Resolution of the Stream
- GET•/MEDIA/VIDEO/<source|destination>.Resolution

Query the Bandwidth of the Stream
- GET•/MEDIA/VIDEO/<source|destination>.Bandwidth

Query the Bandwidth Limitation Indicator
- GET•/MEDIA/VIDEO/<source|destination>.BandwidthLimitExceeded

Query the Link Aggregation Status
- GET•/SYS/MB/UPLINK/<link>.LinkState

SFP+ Module Information

Query the Vendor
- GET•/SYS/MB/UPLINK/<link>/SFP.VendorName

Query the Part Number
- GET•/SYS/MB/UPLINK/<link>/SFP.PartNumber

Query the Compliance
- GET•/SYS/MB/UPLINK/<link>/SFP.Compliance

Query the Maximum Allowed Cable Length
- GET•/SYS/MB/UPLINK/<link>/SFP.MaxLinkLength

Query the Type of the Module
- GET•/SYS/MB/UPLINK/<link>/SFP.Type

EDID Management

Query the Emulated EDIDs
- GET•/EDID.EdidStatus

Query the Validity of a Dynamic EDID
- GET•/EDID/D/<dynamic>.Validity

Query the Preferred Resolution of a User EDID
- GET•/EDID/U/<user>.PreferredResolution

Emulating an EDID on an Input Port
- CALL•/EDID:switch(<dynamic|user|factory>:<emulated>)

Copy an EDID to User Memory
- CALL•/EDID:copy(<dynamic|emulated|factory|user>:<user>)

Deleting an EDID from User Memory
- CALL•/EDID:delete(<user>)

Resetting the Emulated EDIDs
- CALL•/EDID:reset()

Network Configuration

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()

Query the IP Address of the Remote Endpoint
- GET•/REMOTE.RemoteIpAddress

RS-232 Port Configuration

Query the Current Configuration
- GET•/MEDIA/UART/<port>.Rs232Configuration

BAUD Rate Setting
- SET•/MEDIA/UART/<port>.Baudrate=<number>

Parity Setting
- SET•/MEDIA/UART/<port>.Parity=<number>

Stopbits Setting
- SET•/MEDIA/UART/<port>.StopBits=<number>

Databits Setting
- SET•/MEDIA/UART/<port>.DataBits=<number>

Command Injection TCP Port Setting
- SET•/MEDIA/UART/<port>.CommandInjectionPort=<port>

Message Sending via RS-232 Serial Port

Sending a Text (ASCII-format) via Serial Port
- CALL•/MEDIA/UART/<port>:sendText(<message>)

Sending a Binary Message (HEX-format) via Serial Port
- CALL•/MEDIA/UART/<port>:sendBinaryMessage(<message>)

Sending a Message (ASCII-format) via Serial Port
- CALL•/MEDIA/UART/<port>:sendMessage(<message>)

8

Firmware Upgrade - Extender Mode

The endpoint devices can be upgraded 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.

- About the Firmware Package (LFP2 File)
- Short Instructions
- Installation of LDU2
- Detailed Instructions
- Keeping the Configuration Settings

ATTENTION! While the firmware is being upgraded, the normal operation mode is suspended as the endpoint is switched to bootload mode. Signal processing is not performed. Do not interrupt the firmware upgrade. If any problem occurs, reboot the receiver and restart the process.

ATTENTION! The firmware upgrade process has an effect on the configuration and the settings of the device. For more details, please see the Keeping the Configuration Settings section before the upgrade.

8.1. About the Firmware Package (LFP2 File)

The firmware files are packed in an LFP2 package. You need only this file to do the upgrade on your device.

- The package contains all the necessary components, binary, and other files;
- The package also contains each firmware with version number and a list showing the compatible devices.

8.2. Short Instructions

Step 1. Get the firmware pack and the Lightware Device Updater v2 (LDU2) application.

Step 2. Install the LDU2 application.

Step 3. Establish connection between the computer and the device(s) via Ethernet.

Step 4. Start LDU2 and follow the instructions shown on the screen.

8.3. Installation of LDU2

Minimum System Requirement

RAM: 1 GB

Installation Modes

LDU2 has two installation modes: **Normal** and **Snapshot**.

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

Comparison of install types

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

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.

Installation for macOS

Mount the DMG file with 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 the LDU2 into another location just drag the icon over the desired folder.

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

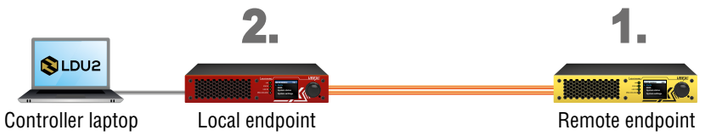
8.4. Detailed Instructions

8.4.1. Establish Connection

Make sure that the computer and the device are connected over Ethernet and the connection is established between them.

8.4.2. The Correct Order of the Upgrading

It is important that the remote device has to be upgraded at first, the local device which is connected to the computer directly has to be the second one.



The sequence of the firmware upgrade

8.4.3. Start the LDU2 Application and Follow the Steps

The Steps of the Upgrade in Quick Summary:

Step 1. Select the firmware package file.

Step 2. Select the remote unit first for upgrading.

Step 3. Check the upgrade parameters.

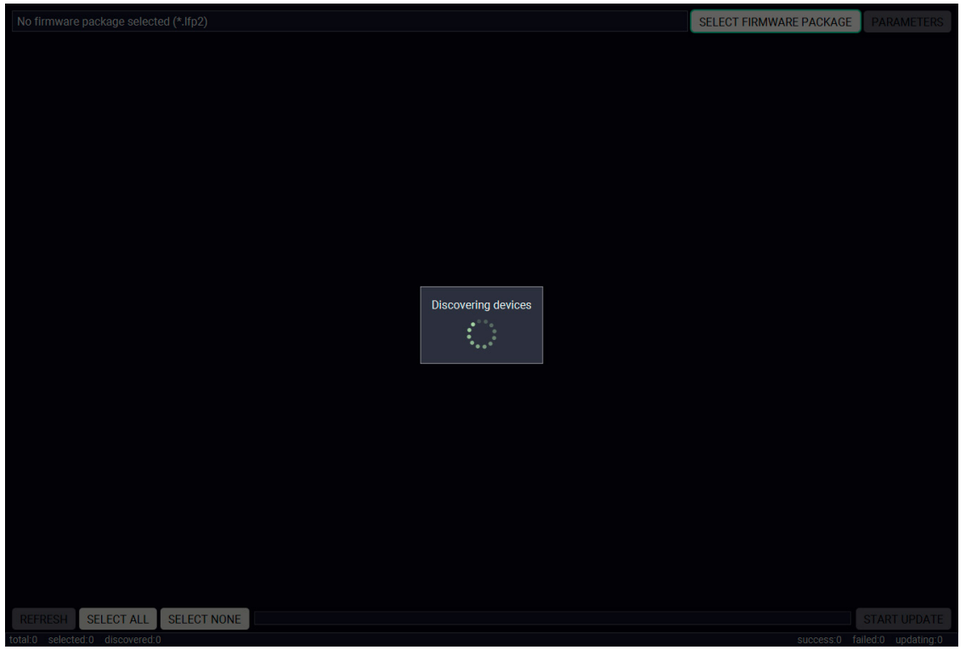
Step 4. Start the update and wait until it is finished.

Step 5. Wait until the unit reboots with the new firmware.

Step 6. Repeat the procedure with the local endpoint.

Discovering the Devices

After launching LDU2 the device discovery process starts finding the Lightware devices on the network.



Device discovery is in progress in LDU2

Device List

When the discovery has completed, the devices available on the network are listed in the application.

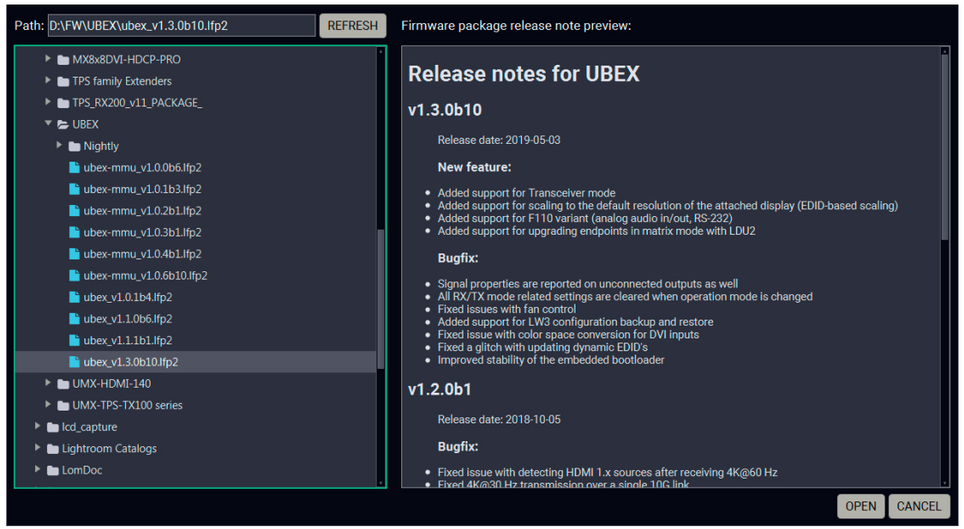
Legend of the Icons

Icon	Name	Description
	Identify the device	Clicking on the icon causes the four front panel LEDs blink in green for 10 seconds. The feature helps to identify the device itself in the rack shelf.
	IP address editor	To modify IP address settings quickly it is not necessary to enter the device's settings/network menu, you can set them by clicking the pencil icon beside the IP address.
	Further information available	Device is unreachable. Change the IP address using the front panel LCD menu or the IP address editor of the LDU2.
Service Mode	Service mode	The device is in bootload (service) mode. The firmware upgrade procedure can be continued in this mode.

Upgrade 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.



Firmware file browser and the release notes window

After the package file is loaded, the list is filtered to show compatible devices only. The current firmware version of the device is highlighted in orange if it is different from the version of the package loaded.

Filtered device list based on the selected firmware package

Step 2. Select the remote unit first for upgrading.

Pick the remote device for upgrading. The selected line will be highlighted in green.

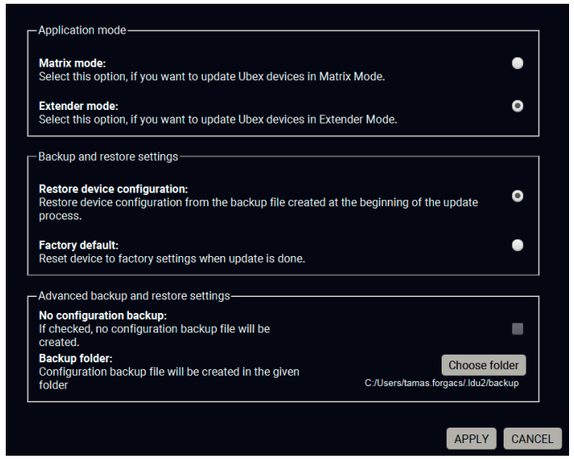
The remote unit is selected for upgrading

> TIPS AND TRICKS: If you are not sure which device is connected to your controller device directly, use the **Identify me** feature clicking on the 👁 button. It 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.

Step 3. Check the upgrade parameters.

ATTENTION! The default settings in the Parameters window should be fine for most cases. Please do not modify them if it is not necessary.

Click on the **Parameters** button to configure the firmware upgrade.



Parameters menu for the UBEX endpoints

Application Mode

The application mode (Extender or Matrix mode) of the current UBEX system can be selected in this section. Select the **Extender mode**.

See more details about the application modes in the Application Modes section.

Backup and Restore Settings

- **Restore device configuration**: the configuration settings of the endpoint devices will be restored after the firmware upgrade.
- **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 upgrade is done. See the whole list of factory default settings of the endpoint device in the Factory Default Settings section.

Advanced Backup and Restore Settings

- **No configuration backup**: if it is checked, the configuration of the endpoint device will not be restored after the firmware upgrade.
- **Backup folder**: Set the path of the device configuration backup file which is created automatically. The default path is **USER_HOME/.ldu2/backup**.

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.

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 the all procedures in the lower light green progress bar.

Firmware upgrade is in progress

INFO: The device might reboot several times during the firmware upgrade procedure.

Step 5. Wait until the unit reboots with the new firmware.

Once the firmware upgrade procedure is completed, the unit reboot with the new firmware.

Firmware upgrade procedure is done

Step 6. Repeat the procedure with the local endpoint.

Repeat the whole procedure with the another endpoint.

Setting Back the Device to Normal Operation

If the endpoint device remains in bootload (firmware upgrade) mode for some reason, pressing the jog dial control knob for **3 seconds** results setting back the device to normal operation mode.

8.5. Keeping the Configuration Settings

By default, device configuration settings are restored when firmware upgrade 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. See the details in the Configuration Cloning (Backup Tab) section.

The following flow chart demonstrates how this function works in the background.

1. **Start of the Upgrade**

   The device reboots and starts in bootload mode (firmware upgrade mode).

2. **Backup**

   The current configuration of the device is being saved into a configuration backup file on your computer. You can find a detailed list about the saved settings in the Content of Backup File section.

3. **Upgrade**

   The CPU firmware and the FPGA binary are changed to the newer ones in the package.

4. **Factory reset**

   Before the upgrade all configuration settings are restored to the factory default values.

5. **Conversion / Restore**

   Before the restore procedure the firmware package checks the backup data and if it is needed, a conversion is applied to avoid incompatibility problems between the firmware versions. After the conversion all configuration settings are restored to the device.
   When the factory default option is enabled in the Parameters window, the conversion / restore procedure will not be performed!

6. **End**

   Once the firmware upgrade procedure is finished, the device reboots and is ready to use.

The details about the procedure: when firmware upgrade starts, the first step is making a backup of the settings of the device. The firmware package checks the backup data and if it is needed, a conversion is applied to avoid incompatibility problems between the firmware versions. If you do not want to keep configuration settings, you can set the **Factory default** option enabled.

9

Troubleshooting - Extender Mode

Usually, if the system seems not to transmit 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

9.1. 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 - UBEX Endpoint Devices section.

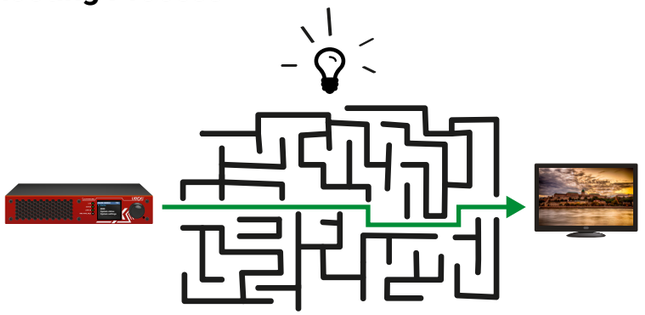
Symptom	Root cause	Action	Refer to
Video signal			
No picture on the video output	Device or devices are not powered properly	Check the endpoints and the other devices if they are properly powered; try to unplug and reconnect them.	2.3.2
	Cable connection problem	Cables must fit very well, check all the connectors (HDMI and optical/DAC cables).	2.3 3.3
	Optical cable became contaminated	Use special fiber optical cable cleaning equipment to clean it carefully.	
	No incoming signal (RX/TRX)	If the front panel LINK OK LED does not light, no connection is established between the endpoints. Check the cable connections on the SFP+ ports.	3.3
	Singlemode-multimode SFP+ module pairs	Check the installed SFP+ modules and install multimode or singlemode modules by pairs only.	3.3
	SFP module is installed instead of SFP+ module	Install SFP+ transceiver module to the SFP+ port	3.3
	Not the proper video stream is the active one (RX)	Check which video stream switched to the current output (the setting is available in the transmitter side).	5.3.2 6.4 7.4.4
	Video stream is disabled (TX)	Enable the stream.	5.3.1 6.5.5 7.4.5
	Video stream is disabled (RX)	Enable the stream.	5.4.1 7.5.5
	Video stream is disabled (TRX)	Enable the stream.	5.5.2 6.5.5 7.6.3

Symptom	Root cause	Action	Refer to
Video signal			
No picture on the video output	Sink device is not able to receive/display the video format	Check the emulated EDID; select another (e.g. emulate the EDID of the display on the input port).	5.6 6.9.1 7.11
		Scale the stream on HDMI in 1 port of the transmitter to the resolution and refresh rate of the sink device.	5.3.1 6.5.3 7.4.7
	Sink device is not able to receive/display the video format	Scale the stream on the HDMI out 1 port of the receiver to the resolution and refresh rate of the sink device.	5.4.1 6.5.6 7.5.6
	HDCP is disabled	Enable HDCP on the input ports of the transmitter.	5.3.1 6.5.1 7.4.11
Not the desired picture displayed on the video output	Video output is set to test pattern (no sync screen) statically (RX)	Check No sync screen settings in the HDMI output properties (RX).	5.4.1 6.8.2 7.5.13
	Video output is set to test pattern (no sync screen) as there is no picture on video source	Check video settings of the source.	
Colors of the video is incorrect	Incorrect color space setting is active (TX)	Check the color space settings on the TX side	5.3.1 6.5.3 6.5.4 7.4.9
	Incorrect color space setting is active (RX)	Check the color space settings on the RX side	5.4.1 6.5.6 6.5.7 7.5.10

Symptom	Root cause	Action	Refer to
Audio signal			
No audio is present on output	Source audio volume is low or muted	Check the audio settings of the source.	
	The incoming audio signal is unsupported	Query the status of the audio output port and select a supported signal source	7.9.4
	The analog audio output port is muted	Check the analog audio output port properties	6.7.2 7.8.5
	Volume of the analog audio port is set low	Check the analog audio input/output port properties	6.7.1 6.7.2 7.8.1 7.8.2
HDMI output signal contains no audio	DVI EDID is emulated	Check the EDID and select and HDMI EDID to emulate (the setting is available in the transmitter side).	5.6 6.9.1 7.11
Not the desired audio can be heard on the output	Audio stream is switched to another output	Check which audio stream switched to the current output.	6.6 7.7.4
Network			
No LAN connection can be established	Incorrect IP address is set (fix IP)	Use dynamic IP address by enabling DHCP option.	5.8.1 6.11.2 7.12.2
		Restore the factory default settings (with DHCP).	5.8.5 6.11.3 7.3.15
	IP address conflict	Check the IP address of the other devices, too.	

Symptom	Root cause	Action	Refer to
RS-232 signal			
Connected serial device does not respond	Cable connection problem	Check the connectors to fit well; check the wiring of the plugs.	2.3.6 20.11.1
	RS-232 settings are different	Check the port settings of the endpoint and the connected serial device.	6.10.2 7.13
	Messaging via serial port is not working	Check the serial messaging rules and/or apply escaping in the message.	7.14
Miscellaneous			
Front panel button is out of operation	The button is locked	Disable control lock.	7.3.13
I cannot find my device in the server room	All AV boxes and gadgets look the same	Use the "Identify Me" feature	6.11.1 7.3.6

9.2. How to Speed Up the Troubleshooting Process



Lightware's technical support team is always working hard to provide the fastest support possible. Our team's response time is one of the best in the industry and in the toughest of cases we can directly consult with the hardware or software engineer who designed the product to get the information from the most reliable source.

However, the troubleshooting process can be even faster... with your help.

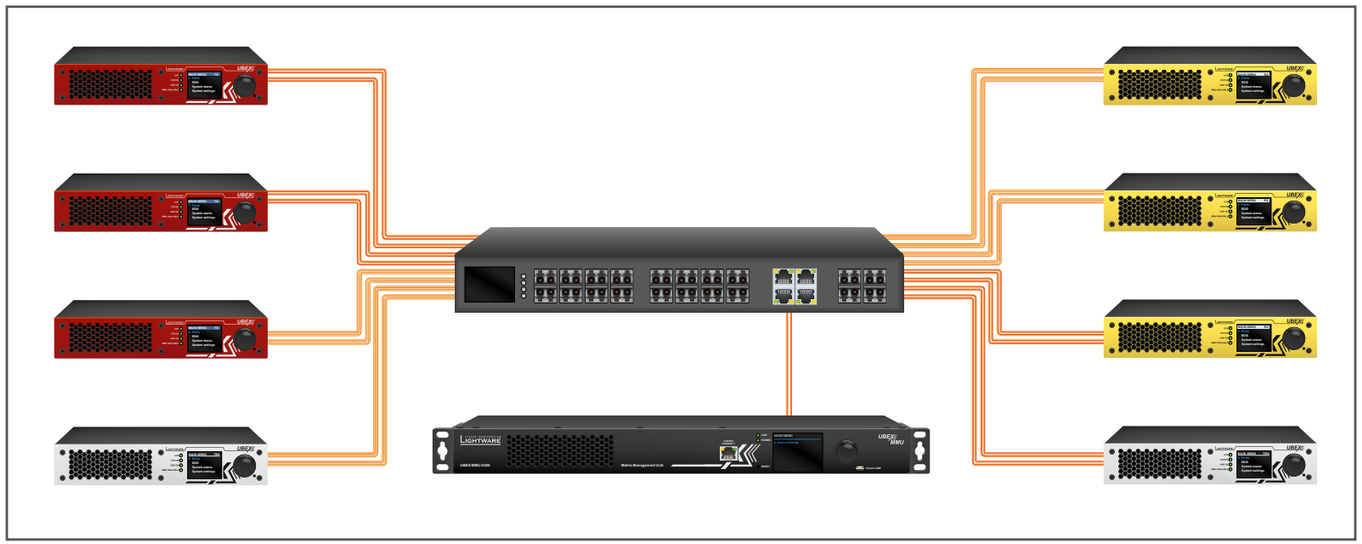
There are certain pieces of information that push us in the right direction to finding the root cause of the problem. If we receive most of this information in the first e-mail or it is gathered at the time when you call us, then there is a pretty high chance that we will be able to respond with the final solution right away.

This information is the following:

- Schematic (a pdf version is preferred, but a hand drawing is sufficient).
- Serial number(s) of the device(s) (it is either printed somewhere on the box or you can query it in the Device Controller software or on the built-in website).
- Firmware versions of the devices (please note that there may be multiple CPUs or controllers in the device and we need to know all of their firmware versions, a screenshot is the best option).
- Cable lengths and types.
- Patch panels, gender changers or anything else in the signal path that can affect the transmission.
- Signal type (resolution, refresh rate, color space, deep color).
- Emulated EDID(s) (please save them as file and send them to us).
- Actions to take in order to re-create the problem (if we cannot reproduce the problem, it is hard for us to find the cause).
- Photo or video about the problem (for example: "image noise" can mean many different things, it's better if we see it too).
- Error logs from the Device Controller software.
- In the case of Event Manager issue the event file and/or backup file from the Device Controller software.

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

Matrix Mode



The following chapters are related to the Matrix mode.

Matrix mode = virtual AV matrix with more transmitters, receivers, and transceivers, and a Matrix Management Unit (MMU) which controls the AV network.

For the Extender mode see the Extender Mode chapters.

10

Installation - Matrix Mode

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

- Mounting Options
- SFP / SFP+ Slot Connection
- Ethernet Switch - Detailed Requirements
- Connections
- Ethernet Switch Configuration
- Startup of the System

10.1. Mounting Options

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 be also used for building the unit into the furniture:

Mounting bracket V2

1U high rack shelf

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.

10.1.1. Mounting Bracket V2 for the Endpoint Devices

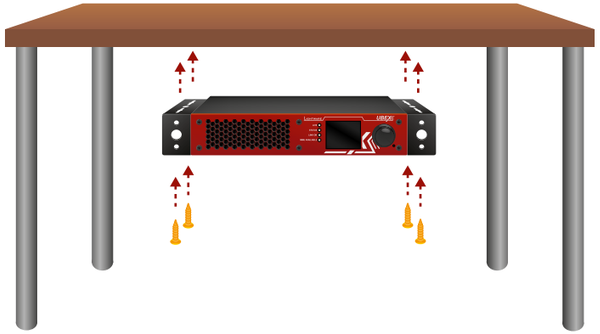
Mounting bracket V2 gives an opportunity to mount the device to any furniture surface. Fasten the bracket on the side of the unit with the provided screws and fasten it to a stand / board / truss / furniture.

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! 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.

Furniture Mounting

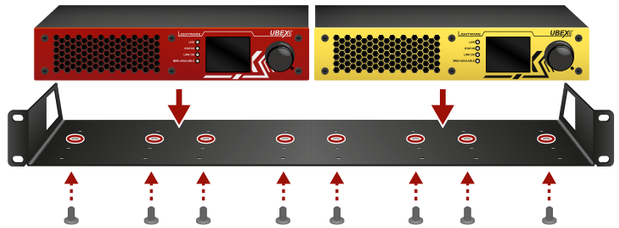


WARNING! Pay attention to the ventilation holes when designing the system. Front and rear ventilation holes must not be covered.

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

10.1.2. Rack Shelf Mounting for the Endpoint Devices

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



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

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.

10.1.3. 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.

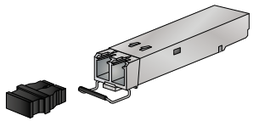
INFO: The screws for the rack frame are not supplied to the device.

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

10.2. 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.

10.2.1. 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 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 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.

10.2.2. 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.

10.3. 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**.
- Supports Internet Group Management Protocol version 2 (RFC 2236) snooping.
- IPv4 (or Layer 2) Multicast Forwarding based on **IGMP v2 snooping**, with at least **16 addresses available for each endpoint**, e.g. 4096 IPv4 multicast addresses for 256 endpoints.
- 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.

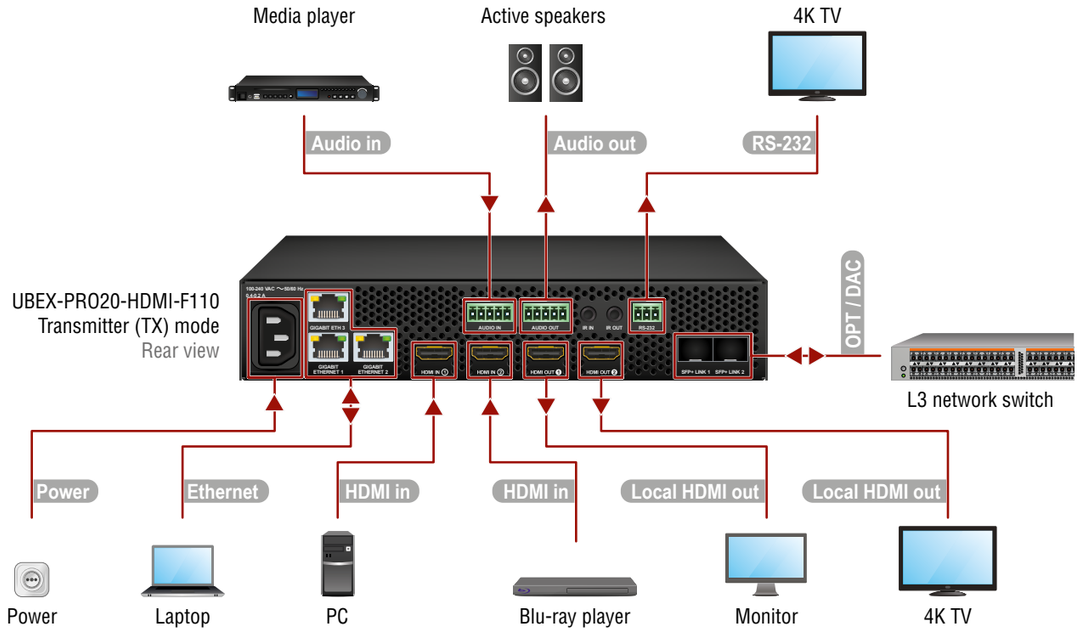
Installation and Network Guide for UBEX

For more details about requirements of the network switch 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

10.4. Connections

10.4.1. Endpoint Devices - Transmitter Operation Mode



Connections for the F110 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** - see the details in the Operation Mode section;

After connecting the device to the network and the MMU:

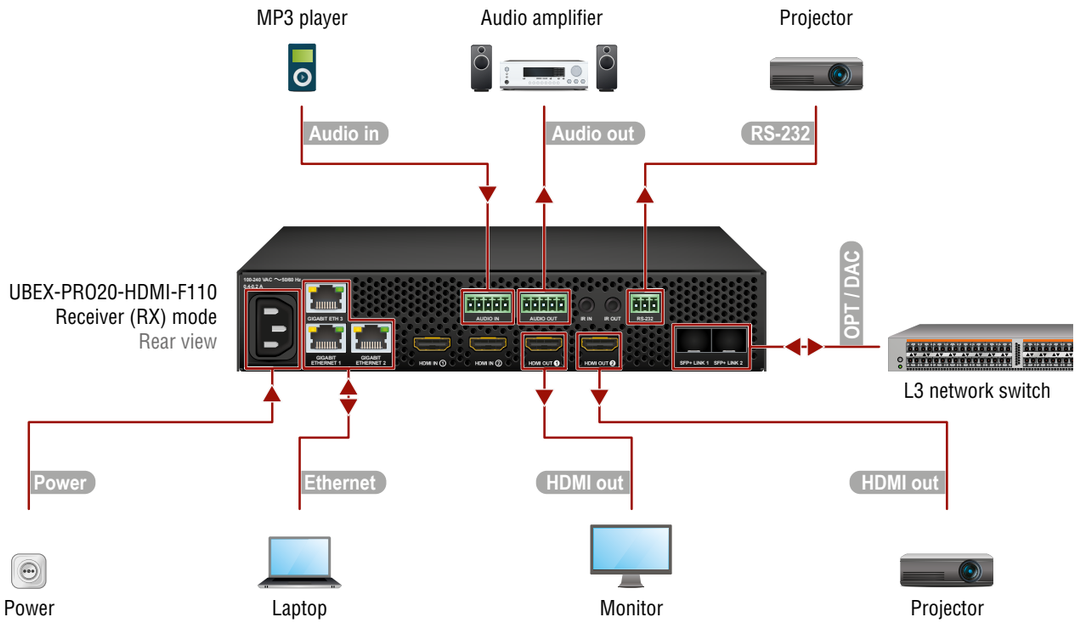
- via **Lightware Device Controller (LDC) software** - see the details in the Device Map section;
- via **LW3 protocol command** - see the details in the Set the Operation Mode section.

For F100 and F110 models	OPT DAC	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.
	HDMI in	Connect the transmitter and the source devices (e.g. PC, Blu-ray player) using the HDMI input 1 and 2 ports by HDMI cables.
	Local HDMI out	Connect the local sink devices (e.g. monitor, 4K TV) to the HDMI output 1 and 2 ports by HDMI cables.
	Ethernet	Optionally connect the transmitter to a LAN in order to control the device.
	Power	Connect the power adaptor to the AC input on the transmitter first, then to the AC power socket.
For F110 model only	Audio in	Connect an audio source device (e.g. media player) to the audio input connector.
	Audio out	Connect an audio sink device (e.g. active speakers) to the audio output connector.
	RS-232	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.

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

INFO: The Infrared function will be added by future firmware update.

10.4.2. Endpoint Devices - Receiver Operation Mode



Connections for the F110 model in receiver operation mode

For F100 and F110 models	OPT DAC	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.
	HDMI out	Connect the sink devices (e.g. monitor, projector) to the HDMI output 1 and 2 ports by HDMI cables.
	Ethernet	Optionally connect the receiver to a LAN in order to control the device.
	Power	Connect the power adaptor to the AC input on the receiver first, then to the AC power socket.
For F110 model only	Audio in	Connect an audio source device (e.g. MP3 player) to the audio input connector.
	Audio out	Connect an audio sink device (e.g. audio amplifier) to the audio output connector.
	RS-232	Optionally for RS-232 extension: connect the controlled unit (e.g. projector) to the RS-232 port of the device with a serial cable.

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

INFO: The Infrared function will be added by future firmware update.

Changing the Operation Mode

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

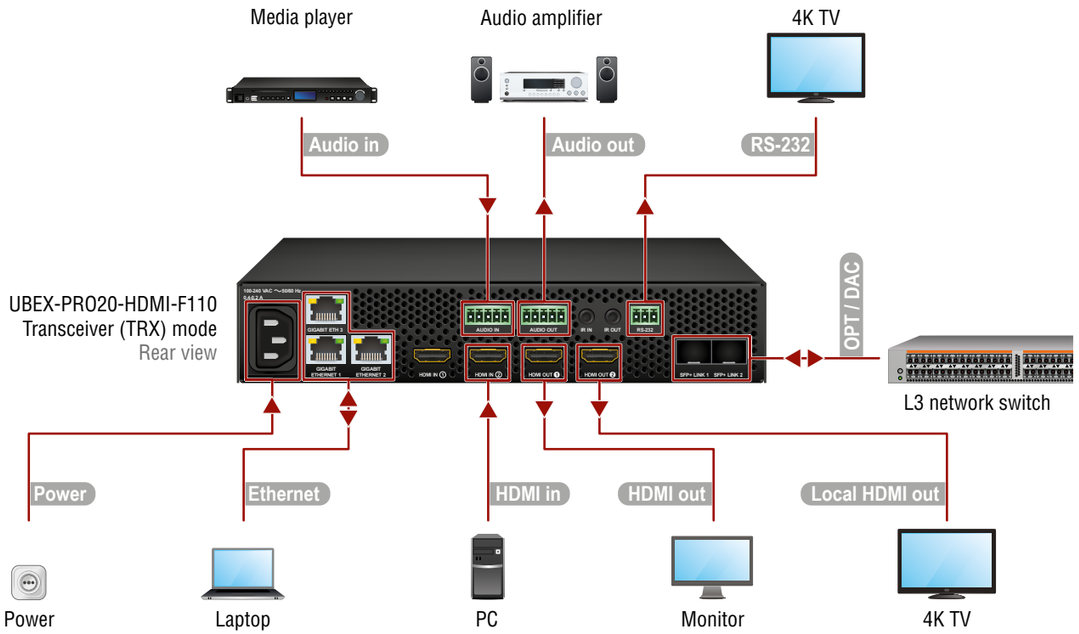
Before connecting the device to the network and the MMU:

- via **front panel LCD menu** - see the details in the Operation Mode section;

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.

10.4.3. Endpoint Devices - Transceiver Operation Mode



Connections for the F110 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** - see the details in the Operation Mode section;

After connecting the device to the network and the MMU:

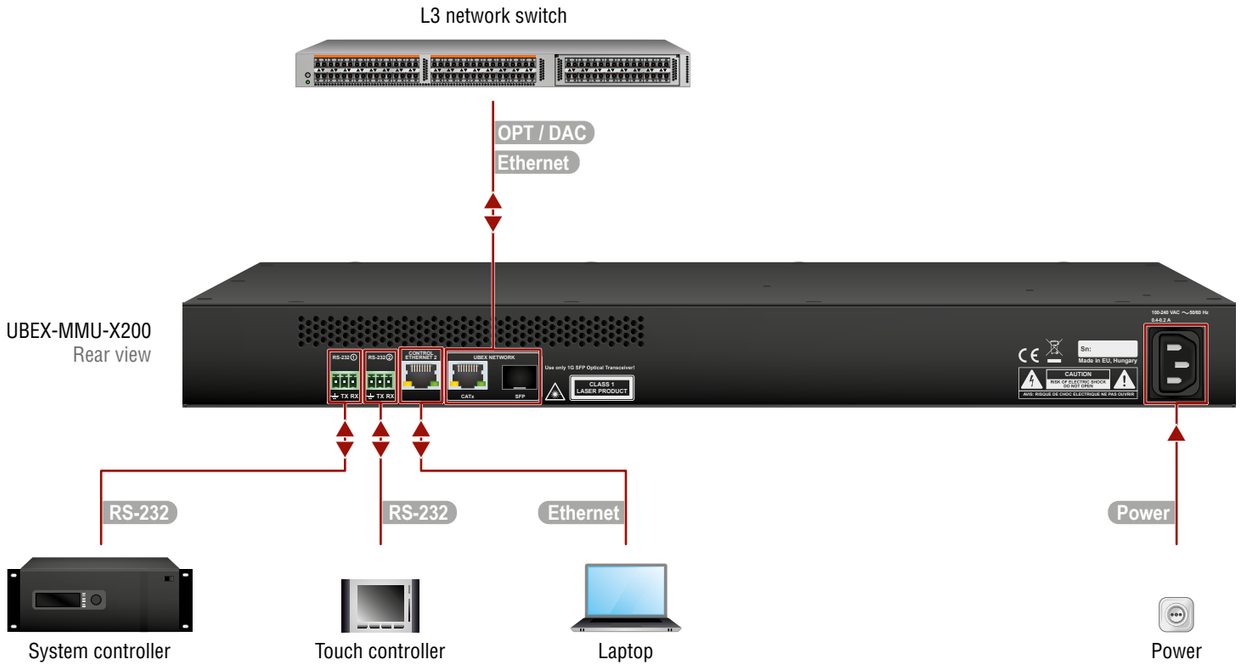
- via **Lightware Device Controller (LDC) software** - see the details in the Device Map section;
- via **LW3 protocol command** - see the details in the Set the Operation Mode section.

For F100 and F110 models	OPT DAC	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.
	HDMI in	Connect the transceiver and 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.
	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.
For F110 model only	Audio in	Connect an audio source (e.g. media player) to the audio input connector.
	Audio out	Connect an audio sink device (e.g. audio amplifier) to the audio output connector.
	RS-232	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.

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

INFO: The Infrared function will be added by future firmware update.

10.4.4. Matrix Management Unit (MMU)



Connections for the UBEX-MMU-X200 Matrix Management Unit

OPT / DAC Ethernet

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.

Ethernet

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

RS-232

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.

10.5. Ethernet Switch Configuration

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

10.5.1. 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.

10.5.2. 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.

10.5.3. 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.

10.5.4. Optional Configuration

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

10.5.5. 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:

https://lightware.com/media/lightware/filedownloader/file/Support-Guide/Installation_and_Network_Setup_Guide_for_UBEX.pdf

10.6. 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.

10.6.1. 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.

10.6.2. Configure the Operation Mode

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

- **Before** connecting the device to the UBEX matrix - use the **Front panel LCD menu**. See the details in the Operation Mode section.
- **After** connecting the device to the UBEX matrix - use the **Lightware Device Controller software**. See the details in the Device Map section.

10.6.3. 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 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

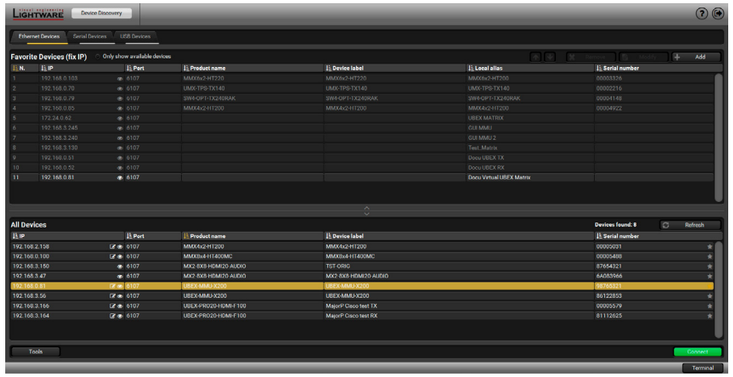
Check the network settings of the MMU. You can find the factory default settings of the device in the UBEX-MMU-X200 section. The network settings can be changed using the following method:

- 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 Lightware Device Controller - Matrix Mode chapter.

Discovering the MMU



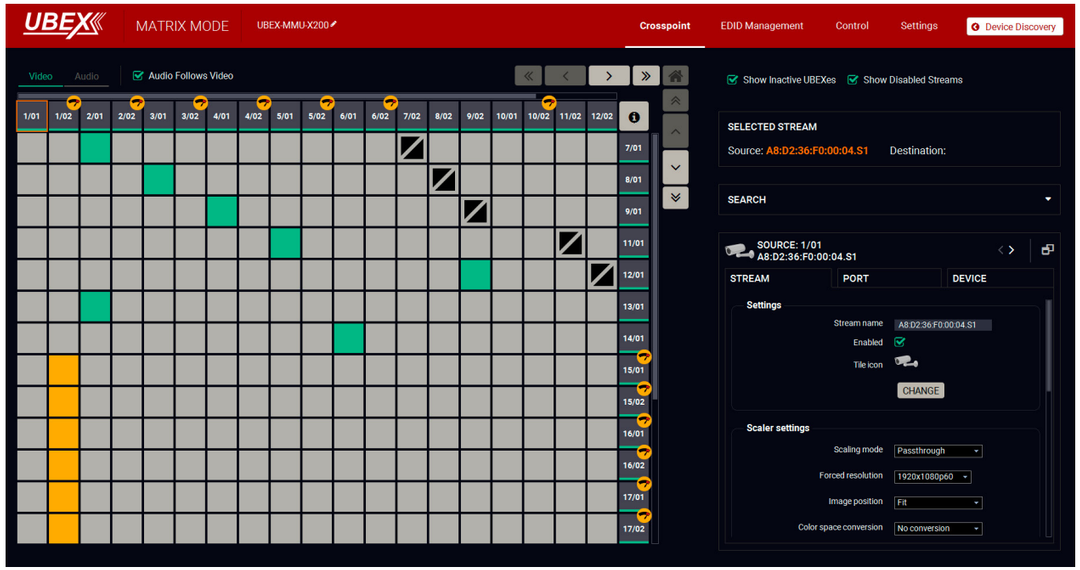
Step 1. Open the LDC software. The **Device discovery** window will launch automatically to discover all available Lightware devices on the network where the controller device is connected to.

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.

10.6.4. 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.



The Crosspoint menu in the LDC software

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

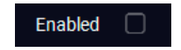
Source (Input Stream of a Transmitter or Transceiver) Side

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

10.6.5. Customize the View of the Matrix



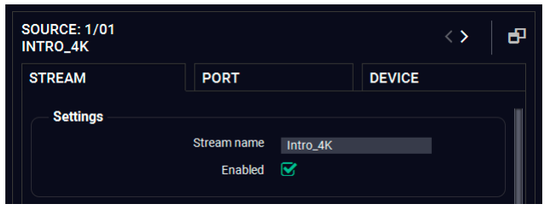
If not all input / output ports of the endpoints are used in your matrix, you can hide the unused ones. Click on the unused source / destination port. Select the **Stream tab** and remove the tick in the **Enabled** option. The disabled sources / destinations can be hidden when you disable the **Show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

10.6.6. 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

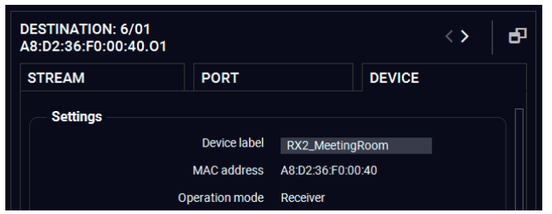


Click on the source / destination port where the stream is transmitted / received. Select the **Stream tab** and find the **Stream name** field and type a unique name which can describe the stream well, for example: Intro_4K.

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 stream 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.

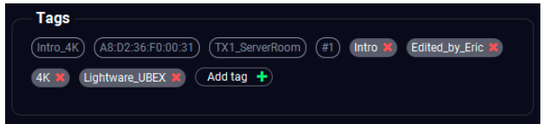
TIPS AND TRICKS: If you are not sure which is your selected device physically, use the **Identify unit** function. Clicking on the button results the blinking of the front panel status LEDs for 10 seconds.

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

10.6.7. 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.



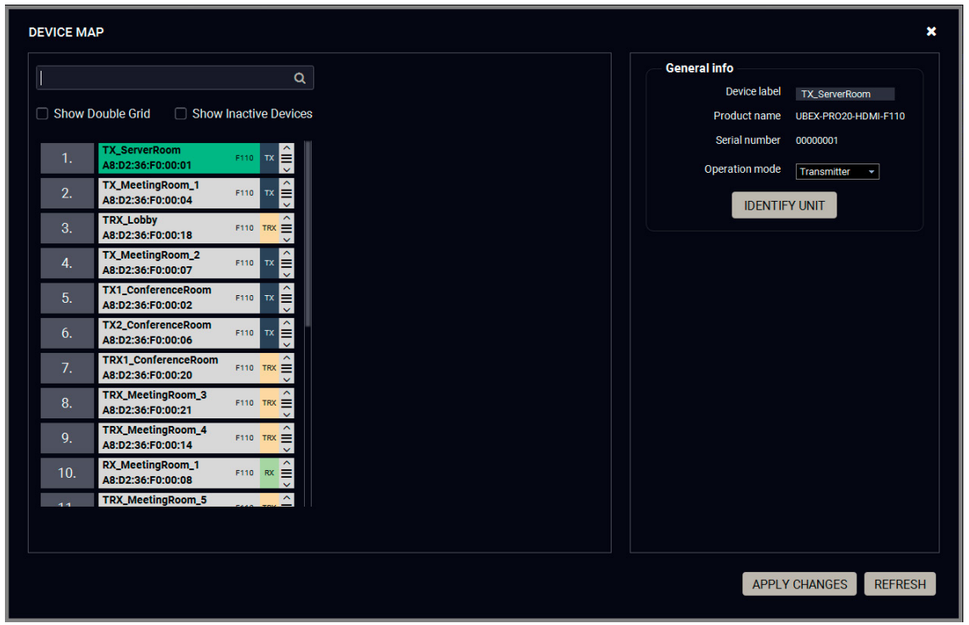
INFO: The following information are automatically added to the tags: stream name, device label, logical device ID.

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

10.6.8. 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.

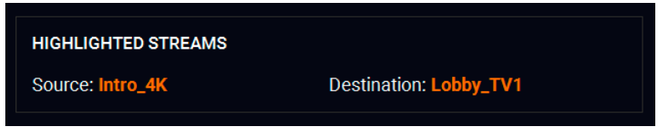


Device map window

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.

10.6.9. 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.

10.6.10. 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:

Crosspoint (connection) tile

Source/destination port tile

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

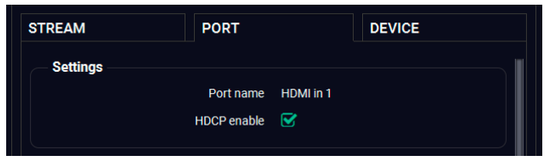
More possible solutions can be applied to avoid the bandwidth limitation:

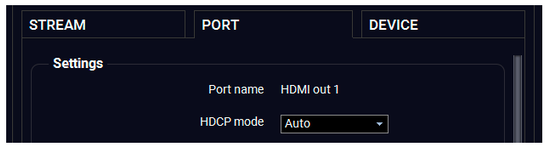
- Enable the scaler / FRC on the HDMI inputs of the transmitter;
- Apply the color space conversion on the stream source(s).
- In the case of 10 GbE link (only one SFP+ module / DAC cable is installed in the SFP+ ports) upgrade the bandwidth performance of the endpoint to 20 GbE.

10.6.11. Set the HDCP Settings

Check the HDCP settings either 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.

10.6.12. 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)

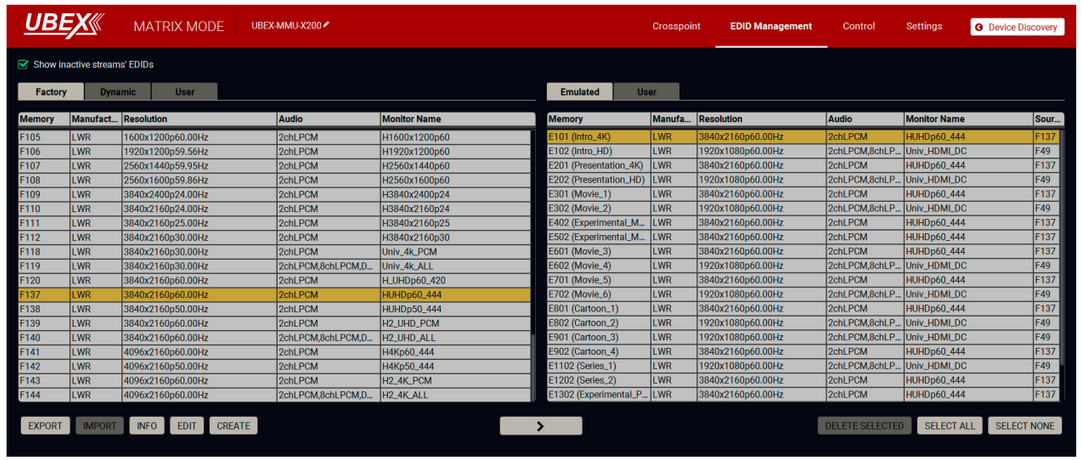
In our example the incoming signal on the HDMI in 1 port is 4K UHD 60 Hz (3840x2160p@60Hz 4:4:4).

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.



EDID Management menu in the LDC

> TIPS AND TRICKS: If there is no pre-installed factory EDID in the list which can fit with your system, a new EDID can be created via the EDID Creator wizard. See more details about it in the Creating an EDID - Easy EDID Creator section.

10.6.13. Set the Scaler and the Frame Rate Converter

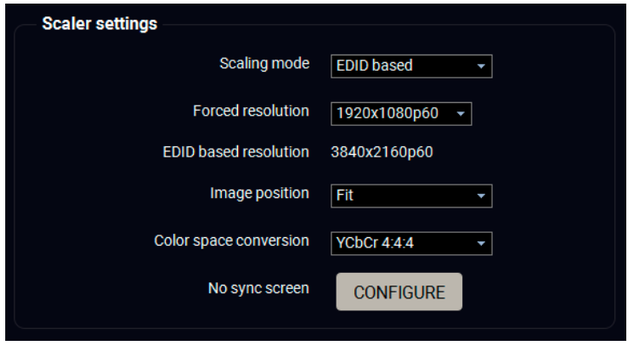
Set up the scaler and the frame rate converter (FRC) for the best user experience. The forced resolution and refresh rate are recommended to fit the supported resolution / refresh rate of the sink device.

> **ATTENTION!** Both output ports have FRC and CSC functions but the scaler is available for the HDMI out 1 port only.

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.

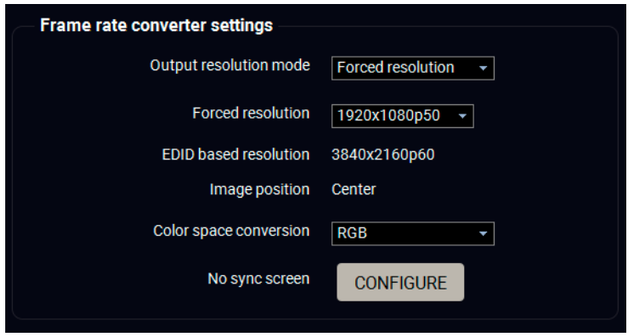
Click on the desired destination port and select the **Port tab**. Set the Scaling Mode setting to **EDID based** which means the receiver read out the EDID of the sink device and scaling the image to that. In our example it is **3840x2160p60**. Set the Image position to **Fit**, the Color space conversion to **YCbCr 4:4:4**.



Frame Rate Converter - Example

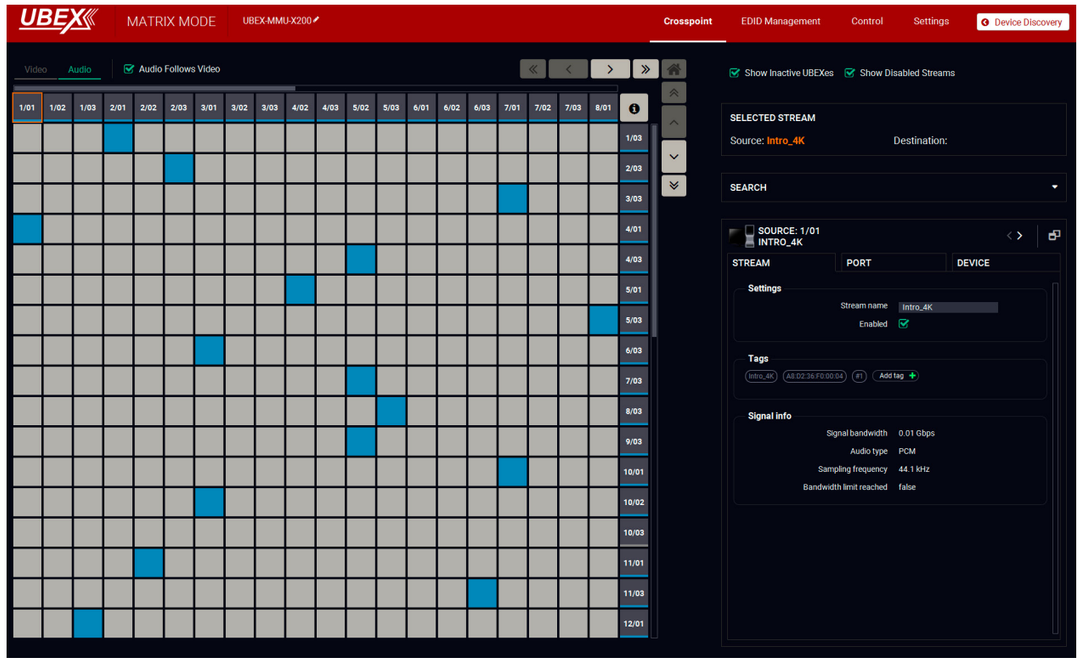
In our example the other sink device is a full HD monitor with 50 Hz refresh rate and we have to display a 1080p60 Hz video on that. The signal is transmitted on the HDMI out 2 port of the UBEX receiver.

Click on the desired destination port and select the **Port tab**. Set the Output resolution mode to **Forced resolution**, the Forced resolution to **1920x1080p50**, the Color space conversion to **RGB**.



10.6.14. Set the Audio Crosspoint State

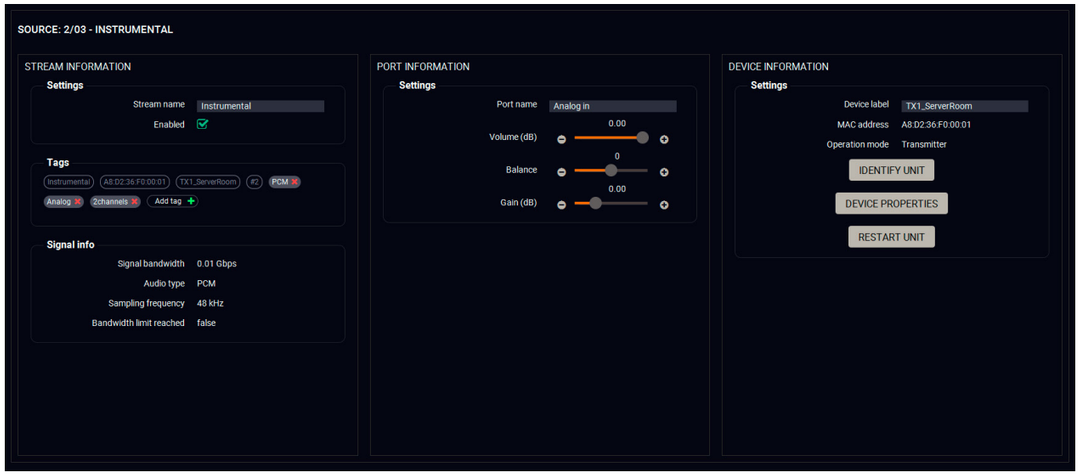
Set up the audio crosspoint settings. Navigate to the Crosspoint menu and select the **Audio layer**. Digital and analog audio source streams are also selectable in the case of UBEX-PRO20-HDMI-F110 endpoint device. All audio streams can be selected to all outputs.



Audio crosspoint menu in the LDC

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

10.6.15. Set the Parameters of the Audio Streams



Analog audio input port properties window in the LDC

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.

11

UBEX Concept - Matrix Mode

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

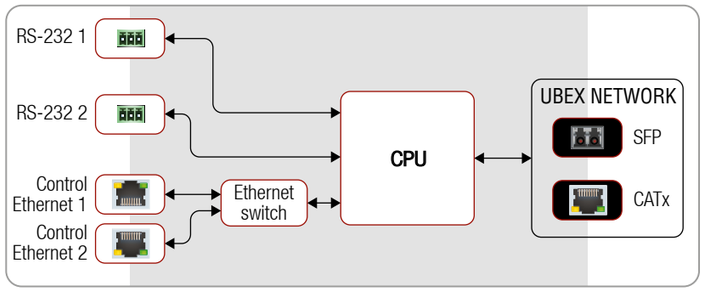
- The Matrix Management Unit (MMU)
- Control Features
- Video Interface
- Audio Interface
- Serial Interface
- SFP / SFP+ Interfaces
- Further Built-in Features
- Software Control Modes

11.1. 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.

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.

The Functions of the Matrix Management Unit (in Matrix Mode):

- Dynamic crosspoint handling
- Network bandwidth utilization management
- EDID management
- Monitoring of the network and the endpoints
- Backup and restore
- Interface for third-party system controllers

What if the Connection with the MMU is lost?

If the connection with the MMU is lost, the AV signal transmission between the endpoint devices will continue without any problem. You can calculate with the following restrictions:

- Establishing the connection to the UBEX matrix is not available;
- Crosspoint changing is not available;
- Dynamic EDID will not be changed in the case changing a sink device on a receiver;
- Control features of the system are not available.

Once the MMU returns to the system and establishes the connection with the endpoint devices, the above listed restrictions cease immediately.

11.2. 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:

Interface	MMU	Endpoints
Ethernet Interface	✓	✓
Serial Interface	✓	-

ATTENTION! The RS-232 port of the F110 endpoint model 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.

11.2.1. Ethernet Interface

Description

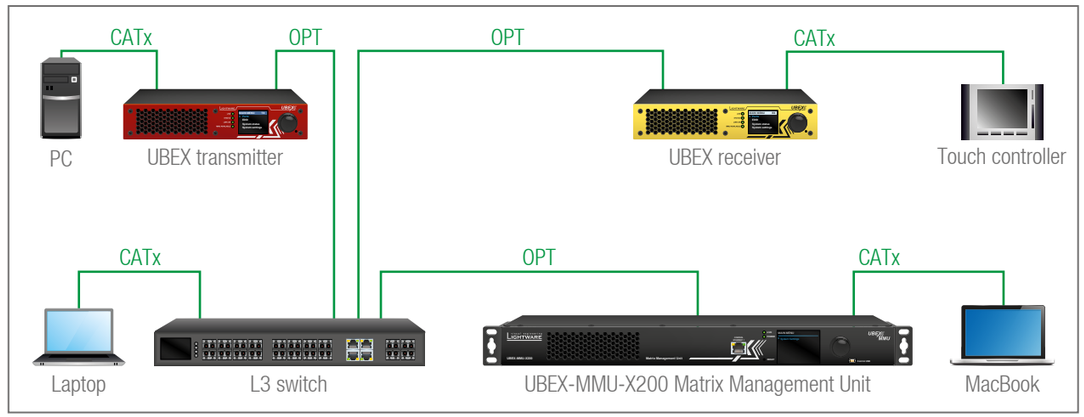
The endpoint devices and the Matrix Management Unit can be controlled over Ethernet interface. The ports are standard RJ45 connectors in the case of endpoint and the MMU as well.

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: Lightware Device Controller - Matrix Mode);
- **LW3 protocol commands** (details: Programmer's Reference - Matrix Mode).

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.

11.2.2. 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.

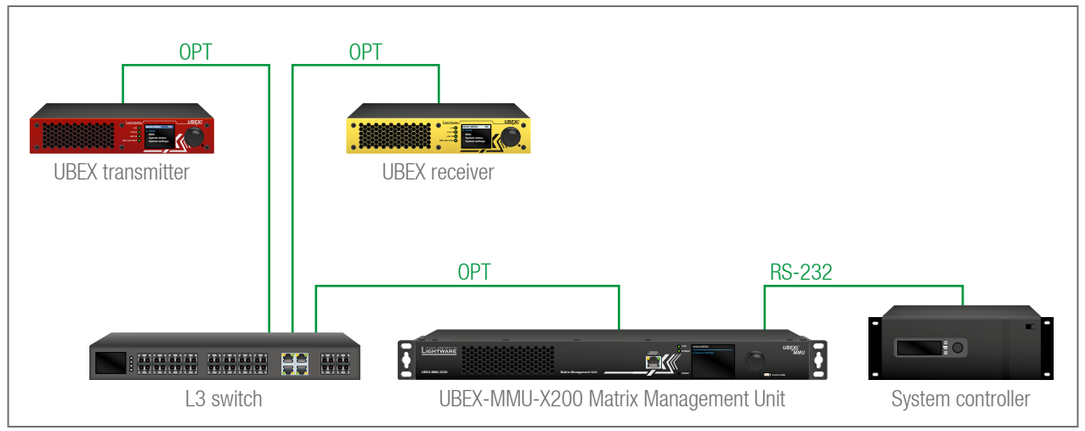
Description

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: Lightware Device Controller - Matrix Mode);
- **LW3 protocol commands** (details: Programmer's Reference - Matrix Mode).

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.

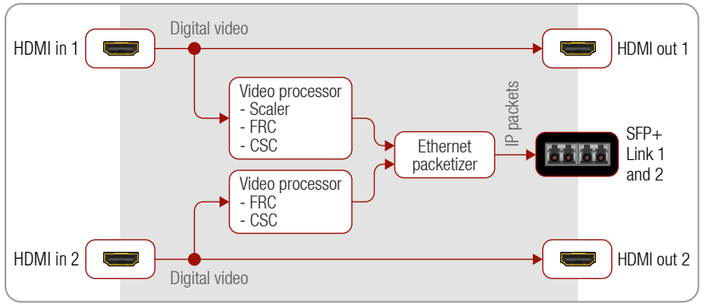
11.3. Video Interface

11.3.1. Transmitter Mode

Port Diagram

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

- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110



Video port diagram of the F100/F110 transmitter

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 has **video scaler**, **frame rate converter (FRC)**, and **color space converter (CSC)** functions. The processor of the HDMI in 2 has **frame rate converter** and **color space converter** functions.

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.

SFP+ Interface

After the Ethernet packetizing the two video streams are transmitted to the remote endpoint device via the SFP+ ports.

Summary Tables

HDMI INPUTS		
	HDMI input 1	**HDMI input 2**
Accepted signal	up to 4K@60 4:4:4	up to 4K@60 4:4:4
Scaler	✓	-
Frame rate converter (FRC)	✓	✓
Color space converter (CSC)	✓	✓

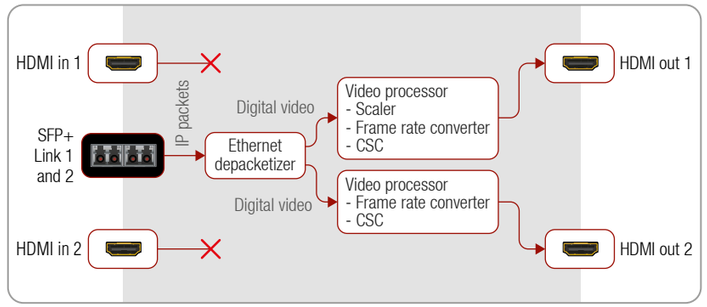
HDMI OUTPUTS		
	HDMI output 1	**HDMI output 2**
Output signal	up to 4K@60 4:4:4	up to 4K@60 4:4:4
Signal source	HDMI in 1	HDMI in 2

11.3.2. Receiver Mode

Port Diagram

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

- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110



Video port diagram of the F100/F110 receiver

SFP+ Interface

The receiver can receive two HDMI video streams via the SFP+ input ports (SFP+ Link 1 and 2).

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 either.

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

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).

HDMI Input Modes

The HDMI input ports of the receiver cannot accept video signals due to software limitation.

Summary Tables

HDMI INPUTS		
	HDMI input 1	**HDMI input 2**
Accepted signal	⛔	⛔

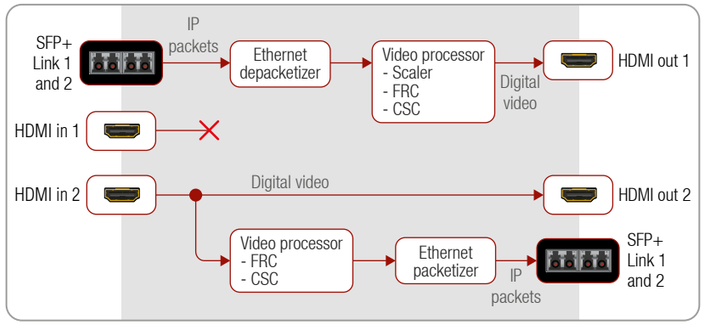
HDMI OUTPUTS		
	HDMI output 1	**HDMI output 2**
Output signal	up to 4K@60 4:4:4	up to 4K@60 4:4:4
Signal source	Selected input port of the remote device	Selected input port of the remote device
Scaler	✓	-
Frame rate converter (FRC)	✓	✓
Color space converter (CSC)	✓	✓

11.3.3. Transceiver Mode

Port Diagram

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

- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110



Video port diagram of the F100/F110 transceiver

SFP+ Interface

The transceiver is able to send and receive HDMI video streams together in the same time over the SFP+ 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 (it contains **frame rate converter (FRC)** and **color space converter (CSC)** functions). The video processor settings are available in the LDC software (see the details in the Video Source Port Properties Window or in the Source Stream Panel section).

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 LDC software (see the details in the Video Destination Port Properties Window or in the HDMI Out 1 Panel section).

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.

Summary Tables

HDMI INPUTS		
	HDMI input 1	**HDMI input 2**
Accepted signal	⛔	up to 4K@60 4:4:4
Scaler	-	-
Frame rate converter (FRC)	-	✓
Color space converter (CSC)	-	✓

HDMI OUTPUTS		
	HDMI output 1	**HDMI output 2**
Output signal	up to 4K@60 4:4:4	up to 4K@60 4:4:4
Signal source	Input port of the remote device	HDMI in 2
Scaler	✓	-
Frame rate converter (FRC)	✓	-
Color space converter (CSC)	✓	-

11.3.4. 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 is still received by the receiver). In that case the stream tile of the disabled stream becomes amber in the LDC software.

	HDMI in 1			HDMI in 2		
Transmitter side	**Status**	**Stream tile (LDC)**	**Port tile (LDC)**	**Status**	**Stream tile (LDC)**	**Port tile (LDC)**
	Enabled		1/01	Disabled		1/02

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 is still received). In that case the stream tile of the disabled stream becomes amber in the LDC software.

	HDMI out 1			HDMI out 2		
Receiver side	**Status**	**Stream tile (LDC)**	**Port tile (LDC)**	**Status**	**Stream tile (LDC)**	**Port tile (LDC)**
	Enabled		1/01	Disabled		1/02

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.

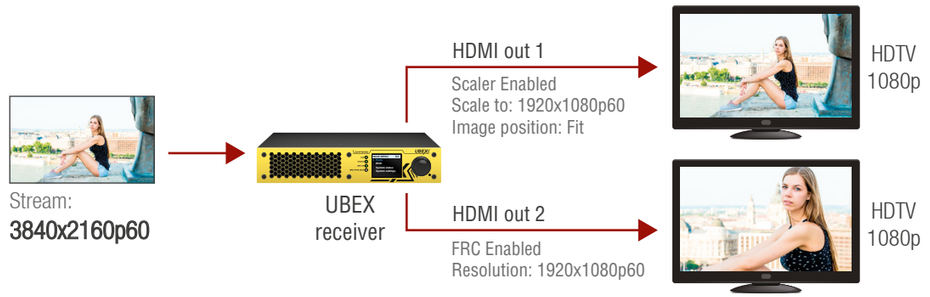
	HDMI in 2			HDMI out 1		
Transceiver side	**Status**	**Stream tile (LDC)**	**Port tile (LDC)**	**Status**	**Stream tile (LDC)**	**Port tile (LDC)**
	Enabled		1/02	Enabled		1/01

INFO: You can find the bandwidth requirements belong to each resolutions in the Required Bandwidth of the Resolutions section.

11.3.5. The Difference between the Scaler and the FRC - Example

The following example helps to understand how the scaler and the frame rate converter work and describes the differences between them.

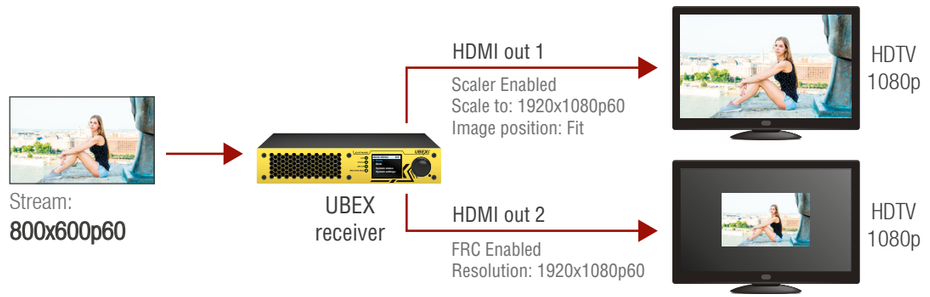
Example for Downscaling



When the resolution of the stream is bigger than the supported resolution of the sink devices:

- **HDMI out 1**: set the scaler for the supported resolution to fit the stream to the sink device.
- **HDMI out 2**: the frame rate converter crops the center part with 1080p resolution from the picture.

Example for Upscaling



When the resolution of the stream is smaller than the supported resolution of the sink devices:

- **HDMI out 1**: set the scaler for the supported resolution and it fits the stream for the sink device.
- **HDMI out 2**: the frame rate converter fills the extra image part with black pixels.

11.3.6. Timing Modes

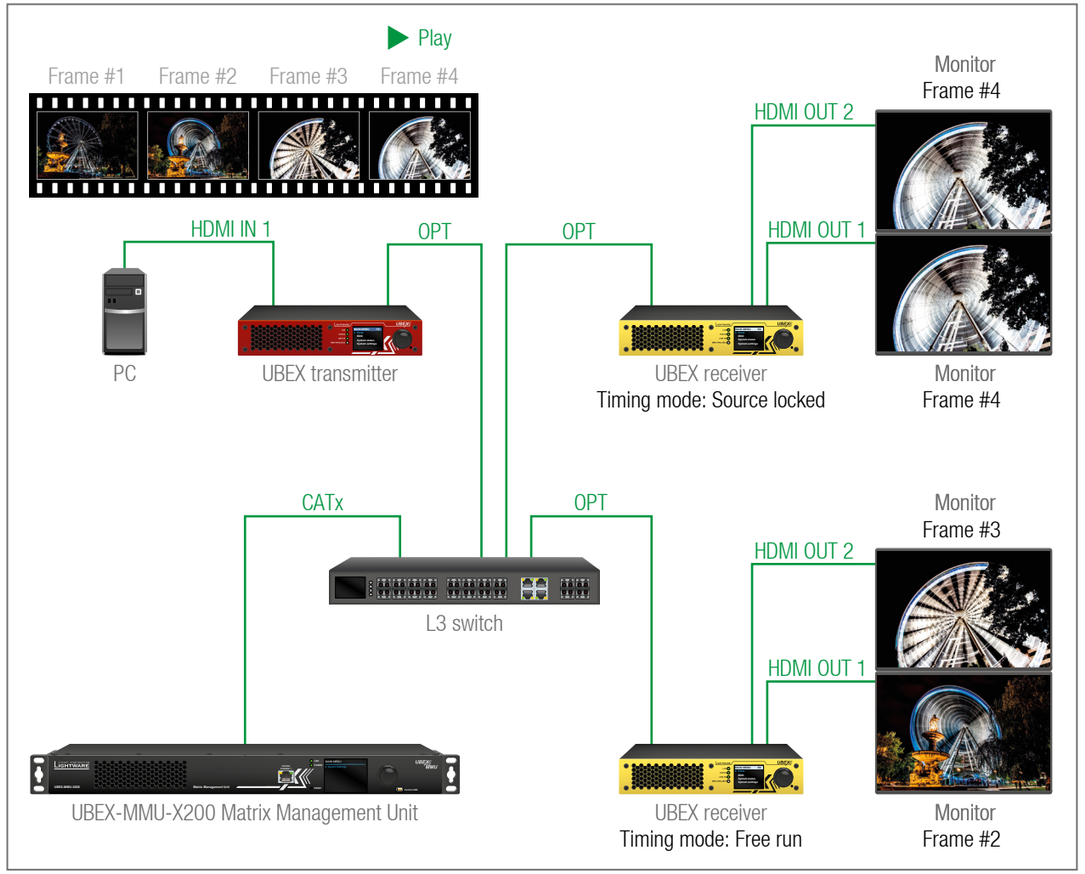
Technical Background

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



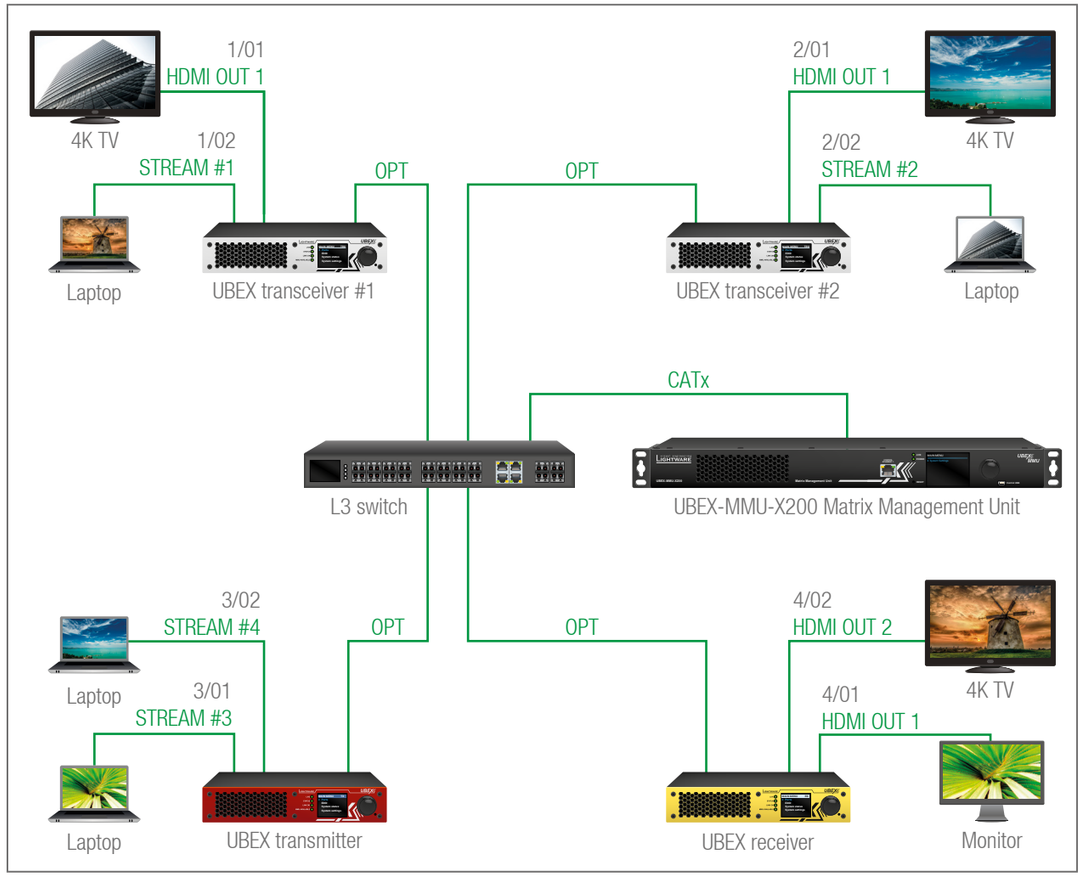
The Concept

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 **free run**. The differences between the actual content of the connected monitors might be noticeable.

The HDMI output ports of the lower 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.

11.3.7. HDMI Signal Transmission - Example



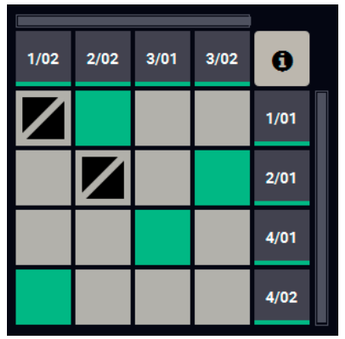
The Concept

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 A/V 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 Lightware Device Controller - Matrix Mode 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.

UBEX Endpoint	HDMI Port	Stream	Port ID
UBEX transceiver #1	HDMI IN 2	Stream #1	1/02
	HDMI OUT 1	-	1/01
UBEX transceiver #2	HDMI IN 2	Stream #2	2/02
	HDMI OUT 1	-	2/01
UBEX transmitter	HDMI IN 1	Stream #3	3/01
	HDMI IN 2	Stream #4	3/02
UBEX receiver	HDMI OUT 1	-	4/01
	HDMI OUT 2	-	4/02

Crosspoint Possibilities

The following table shows the available crosspoint possibilities:

Crosspoint possibilities of the video streams for the UBEX matrix					Destinations			
					TRX #1	TRX #2	RX	
					1/01	2/01	4/01	4/02
					4K TV	4K TV	4K TV	Monitor
Sources	TRX #1	Laptop	1/02	Stream #1	-	✓	✓	✓
	TRX #2	Laptop	2/02	Stream #2	✓	-	✓	✓
	TX	Laptop	3/01	Stream #3	✓	✓	✓	✓
		Laptop	3/02	Stream #4	✓	✓	✓	✓

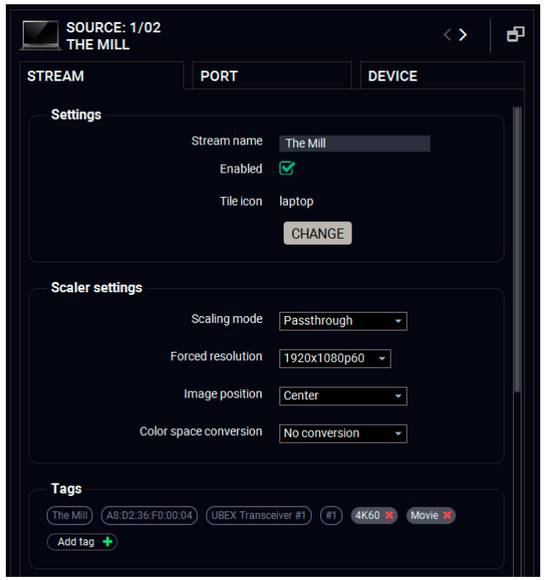
Summary: The video streams of the transmitters can be selected to all sink devices. The video stream of a transceiver is not selectable to the output of the same transceiver.

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.

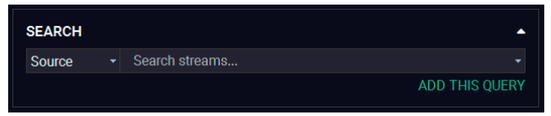
The following settings help the user to handle the streams in a bigger matrix:

- **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 HD 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.

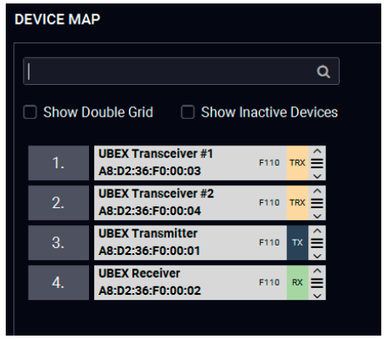
Device Map

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 be also changed in the Device map.

See the details about the tool in the Device Map section.



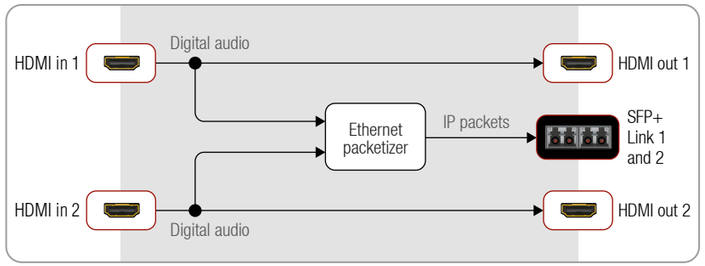
11.4. Audio Interface

11.4.1. Transmitter Mode - F100 Model

Port Diagram

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

- UBEX-PRO20-HDMI-F100



Audio port diagram of the F100 transmitter

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.

11.4.2. Receiver Mode - F100 Model

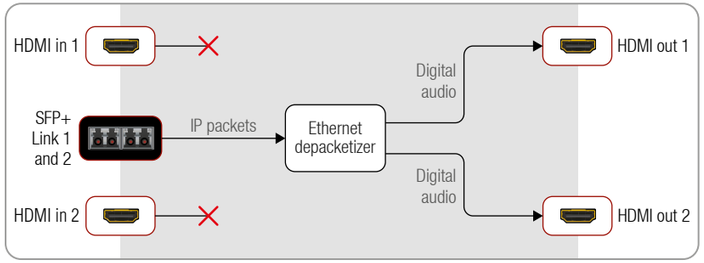
Port Diagram

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

- UBEX-PRO20-HDMI-F100

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.



Audio port diagram of the F100 receiver

The HDMI input ports of the receiver cannot accept audio signals due to software limitation.

11.4.3. Transceiver Mode - F100 Model

Port Diagram

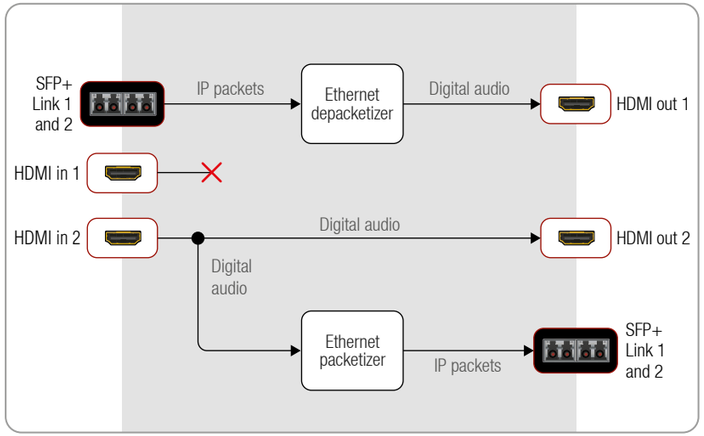
The port diagram is valid for the following UBEX endpoint model:

- UBEX-PRO20-HDMI-F100

Description

The transceiver receives one HDMI audio streams 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.



Audio port diagram of the F100 transceiver

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

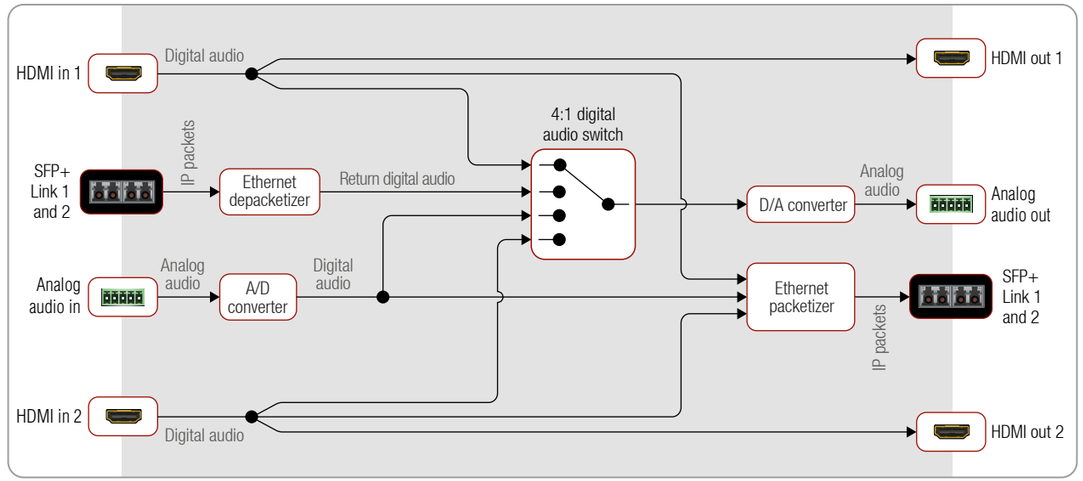
The HDMI input 1 port of the transceiver cannot accept audio signals due to software limitation.

11.4.4. Transmitter Mode - F110 Model

Port Diagram

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

- UBEX-PRO20-HDMI-F110



Audio port diagram of the F110 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 out 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 endpoint model converts the **uncompressed stereo audio** stream to analog audio. The analog audio output port supports **PCM audio format up to 48 kHz**.

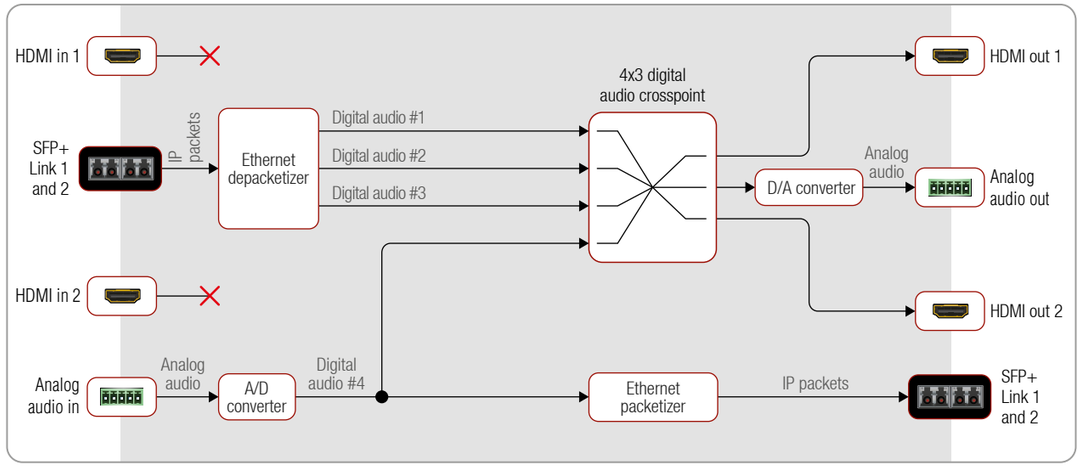
> **ATTENTION!** If unsupported audio signal is selected to the analog audio output, the port will be muted automatically. The current status of the port can be queried by an LW3 protocol command, see the details in the Query the Status of the Analog Audio Output section.

11.4.5. Receiver Mode - F110 Model

Port Diagram

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

- UBEX-PRO20-HDMI-F110



Port diagram of the F110 receiver

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.

Signal Support of the Analog Audio Output

The UBEX-PRO20-HDMI-F110 endpoint model converts the **uncompressed stereo audio** stream to analog audio. The analog audio output port supports **PCM audio format up to 48 kHz**.

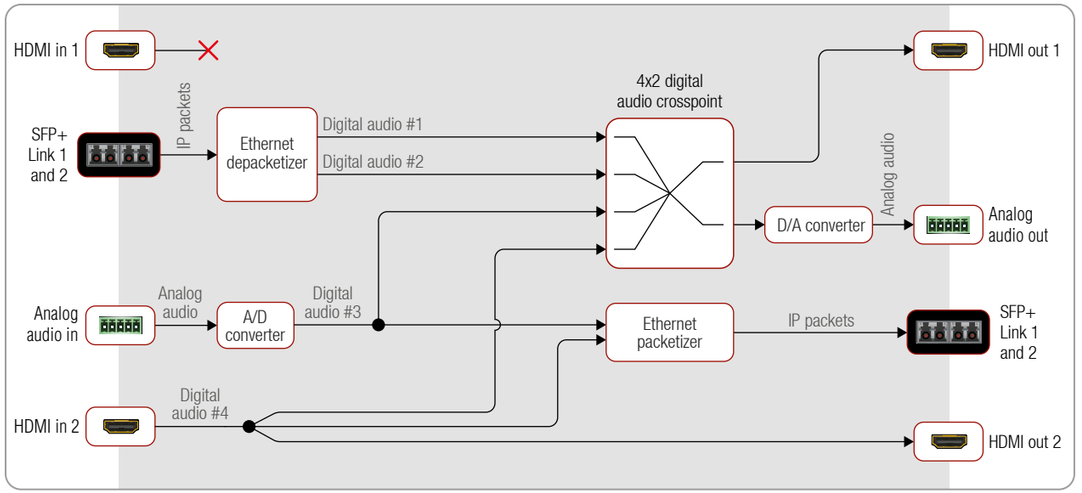
> **ATTENTION!** If unsupported audio signal is selected to the analog audio output, the port will be muted automatically. The current status of the port can be queried by an LW3 protocol command, see the details in the Query the Status of the Analog Audio Output section.

11.4.6. Transceiver Mode - F110 Model

Port Diagram

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

- UBEX-PRO20-HDMI-F110



Port diagram of the F110 transceiver

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.

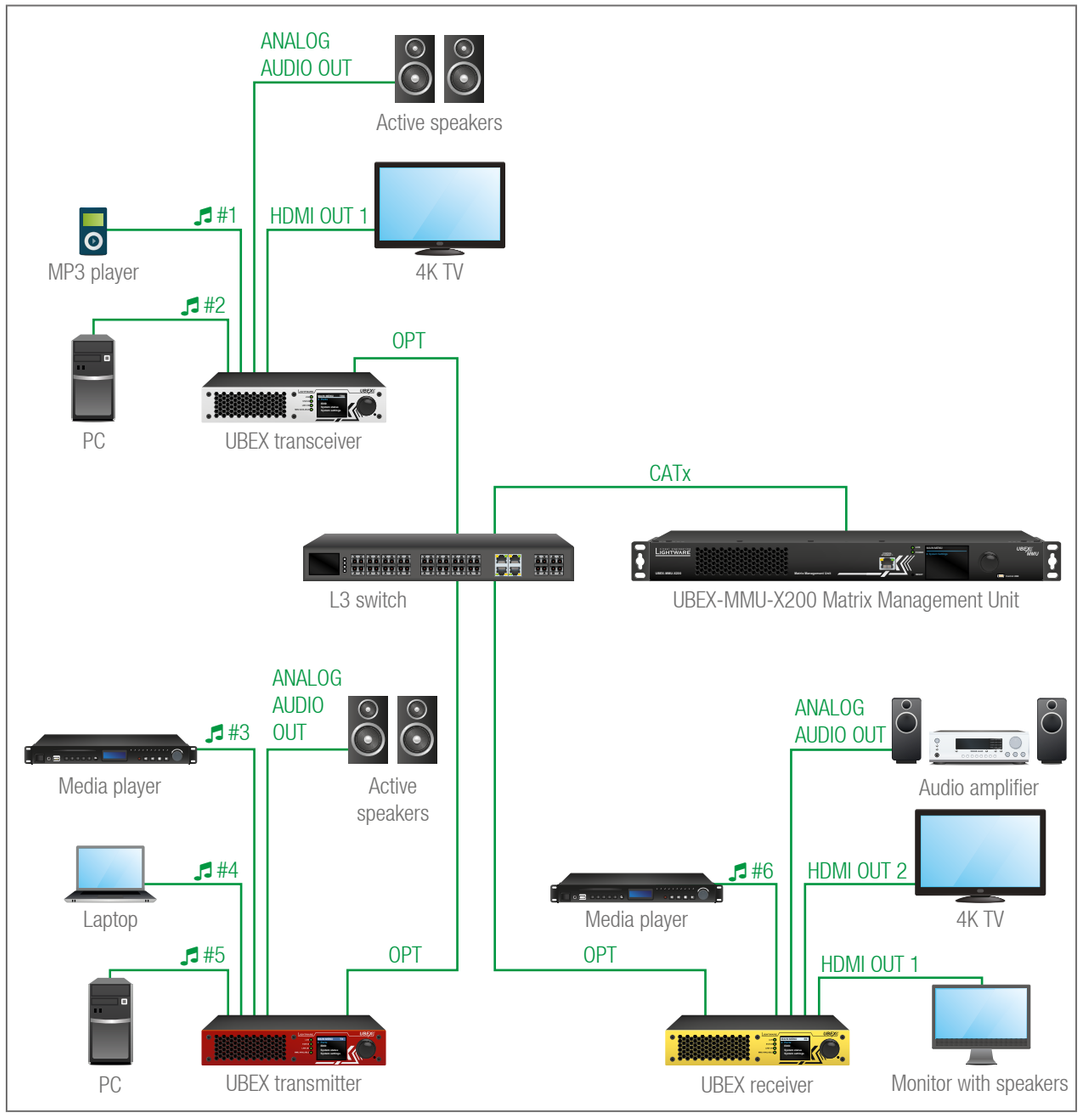
The HDMI input 1 port does not accept signal when the device is configured as transceiver.

Signal Support of the Analog Audio Output

The UBEX-PRO20-HDMI-F110 endpoint model converts 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.

11.4.7. 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 A/V system.

The following table shows the available crosspoint possibilities:

Crosspoint possibilities of the audio streams for the UBEX matrix			Sink devices					
			TRX		TX	RX		
			Active speakers	4K TV	Active speakers	Audio amplifier	4K TV	Monitor with speakers
Sources	TRX	MP3 player ♫ #1	✓	✓	✓	✓	✓	✓
		PC ♫ #2	✓	✓	✓	✓	✓	✓
	TX	Media player ♫ #3	✓	✓	✓	✓	✓	✓
		Laptop ♫ #4	✓	✓	✓	✓	✓	✓
		PC ♫ #5	✓	✓	✓	✓	✓	✓
	RX	Media player ♫ #6	✓	✓	✓	✓	✓	✓

Summary: All audio streams of the source devices can be selected to all sink devices except the local HDMI outputs which are always transmitted the audio signals of the inputs.

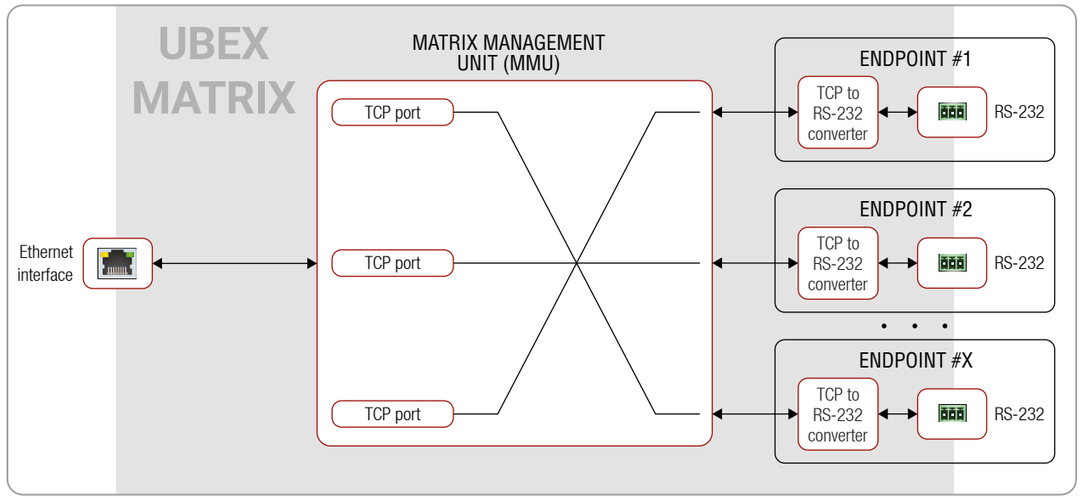
11.5. Serial Interface

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

ATTENTION! Only the UBEX-PRO20-HDMI-F110 model has built with serial interface port.

11.5.1. Technical Background

Port Diagram



Port diagram of the serial interface for the UBEX matrix

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.

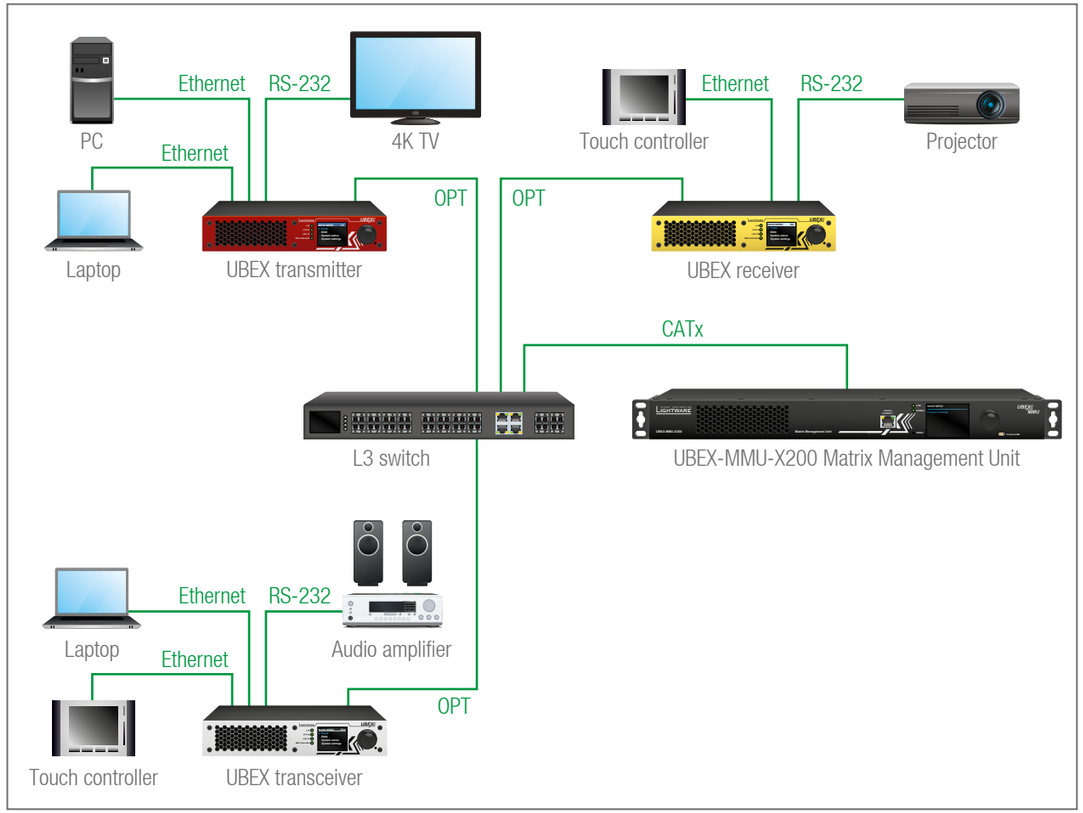
INFO: It does not matter which device of the Ethernet interface (the MMU directly or any endpoints) you want to use establishing connection with the UBEX matrix, you will reach the MMU finally.

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.

11.5.2. 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 RS-232 Serial Port section.

11.6. SFP / SFP+ Interfaces

Definitions

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. *

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

11.6.1. 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 modules up to 10Gbps bandwidth/modules. The modules 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.
- 2x 10 GbE DAC cables

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.

11.6.2. 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.

11.7. Further Built-in Features

11.7.1. 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 UBEX-MMU-X200 section.

You can find more information about the backup procedure in the System Tab section.

11.7.2. 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 sink 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.

11.8. 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 Lightware Device Controller - Matrix Mode 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 - Matrix Mode chapter.

12

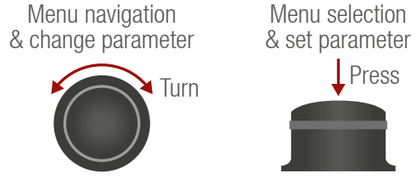
Front Panel LCD Menu Operation - MMU

This chapter is about the operating of the Matrix Management Unit describing the functions which are available by the front panel controls:

- Introduction
- System Settings Menu

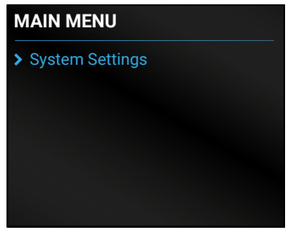
12.1. Introduction

12.1.1. 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 pressed to enter a menu or edit/set a parameter.

12.1.2. Parameter Selection



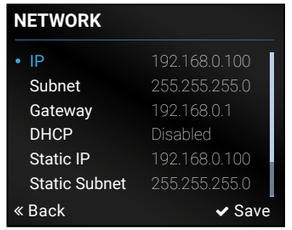
The **blue** colored line means the selected menu/parameter, the **green** one means the current setting.

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

12.2. System Settings Menu

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

12.2.1. Network

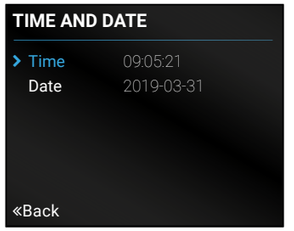


The parameters of the network connection can be set in this submenu. The first three lines (IP, Subnet, and Gateway parameters) show the current settings. If the DHCP option is disabled, three more parameters are listed which can be set for a static IP address:

- 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.

12.2.2. Time and Date



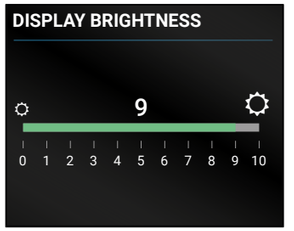
The internal clock and date that is used for logging events can be set in this submenu.

Time format: HH:MM:SS

Date format: YYYY-MM-DD

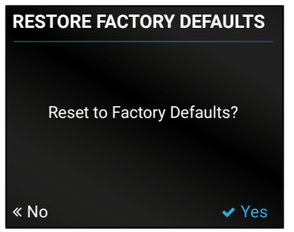
> TIPS AND TRICKS: The time and date can be set easily in the built-in web or in the Lightware Device Controller software manually or by synchronizing with the local computer. See the details in the System Tab section.

12.2.3. 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.

12.2.4. Restore Factory Defaults



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

MATRIX MODE

13

Front Panel LCD Menu Operation - Endpoints

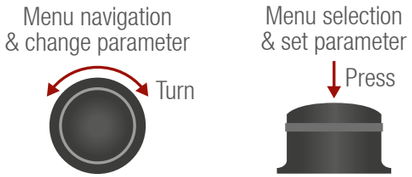
This chapter is about the operating of the endpoint device describing the functions which are available by the front panel controls:

- Introduction
- The Tree Structure of the LCD Menu
- Ports Menu - Transmitter Mode
- Ports Menu - Receiver Mode
- Ports Menu - Transceiver Mode
- EDID Menu
- System Status Menu
- System Settings Menu

13.1. Introduction

13.1.1. 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 pressed to enter a menu or edit/set a parameter.

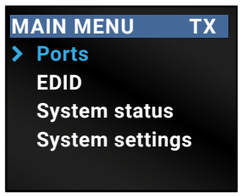


> TIPS AND TRICKS: The faster you rotate the jog dial, the faster the parameter list is scrolled.

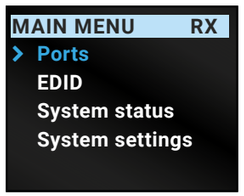
13.1.2. Operation Mode Visualization

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

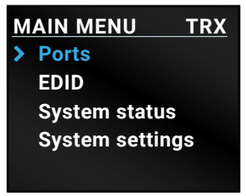
- The color of the header is **blue** for the transmitter, **white** for the receiver, and **black with a white stripe** for the transceiver;
- There is a TX, RX, or TRX label in the main menu of the menu structure.



Main menu of the transmitter



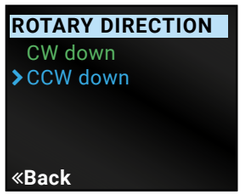
Main menu of the receiver



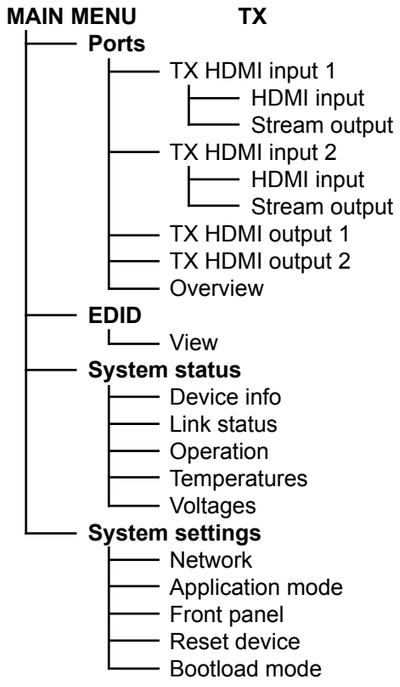
Main menu of the transceiver

13.1.3. Parameter Selection

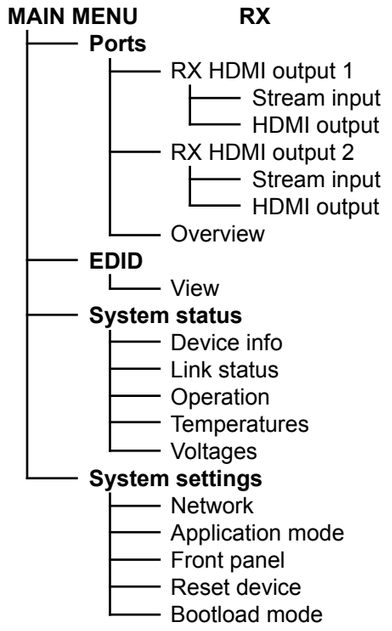
The **blue** colored line means the selected menu/parameter, the **green** one means the current setting.



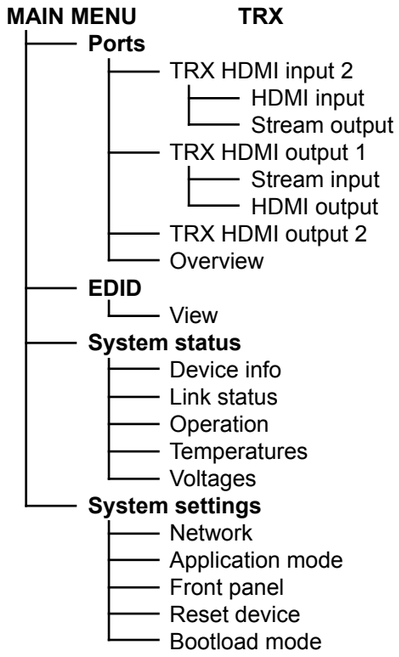
13.2. The Tree Structure of the LCD Menu



The tree structure of the transmitter mode

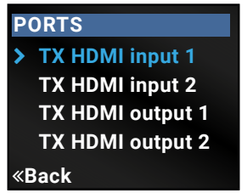


The tree structure of the receiver mode



The tree structure of the transceiver mode

13.3. Ports Menu - Transmitter 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.

13.3.1. TX HDMI Input 1 and 2 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

13.3.2. TX HDMI Output 1 and 2 Ports

The following information is displayed for both local output ports:

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

13.3.3. Overview

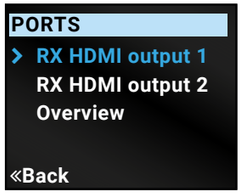
The current status of the input and output ports is summarized in the Overview menu. The icons display information about the port and the incoming/transmitted signals.

TIPS AND TRICKS: Press enter on the selected port for the settings and detailed status information.

Icon	Icon is blue (inactive)	Icon is white (active)
	Sink is **not** connected	Sink is connected
	Signal is **not** present	Signal is present
	Signal is **not** encrypted with HDCP	Signal is encrypted with HDCP
	No audio signal in the video stream	Audio is embedded in the video stream

13.4. Ports Menu - Receiver 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.

13.4.1. RX HDMI Output 1 and 2 Ports

Stream Input

The following settings and information are related to the video stream coming from the TX input ports:

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

HDMI Output

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

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

13.4.2. Overview

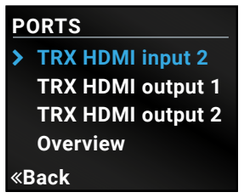
The current status of the output ports is summarized in the Overview menu. The icons display information about the port and the transmitted signals.

TIPS AND TRICKS: Press enter on the selected port for the settings and detailed status information.

Icon	Icon is blue (inactive)	Icon is white (active)
	Sink is **not** connected	Sink is connected
	Signal is **not** present	Signal is present
	Signal is **not** encrypted with HDCP	Signal is encrypted with HDCP
	No audio signal in the video stream	Audio is embedded in the video stream

13.5. Ports Menu - Transceiver 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.

13.5.1. TRX HDMI Input 2 Port

HDMI Input

The HDCP setting and information about the HDMI input 2 port are displayed:

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

Stream Output

The following settings and information is related to the video stream which is sent toward the remote TRX endpoint:

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

13.5.2. TRX HDMI Output 1 Port

Stream Input

The following settings and information are 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

13.5.3. TRX HDMI Output 2 Port

The following information is displayed for the local output port:

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

13.5.4. Overview

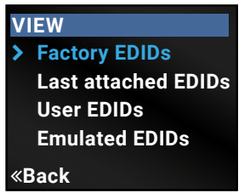
The current status of the local (L) and remote (R) input/output ports is summarized in the Overview menu. The icons display information about the port and the transmitted signals.

TIPS AND TRICKS: Press enter on the selected port for the settings and detailed status information.

Icon	Icon is blue (inactive)	Icon is white (active)
	Sink is **not** connected	Sink is connected
	Signal is **not** present	Signal is present
	Signal is **not** encrypted with HDCP	Signal is encrypted with HDCP
	No audio signal in the video stream	Audio is embedded in the video stream

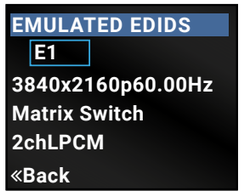
13.6. EDID Menu

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



13.6.1. View

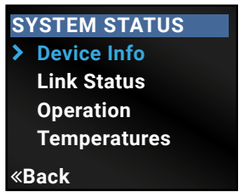
Select the desired EDID memory block: **Factory EDIDs**, **Last Attached EDIDs**, **User EDIDs**, or **Emulated EDIDs** (only in case of the transmitter). Select the Name item and press the knob. Use the jog dial to step between the EDIDs. The following information can be checked:



- Preferred Resolution
- Monitor Name
- Audio Info

13.7. System Status Menu

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



Device Info

Hardware- and software-related information are 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.

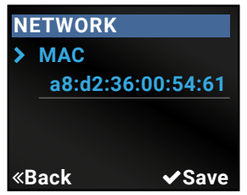
> **WARNING! If the front panel Status LED blinks, power off the device immediately.**

13.8. 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.

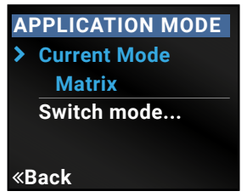
13.8.1. Network

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



13.8.2. 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.



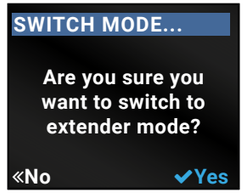
Follow the steps to change the application mode to Extender mode:

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

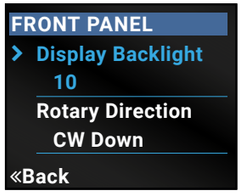
Step 2. Select the **Switch Mode...** option.

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

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



13.8.3. Front Panel



Display Backlight

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

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).

13.8.4. Reset Device

There is a possibility to reset the device. it results in a reboot only and DOES NOT reload the factory default settings.

13.8.5. Bootload Mode

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

Setting Back the Device to Normal Operation

Press the jog dial control knob for **3 seconds** for setting back the device to normal operation mode.

14

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 Lightware Device Controller - Matrix Mode.

- Establishing the Connection
- The Layout of the Built-in Web

System Requirements

Operating System: Microsoft Windows XP, Windows Vista, Windows 7, Windows 10, 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.

14.1. 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.

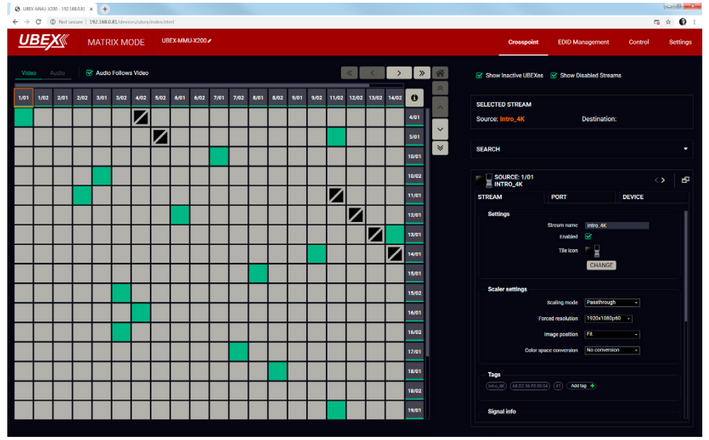
Step 2. Change to the desired IP settings if it needed.

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**).

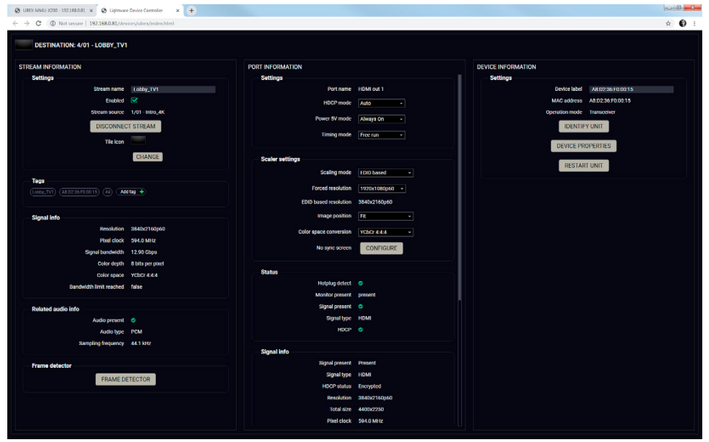
14.2. The Layout of the Built-in Web

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.

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



Built-in Web page displaying the Crosspoint menu



Built-in Web page displaying the Destination Port Properties Window

15

Lightware Device Controller - Matrix Mode

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.

- Install and Upgrade
- Running the LDC
- Establishing Connection
- Crosspoint Menu - Video Layer
- Crosspoint Menu - Audio Layer
- Search Field
- Default Naming / Numbering Explanation
- Video Source Port Properties Window
- Video Destination Port Properties Window
- Audio Port Properties Windows
- Device Properties Window - Transmitter Mode
- Device Properties Window - Receiver Mode
- Device Properties Window - Transceiver Mode
- Diagnostic Tools
- EDID Management Menu
- Control Menu
- Device Map
- MMU Settings
- Terminal Window

15.1. Install and Upgrade

INFO: After the installation, the Windows and the macOS application has the same look and functionality.

Installation for Windows OS

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

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

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

Comparison of installation types

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

Installation for macOS

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

Upgrading of LDC

Step 1. Run the application.

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

The current and the update version 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 the **About icon** and the **Update** button.

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

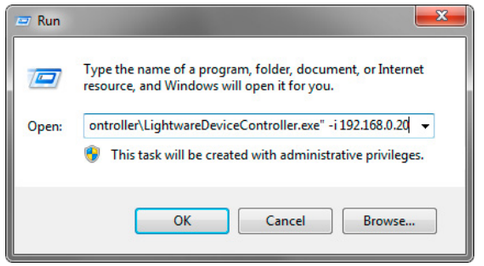
- If you do not want to check for the updates automatically, uncheck **the circle**, which contains the green tick.
- If you want to postpone the update, a reminder can be set with different delays from the **drop down list**.
- If the proxy settings traverse the update process, set the proper values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

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

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

15.2. Running the LDC

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



Connecting to a Device with Static IP Address

Format: `LightwareDeviceController -i <IP_address>:<port>`

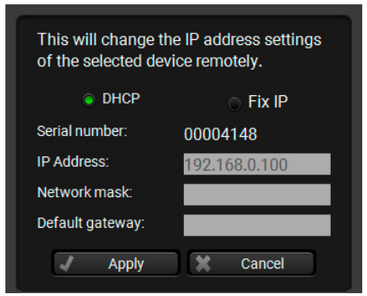
Example: `LightwareDeviceController -i 192.168.0.20:6107`

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.

15.3. 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.

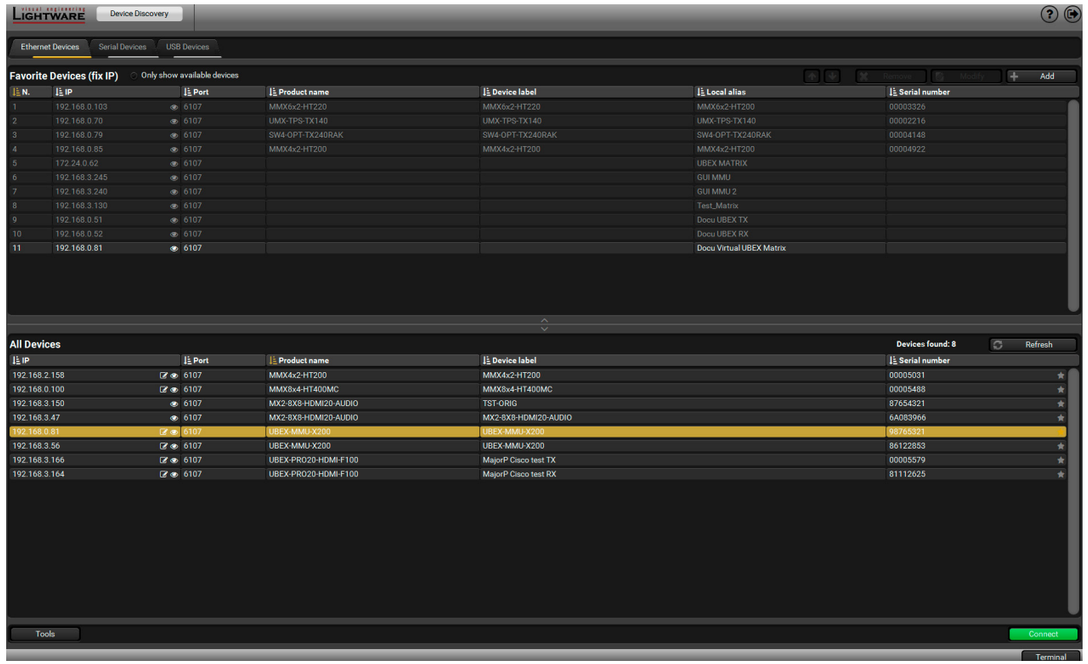


Change IP Address

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

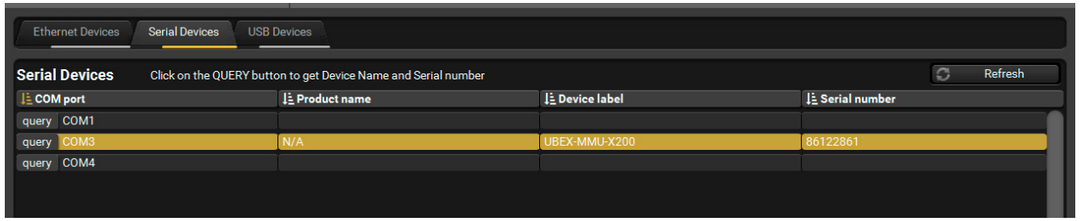
You can see the new settings only in this window.

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



Device discovery window in LDC

Step 3. Select the UBEX-MMU-X200 device from the discovered **Ethernet devices** or under **Serial devices**; when the device is connected through RS-232 click on the Query button next to the desired serial port to display the 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.



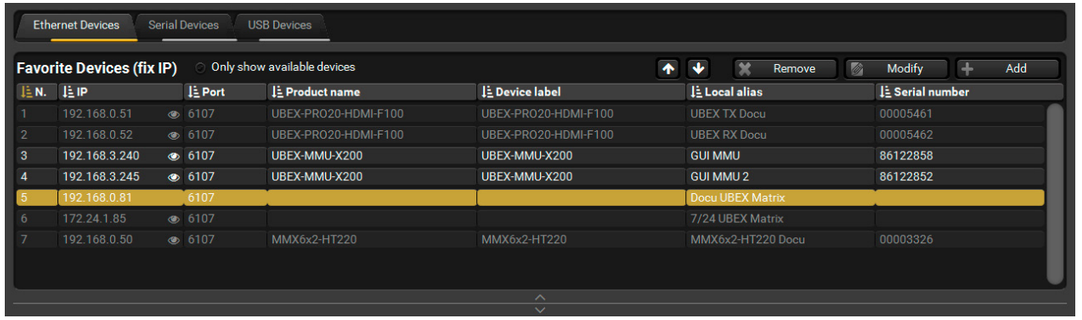
Serial devices tab

Favorite Devices (fix IP)

Clicking on the grey star icon beside of the discovered devices the most used units can be saved to the Favorite devices.

ATTENTION! The devices set with static (fix) IP address only can be saved as favorite device.

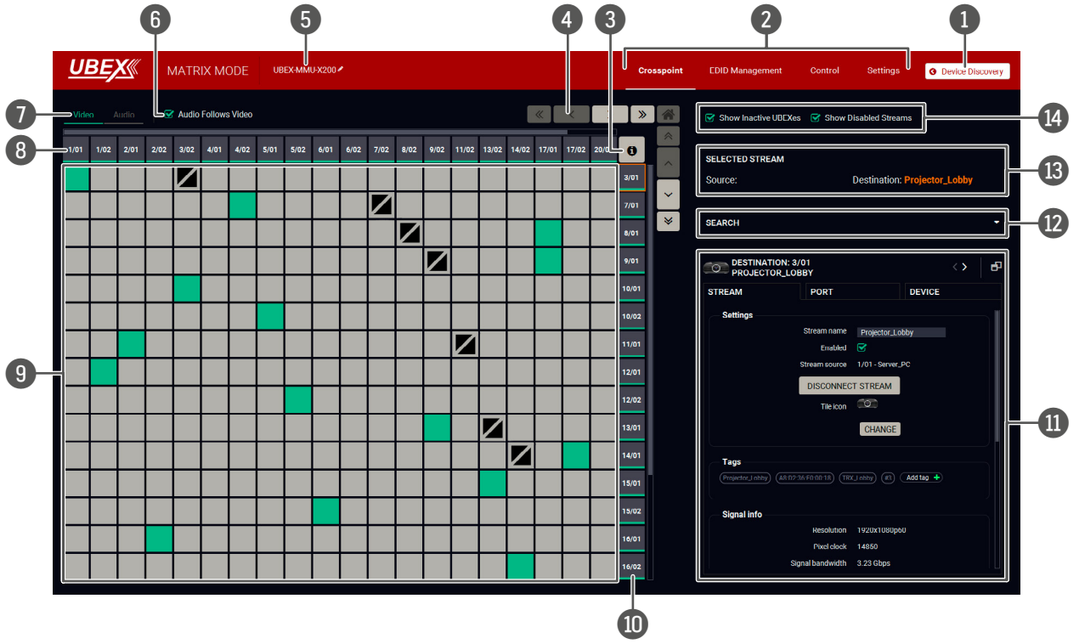
Once the device is set as favorite, the star icon will be highlighted with yellow and the device will be displayed between the Favorite Devices (fix IP) window section.



Favorite Devices window section

15.4. Crosspoint Menu - Video Layer

15.4.1. Grid View



The grid view of the crosspoint menu - Video layer in Matrix mode

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 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, and **Settings menu**) 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 **Crosspoint tile legend** Clicking on the button makes the tile legend window opens.

4 **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.

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 **Audio follows video switcher** The explanation of the two available options are the following:

- **Enabled**: the audio stream follows the video stream when the video crosspoint is changed. Beside of 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.

7 **Layer tabs** The **video** and the **audio** crosspoint panel can be selected on the tabs.

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 **Connections** The crosspoint connections can be selected in this table.

◪ 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.

10 **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.

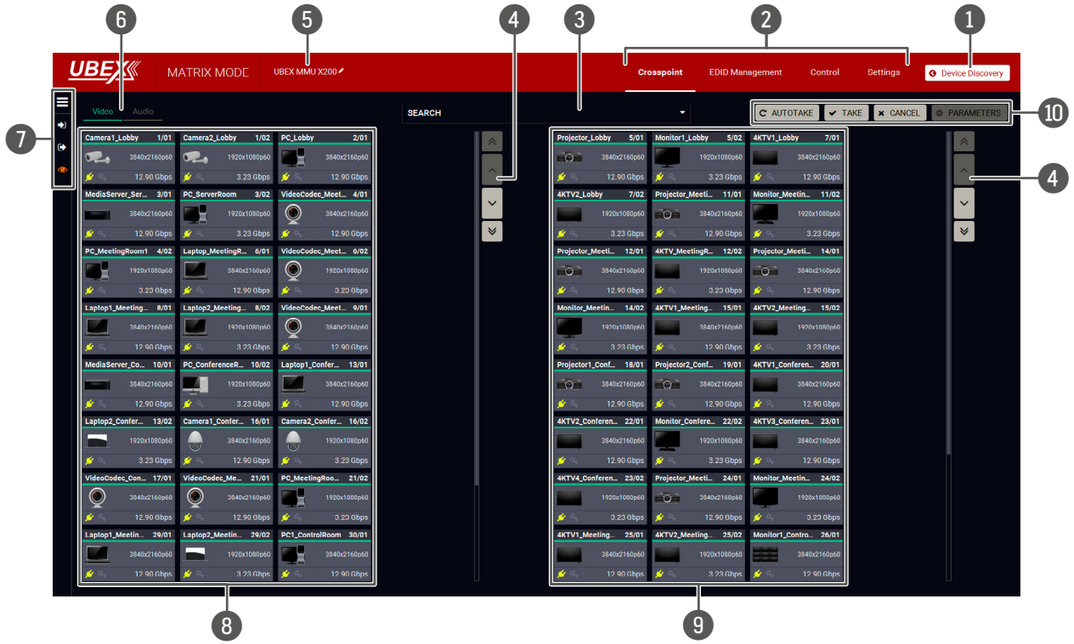
11 **Properties window** The properties, available settings, and status information of the selected source or destination are displayed in this section. Three tabs are available: **Stream**, **Port**, and **Device**. Clicking on the 🗗 icon the properties section opens in new window. See more details 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.

12 **Search field** Streams, ports, and devices can be searched in the field. See the details in the Search Field section.

13 **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.

14 **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.

15.4.2. Tile View



The tile view of the crosspoint menu - Video layer in Matrix mode

The Concept

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, and **Settings menu**) 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 **Search field** Streams, ports, and devices can be searched in the field. See the details in the Search Field section.

4 **Navigation buttons** Clicking on the navigation buttons shows the available sources/destinations and crosspoints which cannot be displayed within the recent window size.

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.

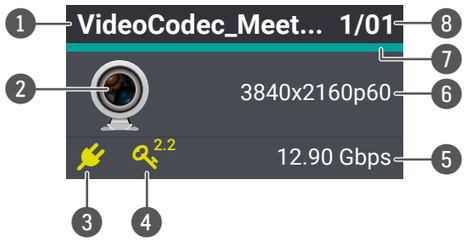
9 **Destination streams** Each tile represents an output port of a receiver or transceiver. See the explanation of the destination numbering in the Source and Destination Numbering section.

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

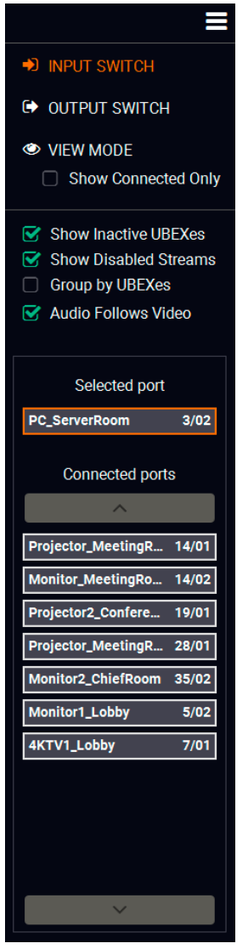
The port tiles and the colors of the displayed icons represent different states and information.



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**
   - Signal is encrypted with HDCP 2.2.
   - 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. Beside of 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.

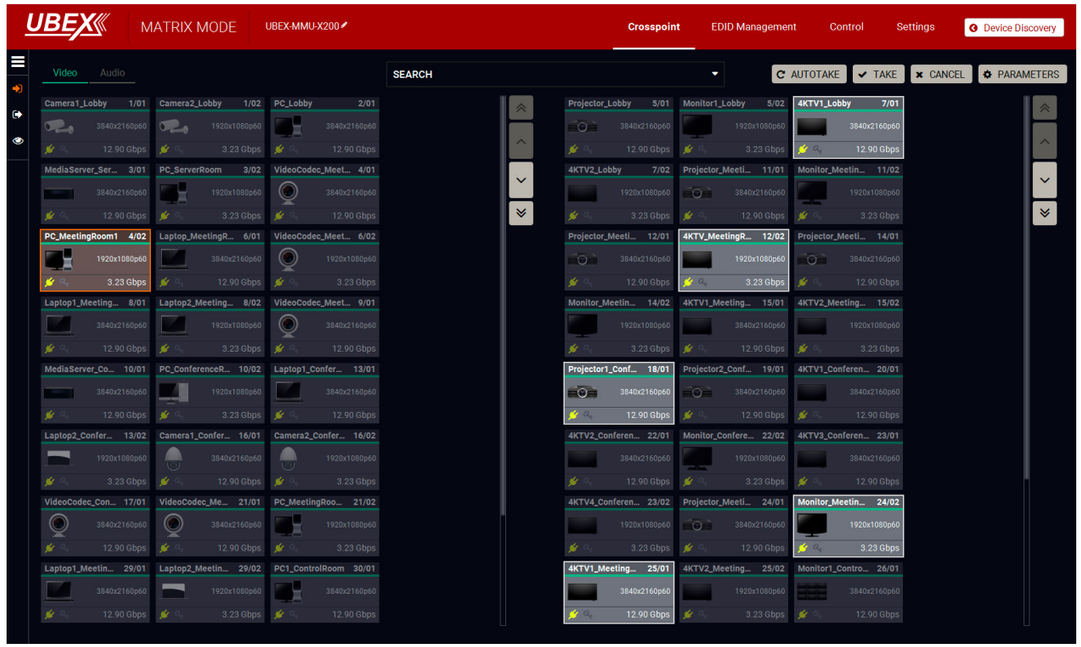
Connections

- **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

Step 1. Press the desired **Input switch** or **Output switch** button to select the switching mode.

Step 2. Select the desired port; it will be highlighted with orange color and displayed also in the **Selected port** section on the left.

Step 3. Connected ports are highlighted with white color and displayed also in the **Connected ports** section on the left.

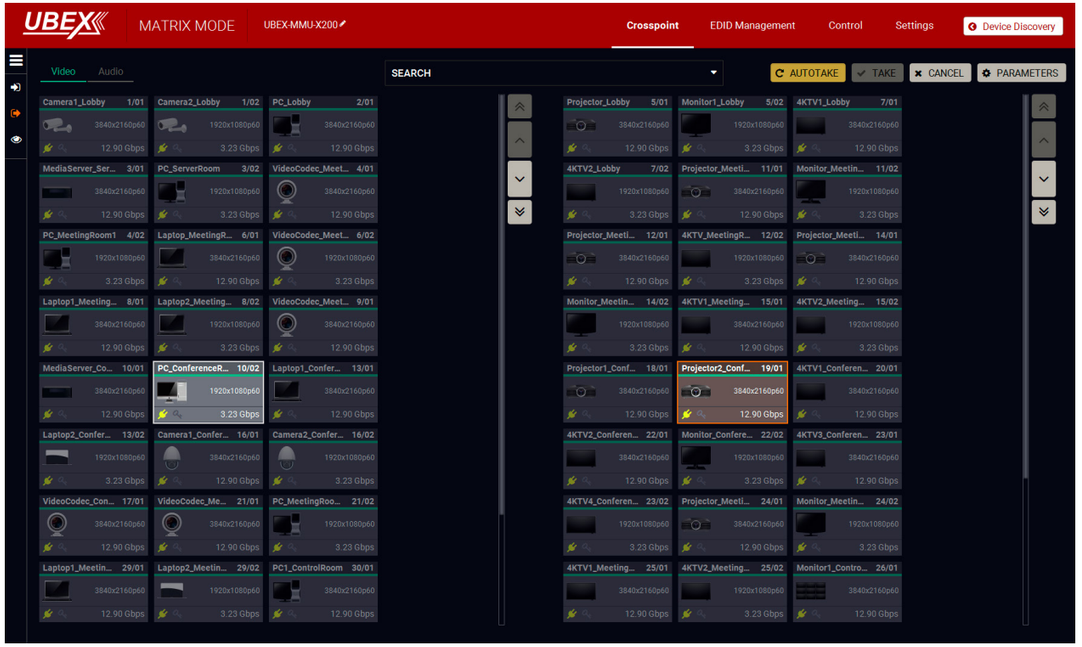
Step 4. Create the desired crosspoint settings by selecting/deselecting the ports; they will start to blink.

Step 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 change 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

Step 1. Press the desired **Input switch** or **Output switch** button to select switching mode.

Step 2. Select the desired port; it will be highlighted with orange color and displayed also in the **Selected port** section on the left.

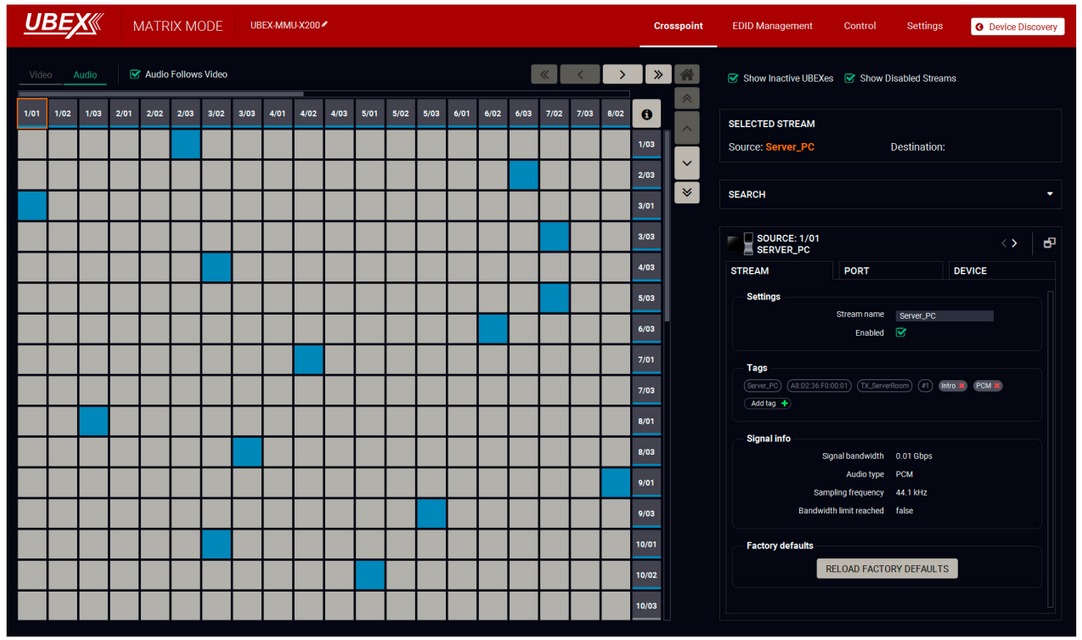
Step 3. Connected ports are highlighted with white color and displayed also in the **Connected ports** section on the left.

Step 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 change the Take/Autotake mode state.

15.5. Crosspoint Menu - Audio Layer

15.5.1. 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.

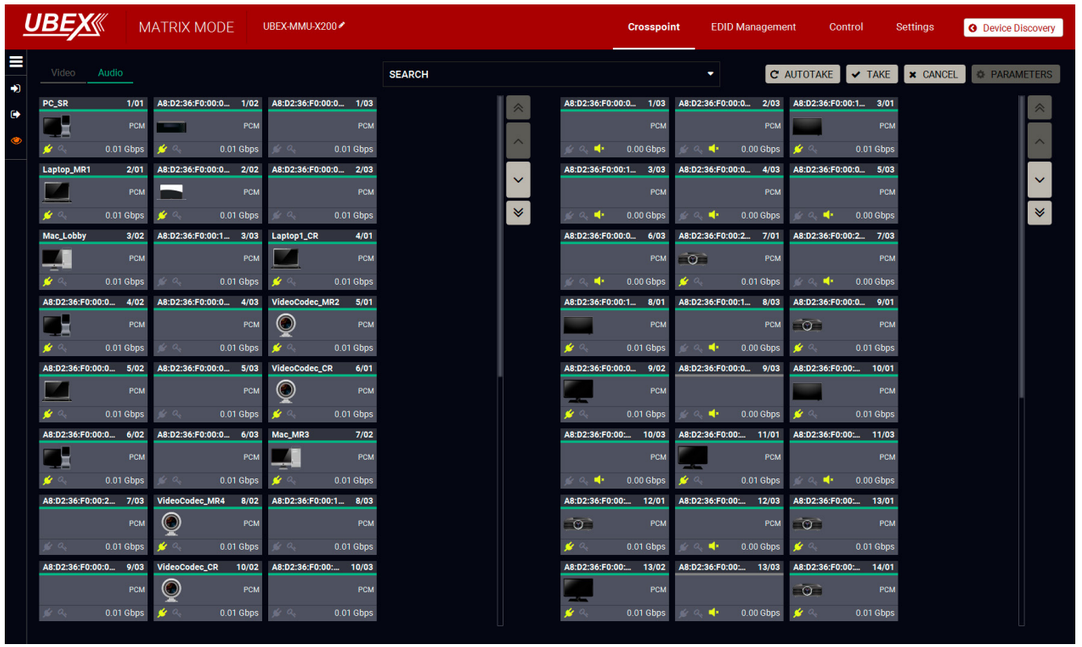
Clicking on the source or the destination port the properties panel opens on the right side - all audio related information and options are available here. Tags are also attached to the audio stream. See the details about the available settings in the Audio Port Properties Windows section.

> 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.

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. Beside of 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.

15.5.2. Tile View



The tile view of the crosspoint menu - Audio 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. See the details about the available settings in the Audio Port Properties Windows section.

15.6. Search Field

15.6.1. 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.

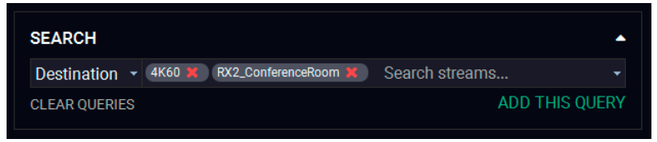
Step 2. Type the name of stream or device. The hints will be appeared in the list.

The Search field

Step 3. Select the desired tag / stream name / device name. The crosspoint table will be filtered to the ports containing the searched text.

The crosspoint view before and after the search

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.



The Search field with more keywords

ATTENTION! The saved queries will be cleared after closing the LDC application.

15.6.2. 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:

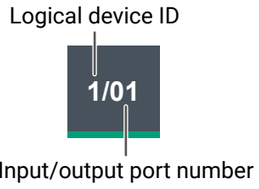
- **Video crosspoint - Grid view / Tile view**
  - Video streams
  - Video ports
  - Endpoint Devices
- **Audio crosspoint - Grid view / Tile view**
  - Audio streams
  - Audio ports
  - Endpoint Devices
- **Control menu - Ethernet**
  - Ethernet ports
  - Endpoint devices
- **Control menu - RS-232**
  - 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.

15.7. Default Naming / Numbering Explanation

The following section explains the default numbering of the sources/ destinations and the default stream names of the endpoint devices.

15.7.1. 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.

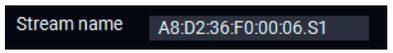
15.7.2. Default Naming of the Devices and the Streams

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.

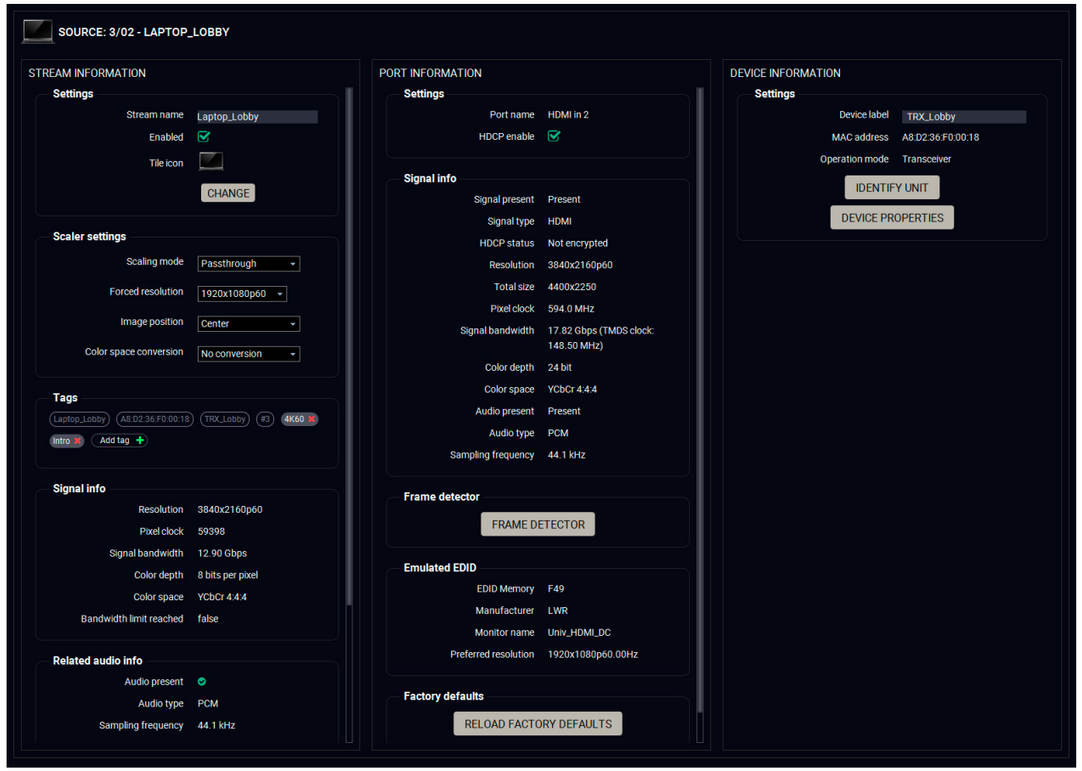


Example: A8:D2:36:F0:00:33.S1

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.

15.8. 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.



Video source port properties window

15.8.1. 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.

Scaler / Frame Rate Converter Settings

- **Scaling mode / Output resolution 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 on the video signal;
- **Forced resolution**: list of the available resolutions with refresh rate values. The selected one will be applied on the video signal. See the available resolution in the Resolutions of the Scaler / FRC section.
- **Image position** (Stretch / Fit / Center)

> INFO: The image position setting (scaler) is available at the HDMI in 1 port only.

- **Color space conversion** (No conversion / RGB / YUV 4:4:4 / YUV 4:2:2).

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 current stream after a possible rescaling / frame rate conversion.
- **Reloading factory default settings** for the selected port.

15.8.2. Port Information

The most important information and settings of the input port are available in the Port information section.

Settings

- **HDCP setting** (Enable / Disable)

Signal Info

All important audio and video information (e.g. HDCP status, resolution, total size, pixel clock, color space, embedded audio information, e.g.) 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.
- **Reloading factory default settings** for the selected port.

15.8.3. Device Information

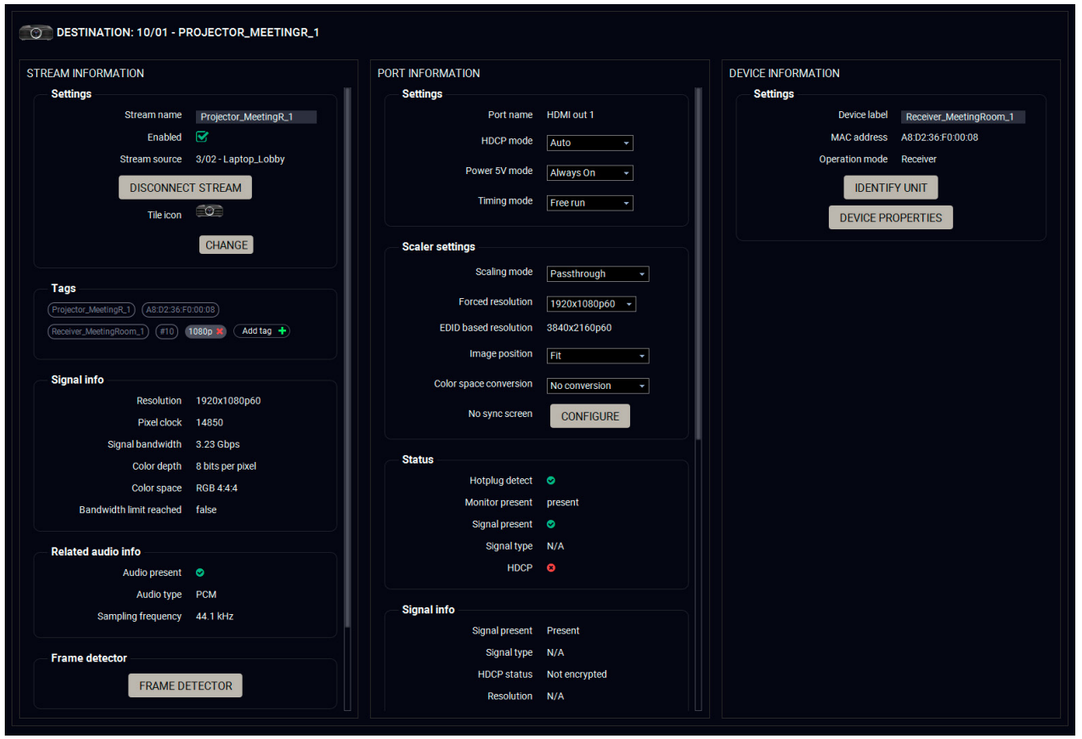
The most important information and settings of the transmitter are available in the Device information section.

Settings

- **Device label**: the default label is the MAC address of the device but it can be changed to any unique name.
- 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.
- **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. See the details:
  - For Transmitter (TX) operation mode in the Device Properties Window - Transmitter Mode section.
  - For Transceiver (TRX) operation mode in the Device Properties Window - Transceiver Mode section.

15.9. 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

15.9.1. 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 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.
- **Reloading factory default settings** for the selected port.

15.9.2. Port Information

The most important information and settings of the input port are available in the Port information section.

Settings

- **HDCP mode** (Auto / Always);
- **Power 5V mode** (Auto / Always on / Always off);
- **Timing mode** (Free run / Source locked)

Scaler / Frame Rate Converter Settings

- **Scaling mode / Output resolution 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 on the video signal;
  - EDID based: the scaler forces the resolution which 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 on the video signal. See the available resolution in the Resolutions of the Scaler / FRC section.
- EDID based resolution: the resolution which is read out from the EDID of the connected sink device.
- **Image position** (Stretch / Fit / Center);

INFO: The image position setting (scaler) is available at the HDMI out 1 port only.

- **Color space conversion** (No conversion / RGB / YUV 4:4:4 / YUV 4:2:2);
- No Sync Screen (Test Pattern).

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.
- **Reloading factory default settings** for the selected port.

15.9.3. Device Information

The most important information and settings of the transmitter are available in the Device information section.

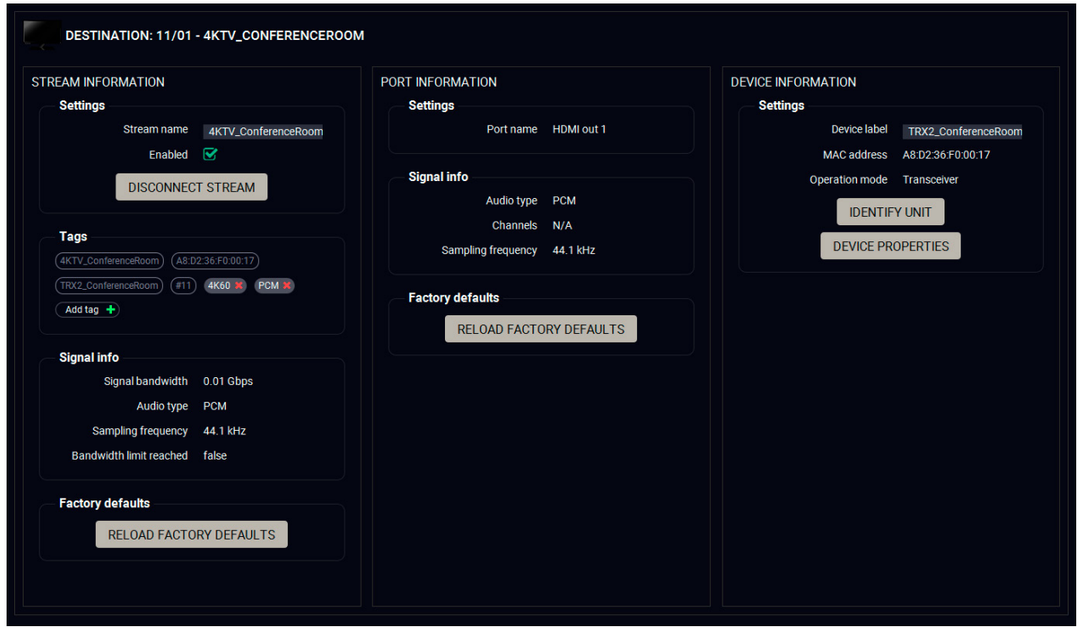
Settings

- **Device label**: the default label is the MAC address of the device but it can be changed to any unique name.
- **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. See the details:
  - For Receiver (RX) operation mode in the Device Properties Window - Receiver Mode section.
  - For Transceiver (TRX) operation mode in the Device Properties Window - Transceiver Mode section.

15.10. Audio Port Properties Windows

15.10.1. HDMI Source / 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 destination port properties window

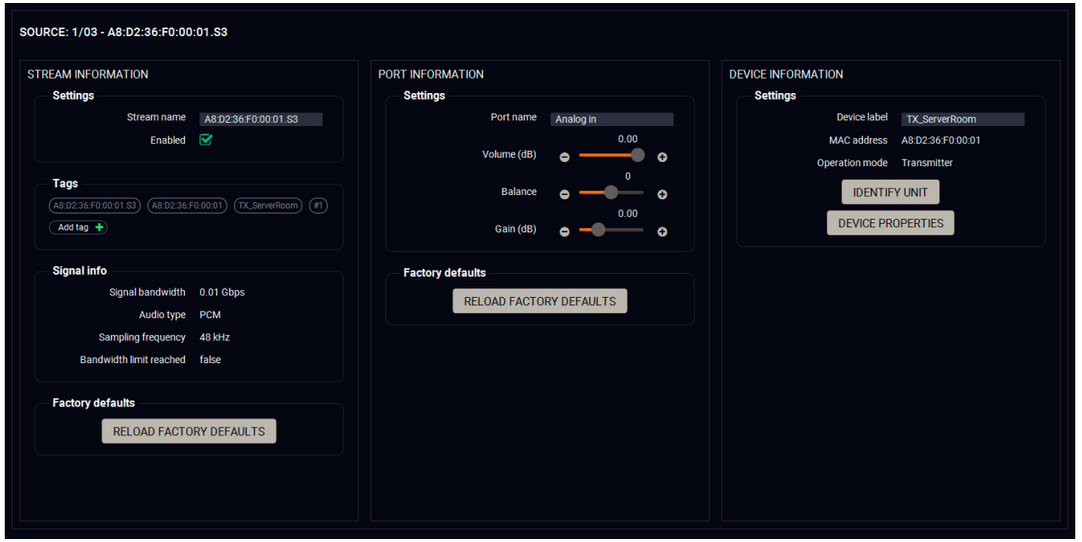
The most important signal information is available on the panel.

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** (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.
- **Reloading factory default settings** for the selected port.
- **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.

15.10.2. 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.

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 -1%, the ⊕ icon results +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 -1, the ⊕ icon results +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 -1 dB, the ⊕ icon results +1 dB in the gain setting. The default value is 0 dB.
- **Reloading factory default settings** for the selected port.
- **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.

15.10.3. 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

The most important signal information is available on the panel.

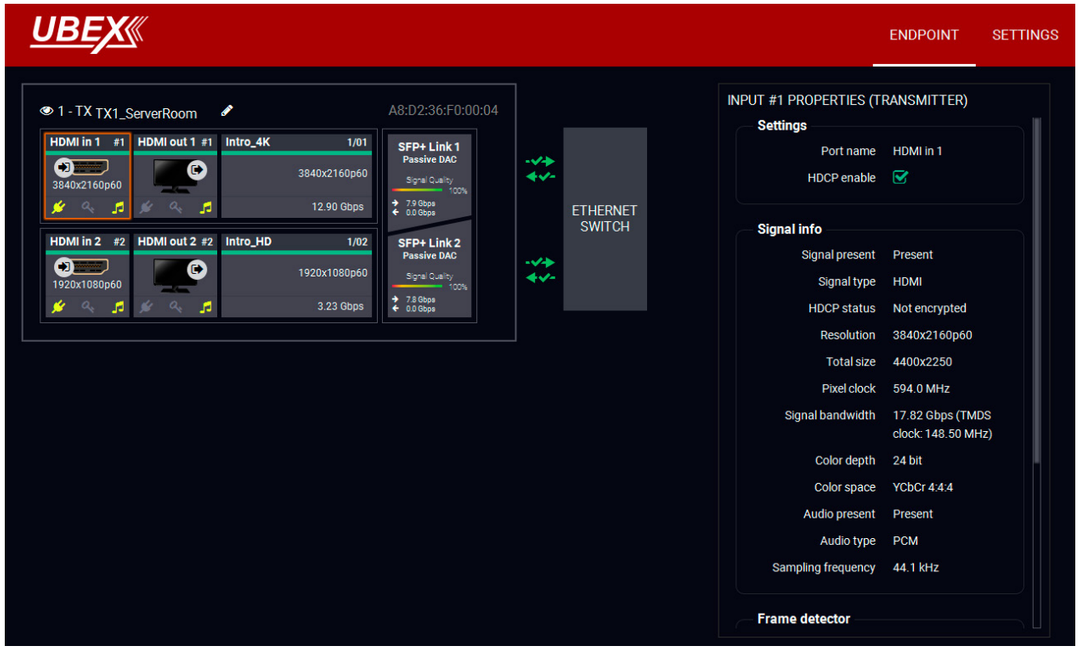
Settings and Tools

- **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 -1%, the ⊕ icon results +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 -1, the ⊕ icon results +1 in the balance setting. The default value is 0 (center).
- **Mute**: enable or disable the muting of the output port.
- **Reloading factory default settings** for the selected port.
- **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.

15.11. Device Properties Window - Transmitter Mode

15.11.1. 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.



Endpoint tab of the Device properties window - Transmitter - Input port properties

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.
- **Reloading factory default settings** for the selected port.

15.11.2. HDMI Output Ports

INFO: The properties panel belongs to the local HDMI outputs of the transmitter.

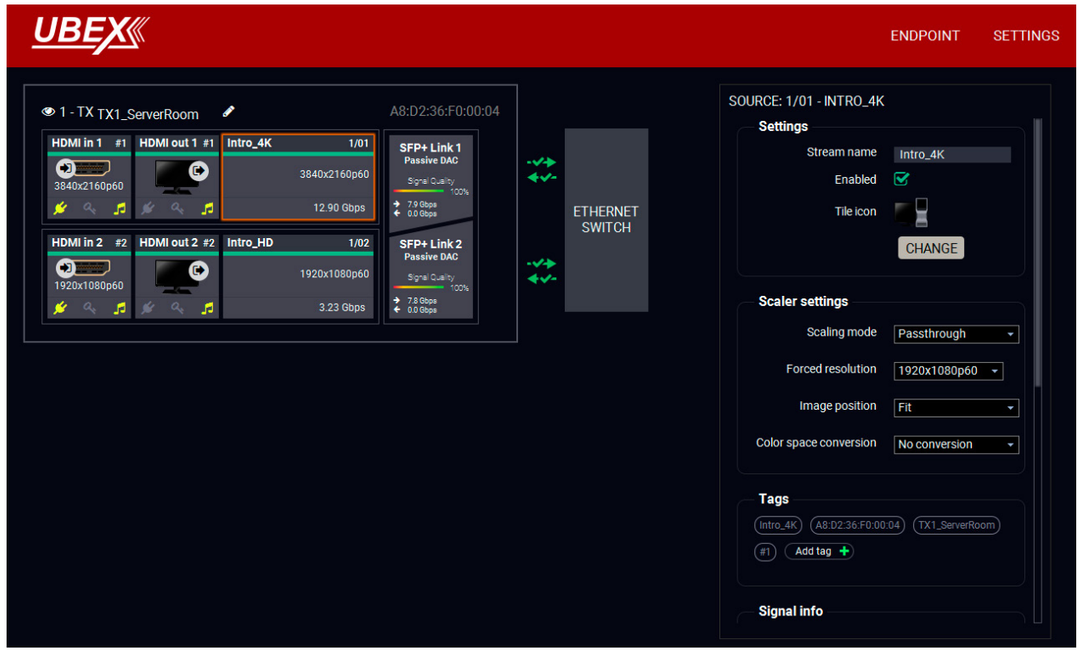
Clicking on the HDMI output 1 or 2 port icon results in opens the Port properties. The most important signal and display information and settings are available from the panel.

Available Settings and Tools

- **HDCP mode** (Auto / Always);
- **Power 5V mode** (Auto / Always on / Always off);
- Frame Detector - The tool displays the frame information of the original stream coming from the input port before a possible rescaling / frame rate conversion.
- **Reloading factory default settings** for the selected port.

15.11.3. Stream Properties Panels

Clicking on the Stream 1 or Stream 2 panels on the transmitter side opens the properties of the video input streams. The most important signal information and settings are available from the panel.



Endpoint tab of the Device properties window - Transmitter - 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.

Tags

Unique and configurable tags can be attached to the stream for the best identification. The tags are searchable in the Search Field.

Scaler Settings (only for the Stream of the HDMI in 1)

- **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 on the video signal;
- **Forced resolution**: list of the available resolutions with refresh rate values. The selected one will be applied on the video signal. See the available resolution in the Resolutions of the Scaler / FRC section.
- **Image position** (Stretch / Fit / Center)
- **Color space conversion** (No conversion / RGB / YUV 4:4:4 / YUV 4:2:2).

Frame Rate Converter Settins (only for the Stream of the HDMI in 2)

- **Output resolution mode**:
  - Passthrough: the FRC is in pass-through mode.
  - Forced resolution: the FRC is active, the selected value in the forced resolution option will be applied on the video signal;
- **Forced resolution**: list of the available resolutions with refresh rate values. The selected one will be applied on the display device. See the available resolution in the Resolutions of the Scaler / FRC section.
- **Color space conversion** (No conversion / RGB / YUV 4:4:4 / YUV 4:2:2);

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.
- **Reloading factory default settings** for the selected port.

15.11.4. 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.

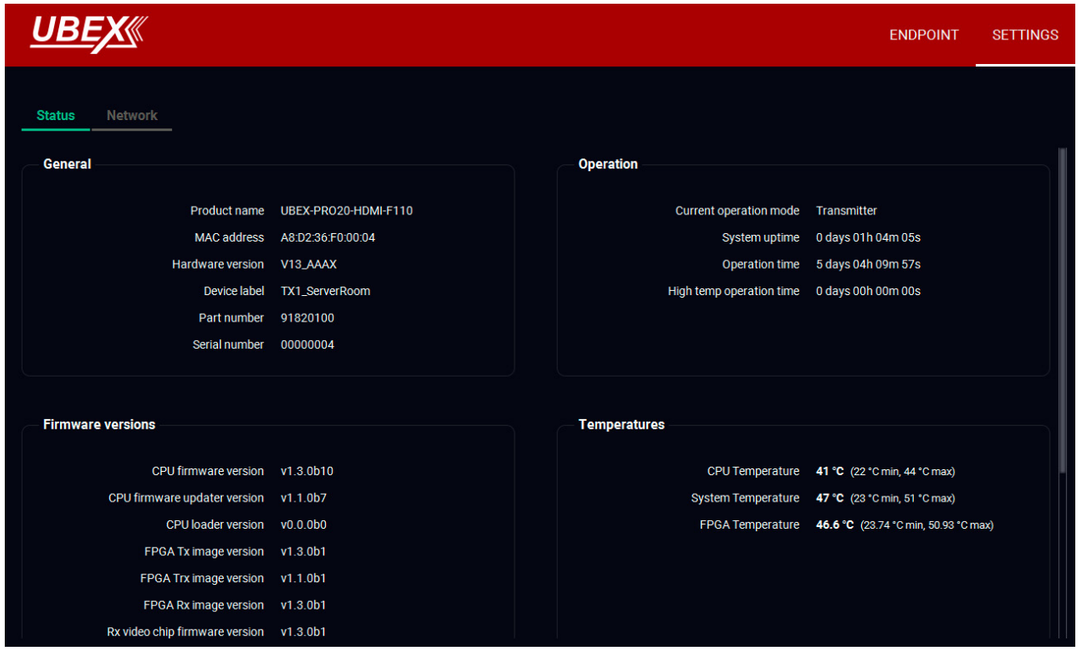
15.11.5. Link Aggregation Status Indicator

Icon	Description
	SFP+ connection is established successfully and the link aggregation is working successfully.
	Waiting for the link aggregation.
	No connection is established between the SFP+ links.

INFO: You can find possible causes and solution suggestions in the Troubleshooting - Matrix Mode chapter in the case of no connection or link aggregation problems.

15.11.6. 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.

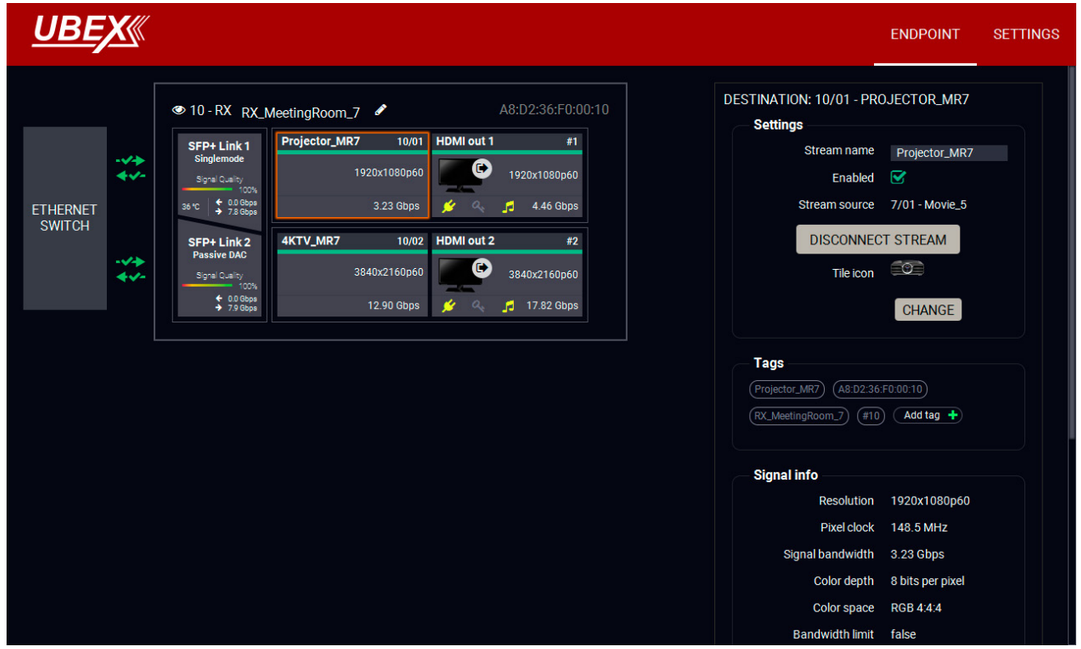
IP address and DHCP settings can be set on this tab. Always press the **Apply settings** button to save changes.

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.

15.12. Device Properties Window - Receiver Mode

15.12.1. 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.



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.

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

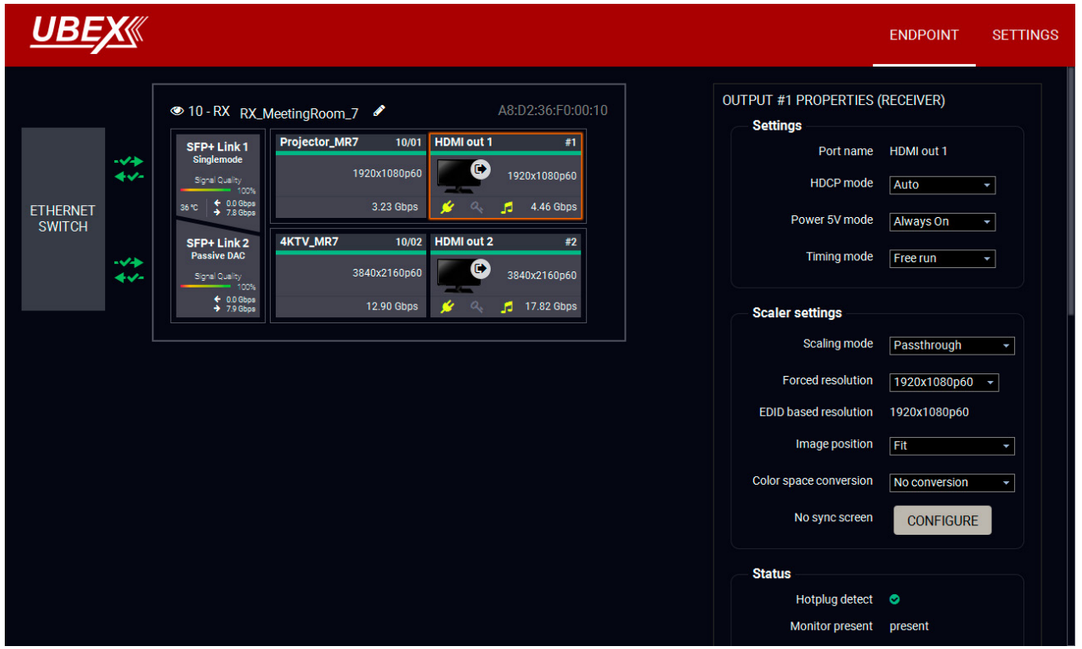
Information (presence, audio type, sampling frequency) of the embedded audio is available in the related audio info section.

Tools

- Frame Detector - The tool displays the frame information of the transmitted stream after a possible rescaling / frame rate conversion.
- **Reloading factory default settings** for the selected port.

15.12.2. 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.



Endpoint tab of the Device properties window - Receiver - Output port properties

Settings

- **HDCP mode** (Auto / Always);
- **Power 5V mode** (Auto / Always on / Always off);
- **Timing mode** (Free run / Source locked)

Scaler Settings (only for the HDMI out 1)

- **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 on the video signal;
  - EDID based: the scaler forces the resolution which 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 on the video signal. See the available resolution in the Resolutions of the Scaler / FRC section.
- EDID based resolution: the resolution which is read out from the EDID of the connected sink device.
- **Image position** (Stretch / Fit / Center);
- **Color space conversion** (No conversion / RGB / YUV 4:4:4 / YUV 4:2:2);
- No Sync Screen (Test Pattern).

Frame Rate Converter Settings (only for the HDMI out 2)

- **Output resolution 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 on the video signal;
  - EDID based: the scaler forces the resolution which 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 on the video signal. See the available resolution in the Resolutions of the Scaler / FRC section.
- EDID based resolution: the resolution which is read out from the EDID of the connected sink device.
- **Color space conversion** (No conversion / RGB / YUV 4:4:4 / YUV 4:2:2);
- No Sync Screen (Test Pattern).

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.
- **Reloading factory default settings** for the selected port.

15.12.3. 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.

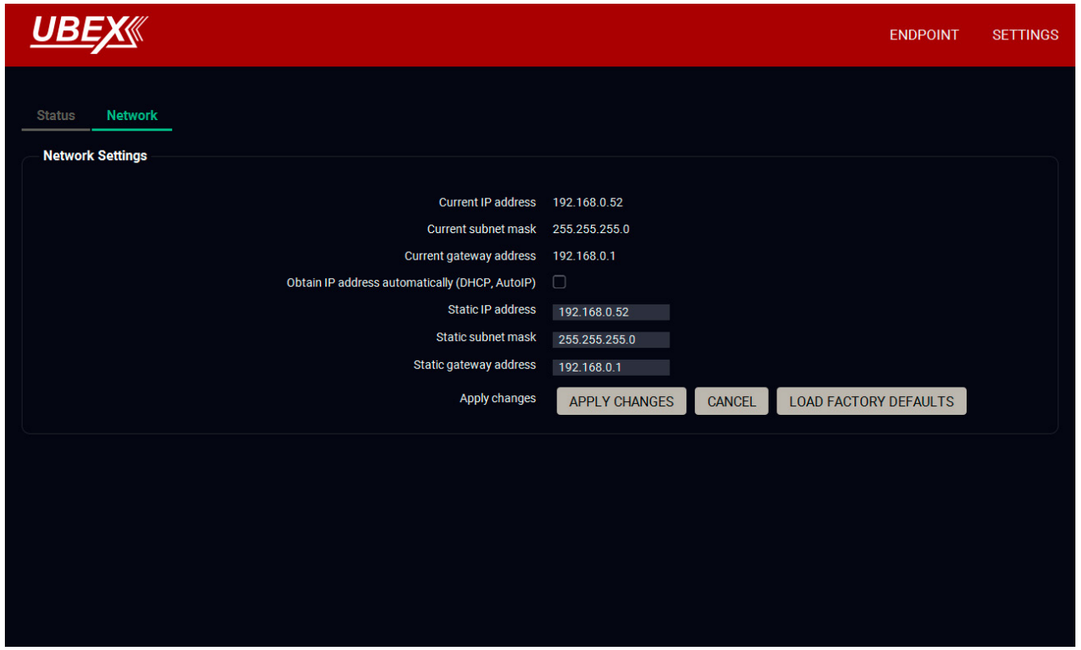
15.12.4. Link Aggregation Status Indicator

Icon	Description
	SFP+ connection is established successfully and the link aggregation is working successfully.
	Waiting for the link aggregation.
	No connection is established between the SFP+ links.

INFO: You can find possible causes and solution suggestions in the Troubleshooting - Matrix Mode chapter in the case of no connection or link aggregation problems.

15.12.5. 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.

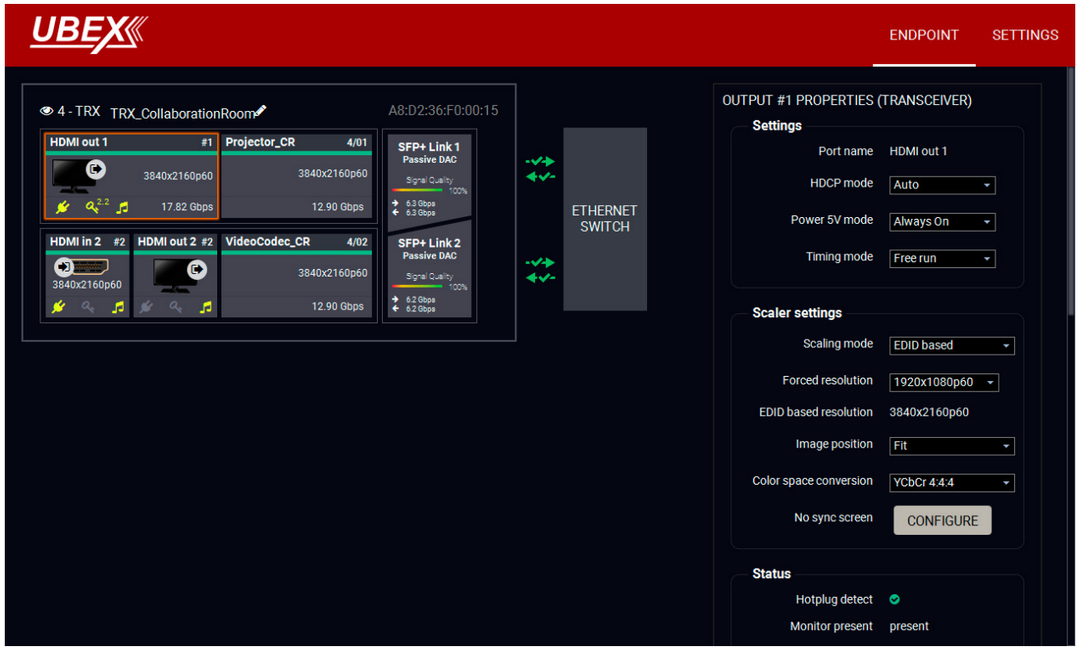
IP address and DHCP settings can be set on this tab. Always press the Apply settings button to save changes.

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.

15.13. Device Properties Window - Transceiver Mode

15.13.1. 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.



Endpoint tab of the Device properties window - Transceiver - Output port properties

Settings

- **HDCP mode** (Auto / Always);
- **Power 5V mode** (Auto / Always on / Always off);
- **Timing mode** (Free run / Source locked)

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 on the video signal;
  - EDID based: the scaler forces the resolution which 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 on the video signal. See the available resolution in the Resolutions of the Scaler / FRC section.
- EDID based resolution: the resolution which is read out from the EDID of the connected sink device.
- **Image position** (Stretch / Fit / Center);
- **Color space conversion** (No conversion / RGB / YUV 4:4:4 / YUV 4:2:2);
- No Sync Screen (Test Pattern).

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

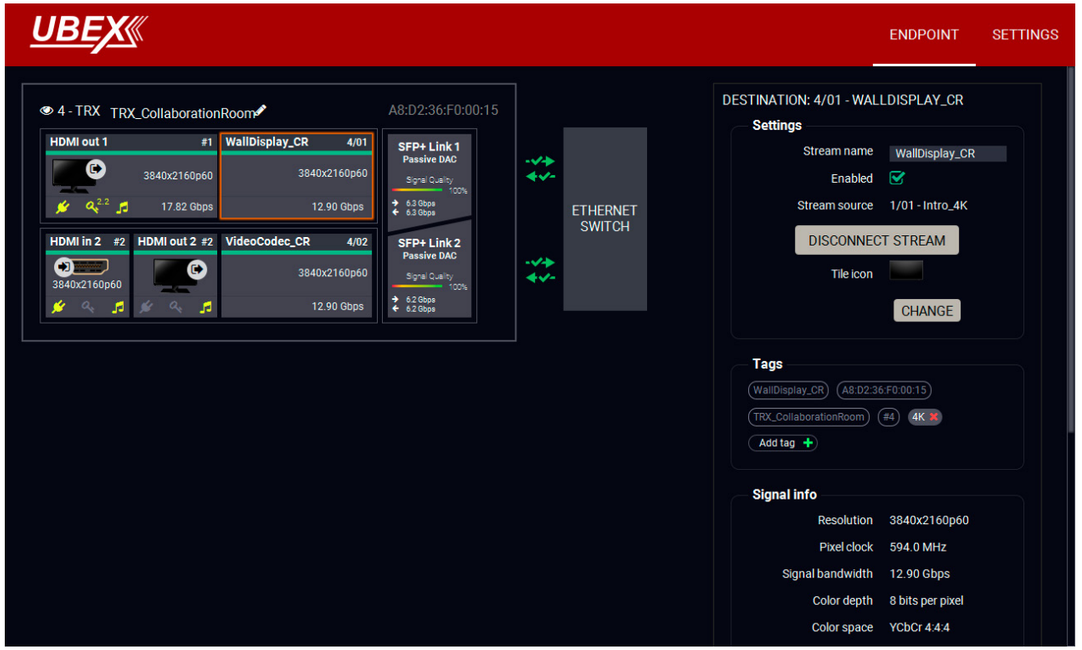
All related information about the sink device connected to the output port.

Tools

- Frame Detector - The tool displays the frame information of the transmitted stream after a possible rescaling / frame rate conversion.
- **Reloading factory default settings** for the selected port.

15.13.2. 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

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

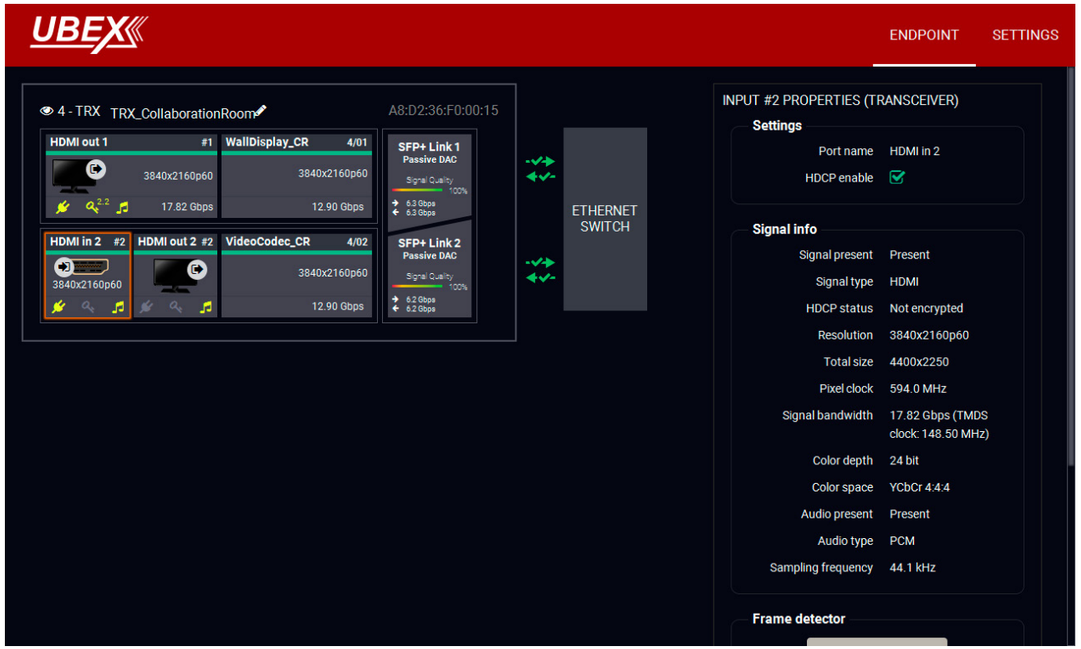
Information (presence, audio type, sampling frequency) of the embedded audio is available in the related audio info section.

Tools

- Frame Detector - The tool displays the frame information of the transmitted stream after a possible rescaling / frame rate conversion.
- **Reloading factory default settings** for the selected port.

15.13.3. 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.



Endpoint tab of the Device properties window - Transceiver - Input port properties

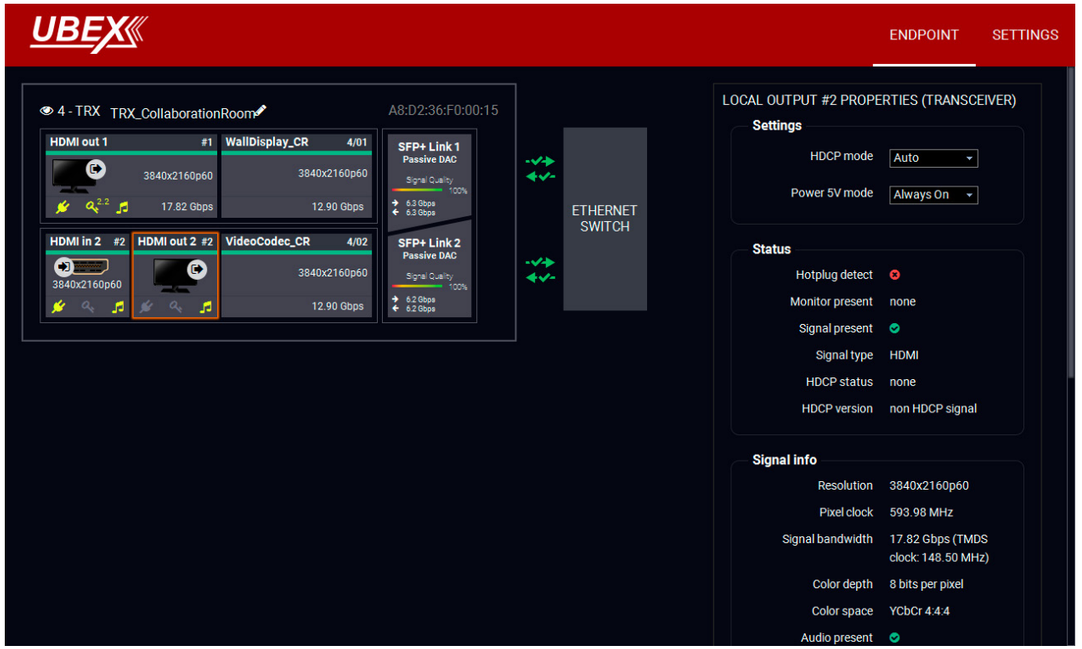
Available Settings and Tools

- **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.
- **Reloading factory default settings** for the selected port.

15.13.4. 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.



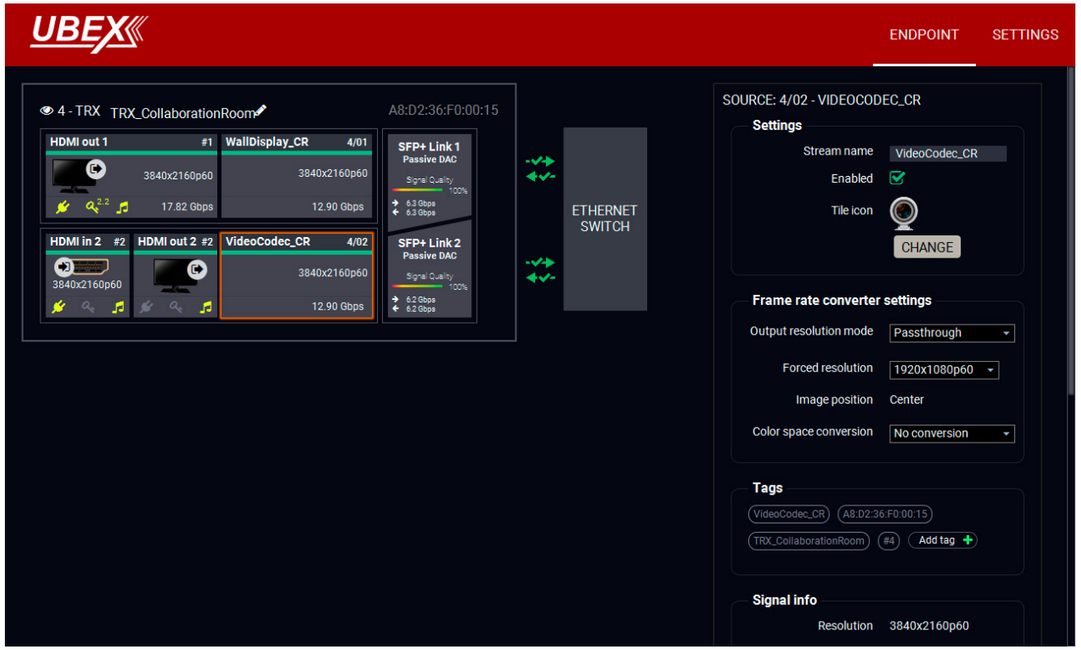
Endpoint tab of the Device properties window - Transceiver - Local output port properties

Available Settings and Tools

- **HDCP mode** (Auto / Always);
- **Power 5V mode** (Auto / Always on / Always off);
- Frame Detector - The tool displays the frame information of the original stream coming from the input port before a possible rescaling / frame rate conversion.
- **Reloading factory default settings** for the selected port.

15.13.5. 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.

Tags

Unique and configurable tags can be attached to the stream for the best identification. The tags are searchable in the Search Field.

Frame Rate Converter Settins

- **Output resolution mode**:
  - Passthrough: the FRC is in pass-through mode.
  - Forced resolution: the FRC is active, the selected value in the forced resolution option will be applied on the video signal;
- **Forced resolution**: list of the available resolutions with refresh rate values. The selected one will be applied on the display device. See the available resolution in the Resolutions of the Scaler / FRC section.
- **Color space conversion** (No conversion / RGB / YUV 4:4:4 / YUV 4:2:2);

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.
- **Reloading factory default settings** for the selected port.

15.13.6. 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.

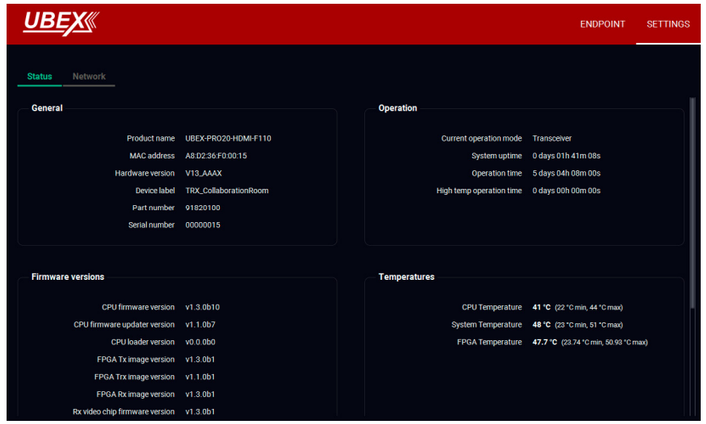
15.13.7. Link Aggregation Status Indicator

Icon	Description
	SFP+ connection is established successfully and the link aggregation is working successfully.
	Waiting for the link aggregation.
	No connection is established between the SFP+ links.

INFO: You can find possible causes and solution suggestions in the Troubleshooting - Matrix Mode chapter in the case of no connection or link aggregation problems.

15.13.8. Settings Tab

Clicking on the Settings menu opens the settings panel of the endpoint.



Settings tab of the Device properties window - TRX - 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.

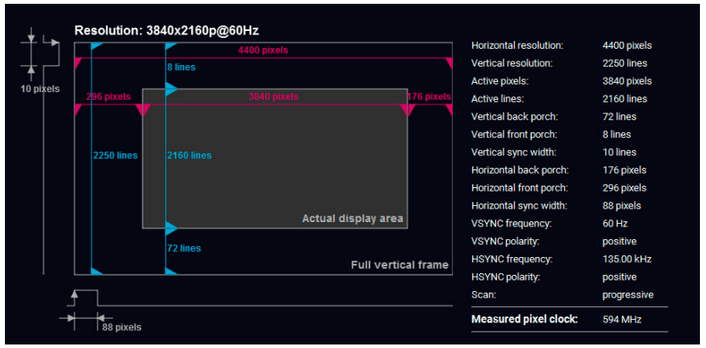
IP address and DHCP settings can be set on this tab. Always press the Apply settings button to save changes.

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.

15.14. Diagnostic Tools

15.14.1. 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 **Frame detector** button.



Frame detector window

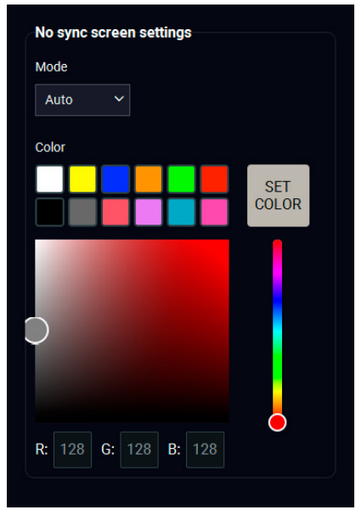
Lightware's Frame Detector function works like a signal analyzer and allows to determine the exact video format that is present on the port, thus it helps to identify various problems. E.g. actual timing parameters may differ from the expected and this may cause some displays to drop the picture.

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). 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.

15.14.2. No Sync Screen (Test Pattern)

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

Mode



- **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.

Color

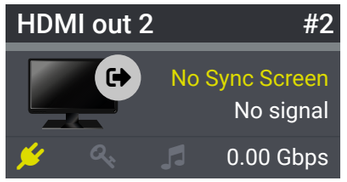
Three ways are available to set the no sync screen color:

- 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

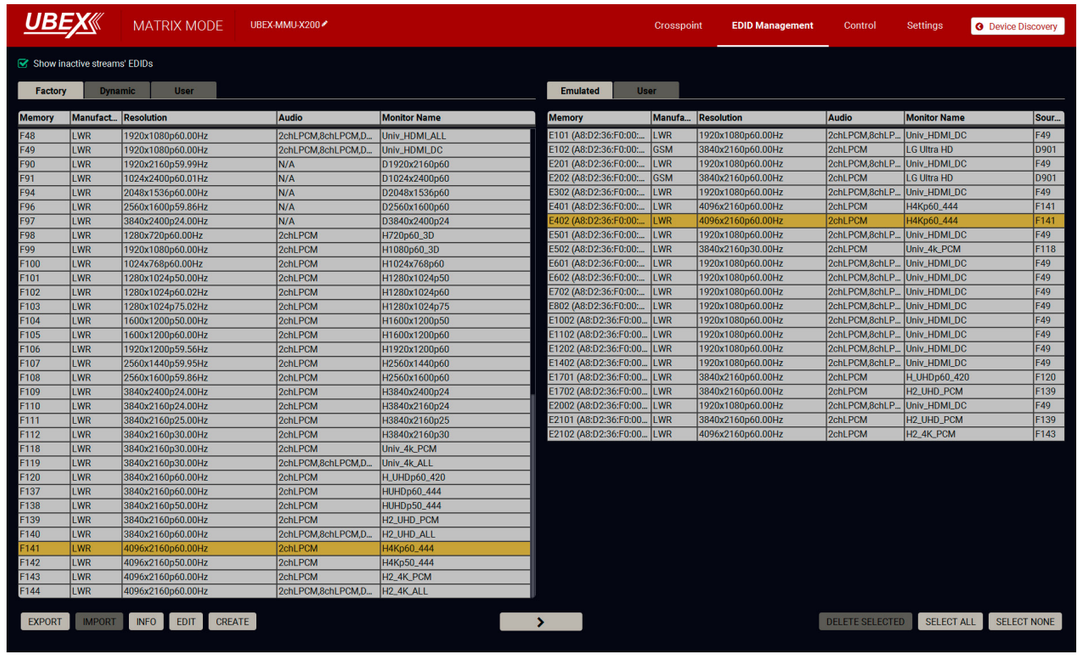
The port tile of the HDMI outputs displays when No sync screen mode is active.



> INFO: No sync screen will be active in the case of connected sink device to the output port only.

15.15. 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.



EDID Management menu

Control Buttons

EXPORT	Exporting an EDID (save to a file)	>	Transfer button: executing EDID emulation or copying
IMPORT	Importing an EDID (load from a file)	DELETE SELECTED	Deleting EDID (from User memory)
INFO	Display EDID Summary window	SELECT ALL	Selecting all memory places in the right panel
EDIT	Opening Advanced EDID Editor with the selected EDID	SELECT NONE	Selecting none of the memory places in the right panel
CREATE	Opening Easy EDID Creator		

15.15.1. 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

EXPORT

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

IMPORT

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)

DELETE SELECTED

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

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

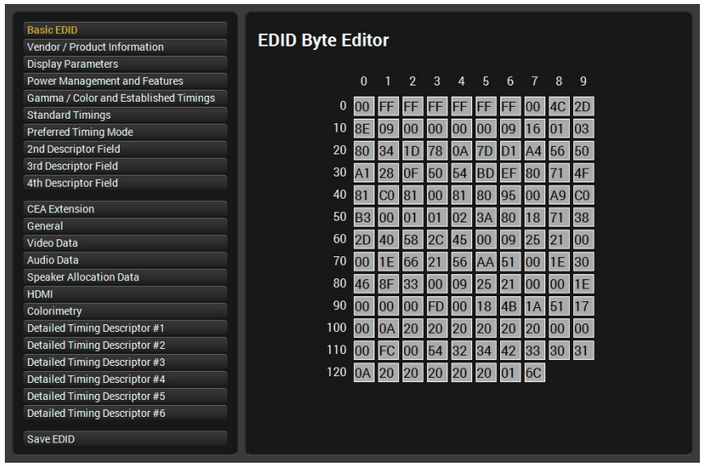
Step 2. Select the desired **memory** slot(s); one or more can be selected (“Select All” and “Select None” buttons can be used). The EDID(s) will be highlighted with yellow.

Step 3. Press the **Delete selected** button to delete the EDID(s).

15.15.2. Editing an EDID

EDIT

Select an EDID from Source panel and press Edit button to display Advanced EDID Editor window. The editor can read and write all descriptors, which are defined in the standards, including the additional CEA extensions. Any EDID from the device's memory or a saved EDID file can be loaded into the editor. The software resolves the raw EDID and displays it as readable information to the user. All descriptors can be edited, and saved in an EDID file, or uploaded to the User memory.

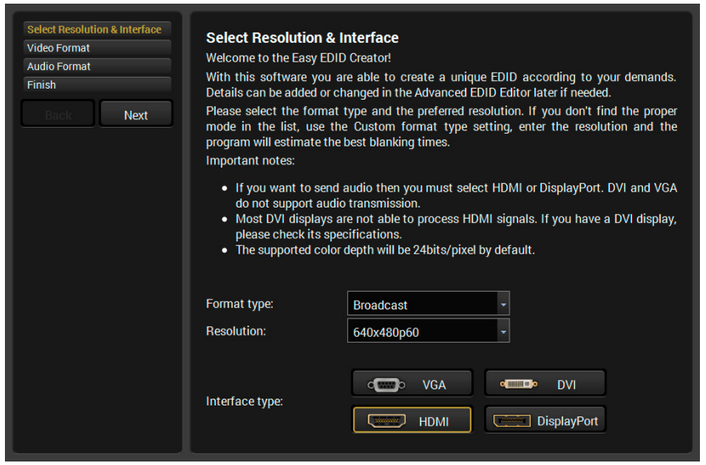


EDID Editor window

15.15.3. Creating an EDID - Easy EDID Creator

CREATE

Since 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 Source panel, **Easy EDID Creator** is opened in a new window.

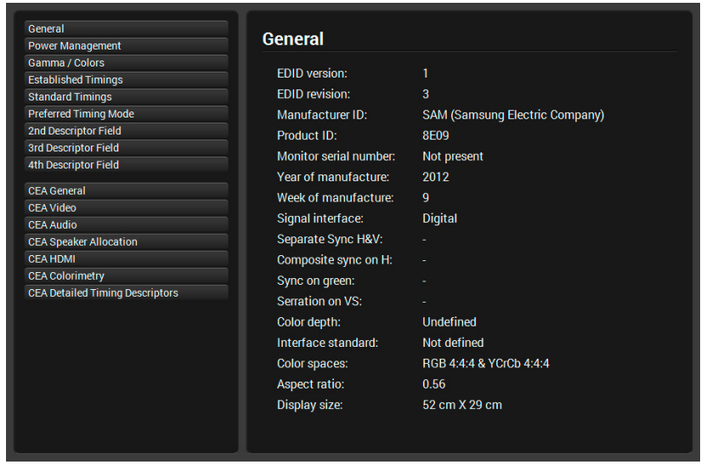


EDID Creator window

15.15.4. EDID Summary Window

INFO

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



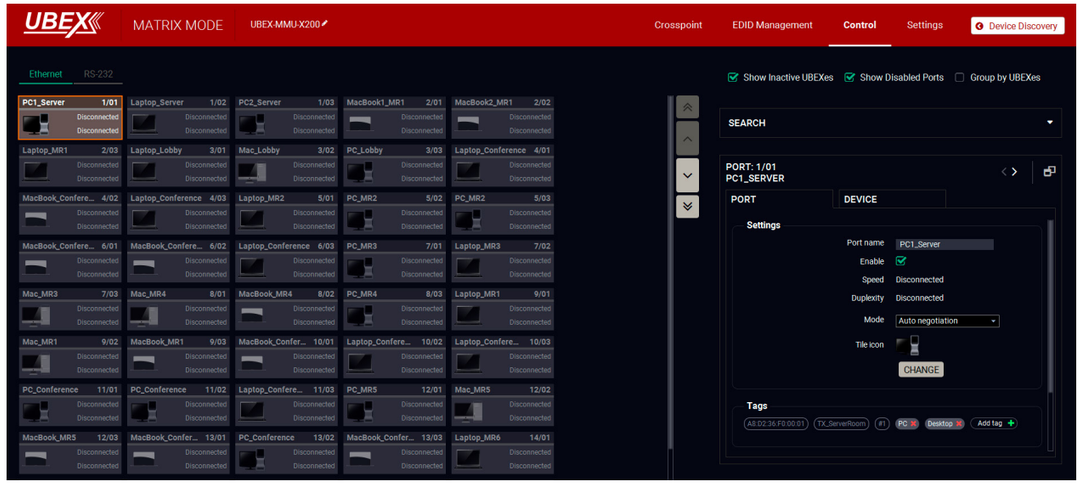
EDID summary window

15.16. Control Menu

The Ethernet control ports and the RS-232 port (only for the UBEX-PRO20-HDMI-F110) can be configured in the Control menu.

15.16.1. Ethernet Tab

Clicking on the Ethernet port icon results opening the Port properties. The most important information and settings are available on the panel.



Ethernet tab in the Control menu

Switchers

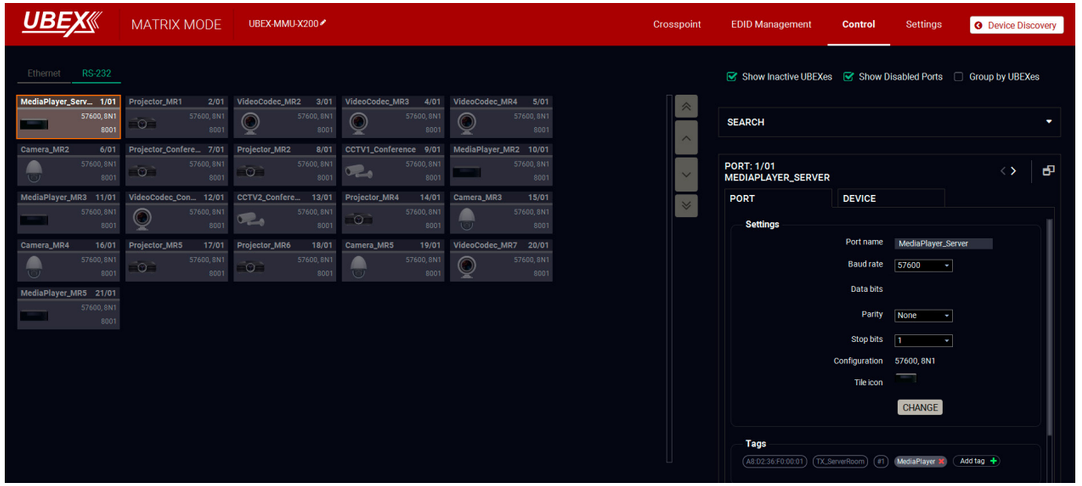
- **Show Inactive UBEXes**: when it is enabled, the inactive endpoints appear in the list.
- **Show Disabled Ports**: when it is enabled, the disabled ports appear in the list.
- **Group by UBEXes**: when it is enabled, the ports belonging to one endpoint device are arranged to one group for the better 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.

15.16.2. RS-232 Tab

Clicking on the RS-232 port icon results opening the Port properties. The most important information and settings are available on the panel.



RS-232 tab in the Control menu

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.

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.

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

A typical usage when a message is sent and it contains such a character that must be escaped.

Example

The original message: `Set(01)`

The escaped message: `Set\(01\)`

The above case is a typical example: the UBEX endpoint device is directed to send out a message over one of its port. The round brackets in the message are escaped.

Using Hexadecimal Codes

Hexadecimal codes can be inserted in the ASCII message when using:

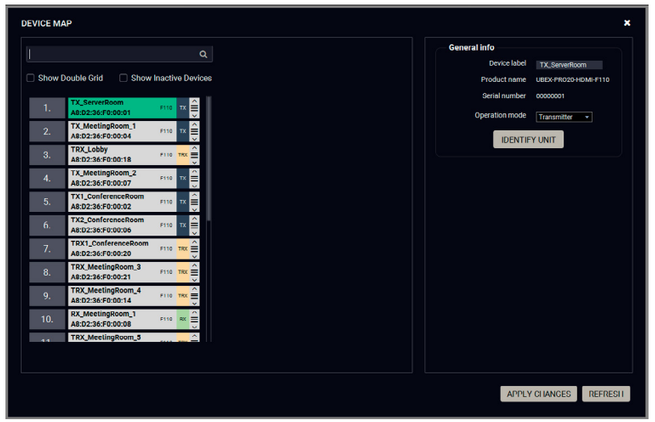
Message: `C00\x0D`

- **C00**: the message.
- **\x**: indicates that the following is a hexadecimal code.
- **0D**: the hexadecimal code (Carriage Return).

See more serial message sending method using LW3 protocol commands in the Sending a Text (ASCII-format) via Serial Port, Sending a Binary Message (HEX-format) via Serial Port, and Sending a Message (ASCII-format) via Serial Port sections.

15.17. 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.



Device map window

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.

15.17.1. 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.

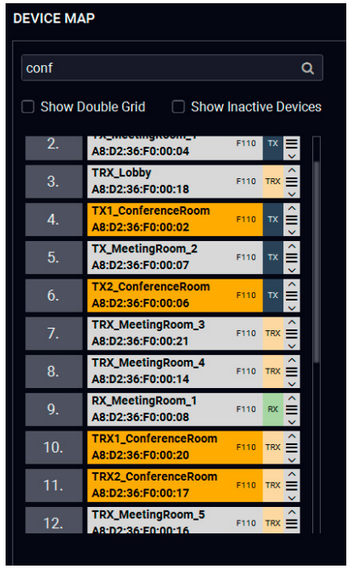
Step 1. **Select** the tile of the desired endpoint device by clicking with the left button of the mouse.

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.

Searching a Device

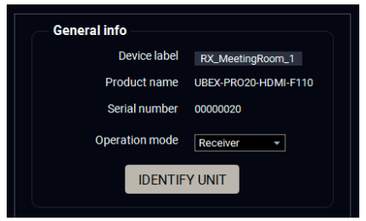


> TIPS AND TRICKS: It is recommended to change the name of the devices to unique ones before the searching, it can help a lot to find the desired device in the matrix. See the details about the device renaming in the Device Information section for the source side and the Device Information section for 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.

15.17.2. Operation Mode Changing

The operation mode (transmitter / receiver / transceiver) can be changed in the device map window.



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.

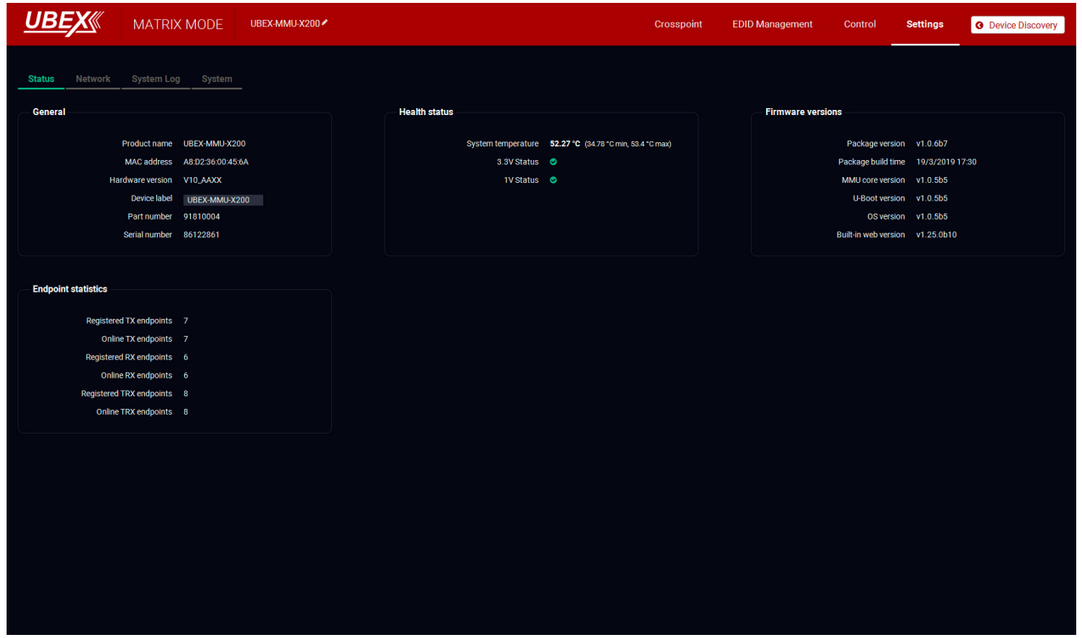
Step 4. The change will be applied after rebooting the endpoint.

> **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.

15.18. MMU Settings

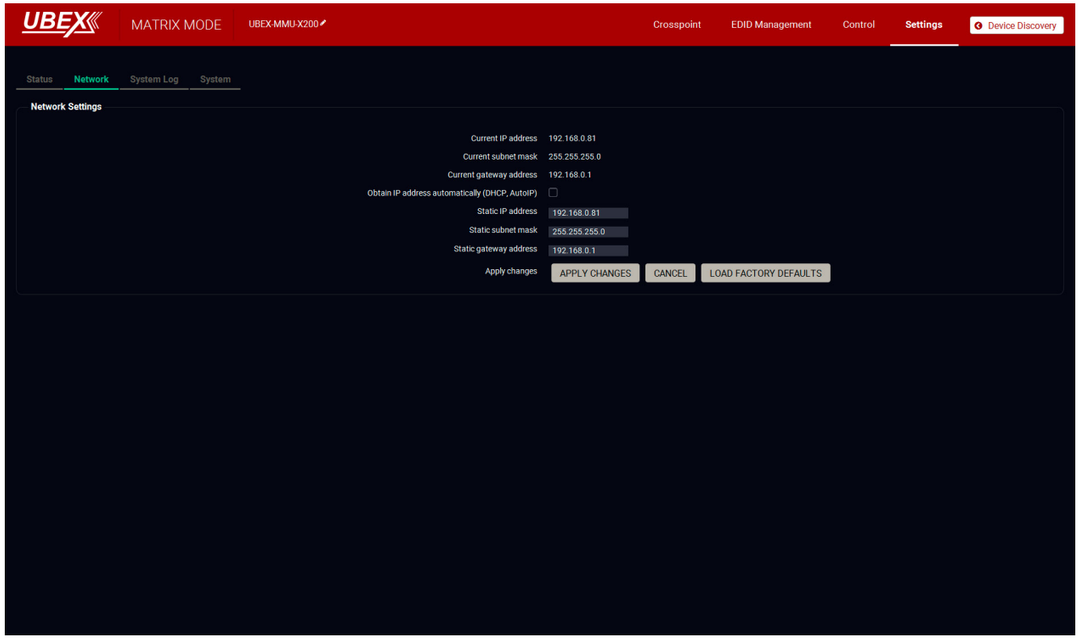
15.18.1. Status Tab



Status tab in the MMU settings menu

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.

15.18.2. Network Tab

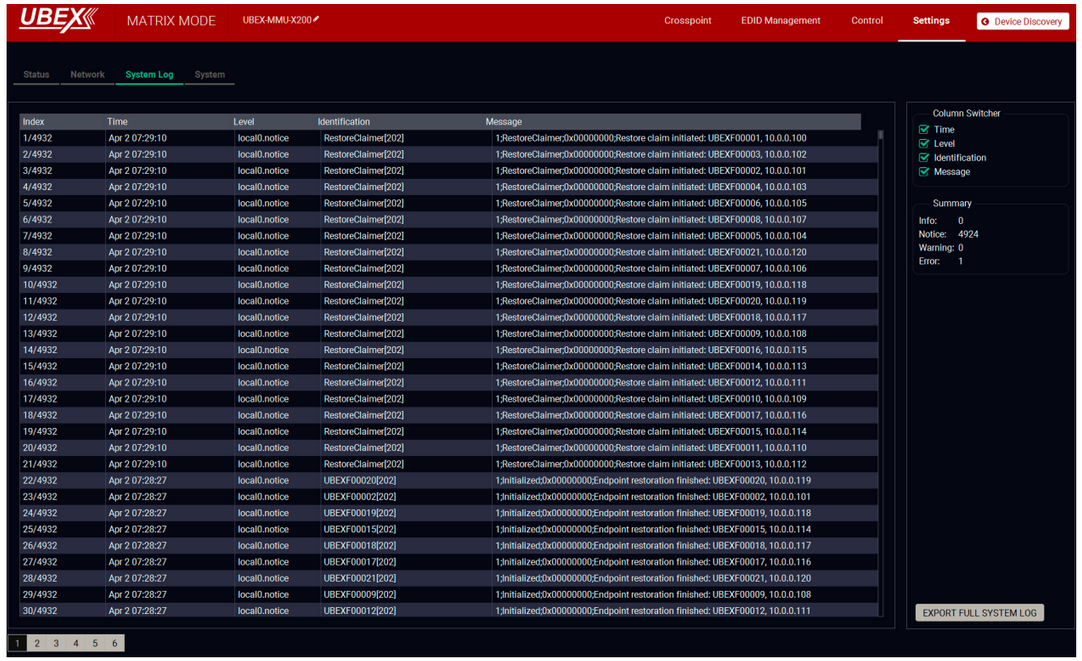


Network tab in MMU settings menu

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.

15.18.3. System Log Tab



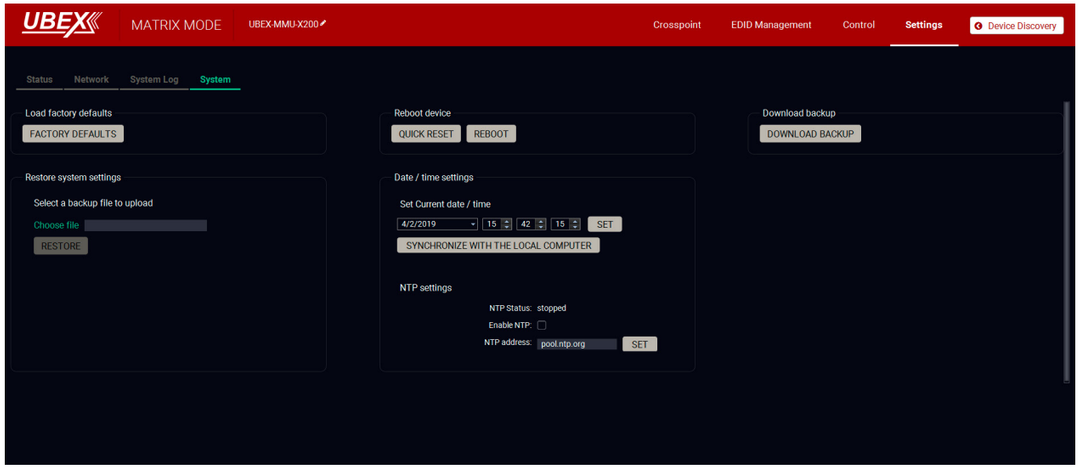
System log tab in the MMU settings menu

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 summerized on the right side of the tab in the **Summary** section. The list can be costumized 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.

15.18.4. System Tab



System tab in the MMU settings menu

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.
- **Download backup** - saving the configuration backup file of the device. See the contents of the file in the UBEX-MMU-X200 section.
- **Reboot device**
  - Quick reset: the controller software of the MMU reboots, but the hardware of the unit does not reboot.
  - Reboot: the MMU reboots, it is the same like disconnecting the power source and reconnecting again.

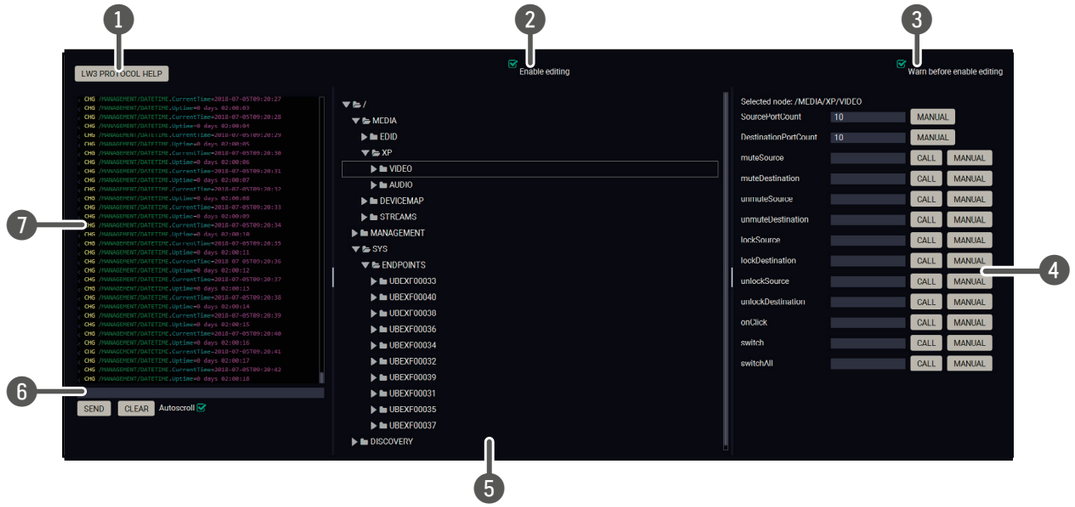
INFO: The video signal transmission is **not** affected by any kind of rebooting of the MMU.

- **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.
  - **NTP settings**: an NTP server address can be set and enable/disable the service to synchronize the date and time.

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

15.19. Terminal Window

Select the Settings / Terminal menu to open the Terminal window.



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

16

Programmer's Reference - Matrix Mode

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.

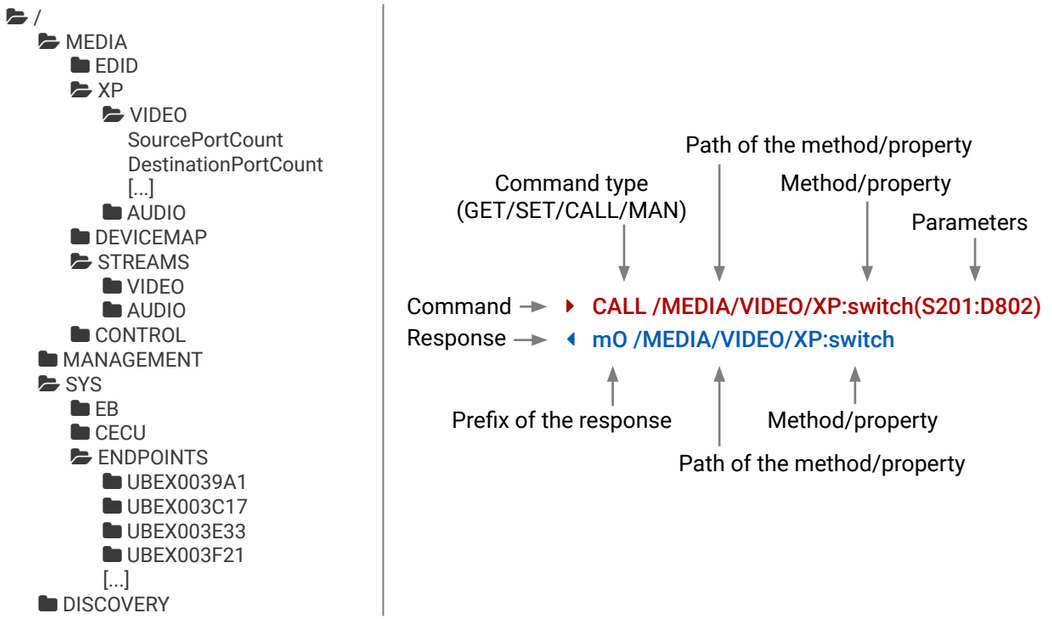
- Overview
- Protocol Rules
- The Tree Structure of the UBEX Matrix
- System Commands - MMU
- System Commands - Endpoints
- Endpoint Management Commands
- Video Crosspoint Settings
- Video Stream Settings - Source (Input) Side
- Video Stream Settings - Destination (Output) Side
- Audio Crosspoint Settings
- Audio Stream Settings
- Analog Audio Port Settings
- EDID Management
- System Monitoring Commands
- Network Configuration - MMU
- Ethernet Port Configuration - Endpoint
- Serial Port Configuration - MMU
- Serial Port Configuration - Endpoint Devices
- Message Sending via RS-232 Serial Port
- LW3 Protocol Commands - Quick Summary

16.1. 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.

16.2. Protocol Rules

16.2.1. LW3 Tree Structure and Command Structure (Examples)



16.2.2. 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.
- When a command is issued by the device, the received response cannot be processed by the CPU.
- node paths describe the exact location of the node, listing each parent node up to the root.

16.2.3. 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/CECU
- 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 for how to use the primitives. For every node, property and method in the tree there is a manual, type the MAN command to get the manual:

- MAN /MEDIA/STREAMS/VIDEO/D201/PORT.Output5vMode
- pm /MEDIA/STREAMS/VIDEO/D201/PORT.Output5vMode ["Auto" | "AlwaysOn" | "AlwaysOff"]

16.2.4. Prefix Summary

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

The following prefixes are defined in the LW3 protocol:

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

16.2.5. 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

16.2.6. 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 which 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\(01\))**

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

- 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.

16.2.8. 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
- o- /MEDIA/XP/VIDEO
- o- /MEDIA/EDID
- o- /DISCOVERY

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/*

16.2.9. Notifications about the Changes of the Properties

When the value of a property is changed and the user is subscribed to the node, which the property belongs to, an asynchronous notification is generated. This is notification is called as 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.

- OPEN /MANAGEMENT/LABEL
- o- /MANAGEMENT/LABEL
- GET /MANAGEMENT/LABEL.DeviceLabel
- pm /MANAGEMENT/LABEL.DeviceLabel=UBEX-MMU-X200

Connection #1

- GET /MANAGEMENT/LABEL.DeviceLabel
- pm /MANAGEMENT/LABEL.DeviceLabel=UBEX-MMU-X200
- SET /MANAGEMENT/LABEL.DeviceLabel=MMU_ServerRoom
- pw /MANAGEMENT/LABEL.DeviceLabel=MMU_ServerRoom

Connection #2

- CHG /MANAGEMENT/LABEL.DeviceLabel=MMU_ServerRoom → **Connection #1**

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

16.2.10. Legend for the Control Commands

Format	Description
<in>	Stream source ID
<out>	Output port ID
<port>	Interface port ID
<expression>	Batched argument: the underline means that more expressions or parameters can be placed using a semicolon, e.g. **S101;S102;S401** or **S101:D301;S302:D201**
<UBEX_EP>	UBEX endpoint ID, e.g. UBEXF254D9
<dev_ID>	Logical device ID of the UBEX endpoint
▸	Sent command
◂	Received response
•	Space character
|	Separator line ("or" character)

16.3. 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.

16.3.1. The Tree Structure of the MMU

- /
  - MEDIA
    - EDID
    - XP
      - VIDEO
      - AUDIO
    - DEVICEMAP
      - X1
      - X2
      - [...]
    - STREAMS
      - VIDEO
      - AUDIO
    - CONTROL
  - MANAGEMENT
  - SYS
    - EB
    - CECU
    - ENDPOINTS
      - UBEX0039A1
      - UBEX003C17
      - [...]
  - DISCOVERY

16.3.2. 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>

16.3.3. 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 DEVICEMAP), 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:

Stream ID	Operation mode	Discovery order	Port number
S101	TX	1.	HDMI in 1
S102			HDMI in 2
D201	RX	2.	HDMI out 1
D202			HDMI out 2
S302	TRX	3.	HDMI in 2
D301			HDMI out 1

Examples and explanations for stream IDs

16.4. System Commands - MMU

16.4.1. Set the Device Label

> INFO: The device label can be changed to a custom text in the Status Tab of the LDC software.

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

Command and Response

- 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

16.4.2. 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

16.4.3. Query the Firmware Package Version

Command and Response

- GET•/MANAGEMENT/UID/PACKAGE.Version
- pr•/MANAGEMENT/UID/PACKAGE.Version=<firmware_version>

Example

- GET /MANAGEMENT/UID/PACKAGE.Version
- pr /MANAGEMENT/UID/PACKAGE.Version=v1.0.6b10

16.4.4. 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

- GET•/MANAGEMENT/DATETIME.CurrentTime
- pr•/MANAGEMENT/DATETIME.CurrentTime=<date_time>

Parameters

Parameter	Description	Formula
<date_time>	Current date and time	YYYY-MM-DDTHH:MM:SS

Example

- GET /MANAGEMENT/DATETIME.CurrentTime
- pr /MANAGEMENT/DATETIME.CurrentTime=2019-03-31T14:57:23

16.4.5. 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>
- mO•/MANAGEMENT/DATETIME:setTime=

Parameters

See at previous section.

Example

- CALL /MANAGEMENT/DATETIME:setTime=2019-03-31T14:58:00
- mO /MANAGEMENT/DATETIME.setTime=

16.4.6. 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

- 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

16.4.7. 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

Identifier	Parameter description	Value	Explanation
<logical_value>	NTP service is enabled or disabled.	**true**	The NTP is enabled.
		false	The NTP is disabled.

Example

- SET /MANAGEMENT/DATETIME.EnableNtp=true
- pw /MANAGEMENT/DATETIME.EnableNtp=true

16.4.8. 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

16.4.9. 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=

16.4.10. 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=

16.4.11. Restore the Factory Default Settings

Command and Response

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

Example

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

The device is restarted, current connections are terminated, and the default settings are restored. See the complete list in the UBEX-MMU-X200 section.

16.5. System Commands - Endpoints

Parameters

Parameter	Description	Formula
<UBEX_EP>	UBEX endpoint ID	UBEX<last_6_characters_of_the_MAC_address>

16.5.1. 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.

The Device Label can be 64 characters long and ASCII characters are allowed. Longer names will be truncated.

Command and Response

- SET•/SYS/ENDPOINTS/<UBEX_EP>.DeviceLabel=<custom_name>
- pw•/SYS/ENDPOINTS/<UBEX_EP>.DeviceLabel=<custom_name>

Example

- SET /SYS/ENDPOINTS/UBEX0039A1.DeviceLabel=UBEX_RX_Theater
- pw /SYS/ENDPOINTS/UBEX0039A1.DeviceLabel=UBEX_RX_Theater

16.5.2. Query the Product Name

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

Command and Response

- GET•/SYS/ENDPOINTS/<UBEX_EP>.ProductName
- pr•/SYS/ENDPOINTS/<UBEX_EP>.ProductName=<Product_name>

Example

- GET /SYS/ENDPOINTS/UBEX0039A1.ProductName
- pr /SYS/ENDPOINTS/UBEX0039A1.ProductName=UBEX-PRO20-HDMI-F110

16.5.3. Bootload Mode Setting

The device can be set to booload (service / firmware upgrade) mode. The AV signal transmission is terminated in this mode.

Command and Response

- CALL•/SYS/ENDPOINTS/<UBEX_EP>:bootload()
- mO•/SYS/ENDPOINTS/<UBEX_EP>:bootload=

Example

- CALL /SYS/ENDPOINTS/UBEX0039A1:bootload()
- mO /SYS/ENDPOINTS/UBEX0039A1:bootload=

Setting Back the Device to Normal Operation

Press the jog dial control knob for **3 seconds** for setting back the device to normal operation mode.

16.5.4. Query the Operation Mode

Command and Response

- GET•/SYS/ENDPOINTS/<UBEX_EP>.OperationMode
- pw•/SYS/ENDPOINTS/<UBEX_EP>.OperationMode=<operation_mode>

Parameters

Identifier	Parameter description	Value	Explanation
<operation_mode>	The operation mode of the endpoint device	**Transmitter**	The endpoint device operates as a **Transmitter**. See the details in the Transmitter Mode section.
		Receiver	The endpoint device operates as a **Receiver**. See the details in the Receiver Mode section.
		Transceiver	The endpoint device operates as a **Transceiver**. See the details in the Transceiver Mode section.

Example

- GET /SYS/ENDPOINTS/UBEX0039A1.OperationMode
- pw /SYS/ENDPOINTS/UBEX0039A1.OperationMode=Transceiver

16.5.5. 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>

Parameters

Identifier	Parameter description	Value	Explanation
<operation_mode>	The operation mode of the endpoint device	**Transmitter**	The endpoint device is set to **Transmitter**. See the details in the Transmitter Mode section.
		Receiver	The endpoint device is set to **Receiver**. See the details in the Receiver Mode section.
		Transceiver	The endpoint device is set to **Transceiver**. See the details in the Transceiver Mode section.

Example

- SET /SYS/ENDPOINTS/UBEX0039A1.OperationMode=Receiver
- pw /SYS/ENDPOINTS/UBEX0039A1.OperationMode=Receiver

16.5.6. 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

16.5.7. Identify the Device

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

Command and Response

- CALL•/SYS/ENDPOINTS/<UBEX_EP>:identifyMe()
- mO•/SYS/ENDPOINTS/<UBEX_EP>:identifyMe

Example

- CALL /SYS/ENDPOINTS/UBEX0039A1:identifyMe()
- mO /SYS/ENDPOINTS/UBEX0039A1:identifyMe

16.5.8. Restarting the Device

Calling the method results the endpoint restarts – 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()
- mO•/SYS/ENDPOINTS/<UBEX_EP>:reset=

Example

- CALL /SYS/ENDPOINTS/UBEX0039A1:reset()
- mO /SYS/ENDPOINTS/UBEX0039A1:reset=

16.5.9. Restore the Factory Default Settings

Command and Response

- CALL•/SYS/ENDPOINTS/<UBEX_EP>:factoryDefaults()
- mO•/SYS/ENDPOINTS/<UBEX_EP>:factoryDefaults=

Example

- CALL /SYS/ENDPOINTS/UBEX0039A1:factoryDefaults()
- mO /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.

16.6. Endpoint Management Commands

Parameters

Parameter	Description	Formula
<UBEX_EP>	UBEX endpoint ID	UBEX<last_6_characters_of_the_MAC_address>

16.6.1. 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

16.6.2. 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

16.6.3. 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

16.6.4. 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

16.6.5. 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

16.6.6. 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

16.6.7. 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

16.6.8. 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

16.6.9. Query the Connection Status of an Endpoint

Command and Response

- GET•/SYS/ENDPOINTS/<UBEX_EP>.ConnectionStatus
- pr•/SYS/ENDPOINTS/<UBEX_EP>.ConnectionStatus=<status>

Parameters

Identifier	Parameter description	Value	Explanation
<status>	Connection status of the selected endpoint	**Offline**	The device powered off or not connected to the UBEX matrix.
		Connecting	The device is establishing connection to the UBEX matrix.
		Online	The device is powered on and ready to use in the UBEX matrix.

Example

- GET /SYS/ENDPOINTS/UBEX0039A1.ConnectionStatus
- pr /SYS/ENDPOINTS/UBEX0039A1.ConnectionStatus=Online

16.6.10. Query the Claiming Status of an Endpoint

Command and Response

- GET•/SYS/ENDPOINTS/<UBEX_EP>.ClaimingStatus
- pr•/SYS/ENDPOINTS/<UBEX_EP>.ClaimingStatus=<status>

Parameters

Identifier	Parameter description	Value	Explanation
<status>	Claiming status of the selected endpoint	**Unclaiming**	The device is under the unclaiming procedure, it can be after the running of the *unclaimEndpoint()* or *unclaimAllEndpoint()* commands typically.
		Initializing	The device is under initialization, it can be during the first connecting to the MMU typically.
		Claiming	The device is under the claiming procedure.
		Reclaiming	The device is under the reclaiming procedure, it can be after operation mode changing typically.
		Restoring	The device is under the restoring procedure, it can be during rebooting of a claimed endpoint device.
		Claimed	The device is claimed by the MMU and ready to use in the UBEX matrix.

Example

- GET /SYS/ENDPOINTS/UBEX0039A1.ClaimingStatus
- pr /SYS/ENDPOINTS/UBEX0039A1.ClaimingStatus=Claimed

16.6.11. 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>)
- mO•/SYS/ENDPOINTS:unclaimEndpoint=

Example

- CALL /SYS/ENDPOINTS:unclaimEndpoint(UBEX0039A1)
- mO /SYS/ENDPOINTS:unclaimEndpoint=

16.6.12. Unclaiming All Endpoints

The command makes all endpoints to be unclaimed from the UBEX matrix.

Command and Response

- CALL•/SYS/ENDPOINTS:unclaimAllEndpoint()
- mO•/SYS/ENDPOINTS:unclaimAllEndpoint=

Example

- CALL /SYS/ENDPOINTS:unclaimAllEndpoint()
- mO /SYS/ENDPOINTS:unclaimAllEndpoint=

16.6.13. 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

16.6.14. 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

16.6.15. 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

- CALL•/MEDIA/DEVICEMAP:assign(logical_device_ID:<UBEX_EP>)
- mO•/MEDIA/DEVICEMAP:assign=

Example

- CALL /MEDIA/DEVICEMAP:assign(X3:UBEX0039A1;X1:UBEX003958)
- mO /MEDIA/DEVICEMAP:assign=

16.7. Video Crosspoint Settings

Parameters

Parameter	Description	Formula
<in>	Input stream coming from the TX / TRX	S<logical_devive_ID><stream_nr>
<out>	Output port of the RX / TRX	D<logical_device_ID><out_port_nr>

16.7.1. Switching the Video Stream to One Destination

Command and Response

- CALL•/MEDIA/XP/VIDEO:switch(<in>:<out>)
- mO•/MEDIA/XP/VIDEO:switch=

Example

- CALL /MEDIA/XP/VIDEO:switch(S501:D302;S102:D102)
- mO /MEDIA/XP/VIDEO:switch=

16.7.2. Switching a Video Stream to All Destinations

The selected video stream is switched to all outputs.

Command and Response

- CALL•/MEDIA/XP/VIDEO:switchAll(<in>)
- mO•/MEDIA/XP/VIDEO:switchAll=

Example

- CALL /MEDIA/XP/VIDEO:switchAll(S101)
- mO /MEDIA/XP/VIDEO:switchAll=

16.7.3. 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/*.*
- pr•/MEDIA/XP/VIDEO/*.*

16.7.4. 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
- pr•/MEDIA/XP/VIDEO.SourcePortCount=<number>

Example

- GET /MEDIA/XP/VIDEO.SourcePortCount
- pr /MEDIA/XP/VIDEO.SourcePortCount=21

16.7.5. 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
- pr•/MEDIA/XP/VIDEO.DestinationPortCount=<number>

Example

- GET /MEDIA/XP/VIDEO.DestinationPortCount
- pr /MEDIA/XP/VIDEO.DestinationPortCount=23

16.8. Video Stream Settings - Source (Input) Side

Parameters

Parameter	Description	Formula
<in>	Input stream coming from the TX / TRX	S<logical_devive_ID><stream_nr>

16.8.1. 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:F0:00:03.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

16.8.2. 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

16.8.3. 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
- pr•/MEDIA/STREAMS/VIDEO/<in>.Tags=<tag>

Example

- GET /MEDIA/STREAMS/VIDEO/S102.Tags
- pr /MEDIA/STREAMS/VIDEO/S102.Tags=4K60;movie;Die_Hard_2

16.8.4. 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>)
- mO•/MEDIA/STREAMS/VIDEO/<in>:addTags=

Example

- CALL /MEDIA/STREAMS/VIDEO/S401:addTags(4K30;intro)
- mO /MEDIA/STREAMS/VIDEO/S401:addTags=

16.8.5. Deleting Tags of the Stream

Command and Response

- CALL•/MEDIA/STREAMS/VIDEO/<in>:removeTags(<tag>)
- mO•/MEDIA/STREAMS/VIDEO/<in>:removeTags=

Example

- CALL /MEDIA/STREAMS/VIDEO/S101:removeTags(cartoon;1080p)
- mO /MEDIA/STREAMS/VIDEO/S101:removeTags=

16.8.6. Deleting All Tags of the Stream

Command and Response

- CALL•/MEDIA/STREAMS/VIDEO/<in>:removeAllTags()
- mO•/MEDIA/STREAMS/VIDEO/<in>:removeAllTags=

Example

- CALL /MEDIA/STREAMS/VIDEO/S101:removeAllTags()
- mO /MEDIA/STREAMS/VIDEO/S101:removeAllTags=

16.8.7. 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
- pr•/MEDIA/STREAMS/VIDEO/<in>.DeviceTags=<tag>

Example

- GET /MEDIA/STREAMS/VIDEO/S201.DeviceTags
- pr /MEDIA/STREAMS/VIDEO/S201.DeviceTags=Intro;A8:D2:36:F0:00:35;TX_MeetingRoom;#2

16.8.8. Enable/Disable the Stream

Command and Response

- SET•/MEDIA/STREAMS/VIDEO/<in>/STREAM.Enabled=<logical_value>
- pw•/MEDIA/STREAMS/VIDEO/<in>/STREAM.Enabled=<logical_value>

Parameters

Identifier	Parameter description	Value	Explanation
<logical_value>	The stream is unmuted or muted.	**true**	The stream is enabled (unmuted).
		false	The stream is disabled (muted).

Example

- SET /MEDIA/STREAMS/VIDEO/S101/STREAM.Enabled=true
- pw /MEDIA/STREAMS/VIDEO/S101/STREAM.Enabled=true

16.8.9. Resolution Setting

The resolution which 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 find in the Resolutions of the Scaler / FRC section.

16.8.10. 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

Identifier	Parameter description	Value	Explanation
<resolution_mode>	Resolution mode setting	**Pass**	Pass-through mode - the original stream is transmitted.
		Forced	The device forces the resolution set in the *ResolutionSetting* for the stream and transmits it to the destination side.

Example

- SET /MEDIA/STREAMS/VIDEO/S302/STREAM.ResolutionMode=Forced
- pw /MEDIA/STREAMS/VIDEO/S302/STREAM.ResolutionMode=Forced

16.8.11. Scaler - Image Position Setting

The resolution which 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.

ATTENTION! The scaler settings are available for the stream of the HDMI input 1 port of the transmitter only.

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

16.8.12. 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

Identifier	Parameter description	Value	Explanation
<color_space>	Color space setting	**Pass**	Pass-through mode - the original color space of the stream is transmitted to the sink device.
		RGB	Forced RGB color space.
		YCbCr 4:4:4	Forced YCbCr 4:4:4 color space.
		YCbCr 4:2:2	Forced YCbCr 4:2:2 color space.

Example

- SET /MEDIA/STREAMS/VIDEO/S101/STREAM.ColorSpaceSetting=YCbCr 4:4:4
- pw /MEDIA/STREAMS/VIDEO/S101/STREAM.ColorSpaceSetting=YCbCr 4:4:4

16.8.13. 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 receiver side only. See the related LW3 protocol command in the Timing Mode Setting section.

Command and Response

- GET•/MEDIA/STREAMS/VIDEO/<in>/STREAM.TimingMode
- pr•/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
- pr /MEDIA/STREAMS/VIDEO/S101/STREAM.TimingMode=SourceLocked

16.8.14. 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

- SET•/MEDIA/STREAMS/VIDEO/<in>/PORT.HdcpEnable=<logical_value>
- pw•/MEDIA/STREAMS/VIDEO/<in>/PORT.HdcpEnable=<logical_value>

Parameters

The <logical_value> can be set to **true** or **false**.

Example

- SET /MEDIA/STREAMS/VIDEO/S101/PORT.HdcpEnable=true
- pw /MEDIA/STREAMS/VIDEO/S101/PORT.HdcpEnable=true

16.9. Video Stream Settings - Destination (Output) Side

Parameters

Parameter	Description	Formula
<out>	Output port of the RX / TRX	D<logical_device_ID><out_port_nr>

16.9.1. Query the Name of the Destination

> INFO: The default name of the output port is the MAC address of the receiver 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
- pw•/MEDIA/STREAMS/VIDEO/<out>.DestinationName=<name>

Example

- GET /MEDIA/STREAMS/VIDEO/D601.DestinationName
- pw /MEDIA/STREAMS/VIDEO/D601.DestinationName=Projector_Lobby

16.9.2. 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

16.9.3. Query the Tags of the Destination

Command and Response

- GET•/MEDIA/STREAMS/VIDEO/<out>.Tags
- pr•/MEDIA/STREAMS/VIDEO/<out>.Tags=<tag>

Example

- GET /MEDIA/STREAMS/VIDEO/D102.Tags
- pr /MEDIA/STREAMS/VIDEO/D102.Tags=movie;4K60;Pretty_Woman

16.9.4. 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=

Example

- CALL /MEDIA/STREAMS/VIDEO/D401:addTags(4K30;intro)
- mO /MEDIA/STREAMS/VIDEO/D401:addTags=

16.9.5. 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/D101:removeTags(cartoon;1080p)
- mO /MEDIA/STREAMS/VIDEO/D101:removeTags=

16.9.6. 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=

16.9.7. 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

16.9.8. 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

Identifier	Parameter description	Value	Explanation
<logical_value>	The stream is unmuted or muted.	**true**	The stream is enabled (unmuted).
		false	The stream is disabled (muted).

Example

- SET /MEDIA/STREAMS/VIDEO/D101/STREAM.Enabled=true
- pw /MEDIA/STREAMS/VIDEO/D101/STREAM.Enabled=true

16.9.9. Resolution Setting

The resolution which 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 find in the Resolutions of the Scaler / FRC section.

16.9.10. 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

Identifier	Parameter description	Value	Explanation
<resolution_mode>	Resolution mode setting	**Pass**	Pass-through mode - the original stream is transmitted to the sink device.
		Forced	The endpoint device forces the resolution set in the *ResolutionSetting* for the stream and transmits it to the sink device.
		EdidBased	The endpoint device forces the resolution which is read out from the EDID of the connected sink device.

Example

- SET /MEDIA/STREAMS/VIDEO/D302/PORT.ResolutionMode=Forced
- pw /MEDIA/STREAMS/VIDEO/D302/PORT.ResolutionMode=Forced

16.9.11. 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

16.9.12. Scaler - Image Position Setting

The resolution which 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.

ATTENTION! The scaler settings are available for the stream of the HDMI output 1 port only.

Command and Response

- SET•/MEDIA/STREAMS/VIDEO/<out>/PORT.ImagePosition=<image_position>
- pw•/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
- pw /MEDIA/STREAMS/VIDEO/D101/PORT.ImagePosition=Fit

16.9.13. Color Space Converter Setting

Command and Response

- SET•/MEDIA/STREAMS/VIDEO/<out>/PORT.ColorSpaceSetting=<color_space>
- pw•/MEDIA/STREAMS/VIDEO/<out>/PORT.ColorSpaceSetting=<color_space>

Parameters

Identifier	Parameter description	Value	Explanation
<color_space>	Color space setting	**Pass**	Pass-through mode - the original color space of the stream is transmitted to the sink device.
		RGB	Forced RGB color space.
		YCbCr 4:4:4	Forced YCbCr 4:4:4 color space.
		YCbCr 4:2:2	Forced YCbCr 4:2:2 color space.

Example

- SET /MEDIA/STREAMS/VIDEO/D101/PORT.ColorSpaceSetting=RGB
- pw /MEDIA/STREAMS/VIDEO/D101/PORT.ColorSpaceSetting=RGB

16.9.14. 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
- pr•/MEDIA/STREAMS/VIDEO/<out>/PORT.TimingMode=<timing_mode>

Parameters

The <timing_mode> can be **Freerun** or **SourceLocked**.

Example

- GET /MEDIA/STREAMS/VIDEO/D101/STREAM.TimingMode
- pr /MEDIA/STREAMS/VIDEO/D101/STREAM.TimingMode=SourceLocked

16.9.15. 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>
- pw•/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
- pw /MEDIA/STREAMS/VIDEO/D202/PORT.TimingModeSetting=SourceLocked

16.9.16. No Sync Screen (Test Pattern) Mode

The No sync screen feature generates an image which can be displayed when no incoming signal on the port. The following method turns on or off the Test Pattern function:

Command and Response

- SET•/MEDIA/STREAMS/VIDEO/<out>/PORT.NoSyncMode=<nosync_mode>
- pw•/MEDIA/STREAMS/VIDEO/<out>/PORT. NoSyncMode=<nosync_mode>

Parameters

Identifier	Parameter description	Value	Explanation
<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 there is an incoming signal.

Example

- SET /MEDIA/STREAMS/VIDEO/D1002/PORT.NoSyncMode=NoSignal
- pw /MEDIA/STREAMS/VIDEO/D1002/PORT.NoSyncMode=NoSignal

16.9.17. No Sync Screen (Test Pattern) Color Setting

The No sync screen feature generates an image which 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>
- pw•/MEDIA/STREAMS/VIDEO/<out>/PORT. NoSyncColor=<RGB_code>

Example

- SET /MEDIA/STREAMS/VIDEO/D901/PORT.NoSyncColor=128,128,128
- pw /MEDIA/STREAMS/VIDEO/D901/PORT.NoSyncColor=128,128,128

16.9.18. 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

- SET•/MEDIA/STREAMS/VIDEO/<out>/PORT.HdcpMode=<HDCP_mode>
- pw•/MEDIA/STREAMS/VIDEO/<out>/PORT.HdcpMode=<HDCP_mode>

Parameters

The <HDCP_mode> can be set to **Auto** or **Always**.

Example

- SET /MEDIA/STREAMS/VIDEO/D101/PORT.HdcpMode=Always
- pw /MEDIA/STREAMS/VIDEO/D101/PORT.HdcpMode=Always

16.10. Audio Crosspoint Settings

Parameters

Parameter	Description	Formula
<in>	Audio stream source ID	S<logical_devive_ID><stream_nr>
<out>	Audio destination ID	D<logical_device_ID><out_port_nr>

16.10.1. 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/*.*

16.10.2. 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=

16.10.3. 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=

16.10.4. 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

16.10.5. 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

16.11. Audio Stream Settings

Parameters

Parameter	Description	Formula
<in>	Audio stream source ID	S<logical_devive_ID><stream_nr>
<out>	Audio destination ID	D<logical_device_ID><out_port_nr>

16.11.1. Enable/Disable the Audio Stream Source

Command and Response

- SET•/MEDIA/STREAMS/AUDIO/<in>/STREAM.Enabled=<logical_value>
- pw•/MEDIA/STREAMS/AUDIO/<in>/STREAM.Enabled=<logical_value>

Parameters

Identifier	Parameter description	Value	Explanation
<logical_value>	The audio stream is unmuted or muted.	**true**	The audio stream is enabled (unmuted).
		false	The audio stream is disabled (muted).

Example

- SET /MEDIA/STREAMS/AUDIO/I101/STREAM.Enabled=true
- pw /MEDIA/STREAMS/AUDIO/I101/STREAM.Enabled=true

16.11.2. 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

Identifier	Parameter description	Value	Explanation
<logical_value>	The audio stream is unmuted or muted.	**true**	The audio stream is enabled (unmuted).
		false	The audio stream is disabled (muted).

Example

- SET /MEDIA/STREAMS/AUDIO/O101/STREAM.Enabled=true
- pw /MEDIA/STREAMS/AUDIO/O101/STREAM.Enabled=true

16.11.3. 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

16.11.4. 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

16.11.5. 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

16.11.6. 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

16.11.7. Query the Tags of the Stream/Destination

The query returns with the tags which are added by the user.

Command and Response

- 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

16.11.8. 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=

Example

- CALL /MEDIA/STREAMS/AUDIO/S401:addTags(intro;chillout)
- mO /MEDIA/STREAMS/AUDIO/S401:addTags=

16.11.9. Deleting Tags of the Stream

Command and Response

- CALL•/MEDIA/STREAMS/AUDIO/<in|out>:removeTags(<tag>)
- mO•/MEDIA/STREAMS/AUDIO/<in|out>:removeTags=

Example

- CALL /MEDIA/STREAMS/AUDIO/D101:removeTags(speakers;meeting_room)
- mO /MEDIA/STREAMS/AUDIO/D101:removeTags=

16.11.10. 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=

16.11.11. 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

16.12. Analog Audio Port Settings

ATTENTION! Only the UBEX-PRO20-HDMI-F110 endpoint model is built with analog audio input and output ports.

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

16.12.1. Setting the Volume in dB

Command and Response

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

Parameters

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

Example

- SET /MEDIA/STREAMS/AUDIO/S103/PORT.VolumedB=-15
- pw /MEDIA/STREAMS/AUDIO/S103/PORT=-15.000

16.12.2. 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=50
- pw /MEDIA/STREAMS/AUDIO/D103/PORT.VolumePercent=50.00

16.12.3. 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

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

Example

- SET /MEDIA/STREAMS/AUDIO/D103/PORT.Balance=+25
- pw /MEDIA/STREAMS/AUDIO/D103/PORT.Balance=+25

16.12.4. 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

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

Example

- SET /MEDIA/STREAMS/AUDIO/S103/PORT.Gain=4
- pw /MEDIA/STREAMS/AUDIO/S103/PORT.Gain=4

16.12.5. 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

Identifier	Parameter description	Value	Explanation
<logical_value>	The port is muted or unmuted.	**true**	The port is muted.
		false	The port is unmuted.

Example

- SET /MEDIA/STREAMS/AUDIO/D103/PORT.Mute=true
- pw /MEDIA/STREAMS/AUDIO/D103/PORT.Mute=true

16.13. 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.

Parameters

Parameter	Description
<emulated>	The emulated EDID memory of the desired input port. Example: E1.
<dynamic>	Dynamic EDID memory index. Example: D1
<user>	User EDID memory index. Example: U1
<factory>	Factory EDID memory index. Example: F1

16.13.1. 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

The 'Validity' property is true then a valid EDID is stored in D1 memory place.

16.13.2. 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

16.13.3. 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

16.13.4. 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=

16.13.5. 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.

16.13.6. 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=

16.13.7. 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 one. See the table in the Factory EDID List section.

16.14. System Monitoring Commands

Parameters

Parameter	Description	Formula
<in>	Input stream coming from the TX / TRX	S<logical_devive_ID><stream_nr>
<out>	Output port of the RX / TRX	D<logical_device_ID><out_port_nr>

16.14.1. Query Connected Device Presence

Connected property indicates that cable or device is connected to the input or output port.

Command and Response

- GET•/MEDIA/STREAMS/VIDEO/<in|out>/PORT.Connected
- pr•/MEDIA/STREAMS/VIDEO/<in|out>/PORT.Connected=<parameter>

Parameters

Identifier	Parameter description	Value	Explanation
<parameter>	Connected device or cable indicator	**0**	Not present
		1	Present
		F	Unknown

Example

- GET /MEDIA/STREAMS/VIDEO/S101/PORT.Connected
- pr /MEDIA/STREAMS/VIDEO/S101/PORT.Connected=1

16.14.2. Query Video Signal Presence on a Port

SignalPresent property indicates valid signal present on the port.

Command and Response

- GET•/MEDIA/STREAMS/VIDEO/<in|out>/PORT.SignalPresent
- pr•/MEDIA/STREAMS/VIDEO/<in|out>/PORT.SignalPresent=<parameter>

Parameters

Identifier	Parameter description	Value	Explanation
<parameter>	Signal present indicator	**0**	Not present
		1	Present
		F	Unknown

Example

- GET /MEDIA/STREAMS/VIDEO/D101/PORT.SignalPresent
- pr /MEDIA/STREAMS/VIDEO/D101/PORT.SignalPresent=1

16.14.3. Query Video Signal Presence in a Stream

SignalPresent property indicates valid signal present in the stream.

Command and Response

- GET•/MEDIA/STREAMS/VIDEO/<in|out>/STREAM.SignalPresent
- pr•/MEDIA/STREAMS/VIDEO/<in|out>/STREAM.SignalPresent=<parameter>

Parameters

Identifier	Parameter description	Value	Explanation
<parameter>	Signal present indicator	**0**	Not present
		1	Present
		F	Unknown

Example

- GET /MEDIA/STREAMS/VIDEO/D101/STREAM.SignalPresent
- pr /MEDIA/STREAMS/VIDEO/D101/STREAM.SignalPresent=1

16.14.4. 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

Identifier	Parameter description	Value	Explanation
<parameter>	Embedded audio presence indicator	**0**	Not present
		1	Present
		F	Unknown

Example

- GET /MEDIA/STREAMS/VIDEO/S101/STREAM.EmbeddedAudioPresent
- pr /MEDIA/STREAMS/VIDEO/S101/STREAM.EmbeddedAudioPresent=1

16.14.5. 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

Identifier	Parameter description	Value	Explanation
<signal_type>	Signal type	**0**	DVI
		1	HDMI
		F	Unknown

Example

- GET /MEDIA/STREAMS/VIDEO/D101/STREAM.SignalType
- pr /MEDIA/STREAMS/VIDEO/D101/STREAM.SignalType=1

16.14.6. 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

16.14.7. 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

16.14.8. 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

16.14.9. 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

16.14.10. Query the Bandwidth of the Stream

Bandwidth property provides the required Ethernet bandwidth of the stream.

Command and Response

- GET•/MEDIA/STREAMS/VIDEO/<in|out>/STREAM.Bandwidth
- pr•/MEDIA/STREAMS/VIDEO/<in|out>/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.

16.14.11. 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.Bandwidth=<logical_value>

Parameters

Identifier	Parameter description	Value	Explanation
<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

16.14.12. Query the Status of the Analog Audio Output

MuteStatus property indicates the current status of the analog audio output port.

ATTENTION! The UBEX-PRO20-HDMI-F110 endpoint model is built with analog audio output port only.

Command and Response

- GET•/MEDIA/STREAMS/AUDIO/<out>/Port.MuteStatus
- pr•/MEDIA/STREAMS/AUDIO/<out>/Port.MuteStatus=<status>

Parameters

Identifier	Parameter description	Value	Explanation
<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

16.15. 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.

16.15.1. 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

16.15.2. 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

16.15.3. 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

16.15.4. 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

16.15.5. 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

16.15.6. 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

16.15.7. 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

16.15.8. 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

16.15.9. Apply Network Settings

Command and Response

- CALL•/MANAGEMENT/NETWORK:ApplySettings()
- mO•/MANAGEMENT/NETWORK:ApplySettings

Example

- CALL /MANAGEMENT/NETWORK:ApplySettings()
- mO /MANAGEMENT/NETWORK:ApplySettings

All changed network settings are applied and the control network interface is going to be restarted.

16.16. Ethernet Port Configuration - Endpoint

16.16.1. 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

16.16.2. Ethernet Mode Setting

Command and Response

- SET•/MEDIA/CONTROL/ETHERNET/<port>/PORT.Mode=<mode>
- pw•/MEDIA/CONTROL/ETHERNET/<port>/PORT.Mode=<mode>

Parameters

Identifier	Parameter description	Value	Explanation
<mode>	Setting of autonegotiation or manual speed and duplexity	**0**	Autonegotiation
		1	10Mbps half-duplex
		2	10Mbps full-duplex
		3	100Mbps half-duplex
		4	100Mbps full-duplex
		5	1000Mbps full-duplex

Example

- SET /MEDIA/CONTROL/ETHERNET/P102/PORT.Mode=0
- pw /MEDIA/CONTROL/ETHERNET/P102/PORT.Mode=0

16.16.3. 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

16.16.4. 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

16.16.5. 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=

16.16.6. 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=

16.16.7. 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=

16.16.8. 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

16.17. Serial Port Configuration - MMU

> INFO: The serial port numbering can be found in the Control Port Numbering - MMU section.

16.17.1. Baudrate Setting

Command and Response

- SET•/MANAGEMENT/CONTROL/SERIAL/<port>.Baudrate=<baudrate>
- pw•/MANAGEMENT/CONTROL/SERIAL/<port>.Baudrate=<baudrate>

Parameters

Identifier	Parameter description	Value	Explanation
<number>	Baud rate value	**0**	0
		200	200
		300	300
		600	600
		1200	1200
		1800	1800
		2400	2400
		4800	4800
		9600	9600
		19200	19200
		38400	38400
		57600	57600
		115200	115200

Example

- SET /MANAGEMENT/CONTROL/SERIAL/P2.Baudrate=9600
- pw /MANAGEMENT/CONTROL/SERIAL/P2.Baudrate=9600

16.17.2. 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=7
- pw /MANAGEMENT/CONTROL/SERIAL/P1.DataBits=7

16.17.3. 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

16.17.4. Parity Setting

Command and Response

- SET•/MANAGEMENT/CONTROL/SERIAL/<port>.Parity=<parity>
- pw•/MANAGEMENT/CONTROL/SERIAL/<port>.Parity=<parity>

Parameters

The <stopbits> 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

16.17.5. 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

16.18. Serial Port Configuration - Endpoint Devices

ATTENTION! Only the UBEX-PRO20-HDMI-F110 endpoint model is built with RS-232 port.

16.18.1. BAUD Rate Setting

Command and Response

- SET•/MEDIA/CONTROL/UART/<port>/PORT.Baudrate=<number>
- pw•/MEDIA/CONTROL/UART/<port>/PORT.Baudrate=<number>

Parameters

Identifier	Parameter description	Value	Explanation
<number>	Baud rate value	**0**	4800
		1	7200
		2	9600
		3	14400
		4	19200
		5	38400
		6	57600
		7	115200

Example

- SET /MEDIA/CONTROL/UART/P101/PORT.Baudrate=7
- pw /MEDIA/CONTROL/UART/P101/PORT.Baudrate=7

16.18.2. Stopbits Setting

Command and Response

- SET•/MEDIA/CONTROL/UART/<port>/PORT.StopBits=<number>
- pw•/MEDIA/CONTROL/UART/<port>/PORT.StopBits=<number>

Parameters

Identifier	Parameter description	Value	Explanation
<number>	Stop bits value	**0**	1
		1	1,5
		2	2

Example

- SET /MEDIA/CONTROL/UART/P101/PORT.StopBits=0
- pw /MEDIA/CONTROL/UART/P101/PORT.StopBits=0

16.18.3. Parity Setting

Command and Response

- SET•/MEDIA/CONTROL/UART/<port>/PORT.Parity=<number>
- pw•/MEDIA/CONTROL/UART/<port>/PORT.Parity=<number>

Parameters

Identifier	Parameter description	Value	Explanation
<number>	Parity value	**0**	None
		1	Odd
		2	Even

Example

- SET /MEDIA/CONTROL/UART/P101/PORT.Parity=0
- pw /MEDIA/CONTROL/UART/P101/PORT.Parity=0

16.18.4. 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

16.18.5. 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>)
- mO•/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)
- mO /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*.

16.18.6. Query the Current Configuration

Command and Response

- GET•/MEDIA/CONTROL/UART/<port>.Rs232Configuration
- pr•/MEDIA/CONTROL/UART/<port>.Rs232Configuration=<configuration>

Example

- GET /MEDIA/CONTROL/UART/P101.Rs232Configuration
- pr /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*.

16.18.7. 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

16.18.8. 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

16.18.9. 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

16.18.10. 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>)
- mO•/MEDIA/CONTROL/UART/<port>:addTags=

Example

- CALL /MEDIA/CONTROL/UART/P101:addTags(projector;dsub)
- mO /MEDIA/CONTROL/UART/P101:addTags=

16.18.11. Deleting Tags of the Port

Command and Response

- CALL•/MEDIA/CONTROL/UART/<port>:removeTags(<tag>)
- mO•/MEDIA/CONTROL/UART/<port>:removeTags=

Example

- CALL /MEDIA/CONTROL/UART/P101:removeTags(controlroom;media_player)
- mO /MEDIA/CONTROL/UART/P101:removeTags=

16.18.12. Deleting All Tags of the Port

Command and Response

- CALL•/MEDIA/CONTROL/UART/<port>:removeAllTags()
- mO•/MEDIA/CONTROL/UART/<port>:removeAllTags=

Example

- CALL /MEDIA/CONTROL/UART/P101:removeAllTags()
- mO /MEDIA/CONTROL/UART/P101:removeAllTags=

16.18.13. 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:D2:36:F0:00:35;RX_MeetingRoom;#2

16.19. Message Sending via RS-232 Serial Port

ATTENTION! The message sending via serial port can be applied in the endpoint devices only. It does not work with the MMU.

ATTENTION! Only the UBEX-PRO20-HDMI-F110 endpoint model is built with RS-232 port.

16.19.1. Sending a Text (ASCII-format) via Serial Port

The command is for sending a command message in ASCII-format. This method **does not allow** escaping the control characters.

Command and Response

- CALL•/MEDIA/CONTROL/UART/<port>/PORT:sendText(<message>)
- mO•/MEDIA/CONTROL/UART/<port>/PORT:sendText

Example

- CALL /MEDIA/CONTROL/UART/P101/PORT:sendText(open)
- mO /MEDIA/CONTROL/UART/P101/PORT:sendText

The 'open' text is sent out via the P1 serial port.

16.19.2. Sending a Binary Message (HEX-format) via Serial Port

The command is for sending a command message in Hexadecimal-format. This method **does not allow** escaping the control 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.

16.19.3. 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> charaters to be recognized by the controlled device, then they need to be escaped. You can use the following format for escaping:

$$<command_1><\x0d\x0a><command_2><\x0d\x0a>...<command_n><\x0d\x0a>$$

16.20. LW3 Protocol Commands - Quick Summary

System Commands - MMU

Set the Device Label
- SET•/MANAGEMENT/LABEL.DeviceLabel=<custom_name>

Query the Product Name
- GET•/.ProductName

Query the Firmware Package Version
- GET•/MANAGEMENT/UID/PACKAGE.Version

Query the Date and Time of the System
- GET•/MANAGEMENT/DATETIME.CurrentTime

Setting of the Date and Time Manually
- CALL•/MANAGEMENT/DATETIME:setTime=<date_time>

Setting the NTP Server
- SET•/MANAGEMENT/DATETIME.NtpServerAddress=<server_address>

Enable/Disable NTP
- SET•/MANAGEMENT/DATETIME.EnableNtp=<logical_value>

Setting the Brightness of the LCD Screen
- SET•/SYS/CECU/LCD.Brightness=<parameter>

Software Resetting the Device
- CALL•/SYS:softReset()

Rebooting the Device
- CALL•/SYS:reset()

Restore the Factory Default Settings
- CALL•/SYS:factoryDefaults()

System Commands - Endpoints

Set the Device Label
- SET•/SYS/ENDPOINTS/<UBEX_EP>.DeviceLabel=<custom_name>

Query the Product Name
- GET•/SYS/ENDPOINTS/<UBEX_EP>.ProductName

Bootload Mode Setting
- CALL•/SYS/ENDPOINTS/<UBEX_EP>:bootload()

Query the Operation Mode
- GET•/SYS/ENDPOINTS/<UBEX_EP>.OperationMode

Set the Operation Mode
- SET•/SYS/ENDPOINTS/<UBEX_EP>.OperationMode=<operation_mode>

Query the MAC Address of the Device
- GET•/SYS/ENDPOINTS/<UBEX_EP>.MacAddress

Identify the Device
- CALL•/SYS/ENDPOINTS/<UBEX_EP>:identifyMe()

Restarting the Device
- CALL•/SYS/ENDPOINTS/<UBEX_EP>:reset()

Restore the Factory Default Settings
- CALL•/SYS/ENDPOINTS/<UBEX_EP>:factoryDefaults()

Endpoint Management Commands

Query the Number of Registered Endpoints
- GET•/SYS/ENDPOINTS.RegisteredEndpoints

Query the Number of Connected Endpoints
- GET•/SYS/ENDPOINTS.ConnectedEndpoints

Query the Number of Registered Transmitters
- GET•/SYS/ENDPOINTS.RegisteredTxEndpoints

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 Number of Connected Transceivers
- GET•/SYS/ENDPOINTS.ConnectedTrxEndpoints

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/*.*

Query the Number of the Source Ports

- GET•/MEDIA/XP/VIDEO.SourcePortCount

Query the Number of the Destination Ports

- GET•/MEDIA/XP/VIDEO.DestinationPortCount

Video Stream Settings - Source (Input) Side

Query the Name of the Stream

- GET•/MEDIA/STREAMS/VIDEO/<in>.SourceName

Setting the Name of the Stream

- SET•/MEDIA/STREAMS/VIDEO/<in>.SourceName=<name>

Query the Tags of the Stream

- GET•/MEDIA/STREAMS/VIDEO/<in>.Tags

Adding Tags to the Stream

- CALL•/MEDIA/STREAMS/VIDEO/<in>:addTags(<tag>)

Deleting Tags of the Stream

- CALL•/MEDIA/STREAMS/VIDEO/<in>:removeTags(<tag>)

Deleting All Tags of the Stream

- CALL•/MEDIA/STREAMS/VIDEO/<in>:removeAllTags()

Query All Tags of the Device

- GET•/MEDIA/STREAMS/VIDEO/<in>.DeviceTags

Enable/Disable the Stream

- SET•/MEDIA/STREAMS/VIDEO/<in>/STREAM.Enabled=<logical_value>

Resolution Setting

- SET•/MEDIA/STREAMS/VIDEO/<in>/STREAM.ResolutionSetting=<resolution>

Resolution Mode Setting

- SET•/MEDIA/STREAMS/VIDEO/<in>/STREAM.ResolutionMode=<resolution_mode>

Scaler - Image Position Setting

- SET•/MEDIA/STREAMS/VIDEO/<in>/STREAM.ImagePosition=<image_position>

Color Space Converter Setting

- SET•/MEDIA/STREAMS/VIDEO/<in>/STREAM.ColorSpaceSetting=<color_space>

Query the Timing Mode

- GET•/MEDIA/STREAMS/VIDEO/<in>/STREAM.TimingMode

HDCP Setting

- SET•/MEDIA/STREAMS/VIDEO/<in>/PORT.HdcpEnable=<logical_value>

Video Stream Settings - Destination (Output) Side

Query the Name of the Destination

- GET•/MEDIA/STREAMS/VIDEO/<out>.DestinationName

Setting the Name of the Destination

- SET•/MEDIA/STREAMS/VIDEO/<out>.DestinationName=<name>

Query the Tags of the Destination

- GET•/MEDIA/STREAMS/VIDEO/<out>.Tags

Adding Tags to the Destination

- CALL•/MEDIA/STREAMS/VIDEO/<out>:addTags(<tag>)

Deleting Tags of the Destination

- CALL•/MEDIA/STREAMS/VIDEO/<out>:removeTags(<tag>)

Deleting All Tags of the Destination

- CALL•/MEDIA/STREAMS/VIDEO/<out>:removeAllTags()

Query All the Tags of the Device

- GET•/MEDIA/STREAMS/VIDEO/<out>.DeviceTags

Enable/Disable the Stream

- SET•/MEDIA/STREAMS/VIDEO/<out>/STREAM.Enabled=<logical_value>

Resolution Setting

- SET•/MEDIA/STREAMS/VIDEO/<out>/PORT.ResolutionSetting=<resolution>

Resolution Mode Setting

- SET•/MEDIA/STREAMS/VIDEO/<out>/PORT.ResolutionMode=<resolution_mode>

Query the EDID Based Resolution

- GET•/MEDIA/STREAMS/VIDEO/<out>/PORT.EdidBasedResolution

Scaler - Image Position Setting

- SET•/MEDIA/STREAMS/VIDEO/<out>/PORT.ImagePosition=<image_position>

Color Space Converter Setting

- SET•/MEDIA/STREAMS/VIDEO/<out>/PORT.ColorSpaceSetting=<color_space>

Query the Timing Mode

- GET•/MEDIA/STREAMS/VIDEO/<out>/PORT.TimingMode

Timing Mode Setting

- SET•/MEDIA/STREAMS/VIDEO/<out>/PORT.TimingModeSetting=<timing_mode>

No Sync Screen (Test Pattern) Mode

- SET•/MEDIA/STREAMS/VIDEO/<out>/PORT.NoSyncMode=<nosync_mode>

No Sync Screen (Test Pattern) Color Setting

- SET•/MEDIA/STREAMS/VIDEO/<out>/PORT.NoSyncColor=<RGB_code>

HDCP Setting

- SET•/MEDIA/STREAMS/VIDEO/<out>/PORT.HdcpMode=<HDCP_mode>

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>/PORT.Gain=<gain>

Mute/Unmute the Analog Audio Output Port

- SET•/MEDIA/STREAMS/AUDIO/<out>/PORT.Mute=<logical_value>

EDID Management

Query the Validity of a Dynamic EDID

- GET•/MEDIA/EDID/D/<dynamic>.Validity

Query the Preferred Resolution of an EDID

- GET•/MEDIA/EDID/U|F|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>:<user>)

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 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

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

Baudrate 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>.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>.Enable=<logical_value>

Setting the Name of the Port

- SET•/MEDIA/CONTROL/UART/<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/<port>.DeviceTags

Message Sending via RS-232 Serial Port

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>)

17

Firmware Upgrade - Matrix Mode

The Matrix Management Unit (MMU) can be upgraded 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.

- About the Firmware Package (LFP2 File)
- Short Instructions
- Installation of LDU2
- Upgrading of the MMU - Detailed Instructions
- Upgrading of the Endpoints - Detailed Instructions
- Keeping the Configuration Settings

ATTENTION! The firmware upgrade process has an effect on the configuration and the settings of the device. For more details, please see the Keeping the Configuration Settings section before the upgrade.

17.1. About the Firmware Package (LFP2 File)

The firmware files are packed in an LFP2 package. You need only this file to do the upgrade on your device.

- The package contains all the necessary components, binary, and other files;
- The package also contains each firmware with version number and a list showing the compatible devices.

17.2. Short Instructions

Step 1. Get the firmware pack and the Lightware Device Updater v2 (LDU2) application.

Step 2. Install the LDU2 application.

Step 3. Establish connection between the computer and the device(s) via Ethernet.

Step 4. Start LDU2 and follow the instructions shown on the screen.

17.3. Installation of LDU2

Minimum System Requirement

RAM: 1 GB

Installation Modes

LDU2 has two installation modes: **Normal** and **Snapshot**.

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

Comparison of install types

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

Installation on 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 mode of the installation.

Installation on macOS

Mount the DMG file with 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 the LDU2 into another location just drag the icon over the desired folder.

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

17.4. Upgrading of the MMU - Detailed Instructions

The following instructions belong to the **UBEX-MMU-X200** Matrix Management Unit only. For the upgrading of the endpoint devices see the Upgrading of the Endpoints - Detailed Instructions section.

17.4.1. Establish Connection

Make sure that the computer and the device are connected over Ethernet and the connection is established between them.

17.4.2. Start the LDU2 Application and Follow the Steps

The Steps of the Upgrade in Quick Summary:

Step 1. Select the firmware package file.

Step 2. Select the unit for upgrading.

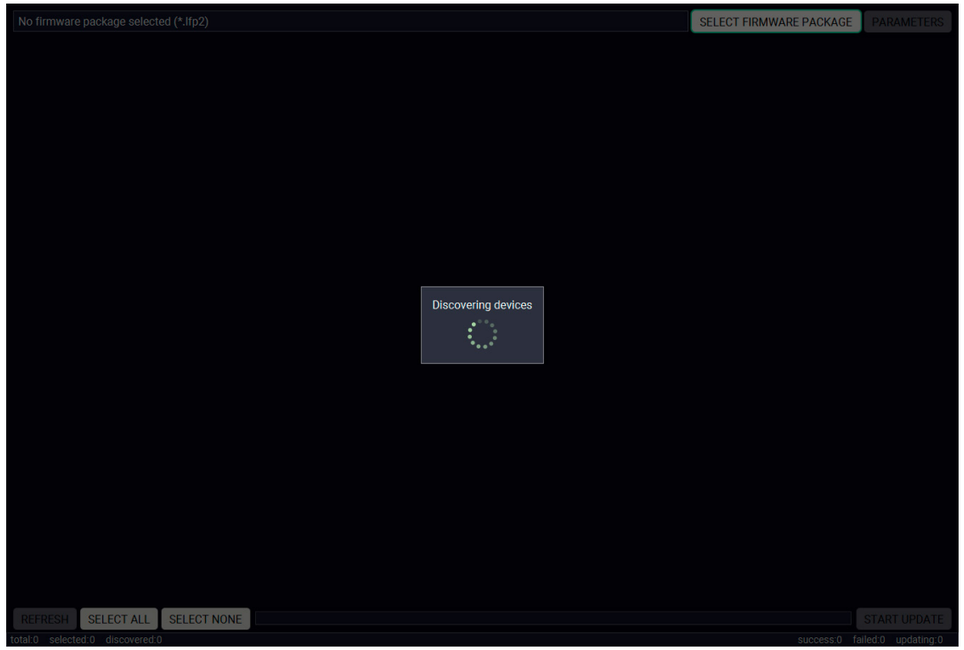
Step 3. Check the upgrade parameters.

Step 4. Start the update and wait until it is finished.

Step 5. Wait until the unit reboots with the new firmware.

Discovering the Devices

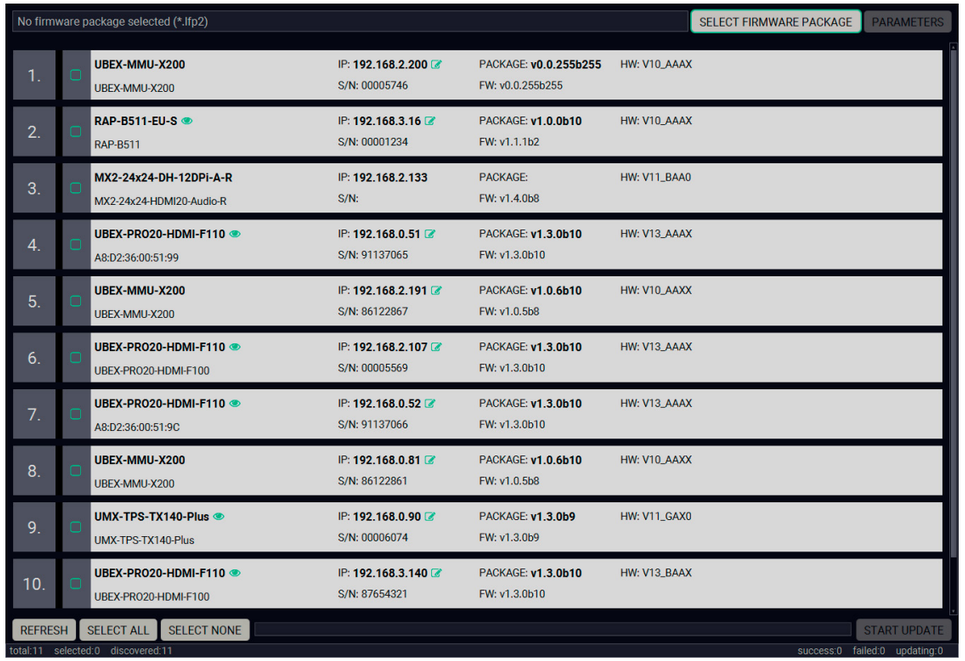
After launching LDU2 the device discovery process starts finding the Lightware devices on the network.



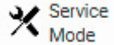
Device discovery is in progress in LDU2

Device List

When the discovery has completed, the devices available on the network are listed in the application.



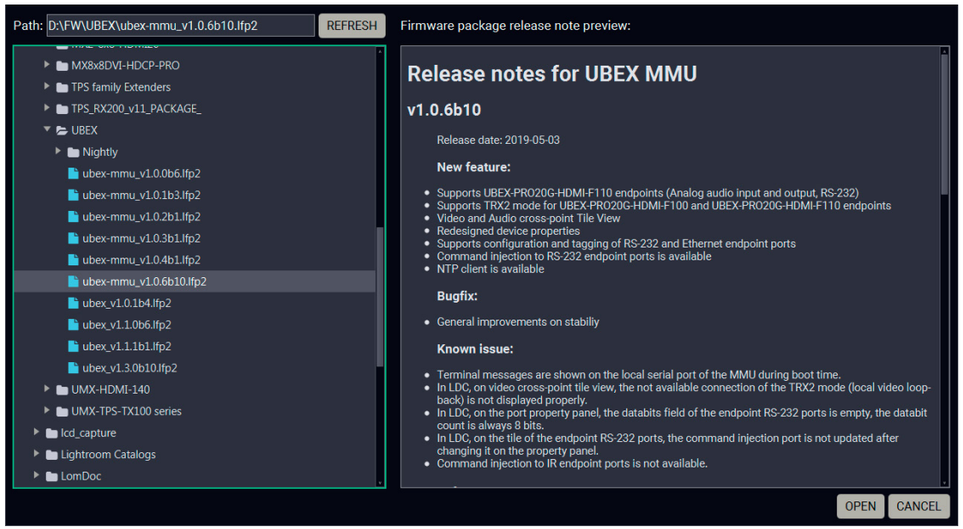
Legend of the Icons

Icon	Name	Description
	IP address editor	To modify IP address settings quickly it is not necessary to enter the device's settings/network menu, you can set them by clicking the pencil icon beside the IP address.
	Further information available	Device is unreachable. Change the IP address using the front panel LCD menu or the IP address editor of the LDU2.
	Service mode	The device is in bootload (service) mode. The firmware upgrade procedure can be continued in this mode.

Upgrade Steps

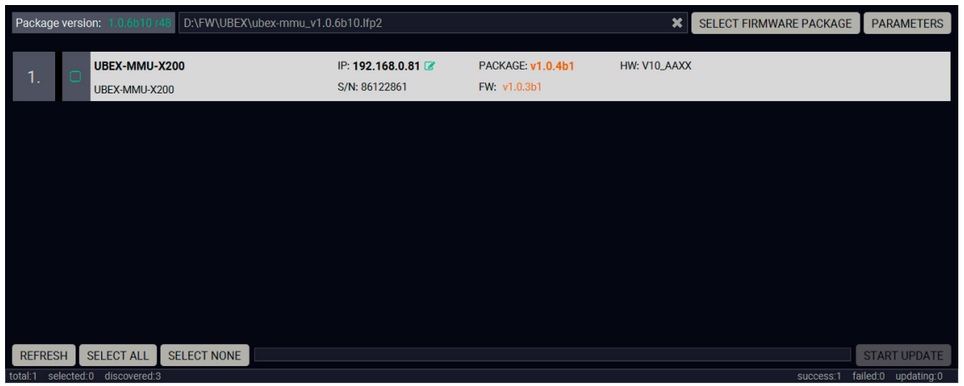
Step 1. Select the firmware package.

Click on the **Select Firmware Package** button and navigate to the location where the LFP2 file of the MMU is saved. When you click on the name of package, the preview of the release notes are displayed on the right side.



Firmware file browser and the release notes window

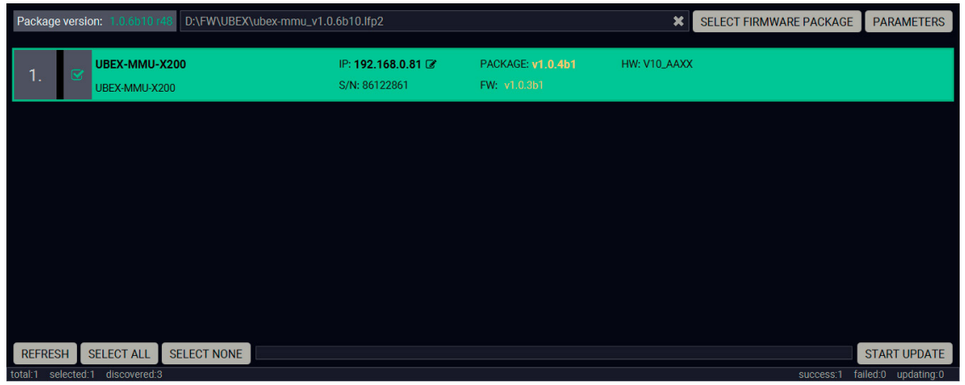
After the package file is loaded, the list is filtered to show compatible devices only. The current firmware version of the device is highlighted in orange if it is different from the version of the package loaded.



Filtered device list based on the selected firmware package

Step 2. Select the unit for upgrading.

Pick the MMU(s) for upgrading. The selected line will be highlighted in green.

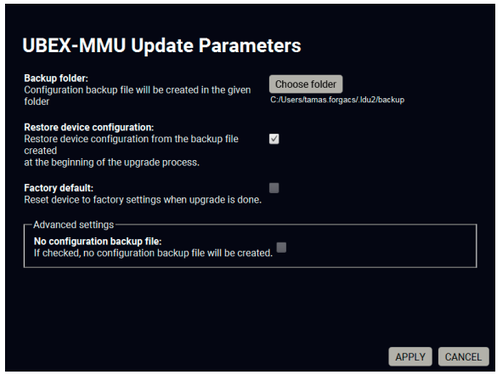


The unit is selected for upgrading

Step 3. Check the upgrade parameters.

> **ATTENTION!** The default settings in the Parameters window should be fine for most cases. Please do not modify them if it is not necessary.

Click on the **Parameters** button to configure the firmware upgrade.



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 upgrade. Enabled by default.

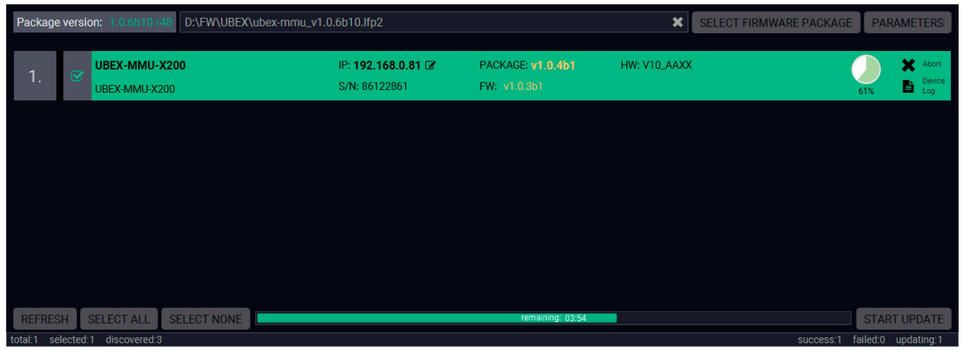
Factory Default

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 upgrade 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.

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 the all procedures in the lower light green progress bar.



Firmware upgrade is in progress

ATTENTION! While the firmware is being upgraded, the normal operation mode is suspended as the MMU is switched to bootload mode. Do not interrupt the firmware upgrade. If any problem occurs, reboot the device and restart the process.

INFO: The device might reboot several times during the firmware upgrade procedure.

INFO: The percent counter can be changed to "Waiting for device" description in few times during the upgrade. 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 upgrade procedure is completed, the unit reboot with the new firmware.

Firmware upgrade procedure is done

17.5. Upgrading of the Endpoints - Detailed Instructions

The following instructions belong to the **endpoint devices** (UBEX-PRO20-HDMI-F100 / F110) only. For the upgrading of the endpoint devices see the Upgrading of the MMU - Detailed Instructions section.

The Steps of the Preparing in Quick Summary

The endpoint devices are required to be prepared before the firmware upgrading. 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 upgrade) mode** via front panel LCD menu or using LW3 protocol commands.

The Steps of the Upgrade in Quick Summary:

Step 1. Select the firmware package file.

Step 2. Select the units for upgrading.

Step 3. Check the upgrade parameters.

Step 4. Start the update and wait until it is finished.

Step 5. Wait until the units reboot with the new firmware.

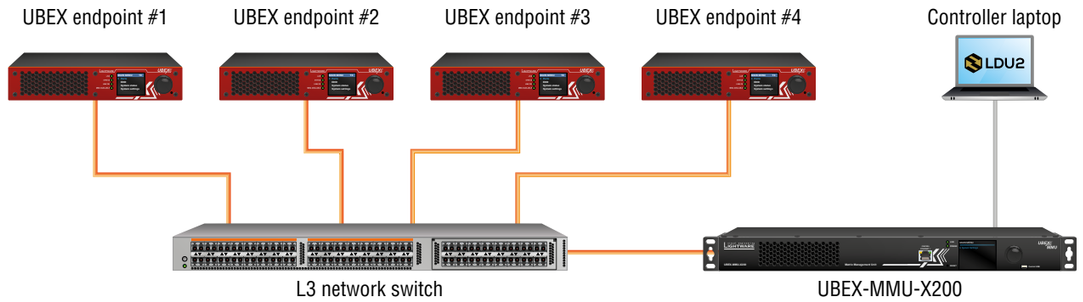
17.5.1. The Steps of the Preparing - Detailed Instructions

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.



Installation example for upgrading the endpoint devices in Matrix mode

Step 3 - Set the IP Addresses of the Endpoint Devices.

Two possible methods are for completing it:

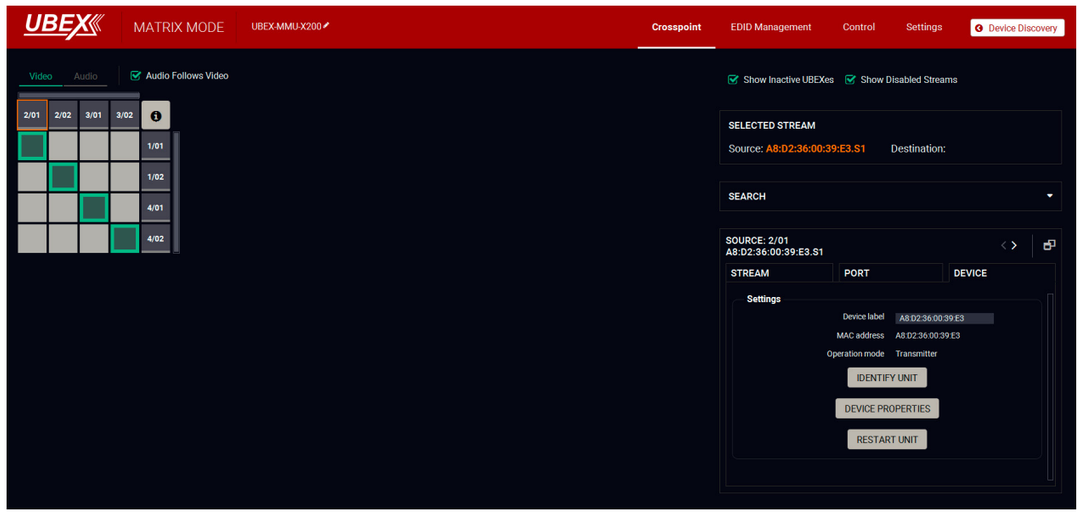
- via **Lightware Device Controller (LDC)** software;
- via using **LW3 protocol commands**.

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.

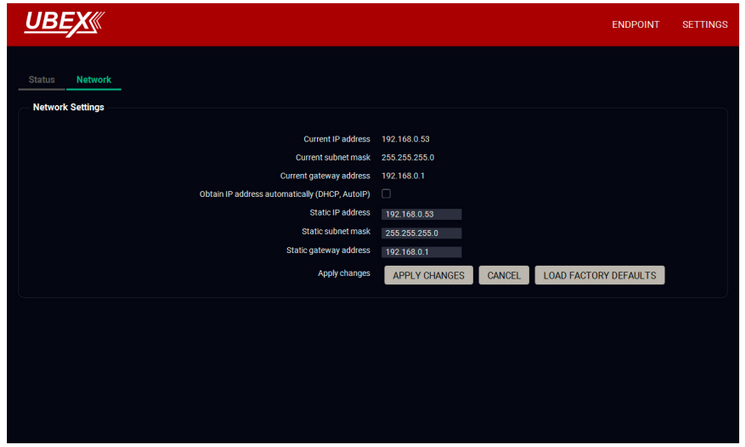
Select a source or destination stream in the crosspoint area to open the properties section in the right side. Navigate to the **Device tab** and select the **Device Properties** button to open the device properties window.



Crosspoint menu - Port properties section - Device tab in the LDC software

A pop window opens with the device properties. Navigate to the **Settings menu** and select the **Network tab**. Set the IP address of the endpoint device (**static** or **dynamic (DHCP)**).

ATTENTION! Always click on the **Apply Changes** button before closing the Device properties window.



Device properties window - Settings menu - Network tab in the LDC software

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 upgraded.

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)**:

- 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:

- 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 upgraded.

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 upgraded.

Step 4 - Set All Endpoints to Bootload (Service / Firmware Upgrade) 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 upgrade) mode.

Example:

- CALL /MEDIA/DEVICEMAP/X1:bootload()

Repeat the procedure with all endpoint devices which are wanted to be upgraded.

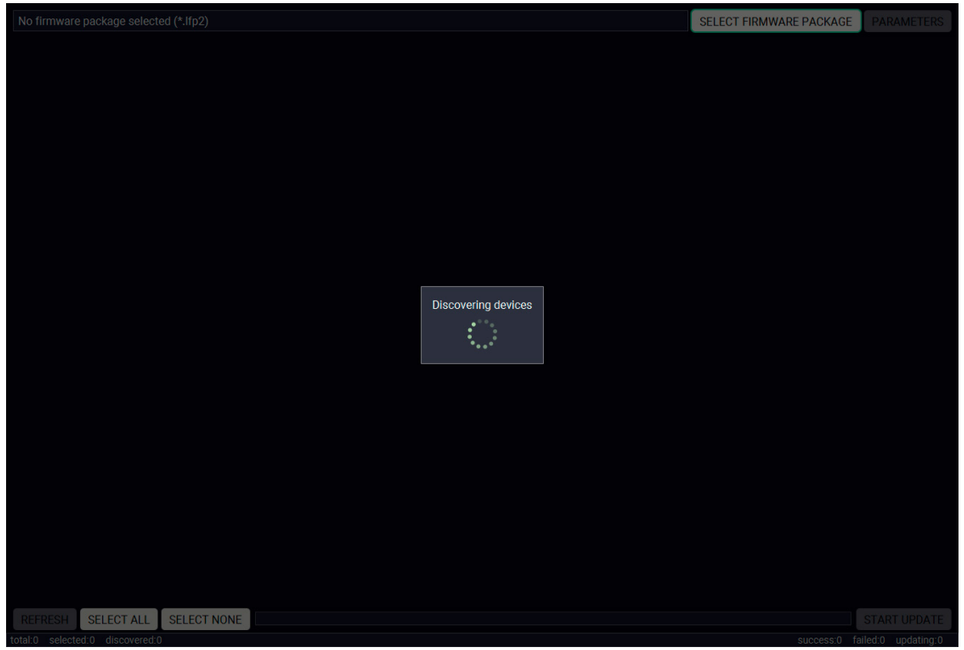
Via Front Panel LCD Menu

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 upgrade) mode.

17.5.2. Start the LDU2 Application and Follow the Steps

Discovering the Devices

After launching LDU2 the device discovery process starts finding the Lightware devices on the network.



Device discovery is in progress in LDU2

Device List

When the discovery has completed, the devices available on the network are listed in the application.

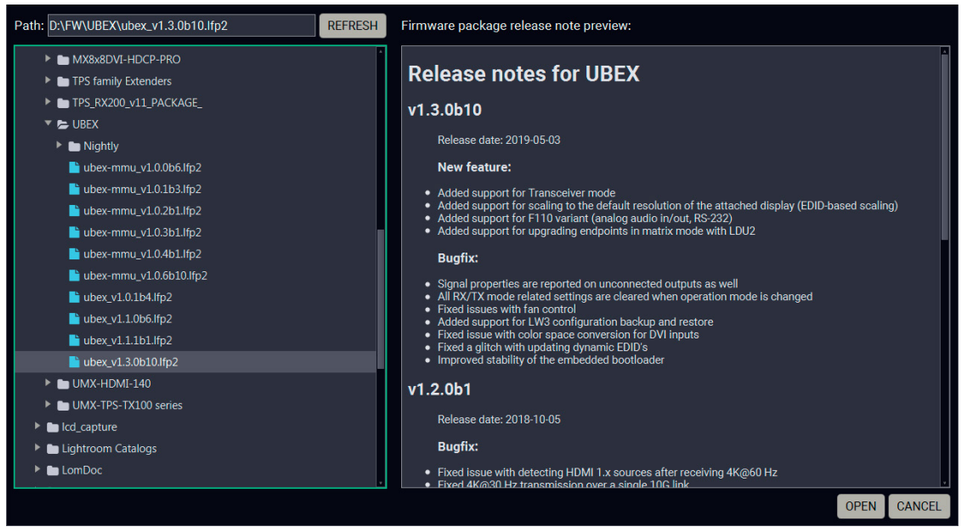
Legend of the Icons

Icon	Name	Description
	Identify the device	Clicking on the icon causes the four front panel LEDs blink in green for 10 seconds. The feature helps to identify the device itself in the rack shelf.
	IP address editor	To modify IP address settings quickly it is not necessary to enter the device's settings/network menu, you can set them by clicking the pencil icon beside the IP address.
	Further information available	Device is unreachable. Change the IP address using the front panel LCD menu or the IP address editor of the LDU2.
Service Mode	Service mode	The device is in bootload (service) mode. The firmware upgrade procedure can be continued in this mode.

Upgrade 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.



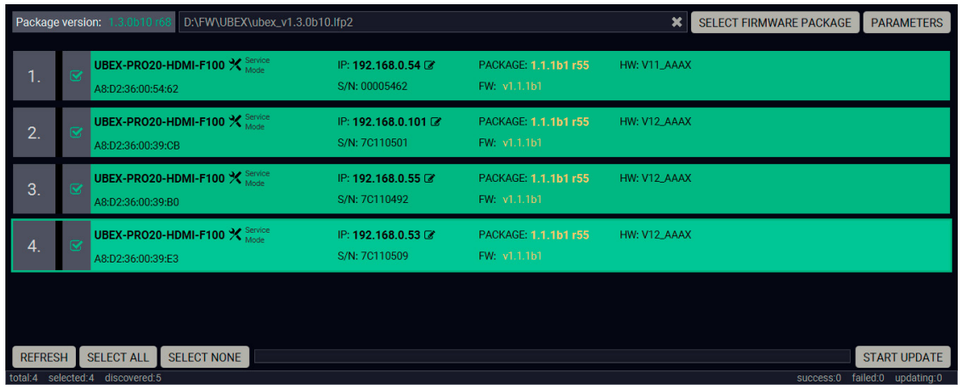
Firmware file browser and the release notes window

After the package file is loaded, the list is filtered to show compatible devices only. The current firmware version of the device is highlighted in orange if it is different from the version of the package loaded.

Filtered device list based on the selected firmware package

Step 2. Select the units for upgrading.

Pick the devices for upgrading. The selected lines will be highlighted in green.



The units are selected for upgrading

TIPS AND TRICKS: If you are not sure which device is connected to your controller device directly, use the **Identify me** feature clicking on the button. It 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.

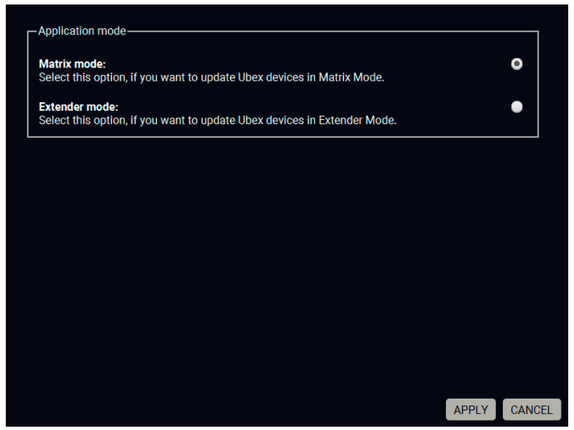
Step 3. Check the upgrade parameters.

Click on the **Parameters** button to configure the firmware upgrade.

Application Mode

The application mode (Extender or Matrix mode) of the current UBEX system can be selected in this section. Select the **Matrix mode**.

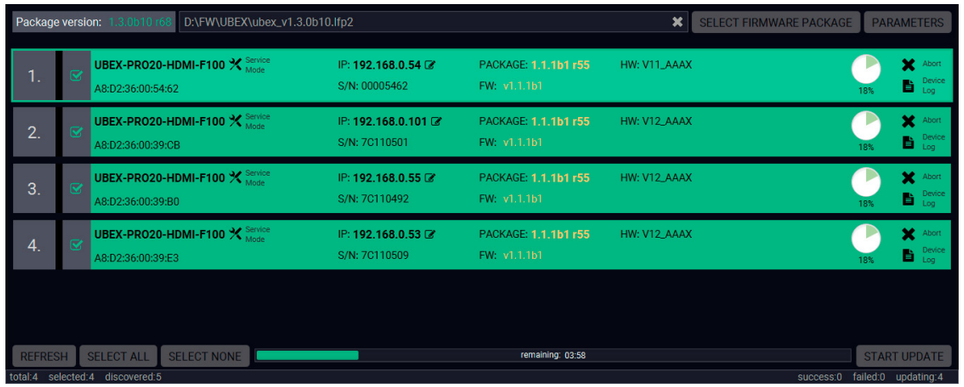
Click on the **Apply** button to save the settings.



Parameters menu for the UBEX endpoints

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 the all procedures in the lower light green progress bar.

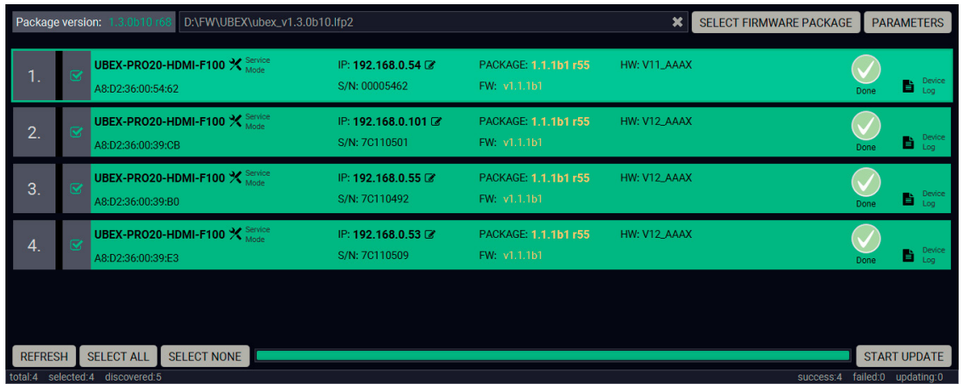


Firmware upgrade is in progress

INFO: The devices might reboot several times during the firmware upgrade procedure.

Step 5. Wait until the units reboot with the new firmware.

Once the firmware upgrade procedure is completed, the units reboot with the new firmware.



Firmware upgrade procedure is done

Setting Back the Device to Normal Operation

If the endpoint device remains in bootload (firmware upgrade) mode for some reason, pressing the jog dial control knob for **3 seconds** results setting back the device to normal operation mode.

17.6. Keeping the Configuration Settings

By default, device configuration settings are restored when firmware upgrade 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. See the details in the System Tab section.

The following flow chart demonstrates how this function works in the background.

1. **Start of the Upgrade**

   The device downloads

2. **Backup**

   The current configuration of the device is being saved into a configuration backup file on your computer. You can find a detailed list about the saved settings in the Content of Backup File section.

3. **Upgrade**

   The CPU firmware is changed to the newer ones in the package.

4. **Factory reset**

   Before the upgrade all configuration settings are restored to the factory default values.

5. **Conversion / Restore**

   Before the restore procedure the firmware package checks the backup data and if it is needed, a conversion is applied to avoid incompatibility problems between the firmware versions. After the conversion all configuration settings are restored to the device.
   When the factory default option is enabled in the Parameters window, the conversion / restore procedure will not be performed!

6. **End**

   Once the firmware upgrade procedure is finished, the device reboots and is ready to use.

The details about the procedure: when firmware upgrade starts, the first step is making a backup of the settings of the device. The firmware package checks the backup data and if it is needed, a conversion is applied to avoid incompatibility problems between the firmware versions. If you want to keep configuration settings, enable the **Restore device configuration** option in the Parameters menu, else you can set the **Factory default** option enabled.

18

Troubleshooting - Matrix Mode

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

18.1. 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 - UBEX Endpoint Devices section for the endpoint devices and to the Front and Rear View - UBEX-MMU-X200 section for the MMU.

Symptom	Root cause	Action	Refer to
Video signal			
No picture on the video output	Device or devices are not powered properly	Check the endpoints, the MMU, the network switch, and the other devices if they are properly powered; try to unplug and reconnect them.	2.3
	Cable connection problem	Cables must fit very well, check all the connectors (HDMI and optical/DAC cables).	2.3 10.2
	Optical cable became contaminated	Use special fiber optical cable cleaning equipment to clean it carefully.	
	Incorrect settings are applied in the network switch	Check the configuration settings of the network switch. See more typical switch related issues on the next page.	10.5
	Singlemode-multimode SFP / SFP+ module pairs	Check the installed SFP / SFP+ modules and install multimode or singlemode modules by pairs only.	10.2
	SFP module is installed instead of SFP+ module	Install SFP+ transceiver module to the SFP+ port	10.2
	Incompatible SFP+ modules are in the endpoint and the network switch	Check the compatibility of the installed SFP+ modules: singlemode / multimode pairs, parameters of the modules	10.2
	Not the proper video stream is the active one	Check the crosspoint state which video stream switched to the current output.	15.4 16.7.3
	Video stream is disabled	Enable the source stream.	15.8.1 16.8.8
	Output port is disabled	Enable the destination stream.	15.9.1 16.9.7
	Display is not able to receive the video format	Check the emulated EDID; select another (e.g. emulate the EDID of the display on the input port).	15.15.1 16.13

Symptom	Root cause	Action	Refer to
Video signal			
No picture on the video output	Display is not able to display the video format	Scale the stream on HDMI in 1 port of the transmitter to the resolution and refresh rate of the sink device.	15.8.1 16.8.10
	Display is not able to display the video format	Scale the stream on the HDMI out 1 port of the receiver to the resolution and refresh rate of the sink device.	15.9.2 16.9.10
	HDCP is disabled (TX)	Enable HDCP on the TX input ports.	15.8.2 16.8.14
	HDCP is disabled (RX)	Enable HDCP on the RX output ports.	15.9.2 16.9.18
Not the desired picture displayed on the video output	Video output is set to test pattern (no sync screen) statically (RX)	Check No sync screen settings in the HDMI output properties (RX).	15.14.2 16.9.16
	Video stream is switched to another output	Check the crosspoint state.	15.4 16.7.3
Colors of the video is incorrect	Incorrect color space setting is active (TX)	Check the color space settings on the TX side.	15.8.1 16.8.12
	Incorrect color space setting is active (RX)	Check the color space settings on the RX side.	15.9.2 16.9.13
Audio signal			
No audio is present on output	Source audio volume is low or muted	Check the audio settings of the source.	
	The incoming audio signal is unsupported	Query the status of the audio output port and select a supported signal source	16.14.12
	The analog audio output port is muted	Check the analog audio output port properties	15.10.3 16.12.5
	Volume of the analog audio port is set low	Check the analog audio input/output port properties	15.10.2 15.10.3 16.12.1 16.12.2

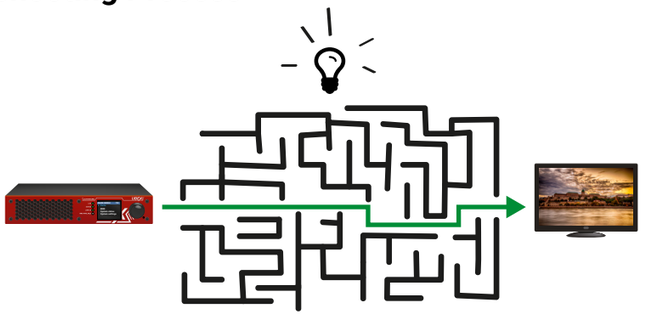
Symptom	Root cause	Action	Refer to
Audio signal			
HDMI output signal contains no audio	DVI EDID is emulated	Check the EDID and select and HDMI EDID to emulate (the setting is available in the transmitter side).	15.15.1 16.13
Not the desired audio can be heard on the output	Audio stream is switched to another output	Check the audio crosspoint settings.	15.4 16.10.1
Network switch related issues *			
No picture on the video output	Link aggregation is not set in the switch.	Create Link Aggregation Groups (LAG's)/EtherChannels etc. for each port pair that is used.	10.5.1
The picture is always dropped	VLAN tagging is not set.	Set the 286 VLAN ID and add all LAGs to this VLAN.	10.5.2
Bandwidth problem on the network with a single 4K60 stream	All streams are transmitted to all outputs because IGMPv2 snooping in not enabled.	Enable IGMPv2 snooping.	10.5.3
All streams are transmitted except the 4K60 one	One of the 10G link cables is connected to another LAG.	Check the LLDP and the status of the LAGs.	10.5.4
	Only one SFP+ module / DAC cable is installed in the endpoint device instead of two.	Install two 10GbE SFP+ modules / DAC cables between the endpoint and the network switch	10.2
Black stripes in the picture	IGMPv2 snooping in not enabled.	Enable IGMPv2 snooping.	10.5.3
	Optical cable became contaminated.	Use special fiber optical cable cleaning equipment to clean it carefully.	
	Cable connection problem.	Cables must fit very well, check all the connectors (video and optical/DAC cables).	2.3 10.2

***** 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

Symptom	Root cause	Action	Refer to
Network			
No LAN connection can be established	Incorrect IP address is set (fix IP)	Use dynamic IP address by enabling DHCP option.	12.2.1 15.18.2 16.15.2
		Restore the factory default settings (with fix IP).	12.2.4 15.18.4 16.4.11
No LAN connection can be established	IP address conflict	Check the IP address of the other devices, too.	
RS-232 signal - Endpoints			
Connected serial device does not respond	Cable connection problem	Check the connectors to fit well; check the wiring of the plugs.	2.3.6 20.11.1
	RS-232 settings are different	Check the port settings of the endpoint and the connected serial device.	15.16.2 16.18
	Messaging via serial port is not working	Check the serial messaging rules and/or apply escaping in the message.	15.16.2 16.19
RS-232 signal - MMU			
Connected serial device does not respond	Cable connection problem	Check the connectors to fit well; check the wiring of the plugs.	2.3.6 20.11.1
	RS-232 settings are different	Check the port settings of the MMU and the connected serial device.	16.17
Miscellaneous			
I cannot find my endpoint device in the server room	All AV boxes and gadgets look the same.	Use the "Identify Me" feature.	15.8.3 15.9.3 16.5.7

18.2. How to Speed Up the Troubleshooting Process



Lightware's technical support team is always working hard to provide the fastest support possible. Our team's response time is one of the best in the industry and in the toughest of cases we can directly consult with the hardware or software engineer who designed the product to get the information from the most reliable source.

However, the troubleshooting process can be even faster... with your help.

There are certain pieces of information that push us in the right direction to finding the root cause of the problem. If we receive most of this information in the first e-mail or it is gathered at the time when you call us, then there is a pretty high chance that we will be able to respond with the final solution right away.

This information is the following:

- Schematic (a pdf version is preferred, but a hand drawing is sufficient).
- Serial number(s) of the device(s) (it is either printed somewhere on the box or you can query it in the Device Controller software or on the built-in website).
- Firmware versions of the devices (please note that there may be multiple CPUs or controllers in the device and we need to know all of their firmware versions, a screenshot is the best option).
- Cable lengths and types (in our experience, it's usually the cable).
- Patch panels, gender changers or anything else in the signal path that can affect the transmission.
- Signal type (resolution, refresh rate, color space, deep color).
- Emulated EDID(s) (please save them as file and send them to us).
- Actions to take in order to re-create the problem (if we cannot reproduce the problem, it is hard for us to find the cause).
- Photo or video about the problem ('image noise' can mean many different things, it's better if we see it too).
- Error logs from the Device Controller software.
- In the case of Event Manager issue the event file and/or backup file from the Device Controller software.

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

19

Technologies

The following sections contain descriptions and useful technical information how the devices work in the background. The content is based on experiences and cases we met in practice. These sections help to understand features and technical standards like the followings:

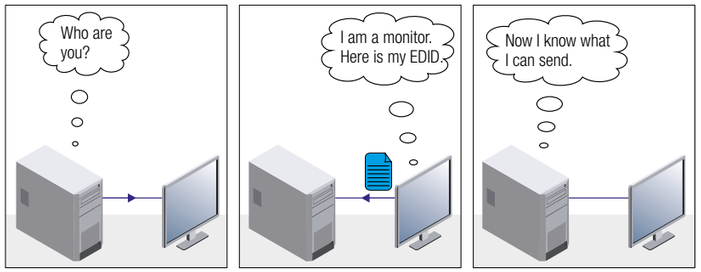
- EDID Management
- HDCP Management
- Pixel Accurate Reclocking
- AV Over IP

19.1. EDID Management

19.1.1. Understanding the EDID

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

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



EDID Communication

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

Common Problems Related to EDID

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

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

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

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

19.1.2. 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.

19.2. HDCP Management

Lightware Visual Engineering is a legal HDCP adopter. Several functions have been developed which helps to solve HDCP related problems. Complex AV systems often have both HDCP and non-HDCP components. The matrix allows transmitting HDCP encrypted and unencrypted signals. The devices will be still HDCP compliant as they will never output an encrypted signal to a non-HDCP compliant display device. If an encrypted signal is switched to a non-compliant output, a red screen alert or muted screen will appear.

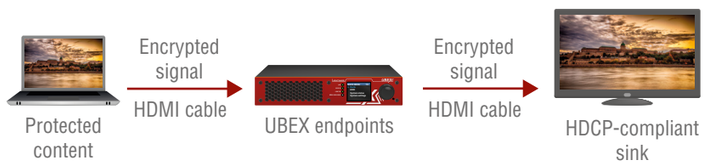
19.2.1. Protected and Unprotected Content

Many video sources send HDCP protected signal if they detect that the sink is HDCP capable – even if the content is not copyrighted. This can cause trouble if an HDCP capable device is connected between the source and the display. In this case, the content cannot be viewed on non-HDCP capable displays and interfaces like event controllers. Rental and staging technicians often complain about certain laptops, which are always sending HDCP encrypted signals if the receiver device (display, matrix router, etc.) reports HDCP compliancy. However, HDCP encryption is not required all the time e.g. computer desktop image, certain laptops still do that.

To avoid unnecessary HDCP encryption, Lightware introduced the HDCP enabling/disabling function: the HDCP capability can be disabled in the Lightware device. If HDCP is disabled, the connected source will detect that the sink is not HDCP capable, and turn off authentication.

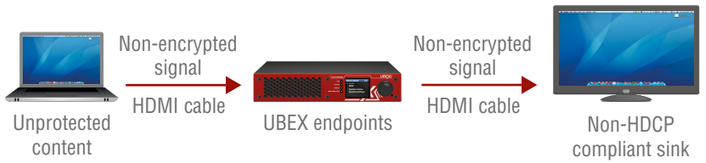
19.2.2. Disable Unnecessary Encryption

HDCP Compliant Sink



All the devices are HDCP-compliant, no manual setting is required, both protected and unprotected contents are transmitted and displayed on the sink.

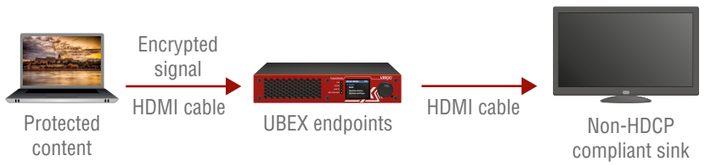
Not HDCP-compliant Sink 1.



Non-HDCP compliant sink is connected to the 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.

19.2.3. 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 HDCPv1, 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). 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 to apply a previous version of HDCP (e.g. HDCP v1.4) between the source and the display if the source device allows it. According to the standard if the image content is protected with HDCP, the highest supported content protection level has to be applied. However, if the highest level of protection is not justified by the source content the level may be decreased to avoid compatibility problems; this case is determined by the source.

HDCP v2.2 Source and HDCP v1.4 Sink

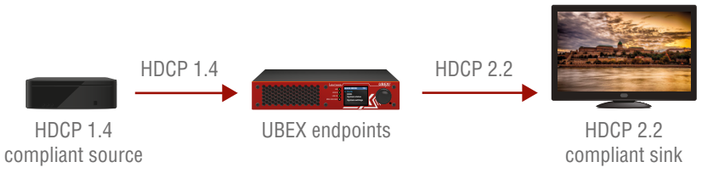
In this case the signal of an HDCP v2.2 compliant source is switched to an HDCP v1.4 compliant sink device. The signal is encrypted with HDCP v2.2 on the input and encrypted with HDCP v1.4 on the output of the Lightware device. A lower level of encryption may be applied only if the source device/content 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.

The content is Stream type 0

The content is Stream type 1 (High-value content)

HDCP v1.4 Source and HDCP v2.2 Sink

The below example is the reversal of the previous case. An HDCP v1.4 compliant source sends a signal with HDCP v1.4 encryption. The signal is switched to an HDCP v2.2 compliant sink device. In this case the outgoing signal has to be encrypted with the highest supported encryption level towards the sink, as the Lightware device and the sink are both HDCP v2.2 compliant. The HDCP v2.2 standard does not allow keeping the original HDCP v1.4 encryption level on the output.



What Kind of Signal Will be on the Output of the Lightware Device?

See below table that summarizes the possible cases:

Incoming Signal	HDCP v1.4 Compatible Sink on the Output	HDCP v2.2. Compatible Sink on the Output
HDCP v1.4	HDCP v1.4	HDCP v2.2
HDCP v2.2 (convertible)*	HDCP v1.4	HDCP v2.2
HDCP v2.2 (not convertible)*	Black screen	HDCP v2.2

* Stream type 0: the video stream allows to convert the signal to apply a lower level of encryption.

** Stream type 1 (High-value content): the video stream does not allow to convert the signal.

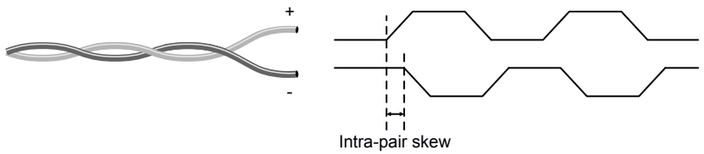
19.3. Pixel Accurate Reclocking

Signal reclocking is an essential important procedure in digital signal transmission. After passing the reclocking circuit, the signal becomes stable, jitter-free, and can be transmitted over more equipment like processors, or event controllers. Without reclocking, sparkles, noise, and jaggies appear on the image.

Lightware's sophisticated Pixel Accurate Reclocking technology fixes more problems than general TMDS reclocking. It removes not only intra-pair skew but inter-pair skew as well. The Pixel Accurate Reclocking circuit eliminates the following errors:

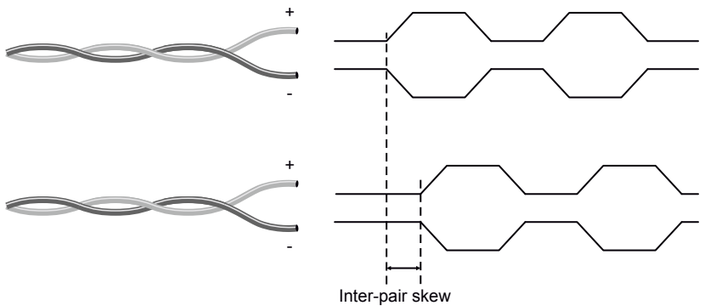
Intra-pair skew

Skew between the + and - wires within a differential wire pair (e.g. Data2- and Data2+). It's caused by different wire lengths or slightly different wire construction (impedance mismatch) in DVI cable. It results in jitter.



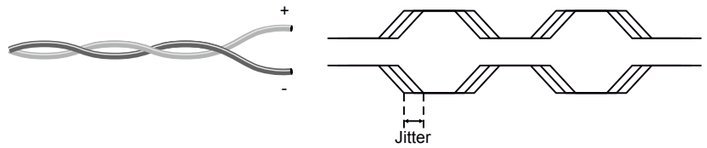
Inter-pair skew

Skew between two differential wire pairs in a cable. It is caused by different wire pair lengths or different number of twists in the DVI cable. Too much inter-pair skew results color shift in the picture or sync loss.



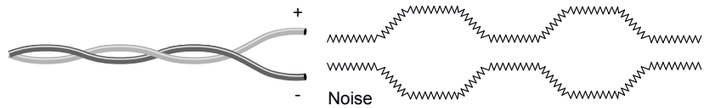
Jitter

Signal instability in the time domain. The time difference between two signal transitions should be a fixed value, but noise and other effects cause variations.



Noise

Electromagnetic interference between other electronic devices such as mobile phones, motors, etc. and the DVI cable are coupled onto the signal. Too much noise results in increased jitter.



19.4. AV Over IP

19.4.1. Basics

Beside the traditional AV matrix switchers 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 increasing of the using of the IT-related devices and equipment all around the world - from the offices to the homes.

The main difference compared with 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.

19.4.2. 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

19.4.3. Link Aggregation Protocol

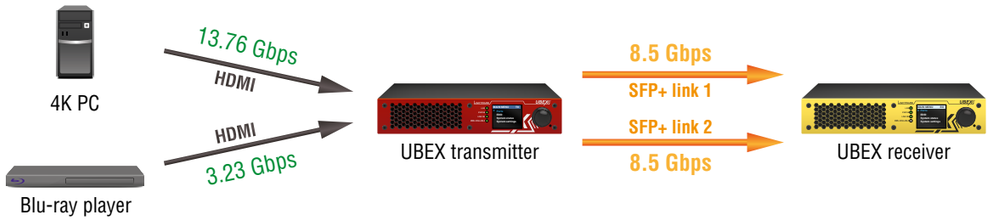
The UBEX endpoints use Link Aggregation Control Protocol (LACP) to share equally the signal bandwidth of the streams between the two the SFP+ ports.

> 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 is happened with two different method 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.

Example for the Link Aggregation Protocol



Example for the working of the LACP

19.4.4. 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

20

Appendix

Tables, drawings, guides, technical details, and the Quick Link Collection as follows:

- Specification
- Input/Output Port Numbering
- Factory Default Settings
- Content of Backup File
- Release Notes of the Firmware Packages
- Resolutions of the Scaler / FRC
- Factory EDID List
- Mechanical Drawings
- Hidden USB Connector for Debug Purpose
- Required Bandwidth of the Resolutions
- Cable Wiring Guide
- Quick Link Collection
- Further Information

20.1. Specification

20.1.1. UBEX-PRO20-HDMI-F100

General

Compliance ..... CE
EMC compliance (emission) ..... IEC/EN 55032:2015
EMC compliance (immunity) ..... IEC/EN 55035:2017
RoHS compliance ..... EN 50581:2012
Safety compliance ..... IEC/EN 62368-1:2014
Warranty ..... 3 years
Cooling ..... 2x built-in fans
Operating temperature ..... 0 to +50˚C (+32 to +122˚F)
Operating humidity ..... 10% to 90%, non-condensing

Power

Power source ..... IEC 100-230 V AC, 50/60 Hz

Power Consumption

Resolution	TX mode	RX mode	TRX mode
4K60	21,1 W	21,4 W	-
4K30	20,3 W	20,2 W	-
4K30 + 4K30	22,9 W	20,9 W	21,9 W
4K60 + 1080p60	24,2 W	21,4 W	22,8 W
4K60 + 4K30	22,1 W	21,1 W	21,6 W

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 ..... 2077 g (4,57 lbs)

Video Ports

Number of ports ..... 2x HDMI inputs, 2x HDMI outputs
Port connector type ..... 19-pole HDMI Type A receptacle
Standard ..... DVI 1.0, HDMI 2.0
Max. video resolutions ..... 3840x2160@60 Hz, 30 bit
..... 4096x2160@60 Hz, 30 bit
Audio formats ..... 8 channel PCM
..... Dolby Digital, Dolby Digital Plus, Dolby TrueHD
..... DTS, DTS-HD Master Audio 7.1, WMA Pro

SFP+ Port Slots

Number of ports 2
Supported data rate ..... up to 10 Gbps
Accepted interfaces ..... SFP+ optical transceiver modules
..... DAC cables

Ethernet Ports

Number of ports 2
Connector type ..... Locking RJ45
Ethernet data rate ..... 1000Base-T, full duplex with autodetect
Power over Ethernet (PoE) ..... Not supported

20.1.2. UBEX-PRO20-HDMI-F110

General

Compliance ..... CE
EMC compliance (emission) ..... IEC/EN 55032:2015
EMC compliance (immunity) ..... IEC/EN 55035:2017
RoHS compliance ..... EN 50581:2012
Safety compliance ..... IEC/EN 62368-1:2014
Warranty ..... 3 years
Cooling ..... 2x built-in fans
Operating temperature ..... 0 to +50˚C (+32 to +122˚F)
Operating humidity ..... 10% to 90%, non-condensing

Power

Power source ..... IEC 100-230 V AC, 50/60 Hz

Power Consumption

Resolution	TX mode	RX mode	TRX mode
4K60	21,1 W	21,4 W	-
4K30	20,3 W	20,2 W	-
4K30 + 4K30	22,9 W	20,9 W	21,9 W
4K60 + 1080p60	24,2 W	21,4 W	22,8 W
4K60 + 4K30	22,1 W	21,1 W	21,6 W

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 Ports

Number of ports ..... 2x HDMI inputs, 2x HDMI outputs
Port connector type ..... 19-pole HDMI Type A receptacle
Standard ..... DVI 1.0, HDMI 2.0
Max. video resolutions ..... 3840x2160@60 Hz, 30 bit
..... 4096x2160@60 Hz, 30 bit
Audio formats ..... 8 channel PCM
..... Dolby Digital, Dolby Digital Plus, Dolby TrueHD
..... DTS, DTS-HD Master Audio 7.1, WMA Pro

SFP+ Port Slots

Number of ports 2
Supported data rate ..... up to 10 Gbps
Accepted interfaces ..... SFP+ optical transceiver modules
..... DAC cables

Ethernet Ports

Number of ports 3
Connector type ..... Locking RJ45
Ethernet data rate ..... 1000Base-T, full duplex with autodetect
Power over Ethernet (PoE) ..... Not supported

Analog Audio Ports

Analog Audio Input Port

Audio port connector ..... 5-pole Phoenix connector
Signal transmission ..... Balanced and unbalanced audio
Gain ..... 0 – 21 dB
Volume ..... -95 – 0 dB

Analog Audio Output Port

Audio port connector ..... 5-pole Phoenix connector
Supported signal ..... PCM, up to 48 kHz
Volume ..... -57 – 0 dB
Nominal Differential Output Level ..... +4 dBu @ 0 dB Gain
Nominal Differential Output Level ..... +7 dBu @ 3 dB Gain

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 Ports

Number of IR ports ..... 2 (1x RX, 1x TX)
Connector type ..... 3.5mm TRS (approx. 1/8" jack)

20.1.3. UBEX-MMU-X200

General

Compliance ..... CE
EMC compliance (emission) ..... IEC/EN 55032:2015
EMC compliance (immunity) ..... IEC/EN 55035:2017
RoHS compliance ..... EN 50581:2012
Safety compliance ..... IEC/EN 62368-1:2014
Warranty ..... 3 years
Cooling ..... Passive
Operating temperature ..... 0 to +50˚C (+32 to +122˚F)
Operating humidity ..... 10% to 90%, non-condensing

Power

Power source ..... IEC 100-230 V AC, 50/60 Hz
Power consumption ..... 3 W

Enclosure

Rack mountable ..... Yes
Material ..... 1 mm steel
Dimensions in mm ..... 482W x 150D x 43.9H
Dimensions in inch ..... 18.9W x 5.9D x 1.7 H
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

Ethernet Port

Connector type ..... Locking RJ45
Ethernet data rate ..... 1000Base-T, full duplex with autodetect
Power over Ethernet (PoE) ..... Not supported

Control Ethernet Ports

Control Ethernet 1

Connector type ..... Locking RJ45
Location ..... Front panel
Ethernet data rate ..... 100Base-T, auto-negotiation, auto-MDI/MDIX
Power over Ethernet (PoE) ..... Not supported

Control Ethernet 2

Connector type ..... Locking RJ45
Location ..... Rear panel
Ethernet data rate ..... 1000Base-T, auto-negotiation, auto-MDI/MDIX
Power over Ethernet (PoE) ..... Not supported

USB Control Port

USB connector ..... USB mini B type

USB 2.0 compliance..... Yes

RS-232 Control Ports

Number of ports..... 2

Connector type..... 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

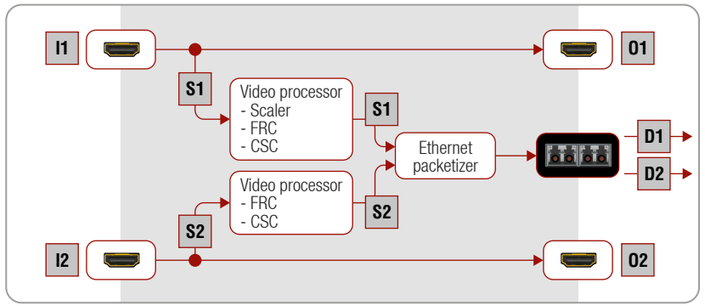
20.2. Input/Output Port Numbering

ATTENTION! The following endpoint AV port numbering tables are valid for the Extender mode only. The port numbering of the Matrix mode depends on various circumstances and based on calculation. See the details in the Stream ID Calculation section.

20.2.1. UBEX-PRO20-HDMI-F100 - Transmitter Mode

Description		Video port nr. (LW3)	Audio port nr. (LW3)
HDMI ports	HDMI in 1	I1	I1
	HDMI in 2	I2	I2
	HDMI out 1 (local out 1)	O1	O1
	HDMI out 2 (local out 2)	O2	O2
Source streams	Stream 1	S1	S1
	Stream 2	S2	S2
Destination streams	Stream 1	D1	D1
	Stream 2	D2	D2

Port Diagram

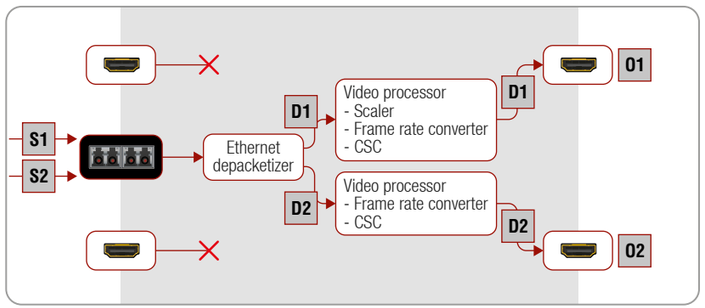


AV port diagram of the F100 transmitter with the port numbers

20.2.2. UBEX-PRO20-HDMI-F100 - Receiver Mode

Description		Video port nr. (LW3)	Audio port nr. (LW3)
HDMI ports	HDMI out 1	O1	O1
	HDMI out 2	O2	O2
Source streams	Stream 1	D1	D1
	Stream 2	D2	D2
Destination streams	Stream 1	S1	S1
	Stream 2	S2	S2

Port Diagram

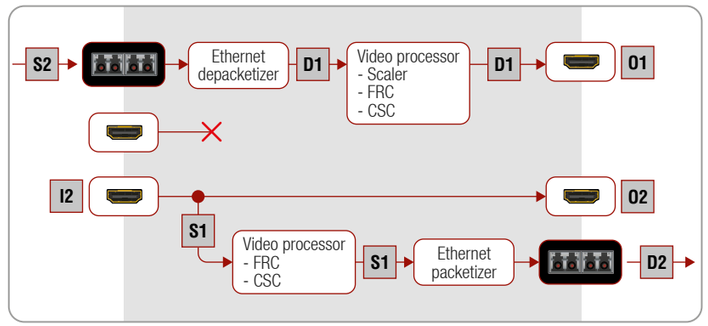


AV port diagram of the F100 receiver with the port numbers

20.2.3. UBEX-PRO20-HDMI-F100 - Transceiver Mode

Description		Video port nr. (LW3)	Audio port nr. (LW3)
HDMI ports	HDMI in 2	I2	I2
	HDMI out 1	O1	O1
	HDMI out 2 (local output)	O2	O2
Source streams	Stream 1 (from HDMI in 2)	S1	S1
	Stream 2 (from the remote device)	S2	S2
Destination streams	Stream 1 (toward HDMI out 2)	D1	D1
	Stream 2 (toward the remote device)	D2	D2

Port Diagram



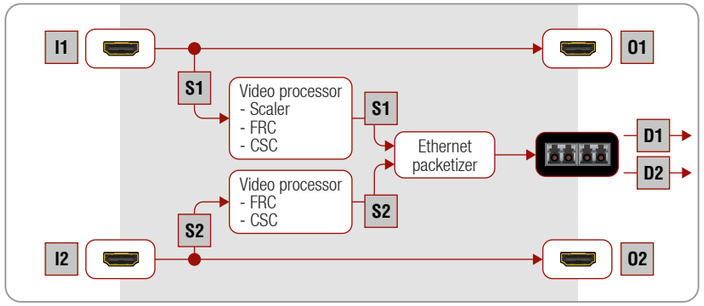
AV port diagram of the F100 transceiver with the port numbers

20.2.4. UBEX-PRO20-HDMI-F110 - Transmitter Mode

Audio-Video Port Numbering Table

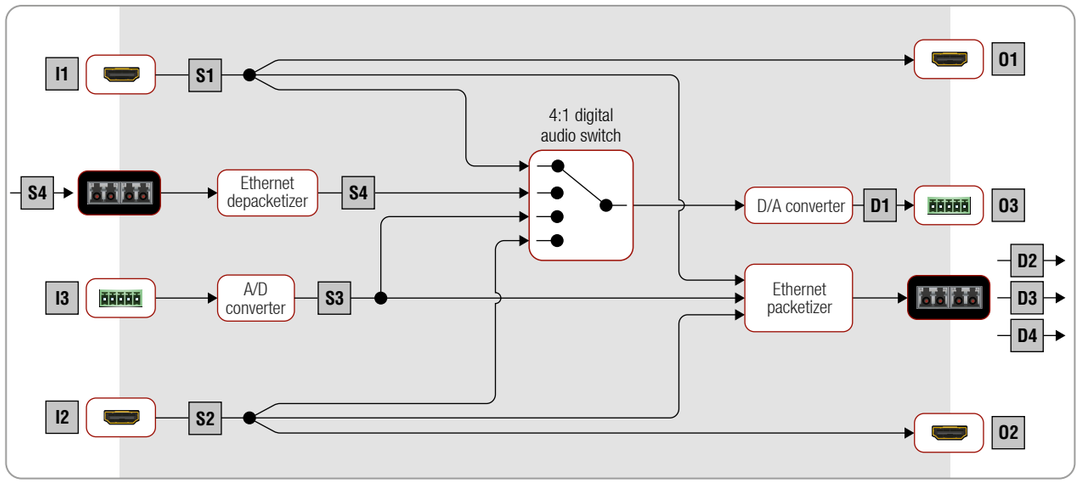
Description		Video port nr. (LW3)	Audio port nr. (LW3)
HDMI ports	HDMI in 2	I2	I2
	HDMI out 1	O1	O1
	HDMI out 2 (local output)	O2	O2
Analog audio ports	Analog audio in	-	I3
	Analog audio out	-	O3
Source streams	HDMI stream 1	S1	S1
	HDMI stream 2	S2	S2
	Analog audio input stream	-	S3
	Remote audio input stream	-	S4
Destination streams	Analog audio output stream	-	D1
	HDMI stream 1	D1	D2
	HDMI stream 2	D2	D3
	Remote audio output stream	-	D4

Video Port Diagram



Video port diagram of the F110 transmitter with the port numbers

Audio Port Diagram



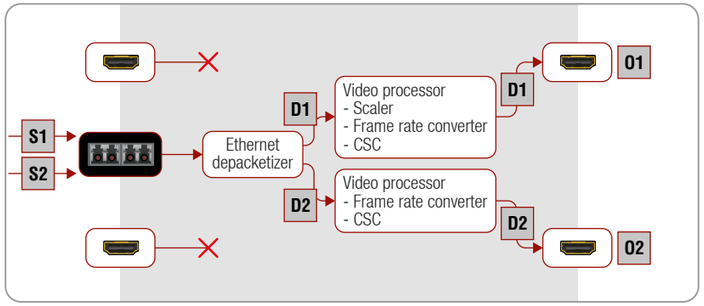
Audio port diagram of the F110 transmitter with the port numbers

20.2.5. UBEX-PRO20-HDMI-F110 - Receiver Mode

Audio-Video Port Numbering Table

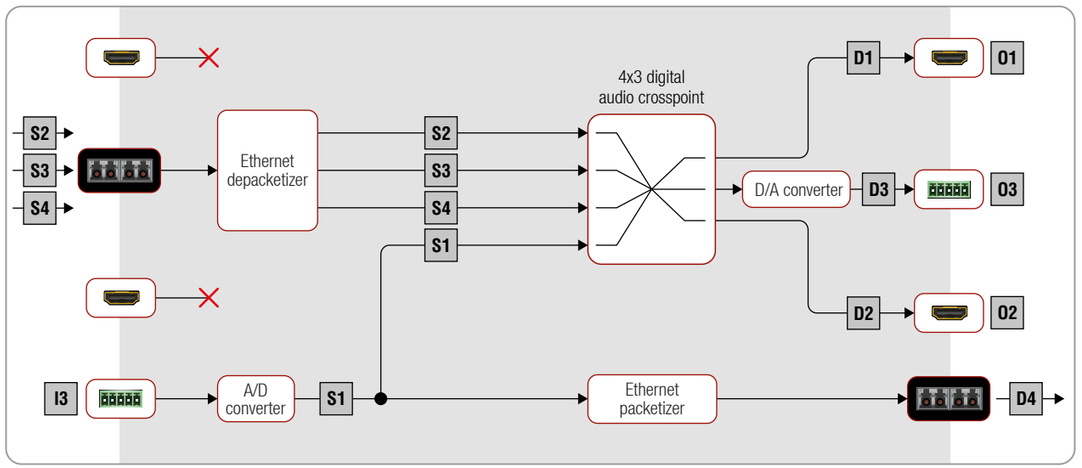
Description		Video port nr. (LW3)	Audio port nr. (LW3)
HDMI ports	HDMI out 1	O1	O1
	HDMI out 2	O2	O2
Analog audio ports	Analog audio in	-	I3
	Analog audio out	-	O3
Source streams	Analog audio input stream	-	S1
	HDMI stream 1	S1	S2
	HDMI stream 2	S2	S3
	Remote audio input stream	-	S4
Destination streams	HDMI stream 1	D1	D1
	HDMI stream 2	D2	D2
	Analog audio output stream	-	D3
	Remote audio output stream	-	D4

Video Port Diagram



Video port diagram of the F110 receiver with the port numbers

Audio Port Diagram



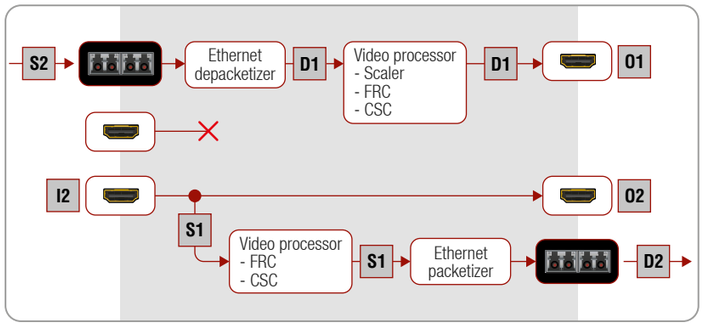
Audio port diagram of the F110 receiver with the port numbers

20.2.6. UBEX-PRO20-HDMI-F110 - Transceiver Mode

Audio-Video Port Numbering Table

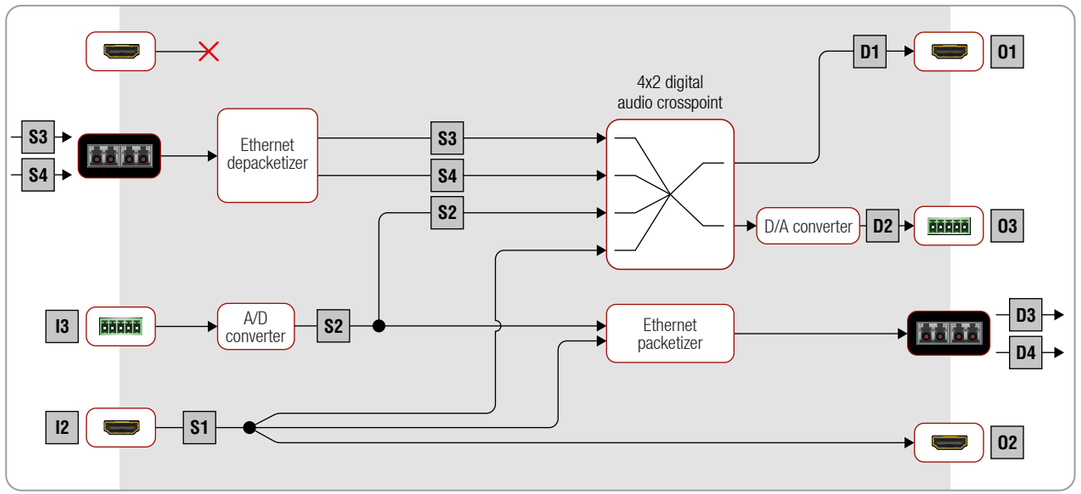
	Description	Video port nr. (LW3)	Audio port nr. (LW3)
HDMI ports	HDMI in 2	I2	I2
	HDMI out 1	O1	O1
	HDMI out 2	O2	O2
Analog audio ports	Analog audio in	-	I3
	Analog audio out	-	O3
Source streams	HDMI stream 1 (from HDMI in 2)	S1	S1
	Analog audio input stream	-	S2
	HDMI stream 2 (from the remote device)	S2	S3
	Remote audio input stream	-	S4
Destination streams	HDMI stream 1 (toward HDMI out 1)	D1	D1
	Analog audio output stream	-	D2
	HDMI stream 2 (toward the remote device)	D2	D3
	Remote audio output stream	-	D4

Video Port Diagram



Video port diagram of the F110 transceiver with the port numbers

Audio Port Diagram



Audio port diagram of the F110 transceiver with the port numbers

20.2.7. Control Port Numbering - Endpoint Devices

UBEX-PRO20-HDMI-F100

The port numbering is valid for all operation modes (TX / RX / TRX).

Description		Port number
Ethernet	Gigabit Ethernet 1	P1
	Gigabit Ethernet 2	P2

UBEX-PRO20-HDMI-F110

The port numbering is valid for all operation modes (TX / RX / TRX).

Description		Port number
Ethernet	Gigabit Ethernet 1	P1
	Gigabit Ethernet 2	P2
	Gigabit Ethernet 3	P3
Serial	RS-232	P1

20.2.8. Control Port Numbering - MMU

Description		Port number
Serial control ports	RS-232 1	P1
	RS-232 2	P2

20.3. Factory Default Settings

20.3.1. UBEX-PRO20-HDMI-F100

Parameter	Setting/Value
General settings	
Display backlight	10
Jog dial rotary direction	CW down
Video input port settings (TX - HDMI in 1 and 2 / TRX - HDMI in 2)	
HDCP	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	Auto
Power 5V mode	Always on
Timing mode	Free run
No sync screen mode	Auto
No sync screen color	R: 128, G: 128, B: 128 (grey)
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	Auto
No sync screen color	R: 128, G: 128, B: 128 (grey)
Scaler settings (TX - HDMI in 1 / RX - HDMI out 1 / TRX - HDMI out 1)	
Scaler enable	Disabled (Pass-through mode)
Scale to	1920x1080p60
Image position	Fit
Frame rate converter settings (TX - HDMI in 2 / RX - HDMI out 2 / TRX - HDMI in 2)	
FRC enable	Disabled (Pass-through mode)
Resolution to force	1920x1080p60
Color space converter settings (All HDMI ports of TX / RX / TRX)	
Color space conversion (CSC)	No conversion
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
Miscellaneous	
Application mode	Auto
Unique port names	Cleared
Unique device label	Cleared
User EDIDs	Not cleared

20.3.2. UBEX-PRO20-HDMI-F110

Parameter	Setting/Value
General settings	
Display backlight	10
Jog dial rotary direction	CW down
Video input port settings (TX - HDMI in 1 and 2 / TRX - HDMI in 2)	
HDCP	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	Auto
Power 5V mode	Always on
Timing mode	Free run
No sync screen mode	Auto
No sync screen color	R: 128, G: 128, B: 128 (grey)

Parameter	Setting/Value
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	Auto
No sync screen color	R: 128, G: 128, B: 128 (grey)
Scaler settings (TX - HDMI in 1 / RX - HDMI out 1 / TRX - HDMI out 1)	
Scaler enable	Disabled (Pass-through mode)
Scale to	1920x1080p60
Image position	Fit
Frame rate converter settings (TX - HDMI in 2 / RX - HDMI out 2 / TRX - HDMI in 2)	
FRC enable	Disabled (Pass-through mode)
Resolution to force	1920x1080p60
Color space converter settings (All HDMI ports of TX / RX / TRX)	
Color space conversion (CSC)	No conversion
Analog audio input port properties	
Volume	0.00 dB (100%)
Balance	0 (center)
Gain	0.00 dB
Analog audio output port properties	
Volume	0.00 dB (100%)
Balance	0 (center)
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

Parameter	Setting/Value
RS-232 port settings	
Operation mode	Command injection
TCP port	8001
Baud rate	57600
Data bits	8
Parity	None
Stop bits	1
Miscellaneous	
Application mode	Auto
Unique port names	Cleared
Unique device label	Cleared
User EDIDs	Not cleared

20.3.3. UBEX-MMU-X200

Parameter	Setting/Value
Network settings	
IP address	192.168.0.100
Subnet mask	255.255.255.0
Static gateway	192.168.0.1
DHCP	Disabled
LW3 port number	6107
RS-232 port configuration	
Baud rate	115200
Databits	8
Stopbits	1
Parity	None
UBEX matrix	
UBEX matrix database, including: ▪ Database of claimed endpoints; ▪ Crosspoint settings; ▪ Stream names; ▪ Device names; ▪ Tags; ▪ Port properties; ▪ Scaler / FRC / CSC settings.	Cleared

20.4. Content of Backup File

The backup file contains numerous settings and parameters saved from the device. When the file is uploaded to a device, the followings will be overwritten.

For the procedure of the backup and restore function see the details in the Configuration Cloning (Backup Tab) section for the Extender mode, and in the System Tab section for the Matrix mode.

20.4.1. UBEX-PRO20-HDMI-F100 - Transmitter Mode

General
Application mode selection setting
Crosspoint settings
Video stream switch state, Audio stream switch state
HDMI input ports
Video port name
HDCP setting
Stream settings
Enable/disable status
Color space conversion setting
Scaler settings
Enable/disable status, Resolution setting, Image position
Color space conversion setting
Frame rate converter (FRC) settings
Enable/disable status, Resolution setting
Color space conversion setting
HDMI output ports
Port name, HDCP mode, Power +5V mode, Color depth setting
Ethernet ports
Enable/disable status, Mode setting
Static IP address, Network mask, Gateway address
DHCP status (enable / disable)
Miscellaneous settings
Device label, Control lock status
Display brightness, Jog dial rotary direction, Fan setting
User EDID data (U1-U12), Emulated EDIDs by ports

20.4.2. UBEX-PRO20-HDMI-F100 - Receiver Mode

General
Application mode selection setting
Crosspoint settings
Video stream switch state, Audio stream switch state
Stream settings
Enable/disable status
Color space conversion setting
Scaler settings
Enable/disable status, Resolution setting, Image position
Color space conversion setting
Frame rate converter (FRC) settings
Enable/disable status, Resolution setting
Color space conversion setting
HDMI output ports
Port name, HDCP mode, Power +5V mode, Color depth setting
No sync screen mode, No sync screen color
Ethernet ports
Enable/disable status, Mode setting
Static IP address, Network mask, Gateway address
DHCP status (enable / disable)
Miscellaneous settings
Device label, Control lock status
Display brightness, Jog dial rotary direction, Fan setting
User EDID data (U1-U12), Emulated EDIDs by ports

20.4.3. UBEX-PRO20-HDMI-F100 - Transceiver Mode

General
Application mode selection setting
Crosspoint settings
Video stream switch state, Audio stream switch state
HDMI input port
Video port name
HDCP setting
Stream settings
Enable/disable status
Color space conversion setting
Scaler settings
Enable/disable status, Resolution setting, Image position
Color space conversion setting
Frame rate converter (FRC) settings
Enable/disable status, Resolution setting
Color space conversion setting
HDMI output ports
Port name, HDCP mode, Power +5V mode, Color depth setting
No sync screen mode, No sync screen color
Ethernet ports
Enable/disable status, Mode setting
Static IP address, Network mask, Gateway address
DHCP status (enable / disable)
Miscellaneous settings
Device label, Control lock status
Display brightness, Jog dial rotary direction, Fan setting
User EDID data (U1-U12), Emulated EDIDs by ports

20.4.4. UBEX-PRO20-HDMI-F110 - Transmitter Mode

General
Application mode selection setting
Crosspoint settings
Video stream switch state, Audio stream switch state
HDMI input ports
Video port name, HDCP setting
Stream settings
Enable/disable status
Color space conversion setting
Scaler settings
Enable/disable status, Resolution setting, Image position
Color space conversion setting
Frame rate converter (FRC) settings
Enable/disable status, Resolution setting
Color space conversion setting
HDMI output ports
Port name, HDCP mode, Power +5V mode, Color depth setting
Analog audio input port
Port name, Volume, Balance, Gain settings
Analog audio output port
Port name, Mute state, Volume, Balance, Gain settings
Ethernet ports
Enable/disable status, Mode setting
Static IP address, Network mask, Gateway address
DHCP status (enable / disable)
RS-232 port
Port name, Command injection status, Command injection port nr.
Baud rate, Data bits, Parity, Stop bits
Miscellaneous settings
Device label, Control lock status
Display brightness, Jog dial rotary direction, Fan setting
User EDID data (U1-U12), Emulated EDIDs by ports

20.4.5. UBEX-PRO20-HDMI-F110 - Receiver Mode

General
Application mode selection setting
Crosspoint settings
Video stream switch state, Audio stream switch state
Stream settings
Enable/disable status
Color space conversion setting
Scaler settings
Enable/disable status, Resolution setting, Image position
Color space conversion setting
Frame rate converter (FRC) settings
Enable/disable status, Resolution setting
Color space conversion setting
HDMI output ports
Port name, HDCP mode, Power +5V mode, Color depth setting
No sync screen mode, No sync screen color
Analog audio input port
Port name, Volume, Balance, Gain settings
Analog audio output port
Port name, Mute state, Volume, Balance, Gain settings
Ethernet ports
Enable/disable status, Mode setting
Static IP address, Network mask, Gateway address
DHCP status (enable / disable)
RS-232 port
Port name, Command injection status, Command injection port nr.
Baud rate, Data bits, Parity, Stop bits
Miscellaneous settings
Device label, Control lock status
Display brightness, Jog dial rotary direction, Fan setting
User EDID data (U1-U12), Emulated EDIDs by ports

20.4.6. UBEX-PRO20-HDMI-F110 - Transceiver Mode

General
Application mode selection setting
Crosspoint settings
Video stream switch state, Audio stream switch state
HDMI input port
Video port name, HDCP setting
Stream settings
Enable/disable status
Color space conversion setting
Scaler settings
Enable/disable status, Resolution setting, Image position
Color space conversion setting
Frame rate converter (FRC) settings
Enable/disable status, Resolution setting
Color space conversion setting
HDMI output ports
Port name, HDCP mode, Power +5V mode, Color depth setting
No sync screen mode, No sync screen color
Analog audio input port
Port name, Volume, Balance, Gain settings
Analog audio output port
Port name, Mute state, Volume, Balance, Gain settings
Ethernet ports
Enable/disable status, Mode setting
Static IP address, Network mask, Gateway address
DHCP status (enable / disable)
RS-232 port
Port name, Command injection status, Command injection port nr.
Baud rate, Data bits, Parity, Stop bits
Miscellaneous settings
Device label, Control lock status
Display brightness, Jog dial rotary direction, Fan setting
User EDID data (U1-U12), Emulated EDIDs by ports

20.4.7. UBEX-MMU-X200

General
Device label
NTP mode, NTP server address
Endpoint management settings
List of the claimed endpoints
Operation mode of the endpoints
Device assignments
Crosspoint settings
Video stream connection states, Audio stream connection states
Stream source settings
Stream names, Tags, Icons
HDCP setting
Scaler enable/disable status, Resolution setting, Image position
Frame rate converter enable/disable status, Resolution setting
Color space conversion setting
Destination port settings
Stream names, Tags, Icons
HDCP mode, Power +5V mode, Color depth setting
Scaler enable/disable status, Resolution setting, Image position
Frame rate converter enable/disable status, Resolution setting
Color space conversion setting
No sync screen mode, No sync screen color
EDID management settings
User EDID data, Emulated EDIDs by ports, Dynamic EDID data
Ethernet port settings
MMU control ports: Name, Mode
Endpoint control ports: Name, Mode
Serial port configuration
MMU: Baudrate, Databits, Stopbits, Parity
Endpoints: Baudrate, Stopbits, Parity, Port name

20.5. Release Notes of the Firmware Packages

20.5.1. Endpoint Series

Valid for the following models:

- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110

v1.3.0b10

Release date: 2019-05-03

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

v1.2.0b1

Release date: 2018-10-05

Bugfix:

- Fixed issue with detecting HDMI 1.x sources after receiving 4K@60 Hz
- Fixed 4K@30 Hz transmission over a single 10G link
- Fixed image artifacts with a few scaling configurations

v1.1.1b1

Release date: 2018-08-30

Bugfix:

- More robust SCDC handling is introduced.

v1.1.0b6

Release date: 2018-06-25

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.

v1.0.1b4

Release date: 2018-05-14

20.5.2. Matrix Management Unit (MMU)

Valid for the following model:

- UBEX-MMU-X200

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 stabiliy

v1.0.4b1

Release date: 2018-11-20

Bugfix:

- Fixed configuration loss during backup-restore and firmware upgrade. 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.

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-initialisation 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

20.5.3. Known Issues

Endpoint Firmware Package v1.3.0

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.

- 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
- HBR audio formats (Dolby TrueHD; DTS-HD Master Audio 7.1) are not supported
- Infrared functions are not implemented in the F110 model

MMU Firmware Package v1.0.6

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.
- MMU managed Endpoint firmware update is not supported, the Endpoints have to be updated separately by the LDU2 software.

20.6. Resolutions of the Scaler / FRC

The following list contains the resolutions and refresh rates which can be forced on the scaler and the frame rate converter for the sink device.

Resolution	Comment
640 x 480 @ 60 Hz	
720 x 480 @ 60 Hz	
720 x 576 @ 50 Hz	
800 x 600 @ 60 Hz	
848 x 480 @ 60 Hz	
1024 x 768 @ 60 Hz	
1280 x 720 @ 50 Hz	
1280 x 720 @ 60 Hz	
1280 x 768 @ 50 Hz	
1280 x 768 @ 60 Hz	
1280 x 768 @ 75 Hz	
1280 x 800 @ 60 Hz	
1280 x 1024 @ 50 Hz	
1280 x 1024 @ 60 Hz	
1280 x 1024 @ 75 Hz	
1360 x 768 @ 60 Hz	
1366 x 768 @ 60 Hz	
1400 x 1050 @ 50 Hz	
1400 x 1050 @ 60 Hz	
1400 x 1050 @ 75 Hz	
1440 x 900 @ 60 Hz	
1440 x 1080 @ 60 Hz	
1600 x 900 @ 60 Hz	
1600 x 1200 @ 50 Hz	
1600 x 1200 @ 60 Hz	
1920 x 1080 @ 24 Hz	
1920 x 1080 @ 25 Hz	
1920 x 1080 @ 30 Hz	
1920 x 1080 @ 50 Hz	
1920 x 1080 @ 59 Hz	
1920 x 1080 @ 60 Hz	
1920 x 1200 @ 50 Hz	
1920 x 1200 @ 60 Hz	
2048 x 1080 @ 50 Hz	
2048 x 1080 @ 60 Hz	
2048 x 1200 @ 60 Hz	
2560 x 1080 @ 60 Hz	
2560 x 1440 @ 60 Hz	
2560 x 1600 @ 60 Hz	
2560 x 2048 @ 60 Hz	
3440 x 1440 @ 24 Hz	
3440 x 1440 @ 25 Hz	
3440 x 1440 @ 30 Hz	
3840 x 2160 @ 24 Hz	
3840 x 2160 @ 25 Hz	
3840 x 2160 @ 30 Hz	
3840 x 2160 @ 60 Hz	
3840 x 2160 @ 60 Hz	with reduced blanking
3840 x 2400 @ 24 Hz	
3840 x 2400 @ 30 Hz	
4096 x 2160 @ 24 Hz	
4096 x 2160 @ 25 Hz	
4096 x 2160 @ 30 Hz	
4096 x 2160 @ 50 Hz	
4096 x 2160 @ 60 Hz	

20.7. Factory EDID List

Mem.	Resolution	Type
F1	640 x 480p @ 60.0 Hz	D
F2	848 x 480p @ 60.0 Hz	D
F3	800 x 600p @ 60.32 Hz	D
F4	1024 x 768p @ 60.0 Hz	D
F5	1280 x 768p @ 50.0 Hz	D
F6	1280 x 768p @ 59.94 Hz	D
F7	1280 x 768p @ 75.0 Hz	D
F8	1360 x 768p @ 60.02 Hz	D
F9	1280 x 1024p @ 50.0 Hz	D
F10	1280 x 1024p @ 60.02 Hz	D
F11	1280 x 1024p @ 75.02 Hz	D
F12	1400 x 1050p @ 50.0 Hz	D
F13	1400 x 1050p @ 60.0 Hz	D
F14	1400 x 1050p @ 75.0 Hz	D
F15	1680 x 1050p @ 60.0 Hz	D
F16	1920 x 1080p @ 50.0 Hz	D
F17	1920 x 1080p @ 60.0 Hz	D
F18	2048 x 1080p @ 50.0 Hz	D
F19	2048 x 1080p @ 60.0 Hz	D
F20	1600 x 1200p @ 50.0 Hz	D
F21	1600 x 1200p @ 60.0 Hz	D
F22	1920 x 1200p @ 50.0 Hz	D
F23	1920 x 1200p @ 59.56 Hz	D
F24	2048 x 1200p @ 59.96 Hz	D
F25-F28	Reserved	
F29	1920 x 1080p @ 60.0 Hz	U
F30-F31	Reserved	
F32	640 x 480p @ 59.95 Hz	H
F33	720 x 480p @ 59.94 Hz	H
F34	720 x 576p @ 50.0 Hz	H

Mem.	Resolution	Type
F35	1280 x 720p @ 50.0 Hz	H
F36	1280 x 720p @ 60.0 Hz	H
F37-F40	Reserved	
F41	1920 x 1080p @ 24.0 Hz	H
F42	1920 x 1080p @ 25.0 Hz	H
F43	1920 x 1080p @ 30.0 Hz	H
F44	1920 x 1080p @ 50.0 Hz	H
F45	1920 x 1080p @ 59.94 Hz	H
F46	1920 x 1080p @ 60.0 Hz	H
F47	1920 x 1080p @ 60.0 Hz	U
F48	1920 x 1080p @ 60.0 Hz	U
F49	1920 x 1080p @ 60.0 Hz	U
F50-F89	Reserved	
F90	1920 x 2160p @ 59.99 Hz	D
F91	1024 x 2400p @ 60.01 Hz	D
F92	1920 x 2400p @ 59.97 Hz	D
F93	2048 x 2400p @ 59.98 Hz	D
F94	2048 x 1536p @ 60.0 Hz	D
F95	2048 x 1536p @ 75.0 Hz	D
F96	2560 x 1600p @ 59.86 Hz	D
F97	3840 x 2400p @ 24.0 Hz	D
F98	1280 x 720p @ 60.0 Hz	H3D
F99	1920 x 1080p @ 60.0 Hz	H3D
F100	1024 x 768p @ 60.0 Hz	H
F101	1280 x 1024p @ 50.0 Hz	H
F102	1280 x 1024p @ 60.02 Hz	H
F103	1280 x 1024p @ 75.02 Hz	H
F104	1600 x 1200p @ 50.0 Hz	H
F105	1600 x 1200p @ 60.0 Hz	H
F106	1920 x 1200p @ 59.56 Hz	H

Mem.	Resolution	Type
F107	2560 x 1440p @ 59.95 Hz	H
F108	2560 x 1600p @ 59.86 Hz	H
F109	3840 x 2400p @ 24.0 Hz	H
F110	3840 x 2160p @ 24.0 Hz	H
F111	3840 x 2160p @ 25.0 Hz	H
F112	3840 x 2160p @ 30.0 Hz	H
F113-F117	Reserved	
F118	3840 x 2160p @ 30.0 Hz	U
F119	3840 x 2160p @ 30.0 Hz	U
F120	3840 x 2160p @ 60.0 Hz	H
F121	1440 x 1080p @ 59.91 Hz	H
F122	2560 x 2048p @ 59.98 Hz	H
F123	1280 x 800p @ 59.91 Hz	H
F124	1440 x 900p @ 59.9 Hz	H
F125	1366 x 768p @ 60.0 Hz	H
F126	1600 x 900p @ 59.98 Hz	H
F127	2048 x 1080p @ 60.0 Hz	H
F128	2560 x 1080p @ 60.0 Hz	H
F129	3440 x 1440p @ 24.99 Hz	H
F130	3440 x 1440p @ 29.99 Hz	H
F131	4096 x 2160p @ 25.0 Hz	H
F132	4096 x 2160p @ 30.0 Hz	H
F133	4096 x 2160p @ 60.0 Hz	H
F134	3440 x 1440p @ 23.99 Hz	H
F135	4096 x 2160p @ 24.0 Hz	H
F136	3840 x 2400p @ 29.99 Hz	H
F137	3840 x 2160p @ 60.0 Hz	H
F138	3840 x 2160p @ 50.0 Hz	H
F139	3840 x 2160p @ 60.0 Hz	H
F140	3840 x 2160p @ 60.0 Hz	H

Mem.	Resolution	Type
F141	4096 x 2160p @ 60.0 Hz	H
F142	4096 x 2160p @ 50.0 Hz	H
F143	4096 x 2160p @ 60.0 Hz	H
F144	4096 x 2160p @ 60.0 Hz	H
F145	Reserved	
F146	3840 x 2160p @ 60.0 Hz	H
F147	3840 x 2160p @ 60.0 Hz	H
F148	3840 x 2160p @ 60.0 Hz	H

Legend

D: DVI EDID

H: HDMI EDID

H3D: HDMI EDID with 3D support

U: Universal EDID

Please note that minor changes in the factory EDID list may be applied in the later firmware versions.

20.8. Mechanical Drawings

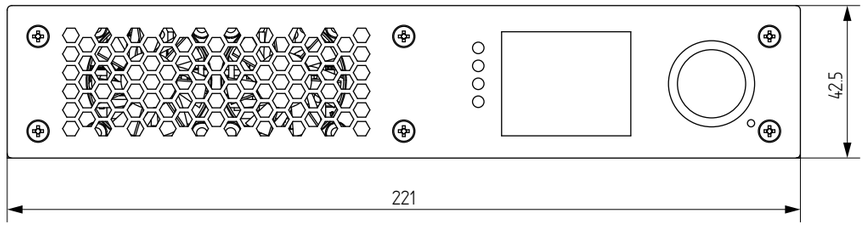
20.8.1. UBEX Endpoint Devices

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

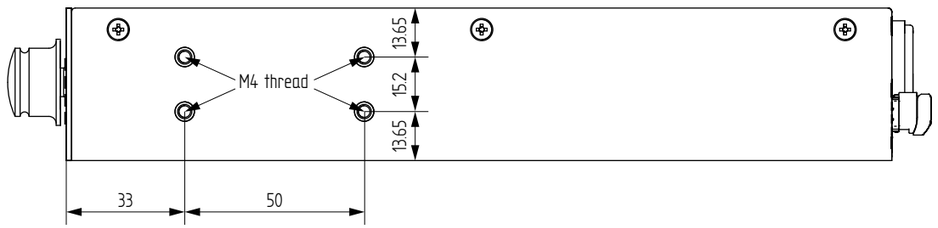
Affected models:

- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-F110

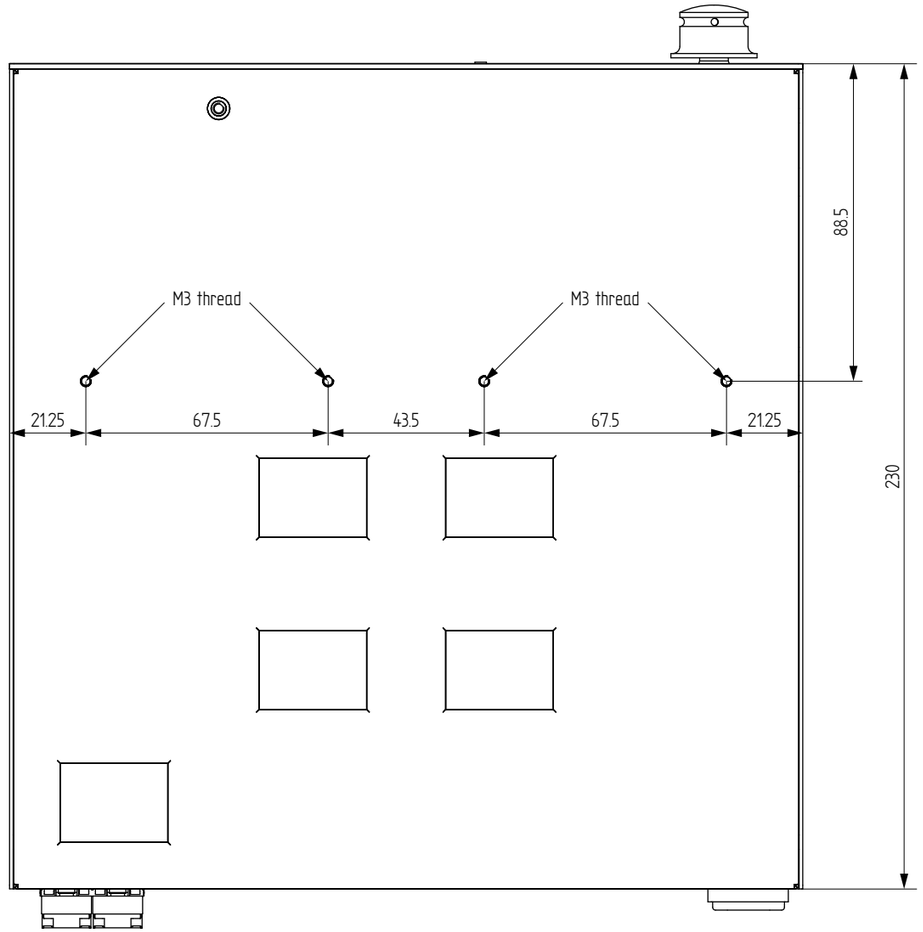
Front View



Side View



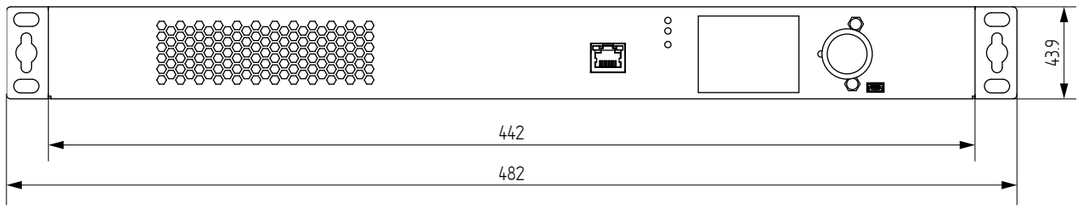
Bottom View



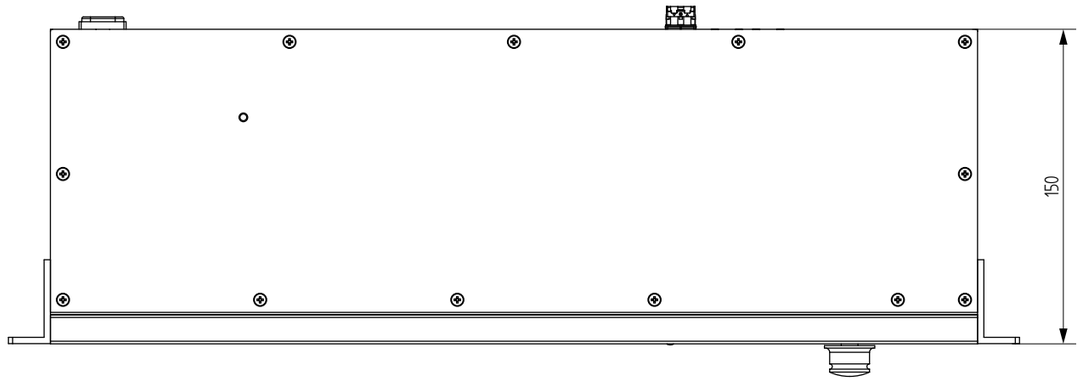
20.8.2. UBEX-MMU-X200

The following drawings present the physical dimensions of the Matrix Management Unit. Dimensions are in mm.

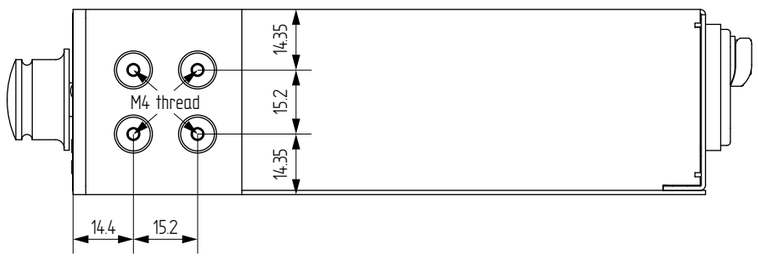
Front View (1:1)



Top View (1:1)



Side View (2:1)



20.9. Hidden USB Connector for Debug Purpose

UBEX endpoints are built with a standard USB 2.0 mini B-type connector which is hidden under the jog dial control knob.

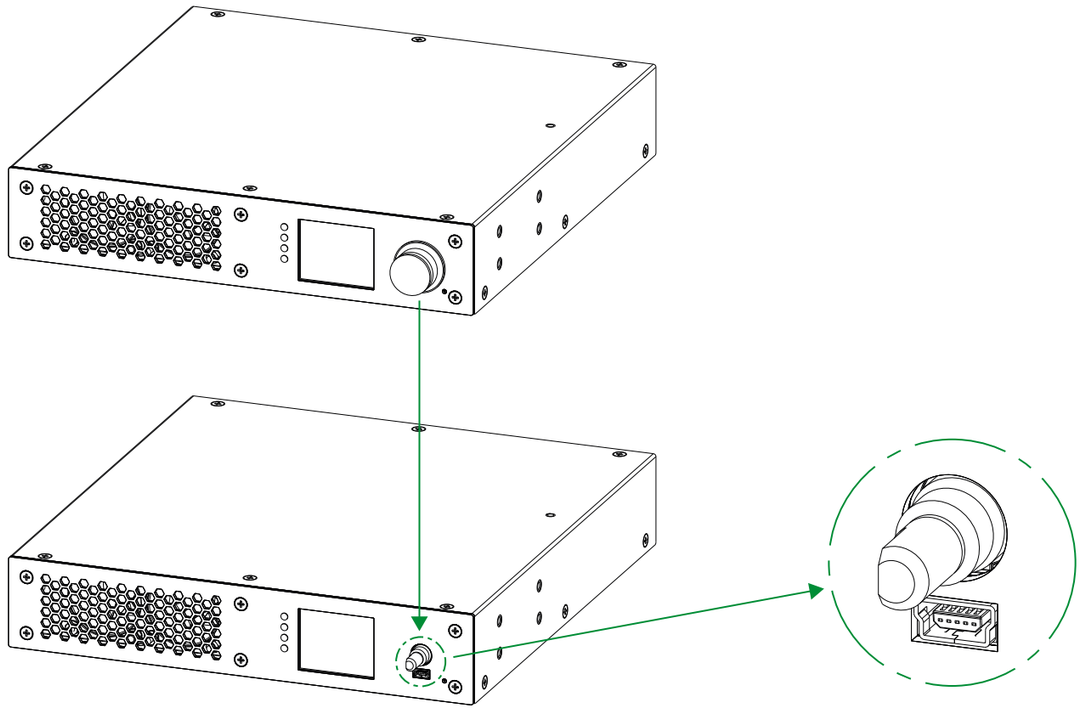
> **ATTENTION!** The USB connector is for debug purpose. Please use it only in case the Lightware Support requests it.

Follow the steps to reach the hidden USB connector:

Step 1. Find the screw in the side of the jog dial knob and use a hex key size 1.3 to remove it.

Step 2. Pull down the jog dial knob from the holder.

Step 3. The USB mini connector is available now.



The location of the hidden USB mini connector

20.10. Required Bandwidth of the Resolutions

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 **Gb/s**.

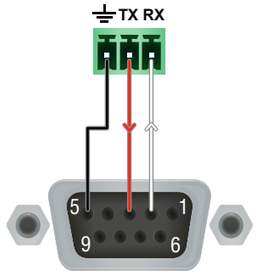
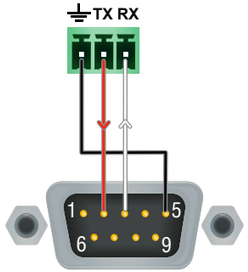
				TX - HDMI IN 1																	
				No signal	1280x720p60 (720p)			1920x1080p60 (1080p)			3840x2160p30 (4K UHD 30)			4096x2160p30 (4K30)			3840x2160p60 (4K UHD 60)			4096x2160p60 (4K60)		
					YCbCr 4:2:2	RGB / YCbCr 4:4:4		YCbCr 4:2:2	RGB / YCbCr 4:4:4		YCbCr 4:2:2	RGB / YCbCr 4:4:4		YCbCr 4:2:2	RGB / YCbCr 4:4:4		YCbCr 4:2:2	RGB / YCbCr 4:4:4		YCbCr 4:2:2	RGB / YCbCr 4:4:4	
					16 bit	24 bit	30 bit	16 bit	24 bit	30 bit	16 bit	24 bit	30 bit	16 bit	24 bit	30 bit	16 bit	24 bit	30 bit	16 bit	24 bit	30 bit
TX - HDMI IN 2	No signal			N/A	0.96	1.43	1.79	2.15	3.23	4.03	4.30	6.45	8.06	4.59	6.88	8.60	8.60	12.90	16.12	9.17	13.76	17.20
	1280x720 60 Hz (720p)	YCbCr 4:2:2	16 bit	0.96	1.92	2.39	2.75	3.11	4.19	4.99	5.26	7.41	9.02	5.55	7.84	9.56	9.56	13.86	17.08	10.13	14.72	18.16
		RGB / YCbCr 4:4:4	24 bit	1.43	2.39	2.86	3.22	3.58	4.66	5.46	5.73	7.88	9.49	6.02	8.31	10.03	10.03	14.33	17.55	10.60	15.19	18.63
			30 bit	1.79	2.75	3.22	3.58	3.94	5.02	5.82	6.09	8.24	9.85	6.38	8.67	10.39	10.39	14.69	17.91	10.96	15.55	18.99
	1920x1080 60 Hz (1080p)	YCbCr 4:2:2	16 bit	2.15	3.11	3.58	3.94	4.30	5.38	6.18	6.45	8.60	10.21	6.74	9.03	10.75	10.75	15.05	18.27	11.32	15.91	19.35
		RGB / YCbCr 4:4:4	24 bit	3.23	4.19	4.66	5.02	5.38	6.46	7.26	7.53	9.68	11.29	7.82	10.11	11.83	11.83	16.13	19.35	12.40	16.99	20.43
			30 bit	4.03	4.99	5.46	5.82	6.18	7.26	8.06	8.33	10.48	12.09	8.62	10.91	12.63	12.63	16.93	20.15	13.20	17.79	21.23
	3840x2160 30 Hz (4K UHD 30)	YCbCr 4:2:2	16 bit	4.30	5.26	5.73	6.09	6.45	7.53	8.33	8.60	10.75	12.36	8.89	11.18	12.90	12.90	17.20	20.42	13.47	18.06	21.50
		RGB / YCbCr 4:4:4	24 bit	6.45	7.41	7.88	8.24	8.60	9.68	10.48	10.75	12.90	14.51	11.04	13.33	15.05	15.05	19.35	22.57	15.62	20.21	23.65
			30 bit	8.06	9.02	9.49	9.85	10.21	11.29	12.09	12.36	14.51	16.12	12.65	14.94	16.66	16.66	20.96	24.18	17.23	21.82	25.26
	4096x2160 30 Hz (4K30)	YCbCr 4:2:2	16 bit	4.59	5.55	6.02	6.38	6.74	7.82	8.62	8.89	11.04	12.65	9.18	11.47	13.19	13.19	17.49	20.71	13.76	18.35	21.79
		RGB / YCbCr 4:4:4	24 bit	6.88	7.84	8.31	8.67	9.03	10.11	10.91	11.18	13.33	14.94	11.47	13.76	15.48	15.48	19.78	23.00	16.05	20.64	24.08
			30 bit	8.60	9.56	10.03	10.39	10.75	11.83	12.63	12.90	15.05	16.66	13.19	15.48	17.20	17.20	21.50	24.72	17.77	22.36	25.80
	3840x2160 60 Hz (4K UHD 60)	YCbCr 4:2:2	16 bit	8.60	9.56	10.03	10.39	10.75	11.83	12.63	12.90	15.05	16.66	13.19	15.48	17.20	17.20	21.50	24.72	17.77	22.36	25.80
		RGB / YCbCr 4:4:4	24 bit	12.90	13.86	14.33	14.69	15.05	16.13	16.93	17.20	19.35	20.96	17.49	19.78	21.50	21.50	25.80	29.02	22.07	26.66	30.10
			30 bit	16.12	17.08	17.55	17.91	18.27	19.35	20.15	20.42	22.57	24.18	20.71	23.00	24.72	24.72	29.02	32.24	25.29	29.88	33.32
	4096x2160 60 Hz (4K60)	YCbCr 4:2:2	16 bit	9.17	10.13	10.60	10.96	11.32	12.40	13.20	13.47	15.62	17.23	13.76	16.05	17.77	17.77	22.07	25.29	18.34	22.93	26.37
		RGB / YCbCr 4:4:4	24 bit	13.76	14.72	15.19	15.55	15.91	16.99	17.79	18.06	20.21	21.82	18.35	20.64	22.36	22.36	26.66	29.88	22.93	27.52	30.96
			30 bit	17.20	18.16	18.63	18.99	19.35	20.43	21.23	21.50	23.65	25.26	21.79	24.08	25.80	25.80	30.10	33.32	26.37	30.96	34.40

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.

20.11. Cable Wiring Guide

20.11.1. Cable Wiring Guide for Serial Data Transmission

The F110 endpoint and the MMU are built with 3-pole Phoenix connector. See below the two examples of the most common assembling cases.

Matrix and a DCE (Data Circuit-terminating Equipment)	Matrix and a DTE (Data Terminal Equipment)
D-SUB 9 and Phoenix	D-SUB 9 and Phoenix
 2: TX data transmit 3: RX data receive 5: Ground	 2: TX data receive 3: RX data transmit 5: Ground

20.11.2. Audio Cable Wiring Guide

Inputs and outputs of audio devices are symmetric or asymmetric. The main advantage of the symmetric lines is the better protection against the noise therefore, they are widely used in the professional audio industry. Symmetric audio is most often referred to as balanced audio, as opposed to asymmetric, which is referred to as unbalanced audio. Lightware products are usually built with 5-pole Phoenix connectors so we would like to help users assembling their own audio cables. See the most common cases below.

ATTENTION! Symmetric and asymmetric lines can be linked with passive accessories (e.g. special cables), but in this case half of the line level is lost.

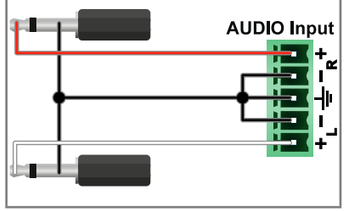
ATTENTION! There are numerous types of regularly used connector and cable types to connect audio devices. Please always make sure that a connector or cable fits your system before use.

ATTENTION! Never join the phase-inverted (negative, cold or -) poles (either right and left) to the ground or to each other on the output side, as this can damage the unit.

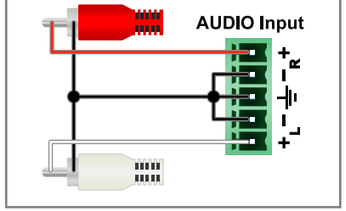
INFO: Use a galvanic isolation in case of a ground loop.

From Unbalanced Output to Balanced Input

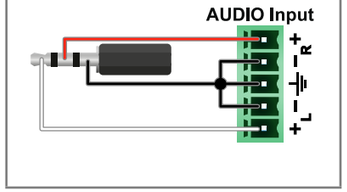
2 x 6.3 (1/4") TS - Phoenix



2 x RCA - Phoenix

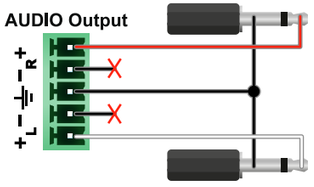


3.5 (1/8") TRS - Phoenix

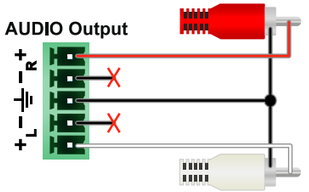


From Balanced Output to Unbalanced Input

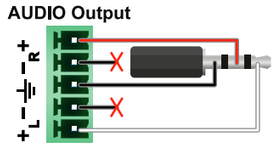
Phoenix - 2 x 6.3 (1/4") TS



Phoenix - 2 x RCA

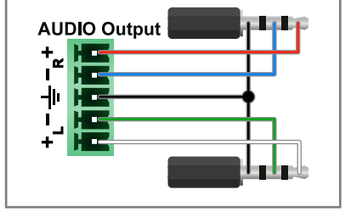


Phoenix - 3.5 (1/8") TRS

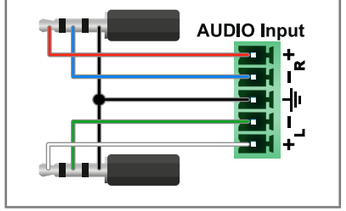


From Balanced Output to Balanced Input

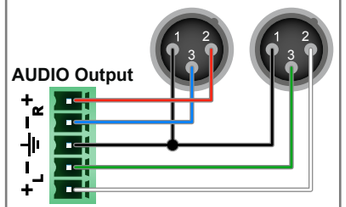
Phoenix - 2 x 6.3 (1/4") TRS



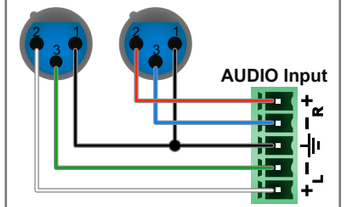
2 x 6.3 TRS (1/4") - Phoenix



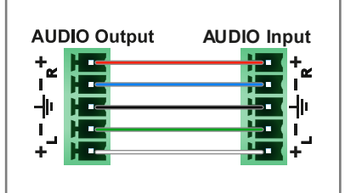
Phoenix - 2 x XLR



2 x XLR - Phoenix



Phoenix - Phoenix



For more information about the cable wiring see the **Cable Wiring Guide** on our website www.lightware.com.

20.12. 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**.

20.12.1. Extender Mode

Activity	Front panel	LDC sw.	LW3 comm.
General			
Application mode change	-	-	7.3.10
Backup/restore	-	6.12	-
Control lock	-	-	7.3.13
Custom text on the LCD screen	-	-	7.3.4
Device label change	-	6.11.1	7.3.1
Factory default restore	5.8.5	6.11.3	7.3.15
Firmware version query	5.7	6.11.1	7.3.3
Identify the device	-	6.11.1	7.3.6
Jog dial control knob - rotary direction	5.8.4	-	7.3.11
LCD screen brightness	5.8.4	-	7.3.12
Log file export	-	6.11.3	-
Operation mode (TX/RX/TRX) change	5.8.2	6.11.1	7.3.10
Operation mode (TX/RX/TRX) query	5.1.2	6.11.1	7.3.9
Restarting the device	5.8.6	6.11.3	7.3.14
Video (TX)			
CSC setting (HDMI in 1)	5.3.1	6.5.3	7.4.9
CSC setting (HDMI in 2)	5.3.1	6.5.4	7.4.9
FRC - Forced resolution	5.3.1	6.5.4	7.4.6
FRC - Output resolution mode	5.3.1	6.5.4	7.4.7
HDCP setting (inputs)	5.3.1	6.5.1	7.4.11
HDCP setting (local outputs)	5.3.3	6.5.2	7.4.12
Port status query (inputs)	5.3.4	6.5.1	7.4.1
Port status query (local outputs)	5.3.3	6.5.2	7.4.2
Scaler - Image position	5.3.1	6.5.3	7.4.8
Scaler - Forced resolution	5.3.1	6.5.3	7.4.6
Scaler - Scaling mode	5.3.1	6.5.3	7.4.7
Stream enable/disable	5.3.1	6.5.5	7.4.5
Stream status query	5.3.1	6.5.5	7.4.1
Video (RX)			
Crosspoint change	5.3.2	6.4	7.5.4
Crosspoint state query	5.3.2	6.4	7.5.3
CSC setting (HDMI out 1)	5.4.1	6.5.6	7.5.10
CSC setting (HDMI out 2)	5.4.1	6.5.7	7.5.10
FRC - Forced resolution	5.4.1	6.5.7	7.5.8
FRC - Output resolution mode	5.4.1	6.5.7	7.5.6
HDCP setting	5.4.1	6.5.8	7.5.15
Port status query	5.4.2	6.5.8	7.5.2
Scaler - Image position	5.4.1	6.5.6	7.5.9
Scaler - Forced resolution	5.4.1	6.5.6	7.5.8
Scaler - Scaling mode	5.4.1	6.5.6	7.5.6
Stream enable/disable	5.4.1	6.5.5	7.5.5
Stream status query	5.4.1	6.5.8	7.5.1
Timing mode setting	-	6.5.8	7.5.12
Video (TRX)			
CSC setting (input)	5.5.1	6.5.4	7.6.9
CSC setting (output)	5.5.2	6.5.6	7.6.9
FRC - Forced resolution	5.5.1	6.5.4	7.6.7
FRC - Output resolution mode	5.5.1	6.5.4	7.6.4
HDCP setting (input)	5.5.1	6.5.1	7.6.14
HDCP setting (local output)	5.5.5	6.5.2	7.6.15
HDCP setting (output)	5.5.2	6.5.8	7.6.15
Port status query (input)	5.5.1	6.5.1	7.6.1
Port status query (local output)	5.5.5	6.5.2	7.6.2
Port status query (output)	5.5.2	6.5.8	7.6.2
Scaler - Image position	5.5.2	6.5.6	7.6.8
Scaler - Forced resolution	5.5.2	6.5.6	7.6.7
Scaler - Scaling mode	5.5.2	6.5.6	7.6.5
Stream enable/disable (input)	5.5.1	6.5.5	7.6.3
Stream enable/disable (output)	5.5.2	6.5.5	7.6.3
Stream status query (input)	5.5.1	6.5.5	7.6.1
Stream status query (local output)	5.5.5	6.5.2	7.6.2
Stream status query (output)	5.5.2	6.5.8	7.6.2
Timing mode setting	-	6.5.8	7.6.11
Audio			
Analog audio balance setting (input)	-	6.7.1	7.8.3
Analog audio balance setting (output)	-	6.7.2	7.8.3
Analog audio gain setting	-	6.7.1	7.8.4
Analog audio output status query	-	6.6	7.9.4
Analog audio volume setting in dB (input)	-	6.7.1	7.8.1
Analog audio volume setting in dB (output)	-	6.7.2	7.8.1
Analog audio volume setting in percent (input)	-	6.7.1	7.8.2
Analog audio volume setting in percent (output)	-	6.7.2	7.8.2
Audio stream enable/disable	-	-	7.7.5
Crosspoint change	-	6.7.3	7.7.4
Mute/unmute the analog output	-	6.7.2	7.8.5
Port status query (RX - outputs)	5.4.2	6.6	7.7.2
Port status query (TRX - inputs)	5.5.6	6.6	7.7.1
Port status query (TRX - outputs)	5.5.6	6.6	7.7.2
Port status query (TX - inputs)	5.3.4	6.6	7.7.1
Port status query (TX - outputs)	5.3.4	6.6	7.7.2
EDID Management			
Copy / save a user EDID	5.6.3	6.9.1	7.11.5
Create EDID	-	6.9.3	-
Delete a user EDID	-	6.9.1	7.11.6
Edit an EDID	-	6.9.2	-
Reset the emulated EDIDs	-	6.9.1	7.11.7
Switch (emulate)	5.6.2	6.9.1	7.11.4
Query the emulated EDID	5.6.1	6.9	7.11.1

Activity	Front panel	LDC sw.	LW3 comm.
Diagnostics			
Frame detector	-	6.8.1	-
No sync screen (test pattern) color (RX)	5.4.1	6.8.2	7.5.14
No sync screen (test pattern) color (TRX)	5.5.2	6.8.2	7.6.13
No sync screen (test pattern) mode (RX)	5.4.1	6.8.2	7.5.13
No sync screen (test pattern) mode (TRX)	5.5.2	6.8.2	7.6.12
RS-232 Interface			
RS-232 port configuration	-	6.10.2	7.13
Sending ASCII-format text	-	-	7.14.1
Sending ASCII-format message	-	6.10.2	7.14.3
Sending binary message	-	-	7.14.2
Network			
DHCP (dynamic IP address) setting	5.8.1	6.11.2	7.12.2
Gateway address change (static)	5.8.1	6.11.2	7.12.8
IP address query	5.8.1	6.11.2	7.12.3
IP address setting (static)	5.8.1	6.11.2	7.12.4
Subnet mask change (static)	5.8.1	6.11.2	7.12.6
SFP+ Interface			
Bandwidth limitation indicator query	-	6.5.10	7.9.8
Bandwidth query	5.7	6.5.9	7.9.7
General status query	5.7	6.5.9	-
Link aggregation status query	5.7	6.5.11	7.9.9
SFP+ module information query	5.7	6.5.9	7.10

20.12.2. Matrix Mode

Activity	Front panel	LDC / Built-in Web	LW3 comm.
General - MMU			
Backup/restore	-	15.18.4	-
Date and time settings	12.2.2	15.18.4	16.4.5
Device label change	-	15.18.1	16.4.1
Factory default restore	12.2.4	15.18.4	16.4.11
Firmware version query	-	15.18.1	16.4.3
LCD screen brightness	12.2.3	-	16.4.8
Log file export	-	15.18.4	-
NTP - enable/disable	-	15.18.4	16.4.7
NTP server address setting	-	15.18.4	16.4.6
Restarting the device	-	15.18.4	16.4.10
Software resetting the device	-	15.18.4	16.4.9
General - Endpoints			
Application mode change	13.8.2	-	-
Device label change (RX/TRX)	-	15.9.3	16.5.1
Device label change (TX/TRX)	-	15.8.3	16.5.1
Factory default restore	-	-	16.5.9
Firmware version query (RX)	13.7	15.12.5	-
Firmware version query (TX)	13.7	15.11.6	-
Firmware version query (TRX)	13.7	15.13.8	-
Identify the device (RX/TRX)	-	15.9.3	16.5.7
Identify the device (TX/TRX)	-	15.8.3	16.5.7
Jog dial control knob - rotary direction	13.8.3	-	-
LCD screen brightness	13.8.3	-	-
MAC address query (RX/TRX)	13.8.1	15.9.3	16.5.6
MAC address query (TX/TRX)	13.8.1	15.8.3	16.5.6
Operation mode (TX, RX, or TRX) change	-	15.17.2	16.5.5
Operation mode (TX, RX, or TRX) query	13.1.2	15.17	16.5.4
Restarting the device	13.8.4	-	16.5.8

Activity	Front panel	LDC / Built-in Web	LW3 comm.
Endpoint Management			
MAC address query (RX/TRX)	13.8.1	15.12.5	16.5.6
MAC address query (TX/TRX)	13.8.1	15.11.6	16.5.6
Query the claiming status of an endpoint	-	-	16.6.10
Query the connection status of an endpoint	-	-	16.6.9
Query the number of connected endpoints	-	15.18.1	16.6.2
Query the number of connected transmitters	-	15.18.1	16.6.4
Query the number of connected receivers	-	15.18.1	16.6.6
Query the number of connected transceivers	-	15.18.1	16.6.8
Re-order the endpoints (Device Map)	-	15.17	16.6.15
Unclaiming an endpoint	-	-	16.6.11
Unclaiming all endpoints	-	-	16.6.12
Crosspoint settings			
Searching a source / destination / device / tag	-	15.6	-
Switching the audio stream to one destination	-	15.5	16.10.2
Switching an audio stream to all destinations	-	15.5	16.10.3
Switching the video stream to one destination	-	15.4	16.7.1
Switching a video stream to all destinations	-	15.4	16.7.2
Query the number of the destination ports	-	-	16.7.5
Query the number of the source ports	-	-	16.7.4

Activity	Front panel	LDC / Built-in Web	LW3 comm.
Video (Sources)			
CSC setting	-	15.8.1	16.8.12
FRC - Forced resolution	-	15.8.1	16.8.9
FRC - Output resolution mode	-	15.8.1	16.8.10
HDCP setting	-	15.8.2	16.8.14
Icon setting	-	15.8.1	-
Port status query	13.3.3	15.8.2	16.7.3
Scaler - Image position	-	15.8.1	16.8.11
Scaler - Forced resolution	-	15.8.1	16.8.9
Scaler - Scaling mode	-	15.8.1	16.8.10
Stream enable/disable	-	15.8.1	16.8.8
Stream naming	-	15.8.1	16.8.2
Stream status query	13.3.1	15.8.1	16.7.3
Tags - Adding a new tag	-	15.8.1	16.8.4
Tags - Delete a tag	-	15.8.1	16.8.5
Tags - Delete all the tags	-	15.8.1	16.8.6
Tags - Query the tags of the stream	-	15.8.1	16.8.3
Video (Destinations)			
CSC setting	-	15.9.2	16.9.13
FRC - Forced resolution	-	15.9.2	16.9.9
FRC - Output resolution mode	-	15.9.2	16.9.10
HDCP setting	-	15.9.2	16.9.18
Icon setting	-	15.9.1	-
Port status query	13.4.2	15.9.2	16.7.3
Scaler - Image position	-	15.9.2	16.9.12
Scaler - Forced resolution	-	15.9.2	16.9.9
Scaler - Scaling mode	-	15.9.2	16.9.10
Stream enable/disable	-	15.9.1	16.9.7
Stream naming	-	15.9.1	16.9.2
Stream status query	13.4.1	15.9.1	16.7.3
Tags - Adding a new tag	-	15.9.1	16.9.4
Tags - Delete a tag	-	15.9.1	16.9.5
Tags - Delete all the tags	-	15.9.1	16.9.6
Tags - Query the tags of the stream	-	15.9.1	16.9.3
Timing mode setting	-	15.9.2	16.9.15
Audio			
Analog audio balance setting (input)	-	15.10.2	16.12.3
Analog audio balance setting (output)	-	15.10.3	16.12.3
Analog audio gain setting	-	15.10.2	16.12.4
Analog audio output status query	-	15.10.3	16.14.12
Analog audio volume setting in dB (input)	-	15.10.2	16.12.1
Analog audio volume setting in dB (output)	-	15.10.3	16.12.1
Analog audio volume setting in percent (input)	-	15.10.2	16.12.2
Analog audio volume setting in percent (output)	-	15.10.3	16.12.2
Mute/unmute the analog audio output	-	15.10.3	16.12.5
Stream destination enable/disable	-	15.10	16.11.2
Stream destination naming	-	15.10	16.11.6
Stream source enable/disable	-	15.10	16.11.1
Stream source naming		15.10	16.11.4
Stream status query		15.10	16.10.1
Port status query		15.10	16.10.1
Tags - Adding a new tag	-	15.10	16.11.8
Tags - Delete a tag	-	15.10	16.11.9
Tags - Delete all the tags	-	15.10	16.11.10
Tags - Query the tags of the stream	-	15.10	16.11.7
EDID Management			
Copy / save a user EDID	-	15.15.1	16.13.5
Create EDID	-	15.15.3	-
Delete a user EDID	-	15.15.1	16.13.6
Edit an EDID	-	15.15.2	-
Query the resolution of an emulated EDID	13.6.1	15.15.1	16.13.2
Reset the emulated EDIDs	-	15.15.1	16.13.7
Switch (emulate)	-	15.15.1	16.13.3
Diagnostics			
Frame detector	-	15.14.1	-
No sync screen (test pattern) color	-	15.14.2	16.9.17
No sync screen (test pattern) mode	-	15.14.2	16.9.16
Network - MMU			
DHCP (dynamic IP address) setting	12.2.1	15.18.2	16.15.2
Gateway address change (static)	12.2.1	15.18.2	16.15.8
IP address query	12.2.1	15.18.2	16.15.3
IP address setting (static)	12.2.1	15.18.2	16.15.4
Subnet mask change (static)	12.2.1	15.18.2	16.15.6
Ethernet Port Configuration - Endpoints			
Ethernet mode setting	-	15.16.1	16.16.2
Port enable/disable	-	15.16.1	16.16.1
Port naming	-	15.16.1	16.16.3
Tags - Adding a new tag	-	15.16.1	16.16.5
Tags - Delete a tag	-	15.16.1	16.16.6
Tags - Delete all the tags	-	15.16.1	16.16.7
Tags - Query the tags of the port	-	15.16.1	16.16.4
RS-232 Interface - MMU			
RS-232 port configuration	-	-	16.17

Activity	Front panel	LDC / Built-in Web	LW3 comm.
RS-232 Interface - Endpoints			
Command injection TCP port number changing	-	15.16.2	16.18.4
Command injection TCP port numbers remapping	-	-	16.18.5
Port enable/disable	-	15.16.2	16.18.7
Port naming	-	15.16.2	16.18.8
RS-232 port configuration	-	15.16.2	16.18
Sending ASCII-format text	-	-	16.19.1
Sending ASCII-format message	-	15.16.2	16.19.3
Sending binary message	-	-	16.19.2
Tags - Adding a new tag	-	15.16.2	16.18.10
Tags - Delete a tag	-	15.16.2	16.18.11
Tags - Delete all the tags	-	15.16.2	16.18.12
Tags - Query the tags of the port	-	15.16.2	16.18.9
Query the current configuration	-	15.16.2	16.18.6
AV Network Management			
Bandwidth limitation indicator query	-	15.4	16.14.11
Bandwidth query	13.7	15.4.2	16.14.10
General SFP+ interface status query (RX)	13.7	15.11.4	-
General SFP+ interface status query (TRX)	13.7	15.13.6	-
General SFP+ interface status query (TX)	13.7	15.12.3	-
Link aggregation status query (RX)	13.7	15.11.5	-
Link aggregation status query (TRX)	13.7	15.13.7	-
Link aggregation status query (TX)	13.7	15.12.4	-
SFP+ module information query (RX)	13.7	15.11.4	-
SFP+ module information query (TRX)	13.7	15.13.6	-
SFP+ module information query (TX)	13.7	15.12.3	-

20.13. Further Information

Limited Warranty Statement

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

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

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

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

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

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

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

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

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

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

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

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

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

Document Revision History

Rev.	Release date	Changes	Editor
1.0	12-06-2018	Initial version	Tamas Forgacs
1.1	19-07-2018	Added UBEX-MMU-X200 model and the Matrix mode chapters, added Firmware upgrade chapters, major updates for the endpoint firmware v1.1.0	Tamas Forgacs
1.2	14-11-2018	Added Front panel LCD menu operation and Built-in web chapters for the MMU, added Required bandwidth of the resolutions section, added Wiring guide for RS-232 data transmission section	Tamas Forgacs
1.3	22-05-2019	Added supplement in connection with UBEX-PRO20-HDMI-F110 endpoint model, added Transceiver endpoint operation mode, added Crosspoint menu - Tile view to the LDC chapter	Tamas Forgacs

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