visual engineering
LIGHTWARE

User's Manual

Extender Application Mode

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

AV Over IP Multimedia Extender

Important Safety Instructions

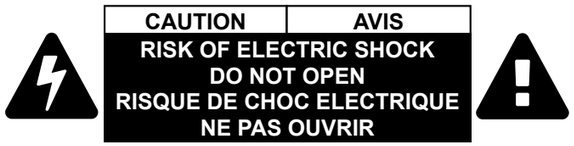
Class I apparatus construction.

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

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

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

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



Ventilation

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

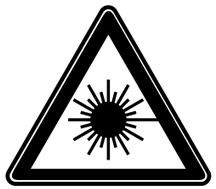
WARNING

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.

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

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

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

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

Navigation Buttons

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

Navigate to the Table of Contents.

Step back one page.

Step forward to the next page.

Document Information

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

Item		Version
Lightware Device Controller (LDC) software		1.34.0b2
Lightware Device Updater V2 (LDU2) software		2.0.0b22
Firmware package	UBEX-PRO20-HDMI-F100	1.4.1
	UBEX-PRO20-HDMI-F110	1.4.1
	UBEX-PRO20-HDMI-R100 series	1.4.1
Hardware	UBEX-PRO20-HDMI-F100	1.2
	UBEX-PRO20-HDMI-F110	1.3
	UBEX-PRO20-HDMI-R100 series	1.3

Document revision: **1.6**

Release date: 04-12-2019

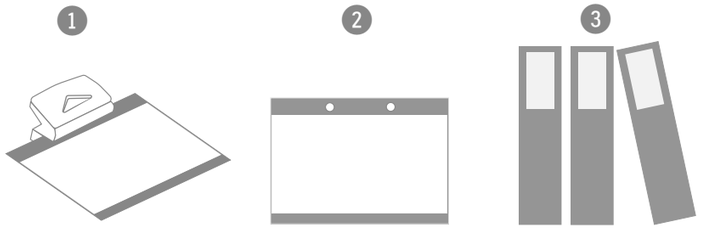
Editor: Tamas Forgacs

About Printing

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

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

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

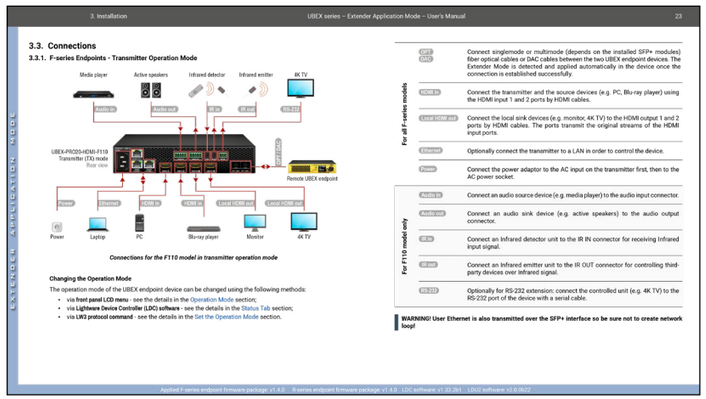


Page Legend

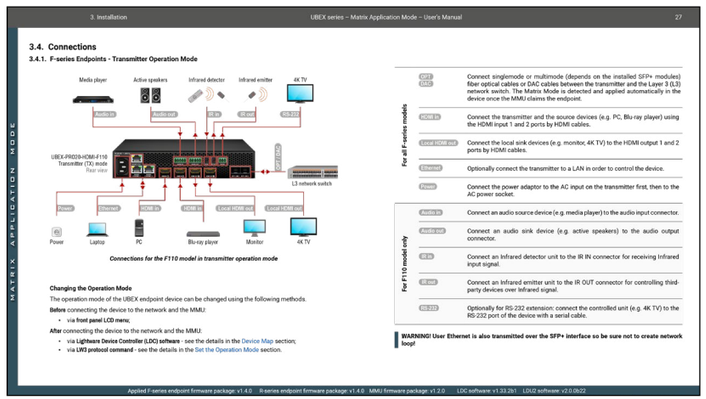
The **side and bottom color** of the pages indicates the related application mode of the device.

This document is about the Extender application mode only. The user's manual of the UBEX Matrix mode can be downloaded from the following link:

https://lightware.com/pub/media/lightware/filedownloader/file/User-Manual/UBEX_Matrix_UsersManual_v1.6.pdf



Sample page for Extender mode



Sample page for Matrix mode

Device Legend

The UBEX F-series 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 (TX)

Receiver (RX)

Transceiver (TRX)

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

Information Searching Optimization - Hashtag (#) Keywords in the Document

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

The format of the keywords is the following:

#<keyword>

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

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

Example

#dhcp

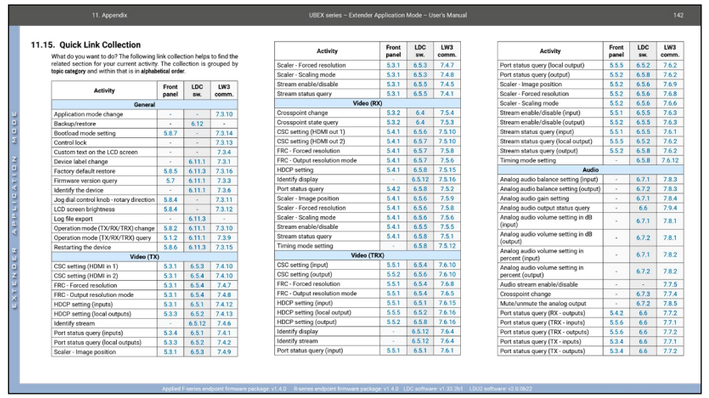
This keyword is placed at the DHCP (dynamic IP address) setting in the front panel operation, the Lightware Device Controller (LDC) and the LW3 programmer's reference section.

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

Information Searching Optimization - The Quick Link Collection

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

The section of the quick link collection is highlighted with claret in the table of contents of the document.



Sample page of the Quick Link Collection

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1 Introduction

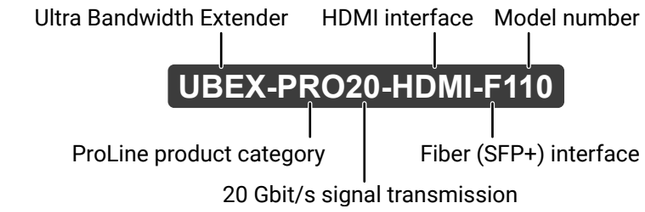
Thank you for choosing Lightware's UBEX families extender. In the first chapter we would like to introduce the device highlighting the most important features in the following sections:

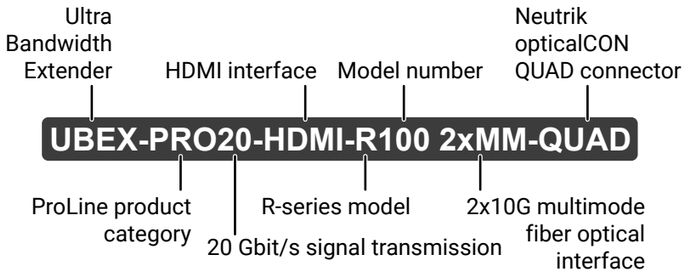
1.1. Description

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.

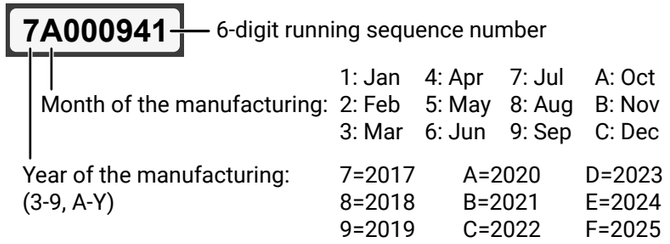
Model Denomination





About the Serial Number

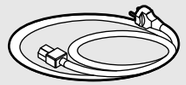
Lightware devices contain a label indicating the unique serial number of the product. The structure is the following:



1.2. Box Contents

1.2.1. UBEX-PRO20-HDMI-F100 / F110

UBEX F series endpoint device



IEC power cable

UTP patch cable (3 m)

Safety & warranty info, Quick Start Guide

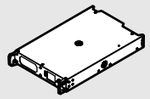
Phoenix Combicon 3-pole connector *

Phoenix Combicon 5-pole connector *

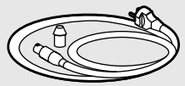
* For UBEX-PRO20-HDMI-F110 model.

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

1.2.2. UBEX-PRO20-HDMI-R100 Series



UBEX R-series endpoint device



Power cable with Neutrik powerCON connector

UTP patch cable (3 m)

Safety & warranty info, Quick Start Guide

1.3. Features

For All UBEX Endpoint Models

Uncompressed 4K Support

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

Ethernet Based Extender

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

Pixel Accurate Reclocking

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

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.

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.

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.

Changeable Operation Mode

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

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.

Seamless Switching (Clean Cut)

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

Multi Stream

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

Color Space Conversion

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

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.

Modular SFP+ Interface

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

Silent Operation

The optimized fan operation allows installing the endpoint device to places where minimum sound emission requires.

Open API

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

Only for UBEX-PRO20-HDMI-F110 Model

Audio Embedder and De-embedder Function

The analog audio can be embedded to HDMI outputs and embedded audio can be routed to the analog audio output in transmitter, receiver, and transceiver operation modes as well.

RS-232 Interface

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

Infrared Interface

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

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

Mounting Threads

Mounting threads on top and one of the sides for the R-series models to conform strict installation safety regulations.

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:

		Power connector		AV transmission interface					Video ports		Audio ports		Interface ports			
					Multimode		Singlemode						Ethernet			
		IEC power	Neutrik powerCON TRUE1	SFP+ slots	Neutrik opticalCON DUO	Neutrik opticalCON QUAD	Neutrik opticalCON DUO	Neutrik opticalCON QUAD	2x HDMI inputs *	2x HDMI outputs *	Analog audio input	Analog audio output	Standard RJ45	Neutrik etherCON	Infra input and output	RS-232
F-series models	**UBEX-PRO20-HDMI-F100**	✓	-	✓	-	-	-	-	✓	✓	-	-	✓ (2x)	-	-	-
	UBEX-PRO20-HDMI-F110	✓	-	✓	-	-	-	-	✓	✓	✓	✓	✓ (3x)	-	✓	✓
Rental (R-series) models	**UBEX-PRO20-HDMI-R100 2xMM-2xDUO**	-	✓	-	✓ (2x)	-	-	-	✓	✓	-	-	-	✓ (1x)	-	-
	UBEX-PRO20-HDMI-R100 2xMM-QUAD	-	✓	-	-	✓ (1x)	-	-	✓	✓	-	-	-	✓ (2x)	-	-
	UBEX-PRO20-HDMI-R100 2xSM-2xDUO	-	✓	-	-	-	✓ (2x)	-	✓	✓	-	-	-	✓ (1x)	-	-
	UBEX-PRO20-HDMI-R100 2xSM-QUAD	-	✓	-	-	-	-	✓ (1x)	✓	✓	-	-	-	✓ (2x)	-	-
	UBEX-PRO20-HDMI-R100 2xSM-BiDi-DUO	-	✓	-	-	-	✓ (1x)	-	✓	✓	-	-	-	✓ (2x)	-	-

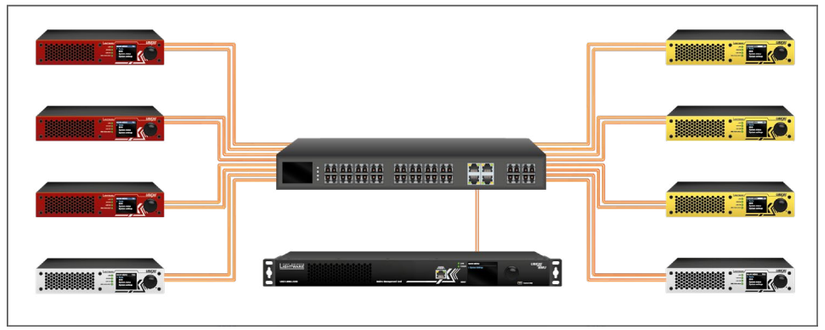
* The HDMI input and output ports of the R-series endpoint models have **flange** mounting option.

1.5. Application Modes

UBEX extender system has two main application modes: *#applicationmode*

- **Extender Mode** - Point-to-point connection between a transmitter and a receiver, or between two transceiver endpoint devices. **This document is about the Extender mode only.** *#extendermode*

- **Matrix Mode** - Virtual AV matrix with more transmitters, receivers, transceivers, and a Matrix Management Unit (MMU) which controls the AV network. The user's manual of the UBEX Matrix mode can be downloaded from the following link: *#matrixmode*
  https://lightware.com/pub/media/lightware/filedownloader/file/User-Manual/UBEX_Matrix_UsersManual_v1.6.pdf



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

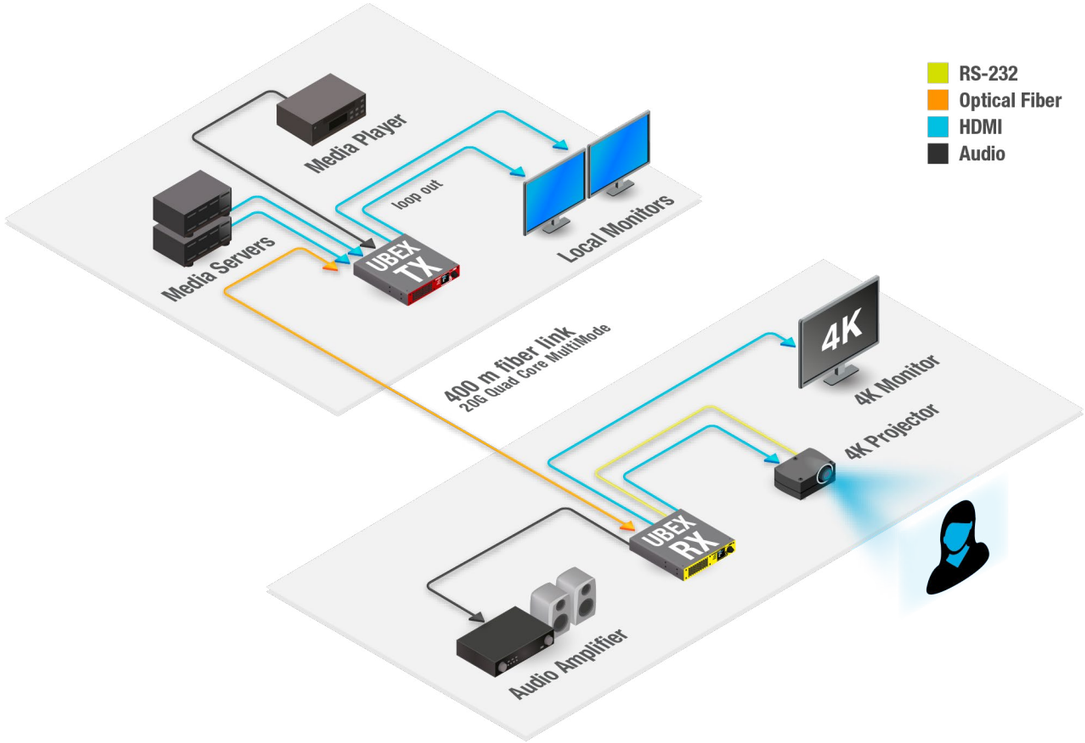
The two modes bring different functionality and control methods for the endpoint and the MMU devices. The following settings are available in the MMU only in case the Matrix mode:

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

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

1.6. Typical Application Diagrams

1.6.1. Transmitter-Receiver Pair



Application diagram of Extender mode - TX-RX pair

Description

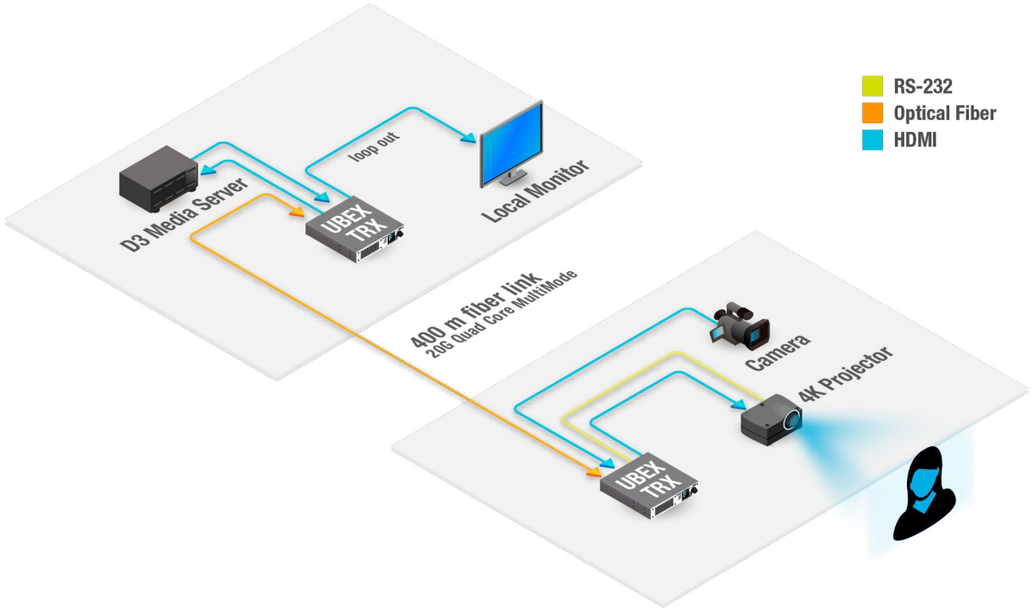
The UBEX transmitter (UBEX-PRO20-HDMI-F110, TX operation mode) has two video source devices (media servers) and an audio source device (media player). The streams can be checked on the local monitors connected to the transmitter.

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. Transceiver-Transceiver 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.

2

Product Overview

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

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

2.1.1. Front View

All Models

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

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

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.

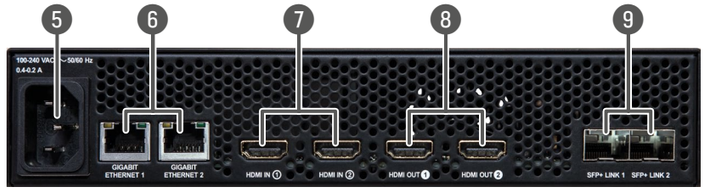
4 **Reset button** — Reboots the device (the same as disconnecting from the power source and reconnecting again).

Status LEDs

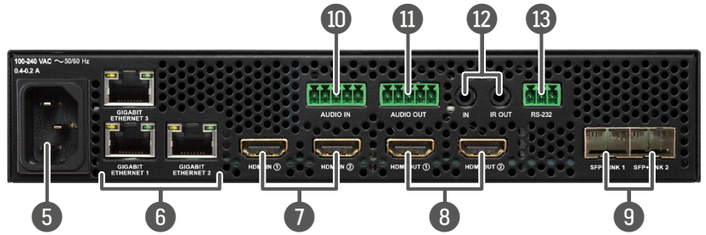
LIVE		Transmitter / Receiver / Transceiver
	blinking	The device is powered and ready to use.
	off	The device is not powered or out of operation.
STATUS		**Transmitter / Receiver / Transceiver**
	on	All measured temperature and voltage values are within the limits.
	blinking	Measured temperature or voltage 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.

2.1.2. Rear View

UBEX-PRO20-HDMI-F100



UBEX-PRO20-HDMI-F110



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

6 **Ethernet connectors** — Standard locking RJ45 connectors for 1 Gbps Ethernet connections to control the device, for user Ethernet access, and firmware upgrade purpose. See the details about the cable wiring in the Ethernet Connectors section and the concept of the operation in the Ethernet Control Interface section.

7 **HDMI input ports** — HDMI input ports with HDMI 2.0 support for the source devices (only for transmitter and transceiver operation modes). See more details about the HDMI interface in the Video Interface section.

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. See more details about the HDMI interface in the Video Interface section.

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. See more details about the SFP+ interface in the SFP+ Interface section.

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

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

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

13 **RS-232 connector** — 3-pole Phoenix connector for serial communication. See more details about the pin assignment in the RS-232 Connector section, about the cable wiring in the Cable Wiring Guide for Serial Data Transmission section, and the concept of the operation in the Serial Interface section.

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

2.2.1. Front View

All Models

1	**Mounting ears**	Durable mounting ears on both sides of the device for the easy mounting in the case of rental or staging application. The ears serve more purposes, see the details in the Mounting Options - R-series Endpoint Devices section.
2	**Status LEDs**	The LEDs give immediate feedback about the current status of the endpoint device. See the details about the operation of the LEDs in the Status LEDs section (on the right side).
3	**LCD screen**	LCD screen showing the most important settings and parameters in the front panel menu. The available settings and information depends on the current application mode. See the details in the Front Panel LCD Menu Operations chapter.
4	**Jog dial control knob**	Easy setting and menu navigation by the jog dial control. Keep dialing 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).

Status LEDs

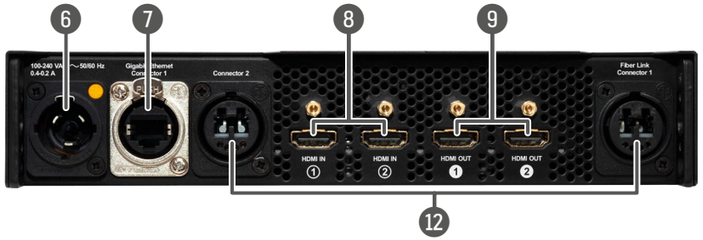
LIVE		**Transmitter / Receiver / Transceiver**
	blinking	The device is powered and ready to use.
	off	The device is not powered or out of operation.
STATUS		**Transmitter / Receiver / Transceiver**
	on	All measured temperature and voltage values are within the limits.
	blinking	Measured temperature or 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 the fiber optical links and the Link Aggregation is working.
	blinking	The connection is established on the fiber optical links and LACP detection period is active.
	off	No connection is established on one of the fiber optical 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.

2.2.2. Rear View

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

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

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



6 **Neutrik powerCON AC connector**

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

7 **Neutrik etherCON Ethernet connectors**

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

8 **HDMI input ports with flange**

HDMI input ports with HDMI 2.0 support for the source devices (only for transmitter and transceiver operation modes). See more details about the HDMI interface in the Video Interface section.

9 **HDMI output ports with flange**

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. See more details about the HDMI interface in the Video Interface section.

10 **Neutrik opticalCON QUAD optical connector**

Neutrik opticalCON QUAD NO4FDW-A singlemode or multimode fiber optical connector for AV signal transmission.

- **2xMM-QUAD**: supports **multimode** cable connection.
- **2xSM-QUAD**: supports **singlemode** cable connection.

See more details about it in the Neutrik opticalCON Connectors section.

11 **Neutrik opticalCON DUO BiDi optical connector**

Neutrik opticalCON DUO NO2-4FDW-A **singlemode** fiber optical connector with BiDi support for AV signal transmission. See more details about it in the Neutrik opticalCON Connectors section.

The connector does not support the Neutrik opticalCON cross cables. Please use standard cable only.

12 **Neutrik opticalCON DUO optical connector**

2x Neutrik opticalCON DUO NO2-4FDW-A singlemode or multimode fiber optical connectors for AV signal transmission.

- **2xMM-2xDUO**: supports **multimode** cable connection.
- **2xSM-2xDUO**: supports **singlemode** cable connection.

See more details about it in the Neutrik opticalCON Connectors section.

See more details about the fiber optical connectors in the Neutrik opticalCON Connectors section and about the connection possibilities / connector pin layouts in the Connection between F-series and R-series Endpoints section.

2.3. Electrical Connections

The following sections describe all possible electrical connections of the UBEX endpoint 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. *

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

UBEX F-series endpoint devices contain 2 pieces standard SFP+ slots for the fiber optical connections via SFP+ modules or DAC cables. The installedSFP+ modules can be singlemode or multimode as well.

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

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

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

Standard IEC Connector

UBEX F-series endpoint devices 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.

Neutrik powerCON TRUE1 Connector

UBEX R-series endpoint devices contains Neutrik powerCON TRUE1 NAC3MPX-WOT power connector and works with 100 to 240 Volts AC, 50 Hz or 60 Hz power sources.

Connect the Neutrik powerCON to the AC input connector; the extender is immediately powered on.

See the details about the assembly instructions for the Neutrik powerCON TRUE1 cables on the website of the vendor:

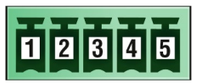
https://www.neutrik.com/en/product/nac3mx-w-top

2.3.3. Symmetrical Analog Stereo Audio Connector

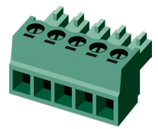
5-pole Phoenix connector is used for balanced analog audio (line in/out). Unbalanced audio signals can be connected as well. For asymmetrical output, connect only + and ground. For asymmetrical input connect + and ground to the source and connect – to the ground.

Compatible Plug Type

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



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



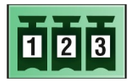
5-pole Phoenix connector pin assignments

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.

2.3.4. RS-232 Connector

UBEX-PRO20-HDMI-F110 model 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

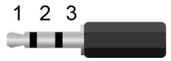
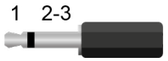
Phoenix® Combicon series (3.5mm pitch, 3-pole), type: MC 1.5/3-ST-3.5.

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.

2.3.5. IR Connector

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

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

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

You can find more information about IR interface in the Infrared Interface section.

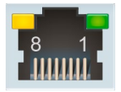
2.3.6. HDMI Connector

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.

2.3.7. Ethernet Connectors

Standard RJ45 Connector

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



Neutrik etherCON Connector

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

ATTENTION! Does not intermate with CAT6 cable connector NE8MC6-MO and NKE6S* cables.

Wiring of LAN Cables

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

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!

2.3.8. Neutrik opticalCON Connectors

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

	UBEX-PRO20-HDMI-R100 models				
	2xMM-2xDUO	2xSM-2xDUO	2xSM-BiDi-DUO	2xMM-QUAD	2xSM-QUAD
Number of connectors	2	2	1	1	1
Connector drawing					
Connector type	NO2-4FDW-A			NO4FDW-A	
Type of the SFP+ module inside the enclosure	2x Finisar FTLX8574D3BCL	2x Finisar FTLX1475D3BCL	Module A: 1x Finisar FTLX2072D327 Module B: 1x Finisar FTLX2072D333	2x Finisar FTLX8574D3BCL	2x Finisar FTLX1475D3BCL
Mode	Multimode	Singlemode	Singlemode	Multimode	Singlemode
Supported cable	LC, Neutrik opticalCON DUO	LC, Neutrik opticalCON DUO	LC, Neutrik opticalCON DUO	Neutrik opticalCON QUAD	Neutrik opticalCON QUAD
Number of required optical cables for 20GbE	2x Neutrik opticalCON DUO / 4x LC simplex / 2x LC duplex		1x Neutrik opticalCON DUO / 2x LC simplex	1x Neutrik opticalCON QUAD	

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

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

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

3 Installation

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

3.1. Mounting Options - F-series Endpoint Devices

Devices can be mounted in several ways, depending on the application. Besides using with rack shelf, a mounting bracket is available which offers easy mounting on truss systems with standard clamps. The bracket can 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

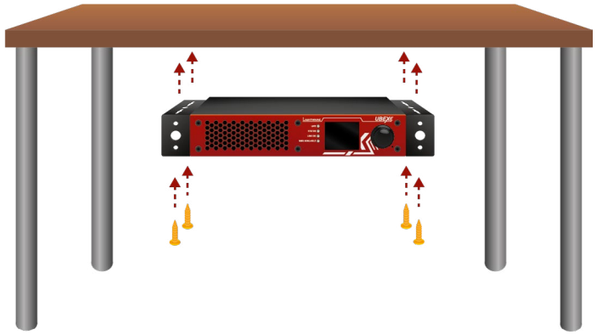
Mounting bracket V2 gives an opportunity to mount the device to any furniture surface. Fasten the bracket on the side of the unit with the provided screws and fasten it to a stand / board / truss / furniture.

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

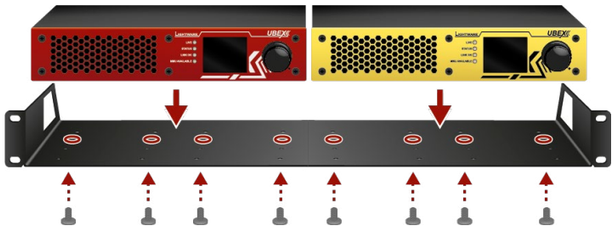


WARNING! Pay attention to the ventilation holes when designing the system. Front and rear ventilation holes must not be covered.

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. Mounting Options - R-series Endpoint Devices

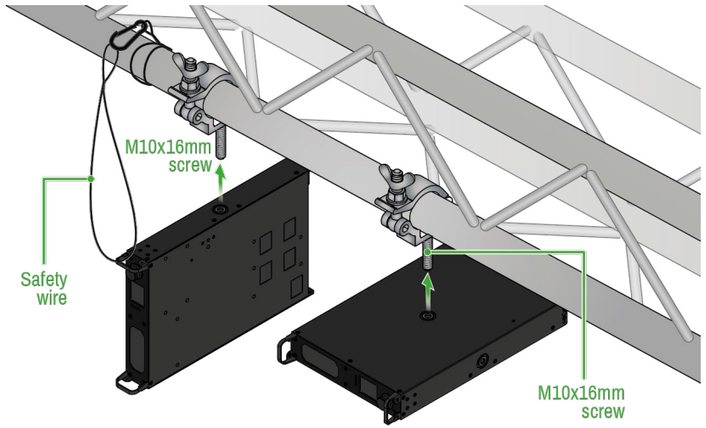
UBEX R-series endpoint devices can be mounted in several ways, depending on the application. They can be mounted into the rack in pairs, or can be used standalone. Rack ears also serve easy handling and bump protection, mounting threads on top and one of the sides to conform strict installation safety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

ATTENTION! To ensure the correct ventilation and avoid overheating let enough free space in front and rear of the appliance and keep the ventilation holes free.

3.2.1. Truss Mounting

Mounting thread on top and on one of the sides for safe and secure installation. Rigging the handles with a safety wire rope is highly recommended for safety reasons.

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



Truss mounting for R-series endpoint devices

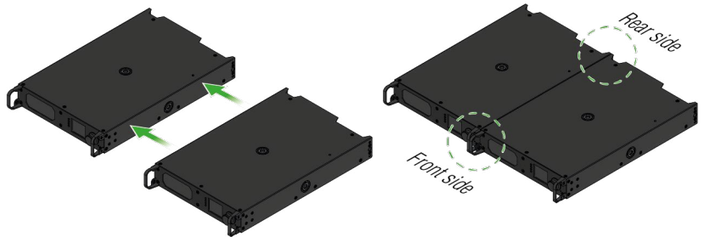
3.2.2. Standard Rack Installation

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

- 2 pcs rack ears,
- 12 pcs. black, M4x8mm hexagon socket countersunk head screws.

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

Step 1. Take two devices directly each other.



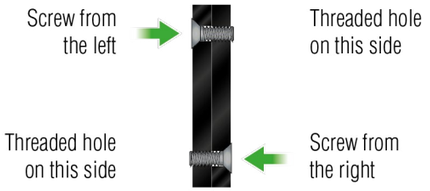
Step 2. Two mounting holes on the front ears and two on the back of the chassis is for fastening the two units to each other with 2x 2 pcs **M4x8 mm** screws. This way you get a one-rack wide and 1U high device.

Front View

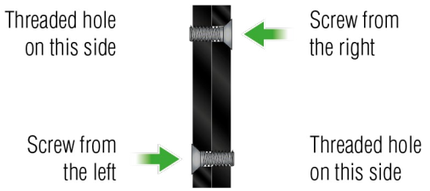
Rear View

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

Front side

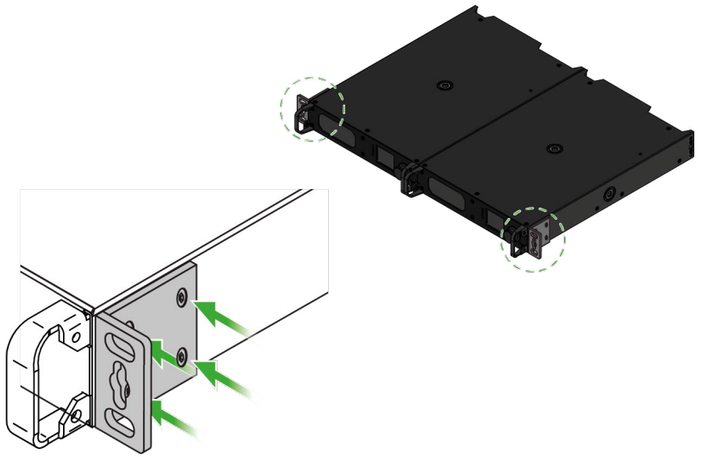


Rear side



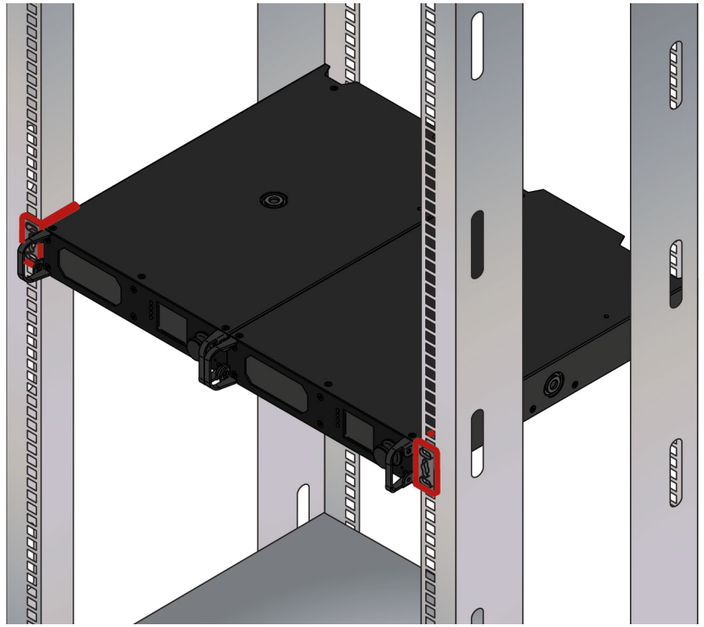
Mounting direction of the screws

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



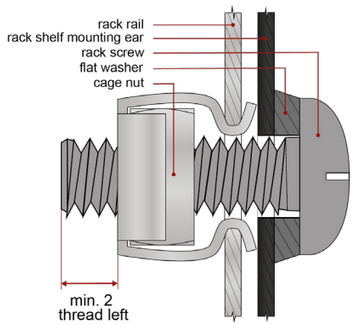
Assembly of the mounting ears

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



Standard rack installation

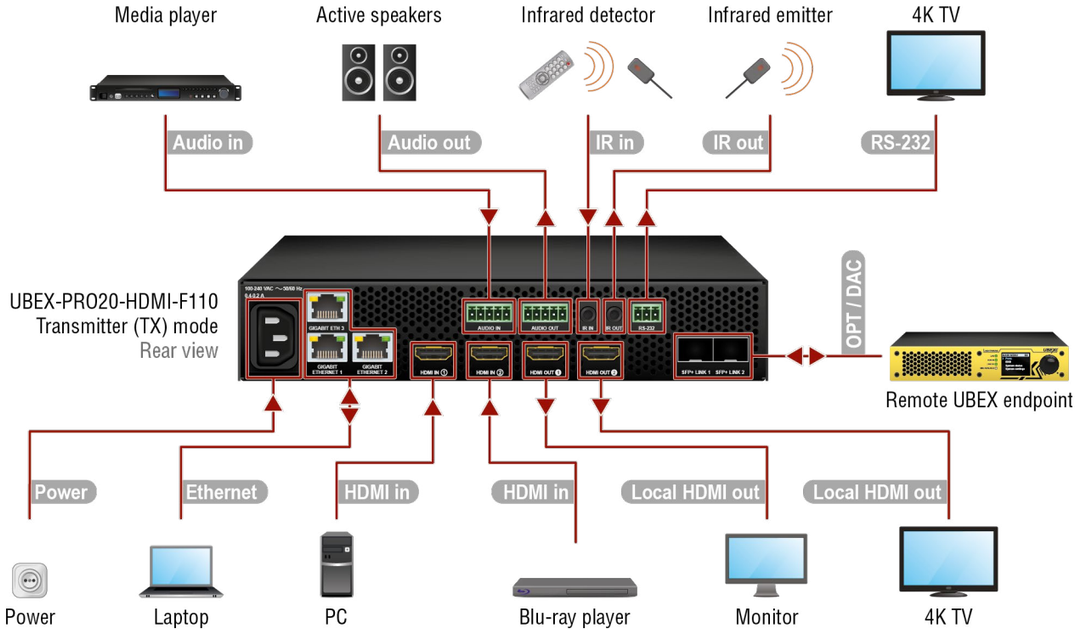
ATTENTION! Always use all the four screws for fixing the rack ears to the rack rail. Choose properly sized screws for mounting. Keep minimum two thread left after the nut screw.



Mounting the rack ears to the rack rail

3.3. Connections

3.3.1. F-series Endpoints - Transmitter Operation Mode



Connections for the F110 model in transmitter operation mode

Changing the Operation Mode

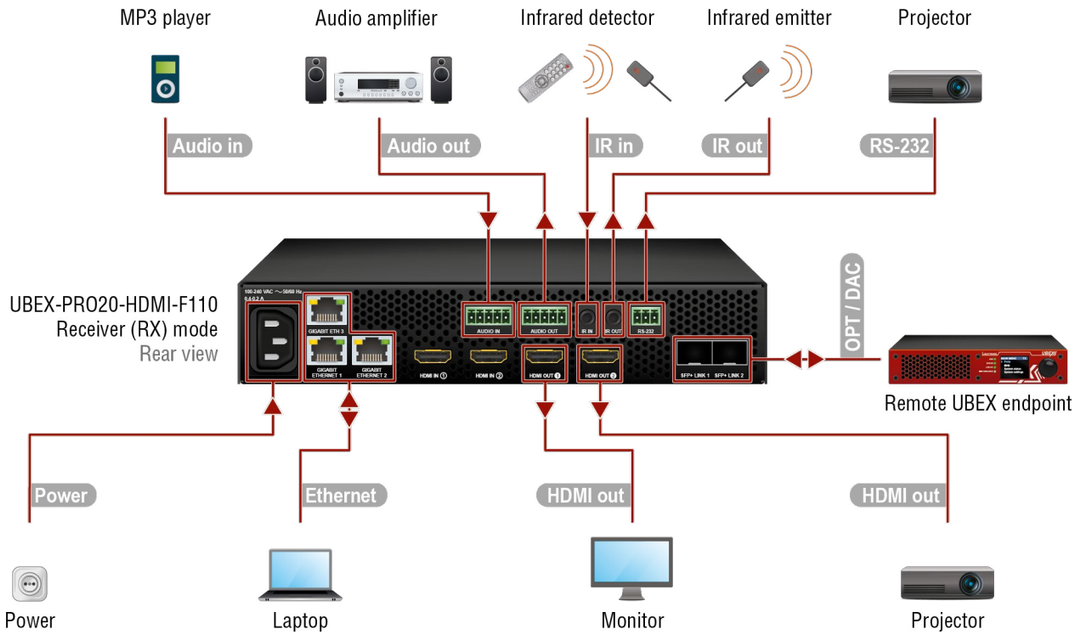
The operation mode of the UBEX endpoint device can be changed using the following methods:

- 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 all F-series 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.
	IR in	Connect an Infrared detector unit to the IR IN connector for receiving Infrared input signal.
	IR out	Connect an Infrared emitter unit to the IR OUT connector for controlling third-party devices over Infrared signal.
	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!

3.3.2. F-series Endpoints - 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:

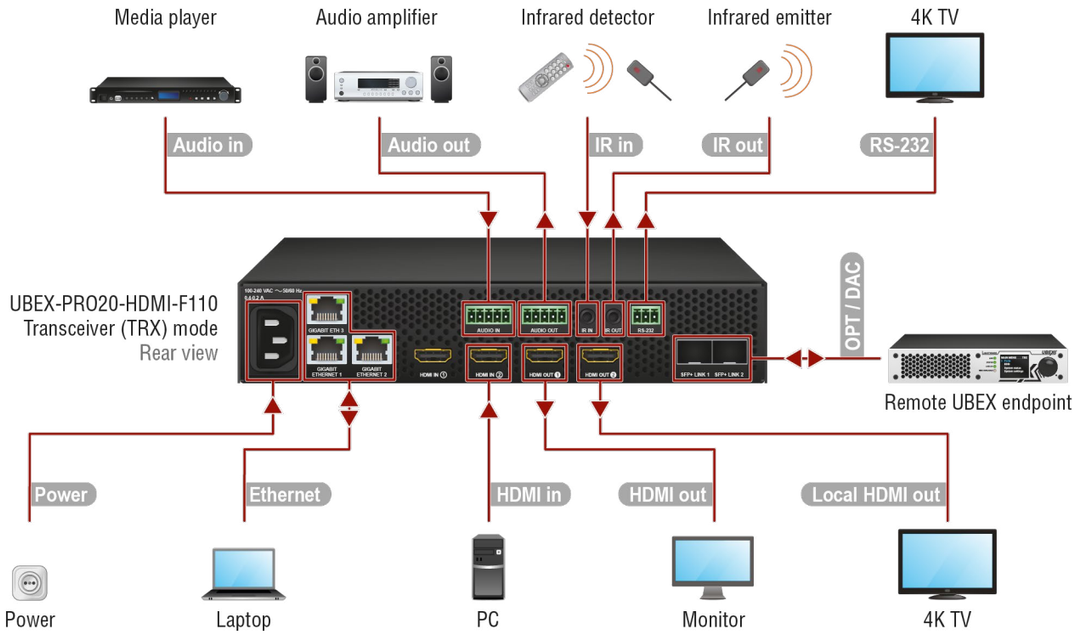
- via **front panel LCD menu** - see the details in the Operation Mode section;
- via **Lightware Device Controller (LDC) software** - see the details in the Status Tab section;
- via **LW3 protocol command** - see the details in the Set the Operation Mode section.

For all F-series 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.
	IR in	Connect an Infrared detector unit to the IR IN connector for receiving Infrared input signal.
	IR out	Connect an Infrared emitter unit to the IR OUT connector for controlling third-party devices over Infrared signal.
	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 HDMI input ports cannot accept AV signals when the device is configured as receiver.

3.3.3. F-series Endpoints - 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.

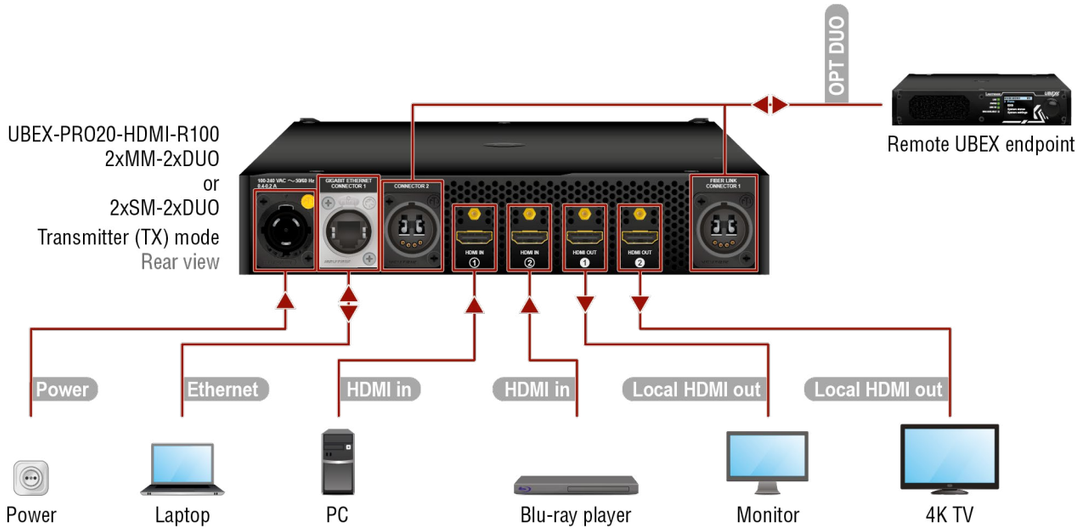
For all F-series models	OPT DAC	Connect singlemode or multimode (depends on the installed SFP+ modules) fiber optical cables or DAC cables between the two UBEX endpoint devices. The Extender Mode is detected and applied automatically in the device once the connection is established successfully.
	HDMI 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.
	IR in	Connect an Infrared detector unit to the IR IN connector for receiving Infrared input signal.
	IR out	Connect an Infrared emitter unit to the IR OUT connector for controlling third-party devices over Infrared signal.
	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 HDMI input 1 port cannot accept AV signal when the device is configured as transceiver.

3.3.4. R-series Endpoints - Transmitter Operation Mode

2xMM-2xDUO and 2xSM-2xDUO



2xMM-QUAD and 2xSM-QUAD

2xSM-BiDi-DUO

For all R-series models	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.
2xMM-2xDUO	OPT DUO	Connect the device and the remote UBEX endpoint by 2 pcs **multimode** Neutrik opticalCON DUO or 4 pcs multimode LC fiber optical cables.
2xMM-QUAD	OPT QUAD	Connect the device and the remote UBEX endpoint by a **multimode** Neutrik opticalCON QUAD fiber optical cable.
2xSM-2xDUO	OPT DUO	Connect the device and the remote UBEX endpoint by 2 pcs **singlemode** Neutrik opticalCON DUO or 4 pcs singlemode LC fiber optical cables.
2xSM-QUAD	OPT QUAD	Connect the device and the remote UBEX endpoint by a **singlemode** Neutrik opticalCON QUAD fiber optical cable.
2xSM-BiDi-DUO	OPT BiDi DUO	Connect the device and the remote UBEX endpoint by a singlemode Neutrik opticalCON DUO BiDi or 2 pcs **singlemode** LC fiber optical cables. **The connector does not support the Neutrik opticalCON cross cable. Please use standard cable only.**

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

ATTENTION! An endpoint model can be connected to the same type of endpoint model, for example a 2xMM-2xDUO can be connected to another 2xMM-2xDUO. Or the 2xSM-BiDi-DUO is compatible any F-series endpoint device which is built with BiDi SFP+ modules.

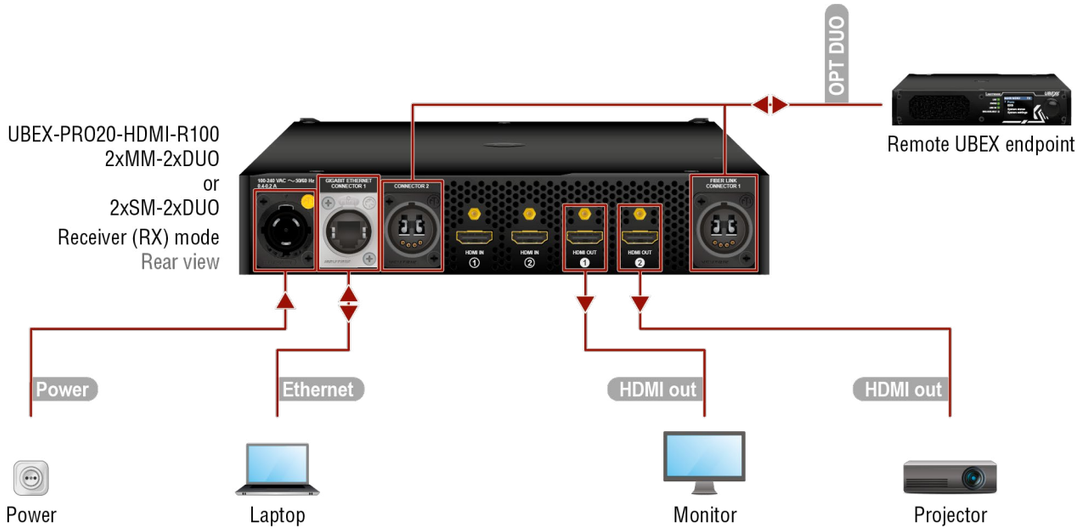
Changing the Operation Mode

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.

3.3.5. R-series Endpoints - Receiver Operation Mode

2xMM-2xDUO and 2xSM-2xDUO



2xMM-QUAD and 2xSM-QUAD

2xSM-BiDi-DUO

For all R-series models	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.
2xMM-2xDUO	OPT DUO	Connect the device and the remote UBEX endpoint by 2 pcs **multimode** Neutrik opticalCON DUO or 4 pcs multimode LC fiber optical cables.
2xMM-QUAD	OPT QUAD	Connect the device and the remote UBEX endpoint by a **multimode** Neutrik opticalCON QUAD fiber optical cable.
2xSM-2xDUO	OPT DUO	Connect the device and the remote UBEX endpoint by 2 pcs **singlemode** Neutrik opticalCON DUO or 4 pcs singlemode LC fiber optical cables.
2xSM-QUAD	OPT QUAD	Connect the device and the remote UBEX endpoint by a **singlemode** Neutrik opticalCON QUAD fiber optical cable.
2xSM-BiDi-DUO	OPT BiDi DUO	Connect the device and the remote UBEX endpoint by a singlemode Neutrik opticalCON DUO BiDi or 2 pcs **singlemode** LC fiber optical cables. **The connector does not support the Neutrik opticalCON cross cable. Please use standard cable only.**

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

ATTENTION! An endpoint model can be connected to the same type of endpoint model, for example a 2xMM-2xDUO can be connected to another 2xMM-2xDUO. Or the 2xSM-BiDi-DUO is compatible any F-series endpoint device which is built with BiDi SFP+ modules.

INFO: The HDMI input ports cannot accept AV signals when the device is configured as receiver.

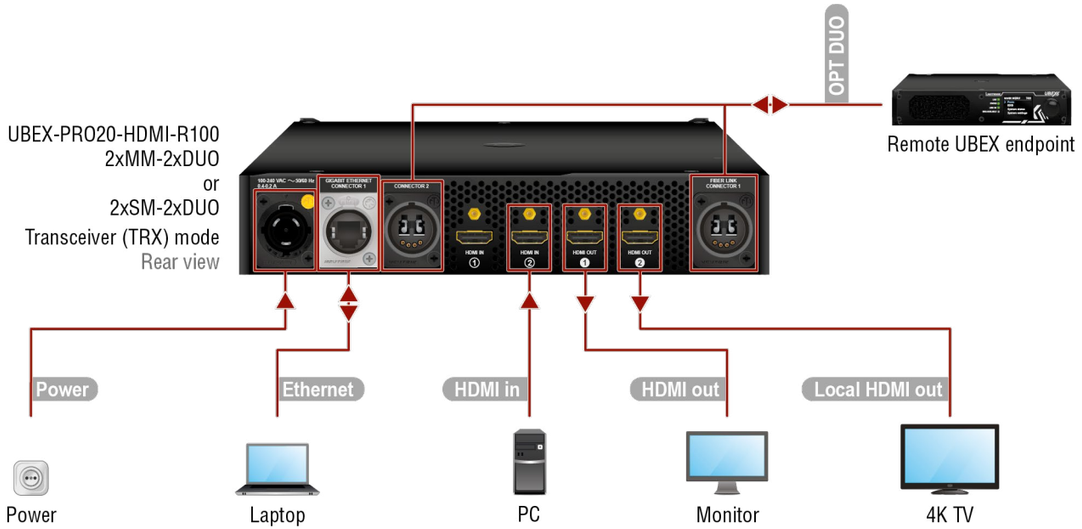
Changing the Operation Mode

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.

3.3.6. R-series Endpoints - Transceiver Operation Mode

2xMM-2xDUO and 2xSM-2xDUO



2xMM-QUAD and 2xSM-QUAD

2xSM-BiDi-DUO

For all R-series models	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.
2xMM-2xDUO	OPT DUO	Connect the device and the remote UBEX endpoint by 2 pcs **multimode** Neutrik opticalCON DUO or 4 pcs multimode LC fiber optical cables.
2xMM-QUAD	OPT QUAD	Connect the device and the remote UBEX endpoint by a **multimode** Neutrik opticalCON QUAD fiber optical cable.
2xSM-2xDUO	OPT DUO	Connect the device and the remote UBEX endpoint by 2 pcs **singlemode** Neutrik opticalCON DUO or 4 pcs singlemode LC fiber optical cables.
2xSM-QUAD	OPT QUAD	Connect the device and the remote UBEX endpoint by a **singlemode** Neutrik opticalCON QUAD fiber optical cable.
2xSM-BiDi-DUO	OPT BiDi DUO	Connect the device and the remote UBEX endpoint by a singlemode Neutrik opticalCON DUO BiDi or 2 pcs **singlemode** LC fiber optical cables. **The connector does not support the Neutrik opticalCON cross cable. Please use standard cable only.**

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

ATTENTION! An endpoint model can be connected to the same type of endpoint model, for example a 2xMM-2xDUO can be connected to another 2xMM-2xDUO. Or the 2xSM-BiDi-DUO is compatible any F-series endpoint device which is built with BiDi SFP+ modules.

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

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.

3.4. Connection between F-series and R-series Endpoints

The UBEX F-series endpoint devices are built with SFP+ ports, the R-series devices are built with Neutrik opticalCON DUO and QUAD fiber optical connections. This section is about how to establish connection between an F and R-series endpoint device over the different type of connectors.

3.4.1. SFP+ to Neutrik opticalCON DUO

This method is working between the following endpoint models:

F-series endpoint model		R-series endpoint model
UBEX-PRO20-HDMI-F100	⟷	UBEX-PRO20-HDMI-R100 2xMM-2xDUO
UBEX-PRO20-HDMI-F110		UBEX-PRO20-HDMI-R100 2xSM-2xDUO

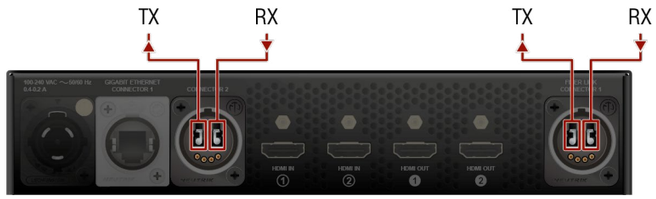
Connecting Steps

Step 1. Insert 2 pcs 10GbE singlemode/multimode SFP+ transceiver modules to the SFP+ slots of the F100 / F110 endpoint device.

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

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

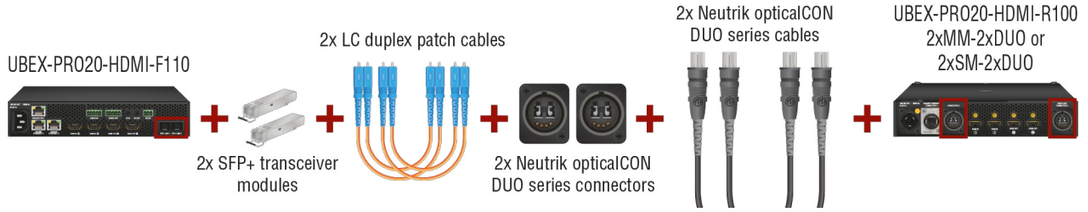
Step 3. Establish connection between the additional Neutrik opticalCON DUO connectors and the R100 endpoint device by 2 pcs singlemode/multimode Neutrik opticalCON DUO series cables. The following figure shows the correct cabling layout of optical connectors on the R100 endpoint device:



Layout of the 2xMM-2xDUO / 2xSM-2xDUO models (rear view)

Layout of the extra connector (rear view)

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



Required fiber optical equipment for connecting an F110 and an R100 DUO endpoint device

INFO: This method does not work in case of using **DAC cables** in the F-series endpoint device.

3.4.2. SFP+ to Neutrik opticalCON QUAD

This method is working between the following endpoint models:

F-series endpoint model		R-series endpoint model
UBEX-PRO20-HDMI-F100	⟷	UBEX-PRO20-HDMI-R100 2xMM-QUAD
UBEX-PRO20-HDMI-F110		UBEX-PRO20-HDMI-R100 2xSM-QUAD

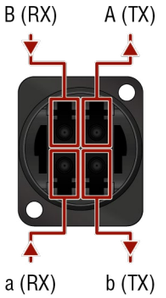
Connecting Steps

Step 1. Insert 2 pcs 10GbE singlemode/multimode SFP+ transceiver modules to the SFP+ slots of the F100 / F110 endpoint device.

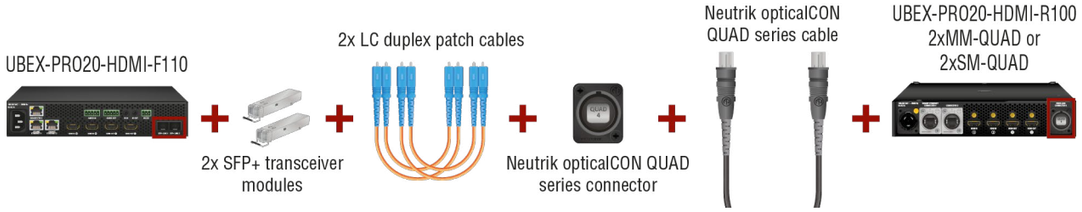
Step 2. You need a singlemode/multimode Neutrik opticalCON QUAD series connector and 2 pcs singlemode/multimode fiber optical patch cables with LC duplex connectors. Connect the SFP+ modules and the back of the Neutrik opticalCON QUAD connector by the patch cables (2 pcs standard LC duplex connectors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

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

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



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



Required fiber optical equipment for connecting an F110 and an R100 QUAD endpoint device

INFO: This method does not work in case of using **DAC cables** in the F-series endpoint device.

3.4.3. SFP+ BiDi to Neutrik opticalCON DUO BiDi

This method is working between the following endpoint models:

F-series endpoint model		R-series endpoint model
UBEX-PRO20-HDMI-F100	⟷	UBEX-PRO20-HDMI-R100 2xSM-BiDi-DUO
UBEX-PRO20-HDMI-F110		

Connecting Steps

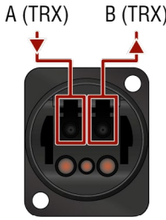
Step 1. Insert 2 pcs 10GbE singlemode SFP+ BiDi transceiver modules to the SFP+ slots of the F100 / F110 endpoint device.

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

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

Step 3. Establish connection between the additional Neutrik opticalCON DUO connector and the R100 endpoint device by a singlemode/multimode Neutrik opticalCON DUO BiDi cable. The following figure shows the correct cabling layout of optical connectors on the R100 endpoint device:

Layout of the 2xSM-BiDi-DUO model (rear view)

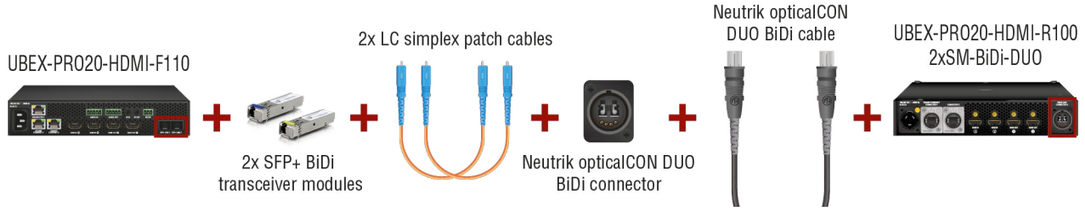


Layout of the extra connector (rear view)

SFP+ modules behind th Neutrik opticalCON DUO connector		
Channel	**Type of the SFP+ module**	**Wavelength**
A	Finisar FTLX2072D327	1271 nm
B	Finisar FTLX2072D333	1331 nm

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

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



Required fiber optical equipment for connecting an F110 and an R100 2xSM-BiDi-DUO endpoint device

INFO: This method does not work in case of using **DAC cables** in the F-series endpoint device.

3.5. 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.

3.5.1. 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 4. Put up on the handle bar.

Step 5. Connect the module to the to one of the SFP+ port slot.

Step 6. 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.

3.5.2. 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.

3.6. 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.

3.6.1. 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.

3.6.2. 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 **Front panel LCD menu**. See the details in the Operation Mode section.

3.6.3. 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.

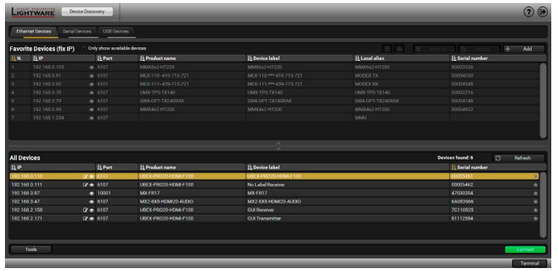
Lightware Device Controller Software

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 (LDC) chapter.

Discovering the Device

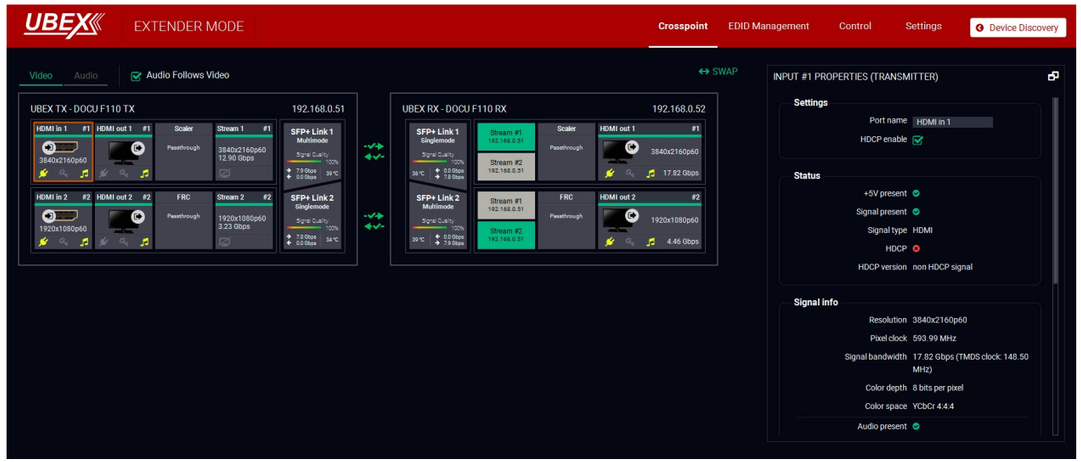
Step 1. Open the LDC software. The **Device discovery** window will launch automatically to discover all available Lightware devices on the network where the controller device is connected to.

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



3.6.4. 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.

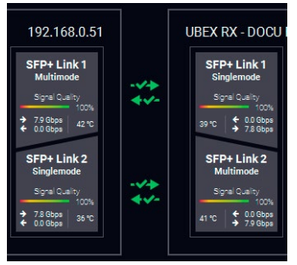
Step 2. Check the HDMI signal status on the **HDMI out 1 and 2 output ports** - if the **signal status indicator** is green, the signal is present and sink device is connected; if it is grey, no transmitted signal on the port.

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



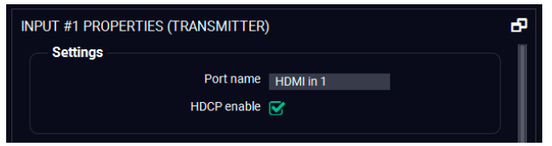
Check the connection status of the SFP+ links:

- **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.

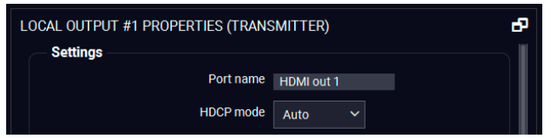
3.6.5. Set the HDCP Settings

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.

3.6.6. 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

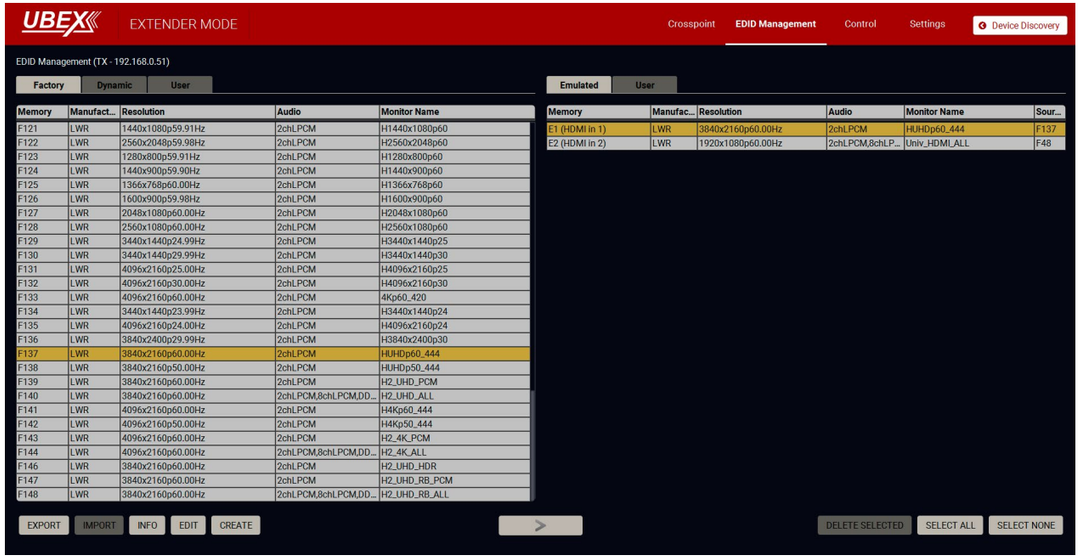
In our example the incoming signal on the HDMI in 1 port is 4K UHD 60 Hz (3840x2160p@60Hz 4:4:4).

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.

3.6.7. Set the Scaler and the Frame Rate Converter

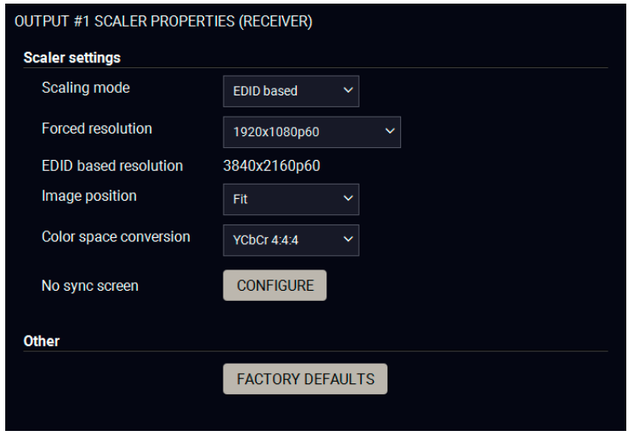
Set up the scaler and the frame rate converter (FRC) for the best user experience. The forced resolution and refresh rate are recommended to fit the supported resolution / refresh rate of the sink device.

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.

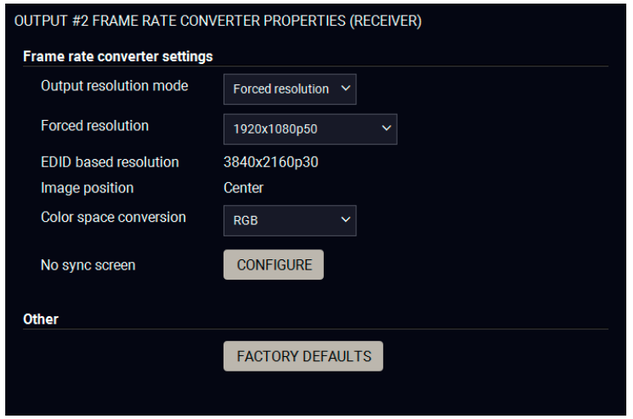
Navigate to the **Crosspoint menu - Video tab** and select the **Scaler** panel on the receiver side. Set the Scaling Mode setting to **EDID based** which means the receiver read out the EDID of the sink device and scaling the image to that. In our example it is **3840x2160p60**.Set the Image position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



Frame Rate Converter - Example

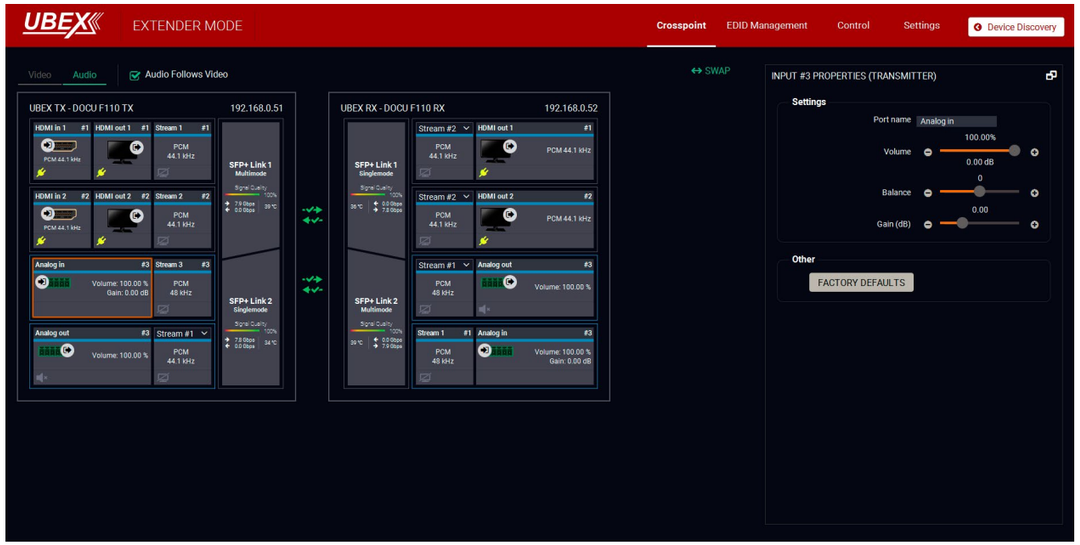
In our example the other sink device is a full HD monitor with 50 Hz refresh rate and we have to display a 1080p60 Hz video on that. The signal is transmitted on the HDMI out 2 port of the UBEX receiver.

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**.



TIPS AND TRICKS: The stream and the connected display device can be identified by using the Identify Stream / Identify Display feature. It makes generating 10 test colors on the display device for 10 seconds.

3.6.8. 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

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

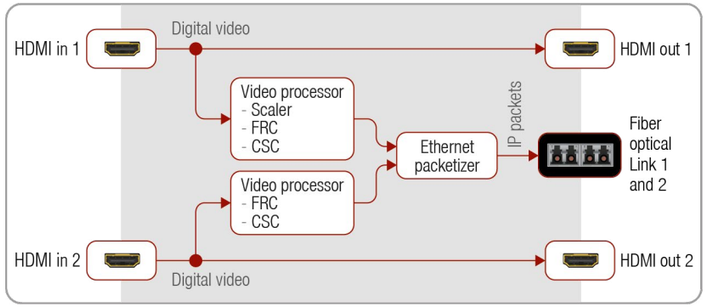
4.1. Video Interface

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
- UBEX-PRO20-HDMI-R100 series



Video port diagram of the F100/F110/R100 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.

Fiber Optical Interface

After the Ethernet packetizing the two video streams are transmitted to the remote endpoint device via the SFP+ / fiber optical 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)	✓	✓

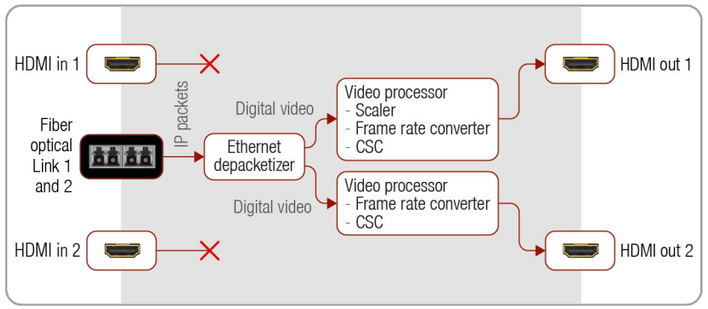
HDMI OUTPUTS		
	HDMI output 1	**HDMI output 2**
Output signal	up to 4K@60 4:4:4	up to 4K@60 4:4:4
Signal source	HDMI in 1	HDMI in 2

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
- UBEX-PRO20-HDMI-R100 series



Video port diagram of the F100/F110/R100 receiver

Fiber Optical Interface

The receiver can receive two HDMI video streams via the SFP+ / fiber optical input ports (Fiber optical 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	⛔	⛔

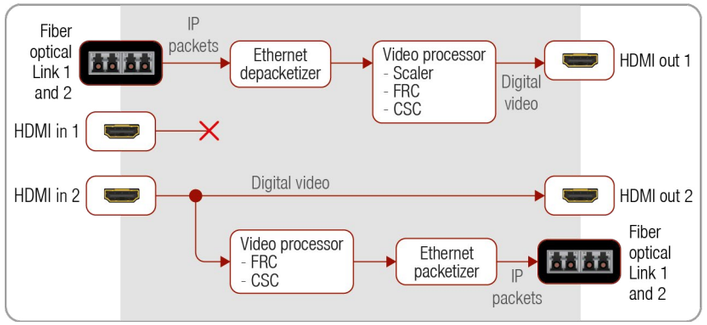
HDMI OUTPUTS		
	HDMI output 1	**HDMI output 2**
Output signal	up to 4K@60 4:4:4	up to 4K@60 4:4:4
Signal source	Selected input port of the remote device	Selected input port of the remote device
Scaler	✓	-
Frame rate converter (FRC)	✓	✓
Color space converter (CSC)	✓	✓

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
- UBEX-PRO20-HDMI-R100 series



Video port diagram of the F100/F110/R100 transceiver

Fiber Optical Interface

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

HDMI Input Modes

The transceiver can receive one HDMI video stream from the HDMI in 2 input port. The signal can be up to 4K@60 Hz 4:4:4. The video stream can be processed in the video processor (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).

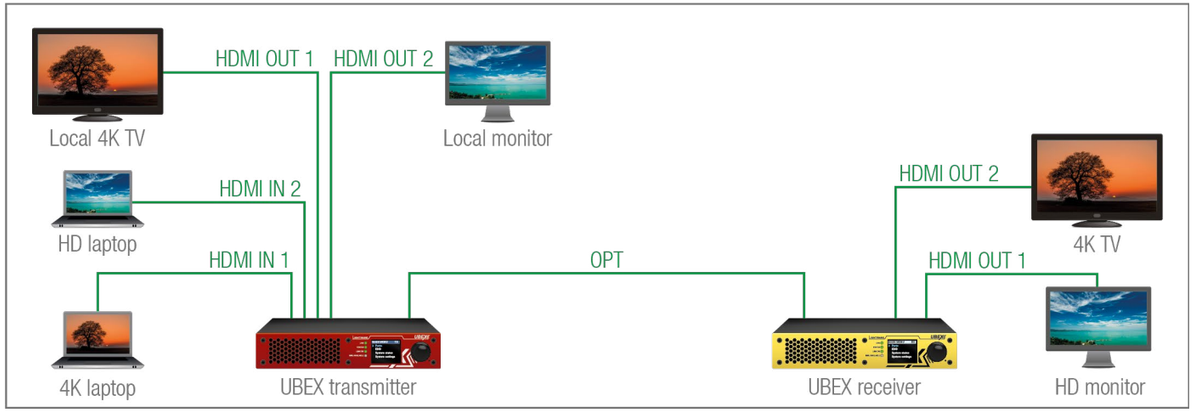
The HDMI out 2 transmits the HDMI signal coming from the HDMI in 1 input port so it operates as a local output port. The stream cannot be affected by any video processing.

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.

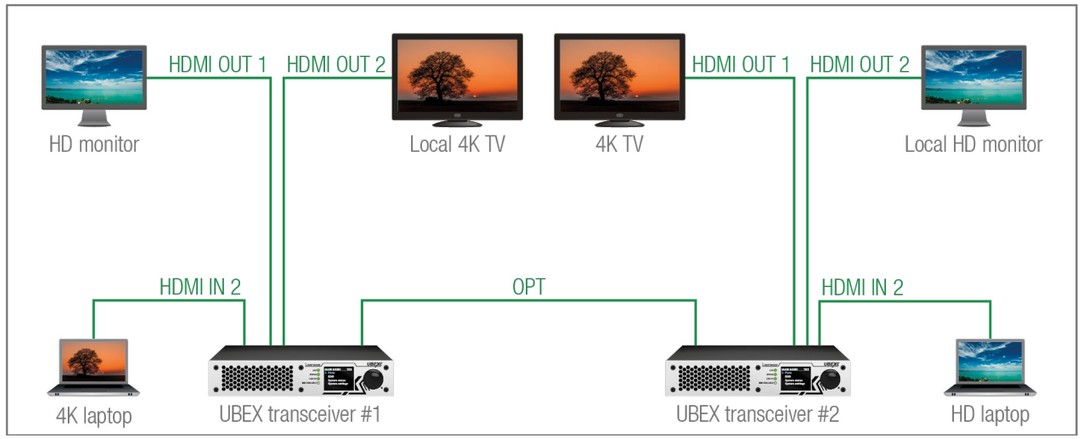
The scaler is available on the receiver and transmitter side either. The stream of the HDMI in 1 can be re-scaled and the transmitter transmits the optimized stream toward the receiver.

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

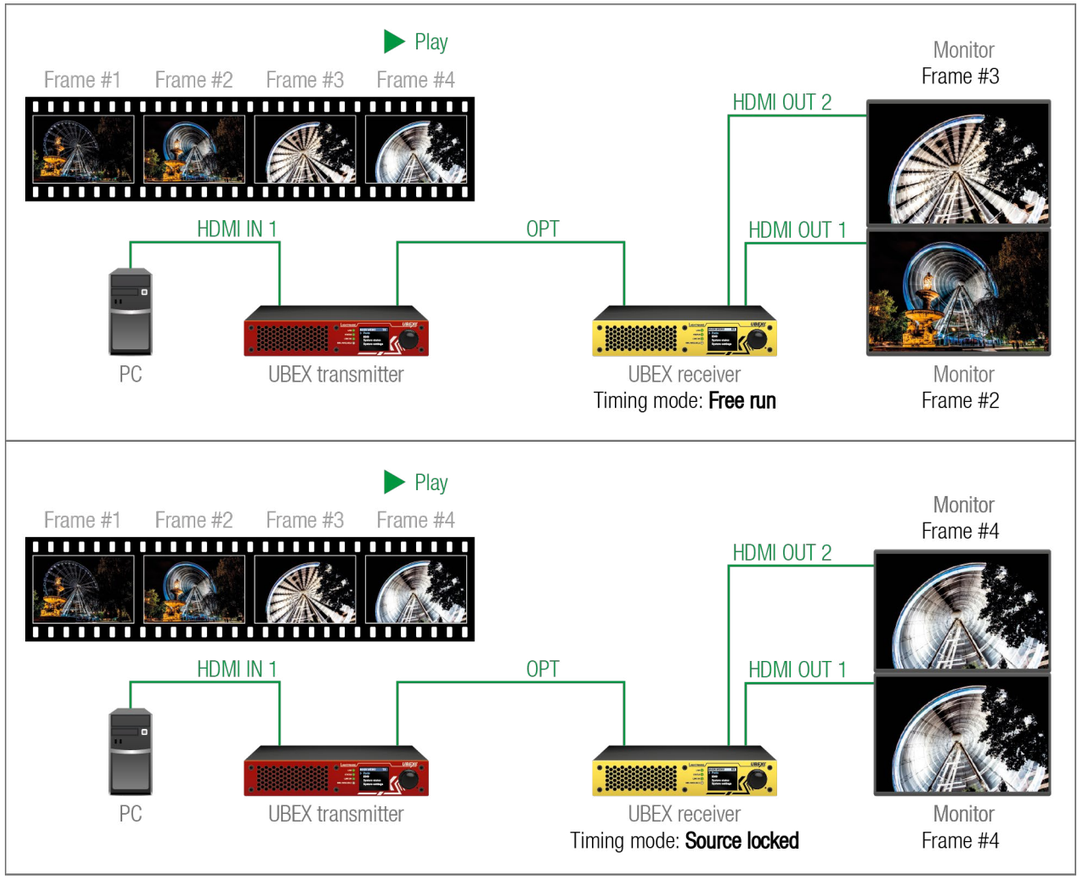
Technical Background

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.

	HDMI in 1		HDMI in 2	
Transmitter side	**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.

	HDMI out 1		HDMI out 2	
Receiver side	**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.

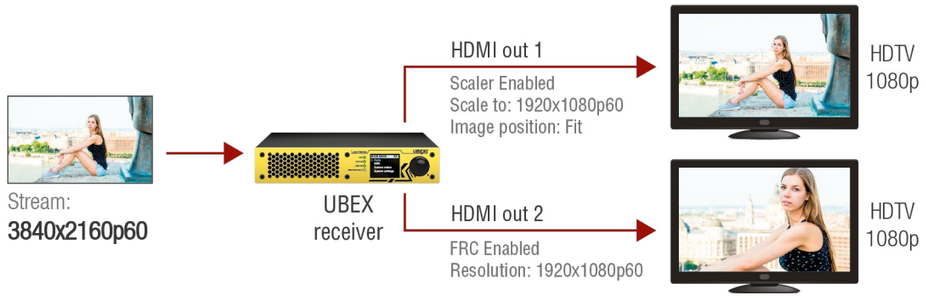
	HDMI in 2		HDMI out 1	
Transceiver side	**Status**	**Stream tile (LDC)**	**Status**	**Stream tile (LDC)**
	Enabled	Stream 1	Enabled	Stream 1

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.

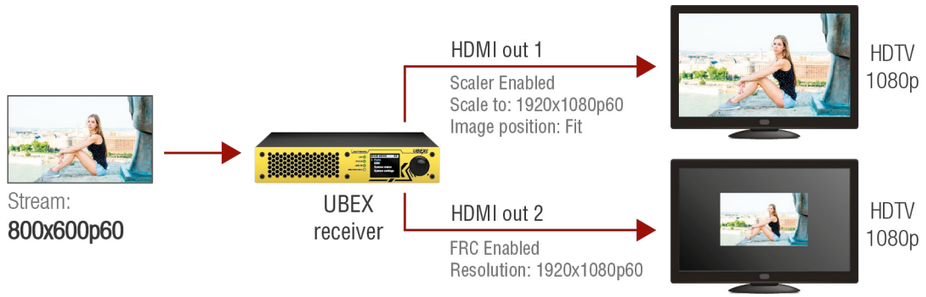
Example for Downscaling



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.

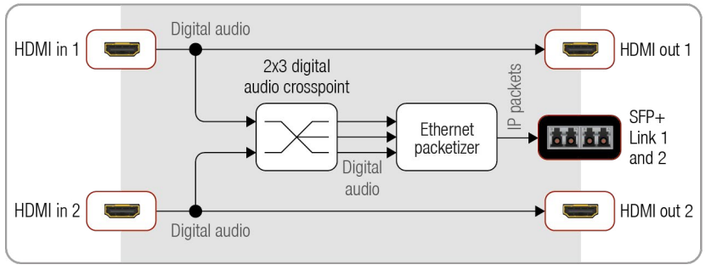
4.2. Audio Interface

4.2.1. Transmitter Mode - F100/R100 Models

Port Diagram

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

- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-R100 series



Audio port diagram of the F100/R100 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

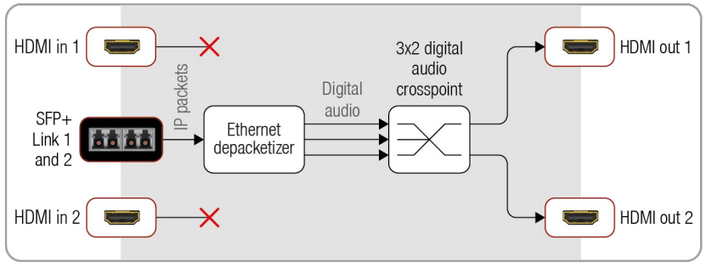
When the F100/R100 transmitter connects to an F110 endpoint device, the number of audio outputs expands to three due to the analog audio output port on the remote side. In this case the digital audio crosspoint changes to 2x3 (2 inputs and 3 outputs).

4.2.2. Receiver Mode - F100/R100 Models

Port Diagram

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

- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-R100 series



Audio port diagram of the F100/R100 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

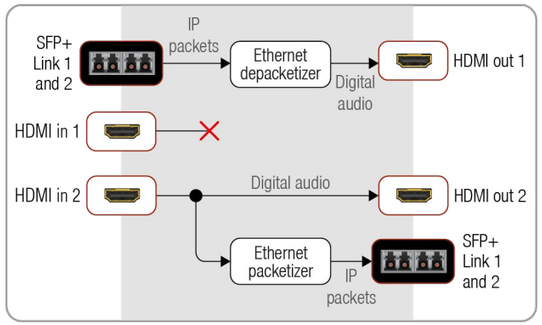
When the F100/R100 receiver connects to an F110 endpoint device, the number of audio inputs expands to three due to the analog audio input stream received via the SFP+ links. In this case the digital audio crosspoint changes to 3x2 (3 inputs and 2 outputs).

4.2.3. Transceiver Mode - F100/R100 Models

Port Diagram

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

- UBEX-PRO20-HDMI-F100
- UBEX-PRO20-HDMI-R100 series



Description

The 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

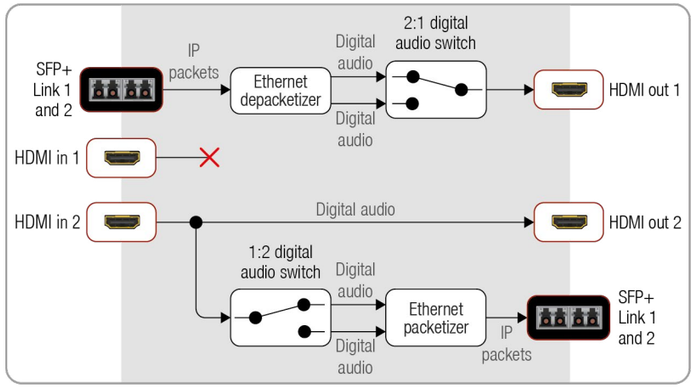
When the F100/R100 transceiver connects to an F110 endpoint device, the port diagram changes due to the expanded audio possibilities.

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.



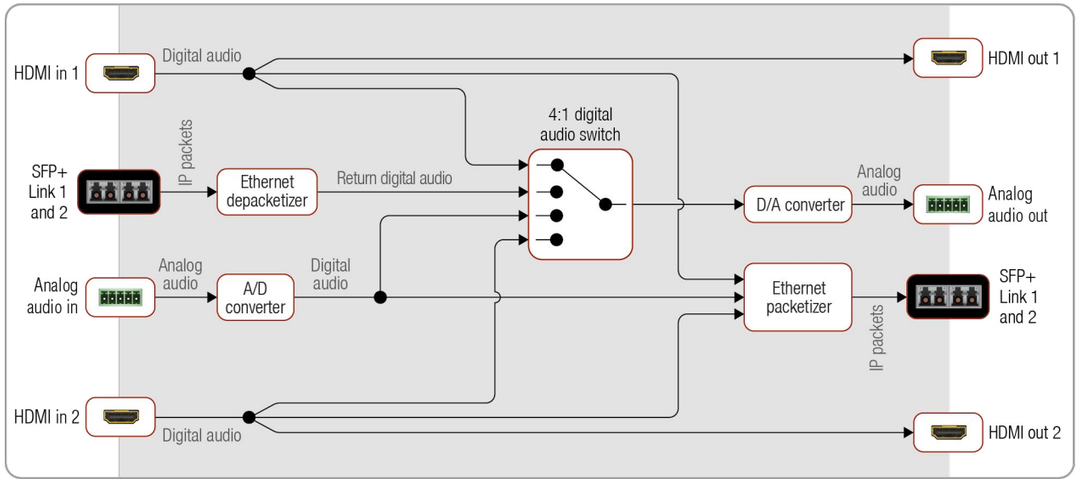
Audio port diagram of the F100/R100 transceiver in connection with an F110 endpoint

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**.

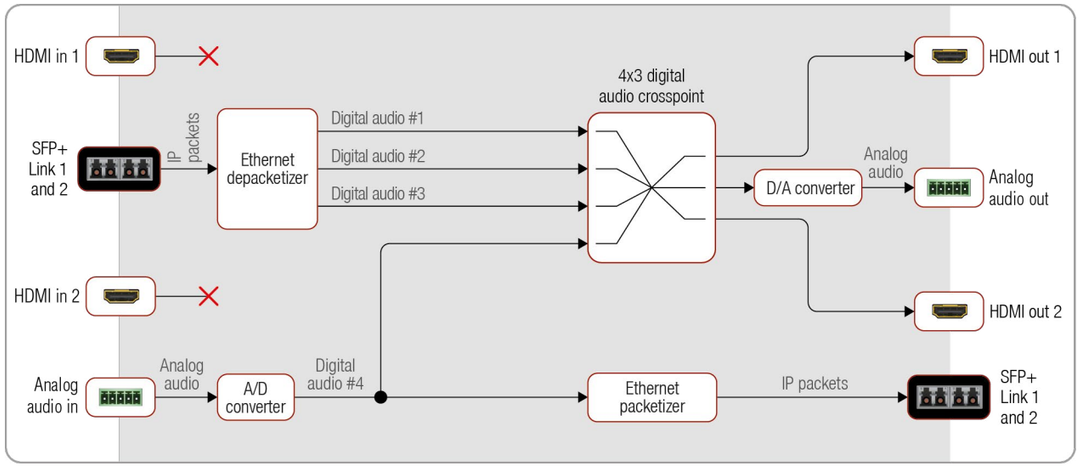
> **ATTENTION!** If unsupported audio signal is selected to the analog audio output, the port will be muted automatically. The current status of the port can be queried by an LW3 protocol command, see the details in the Query the Status of the Analog Audio Output section.

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**.

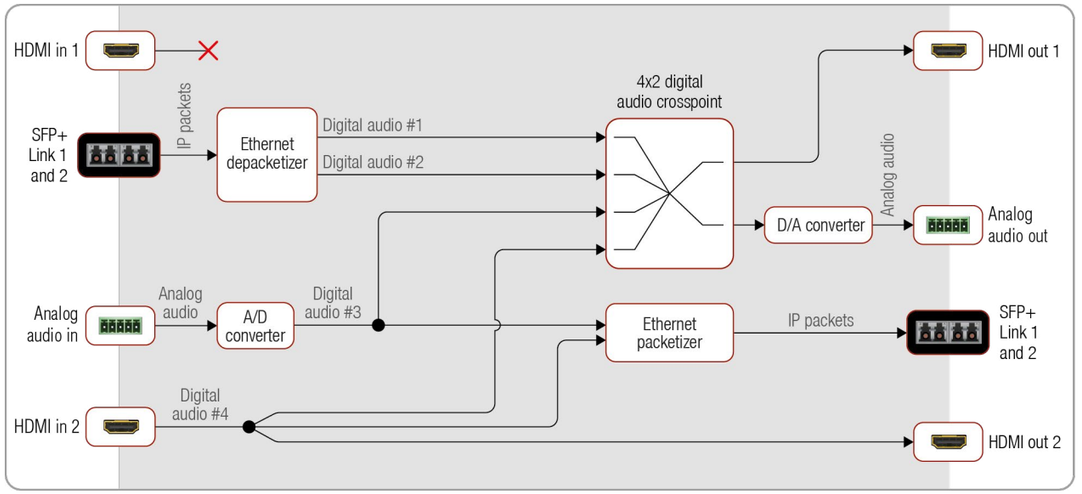
ATTENTION! If unsupported audio signal is selected to the analog audio output, the port will be muted automatically. The current status of the port can be queried by an LW3 protocol command, see the details in the Query the Status of the Analog Audio Output section.

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.

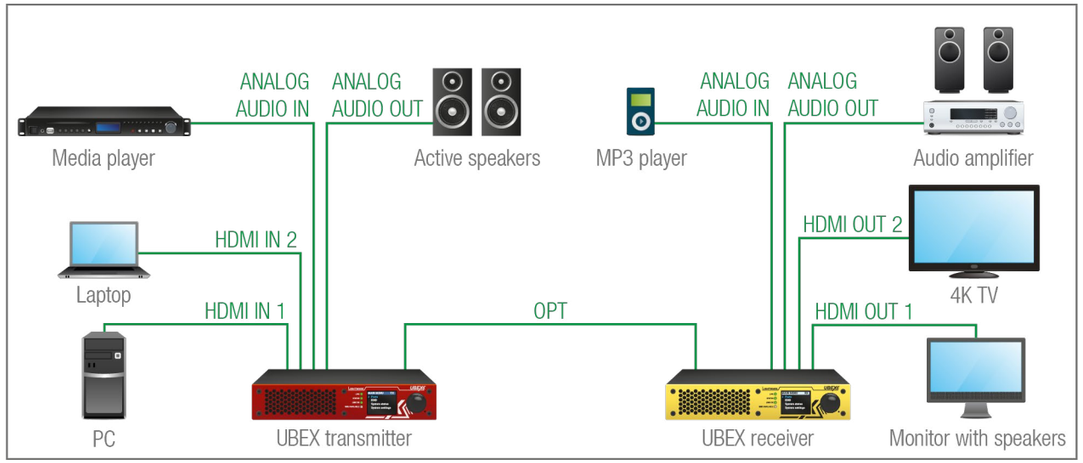
The HDMI input 1 port does not accept signal when the device is configured as transceiver.

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.

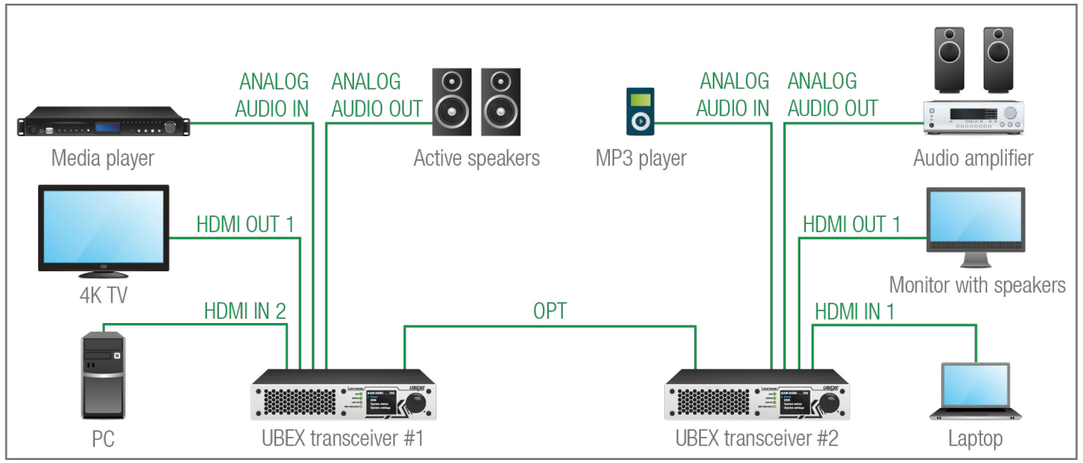
The F110 receiver has three sink devices: a monitor with speakers and a 4K TV on the HDMI output ports; and an audio amplifier on the analog audio output port. A source device is also connected to the receiver: an MP3 player on the analog audio output port.

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.

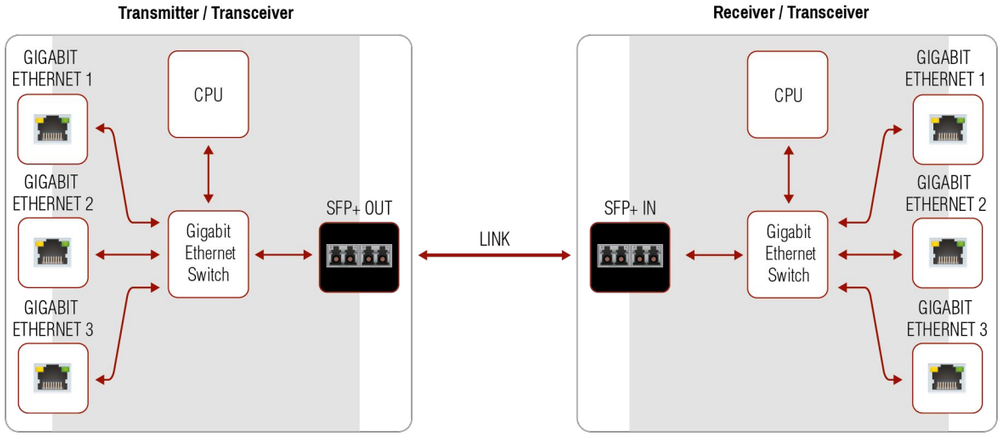
4.3. Ethernet Control Interface

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



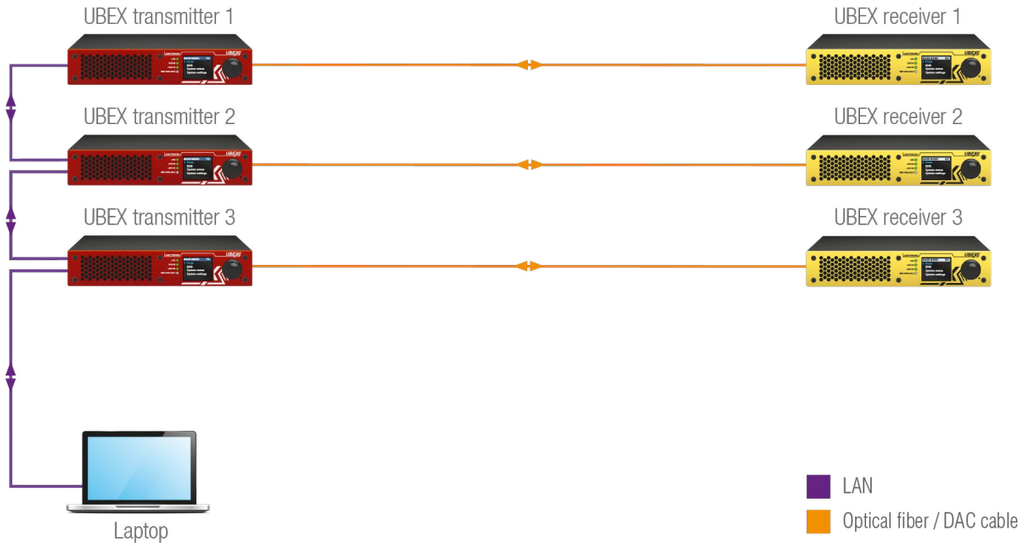
Port diagram of the Ethernet interface for the F110 model

Number of the Gigabit Ethernet Ports

The following table shows the number of the Gigabit Ethernet ports by endpoint models.

Endpoint model	Number of Gigabit Ethernet ports
UBEX-PRO20-HDMI-F100	2
UBEX-PRO20-HDMI-F110	3
UBEX-PRO20-HDMI-R100 2xMM-2xDUO	1
UBEX-PRO20-HDMI-R100 2xSM-2xDUO	1
UBEX-PRO20-HDMI-R100 2xMM-QUAD	2
UBEX-PRO20-HDMI-R100 2xSM-QUAD	2
UBEX-PRO20-HDMI-R100 2xSM-BiDi-DUO	2

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).

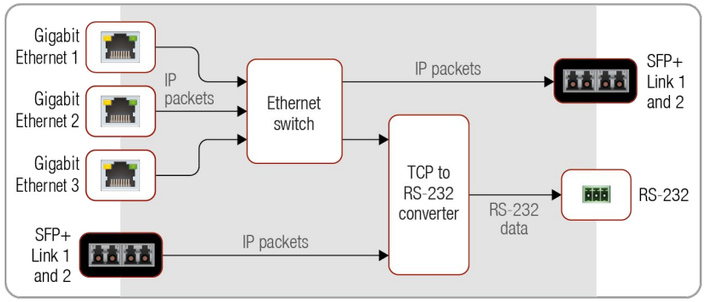
ATTENTION! When one of the extender is in firmware upgrade mode, the Ethernet communication will be lost during the upgrade procedure.

4.4. Serial Interface

DIFFERENCE: Only the UBEX-PRO20-HDMI-F110 model has built with serial interface port.

4.4.1. Technical Background

Port Diagram

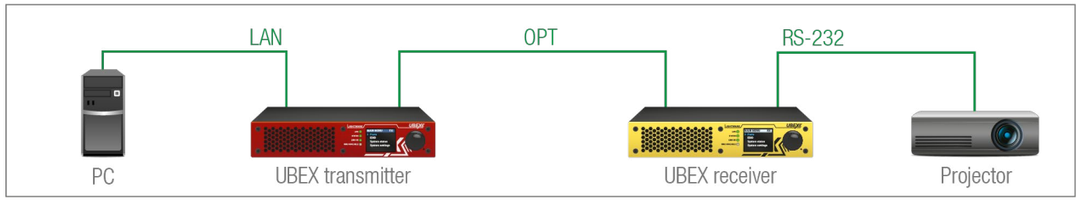


Port diagram of the serial interface

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 in text, hexa, and binary format 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 Communication Ports section.

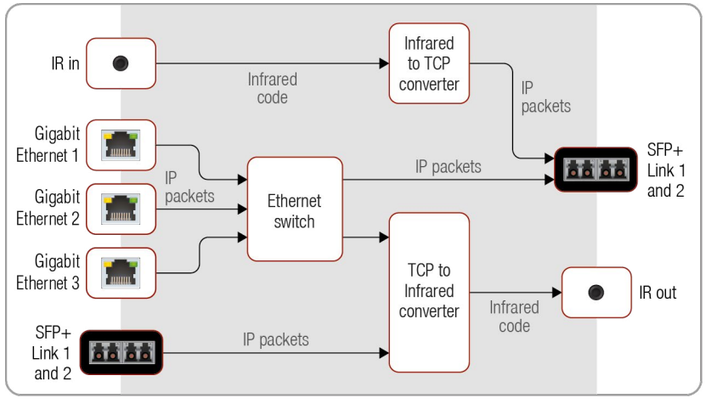
4.5. Infrared Interface

DIFFERENCE: Only the UBEX-PRO20-HDMI-F110 model has built with Infrared interface ports.

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

4.5.1. Technical Background

Port Diagram



Port diagram of the Infrared interface

The endpoint device uses **command injection** which means in the practice it works as a TCP/IP -> Infrared converter so the TCP/IP data signal is converted to Infrared code. The Infrared code can be received from the IR in port or it is sent over the Ethernet interface (via the Gigabit Ethernet 1-3 ports) which addresses the IR out port of the remote endpoint device. TCP/IP port numbers are defined for the IR output port for this purpose. E.g. the default Command Injection port number of the IR out port is 9002. If data is coming from the SFP+links which addresses to the port no. 9002, it will be transmitted to the IR output port.

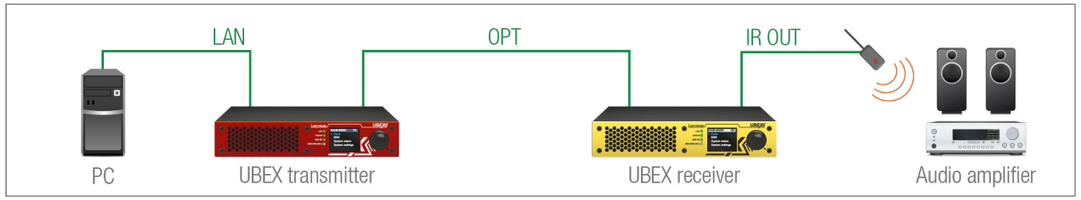
INFO: The modulation of output IR signal can be turned off or on by LW3 protocol command, see the Enable/Disable Output Signal Modulation section.

Infrared Message Sending

Infrared message can be sent over the IR output port in two formats:

- Pronto hex message in **little-endian format** using LDC (see the details in the Infra Tab section) or LW3 protocol command (see the details in the Sending Hex Codes in Little-endian Format via IR Port section);
- Pronto hex message in **big-endian format** using LW3 protocol command (see the details in the Sending Hex Codes in Big-endian Format via IR Port section).

4.5.2. Infrared Signal Transmission - Example



The Concept

The IR code is sent from the PC over LAN where the message addresses the port number of the IR output port of the receiver. The audio amplifier is controlled remotely by the IR signal.

4.6. SFP+ Interface

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

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

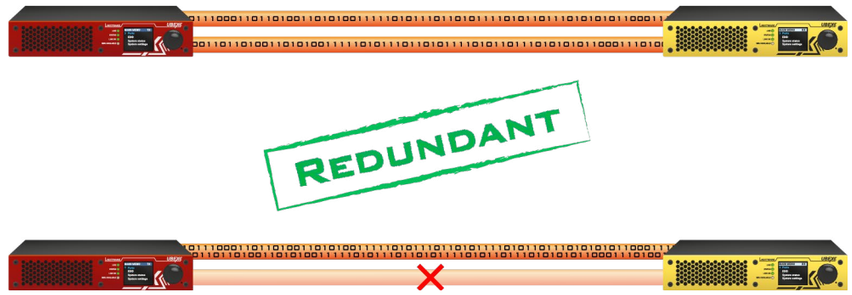
- 2x SFP+ transceiver modules up to 10Gbps bandwidth/modules. The modules can be singlemode or multimode, built with LC duplex connectors or BiDi modules. The maximum allowed fiber optical cable length depends on the installed SFP+ modules. Always check the specification of the module.
- 2x 10GbE DAC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

4.7. Redundant Fiber Optical Connections

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



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

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

4.8. Further Built-in Features

4.8.1. 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.

4.8.2. 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.

4.9. 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 (LDC) 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 chapter.

5

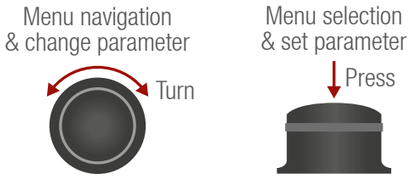
Front Panel LCD Menu Operations

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

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.

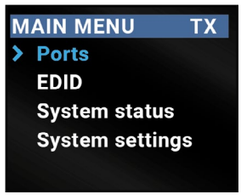


> TIPS AND TRICKS: The faster you rotate the jog dial, the faster the parameter list is scrolled.

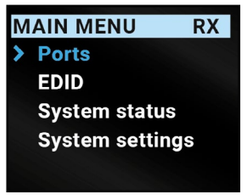
5.1.2. Operation Mode Visualization

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

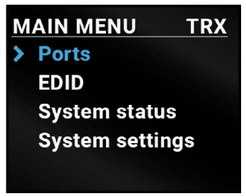
- The color of the header is **blue** for the transmitter, **white** for the receiver, and **black with a white stripe** for the transceiver;
- There is a TX, RX or TRX label in the main menu of the menu structure.



Main menu of the transmitter



Main menu of the receiver

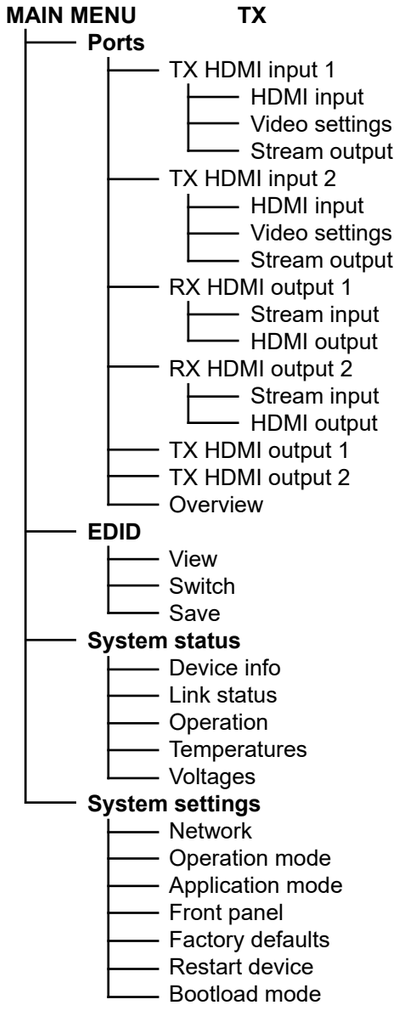


Main menu of the transceiver

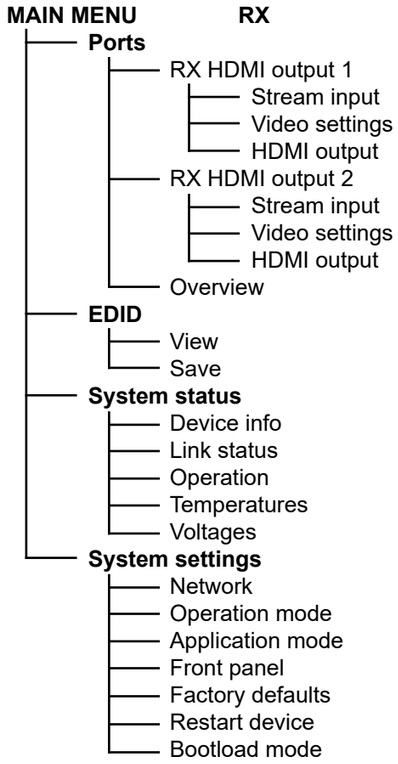
5.1.3. Parameter Selection

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

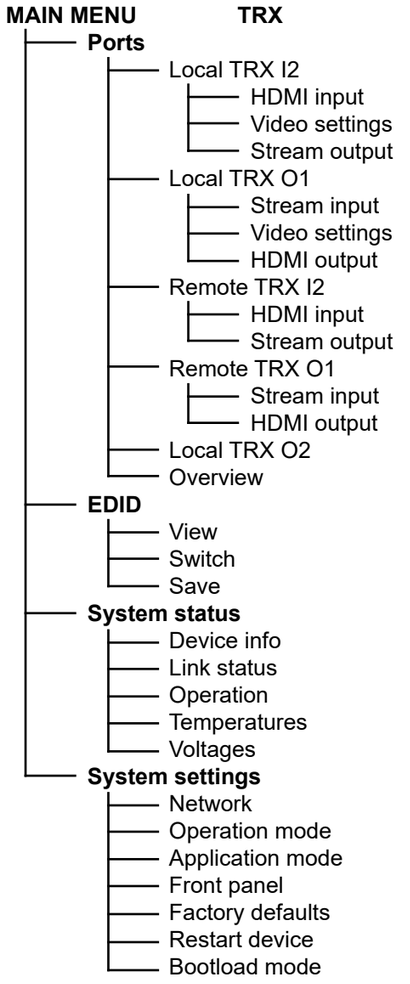
5.2. The Tree Structure of the LCD Menu



The tree structure of the transmitter mode

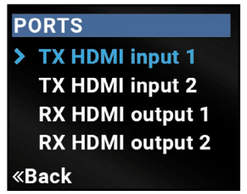


The tree structure of the receiver mode



The tree structure of the transceiver mode

5.3. Ports Menu - Transmitter Mode



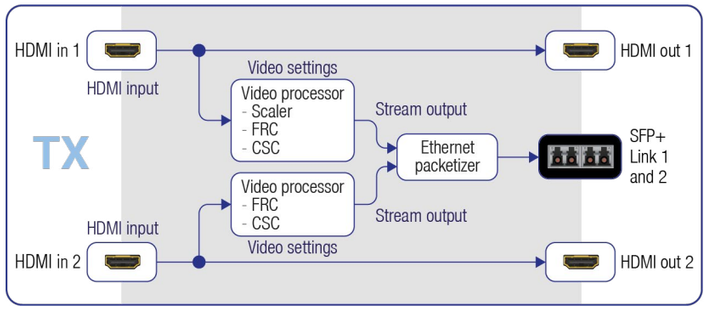
The most important settings and status information of the HDMI ports are available in the Ports menu.

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 *#hdcp*
- +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** *#scaler #frc*
  - 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 *#csc #colorspace*

Stream Output

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

- **Stream enable** - Enabled / Disabled *#streamenable*
- 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 *#switch #crosspoint*
  - 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

#hdcp #power5v

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.

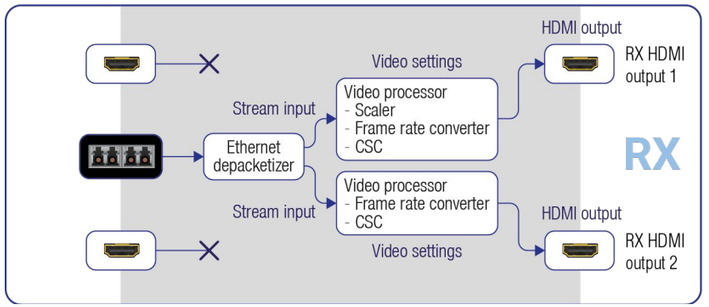
Icon	Icon is blue (inactive)	Icon is white (active)
	Sink is **not** connected	Sink is connected
	Signal is **not** present	Signal is present
	Signal is **not** encrypted with HDCP	Signal is encrypted with HDCP
	No audio signal in the video stream	Audio is embedded in the video stream

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 *#streamenable*
- 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** *#scaler #frc*
  - 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 *#csc #colorspace*
- **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: *#testpattern #nosyncscreen*
  - **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 #power5v*

- **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

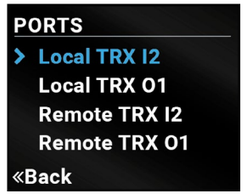
The current status of the output ports is summarized in the Overview menu. The icons display information about the port and the transmitted signals.

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

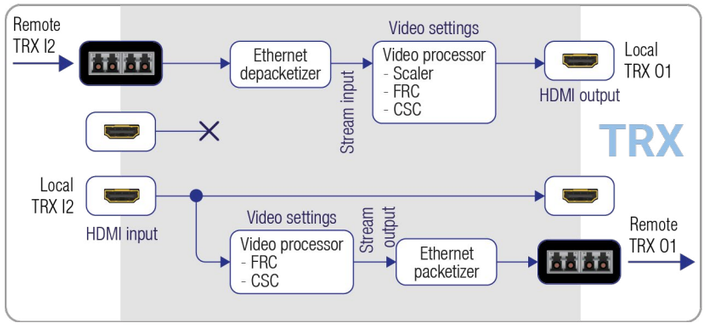
5.5. Ports Menu - Transceiver Mode

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 *#hdcp*
- +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** *#frc*
  - 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 *#csc #colorspace*

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 *#streamenable*
- 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 *#streamenable*
- 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** *#scaler*
  - 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 *#csc #colorspace*
- **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: *#testpattern #nosyncscreen*
  - **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 #power5v*

- **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 #hdcp
- **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. #edid

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.

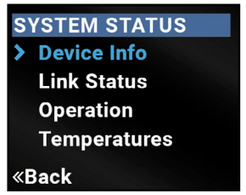
Step 2. Select the **Source** EDID item and press the knob. Use the jog dial to select the desired EDID (D1-D4) and press the knob.

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. #status



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. #firmwareversion

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.

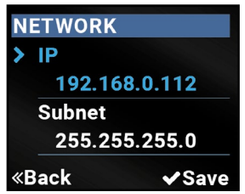
WARNING! If the front panel Status LED blinks, power off the device immediately.

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:

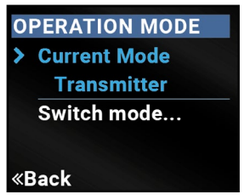


- Static IP,
- Static subnet,
- Static gateway.

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. *#network #ipaddress #dhcp #mac*

5.8.2. Operation Mode

The operation mode - the unit works as a transmitter or receiver - can be set in the submenu. *#operationmode #transmitter #receiver #transceiver #tx #rx #trx*



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**.

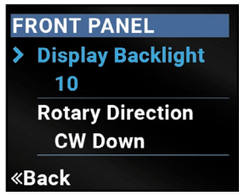
Step 4. Confirm the selection, press the **Yes**.

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. *#applicationmode #extendermode #matrixmode*

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). *#rotary #jogdial*

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. *#factory*

5.8.6. Restart Device

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

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 chapter. *#bootload*

6

Lightware Device Controller (LDC)

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.

6.1. Install and Upgrade

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

Minimum System Requirement

RAM: 1 GB

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.

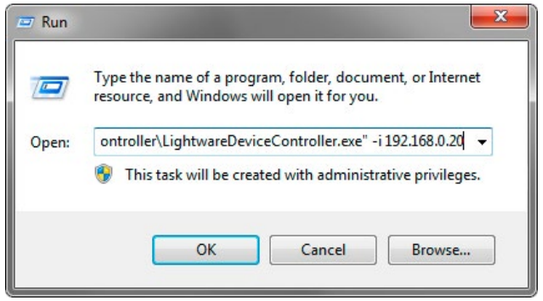
- If you do not want to check for the updates automatically, uncheck **the circle**, which contains the green tick.
- If you want to postpone the update, a reminder can be set with different delays from the **drop down list**.
- If the proxy settings traverse the update process, set the proper values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

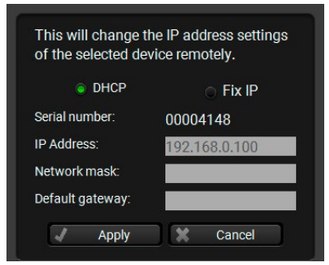
Step 2. Run the controller software; device discovery window appears automatically.

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 next to the IP address.

You can see the new settings only in this window.

#network #ipaddress #dhcp #mac

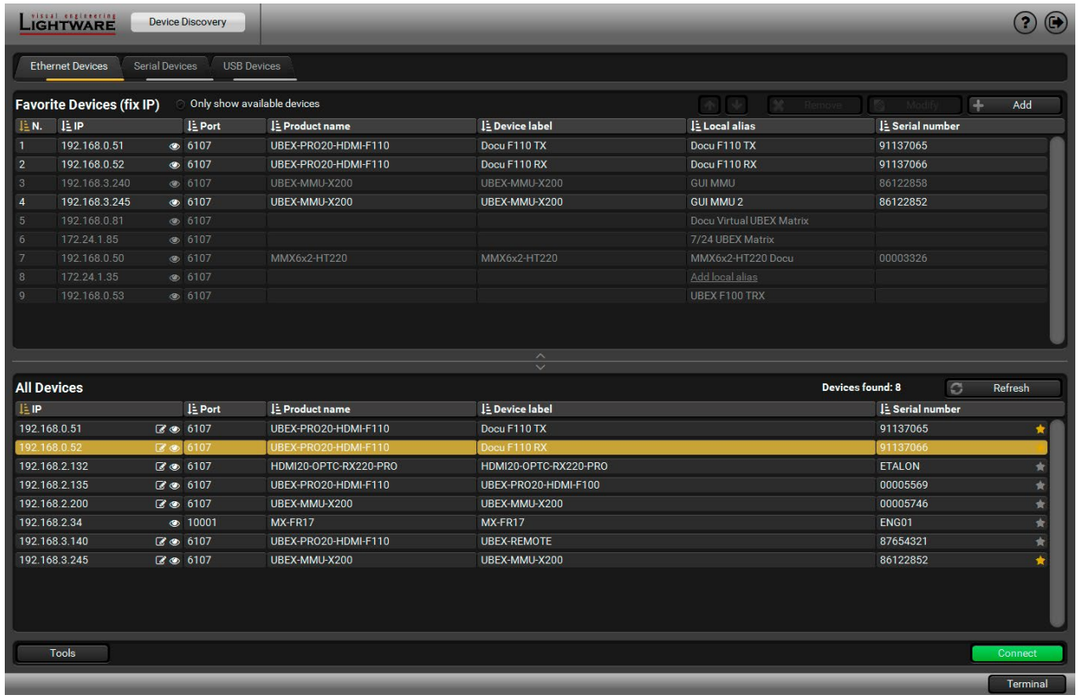


Identifying the Device

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. *#identifyme*

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)

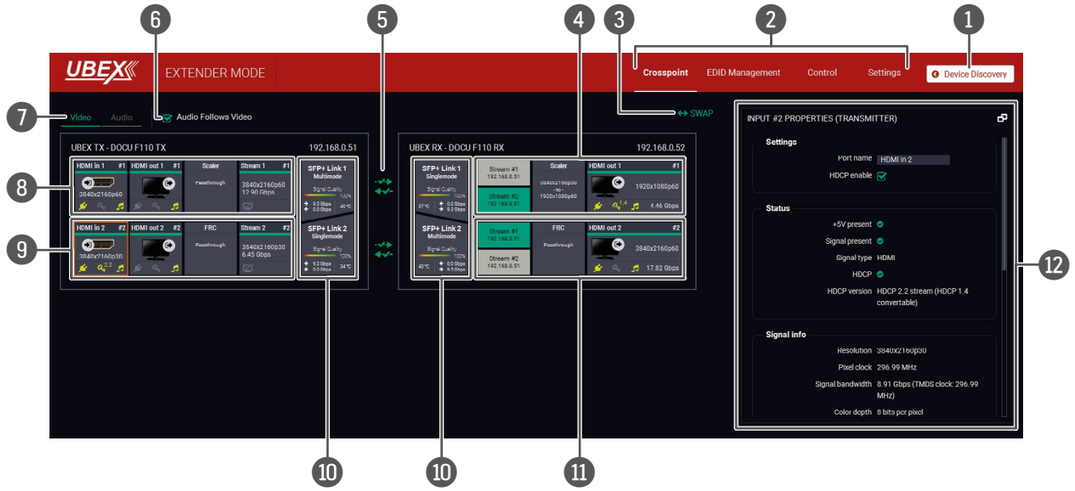
Clicking on the grey star icon next to of the discovered devices the most used units can be saved to the Favorite devices.

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 **Swap button** — Clicking on the button the orientation of the endpoint devices can be swapped. The feature effects the GUI view only.

4 **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.

5 **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.

6 **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.

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

8 **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.

9 **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.

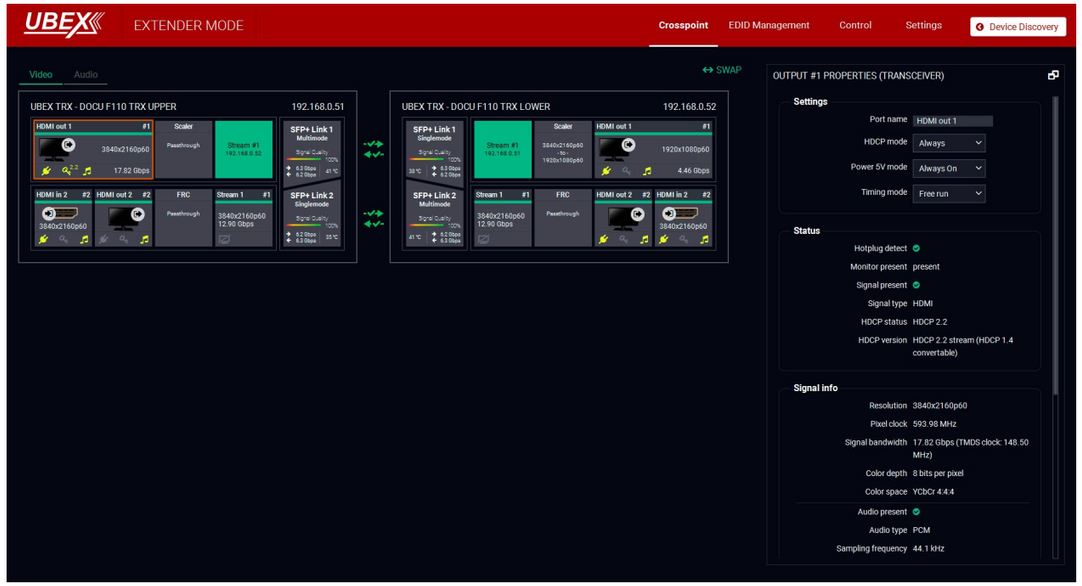
10 **SFP+ ports** — Status information and parameters of the SFP+ Link 1 and 2.

11 **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.

12 **Properties window** — 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.

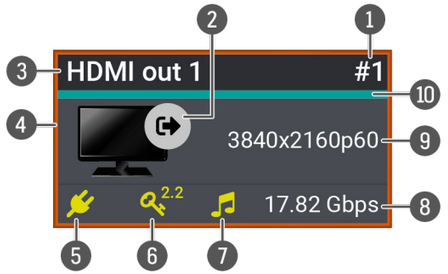
Properties Windows

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.

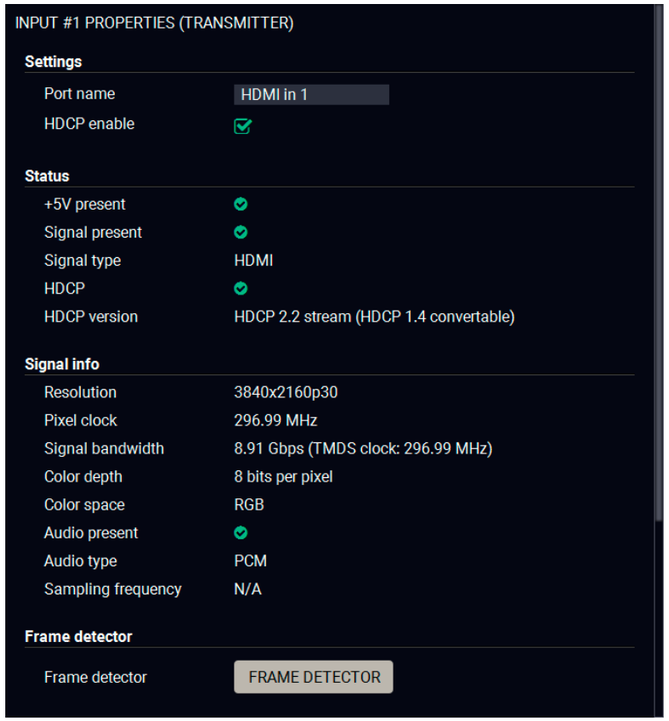


1. **Port ID**
2. **Input / output indicator**
   - Input port (signal source)
   - Output port (destination)
3. **Port name**
4. **Selected port indicator**
   If the frame is orange, the properties panel of the port is displayed.
5. **+5V / Hotplug state**
   - Source/sink is connected.
   - Source/sink 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: *#hdcp*



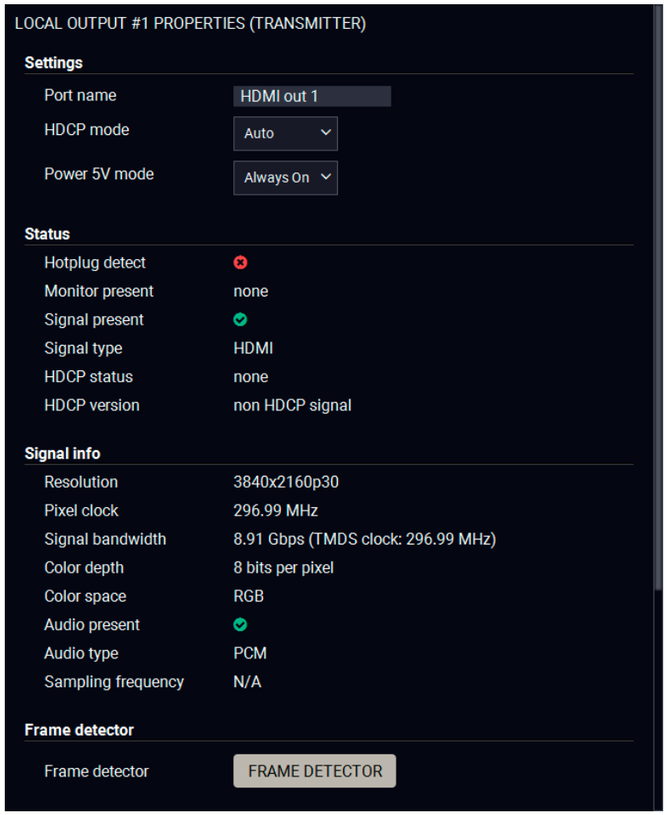
Port properties window of the HDMI in 1 (TX)

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: *#hdcp #power5v*



Port properties window of the HDMI out 1 (TX)

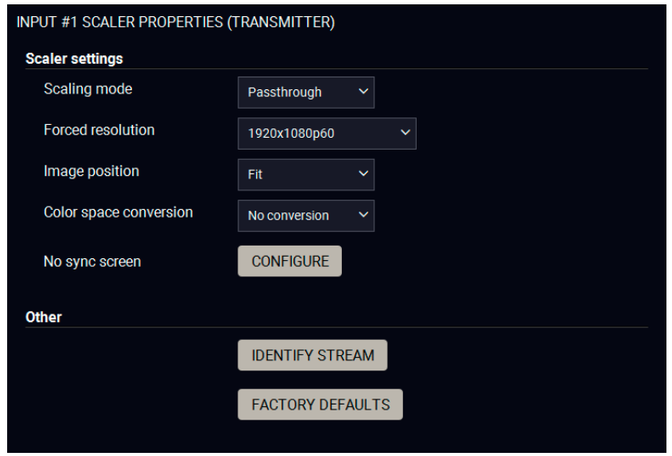
Available settings and tools:

- 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. *#scaler #csc #colorspace*

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



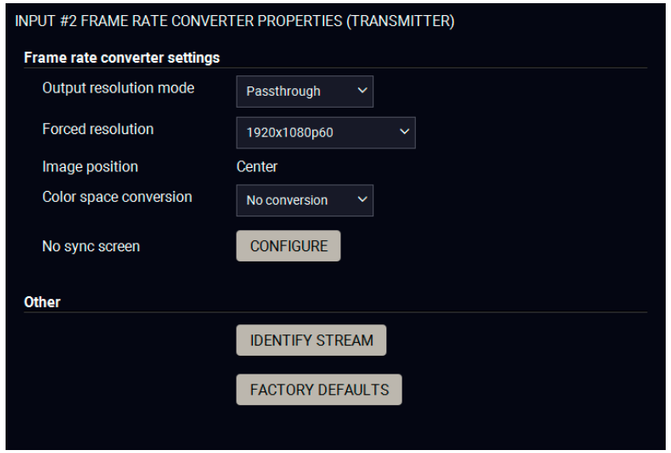
Scaler panel for the HDMI in 1 (TX)

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);
- No Sync Screen (Test Pattern) settings;
- Identify Stream / Identify Display button;
- **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 #csc #colorspace



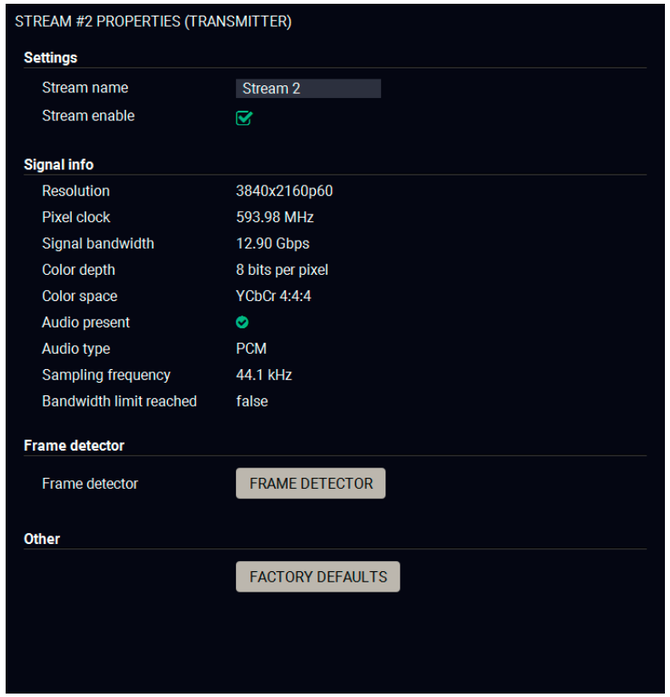
FRC panel for the HDMI in 2 (TX)

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);
- No Sync Screen (Test Pattern) settings;
- Identify Stream / Identify Display button;
- **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. #streamenable



Stream 2 properties panel (TX)

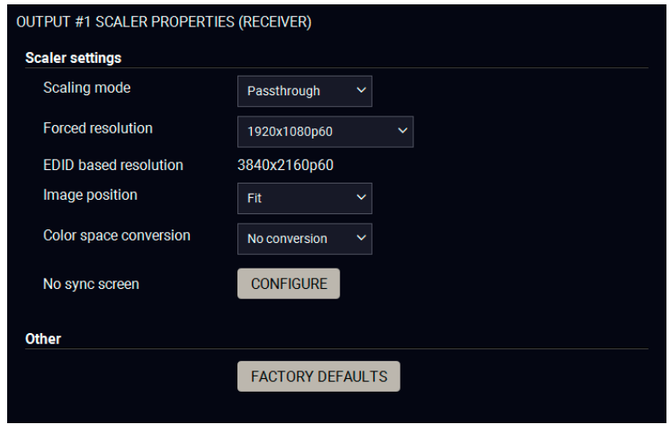
Available settings and tools:

- 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. #scaler #csc #colorspace

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



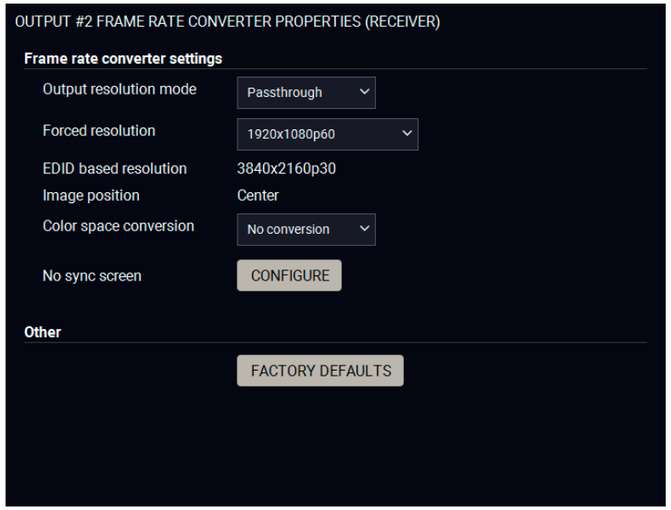
Scaler panel for the HDMI out 1 (RX)

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 #csc #colorspace



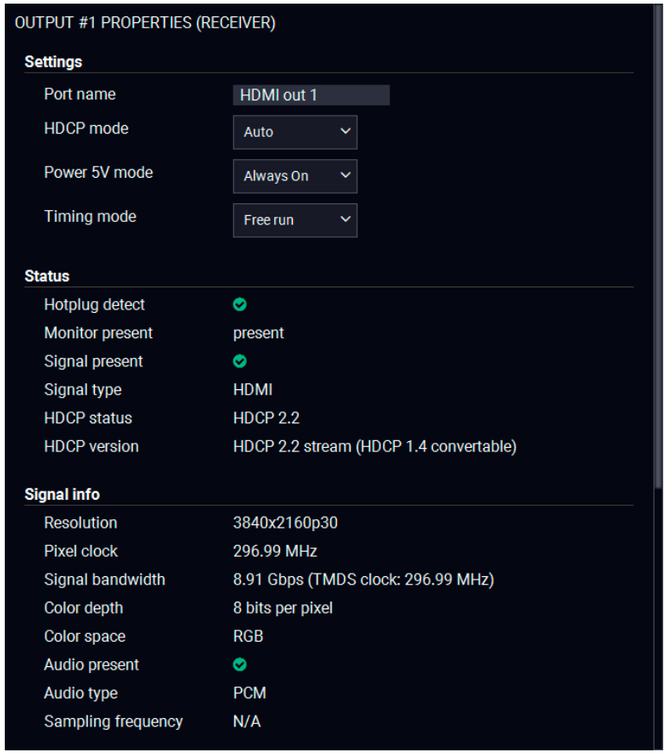
FRC panel for the HDMI out 2 (RX)

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: #hdcp #power5v #timingmode #freerun #sourcelocked



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;
- Identify Stream / Identify Display button;
- **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

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. *#switch #crosspoint*

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 chapter in the case of no connection or link aggregation problems.

6.5.12. Identify Stream / Identify Display

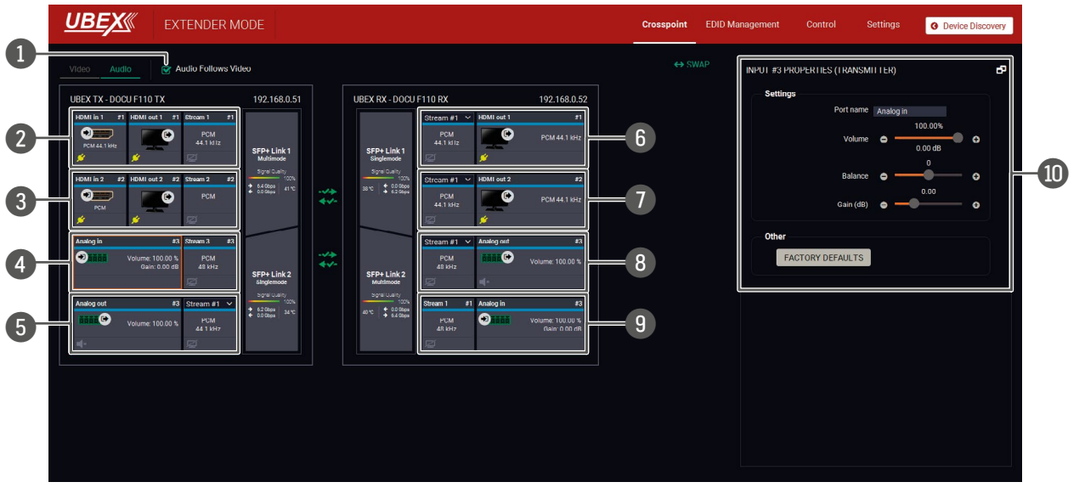
Clicking on the Identify Stream / Identify Display button makes generating 10 test colors on the display device for 10 seconds. The feature helps to identify the stream and the screen itself physically. *#identifystream #identifydisplay*

The order of the test colors in the Identify stream feature

The feature is available on the following panels:

- Scaler Panel - Input Side (TX Mode)
- FRC - Input Side (TX/TRX Modes)
- HDMI Output Ports (RX/TRX Modes)

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. #audio

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.

DIFFERENCE: 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.

#analogaudio #volume #balance #gain

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:

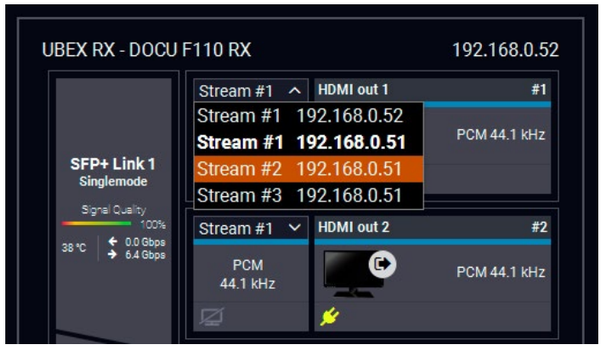
Port properties window of the Analog out (RX)

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. *#switch #crosspoint*

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.

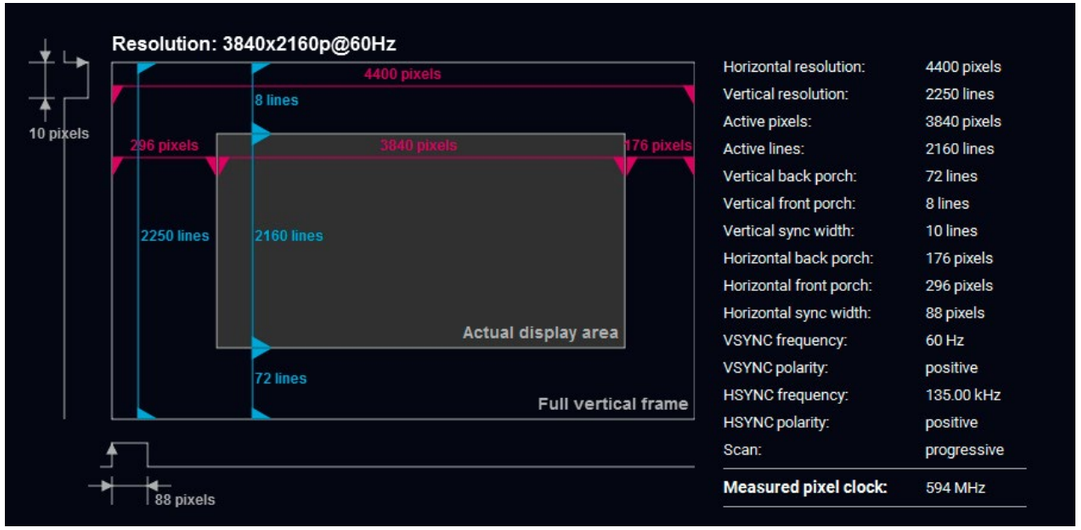
Streams - TRX-TRX Pair

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

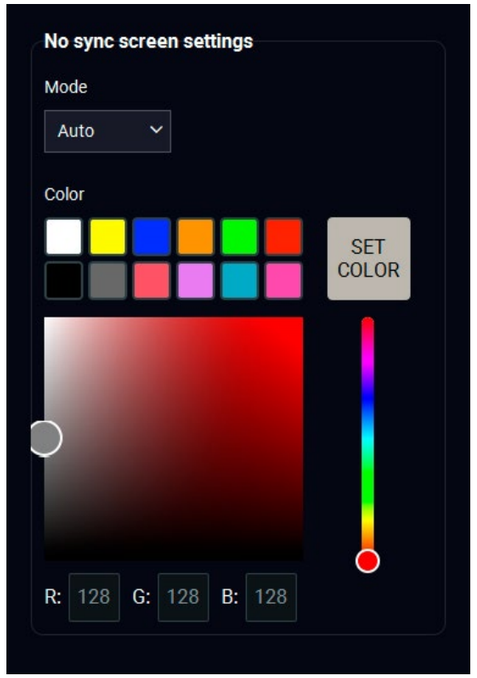
Lightware's Frame Detector function works like a signal analyzer and allows to determine the exact video format that is present on the port, thus it helps to identify various problems. E.g. actual timing parameters may differ from the expected and this may cause some displays to drop the picture.

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.

#framedetector

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: *#testpattern #nosyncscreen*



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

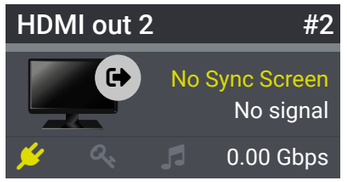
Three ways are available to set the no sync screen color:

- 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

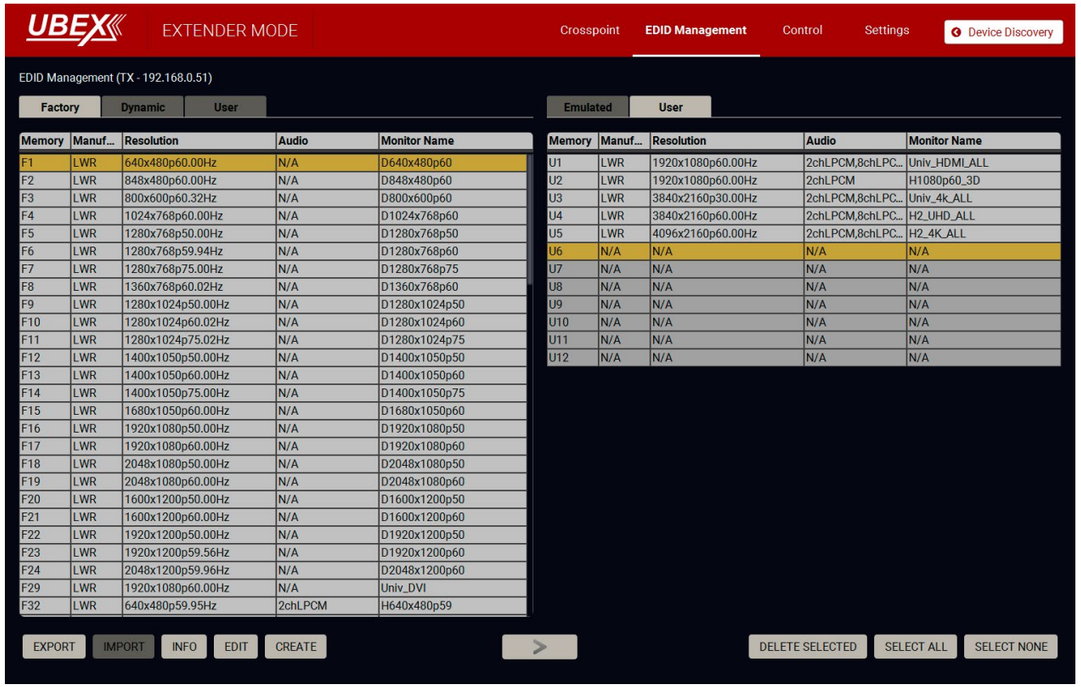
The port tile of the HDMI outputs displays when No sync screen mode is active.



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



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.

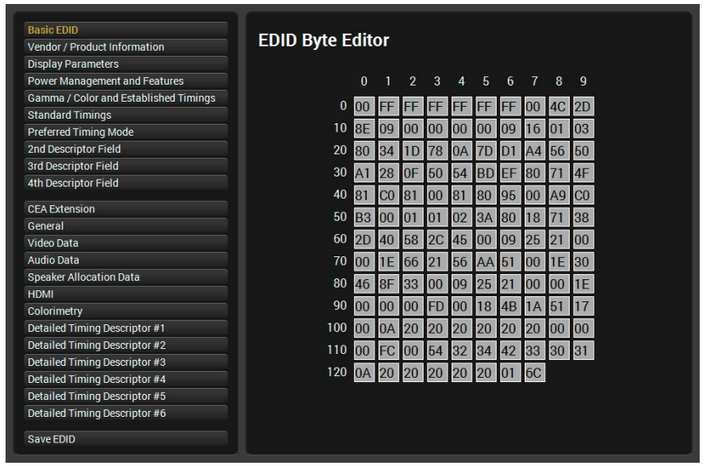
Step 2. Select the desired **memory** slot(s); one or more can be selected (“Select All” and “Select None” buttons can be used). The EDID(s) will be highlighted with yellow.

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.

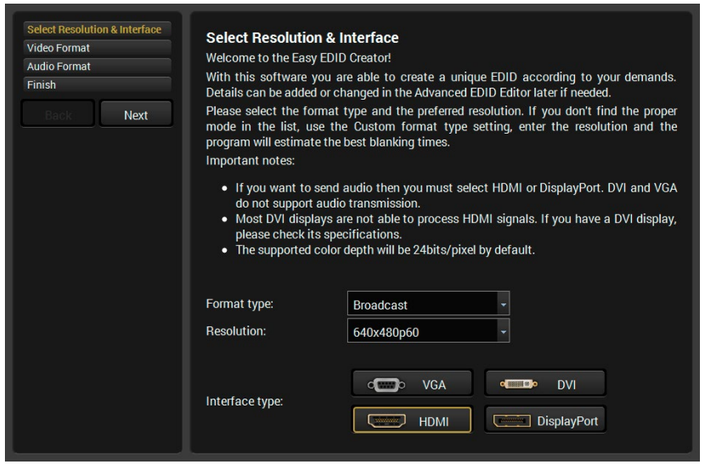


EDID Editor window

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.

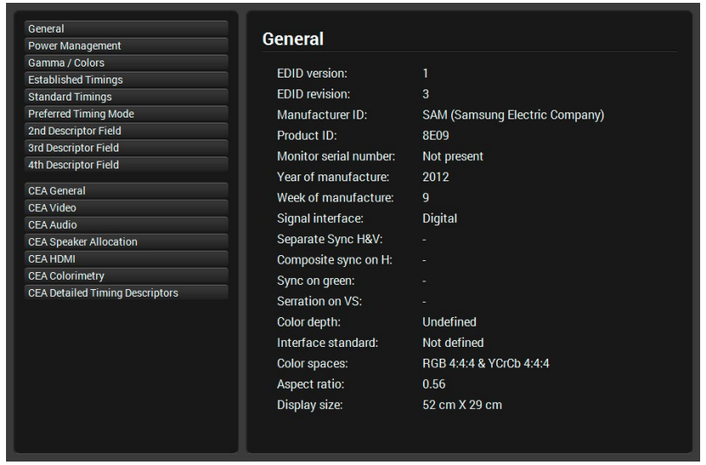


EDID Creator window

6.9.4. EDID Summary Window

INFO

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



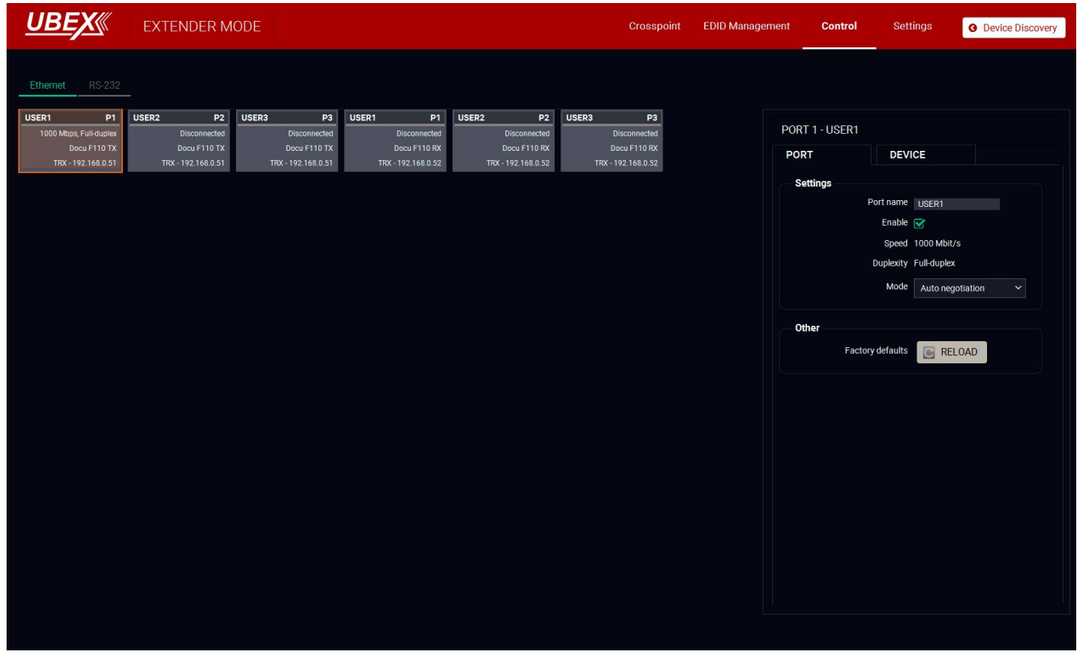
EDID summary window

6.10. Control Menu

The Ethernet control ports, the RS-232 port, and the Infrared input/output ports 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*



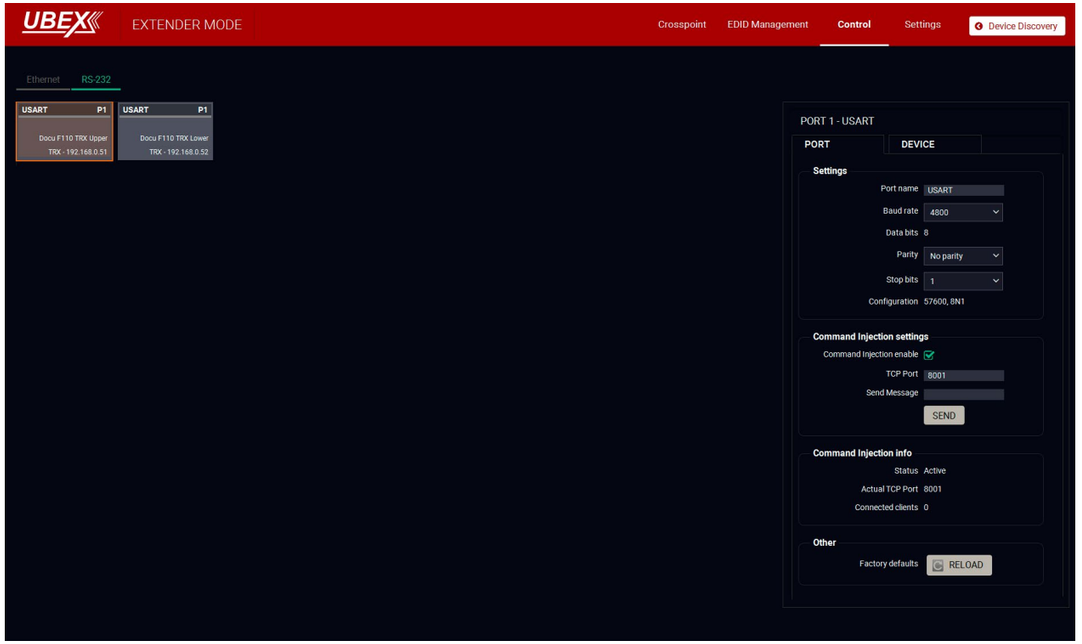
Ethernet tab in the Control menu

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. *#rs232 #rs-232 #serial*

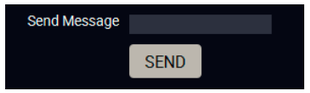


RS-232 tab in the Control menu

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. *#message*

Escaping the Control Characters

DEFINITION: An escape sequence is a sequence of characters that does not represent itself when used inside a character or string literal, but is translated into another character or a sequence of characters.

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

Control characters are the 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:

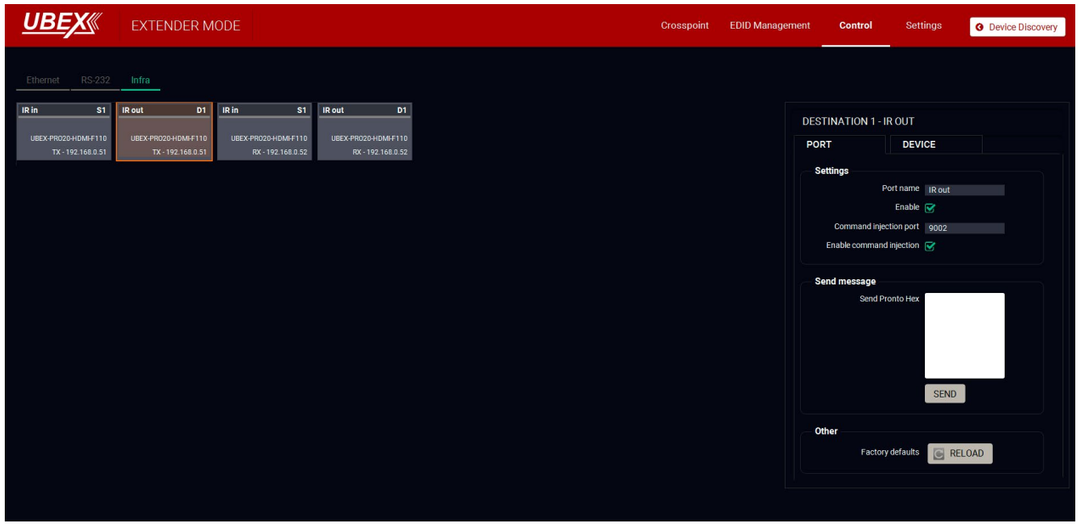
Message: `C00\x0D`

- **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.

6.10.3. Infra Tab

Clicking on a Infra port icon results opening the Port properties. The most important settings are available on the panel. *#infra #ir #message*



Infra tab in the Control menu

Available settings and tools:

- Port naming;
- **Enable/disable the port**;
- **Command injection port**;
- **Enable command Injection** (enable / disable);
- **Send message** (for IR out ports only): sending pronto hex message in little-endian format on the Infra output port.

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

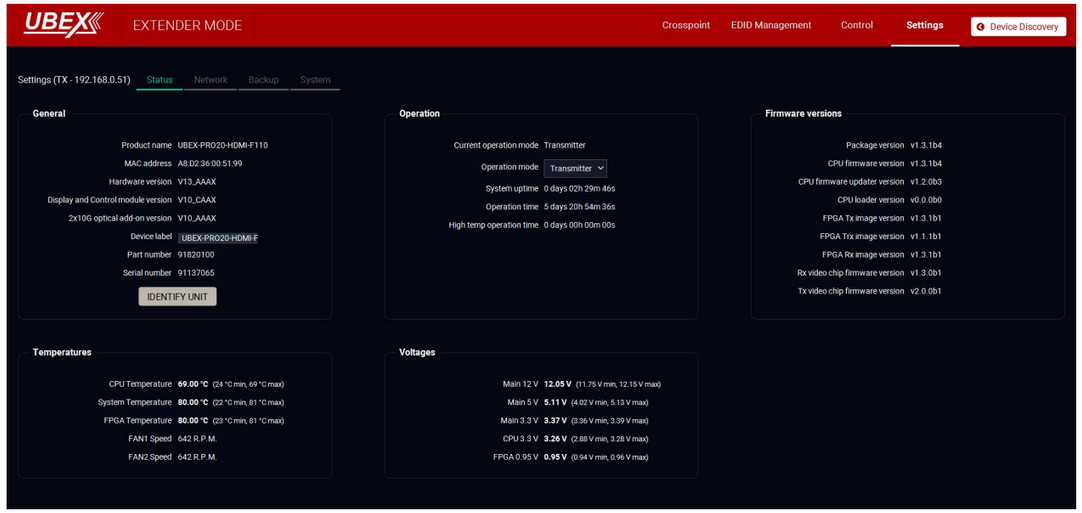
INFO: You can send pronto hex message in **big-endian format** as well using LW3 protocol command. See the details in the Sending Hex Codes in Big-endian Format via IR Port section.

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. *#status #firmwareversion #mac #identifyme #devicelabel #label #operationmode #transmitter #receiver #transceiver #tx #rx #trx*

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).

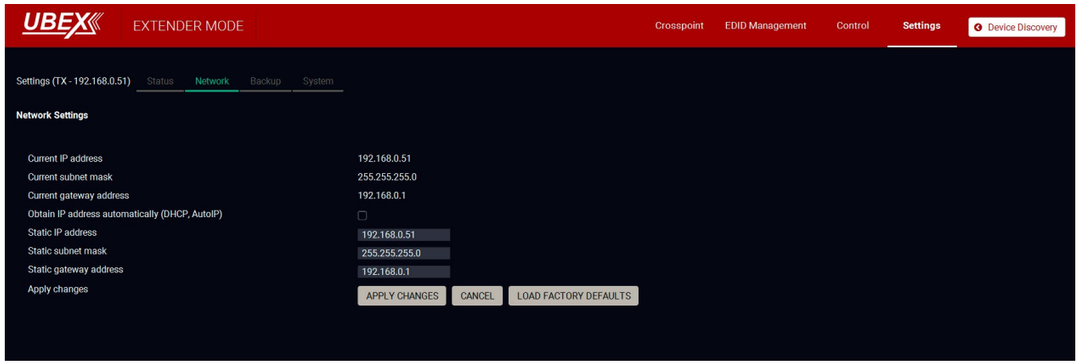
Step 2. Confirm your selection, press **OK**.

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

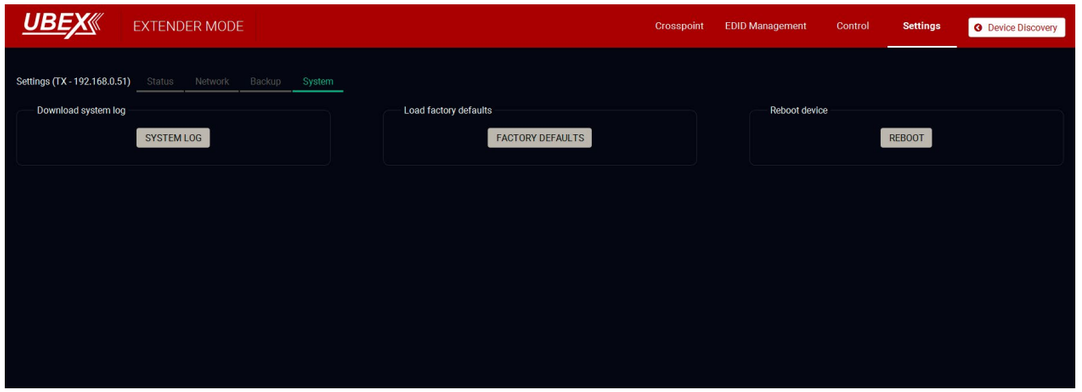


Network tab in the Settings menu

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. *#network #ipaddress #dhcp*

6.11.3. System Tab

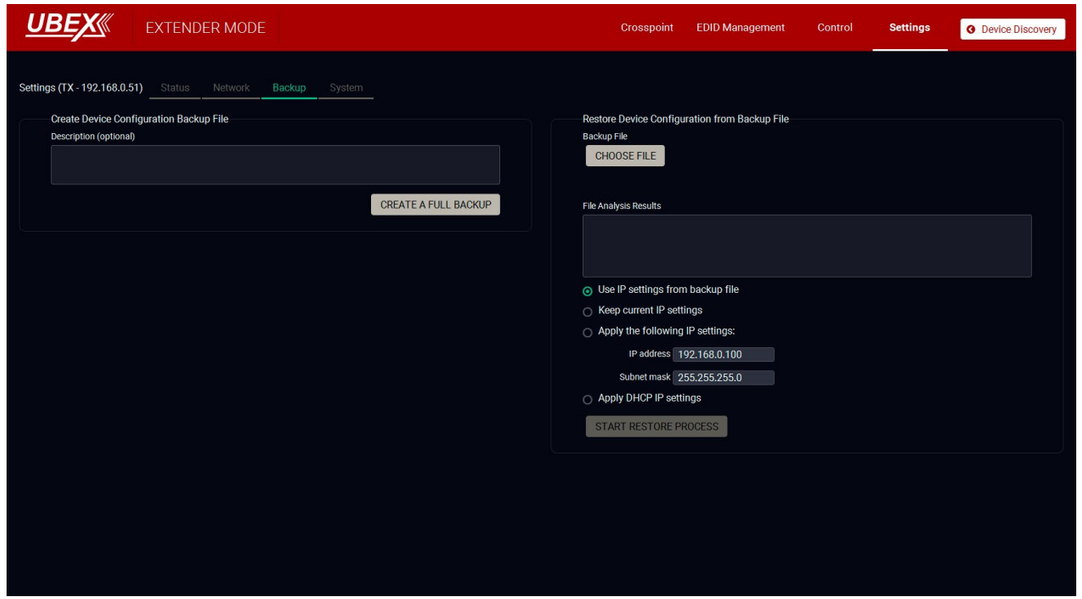


System tab in the Settings menu

Three functions are available under System tab:

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

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. *#backup #configurationcloning*

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.

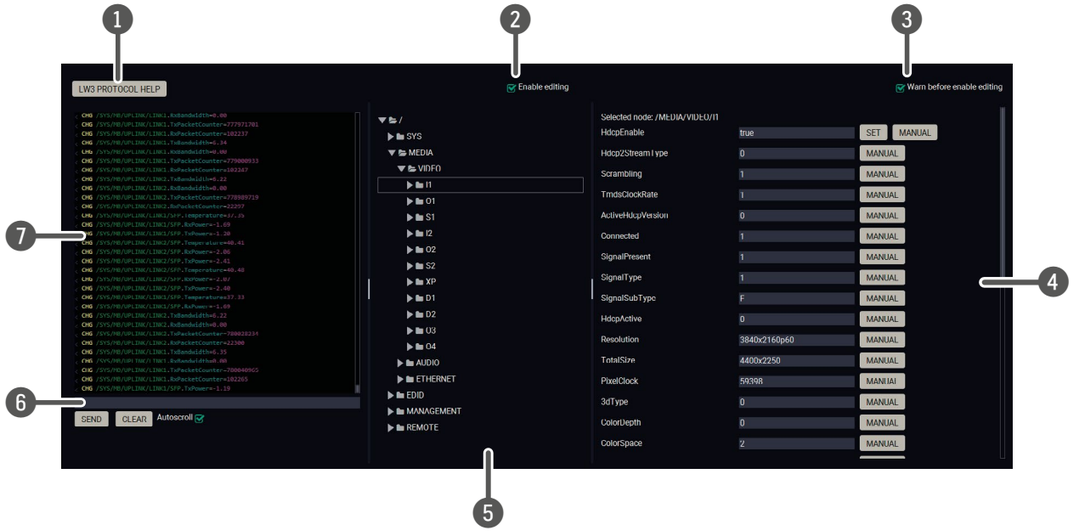
Step 3. The file is checked and the result will be displayed in the textbox below. If the file is correct, the settings can be restored.

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.

#advancedview #terminal

7

Programmers' Reference

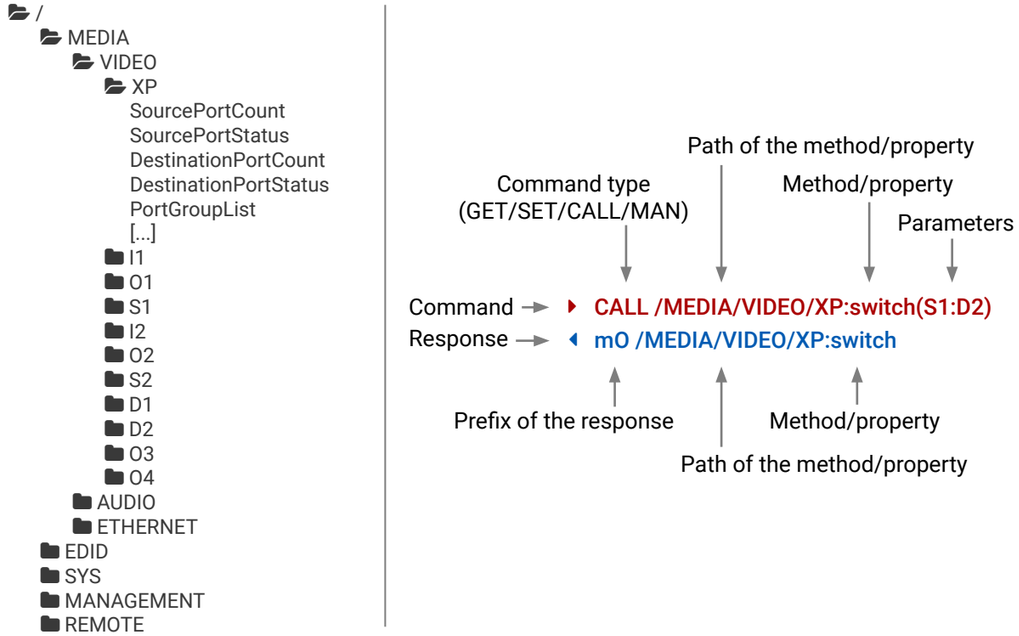
The device can be controlled through Lightware 3 (LW3) protocol commands to ensure the compatibility with other Lightware products. The supported LW3 commands are described in this chapter.

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 *#devicelabel #label*

- 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 *#firmwareversion*

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

Example

- GET /MANAGEMENT/UID/PACKAGE.Version
- pr /MANAGEMENT/UID/PACKAGE.Version=v1.4.1b2

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 *#identifyme*

- 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

#operationmode #transmitter #receiver #transceiver #tx #rx #trx

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 *#applicationmode #extendermode #matrixmode*

- 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 *#rotary #jogdial*

- 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 *#controllock*

- 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. Bootload Mode Setting

The device can be set to bootload (service / firmware upgrade) mode. The AV signal transmission is terminated in this mode.

Command and Response *#bootload*

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

Example

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

7.3.15. 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 *#restart #reboot #reset*

- CALL•/SYS:reset()
- mO•/SYS:reset=

Example

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

7.3.16. Restore the Factory Default Settings

Command and Response *#factory*

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

Example

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

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

7.4. 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 *#portstatus*

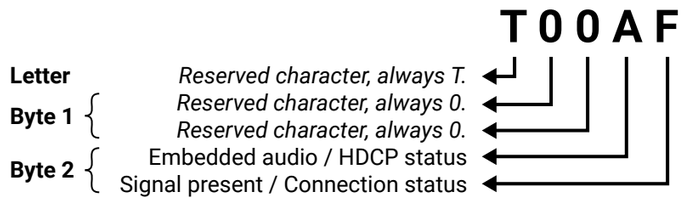
- GET•/MEDIA/VIDEO/XP.SourcePortStatus
- pr•/MEDIA/VIDEO/XP.SourcePortStatus=<in_status>;...;<in_status>

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

7.4.2. Query the Status of Destination Port

Command and Response *#portstatus*

- 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 *#switch #crosspoint*

- 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 *#streamenable*

- 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. Identify Stream

Calling the method makes generating 10 test colors on the display device for 10 seconds. The feature helps to identify the stream and the screen itself physically.

Command and Response *#identifystream*

- CALL•/MEDIA/VIDEO/<source>:identify()
- mO•/MEDIA/VIDEO/<source>:identify

Example

- CALL /MEDIA/VIDEO/S1:identify()
- mO /MEDIA/VIDEO/S1:identify

Explanation

7.4.7. 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.

7.4.8. 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

7.4.9. 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 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

#scaler #frc

7.4.10. Color Space Converter Setting

Command and Response *#csc #colorspace*

- 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

7.4.11. 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.

DIFFERENCE: The timing mode can be changed in the output ports of the receiver/transceiver only.

Command and Response *#timingmode #freerun #sourcelocked*

- 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

7.4.12. 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

7.4.13. 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

#hdcp

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 *#portstatus*

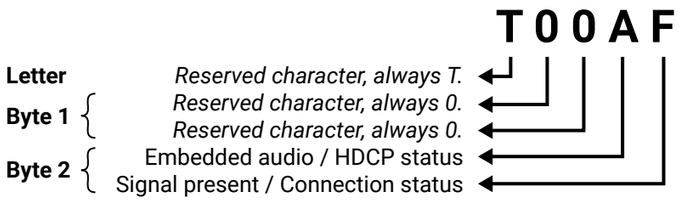
- GET•/MEDIA/VIDEO/XP.SourcePortStatus
- pr•/MEDIA/VIDEO/XP.SourcePortStatus=<out_status>;...;<out_status>

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 *#portstatus*

- 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 *#switch #crosspoint*

- 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 *#streamenable*

- 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 *#scaler #frc*

- 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

#scaler #frc

7.5.10. Color Space Converter Setting

Command and Response *#csc #colorspace*

- 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

#timingmode #freerun #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 *#timingmode #freerun #sourcelocked*

- 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 *#testpattern #nosyncscreen*

- 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 *#hdcp*

- 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

7.5.16. Identify Display

Calling the method makes generating 10 test colors on the display device for 10 seconds. The feature helps to identify the stream and the screen itself physically.

Command and Response *#identifydisplay*

- CALL•/MEDIA/VIDEO/<out>:identify()
- mO•/MEDIA/VIDEO/<out>:identify

Example

- CALL /MEDIA/VIDEO/O1:identify()
- mO /MEDIA/VIDEO/O1:identify

Explanation

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 *#poststatus*

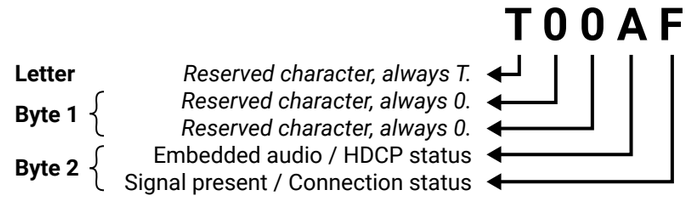
- GET•/MEDIA/VIDEO/XP.SourcePortStatus
- pr•/MEDIA/VIDEO/XP.SourcePortStatus=<in_status>;...;<in_status>

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 *#poststatus*

- 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 *#streamenable*

- 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. Identify Stream / Identify Display

Calling the method makes generating 10 test colors on the display device for 10 seconds. The feature helps to identify the stream and the screen itself physically.

Command and Response *#identifystream #identifydisplay*

- CALL•/MEDIA/VIDEO/<source|out>:identify()
- mO•/MEDIA/VIDEO/<source|out>:identify

Example

- CALL /MEDIA/VIDEO/S1:identify()
- mO /MEDIA/VIDEO/S1:identify

Explanation

7.6.5. 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

7.6.6. 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

7.6.7. 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

#scaler #frc

7.6.8. 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 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.

7.6.9. 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**.

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

#scaler #frc

7.6.10. Color Space Converter Setting

Command and Response *#csc #colorspace*

- 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

7.6.11. 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.

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 *#timingmode #freerun #sourcelocked*

- 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

7.6.12. 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 *#timingmode #freerun #sourcelocked*

- 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

7.6.13. 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.

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

Command and Response *#testpattern #nosyncscreen*

- 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

7.6.14. 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.

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

7.6.15. 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 *#hdcp*

- 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

7.6.16. 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. *#audio*

7.7.1. Query the Status of Source Port

Command and Response *#portstatus*

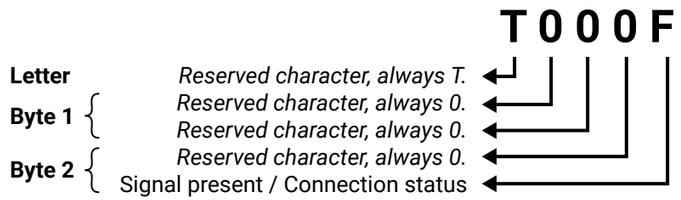
- GET•/MEDIA/AUDIO/XP.SourcePortStatus
- pr•/MEDIA/AUDIO/XP.SourcePortStatus=<in_status>;...;<in_status>

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 *#switch #crosspoint*

- 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 *#streamenable*

- 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

DIFFERENCE: 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

#analogaudio #volume

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

#balance #gain

7.8.5. Mute/Unmute the Analog Audio Output Port

DIFFERENCE: The setting is available on the analog audio output port only.

Command and Response *#mute #unmute*

- 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. *#systemmonitor*

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.

DIFFERENCE: 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.

#sfp

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. *#edid*

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. *#network #dhcp #ipaddress #mac*

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 MAC Address

Command and Response

- GET•/MANAGEMENT/NETWORK.MacAddress
- pr•/MANAGEMENT/NETWORK.MacAddress=<MAC_address>

Example

- GET /MANAGEMENT/NETWORK.MacAddress
- pr GET /MANAGEMENT/NETWORK.MacAddress=A8:D2:36:00:39:DA

7.12.4. 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

7.12.5. 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

7.12.6. 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

7.12.7. 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

7.12.8. 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

7.12.9. 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

7.12.10. Apply Network Settings

Command and Response

- CALL•/MANAGEMENT/NETWORK:ApplySettings()
- mO•/MANAGEMENT/NETWORK:ApplySettings

Example

- CALL /MANAGEMENT/NETWORK:ApplySettings()
- mO /MANAGEMENT/NETWORK:ApplySettings

7.12.11. 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

DIFFERENCE: Only the UBEX-PRO20-HDMI-F110 model has built with serial interface port. *#rs232 #rs-232 #serial*

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. Infrared Port Configuration

DIFFERENCE: Only the UBEX-PRO20-HDMI-F110 model has built with Infrared interface port. #infra #ir

Parameters

Parameter	Description
<in>	IR input port, example: S1
<out>	IR output port, example: D1

7.14.1. Enable/Disable the Port

Command and Response

- SET•/MEDIA/IR/<in|out>.Enable=<logical_value>
- pw•/MEDIA/IR/<in|out>.Enable=<logical_value>

Parameters

Identifier	Parameter description	Value	Explanation
<logical_value>	Port enable/ disable setting	**true**	The port is enabled.
		false	The port is disabled.

Example

- SET /MEDIA/IR/S1.Enable=true
- pw /MEDIA/IR/S1.Enable=true

7.14.2. Enable Command Injection

Command and Response

- SET·/MEDIA/IR/<in|out>.CommandInjectionEnable=<logical_value>
- pw·/MEDIA/IR/<in|out>.CommandInjectionEnable=<logical_value>

Parameters

Identifier	Parameter description	Value	Explanation
<logical_value>	Command injection enable/ disable setting	**true**	CI is enabled.
		false	CI is disabled.

Example

- SET /MEDIA/IR/D1.CommandInjectionEnable=true
- pw /MEDIA/IR/D1.CommandInjectionEnable=true

7.14.3. Change Command Injection Port Number

Command and Response

- SET·/MEDIA/IR/<in|out>.CommandInjectionPort=<port_no>
- pw·/MEDIA/IR/<in|out>.CommandInjectionPort=<port_no>

Example

- SET /MEDIA/IR/S1.CommandInjectionPort=9001
- pw /MEDIA/IR/S1.CommandInjectionPort=9001

7.14.4. Enable/Disable Output Signal Modulation

Command and Response

- SET·/MEDIA/IR/<out>.EnableModulation=<logical_value>
- pw·/MEDIA/IR/<out>.EnableModulation=<logical_value>

Parameters

Identifier	Parameter description	Value	Explanation
<logical_value>	Signal modulation enable/ disable setting	**true**	The signal modulation is enabled.
		false	The signal modulation is disabled.

Example

- SET /MEDIA/IR/D1.EnableModulation=false
- pw /MEDIA/IR/D1.EnableModulation=false

INFO: The default setting value is **true** (enabled).

7.15. Message Sending via Communication Ports

DIFFERENCE: Only the UBEX-PRO20-HDMI-F110 model has built with serial and Infrared interface ports.

7.15.1. Sending a Text (ASCII-format) via Serial Port

The command is for sending a command message in ASCII-format. This method **does not allow** sending message with control and non-printable characters.

Command and Response

- 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. *#message*

7.15.2. Sending a Binary Message (HEX-format) via Serial Port

The command is for sending a command message in Hexadecimal-format. This method **does not require escaping** the control and non-printable characters.

Command and Response

- CALL•/MEDIA/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.

7.15.3. 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> characters 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>

7.15.4. Sending Hex Codes in Little-endian Format via IR Port

Command and Response

- CALL·/MEDIA/IR/<out>:sendProntoHex(<hex_code>)
- mO·/MEDIA/IR/<out>:sendProntoHex

Parameters

Identifier	Parameter description	Parameter values
<hex_code>	Pronto hex format code	Accepts maximum 765 character-long code in hexadecimal format (0-9; A-F; a-f) without space character in little-endian system.

INFO: This command can send exactly one pronto hex message. The header of the IR code contains the length of the whole code in hexa format. If the code is deficient or duplicated, it causes syntax error.

TIPS AND TRICKS: Download a code which belongs to your controlled device from a web database from the Internet.

Example

- CALL /MEDIA/IR/D1:sendProntoHex (00006D0025000300A900A80015 003F00150 03F0 015003F00150015001500150015001500150015001500150 0150015003F0015003F001500 3F00150015001500150 015001 5001500150015001500150015003F0015003F0015003F00150015001500 150015001500150015001500150015001500150015001500150015003F0015003F0015003F0015003 F0015003F00150000207A900A80015001500150015006E0E)
- mO /MEDIA/IR/D1:sendProntoHex

7.15.5. Sending Hex Codes in Big-endian Format via IR Port

Command and Response

- CALL·/MEDIA/IR/<out>:sendProntoHexBigEndian(<hex_code>)
- mO·/MEDIA/IR/<out>:sendProntoHexBigEndian

Parameters

Identifier	Parameter description	Parameter values
<hex_code>	Pronto hex format code	Accepts maximum 765 character-long code in hexadecimal format (0-9; A-F; a-f) without space character in big-endian system.

INFO: This command can send exactly one pronto hex message. The header of the IR code contains the length of the whole code in hexa format. If the code is deficient or duplicated, it causes syntax error.

Example

- CALL /MEDIA/IR/D1:sendProntoHexBigEndian(0000006d0025000300a900a80015 003f0015003f0015 003f00150015001500150015001500150015001500150015003f0015003f0015003f0015003f00150015001500150015001500150015001500150015001500150015003f0015003f0015 003f00150015001500150015001500150015001500150015001500150015001 5001500150015001500150015003f0015003f0015003f0015003f0015 003f0015070200a900a80015001500150e6e)
- mO /MEDIA/IR/D1:sendProntoHexBigEndian

Learning Raw IR Code with a Terminal Program

Step 1. Connect to the endpoint device with a terminal program.

Step 2. Push the desired button of the remote control to scan the raw IR code.

Step 3. Remove all the non-hexadecimal characters (e.g. spaces, h characters etc.) from the code.

The pronto hex code which learned by a Lightware device is big-endian format.

7.16. 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>

Bootload Mode Setting
- CALL•/SYS:bootload()

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>

Identify Stream
- CALL•/MEDIA/VIDEO/<source>:identify()

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>

Identify Display
- CALL•/MEDIA/VIDEO/<out>:identify()

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>

Identify Stream / Identify Display
- CALL•/MEDIA/VIDEO/<source|out>:identify()

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 MAC Address
- GET•/MANAGEMENT/NETWORK.MacAddress

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>

Infrared Port Configuration

Enable/Disable the Port
- SET•/MEDIA/IR/<in|out>.Enable=<logical_value>

Enable Command Injection
- SET·/MEDIA/IR/<in|out>.CommandInjectionEnable=<logical_value>

Change Command Injection Port Number
- SET·/MEDIA/IR/<in|out>.CommandInjectionPort=<port_no>

Enable/Disable Output Signal Modulation
- SET·/MEDIA/IR/<out>.EnableModulation=<logical_value>

Message Sending via Communication Ports

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>)

Sending Hex Codes in Little-endian Format via IR Port

- CALL·/MEDIA/IR/<out>:sendProntoHex(<hex_code>)

Sending Hex Codes in Big-endian Format via IR Port

- CALL·/MEDIA/IR/<out>:sendProntoHexBigEndian(<hex_code>)

8

Firmware Upgrade

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.

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.

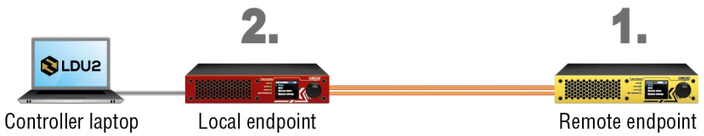
8.4. Detailed Instructions

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.

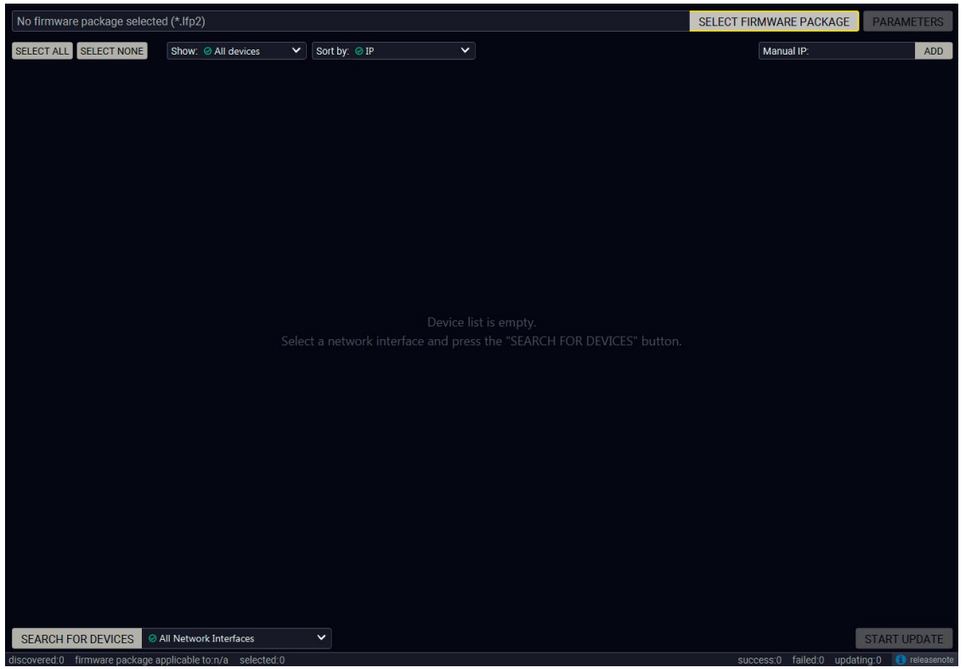
Step 4. Start the update and wait until it is finished.

Step 5. Wait until the unit reboots with the new firmware.

Step 6. Repeat the procedure with the local endpoint.

Discovering the Devices

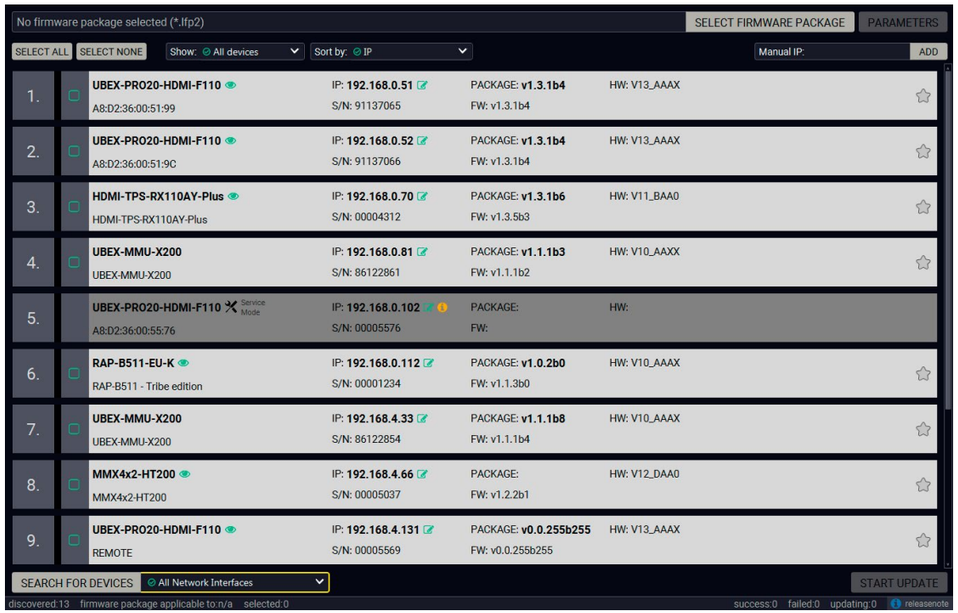
After launching LDU2 the device discovery an empty window appears. Click on the **Search for devices** button to start finding the Lightware devices on the network.



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.



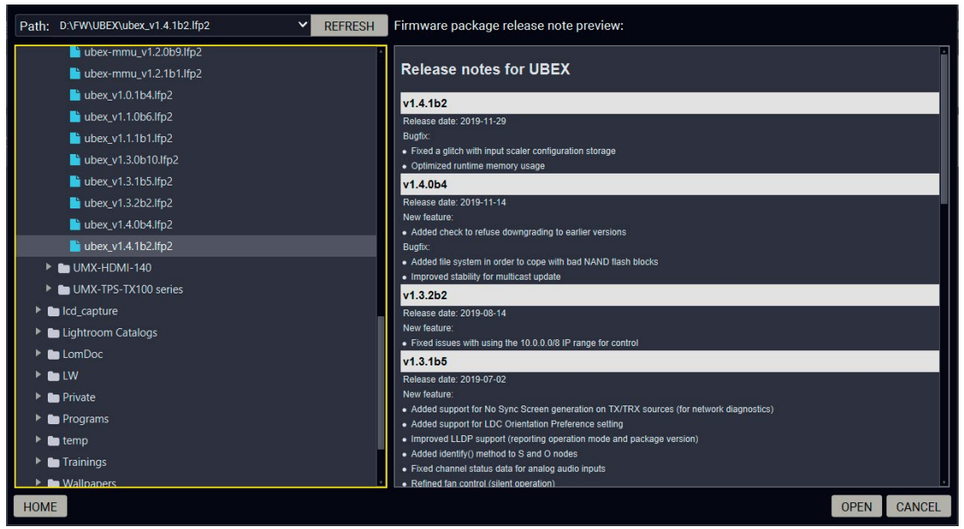
Legend of the Icons

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 next to 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.
	Favorite device	Frequently used devices can be highlighted with the star icon as favorite unit. In this case the star becomes orange filled.

Upgrade Steps

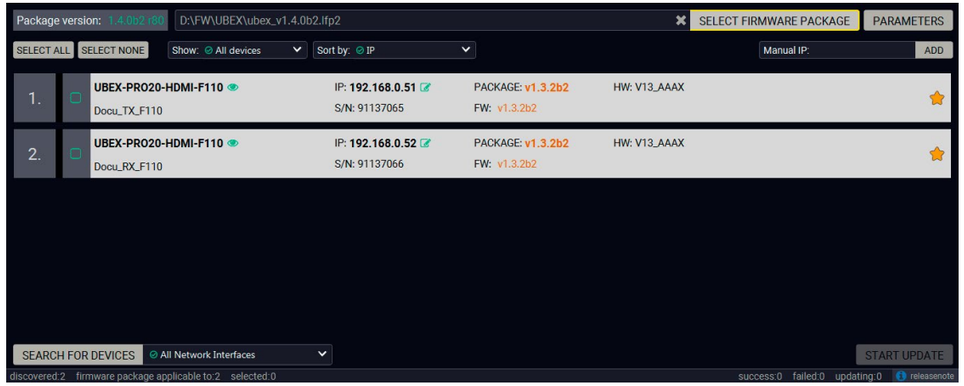
Step 1. Select the firmware package.

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

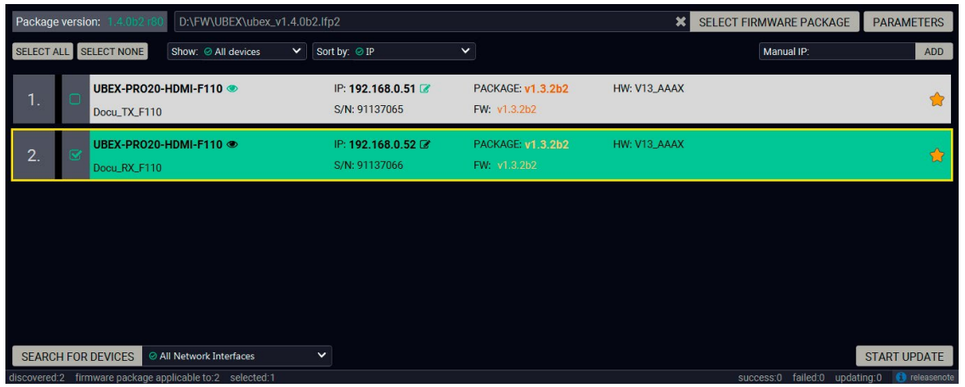
After the package file is loaded, the list is filtered to show compatible devices only. The current firmware version of the device is highlighted in orange if it is different from the version of the package loaded.



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.



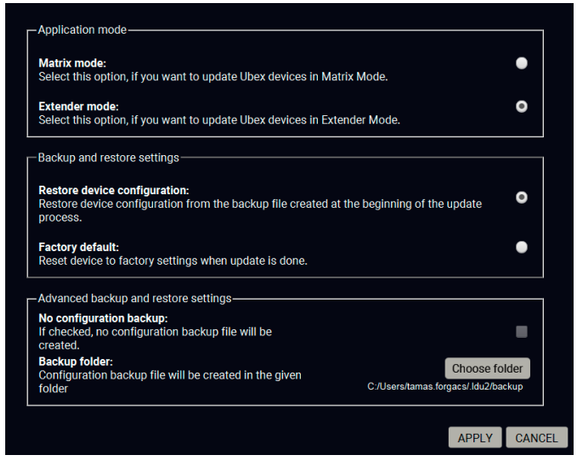
The remote unit is selected for upgrading

> 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

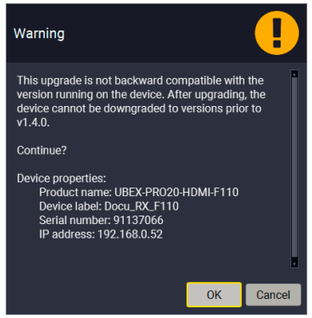
- **No configuration backup**: if it is checked, the configuration of the endpoint device will not be restored after the firmware upgrade.
- **Backup folder**: Set the path of the device configuration backup file which is created automatically. The default path is **USER_HOME/.ldu2/backup**.

Once the parameters are set, click on the **Apply** button to save the settings.

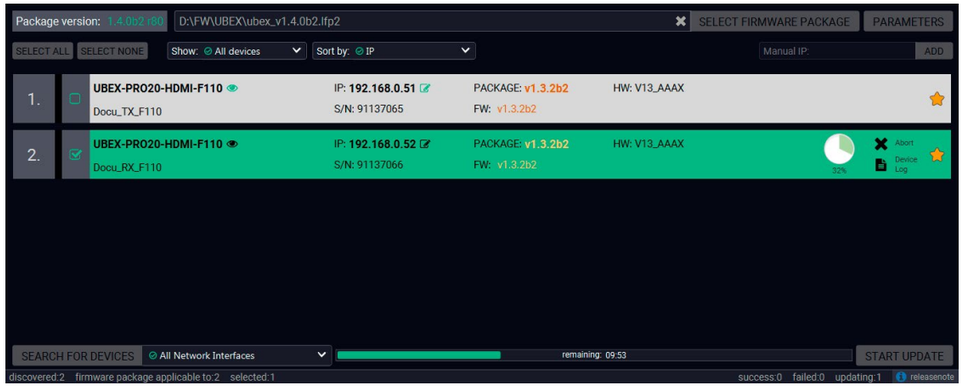
Step 4. Start the update and wait until it is finished.

Click on the **Start Update** button to start the procedure.

ATTENTION! This upgrade is not backward compatible with the version running on the device. After upgrading the device cannot be downgraded to versions prior v1.4.0. Click on the OK button if you want to continue the upgrade 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.

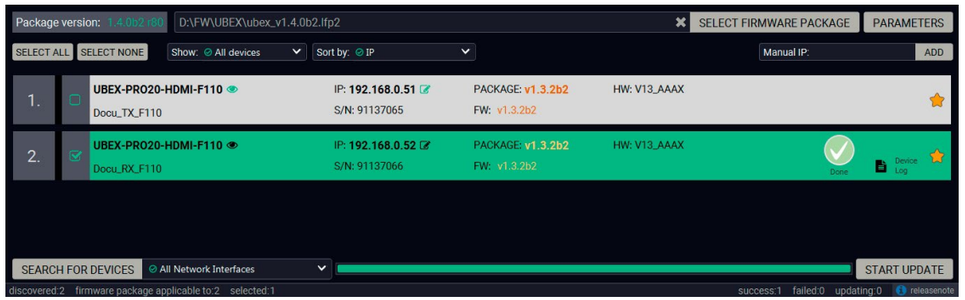


Firmware upgrade is in progress

INFO: The device might reboot several times during the firmware upgrade procedure.

Step 5. Wait until the unit reboots with the new firmware.

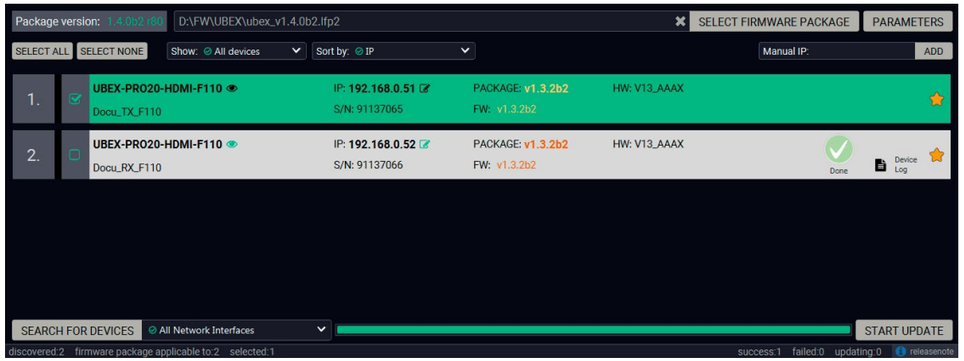
Once the firmware upgrade procedure is completed, the unit reboot with the new firmware.

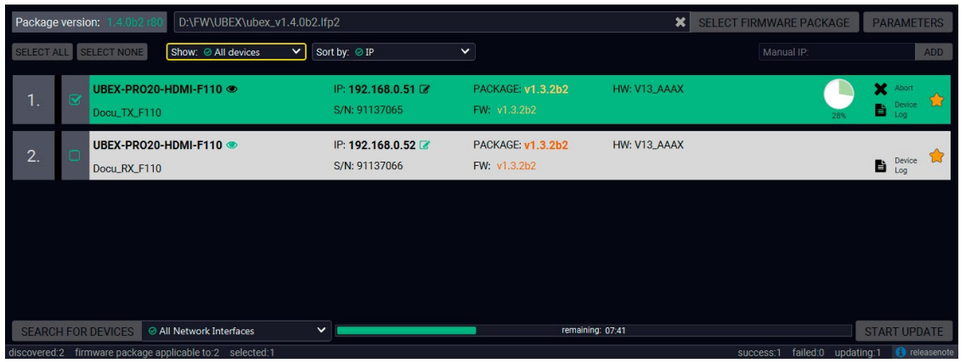


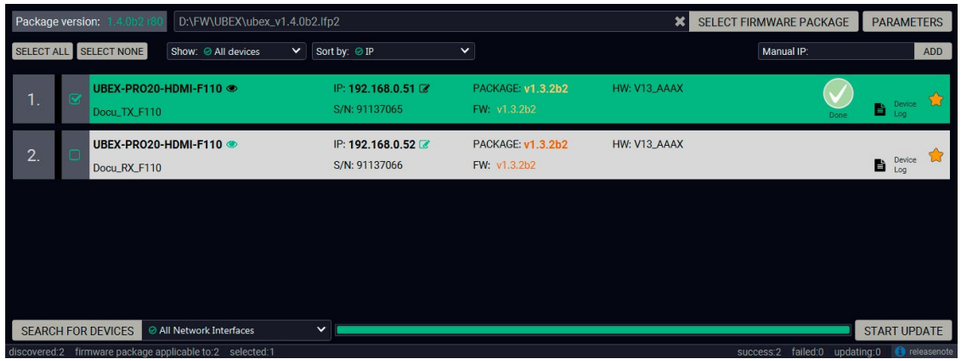
Firmware upgrade procedure is done

Step 6. Repeat the procedure with the local endpoint.

Repeat the whole procedure with the another endpoint.







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

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:

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 - F-series Endpoint Devices section.

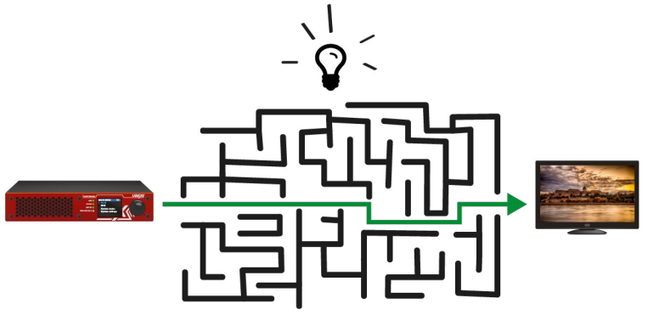
Symptom	Root cause	Action	Refer to
Video signal			
No picture on the video output	Device or devices are not powered properly	Check the endpoints and the other devices if they are properly powered; try to unplug and reconnect them.	2.3.2
	Cable connection problem	Cables must fit very well, check all the connectors (HDMI and optical/DAC cables).	2.3 3.5
	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.	3.5
	Singlemode-multimode SFP+ module pairs	Check the installed SFP+ modules and install multimode or singlemode modules by pairs only.	3.5
	SFP module is installed instead of SFP+ module	Install SFP+ transceiver module to the SFP+ port	3.5
	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 7.4.8
	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 7.4.12
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 7.4.10
	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 7.3.16
	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.	2.3.4 12.11.1
	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.	7.15
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.

10

Technologies

The following sections contain descriptions and useful technical information how the devices work in the background. The content is based on experiences and cases we met in practice. These sections help to understand features and technical standards like the followings:

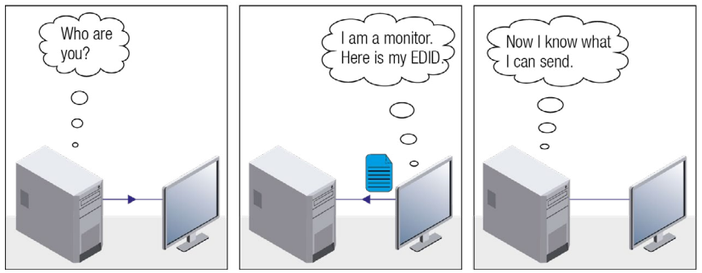
- EDID Management
- HDCP Management
- Pixel Accurate Reclocking
- AV Over IP

10.1. EDID Management

10.1.1. Understanding the EDID

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

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



EDID Communication

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

Common Problems Related to EDID

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

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

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

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

10.1.2. Advanced EDID Management

Each DVI sink (e.g. monitors, projectors, plasma displays, etc...) must support the EDID data structure. Source BIOS and operating systems are likely to query the sink using DDC2B protocol to determine what pixel formats and interface are supported. DVI standard uses EDID data structure to identify the monitor type and capabilities. Most DVI sources (VGA cards, set top boxes, etc.) will output DVI signal after accepting the connected sink's EDID information. In the case of EDID readout failure or missing EDID, the source will not output DVI video signal.

Lightware devices provide the Advanced EDID Management function that helps system integration. The built-in EDID Router can store and emulate factory pre-programmed- and User programmable EDIDs. The EDID of the attached monitors or projectors for each output are stored in a non-volatile memory. This way the EDID of a monitor is available when the monitor is unplugged or switched off.

Any EDID can be emulated on any input. An emulated EDID can be copied from the EDID router's memory (static EDID emulation), or from the last attached monitor's memory (dynamic EDID emulation). For example, the Lightware device can be set up to emulate a sink device, which is connected to one of the outputs. In this case, the EDID automatically changes, if the monitor is replaced with another display device (as long as it has a valid EDID).

EDID is independently programmable for all inputs without affecting each other. All inputs have their own EDID circuit.

INFO: The user is not required to disconnect the video cable to change an EDID as opposed to other manufacturer's products. EDID can be changed even if a source is connected to the input and powered ON.

INFO: When EDID has been changed, the router toggles the HOTPLUG signal for 2 seconds. Some sources do not sense this signal. In such cases, the source device must be restarted or powered OFF and ON again.

10.2. HDCP Management

Lightware Visual Engineering is a legal HDCP adopter. Several functions have been developed which helps to solve HDCP related problems. Complex AV systems often have both HDCP and non-HDCP components. The 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.

10.2.1. Protected and Unprotected Content

Many video sources send HDCP protected signal if they detect that the sink is HDCP capable – even if the content is not copyrighted. This can cause trouble if an HDCP capable device is connected between the source and the display. In this case, the content cannot be viewed on non-HDCP capable displays and interfaces like event controllers. Rental and staging technicians often complain about certain laptops, which are always sending HDCP encrypted signals if the receiver device (display, matrix router, etc.) reports HDCP compliancy. However, HDCP encryption is not required all the time e.g. computer desktop image, certain laptops still do that.

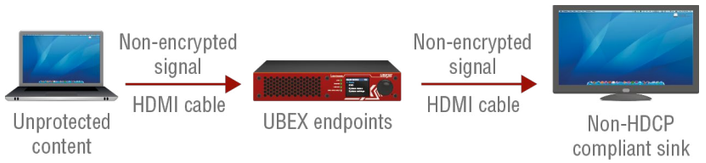
To avoid unnecessary HDCP encryption, Lightware introduced the HDCP enabling/disabling function: the HDCP capability can be disabled in the Lightware device. If HDCP is disabled, the connected source will detect that the sink is not HDCP capable, and turn off authentication.

10.2.2. Disable Unnecessary Encryption

HDCP Compliant Sink

All the devices are HDCP-compliant, no manual setting is required, both protected and unprotected contents are transmitted and displayed on the sink.

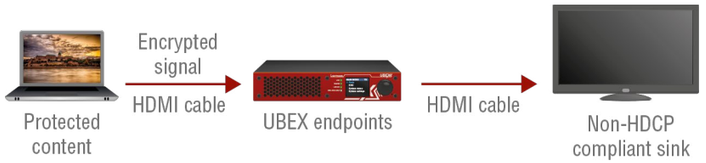
Not HDCP-compliant Sink 1.



Non-HDCP compliant sink is connected to the 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.

10.2.3. 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

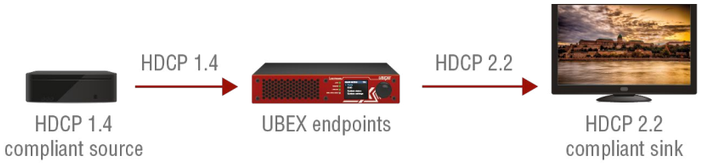
In this case the signal of an HDCP v2.2 compliant source is switched to an HDCP v1.4 compliant sink device. The signal is encrypted with HDCP v2.2 on the input and encrypted with HDCP v1.4 on the output of the Lightware device. A lower level of encryption may be applied only if the source device/content 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.

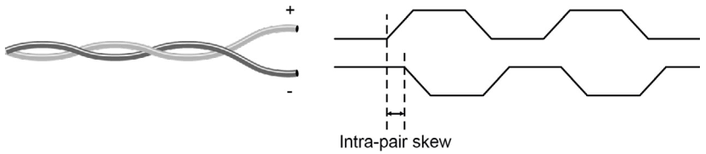
10.3. Pixel Accurate Reclocking

Signal reclocking is an essential important procedure in digital signal transmission. After passing the reclocking circuit, the signal becomes stable, jitter-free, and can be transmitted over more equipment like processors, or event controllers. Without reclocking, sparkles, noise, and jaggies appear on the image.

Lightware's sophisticated Pixel Accurate Reclocking technology fixes more problems than general TMDS reclocking. It removes not only intra-pair skew but inter-pair skew as well. The Pixel Accurate Reclocking circuit eliminates the following errors:

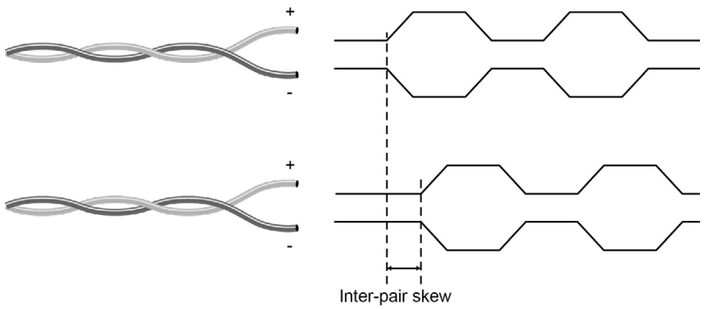
Intra-pair skew

Skew between the + and - wires within a differential wire pair (e.g. Data2- and Data2+). It's caused by different wire lengths or slightly different wire construction (impedance mismatch) in DVI cable. It results in jitter.



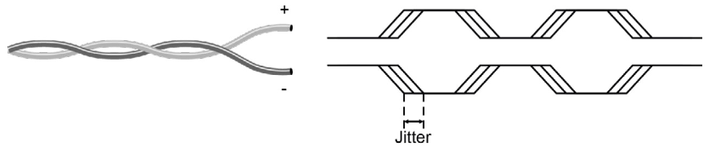
Inter-pair skew

Skew between two differential wire pairs in a cable. It is caused by different wire pair lengths or different number of twists in the DVI cable. Too much inter-pair skew results color shift in the picture or sync loss.



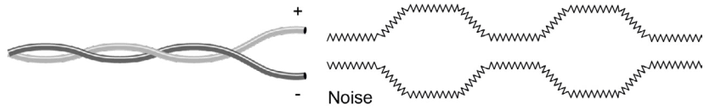
Jitter

Signal instability in the time domain. The time difference between two signal transitions should be a fixed value, but noise and other effects cause variations.



Noise

Electromagnetic interference between other electronic devices such as mobile phones, motors, etc. and the DVI cable are coupled onto the signal. Too much noise results in increased jitter.



10.4. AV Over IP

10.4.1. 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.

10.4.2. 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

10.4.3. Link Aggregation Protocol

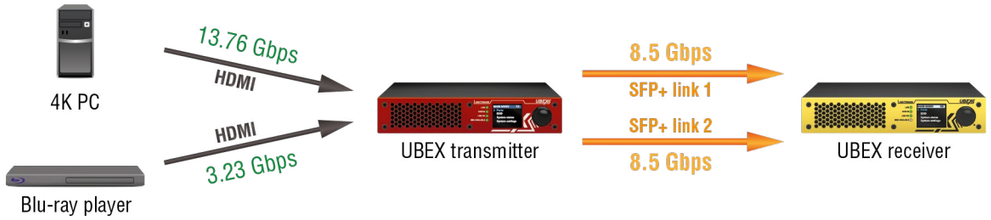
The UBEX endpoints use Link Aggregation Control Protocol (LACP) to share equally the signal bandwidth of the streams between the two the SFP+ ports.

> 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

10.4.4. 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

11

Assembly Guides

This chapter contains step-by-step assembly guides for the UBEX series devices like the following:

11.1. Front Plate Exchange for F-series Endpoint Devices

The section is about the assembling of the UBEX F-series endpoint devices which contains detailed step-by-step guides and the tool requirements.

Affected Models

The front plate can be changed on the following endpoint models:

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

11.1.1. Tool Requirements

Plastic spudger tool

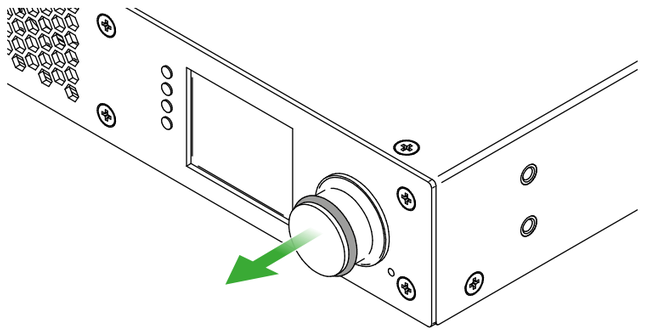
1.3 mm hex wrench (Allen) key

PZ1 screwdriver

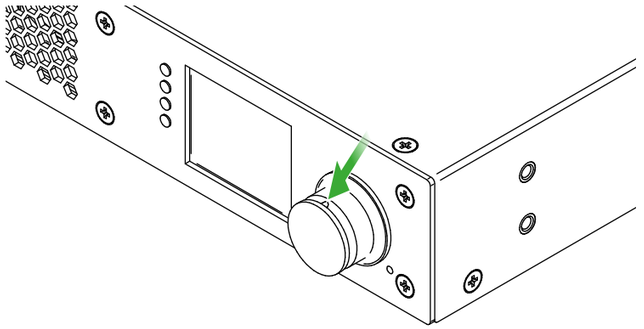
11.1.2. The Steps of the Front Plate Exchange

Removal of the Front Plate

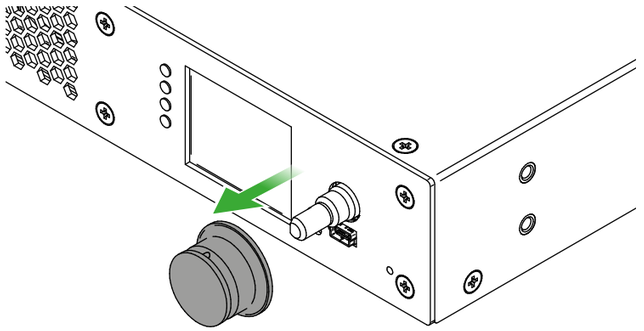
Step 1. Remove the **rubber ring** carefully from the jog dial knob using the plastic spudger tool.



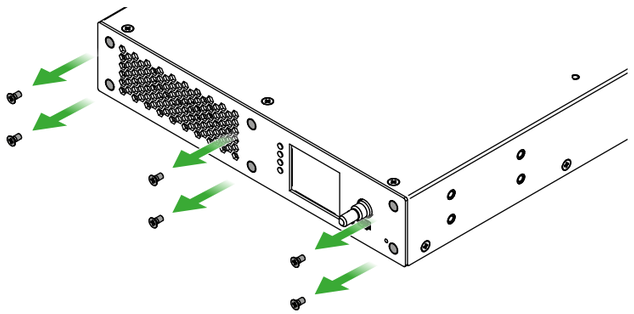
Step 2. Find the screw in the side of the jog dial knob and use a **1.3 mm hexagon (Allen) wrench key** to loosen it.



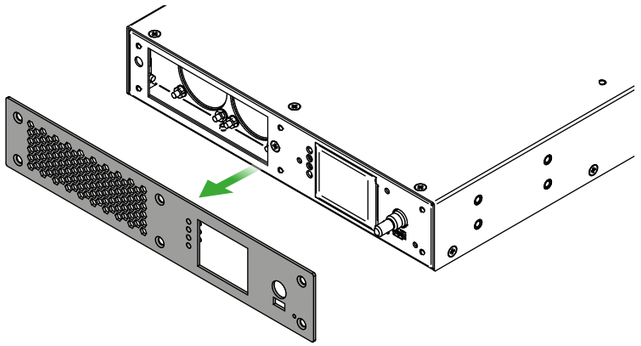
Step 3. Pull down the jog dial knob from the holder.



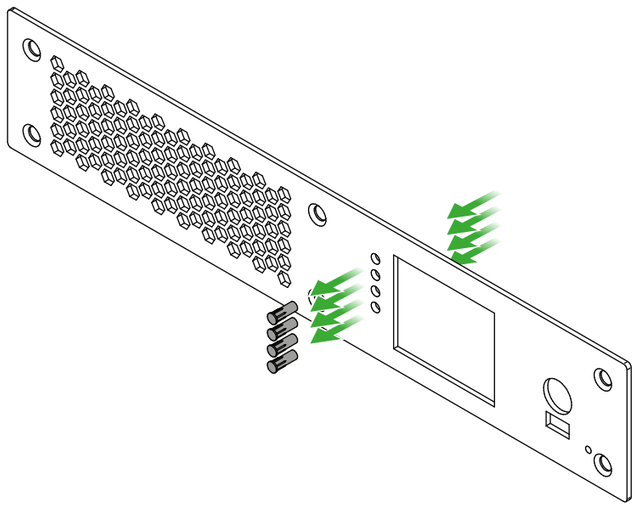
Step 4. Remove all the **six screws** from the front plate using the PZ1 screwdriver.



Step 5. Remove the front plate from the chassis.

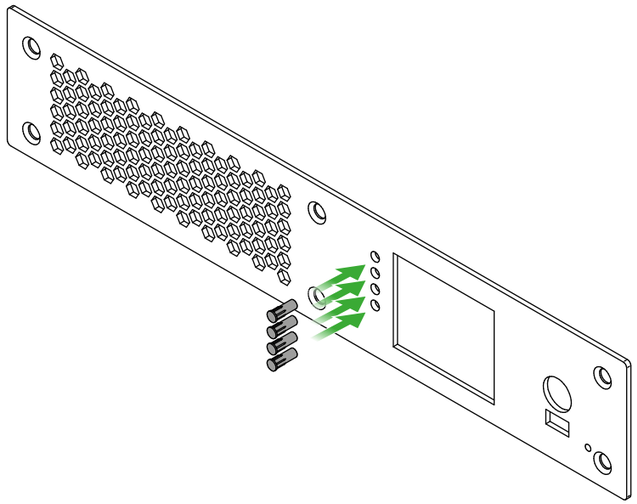


Step 6. Push out the **four light pipes** from the front plate **starting from the rear side** of the plate.

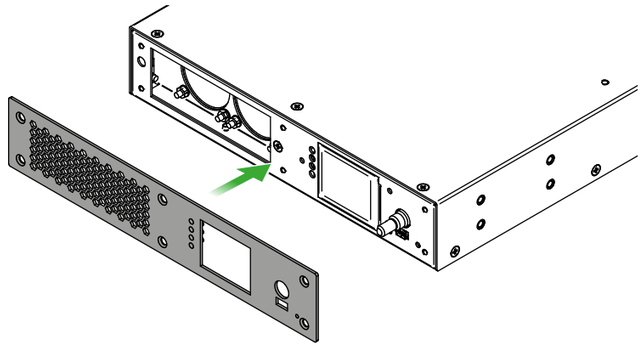


Insertion of the New Front Plate

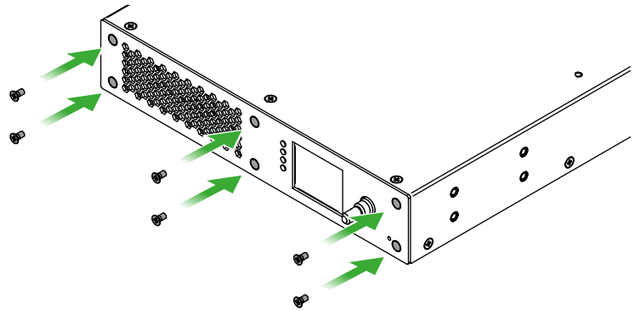
Step 1. Insert the **four light pipes** to the new front plate **starting from the front side** of the plate. Take care of the direction of the light pipes.



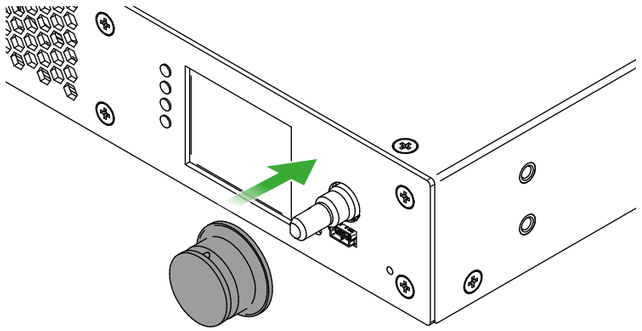
Step 2. Place the front plate to the chassis.



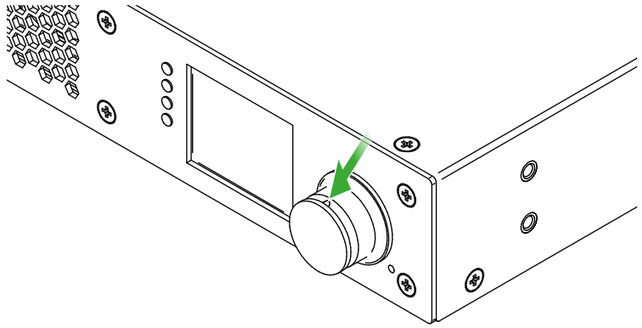
Step 3. Fasten all the **six screws** on the front plate using the PZ1 screwdriver.



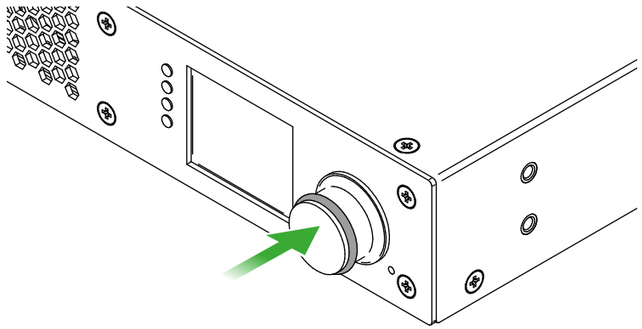
Step 4. Insert the **jog dial knob** to the holder so that **fixing screw hole shall be over the flat part of the holder.**



Step 5. Find the screw in the side of the jog dial knob and use a **1.3 mm hexagon (Allen) wrench key** to fasten it.



Step 6. Place the **rubber ring** carefully to the jog dial knob.



11.2. 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 of the Lightware Support requests it.

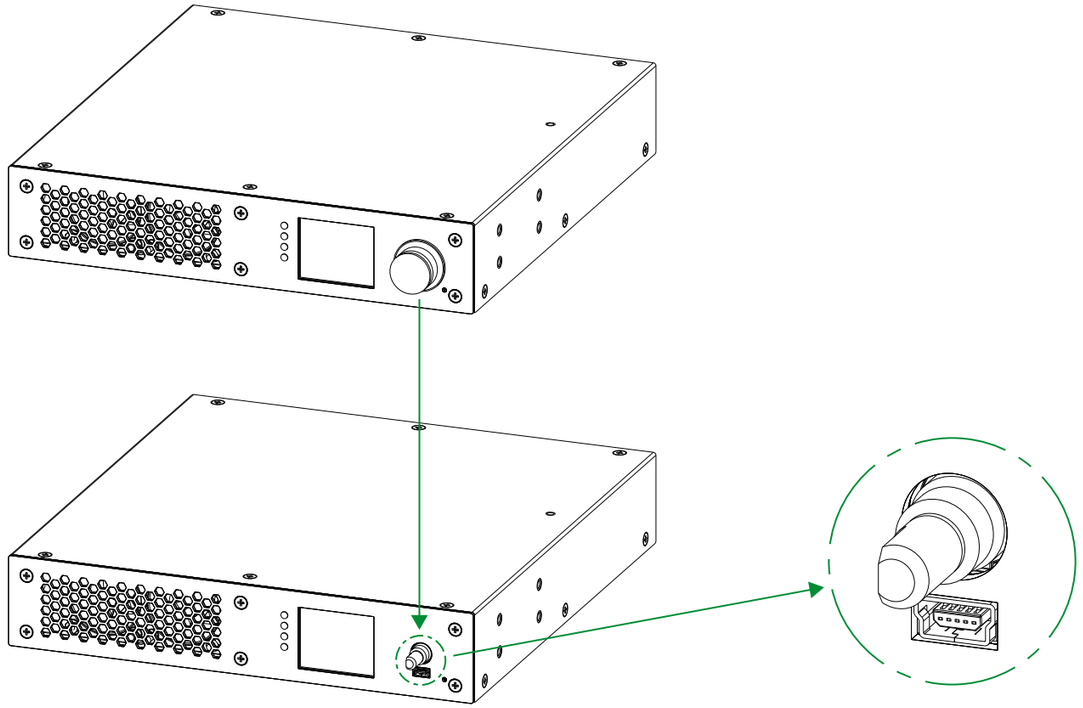
Follow the steps to reach the hidden USB connector:

Step 1. Remove the rubber ring from the jog dial knob.

Step 2. Find the screw in the side of the jog dial knob and use a **hexagon (Allen) key wrench size 1.3mm** to loosen it.

Step 3. Pull down the jog dial knob from the holder.

Step 4. The USB mini connector is available now.



The location of the hidden USB mini connector

11.3. SFP+ Module Changing in R-series Endpoints

The R-series endpoint devices are built with pre-installed SFP+ modules inside the enclosure. The modules can be changed by the user in few simple steps.

SFP+ Modules inside the Enclosure

	Type of the SFP+ module	Number of modules	Optical Mode	Wavelength
2xMM-2xDUO	Finisar FTLX8574D3BCL	2	Multimode	850 nm
2xMM-QUAD	Finisar FTLX8574D3BCL	2	Multimode	850 nm
2xSM-2xDUO	Finisar FTLX1475D3BCL	2	Singlemode	1310 nm
2xSM-QUAD	Finisar FTLX1475D3BCL	2	Singlemode	1310 nm
2xSM-BiDi-DUO	Module A: Finisar FTLX2072D327	1	Singlemode	1271 nm
	Module B: Finisar FTLX2072D333	1		1331 nm

Removal of the Original SFP+ Modules

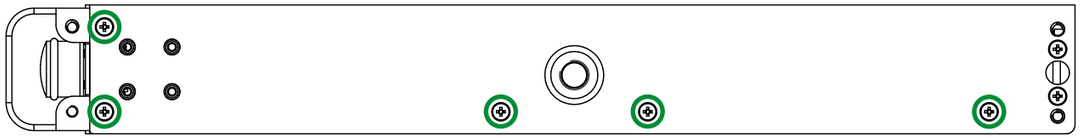
Step 1. **Disconnect** the device from the **power source**.

WARNING! Never disassemble the device when it is connected to the power source. The unit is built with open frame power supply module, touching of it when the device is under power is dangerous.

Step 2. Remove five screws with a **PZ1 screwdriver** from the left side of the device (highlighted below with green).

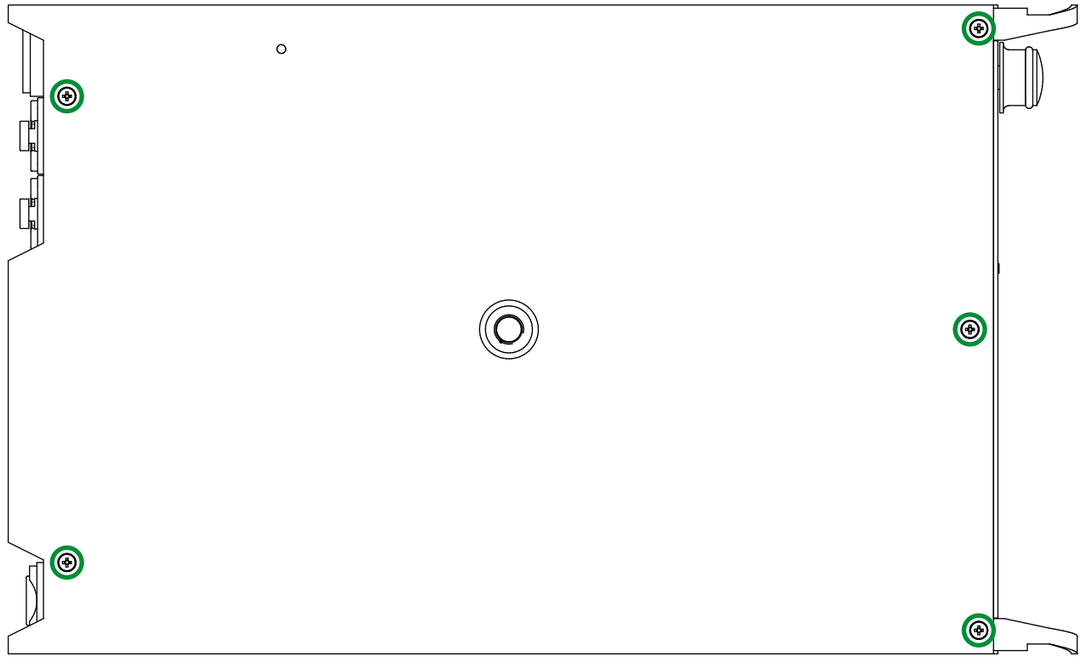
R-series endpoint device - left view

Step 3. Remove five screws from the right side of the device (highlighted below with green).



R-series endpoint device - right view

Step 4. Remove all five screws from the top cover of the device (highlighted below with green).



R-series endpoint device - top view

Step 5. Remove the top cover cautiously.

ATTENTION! The protective ground cable is connected to the top cover. Be sure that the connection is not harmed when removing the cover.

Step 6. Disconnect the LC patch cable connectors from the SFP+ modules.

Step 7. Pull down on the handle bar of the modules.

Step 8. Gently slide out the SFP+ modules from the slot.

Installation of the New SFP+ Modules

ATTENTION! Always be sure the optical mode of the new modules. 2xMM-2xDUO / 2xMM-QUAD models support **multimode**, 2xSM-2xDUO / 2xSM-QUAD / 2xSM-BiDi-DUO support **singlemode** SFP+ modules only.

Step 1. Put up on the handle bar of the new modules.

Step 2. Connect the modules to the SFP+ port slots.

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

Step 4. Place back the top cover cautiously.

Step 5. Screw back all 15 screws to the top, left, and right side of the cover plate of the device.

12

Appendix

Tables, drawings, guides, technical details, and the Quick Link Collection as follows:

12.1. Specification

12.1.1. 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 Supply

Medical compliance ..... IEC 60601-1:2015
ITE compliance ..... IEC 60950-1:2005
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 ..... 4096x2160@60 Hz, 24 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

12.1.2. 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 Supply

Medical compliance ..... IEC 60601-1:2015
ITE compliance ..... IEC 60950-1:2005
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 .....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)

12.1.3. UBEX-PRO20-HDMI-R100 series

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 Supply

Medical compliance .....IEC 60601-1:2015
ITE compliance .....IEC 60950-1:2005
Connector type..... Neutrik powerCON TRUE1 NAC3MPX-WOT
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
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 .....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

Fiber Optical Ports

2xMM-2xDUO

Number of ports.....2
Connector type..... Neutrik opticalCON DUO NO2-4FDW-A
SFP+ modules in the enclosure .....2x Finisar FTLX8574D3BCL
Optical mode.....Multimode
Wavelength..... 850 nm

2xSM-2xDUO

Number of ports.....2
Connector type..... Neutrik opticalCON DUO NO2-4FDW-A
SFP+ modules in the enclosure .....2x Finisar FTLX1475D3BCL
Optical mode.....Singlemode
Wavelength..... 1310 nm

2xMM-QUAD

Number of ports.....1
Connector type.....Neutrik opticalCON QUAD NO4FDW-A
SFP+ modules in the enclosure .....2x Finisar FTLX8574D3BCL
Optical mode.....Multimode
Wavelength..... 850 nm

2xSM-QUAD

Number of ports.....1
Connector type.....Neutrik opticalCON QUAD NO4FDW-A
SFP+ modules in the enclosure .....2x Finisar FTLX1475D3BCL
Optical mode.....Singlemode
Wavelength..... 1310 nm

2xSM-BiDi-DUO

Number of ports.....1
Connector type..... Neutrik opticalCON DUO NO2-4FDW-A
SFP+ modules in the enclosure ..... 1x Finisar FTLX2072D327
..... 1x Finisar FTLX2072D333
Optical mode.....Singlemode
Wavelength..... 1271 nm, 1331 nm

Ethernet Ports

Connector type.....Neutrik etherCON NE8FDV-YK
Number of ports - 2xMM-2xDUO / 2xSM-2xDUO.....1
Number of ports - 2xMM-QUAD / 2xSM-QUAD / 2xSM-BiDi-DUO 2
Ethernet data rate .....1000Base-T, full duplex with autodetect
Power over Ethernet (PoE) .....Not supported

12.2. Maximum Fiber Cable Extensions

12.2.1. F-series Endpoints

The maximum fiber cable extension of the F-series endpoint devices depends on the installed SFP+ modules. Always read the specification of the modules.

12.2.2. R-series Endpoint

The R-series endpoint devices are built with pre-installed SFP+ modules inside the enclosure. The maximum fiber cable extension depends on the modules. The SFP+ modules can be changed by the user, see the details in the SFP+ Module Changing in R-series Endpoints section.

2xMM-2xDUO / 2xMM-QUAD

Multimode fiber optical cables			
OM1 (62.5/125)	**OM2 (50/125)**	**OM3 (50/125)**	**OM4 (50/125)**
Not supported		300 m	400 m

2xSM-2xDUO / 2xSM-QUAD / 2xSM-BiDi-DUO

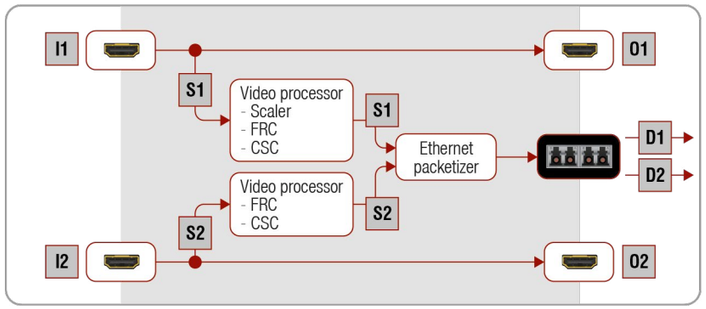
Singlemode fiber optical cables	
OS1	**OS2**
2000 m	10000 m

12.3. Input/Output Port Numbering

12.3.1. UBEX-PRO20-HDMI-F100 / R100 - 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

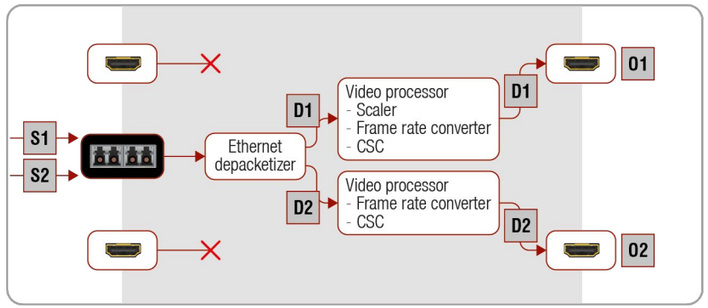


AV port diagram of the F100 transmitter with the port numbers

12.3.2. UBEX-PRO20-HDMI-F100 / R100 - 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

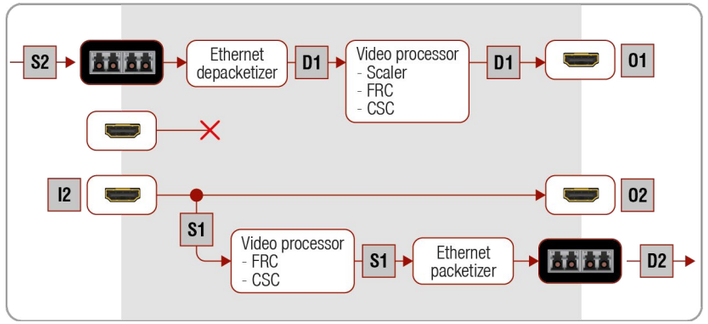


AV port diagram of the F100 receiver with the port numbers

12.3.3. UBEX-PRO20-HDMI-F100 / R100 - 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



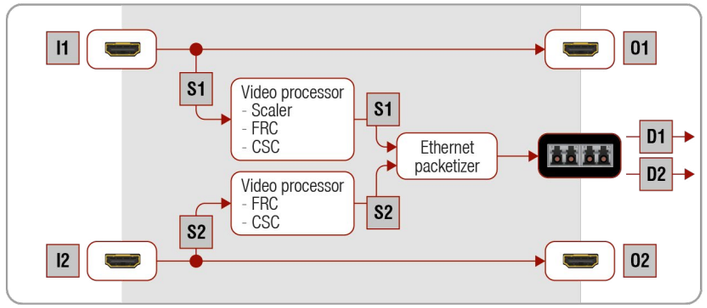
AV port diagram of the F100 transceiver with the port numbers

12.3.4. UBEX-PRO20-HDMI-F110 - Transmitter Mode

Audio-Video Port Numbering Table

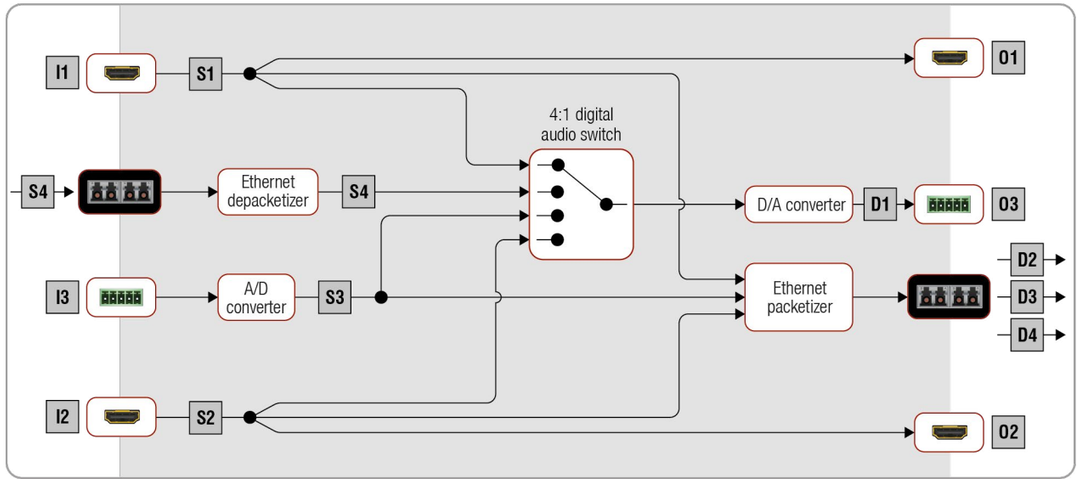
Description		Video port nr. (LW3)	Audio port nr. (LW3)
HDMI ports	HDMI in 2	I2	I2
	HDMI out 1	O1	O1
	HDMI out 2 (local output)	O2	O2
Analog audio ports	Analog audio in	-	I3
	Analog audio out	-	O3
Source streams	HDMI stream 1	S1	S1
	HDMI stream 2	S2	S2
	Analog audio input stream	-	S3
	Remote audio input 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



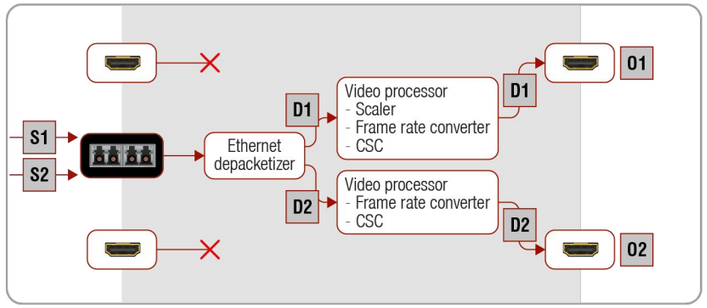
Audio port diagram of the F110 transmitter with the port numbers

12.3.5. UBEX-PRO20-HDMI-F110 - Receiver Mode

Audio-Video Port Numbering Table

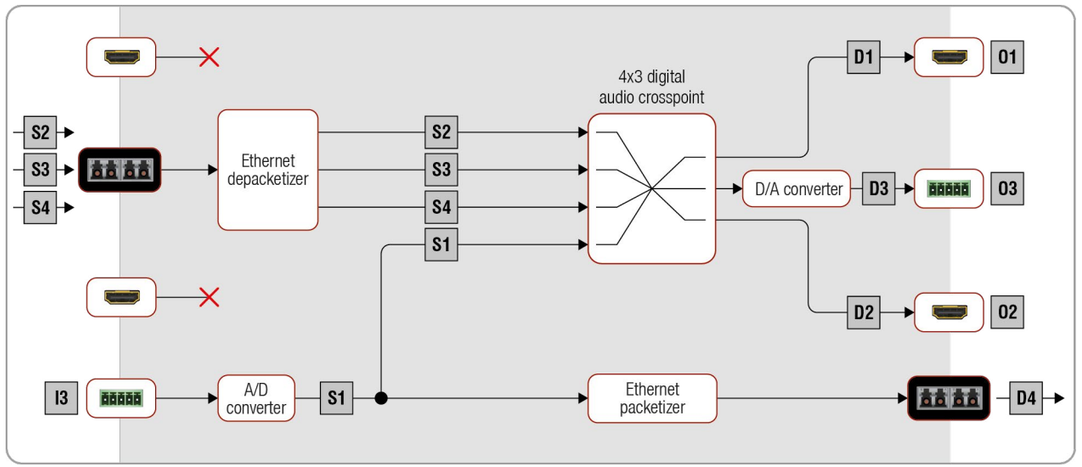
Description		Video port nr. (LW3)	Audio port nr. (LW3)
HDMI ports	HDMI out 1	O1	O1
	HDMI out 2	O2	O2
Analog audio ports	Analog audio in	-	I3
	Analog audio out	-	O3
Source streams	Analog audio input stream	-	S1
	HDMI stream 1	S1	S2
	HDMI stream 2	S2	S3
	Remote audio input stream	-	S4
Destination streams	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



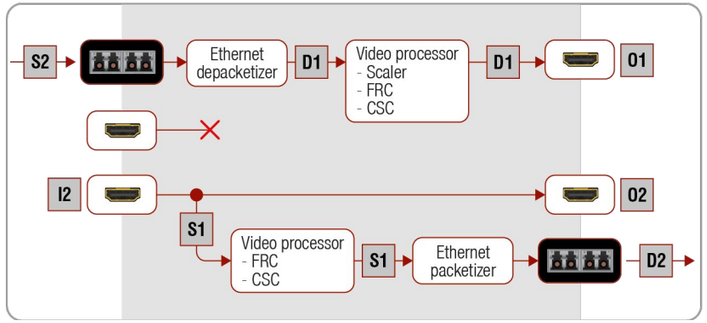
Audio port diagram of the F110 receiver with the port numbers

12.3.6. UBEX-PRO20-HDMI-F110 - Transceiver Mode

Audio-Video Port Numbering Table

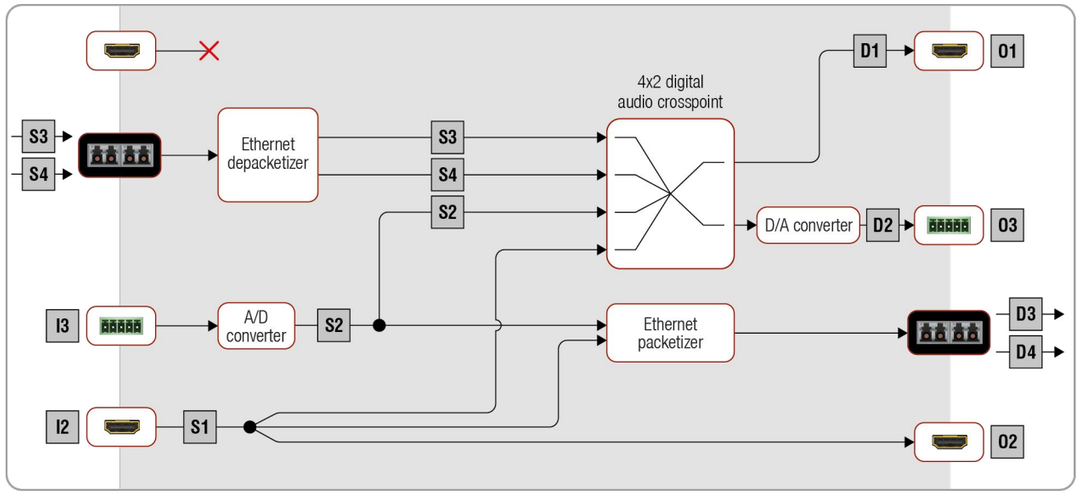
Description		Video port nr. (LW3)	Audio port nr. (LW3)
HDMI ports	HDMI in 2	I2	I2
	HDMI out 1	O1	O1
	HDMI out 2	O2	O2
Analog audio ports	Analog audio in	-	I3
	Analog audio out	-	O3
Source streams	HDMI stream 1 (from HDMI in 2)	S1	S1
	Analog audio input stream	-	S2
	HDMI stream 2 (from the remote device)	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

12.3.7. Control Port Numbering - Endpoint Devices

UBEX-PRO20-HDMI-F100 / R100 series

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

12.4. Factory Default Settings

12.4.1. UBEX-PRO20-HDMI-F100 / R100 series

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

12.4.2. 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)
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

Parameter	Setting/Value
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
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

12.5. 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.

12.5.1. UBEX-PRO20-HDMI-F100 / R100 - 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

12.5.2. UBEX-PRO20-HDMI-F100 / R100 - 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

12.5.3. UBEX-PRO20-HDMI-F100 / R100 - 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

12.5.4. 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
Infrared ports
Port name, Command injection port nr.
Miscellaneous settings
Device label, Control lock status
Display brightness, Jog dial rotary direction, Fan setting
User EDID data (U1-U12), Emulated EDIDs by ports

12.5.5. 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
Infrared ports
Port name, Command injection port nr.
Miscellaneous settings
Device label, Control lock status
Display brightness, Jog dial rotary direction, Fan setting
User EDID data (U1-U12), Emulated EDIDs by ports

12.5.6. 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
Infrared ports
Port name, Command injection port nr.
Miscellaneous settings
Device label, Control lock status
Display brightness, Jog dial rotary direction, Fan setting
User EDID data (U1-U12), Emulated EDIDs by ports

12.6. Release Notes of the Firmware Packages

12.6.1. Release Notes

v1.4.1b2

Release date: 2019-12-03

Bugfix:

- Fixed a glitch with input scaler configuration storage
- Optimized runtime memory usage

v1.4.0b4

Release date: 2019-11-27

New feature:

- Added check to refuse downgrading to earlier versions

Bugfix:

- Added file system in order to cope with bad NAND flash blocks
- Improved stability for multicast update

v1.3.2b2

Release date: 2019-08-14

New feature:

- Fixed issues with using the 10.0.0.0/8 IP range for control

v1.3.1b5

Release date: 2019-07-02

New feature:

- Added support for No Sync Screen generation on TX/TRX sources (for network diagnostics)
- Added support for LDC Orientation Preference setting
- Improved LLDP support (reporting operation mode and package version)
- Added identify() method to S and O nodes
- Fixed channel status data for analog audio inputs
- Refined fan control (silent operation)
- Added support for R100 part numbers
- Added support for IR in F110
- Added support for centralized firmware update

Bugfix:

- Fixed a glitch with some 10G switches not switching streams automatically

Known issue:

- Video output is unstable when scaling a pre-cropped image to 4K@60

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

12.6.2. Known Issues

The firmware package of the UBEX endpoint devices contains a few known issues and limitations which are going to be fixed in the next firmware release.

Endpoint Firmware Package v1.4.1

- 12-bit deep color HDMI signals cannot be transmitted, black image is displayed on the sink device
- 4:2:0 sampling is supported on the input and output ports in pass-through mode only
- The configuration restore procedure works on the same type of operation modes only
- HBR audio formats (Dolby TrueHD; DTS-HD Master Audio 7.1) are not supported
- Video output is unstable when scaling a pre-cropped image to 4K@60.

Endpoint Firmware Package v1.4.0

- Some video process related settings (e.g. scaler, CSC, etc) are not restored on the TX/TRX input ports after restarting the device. Please update your device to v1.4.1.

12.7. 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	

12.8. 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.

12.9. Mechanical Drawings

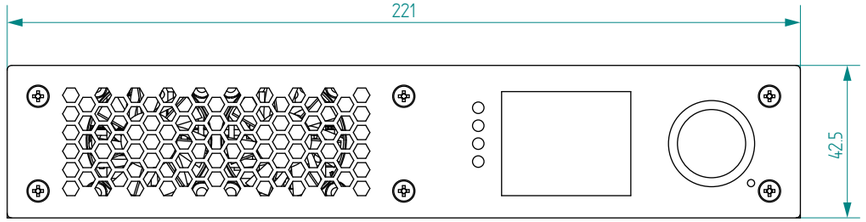
12.9.1. UBEX F-series Endpoint Devices

The following drawings present the physical dimensions of the UBEX F-series endpoints. Dimensions are in mm.

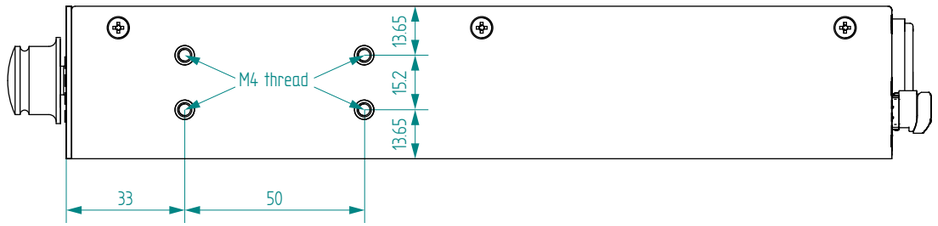
Affected models:

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

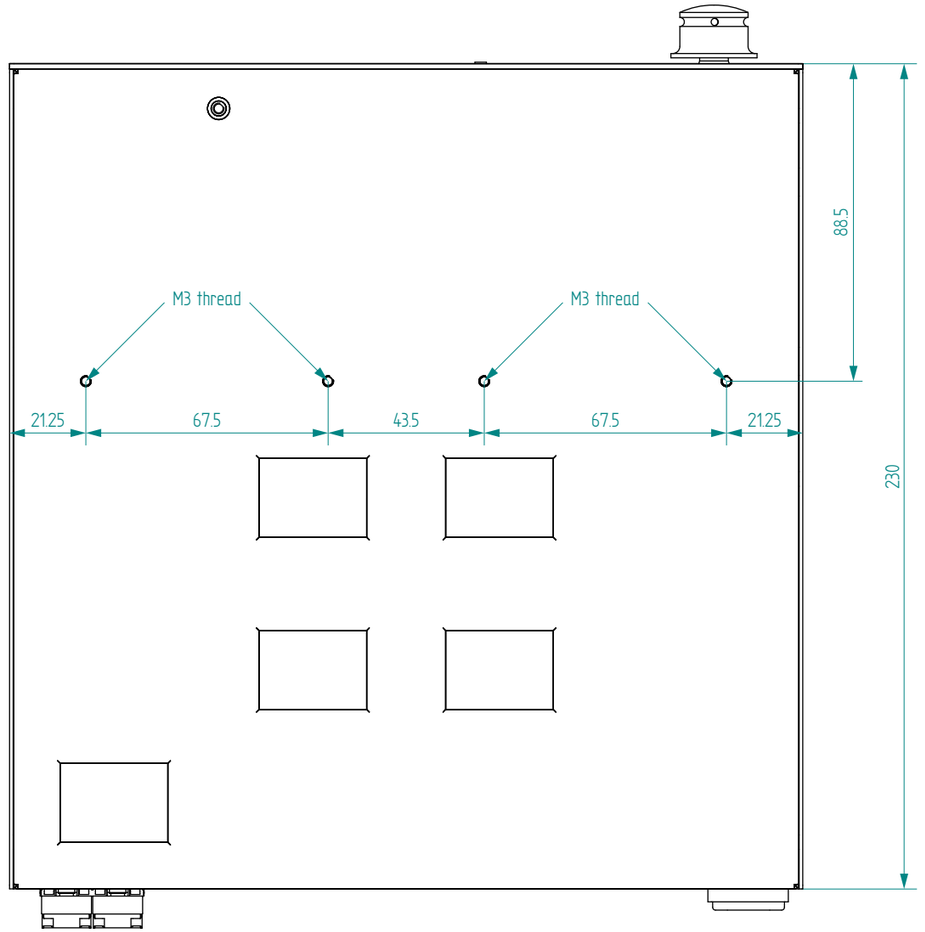
Front View



Side View



Bottom View



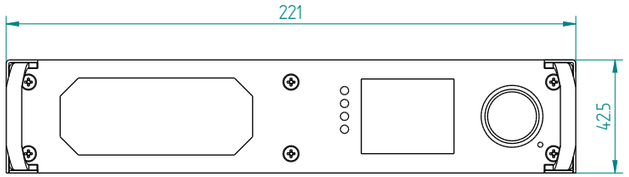
12.9.2. UBEX R-series Endpoint Devices

The following drawings present the physical dimensions of the UBEX R-series endpoints. Dimensions are in mm.

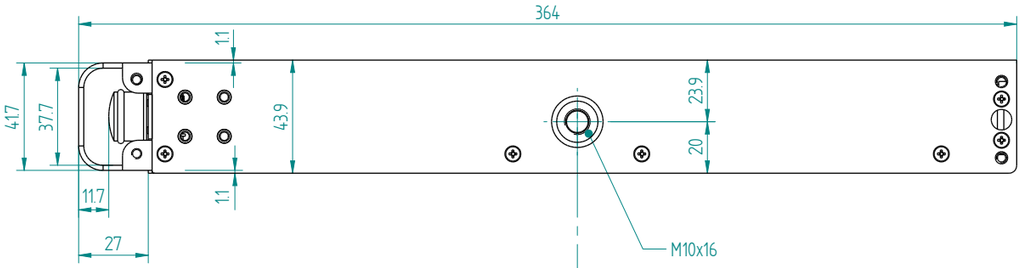
Affected models:

- UBEX-PRO20-HDMI-R100 2xMM-2xDUO
- UBEX-PRO20-HDMI-R100 2xMM-QUAD
- UBEX-PRO20-HDMI-R100 2xSM-2xDUO
- UBEX-PRO20-HDMI-R100 2xSM-QUAD
- UBEX-PRO20-HDMI-R100 2xSM-BiDi-DUO

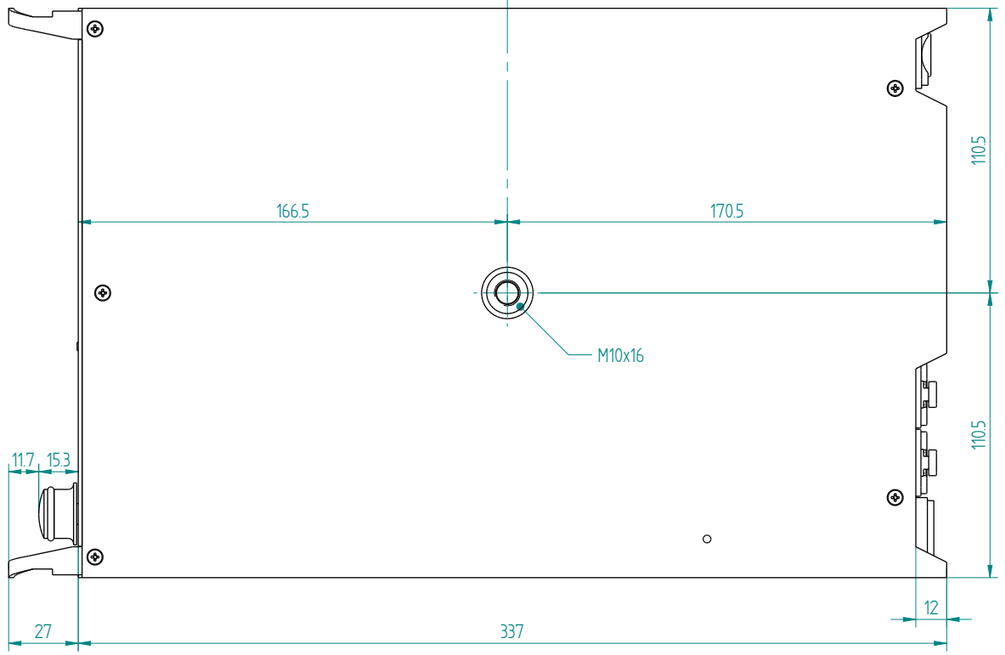
Front View



Side View



Top View



12.10. 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**.

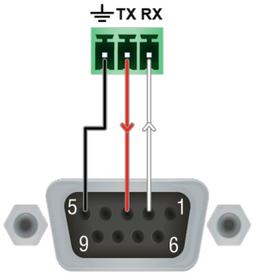
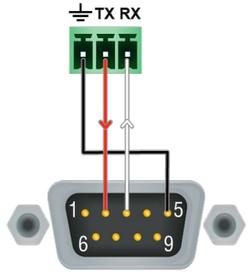
				TX - Stream 1																	
				No signal	1280x720p60 (720p)			1920x1080p60 (1080p)			3840x2160p30 (4K UHD 30)			4096x2160p30 (4K30)			3840x2160p60 (4K UHD 60)			4096x2160p60 (4K60)		
					YCbCr 4:2:2	RGB / YCbCr 4:4:4		YCbCr 4:2:2	RGB / YCbCr 4:4:4		YCbCr 4:2:2	RGB / YCbCr 4:4:4		YCbCr 4:2:2	RGB / 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 - Stream 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.

12.11. Cable Wiring Guide

12.11.1. Cable Wiring Guide for Serial Data Transmission

The F110 endpoint model is built with 3-pole Phoenix connector. See below the two examples of the most common assembling cases.

UBEX and a DCE (Data Circuit-terminating Equipment)	UBEX and a DTE (Data Terminal Equipment)
D-SUB 9 and Phoenix	D-SUB 9 and Phoenix
 2: TX data 3: RX data 5: Ground	 2: RX data 3: TX data 5: Ground

12.11.2. 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.

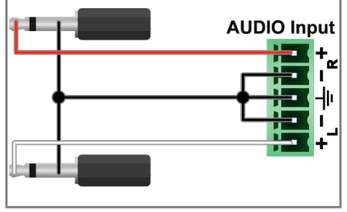
ATTENTION! There are numerous types of regularly used connector and cable types to connect audio devices. Please always make sure that a connector or cable fits your system before use.

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.

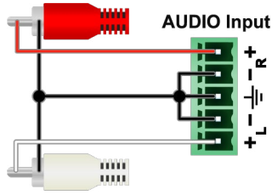
INFO: Use a galvanic isolation in case of a ground loop.

From Unbalanced Output to Balanced Input

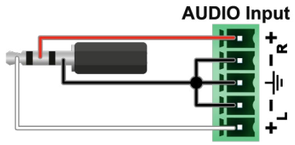
2 x 6.3 (1/4") TS - Phoenix



2 x RCA - Phoenix

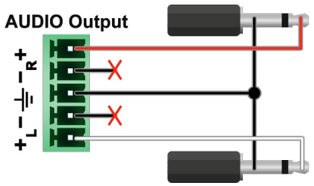


3.5 (1/8") TRS - Phoenix

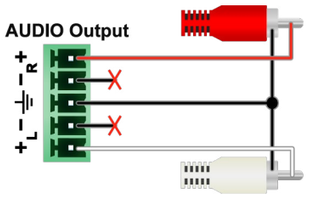


From Balanced Output to Unbalanced Input

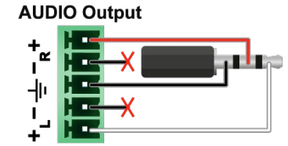
Phoenix - 2 x 6.3 (1/4") TS



Phoenix - 2 x RCA

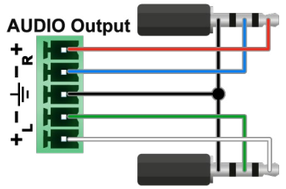


Phoenix - 3.5 (1/8") TRS

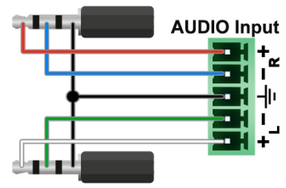


From Balanced Output to Balanced Input

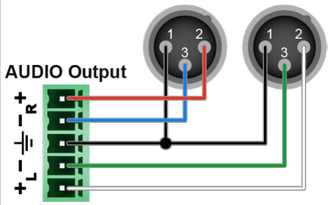
Phoenix - 2 x 6.3 (1/4") TRS



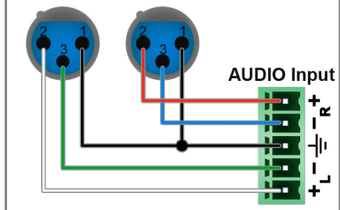
2 x 6.3 TRS (1/4") - Phoenix



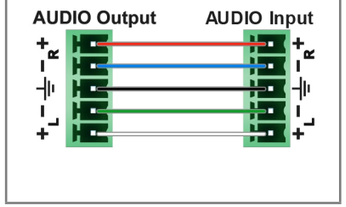
Phoenix - 2 x XLR



2 x XLR - Phoenix



Phoenix - Phoenix



For more information about the cable wiring see the **Cable Wiring Guide** on our website https://lightware.com/support/guides-and-white-papers.

12.12. 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**.

Activity	Front panel	LDC sw.	LW3 comm.
General			
Application mode change	-	-	7.3.10
Backup/restore	-	6.12	-
Bootload mode setting	5.8.7	-	7.3.14
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	7.3.16
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	7.3.15
Video (TX)			
CSC setting (HDMI in 1)	5.3.1	6.5.3	7.4.10
CSC setting (HDMI in 2)	5.3.1	6.5.4	7.4.10
FRC - Forced resolution	5.3.1	6.5.4	7.4.7
FRC - Output resolution mode	5.3.1	6.5.4	7.4.8
HDCP setting (inputs)	5.3.1	6.5.1	7.4.12
HDCP setting (local outputs)	5.3.3	6.5.2	7.4.13
Identify stream	-	6.5.12	7.4.6
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	7.4.9
Scaler - Forced resolution	5.3.1	6.5.3	7.4.7
Scaler - Scaling mode	5.3.1	6.5.3	7.4.8
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
Identify display	-	6.5.12	7.5.16
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	7.6.10
CSC setting (output)	5.5.2	6.5.6	7.6.10
FRC - Forced resolution	5.5.1	6.5.4	7.6.8
FRC - Output resolution mode	5.5.1	6.5.4	7.6.5
HDCP setting (input)	5.5.1	6.5.1	7.6.15
HDCP setting (local output)	5.5.5	6.5.2	7.6.16
HDCP setting (output)	5.5.2	6.5.8	7.6.16
Identify display	-	6.5.12	7.6.4
Identify stream	-	6.5.12	7.6.4
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	7.6.9
Scaler - Forced resolution	5.5.2	6.5.6	7.6.8
Scaler - Scaling mode	5.5.2	6.5.6	7.6.6
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	7.6.12
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

Activity	Front panel	LDC sw.	LW3 comm.
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
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	7.6.14
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	7.6.13
RS-232 Interface			
RS-232 port configuration	-	6.10.2	7.13
Sending ASCII-format text	-	-	7.15.1
Sending ASCII-format message	-	6.10.2	7.15.3
Sending binary message	-	-	7.15.2
Infrared Interface			
Change command injection port number	-	6.10.3	7.14.3
Enable command injection	-	6.10.3	7.14.2
Enable output signal modulation	-	-	7.14.4
Enable the port	-	6.10.3	7.14.1
Sending pronto hex message in big-endian format	-	-	7.15.5
Sending pronto hex message in little-endian format	-	6.10.3	7.15.4

Activity	Front panel	LDC sw.	LW3 comm.
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	7.12.9
IP address query	5.8.1	6.11.2	7.12.4
IP address setting (static)	5.8.1	6.11.2	7.12.5
Subnet mask change (static)	5.8.1	6.11.2	7.12.7
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

12.13. Hashtag Keyword List

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

The format of the keywords is the following:

#<keyword>

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

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

Example

#dhcp

This keyword is placed at the DHCP (dynamic IP address) setting in the front panel operation, the Lightware Device Controller (LDC) and the LW3 programmer's reference section.

The following list contains all hashtag keywords placed in the document with a short description belonging to them. The list is in **alphabetical order** by the hashtag keywords.

Hashtag Keyword	Description
#advancedview	Advanced view window
#analogaudio	Analog audio related settings
#applicationmode	Application mode (extender/matrix) setting
#audio	Audio related settings
#backup	Configuration cloning (backup)
#balance	Balance (for analog audio) setting
#bootload	Bootload mode setting
#colorspace	Color space converter related settings
#configurationcloning	Configuration cloning (backup)
#controllock	Control lock
#crosspoint	Crosspoint switch setting
#csc	Color space converter related settings
#devicelabel	Device label
#dhcp	Dynamic IP address (DHCP) setting
#edid	EDID related settings
#ethernet	Ethernet port settings
#extendermode	Application mode (extender/matrix) setting
#factory	Factory default settings
#firmwareversion	Firmware version query
#framedetector	Frame detector in LDC
#frc	Frame rate converter related settings
#freerun	Timing mode setting
#gain	Gain (for analog audio) setting
#hdcp	HDCP-encryption related setting
#identifydisplay	Identify display feature
#identifyme	Identify me (identify the device) feature
#identifystream	Identify stream feature
#infra	Infrared port related settings
#ipaddress	IP address related settings
#ir	Infrared port related settings
#jogdial	Jog dial control knob related settings
#label	Device label
#log	System log
#mac	MAC address query
#matrixmode	Application mode (extender/matrix) setting
#message	Message sending via communication ports
#mute	Mute (for analog audio) setting
#network	Network (IP address) related settings
#nosyncscreen	Test pattern (no sync screen) settings
#operationmode	Operation mode (TX/RX/TRX) setting
#portstatus	Source/destination port status query
#power5v	Power 5V mode setting
#reboot	Restarting the device
#receiver	Operation mode (TX/RX/TRX) setting
#reset	Restarting the device
#restart	Restarting the device
#rotary	Jog dial control knob related settings
#rs232	RS-232 related settings
#rs-232	RS-232 related settings
#rx	Operation mode (TX/RX/TRX) setting
#scaler	Scaler related settings
#serial	RS-232 related settings
#sfp	SFP+ module monitoring information
#sourcelocked	Timing mode setting
#status	Status query
#streamenable	Stream enable/disable setting
#switch	Crosspoint switch setting
#terminal	Advanced view window
#testpattern	Test pattern (no sync screen) settings
#timingmode	Timing mode setting
#transceiver	Operation mode (TX/RX/TRX) setting
#transmitter	Operation mode (TX/RX/TRX) setting
#trx	Operation mode (TX/RX/TRX) setting
#tx	Operation mode (TX/RX/TRX) setting
#unmute	Unmute (for analog audio) setting
#volume	Volume (for analog audio) setting

12.14. 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
1.4	17-07-2019	Added videowall application, added Infrared interface support, added centralized firmware upgrade method in Matrix mode, added supplement in connection with UBEX-PRO20-HDMI-R100 series endpoint models	Tamas Forgacs
1.5	02-12-2019	User's manual of UBEX is separated to Extender mode and Matrix mode, implemented hashtag (#) keywords for the optimized information search, added Assembly Guides chapter	Tamas Forgacs
1.6	04-12-2019	Minor updates for endpoint firmware package v1.4.1	Tamas Forgacs

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