visual engineering
LIGHTWARE

User's Manual

MODEX-F15-OPTS-TX
MODEX-F15-OPTM-TX
MODEX-F15-OPTS-RX
MODEX-F15-OPTM-RX

Modular Fiber Optical 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.

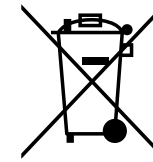| CAUTION	AVIS
RISK OF ELECTRIC SHOCK DO NOT OPEN RISQUE DE CHOC ELECTRIQUE NE PAS OUVRIR	
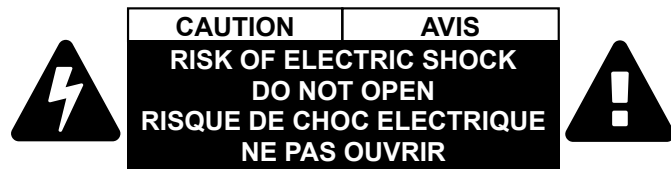
Ventilation

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

CLASS 1 LASER PRODUCT

Common Safety Symbols

Symbol	Description
∿	Alternating current
⏚	Protective conductor terminal
⚡	Caution, possibility of eletric shock
⚠	Caution
☢	Laser radiation

Symbol Legend

The following symbols and markings are used in the document:

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

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

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

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

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

Navigation Buttons

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

Navigate to the Table of Contents.

Step back one page.

Step forward to the next page.

Document Information

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

Item	Version
Lightware Device Controller (LDC) software	1.20.0b5
Lightware Device Updater (LDU) software	1.4.0b3
Controller firmware	2.1.1b2
CPU firmware	2.1.0
Web content	1.16.0
FPGA firmware	2.0.1
Hardware	3.2

Document revision: **3.2**

Release date: 07-11-2018

Editor: Laszlo Zsedenyi

Table of Contents

1

Introduction

Thank you for choosing MODEX, Lightware's Modular Extender family. In the first chapter we would like to introduce the device highlighting the most important features in the below listed sections:

- ▸ Box Contents
- ▸ Description
- ▸ Features of the Device
- ▸ Typical Application

1.1. Box Contents

MODEX transmitter or receiver	Rubber feet with screws and washers (4x)	UTP patch cable (1 m)
Safety & Warranty Info, Quick Start Guide	IEC power cable[1]	Power cable with Neutrik powerCON connector and additional chuck[2]
Phoenix® Combicon 5-pole connector [3]	Infrared transmitter with TS male connector [4]	Infrared receiver with TRS male connector [4]

[1] For all media connectors, excepts: MODEX-CON-OPTS-NT-PCN and MODEX-CON-OPTM-NT-PCN.

[2] Only for the following media connectors: MODEX-CON-OPTS-NT-PCN and MODEX-CON-OPTM-NT-PCN.

[3] Only for the following Modules: MODEX-IF-AUDIN and MODEX-IF-AUDOUT (1-1 pc.), MODEX-IF-AUD (2 pcs.).

[4] Only for the following Modules: MODEX-IF-RS232-IR and MODEX-IF-2ETH-IR.

1.2. Description

The technology built into the MODEX family breaks many standard limitations allowing 30 meters DVI cable on input, Advanced EDID Management, Pixel Accurate Reclocking, LAN and RS-232/RS-422 control.

The half unit extender allows one video & audio module and two interface modules (each can be the same or different type).

The front panel has an additional 10/100 Mbps Ethernet port (with full functionality, but can be used as control interface) and USB KVM connectors (transmitter has one USB-B for the computer; receiver has two USB-A connectors for the keyboard and mouse). Keyboard and mouse functions are emulated by the extender and no USB enumeration occurs while operator switching. A computer is not aware when a keyboard or mouse has been changed.

Model Denomination

Model number Transmitter/Receiver

MODEX-F15-OPTS-TX

Modular extender   Optical interface, single mode or multimode
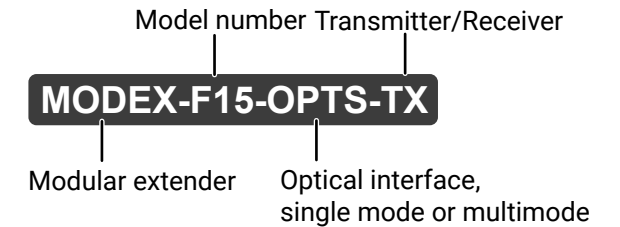
1.3. Features of the Device

ATTENTION! The available features depend on the modules installed into the given MODEX product.

Advanced EDID Management

The user can emulate any EDID on the inputs independently, read out and store any attached monitor's EDID in 100 internal memory locations, upload and download EDID files using Lightware Device Controller software.

Pixel Accurate Reclocking

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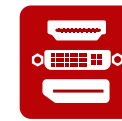
Variable A/V Modules

MODEX can be supplied with different type of Video ports both on transmitter and receiver side: HDMI, DVI, DisplayPort and 3G-SDI connectors. To increase the flexibility, transmitter and receiver can be assembled with different type of video ports.
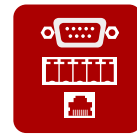
Wide Range of Interface Modules

There are two slots in the extenders where interface modules can be installed. Numerous modules are available which contain Analog-, S/PDIF audio connectors, Ethernet-, RS-232- and Infrared ports in many combinations.

Physical Modules with Different Connectors

MODEX can be ordered with many type of power connectors and optical connectors.
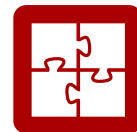
25G Compatibility

Thanks to the LW3 protocol and the design of MODEX and 25G matrix, the devices are compatible and able to send controlling commands to each other.

Signal Transmission up to 10 km

MODEX with single mode optical unit is able to transmit the signal to 10 km distance.
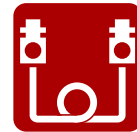
Single Fiber Technology

MODEX-F15-OPTS and -OPTM extenders give optical transmission over a single or duplex fiber; equipped with a Neutrik OpticalCON or industrial grade connector but both can be used with LC fiber cable.

Built-in Web Page

Easy access from a Web browser to control and configure the MODEX pair.

Event Manager

MODEX can be configured to perform an action if a condition appears. E.g. if a signal is present on an input, a command is sent via the RS-232 port.

HDCP Enable / Disable

MODEX extenders are HDCP-capable. To display unprotected content on a non-HDCP capable sink, HDCP can be disabled via the front panel menu or from a web browser by the built-in web page.

1.4. Typical Application

Integrated System Diagram
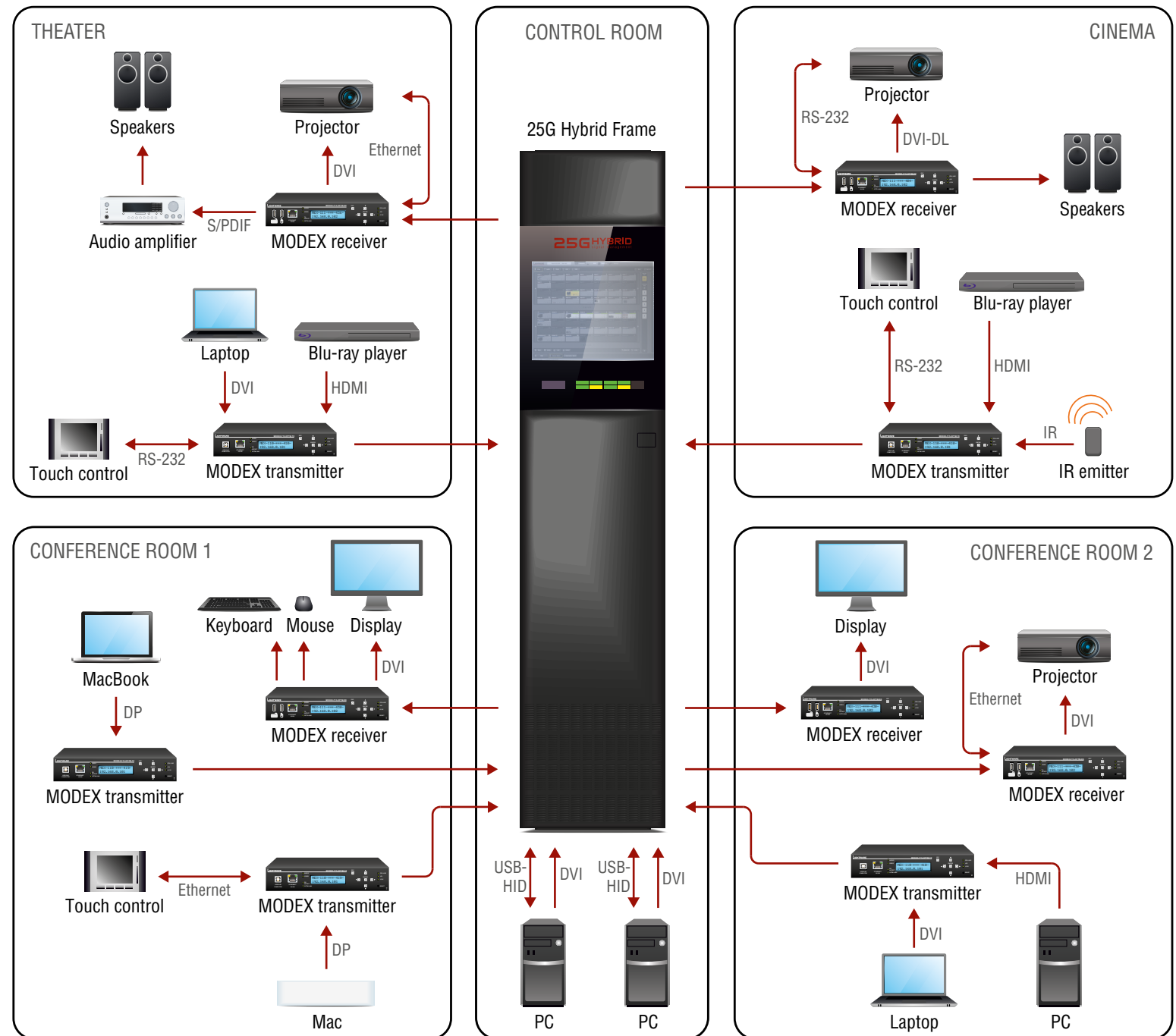
2

Installation

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

- ▶ MOUNTING OPTIONS
- ▶ CONNECTING STEPS

2.1. Mounting Options

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.

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

2.1.1. Rack Shelf Mounting (with 1U high Rack Shelf)

Step 1. Turn the unit upside down.

Step 2. Put the rack shelf upside down on the unit, and position it to get the mounting holes aligned.

Step 3. Fasten the unit on the rack shelf with the provided screws.

Step 4. Mount the rack shelf in the rack.
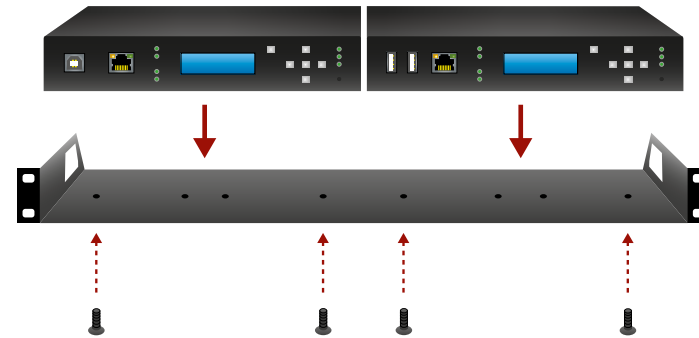
> INFO: The MODEX transmitter and receiver units are half-rack sized.

2.1.2. Truss Mounting (with Mounting Bracket V2)

Step 1. Fasten the mounting bracket on the side of the unit with the provided screws.

Step 2. Use a bolt to attach a standard clamp. (The clamp is not supplied with the device.)

Step 3. Mount the unit on the truss with the clamp.

2.1.3. Through Furniture Mounting (with Mounting Bracket V2)

To get a good result, the thickness of the board should not exceed 25 millimeters.

Step 1. Cut a suitable hole in the board.

Step 2. Attach the mounting bracket on the side of the unit with the provided screws.

Step 3. Mount the unit on the board.

Step 4. Loosen the screws a little on the bracket and adjust the unit to line up with the front of the board.

2.2. Connecting Steps
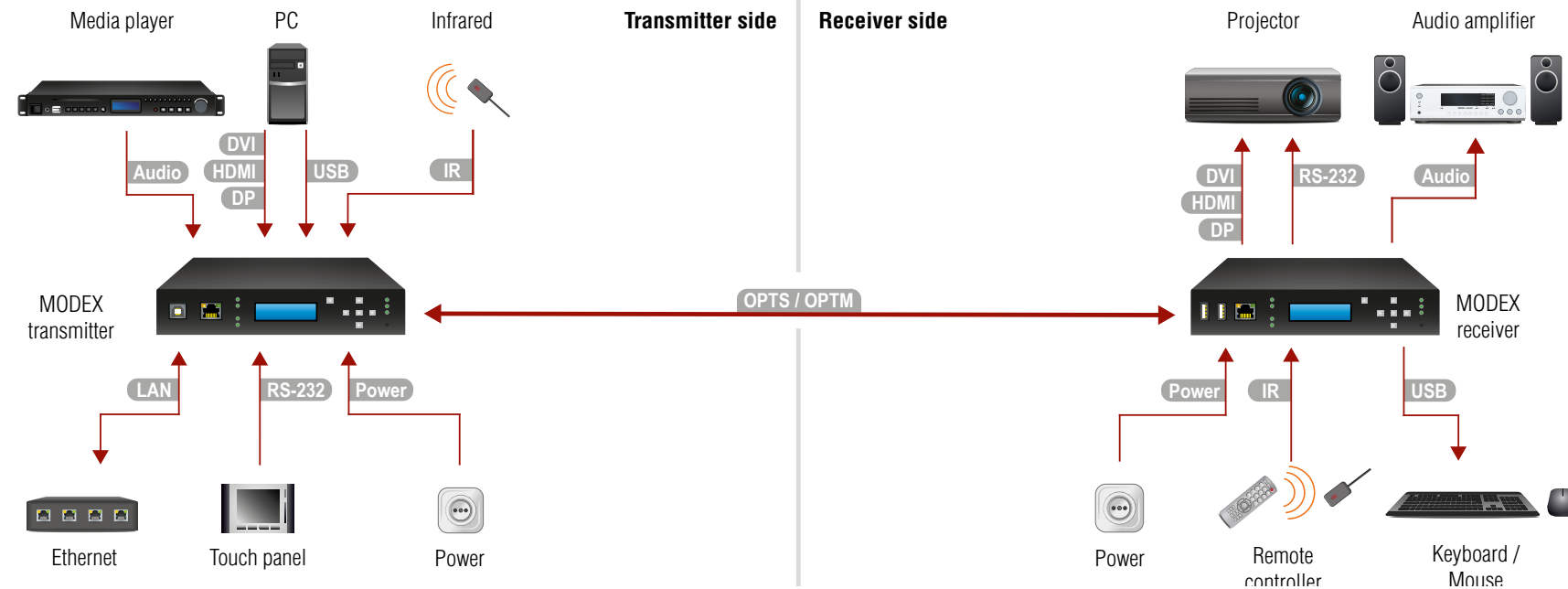
OPTS **OPTM**	**Transmitter**: Connect a multi- (OPTM) or single mode (OPTS) fiber cable to **channel A** of the transmitter.
DVI **HDMI** **DP**	Connect a DVI, HDMI, or DP source (e.g. computer) to the transmitter's DVI, HDMI, DP input connector.
Audio	Connect an audio source (e.g. media player) to the transmitter's audio output connector.
RS-232	Optionally for RS-232 control: connect a controller device (e.g. touch panel) to the RS-232 port(s) of the device(s).
IR	Optionally for Infrared control: - Connect the IR emitter to the IR OUT port of the device. - Connect the IR detector to the IR IN port of the device.
LAN	Optionally connect the transmitter or the receiver to a Local Area Network in order to control the devices by the built-in Web page. Optionally connect Ethernet devices (e.g. switch, laptop, computer etc.) to the available RJ45 connector(s) of the extender(s). All connected devices will work as if they are connected to the same network. **Never connect the receiver and the transmitter to the same LAN network to avoid network loop!**
USB	Optionally for USB HID extension: connect the transmitter to the computer by the USB-B cable.
Power	Connect the power adaptor to the DC input of the switcher first, then to the AC power socket.

OPTS **OPTM**	**Receiver**: Connect a multi- (OPTM) or single mode (OPTS) fiber cable to **channel B** of the receiver.
DVI **HDMI** **DP**	Connect a DVI, HDMI, or DP sink (e.g. projector) to the receiver's DVI, HDMI, DP output connector.
Audio	Connect an audio sink (e.g. audio amplifier) to the receiver's audio output.
RS-232	Optionally for RS-232 control: connect a controlled device (e.g. projector) to the RS-232 port(s) of the device(s).
IR	Optionally for Infrared control: - Connect the IR emitter to the IR OUT port of the device. - Connect the IR detector to the IR IN port of the device.
LAN	Optionally connect the transmitter or the receiver to a Local Area Network in order to control the devices by the built-in Web page. Optionally connect Ethernet devices (e.g. switch, laptop, computer etc.) to the available RJ45 connector(s) of the extender(s). All connected devices will work as if they are connected to the same network. **Never connect the receiver and the transmitter to the same LAN network to avoid network loop!**
USB	Optionally for USB HID extension: connect at least one USB HID device to the receiver.
Power	Connect the power adaptor to the DC input of the switcher first, then to the AC power socket.

3

Product Overview

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

3.1. Front View

INFO: The LCD of MODEX units with hardware v3.0 or above contains light blue backlight. Older MODEX units contain light green backlight.

INFO: See more information about the differences in The New Features from MODEX HW v3.0 (CM-1004) section.
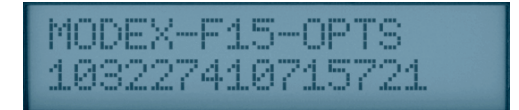
HW v2.2 or below   *HW v3.0 or above*

3.1.1. Transmitter

INFO: The photo below depicts a MODEX-F15-OPTS-TX frame. It is almost identical to a MODEX-F15-OPTM-TX frame with two differences: the "OPTM'"designation and the part number.
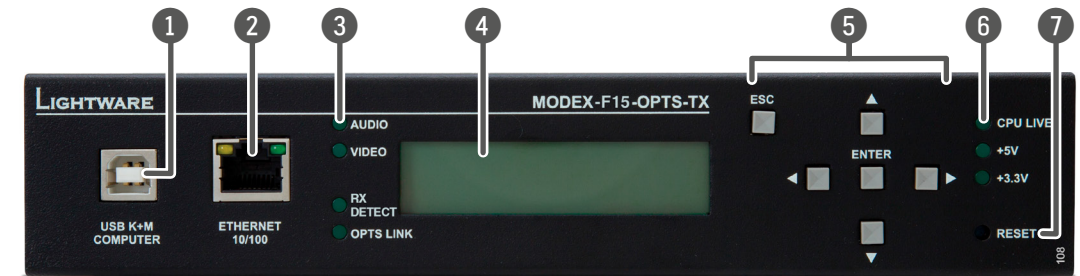
❶ USB KVM — USB connection to HOST (Computer) unit via USB B-type connector. See more information about USB KVM function in USB Interface (KVM Function) section.

❷ Ethernet — Locking RJ45 socket. Remote control port for connecting the unit to Local Area Network (LAN).

❸ Signal Status LEDs — Audio LED lights green when the audio transfer is active. Video LED indicates correct video transmission. RX DETECT LED is green when low speed handshake of the extenders is complete. OPTS/OPTM LINK LED lights when optical link is active.

❹ Menu display — Displays status information and menu operation on the LCD with 2x16 characters. See more information about menu control in Front Panel Menu Concept section.

❺ Menu navigation — Up, down, left, right, enter and escape buttons for menu navigation. See more information about menu control in Front Panel Menu Concept section.

❻ CPU and PSU Status LEDs — CPU live LED blinks to indicate normal operation. +5V and +3.3V LEDs light green when the extender is powered on.

❼ Reset button — Reset button reboots the extender. This is the same as disconnecting from power source and reconnecting again.

Transmitter Frames

Frame type	Part number
MODEX-F15-OPTS-TX	9161 0108
MODEX-F15-OPTM-TX	9161 0110

3.1.2. Receiver

> INFO: The photo below depicts a MODEX-F15-OPTS-RX frame. It is almost identical to a MODEX-F15-OPTM-RX frame with two differences: the 'OPTM' designation and the part number.
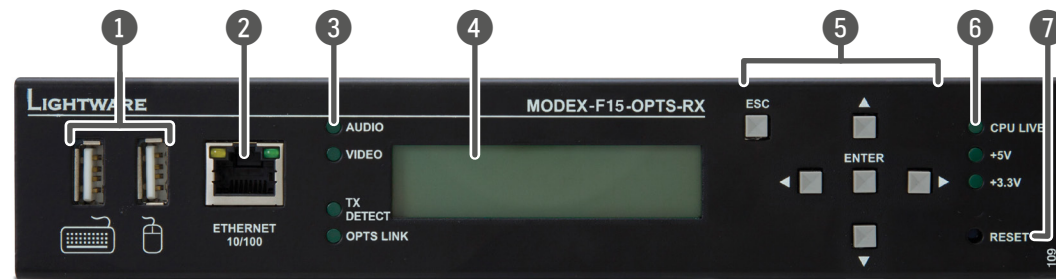
❶ **USB ports**   USB KVM ports for HID-compatible devices (preferably keyboard and mouse). See more information about USB KVM function in USB Interface (KVM Function) section.

❷ **Ethernet**   Locking RJ45 socket. Remote control port for connecting the unit to Local Area Network (LAN).

❸ **Status LEDs**   Audio LED lights green when the audio transfer is active. Video LED indicates correct video transmission. TX DETECT LED is green when low speed handshake of the extenders is complete. OPTS/OPTM LINK LED lights when optical link is active.

❹ **Menu display**   Displays status information and menu operation on the LCD with 2x16 characters. See more information about menu control in Front Panel Menu Concept section.

❺ **Menu navigation**   Up, down, left, right, enter and escape buttons for menu navigation. See more information about menu control in Front Panel Menu Concept section.

❻ **CPU and PSU Status LEDs**   CPU live LED blinks to indicate normal operation. +5V and +3.3V LEDs light green when the extender is powered on.

❼ **Reset button**   Reset button reboots the extender. This is the same as disconnecting from power source and reconnecting again.

Receiver Frames

Frame type	Part number
MODEX-F15-OPTS-RX	9161 0109
MODEX-F15-OPTM-RX	9161 0111

3.2. Rear View

MODEX can be supplied with many kind of interface modules, thus the rear view of the extenders is different. The following example shows the structure of the installed modules.
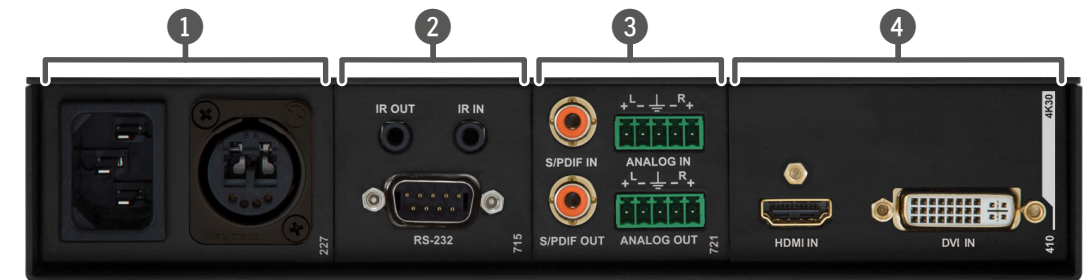
❶ **Media connector**   For the available media connector modules see 3.3 section.

❷ **Interface Module (E)**

❸ **Interface Module (D)**   For the available interface modules see Interface Modules section.

❹ **Video Module (B)**   For the available video modules see Video Modules section.

3.3. Media Connectors

Module code: MODEX-CON-OPTS-EBCJ	
Part nr.	9161 0207
Connector type:	Expanded Beam Junior (HMA) optical connector
Power connector:	IEC power
Fiber type:	Single mode
Extension distance:	10000m

Module code: MODEX-CON-OPTM-EBCJ	
Part nr.	9161 0210
Connector type:	Expanded Beam Junior (HMA) optical connector
Power connector:	IEC power
Fiber type:	Multi mode
Extension distance:	240m

Module code: MODEX-CON-OPTS-EBCM	
Part nr.	9161 0223
Connector type:	Expanded Beam Junior (HMA) optical connector
Power connector:	IEC power
Fiber type:	Single mode
Extension distance:	10000m

Module code: MODEX-CON-OPTM-EBCM	
Part nr.	9161 0226
Connector type:	Expanded Beam Junior (HMA) optical connector
Power connector:	IEC power
Fiber type:	Multi mode
Extension distance:	240m

Module code: MODEX-CON-OPTS-NT	
Part nr.	9161 0227
Connector type:	Neutrik OpticalCON DUO, black
Power connector:	IEC power
Fiber type:	Single mode
Extension distance:	10000m

Module code: MODEX-CON-OPTM-NT	
Part nr.	9161 0228
Connector type:	Neutrik OpticalCON DUO, black
Power connector:	IEC power
Fiber type:	Multi mode
Extension distance:	240m

Module code: MODEX-CON-OPTS-ODVA	
Part nr.	9161 0229
Connector type:	Tyco LC ODVA
Power connector:	IEC power
Fiber type:	Single mode
Extension distance:	10000m

Module code: MODEX-CON-OPTM-ODVA	
Part nr.	9161 0230
Connector type:	Tyco LC ODVA
Power connector:	IEC power
Fiber type:	Multi mode
Extension distance:	240m

Module code: MODEX-CON-OPTS-NT-PCN	
Part nr.	9161 0231
Connector type:	Neutrik OpticalCON DUO, black
Power connector:	Neutrik NAC3MPA-1
Fiber type:	Single mode
Extension distance:	10000m

Module code: MODEX-CON-OPTM-NT-PCN	
Part nr.	9161 0232
Connector type:	Neutrik OpticalCON DUO, black
Power connector:	Neutrik NAC3MPA-1
Fiber type:	Multi mode
Extension distance:	240m

Module code:MODEX-CON-OPTS-HF4	
Part nr.	9161 0233
Connector type:	HF4 (Sommer Cable HICON)
Power connector:	IEC power
Fiber type:	Single mode
Extension distance:	10000m

Module code:MODEX-CON-OPTM-HF4	
Part nr.	9161 0234
Connector type:	HF4 (Sommer Cable HICON)
Power connector:	IEC power
Fiber type:	Multi mode
Extension distance:	240m

Module code: MODEX-CON-OPTS-ST	
Part nr.	9161 0235
Connector type:	ST Fiber 2
Power connector:	IEC power
Fiber type:	Single mode
Extension distance:	10000m

Module code: MODEX-CON-OPTM-ST	
Part nr.	9161 0236
Connector type:	ST Fiber 2
Power connector:	IEC power
Fiber type:	Multi mode
Extension distance:	240m

Module code: MODEX-CON-OPTS-SC	
Part nr.	9161 0237
Connector type:	SC simplex fiber 25G
Power connector:	IEC power
Fiber type:	Single mode
Extension distance:	10000m

Module code: MODEX-CON-OPTM-SC	
Part nr.	9161 0238
Connector type:	SC Fiber
Power connector:	IEC power
Fiber type:	Multi mode
Extension distance:	240m

Module code: MODEX-CON-OPTS-LEMO-TX	
Part nr.	9161 0239
Connector type:	LEMO 3K.93C TX
Power connector:	IEC power
Fiber type:	Single mode
Extension distance:	10000m

Module code: MODEX-CON-OPTS-LEMO-RX	
Part nr.	9161 0240
Connector type:	LEMO 3K.93C RX
Power connector:	IEC power
Fiber type:	Single mode
Extension distance:	10000m

Module code: MODEX-CON-OPTS-NT-BRK-LC	
Part nr.	9161 0241*
Connector type:	Neutrik OpticalCON DUO, black
Fiber type:	Single mode
Extension distance:	10000m

Module code: MODEX-CON-OPTM-NT-BRK-LC	
Part nr.	9161 0242 *
Connector type:	Neutrik OpticalCON DUO, black
Fiber type:	Multi mode
Extension distance:	240m

Module code: MODEX-CON-OPTS-NT-QUAD	
Part nr.	9161 0243
Connector type:	Neutrik NO4FDW-A
Fiber type:	Single mode
Extension distance:	10000m

Module code: MODEX-CON-OPTM-NT-QUAD	
Part nr.	9161 0244
Connector type:	Neutrik NO4FDW-A
Fiber type:	Multi mode
Extension distance:	240m

* „BRK" means the breakout connector. „X" sign means that the LC connector is not connected internally.

3.4. Interface Modules

Module code: MODEX-IF-RS232	
Part nr.	9161 0712
Connector type:	D-SUB 9-pin male
Signal type:	RX/TX bidirectional
Baud rate:	from 4800 to 460800

Module code: MODEX-IF-2xRS232	
Part nr.	9161 0713
Connector type:	D-SUB 9-pin male
Signal type:	RX/TX bidirectional
Baud rate:	from 4800 to 460800

Module code: MODEX-IF-RS232-RS422*	
Part nr.	9161 0714
Connector type:	D-SUB 9-pin male
Signal type:	RX/TX bidirectional
Baud rate:	from 4800 to 460800

*No longer available - discounted module.

Module code: MODEX-IF-RS232-IR	
Part nr.	9161 0715
Connector type	2x3.5 mm TRS connector (1/8" mini-jack)
I/O frequencies	38 kHz/ 38 kHz
Connector type	D-SUB 9-pin male
Signal type	RX/TX bidirectional
Baud rate	from 4800 to 460800
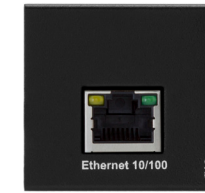
Module code: MODEX-IF-ETH	
Part nr.	9161 0718
Connector type	RJ45 female
Ethernet data rate	10/100Base-T, full duplex with autodetect
Power over Ethernet	Not supported
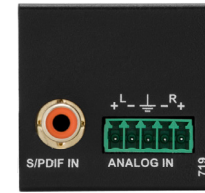
Module code: MODEX-IF-AUDIN	
Part nr.	9161 0719
Connector type	RCA
Audio interface	S/PDIF
Supported audio signal	Digital audio in
Connector type	5-pole Phoenix
Supported audio signal	Analog audio in

Module code: MODEX-IF-AUDOUT	
Part nr.	9161 0720
Connector type	RCA
Audio interface	S/PDIF
Supported audio signal	Digital audio out
Connector type	5-pole Phoenix
Supported audio signal	Analog audio out
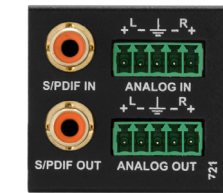
Module code: MODEX-IF-AUD	
Part nr.	9161 0721
Connector type	RCA
Audio interface	S/PDIF
Supported audio signal	Digital audio input,output
Connector type	5-pole Phoenix
Supported audio signal	Analog audio input,output
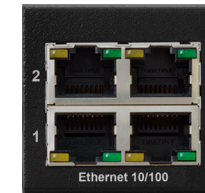
Module code: MODEX-IF-4ETH	
Part nr.	9161 0726
Connector type	RJ45 female
Ethernet data rate	10/100Base-T, full duplex with autodetect
Power over Ethernet	Not supported

3.5. Video Modules

3.5.1. Input Modules
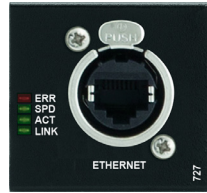
Module code: MODEX-IF-ETH-ECN	
Part nr.	9161 0727
Connector type	Neutrik Ethercon RJ-45 receptacle with latch lock (NE8FBH-S)
Ethernet data rate	10/100Base-T, full duplex with autodetect
Power over Ethernet	Not supported
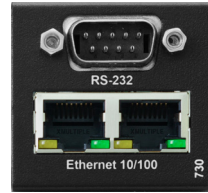
Module code: MODEX-IF-2ETH-RS232	
Part nr.	9161 0730
Connector type	RJ45 female
Ethernet data rate	10/100Base-T, full duplex with autodetect
Power over Ethernet	Not supported
Connector type:	D-SUB 9-pin male
Signal type:	RX/TX bidirectional
Baud rate:	from 4800 to 460800
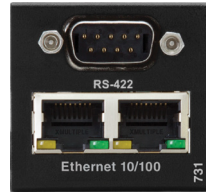
Module code: MODEX-IF-2ETH-RS422*	
Part nr.	9161 0731
Connector type	RJ45 female
Ethernet data rate	10/100Base-T, full duplex with autodetect
Power over Ethernet	Not supported
Connector type:	D-SUB 9-pin male
Signal type:	RX/TX bidirectional
Baud rate:	from 4800 to 460800

*No longer available - discounted module.
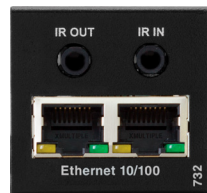
Module code: MODEX-IF-2ETH-IR	
Part nr.	9161 0732
Connector type	2x3.5 mm TRS connector (1/8" mini-jack)
I/O frequencies	38 kHz/ 38 kHz
Connector type	RJ45 female
Ethernet data rate	10/100Base-T, full duplex with autodetect
Power over Ethernet	Not supported
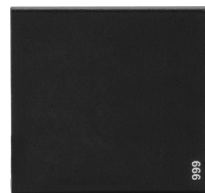
Module code: MODEX-IF-BLANK	
Part nr.	9161 0999

Module code: MODEX-AV-DVIDL-IM	
Part nr.	9161 0401
Connector type	**DVI-D receptacle**
Supp. video formats	DVI 1.0
Max resolution	2560x1600@60Hz, 1920x1200@120Hz
Max pixel clock	165 MHz
Embedded audio	No
Return audio	No
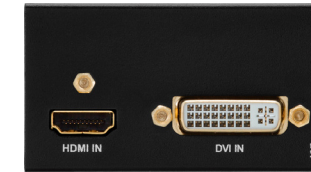
Module code: MODEX-AV-HDMI-DVI-IM	
Part nr.	9161 0407
Connector type	DVI-D receptacle
Supp. video formats	DVI 1.0
Connector type	HDMI receptacle
Supp. video formats	HDMI 1.3a
Max resolution	1920x1200@36 bit, 1600x1200@24 bit
Max pixel clock	225 MHz
Embedded audio	Yes
Return audio	No
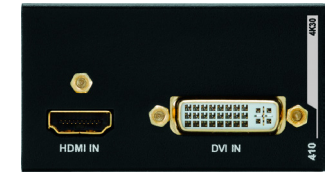
Module code: MODEX-AV-HDMI-DVI-4K-IM	
Part nr.	9161 0410
Connector type	DVI-D receptacle
Supp. video formats	DVI 1.0
Connector type	HDMI receptacle
Supp. video formats	HDMI 1.4
Max resolution	3840x2160@30Hz, 1920x1080p@120Hz
Max pixel clock	300 MHz
Embedded audio	Yes
Return audio	No

Module code: MODEX-AV-DP-IM	
Part nr.	9161 0419
Connector type	Standard DisplayPort gold plated, receptacle
Supp. video formats	DP 1.1a
Max resolution	2560x1600 @ 60Hz, 4096x2160 @ 24Hz
Data rate	Total max. 10.8 Gpbs (1.62/2.7 Gbps/lane)
Embedded audio	Yes

Module code: MODEX-AV-3GSDI-IM*	
Part nr.	9161 0426
Connector type	3xBNC (1x in, 2x loop out) receptacle
Supp. video formats	SD-SDI, HD-SDI, 3G-SDI
Max resolution (3G-SDI Level A)	1920x1080p YCbCr 4:2:2
Max resolution (3G-SDI Level B)	1920x1080p YCbCr 4:2:2
Data rate	Total max 2.97 Gbps
Embedded audio	Yes
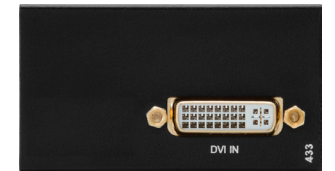
Module code: MODEX-AV-DVI-IM	
Part nr.	9161 0433
Connector type	DVI-D receptacle
Supp. video formats	DVI 1.0, HDMI 1.3a
Max resolution	1920x1200@ 36 bit 1600x1200@ 24 bit
Max pixel clock	225 MHz
Embedded audio	No

*No longer available - discounted module.
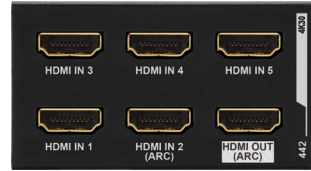
Module code: MODEX-AV-5HDMI-4K-IM-LH	
Part nr.	9161 0442
Connector type	HDMI receptacle
Supp. video formats	DVI 1.0, HDMI 1.4
Max resolution	3840x2160@30Hz, 1920x1080p@120Hz
Max pixel clock	300 MHz
Embedded audio	Yes
Return audio	Yes

Module code: MODEX-AV-2HDMI-4K-IM-LH	
Part nr.	9161 0443
Connector type	HDMI receptacle
Supp. video formats	DVI 1.0, HDMI 1.4
Max resolution	3840x2160@30Hz, 1920x1080p@120Hz
Max pixel clock	300 MHz
Embedded audio	Yes
Return audio	Yes

Module code: MODEX-AV-BLANK	
Part nr.	9161 0699
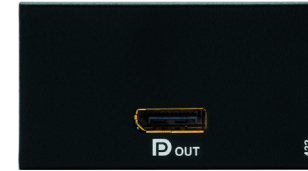
Module code: MODEX-AV-DP-OM	
Part nr.	9161 0422
Connector type	Standard DisplayPort gold plated, receptacle
Supp. video formats	DP 1.1a
Max resolution	2560x1600 @ 60Hz
Data rate	Total max. 10.8 Gpbs (1.62/2.7 Gbps/lane)
Embedded audio	Yes
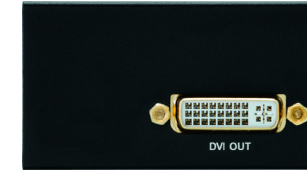
Module code: MODEX-AV-DVI-OM*	
Part nr.	9161 0430
Connector type	DVI-D receptacle
Supp. video formats	DVI 1.0, HDMI 1.3a
Max resolution	1920x1200@ 36 bit 1600x1200@ 24 bit
Data rate	Total max 6.75 Gbps
Embedded audio	Yes
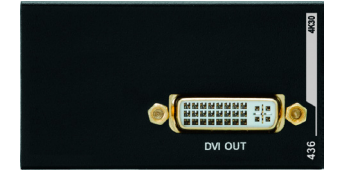
Module code: MODEX-AV-DVI-4K-OM	
Part nr.	9161 0436
Connector type	DVI-D receptacle
Supp. video formats	DVI 1.0, HDMI 1.4
Max resolution	1920x1080p@120Hz, 24 bit 3840x2160@30Hz, 24 bit
Max pixel clock	300 MHz
Embedded audio	Yes

*No longer available - discounted module.

3.5.2. Output Modules

Module code: MODEX-AV-DVIDL-OM	
Part nr.	9161 0404
Connector type	DVI-D receptacle
Supp. video formats	DVI 1.0
Max resolution	2560x1600@60Hz 1920x1200@120Hz
Max pixel clock	165 MHz
Embedded audio	No
Return audio	No

Module code: MODEX-AV-HDMI-OM*	
Part nr.	9161 0413
Connector type	HDMI receptacle
Supp. video formats	DVI 1.0, HDMI 1.3a
Max resolution	1920x1200@36 bit 1600x1200@24 bit
Max pixel clock	225 MHz
Embedded audio	Yes
Return audio	No

Module code: MODEX-AV-HDMI-4K-OM	
Part nr.	9161 0416
Connector type	HDMI receptacle
Supp. video formats	DVI 1.0, HDMI 1.4
Max resolution	1600x1200@60Hz 1920x1080p@120Hz
Max pixel clock	225 MHz
Embedded audio	Yes
Return audio	No

*No longer available - discounted module.
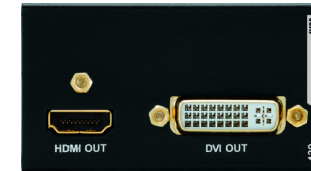
Module code: MODEX-AV-HDMI-DVI-4K-OM	
Part nr.	9161 0439
Connector type	DVI-D receptacle
Supp. video formats	DVI 1.0
Connector type	HDMI receptacle
Supp. video formats	HDMI 1.4
Max resolution	3840x2160@30Hz, 1920x1080p@120Hz
Max pixel clock	300 MHz
Embedded audio	Yes
Return audio	No
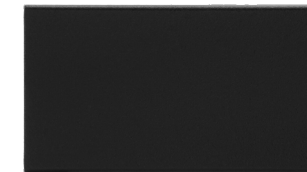
Module code: MODEX-AV-BLANK	
Part nr.	9161 0699

3.6. Electrical Connections

3.6.1. HDMI Connector

Certain video Modules of MODEX transmitter and receiver provide standard 19 pole HDMI connectors for inputs and outputs. Always use high quality HDMI cable for connecting sources and displays.

3.6.2. DVI Connector

29-pole DVI-I connectors, however internally connected pins vary by interface types. This way, user can plug in any DVI connector, but keep in mind that analog signals (such as VGA or RGBHV) are currently not processed – planned for future developments.

Always use high quality DVI cable for connecting sources and displays. Pay attention to the DVI cable, if dual link signal is to be sent, use only dual link capable DVI cables.

3.6.3. DisplayPort Connector

Certain video Modules of MODEX transmitter and receiver provide standard 20-pole DisplayPort connectors for inputs and outputs. Always use high quality DP cable for connecting sources and displays.

3.6.4. BNC Connectors

Standard BNC receptacle is used for SD/HD/3G-SDI input and outputs.

Recommended coax cable type: Belden 1694A

3.6.5. S/PDIF Connector

Certain interface Modules of MODEX devices provide standard RCA receptacles for digital coaxial audio outputs.

ATTENTION! Plugs and sockets on consumer equipment are conventionally color-coded by CEA/CEDIA-863-B (ANSI) to aid correct connections. According to the standard Lightware uses orange colored RCA connectors for S/PDIF signals.

3.6.6. Analog Stereo Audio (Balanced)

5-pole Phoenix connector is used for balanced analog audio. The connector is used on certain interface Modules as a configurable input or output. Always check if this connector is configured as an output or input to prevent connecting two outputs.

Unbalanced audio signals can be connected as well. For unbalanced output, connect only + and ground. For unbalanced input connect + and ground to the source and connect – to the ground.
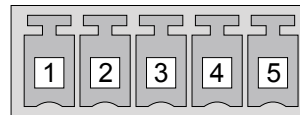
Pin nr.	Signal
1	Left+
2	Left-
3	Ground
4	Right-
5	Right+
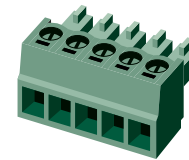
Analog audio connector and plug pin assignments

Compatible plug type

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

You can find more information about audio interface in 3.9 Also see Audio Cable Wiring Guide section.

3.6.7. RS-232 / RS-422 Connector

Certain interface Modules of MODEX devices contain RS-232 / RS-422 port which can be connected by an industry standard 9 pole D-sub female connector.
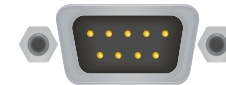
ATTENTION! The serial connection standard of the port is pre-defined and not changeable by the user. User must choose one of the standards (RS-232 or RS-422) before ordering the device.

Pin nr.	RS-232 pin-out	RS-422 pin-out
1	Not connected	RX- data receive complement
2	TX data transmit (output)	RX+ data receive true
3	RX data receive (input)	TX+ data transmit true
4	DTR (Internally connected to Pin 6)	TX- data transmit complement
5	GND signal ground (shield)	GND signal ground (shield)
6	DSR (Internally connected to Pin 4)	DSR (Internally connected to Pin 4)
7	RTS (Internally connected to Pin 8)	RTS (Internally connected to Pin 8)
8	CTS (Internally connected to Pin 7)	CTS (Internally connected to Pin 7)
9	Not connected	Not connected

You can find more information about RS-232 interface in 3.13.1

3.6.8. Ethernet Connector (LAN Port)

The MODEX transmitter and receiver devices provide standard RJ45 connectors for LAN port. Always use high quality Ethernet cable.
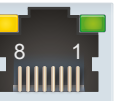
Wiring LAN Cables

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

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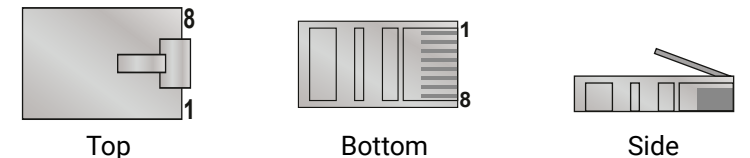
Pin	TIA/EIA T568 A	Color and name	TIA/EIA T568 B	Color and name
1		white/green stripe		white/orange stripe
2		green solid		orange solid
3		white/orange stripe		white/green stripe
4		blue solid		blue solid
5		white/blue stripe		white/blue stripe
6		orange solid		green solid
7		white/brown stripe		white/brown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

3.6.9. IR Connector

IR detector and IR emitter can be connected to the receiver 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:

1 2 3		1 2-3	
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 3.13.2

3.6.10. USB Connector

MODEX extenders provide USB connectors for supporting KVM functionality. The transmitter has 1x USB 2.0 B-type connector and the receiver has 2x USB 2.0 A-type connectors.

You can find more information about USB KVM function in 3.12.

3.6.11. Fiber Optical Connectors

MODEX can be ordered with various types of standard fiber optical connectors.

ST receptacle

SC receptacle

Neutrik opticalCON DUO receptacle
with 2x LC connector
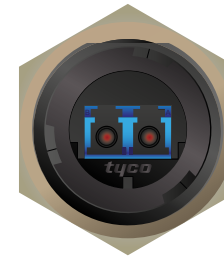
Tyco LC ODVA receptacle
with 2x LC connector
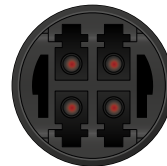
HF4 (Sommer Cable HICON)
receptacle with 4x LC connector

Neutrik opticalCON QUAD
receptacle with 4x LC connector
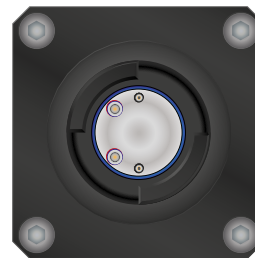
Expanded Beam
Junior receptacle
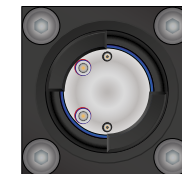
Expanded Beam
Mini receptacle
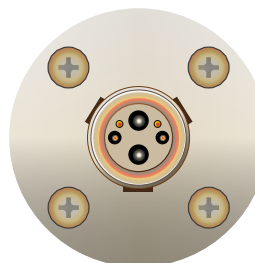
LEMO 3K.93C plug

LEMO 3K.93C socket

Neutrik opticalCON connector (NO2-4FDW type LC duplex) and LC ODVA connector have two fiber channels, channel A and channel B. Only one channel is used (from channel A on transmitter to channel B on receiver). The copper pins of the Neutrik connector are not in use.

3.6.12. Neutrik Power Connector

Certain MODEX media connectors are assembled with special Neutrik power connector, NAC3MPA-1 (Power In). It ensures a very rugged solution in combination with a locking device in order to guarantee a safe power connection.

ATTENTION! PowerCON is a connector without breaking capacity; it should not be connected or disconnected under load or live!

After plugging it in, turn the plug clockwise. To disconnect, first pull the latch backward, turn the plug counterclockwise and unplug the connector.
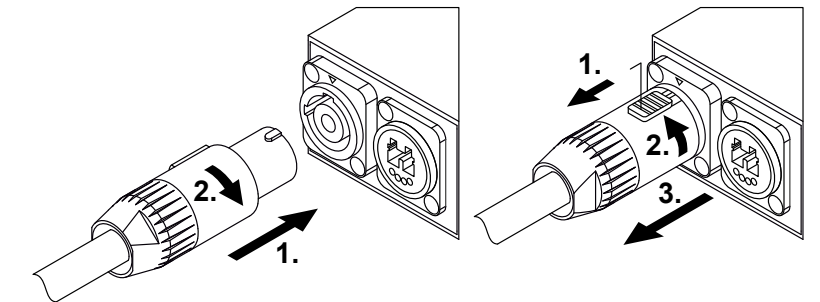
Locking and unlocking Neutrik power connector

Supplied Power Cable

The cable is assembled with NAC3FCA Neutrik power connector (Power In) with white chuck that fits for thin cables (diameter between 6.0 and 11.0 mm). A black-colored chuck is also supplied that fits for thick cables (diameter between 9.5 and 15.0 mm).

Assembling

> **ATTENTION!** Cable assembling can be done only by qualified person!

If the cable needs to be replaced, the following steps help when assembling:

Step 1. Put bushing and chuck onto the cable.

Step 2. Prepare the cable.

Step 3. Insert the wire into the terminals and fasten the clamping device by a flat screw driver.

Step 4. Push insert and chuck into housing (pay attention to the guiding keyway!)

Step 5. Fasten bushing by means of a fork wrench 3/4", min. Torque 2.5 Nm.
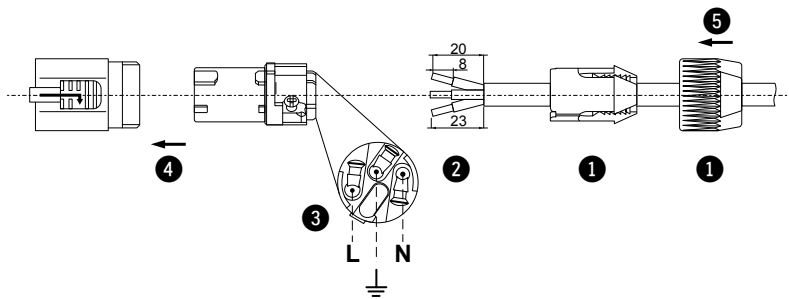
Neutrik power connector assembling

For more information about powering on procedure see section.

3.7. Modular Extender Concept

MODEX extender family is a multifunctional modular transmitter and receiver pair with fiber optical connectivity. MODEX extenders are able to transmit and receive AV signals in many type of interface. The device can be controlled by LAN, serial or Infrared connection depending on the installed interface modules.

> INFO: Depending on the installed video and interface modules, MODEX extenders can support a video variety of AV signals.

Transmitter Interfaces Summary

INPUT	OUTPUT
HDMI / DVI-D / DP	OPTS / OPTM
Analog / Digital audio	HDMI
Ethernet	Analog / Digital audio
RS-232 / RS-422	Ethernet
Infrared	RS-232 / RS-422
USB	Infrared

Receiver Interfaces Summary

INPUT	OUTPUT
OPTS / OPTM	HDMI / DVI-D / DP
Analog / Digital audio	Analog / Digital audio
Ethernet	Ethernet
RS-232 / RS-422	RS-232 / RS-422
Infrared	Infrared
	USB

3.8. Optical Interface

MODEX extenders support single- or multimode fiber optical interface to transmit or receive digital video, analog or digital audio, RS-232 / RS-422, Ethernet, USB, and Infrared signals.

Maximum fiber cable extension distances supported can be found in section.

3.9. Audio Interface

3.9.1. Audio Inputs and Modes

The MODEX transmitter can receive audio signal from three types of sources (depending on the installed interface module):

- ▪ Embedded (DisplayPort or HDMI and/or DVI-D),
- ▪ Digital unbalanced stereo audio sources (S/PDIF),
- ▪ Analog balanced stereo audio sources (5-pole Phoenix).

The audio coming from the digital or analog inputs can be assigned to any video input. The gain levels of the audio input and the volume of the audio output ports are adjustable.

Audio Embedding – Allowed Connections

When the desired video signal is selected, the audio of the transmitted signal can be:

- ▪ The audio of the original signal, or
- ▪ The digital audio signal, or
- ▪ The analog audio signal.

> INFO: The audio of a HDMI input can be embedded only in the original video stream. The audio of HDMI2 input cannot be mixed with the video of HDMI1 input and vice versa.

3.9.2. Audio Outputs and Modes

The MODEX receiver can receive audio signal from three type of sources:

- ▪ Embedded (OPTS / OPTM),
- ▪ Digital balanced stereo audio sources (S/PDIF),
- ▪ Analog balanced stereo audio sources (5-pole Phoenix).

Audio De-embedding

The MODEX receiver has built-in audio de-embedder which means the device is able to receive HDMI / DVI-D / DP signal with embedded audio via the fiber optical line and can separate to video and audio signals on the output side.

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

3.9.3. Crosspoint Modes

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

- Using the LCD menu by pressing the navigation buttons (see 4.5);
- Using the Lightware Device Controller (LDC) (see The Layout of the Crosspoint Menu section);
- Sending LW3 protocol commands (see Video Port and Crosspoint Settings section), or
- Using the **Autoselect** function, see 3.11

3.9.4. Audio Options - Example

> **ATTENTION!** The following drawing is a random example and may not cover all capabilities. The received and transmitted signals depend on the configuration of your MODEX device.
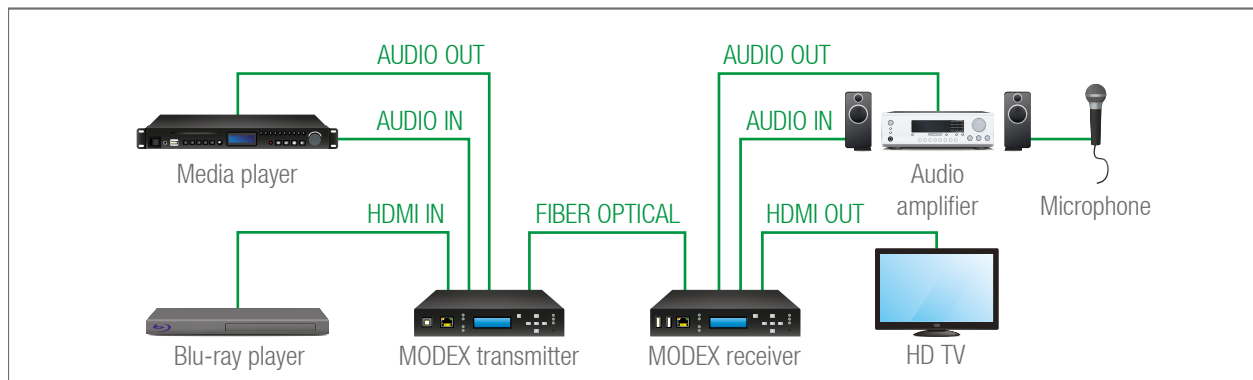
The Concept

Two sources are connected to the MODEX transmitter: a Blu-ray player which sends video and embedded audio signals on HDMI; and a media player which sends audio signals to or receives audio signals from the transmitter. The MODEX receiver accepts the signal on the OPTS/OPTM line. On the MODEX receiver side there are two sinks: an audio amplifier that can accept and send analog audio and a HD TV that can accept digital audio signal. A microphone is also connected to the audio amplifier. The transmitted audio signal depends on the settings of the transmitter and receiver sides.

Three options are available for the audio module both on the RX and TX side:

- **Analog**: only analog audio signal will be transmitted.
- **Digital**: only digital audio signal will be transmitted.
- **Mixed**: both analog and digital audio signals can be transmitted, see available connections in the next section.

The following scenarios are supported for the audio presentation:

- Digital audio signal from the **Blu-ray player** is transmitted to the digital sink device (**HD TV**) and analog audio signal from the **Media player** is transmitted to the analog sink device (**Audio amplifier**) through the fiber optical line.
- Digital audio signal from the **Blu-ray player** is transmitted to the analog sink device (**Audio amplifier**) and analog audio signal from the **Media player** is transmitted to the digital sink device (**HD TV**).

- Analog audio signal from the **Media player** is transmitted both to the analog and digital sink devices (**Audio amplifier** and **HD TV**).
- Digital audio signal from the **Blu-ray player** is transmitted both to the analog and digital sink devices (**Audio amplifier** and **HD TV**).
- Digital audio signal from the **Microphone** is transmitted to the **Media player** as a "reverse direction" through the fiber optical line.

3.9.5. Mixed Audio Mode

The mixed audio mode allows to embed and de-embed analog and digital audio signals as well but the available connections in the crosspoint are limited. Compared with the analog and digital audio modes the crosspoint possibilities are the same so there is no transition between the analog and digital inputs and outputs in the case of analog/digital audio interface modules.

Affected Interface Modules:

- MODEX-IF-AUDIN
- MODEX-IF-AUDOUT
- MODEX-IF-AUD

The following drawing shows all audio layers in the MODEX transmitter and receiver:
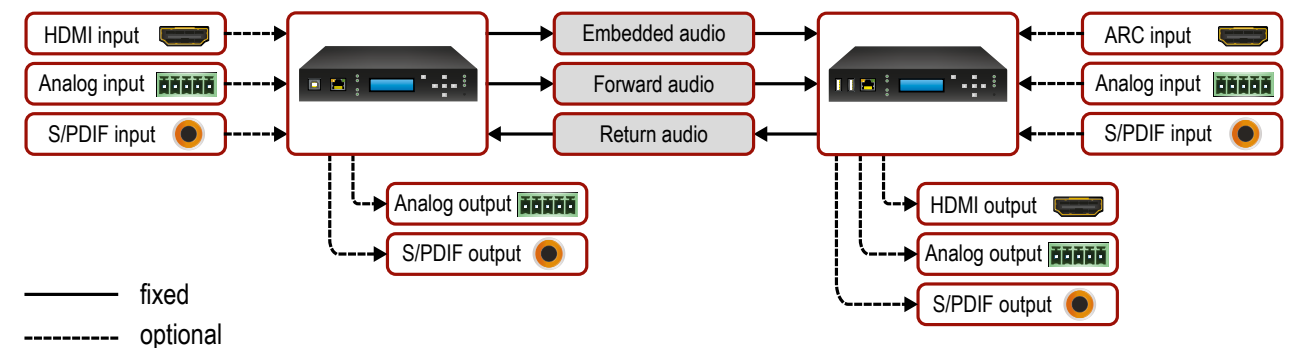
Audio Layers

The three audio layers, between the transmitter and the receiver are defined and fixed, always extended. The other audio inputs and outputs are optional and depend on the installed interface modules; the available crosspoint settings depend on the application mode set in the properties of the audio module.

Available Connections

Transmitter				
Input ports				**Output ports**
HDMI / DP	Return audio	S/PDIF input	Analog input	
✔	-	-	✔	Embedded audio
✔	-	✔	-	Forward audio
✔	✔	✔	-	S/PDIF output
✔	-	-	✔	Analog output

Receiver					
Input ports					**Output ports**
Embedded audio	Forward audio	ARC input	S/PDIF input	Analog input	
-	-	✔	✔	-	Return audio
✔	✔	✔	✔	✔	HDMI / DP
-	✔	✔	✔	-	S/PDIF output
✔	-	-	-	✔	Analog output

3.10. Video Interface

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

- Using the LCD menu by pressing the navigation buttons (see 4.5);
- Using the Lightware Device Controller (LDC) (see 6.4);
- Sending LW3 protocol commands (see Video Port and Crosspoint Settings section), or
- Using the **Autoselect** function, see 3.11

3.10.1. Video Inputs in MODEX Transmitters

The MODEX transmitter can receive video signal from three types of sources (depending on the installed video module):

- DVI-D
- HDMI
- DisplayPort

3.10.2. Video Outputs in MODEX Receivers

The MODEX receiver can output video signal three interfaces (depending on the installed video module):

- DVI-D
- HDMI
- DisplayPort

3.11. The Autoselect Feature

Besides manual crosspoint selection you can choose the Autoselect option for both audio and video ports.

There are three types of Autoselect as follows.

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

INFO: The input ports where the priority is set to 31 will not be scanned
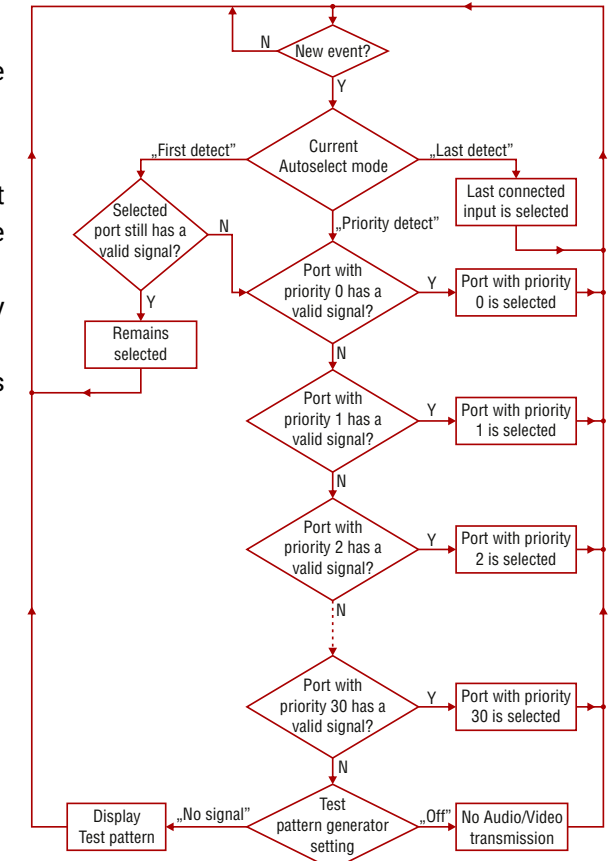
Flowchart of Autoselection Modes

Automatic Input Selection - Example
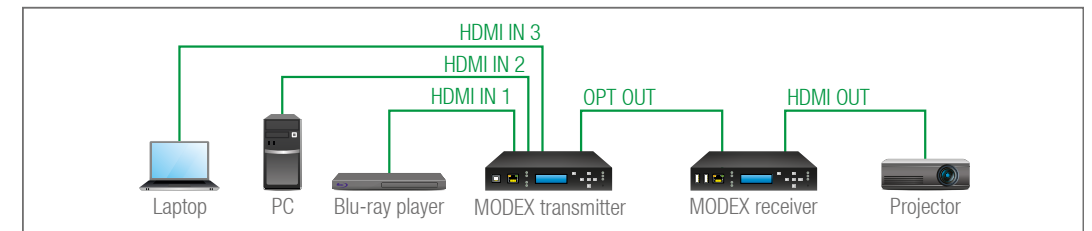
The Concept

If no other source but the laptop is connected to the transmitter, HDMI IN 3 input will be automatically switched to the OPT output. If the Laptop and the PC are also connected to the transmitter, HDMI IN 2 input will be switched to the OPT output. If the Blu-ray player is connected on the HDMI IN 1 input of the transmitter, it will be switched to the OPT output – regardless of the presence of other video signals.

Settings for the Transmitter

- **OPTS / OPTM output**: Set the Autoselect to **Enabled**. The Autoselect mode is Priority detect. The priorities are the followings:

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

Priorities can be set in the Lightware Device Controller software, see 6.5.1 section for the transmitter and 6.5.2 section for the receiver.

3.12. USB Interface (KVM Function)

MODEX extenders support HID-compliant (Human Interface Device) devices to transmit USB signal between the source and sink devices. The MODEX transmitter connects to the controlled device (e.g. PC) and the controlling devices (e.g. computer mouse, keyboard, touch panel) are connected to the MODEX receiver.

ATTENTION! Only HID-compliant devices are supported by the extenders. Non-HID devices (USB sticks, webcams, etc.) will not be working with the MODEX devices.

ATTENTION! USB HUB devices are not supported by the MODEX extenders.

USB KVM function can be used in two different modes: **Transparent** and **Composite mode**. The following sections show the difference between the two modes:

Transparent Mode

Transparent mode is a simple USB data transmission between the extenders. The same data is transmitted on the RX side which is received on the TX side. The content of the transmitted packets are unknown to the Lightware infrastructure so the data is not modified by any means during transmission.

Key Features:

- Supports all HID-compliant devices.
- Driver software for all connected USB devices has to be installed on the controlled computer. When you switch a crosspoint between two sources, the connected mouse and keyboard will be detected as a new hardware in the operating system.
- During normal operation any switching (more generally, any interruption in the signal path) results in the ejection and re-enumeration of the USB device.

Composite Mode

The composite mode is an advanced data transmission method, recommended for most users. MODEX devices use their own data packets during data transmission. Thus, the content of the transmitted packets is known to the Lightware infrastructure.

Key Features:

- Supports the following HID-compliant devices: computer mouse, keyboard built with at most 107 keys and/or specific multimedia keys.
- No driver software is required for the connected devices. The operating system uses the driver of the MODEX to establish the connection for the USB devices.
- During normal operation any interruption in the signal path does not results in the ejection and re-enumeration of the USB device. Thus, the computer will not be aware of any switching in the matrix.

INFO: You can find the related settings for Lightware Device Controller software 6.8

USB KVM Function - Example
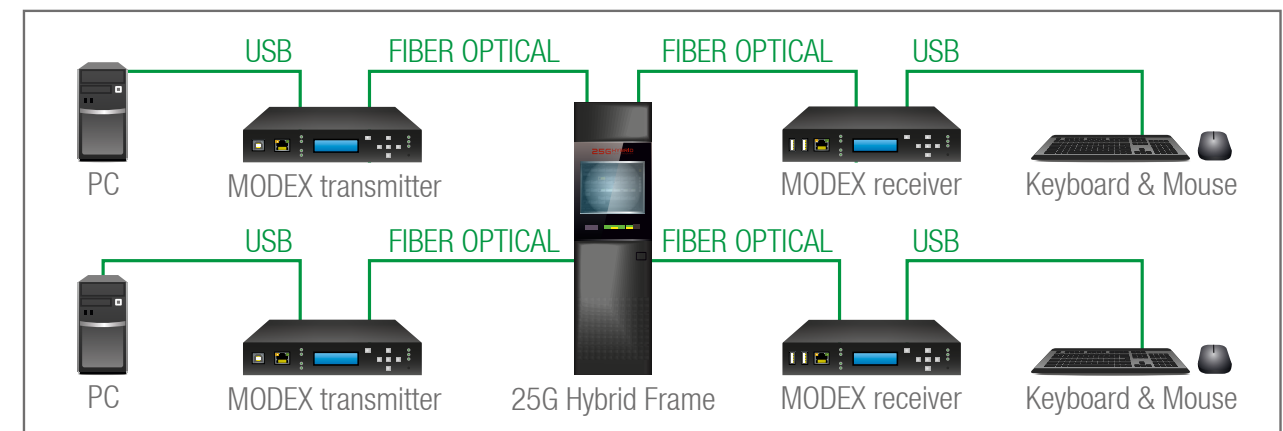
The Concept

Two computers connect to the 25G Hybrid Frame via MODEX transmitters. The PCs are the sink devices for the USB KVM function. The MODEX receivers are connected to the output board of the matrix via fiber optical cables. The keyboards and the mice are connected to the receivers at the end user side.

Composite USB mode is recommended for most users when switching in the matrix is done frequently. The advantages of this mode are:

- No driver installation is needed for the connected USB HID devices;
- The keyboard and mouse can be used immediately after input switching (there is no device re-enumeration procedure in the operating system).

Transparent USB mode is recommended for that users who want to use special USB HID devices with specific buttons and/or do not switch between A/V input sources frequently. The advantages of this mode are:

- There is no restriction on the USB-HID devices if the driver is installed on the connected computer the USB KVM signal is transmitted to the receiver without any limitation.

3.13. Controlling Features

The control interfaces of MODEX devices can be used to install both the transmitter and the receiver at various points in a complex A/V system. This section presents the various type of control interfaces and their working modes.

ATTENTION! The presence of the following interfaces and features depends on the installed interface card in your MODEX device.

3.13.1. Serial Interface

Technical Background

In crosspoint view every serial port appears as an input and an output. It means that Tx data channel of the port is an input and Rx data channel is an output – within one port.

All serial input data are transmitted to the remote device all the time. Thus, the link does not appear as an output as it appears in video or in audio crosspoint. The input port with a link icon symbolizes the input of the remote side. The serial source switched to the local output can be selected on the local device.

The number of the available ports in a unit is determined as follows:

- Number of inputs = Number of the ports [local unit] + Number of the ports [remote unit]
- Number of outputs = Number of the ports [local unit]

If an input is switched to an output, and both the input and the output belongs to the same serial port connector, the result is an internal loopback. This way the serial link can be tested between the source device and the MODEX.
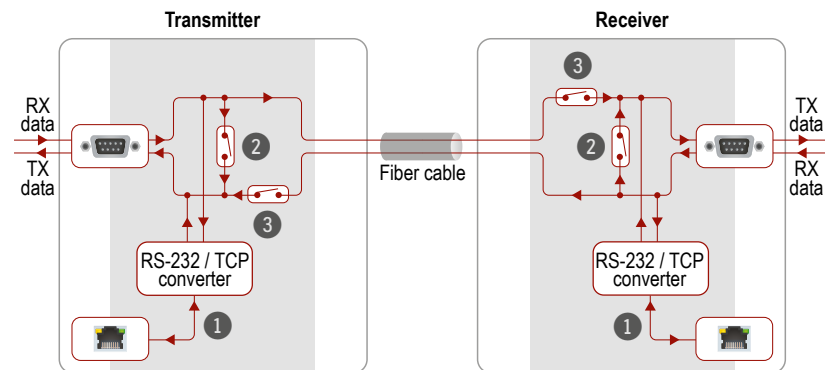
Serial port diagram

① **Command Injection**   ② **Loopback**   ③ **Extended data**

Command Injection - Signal Path
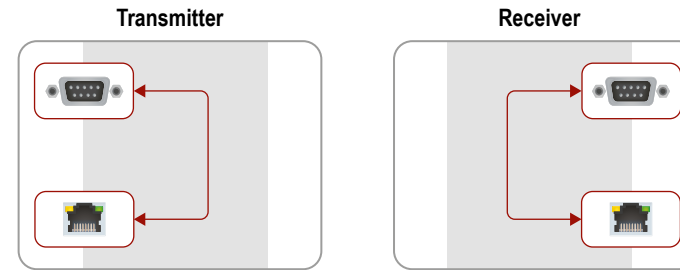
Signal transmission between local Tx/Rx pins and local IP port

Loopback - Signal Path

Signal transmission between local Tx and Rx pins

Extended Data - Signal Path
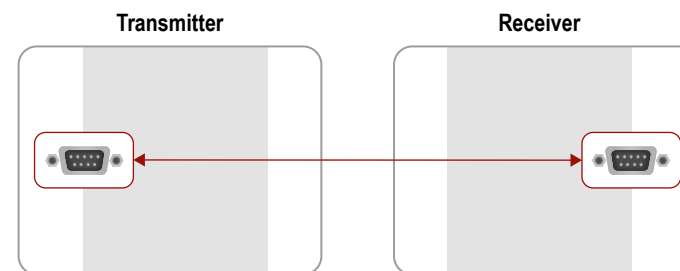
Signal transmission between local and remote devices

ATTENTION! To have a bidirectional connection the link must be enabled in both extenders.

INFO: The working method is similar when more RS-232 ports are assembled in the MODEX, e.g. 2 pieces of MODEX-IF-2xRS232 interface modules (with 2 x 2 pcs. RS-232 ports). But in that case the number of the signal path is multiplied.

INFO: You can find the related settings for Lightware Device Controller software 6.6 section.

3.13.2. Infrared Interface

Technical Background

All infrared input data are transmitted to the remote device all the time. Thus, the link does not appear as an output as it appears in the video or in the audio crosspoint. The input port with a link icon symbolizes the input of the remote side.

The number of the available ports in a unit is determined as follows:

- Number of inputs = Number of inputs [local unit] + Number of inputs [remote unit]
- Number of outputs = Number of outputs [local unit]

ATTENTION! The selection should be done on the local device whose infra source have to be output on a local infra port.
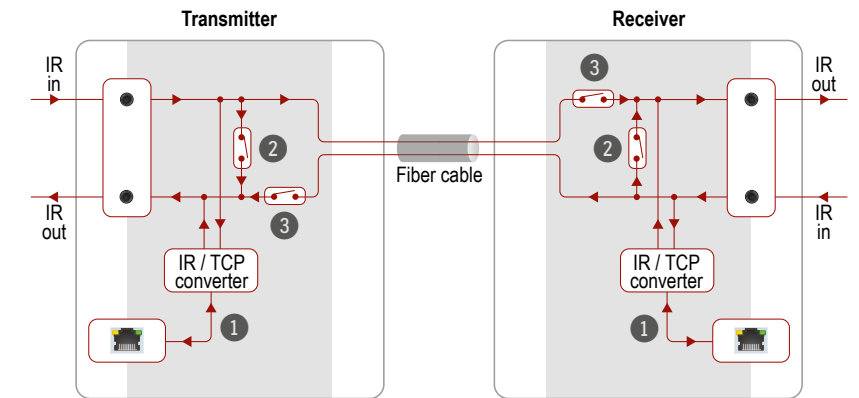
IR port diagram

① **Command Injection**   ② **Loopback**   ③ **Extended data**

Command Injection - Signal Path
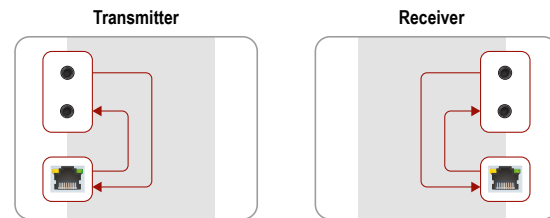
Signal transmission between local IR input/IR output ports and local IP port

Loopback - Signal Path
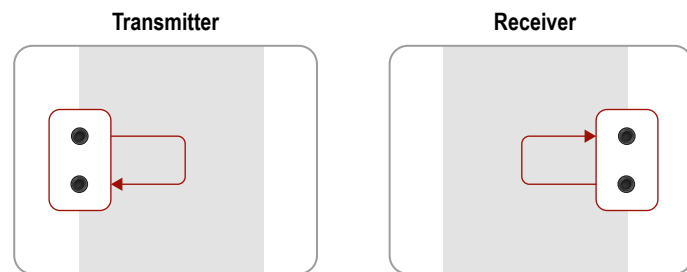
Signal transmission between local IR input and local IR output ports

Extended Data - Signal Path
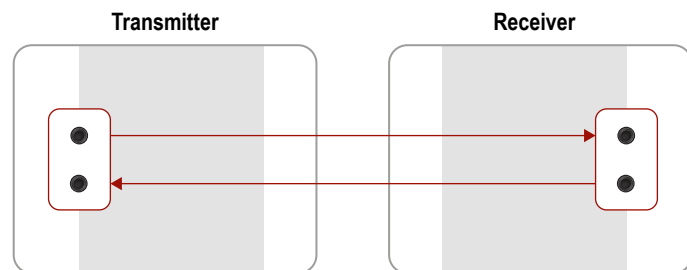
Signal transmission between local and remote devices

INFO: The working method is similar when more IR input and output ports are assembled in the MODEX, e.g. 2 pieces of MODEX-IF-RS232-IR interface modules (with 2 pcs. IR input and 2 pcs. IR output). But in that case the number of the signal path is multiplied.

INFO: You can find the related settings for Lightware Device Controller software 6.7

3.14. Further Built-in Features

3.14.1. Automatically Launched Actions - The Event Manager

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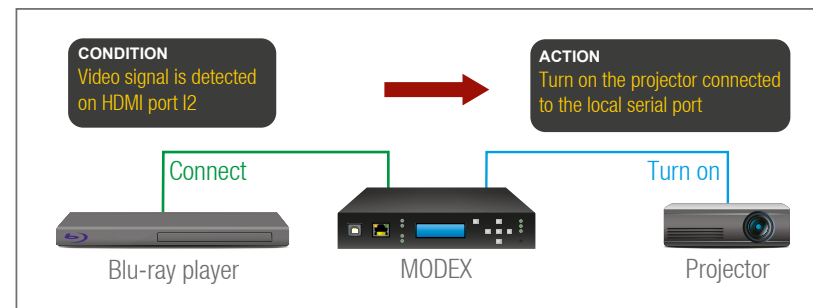
Event Manager example

See more information about the settings 6.11

3.14.2. Advanced EDID Management

Factory Preset EDIDs

The factory EDIDs are factory preprogrammed and cannot be modified. These describe the most common video 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-F136).
- **Dynamic EDID** list shows the display device connected to the outputs of the device. The unit stores EDID of the last device connected to an 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 – U31) can be used to save custom EDIDs.

- **Emulated EDID** list shows the currently emulated EDID for the inputs. The source column displays the memory location that the current EDID was routed from.

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

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

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

See more information about the settings 6.9

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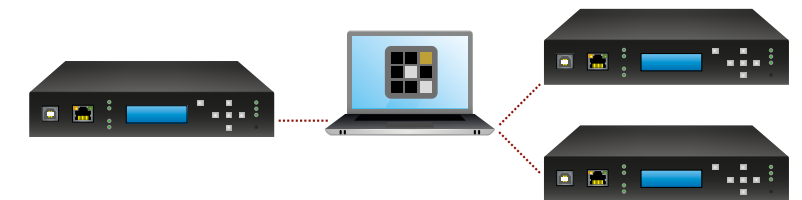
The transmitter and receiver (configuration) cloning of MODEX devices is a simple method that eliminates the need to repeatedly configure certain devices to have identical (non-factory) settings. If more devices are installed in the same type of system then it is enough to set up only one device to fit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

See more information about the settings 6.13

4

Operation

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

▶ Powering On
▶ Front Panel Menu Concept
▶ Status Menu
▶ Link Status Menu
▶ Crosspoint Settings Menu
▶ Port Status & Settings Menu
▶ EDID Settings Menu
▶ Network Settings Menu
▶ Device Presets Menu
▶ Maintenance Menu

4.1. Powering On

Connect the power cord to the device's IEC C14 standard power input connector. The device is immediately powered ON when the power cord is connected to the AC source. If the self-test is finished the last configuration is reloaded and the appliance is ready to use.

INFO: After switching ON, the router reloads the latest settings that were used before it was turned off. The device has an internal emergency memory that stores all current settings and tie configurations. This memory is independent from presets and invisible for the user. This built-in feature helps the system to be ready immediately in case of power failure or accidental power down.

4.2. Front Panel Menu Concept

The extenders have LCD menu and navigation buttons on the front panel. These can be used to change basic settings or display different information about the Modules.

Navigation

Button		Function
▲	(up)	Toggle between menu items
▼	(down)	
◀	(left)	Move the cursor or step back to previous menu
▶	(right)	Move the cursor
◆	(enter)	Execute changes or enter submenu
●	(escape)	Step back to previous menu

Front panel LCD has 2 lines and 16 characters in each line. The name of the menu item is always displayed in the first line. If no button is pressed for 5 minutes, LCD returns to its idle state and Device information is shown.

Idle State

If no button is pressed for 5 minutes or the user navigates out from the menu by the **Escape ●** and/or the **Left ◀** button, LCD gets into idle state. Front panel menu displays the following information in idle state:

```
MEX-108-***-410-
192.168.0.101
```

Device label and IP address.

Properties of the incoming video signal (V) and the audio signal (A) that is embedded to the video.

LCD Menu Structure

LCD menu
- **Status**
  - Modules
  - Firmware
  - Voltages
  - Temperature & Fan
  - Operation time
- **Link Status**
  - Link up time
  - Link quality
  - Remote link quality
  - Link errors
  - Remote link errors
  - Reset counters
- **Crosspoint settings**
  - Video crosspoint
  - Audio crosspoint
- **Port status & settings**
  - Video ports
  - Audio ports
  - Serial ports
  - IR ports
  - USB K&M ports
  - Ethernet ports
- **EDID settings**
  - Switch
  - View
- **Network settings**
  - DHCP
  - Static IP address
  - Subnet mask
  - Gateway
  - Apply settings
- **Device Presets**
  - Run Preset
  - Save Preset
  - Delete Preset
- **Maintenance**
  - Factory defaults
  - Reset
  - Enter bootload

4.3. Status Menu

Status menu has five submenus, you can navigate between them by pressing **Up ▲** and **Down ▼** buttons and select them by pressing **Enter ◆**.

Modules

This submenu shows the main information about the device and installed modules. Entering modules lists all available hardware modules including input/output cards, interface cards and the MODEX frame.

```
◄Modules
 ▾MODEX-F15-OPT►
```

The following information is available for each modules: part number (P/N), serial number (S/N), and hardware revision (HW).

```
◄MODEX-F15-OPTS
 ↕S/N: 6A083595
```

Firmware

This submenu shows the following firmware versions of the device: CPU, FPGA, ASIC, Built-in Web, and Video firmware. The details about firmware upgrade procedure see 8

```
◄CPU Firmware:
 2.1.0b7 r25
```

Voltages

User can check the recent 5V voltage level of the device. Beside the voltage value a status indicator is also displayed that the recent level is OK or not. Value can be refreshed by pressing the **Up ▲** or **Down ▼** buttons.

```
◄5V Level:      ▲
 5.43V (OK)
```

Temperature & Fan

User can check the recent temperature of the CPU. Beside the voltage value a status indicator is also displayed that the recent level is OK or not. Value can be refreshed by pressing the **Up ▲** or **Down ▼** buttons.

```
◄CPU temp.:     ▲
 57.37C (OK)
```

Operation Time

This submenu shows the operation time of the device. The following information is available: device up time, total time, high temperature time.

```
◄Up time:       ▾
 7d 02h 15m 59s
```

4.4. Link Status Menu

Link status menu has five submenus, you can navigate between them by pressing **Up ▲** and **Down ▼** buttons and select them by pressing **Enter ◆**.

Link Up Time

This submenu shows the up time of the transmitted/received signal.

```
◄Link up time: ▾
 0d 00h 04m 46s
```

Link Quality

It shows the quality of the optical link of your device. The value can be 0 to 8, 0 means no connection established between the transmitter and the receiver, 8 is the excellent link quality.

```
◄Link quality: ↕
 8
```

Remote Link Quality

It shows the quality of the optical link of the device which your device is connected to. Meanings of the displayed value is the same as described at the Link quality section.

```
◄Remote link q…↕
 8
```

Link Errors

It shows the number of errors on the channel(s) of the optical link of your device.

```
◄Link errors:  ↕
 Ch0:2
```

Remote Link Errors

It shows the number of errors on the channel(s) of the optical link of the device which your device is connected to.

```
◄Remote link e…↕
 Ch0:0:Ch1:0
```

Reset Counters

You can reset all counters by selecting this submenu. Select it by pressing **Enter ◆** button and approve it with **Enter ◆** or cancel it with **Escape ●**.

```
Reset counters?
Enter:Yes Esc:No
```

4.5. Crosspoint Settings Menu

Audio and video crosspoint settings are available in this menu. The following simple operations can be done here:

- Input/output switching,
- Port autoselect settings (see more details i3.11 section),
- Port locking/unlocking,
- Port muting/unmuting,
- Port disconnecting/reconnecting.

```
◄Crosspoint set…
 ▾Video crosspo►
```

```
◄Crosspoint set…
 ▴Audio crosspo►
```

4.6. Port Status & Settings Menu

Audio, video, and interface control ports settings are available in this menu.

4.6.1. Video Ports

Common Settings

You can set the **Hotplug mode** which can be **Auto**, **Always On**, or **Always Off**.

```
◄Video ports
 ▾Common settin►
```

Input Port Settings (I1, I2, …)

> **ATTENTION!** Input port settings depend on the installed video input module. Different settings might be available for different type of video modules.

The input port related settings are available in this submenu. The number of input ports depends on the installed video input module. The following settings and information can be reach for each ports:

```
◄Video ports
 ↕I1 CHDMI Vide►
```

- **HDCP settings**: You can set it to **Enabled** or **Disabled**.
- **5V Pin**: information about 5V is present or not.
- **Resolution**: recent video resolution is displayed for the selected port.
- **Color info**: recent color info is displayed for the selected port.
- **HDCP Active**: information about the incoming video signal is HDCP-encrypted or not.
- **Factory defaults**: you can set the factory defaults values for the selected port. Select it by pressing **Enter ◆** button and approve it with **Enter ◆** or cancel it with **Escape ●**.

```
Reset settings t
Enter:Yes Esc:No
```

> **ATTENTION!** If the selected port is locked, parameters cannot be changed.

Output Port Settings (O1, O2, …)

> **Reset settings t**
> **Enter:Yes Esc:No**

ATTENTION! Output port settings depend on the installed video output module. Different settings might be available for different type of video modules.

The input port related settings are available in this submenu. The number of input ports depends on the installed video input module. The following settings and information can be reach for each ports:

> **◄Video ports**
> **▲O1 (DP Video)►**

- ▪ **HDCP mode**: You can set it to **Auto** or **Always**.
- ▪ **Color space**: You can set it as **Auto**, **RGB**, **YUV 4:2:2**, or **YUV 4:4:4**.
- ▪ **Resolution**: recent video resolution is displayed for the selected port.
- ▪ **Color info**: recent color info is displayed for the selected port.
- ▪ **HDCP Active**: information about the incoming video signal is HDCP-encrypted or not.
- ▪ **Factory defaults**: you can set the factory defaults values for the selected port. Select it by pressing **Enter ◆** button and approve it with **Enter ◆** or cancel it with **Escape ●**.

> **Reset settings t**
> **Enter:Yes Esc:No**

ATTENTION! If the selected port is locked, parameters cannot be changed.

INFO: Changed settings are saved immediately when selecting by the buttons.

4.6.2. Audio Ports

Common Settings

You can set the audio mode of the interface Module. It can be set to **Analog**, **Digital** or **Mixed**. More details about these modes see 3.9

> **◄Audio ports**
> **▼Common settin►**

Input Port Settings (I1, I2, …)

The input port related settings are available in this submenu. The number of input ports depends on the installed audio and video Modules.

> **◄Audio ports**
> **▼I1 (HDMI Audi►**

Digital or Embedded Audio Settings:

- ▪ **Type**: information about the type of incoming audio signal.
- ▪ **Sampling**: information about the sampling of incoming audio signal.

> **Reset settings t**
> **Enter:Yes Esc:No**

- ▪ **Factory defaults**: you can set the factory defaults values for the selected port. Select it by pressing **Enter ◆** button and approve it with **Enter ◆** or cancel it with **Escape ●**.

Analog Audio Settings:

- ▪ **Gain**: from 0 dB to +24 dB, step 3 dB (default is 0 dB)
- ▪ **Volume**: from 0 dB to -63 dB, step 0.5 dB (default is 0 dB)
- ▪ **Balance**: from 0 to 100%, step 1% (default is 50%=center)
- ▪ **Type**: information about the type of incoming audio signal.
- ▪ **Sampling**: information about the sampling of incoming audio signal.
- ▪ **Factory defaults**: you can set the factory defaults values for the selected port. Select it by pressing **Enter ◆** button and approve it with **Enter ◆** or cancel it with **Escape ●**.

> **Reset settings t**
> **Enter:Yes Esc:No**

Output Port Settings (O1, O2, …)

The output port related settings are available in this submenu. The number of output ports depends on the installed audio and video modules.

> **◄Audio ports**
> **▼O1 (Return au►**

Digital or Embedded Audio Settings:

- ▪ **Type**: information about the type of incoming audio signal.
- ▪ **Sampling**: information about the sampling of incoming audio signal.
- ▪ **Factory defaults**: you can set the factory defaults values for the selected port. Select it by pressing **Enter ◆** button and approve it with **Enter ◆** or cancel it with **Escape ●**.

> **Reset settings t**
> **Enter:Yes Esc:No**

Analog Audio Settings:

- ▪ **Volume**: from 0 dB to -52 dB (step 0.5 dB), from -54 dB to -66 dB (step 2 dB); -69 dB; -72 dB; -78 dB (default is 0 dB)
- ▪ **Balance**: from 0 to 100%, step 1% (default is 50%=center)
- ▪ **Type**: information about the type of incoming audio signal.
- ▪ **Sampling**: information about the sampling of incoming audio signal.
- ▪ **Factory defaults**: you can set the factory defaults values for the selected port. Select it by pressing **Enter ◆** button and approve it with **Enter ◆** or cancel it with **Escape ●**.

ATTENTION! If the selected port is locked, parameters cannot be changed.

INFO: Changed settings are saved immediately when selecting by the buttons.

4.6.3. Serial Ports

ATTENTION! Serial port settings are available just in case a serial interface module is installed.

RS-232 / RS-422 port parameters can be set by each available serial line.

> **◄Port status & …**
> **▼Serial ports ►**

Local Serial Port Settings

- ▪ **Baud rate**: 4800 / 9600 / 14400 / 19200 / 28800 / 38400 / 56000 / 57600 / 115200 / 128000 / 153600 / 230400 / 256000 / 460800
- ▪ **Data bits**: 4 / 5 / 6 / 7 / 8 / 9
- ▪ **Stop bits**: 1 / 1.5 / 2
- ▪ **Parity**: None / Odd / Even / Always zero / Always one
- ▪ **Command Injection**: Enabled / Disabled
- ▪ **Command Injection port number**: default is 8001.
- ▪ **Factory defaults**: you can set the factory defaults values for the selected port. Select it by pressing **Enter ◆** button and approve it with **Enter ◆** or cancel it with **Escape ●**.

> **Reset settings t**
> **Enter:Yes Esc:No**

Optical Link Serial Port Settings

- ▪ **Factory defaults**: you can set the factory defaults values for the selected port. Select it by pressing **Enter ◆** button and approve it with **Enter ◆** or cancel it with **Escape ●**.

> **Reset settings t**
> **Enter:Yes Esc:No**

4.6.4. IR Ports

> **ATTENTION!** IR port settings are available just in case an IR interface module is installed.

Infrared input and output port parameters can be set by each available IR device .

```
◁Port status & …
 ≑Ir ports        ▷
```

IR Input

- **Command Injection**: Enabled / Disabled
- **Command Injection port number**: default is 8102.
- **Factory defaults**: you can set the factory defaults values for the selected port. Select it by pressing **Enter ◆** button and approve it with **Enter ◆** or cancel it with **Escape ●**.

```
Reset settings t
Enter:Yes Esc:No
```

IR Output

- **Output mode**: Emitter / Wired
- **Command Injection**: Enabled / Disabled
- **Command Injection port number**: default is 8101.
- **Factory defaults**: you can set the factory defaults values for the selected port. Select it by pressing **Enter ◆** button and approve it with **Enter ◆** or cancel it with **Escape ●**.

```
Reset settings t
Enter:Yes Esc:No
```

4.6.5. USB K&M Ports

The factory defaults settings can be restored in this submenu by selecting the desired port number and executing **Factory defaults** menu.

```
◁Port status & …
 ≑USB K&M ports▷
```

4.6.6. Ethernet Port

Ethernet related parameters can be set in this submenu for the front panel Ethernet port (P1) and the optical link Ethernet port (P2).

```
◁Port status & …
 ≜Ethernet port▷
```

Front Panel Ethernet Port

- **Port enabled**: Enabled / Disabled
- **Port mode**: Auto negotiation / 10Mbps half-duplex
- **Link**: information about the link.

- **Factory defaults**: you can set the factory defaults values for the selected port. Select it by pressing **Enter ◆** button and approve it with **Enter ◆** or cancel it with **Escape ●**.

```
Reset settings t
Enter:Yes Esc:No
```

Optical Link Ethernet Port

- **Port enabled**: Enabled / Disabled
- **Factory defaults**: you can set the factory defaults values for the selected port. Select it by pressing **Enter ◆** button and approve it with **Enter ◆** or cancel it with **Escape ●**.

```
Reset settings t
Enter:Yes Esc:No
```

4.7. EDID Settings Menu

Two options are available in the EDID settings menu both on transmitter and receiver side: **Switch** and **View**.

4.7.1. EDID Switch in Transmitter

Available input ports are listed in the EDID menu of the transmitter. If there are input ports on the AV module, both will be listed. Currently emulated EDID can be set on each port.

Step 1. Navigate to EDID settings menu and press the **Enter ◆** button.

```
≑EDID settings ▷
```

Step 2. Choose the Switch submenu by pressing the **Enter ◆** button.

```
◁EDID settings
 ⬇Switch        ▷
```

Step 3. Select the desired port by the **Up ▲** and **Down ▼** buttons, than press the **Enter ◆** button.

```
In1←Out1       ▼
  LWR_Univ_HDMI_P
```

Step 4. Currently emulated EDID is shown. In the first line the selected port and the source of the EDID is shown. On attached D1 Dynamic EDID is emulated on DVI input port. The second line is scrolled automatically to display more information about the EDID: the manufacturer code, the resolution with the refresh rate and the sink type.

```
In1←Out1     ◀▶
  LWR_Univ_HDMI_⬍
```

Step 5. Use the **Left ◀** and **Right ▶** buttons to select EDID group: Factory EDIDs (F) / User EDIDs (U) /

```
All←F1        ▲
  LWR D640x480p60
```

Dynamic EDID (D). Use the **Up ▲** and **Down ▼** buttons to select the desired EDID (keep the button pressed to scroll the list faster). The second line of the LCD is scrolled automatically to display more information about the EDID. See more information about EDID structure in 10.1 section.

Step 6. Press the **Enter ◆** button to emulate selected EDID on the input port.

```
 EDID changed
```

4.7.2. EDID Switch in the Receiver

The available video output port is displayed in the EDID menu of the receiver. If there are output ports on the AV module, both will be listed. The EDID of the last attached sink is shown in this menu.

Step 1. Navigate to EDID settings menu and press the **Enter ◆** button.

```
≑EDID settings ▷
```

Step 2. Choose the Switch submenu by pressing the **Enter ◆** button.

```
◁EDID settings
 ⬇Switch        ▷
```

Step 3. Select the desired port by the **Up ▲** and **Down ▼** buttons, than press the **Enter ◆** button.

```
In1←Out1       ▼
  LWR_Univ_HDMI_P
```

Step 4. Currently emulated EDID is shown. In the first line the selected port and the source of the EDID is shown. On attached D1 Dynamic EDID is emulated on DVI input port. The second line is scrolled automatically to display more information about the EDID: the manufacturer code, the resolution with the refresh rate and the sink type.

```
In1←Out1     ◀▶
  LWR_Univ_HDMI_⬍
```

Step 5. Use the **Left** ◄ and **Right** ► buttons to select EDID group: Factory EDIDs (F) / User EDIDs (U) / Dynamic EDID (D). Use the **Up** ▲ and **Down** ▼ buttons to select the desired EDID (keep the button pressed to scroll the list faster). The second line of the LCD is scrolled automatically to display more information about the EDID. See more information about EDID structure in 10.1

```
All←F1              ▲
   LWR D640x480p60
```

Step 6. Press the **Enter** ◆ button to emulate selected EDID on the input port.

```
EDID changed
```

4.7.3. EDID View in the Transmitter and Receiver

You can view all EDID tracks by category listed in the device. Four categories can be chosen: **Factory**, **Dynamic**, **User**, and **Emulated**.

Step 1. Navigate to EDID settings menu and press the **Enter** ◆ button.

```
⬍EDID settings ►
```

Step 2. Choose the View submenu by pressing the **Enter** ◆ button.

```
◄EDID settings
▲View           ►
```

Step 3. Select the desired category by the **Up** ▲ and **Down** ▼ buttons, than press the **Enter** ◆ button.

```
◄View
  ▼Factory       ►
```

Step 4. Select the desired EDID slot by the **Up** ▲ and **Down** ▼ buttons, and view the desired parameter by the **Left** ◄ and **Right** ► buttons.
The following parameters can be viewed: Manufacturer, Name, Resolution, and Audio. Use the **Escape** ● button to leave the menu.

```
◄F18         ◄⬍►
Name:D2048x1080p
```

4.8. Network Settings Menu

If the extender is connected to an Ethernet Network, the settings are available in this menu.

> INFO: If you change more settings in Network menu, it is not necessary to restart the device after every step. Reboot after setting all necessary parameters is enough.

4.8.1. DHCP

Step 1. Navigate to the Network settings / DHCP submenu and press the **Enter** ◆ button.

```
◄Network settin…
 ▼DHCP           ►
```

Step 2. You can check the current state of DHCP setting. Press the **Enter** ◆ button to change it and choose the desired setting by the **Up** ▲ and **Down** ▼ buttons.

```
◄DHCP:
 Disabled        ⬍
```

Step 3. Press the **Enter** ◆ button to confirm the new setting.

```
◄DHCP:           ▼
 Enabled
```

Step 4. Press twice the **Escape** ● button to leave the submenu. A confirmation screen appears, you apply the new setting by pressing the **Enter** ◆ and reject it by pressing the **Escape** ● button.

```
Apply settings?
ENTER=Yes ESC=No
```

4.8.2. Static IP Address

Step 1. Navigate to the Network settings / Static IP address submenu and press the **Enter** ◆ button.

```
◄Network settin…
 ⬍Static IP add►
```

Step 2. You can check the current IP address. Press the **Enter** ◆ button to modify it.

```
◄Static IP add…⬍
 192.168.000.101
```

Step 3. Use the **Left** ◄ and **Right** ► buttons to select character and press the **Up** ▲ and **Down** ▼ buttons to modify it. Press the **Enter** ◆ to complete the editing.

```
◄Static IP addr…
 192.168.000.10⬍
```

Step 4. Press twice the **Escape** ● button to leave the submenu. A confirmation screen appears, you apply the new setting by pressing the **Enter** ◆ and reject it by pressing the **Escape** ● button.

```
Apply settings?
ENTER=Yes ESC=No
```

4.8.3. Subnet Mask

Step 1. Navigate to the Network settings / Subnet mask submenu and press the **Enter** ◆ button.

```
◄Network settin…
 ⬍Subnet mask  ►
```

Step 2. You can check the current IP address. Press the **Enter** ◆ button to modify it.

```
◄Subnet mask:  ⬍
 255.255.255.000
```

Step 3. Use the **Left** ◄ and **Right** ► buttons to select character and press the **Up** ▲ and **Down** ▼ buttons to modify it. Press the **Enter** ◆ to complete the editing.

```
◄Subnet mask:
 255.255.255.00⬍
```

Step 4. Press twice the **Escape** ● button to leave the submenu. A confirmation screen appears, you apply the new setting by pressing the **Enter** ◆ and reject it by pressing the **Escape** ● button.

```
Apply settings?
ENTER=Yes ESC=No
```

4.8.4. Gateway

Step 1. Navigate to the Network settings / Gateway submenu and press the **Enter** ◆ button.

```
◄Network settin…
 ⬍Gateway       ►
```

Step 2. You can check the current IP address. Press the **Enter** ◆ button to modify it.

```
◄Gateway:       ⬍
 192.168.000.001
```

Step 3. Use the **Left** ◄ and **Right** ► buttons to select character and press the **Up** ▲ and **Down** ▼ buttons to modify it. Press the **Enter** ◆ to complete the editing.

```
◄Gateway:
 192.168.000.00⬍
```

Step 4. Press twice the **Escape** ● button to leave the submenu. A confirmation screen appears, you apply the new setting by pressing the **Enter** ◆ and reject it by pressing the **Escape** ● button.

```
Apply settings?
ENTER=Yes ESC=No
```

4.8.5. Apply Settings

If more modifications happened in the network settings, you can do all changes at the same time and save them at the end.

```
Apply settings?
ENTER=Yes ESC=No
```

Navigate to the Network settings / Apply settings submenu and press the **Enter** ◆ button. A confirmation screen appears, you apply the new setting by pressing the **Enter** ◆ and reject it by pressing the **Escape** ● button.

4.9. Device Presets Menu

Each MODEX extender has eight preset memories which can be used to store LW3 commands (settings and configurations). This feature allows to

```
⬧Device Presets▸
```

set the MODEX with previously determined parameters, execute a group of commands, etc… Presets can be organized via the built-in web or LDC easily, see 6.13 section, but the preset can be saved or applied (run) via the front panel, too.

4.9.1. Run a Preset

Step 1. Navigate to the Device Presets / Run Preset submenu and press the **Enter** ◆ button.

```
⬧Run Preset:    ▾
  P1:1 preset
```

Step 2. Select the desired Preset by pressing the **Up** ▴ and **Down** ▾ buttons than press the **Enter** ◆ button.

```
⬧Run Preset:
  P3:3 preset     ⬍
```

Step 3. A confirmation screen appears, you apply the action by pressing the **Enter** ◆ and reject it by pressing the **Escape** ● button.

```
Run preset?
ENTER=Yes ESC=No
```

4.9.2. Save a Preset

Step 1. Navigate to the Device Presets / Save Preset submenu and press the **Enter** ◆ button.

```
⬧Save Preset:    ⬍
  P1:1 preset
```

Step 2. Select the desired Preset by pressing the **Up** ▴ and **Down** ▾

buttons than press the **Enter** ◆ button.

```
⬧Save Preset:
  P1:1 preset     ▾
```

Step 3. A confirmation screen appears, you apply the action by pressing the **Enter** ◆ and reject it by pressing the **Escape** ● button.

```
Save preset?
ENTER=Yes ESC=No
```

4.9.3. Delete a Preset

Step 1. Navigate to the Device Presets / Delete Preset submenu and press the **Enter** ◆ button.

```
⬧Delete Preset:▴
  P1:1 preset
```

Step 2. Select the desired Preset by pressing the **Up** ▴ and **Down** ▾ buttons than press the **Enter** ◆ button.

```
⬧Delete Preset:
  P1:1 preset     ▾
```

Step 3. A confirmation screen appears, you apply the action by pressing the **Enter** ◆ and reject it by pressing the **Escape** ● button.

```
Erase preset?
ENTER=Yes ESC=No
```

4.10. Maintenance Menu

General actions can be executed under the Maintenance menu. You can recall the **Factory default settings**, **Reset** the device, and **Enter to bootload** mode.

```
▴Maintenance     ▸
```

4.10.1. Factory Defaults

Step 1. Navigate to the Maintenance / Factory defaults submenu and press the **Enter** ◆ button.

```
▴Maintenance
 ▾Fact. default▸
```

Step 2. A confirmation screen appears, you apply the action by pressing the **Enter** ◆ and reject it by pressing the **Escape** ● button.

```
Reset settings t
Enter:Yes Esc:No
```

Step 3. The device is restarted. See the factory default values 11.3

4.10.2. Reset the Device

```
▴Maintenance
 ⬧Reset          ▸
```

Step 1. Navigate to the Maintenance / Reset submenu and press the **Enter** ◆ button.

Step 2. A confirmation screen appears, you apply the action by pressing the **Enter** ◆ and reject it by pressing the **Escape** ● button.

```
Restart device?
Enter:Yes Esc:No
```

Step 3. The device is restarted immediately.

4.10.3. Enter Bootload Mode

The firmware of the device can be upgraded in Bootload mode. If the working mode of the device is not switched to bootload mode automatically, the mode can be also switched manually.

Step 1. Navigate to the Maintenance / Enter bootload submenu and press the **Enter** ◆ button.

```
▴Maintenance
 ▴Enter bootloa▸
```

Step 2. A confirmation screen appears, you apply the action by pressing the **Enter** ◆ and reject it by pressing the **Escape** ● button.

```
Enter bootload?
Enter:Yes Esc:No
```

Step 3. LCD will turn to dark. (The device can be switched to normal operation mode by pressing the reset button or turning it off and on again.)

5

Software Control – Using Lightware Built-in Web

The MODEX devices have a feature which allows to connect and control the extender through a web browser. The controlling features are not so wide as in the case of Lightware Device Contoller, but numerous information is displayed and many settings are available. The built-in website in the device is compatible with the most common browsers and requires no additional software components.

- ▶ ESTABLISHING THE CONNECTION
- ▶ THE LAYOUT OF THE BUILT-IN WEB

System Requirements

Operating System: Microsoft Windows XP, Windows Vista, Windows 7, Windows 10, Mac OS X, Linux.

Web Browser: Mozilla Firefox, Google Chrome, Apple Safari.

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

ATTENTION! Only one webpage is allowed to open simultaneously to the same device. Other TCP/IP connections are prohibited while the web page is opened.

5.1. Establishing the Connection

ATTENTION! If the connection is made through the Ethernet port of the router, be sure that the computer is in the same network as the router. If the computer has multiple Ethernet connections (for example Wi-Fi and LAN connections are used simultaneously) you will have to know the IP address for the one that is used for controlling the device.

Step 1. Connect the extender and the computer either via

- ▪ Ethernet, with LAN patch cable (to a Hub, Switch or Router), or
- ▪ Ethernet, with LAN cross cable (directly to Computer).

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

Step 3. Type the IP address to the address bar of the web browser and press Enter. The factory default address is 192.168.0.101 for the transmitter, and 192.168.0.102 for the receiver.

5.2. The Layout of the Built-in Web

The built-in web page allows almost the same controlling functions which are available via the Lightware Device Controller (LDC).
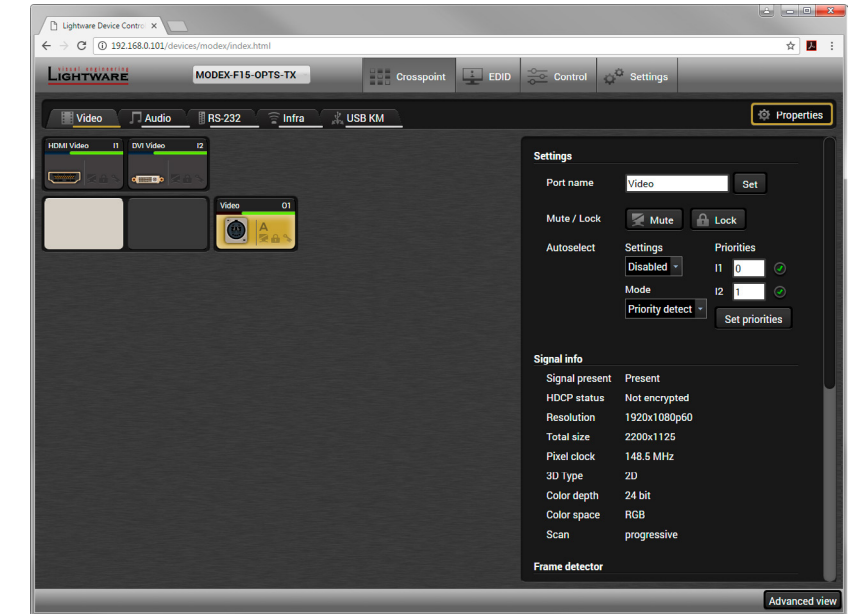
Built-in Webpage Displaying the Crosspoint Menu

6

Software Control – Lightware Device Controller

The device can be controlled by a computer through the Ethernet port and RS-232 / RS-422 using Lightware Device Controller (LDC). The software can be installed on a Windows PC or Mac OS X. The application and the User's manual can be downloaded from www.lightware.com. The Windows and the Mac versions have the same look and functionality.

- ▶ INSTALL AND UPGRADE
- ▶ ESTABLISHING THE CONNECTION
- ▶ THE LAYOUT OF THE CROSSPOINT MENU
- ▶ VIDEO LAYER
- ▶ AUDIO LAYER
- ▶ RS-232 LAYER
- ▶ INFRARED LAYER
- ▶ USB KVM LAYER
- ▶ EDID MENU
- ▶ CONTROL MENU
- ▶ EVENT MANAGER
- ▶ SETTINGS MENU
- ▶ CONFIGURATION CLONING (BACKUP TAB)
- ▶ ADVANCED VIEW WINDOW

6.1. Install and Upgrade

> INFO After the installation, the Windows and the Mac application has the same look and functionality.

Installation for Windows OS

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

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

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

Comparison of Installation Types

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

Installation for Mac OS X

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

> INFO: The MAC installer is equal with the Normal install in case of Windows and results an updateable version with the same attributes.

Upgrading of LDC

Step 1. Run the application.

The **Device Discovery** window appears automatically and the program checks the available updates on our 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. They are shown in this window even with the snapshot install.
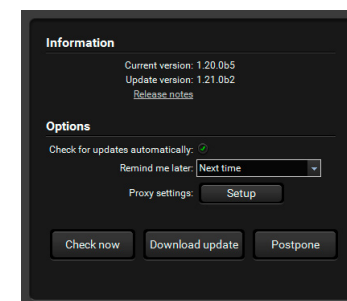
The **Update** window can also be opened by clicking the **About icon** ⊘ and the **Update** button.

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 do not range with the required settings, set the proper values then click the **OK** button.
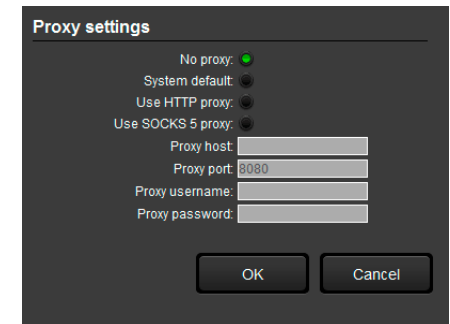
Step 3. Click the **Download update** button to start the upgrading.

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

6.2. Establishing the Connection

Step 1. Connect the device to a computer via Ethernet or serial connection.

Step 2. Run the controller software. The device discovery window appears automatically.
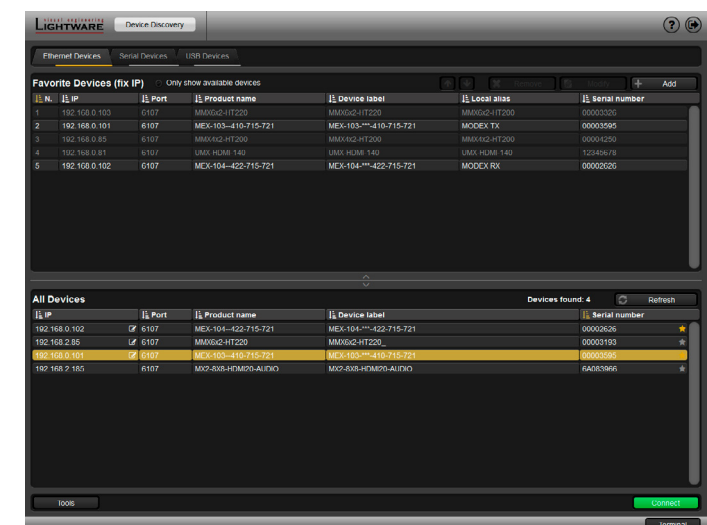
Device Discovery Window in LDC

Step 3. Select the unit from the discovered Ethernet devices. Double click on the name of the extender or select the device and click on the green **Connect** button.

If your device is connected to the computer via serial link, select **Serial Devices** tab. Click on the **Query** button next to the desired serial port to display the name of the device and serial number. Double click on the receiver or select the device and click on the green **Connect** button.

6.3. The Layout of the Crosspoint Menu
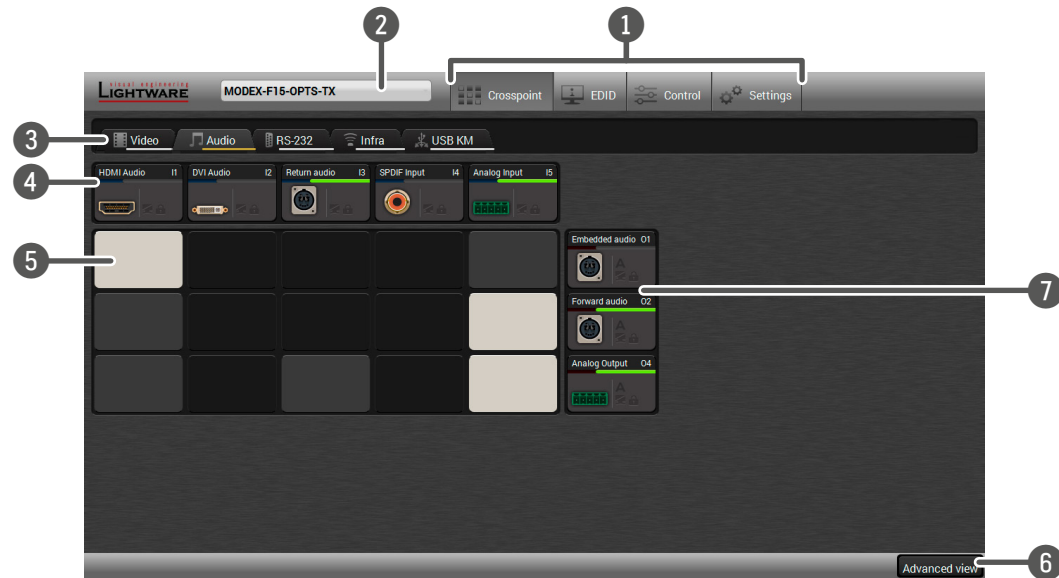
① Main menu   The available menu items are displayed. The active one is shown with dark grey background color.

② Information ribbon   It shows the device label which can be edited in the Settings menu - Status tab, for more information see 6.12.1 Device discovery window can be displayed by clicking on this ribbon.

③ Submenu selector   Each tile represents an input port. The tile below the port shows the current crosspoint setting; if the port is switched to the output, the color of the tile is white, otherwise it is grey.

④ Input ports   Click on the port to open the Port properties window.

⑤ Connections   Light grey square means the port is available but there is no connection between the input and the output. White square means there is a connection between the input and the output port.

⑥ Advanced view   Click on the button to display the Advanced view page. It shows the Terminal window and the LW3 protocol tree.

⑦ Output ports   Click on the port to open the Port properties window.

Port Tiles

The colors of the port tiles and the displayed icons represent different states and information:
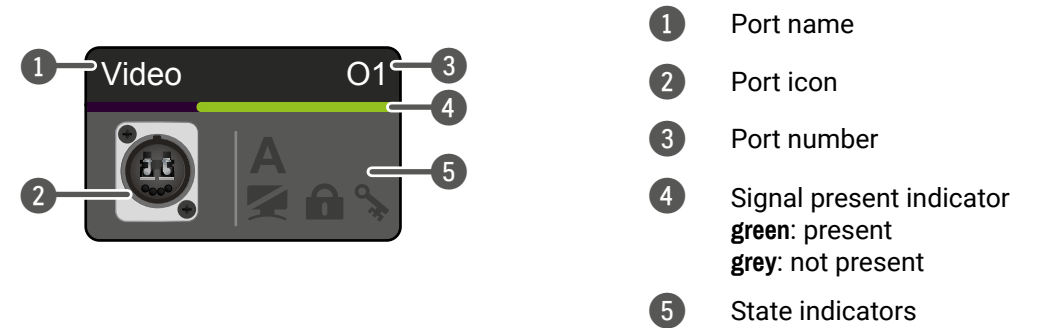
① Port name

② Port icon

③ Port number

④ Signal present indicator
green: present
grey: not present

⑤ State indicators

State Indicators

The following icons represent different states of the port/signal:

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

6.4. Video Layer

After selecting the Video tab the video crosspoint status is displayed.
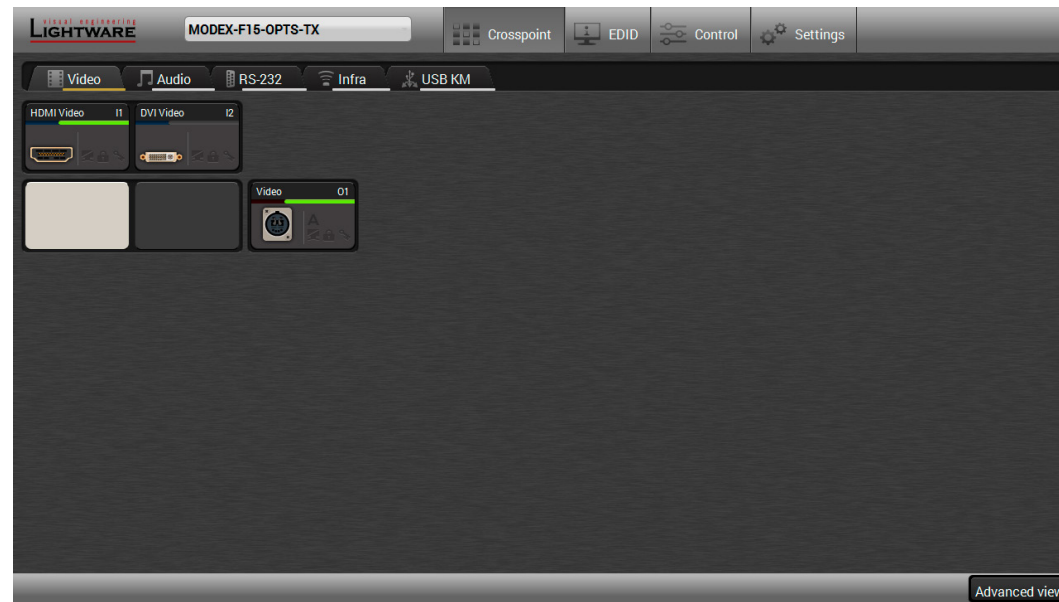
Video Crosspoint Tab

6.4.1. Input Port Properties - Transmitter

Click on the desired input port to open the port properties window.

Available settings:

- ▪ Change the name of the port;
- ▪ HDCP setting (enable / disable);
- ▪ Mute/unmute the port;
- ▪ Lock/unlock the port;
- ▪ Frame detector (see details 6.4.5);
- ▪ Factory default settings for the selected port.
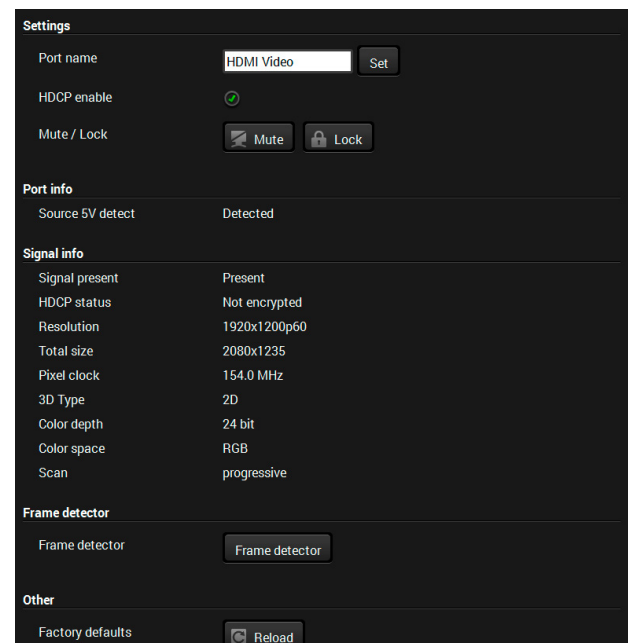
6.4.2. Output Port Properties - Transmitter

Click on the optical output port to open the port properties window. The most important information and settings are available from the panel.

Available settings / information:

- ▪ Change the name of the port;
- ▪ Mute/unmute the port;
- ▪ Lock/unlock the port;
- ▪ **Autoselect settings**: enable / disable, mode, and priorities. (See more details 3.11);
- ▪ Frame detector (see details 6.4.5);
- ▪ Port info: status information about the optical connector (the port type depends on the installed media module). The link uptime, link quality, and the link errors can be checked on the panel. The values can be cleared by clicking on the **Reset** button.
- ▪ Factory default settings for the selected port.

6.4.3. Input Port Properties - Receiver

Click on the optical output port to open the port properties window. The most important information and settings are available from the panel.

Available settings / information:

- ▪ Change the name of the port;
- ▪ Mute/unmute the port;
- ▪ Frame detector (see details 6.4.5);
- ▪ Port info: status information about the optical connector (the port type depends on the installed media module). The link uptime, link quality, and the link errors can be checked on the panel. The values can be cleared by clicking on the **Reset** button.
- ▪ Factory default settings for the selected port.
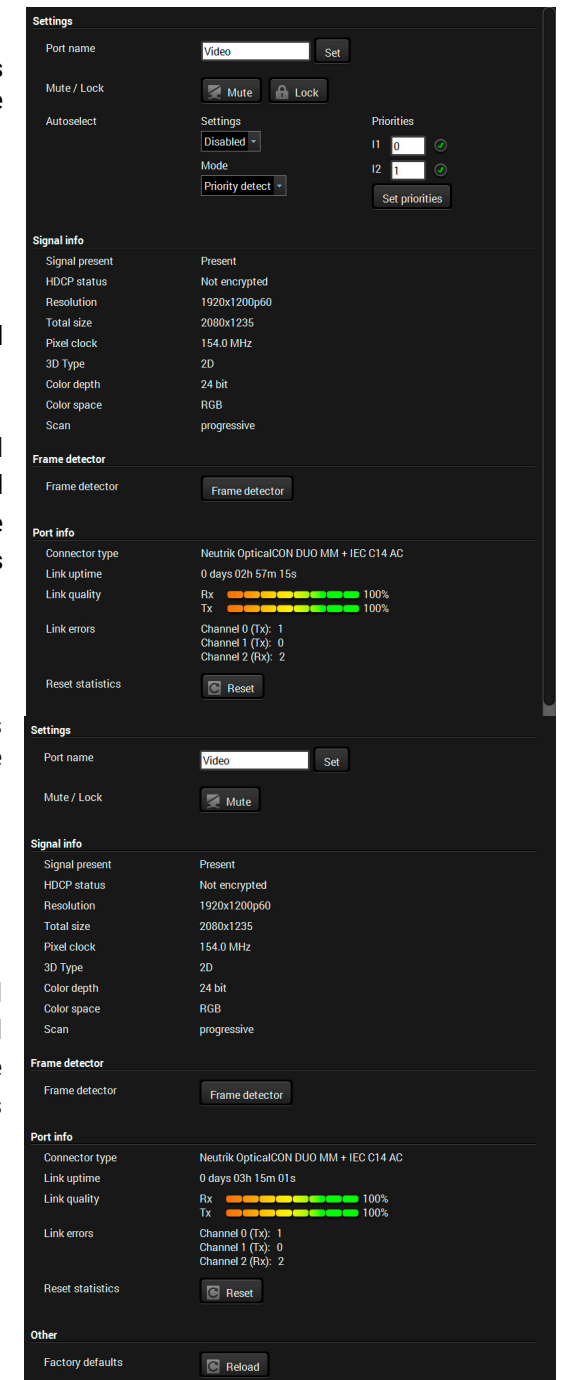
6.4.4. Output Port Properties - Receiver

Click on the desired input port to open the port properties window.

Available settings:

▪ Change the name of the port;;

▪ Mute/unmute the port;

▪ Lock/unlock the port

▪ HDCP mode (Auto / Always);

▪ Output mode: you can set the output signal type. The available settings depend on the video module.

  HDMI port: Auto / HDMI / DVI;

  DP port: Auto / DP 18 bit / DP 24 bit / DP 30 bit;

▪ Output color space (Auto / RGB / YCrCb 4:4:4);

▪ Frame detector (see details 6.4.5);

▪ Factory default settings for the selected port.
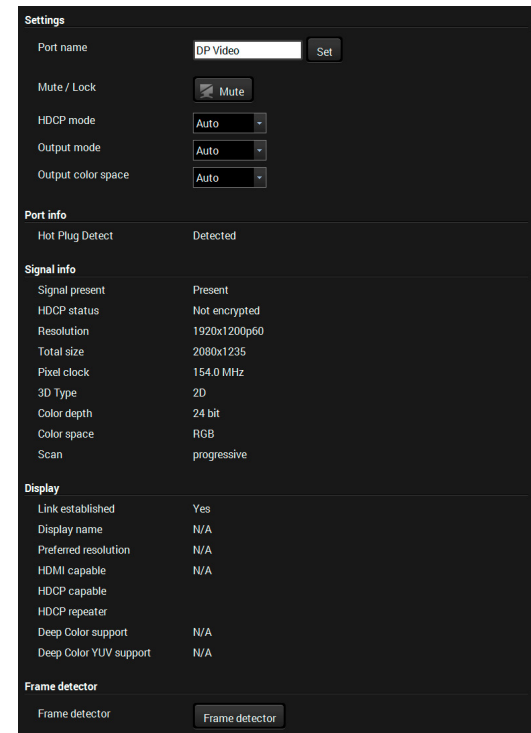
6.4.5. Frame Detector

The ports can show detailed information about the signal like full size and active video resolution. This feature is a good troubleshooter if compatibility problems occur during system installation. To access this function, open the port properties window and click on the **Frame detector** button.
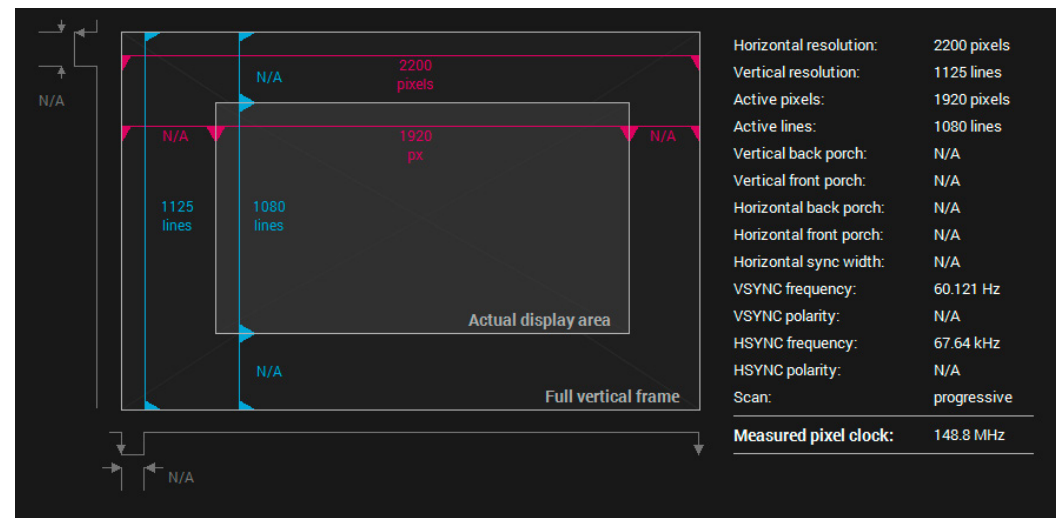
Frame Detector Window

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

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

6.5. Audio Layer

After selecting the Audio tab the video crosspoint status is displayed.
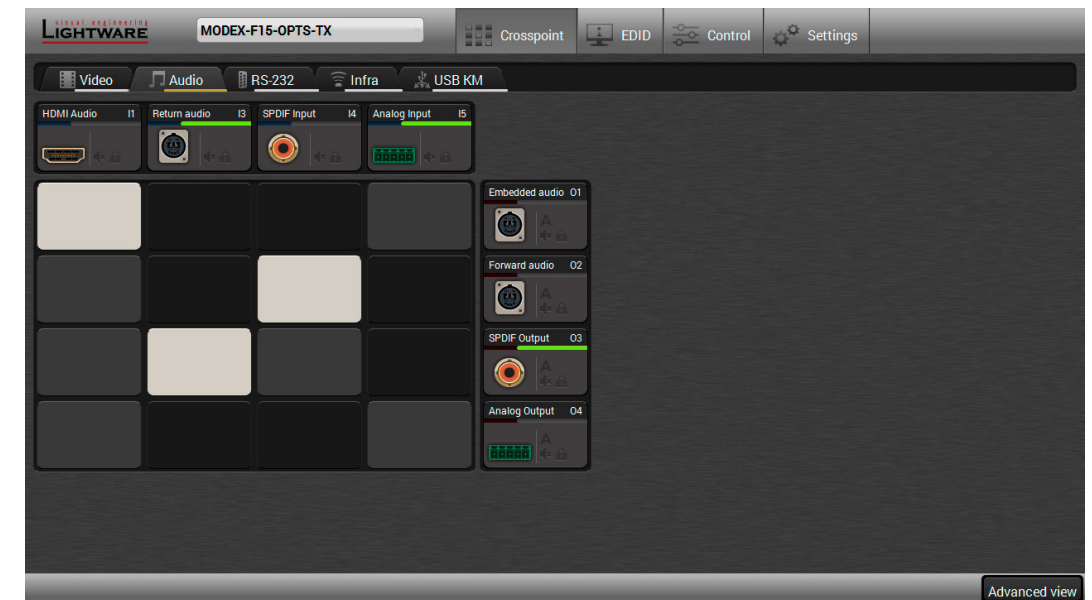
Audio Layer in the Crosspoint Menu

Audio Modes

For audio interface Modules you can set audio modes depending on the purpose of using. Three modes are available by clicking on the icon of analog or digital **input** port: **Analog**, **Digital**, or **Mixed**. See more information about these modes 3.9

The audio modes can be set for the following interface Modules:

▪ MODEX-IF-AUDIN;

▪ MODEX-IF-AUDOUT;

▪ MODEX-IF-AUD.
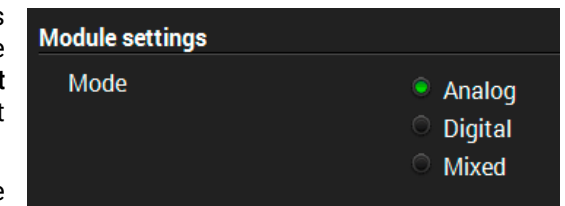
The Layout of the Crosspoint Menu

The analog/digital ports are displayed in the crosspoint menu depending on the selected mode. In Analog mode the digital input and output ports are hidden. In Digital mode the analog ports are hidden. In Mixed mode both analog and digital ports are displayed but the available crosspoint possibilities are limited, see the details 3.9.5

See the differences in the available crosspoint settings:

Analog mode

Digital mode

Mixed mode

6.5.1. Port Properties - Transmitter

Click on the desired input/output port to open the port properties window. This section shows the available settings on the various port types.

> INFO: The listed input and output port types and the available settings may be different in your device. The available port types depend on the installed video and interface modules.

Input ports:

- **HDMI audio**: the original embedded digital audio coming from the HDMI input port.
- **DP audio**: the original embedded digital audio coming from the DisplayPort input port.
- **Return audio**: digital audio transmitted by the receiver via the optical line.
- **S/PDIF input**: digital audio received on the S/PDIF input port.
- **Analog input**: analog audio received on the 5-pole Phoenix input port.

Output port:

- **Embedded audio**: the original embedded digital audio coming from the HDMI / DVI-D / DP input ports and transmitted to the receiver via the optical line.
- **Forward audio**: the audio line coming from the HDMI / DVI-D / DP input ports, the S/PDIF or the analog audio input port and transmitted via the optical line.
- **S/PDIF output**: digital audio which is transmitted over the S/PDIF output port.
- **Analog output**: analog audio which is transmitted over the 5-pole Phoenix output port.

> INFO: The embedded audio and the forward audio are independent signals in the fiber optical lines and they can be transmitted together.

Audio Settings

> **ATTENTION!** The following section lists all available settings but they cannot be applied to all ports. The available options depend on the type of audio port and the installed video and interface Modules in your recent MODEX device.

- Change the name of the port;
- Mute/Unmute the port;
- Lock/Unlock the port;

- Audio mode: Analog / Digital / Mixed;
- Autoselect settings - see the details below;
- Analog audio settings - see the details below;
- Factory default settings.

Autoselect Mode and Settings

Autoselect mode is available on the output ports. Input port selection can be managed automatically by enabling this function. See more details about it 3.11

Analog Audio Settings - Input

The input analog audio settings are available by clicking on the Analog Input port. The following options can be set:

- Gain (dB);
- Volume (dB);
- Balance (dB);
- DC filter enable / disable (the factory default value is disabled);
- Invert phase enable / disable (the factory default value is disabled);
- Sample frequency (the factory default value is 48 kHz).

Analog Audio Settings - Output

The output analog audio settings are available by clicking on the Analog Output port. The following options can be set:

- Volume (dB);
- Treble boost (dB);
- Bass boost (dB).

6.5.2. Port Properties - Receiver

Click on the desired input/output port to open the port properties window. This section shows the available settings for the various port types.

INFO: The listed input and output port types and the available settings may be different in your recent device. The available port types depend on the installed video and interface Modules.

Input ports:

- **Embedded audio**: digital embedded audio coming from the optical input port.
- **Forward audio**: the forwarded digital audio coming from the optical input port.
- **ARC input**: Audio Return Channel; the return audio signal coming from the HDMI output port. Available only in sink devices built with HDMI 1.4 ports or above!
- **S/PDIF input**: digital audio received on the S/PDIF input port.
- **Analog input**: analog audio received on the 5-pole Phoenix input port.

Output port:

- **Return audio**: audio signal transmitted to the transmitter via the optical line.
- **HDMI audio**: the embedded audio line transmitted on the HDMI output port.
- **DP audio**: the embedded audio line transmitted on the DisplayPort output port.
- **S/PDIF output**: digital audio transmitted over the S/PDIF output port.
- **Analog output**: analog audio transmitted over the 5-pole Phoenix output port.

INFO: The embedded audio and the forward audio are independent signals in the fiber optical lines and they can be transmitted together.

Audio Settings

ATTENTION! The following section lists all available settings but they cannot be applied to all ports. Their availability depends on the type of audio port and the installed video and interface modules in your recent MODEX device.

- Change the name of the port;
- Mute/Unmute the port;
- Lock/Unlock the port;
- Audio mode: Analog / Digital / Mixed;
- Autoselect settings - see details on the next page;
- Analog audio settings - see details on the next page;
- Factory default settings.

Autoselect Mode and Settings

Autoselect mode is available on the output ports. Input port selection can be managed automatically by enabling this function. See more details about it 3.11

Analog Audio Settings - Input

The input analog audio settings are available by clicking on the Analog Input port. The following options can be set:

- Gain (dB);
- Volume (dB);
- Balance (dB);
- DC filter enable / disable (the factory default value is disabled);
- Invert phase enable / disable (the factory default value is disabled);
- Sample frequency (the factory default value is 48 kHz).

Analog Audio Settings - Output

The output analog audio settings are available by clicking on the Analog Output port. The following options can be set:

- Volume (dB);
- Treble boost (dB);
- Bass boost (dB).

6.6. RS-232 Layer

ATTENTION! The layer is available only for the following interface Modules: MODEX-IF-RS232, MODEX-IF-2xRS232, MODEX-IF-RS232-RS422, MODEX-IF-RS232-IR, MODEX-IF-2ETH-RS232.

RS-232 Layer in the Crosspoint Menu

Port Properties

Click on the input or output port to open the port properties window.

INFO The input and output port settings are mirrored because the MODEX extenders have bidirectional serial ports.

Available settings:

- Change the name of the port;
- Mute/unmute the port;
- Lock/unlock the port;
- Baud rate: 4800, 9600, 14400, 28800, 38400, 56000, 57600, 115200; 128000, 153600, 230400, 256000, 460800;
- Data bits: 4, 5, 6, 7, 8, 9;
- Parity: No parity, Odd, Even, Zero, One;
- Stop bits: 1, 1.5, or 2;
- Command injection:
  - Enable or disable;
  - TCP port number;
  - Command sending;
    See more details 3.13.1
- Factory default settings.
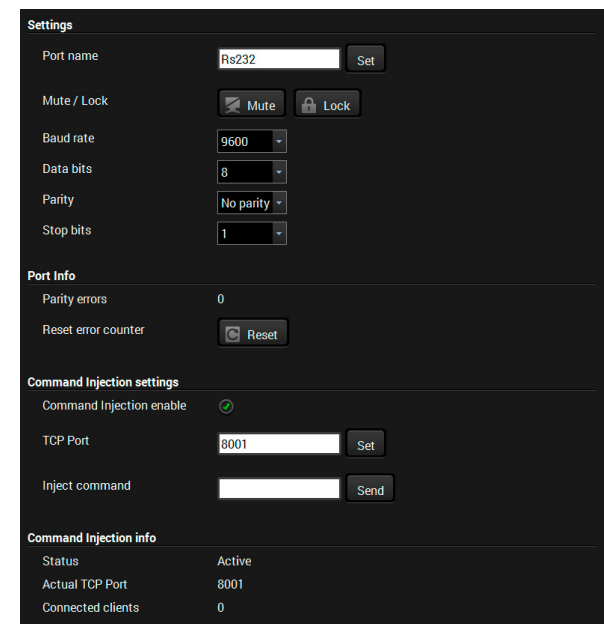
6.7. Infrared Layer

ATTENTION! The layer is available only in case of the following interface Modules: MODEX-IF-RS232-IR and MODEX-IF-2ETH-IR.

ATTENTION! The extenders have 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.
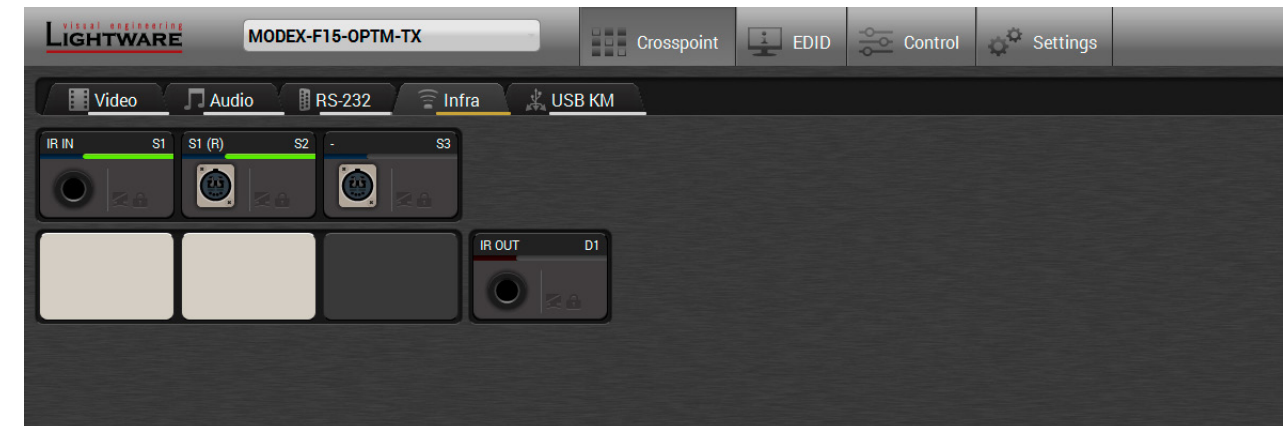
Infra layer in the Crosspoint menu

Input Port Properties

Click on the desired input port to open the port properties window. There are two kinds of input ports in the Infra layer: **Local IR input** (signal is coming from the attached infrared detector unit) and the **Link IR input** (signal is coming from the optical line).

Available settings:

- Change the name of the port;
- Mute/unmute the port;
- Lock/unlock the port;
- Command injection:
  - Enable or disable;
  - TCP port number;
  - Command sending;
    See more details 3.13.2
- Factory default settings.
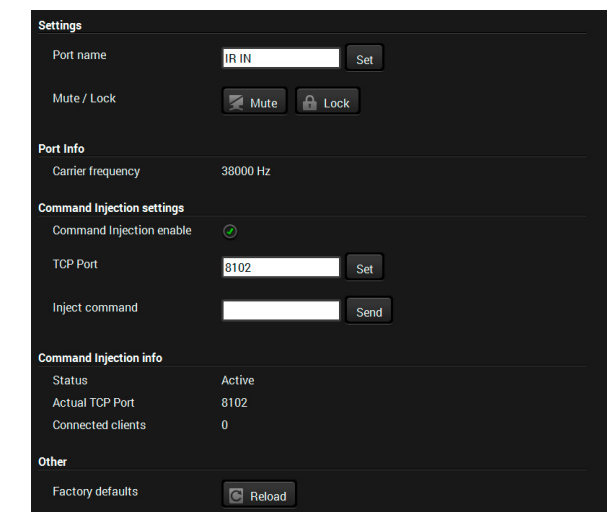
Output Port Properties

Clicking on the output port to open the port properties window.

Available settings:

- Change the name of the port;
- Mute/unmute the port;
- Lock/unlock the port;
- **Output mode:**
  - **Emitter (modulated)**: use this mode for any attached IR emitter unit.
  - **Wired (baseband)**: use this mode for direct wired connection between the output port and the input port of the controlled device.
- Command injection (see more details about this function 3.13.2).
  - Enable / disable;
  - Port number;
- Factory default settings.

6.8. USB KVM Layer

6.8.1. USB KVM in the Receiver
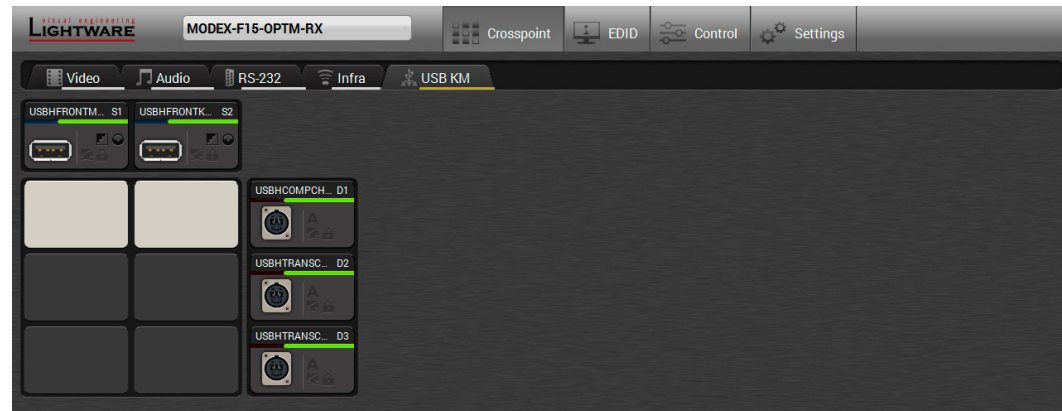
USB KVM layer in the Transmitter

Two USB modes can be set in the USB KVM layer: **Transparent** and **Composite**. For the detailed information about these modes see 3.12

You can use the crosspoint selectors for switching between the USB modes. The factory default settings is the **Autoselect** which means the extender recognizes the attached USB HID devices and sets the mode automatically. In this case the A icon is highlighted in green on the output ports.

| ATTENTION! The USB mode can be set only in the receiver!

State Indicators

Following icons display different states of the USB HID devices on the input ports:

	Icon	Description
Transparent mode capability	◰	Connected device is not transparent mode capable.
	◳	Connected device is transparent mode capable.
Composite mode capability	○	Connected device is not composite mode capable.
	◒	Connected device is composite mode capable but it has limited support.
	◉	Connected device is fully composite mode capable.

Port Properties

Clicking on the output port to open the port properties window. The most important status information is displayed on the panel and the port can be enabled or disabled.

6.8.2. USB KVM in the Transmitter
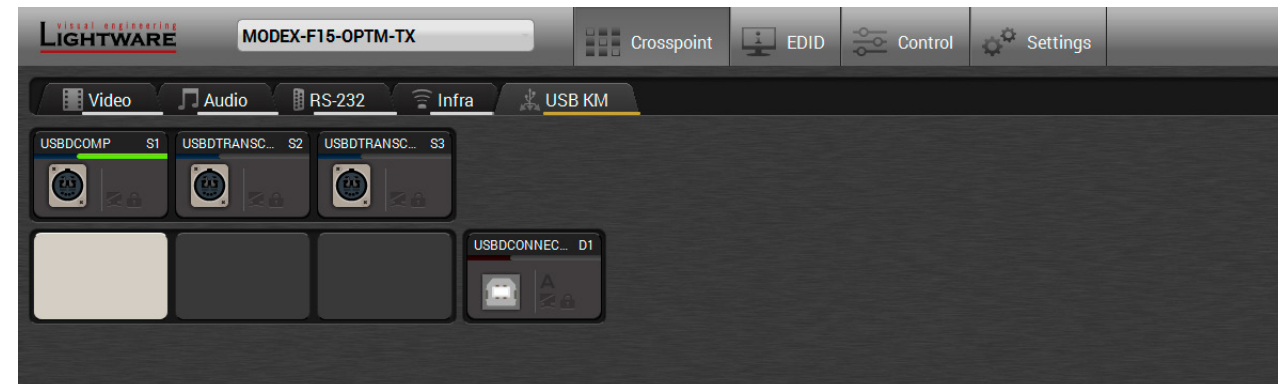
USB KVM layer in the Transmitter

The crosspoint status can be set on the USB KVM layer submenu. USB mode can be **Transparent** or **Composite**, see the details in section 3.12 The green highlights indicate the active USB mode. The USB KVM function works only if crosspoint is set to the active USB channel.

| ATTENTION! The USB mode can only be set in the receiver!

6.9. EDID Menu

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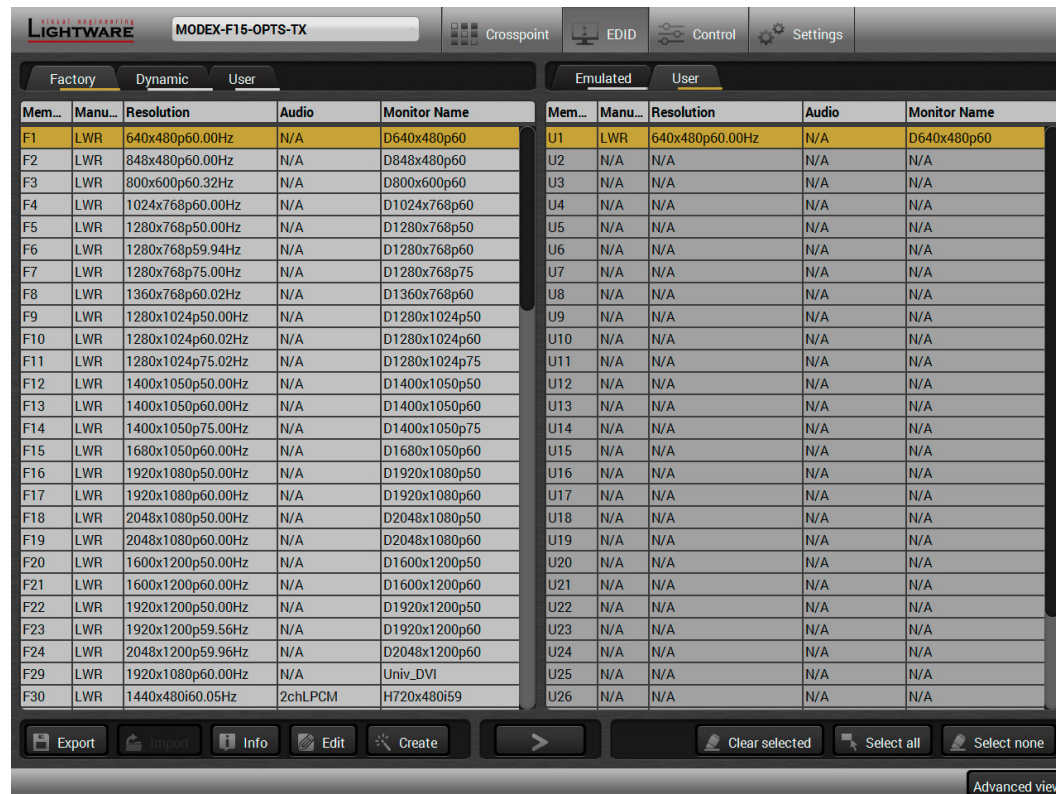
EDID Menu

Control Buttons

 Export Exporting an EDID (save to a file)

 Import Importing an EDID (load from a file)

 Info Display EDID summary window

 Edit Opening Advanced EDID Editor with the selected EDID

 Create Opening Easy EDID Creator

 > Executing EDID emulation or copying (Transfer button)

 Clear selected Deleting EDID (from User memory)

 Select all Selecting all memory places in the right panel

 Select none Selecting none of the memory places in the right panel

6.9.1. EDID Operations

Changing the Emulated EDID

Step 1. Choose the desired **EDID list** in the source panel and select an **EDID**.

Step 2. Press the **Emulated** button at the top of the Destination panel.

Step 3. Select the desired **port** in the right panel (one or more ports can be selected); the EDID(s) will be highlighted with a yellow cursor.

Step 4. Press the **Transfer** button to change the emulated EDID **Learning an EDID**

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

Exporting an EDID

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

Step 1. Select the desired **EDID** in the Source panel (line will be highlighted with yellow).

Step 2. Press the **Export** button to open the dialog box and save the file to the computer.

Importing an EDID

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

Step 1. Press the **User** button at the top of the Source panel and select a **memory** slot.

Step 2. Press the **Import** button below the Source panel.

Step 3. Browse for a file in the newly opened window then press the **Open** button. The EDID is imported into the selected User memory.

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

Deleting EDID(s)

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

Step 1. Press **User** button at 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 in yellow.

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

6.9.2. EDID Summary Window

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

EDID Summary Window

6.9.3. Editing an EDID

Select an EDID in the Source panel and press the **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 memory of the device or a saved EDID file can be loaded into the editor. The software resolves the raw EDID and displays it as readable information to the user. All descriptors can be edited, and saved in an EDID file, or uploaded to the User memory. For more details about EDID Editor please visit our website (www.lightware.com) and download the EDID Editor user's manual.

EDID Editor Window

6.9.4. Creating an EDID - Easy EDID Creator

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

6.10. Control Menu

6.10.1. Ethernet

Ethernet tab in Control menu

Front Ethernet

The settings and status information of the front panel Ethernet port are available in the tab.

Available Settings:

- Port enabling / disabling;
- Mode: Auto negotiation / 10Mb half-duplex / 10Mb full-duplex / 100Mb half-duplex / 100Mb full-duplex;
- Reloading factory default settings.

Link

The settings and status information of the optical Ethernet link are available in the tab.

Available Settings:

- Port enabling / disabling;
- Reloading factory default settings.

6.10.2. Event Manager

See details about Event Manager in the next section.

6.11. Event Manager

The feature allows the device to sense changes on its ports and to react according to pre-defined settings. The idea to develop a feature like the Event Manager is based on the feedbacks from the users. In many cases internal events (such as signal present or HDCP active) shall be displayed but it is not easy when the device is hard to access (e.g. built under the desk).

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

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

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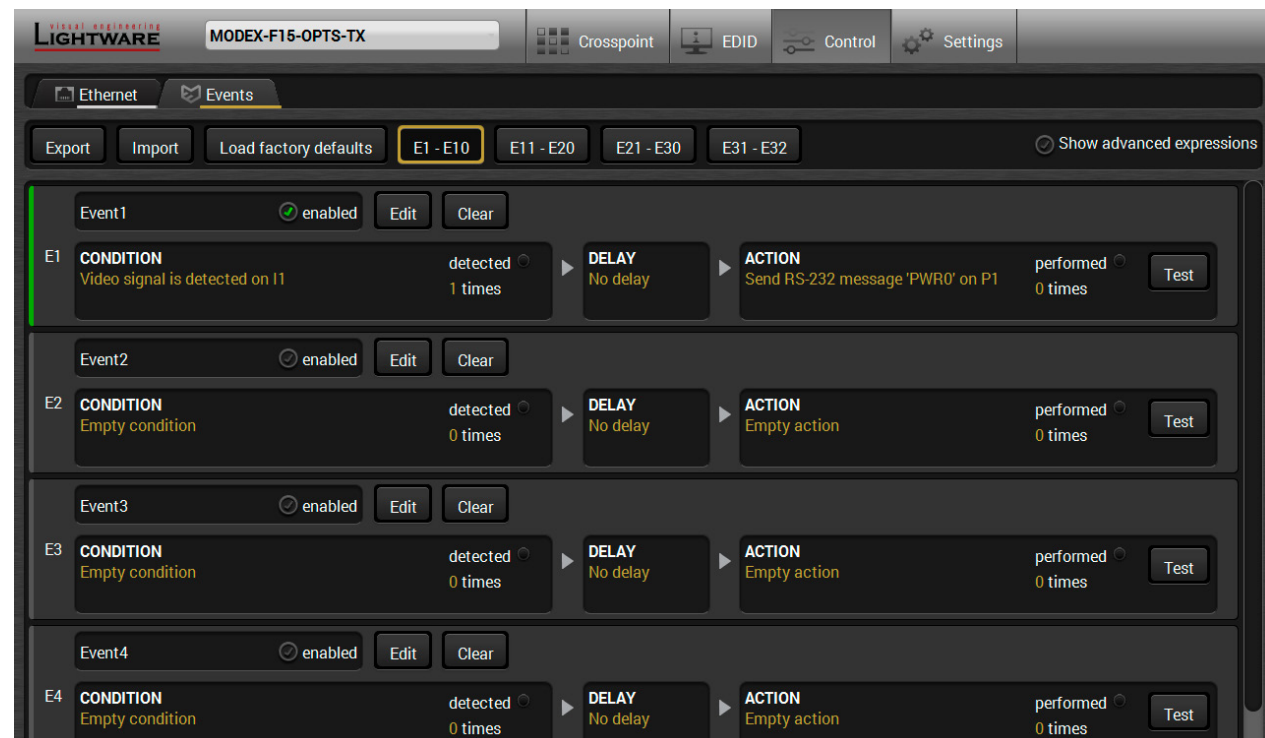
Control Menu, Event Manager Tab

6.11.1. The Event Editor

Press the **Edit** button in the desired Event line to open the Event editor window.
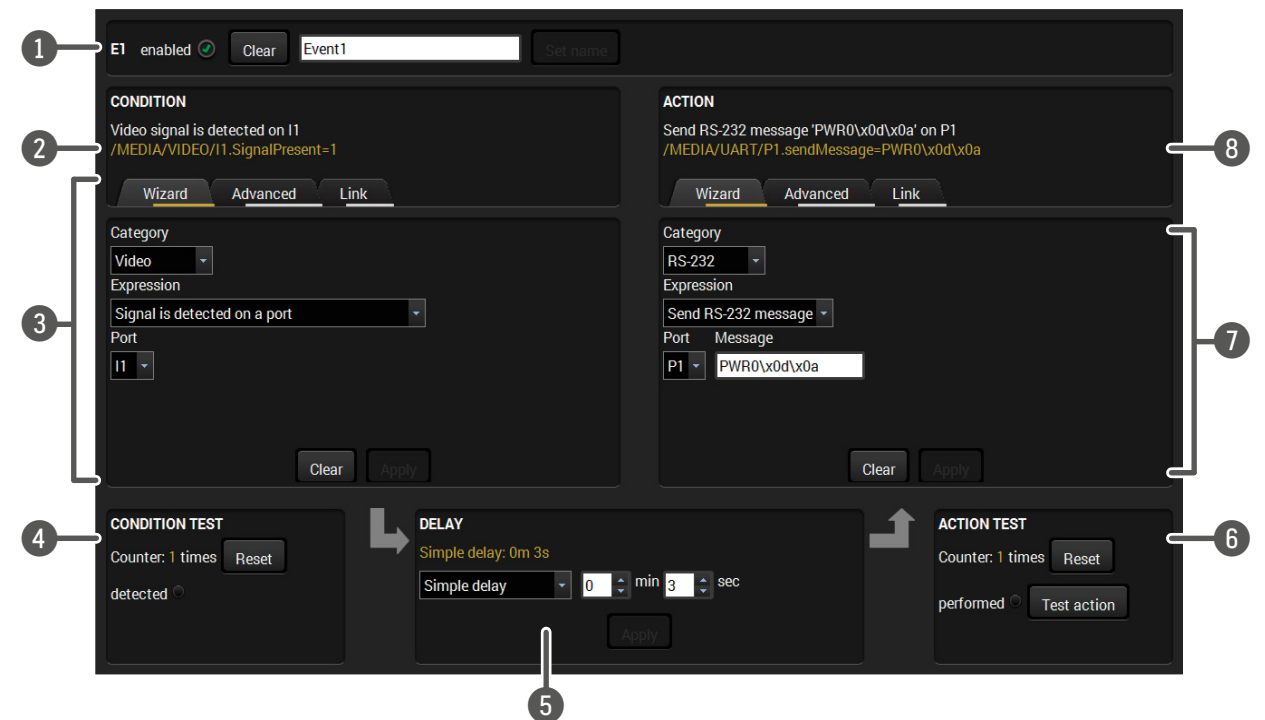
❶	**Event header**	The name of the Event is displayed. Type the desired name and press the **Set name** button. The Event can be cleared by the **Clear** button. **Use the tick mark to enable/disable the Event.**
❷	**Condition header**	If the condition is set, the description (white colored text) and the exact LW3 protocol expression (yellow colored text) can be seen. If the advanced mode was used the description is "Custom condition".
❸	**Condition panel**	The Wizard, the Advanced or the Link tool is available to set the condition. The parameters and settings are displayed below the buttons.
❹	**Condition test**	The set condition can be tested to see how it is working in practice.
❺	**Delay settings**	The action can be scheduled to follow the condition after the set time value.
❻	**Action test**	The set action can be tested to see the working method in the practice.
❼	**Action panel**	The Wizard, the Advanced or the Link tool is available to set the action. The parameters and settings are displayed below the buttons.
❽	**Action header**	If the action is set, the description (white colored text) and the exact LW3 protocol expression (yellow colored text) can be seen. If the advanced mode was used the description is "Custom action".

6.11.2. Create or Modify an Event

Wizard Mode

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

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

Step 2. The wizard mode is displayed as default. Select the desired **Category** first (e.g. Audio or Video).

Step 3. Select the desired **Expression** from the drop-down menu. If it is neccesary to set any other parameter, it is going to be displayed here.

Step 4. Press the **Apply** button to store the settings of the Condition.
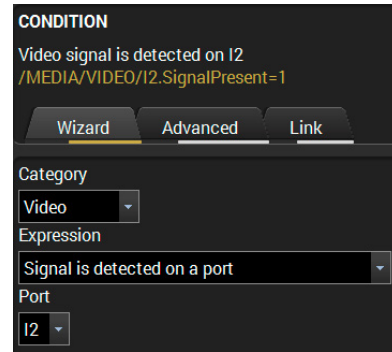
Advanced Mode

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

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

Step 2. As the wizard mode is the default, press the **Advanced** button. The LW3 protocol tree is displayed showing the list of the properties in the drop-down menu. Navigate to the desired node.
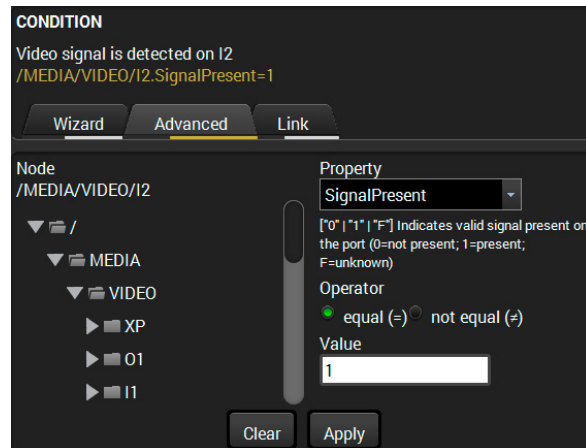
Step 3. Select the desired **Property** from the menu. The **manual** of the property is displayed below to help to select the necessary property and to set the value.

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

The Link Tool

The new interface allows creating more actions for the same condition so a condition can trigger more actions. Similarly, more conditions can be defined for an action. To set such an Event, the Link tool has been introduced.
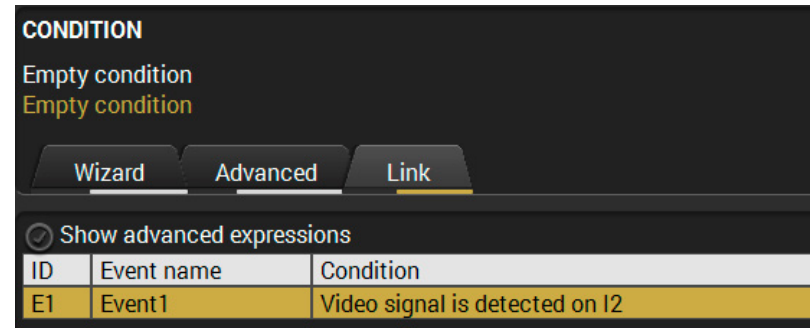
Step 1. Click on the **Edit** button of the desired Event; the **Event editor** is displayed.

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

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

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

6.11.3. Special Tools and Accessories

Name of an Event

The name of an event can be changed by typing the new name and clicking the **Set** button. The following characters are allowed in the name:

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

Enable or Disable an Event

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

Test a Condition

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

Test an Action

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

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

Delay an Action

In most cases the Action is performed immediately after the Condition is detected. But sometimes a delay is necessary between the Condition and the Action. Therefore, the new Event manager contains the Delay panel which allows this feature through the following steps:

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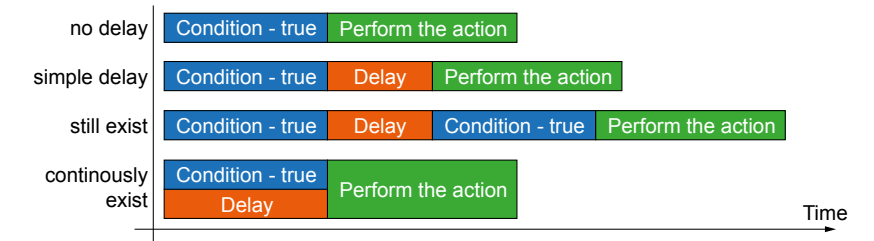
The available delay settings of an Event

TIPS AND TRICKS: The **Show advanced expressions** option is a useful tool when you look for the path or value of a property but just the expression is displayed. The option is available in the Event list window or when the Link tool is used.

6.11.4. Clear One or More Events

Clear an Event

Press the **Clear** button in the Event list or in the header section in the Event editor.

Clear all Events

When all the Events must be cleared press the **Load factory defaults** button above the Event list. You will be prompted to confirm the process.

6.11.5. Export and Import Events

This feature allows saving all the Events. The backup file can be uploaded to another MODEX transmitter or receiver.

Export all Events

Step 1. Press the **Export** button above the Event list.

Step 2. The **Save as** dialog box will appear. Set the desired folder and file name, then press the **Save** button.

The generated file is a simple text file which contains LW3 protocol commands. The file can be viewed in a simple text editor, e.g. Notepad.

▊ **ATTENTION!** Editing the file is recommended only for expert users.

Import all the Events

Step 1. Press the **Import** button above the Event list.

Step 2. The Open dialog box will appear. Select the desired folder and file, then press the **Open** button.

6.11.6. Creating and Event - Example

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

The Concept

The MODEX receiver is connected to a projector through the HDMI output. The device is also connected to the projector through an RS-232 port and can send commands via the serial line.

The task is to turn on the projector when a signal is detected on the HDMI output port.

CONDITION	ACTION
Signal is detected on HDMI output	Turn on the projector
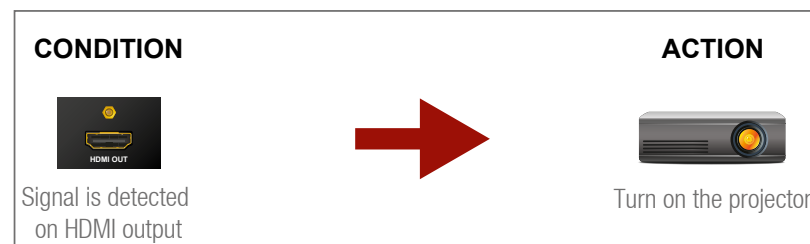
RS-232 Settings

Make sure that the serial link is established between the receiver and the projector. Check that the RS-232 settings on the receiver is set according to the requirements of the projector (baud rate, data bits, parity, stop bits). See the relevant LDC software setting 6.6

Set the Event

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

Step 1. Set the condition.

Select the required parameters to set the condition:

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

Click on the **Apply** button to complete the procedure. When it is done, the condition appears on the upper side in textual and LW3 command format as well.
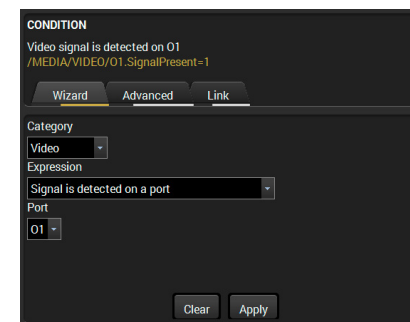
Step 2. Set the action.

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

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

In this example the command has to be closed with the <CR><LF> control characters. These are special characters so they need to be escaped with the \x sequence. You can use the following format for escaping:

$$<command_1><\backslash x0d\backslash x0a><command_2><\backslash x0d\backslash x0a>...<command_n><\backslash x0d\backslash x0a>$$

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

Select the required parameters to set the action:

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

Step 3. Enable the Event.

Select the **E1 enabled** check box in upper left corner to set the Event as launched.
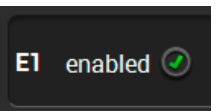
INFO: If you do not find the required category/expression/etc. that you need, choose the Advanced mode in the Wizard where the entire LW3 structure tree is available. For example instead of signal detection you can either set a specified resolution or color range as a condition.
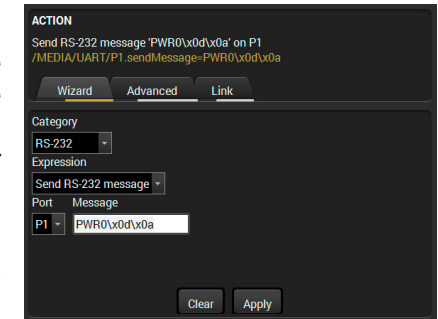
6.12. Settings Menu

6.12.1. Status

Status tab in Settings menu

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

You can set the **High temperature operation** on the right panel: restart the device (default value), force operation, or shutdown the device.

6.12.2. Network

Network tab in Settings menu

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

6.12.3. Backup

Details about this function can be found 6.13

6.12.4. System Log

Events logged by the device and report generators can be found on the System log tab.

System log tab in the Settings menu

LDC is able to collect information from the device and display it in a report. The elements of the report can be sorted by type, time, function, etc, and report tracks can be selected to be displayed in the **Show** section on the left side of the panel.

The report can be exported to a file using the **Log** button. After generating the report, a **Save as** dialog box appears. Select the folder where you want to save the report file. The default file name can be changed. This information package can be sent to the Lightware support team when a problem may arise with the device.

The **Error dump** button generates a .bin file which can help our developers to investigate the emerging issues. The file can be saved and sent to Lightware support team.

| **ATTENTION!** Save the file before powering off or restarting the device.

6.12.5. System

Three functions are available under System tab:

- **Load factory defaults** - recalling factory default settings and values. All factory default settings are listed 11.3
- **Reboot** - rebooting the system.
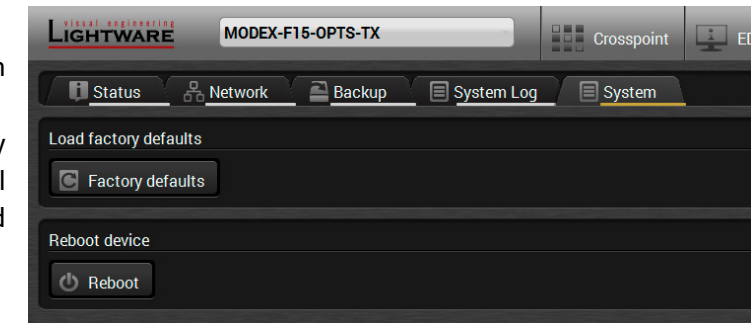
6.13. Configuration Cloning (Backup Tab)
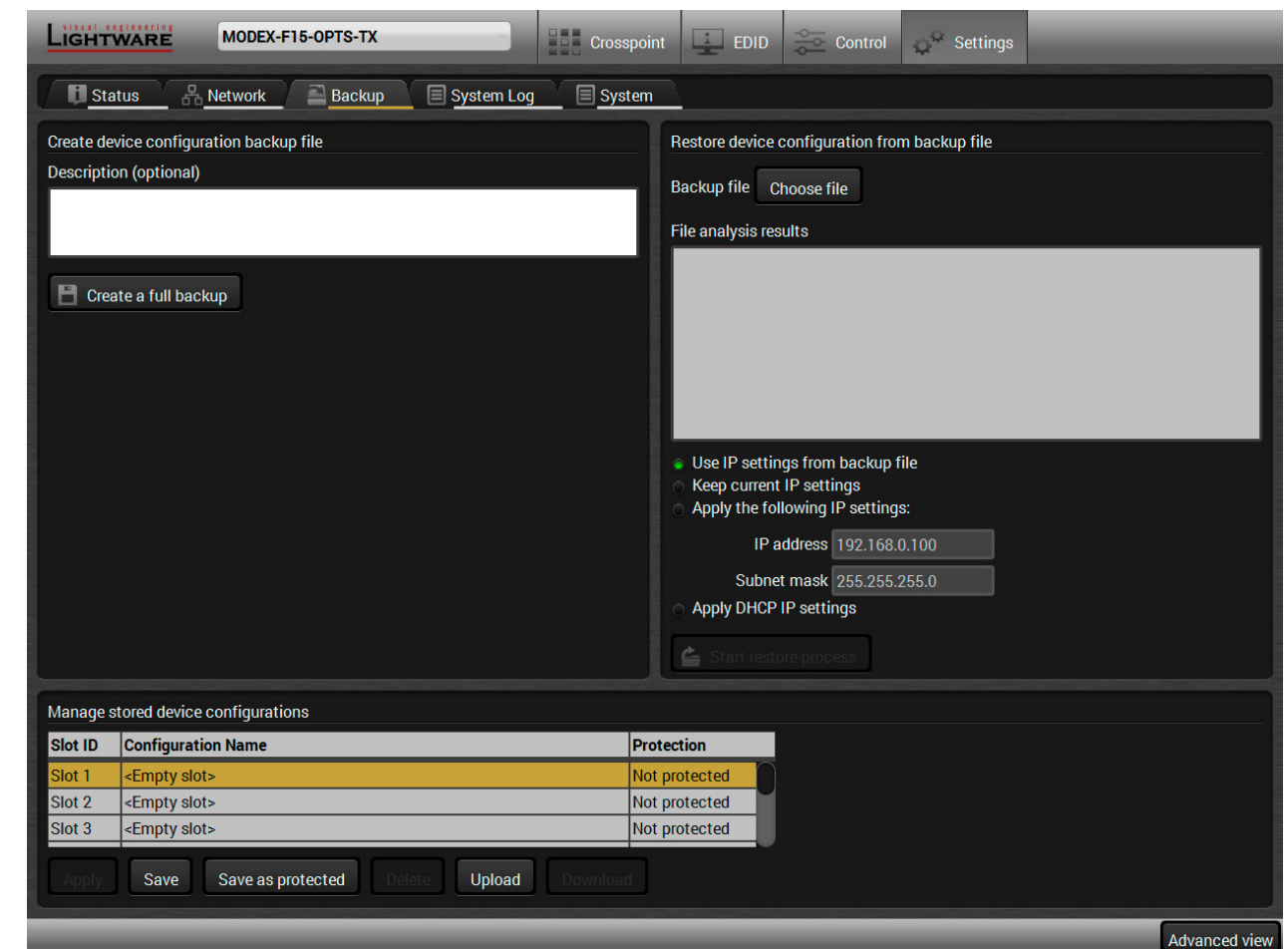
Backup Tab

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 more devices are installed in the same type of system then it is enough to set up only one device to fit the user's needs and then copy those settings to the others, thus saving time and resources.

6.13.1. 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 using 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 necessary when DHCP is not used.

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

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

6.13.2. Save the Settings of a 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 TYPE>_SN<SERIAL NUMBER>.LW3

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

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

About the Backup File

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

See the entire list of saved data 11.2

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

6.13.3. Upload the Settings to a Device (Restore)

> **WARNING! Please note that the settings will be permanently overwritten with the restored parameters in the device. Undo is not available.**

> **ATTENTION!** Cloning can only be 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 to the desired file.

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

Step 4. Choose the **IP settings** that 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.

6.13.4. Create and Restore Backups from the Device Memory

MODEX extenders are able to store backups in their own memory and can be recalled the backups there so that the user does not need to save backup files to a local computer. Eight slots are available for this purpose.

You can save presets without password protection by using **Save** button and with password protection by using the **Save as protected** button. To restore a preset, select the slot of the desired backup and click on the **Apply** button. You can save presets from a file on your local computer by clicking on the **Upload** button and you can also save a preset from the memory of the device to a backup file by using the **Download** button. If you do not need a saved preset any more, select it and click on the **Delete** button (you need the given password for a password protected backup).

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

6.14. Advanced View Window

Advanced view is the surface for displaying the LW3 protocol tree. Commands and specific parameters (which are not available on the graphical user interface of the LDC) can be run and set by the controlling tools.
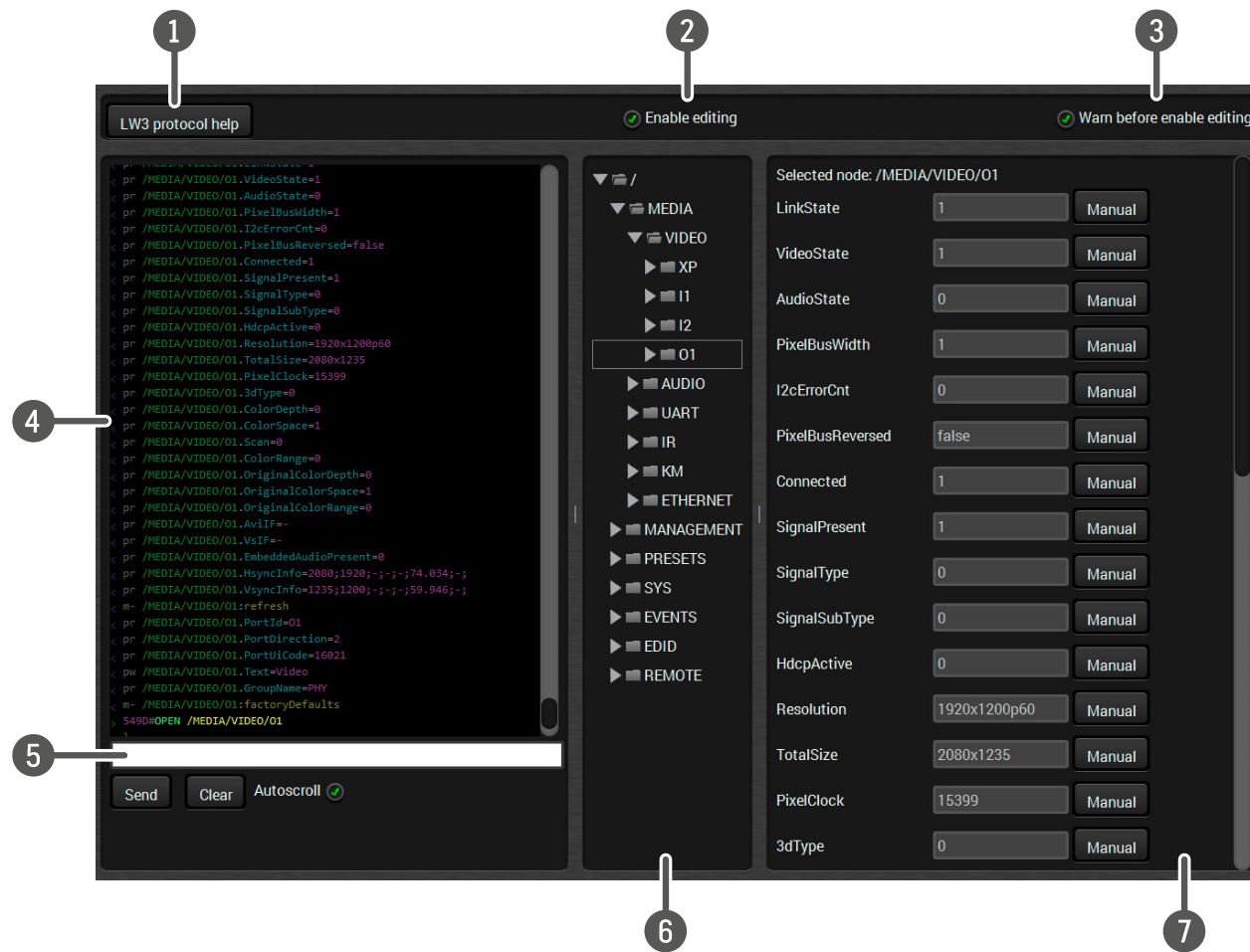
1   **LW3 protocol help**   Clicking on the button opens a help window which presents the most important information about the LW3 protocol commands in HTML format.

2   **Edit mode**   The Advanced window opens in read-only mode by default. If you want to modify the values or parameters, tick this option. You will be prompted to confirm your selection.

3   **Warning mode**   If this option is checked, a warning window pops up when you enable Edit mode.

4   **Terminal window**   Commands and responses with time and date are listed in this window. Sent command is displayed in red and starts with the '>' character, received response is displayed in blue and starts with the '<' character. The content of the window can be cleared by the **Clear** button. If the Autoscroll option is ticked, the list is scrolled automatically when a new line is added.

5   **Command line**   Type the desired command and execute it by the **Send** button. Clear all current commands and responses in the Terminal window by clicking on the **Clear** button.

6   **Protocol tree**   LW3 protocol tree; select an item to see its content.

7   **Node list**   Parameters and nodes of the item selected in the protocol tree are shown here. **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.

7

LW3 Programmers' Reference

The device can be controlled through Lightware 3 (LW3) protocol commands to ensure the compatibility with other Lightware products. The supported LW3commands are described in this chapter. MODEX devices support LW3 protocol commands only.

7.1. Overview

Lightware 3 (LW3) protocol is used by the 25G hybrid matrix, the MODEX family and the new series of Lightware TPS and OPT products. The protocol (LW3) is ASCII-based and all commands are terminated with a carriage return (Cr, '\r') and line feed (Lf, '\n') pair. It is organized as a tree structure that provides outstanding flexibility for implementing a human readable, but programmatically still ease to parse, which is suitable for different products with a different feature list.

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

7.1.1. Elements of the Tree Structure

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

7.1.1.1. Node

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

Format: (the root node): nX•/
Path: nX•/[nodeName]/[nodeName]/[nodeName]

Legend:

n: node

'X' can be:

'-':   default for a node.
'm':   the manual of the node.
'E':   error message for the node.
's':   this is a symlink node.
'v':   this node has virtual children.
'r':   this is a remote node.

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

Following example presents the structure of the tree traversal:

Tree structure

Path of the nodes:

n- /node1

n- /node1/node11

n- /node1/node12

n- /node2

n- /node2/node21

n- /node2/node21/node211

n- /node3

of the nodes
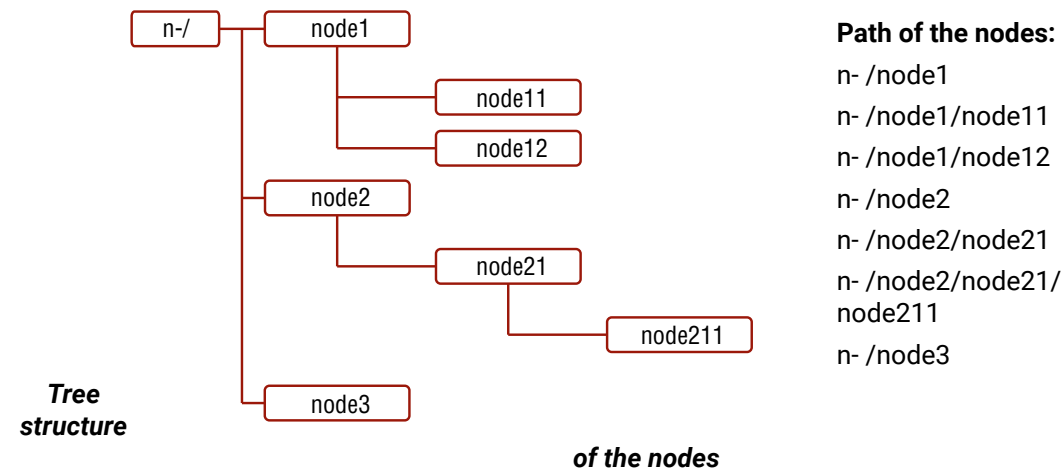
7.1.1.2. Property

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

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

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

Legend:

p: property

'X' can be:

'r':   if the property is read-only.

'w':   if the property is readable, writable.

'm':   the manual of the property.

'E':   error message for the property.

'v':   virtual node property: contains a node path to a node which will be linked to the property's parent node.

Example:

The following two ones are read-only properties:

pr●/node1/node12.ReadOnlyProperty=value1

pr●/.DeviceName=25G Hybrid Device

The following two ones are read-write properties:

pw●/node1/node12.ReadWriteProperty=value2

pw●/.DeviceNickName=John

7.1.1.3. Method

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

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

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

Legend:

m: method

'X' can be:

'O':   when the execution of the method was successful (OK).

'F':   when the execution of the method failed.

'm':   the manual of the method.

'E':   error message for the method.

Example:

mO●/node1/node12:method1

mO●/MEDIA/VIDEO/XP:switch

mE●%E001:Syntax error

mm●/MEDIA/VIDEO/XP:lockSource:Lock one or more source ports

7.1.2. Escaping

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

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

Example:

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

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

> INFO: For a detailed example for escaping see 6.11.6

7.1.3. Error Messages

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

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

Legend:

'X' can be:

'-':   syntax error. Cannot parse the command at all.
'n':   node error.
'p':   property error.
'm':   method error.

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

YYY: error code	Name	Default text
000	Lw3ErrorCodes_None	
001	Lw3ErrorCodes_Syntax	Syntax error
002	Lw3ErrorCodes_NotFound	Not found
003	Lw3ErrorCodes_AlreadyExists	Already exists
004	Lw3ErrorCodes_InvalidValue	Invalid value
005	Lw3ErrorCodes_IllegalParamCount	Illegal parameter count
006	Lw3ErrorCodes_IllegalOperation	Illegal operation
007	Lw3ErrorCodes_AccessDenied	Access denied
008	Lw3ErrorCodes_Timeout	Timeout
009	Lw3ErrorCodes_CommandTooLong	Command too long
010	Lw3ErrorCodes_InternalError	Internal error
011	Lw3ErrorCodes NotImplemented	Not implemented

7.1.4. Prefix Summary

The following prefixes are defined in the LW3 protocol:

'n-':   a node,
'nE':   an error for a node,
'nm':   a manual for a node,
'pr':   a read-only property,
'pw':   read-write property,
'pE':   an error for the property,
'pm':   a manual for the property,
'm-':   a method,
'mO':   a response after a success method execution,
'mF':   a response after a failed method execution,
'mE':   an error for a method,
'mm':   a manual for a method.

7.2. The Tree Structure of the Extender

The /MEDIA node is used by the LDC to connect input ports to output ports on different layers. Each subnode of /MEDIA is representing a layer, e.g. video (/MEDIA/VIDEO), audio (/MEDIA/AUDIO) or RS-232 (/MEDIA/UART). Each layer has a crosspoint to define connections between the ports associated with the layer, all of them are represented by a specific node. E.g. the video layer node is /MEDIA/VIDEO: under the video layer node, the video crosspoint node (XP) and the video ports (I1, I2, …) are located.

The exact content of the nodes (especially the /MEDIA node) depend on the installed Modules. The tree structure is available in the Advanced view of LDC, see 6.14

> INFO: The tree structure is available in Advanced View Window the of LDC.
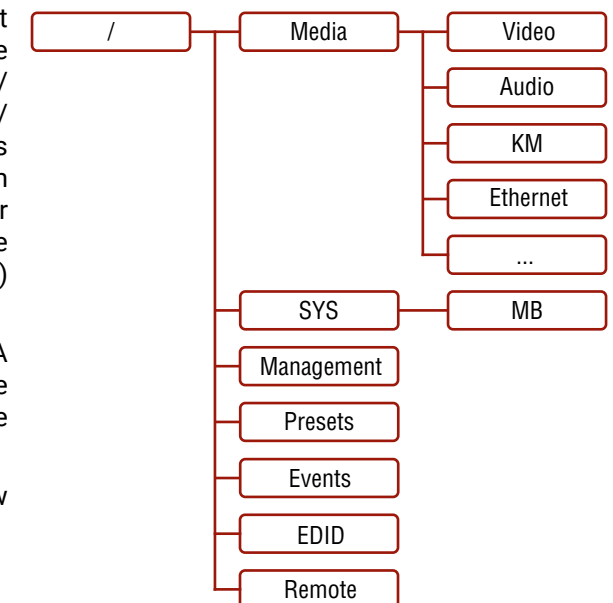
7.3. LW3 Commands

7.3.1. Get Command

The 'GET' command can be used to get the child nodes, properties and methods of a specific node. It can also be used to get the value of a property.

The Response Format

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

The defined prefixes are:

'n-':　　　node

'pr':　　　property - only readable

'pw':　　　property - writable, readable

'm-':　　　method executable

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

Get All Children of a Node

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

Command format:　　　GET●[nodePath]

Response format:　　　n-●[nodePath]**Example**:

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

Get All Properties and Methods of a Node

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

Command format:　　　GET●[nodePath].*

Response format: (for properties)

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

Legend:

X can be:

'r':　　　　　read-only

'w':　　　　　read-write

Response format: (for methods)

m-●[nodePath]:[methodName]

Example:

```
> GET /EDID.*
< pr /EDID.EdidStatus=D1:E1;D1:E2
< m- /EDID:switch
< m- /EDID:switchAll
< m- /EDID:copy
< m- /EDID:delete
< m- /EDID:reset
```

Get All Child Nodes, Properties and Methods of a Node

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

Command format:　　　GETALL●[nodePath]

Response format: (for nodes)

n-●[nodePath]

Response format: (for properties)

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

Legend:

X can be:

'r':　　　read-only

'w':　　　read-write

Response format: (for methods)

m-●[nodePath]:[methodName]

Example:

```
> GETALL /EDID
< n- /EDID/F
< n- /EDID/D
< n- /EDID/U
< n- /EDID/E
< pr /EDID.EdidStatus= D1:E1;D1:E2
< m- /EDID:switch
< m- /EDID:switchAll
< m- /EDID:copy
< m- /EDID:delete
< m- /EDID:reset
```

7.3.2. Set Command

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

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

Response format:

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

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

Example:

```
> SET /SYS/MB/IF1/RS232.Baudrate=9600
< pw /SYS/IF1/MB/RS232.Baudrate=9600
```

Error response format:

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

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

Legend: XXX: error number.

Examples:

```
> SET /SYS/MB/IF1/RS232.CommandInjectionEnable=Yes
< pE /SYS/MB/IF1/RS232.CommandInjectionEnable %E005:Invalid value
```

```
> SET /SYS/MB/IF1/RS232.CommandInjectionStatus=true
< pE %E004:Writing read-only property
```

7.3.3. Invocation

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

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

Response format:

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

mX●[nodePath]:[methodName]=Y

Legend:

X can be:

'O':   if the execution is successful.

'F':   if the execution is failed, but the method could be executed.

'E':   if the method could not be executed: e.g. illegal parameter count.

Y can be:

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

Example:

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

Error response format:

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

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

Example:

```
> CALL /EDID:switch(D1:R1)
< mE /EDID:switch %E004:Invalid value
```

7.3.4. Manual

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

Command format:

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

Response format:

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

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

Example: (for a property)

```
> MAN /MEDIA/VIDEO/I1.HdcpEnable
< pm /MEDIA/VIDEO/I1.HdcpEnable [bool] True, if HDCP authentication is enabled.
```

Example: (for a method)

```
> MAN /SYS/MB/IF1/RS232:factoryDefaults
< mm /SYS/MB/RS232/Local:factoryDefaults [] Restore factory default settings
```

7.3.5. Signature

For some command, the response can contain multiple lines. Each line is terminated with a carriage return (Cr, '\r') and line feed (Lf, '\n') characters. In several cases the number of the lines in the response cannot be determined in advance, e.g. the client is intended waiting for the whole response and also wants to be sure, that the received lines belong together and to the same command. In these cases, a special feature the 'signature' can be used.

The signature is a four digit long hexadecimal value that can be optionally placed before every command. In that case, the response to that particular command will also be preceded by the signature, and the corresponding lines will be between brackets.

Command format:　　XXXX#[command]

Legend:　　　xxxx:　4-digit long hexadecimal value.

Response format:

{XXXX

[command lines]

}

Example:

```
> 1103#GET /MEDIA/UART.*
< {1103
< pr /MEDIA/UART.PortCount=5
< pr /MEDIA/UART.PortUI=P1:21214;P2:15921;P3:15921;P4:15921;P5:15921
< pr /MEDIA/UART.P1=Rs232
< pr /MEDIA/UART.P2=P1 (R)
< pr /MEDIA/UART.P3=-
< pr /MEDIA/UART.P4=-
< pr /MEDIA/UART.P5=-
< }
```

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

7.3.6. Subscription

A user can subscribe to any node. Subscribe to a node means that the user will get a notification if any of the properties of the node is changed. These notifications are asynchronous messages - such as the ones described above - and hence, they are useful to keep the client application up-to-date, without receiving any unwanted information. When the user does not want to be informed about the changes anymore, he can simply unsubscribe from the node.

ATTENTION! The subscriptions are handled separately for connections. Hence, if the connection is terminated all registered subscriptions are deleted. After closing a connection the subscribe command has to be sent in order to get the notifications of the changes on that connection.

Subscribe to a Node

Command format:　　OPEN●[nodePath]

Response format:　　o-●[nodePath]

Example:

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

Subscribe to Multiple Nodes

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

Command format:　　OPEN●[nodePath]/*
Response format:　　o-●[nodePath]/*

Example:

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

Get the Active Subscriptions for the Current Connection

Command format: OPEN

Response format: o-●[nodePath]

Example:

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

Unsubscribe from a Node

Command format: CLOSE●[nodePath]

Response format: c-●[nodePath]

Example:

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

Unsubscribe from Multiple Nodes

Command format: CLOSE●[nodePath]/*

Response format: c-●[nodePath]/*

Example:

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

7.3.7. Notifications about the Changes of the Properties

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

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

Example:

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

A Short Example of How to Use the Subscription

In the following, an example is presented, how the subscriptions are working and how to use them. In the example, there are two independent users controlling the device through two independent connections ('Connection #1' and 'Connection #2'). The events in the rows occur after each other.

Connection #1	`> OPEN /MEDIA/VIDEO/XP`
	`< o- /MEDIA/VIDEO/XP`
	`> GET /MEDIA/VIDEO/XP.DestinationConnectionList`
	`< pr /MEDIA/VIDEO/XP.DestinationConnectionList=I1;I2`

Connection #2	`> GET /MEDIA/VIDEO/XP.DestinationConnectionList`
	`< pr /MEDIA/VIDEO/XP.DestinationConnectionList=I1;I2`
	`> CALL /MEDIA/VIDEO/XP:switch(I1:O1)`
	`< mO /MEDIA/VIDEO/XP:switch`

Connection #1	`< CHG /MEDIA/VIDEO/XP.DestinationConnectionList=I1`

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

7.4. Formal Definitions

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

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

7.5. System Commands

7.5.1. Query the Product Name

The name of the product is a read-only parameter and cannot be modified.

Command format: GET●/.ProductName

Response format: pr●/.ProductName=<Product_name>

Example:

```
> GET /.ProductName
< pr /.ProductName=MEX-110-***-410-715-721
```

7.5.2. Query the Serial Number

Command format: GET●/.SerialNumber

Response format: pr●/.SerialNumber=<serial_nr>

Example:

```
> GET /.SerialNumber
< pr /.SerialNumber=00004550
```

7.5.3. Query the Firmware Version

Command format: GET●/SYS/MB.FirmwareVersion

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

Example:

```
> GET /SYS/MB.FirmwareVersion
< pr /SYS/MB.FirmwareVersion=2.1.1b2 r30
```

7.5.4. Set the Background Light of the LCD Screen

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

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

Example:

```
> SET /MANAGEMENT/UI.LcdMenuBackLightMode=0
< pw /MANAGEMENT/UI.LcdMenuBackLightMode=0
```

Parameters:

0: background light: **OFF** / **1**: background light: **ON** / **2**: background light: **BLINKING**

7.5.5. Set the Displayed Text on the LCD Screen

Two-line long message can be displayed on the LCD screen.

Command format: CALL●/MANAGEMENT/UI:LcdMenuMessage(<time>;<1stline_text>;<2ndline_text>)

Response format: mO●/MANAGEMENT/UI:LcdMenuMessage

Example:

```
> CALL /MANAGEMENT/UI:LcdMenuMessage(100;first line;second line)
< mO /MANAGEMENT/UI:LcdMenuMessage
```

Parameters:

<time>: The displayed text is shown a definite time (100 means 1 second.)

<1stline_text>;<2ndline_text>: The displayed text can be 19 character length and ASCII characters are allowed. Longer names are truncated.

7.5.6. Resetting the Extender

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

Command format: CALL●/SYS:reset()

Response format: mO●/SYS:reset=

Example:

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

7.5.7. Restore the Factory Default Settings

Command format: CALL●/SYS:factoryDefaults()

Response format: mO●/SYS:factoryDefaults=

Example:

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

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

7.6. Video Port and Crosspoint Settings

> INFO: The settings described in the coming sections and port numbering depend on the installed video modules in your device.

7.6.1. Query the Video Crosspoint Setting

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

Response format: pr●/MEDIA/VIDEO/XP.DestinationConnectionList=<I_1>;...;<I_n>:

Legend:

$\quad\quad\quad$ <I_n>:   Video input port number

Example:

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

Explanation: I1 input port is connected to the optical output port.

7.6.2. Switching Video Input

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

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

Example:

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

Explanation: I2 port is connected to O1 port.

7.6.3. HDCP Setting (Transmitter's Input Port)

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

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

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

Example:

```
> SET /MEDIA/VIDEO/I1.HdcpEnable=false
< pw /MEDIA/VIDEO/I1.HdcpEnable=false
```

7.6.4. HDCP Setting (Receiver's Output Port)

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

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

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

Parameters:

.HdcpModeSetting	0	1
HDCP mode	Auto	Always

Example:

```
> SET /MEDIA/VIDEO/O1.HdcpModeSetting=0
< pw /MEDIA/VIDEO/O1.HdcpModeSetting=0
```

7.6.5. HDMI Mode Settings (Output Ports)

> INFO: This setting is available just in case video output Modulee contains DVI/HDMI output port.

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

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

Parameters:

.HdmiModeSetting	0	1	2
HDMI mode	Auto	HDMI	DVI

Example:

```
> SET /MEDIA/VIDEO/O1.HdmiModeSetting=2
< pw / MEDIA/VIDEO/O1.HdmiModeSetting=2
```

7.6.6. DP Mode Settings (Output Port)

> INFO: This setting is available just in case video output module contains DisplayPort output port.

Command format: SET●/MEDIA/VIDEO/<O_n>.DpModeSetting=0|1|2|3

Response format: pw●/MEDIA/VIDEO/<O_n>.DpModeSetting=0|1|2|3

Parameters:

.DpModeSetting	0	1	2	3
DP mode	Auto	18 bit	24 bit	30 bit

Example:

```
> SET /MEDIA/VIDEO/O1.DpModeSetting=0
< pw / MEDIA/VIDEO/O1.DpModeSetting=0
```

7.6.7. Query the Status of Source Ports

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

Response format: pr●/MEDIA/VIDEO/XP.SourcePortStatus=[<I1>;<I2>;…; <In>]

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

Example:

```
> GET /MEDIA/VIDEO/XP.SourcePortStatus
< pr /MEDIA/VIDEO/XP.SourcePortStatus=T00EF;T00AF
```

Legend:

Letter (Character 1)		
	Mute state	**Lock state**
T	Unmuted	Unlocked
L	Unmuted	Locked
M	Muted	Unlocked
U	Muted	Locked

T 0 0 E F

Letter	Mute / Lock status
Byte 1 {	Reserved character, always 0.
	Reserved character, always 0.
Byte 2 {	Embedded audio / HDCP status
	Signal present / Connection status
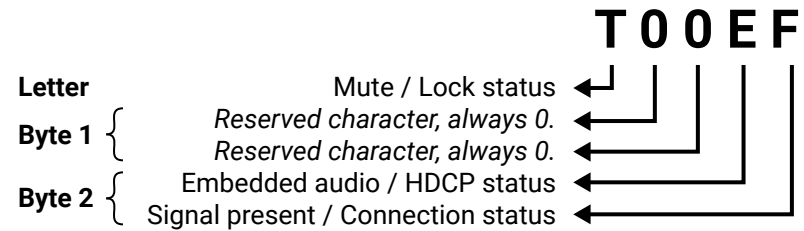
	Byte 1				Byte 2			
	Character 2		Character 3		Character 4		Character 5	
	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0
	Reserved	**Reserved**	**Reserved**	**Reserved**	**Embedded audio status**	**HDCP status**	**Signal present status**	**Connection status**
0 0	Reserved	Reserved	Reserved	Reserved	Unknown			
0 1					Reserved			
1 0	Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	No signal	Not connected
1 1					Embedded audio presents	Encrypted	Signal presents	Connected

Example and Explanation (T00EF):

T	0		0		E		F	
	0 0	0 0	0 0	0 0	1 1	1 0	1 1	1 1
Unlocked, Unmuted	Reserved	Reserved	Reserved	Reserved	Embedded audio presents	Not encrypted	Signal presents	Connected

The Most Common Received Port Status Responses

T00AA	T	0		0		A		A	
	Unlocked, Unmuted	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	
	Unlocked, Unmuted	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	
	Unlocked, Unmuted	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	
	Unlocked, Unmuted	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	
	Unlocked, Unmuted	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	
	Unlocked, Unmuted	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

7.6.8. Query the Status of Destination Ports

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

Response format: pr●/MEDIA/VIDEO/XP.DestinationPortStatus=[<O_1>;<O_2>;...; <O_n>]

The responses contain one letter and a 2-byte long HEX code showing the current state of the output ports.

Example:

```
> GET /MEDIA/VIDEO/XP.DestinationPortStatus
< pr /MEDIA/VIDEO/XP.DestinationPortStatus=T00AF
```

Legend:

See at previous section.

7.6.9. Query the Video Autoselect Settings

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

Response format: pr●/MEDIA/VIDEO/XP.DestinationPortAutoselect=<O_1_set>; <O_2_set>;...;<O_n_set>

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

Legend:

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

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

Example:

```
> GET /MEDIA/VIDEO/XP.DestinationPortAutoselect
< pr /MEDIA/VIDEO/XP.DestinationPortAutoselect=EL
```

Explanation:

EL: the Autoselect is Enabled on output 1, selected mode is Last detect.

▌ INFO: For more information 3.11.

7.6.10. Change the Autoselect Mode

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

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

Legend: see previous section.

Example1:

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

Explanation1: The setting is changed to "EP": Autoselect is enabled (E); the mode is set to "priority detect" (P).

Example2:

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

Explanation2: The setting is changed to "DP": Autoselect is disabled (D). The other settings remain unchanged. Since the outputs are linked, the change will affect local and link out.

7.6.11. Query the Input Port Priority

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

Response format: pr●/MEDIA/VIDEO/XP.PortPrioirtyList=<O_1_list>;<O_2_list>;... ...;<O_n_list>

The response shows the priority of each output one after another. The priority number can be from 0 to 31; 0 is the highest- and 30 is the lowest priority. 31 means that the port will be skipped from the priority list.

Legend:

<O_n_list>   The input port priority order of the given output port: <I_1>,<I_2>,...,<I_m>

Example:

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

Explanation:

There are two outputs, so there are two groups listed in the response (divided by semicolons) and each group (list) contains four priority numbers. The priority list of O1 and O2 are common.

Priority	0	1	...	x
Video input port	I1	I2	...	I_m

Highest priority is assigned to I1 port.

▌ **ATTENTION!** The same priority number can be set to different input ports. When the priority numbers match, the input port with the lowest port number will have the highest priority.

7.6.12. Change the Input Port Priority

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

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

Legend:

<prio>:   Priority number from 0 to 31, equal numbers are allowed (31 means that the port will be skipped from the priority list).

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

Example:

```
> CALL /MEDIA/VIDEO/XP:setAutoselectionPriority(I1\(O1\):6;I2\(O1\):6)
< mO /MEDIA/VIDEO/XP:setAutoselectionPriority
```

Explanation:

The priority number of input 1 and Input 2 has been set to 6 on output 1. The example shows that certain control characters have been escaped: the backslash "\" character is inserted before the "(" and ")" characters. See more information 7.1.2

7.6.13. Mute an Input Port

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

Example:

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

7.6.14. Unmute an Input Port

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

Example:

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

7.6.15. Lock an Input Port

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

Example:

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

7.6.16. Unlock an Input Port

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

Example:

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

7.6.17. Mute an Output

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

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

Example:

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

7.6.18. Unmute an Output

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

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

Example:

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

7.6.19. Lock an Output

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

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

Example:

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

7.6.20. Unlock an Output

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

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

Example:

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

7.6.21. Test Pattern Generator

> INFO: This setting is available only in case of MODEX-AV-HDMI-DVI-4K-OM module is installed in the MODEX receiver.

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

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

Test Pattern Generator Mode Setting

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

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

Parameters:

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

Example:

```
> SET /MEDIA/VIDEO/O1.TpgMode=2
< pw /MEDIA/VIDEO/O1.TpgMode=2
```

Clock Source – The Clock Frequency of the Test Pattern

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

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

Parameters:

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

Example:

```
> SET /MEDIA/VIDEO/O1.TpgClockSource=576
< pw /MEDIA/VIDEO/O1.TpgClockSource=576
```

Test Pattern

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

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

Parameters:

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

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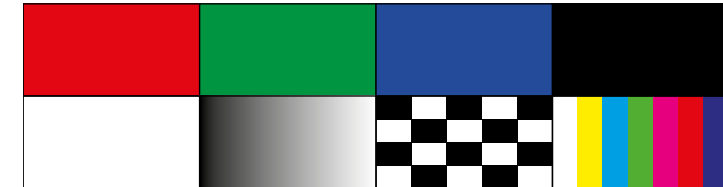
Example:

```
> SET /MEDIA/VIDEO/O1.TpgPattern=GREEN
< pw /MEDIA/VIDEO/O1.TpgPattern=GREEN
```

7.7. Audio Port and Crosspoint Settings

7.7.1. Query the Status of Source Port

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

Response format: pr●/MEDIA/AUDIO/XP.SourcePortStatus=[$<I_1>;<I_2>;...;<I_n>$]

The responses contain one letter and a 2-byte long HEX code showing the current state of the input ports.

Example:

```
> GET /MEDIA/AUDIO/XP.SourcePortStatus
< pr /MEDIA/AUDIO/XP.SourcePortStatus=T000F;M000B;T000C;T0008;T000C
```

Legend:

Letter (Character 1)		
	Mute state	**Lock state**
T	Unmuted	Unlocked
L	Unmuted	Locked
M	Muted	Unlocked
U	Muted	Locked

T 0 0 0 F

- Letter → Mute / Lock status
- Byte 1 → Reserved character, always 0. / Reserved character, always 0.
- Byte 2 → Reserved character, always 0. / Signal present / Connection status

	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

Example and Explanation (for input 2, M000B):

M	0		0		0		B	
Unlocked, Muted	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

The Most Common Received Port Status Responses

T000A	T	0		0		0		A	
Unlocked, Unmuted	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	
Unlocked, Unmuted	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

T000F	T	0		0		0		F	
Unlocked, Unmuted	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

T000C	T	0		0		0		C	
Unlocked, Unmuted	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

7.7.2. Query the Status of Destination Port

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

Response format: pr●/MEDIA/AUDIO/XP.DestinationPortStatus=[$<O_n>$]

The responses contain one letter and a 2-byte long HEX code showing the current state of the output ports.

Example:

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

Legend: See at previous section.

Example (for output 3, M000F):

M	0		0		0		F	
unlocked, muted	0 0 0 0		0 0 0 0		0 0	0 0	1 1	1 1

Explanation: cable is connected to output 2, valid audio signal presents, no information about HDCP-encryption and the audio embedding. The port is unlocked, but muted.

7.7.3. Query the Audio Crosspoint Setting

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

Response format: pr●/MEDIA/AUDIO/XP.DestinationConnectionList=<I_1>;...;<I_n>

Legend:

  <I_n>:   Audio input port number

Example:

```
> GET /MEDIA/AUDIO/XP.DestinationConnectionList
< pr /MEDIA/AUDIO/XP.DestinationConnectionList=I1;I5;0;I3
```

Explanation: I1 input port is connected to the audio output ports.

7.7.4. Query the Audio Autoselect Settings

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

Response format: pr●/MEDIA/AUDIO/XP.DestinationPortAutoselect=<O_1_set>; <O_2_set>;...;<O_n_set>

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

Legend:

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

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

Example:

```
> GET /MEDIA/AUDIO/XP.DestinationPortAutoselect
< pr /MEDIA/AUDIO/XP.DestinationPortAutoselect=EL;DP;DP;DP
```

Explanation:

EL: the Autoselect is Enabled on output 1, selected mode is Last detect.

> ▌ INFO: For more information see 3.11

7.7.5. Change the Autoselect Mode

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

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

Legend: see previous section.

Example1:

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

Explanation1: The setting is changed to "EP": Autoselect is enabled (E); the mode is set to "priority detect" (P).

Example2:

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

Explanation2: The setting is changed to "DP": Autoselect is disabled (D). The other settings remain unchanged. Since the outputs are linked, the change will affect local and link out.

7.7.6. Query the Input Port Priority

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

Response format: pr●/MEDIA/AUDIO/XP.PortPrioirtyList=<O_1_list>;<O_2_list>;... ...;<O_n_list>

The response shows the priority of each output one after another. The priority number can be from 0 to 31; 0 is the highest- and 30 is the lowest priority. 31 means that the port will be skipped from the priority list.

Legend:

<O_n_list>   The input port priority order of the given output port: <I_1>,<I_2>,...,<I_m>

Example:

```
> GET /MEDIA/AUDIO/XP.PortPriorityList
< pr /MEDIA/AUDIO/XP.PortPriorityList=0,1,2,3,4;0,1,2,3,4;0,1,2,3,4; 0,1,2,3,4
```

Explanation:

There are two outputs, so there are two groups listed in the response (divided by semicolons) and each group (list) contains four priority numbers. The priority list of O1 and O2 are common.

Priority	0	1	...	x
Audio input port	I1	I2	...	I_m

Highest priority is assigned to I1 port.

> ▌ **ATTENTION!** The same priority number can be set to different input ports. When the priority numbers match, the input port with the lowest port number will have the highest priority.

7.7.7. Change the Input Port Priority

Command format:

CALL●/MEDIA/AUDIO/XP:setAutoselectionPriority(<I_n>\(<O_m>\):<prio>)

Response format:

mO●/MEDIA/AUDIO/XP:setAutoselectionPrioirty

Legend:

<prio>:   Priority number from 0 to 31, equal numbers are allowed (31 means that the port will be skipped from the priority list).

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

Example:

```
> CALL /MEDIA/AUDIO/XP:setAutoselectionPriority(I1\(O1\):6;I2\(O1\):6)
< mO /MEDIA/AUDIO/XP:setAutoselectionPriority
```

Explanation:

The priority number of input 1 and Input 2 has been set to 6 on output 1. The example shows that certain control characters have been escaped: the backslash "\" character is inserted before the "(" and ")" characters. See more information about escaping in 7.1.2

7.7.8. Switching Audio Input

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

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

Example:

```
> CALL /MEDIA/AUDIO/XP:switch(I5:O1)
< mO /MEDIA/AUDIO/XP:switch
```

Explanation: I5 port is connected to O1 port.

7.7.9. Mute Audio Input

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

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

Example:

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

7.7.10. Unmute Audio Input

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

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

Example:

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

7.7.11. Mute Audio Output

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

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

Example:

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

7.7.12. Unmute Audio Output

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

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

Example:

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

7.7.13. Analog Audio Input Level Settings

Volume

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

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

Parameters:

<level>   Sets the input volume (attenuation) between -63.5 dB and 0 dB in step of -0.5 dB. The value is rounded up if necessary to match with the step value.

Example:

```
> SET /MEDIA/AUDIO/I5.Volume=-15
< pw /MEDIA/AUDIO/I5.Volume=-15.000
```

Balance

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

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

Parameters:

  <level>   Sets the balance; 0 means left balance, 100 means right balance, step is 1. Center is 50 (default).

Example:

```
> SET /MEDIA/AUDIO/I5.Balance=0
< pw /MEDIA/AUDIO/I5.Balance=0
```

Gain

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

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

Parameters:

  <level>   Sets the input gain between 0 and 24 in step of 3. The value is rounded down if necessary to match the step value.

Example:

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

7.7.14. Analog Audio Output Level Settings

Volume

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

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

Parameters:

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

Example:

```
> SET /MEDIA/AUDIO/O2.Volume=-15
< pw /MEDIA/AUDIO/O2.Volume=-15.000
```

Gain

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

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

Parameters:

             <level>   Sets the input gain between -9 dB and 6 dB in step of 3 dB. The value is rounded down if necessary to match the step value.

Example:

```
> SET /MEDIA/AUDIO/O2.Gain=3
< pw /MEDIA/AUDIO/O2.Balance=3
```

7.8. Network Configuration

ATTENTION! Please note that all settings below will be applied after calling ApplySettings() method or after the device is restarted next time. See the description of the method 7.8.9.

7.8.1. Query the DHCP State

Command format: GET●/MANAGEMENT/NETWORK.DhcpEnabled

Response format: pw●/MANAGEMENT/NETWORK.DhcpEnabled=true|false

Example:

```
> GET /MANAGEMENT/NETWORK.DhcpEnabled
< pw /MANAGEMENT/NETWORK.DhcpEnabled=true
```

7.8.2. Change the DHCP State

Command format: SET●/MANAGEMENT/NETWORK.DhcpEnabled=true|false

Response format: pw●/MANAGEMENT/NETWORK.DhcpEnabled=true|false

Example:

```
> SET /MANAGEMENT/NETWORK.DhcpEnabled=false
< pw /MANAGEMENT/NETWORK.DhcpEnabled=false
```

7.8.3. Query the IP Address

Command format: GET●/MANAGEMENT/NETWORK.IpAddress

Response format: pr●/MANAGEMENT/NETWORK.IpAddress=<>IP_Address>

Example:

```
> GET /MANAGEMENT/NETWORK.IpAddress
< pr /MANAGEMENT/NETWORK.IpAddress=192.168.0.101
```

7.8.4. Change the IP Address (Static)

Command format: SET●/MANAGEMENT/NETWORK.StaticIpAddress=<IP_address>

Response format: pw●/MANAGEMENT/NETWORK.StaticIpAddress=<IP_address>

Example:

```
> SET /MANAGEMENT/NETWORK.StaticIpAddress=192.168.0.85
< pw /MANAGEMENT/NETWORK.StaticIpAddress=192.168.0.85
```

7.8.5. Query the Subnet Mask

Command format: GET●/MANAGEMENT/NETWORK.NetworkMask

Response format: pr●/MANAGEMENT/NETWORK.NetworkMask=<netmask>

Example:

```
> GET /MANAGEMENT/NETWORK.NetworkMask
< pr /MANAGEMENT/NETWORK.NetworkMask=255.255.255.0
```

7.8.6. Change the Subnet Mask (Static)

Command format: SET●/MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>

Response format: pw●/MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>

Example:

```
> SET /MANAGEMENT/NETWORK.StaticNetworkMask=255.255.255.0
< pw /MANAGEMENT/NETWORK.StaticNetworkMask=255.255.255.0
```

7.8.7. Query the Gateway Address

Command format: GET●/MANAGEMENT/NETWORK.GatewayAddress

Response format: pr●/MANAGEMENT/NETWORK.GatewayAddress=<gw_address>

Example:

```
> GET /MANAGEMENT/NETWORK.GatewayAddress
< pr /MANAGEMENT/NETWORK.GatewayAddress=192.168.0.1
```

7.8.8. Change the Gateway Address (Static)

Command format: SET●/MANAGEMENT/NETWORK.StaticGatewayAddress=<gw_address>

Response format: pw●/MANAGEMENT/NETWORK.StaticGatewayAddress=<gw_address>

Example:

```
> SET /MANAGEMENT/NETWORK.StaticGatewayAddress=192.168.0.5
< pw /MANAGEMENT/NETWORK.StaticGatewayAddress=192.168.0.5
```

7.8.9. Apply Network Settings

Command format: CALL●/MANAGEMENT/NETWORK:ApplySettings()

Response format: m0●/MANAGEMENT/NETWORK: ApplySettings

Example:

```
> CALL /MANAGEMENT/NETWORK:ApplySettings()
< m0 /MANAGEMENT/NETWORK:ApplySettings
```

Explanation: all network settings which are changed have been applied.

7.9. RS-232 Port Configuration

7.9.1. BAUD Rate Setting

Command format:　　SET●/MEDIA/UART/<P_n>.Baudrate=<Baud_rate>

Response format:　　pw●/MEDIA/UART/<P_n>.Baudrate=<Baud_rate>

Parameters:

<Baud_rate>							
BAUD rate value	4800	9600	14400	19200	28800	38400	56000	57600

<Baud_rate>					
BAUD rate value	115200	128000	153600	230400	256000	460800

Example:

```
> SET /MEDIA/UART/P1.Baudrate=14400
< pw /MEDIA/UART/P1.Baudrate=14400
```

7.9.2. Databit Setting

Command format:　　SET●/MEDIA/UART/<P_n>.DataBits=4|5|6|7|8|9

Response format:　　pw●/MEDIA/UART/<P_n>.DataBits=4|5|6|7|8|9

Example:

```
> SET /MEDIA/UART/P1.DataBits=8
< pw /MEDIA/UART/P1.DataBits=8
```

7.9.3. Stopbits Setting

Command format:　　SET●/MEDIA/UART/<P_n>.StopBits=0|1|2

Response format:　　pw●/MEDIA/UART/<P_n>.StopBits=0|1|2

Parameters:

.StopBits	0	1	2
Stopbit value	1	1,5	2

Example:

```
> SET /MEDIA/UART/P1.StopBits=0
< pw /MEDIA/UART/P1.StopBits=0
```

7.9.4. Parity Setting

Command format:　　SET●/MEDIA/UART/<P_n>.Parity=0|1|2|3|4

Response format:　　pw●/MEDIA/UART/<P_n>.Parity=0|1|2|3|4

Parameters:

.Parity	0	1	2	3	4
Parity setting	no parity	odd	even	zero	one

Example:

```
> SET /MEDIA/UART/P1.Parity=0
< pw /MEDIA/UART/P1.Parity=0
```

7.9.5. Command Injection Mode

Command format:　　SET●/MEDIA/UART/<P_n>.CommandInjectionEnable=true|false

Response format:　　pw●/MEDIA/UART/<P_n>.CommandInjectionEnable=true|false

Example:

```
> SET /MEDIA/UART/P1.CommandInjectionEnable=true
< pw /MEDIA/UART/P1.CommandInjectionEnable=true
```

ATTENTION! The Command injection status is stored in another read-only property: /MEDIA/UART/<P_n>.CommandInjectionStatus.

7.10. Sending Message via the Communication Ports

7.10.1. Send Message via TCP Port

The device can be used for sending a message to a certain IP:port address. The feature allows controlling a connected (third-party) device, below command is for sending an ASCII-format text message:

Command format: CALL●/MEDIA/ETHERNET.tcpText(<IP_address>":"<port_no>"="<message>)

Response format: mO●/MEDIA/ETHERNET:tcpText

Example:

```
> CALL /MEDIA/ETHERNET.tcpText(192.168.0.20:5555=pwr_on)
< mO /MEDIA/ETHERNET:tcpText
```

Send HEX or BIN Message

Message can be sent in other formats by the following methods:

- **tcpMessage**: sending in HEX format.
- **tcpBinary**: sending in BIN format.

The command- and response formats are the same as above mentioned.

▌ INFO: Use the udpMessage, udpText, and udpBinary commands to send a UDP message.

7.10.2. Send Message via an RS-232 Port

The RS-232 ports can be used for sending a message to the other end of the serial channel. The feature allows controlling a connected (third-party) device, below command is for sending an ASCII-format text message:

Command format: CALL●/MEDIA/UART/<P_n>.sendText(<message>)

Response format: mO●/MEDIA/UART/<Pn>:sendText

Example:

```
> CALL /MEDIA/UART/P2.sendText(pwr_on)
< mO /MEDIA/UART/P2:sendText
```

Send Message in HEX or BIN Format

Message can be sent in other formats by the following methods:

- **sendMessage**: sending in HEX format.
- **sendBinaryMessage**: sending in BIN format.

7.11. Infrared Port Configuration

7.11.1. Command Injection Mode

Command format: SET●/MEDIA/IR/<$S|D_n$>.CommandInjectionEnable=true|false

Response format: pw●/MEDIA/IR/<$S|D_n$>.CommandInjectionEnable=true|false

Example:

```
> SET /MEDIA/IR/S1.CommandInjectionEnable=true
< pw /MEDIA/IR/S1.CommandInjectionEnable=true
```

7.12. EDID Management

7.12.1. Query the Emulated EDIDs

Command format: GET●/EDID.EdidStatus

Response format: pr●/EDID.EdidStatus=<E_loc>:<E_1>;<E_loc>:<E_2>;...;<E_loc>:<E_n>

Example:

```
> GET /EDID.EdidStatus
< pr EDID.EdidStatus=D1:E1
```

Explanation:

Emulated EDID memory for input port is listed with the EDID number that is currently emulated on the input.

7.12.2. Query the Validity of a Dynamic EDID

Command format: GET●/EDID/D/D_n.Validity

Response format: pr●/EDID/D/D_n.Validity=true|false

Example:

```
> GET /EDID/D/D1.Validity
< pr EDID/D/D1.Validity=true
```

Explanation:

The 'Validity' property is true, valid EDID is stored in D1 memory place.

7.12.3. Query the Preferred Resolution of an User EDID

Command format: GET•/EDID/U/U$_n$.PreferredResolution

Response format: pr•/EDID/U/U$_n$.PreferredResolution=<preferred_resolution>

Example:

```
> GET /EDID/U/U2.PreferredResolution
< pr EDID/U/U2.PreferredResolution=1920x1080p60.00Hz
```

> INFO: Use the "Manufacturer" property to query the manufacturer and the "MonitorName" property to query the name of the monitor.

7.12.4. Emulating an EDID to an Input Port

Command format: CALL•/EDID:switch(<source>:<destination>)

Response format: mO•/EDID:switch

Example:

```
> CALL /EDID:switch(F49:E2)
< mO /EDID:switch
```

Legend:

<source>:   Source EDID memory place: Factory / User / Dynamic.

<destination>:   The emulated EDID memory of the desired input port.

7.12.5. Copy an EDID to User Memory

Command format: CALL•/EDID:copy(<D$_n$>|<E$_n$>|<F$_n$>|<U$_n$>:<U$_m$>)

Response format: mO•/EDID:copy

Example:

```
> CALL /EDID:copy(D1:U1)
< mO /EDID:copy
```

Explanation:

The EDID of the last connected sink of D1 (Output 1) has been copied to U1.

7.12.6. Deleting an EDID from User Memory

Command format: CALL•/EDID:delete(<U$_n$>)

Response format: mO•/EDID:delete

Example:

```
> CALL /EDID:delete(U1)
< mO /EDID:delete
```

7.12.7. Resetting the Emulated EDIDs

Command format: CALL•/EDID:reset

Response format: mO•/EDID:reset

Example:

```
> CALL /EDID:reset
< mO /EDID:reset
```

Explanation:

Calling this method switches all emulated EDIDs to factory default one. See the table with all factory EDID presets in Factory EDID List section.

7.13. LW3 Commands – Quick Summary

System Settings

Operation / Path	
7.5.1	Query the Product Name GET /.ProductName
7.5.2	Query the Serial Number GET /.SerialNumber
7.5.2	Query the Firmware Version GET /SYS/MB.FirmwareVersion
7.5.4	Set the Background Light of the LCD Screen SET /MANAGEMENT/UI.LcdMenuBackLightMode=0|1|2
7.5.5	Set the Displayed Text on the LCD Screen CALL /MANAGEMENT/UI:LcdMenuMessage(<time>;<firstline_text>;<secondline_text>)
7.5.6	Resetting the Extender CALL /SYS:Reset()
7.5.7	Restore the Factory Default Settings CALL /SYS:factoryDefaults()

Video Port and Crosspoint Settings

Operation / Path	
7.6.1	Query the Video Crosspoint Setting GET /MEDIA/VIDEO/XP.DestinationConnectionList
7.6.2	Switching Video Input CALL /MEDIA/VIDEO/XP:switch(<In>:<Om>)
7.6.3	HDCP Setting (Transmitter's Input Port) SET /MEDIA/VIDEO/<In>.HdcpEnable=true|false
7.6.4	HDCP Setting (Receiver's Output Port) SET /MEDIA/VIDEO/<On>.HdcpModeSetting=0|1
7.6.5	HDMI Mode Settings (Output Ports) SET /MEDIA/VIDEO/<On>.HdmiModeSetting=0|1|2
7.6.6	DP Mode Settings (Output Port) SET /MEDIA/VIDEO/<On>.DpModeSetting=0|1|2|3
7.6.7	Query the Status of Source Ports GET /MEDIA/VIDEO/XP.SourcePortStatus
7.6.8	Query the Status of Destination Ports GET /MEDIA/VIDEO/XP.DestinationPortStatus
7.6.9	Query the Video Autoselect Settings GET /MEDIA/VIDEO/XP.DestinationPortAutoselect

Operation / Path	
7.6.10	Change the Autoselect Mode CALL /MEDIA/VIDEO/XP:setDestinationPortAutoselect(<On>:<On_set>)
7.6.11	Query the Input Port Priority GET /MEDIA/VIDEO/XP.PortPriorityList
7.6.12	Change the Input Port Priority /MEDIA/VIDEO/XP:setAutoselectionPriority(<input>\(<output>\):<prio>)
7.6.13	Mute an Input Port CALL /MEDIA/VIDEO/XP:muteSource(<input>)
7.6.14	Unmute an Input Port CALL /MEDIA/VIDEO/XP:unmuteSource(<input>)
7.6.15	Lock an Input Port CALL /MEDIA/VIDEO/XP:lockSource(<input>)
7.6.16	Unlock an Input Port CALL /MEDIA/VIDEO/XP:unlockSource(<input>)
7.6.17	Mute an Output CALL /MEDIA/VIDEO/XP:muteDestination(<output>)
7.6.18	Unmute an Output CALL /MEDIA/VIDEO/XP:unmuteDestination (<output>)
7.6.19	Lock an Output CALL /MEDIA/VIDEO/XP:lockDestination(<output>)
7.6.20	Unlock an Output CALL/MEDIA/VIDEO/XP:unlockDestination(<output>)
7.6.21	Test Pattern Generator SET /MEDIA/VIDEO/<output>.TpgMode|TpgClockSource|TpgPattern

Audio Port and Crosspoint Settings

Operation / Path	
7.7.1	Query the Status of Source Port
	GET /MEDIA/AUDIO/XP.SourcePortStatus
7.7.2	Query the Status of Destination Port
	GET /MEDIA/AUDIO/XP.DestinationPortStatus
7.7.3	Query the Audio Crosspoint Setting
	GET /MEDIA/AUDIO/XP.DestinationConnectionList
7.7.4	Query the Audio Autoselect Settings
	GET /MEDIA/AUDIO/XP.DestinationPortAutoselect
7.7.5	Change the Autoselect Mode
	SET /MEDIA/AUDIO/XP:setDestinationPortAutoselect(<output>: <output_set>)
7.7.6	Query the Input Port Priority
	GET /MEDIA/AUDIO/XP:switch(<input>:<output>)
7.7.7	Change the Input Port Priority
	SET /MEDIA/AUDIO/XP.PortPriorityList
7.7.8	Switching Audio Input
	CALL /MEDIA/AUDIO/XP:setAutoselectionPriority(<input>\(<output>\):<prio>)
7.7.9	Query the Video Autoselect Settings
	CALL /MEDIA/AUDIO/XP:muteSource
7.7.10	Unmute Audio Input
	CALL /MEDIA/AUDIO/XP:unmuteSource
7.7.11	Mute Audio Output
	CALL /MEDIA/AUDIO/XP:muteDestination
7.7.12	Unmute Audio Output
	CALL /MEDIA/AUDIO/XP:unmuteDestination

Operation / Path	
7.7.13	Analog Audio Input Level Settings
	SET /MEDIA/AUDIO/<input>.Volume|Balance|Gain
7.7.14	Analog Audio Output Level Settings
	SET /MEDIA/AUDIO/<output>.Volume|Gain

Network Configuration

Operation / Path	
7.8.1	Query the DHCP State
	GET /MANAGEMENT/NETWORK.DhcpEnabled
7.8.2	Change the DHCP State
	SET /MANAGEMENT/NETWORK.DhcpEnabled
7.8.3	Query the IP Address
	GET /MANAGEMENT/NETWORK.IpAddress
7.8.4	Change the IP Address (Static)
	SET /MANAGEMENT/NETWORK.StaticIpAddress
7.8.5	Query the Subnet Mask
	GET MANAGEMENT/NETWORK.NetworkMask
7.8.6	Change the Subnet Mask (Static)
	SET /MANAGEMENT/NETWORK.StaticNetworkMask
7.8.7	Query the Gateway Address
	GET /MANAGEMENT/NETWORK.GatewayAddress
7.8.8	Change the Gateway Address (Static)
	SET /MANAGEMENT/NETWORK.StaticGatewayAddress
7.8.9	Apply Network Settings
	CALL /MANAGEMENT/NETWORK:ApplySettings()

RS-232 Port Configuration

	Operation / Path
7.9.1	BAUD Rate Setting
	SET /MEDIA/UART/<port_no>.Baudrate
7.9.2	Databit Setting
	SET /MEDIA/UART/<port_no>.DataBits
7.9.3	Stopbits Setting
	SET /MEDIA/UART/<port_no>.StopBits
7.9.4	Parity Setting
	SET /MEDIA/UART/<port_no>.Parity
7.9.5	Command Injection Mode
	SET /MEDIA/UART/<port_no>.CommandInjectionEnable

Sending Message via Communication Ports

	Operation / Path
7.10.1	Send Message via TCP Port
	CALL /MEDIA/ETHERNET.tcpText(<IP_address>":"<port_no>"="<message>)
7.10.2	Send Message via an RS-232 Port
	CALL /MEDIA/UART/<Pn>.sendText(<message>)

Infrared Port Configuration

	Operation / Path
7.11.1	Command Injection Mode
	SET /MEDIA/IR/<port_no>.CommandInjectionEnable

EDID Management

	Operation / Path
7.12.1	Query the Emulated EDIDs
	GET /EDID.EdidStatus
7.12.2	Query the Validity of a Dynamic EDID
	GET /EDID/D/<dynamic_edid_memory>.Validity
7.12.3	Query the Preferred Resolution of an User EDID
	GET /EDID/U/<user_edid_memory>.PreferredResolution
7.12.4	Emulating an EDID to an Input Port
	CALL /EDID:switch(<source>:<destination>)
7.12.5	Copy an EDID to User Memory
	CALL /EDID:copy(<source>:<destination>)
7.12.6	Deleting an EDID from User Memory
	CALL /EDID:delete(<user_edid_memory>)
7.12.7	Resetting the Emulated EDIDs
	CALL /EDID:reset

Firmware Upgrade

MODEX devices can be upgraded by using the Lightware Device Updater (LDU) software over LAN. The application and the User's manual can be downloaded from www.lightware.com. In order to get the firmware pack with the necessary components (*.lfp file) for your specific product, please contact support@lightware.com.

▶ ABOUT THE FIRMWARE PACKAGE (LFP FILE)
▶ SHORT INSTRUCTIONS
▶ INSTALL AND UPGRADE
▶ DETAILED INSTRUCTIONS

ATTENTION! After firmware upgrade process of v2.1.0 the extenders are set to factory default settings. Factory default values can be seen in the Factory Default Settings section.

ATTENTION! The firmware version v2.1.0 does not support the MODEX-AV-3GSDI-IM module.

ATTENTION! While the firmware is being upgraded, the normal operation mode is suspended as the transmitter is switched to bootload mode. Signal processing is not performed. Do not interrupt the firmware upgrade. If any problem occurs, reboot the transmitter and restart the process.

8.1. About the Firmware Package (LFP File)

The firmware files are packed in an LFP package. You need only this file to do the upgrade on your device.

▪ This allows using the same LFP package for different devices (e.g. MODEX transmitter and receiver have only one common package).
▪ The package contains all the necessary components, binary, and other files; You do not have to get further files.
▪ There is a descriptor file in the package that contains each firmware with version number and a list showing the compatible devices. The descriptor is displayed after loading the LFP file in the LDU.

8.2. Short Instructions

Step 1. Get the firmware pack and the Lightware Device Updater (LDU) application.

Step 2. Install the LDU application.

Step 3. Establish the connection between the computer and the device(s).

Step 4. Start the LDU and follow the instructions shown on the screen.

8.3. Install and Upgrade

Installation for Windows

INFO: The application can be installed under Windows XP or above.

Run the installer. If the User Account Control displays a pop-up message click **Yes**. During the installation you will be prompted to select the type of the installation:

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

Comparison of install types

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

Installation for Mac OS X

INFO: The Windows and the Mac application has the same look and functionality.

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

LDU Upgrade

Step 1. Run the application. In the welcome screen click on the button in the top right corner; the About ⊘ window will appear. Click on the **Check now** button. The program checks for available updates on the Lightware website and shows the available version.
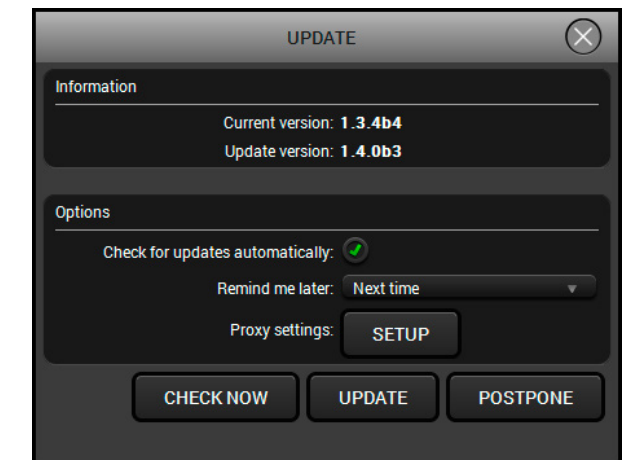
Step 2. Set the desired update settings in the **Options** section.

▪ If you do not want to check for updates automatically, uncheck the **Check for updates automatically** option.

▪ If you want to postpone the update, a reminder can be set with different delays from the **drop down list**.

▪ If the proxy settings do not range with the required settings, set the proper values then click the **OK** button.

Step 3. Press the **Update** button to download the new version; the installer will start.

8.4. Detailed Instructions

8.4.1. Establish the Connection between the Computer and the Device

Make sure that the computer and the device are connected via an Ethernet cable and the connection is established between them.

8.4.2. Check the Firmware Versions

Before starting the upgrade process, please check the actual firmware version. It is displayed on the front panel menu (see the Firmware section) or in Settings menu on Status tab in the Lightware Device Controller software or can be queried with LW3 command (see more information about it in Query the Firmware Version section).

Installed firmware version	Update version	Instructions
v1.x.	v2.0 or above	In this case, please contact our support team (support@lightware.com) for the .lfp packages and detailed instructions.
v2.0 or above	v2.0 or above	Start the LDU and Follow the Instructions
v2.0 or above	v1.x.	Highly not recommended. In this case, please contact our support team (support@lightware.com) for the .lfp packages and detailed instructions.

8.4.3. Start the LDU and Follow the Instructions

After launching LDU welcome screen appears:
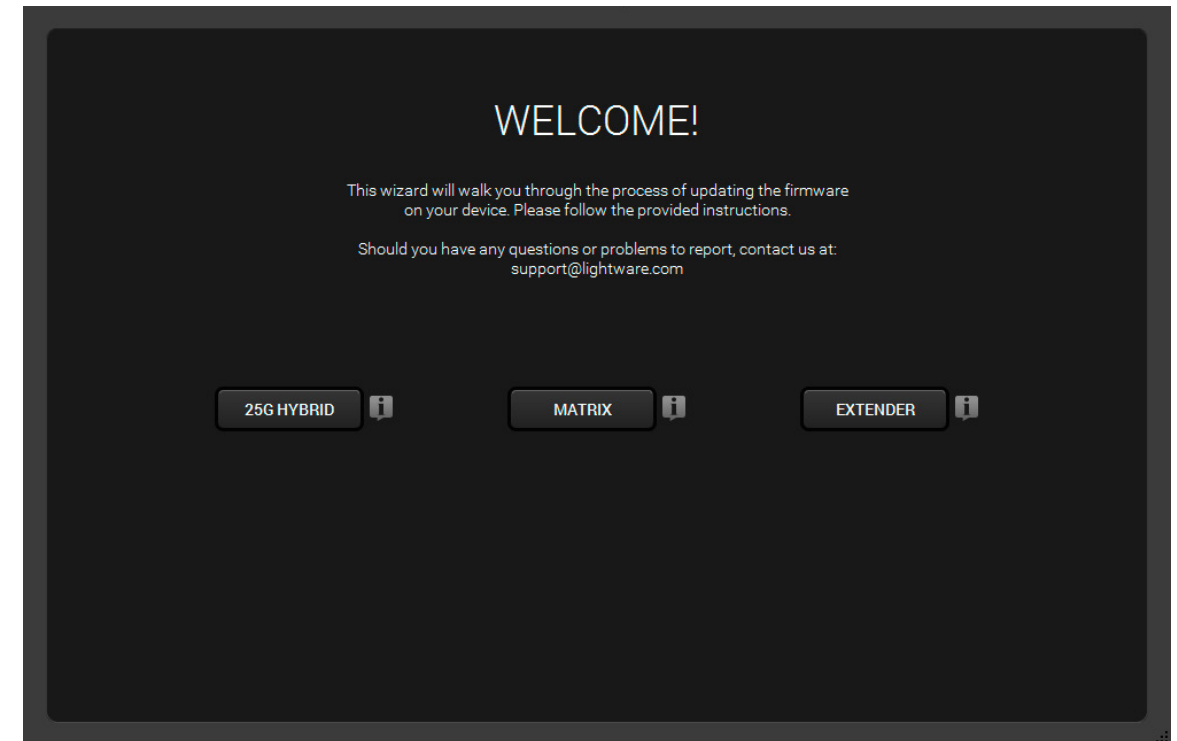
After pressing the ℹ button a list will appear showing the supported devices:

Click on the **Extender** button on the main screen.

Step 1. Select the package.

Click on the Browse button and select the ".lfp" file that will be used for the upgrade.

The package information is displayed:
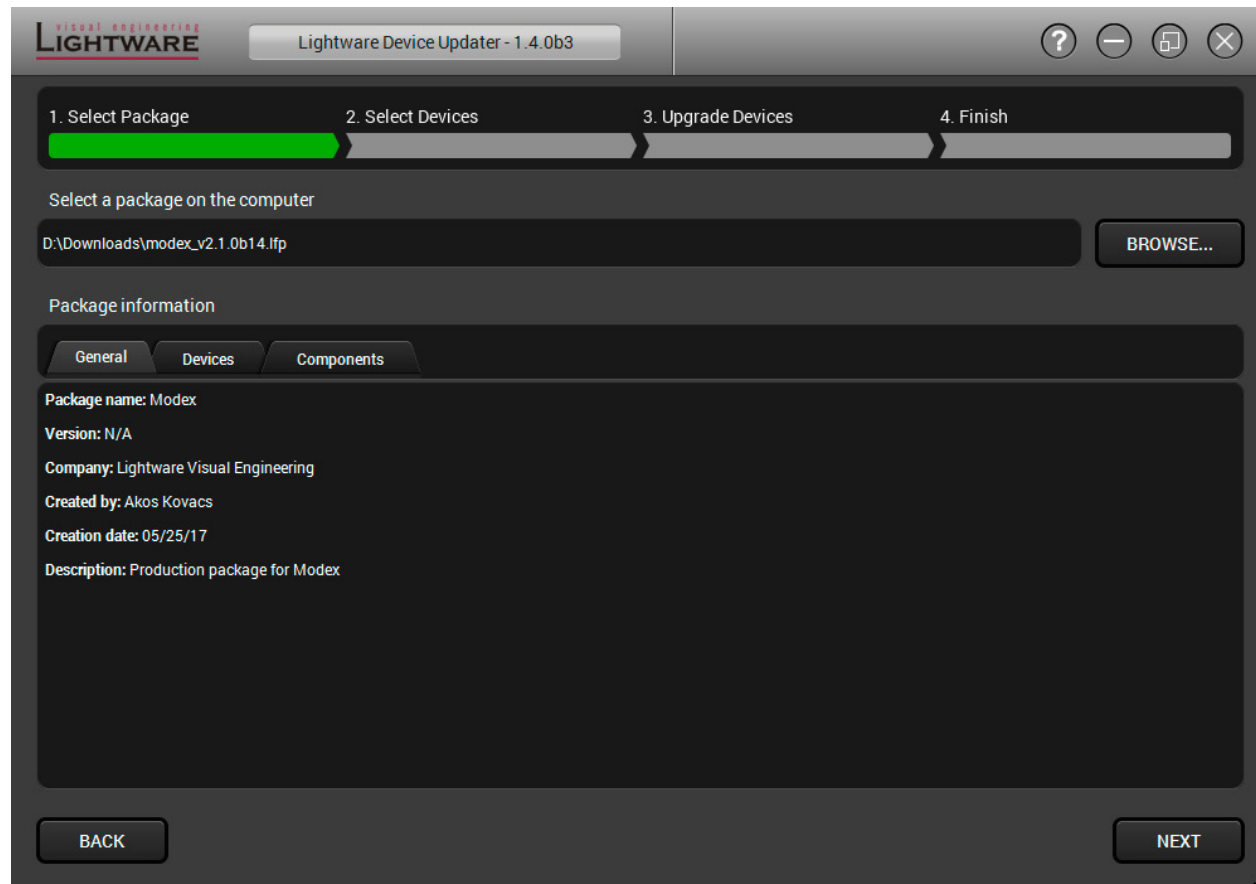
- **General** version info, creation date, short description,
- **Devices** which are compatible with the firmware,
- **Components** in the package with release notes.

TIPS AND TRICKS: Files with ".lfp" extension are associated to LDU during installation. If you double click on the ".lfp" file, the application is launched, the package is loaded automatically and the screen above is shown.

Click on the **Next** button for the instruction panel.
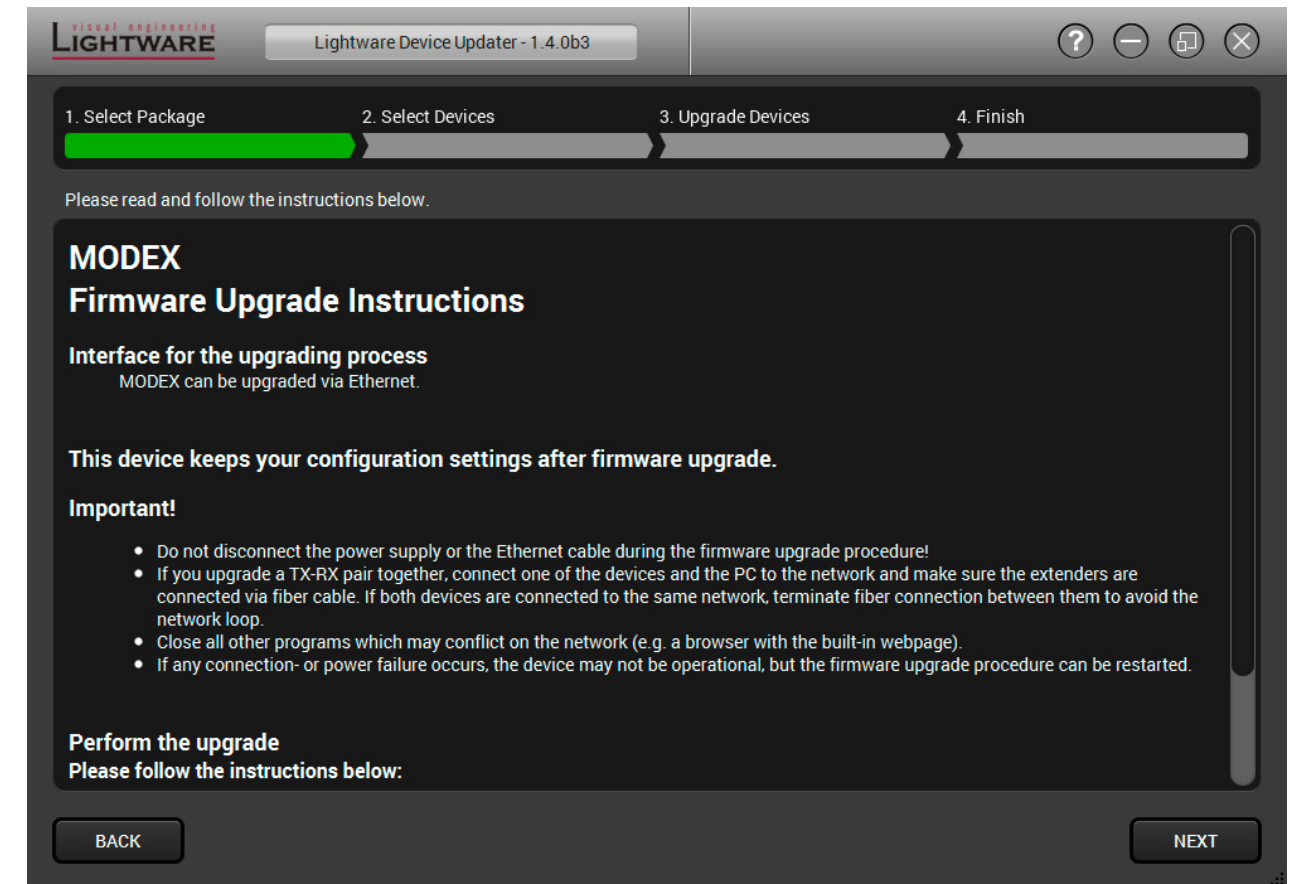
Step 2. Select a device.
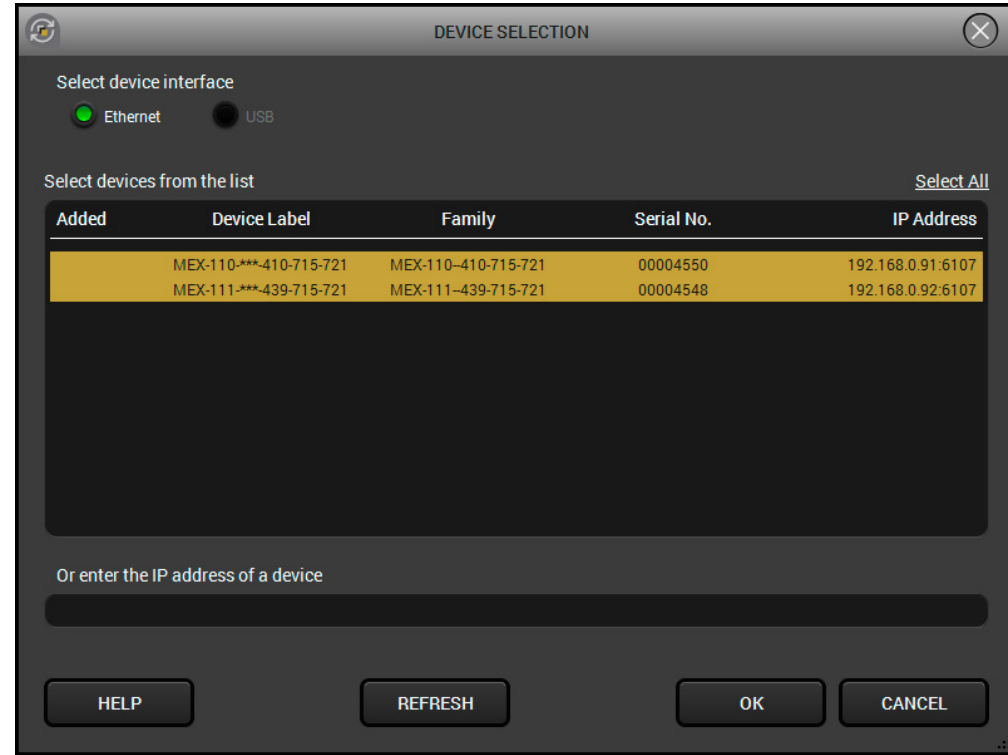
The next step is to select the desired device(s). The available and supported devices are searched for and listed automatically. If the desired device is not listed, update the list by clicking the **Refresh** button. Select the desired device by highlighted them: highlight them with a **yellow cursor,** then click **OK**.

A tick mark can be seen in the **Added** column if the device was added by the user previously.

Firmware Components

The components of the installed and update firmware version for the selected devices are listed on the following screen. (Update version will be uploaded to the device.)

Add a device by clicking on the **Add device** button. The previous screen will be shown; select the desired device(s) and click **OK**.

Remove a device by selecting it (highlight with yellow) and clicking on the **Remove device** button, or by clicking on **Remove all** button to clear the list.

Click on the **Next** button to continue.

Step 3. Upgrade the device.

A warning window will pop up before upgrading the device:

- Do not unplug the power cable and the LAN cable while the upgrade is in progress. Click **OK** to continue.
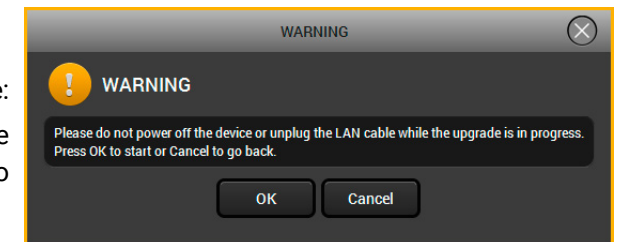
Click on the **Start** button to start the upgrade process.
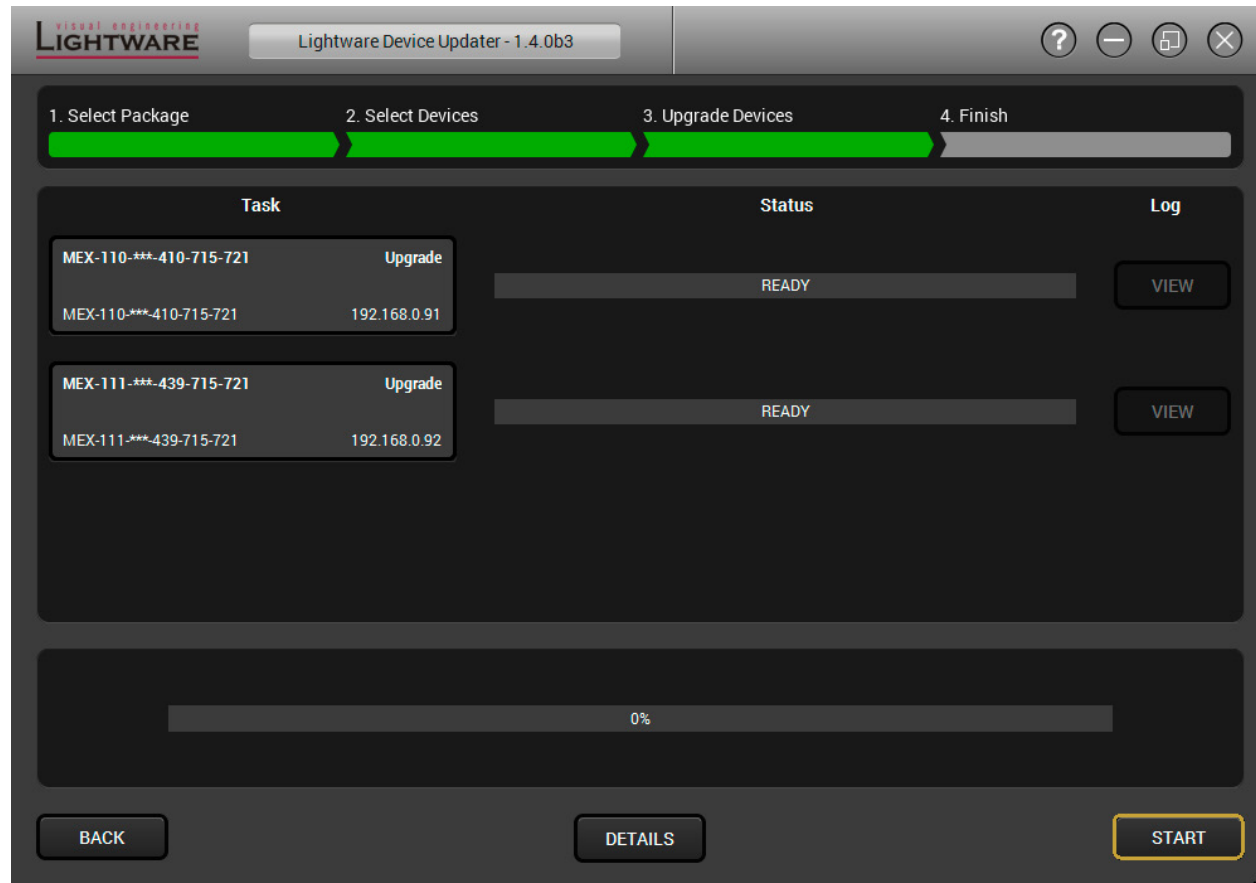
After you confirmed the warnings and clicked on the Start button, the upgrade process starts immediately.
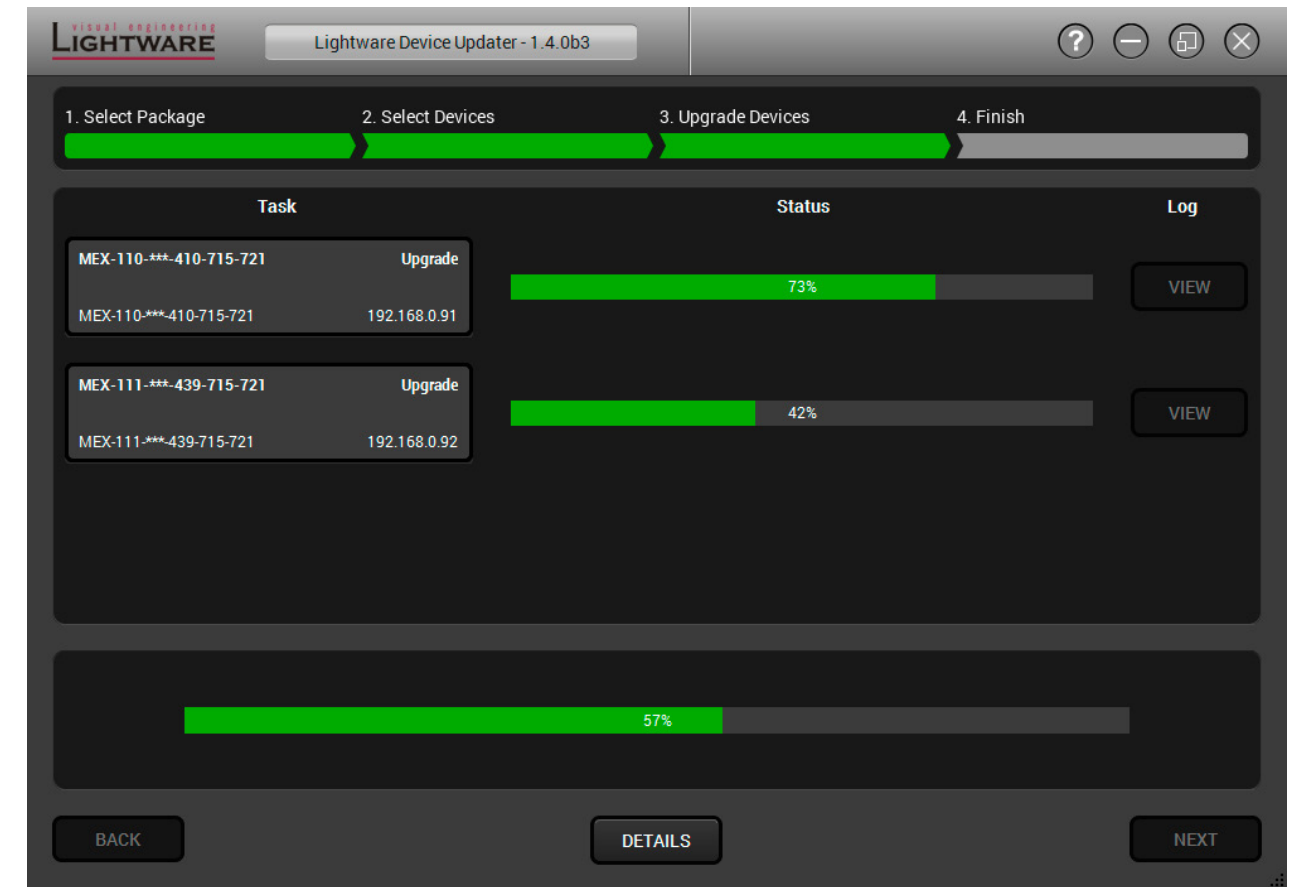
Details button opens a new window where the process is logged – see below.
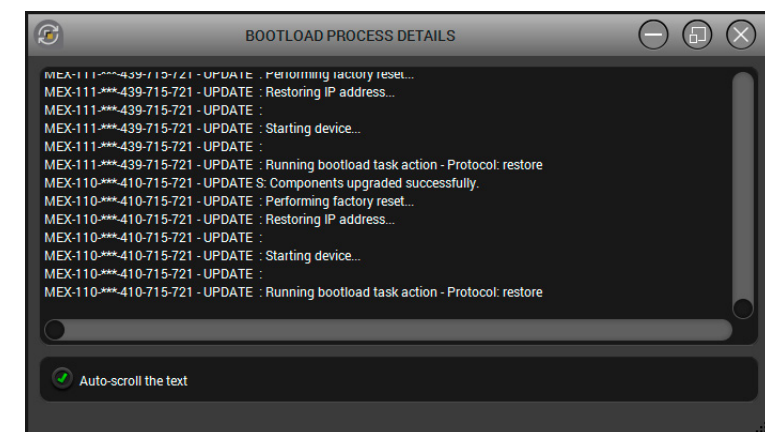
Step 4. Finish.

If the upgrade of a device is finished, the log can be opened by the **View** button on the right. When all the tasks are finished, a window appears. Click **OK** to close and **Next** to display the summary page.
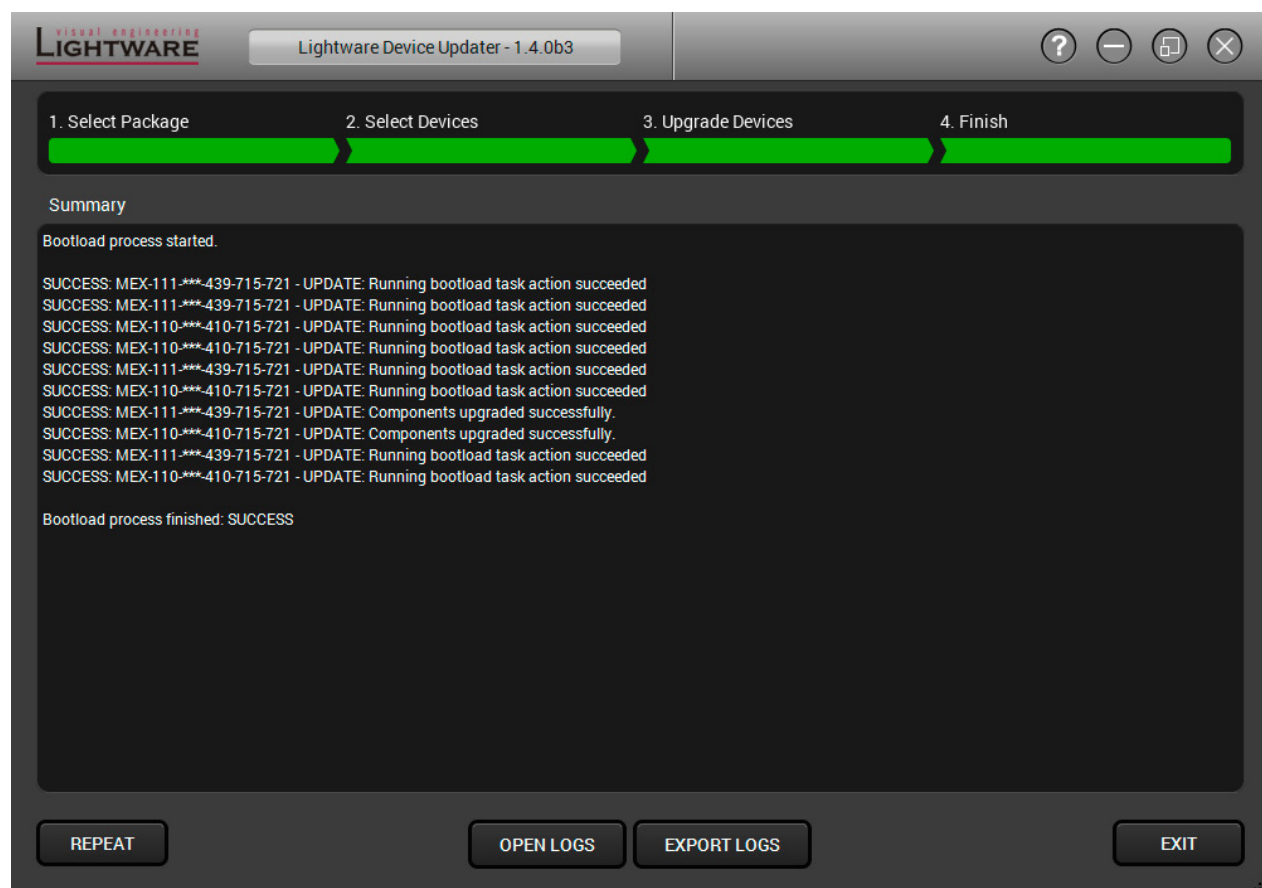
Clicking on the **Repeat** button starts the process again with the selected device(s).

The **Open logs** button opens the temporary folder where the logs can be found.

Export logs by saving the files as a zipped file.

Press **Exit** to close the program.

If the upgrade fails, the progress bar of the device turns to red. Restart the device(s) and repeat the process.

> **ATTENTION!** Although the device is rebooted after the firmware upgrade, switching it off and on again is recommended.

9

Troubleshooting

Usually, if the system seems not to transport the signal as expected, the best strategy for troubleshooting is to check signal integrity through the whole signal chain starting from source side and moving forward to receiver end.

At first, check front panel LEDs and take the necessary steps according to their states. For more information about front and rear panel LEDs of the matrix refer to the Front View and Rear View sections.

Pictogram Legend

- 🔌 Section to connections/cabling.
- 🖥️ Section to front panel operation.
- ▦ Section to LDC software.
- LW2 Section to LW2 protocol commands.
- LW3 Section to LW3 protocol commands.

9.1. Use Case Studies

Symptom	Root cause	Action	Refer to	
	Video & Audio modules			
No picture on the video output	Device(s) not powered properly	Check the extenders and the other devices if they are properly powered; try to unplug and reconnect them.		
	Cable connection problem	Cables must fit very well, check all the connectors.	🔌	3.6
	Optical cable became contaminated	Use special fiber optical cable cleaning equipment to clean it carefully.		
	No incoming signal (transmitter)	If the Video LED does not light on the front panel, no video signal is present on the DVI-D/HDMI/DP input port. Check the source device and the DVI/HDMI/DP cable(s).	🔌	3.6
	No incoming signal (receiver)	If the Video LED does not light, no signal is present on the optical input port. Check the source device and the fiber cable.	🔌	3.6
	Not the proper video port is the active one	Check the properties of the Video module.	🖥️ ▦ LW3	4.5 6.4 7.6.1
	Not the proper interface is the active one	If the source/display has more connectors, check if the proper interface is selected.		
	Output port is muted	Check the mute state of output port of TX and RX.	🖥️ ▦ LW3	4.5 6.4.2 6.4.4 7.6.7 7.6.8
	Display is not able to receive the video format	Check the emulated EDID and select another (e.g. emulate the display's EDID on the input port).	🖥️ ▦ LW3	4.7 6.9.1 7.12.4
	HDCP is disabled	Enable HDCP on transmitter's input port or the receiver's output port.	🖥️ ▦ LW3	4.6.1 6.4.1 6.4.4 7.6.3 7.6.4

Symptom	Root cause	Action	Refer to
Audio interface modules			
No audio is present on output	Other audio port is switched to the output	Check the crosspoint settings of audio layer.	4.6.2 6.5 LW3 7.7.3
	Output port is muted	Check the Audio port properties.	4.5 6.5.1 6.5.2 LW3 7.7.1 7.7.2
	Analog audio input: volume is set very low	Check the Analog audio input port settings (Volume).	6.5.1 6.5.2 LW3 7.7.13
	Analog audio output: volume is set very low	Check the Analog audio output port settings (Volume).	6.5.1 6.5.2 LW3 7.7.14
	Incorrect audio mode is set	Check the selected audio mode and change it to Analog/Digital/Mixed.	4.6.2 6.5
HDMI output signal contains no audio	HDMI mode was set to DVI	Check the properties of the output port on RX and set to HDMI or Auto.	6.4.4 LW3 7.6.5
	DVI EDID is emulated	Check the EDID and select an HDMI EDID to emulate.	4.7 6.9.1 LW3 7.12.4

Symptom	Root cause	Action	Refer to
Serial and Infra modules			
Connected serial device cannot be controlled	Cable connection problem	Check the connectors to fit well; check the wiring of the plugs.	3.6.7
	Serial settings are different	Check the serial port settings in the MODEX to meet with the requirements of the serial device.	4.6.3 6.6 LW3 7.9
	Serial port is muted	Check the mute state of serial port(s).	6.6
	Serial crosspoint is not set properly	Check the crosspoint state of Serial layer.	6.6
Connected IR device cannot be controlled	IR emitter and/or detector connection problem	Check if the IR emitter is plugged in the IR output, and the IR detector in the IR input connector.	3.6.9
	IR carrier frequency setting is different	Check the IR settings in the MODEX to meet with the requirements of the IR device.	6.7
	IR port is muted	Check the mute state of IR port(s).	6.7
	Infra crosspoint is not set properly	Check the crosspoint state of Infra layer.	6.7

Symptom	Root cause	Action	Refer to
LAN (Ethernet)			
No LAN connection can be established	Incorrect IP address is set (direct connect)	Disable DHCP server and set the IP addresses to be in the same subnet.	4.8 6.12.2 7.8
	IP address conflict	Change the IP address to a not reserved one or enable DHCP if DHCP server exists in the network.	4.8 6.12.2 7.8
USB KVM			
USB device does not operate	Cables are not connected on both sides	Check the USB cable between TX and the computer.	
	Not supported USB device is connected	Keyboard, mouse (USB HID devices) are supported mostly, check your device type.	
	USB crosspoint set to the non-active channel	Check the USB mode in the transmitter in LDC and change to the active channel.	6.8.2
	Incorrect USB mode is set	Check the USB mode in the receiver in LDC and change to Composite or Transparent mode.	6.8.1
USB device is always ejected/re-enumerated at crosspoints switching	USB mode is set to Transparent mode	Change the USB mode to Composite in the receiver.	6.8.1
Optical Module			
Extenders are not linked or remote device cannot be reached	Fiber cable is connected to the not used channel	Check the connectors: from TX (Channel A) to RX (Channel B).	2.2
	Optical cable became contaminated	Use special fiber optical cable cleaning equipment to carefully clean it.	
	Different firmware is installed	Check the firmware in TX and RX; the versions have to match. If necessary do firmware upgrade.	6.12.1

9.2. How to Speed Up the Troubleshooting Process?

Lightware's technical support team is always working hard to provide the fastest support possible. Our team's response time is one of the best in the industry and in the toughest of cases we can directly consult with the hardware or software engineer who designed the product to get the information from the most reliable source.
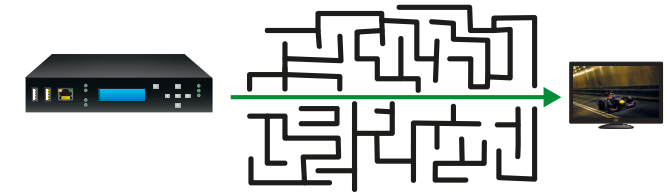
However, the troubleshooting process can be even faster… with your help.

There are certain pieces of information that push us in the right direction to finding the root cause of the problem. If we receive most of this information in the first e-mail or it is gathered at the time when you call us, then there is a pretty high chance that we will be able to respond with the final solution right away.

This information is the following:

- Schematic (a pdf version is preferred, but a hand drawing is sufficient).
- Serial number(s) of the device(s) (it is either printed somewhere on the box or you can query it in the Device Controller software or on the built-in website).
- Firmware versions of the devices (please note that there may be multiple CPUs or controllers in the device and we need to know all of their firmware versions, a screenshot is the best option).
- Cable lengths and types (in our experience, it's usually the cable).
- Patch panels, gender changers or anything else in the signal path that can affect the transmission.
- Signal type (resolution, refresh rate, color space, deep color).
- Emulated EDID(s) (please save them as file and send them to us).
- Actions to take in order to re-create the problem (if we cannot reproduce the problem, it is hard for us to find the cause).
- Photo or video about the problem ('image noise' can mean many different things, it's better if we see it too).
- Error logs from the Device Controller software.
- In the case of Event Manager issue the event file and/or backup file from the Device Controller software.

The more of the above information you can give us the better. Please send these information to the Lightware Support Team (support@lightware.com) to speed up the troubleshooting process.

10

Technologies

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

▶ EDID MANAGEMENT

▶ HDCP MANAGEMENT

▶ PIXEL ACCURATE RECLOCKING

▶ SERIAL MANAGEMENT

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.
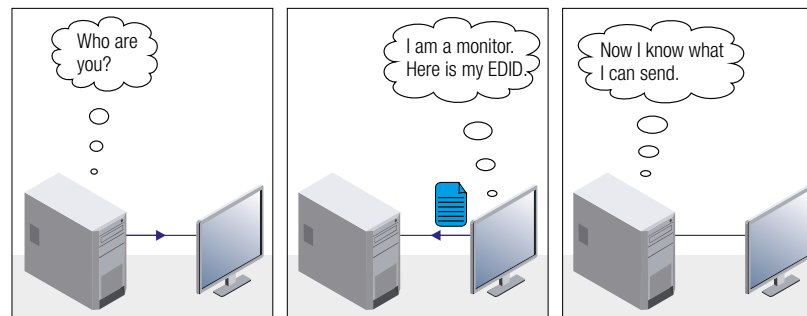
EDID Communication

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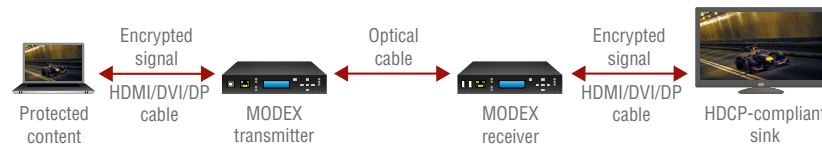
All the devices are HDCP-compliant, no manual setting is required, both protected and unprotected contents are transmitted and displayed on the sink.

Not HDCP-compliant Sink 1.
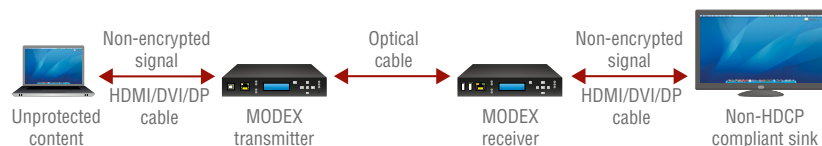
Not-HDCP compliant sink is connected to the matrix. Some sources (e.g. computers) always send HDCP encrypted signals if the receiver device reports HDCP compliancy, however, HDCP encryption is not required all the time (e.g. computer desktop image). If HDCP is enabled in the matrix, the image will not be displayed on the sink.

Setting the HDCP parameter to Auto on the output port and disable HDCP on the input port, the transmitted signal will not be encrypted if the content is not protected. Thus, non-HDCP compliant sinks will display non-encrypted signal.

Not HDCP-compliant Sink 2.
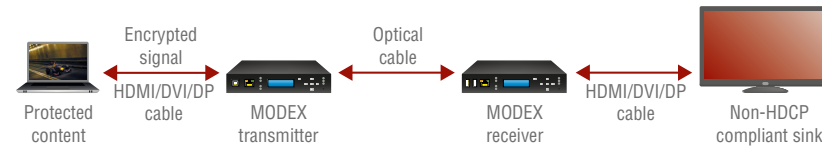
The layout is the same as in the previous case: non-HDCP compliant display device is connected to the matrix but the source would send protected content with encryption. If HDCP is enabled on the input port of the matrix, the source will send encrypted signal. The sink is not HDCP compliant, thus, it will not display the video signal (but blank/red/muted/etc. screen). If HDCP is disabled on the input port of the matrix, the source will not send the signal. The solution is to replace the display device to an HDCP-capable one.

10.3. Pixel Accurate Reclocking

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

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

Intra-pair skew

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

Intra-pair skew
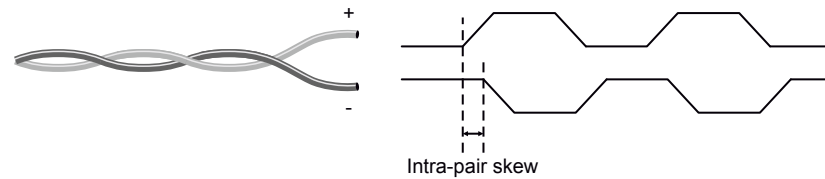
Inter-pair skew

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

Inter-pair skew
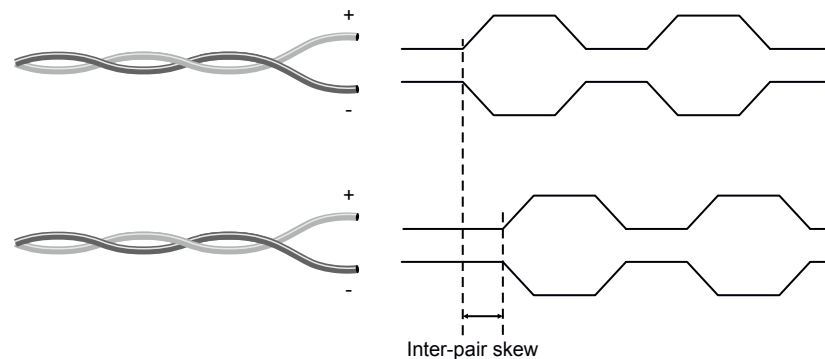
Jitter

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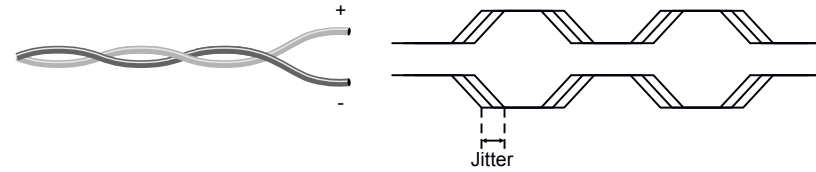
Jitter

Noise

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

Noise
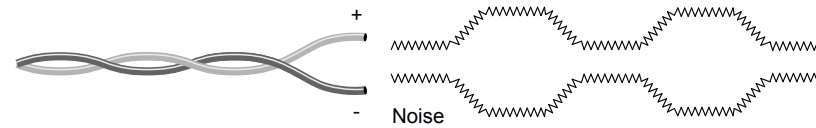
10.4. Serial Management

10.4.1. General Information

There are two types of devices in general serial communication:

- **Data Terminal Equipment:** Data Terminal Equipment (DTE) is an end instrument that converts user information into signals or reconverts received signals. Typical DTE devices: computers, LCD touch panels and control systems.
- **Data Circuit-terminating Equipment:** Data Circuit-terminating Equipment (DCE) is a device that sits between the DTE and a data transmission circuit. It is also called data communication equipment and data carrier equipment. Typical DCE devices: projectors, industrial monitors and amplifiers.

Among others the pin assignment is different between DTE and DCE.

	DTE	DCE
Pin 2:	RD	TD
Pin 3:	TD	RD

RD: Received Data (digital input)
TD: Transmitted Data (digital output)

Different type of serial cables must be used between different serial devices.

	DTE	DCE
DTE	Null-modem	TD
DCE	Straight	Null-modem*

* In general contact DCE with DCE by tail-circuit serial cable.

10.4.2. Types of Serial Cables

Straight Serial Cable	Null-modem Serial Cable
Straight pin-outs both ends.	Straight pin-out at the one end and cross pin-out at the other end (interchange lines of TX and RX).

Serial cables between devices may have male or female plugs and their type may be straight or null-modem in usual.

▎ **ATTENTION!** The cable type does not depend on the plug type.

10.4.3. RS-232 Signal Transmission over Lightware Extender Devices

The following examples describe the detailed integration of Lightware devices between different RS-232 pin assignment units.

▎ INFO: Both transmitter and receiver are DCE units according to their pinouts.

Extending RS-232 between DTE and DCE Third-party Devices

Connect straight serial cable between controller system (DTE) and the transmitter (DCE) and null-modem serial cable between receiver (DCE) and projector (DCE).
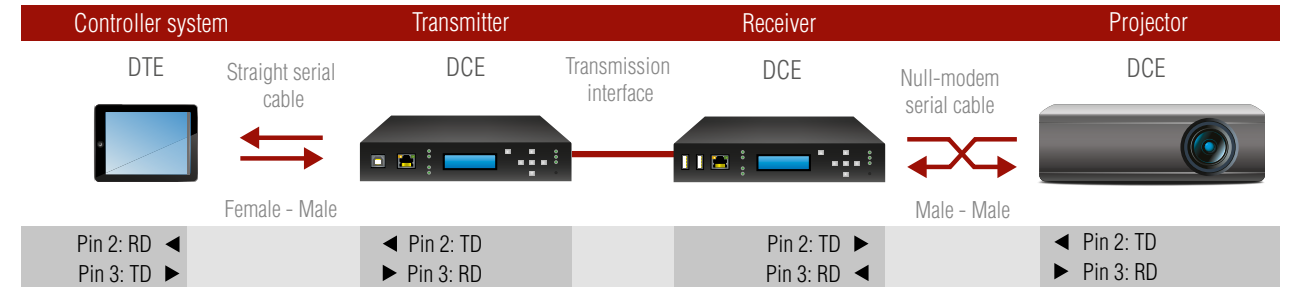
RS-232 Connection Example between a Controller System and a Projector

Extending RS-232 between DTE and DTE Third-party Devices

Connect straight serial cable between controller system (DTE) and the transmitter (DTE) and straight serial cable between receiver (DTE) and computer (DTE).
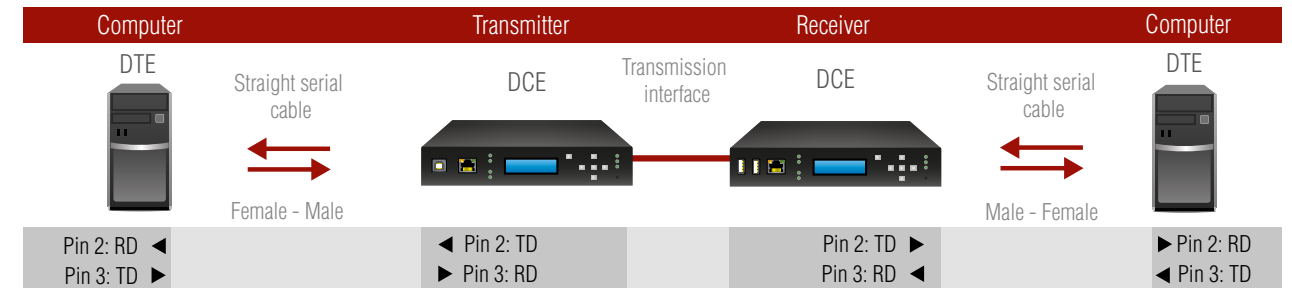
RS-232 Connection Example between Two Computers

11

Appendix

11.1. Specification

11.1.1. Frames

General

Compliance .... CE

EMC compliance (emission) .... EN 55032:2015

EMC compliance (immunity) .... EN 55024:2011

Warranty .... 7 years

Cooling .... Built-in fan

Operating temperature .... 0°C to +50˚C (+32˚F to +122˚F)

Storage temperature .... -20°C to +85°C(-4˚F to +185˚F)

Operating humidity .... 10% to 90%, non-condensing

ESD .... IEC61000-4-2 Level 4

Power

Heat dissipation .... 120 BTU/h (max.), 85 BTU/h (typ)

Power source .... IEC 100-230 V AC, 50/60 Hz

Power consumption .... 6.5 W (typical), 8 W (max) without Modules

.... 15 W (typical) 25 W (max) with Modules

Enclosure

Dimensions in mm .... 221 W x 240 D x 42.5 H mm

Dimensions in inch .... 8.7 W x 9.4 D x 1.6 H

Weight .... 1850 g (excluding all Modules)

Material .... 1 mm steel

Control

Front panel buttons .... Yes

Front panel LCD .... Yes, 2 x 16 characters

Web .... Built-in website (TCP/IP Ethernet)

EDID management (transmitter) .... 136 factory and 31 user programmable EDID

EDID emulation .... 256-Byte Extended EDID v1.3

Connectors

Ethernet .... RJ45 connector

USB KVM (transmitter) .... 1 x USB-B female connector

USB KVM (receiver) .... 2 x USB-A female connector

Ethernet Specification

Ethernet .... 10/100 Mbit/s

USB Specifications

USB standards .... Only HID devices, Smart Card

USB HUB .... Not supported

Device number .... 2x USB HID devices

11.1.2. Media Connectors

Fiber Specifications

Link speed .... 6.25 Gbps

Single mode fiber wavelength .... 1310, 1490, 1550 nm

Multimode fiber wavelength .... 850, 1310, 1550 nm

Single mode extension distance .... 10000 m (32800 ft)

Multimode extension distance .... 240 m (1000 ft)

Optical transmission channel 1 .... OPTS/OPTM connection

Optical transmission channel 2 .... currently not in use

Maximum power output .... 1 mW

Connectors *

Fiber optical .... Neutrik opticalCON NO2-4FDW-A

Fiber optical .... Neutrik opticalCON NO4FDW-A

Fiber optical .... Tyco LC ODVA

Fiber optical .... ST receptacle

Fiber optical .... SC receptacle

Fiber optical .... HF4 (Sommer Cable HICON)

Fiber optical .... LEMO 3K.93C socket (TX)

Fiber optical .... LEMO 3K.93C plug (RX)

Fiber optical .... Expanded Beam Junior

Fiber optical.. Expanded Beam Mini

Power connector...IEC C14 AC

Power connector.................................PowerCON NAC3MPA-1 AC

* The exact type depends on the selected Media connector.

Video Specifications

Supported video resolutions .... Up to 4K (30 Hz, 24 bit)

Max pixel clock ....297 MHz

Frame delay.. No delay

Video signal latency... Approx. 3 lines

Audio Specification

Embedded audio .... 8 channel PCM or HBR compressed

Return AUX .... 4 channel PCM or 5.1 compressed

Forward audio .... 2 channel PCM or 5.1 compressed

Return audio .... 2 channel PCM or 5.1 compressed

11.1.3. Video & Audio Modules

11.1.3.1. MODEX-AV-DVIDL-IM

Part number 9161 0401

Max resolution ....2560x1600@60Hz

.... 1920x1200@120Hz, 24 bit

Max cable length (22 AWG)....................................... 20 m

Color depth..8 bit per color

Color space ....,...,................................RGB

Frame delay.. No delay

Data rate .... Total max 9.9 Gbps

Max pixel clock ....,................................165 MHz

Supported video formats ......,...,..DVI 1.0

3D support.....................,..Yes

Embedded audio / Return audio ....No / No

EDID emulation .... Yes, Advanced EDID management

HDCP compliancy 1.1

Audio capability ....Not supported

Weight.. 100 g

Power consumption..1.4W (typ), 2W (max)

Connectors .... 1x DVI-D receptacle

ESD protection .... IEC61000-4-2 Level 4

11.1.3.2. MODEX-AV-HDMI-DVI-IM

Part number 9161 0407

Max resolution .... 1920x1200@24 bit

.... 1600x1200@24 bit

Max cable length (22 AWG)... 30 m

Color depth.......................................24, 30, 36 bit deep color

Color space .... RGB, YCbCr 4:4:4/4:2:2

Frame delay... No delay

Data rate .... Total max 6.75 Gbps

Max pixel clock ....225 MHz

Supported video formats .... DVI 1.0, HDMI 1.3a

3D support.. No

Embedded audio / Return audio .... Yes / No

EDID emulation .... Yes, Advanced EDID management

HDCP compliancy 1.3

Audio capability *.........................8 channel PCM or HBP compressed

Weight.. 105 g

Power consumption.. 1.3 W (typ) 2.2 W (max)

Connectors .... 1x DVI-D receptacle, 1x HDMI receptacle

ESD protection .... IEC61000-4-2 Level 4

* The transmitted audio depends on the Media connector. For final audio transmission capabilities please see the audio specification of the chosen Media connector.

11.1.3.3. MODEX-AV-HDMI-DVI-4K-IM

Part number 9161 0410

Max resolution ....1600x1200@60Hz, 36 bit

....3840x2160@30Hz, 24 bit

.... 1920x1080p@120Hz, 24 bit

Max cable length (22 AWG)....................................... 30 m

Color depth....................................24, 30, 36 bit deep color

Color space .... RGB, YCbCr 4:4:4/4:2:2

Frame delay... No delay

Data rate .... 9 Gbps

Max pixel clock ....300 MHz

Supported video formats .... DVI 1.0, HDMI 1.4

3D support..Yes

Embedded audio / Return audio .... Yes / No

EDID emulation .... Yes, Advanced EDID management

HDCP compliancy 1.4

Audio capability *.........................8 channel PCM or HBR compressed

Weight.. 105 g

Power consumption.. 2.75W (max)

Connectors......................... 1x DVI-D receptacle, 1x HDMI receptacle

ESD protection .... IEC61000-4-2 Level 4

* The transmitted audio depends on the Media connector. For final audio transmission capabilities please see the audio specification of the chosen Media connector.

11.1.3.4. MODEX-AV-DP-IM

Part number 9161 0419

Max. resolution ....2560x1600 @ 60Hz

....1920x1080 @ 120Hz, 24 bit

....4096x2160 @ 24Hz

Max DP cable length (24 AWG).. 15 m

Color space ....RGB/YUV (4:4:4) – 10 bit-color

....YUV (4:2:2/4:2:0) – 12 bit-color

....RGB (4:4:4) to YUV (4:4:4)

Frame delay... No delay

Data rate ....Total max. 10.8 Gpbs (1.62/2.7 Gbps/lane)

Supported video standards ....DP 1.1a compliant

3D support...Yes

Embedded audio ....Yes

EDID emulation .... Yes, Advanced EDID management

HDCP compliancy 1.3

Audio capability * ....8 channel PCM or HBR compressed

Weight..95 g

Power consumption... 0.8W (typ), 2.5W (max)

Connectors ...Standard DisplayPort gold plated connector, receptacle

ESD protection .... IEC61000-4-2 Level 4

* The transmitted audio depends on the Media connector. For final audio transmission capabilities please see the audio specification of the chosen Media connector.

11.1.3.5. MODEX-AV-3GSDI-IM

Part number 9161 0426

Max resolution ....1920x1080p@60Hz

....3G-SDI Level A: 1920x1080p YCbCr 4:2:2

....3G-SDI Level B: 1920x1080p YCbCr 4:2:2

Max input cable length .... 130 m @ 3G-SDI

Color depth.. 20 bit

Color space ....10 bit / Y, 10 bit / CbCr, 12 bit RGB

Frame delay... No delay

Data rate .... Total max 2.97 Gbps

Supported video formats .... SD-SDI, HD-SDI, 3G-SDI

3D support... No

Embedded audio ....Yes

EDID emulation .... No

Audio capability * .... 8 channel PCM

Weight.. 120 g

Power consumption..................................... 0.7W (typ), 1.1W (max)

Connectors ....3xBNC (1x in, 2x loop out) receptacle

ESD protection .... IEC61000-4-2 Level 4

* The transmitted audio depends on the Media connector. For final audio transmission capabilities please see the audio specification of the chosen Media connector.

11.1.3.6. MODEX-AV-DVI-IM

Part number 9161 0433

Max resolution .... 1920x1200@ 24 bit

.... 1600x1200@ 24 bit

Max cable length (22 AWG).. 30 m

Color depth...24, 30, 36 bit deep color

Color space .... RGB, YCbCr 4:4:4/4:2:2

Frame delay.. No delay

Data rate .... Total max 6.75 Gbps

Max pixel clock ....225 MHz

Supported video formats .... DVI 1.0, HDMI 1.3a

3D support... No

Embedded audio / Return audio .... Yes, Advanced EDID management

HDCP compliancy 1.3

Audio capability * ....8 channel PCM or HBR compressed

Weight.. 105 g

Power consumption... 1.3W (typ), 2.2W (max)

Connectors ....DVI-D receptacle

ESD protection .... IEC61000-4-2 Level 4

* The transmitted audio depends on the Media connector. For final audio transmission capabilities please see the audio specification of the chosen Media connector.

11.1.3.7. MODEX-AV-5HDMI-4K-IM-LH

Part number 9161 0442

Max resolution ....1600x1200@60Hz, 36 bit

.... 1920x1080@120Hz, 24 bit

3840x2160@30Hz, 24 bit

.... 1920x1080p@120Hz, 24 bit

Max cable length (22 AWG).. 15 m

Color depth...24, 30, 36 bit deep color

Color space .... RGB, YCbCr 4:4:4/4:2:2

Frame delay.. No delay

Data rate .... Total max 9 Gbps

Max pixel clock ....300 MHz

Supported video formats .... DVI 1.0, HDMI 1.4

3D support..Yes

Embedded audio / Return audio .... Yes / Yes (IN2 and OUT)

EDID emulation ....Yes, Advanced EDID management

HDCP compliancy 1.4

Audio capability * ....8 channel PCM or HBR compressed

Weight... 150 g

Power consumption................................... 6.7 W (typ.), 12.8 W (max.)

Connectors .... 6x HDMI

ESD protection .... IEC61000-4-2 Level 4

* The transmitted audio depends on the Media connector. For final audio transmission capabilities please see the audio specification of the chosen Media connector.

11.1.3.8. MODEX-AV-2HDMI-4K-IM-LH

Part number 9161 0443

Max resolution ....1600x1200@60Hz, 24 bit

.... 1920x1080@120Hz, 24 bit

....3840x2160@30Hz, 24 bit

.... 1920x1080p@120Hz, 24 bit

Max cable length (22 AWG).. 15 m

Color depth...24, 30, 36 bit deep color

Color space .... RGB, YCbCr 4:4:4/4:2:2

Frame delay.. No delay

Data rate .... Total max 9 Gbps

Max pixel clock ....300 MHz

Supported video formats .... DVI 1.0, HDMI 1.4

3D support..Yes

Embedded audio / Return audio .... Yes / Yes (IN2 and OUT)

EDID emulation ....Yes, Advanced EDID management

HDCP compliancy 1.4

Audio capability * .... 8 channel PCM or HBR compressed

Weight .... 105 g

Power consumption .... 5.5 W (typ.), 10.7 W (max.)

Connectors .... 3x HDMI receptacle

ESD protection .... IEC61000-4-2 Level 4

* The transmitted audio depends on the Media connector. For final audio transmission capabilities please see the audio specification of the chosen Media connector.

11.1.3.9. MODEX-AV-DVIDL-OM

Part number 9161 0404

Max resolution .... 2560x1600@60Hz

.... 1920x1200@120Hz, 24 bit

Max cable length (22 AWG) .... 20 m

Color depth .... 8 bit per color

Color space .... RGB

Frame delay .... No delay

Data rate .... Total max 9.9 Gbps

Max pixel clock .... 165 MHz

Supported video formats .... DVI 1.0

3D support .... Yes

Embedded audio / Return audio .... No / No

EDID emulation .... Yes, Advanced EDID management

HDCP compliancy 1.1

Audio capability .... Not supported

Weight .... 100 g

Power consumption .... 3.5W (typ), 3.5W (max)

Connectors .... 1x DVI-D receptacle

ESD protection .... IEC61000-4-2 Level 4

11.1.3.10. MODEX-AV-HDMI-OM

Part number 9161 0413

Max resolution .... 1920x1200@24 bit

.... 1600x1200@24 bit

Max cable length (22 AWG) .... 30 m

Color depth .... 24, 30, 36 bit deep color

Color space .... RGB, YCbCr 4:4:4/4:2:2

Frame delay .... No delay

Data rate .... Total max 6.75 Gbps

Max pixel clock .... 225 MHz

Supported video formats .... DVI 1.0, HDMI 1.3a

3D support .... No

Embedded audio / Return audio .... Yes / No

EDID emulation .... Yes, Advanced EDID management

HDCP compliancy 1.3

Audio capability * .... 8 channel PCM or HBP compressed

Weight .... 95 g

Power consumption .... 0.4 W (typ) 0.7 W (max)

Connectors .... 1x HDMI receptacle

ESD protection .... IEC61000-4-2 Level 4

* The transmitted audio depends on the Media connector. For final audio transmission capabilities please see the audio specification of the chosen Media connector.

11.1.3.11. MODEX-AV-HDMI-4K-OM

Part number 9161 0416

Max resolution .... 1600x1200@60Hz, 36 bit

.... 3840x2160@30Hz, 24 bit

.... 1920x1080p@120Hz, 24 bit

Max cable length (22 AWG) .... 30 m

Color depth .... 24, 30, 36 bit deep color

Color space .... RGB, YCbCr 4:4:4/4:2:2

Frame delay .... No delay

Data rate .... 9 Gbps

Max pixel clock .... 300 MHz

Supported video formats .... DVI 1.0, HDMI 1.4

3D support .... Yes

Embedded audio / Return audio .... Yes / No

EDID emulation .... Yes, Advanced EDID management

HDCP compliancy 1.4

Audio capability * .... 8 channel PCM or HBR compressed

Weight .... 95 g

Power consumption .... 0.38W (typ), 2.88 W (max)

Connectors .... 1x HDMI receptacle

ESD protection .... IEC61000-4-2 Level 4

* The transmitted audio depends on the Media connector. For final audio transmission capabilities please see the audio specification of the chosen Media connector.

11.1.3.12. MODEX-AV-DP-OM

Part number 9161 0422

Max. resolution .... 2560x1600 @ 60Hz

Max DP cable length (24 AWG) .... 15 m

Color depth .... 24 / 30 / 36 bit deep color

Color space .... RGB/YUV (4:4:4) – 10 bit-color

.... YUV (4:2:2/4:2:0) – 12 bit-color

.... RGB (4:4:4) to YUV (4:4:4)

Frame delay .... No delay

Data rate .... Total max. 10.8 Gpbs (1.62/2.7 Gbps/lane)

Supported video standards .... DP 1.1a compliant

3D support .... Yes

EDID emulation .... Yes, Advanced EDID management

HDCP compliancy 1.3

Audio capability * .... 8 channel PCM or HBR compressed

Weight .... 95 g

Power consumption .... 0.8W (typ), 2.5W (max)

Connectors ... Standard DisplayPort gold plated connector, receptacle

ESD protection .... IEC61000-4-2 Level 4

* The transmitted audio depends on the Media connector. For final audio transmission capabilities please see the audio specification of the chosen Media connector.

11.1.3.13. MODEX-AV-DVI-OM

Part number 9161 0430

Max resolution .... 1920x1200@ 36 bit

.... 1600x1200@ 24 bit

Max cable length (22 AWG)... 30 m

Color depth....................................... 24, 30, 36 bit deep color

Color space .... RGB, YCbCr 4:4:4/4:2:2

Frame delay.. No delay

Data rate .... Total max 6.75 Gbps

Max pixel clock .... 225 MHz

Supported video formats .... DVI 1.0, HDMI 1.3a

3D support... No

Embedded audio / Return audio .... Yes, Advanced EDID management

HDCP compliancy 1.3

Audio capability *......................... 8 channel PCM or HBR compressed

Weight... 95 g

Power consumption........................... 0.4W (typ), 0.7W (max)

Connectors... DVI-D receptacle

ESD protection .... IEC61000-4-2 Level 4

* The transmitted audio depends on the Media connector. For final audio transmission capabilities please see the audio specification of the chosen Media connector.

11.1.3.14. MODEX-AV-DVI-4K-OM

Part number 9161 0436

Max resolution ....1600x1200@60Hz, 36 bit

....3840x2160@30Hz, 24 bit

.... 1920x1080p@120Hz, 24 bit

Max cable length (22 AWG)... 30 m

Color depth....................................... 24, 30, 36 bit deep color

Color space .... RGB, YCbCr 4:4:4/4:2:2

Frame delay.. No delay

Data rate .... 9 Gbps

Max pixel clock .... 300 MHz

Supported video formats .... DVI 1.0, HDMI 1.4

3D support... Yes

Embedded audio / Return audio .... Yes / No

EDID emulation .... Yes, Advanced EDID management

HDCP compliancy 1.4

Audio capability *......................... 8 channel PCM or HBR compressed

Weight... 100 g

Power consumption........................0.38 W (typ), 2.88 (max)

Connectors... 1x DVI-D receptacle

ESD protection .... IEC61000-4-2 Level 4

* The transmitted audio depends on the Media connector. For final audio transmission capabilities please see the audio specification of the chosen Media connector.

11.1.3.15. MODEX-AV-HDMI-DVI-4K-OM

Part number 9161 0439

Max resolution ....1600x1200@60Hz, 36 bit

....3840x2160@30Hz, 24 bit

.... 1920x1080p@120Hz, 24 bit

Max cable length (22 AWG)... 15 m

Color depth....................................... 24, 30, 36 bit deep color

Color space .... RGB, YCbCr 4:4:4/4:2:2

Frame delay.. No delay

Data rate .... Total max 9 Gbps

Max pixel clock .... 300 MHz

Supported video formats .... DVI 1.0, HDMI 1.4

3D support... Yes

Embedded audio / Return audio .... Yes / Yes (IN2 and OUT)

EDID emulation .... Yes, Advanced EDID management

HDCP compliancy 1.4

Audio capability *......................... 8 channel PCM or HBR compressed

Weight... 110 g

Power consumption................................. 0.38 W (typ), 2.88 W (max)

Connectors......................... 1x DVI-D receptacle, 1x HDMI receptacle

ESD protection .... IEC61000-4-2 Level 4

* The transmitted audio depends on the Media connector. For final audio transmission capabilities please see the audio specification of the chosen Media connector.

11.1.4. Interface Modules

11.1.4.1. MODEX-IF-RS232

Part number 9161 0712

Supported baud rate ....from 4800 to 460800 (configurable)

Signal type... RX/TX bidirectional

Weight... 60 g

Power consumption........................ 0.1 W (typ) 0.2 W (max)

Connector... 1x 9-pole D-sub

ESD protection .... IEC61000-4-2 Level 4

11.1.4.2. MODEX-IF-2xRS232

Part number 9161 0713

Supported baud rate ....from 4800 to 460800 (configurable)

Signal type... RX/TX bidirectional

Weight... 70 g

Power consumption........................0.1 W (typ), 0.2 W (max)

Connector... 2x 9-pole D-sub

ESD protection .... IEC61000-4-2 Level 4

11.1.4.3. MODEX-IF-RS232-RS422

General

Part number 9161 0714

Weight... 70 g

Power consumption........................0.1 W (typ), 0.2 W (max)

Connector... 2x 9-pole D-sub

ESD protection .... IEC61000-4-2 Level 4

RS-232

Supported baud rate .... from 4800 to 460800 (configurable)

Signal type .... RX/TX bidirectional

RS-422

Pin assignment .... 1: RX-, 2: RX+, 3: TX+, 4: TX-, 5: GND

Signal levels .... ±5 V

11.1.4.4. MODEX-IF-RS232-IR

General

Part number 9161 0715

Weight .... 65 g

Power consumption .... 0.1 W (typ), 0.2 W (max)

IR connector . 2x3.5 mm TRS connector (1/8" mini-jack), 9-pole D-sub

ESD protection .... No

RS-232

Supported baud rate .... from 4800 to 460800 (configurable)

Signal type .... RX/TX bidirectional

IR (Valid for the Supplied IR Receiver and IR Emitter)

Supported frequencies (input carrier frequency) .... 38 kHz

Supported frequencies (output carrier frequency) .... 38 kHz (configurable)

11.1.4.5. MODEX-IF-ETH

Part number 9161 0718

Ethernet data rate .... 10/100Base-T, full duplex with autodetect

Ethernet protocol ARP, ICMP (ping), IP, TCP, DHCP, HTTP, SMTP, Telnet

Power over Ethernet .... Not supported

Auto-MDIX .... Yes

Weight .... 70 g

Power consumption .... 0.05 W (typ), 0.066 W (max)

Connector .... 1x female RJ45

ESD protection .... IEC61000-4-2 Level 4

11.1.4.6. MODEX-IF-AUDIN

General

Part number 9161 0719

Weight .... 80 g

Power consumption .... 0.2 W (typ), 0.33 W (max)

Connector .... 1x RCA, 1x 5 pole Phoenix

ESD protection .... IEC61000-4-2 Level 4

S/PDIF Digital Audio

Audio format .... S/PDIF

Supported sample rates .... 16 to 48 kHz

AES/EBU compatibility .... No

Bit depths .... Up to 24 bits

Analog Audio

Sample frequency .... 48 kHz

Maximum level .... Input: 4.4 Vp-p

Frequency response .... 20 Hz to 20 kHz: ±1 dB

Gain .... -5dB to 19dB

Input impedance .... 28 kΩ

11.1.4.7. MODEX-IF-AUDOUT

General

Part number 9161 0720

Weight .... 80 g

Power consumption .... 0.2 W (typ), 0.33 W (max)

Connector .... 1x RCA, 1x 5 pole Phoenix

ESD protection .... IEC61000-4-2 Level 4

S/PDIF Digital Audio

Audio format .... S/PDIF

Supported sample rates .... 16 to 48 kHz

AES/EBU compatibility .... No

Bit depths .... Up to 24 bits

Analog Audio

Sample frequency .... 16 to 96 kHz

Maximum level .... 4.4 Vp-p (6 dBu)

Frequency response .... 20 Hz to 20 kHz: ±1 dB

Volume .... +5dB to -73dB (and - ∞dB)

Output impedance .... 1.2 kΩ

11.1.4.8. MODEX-IF-AUD

General

Part number 9161 0721

Weight .... 90 g

Power consumption .... 0.2 W (typ), 0.33 W (max)

Connector .... 1x RCA, 1x 5 pole Phoenix

ESD protection .... IEC61000-4-2 Level 4

S/PDIF Digital Audio

Audio format .... S/PDIF

Supported sample rates .... 16 to 48 kHz

AES/EBU compatibility .... No

Bit depths .... Up to 24 bits

Analog Audio

Sample frequency .... 48 kHz

Maximum level .... Input: 4.4 Vp-p; output: 4.4 Vp-p (6 dBu)

Frequency response .... 20 Hz to 20 kHz: ±1 dB

Volume .... Input: -5dB to 19dB

.... Output: +5dB to -73dB (and - ∞dB)

Input/output impedance .... Input: 28 kΩ; output: 1.2 kΩ

11.1.4.9. MODEX-IF-4ETH

Part number 9161 0726

Ethernet data rate .... 10/100Base-T, full duplex with autodetect

Ethernet protocol ARP, ICMP (ping), IP, TCP, DHCP, HTTP, SMTP, Telnet

Power over Ethernet .... Not supported

Auto-MDIX .... Yes

Weight .... 75 g

Power consumption...1.5 W (typ), 2.3 W (max)

Connector...4x female RJ45

ESD protection .... IEC61000-4-2 Level 4

11.1.4.10. MODEX-IF-ETH-ECN

Part number 9161 0727

Ethernet data rate .... 10/100Base-T, full duplex with autodetect

Ethernet protocolARP, ICMP (ping), IP, TCP, DHCP, HTTP, SMTP, Telnet

Power over Ethernet ....Not supported

Auto-MDIX ....Yes

Weight..75 g

Power consumption...1.5 W (typ), 2.3 W (max)

Connector......... 1x Neutrik Ethercon RJ-45 receptacle with latch lock (NE8FBH-S)

ESD protection .... IEC61000-4-2 Level 4

11.1.4.11. MODEX-IF-2ETH-RS232

General

Part number 9161 0730

Weight..85 g

Power consumption...1.5 W (typ), 2.3 W (max)

Connector...2x RJ45, 1x 9-pole D-sub

ESD protection .... IEC61000-4-2 Level 4

Ethernet

Ethernet data rate .... 10/100Base-T, full duplex with autodetect

Ethernet protocolARP, ICMP (ping), IP, TCP, DHCP, HTTP, SMTP, Telnet

Power over Ethernet ....Not supported

Auto-MDIX ....Yes

RS-232

Supported baud rate....................from 4800 to 460800 (configurable)

Signal type.. RX/TX bidirectional

11.1.4.12. MODEX-IF-2ETH-RS422

General

Part number 9161 0731

Weight..85 g

Power consumption...1.5 W (typ), 2.3 W (max)

Connector...2x RJ45, 1x 9-pole D-sub

ESD protection .... IEC61000-4-2 Level 4

Ethernet

Ethernet data rate .... 10/100Base-T, full duplex with autodetect

Ethernet protocolARP, ICMP (ping), IP, TCP, DHCP, HTTP, SMTP, Telnet

Power over Ethernet ....Not supported

Auto-MDIX ....Yes

RS-422

Supported baud rate....................from 4800 to 460800 (configurable)

Signal type.. RX/TX bidirectional

Pin assignment ....1: RX-, 2: RX+, 3: TX+, 4: TX-, 5: GND

Signal levels .... ±5 V

11.1.4.13. MODEX-IF-2ETH-IR

General

Part number 9161 0732

Weight..80 g

Power consumption...1.5 W (typ), 2.3 W (max)

Connector............ 2x RJ45, 2x 3.5mm TRS connector (1/8" mini-jack)

ESD protection .... IEC61000-4-2 Level 4

Ethernet

Ethernet data rate .... 10/100Base-T, full duplex with autodetect

Ethernet protocolARP, ICMP (ping), IP, TCP, DHCP, HTTP, SMTP, Telnet

Power over Ethernet ....Not supported

Auto-MDIX ....Yes

IR (Valid for the Supplied IR Receiver and IR Emitter)

Supported frequencies (input carrier frequency)....................... 38 kHz

Supported frequencies (output carrier frequency) .... 38 kHz (configurable)

11.2. 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:

Crosspoint settings
Audio autoselect settings, Mute ports, Lock ports, Switch ports
Video autoselect settings, Mute ports, Lock ports, Switch ports
Video input port(s) (HDMI / DVI-D / DP) - Transmitter
Video port name, Audio port name, HDCP setting
Video output port(s) (HDMI / DVI-D / DP) - Receiver
Video port name, Audio port name, HDCP setting, Color space, HDMI mode / DP mode
Analog audio input ports
Volume, Balance, Gain, Port name
Analog audio output ports
Volume, Balance, Bass, Treble, Port name
RS-232 port
RS-232 mode, Command Injection setting, Baud rate, Data bits, Stop bits, Parity
Port name and Command Injection port number
Infrared input/output ports
Port name, Frequency, Command Injection setting
Recognized codes (code0 - code19)
USB KVM
Port name, Enable / disable setting
Network settings
DHCP status (enable / disable)
Static IP address, Network mask, Gateway address
Further settings
User EDID data (U1-U31)
Event Manager: settings of all Events (1-32)

For the detailed instructions about backup and restore procedure see the related Lightware Device Controller software function in section 6.13

11.3. Factory Default Settings

Parameter	Setting/Value
Video port settings	
HDCP	Enabled
Test pattern mode	Disabled
Test pattern clock source	480p
Test pattern	Bar
Autoselect	Disabled
Autoselect mode	Priority detect
Output HDMI / DP mode	Auto
Output HDCP mode	Auto
Output color space	Auto
Analog/digital audio port settings	
Mode	Analog
Volume	0.00 dB (100%)
Balance	50 (center)
Gain	0
Sampling frequency	48 kHz
Autoselect	Disabled
Autoselect mode	Priority detect
Network settings	
IP address - TX	192.168.0.101
IP address - RX	192.168.0.102
Subnet mask	255.255.255.0
Static gateway	192.168.0.1
DHCP	Disabled
LW3 port number	6107
HTTP port number	80
Ethernet port mode	Auto negotiation
RS-232 settings	
Baud rate	9600
Databits	8
Parity	No
Stopbits	1

Parameter	Setting/Value
Command Injection status	Enabled
Command injection port nr. (TCP port)	8001
IR port settings	
Command Injection	Enabled
Output mode	Emitter (Moduleated)
Command injection output port nr.	8101
Command injection input port nr.	8102
General settings	
High temperature operation	Restart device

For the procedure of reloading factory default values see System section in LDC chapter. For more information about the navigation see 4.10.1 n.

11.4. Maximum Fiber Cable Extensions

	Singlemode (OPTS)		Multimode (OPTM)			
	OS1	OS2	OM1 (62.5/125)	OM2 (50/125)	OM3 (50/125)	OM4 (50/125)
For all resolutions	5000 m	10000 m	Not supported	240 m		

11.5. Factory EDID List

Mem.	Resolution					Type
F1	640 x	480	@ 60.00	Hz		D
F2	848 x	480	@ 60.00	Hz		D
F3	800 x	600	@ 60.32	Hz		D
F4	1024 x	768	@ 60.00	Hz		D
F5	1280 x	768	@ 50.00	Hz		D
F6	1280 x	768	@ 59.94	Hz		D
F7	1280 x	768	@ 75.00	Hz		D
F8	1360 x	768	@ 60.02	Hz		D
F9	1280 x	1024	@ 50.00	Hz		D
F10	1280 x	1024	@ 60.02	Hz		D
F11	1280 x	1024	@ 75.02	Hz		D
F12	1400 x	1050	@ 50.00	Hz		D
F13	1400 x	1050	@ 60.00	Hz		D
F14	1400 x	1050	@ 75.00	Hz		D
F15	1680 x	1050	@ 60.00	Hz		D
F16	1920 x	1080	@ 50.00	Hz		D
F17	1920 x	1080	@ 60.00	Hz		D
F18	2048 x	1080	@ 50.00	Hz		D
F19	2048 x	1080	@ 60.00	Hz		D
F20	1600 x	1200	@ 50.00	Hz		D
F21	1600 x	1200	@ 60.00	Hz		D
F22	1920 x	1200	@ 50.00	Hz		D
F23	1920 x	1200	@ 59.56	Hz		D
F24	2048 x	1200	@ 59.96	Hz		D
F25-F28	Reserved					D
F29	Universal_DVI					D
F30	1440 x	480i	@ 60.05	Hz		H

Mem.	Resolution					Type
F31	1440 x	576i	@ 50.08	Hz		H
F32	640 x	480	@ 59.95	Hz		H
F33	720 x	480	@ 59.94	Hz		H
F34	720 x	576	@ 50.00	Hz		H
F35	1280 x	720	@ 50.00	Hz		H
F36	1280 x	720	@ 60.00	Hz		H
F37	1920 x	1080i	@ 50.04	Hz		H
F38	1920 x	1080i	@ 50.00	Hz		H
F39	1920 x	1080i	@ 60.05	Hz		H
F40	1920 x	1080i	@ 60.05	Hz		H
F41	1920 x	1080	@ 24.00	Hz		H
F42	1920 x	1080	@ 25.00	Hz		H
F43	1920 x	1080	@ 30.00	Hz		H
F44	1920 x	1080	@ 50.00	Hz		H
F45	1920 x	1080	@ 60.00	Hz		H
F46	1920 x	1080	@ 60.00	Hz		H
F47	Universal_HDMI_PCM					H
F48	Universal_HDMI_ALL					H
F49	Universal_HDMI_DC					H
F50-F89	Reserved					
F90	1920 x	2160	@ 59.99	Hz		D
F91	1024 x	2400	@ 60.01	Hz		D
F92	1920 x	2400	@ 59.97	Hz		D
F93	2048 x	2400	@ 59.98	Hz		D
F94	2048 x	1536	@ 60.00	Hz		D
F95	2048 x	1536	@ 75.00	Hz		D
F96	2560 x	1600	@ 59.86	Hz		D

Mem.	Resolution					Type
F97	3840 x	2400	@ 24.00	Hz		D
F98	1280 x	720	@ 60.00	Hz		H3D
F99	1920 x	1080	@ 60.00	Hz		H3D
F100	1024 x	768	@ 60.00	Hz		H
F101	1280 x	1024	@ 50.00	Hz		H
F102	1280 x	1024	@ 60.02	Hz		H
F103	1280 x	1024	@ 75.02	Hz		H
F104	1600 x	1200	@ 50.00	Hz		H
F105	1600 x	1200	@ 60.00	Hz		H
F106	1920 x	1200	@ 59.56	Hz		H
F107	2560 x	1440	@ 59.95	Hz		H
F108	2560 x	1600	@ 59.86	Hz		H
F109	3840 x	2400	@ 24.00	Hz		H
F110	3840 x	2160	@ 24.00	Hz		H
F111	3840 x	2160	@ 25.00	Hz		H
F112	3840 x	2160	@ 30.00	Hz		H
F113-F117	Reserved					
F118	Universal_4K_PCM					H4K
F119	Universal_4K_ALL					H4K
F120	3840 x	2160	@ 60.00	Hz		UHD
F121	1440 x	1080	@ 59.91	Hz		H
F122	2560 x	2048	@ 59.98	Hz		H
F123	1280 x	800	@ 59.91	Hz		H
F124	1440 x	900	@ 59.90	Hz		H
F125	1368 x	768	@ 59.85	Hz		H
F126	1600 x	900	@ 59.98	Hz		H
F127	2048 x	1080	@ 60.00	Hz		H

| Mem.	Resolution					Type
F128	2560 x	1080	@ 60.00	Hz		H
F129	3440 x	1440	@ 24.99	Hz		H
F130	3440 x	1440	@ 29.99	Hz		H
F131	4096 x	2160	@ 25.00	Hz		H
F132	4096 x	2160	@ 30.00	Hz		H
F133	4096 x	2160	@ 60.00	Hz		H4K
F134	3440 x	1440	@ 23.99	Hz		H
F135	4096 x	2160	@ 24.00	Hz		H
F136	3840 x	2400	@ 29.99	Hz		H

Legend

D: DVI EDID

H: HDMI **U**:Universal EDID (supporting many common EDIDs)

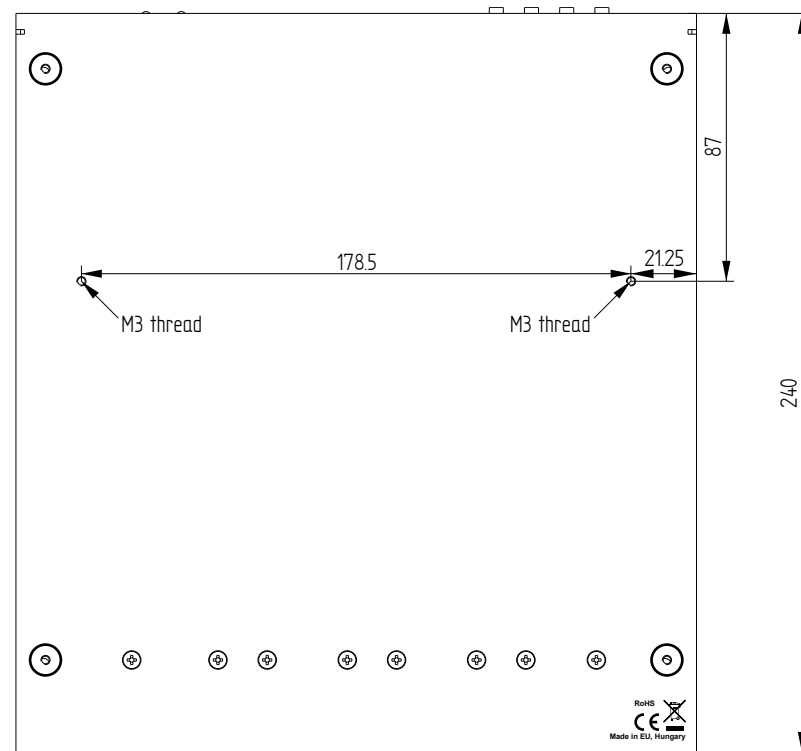Please note that minor changes in the factory EDID list may be applied in farther firmware versions.

11.6. Mechanical Drawings

The following drawings present the physical dimensions of the transmitter. Dimensions are in mm.
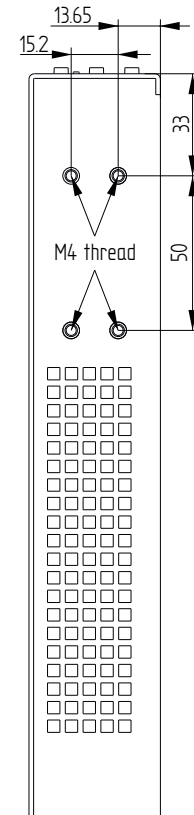
Front View
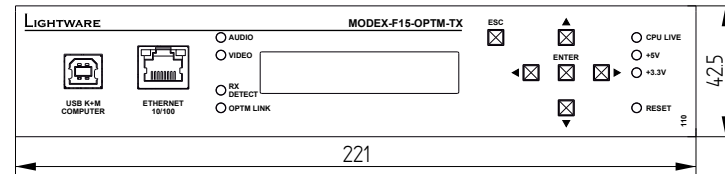
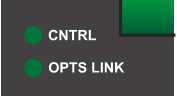**Bottom View**

Side View

## 11.7. The New Features from MODEX HW v3.0 (CM-1004)

Introduction

The hardware of MODEX units have been redesigned and released with version 3.0. The new hardware contains developments and new features which affects the usage of the product.

> **ATTENTION!** HW v2.2 and v3.0 are compatible. A TX assembled with HW v2.2 and an RX with HW v3.0 are compatible with each other and vice versa.

The following table contains the differences between the hardware versions:

Feature / Parameter	HW v2.2	from HW v3.0
Serial number	till 59xxxxxx (October, 2015)	from 5Axxxxxx (November, 2015)
Compatible firmware	All	from v1.2.8
LCD backlight	MODEX-F15-OPTS 103227410715721	MODEX-F15-OPTS 103227410715721
The label of low link speed	● CNTRL ● OPTS LINK	● RX DETECT ● OPTS LINK ● TX DETECT ● OPTS LINK
Remote firmware upgrade via the optical link	not available	available
Cooling	Convection only	Cooling fan
Part number of frames		
MODEX-F15-OPTS-TX	9161 0103	9161 0108
MODEX-F15-OPTS-RX	9161 0104	9161 0109
MODEX-F15-OPTM-TX	9161 0106	9161 0110
MODEX-F15-OPTM-RX	9161 0107	9161 0111

The Airflow in the case of a MODEX from HW v3.0
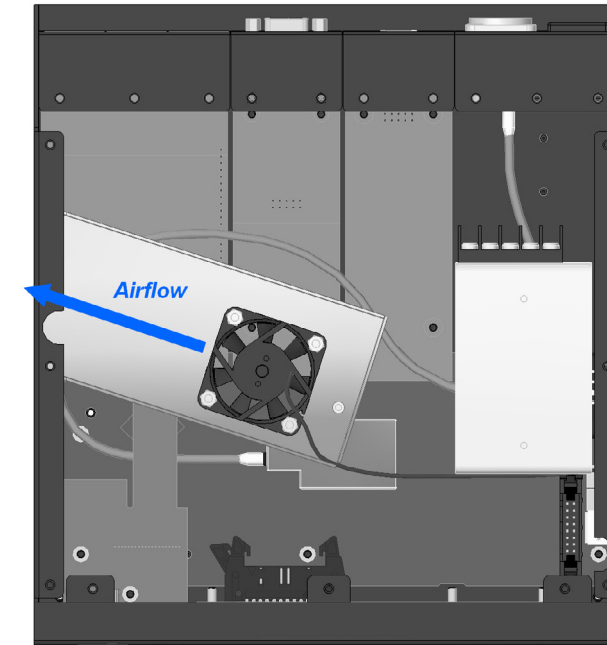
Internal view of MODEX with HW v3.2

11.8. Audio Cable Wiring Guide

Inputs and outputs of audio devices are symmetric or asymmetric. The main advantage of the symmetric lines is the better protection against the noise therefore, they are widely used in the professional audio industry. Symmetric audio is most often referred to as balanced audio, as opposed to asymmetric, which is referred to as unbalanced audio. Lightware products are usually built with 5-pole Phoenix connectors so we would like to help users assembling their own audio cables. See the most common cases below.

ATTENTION! Symmetric and asymmetric lines can be linked with passive accessories (e.g. special cables), but in this case half of the line level is lost.

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

ATTENTION! Never join the phase-inverted (negative, cold or -) poles (either right and left) to the ground or to each other on the output side, as this can damage the unit.

INFO: Use a galvanic isolation in case of a ground loop.
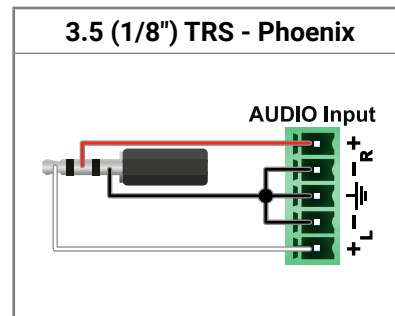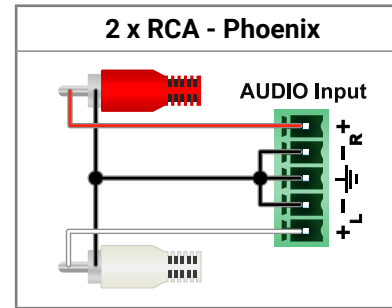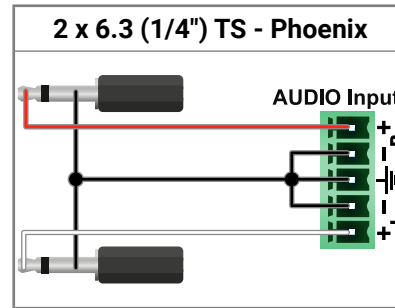
The Pinout of the 5-pole Phoenix Connector
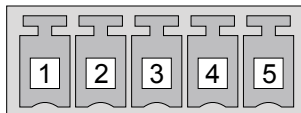
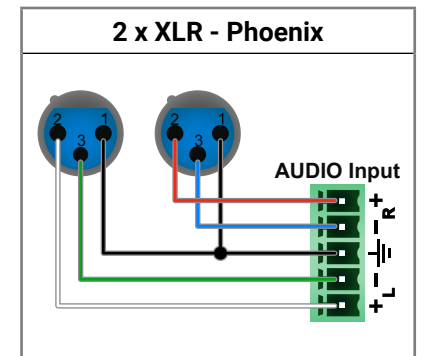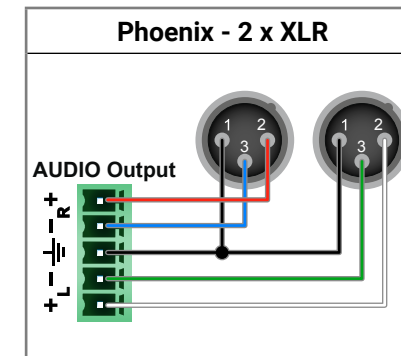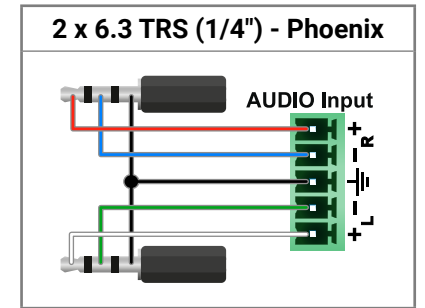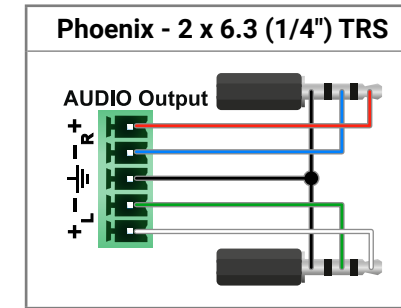| Pin nr.	Signal
1	Left+
2	Left-
3	Ground
4	Right-
5	Right+
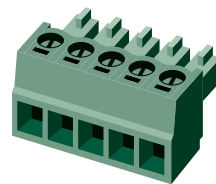
Compatible Plug Type

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

From Unbalanced Output to Balanced Input

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
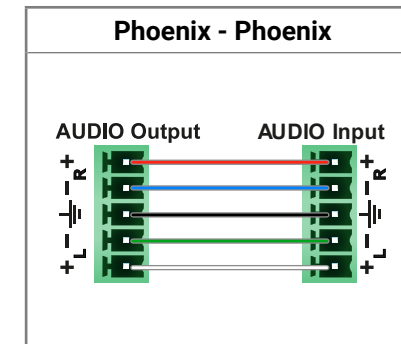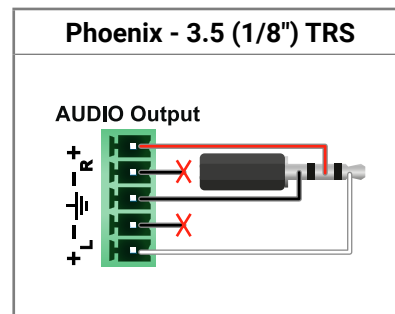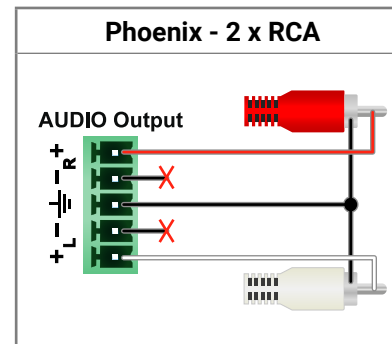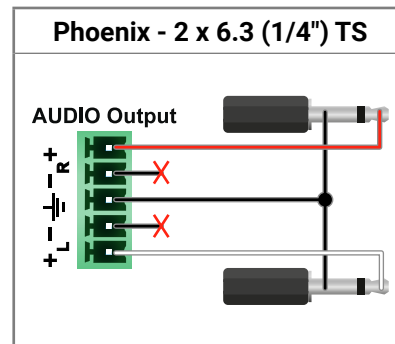
11.9. Further Information

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	20-03-2014	Initial version	Laszlo Zsedenyi
1.1	06-10-2014	New Modules added	Laszlo Zsedenyi
1.2	19-12-2014	New Modules added, Lightware Device Updater added and Firmware upgrade process changed, web control section updated	Laszlo Zsedenyi
1.3	16-01-2015	Minor changes in Technologies section (HDCP)	Laszlo Zsedenyi
1.4	08-04-2015	New Modules added, serial and IR crosspoint sections changed.	Laszlo Zsedenyi
1.5	02-12-2015	New Modules added, LDU chapter updated, changes of HW v3.0 and FW 1.2.8	Laszlo Zsedenyi
1.6	15-12-2015	Safety instructions updated, CE page pulled out	Laszlo Zsedenyi
2.0	30-05-2017	Changes of FW v2.1.0 and web control v2.1.0, upgraded USB KVM function and audio options, LDC support, new Modules added	Tamas Forgacs
2.1	03-07-2017	Updated safety information	Tamas Forgacs
3.0	23-02-2018	New template format, add some basic info to the media connectors, video and interface modules, add system commands in LW3 progref, add serial description	Judit Barsony
3.1	31-10-2018	1080p120 Hz signal support info added.	Laszlo Zsedenyi
3.2	07-11-2018	Minor type corrections.	Laszlo Zsedenyi

Contact Us

sales@lightware.com

+36 1 255 3800

support@lightware.com

+36 1 255 3810

Lightware Visual Engineering LLC.

Peterdy 15, Budapest H-1071, Hungary

www.lightware.com