visual engineering
LIGHTWARE

UMX-OPT-TX150R

User's Manual

SAFETY INSTRUCTIONS

Class II apparatus construction.

This 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 top cover will expose dangerous voltages. To avoid personal injury, do not remove the top cover. Do not operate the unit without the cover installed.

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.

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

WEEE (Waste Electrical & Electronic Equipment)

Correct Disposal of This Product

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

This laser product is designated as Class 3R, wavelengths are 778, 800, 825, 850, 911 and 980 nm. Direct intrabeam viewing normally hazardous.

DECLARATION OF CONFORMITY

We,

Lightware Kft. 15 Peterdy Street, Budapest H-1071, HUNGARY

as manufacturer declare, that the product

UMX-OPT-TX150R
(Computer Monitor Extender)

in accordance with the EMC Directive 2004/108/EC and the Low Voltage Directive 2006/95/EEC is in conformity with the following standards:

EMI/EMC ..... EN 55022 Class B

Safety..... UL, CUL, GS, CR, RCM, PSE, Class II

Date: 24 April 2013

Name: Gergely Vida (Managing Director)

Signed: Vida A. Gergely

Table of contents

1. Introduction

Dear Customer,

Thank you for choosing Lightware UMX-OPT-TX150R monitor extender.

Lightware's UMX-OPT-TX150R is an all-round, universal video and audio transmitter for ever-changing environments such as small board and conference rooms. The extender was designed to handle digital and analog video and audio signals e.g. VGA, YPbPr, DVI and HDMI 1.3 with analog stereo, 5.1 S/PDIF and even 7.1 HDMI embedded audio.

2. General description

2.1. Box contents

- UMX-OPT-TX150R unit
- Quick Start Guide
- User's manual (this document)
- +5V DC wall plug adaptor

2.2. Features

- **Advanced EDID Management –** The user can emulate any EDID at the extender's inputs independently, read out and store the attached monitor's EDID in the internal memory locations, upload and download EDID files using Matrix Control Software.
- **2.25 Gb/s channel transmission –** Extend any VGA, DVI or HDMI signal between 25 and 225 MHz pixel clock frequency conforming to DVI 1.0 and HDMI 1.3 standards.
- **Supports all HDTV resolutions –** 720p, 1080i, 1080p 2K etc. HDTV signals up to 225 MHz pixel clock frequency are passed through regardless of the resolution.
- **Control by front and rear panel buttons –** Video and audio source select buttons, EDID address selection with four decimal rotary switches, baud rate selector, LEARN EDID and reset buttons are available for Advanced EDID Management and control the device.
- **Galvanic Isolation between source and display –** Lightware fiber optical extenders are isolated between transmitter and receiver to eliminate ground loop noise or HUM effects.
- **Single Fiber Technology –** All of the high-speed TMDS data lanes are transmitted using only one multimode 50/125 (or 62.5/125) fiber optical cable.
- **USB control –** Input status, Advanced EDID Management, Terminal Window and hardware information can be accessed with Lightware Matrix Controller software via USB connection.
- **Intelligent HID Emulation -** Intelligent HID (Human Interface Device) Emulation is provided for two devices with full transparency. Special HID devices including keyboards and mouse - are emulated by the extender and transparently transferred to the computer with the result that no drivers are required for proper functionality, it's as easy as Plug & Play.
- **RS-232 control –** Input status, Advanced EDID Management, Terminal Window and hardware information can be accessed with Lightware Matrix Controller software via simple ASCII based RS-232 protocol.

- **Bi-directional RS-232 pass-through –** AV systems can contain serial port controllers and controlled devices. Serial port pass-through supports any unit that works with standard RS-232.
- **Universal power adaptor** – UMX-OPT-TX150R transmitter is equipped with a universal +5V DC power adaptor, which accepts AC voltages from 100 to 240 Volts with 50 or 60 Hz line frequency.
- **Locking DC connector** – Special plug of wall adaptor ensures safe power supply. This type of connector prevents unwanted extractions.
- **HDCP compliant –** UMX-OPT-TX150R complies with HDCP standard. Lightware is a legal HDCP adopter. Both HDCP encrypted and non-HDCP components can be installed in the same system. The included advanced HDCP management eliminates the need for re-authentication upon switching.
- **20 meters input cable compensation –** Using 22AWG high quality DVI or HDMI cable, the digital inputs are automatically compensated for up to 20 meters cable length at 24bpp, which extends installation possibilities even at the highest HDTV or computer resolutions.
- **Pixel Accurate Reclocking –** (removes jitter caused by long cables) The output has a clean, jitter free signal, eliminating signal instability and distortion caused by long cables or connector reflections.
- **Frame detector and signal analysis –** Using the Lightware Matrix Controller software the exact video and audio signal format can be determined such as timing, frequencies, scan mode, HDCP encryption, color range, color space and audio sample rate.
- **Deep Color support and conversion –** It is possible to transmit the highest quality 36-bit video streams for perfect color reproduction.
- **DVI/HDMI conversion –** The transmitter is able to convert from HDMI to DVI signals so that you can watch HDMI videos on your computer display without audio.
- **Zero frame delay – Even on Analog Inputs -** Lightware's UMX-OPT-TX150R add no frame noticeable delay to the switched signal. There is no frame or line period delays to the signals when passing a Lightware device.
- **Separate Audio and Video switching –** Video and audio signals are separated and can be switched independently. Even if the HDMI stream contains embedded audio.
- **Analog Audio and Video A/D conversion –** UMX-OPT-TX150R converts uncompressed analog audio and video signal to digital and places it to the output.
- **Rack mounting options** – Several mounting methods ensure universal usage. Units can be placed into standard racks or under flat surfaces.
- **Input (video & audio) status LEDs –** Front panel LEDs give feedback about state of the unit and the video and audio signals.
- **Accepts analog and digital audio signals -** Accepts analog stereo; 5.1 S/PDIF and even 7.1 HDMI embedded audio signals. Analog signals are converted to digital formats and digital or digitized analog audio can be embedded in the video stream.
- **Autoswitch function for video and audio inputs –** Autoselect mode with or without priority can toggles between inputs. It helps the handling of the transmitter and installation of new devices.

2.3. Typical applications

Some typical connection variations with the signal extender are shown on Figure 2-1 and Figure 2-2.

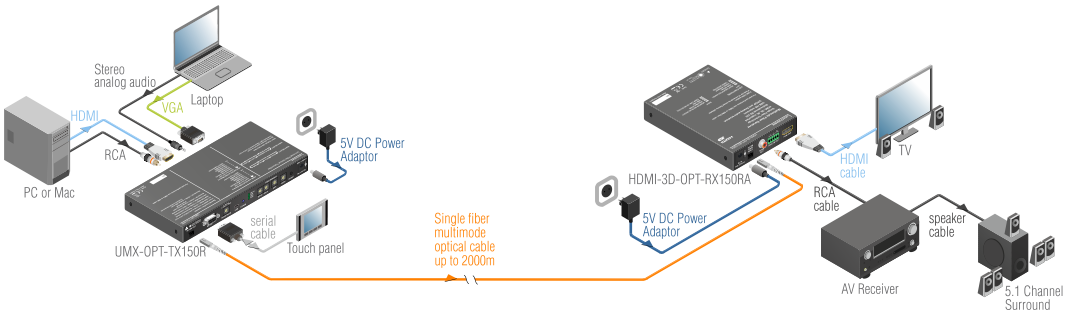


Figure 2-1. Typical stand-alone application for UMX-OPT-TX150R

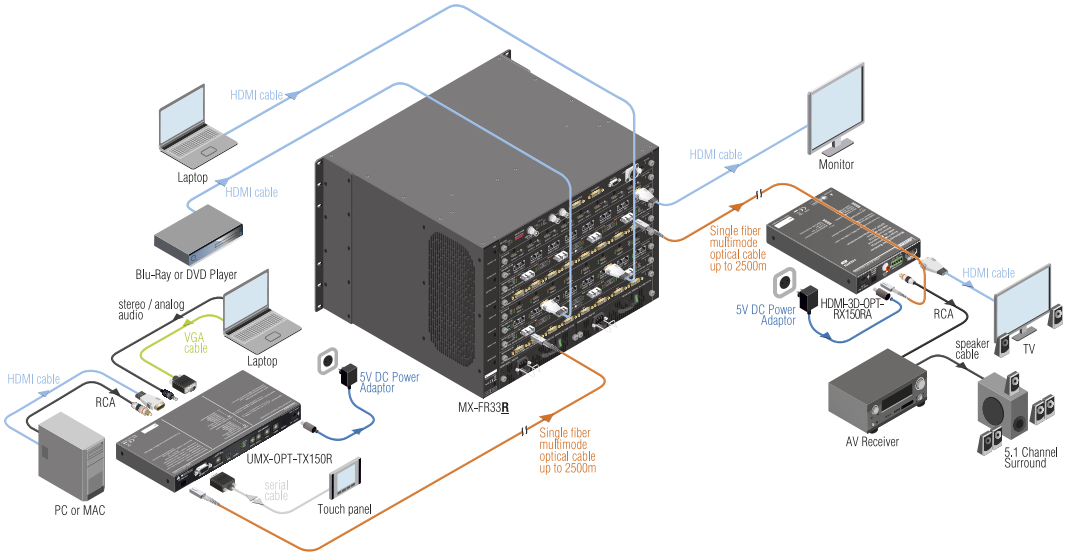


Figure 2-2. Integrated system application for UMX-OPT-TX150R

Info: *For the compatible Lightware products please see the compatibility table on the Lightware homepage.*

2.4. Application examples

- Executive boardrooms
- Small classrooms
- Conference rooms, collaborative telepresence
- Multiroom video and audio control
- Home theatre systems

2.5. Understanding EDID

2.5.1. Basics

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

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

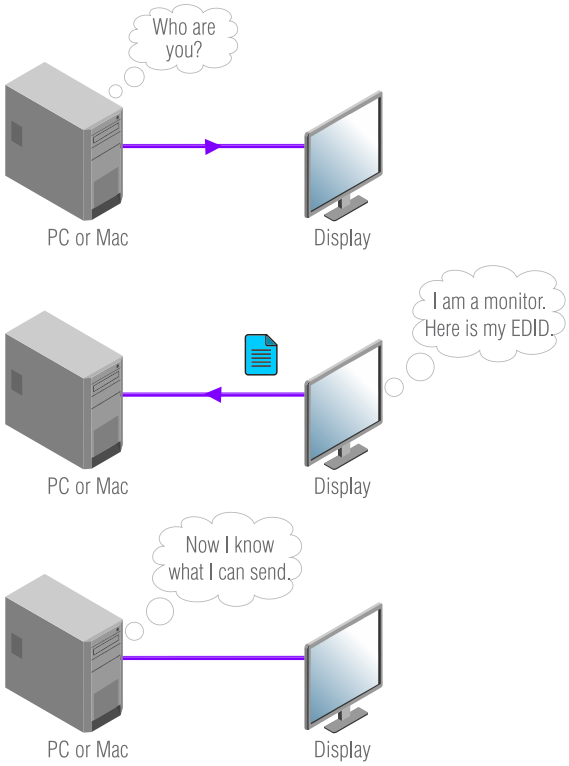


Figure 2-3. EDID communication

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 are HDMI capable which have the extension.

2.5.2. Common problems related to EDID

Problem: „I have changed to a different EDID on an input port of the matrix 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 don't sense that EDID has been changed. You need to restart your source to make it read out the EDID again.

Problem: „I have a UMX-OPT-TX150R and I'm using a Lightware factory preset EDID. I would like to be able to choose from different resolutions, but my source allows only one resolution."

Solution: Most Lightware factory preset EDIDs allow only one resolution, forcing the sources to output only that particular signal. You need to select a Universal EDID. It supports all common VESA resolutions. Additionally it also features audio support.

2.6. Advanced EDID Management

Each DVI sink (e.g. monitors, projectors, plasma displays, and switcher inputs) 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. HDMI standard makes use of EDID data structure for the identification of the monitor type and capabilities. Most DVI sources (graphic cards, set top boxes, etc.) will output DVI signal after accepting the connected sink's EDID information. In case of EDID readout failure or missing EDID the source will not output DVI video signal. UMX-OPT-TX150R provides Lightware's Advanced EDID Management function that helps system integration. The built in EDID Router stores and emulates 36 EDID data plus all monitor's EDID that are connected to the output connectors. There are 20 factory preset and 16 user programmable EDIDs. The router stores the EDID of all attached monitors or projectors for the output in a non-volatile memory. This way the EDID from a monitor is available when the monitor is unplugged, or switched off.

An emulated EDID can be copied from the EDID router's memory (static EDID emulation), or from the last attached monitors memory (dynamic EDID emulation). For example, the router can be set up to emulate a device, which is connected to the output. 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. EDID Router can be controlled via USB or serial port.

Info: *The user is not required to disconnect the video cables 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 it is powered ON.*

Info: *When EDID has been changed, the unit toggles the HOTPLUG signal for 2 seconds. Some sources do not observe this signal, so in this case the change is not recognized by the source. In such cases the source device must be restarted or powered OFF and ON again.*

2.7. HDCP management

Lightware Visual Engineering is a legal HDCP adopter, and has developed several functions that helps to solve HDCP related problems.

2.7.1. HDPC key caching

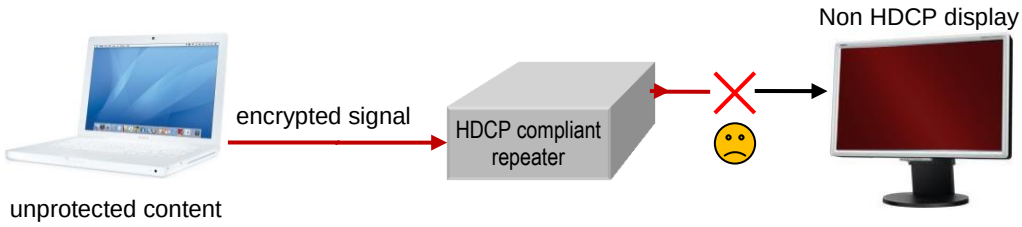
Lightware introduced the HDCP key cashing technique in early 2009 that validates all the display keys in an AV system during system boot up and keeps them constantly available for sources. This method eliminates the HDCP handshake at every switch and keeps all sources sending uninterrupted signals.

Without this function the sources should re-authenticate HDCP after each crosspoint switch which makes the displays to drop the signal and go black for 5-8 seconds. The HDCP key cashing technique avoids this and allows instantaneous switching between two encrypted signals.

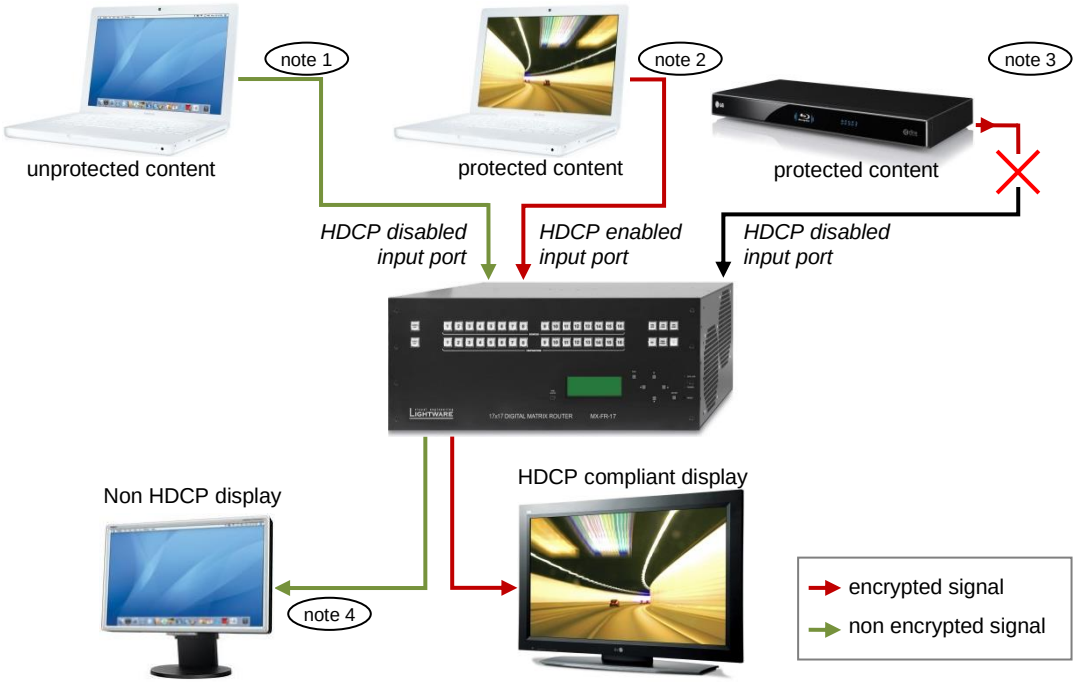
2.7.2. Avoiding unnecessary HDCP encryption

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 a HDCP capable device (e.g. repeater or matrix router) is connected between the source and the display. In this case the content can't be viewed on non-HDCP capable displays and interfaces like event controllers.

Rental and staging technicians often complain about Apple laptops, who always send 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) MacBook and MacBookPro still do that.



To avoid unnecessary HDCP encryption, Lightware introduced the HDCP enabling/disabling function: the HDCP capability can be disabled on each input port separately. If HDCP is disabled on an input port, the connected source will detect that the sink is not HDCP capable, and turn off authentication. The source will not be able to communicate with any of the devices (displays, repeaters, etc.) that are connected to the routers output, therefore it could not see if they are HDCP capable or not.



Note 1: *If a source detects that the input port is HDCP disabled, it will send only unprotected content.*

Note 2: *If a source detects that the input port is HDCP enabled, it could send protected or unprotected contents as well.*

Note 3: *HDCP protected content will not be sent to any input port with disabled HDCP setting.*

Note 4: *HDCP protected content will never be sent to a non HDCP compliant display.*

Please note that if HDCP capability is disabled on an input port, the connected source cannot send protected content to any display. If HDCP function is enabled on an input port and the source sends encrypted signal, the non-HDCP compliant devices cannot display the video. This new feature does not remove the encryption of an encrypted signal, and does not void HDCP standard at all.

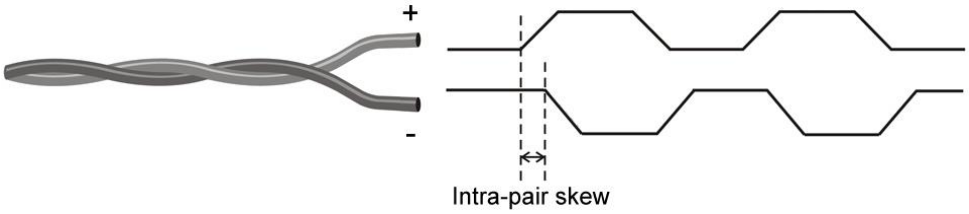
2.8. Pixel Accurate Reclocking

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

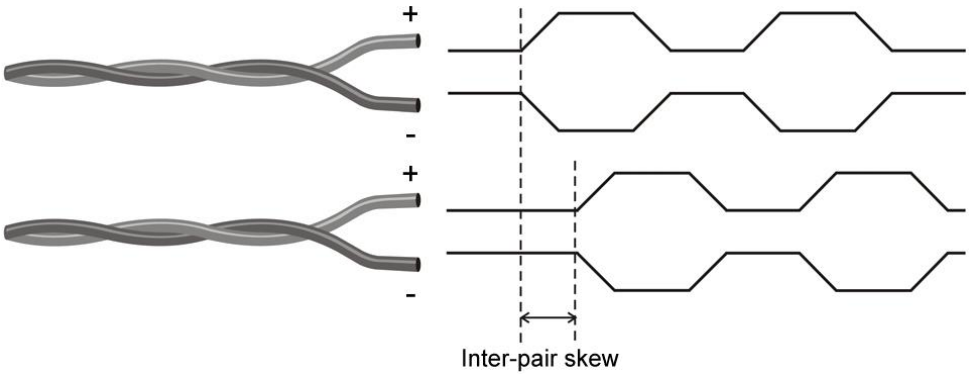
Lightware's sophisticated Pixel Accurate Reclocking technology fixes more problems than general TMDS reclocking. It removes not only intra-pair skew but inter-pair skew as well.

The Pixel Accurate Reclocking circuit eliminates the following errors:

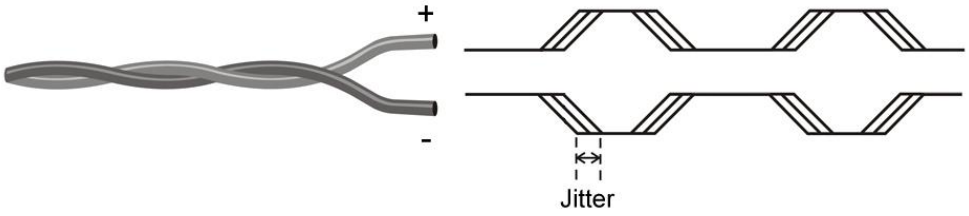
Intra-pair skew: skew between the + and - wires within a differential wire pair (e.g. Data2- and Data2+). It's caused by different wire lengths or slightly different wire construction (impedance mismatch) in HDMI cable. It results in jitter.



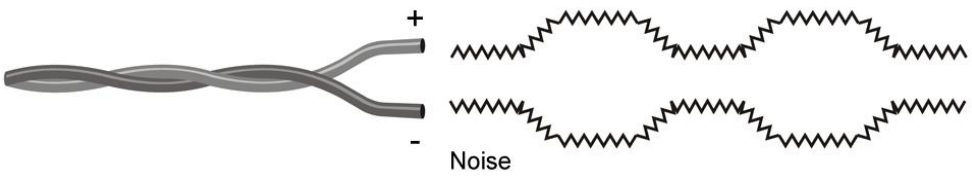
Inter-pair skew: skew between two differential wire pairs in a cable. It's caused by different wire pair lengths or different number of twists in the HDMI cable. Too much inter-pair skew results in color shift in the picture or sync loss.



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



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



The Pixel Accurate Reclocking circuit completely regenerates the original video signal and outputs a strong, high-quality digital signal that conforms to the HDMI specification.

3. Controls and connections

3.1. UMX-OPT-TX150R front view

Figure 3-1. UMX-OPT-TX150R front view

1	**DVI-I IN**	Connect one DVI cable (DVI-DVI or DVI-HDMI) or VGA cable with VGA-to-DVI adapter between the source and the transmitter. For more information see section *4.4* on page *19*.
2	**VGA IN**	Connect one VGA cable between the analog video source and the transmitter. For more information see chapter *4.2* on page*18*.
3	**HDMI IN**	Connect one HDMI cable between the HDMI source and the transmitter. For more information see chapter *4.1* on page *18*.
4	**AUDIO 1 IN**	3.5 mm jack connector for unbalanced analog stereo audio input signal with right and left channel. For more information see section *4.8* on page *21*.
5	**AUDIO 2 IN**	3.5 mm jack connector for unbalanced analog stereo audio input signal with right and left channel. For more information see section *4.8* on page *21*.
6	**S/PDIF input**	RCA jack connector with S/PDIF digital audio signal. For more information see chapter *4.3* on page *19*.
7	**Status LEDs**	The LEDs give feedback about state of the unit and the video and audio signals. For more information about names and meanings of the Status LEDs see chapter *6.1* on page *29*.
8	**VIDEO SEL.**	Switching between video inputs (DVI-D / DVI-A / VGA / HDMI / Autoselect) is available with the VIDEO select button. For more information see section *6.3* on page *30*.
9	**AUDIO SEL.**	Switching between audio inputs (DVI-D / Audio 1 / Audio 2 / HDMI / S/PDIF) is available with the AUDIO select button. For more information see section *6.4* on page *30*.

3.2. UMX-OPT-TX150R rear view

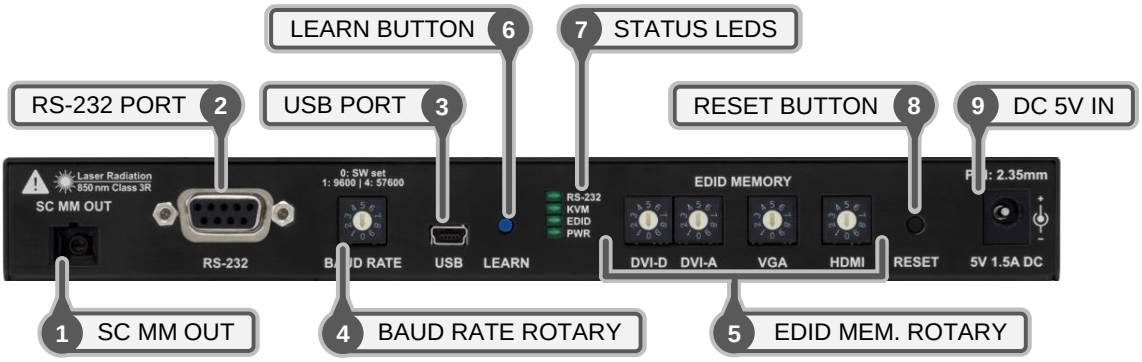


Figure 3-2. UMX-OPT-TX150R rear view

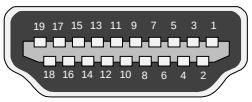
1	**SC MM OUT**	Connect a 50/125 multimode fiber optical cable (OM4 is recommended) between the SC MM OUT of the transmitter unit and the SC MM IN of the receiver unit. (e.g. HDMI-3D-OPT-RX100RA or a Lightware Hybrid Matrix equipped with fiber optical input cards). For more information see chapter 4.6 on page 20.
2	**RS-232 port**	9-pole D-sub female connector for standard RS-232 port. Connect a serial cable between the transmitter unit and the serial device. RS-232 pass-through, third party control and Advanced EDID management are available via the RS-232 interface. For more information see chapters 4.5 and 5.2 - 0 on pages 20 and 22 - 27.
3	**USB PORT**	Mini USB-B connector for standard USB port. Connect a USB-A – Mini USB-B cable between the transmitter unit and the computer. Advanced EDID management, control and firmware upgrades are available via the USB interface. For more information see chapter 4.7 on page 20. (USB port can be used as USB KVM for HID devices, as well. This function is under development, available later.)
4	**BAUD RATE ROTARY**	The rotary switch selects one of 5 speeds of the serial communication (#1 .. #4) or the Software Control mode (#0). The #8 and #9 states are used for special functions. For more information see chapter 5.4.4 on page 26 and.
5	**EDID MEM. ROTARY**	The rotary switch selects one of 10 addresses on every input port. EDID memories #1 .. #5 contain factory presets and #6 .. #9 are user programmable. Address #0 enable dynamic EDID emulation which copies EDID from receiver device's video output. For more information see chapter 6.8 - 6.12 on page 41 - 46.
6	**LEARN BUTTON**	Stores the EDID of the display device attached to receiver device's video output in the selected memory address between #6 .. #9 on the selected input port. To learn the EDID, select the desired input and an appropriate address with the rotary switches and press and hold the Learn button for two seconds. For more information see chapter 6.10 on page 45.
7	**Reset button**	Hardware reset button. It resets the whole device, however saved settings and EDIDs will be preserved. This is the same as disconnecting from power source, and reconnect again.
8	**STATUS LEDS**	The LEDs give feedback about state of the unit and the communications. For more information about names and meanings of the Status LEDs see chapter 6.1 on page 29.
9	**DC 5V in**	Connect the output of the supplied +5V DC power adaptor. **CAUTION! Warranty void if damage occurs due to use of a different power source.**

Info: *Use a flat head screwdriver to the rotary swithes that fits into the actuator. Avoid the use of keys, coins, knives and other sharp objects because they might cause permanent damage to the rotary switches.*

4. Electrical connections

4.1. HDMI Input

UMX-OPT-TX150R provides standard 19 pole HDMI connector for HDMI input. Always use high quality HDMI cable for connecting sources and displays.



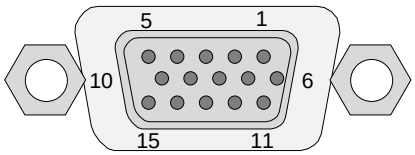
HDMI Type A receptacle

Pin	Signal	Pin	Signal
1	TMDS Data2+	**11**	TMDS Clock Shield
2	TMDS Data2 Shield	**12**	TMDS Clock–
3	TMDS Data2–	**13**	CEC
4	TMDS Data1+	**14**	Reserved
5	TMDS Data1 Shield	**15**	SCL
6	TMDS Data1–	**16**	SDA
7	TMDS Data0+	**17**	DDC/CEC/HEC Ground
8	TMDS Data0 Shield	**18**	+5 V Power (max 50 mA)
9	TMDS Data0–	**19**	Hot Plug Detect
10	TMDS Clock+		

Table 4-1. HDMI connector pin assignments

4.2. VGA Input

UMX-OPT-TX150R provides standard 15 pole D-SUB female connector for VGA input. Always use high quality VGA cable for connecting sources and displays.



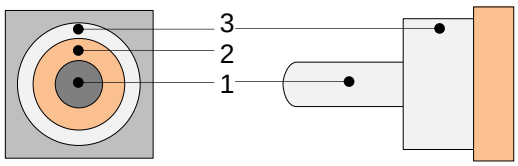
D-SUB 15 pole female connector (DE15F)

Pin nr.	Name	Description
1	RED	Red Video (75 ohm, 0.7 V p-p)
2	GREEN	Green Video (75 ohm, 0.7 V p-p)
3	BLUE	Blue Video (75 ohm, 0.7 V p-p)
4	ID2	Monitor ID Bit (Not used, internally connected to Pin 5)
5	GND	Ground
6	RGND	Red Ground (Internally connected to Pin 5)
7	GGND	Green Ground (Internally connected to Pin 5)
8	BGND	Blue Ground (Internally connected to Pin 5)
9	KEY	Optional +5V output from graphics card
10	SGND	Sync Ground (Internally connected to Pin 5)
11	ID0	Monitor ID Bit 0 (Not used, internally connected to Pin 5)
12	SDA	I^2C bidirectional data line
13	HSYNC	Horizontal Sync
14	VSYNC	Vertical Sync which works also as data clock
15	SCL	I^2C data clock in DDC2

Table 4-2. D-sub connector pin assignment for standard VGA

4.3. Digital audio input connector

UMX-OPT-TX150R has standard RCA receptacles for digital coaxial audio input.



RCA receptacle RCA plug

Nr.	Name
1	S/PDIF input or output
2	Plastic insulator
3	GND

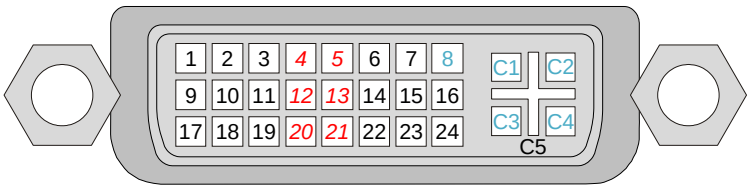
Table 4-3. RCA connector pin assignments for digital audio

Info: *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.*

4.4. DVI-I input

The transmitter unit provides standard 29 pole DVI-I connectors for DVI-D (digital) or DVI-A (analog) inputs. This way, users can plug in any DVI connector, but keep in mind that the transmitter unit accepts single link DVI, HDMI or analog (such as VGA or RGBHV) signals on the DVI input.

Always use high quality DVI cable for connecting sources and displays.



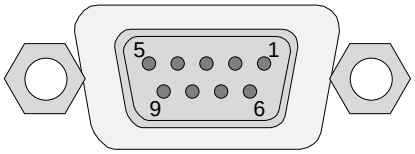
29 pole DVI-I connector

Pin	Signal	Pin	Signal	Pin	Signal
1	TMDS Data2-	**9**	TMDS Data1-	**17**	TMDS Data0-
2	TMDS Data2+	**10**	TMDS Data1+	**18**	TMDS Data0+
3	TMDS Data2 Shield	**11**	TMDS Data1 Shield	**19**	TMDS Data0 Shield
4	*not connected*	**12**	*not connected*	**20**	*not connected*
5	*not connected*	**13**	*not connected*	**21**	*not connected*
6	DDC Clock	**14**	+5V Power	**22**	TMDS Clock Shield
7	DDC Data	**15**	GND (for +5V)	**23**	TMDS Clock+
8	*Analog Vertical Sync*	**16**	Hot Plug Detect	**24**	TMDS Clock-
C1	*Analog Red*	**C2**	*Analog Green*	**C3**	*Analog Blue*
C4	*Analog Horizontal Sync*	**C5**	GND		

Table 4-4. DVI-I connector pin assignments

4.5. RS-232 port

UMX-OPT-TX150R has RS-232 pass-through function or can be remote controlled through industry standard 9 pole D-SUB female connector. The extender uses RS-232 port.



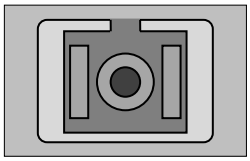
D-SUB 9 pole female connector (DE9F)

Pin nr.	RS-232
1	NC - non connected
2	**TX data transmit (output)**
3	**RX data receive (input)**
4	DTR (Internally connected to Pin 6)
5	**GND signal ground (shield)**
6	DSR (Internally connected to Pin 4)
7	RTS (Internally connected to Pin 8)
8	CTS (Internally connected to Pin 7)
9	NC - non connected

Table 4-5. D-sub connector pin assignment for standard RS-232

4.6. Fiber optical output

UMX-OPT-TX150R has SC fiber connector. Always use high quality fiber cable for connecting transmitters and receivers.



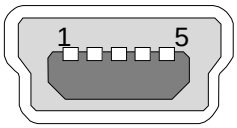
SC fiber receptacle

Info: *Fiber optic cables can be easily damaged if they are improperly handled or installed. Handle the optical cables with care to avoid damage and/or limiting their usefulness.*

Warning! *Avoid exposure to beam! Direct intrabeam viewing normally hazardous.*

4.7. USB connector

UMX-OPT-TX150R has standard Mini USB Type B receptacle.



Mini USB B connector

Pin	Name	Cable color	Signal description
1	VBUS	Red	+5V
2	D -	White	Data -
3	D +	Green	Data +
4	ID	None	Not connected
5	GND	Black	Signal ground

Table 4-6. Mini USB B connector pin assignments

4.8. Analog audio connectors

Unbalanced analog audio 1 and audio 2 can be connected to the device with TRS (Tip, Ring, and Sleeve) connectors. They are also known as (3,5 mm or approx. 1/8") audio jack, phone jack, phone plug, and mini-jack plug.

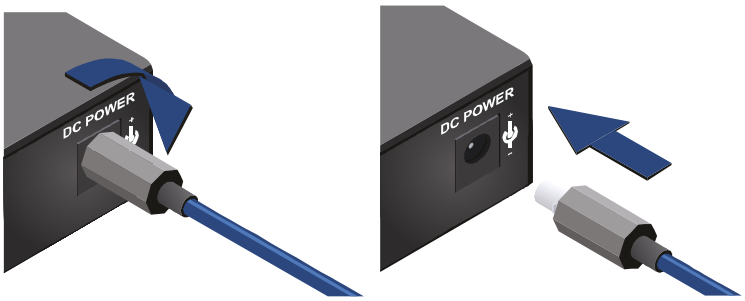
3 pole TRS

	TRS connector
1 Tip	Right channel
2 Ring	Left channel
3 Sleeve	GND

Table 4-7. TRS connector pin assignment

4.9. DC +5V connection

The device has locking DC connector to establish robust and safe power connection. After plugging it in, turn the plug clockwise as you can see in the picture below.



Locking DC connector

Do not forget to turn the connector counterclockwise before trying to disconnect the power adaptor.

Always use the supplied +5V power adaptor.

Warning! *Warranty void if damage occurs due to use of a different power source.*

5. Installation

5.1. Mounting of UMX-OPT-TX150R

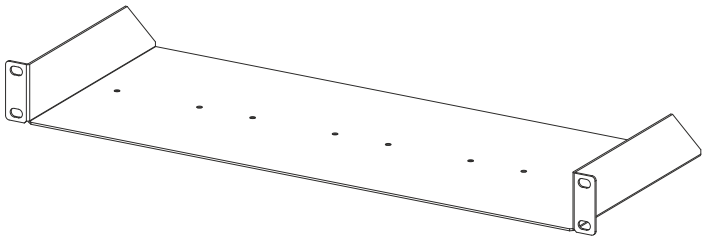
To mount the half rack sized extender unit Lightware supplies optional accessories for different usage. All kind of mounting kits have a similar fixing method. UMX-OPT-TX150R transmitter unit has two mounting holes with inner thread on the bottom side. Fasten the device by screwing the enclosed M3x6 mm cross recessed, countersunk head screws (DIN 965A) through two holes of the shelf into the device's mounting hole.

To order mounting accessories please contact *Lightware LLC.*

5.1.1. Rack shelf

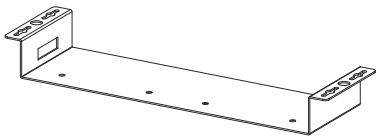
Allows rack mounting for half-rack, quarter-rack and pocket sized units.

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



5.1.2. Under desk mounting kit double

The UD-kit double makes it easy to mount a single device on any flat surface (e.g. furniture).



5.2. About serial devices

5.2.1. General information about serial communication

In our aspect there are two type 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 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)

Info: *UMX-OPT-TX150R is DCE unit according to their pin-out.*

Different type of serial cables must be used between different serial devices.

	DTE	DCE
DTE	Null-modem	Straight
DCE	Straight	Null-modem*

* in general contact DCE with DCE by tail-circuit serial cable. To connect UMX-OPT-TX150R and a DCE unit use male-male null-modem cable.

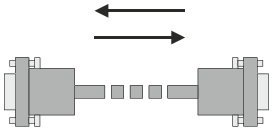
5.2.2. Type of serial cables

Serial cables between devices may have male or female plugs and their type may be straight or null-modem.

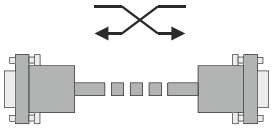
Info *The cable type does not depend on the plug type.*

If cable's plug and device's receptacle do not match get a suitable cable or use a gender changer.

- **Straight serial cable –** straight pin-outs both ends



- **Null-modem serial cable –** straight pin-out at the one end and cross pin-out at the other end. (Interchange lines of TX and RX).

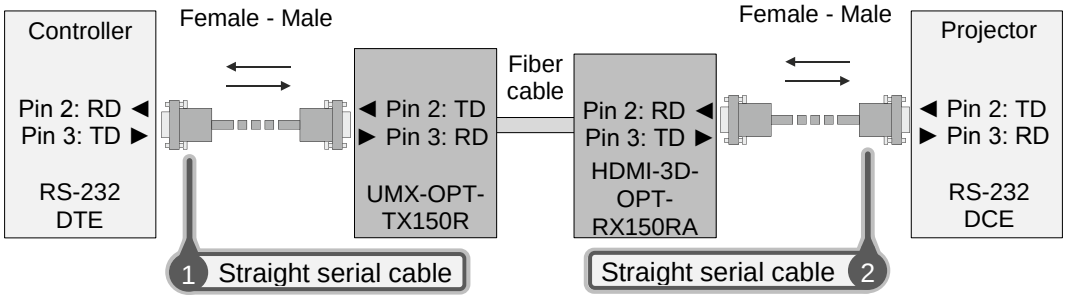


5.2.3. Example connection diagrams

The following cases are examples. Devices may have different receptacles and pin-outs.

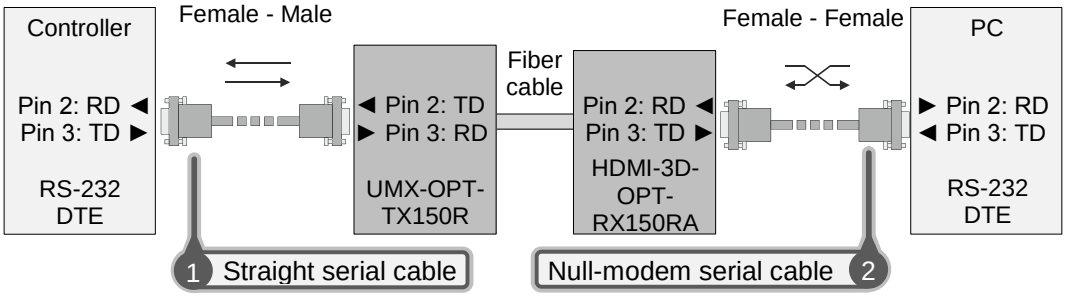
- **To extend RS-232 between controller system (DTE) and projector (DCE).**

Connect straight serial cable between controller system (DTE) and the UMX-OPT-TX150R transmitter (DCE) and null-modem serial cable between HDMI-3D-OPT-RX150RA receiver (DCE) and projector (DCE).



- **To extend RS-232 between controller (DTE) and computer (DTE).**

  Connect straight serial cable between controller system (DTE) and the UMX-OPT-TX150R transmitter (DCE) and straight serial cable between HDMI-OPT-RX150RA receiver (DCE) and computer (DTE).



5.3. Connecting serial devices

Extender units can be UMX-OPT-TX150R and any Lightware fiber optical receiver or Lightware Hybrid Matrix equipped with fiber optical input cards, etc. For the compatible Lightware products please see the compatibility table on the *Lightware* homepage.

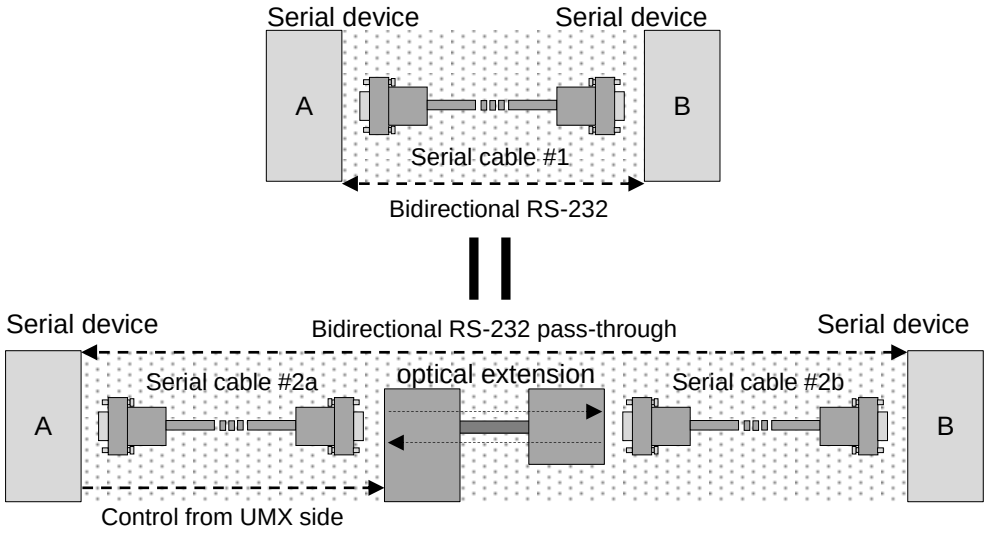


Figure 5-1. Connecting serial devices

If cable's plug and device's receptacle do not match get a suitable cable or use a gender changer.

5.4. Operation modes

There are two kinds of operations for the unit regarding the serial port: you can control the unit via USB and serial port or use the bidirectional serial link through the fiber optical cable with a compatible fiber optical receiver.

5.4.1. Control mode

In the first case the CPU in the transmitter can receive commands and send responses either to and from the own serial port or to and from the serial port on the receiver unit through the fiber optical cable.

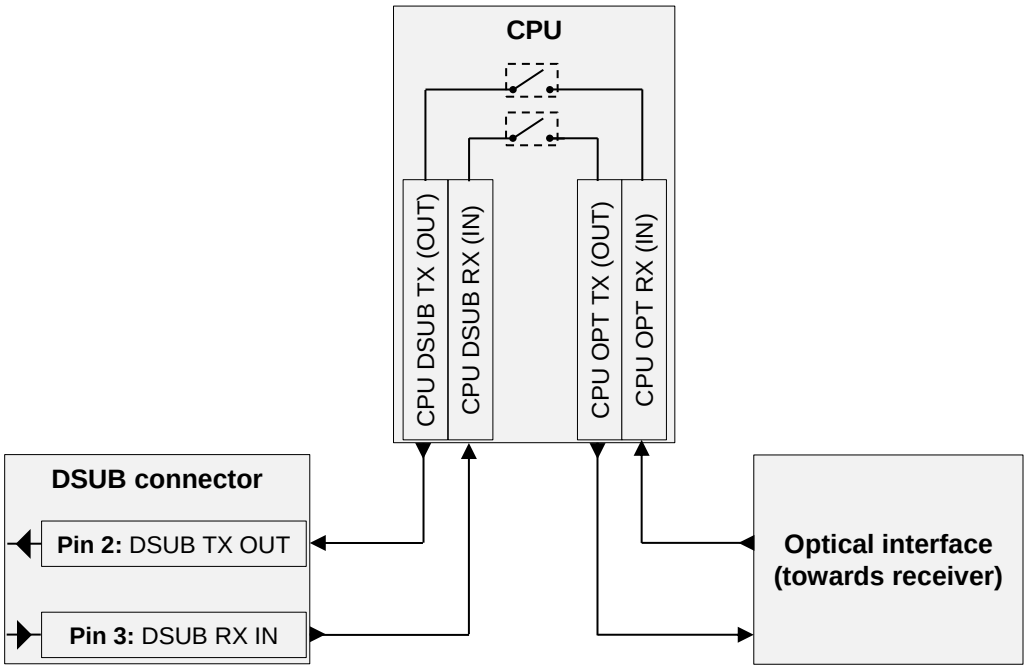


Figure 5-2. UMX-OPT-TX150R in control mode

5.4.2. Pass-through mode

In case of the second mode the serial connectors on the transmitter and on the receiver are linked together through the fiber optical cable.

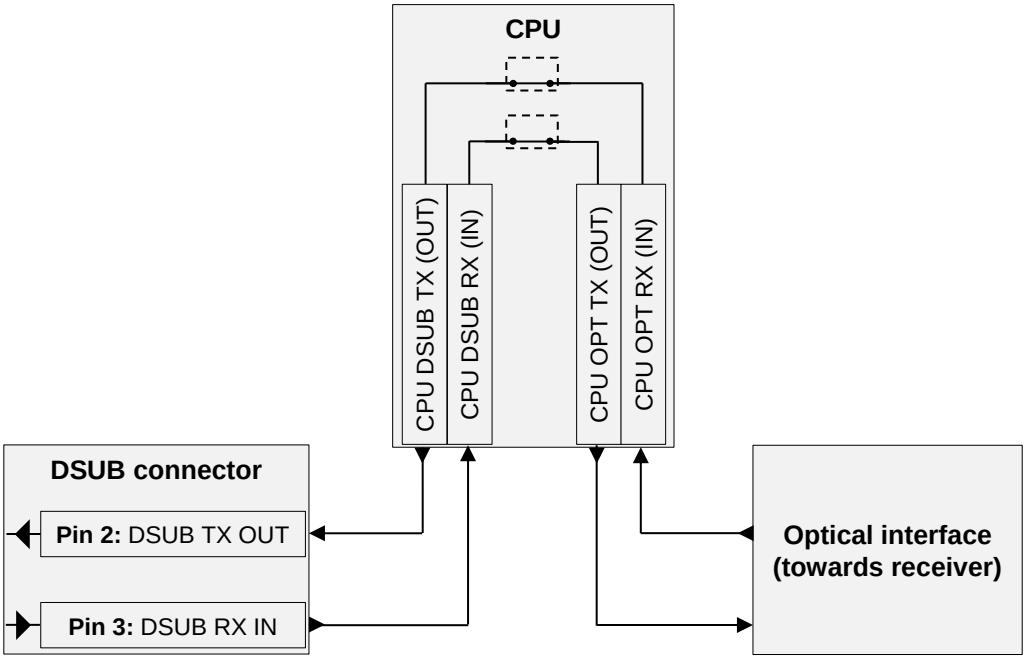


Figure 5-3. UMX-OPT-TX150R in pass-through mode

5.4.3. Changing the working mode

Turn the BAUD RATE rotary switch to address #8, and press and hold the LEARN button for approximately 3 seconds. (The addresses of EDID MEMORY rotary switches can be anything.)

+LEARN = Toggle between pass and control mode

BAUD RATE

The current status can be seen on the rear panel LED tower. If the working mode is PASS-THROUGH the RS-232 LED is off. If the working mode is CONTROL the RS-232 LED lights continuously.

Changing the working mode can be done by protocol command (section *10.4.5* on page *74*) or the Lightware Matrix Controller software (section *9.3.2* on page *57*), as well.

Info: *UMX-OPT-TX150R stores the RS-232 working mode and starts the saved one after reboot.*

The RS-232 settings – baud rate is included – are valid for the CONTROL and the PASS-THROUGH mode, as well.

For example if the BAUD RATE was changed from 57600 to 9600 in CONTROL mode the device sends commands only with 9600 BAUD RATE in PASS-THROUGH mode, as well.

5.4.4. Speed of the serial communication

UMX-OPT-TX150R uses some of the standard timings for the RS-232 control and pass-through mode. To work the bidirectional serial communication well between serial ending devices users must choose the proper baud rate on the transmitter units. Please read the serial devices' user's manual to find the appropriate baud rates. The best one is both devices' most common value.

If the communication speed ability of a serial device is unknown use the lowest (#1: 9600) value.

Lightware Matrix Controller software works with 9600 or 57600 baud. The BAUD RATE rotary must be #0, #1 or #4. In case of #0 the controller software gives the baud rate to the device.

Available BAUD RATE rotary values:

#0	Software set (57600 default)	#5	Not used
#1	9600	#6	Not used
#2	19200	#7	Not used
#3	38400	#8	RS232=Pass / Control
#4	57600	#9	KVM (under development)

5.4.5. Detailed example

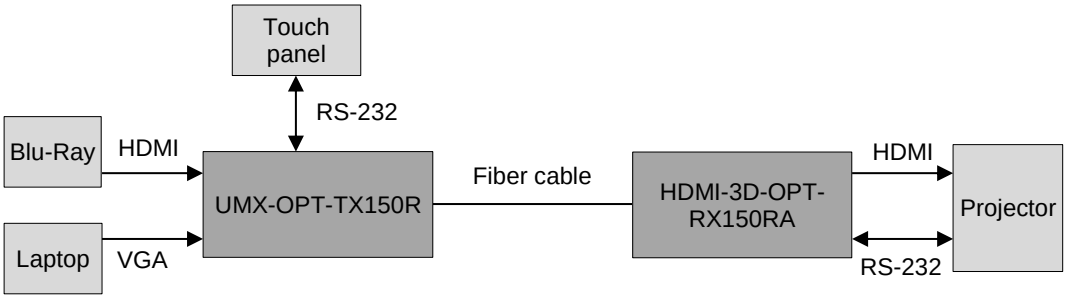


Figure 5-4. Example system diagram

The system consists of the following: a Blu-Ray player and a laptop as sources, a programmable touch panel as a controller, then a Lightware UMX-OPT-TX150R and HDMI-3D-OPT-RX150R as the optical extenders, then a projector as a sink device. The touch panel has three buttons. The desired functions of the buttons are that they can power on and off the projector, and switch between the inputs. Let's examine the detailed solution.

Three types of the touch panel's commands:

( ): settings of the touch panel / not sent /

[ ]: command to the projector / sent via RS-232 to UMX-OPT-TX150R then via fiber optical cable to the projector /

{ }: command to the UMX-OPT-TX150R / sent via RS-232 to UMX-OPT-TX150R /

Initializing:

First of all the touch panel can control the projector only if RS-232 settings are the same for the touch panel and the projector.

```
Commands:          Comments:

(set_RS-232)       /* Set the appropriate RS-232 settings which are fit to
                      the UMX-OPT-TX150R and the projector as well. */
```

Info: *57600, 38400, 19200 or 9600 Baud, 8 bit, 1stop bit, no parity. These settings are fit to the UMX-OPT-TX150R.*

Button 1 (Power on the projector):

The touch panel can control the projector only if the UMX-OPT-TX150R is in pass-through mode.

```
{RS232=PASS}       /* Set the UMX-OPT-TX150R in pass-through mode */
[projector_on]     /* Power on the projector */
```

Button 2 (Select the HDMI input):

The touch panel can only control the UMX-OPT-TX150R if that is in control mode.

```
Commands:          Comments:

{RS232=CONTROL}    /* Set the UMX-OPT-TX150R in control mode */
{4@1 AV}           /* Select the HDMI input on the UMX-OPT-TX150R */
```

Button 3 (Power off the projector):

The touch panel can control the projector only if the UMX-OPT-TX150R is in pass-through mode.

```
Commands:          Comments:

{RS232=PASS}       /* Set the UMX-OPT-TX150R in pass-through mode */
[projector_off]    /* Power off the projector */
```

5.5. Boot up of UMX-OPT-TX150R transmitter unit

Warning! *When building an electronic system, make sure that all of the devices are powered down before connecting them. Powered on devices may have dangerous voltage levels that can damage sensitive electronic circuits.*

After all the other connections in the system are complete, connect the output of the +5V Power Adaptor to the UMX-OPT-TX150R.

The special locking DC plug provides safe connection. Plug the connector into the +5V 1A DC IN receptacle and twist 90° clockwise to lock it. Plug the adaptor into the electric outlet. The unit is immediately powered ON.

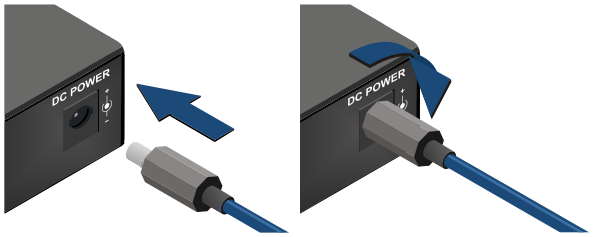


Figure 5-5. Locking DC plug

After being powered on, the UMX-OPT-TX150R lights up all LEDs from top to bottom, than displays its firmware version using the three upper LEDs of the front panel VIDEO LED bar. The top LED (DVI-D) means the first number of the firmware version, actually this is the main version. From the top the second (DVI-A) and the third (VGA) LEDs mean the second and the third number of the firmware version, actually these are the subversions.

The following example shows this process for a firmware version of 1.0.1

The top LED (DVI-D) blinks once → Short pause → The second LED (DVI-A) does not blink, this means the number 0 → Short pause → The third LED (VGA) blinks once → Short pause → The normal function of the LED is in effect.

After indicating the firmware version, UMX-OPT-TX150R checks the video output: reads the EDID if there is a Hot Plug signal and authenticates devices in case of HDCP encryption. This procedure takes approximately 5 seconds.

UMX-OPT-TX150R stores the video and audio crosspoint state in a non-volatile memory and after booting it starts with it.

After the UMX-OPT-TX150R is initialized, the attached source(s), receiver pair and monitor(s) can be powered on.

Info *If none of the LEDs light up upon power-up, the unit is most likely damaged and further use is not advised. Please contact support@lightware.eu*

6. Operation of UMX-OPT-TX150R

6.1. Front and rear panel LEDs

VIDEO Status LEDs (DVI-D, DVI-A, VGA, HDMI) is

- ON when the video input port is selected and there is a valid video signal on it.
- BLINKING when the video input port is selected and there is no valid video signal on it.
- OFF when the video input port is NOT selected. Another port is active or there was a disconnect command.

AUDIO Status LED (DVI-D, Audio 1, Audio 2, HDMI, S/PDIF) is

- ON when the audio input port is selected.
- OFF when the audio input port is NOT selected. Another port is active or there was a disconnect command.

HDCP LED is

- ON when the incoming video signal is HDCP protected.
- OFF when the incoming video signal is NOT protected.

Autoselect LED is

- ON when the autoselect mode is selected and a valid video signal is found.
- BLINKING when the autoselect mode is selected and video signal searching is in progress.
- OFF when another video input port (DVI-D, DVI-A, VGA, HDMI) is selected.

LINK LED is

- ON when the TX and the RX (or OPT-IB) are connected to each other via the optical cable and they can communicate.
- OFF when the TX and RX (or OPT-IB) are not connected or they CANNOT communicate.

RS-232 LED is

- ON when the RS-232 working mode is CONTROL.
- OFF when the RS-232 working mode is PASS.

KVM LED is

- always OFF in this firmware version. USB HID (KVM) extension is under development, only available later.

EDID LED

- is ON when there is a valid EDID on the currently active input port.
- is BLINKING FAST continuously when there is an INVALID EDID on the currently active input port.
- BLINKS FAST THREE TIMES when EDID learning was unsuccessful.
- BLINKS SLOW THREE TIMES when EDID learning was successful.

PWR LED is

- ON: when the transmitter unit is powered with +5V DC and ready to use.
- BLINKING: when the transmitter unit is powered but an error occurred.
- OFF: when the transmitter unit is NOT powered or out of order.

6.2. Input selection

Video and Audio input can be chosen with:

- VIDEO and AUDIO SELECT button on the front panel (sections 6.3, 6.4 on page 30)
- Autoselect mode (section 6.5 - 6.7 on pages 31 - 35)
- Lightware Matrix Controller software (section 9.3.1 on page 57)
- Protocol command (section 10.6.1 on page 81)

6.3. Video input selection

The order of the video selection is shown on the Figure 6-1. After the VIDEO SELECT button was pushed, the next video input will be chosen. The corresponding LED lights up.

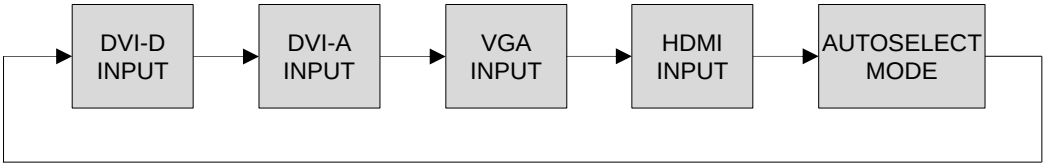


Figure 6-1. Video input selection order

6.4. Audio input selection

The order of the audio selection depends on the selected video input. The audio inputs can be selected are shown on Figure 6-2, Figure 6-3, Figure 6-4.

After the AUDIO SELECT button was pushed, the next input will be chosen. The corresponding LED lights up.

In case of analog video inputs (DVI-A and VGA) any audio input can be selected. After the AUDIO SELECT button was pushed, the next audio input will be chosen. The corresponding LED lights up.

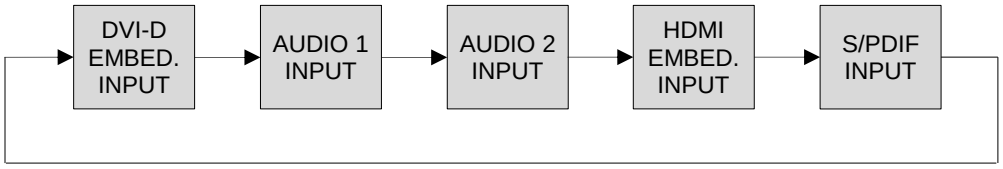


Figure 6-2. Audio input selection order for analog video inputs

In case of the digital video inputs (DVI-D and HDMI) the embedded audio input of the selected video input, the analog audio 1, analog audio 2 inputs and the S/PDIF audio can be selected.

It means that analog audio input 1, analog audio input 2, HDMI embedded and S/PDIF audio inputs can be used for HDMI video input.

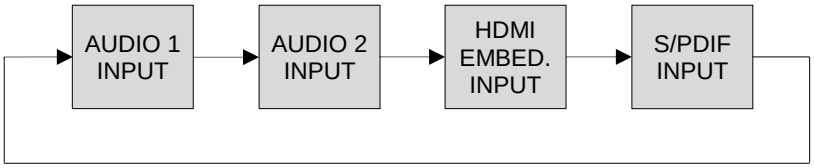


Figure 6-3. Audio input selection order for HDMI video input

The DVI-D embedded audio, analog audio input 1, analog audio input 2 and S/PDIF audio inputs can be used for DVI-D video input.

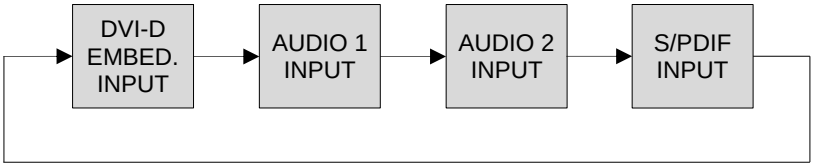


Figure 6-4. Audio input selection order for DVI-D video input

6.5. The Autoselect mode

The Autoselect function means UMX-OPT-TX150R can recognize the incoming valid video and audio signals on all the input ports and can choose one automatically, without user intervention. Autoselect searching starts after an event. It can be the stepping into Autoselect mode, plugging or unplugging a video or audio cable or appearing or disappearing a valid video or audio signal.

6.6. Video input in Autoselect mode

Info: *DVI-D, VGA and HDMI video inputs are available for video autoselect. DVI-A input can be choosen manually only.*

The video Autoselect mode can work in three ways:

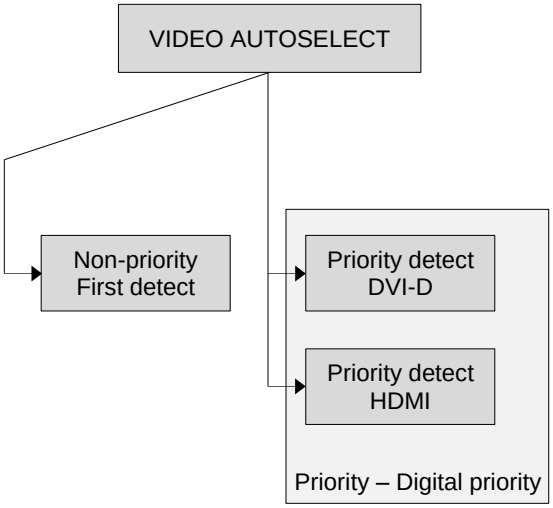


Figure 6-5. Autoselect for video inputs

6.6.1. Non-priority (first detect)

The device checks the DVI-D input first. If there is a valid video signal on the DVI-D input it will be selected. If there is no video signal on the DVI-D input the device checks the VGA input. If there is a valid video signal on the VGA input it will be selected. If there is no video signal on the VGA input the device checks the HDMI input. If there is a valid video signal on the HDMI input it will be selected. If there is no video signal on the HDMI input the searching process starts again. The selected video input port remains active while there is a valid video signal on it. If the selected input was unplugged or the valid video signal was disappeared the searching process starts again from the DVI-D input. If one of the input ports (e.g. VGA) was selected - and there is a valid video signal on it - and a valid video signal was appeared on the other input port (e.g. HDMI) – by connecting or powering on a video source - the searching process does NOT start again. The previous selected video input port (VGA) remains the active one.

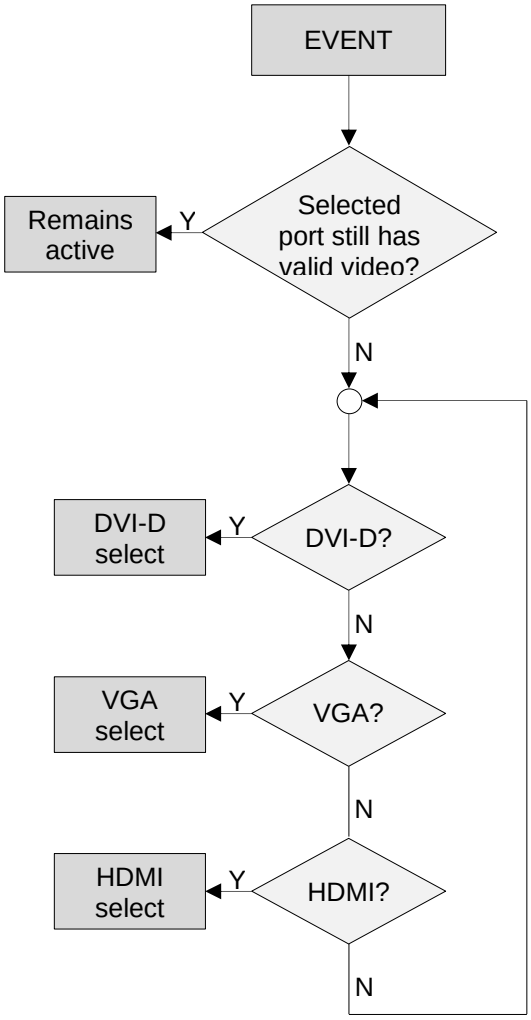


Figure 6-6. Non-priority video selection flowchart

6.6.2. HDMI Digital priority

The device always checks the HDMI input first. If there is a valid video signal on the HDMI input it will be selected. If there is no video signal on the HDMI input the device checks the DVI-D input. If there is a valid video signal on the DVI-D input it will be selected. If there is no video signal on the DVI-D input the device checks the VGA input. If there is a valid video signal on the VGA input it will be selected. If there is no video signal on the VGA input neither the searching process starts again from the HDMI input. If the selected input was unplugged or the valid video signal was disappeared the searching process starts again from the HDMI input. If one of the input ports (e.g. VGA) was selected - and there is a valid video signal on it - and a valid video signal was appeared on the HDMI input port – by connecting or powering on a video source - the searching process STARTS AGAIN with checking the HDMI input. The previous selected video input port (VGA) becomes inactive and the privileged one (HDMI) becomes active. In briefly in case of incoming valid HDMI video signal on the HDMI input, it will always be selected even if there was an earlier selected video signal.

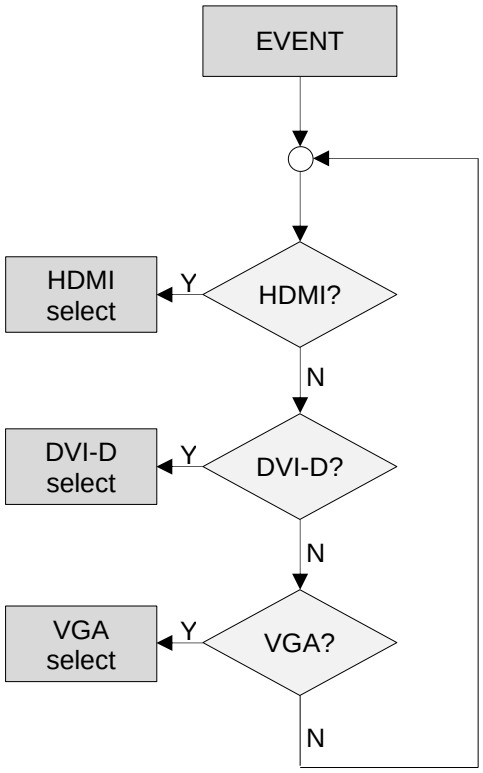


Figure 6-7. HDMI Digital priority video selection flowchart

6.6.3. DVI-D Digital priority

The device always checks the DVI-D input first. If there is a valid video signal on the DVI-D input it will be selected. If there is no video signal on the DVI-D input the device checks the HDMI input. If there is a valid video signal on the HDMI input it will be selected. If there is no video signal on the HDMI input the device checks the VGA input. If there is a valid video signal on the VGA input it will be selected. If there is no video signal on the VGA input neither the searching process starts again from the DVI-D input. If the selected input was unplugged or the valid video signal was disappeared the searching process starts again from the DVI-D input. If one of the input ports (e.g. VGA) was selected - and there is a valid video signal on it - and a valid video signal was appeared on the DVI-D input port – by connecting or powering on a video source - the searching process STARTS AGAIN with checking the DVI-D input. The previous selected video input port (VGA) becomes inactive and the privileged one (DVI-D) becomes active. In briefly in case of incoming valid DVI-D video signal on the DVI-D input, it will always be selected even if there was an earlier selected video signal.

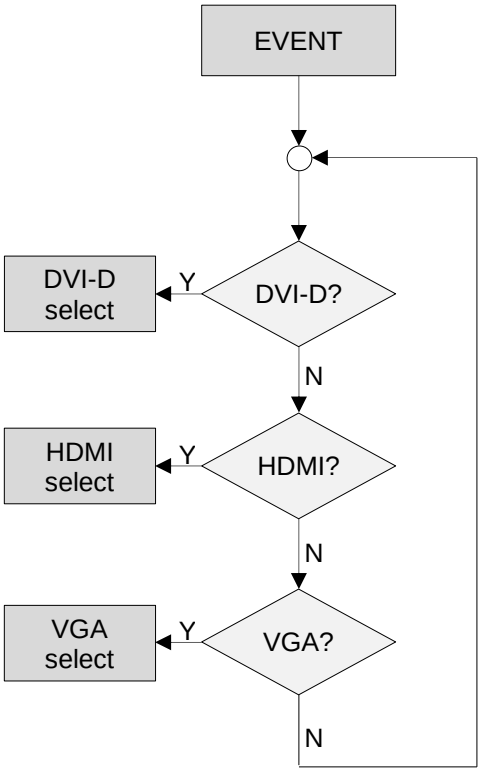


Figure 6-8. DVI-D Digital priority video selection flowchart

User can toggle between the three video Autoselect priority modes with the Lightware Matrix Controller software (see chapter *9.3.4* on page *62*), protocol command (see chapter *10.4.13* on page *77*) or the service menu (see chapter *7* on page *48*).

6.7. Audio input in Autoselect mode

Info: *DVI-D or HDMI embedded (either of them, depends on the result of the video autoselect), S/PDIF and Analog audio 2 inputs are available for audio autoselect. Analog audio 1 input can be choosen manually only.*

The audio Autoselect mode can work in ten ways:

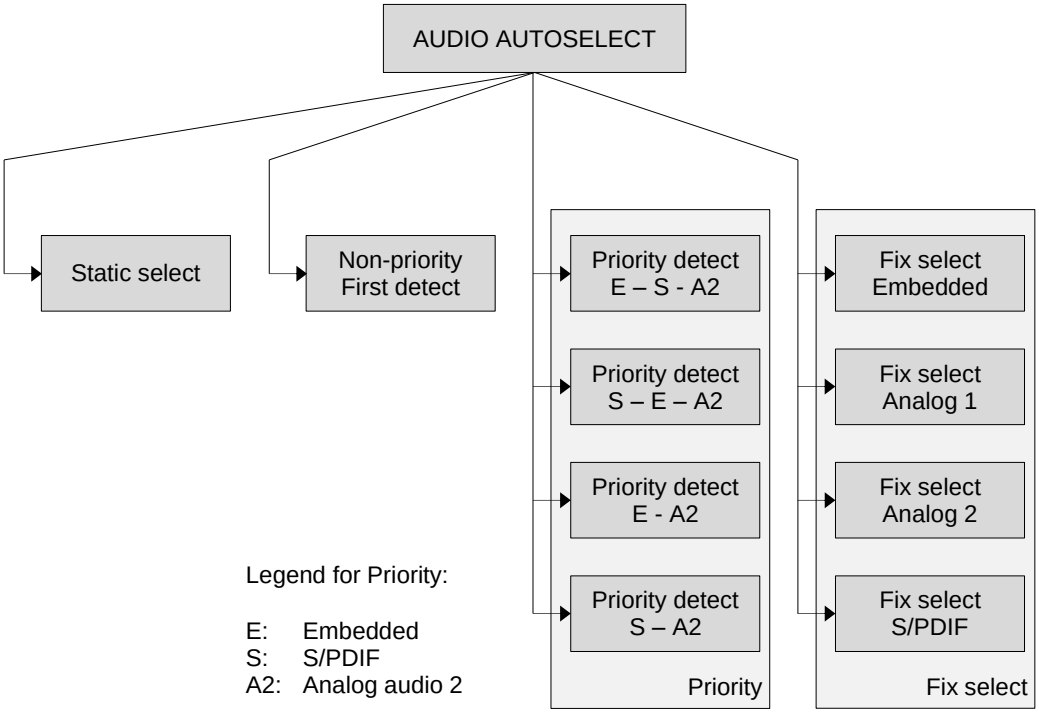


Figure 6-9. Autoselect for audio inputs

6.7.1. Static select

The device select one video input during the video Autoselect procedure. If the result was a digital video input (DVI-D or HDMI) its embedded audio input will be selected. (DVI-D embedded audio to the DVI-D video or HDMI embedded audio to the HDMI video input.) If the DVI-A video input was selected in Autoselect mode the Analog audio 1 input will be selected. If the VGA video input was selected in Autoselect mode the Analog audio 2 input will be selected. This video and audio input assigning will be occurred even if there is no valid audio signal on the input. The selected audio input will be active until a new result of video Autoselect or the device exits from the Autoselect mode.

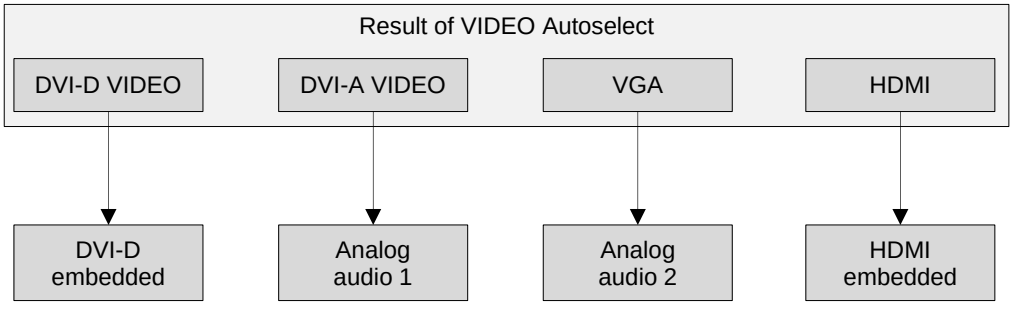


Figure 6-10. Static priority audio selection flowchart

6.7.2. Non-priority (first detect)

After the video Autoselect the device checks the embedded audio input. (DVI-D embedded audio input to the DVI-D video input or HDMI embedded audio input to the HDMI video input) If there is a valid embedded audio signal it will be selected. If there is no valid embedded audio signal the device checks the S/PDIF audio input. If there is a valid S/PDIF audio signal on the S/PDIF audio input it will be selected. If there is no valid audio signal on the S/PDIF input the device selects the analog audio 2 input, even if there is no audio signal on this input. If there is an event (any audio is plugged or unplugged) the device checks the selected audio input port. If there is valid audio signal on this input port it remains the active input port. If there is no audio on the selected port the searching process starts again. The selected audio input will be active until a new result of video Autoselect or the device exits from the Autoselect mode.

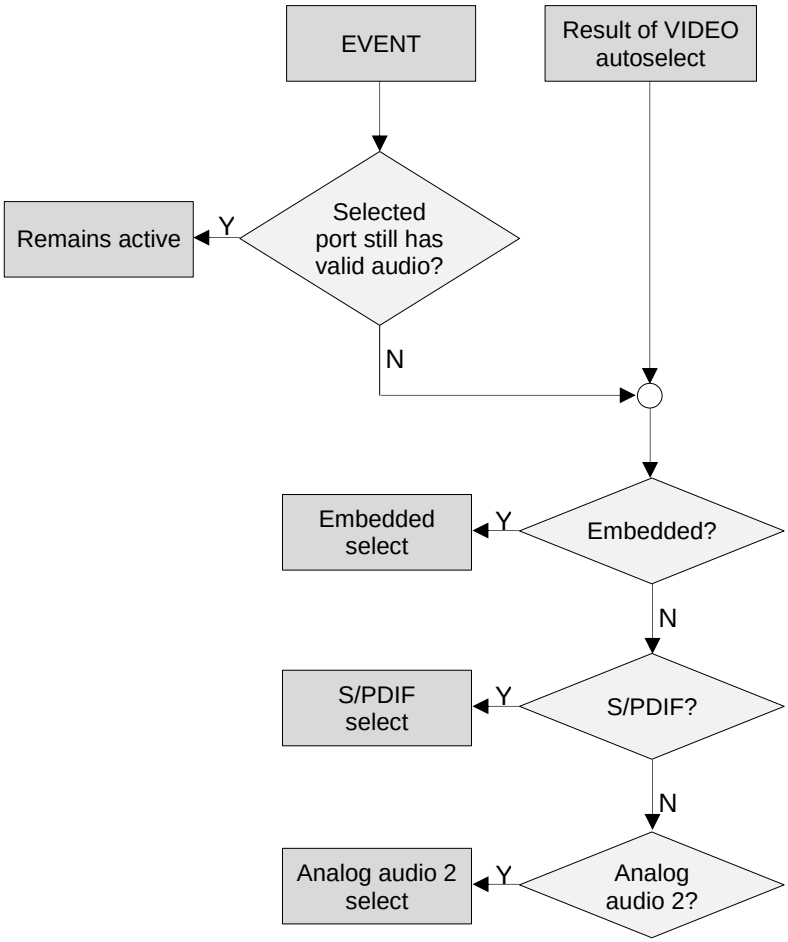


Figure 6-11. Non-priority audio selection flowchart

6.7.3. Priority detect – Embedded, S/PDIF, Analog audio 2

After the video Autoselect the device checks the embedded audio input. (DVI-D embedded audio input to the DVI-D video input or HDMI embedded audio input to the HDMI video input) If there is a valid embedded audio signal it will be selected. If there is no valid embedded audio signal the device checks the S/PDIF audio input. If there is a valid S/PDIF audio signal on the S/PDIF audio input it will be selected. If there is no valid audio signal on the S/PDIF input the device selects the analog audio 2 input, even if there is no audio signal on this input. Any audio event occurs a new searching from the embedded input port. The selected audio input will be active until a new result of video Autoselect, an audio event or the device exits from the Autoselect mode.

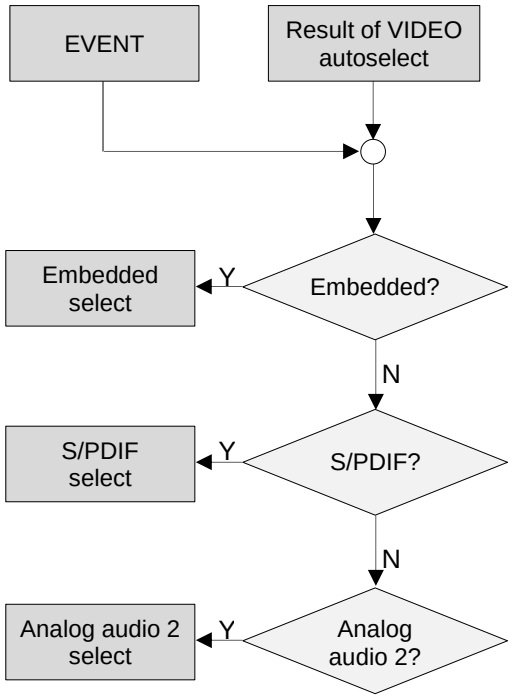


Figure 6-12. Priority (E-S-A2) audio selection flowchart

6.7.4. Priority detect – S/PDIF, Embedded, Analog audio 2

After the video Autoselect the device checks the S/PDIF audio input. If there is a valid S/PDIF audio signal on the S/PDIF audio input it will be selected. If there is no valid audio signal on the S/PDIF audio input port the device checks the embedded audio input (DVI-D embedded audio input to the DVI-D video input or HDMI embedded audio input to the HDMI video input). If there is a valid embedded audio signal it will be selected. If there is no valid embedded audio signal on the embedded input port the device selects the analog audio 2 input, even if there is no audio signal on this input. Any audio event occurs a new searching from the S/PDIF input port. The selected audio input will be active until a new result of video Autoselect, an audio event or the device exits from the Autoselect mode.

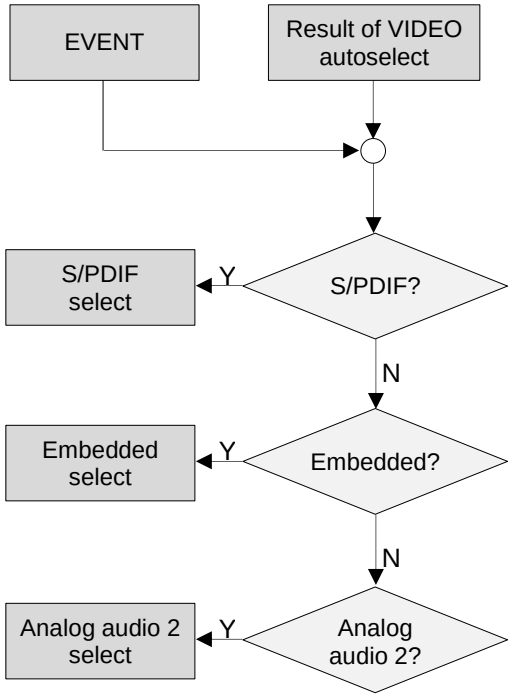


Figure 6-13. Priority (S-E-A2) audio selection flowchart

6.7.5. Priority detect –Embedded, Analog audio 2

After the video Autoselect the device checks the embedded audio input. (DVI-D embedded audio input to the DVI-D video input or HDMI embedded audio input to the HDMI video input) If there is a valid embedded audio signal it will be selected. If there is no valid embedded audio signal the device selects the analog audio 2 input, even if there is no audio signal on this input. Any audio event occurs a new searching from the embedded input port. The selected audio input will be active until a new result of video Autoselect, an audio event or the device exits from the Autoselect mode.

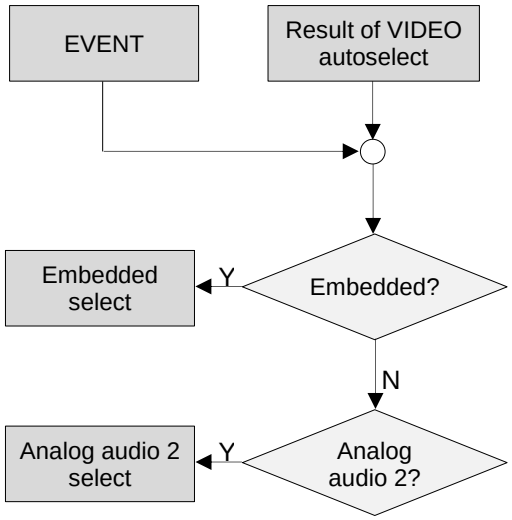


Figure 6-14. Priority (E -A2) audio selection flowchart

6.7.6. Priority detect – S/PDIF, Analog audio 2

After the video Autoselect the device checks the S/PDIF audio input. If there is a valid S/PDIF audio signal on the S/PDIF audio input it will be selected. If there is no valid audio signal on the S/PDIF audio input port the device checks the embedded audio input (DVI-D embedded audio input to the DVI-D video input or HDMI embedded audio input to the HDMI video input). If there is a valid embedded audio signal it will be selected. If there is no valid embedded audio signal on the embedded input port the device selects the analog audio 2 input, even if there is no audio signal on this input. Any audio event occurs a new searching from the S/PDIF input port. The selected audio input will be active until a new result of video Autoselect, an audio event or the device exits from the Autoselect mode.

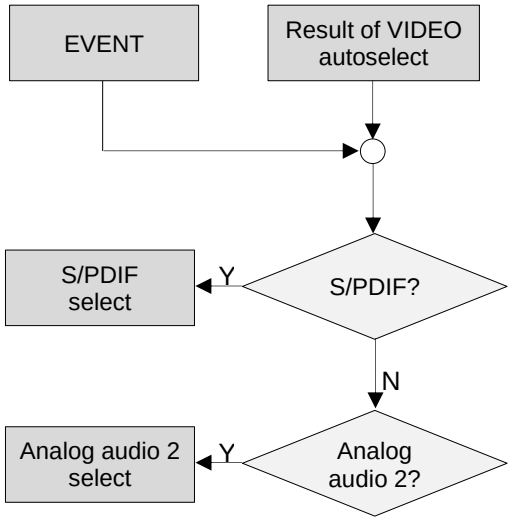


Figure 6-15. Priority (S -A2) audio selection flowchart

6.7.7. Fix select – Embedded

The device selects always the embedded audio input in any case independently the result of the video Autoselect or the audio input validity. The selected audio input is active until another Audiopriority setting or if the device exits from the Autoselect mode.

6.7.8. Fix select – Analog audio 1

The device selects always the Analog audio 1 input in any case independently the result of the video Autoselect or the audio input validity. The selected audio input is active until another Audiopriority setting or if the device exits from the Autoselect mode.

6.7.9. Fix select – Analog audio 2

The device selects always the Analog audio 2 input in any case independently the result of the video Autoselect or the audio input validity. The selected audio input is active until another Audiopriority setting or if the device exits from the Autoselect mode.

6.7.10. Fix select – S/PDIF

The device selects always the S/PDIF audio input in any case independently the result of the video Autoselect or the audio input validity. The selected audio input is active until another Audiopriority setting or if the device exits from the Autoselect mode.

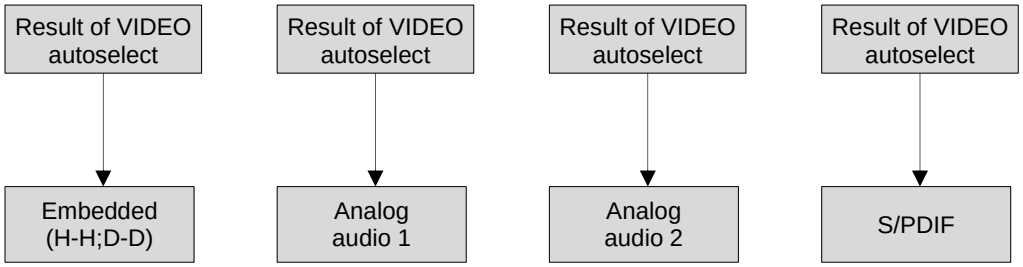


Figure 6-16. Fix select audio selection flowcharts

User can toggle between the ten audio Autoselect priority modes with the Lightware Matrix Controller software (see chapter *9.3.4* on page *62*), protocol command (see chapter *10.4.15* on page *77*) or the service menu (see chapter *7* on page *48*).

6.8. About EDID memory

EDID memory is non-volatile and consists of four blocks, each for different purpose. These blocks are:

- Factory preset EDIDs
- User saved EDIDs
- Dynamic EDID (EDID of last connected sink on the DDC output port)
- Emulated EDIDs (EDID currently emulated on a specific input port)

This manual refers to the EDIDs in two ways. Using, selecting EDIDs with

- Lightware Matrix Controller software
- Rotary switches

6.8.1. EDIDs are referred with Lightware Matrix Controller

In the first case EDID is mentioned with the Matrix Controller software or the protocol commands. EDIDs are numbered from 1 in each block, and they can be referred as the first letter of the block name, and the number of the desired EDID. This way F02 refers to the second factory preset EDID, and D01 refers to the display device's EDID on the output (on the DDC output).

The EDID memory structure in protocol reference:

Factory Preset EDIDs (F01 .. F20):

F01 .. F05 ..... DVI-D Factory Preset EDIDs

F06 .. F10 ..... DVI-A Factory Preset EDIDs

F11 .. F15 ..... VGA Factory Preset EDIDs

F16 .. F20 ..... HDMI Factory Preset EDIDs

User programmable memories (U01 .. U16):

U01 .. U04 ..... User programmable DVI-D memories

U05 .. U08 ..... User programmable DVI-A memories

U09 .. U12 ..... User programmable VGA memories

U13 .. U16 ..... User programmable HDMI memories

Last attached monitor's EDID: (D01):

D01 ..... Last attached monitor's EDID on the output

Emulated EDIDs (E01 .. E04):

E01 .....Emulated EDIDs on the DVI-D input

E02 .....Emulated EDIDs on the DVI-A input

E03 .....Emulated EDIDs on the VGA input

E04 ..... Emulated EDIDs on the HDMI input

6.8.2. EDIDs are referred with rotary switches

In the second case EDID is mentioned with the rear panel rotary switches. EDIDs are numbered from 0 on each rotary, and they can be referred with hash symbol, and the number of the desired EDID. This way #6 on the DVD-D rotary refers to the first user preset EDID (U01), and #0 refers to the display device's EDID (called Dynamic or Last attached monitor's EDID) on the output (on the DDC output).

Info: *The Emulated EDIDs on the video inputs can be chosen by rotary switches only!*

6.8.3. The assigning table

To help understand the EDID memory structure see the matching table below. It shows all the EDIDs, their short descriptions and their references.

Number on DVI-D EDID rotary	EDIDs for DVI-D Input	EDID reference in protocol
#0	Copy from SC MM OUT (Dynamic EDID)	D01
#1	Factory EDID Universal HDMI (default)	F01
#2	Factory EDID (DVI) 1024x768@60	F02
#3	Factory EDID (HDMI) 1280x720p@60	F03
#4	Factory EDID (HDMI) 1920x1080p@60	F04
#5	Factory EDID (DVI) 1920x1200@60	F05
#6	User EDID (def.: Univ. HDMI EDID)	U01
#7	User EDID (def.: Univ. HDMI EDID)	U02
#8	User EDID (def.: Univ. HDMI EDID)	U03
#9	User EDID (def.: Univ. HDMI EDID)	U04

Number on DVI-A EDID rotary	EDIDs for DVI-A Input	EDID reference in protocol
#0	Copy from SC MM OUT (Dynamic EDID)	D01
#1	Factory EDID Universal Analog (default)	F06
#2	Factory EDID (Analog) 1024x768@60	F07
#3	Factory EDID (Analog) 1280x720@60	F08
#4	Factory EDID (Analog) 1920x1080@60	F09
#5	Factory EDID (Analog) 1920x1200@60	F10
#6	User EDID (def.: Univ. Analog EDID)	U05
#7	User EDID (def.: Univ. Analog EDID)	U06
#8	User EDID (def.: Univ. Analog EDID)	U07
#9	User EDID (def.: Univ. Analog EDID)	U08

Number on VGA EDID rotary	EDIDs for VGA Input	EDID reference in protocol
#0	Copy from SC MM OUT (Dynamic EDID)	D01
#1	Factory EDID Universal Analog (default)	F11
#2	Factory EDID (Analog) 1024x768@60	F12
#3	Factory EDID (Analog) 1280x720@60	F13
#4	Factory EDID (Analog) 1920x1080@60	F14
#5	Factory EDID (Analog) 1920x1200@60	F15
#6	User EDID (def.: Univ. Analog EDID)	U09
#7	User EDID (def.: Univ. Analog EDID)	U10
#8	User EDID (def.: Univ. Analog EDID)	U11
#9	User EDID (def.: Univ. Analog EDID)	U12

Number on HDMI EDID rotary	EDIDs for HDMI Input	EDID reference in protocol
#0	Copy from SC MM OUT (Dynamic EDID)	D01
#1	Factory EDID Universal HDMI (default)	F16
#2	Factory EDID (DVI) 1024x768@60	F17
#3	Factory EDID (HDMI) 1280x720p@60	F18
#4	Factory EDID (HDMI) 1920x1080p@60	F19
#5	Factory EDID (DVI) 1920x1200@60	F20
#6	User EDID (def.: Univ. HDMI EDID)	U13
#7	User EDID (def.: Univ. HDMI EDID)	U14
#8	User EDID (def.: Univ. HDMI EDID)	U15
#9	User EDID (def.: Univ. HDMI EDID)	U16

All EDIDs (including factory presets; user programmable memories and EDID at SC MM output) can be switched and emulated at any of the inputs.

Info: *The factory EDIDs (Fxx) are factory preprogrammed and cannot be modified. These are the most commonly used resolutions.*

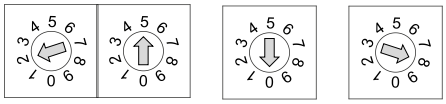
Info: *UMX-OPT-TX150R can handle both 128 Byte EDID and 256 Byte extended EDID structures.*

Info: *The attached monitor's EDID is the Lightware Universal EDID by factory default.*

Warning! *Emulated EDIDs can be switched with the rotary switches only.*

6.8.4. Example state of the rotary switches

The rotary switches have the following state:



DVI-D Rotary is in #2 state, it means Factory EDID (DVI) 1024x768@60 is the selected EDID on the DVI-D input port.

DVI-A Rotary is in #5 state, it means Factory EDID (Analog) 1920x1200@60 is the selected EDID on the DVI-A input port.

VGA Rotary is in #0 state, it means Dynamic EDID is the selected EDID on the VGA input port. (The EDID will be copied from SC MM OUT)

HDMI Rotary is in #8 state, it means the 3rd User EDID is the selected EDID on the HDMI input port.

The rotary switches select the EDIDs highlighted gray in the tables below:

	DVI-D EDID rotary			DVI-A EDID rotary	
#0	Copy from SC MM OUT (Dynamic EDID)	D01	#0	Copy from SC MM OUT (Dynamic EDID)	D01
#1	Factory EDID Universal HDMI (default)	F01	#1	Factory EDID Universal Analog (default)	F06
#2	Factory EDID (DVI) 1024x768@60	F02	#2	Factory EDID (Analog) 1024x768@60	F07
#3	Factory EDID (HDMI) 1280x720p@60	F03	#3	Factory EDID (Analog) 1280x720@60	F08
#4	Factory EDID (HDMI) 1920x1080p@60	F04	#4	Factory EDID (Analog) 1920x1080@60	F09
#5	Factory EDID (DVI) 1920x1200@60	F05	#5	Factory EDID (Analog) 1920x1200@60	F10
#6	User EDID (def.: Univ. HDMI EDID)	U01	#6	User EDID (def.: Univ. Analog EDID)	U05
#7	User EDID (def.: Univ. HDMI EDID)	U02	#7	User EDID (def.: Univ. Analog EDID)	U06
#8	User EDID (def.: Univ. HDMI EDID)	U03	#8	User EDID (def.: Univ. Analog EDID)	U07
#9	User EDID (def.: Univ. HDMI EDID)	U04	#9	User EDID (def.: Univ. Analog EDID)	U08

	VGA EDID rotary			HDMI EDID rotary	
#0	Copy from SC MM OUT (Dynamic EDID)	D01	#0	Copy from SC MM OUT (Dynamic EDID)	D01
#1	Factory EDID Universal Analog (default)	F11	#1	Factory EDID Universal HDMI (default)	F16
#2	Factory EDID (Analog) 1024x768@60	F12	#2	Factory EDID (DVI) 1024x768@60	F17
#3	Factory EDID (Analog) 1280x720@60	F13	#3	Factory EDID (HDMI) 1280x720p@60	F18
#4	Factory EDID (Analog) 1920x1080@60	F14	#4	Factory EDID (HDMI) 1920x1080p@60	F19
#5	Factory EDID (Analog) 1920x1200@60	F15	#5	Factory EDID (DVI) 1920x1200@60	F20
#6	User EDID (def.: Univ. Analog EDID)	U09	#6	User EDID (def.: Univ. HDMI EDID)	U13
#7	User EDID (def.: Univ. Analog EDID)	U10	#7	User EDID (def.: Univ. HDMI EDID)	U14
#8	User EDID (def.: Univ. Analog EDID)	U11	#8	User EDID (def.: Univ. HDMI EDID)	U15
#9	User EDID (def.: Univ. Analog EDID)	U12	#9	User EDID (def.: Univ. HDMI EDID)	U16

6.8.5. Switching the EDID with a rotary switch

Use a screwdriver to change the memory address on the rear side of the UMX-OPT-TX150R.

After either one of the rotary switches has been rotated, the unit waits approximately 2 seconds before the selected EDID becomes active.

Info *After every EDID change, UMX-OPT-TX150R toggles the HOT PLUG signal for approx. 1 second. Some graphic cards or DVD players do not sense the HOT PLUG signal, and even if EDID has been changed, the set resolution is not affected. In this case the source device must be restarted, or powered OFF and ON again.*

Important! *Switching EDID for any inputs is available only with rotary switches. (Switching with Lightware Matrix Controller Software or protocol command is not available.)*

6.8.6. Deleting the EDID

Deleting EDID is available only with Lightware Matrix Controller Software. Only user EDIDs can be deleted. Deleting means the factory EDID (Universal HDMI or Analog EDID) will be loaded into the desired user EDID memory.

6.9. EDID types

Most of the factory preset EDIDs include only one resolution. This is to force the connected source to give a signal with the needed resolution. However there are Universal EDIDs as well which allow many resolutions.

The factory EDIDs are divided into groups regarding their type. Some EDIDs are supporting DVI only, some support HDMI, and some are for analog VGA signals.

Analog EDIDs can be used for VGA (RGBH) input port.

DVI EDIDs does not support embedded audio.

HDMI EDIDs support embedded audio. These EDIDs – include Universal HDMI EDID - indicate that any audio format is accepted (PCM, Dolby, DTS, etc.).

Info: *Analog and HDMI user EDIDs are the Universal Analog and HDMI EDIDs in factory defaults.*

6.9.1. Factory preset EDID list

Lightware factory pre-loaded EDIDs are specially provided to force graphic cards to output only the exact pixel resolution and refresh rate.

HDMI and VGA universal EDIDs (#1 on both rotary switches) allow multiple resolutions including all common VESA defined resolutions. In addition, HDMI universal EDID also features audio support. The use of universal EDID is recommended for fast and easy system setup.

Mem.	Resolution	Type	Audio support		Deep color support		
			PCM	Other	24 bit	30 bit	36 bit
F01	**Universal_HDMI_DC**	HDMI	✓	✓	✓	x	✓
F02	1024 x 768 @ 60.0 Hz	DVI	x	x	x	x	x
F03	1280 x 720 @ 60.0 Hz	HDMI	✓	x	✓	x	x
F04	1920 x 1080 @ 60.0 Hz	HDMI	✓	x	✓	x	x
F05	1920 x 1200 @ 59.55 Hz	DVI	x	x	x	x	x
F06	**Universal_Analog**	Analog	x	x	x	x	x
F07	1024 x 768 @ 60.0 Hz	Analog	x	x	x	x	x
F08	1280 x 720 @ 60.0 Hz	Analog	x	x	x	x	x
F09	1920 x 1080 @ 60.0 Hz	Analog	x	x	x	x	x
F10	1920 x 1200 @ 59.55 Hz	Analog	x	x	x	x	x
F11	**Universal_Analog**	Analog	x	x	x	x	x
F12	1024 x 768 @ 60.0 Hz	Analog	x	x	x	x	x
F13	1280 x 720 @ 60.0 Hz	Analog	x	x	x	x	x
F14	1920 x 1080 @ 60.0 Hz	Analog	x	x	x	x	x
F15	1920 x 1200 @ 59.55 Hz	Analog	x	x	x	x	x
F16	**Universal_HDMI_DC**	HDMI	✓	✓	✓	x	✓
F17	1024 x 768 @ 60.0 Hz	DVI	x	x	x	x	x
F18	1280 x 720 @ 60.0 Hz	HDMI	✓	x	✓	x	x
F19	1920 x 1080 @ 60.0 Hz	HDMI	✓	x	✓	x	x
F20	1920 x 1200 @ 59.55 Hz	DVI	x	x	x	x	x

Table 6-1. Factory Preset EDID list

Info *The F01..F20 EDIDs are factory preprogrammed and cannot be modified. These are the most commonly used resolutions.*

6.10. Learning the EDID

The factory preset EDIDs cannot be changed by the user. Only addresses #6 .. #9 (on any rotary switches) are user programmable.

Important! *EDID learning is only available from the active input to a user memory location which was selected by a rotary switch. EDID learning is not allowed in AUTOSELECT mode.*

Info: *Before a digital EDID will be selected to an analog output port UMX-OPT-TX150R removes the digital descriptor from the EDID and selects it.*

After connecting the sink device to the unit's output (for example the receiver unit's HDMI OUT), use a screwdriver to select an empty memory address. EDIDs are stored in a multiple programmable non-volatile memory.

Push the LEARN button on the front side of the device and hold it down for approximately 3 seconds.

If the EDID storing was successful on the active port, the EDID LED blinks 3 times in 3 seconds slowly then they return to their original function.

If the storing was unsuccessful on the active port, the EDID LED blinks 3 times in 1 second quickly then they return to their original function.

Info: *The last attached monitor's EDIDs are stored automatically, until a new monitor is attached to the output (or receiver's output). In case of powering the unit off, the last attached monitor's EDID remains in non-volatile memory.*

Info: *As a matter of fact UMX-OPT-TX150R always learns the stored last attached monitor's EDID into the user programmable EDID memory. If the attached sink device on the output is unplugged pushing and holding the LEARN EDID button causes a successful EDID learning without plugging in the monitor again (even after a power reset).*

6.11. Switching the EDID

Use a screwdriver to change the memory address on the rear side of the UMX-OPT-TX150R.

After any of the rotary switches has been rotated, the unit waits approximately 2 seconds before the selected EDID becomes active.

The address #0 (on any rotary switches) has a special function. If a receiver is connected to the output, then its EDID is copied to the input connector. If no receiver is connected to the output then the EDID transmitted to the input connector is the EDID of the last connected monitor.

Info *After every EDID change, UMX-OPT-TX150R toggles the HOT PLUG signal for approx. 1 second. Some graphic cards or DVD players do not sense the HOT PLUG signal, and even if EDID has been changed, the set resolution is not affected. In this case the source device must be restarted, or powered OFF and ON again.*

Important! *Switching EDID is available only with rotary switches. (Switching with Lightware Matrix Controller Software or protocol command is not available.)*

6.12. Deleting the EDID

Only user and last attached EDIDs can be deleted. Deleting means the factory EDID (Universal HDMI or Analog EDID) will be loaded into the desired user EDID memory.

6.13. HDCP management

The UMX-OPT-TX150R can work as a HDCP compliant device, or act as a non-HDCP compliant sink. The HDCP capability can be disabled or enabled on the digital video input ports (DVI-D, HDMI). This function helps to apply encryption only when it is mandatory.

Some video sources send encrypted signal when they are connected to a HDCP capable device even if the content is not protected. This way even the unprotected content cannot be displayed on non-HDCP displays if the signal travels through a HDCP compliant matrix or repeater

However HDCP encryption is not required all the time (e.g. computer desktop image) some video cards still encrypt if they detect that the sink is HDCP capable.

Avoiding unnecessary HDCP encryption

If HDCP is disabled on any digital video input port, the connected source will detect that the sink is not HDCP capable, and turn off authentication. The source will not be able to communicate with any of the devices (displays, repeaters, etc.) that are connected to the receiver's output, therefore it could not see if they are HDCP capable or not.

This forces the source to send unprotected signal only. If HDCP capability is disabled on an input port, the connected source cannot send protected content to any display. If HDCP function is enabled on an input port and the source sends encrypted signal, the non-HDCP compliant devices cannot display the video.

Info: *In HDCP disable mode, protected content (i.e. Blu-ray disc) will not be displayed, thus maintaining the rules set by the HDCP standard.*

To toggle the HDCP function on the desired input port, use Matrix Controller software (see section 9.3.3 on page 58), use protocol command (see section 10.8.1 on page 84), or turn the desired digital input's rotary switch to address #1, and press and hold the LEARN button for approximately 3 seconds.

+LEARN = HDCP enable / disable on DVI-D input


HDMI

+LEARN = HDCP enable / disable on HDMI input

The status change appears on the front panel's LED tower. When the status changed the EDID LED blinks three times quickly.

HDCP key counter

HDCP key counter is a tool that counts and validates the number of keys that can be accepted by a source device when connected to an HDCP repeater.

HDCP key counting is available with protocol command. For more information, see section 10.4.8 on page 75.

6.14. No sync color

The device generates a solid 640x480 resolution image when there is no incoming signal and this function is enabled. The status of the function and the color of this picture can be set in the Lightware Matrix Controller software (section 9.3.3 on page 58) or with protocol command (section 10.8.12 on page 90). The service menu (section 7 on page 48) allows enabling or disabling this function but only for all the input ports (the color set is not allowed in the service menu).

6.15. Hardware reset

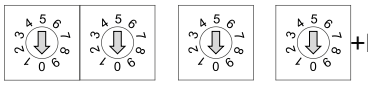
If any malfunction is noticed and the device does not respond it can be necessary to have a hardware reset. Push and release the reset button to restart the device.

This process can be induced by protocol command as well. For more information see section 10.4.9 on page 75.

Info: *Saved settings and EDIDs will be remained after the reboot.*

6.16. Reload factory defaults

Factory default settings can be reloaded with the procedure below:


DVI-D DVI-A VGA HDMI

+LEARN = Restore factory defaults

Turn all of the rotary switches to address #0, and press and hold the LEARN button for approximately 10 seconds.

After restoring default values press the reset button to reboot the device.

This operation affects the crosspoint table and configuration, I/O settings and stored User and Dynamic EDIDs and the RS-232 mode.

This process can be induced by protocol command as well. For more information see section 10.4.4 on page 73.

Warning! *User and Dynamic EDIDs will be cleared (refilled with Lightware Universal EDID) after reloading the factory defaults.*

Warning! *Reloading factory defaults by rotary switches plus learn button AFFECTS the serial operation mode and the RS-232 baud rate options as well. The default operation mode is the PASS mode and the default baud rate is 57600 baud in the UMX-OPT-TX150R. If the previous serial settings differ from the default ones, please set up the necessary values after reboot with protocol commands. (Set the RS-232 operation mode command in section 10.4.5 on page 74 and the Change RS-232 baud rate command in section 10.4.2 on page 73.)*

7. Service menu

7.1. The concept

The service menu allows changing some main services (without using any controller software) which are not available directly with front or rear panel operation.

Info: *The normal operation is suspended if the device enter the service menu. Video, audio and RS-232 transmisson is stopped during the service menu. Signal transmisson will be restored after a reboot.*

7.1.1. The structure of the service menu

The service menu contains functions (what device has e.g. Video priority mode, Output mode) as a menu items and every function have some (at least two) values can be set. There is no submenu.

Info: *The available functions and its settings depend on the device type. For the complete list of functions and settings please read section 7.2.1 on page 51.*

7.1.2. Service menu display

The service menu uses the device's LEDs to inform the user.

1. Some of the devices' LEDs (three or four LEDs in generally) show the number of the currently selected function (menu item) IN BINARY FORM. These LEDs are called MENU FEEDBACK LEDs.

In case of the first item the LSB (Least Significant Bit) LED lights only the other ones are off. If the second digit and the LSB light at the same time it means the third menu item. The next table contains a detailed example of a binary display.

Functions as a menu items			
in binary form by LEDs			in decimal form
LED 3	LED 2	LED 1	
○	○	●	1st function
○	●	○	2nd function
○	●	●	3rd function
●	○	○	4th function
●	○	●	5th function
●	●	○	6th function
●	●	●	7th function

Table 7-1. Numbers of the functions in binary form

2. Another dedicated LED shows the number of the currently selected value of the selected menu item by its blinking number. It is called VALUE FEEDBACK LED. If the selected menu item contains six values can be set the LED can be blinks from one to six according the number of the selected value. If the selected value is the 5th one the LED blinks 5 times. After a short break the LED starts blinking 5 times again.

Info: *The allocation of the LEDs for the service menu depends on the device type. For the complete list of LED allocation please read section 7.2.2 on page 51.*

7.1.3. Enter the service menu

Executing a device specific sequence results the entering to the service menu.

Info: *The entering the service menu depends on the device type. For the entering procedure of the device please read section 7.2.3 on page 51.*

7.1.4. Navigation in the service menu

After the entering the 1st menu item and the last saved value will be selected.

Info: *The functions and the settings in the service menu can be modified by Lightware Matrix Controller software or protocol commands, as well. The last saved values mean the last saving by any way, instead of the last saving by the service menu.*

After every pressing of the FUNCTION SELECT BUTTON the next function will be selected. (The value feedback LED shows the corresponding last saved value.) The first menu item will be selected after the last one.

After every pressing of the VALUE SELECT BUTTON the next value will be selected. The first value will be selected after the last one.

7.1.5. Saving in the service menu

In the service menu the device saves every value changing after some seconds (the saving time) automatically. If the device exits from service menu (because of a hardware reset) before the SAVING TIME after a value changing the last modification will be lost.

7.1.6. Exit from service menu

During the service menu the device is suspends its normal operation. The signal transmission and the communication (USB, RS-232 control and RS-232 pass-through) are out of work in this case. The only way to restore the normal operation is a hardware reset. It can be performed by pushing and releasing the RESET button on the rear side of the device or just plug out then plug in the power supply. The saved settings are stored in an external storage and the device keeps that after reboot.

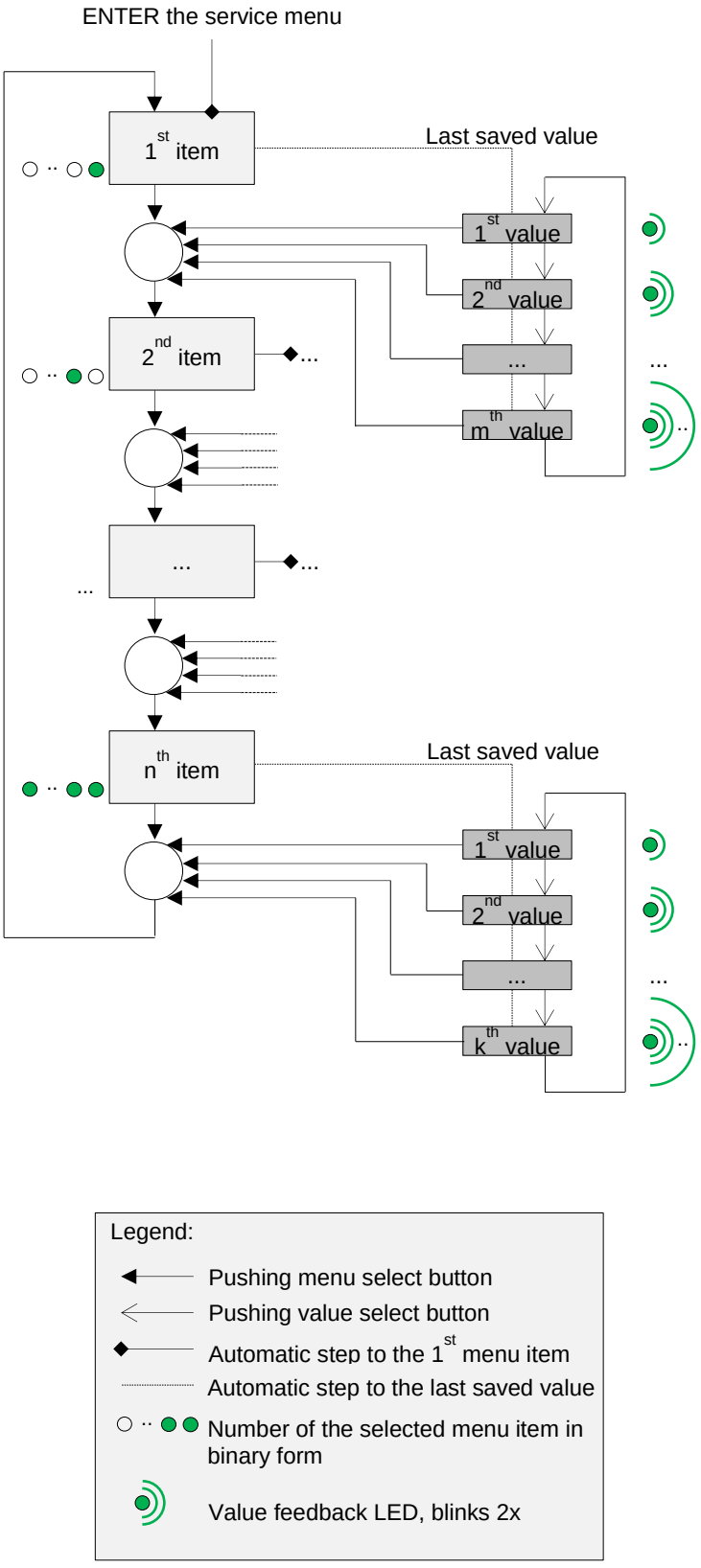


Figure 7-1. The service menu flowchart

7.2. The service menu in case of UMX-OPT-TX150R

7.2.1. The device specific structure of the service menu

	Menu item			Number of blinks on DVI-D audio LED					
	Select with VIDEO button			Select with AUDIO button					
Function	**DVI-A VIDEO**	**VGA VIDEO**	**HDMI VIDEO**	**1**	**2**	**3**	**4**	**5**	**6**
Output mode	○	○	●	Auto	DVI	HDMI 24	n/a	n/a	n/a
HDCP input mode for all inputs	○	●	○	Disable	Enable	n/a	n/a	n/a	n/a
HDCP output mode	○	●	●	Auto	Always	n/a	n/a	n/a	n/a
NoSyncScreen enable for all inputs	●	○	○	Disable	Enable	n/a	n/a	n/a	n/a
Video priority	●	○	●	First detect	DVI-D priority	n/a	n/a	HDMI priority	n/a
Audio priority	●	●	○	Static select	First detect	Priority E - S - A2	Priority S - E - A2	Priority E - A2	Priority S - A2
Audio fix	●	●	●	Embedded	Analog 1	Analog 2	S/PDIF	n/a	n/a

Warning! *The values (enable / disable) of the HDCP input mode and the NoSyncScreen functions (in the highlighted rows) can be set for every input port separately during the normal operation. The service mode set the value FOR ALL THE INPUT PORTS. The value feedback LED shows enable value if the NoSnycScreen or the HDCP is enabled on ANY input port.*

Info: *The audio priority modes use the following abbreviations: E - Embedded, S – S/PDIF, A1 – Analog 1, A2 – Aalog 2 audio input port. For the detaiteld explanation of the Autoselect mode see sections 6.6, 6.7 on pages 31, 35.*

7.2.2. The device specific service menu display

The menu feedback LEDs are the DVI-A, VGA and HDMI VIDEO LEDs and the DVI-D AUDIO LED is the value feedback LED in case of the UMX-OPT-TX150R.

7.2.3. Enter the service menu of UMX-OPT-TX150R

Step 1. Supply the unit with +5V DC

Step 2. Press and hold the RESET button.

Step 3. While pressing and holding the RESET button press and hold the VIDEO SELECT button.

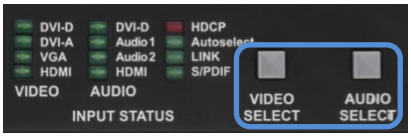
Step 4. Release the RESET button.

Step 5. Release the VIDEO SELECT button.

Info: *Don't need to unplug video or fiber cables to enter the service menu.*

7.2.4. Navigation in the service menu of UMX-OPT-TX150R

The VIDEO SELECT button is the function select button and the AUDIO SELECT button is the value select button in case of the UMX-OPT-TX150R.



7.2.5. Saving in the service menu in case of the UMX-OPT-TX150R

The SAVING TIME is three seconds in case of the UMX-OPT-TX150R.

In the service menu the device saves every value changing after three seconds automatically. If the device exits from service menu (because of a hardware reset) before 3 seconds after a value changing the last modification will be lost.

7.2.6. Exit from service menu in case of the UMX-OPT-TX150R

During the service menu the device is suspends its normal operation. The signal transmission and the communication (USB, RS-232 control and RS-232 pass-through) are out of work in this case. The only way to restore the normal operation is a hardware reset. It can be performed by pushing and releasing the RESET button on the rear side of the device or just plugging out then plugging in the power supply. The saved settings are stored in an external storage and the device keeps that after reboot.

8. Remote operation

UMX-OPT-TX150R can be controlled through various interfaces remotely. This makes it possible to use functions that are not accessible via the front panel. Also, this helps system integrators and operators to control multiple devices in a big system through a single user interface.

8.1. Control interfaces

Users can connect to the matrix through

- USB
- Serial port (RS-232)

After establishing connection, there is no difference between connection types (except some rare cases, which are uniquely noted).

The available remote connections and the relating chapters are listed below.

User interface	Connection type		further information
	USB port	RS-232 serial port	
Lightware matrix controller software	✓	✓	chapter 9 on page 54
third party control system	no	✓	chapter 10 on page 69

Table 8-1. Available remote connections

8.2. Multiple simultaneous connections

The transmitter allows simultaneous remote control over multiple interfaces. USB and Serial connections can be used at the same time.

8.3. Serial port settings

UMX-OPT-TX150R uses RS-232 communication port. The device uses standard RS-232 interface with the following default settings:

57600 Baud, 8 data bit, 1 stop bit, no parity

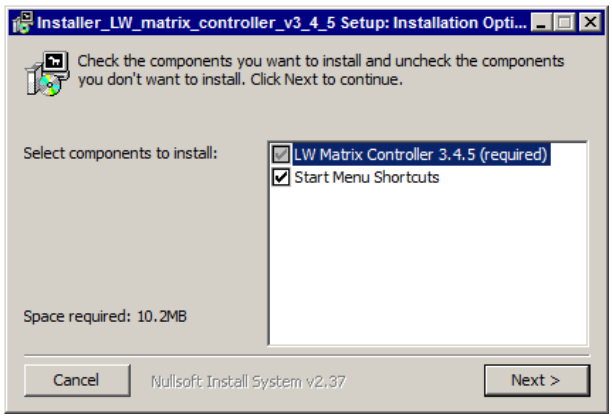
The serial port baud rate can be changed with the BAUD RATE rotary (addresses #1 .. #4) on the rear panel (section 5.4.4 on page 26) or remotely by protocol command - in case of #0 BAUD RATE rotary state (section 10.4.2 on page 73).

9. Software control – Using the Lightware Matrix Controller

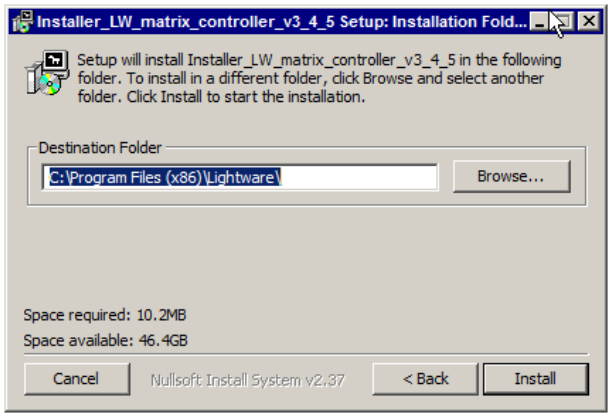
The device can be controlled using the Lightware Matrix Controller from a Windows PC or laptop through USB and RS-232 port.

9.1. Installing the Matrix Controller software

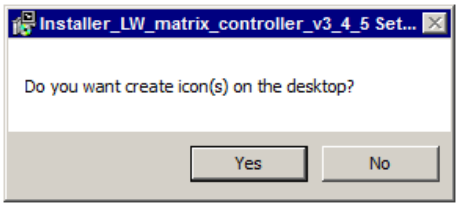
Step 1. Run Installer_LW_matrix_controller_v3_4_5.exe



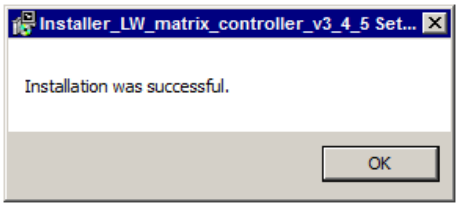
Step 2. Select destination folder and click Install (Using the default path is highly recommended)



Step 3. If you want to create desktop icon click Yes in the next pop-up window:



Step 4. After finishing the installation the following message appears:



Step 5. To run Lightware matrix control software find the shortcut icon in Start menu → Programs → Lightware → LW_matrix_controller_v3_4_5 or on the desktop, and double click:

Uninstalling

To uninstall the control software double click on: Start menu → Programs → Lightware → LW_matrix_controller_v3_4_5 → Uninstall

9.2. Establishing the connection

Info: *Lightware Matrix Controller can works with two baud rates: 9600 Baud or 57600 Baud. The software is able to recognize and set the appropriate baud rate from the two values mentioned above, but these values cannot set or changed by the user. If the computer has different serial communication settings (e.g. 19200 Baud) the Matrix Controller software cannot connect to the device.*

Step 1. Connect the device and the computer either via

- Serial port, with an RS-232 Male to Female cable (straight through)
- USB port, with a Mini USB-B cable

Info: *Upon connecting the matrix to the computer with USB, the operating system recognizes the device as a standard USB Input device (HID) and installs the required driver.*

Step 2. Start the application

To run the CONTROL SOFTWARE double click on the icon of the software on the desktop or select proper shortcut from Start Menu → Programs → Lightware folder.

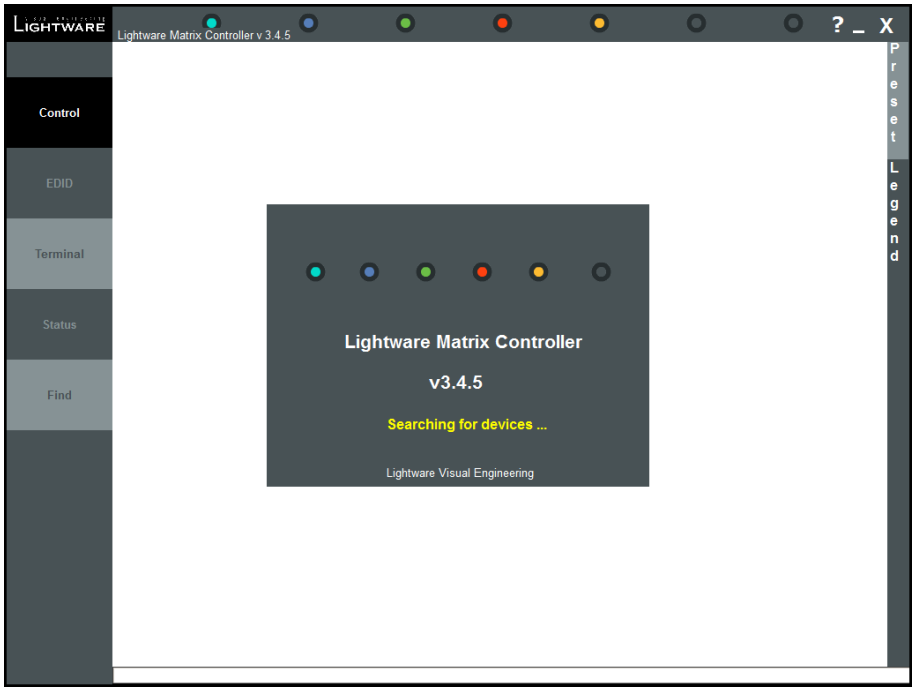


Figure 9-1. Matrix Controller software startup

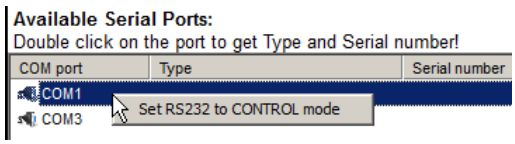
Step 3. The Find dialog appears automatically

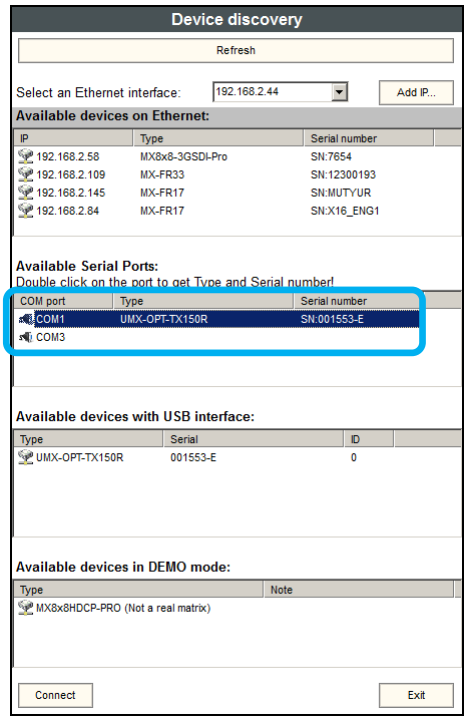
If the connection has been made via **serial port**, the device type and serial number can be inquired by double clicking the appropriate port, or it can be highlighted with a single click.

If the connection has been made via **USB port**, the device type and the serial number are displayed automatically. Click the desired device, to highlight it.

Info: *Lightware Matrix Controller software can only connect to the extender if it is in control mode. If the UMX-OPT-TX150R is in pass-through mode, the software cannot communicate with it and cannot list it as an available device.*

If you want to connect to the extender which is in pass-through mode click on the desired com port with the right mouse button, then choose the "Set RS-232 to CONTROL mode" option. The software sets the extender to CONTROL mode. Now the device can be listed with double left click on the discover window.





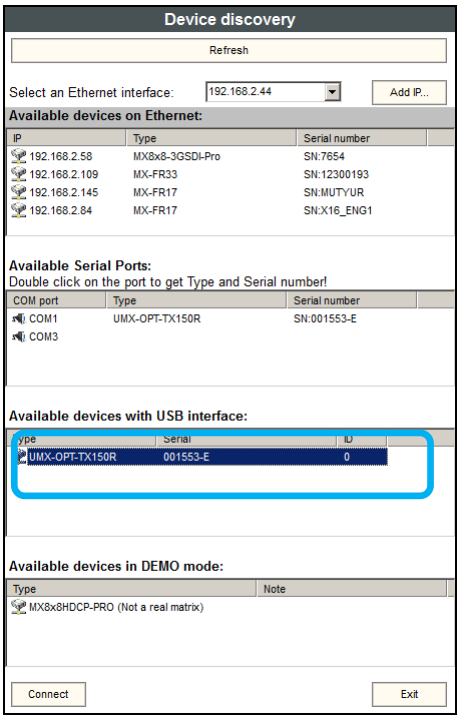


Figure 9-2. Serial connection

Figure 9-3. USB connection

Step 4. Click on the Connect button to connect to the device

Info: *If the device is not listed, try searching again, or reconnect the device and restart the application.*

When the Lightware Matrix Controller finds the hardware, it determines the product type, and the control menu appears. The current state of the crosspoint switch is displayed.

Info: *The controller software can communicate only with Lightware protocol.*

Info: *For RS-232 connection the transmitter has to be set to 9600 or 57600 baud rate. The controller software determines the baud rate automatically.*

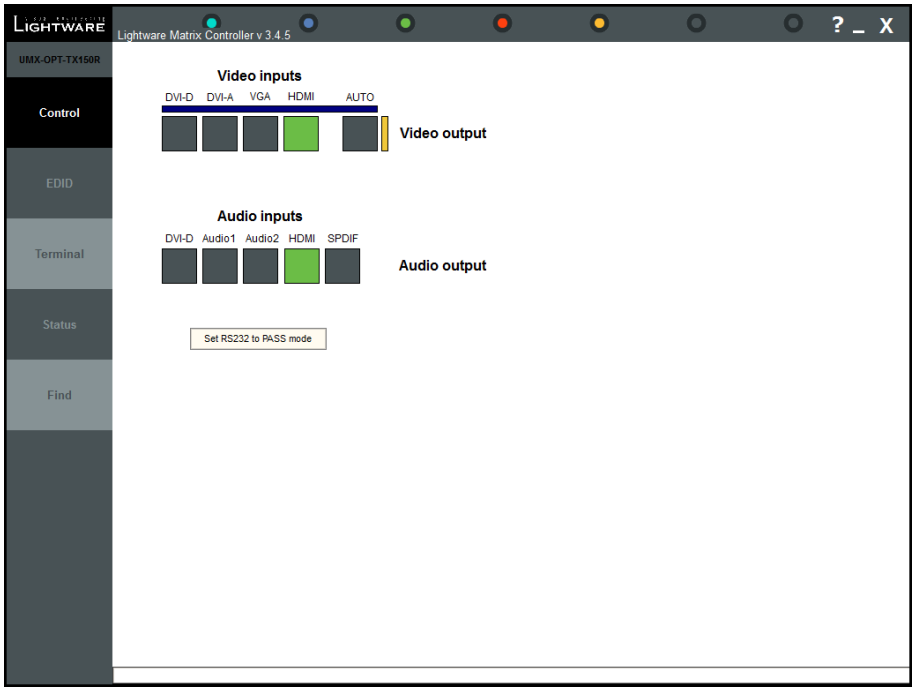
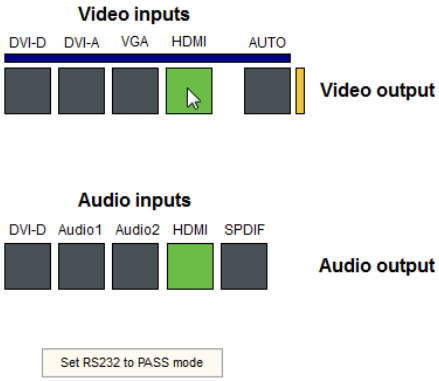


Figure 9-4. Matrix Controller crosspoint array

9.3. Control menu

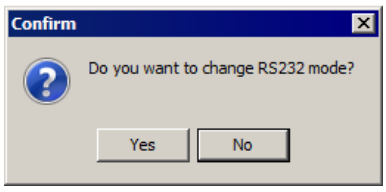
This menu contains the crosspoint area. After connecting to a new device, this menu appears by default. This menu displays the current state of the device. Each green square represents an active connection between the inputs and the output. There can be only one green square in any row.



9.3.1. Switch

For making a connection click on the desired square. Video and audio signals can be switched independently

9.3.2. Toggle between the working modes



For changing the RS-232 working mode click on the button below:

Set RS232 to PASS mode

OR

Set RS232 to CONTROL mode

Click "Yes" in the confirmation window.

Warning! *If the device was set to pass-through mode it cannot communicate with the Lightware Matrix Controller software. Before any new command for the extender the control mode must be selected again.*

9.3.3. Input parameter settings

By clicking on the video inputs a dialog window appears showing the parameters for the active input.

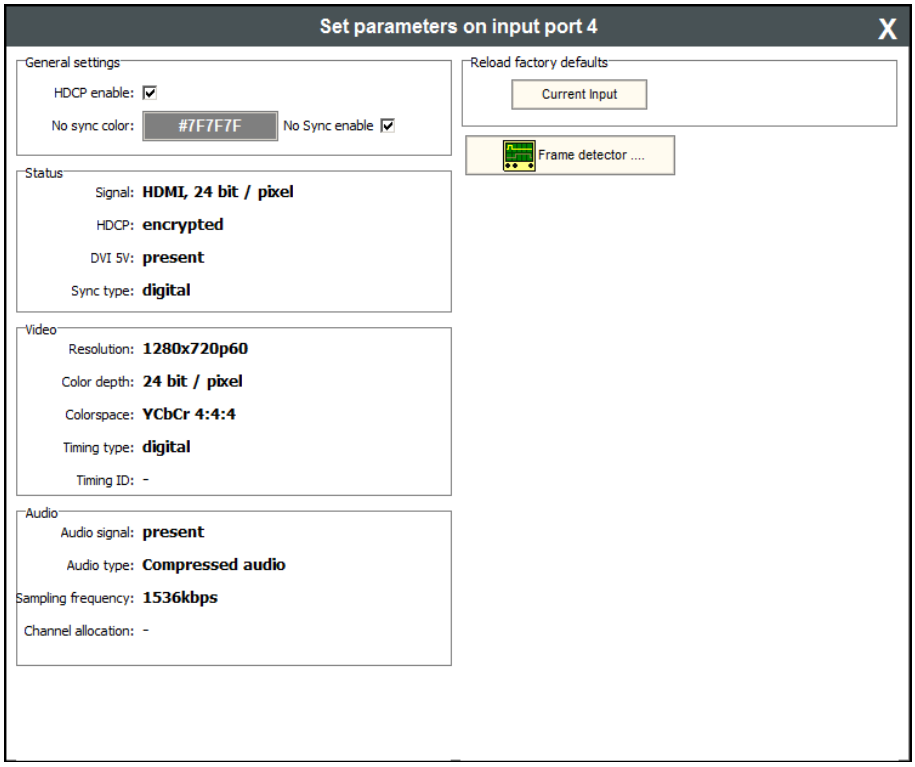


Figure 9-5. Input parameters for digital video signal

General settings

HDCP enable

The HDCP capability can be enabled or disabled on the input port with using the HDCP enable checkbox. This can prevent unnecessary HDCP encryption with certain source devices. Note that only unprotected content can be played on the source if this setting is disabled. For more information about HDCP handling see section *2.7* on page*13*.

No sync color

The port generates a solid 640x480 resolution image when there is no incoming signal and the No Sync enable check box is marked. The color of this picture can be set here. Double click on the colored field, a new window will appear. Choose the desired color then click the 'OK' button to apply changes. Click the Cancel button to discard changes and close the window.

No sync enable

If the No Sync enable check box is marked the port generates a solid 640x480 resolution image when there is no incoming signal. If the check box is unmarked and there is no incoming signal the device does not give the video signal and the hotplug on the output.

Info: *Audio transmission is available with video transmission only. If the No sync picture is disabled the audio transmission is available with valid incoming video signal only.*

Input port status

Connection status of the selected input port is shown here. (Type of the video signal, HDCP encryption, the source 5V, sync type)

Info: *These fields are filled automatically by the device after the examination of the signal.*

Video

Resolution, color depth and colorspace of the incoming signal are shown here.

The 'Timing type' and 'Timing ID' fields show which parameters are used to digitize the incoming analog signal. The input port measures the incoming analog signal and determines the timings. If the parameters need adjustment, it can be done on the right side at 'analog options'. In this case the 'Timing ID' field changes to 'user modified' unless the parameters are not saved.

Info: *These fields are filled automatically by the device after the examination of the signal.*

Audio

Information about the embedded audio signal is shown here. (Audio signal, audio type, sampling frequency, channel allocation)

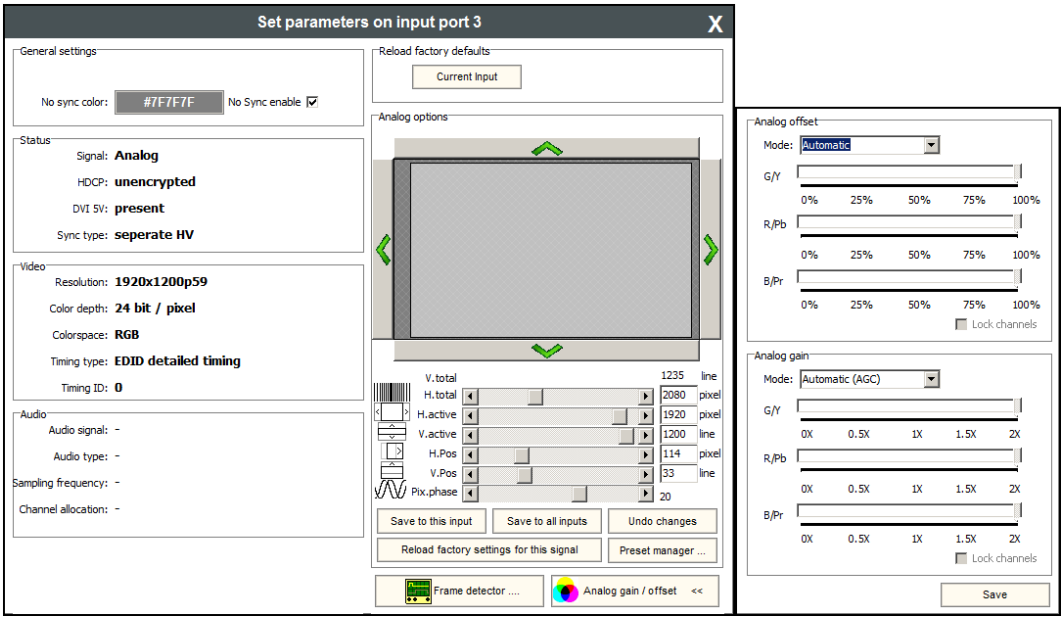
Info: *These fields are filled automatically by the device after the examination of the signal.*

Reload factory defaults

Current input: Reloads the default values to the currently selected input.

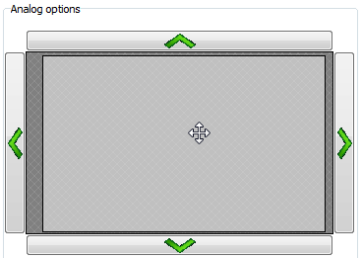
Analog video options

Analog video signals are digitized on the input. The timing parameters can be adjusted here if needed. Timing presets can be saved for each resolution separately.



9-6. Input parameters for analog signal

Screen position



Screen position is an easy way to fit the visible area of the analog video signal and the sink device. Actually the horizontal and vertical positions (H.Pos and V.Pos) can be set with two different methods:

1. Click on the arrows to increase or decrease the H.Pos and V.Pos values,

   OR

2. Move the mouse over the visible (grey) area. Click and hold with the left mouse button. Drag the visible area to the desired position.

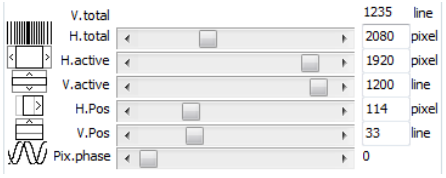
Analog video timings

V.total: Total line number of the whole image. (The visible and the blanking area)

H.total: Total pixel number of the whole image. (The visible and the blanking area)

H.active: Pixel number of the visible image.

V.active: Line number of the visible image.

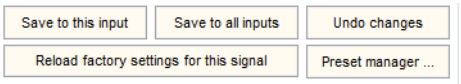


H.Pos and V.Pos: Horizontal and vertical position values specify the location of the visible area on the sink device. Black border on any side of the picture can means wrong settings for the position of the visible area.

Pix.phase: In case of unclear picture changing pixel phase can solve the problem. Changing the source device or the cable can cause pixel phase shifting.

Presets

User's settings for analog video timings can be set into the UMX-OPT-TX150R as presets. One preset contains the following values which can be set by the user: H.active, V.active, H.pos, V.pos and Pix.phase.



Presets can be assigned for each different resolution to the actual or to all inputs.

Save to this input: Preset assigned for the current resolution will be set to the actual input.

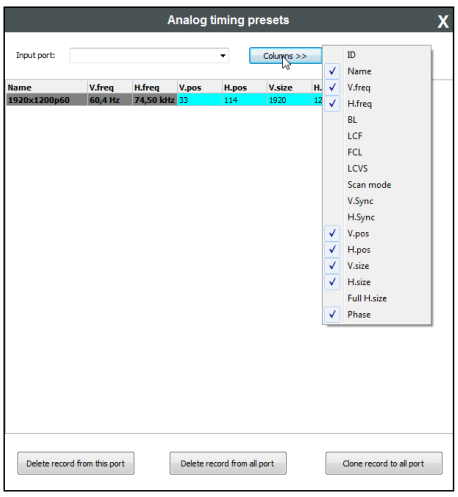
Save to all inputs: Preset assigned for the current resolution will be set to all inputs.

Undo changes: Backup the last saved preset values. If there were no saved values it sets up the original settings.

Reload factory settings for this signal: Clear the saved preset for this resolution from all the inputs, and sets up the original settings.

Preset manager

User can handle the saved values with the built-in preset manager. Click on the "Preset manager..." button and a new window will open. Presets are showed for the actual input port.



Delete record from this port: Delete the selected preset from only the current port.

Delete record from all ports: Don't need to open every preset manager for each input port to delete an unwanted preset. Just click the "Delete record from all ports" button. Never mind if the selected preset has different number in the other input properties list, because the device search by the current resolution.

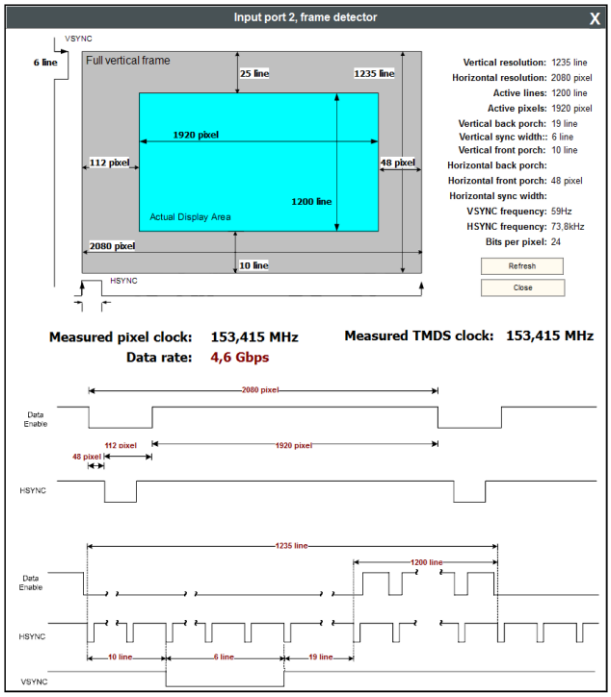
Clone record to all port: Don't need to reload the saved values and save to all port. It can be done with only one step. Just select the desired preset and click the "Clone record to all port" button.

Columns: User can select which fields will be shown for the saved presets. The default fields are: Name, V.freq, H.freq, V.pos, H.pos, V.size, H.size and Phase.

Info: *Analog timing presets can be saved only for the analog input port so „Delete record from all ports" and „Clone record to al port" buttons are kept for compatibility reasons.*

Frame detector

Click the frame detector button to view the measured detailed timings on the incoming signal.



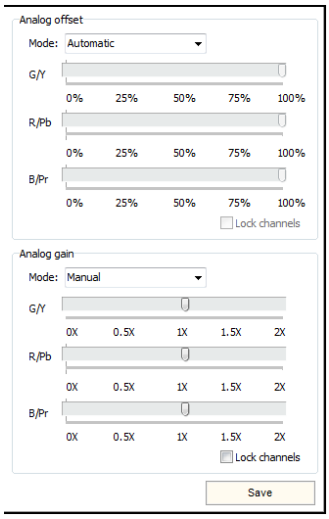
The dark grey zone is the blanking area (non-visible) and the cyan colored zone is the picture (visible area).

Info: *Resolution is given by the source devices always means the picture (visible area) resolution and the refresh rate means the VSYNC frequency.*

If the Refresh button is clicked on then the UMX-OPT-TX150R samples and calculates the analog signal values again.

Click on the Close button to close the Frame detector window and step back to the current input port settings window.

Info: *The frame detector only gives information about video signal from the selected input.*



Analog gain / offset

Analog gain / offset window allows users to correct the gain and the offset values if the automatic mode doesn't give a good result. Gain and offset settings method are the same:

Step 1. Select the manual mode if the settings need to be changed.

Step 2. Tick the Lock channels if the three components might change with the same extent.

Step 3. Use the mouse to drag the slider and set to the desired position.

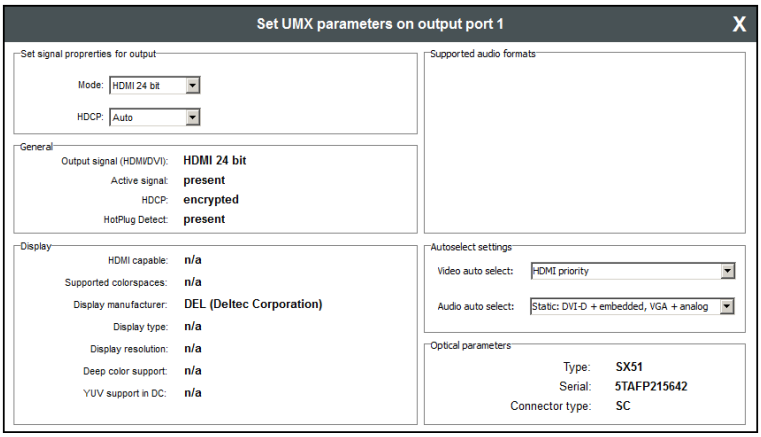
Step 4. Click on the Save button to store the changes.

Step 5. Click on the OK button when the confirmation message appears.

Step 6. Click on the Analog gain / offset button to close the window.

9.3.4. Output parameter settings

By clicking on the Video output label a dialog window appears showing the parameters for the corresponding output.



Output properties

Mode

The ‘Mode’ can be set to Auto, DVI, HDMI 24bit, HDMI 30bit or HDMI 36bit. The ‘Auto’ option sets the signal mode regarding to the attached display device’s EDID and the incoming signal.

HDCP

The ‘HDCP’ option sets the HDCP encryption on the output. The Auto setting applies encryption when the incoming signal is encrypted. The Always setting forces encryption on any incoming video signal.

General

Information about the signal and the connection status is shown here.

Info: *These fields are filled automatically by the device after the examination of the signal.*

Display

Information retrieved from the connected display’s EDID is shown.

Info: *These fields are filled automatically by the device after the examination of the signal.*

Supported audio formats

The connected display’s supported audio formats are shown based on the read EDID.

Autoselect settings

Video auto select

The video Autoselect settings are available in this drop-down menu. It can be:

- NonPriority, First detect,
- DVI-D priority or
- HDMI priority.

For detailed description about video Autoselect please read chapter 6.6 on page 31.

Audio auto select

The audio Autoselect settings are available in this drop-down menu. It can be

- Static select (Digital + embedded, DVI-A + Audio 1, VGA + Audio 2),
- First detect (Embedded, SPDIF, Analog 2),
- Priority detect (Embedded, S/PDIF, Analog 2),
- Priority detect (S/PDIF, Embedded, Analog 2),
- Priority detect (Embedded, Analog 2),
- Priority detect (S/PDIF, Analog 2),
- Fix select (Embedded),
- Fix select (Analog 1),
- Fix select (Analog 2),
- Fix select (S/PDIF),

For detailed description about audio Autoselect please read chapter *6.7* on page *35*.

Optical parameters

Optical parameters give information about the device's optical module and the type of the connector.

Info: *These fields are filled automatically by the device after the examination of the signal.*

9.4. EDID menu

Advanced EDID Management can be accessed by clicking on the EDID menu. This view is divided in two segments. The upper segment can be opened by clicking the green arrow. This segment contains the EDID editor. The lower segment is the EDID router area. This consists of two list windows, which can display a selected part of the EDID memory.

Info: *When the user enters the menu for the first time, the software starts to download the whole EDID list from the device. It may take about 30-40 seconds.*

9.4.1. EDID Router operation

After the list is downloaded, the current status is shown. The EDID memory consists of four parts. Any memory part can be displayed on either side by using the drop down lists.

The **Emulated EDID List** shows the currently emulated EDIDs for each input. It contains the resolution, manufacturer and vendor name of the EDID reported to the sources for each input separately. The source column displays the memory location that the current EDID was routed from.

The **Last attached Monitor's EDID List** contains the resolution, manufacturer and vendor name of the display devices connected to device's output. The device remembers the last display device's EDID, so there is an EDID shown even if there is no device attached to the transmitter's output at the moment.

The **Factory EDID List** shows the factory memory locations (01# - 20#) with preprogrammed EDID.

The **User EDID List** shows the memory locations (21# - 36#) which can be used by the user to save custom EDIDs.

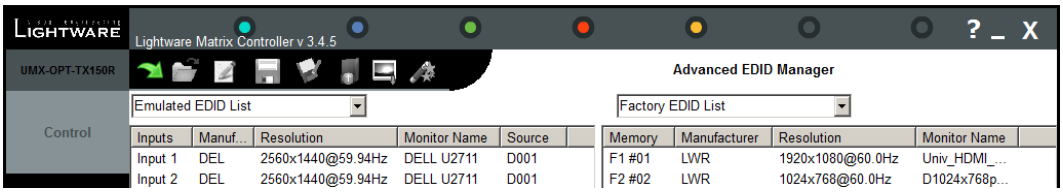


Figure 9-7. EDID Management menu

Any source reads the EDID from the Emulated EDID memory for the corresponding port. The user can select an EDID with the rotary switches to the desired input's memory location. This is called EDID switching. There are two types of the emulation: static and dynamic.

- Static EDID emulation happens, when an EDID from the Factory or User EDID list is selected by the Rotary switches (#1 .. #36). In this case the Emulated EDID will remain the same until the user emulates another EDID.
- Dynamic EDID emulation can be enabled by selecting #0 on the EDID Rotary switch. The attached monitor's EDID is copied to the INPUT, if a new monitor is attached to the output, the emulated EDID changes automatically.

Changing the emulated EDID at one or all inputs

To change the emulated EDID use the EDID Rotary switches on the rear panel of the device.

Info: *If dynamic emulation is established, the emulated EDID will be changed on the INPUT every time a new monitor is connected to the OUTPUT. If the monitor is disconnected from the output, the last EDID remains emulated for the source. This feature helps especially rental technicians or system integrators to keep the source continuously transmitting the signal, and adopt the system for new incoming display devices.*

Info: *Power ON/OFF cycle will not affect the emulated EDID or other settings.*

Info: *EDID routing procedure causes a status change, hence it is reported back to the CONTROL SOFTWARE within 2-3 seconds.*

Learning EDID from attached display device

The system is able to learn the EDID from a connected display device and store it in one of the user programmable memory locations.

Step 1. Select the User Memory in the drop-down menu in one of the list windows.

Step 2. Select the EDID to be saved from the other list window.

Step 3. Drag and drop the selected EDID to the desired User Memory location.

Step 4. Click Yes in the pop-up dialog window to confirm EDID change.

Saving EDID from memory to file

The control software is able to download EDID from the matrix and to save it as an EDID file (.dat file extension).

Step 1. Select the desired EDID list in the drop-down menu in the list windows.

Step 2. Right click on the EDID to be saved.

Step 3. Click on the "Save to file" in the pop-up window.

Step 4. The Matrix Controller Software downloads the desired EDID and a save dialog appears. It may take a few seconds to download the EDID. If the save dialog is shown, type in the file name, and press Save button. After the process was completed, an "EDID saved!" message confirms the command.

Load EDID from file to memory

The system is able to load EDID from a file located on the computer and store it in the matrix. EDID are stored in *.dat files.

Step 1. Select the User Memory list in one of the list windows

Step 2. Right click on the desired memory location. Then select "Load from file" from the pop-up menu.

Step 3. Browse your hard drive to find the desired EDID file. The software checks whether the selected file is a valid EDID file.

Step 4. Click Open in the browser window.

Delete EDID

Only user EDIDs can be deleted. Deleting means the factory EDID (Universal HDMI or Analog EDID) will be loaded into the desired user EDID memory.

Step 1. Select the User Memory in the drop-down menu in one of the list windows.

Step 2. Right click on the desired memory location. Then select "Delete EDID" from the pop-up menu.

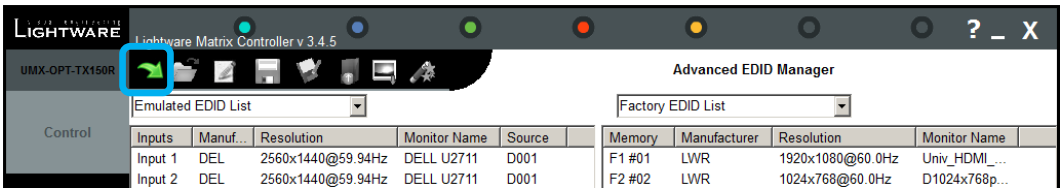
Step 3. Click Yes in the pop-up dialog window to confirm EDID delete.

9.4.2. Advanced EDID Editor

This powerful tool is essential for AV professionals. The Lightware Advanced EDID Editor is integrated into the Lightware Matrix Controller software, and it makes possible to manage every setting in the EDID on an intuitive user interface. The editor can read and write all descriptors, which are defined in the standards, including the additional CEA extensions.

Any EDID from the transmitter's memory or a saved EDID file can be loaded in 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 transmitter's memory.

By clicking on the green arrow, the editor area rolls down.



When the user enters the menu for the first time, an empty EDID is loaded into the editor's memory.

All EDID in the transmitter's memory can be edited in the following way:

Step 1. Right click on the desired EDID to be loaded to the EDID Editor.

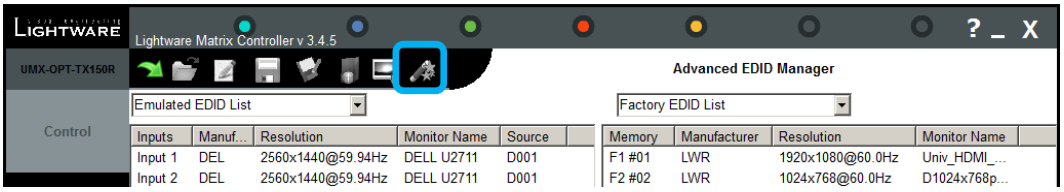
Step 2. In the pop-up menu, click on Edit EDID. The editor area automatically rolls down, and the EDID is loaded into the editor area.

For further information, see the user's manual of Advanced EDID Editor on the Lightware website: *www.lightware.eu*

9.4.3. Easy EDID Creator

Since the above mentioned advanced editor needs more complex knowledge about EDID, Lightware introduced a wizard like interface for fast and easy EDID creation. With Lightware Easy EDID Creator it is possible to create custom EDIDs in four simple steps.

By clicking on the wizard icon, the Easy EDID Creator opens in a new window.



For further information, see the user's manual of Easy EDID Creator on the Lightware website: *www.lightware.eu*

9.5. Terminal menu

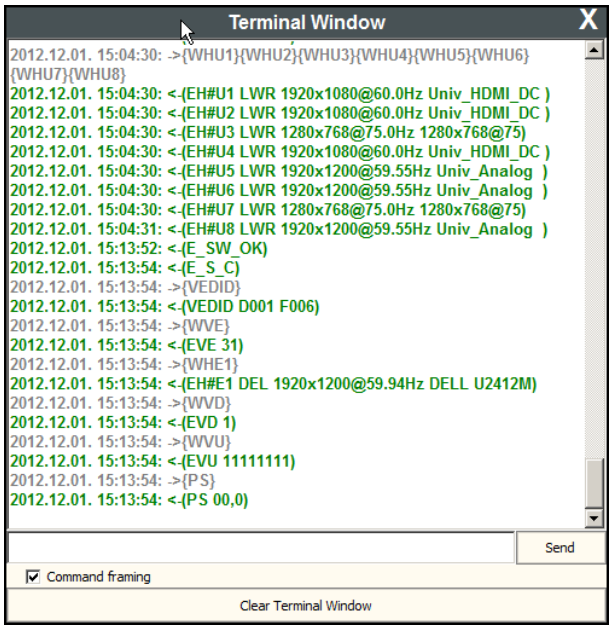


Figure 9-8. Terminal window

This general-purpose serial terminal is intended mainly for testing and debugging purposes. After a successful connection is established with a transmitter this terminal can be used either via serial RS-232 or USB connection. All commands can be used here that are discussed in the programmer's reference, chapter *10* on page *69*. The text can be typed directly.

By default commands are automatically surrounded by framing brackets. Every sent command and every received response gets an arrow (-> or <-) prefix, and has different font colors in order to help distinguishing.

The timecode in every row shows the exact time when the command was sent or the response received.

If the "Command framing" checkbox is unchecked, you can send multiple commands together, however in this case you have to type in the framing brackets manually.

9.6. Status menu

Basic device information, such as the installed boards' firmware and hardware revisions are displayed in this window.

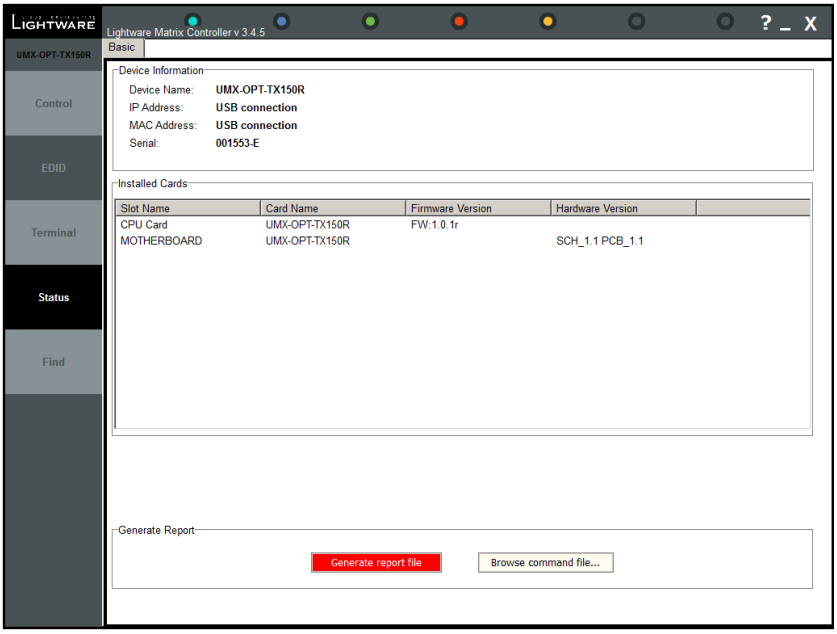


Figure 9-9. Status menu

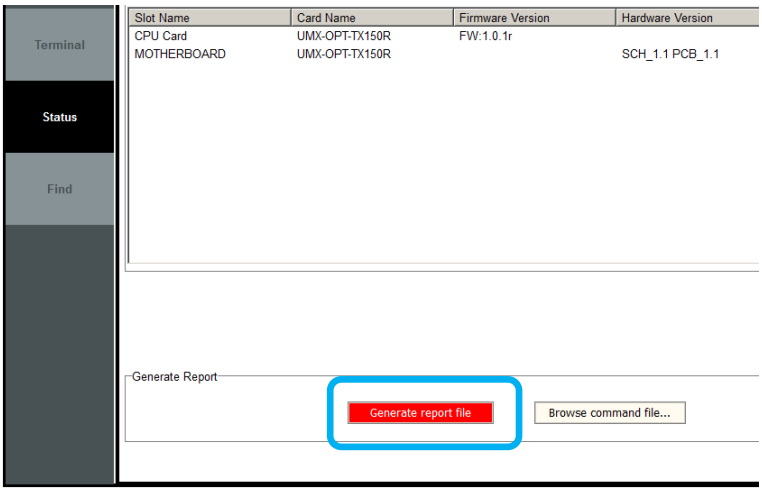
9.6.1. Generate report file

Lightware Matrix Controller allows user to generate a standard report file which contains basic information about the health and the version numbers of the device.

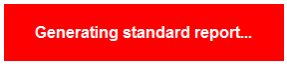
The default file name is:

Lightware_matrix_standard_report_dd_mm_yyyy@hh_mm.lwr

User's issues can be solved easier by Lightware technical support if the generated report file was sent.



During the process a big red message will be appeared:



Important! *Let the Lightware Matrix Controller software to finish the process! Do not exit or select another menu item.*

After finishing a window explorer will be opened and shown the actual folder which contains the generated report file.

9.6.2. Browse command file

Lightware Matrix Controller software can run a special command file. After running the software save a result file. It is useful for debugging for the Lightware technical support.

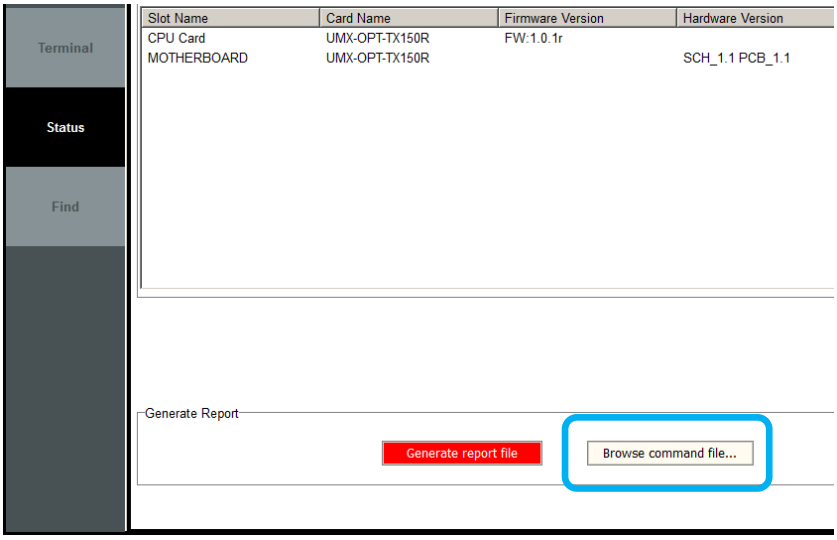
If a command file was sent:

Step 1. Save it to the computer.

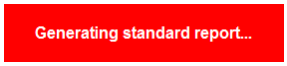
Step 2. Click to the 'Brose command file…' button. A browser window will be opened.

Step 3. Choose the command file. Another browser window will be appeared where the generated result file will be saved.

Important! *Let the Lightware Matrix Controller software to finish the process! Do not exit or select another menu item.*



During the process a big red message will be appeared:

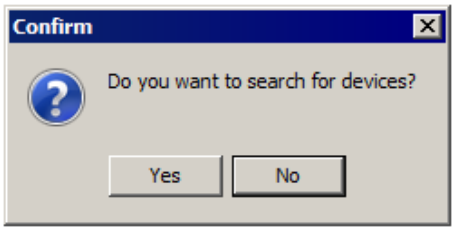


9.7. Find menu

By clicking this menu, the available devices can be rescanned on the serial port, USB and on the Ethernet. If the Matrix Controller Software has a live connection to a device on a port, a question window appears, asking if you really want to search for devices.

Clicking Yes will open the Find window. See section 9.2 about establishing the connection on page 55.

Clicking No will close the pop up window, the original connection remains active.



10. Programmers reference

Users can connect to the extender through serial and USB port.

Lightware UMX-OPT-TX150R can be controlled with external devices which can communicate according to the extender protocol.

10.1. Serial port settings

UMX-OPT-TX150R uses RS-232 communication port. D-SUB connector pin assignments can be found in section *4.5* on page *19*.

The device uses standard RS-232 interface with the following default settings:

57600 Baud, 8 data bit, 1 stop bit, no parity

The serial port baud rate can be changed with rear panel rotary switch (section *5.4.4* on page *26*) or protocol command - in case of #0 BAUD RATE rotary state (section *10.4.2* on page *73*).

10.2. Protocol description

The protocol description hereinafter stands for Lightware protocol.

The devices accept commands surrounded by curly brackets - { } - and responds with data surrounded by round brackets - ( ) - only if a command was successfully executed. All input commands are converted to uppercase, but respond commands can contain upper and lower case letters as well.

Legend for control commands:

<in>	=	input number in 1 or 2 digit ASCII format (01,5,07,16 etc.)
<out>	=	output number in 1 or 2 digit ASCII format
<in²>	=	input number in 2 digit ASCII format (01, 02, 10, 12 etc.)
<out²>	=	output number in 2 digit ASCII format (01, 02, 10, 12 etc.)
<loc>	=	location number in 1, 2 or 3 digit ASCII format
<id>	=	id number in 1 or 2 digit ASCII format
<id²>	=	id number in 2 digit ASCII format
<*italic*>	=	italic parameters are optional
CrLf	=	Carriage return, Line feed (0x0D, 0x0A)
●	=	space character (0x20)
→	=	each command issued by the controller
←	=	each response received from the transmitter

ASCII table:

The most frequently used characters are highlighted.

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
0	00	[NUL]	32	20	[Space]	64	40	@	96	60	`
1	01	[SOH]	33	21	!	65	41	A	97	61	a
2	02	[STX]	34	22	"	66	42	B	98	62	b
3	03	[ETX]	35	23	#	67	43	C	99	63	c
4	04	[EOT]	36	24	$	68	44	D	100	64	d
5	05	[ENQ]	37	25	%	69	45	E	101	65	e
6	06	[ACK]	38	26	&	70	46	F	102	66	f
7	07	[BEL]	39	27	'	71	47	G	103	67	g
8	08	[BS]	40	28	(	72	48	H	104	68	h
9	09	[TAB]	41	29	)	73	49	I	105	69	i
10	0A	[LF]	42	2A	*	74	4A	J	106	6A	j
11	0B	[VT]	43	2B	+	75	4B	K	107	6B	k
12	0C	[FF]	44	2C	,	76	4C	L	108	6C	l
13	0D	[CR]	45	2D	-	77	4D	M	109	6D	m
14	0E	[SOH]	46	2E	.	78	4E	N	110	6E	n
15	0F	[SI]	47	2F	/	79	4F	O	111	6F	o
16	10	[DLE]	48	30	0	80	50	P	112	70	p
17	11	[DC1]	49	31	1	81	51	Q	113	71	q
18	12	[DC2]	50	32	2	82	52	R	114	72	r
19	13	[DC3]	51	33	3	83	53	S	115	73	s
20	14	[DC4]	52	34	4	84	54	T	116	74	t
21	15	[NAK]	53	35	5	85	55	U	117	75	u
22	16	[SYN]	54	36	6	86	56	V	118	76	v
23	17	[ETB]	55	37	7	87	57	W	119	77	w
24	18	[CAN]	56	38	8	88	58	X	120	78	x
25	19	[EM]	57	39	9	89	59	Y	121	79	y
26	1A	[SUB]	58	3A	:	90	5A	Z	122	7A	z
27	1B	[ESC]	59	3B	;	91	5B	[	123	7B	{
28	1C	[FS]	60	3C	<	92	5C	\	124	7C	|
29	1D	[GS]	61	3D	=	93	5D	]	125	7D	}
30	1E	[RS]	62	3E	>	94	5E	^	126	7E	~
31	1F	[US]	63	3F	?	95	5F	_	127	7F	[DEL]

10.3. Status and identification commands

10.3.1. View product type

Description: Identification of the device. Type 'i' or 'I' then the transmitter responds its name.

Format		Example
Command	{I}	→ {i}
Response	(<PRODUCT_TYPE>)CrLf	← (I:UMX-OPT-TX150R)CrLf

Legend: <PRODUCT_TYPE> shows the extender model.

Explanation: The connected device is an UMX-OPT-TX150R.

10.3.2. View serial number

Description: The extender responds its 8-digit serial number.

Format		Example
Command	{S}	→ {s}
Response	(<SERIAL_NUMBER>)CrLf	← (SN:10170142)CrLf

Legend: < SERIAL_NUMBER > shows the serial number of the extender.

Explanation: The connected device's serial number is 10170142.

Info: *Only the last 4 numbers are written onto the back of the transmitter.*

10.3.3. View Firmware version of the CPU

Description: View the CPU firmware revision.

Format		Example
Command	{F}	→ {f}
Response	(FW:<FW_VER><S>)CrLf	← (FW:1.0.1r)CrLf

Legend: <FW_VERSION> is the firmware version. It is followed by <s> string which may indicate special versions. <s>=r indicates standard version.

Explanation: The connected device's firmware version is 1.0.1r.

10.3.4. View installed controllers' firmware

Description: Shows the firmware revisions of the installed controllers.

Format		Example
Command	{FC}	→ {fc}
Response	(CF●END)CrLf	← (CF END)CrLf

Explanation: There is no installed controller. This command is reserved for compatibility reasons.

10.3.5. View device's temperature

Description: Queries temperature status.

Format		Example
Command	{ST}	→ {st}
Response	(ST●CPU●<*DESC*>●<*TEMP*>)CrLf	← (ST CPU N/A N/A N/A N/A N/A 23.1C)CrLf

Legend: <DESC> N/A N/A N/A N/A N/A – reserved for compatibility reasons

<TEMP> The inner temperature.

Explanation: Internal temperature is 23.1 Celsius.

10.3.6. View CPU firmware compile time

Description: Shows the CPU firmware compile time.

Format		Example
Command	{CT}	→ {ct}
Response	(Compiled:<DATE>●<TIME>● Build:<tag>)CrLf	← (Compiled:Sep 21 2012 14:06:36 Build:4427)CrLf

Legend: <DATE> Month, Day and Year

<TIME> Hours, minutes and seconds

<tag> Identification number of the firmware

Explanation: The firmware was made in 21.09.2012, 14:06:36 and the identification number of the firmware is 4427.

10.3.7. View installed I/O boards

Description: Shows the hardware name and revision of the installed cards. The number of responses varies regarding the frame size (number of slots).

Format		Example
Command	{IS}	→ {is}
Response	(SL#●0●<MB_DESC>)CrLf	← (SL# 0 UMX-OPT-TX150R SCH_1.1 PCB_1.1)CrLf
	(SL●END)CrLf	← (SL END)CrLf

Legend: Slot 0 represents the motherboard.

<MB_DESC> The motherboard description contains the name and the version number.

Explanation: The extender reports that it has one motherboard called UMX-OPT-TX150R and its version number is SCH_1.1 PCB_1.1.

10.3.8. Query all port status

Description: Shows the actual status of all input and output ports.

Format		Example
Command	{PS}	→ {ps}
Response	(PS●<INPUT_D>,<OUTPUT_D>)CrLf	← (PS 0000,0)CrLf

Explanation: This command is reserved for compatibility reasons.

Legend: <INPUT_D> contains 4 decimal numbers. Each number must be 0. <OUTPUT_D> contains 1 decimal number. It must be 0. The input and output state tables are separated with a comma "," character.

10.4. System commands

10.4.1. Query current control protocol

Description: Shows the control protocol.

Format		Example
Command	{P_?}	–{p_?}
Response	(CURRENT●PROTOCOL●=●#<x>)CrLf	←(CURRENT PROTOCOL = #1)CrLf

Legend: <x> stands for the active protocol.

Explanation: Protocol 1 is active here.

Info: *User can query the protocol only. This command is reserved for compatibility reasons.*

10.4.2. Change RS-232 baud rate

Description: The RS-232 baud rate can be set when the BAUD RATE rotary has #0 (software set) state. The command has to be sent with the earlier baud rate but the response comes with the new baud rate.

Format	Example
Command {RS232BAUD=<rate>} Response (RS232BAUD=<rate>)CrLf	→ {RS232BAUD=9600} ← (RS232BAUD=9600)CrLf

Explanation: The device RS-232 port is set to 9600 baud.

Possible settings:

<rate>	Baud rate	
9600	9600 baud	
19200	19 200 baud	
38400	38 400 baud	
57600	57 600 baud	(default)
115200	115 200 baud	

10.4.3. Query RS-232 baud rate

Description: The RS-232 baud rate can be checked. It works via RS-232 as well, but if it is used the command has to be sent with the appropriate baud rate.

Format	Example
Command {RS232BAUD=?} Response (RS232BAUD=<rate>)CrLf	→ {RS232BAUD=?} ← (RS232BAUD=57600)CrLf

Legend: Please read section *10.4.2* on page *73*.

Explanation: The device communicates with 57600 baud on the RS-232 port.

10.4.4. Reload factory defaults

Description: Factory default settings can be reloaded for different functions separately. Multiple functions can be entered.

Format	Example
Command {FACTORY=<f1>;<f2>;…;<fx>} Response (FACTORY●<f1>…)CrLf (FACTORY●<f2>…)CrLf … (FACTORY●<fx>…)CrLf	→ {factory=xpoint;iocards;edidmem} ← (FACTORY XPOINT…)CrLf ← (FACTORY IOCARDS…)CrLf ← (FACTORY EDIDS…)CrLf

Legend: *<f1>, <f2>* are the names of the functions which have to be reset to factory default. Any number of <fx> can be entered, separated by semicolons.

<fx>	Restores factory settings to	Additional response
XPOINT	Crosspoint table and configuration	none
GENERAL	Elevelsend, RS-232 working mode, baud rate	none
IOCARDS	All I/O settings	none
EDIDMEM	Clear User and Dynamic EDIDs	(DE_OK) (E_SW_OK) … (E_SW_OK)
ALL	Restores all of the factory settings listed above	none

Explanation: Factory default settings reloaded for crosspoint and I/O card configurations and emulated EDIDs.

Info: *The response may contain additional messages as the transmitter makes the configurations. These responses can be omitted.*

Info: *After resetting the needed parameters, the device restarts. In case of USB connection reconnecting is always necessary.*

Warning! *Reloading GENERAL factory defaults AFFECTS the serial operation mode and the RS-232 baud rate options as well. The default operation mode is the PASS mode and the default baud rate is 57600 baud in the UMX-OPT-TX150R. If the previous serial settings differ from the default ones, please set up the necessary values after reboot with protocol commands. (Set the RS-232 operation mode command in section 10.4.5 on page 74 and the Change RS-232 baud rate command in section 10.4.2 on page 73.)*

10.4.5. Set the RS-232 operation mode

Description: This command sets the RS-232 port operation mode.

Format		Example
Command	{RS232=<mode>}	→ {rs232=control}
Response	(RS232=<mode>)CrLf	← (RS232=CONTROL)CrLf

Legend: <mode> Two kinds of operation modes can be:
- <CONTROL> The CPU in the transmitter can receive commands and send responses.
- <PASS> The serial connectors on the transmitter and on the receiver are linked together.

Explanation: The device can be controlled via RS-232 port.

10.4.6. Query the RS-232 operation mode

Description: This command queries the current RS-232 operation mode.

Format		Example
Command	{RS232=?}	→ {rs232=?}
Response	(RS232=<mode>)CrLf	← (RS232=CONTROL)CrLf

Legend: Please read section 10.4.5 on page 74.

Explanation: The device can be controlled via RS-232 port.

10.4.7. Clear HDCP key cache

Description: The device stores the HDCP keys from the connected devices. These cached keys can be cleared with this command.

Format		Example
Command	{:HDCPRESET}	→ {:hdcpreset}
Response	(Done)CrLf	← (Done)CrLf

Explanation: HDCP key cache is cleared.

Info: *This function is useful when too many keys were cached and a connected source device cannot accept so many keys.*

10.4.8. Count HDCP keys

Description: If there is an HDCP source on the HDMI input of the device, the device can ask the source whether it can handle <num> piece of sink devices.

Format		Example
Command	{:HDCPTEST<in>@<num>}	→ {:hdcptest4@9}
Response	(HDCPTEST=<resp>)CrLf	← (HDCPTEST=SUCCESS)CrLf

Legend:

<in>	input port where the key counting will be executed. This input port must be selected.
<num>	the number of the HDCP keys
<res>	Result of the HDCP key counting: **SUCCESS**: The source on the <in> input can handle <num> HDCP sink devices. **FAIL**: The source on the <in> input cannot handle <num> HDCP sink devices. **UNAVAILABLE**: If the <in> input isn't a HDCP compliant input (e.g. VGA), the key counting function isn't available. **NOAUTH**: If the <in> input is a HDCP compliant input but there is no connected source, the device cannot execute the key counting.

Explanation: The source on the 4th input can handle 9 HDCP sink devices.

10.4.9. Restart transmitter

Description: The extender can be restarted without unplugging power.

Format		Example
Command	{RST}	→ {rst}
Response	(Booting…)CrLf	← (Booting…)CrLf
	(<name>●READY!)CrLf	← (UMX-OPT-TX150R READY!)

Legend:

<name>	is the type of the extender

Explanation: The extender reboots and sends a message when it is ready.

Info: *The response can be seen only if the connection to the extender via RS-232 is still alive. The response cannot be seen and reconnect is always necessary in case of USB connection.*

10.4.10. View error list

Description: Shows the basic error list since last boot up.

Format		Example
Command	{ELIST=?}	→ {elist=?}
Response	(ELIST#<num>●*<elevel>*●*<code>* ●*<param>*●*<occ>*)CrLf	← (ELIST#1 Notice BOOT p:6 o:1)CrLf
	…	…
	(ELIST#<num>●*<elevel>*●*<code>* ●*<param>*●*<occ>*)CrLf	← *(ELIST#2 Notice READY p:0 o:1)*CrLf

Legend:

<num>:	line number	
<elevel>:	NOTICE =	Not an error. Initialization information.
	WARNING =	Possible problem without influencing normal operation.
	MATTER =	Problem that may lead to further errors.
	ERROR =	Serious error. Must report to support.
	FATAL =	Fatal error. Normal operation is not possible.

<code>: short name for type of log entry

<param>: technical parameter

<occ>: occurrence number for this type of log entry

Explanation: There are no errors only standard notices that occur on boot up.

Info: *The error list can contain NOTICEs and WARNINGs under normal operation. These entries do not mean that there is any problem with the matrix!*

10.4.11. Configure remote alerts

Description: The device logs different levels of errors. Configure which level of errors has to be sent out as an alarm message.

Format		Example
Command	{ELEVELSEND#<p>=<0>,<1>,<2>,<3>,<4>}	→ {ELEVELSEND#1=0,0,1,1,1}
Response	(ELEVELSEND#<p>=<0>,<1>,<2>,<3>,<4>)CrLf	← (ELEVELSEND#1=0,0,1,1,1)CrLf

Explanation: The device will send an immediate message on all control interfaces when a ‘matter’, ‘error’ or ‘fatal’ level error occurs.

Legend:

<p>:	Adjusted control interface	must be 1 = RS-232
<0>:	‘Notice’ level events	0 = no immediate message send 1 = immediate message
<1>:	‘Warning’ level events	0 = no immediate message send 1 = immediate message
<2>:	‘Matter’ level events	0 = no immediate message send 1 = immediate message
<3>:	‘Error’ level events	0 = no immediate message send 1 = immediate message
<4>:	‘Fatal’ level events	0 = no immediate message send 1 = immediate message

10.4.12. Query level of remote alerts

Description: User can check which level of errors has to be sent out as an alarm message.

Format		Example
Command	{ELEVELSEND#<p>=?}	→ {ELEVELSEND#1=?}
Response	(ELEVELSEND#<p>=<0>,<1>,<2>,<3>,<4>)CrLf	← (ELEVELSEND#1=0,0,1,1,1)CrLf

Legend: Please read section *10.4.11* on page *76*.

Explanation: The device will send an immediate message on all control interfaces when a ‘matter’, ‘error’ or ‘fatal’ level error occurs.

10.4.13. Set the video priority settings

Description: This command sets the video priority order of the Autoselect mode.

Format		Example
Command	{VIDEOPRIORITY=<vpmode>}	→ {videopriority=4}
Response	(VIDEOPRIORITY=<vpmode>)CrLf	← (VIDEOPRIORITY=4)CrLf

Legend: <vpmode> Three kinds of video priority modes can be:

<0> **First detect (factory default)**
First the device check the DVI-D than VGA than the HDMI video input port. That port will be selected which contains valid video signal.

<1> **DVI-D priority**
If there is a valid signal on the DVI-D input, this port always will be selected, even if the active port was the VGA or the HDMI input port.

<4> **HDMI priority**
If there is a valid signal on the HDMI input, this port always will be selected, even if the active port was the VGA, DVI-A or the DVI-D input port.

Please see section 6.6 on page 31 for detailed information about video Autoselect.

Explanation: The device uses HDMI priority in the Autoselect mode.

10.4.14. Query the video priority settings

Description: This command queries the video priority mode.

Format	Example
Command {VIDEOPRIORITY=?}	→ {videopriority=?}
Response (VIDEOPRIORITY=<vpmode>)CrLf	← (VIDEOPRIORITY=1)CrLf

Legend: Please read section 10.4.13 on page 76.

Explanation: The device uses HDMI priority in the Autoselect mode.

10.4.15. Set the audio priority settings

Description: This command sets the audio priority order of the Autoselect mode.

Format	Example
Command {AUDIOPRIORITY=<apmode>}	→ {audiopriority=1}
Response (AUDIOPRIORITY=<apmode>)CrLf	← (AUDIOPRIORITY=1)CrLf

Legend: <pmode> Ten kinds of audio priority modes can be:

<0> **Static select:**
Digital+Embedded, DVI-A+Analog1, VGA+Analog2

<1> **First detect:**
Embedded, S/PDIF, Analog 2

<2> **Priority:**
Embedded, S/PDIF, Analog 2

<3> **Priority:**
S/PDIF, Embedded, Analog 2

<4> **Priority:**
Embedded, Analog 2

<5> **Priority:**
S/PDIF, Analog 2

<H1> **Fix select:** Embedded

<A1> **Fix select:** Analog 1

<A2> **Fix select:** Analog 2

<S1> **Fix select:** S/PDIF

Please see section 6.7 on page 35 for detailed information about audio Autoselect.

Explanation: The device uses the first detect method in the Autoselect mode.

10.4.16. Query the audio priority settings

Description: This command queries the audio priority mode.

Format	Example
Command {AUDIOPRIORITY=?}	→ {audiopriority=?}
Response (AUDIOPRIORITY=<apmode>)CrLf	← (AUDIOPRIORITY=1)CrLf

Legend: Please read section 10.4.15 on page 77.

Explanation: The device uses the first detect method in the Autoselect mode.

10.5. EDID router commands

The EDID router manipulates the EDID memory, which has memory locations that are assigned to specific input or output ports. Please read section 6.8 on page 41 about EDID memory structure.

Warning! *Emulated EDIDs can be switched with the rotary switches only.*

10.5.1. Save EDID to user memory (Learn EDID)

Description: Learn EDID from <loc2> to <loc1>.

Format		Example
Command	{<loc1>:<loc2>}	→ {u3:d1}
Response	(E_SW_OK)CrLf (E_S_C) CrLf	← (E_SW_OK)CrLf ← (E_S_C)CrLf

Legend: <loc1> has to be 'Uxx'.

<loc2> can be 'Fxx' or 'Uxx' or 'Dxx'.

Explanation: EDID from the output 1 is saved to user EDID #3.

Info: *The transmitter sends (E_S_C) only if the new EDID is different from the earlier one.*

10.5.2. View emulated EDIDs on all inputs

Description: Shows the currently emulated EDIDs for all the inputs. The value at the given index (<in1>, <in2>, <in3>, <in4>) shows which EDID is used on that particular input.

Format		Example
Command	{VEDID}	→ {vedid}
Response	(VEDID●<in1>●<in2>● <in3>●<in4>)CrLf	← (VEDID F005 D001 U001 U002)CrLf

Legend: All <inx> indexes show a <loc> which was copied to that input port.

Explanation: F005 (Factory preset EDID F05) is emulated on the input 1. EDID from output is dynamically emulated on input 2. First and the second User EDID are emulated on input 3 and input 4.

10.5.3. Watch EDID validity table

Description: Shows EDID validity table, which contains information about the EDID memory states.

Format		Example
Command	{WV<type>}	→ {wv*}
Response	(EV<type>● <VALIDITY_TABLE>)CrLf	← (EVU 3111111111111111)CrLf ← (EVD 1)CrLf ← (EVE 1111)CrLf

Legend:

<type>	<name>	Response length
F	Factory preset EDIDs	20
U	User saved EDIDs	16
D	Dynamic EDID	1
E	Emulated EDIDs	4
*	All 'U', 'D' and 'E' EDIDs	

Each number represents the EDID validity state for the corresponding memory location.

Value	Description
'0'	invalid EDID
'1'	valid EDID
'3'	changed EDID

Explanation: There is one '3' in the first row on the 1st position. This means that the user EDID is changed since the last EDID query on that port.

Info: *If a changed EDID is queried by the {WH} command (see the next section), its value returns to '1'.*

Info: *EDID deleting means the universal EDID will be uploaded to the deleted EDID's place.*

10.5.4. View EDID header

Description: Shows basic information about EDIDs in the memory.

Format	Example
Command {WH<loc>} Response (EH#<loc>● <EDID_HEADER>)CrLf	→ {whe1} ← (EH#E1 LWR 1920x1080@60Hz Univ_HDMI_DC)CrLf

Legend: Depending on <loc> the query can be for one EDID, all EDID in the block.

<loc>	Result	Response
Fxx	Factory EDID query	header for one EDID
Uxx	User EDID query	
Dxx	Dynamic EDID query	
Exx	Emulated EDID query	
F*	All Factory preset EDIDs	headers for all (20) Factory EDIDs
U*	All User saved EDIDs	headers for all (16) user EDIDs
D*	All Dynamic EDIDs	header from the output (1)
E*	All Emulated EDIDs	headers from all the four inputs (4)

<EDID_HEADER> consists of 3 fields separated by spaces:

PNPID code The three letter abbreviation of the manufacturer

Preferred resolution The resolution and refresh rate stored in the preferred detailed timing block.

Name The name of display device stored in product descriptor.

Explanation: Shows the EDID from the input 1.

10.5.5. Download EDID content from the transmitter

Description: EDID hex bytes can be read directly. The transmitter will issue the whole content of the EDID present on memory location <loc> (256 bytes).

Format	Example
Command {WE<loc>} Response (EB#<loc>●<B1> ●<B2>●..●<B256>)CrLf	→ {wef1} ← (*EB#F1 00 FF FF FF FF FF FF 00 32 F2 00 00 00 .. .. .. 00 92*) CrLf

Legend: <B1>..<B256> are space separated hex characters represented in ASCII format.

Explanation: Full EDID from memory location 1 is downloaded.

10.5.6. Upload EDID content to the transmitter

Description: EDID hex bytes can be written directly to the user programmable memory locations.

Sequence:

Step 1. Prepare the device to accept EDID bytes to the specified location <loc> with command *{WL#<loc>}*

Step 2. Device responds that it is ready to accept EDID bytes with *(E_L_S)CrLf*

Step 3. Send 1 block of EDID (1 block consist of 8 bytes of hex data represented in ASCII format) with command:
{WB#<num>●<B1>●<B2>●<B3>●<B4>●<B5>●<B6>●<B7>●<B8>}

Step 4. The device acknowledges with response *(EL#<num>)*

Step 5. Repeat steps 3 and 4 to send the remaining 31 blocks of EDID (32 altogether)

Step 6. After the last acknowledge, the device indicates that the EDID status changed by sending *(E_S_C) CrLf*

Format		Example
Command	{WL#<loc>}	→ {wl#u3}
Response	(E_L_S)CrLf	← (E_L_S) CrLf
Command	{WB#1●<B1>●<B2>●<B3> ●<B4>●<B5>●<B6>●<B7> ●<B8>}	→ {wb#1 00 FF FF FF FF FF FF 00}
Response	(EL#<num>)CrLf	← (EL#1)CrLf
Command	{WB#2●<B9>●<B10> ●<B11>●<B12>●<B13> ●<B14>●<B15>●<B16>}	→ {wb#2 38 A3 8E 66 01 01 01 01}
Response	(EL#<num>) CrLf	← (EL#2)CrLf
	⋮	⋮
Command	{WB#32●<B249>●<B250> ●<B251>●<B252>●<B253> ●<B254>●<B255>●<B256>}	→ {wb#32 36 59 42 0A 20 20 00 96}
Response	(EL#<num>) CrLf	← (EL#32)CrLf
Response	(E_S_C) CrLf	← (E_S_C)CrLf

Legend: <num> represents the sequential number of every 8 byte part of EDID. <num> is between 1 and 32. <B1>..<B256> are the bytes of EDID.

Explanation: Full EDID uploaded to memory location U3.

10.5.7. Delete EDID from memory

Description: Clear EDID from memory location <loc>.

Format		Example
Command	{DE<loc>}	→ {deu3}
Response	(E_SW_OK)CrLf	← (E_SW_OK)
	(DE_OK)CrLf	← (DE_OK)CrLf
	(E_S_C)CrLf	← (E_S_C)CrLf

Legend: Depending on <loc>, one EDID, or all EDIDs in a block can be cleared.

<loc>	Result
Fxx	Not valid! Factory EDID cannot be deleted. No response.
Uxx	Specified User EDID is deleted.
Dxx	Dynamic EDID is the Universal EDID by factory default and it cannot be deleted.
Exx	Specified Emulated EDID is selected by a rotary switch and it cannot be deleted.
F*	Not valid! Factory EDID cannot be deleted. No response.
U*	All User EDIDs are deleted.
D*	UMX-OPT-TX150R contains only one Dynamic EDID and and it cannot be deleted..
E*	All Emulated EDIDs are selected by rotary switches and they cannot be deleted.

Explanation: Third user EDID is cleared from memory.

Info: *Only user EDIDs can be deleted. Deleting means the factory EDID (Universal HDMI or Analog EDID) will be loaded into the desired user EDID memory.*

10.6. Control commands

Description: The following commands with <A/V/AV> option can take effect in multiple layers, according to their parameters. Depending on 'A' or 'V' it can change only the Audio, or only the Video layer; or 'AV' changes both.

Info: *<A/V/AV> option usually can be skipped for legacy purposes.*
In this case using router commands the router changes all (Video & Audio) layers, but using status commands it displays information about only the Video layer.
Please use AV option, when available.

10.6.1. Switch one input to one output

Description: This command switches the output to an input.

Format		Example
Command	{<in>@<out>●<*A/V/AV*>}	→ {2@1 av}
Response	(O<out²>●I<in²>●<*A/V/AV*>)CrLf	← (O01 I02 AV)CrLf

Legend: <*A/V/AV*>: Layer select:
A: Audio layer
V: Video layer
AV: Audio&Video layer
<in> must be 1,2,3,4 or 5 in case of video input.
1: DVI-D video input
2:DVI-I video input
3: VGA video input
4: HDMI video input
5: Automatic source selection
<in> must be 1,2,3,4 or 5 in case of audio input.
1: DVI-D embedded audio input
2: Analog audio 1 input
3: Analog audio 2 input
4: HDMI embedded audio input

5: S/PDIF audio input
<out> must be 1

Explanation: The example shows how to connect both Audio and Video from input 2 to output 1.

Info: *If the command is used without the* <A/V/AV> parameter, both layers are switched.

10.6.2. Disconnect any inputs from output

Description: Switch the output to virtual unconnected input. No signal or the No sync picture on the output.

Format		Example
Command	{<in>@<out>●*<A/V/AV>*}	→ {0@1}
Response	(O<out²>●I<in²>●*<A/V/AV>*)CrLf	← (O01 I00)CrLf

Legend: *<A/V/AV>:* Layer select:
A: Audio layer
V: Video layer
AV: Audio&Video layer
<in> must be 0.
<out> must be 1.

Explanation: Inputs are disconnected from the output. (No input will be connected.)

Info: *To make a disconnected output live again another input has to be switched to it.*

10.6.3. View all connections on the output

Description: This command displays the connections on a single or multiple layers.

Format		Example
Command	{VC●*<A/V/AV>*}	→ {vc●av}
Response	*(ALLV●<in²>)CrLf* *(ALLA●<in²>)*CrLf	← (ALLV●01)CrLf (ALLA●01)CrLf

Legend: Please read section *10.6.1* on page *81*.

Explanation: The response contains all the connections, if both layers are selected the response is two messages.
The example shows that output 1 Audio & Video are connected to input 1 Audio & Video.

Info: *If the command is used without the* <A/V/AV> parameter, the response shows only the video layer connections.

10.6.4. Query the autoselect state

Description: This command queries the actual state of the autoselect.

Format		Example
Command	{AUTOSELECT=?}	→ {autoselect=?}
Response	(AUTOSELECT=<port>)CrLf	← (AUTOSELECT=3)CrLf

Legend: *<port>:* The number of the selected input port:
S: Searching is in progress and there is no selected video input.
1: DVI-I input is selected.
3: VGA input is selected.
4: HDMI input is selected.
N/A: The device is not in autoselect mode.

Explanation: The device is in autoselect mode and the VGA input is selected.

10.7. Error log related commands

UMX-OPT-TX150R logs the error events into an EPROM memory. The device emulates a standard FAT16 file system with a fix directory and file structure.

M:\LOG\1970_01\1.CSV

M:\	virtual drive letter, root directory
LOG	directory
1970_01	directory, contains the log file
1.CSV	the log file (format of the log file is CSV - comma separated values)

Important! *The drive letter, directory names and file names are given with upper case and the commands are case sensitive.*

10.7.1. List a directory

Description: List the content of a directory.

Format		Example	
Command	{SD_DIR=<path>}	→	{sd_dir=M:\LOG}
Response	(DIR1●<cont>)CrLf (DIR_END)CrLf	← ←	(DIR1 1970_01 <DIR>)CrLf (DIR_END)CrLf

Legend: *<path>:* The path of the directory with absolute reference. There are only two directory: LOG and 1970_01 and the drive letter is always M:\.
<cont>: The content of the given directory.

Explanation: LOG directory contains the 1970_01 directory.

10.7.2. List the log file

Description: The command lists the saved error events. The log file is always available.

Format		Example	
Command	{SD_GETT=M:\LOG\ 1970_01\1.CSV}	→	{SD_GETT=M:\LOG\ 1970_01\1.CSV}
Response	(LOG#1 …)CrLf (LOG#2…)CrLf … (LOG●END)CrLf	← ←	(LOG#1 level;time;code; param;task;occurency;info)CrLf (LOG END)CrLf

Legend: *LOG#1* The header of the log file.
LOG#x Every LOG# row is different event.

Explanation: The log file doesn't contain any event. The header (LOG#1) is shown only.

10.7.3. Clear the log file

Description: This command clears the error events but keeps the empty log file with header and the directory structure.

Format		Example
Command	{SD_FORMAT}	→ {sd_format}
Response	(OK)CrLf	← (OK)CrLf

Explanation: The log file content is cleared.

10.8. Input properties

The following commands are setting up the properties of the input ports. If only one or a few parameters have to be modified, the protocol enables to mask the other parameters, so they can stay untouched. To mask a parameter use “x” or “X” as its value.

Example: {:ANALOG#2@SI=x;x;x;x;210;x;} Only change the horizontal position on the input port 2.

Info: *If the input port is not a selected, active port and this port is affected by an input command the response will be N/A.*

10.8.1. Set input port properties

Description: This command changes the setup of the input ports.

Format		Example
Command	{:DVII#<in>@<S/A>I=<VIDEO>;<X1>;<X2>;<HDCP>}	→ {:dvii#1@si=x;x;x;1}
Response	(DVII#<in>@<S/A>I=<VIDEO>;<X>;<X>;<HDCP>;<STATUS>;<SOURCE>;<*ATIM1/DCS*>;<*ATIM2/DRES*>;<*ARES/HAUDIO*>;<*HASAMP*><*HCH*>)CrLf	← (DVII#1@SI=D;x;x;1;3;H;20;1920x1080p60;P;48;)CrLf

Explanation: This command enables the HDCP encryption.

Legend:
<S/A>: **Affected ports:**
S = single selected input
A = all inputs
<VIDEO> **Video source: (read-only)**
A = Automatic analog (color space detected by sync)
D = Digital (HDMI / YPbPr)

Info: *Video source gives information about the source. It is a read-only parameter. Automatic analog (A) setting available with analog VGA INPUT and Digital (D) setting available with HDMI INPUT.*

<X1>: Reserved for compatibility reasons. Don’t care.
<X1>: Reserved for compatibility reasons. Don’t care.

Info: *The following parameters are available above 1.0.9 firmware version*

Info: *HDCP setting available only on the HDMI input port.*

<HDCP>: **HDCP capability:**
0 = disabled,
1 = enabled.

Info: *The following parameters cannot be set, they only appear in response.*

<STATUS> **Status** (hexadecimal):
bit 0: (LSB): Power 5V

0 = not detected
1 = detected
bit 1: Source signal HDCP:
0 = not protected
1 = protected
bit 2: Don't care
bit 3: Don't care

<SOURCE> **Actual video source**:
H = HDMI
D = DVI
R = RGBHV (analog signal, separate HV sync)
C = Component signal (analog signal, embedded sync)
- = No video detected.

Source dependent parameters:

Analog signal properties are displayed, when <SOURCE> = R / C:

<ATIM1> **Analog timing1:**
0 = SMTPE standard
1 = User saved preset
2 = EDID detailed timing
3 = Factory preset
4 = GTF formula
5 = User modified (not saved)

<ATIM2> **Analog timing2:** (depending on <ATIM1>)
<ATIM1> = 0 -> SMTPE record number
<ATIM1> = 1 -> User preset number
<ATIM1> = 2 -> Detailed timing number
<ATIM1> = 3 -> Factory preset number
<ATIM1> = 4 -> Fixed zero.

<ARES> **Resolution string**. (example: 1600x1200p60)

Digital signal properties are displayed, when <SOURCE> = H / D:

<DCS> 2 byte hexadecimal number:
bit 0 = 1: Color depth: 30 bit/pixel (not supported)
bit 1 = 1: Color depth: 36 bit/pixel
bit 2 = 1: Color depth: 48 bit/pixel (not supported)
bit 0&1&2 =0: Color depth: 24 bit/pixel
bit 4: Color space: YCbCr422
bit 5: Color space: YCbCr444

<DRES> **Incoming resolution string**. (example: 1600x1200p60)

If HDMI signal present <SOURCE> = H, there are more HDMI specific parameters:

<HAUDIO> **HDMI Audio properties:**
0 = no audio
P = 2 channel stereo (L-PCM)
M = Multichannel-PCM (M-PCM)
S = Compressed audio
H = HBR audio
D = DST audio (not supported)
E = DSD audio (not supported)

<HASAMP> If <HAUDIO> not S or H: HDMI audio sample rate in kHz.
<HAUDIO> = S (Compressed) multiply by 32,
<HAUDIO> = H (HBR) multiply by 4

32	32	kHz
44	44,1	kHz
48	48	kHz
88	88,2	kHz
96	96	kHz
176	176,4	kHz
192	192	kHz

<HCH> Contains CEA-861 compatible channel assignment, if M-PCM signal present:

0x00	-	-	-	-	-	-	FR	FL
0x01	-	-	-	-	-	LFE	FR	FL
0x02	-	-	-	-	FC	-	FR	FL
0x03	-	-	-	-	FC	LFE	FR	FL
0x04	-	-	-	RC	-	-	FR	FL
0x05	-	-	-	RC	-	LFE	FR	FL
0x06	-	-	-	RC	FC	-	FR	FL
0x07	-	-	-	RC	FC	LFE	FR	FL
0x08	-	-	RR	RL	-	-	FR	FL
0x09	-	-	RR	RL	-	LFE	FR	FL
0x0A	-	-	RR	RL	FC	-	FR	FL
0x0B	-	-	RR	RL	FC	LFE	FR	FL
0x0C	-	RC	RR	RL	-	-	FR	FL
0x0D	-	RC	RR	RL	-	LFE	FR	FL
0x0E	-	RC	RR	RL	FC	-	FR	FL
0x0F	-	RC	RR	RL	FC	LFE	FR	FL
0x10	RRC	RLC	RR	RL	-	-	FR	FL
0x11	RRC	RLC	RR	RL	-	LFE	FR	FL
0x12	RRC	RLC	RR	RL	FC	-	FR	FL
0x13	RRC	RLC	RR	RL	FC	LFE	FR	FL
0x14	FRC	FLC	-	-	-	-	FR	FL
0x15	FRC	FLC	-	-	-	LFE	FR	FL
0x16	FRC	FLC	-	-	FC	-	FR	FL
0x17	FRC	FLC	-	-	FC	LFE	FR	FL
0x18	FRC	FLC	-	RC	-	-	FR	FL
0x19	FRC	FLC	-	RC	-	LFE	FR	FL
0x1A	FRC	FLC	-	RC	FC	-	FR	FL
0x1B	FRC	FLC	-	RC	FC	LFE	FR	FL
0x1C	FRC	FLC	RR	RL	-	-	FR	FL
0x1D	FRC	FLC	RR	RL	-	LFE	FR	FL
0x1E	FRC	FLC	RR	RL	FC	-	FR	FL
0x1F	FRC	FLC	RR	RL	FC	LFE	FR	FL

Where:

FL	Front Left
FC	Front Center
FR	Front Right
FLC	Front Left Center
FRC	Front Right Center
RL	Rear Left
RC	Rear Center
RR	Rear Right
RLC	Rear Left Center
RRC	Rear Right Center
LFE	Subwoofer

10.8.2. Query input port properties

Description: Check status of the input ports.

Format		Example
Command	{:DVII#<in>@<S/A>I=?}	→ {:dvii#1@si=?}
Response	(DVII#<in>@<S/A>I= <VIDEO>; <X1>; <X2>; <HDCP>; <STATUS>; <SOURCE>; *<ATIM1/DCS>;* *<ATIM2/DRES>;* *<ARES/HAUDIO>;* *<HASAMP>;* *<HCH>;*)CrLf	← (DVII#1@SI= D; x; x; 1; 3; H; 20; 1920x1080p60; P; 48;)CrLf

Legend: Please read section *10.8.1* on page *84*.

Explanation: This command queries the HDMI input port properties.

10.8.3. Set analog timing properties

Description: This command changes the setup of the analog timing data.

Format		Example
Command	{:ANALOG#<in>@<S/A>I= <PHS>;<FHS>; <HS>;<VS>; <HP>;<VP>;}	→ {:analog#2@si= 10;2160; 1600;1200; 455;41;}
Response	(DVII#<in>@<S/A>I= <PHS><FHS>; <HS>;<VS>; <HP>;<VP>; *<LCF>;* *<FORM>;<VSP>;<HSP>;* *<FPS>;*)CrLf	← (ANALOG#2@SI= 10;2160; 1600;1200; 455;41; 1124; P;-;-; 50;)CrLf

Legend:

<S/A>:	**Affected ports:**	
	S = single selected input	
	A = all inputs	
<PHS>	Phase	
<FHS>	Full Horizontal Size	
<HS>	Horizontal Size	
<VS>	Vertical Size	
<HP>	Horizontal Position	
<VP>	Vertical Position	

Info: *The following parameters cannot be set, they only appear in response.*

<LCF>	*Full Vertical Size (Line Count per Field)*
<FORM>	*Format: Progressive or Interlaced*
<VSP>	*Vertical Sync. Polarity*
<HSP>	*Horizontal Sync. Polarity*
<FPS>	Frame Per Sec in Hz

10.8.4. Query analog timing properties

Description: Check analog timing data of the input ports.

Format		Example
Command	{:ANALOG#<in>@<S/A>I=?}	→ {:analog#2@si=?}
Response	(ANALOG#<in>@<S/A>I= <PHS>;<FHS>; <HS>;<VS>; <HP>;<VP>;*<LCF>;* *<FORM>;<VSP>;<HSP>;<FPS>*)CrLf	← (ANALOG#2@SI= 0;2160; 1600;1200; 455;41;1242; P;+;+;60;)CrLf

Legend: Please read section *10.8.3* on page *87*.

10.8.5. Reset analog timing properties

Description: This command resets the analog timing properties.

Format		Example
Command	{:ANALOG#<in>@<S/A>I=RESET}	→ {:analog#2@si=reset}
Response	(ANALOG#<in>@<S/A>I= *<PHS>;<FHS>;* *<HS>;<VS>;* *<HP>;<VP>;<LCF>;* *<FORM>;<VSP>;<HSP>;<FPS>)CrLf*	← (ANALOG#1@SI= 0;2160; 1600;1200; 455;41;1242; P;+;+;60;)CrLf

Legend: Please read section *10.8.3* on page *87*.

10.8.6. Set analog color properties

Description: Set analog color properties data of the input ports.

Format		Example
Command	{:PICTURE#<in>@<S/A>I= *<DF_CHA>;<DF_CHB>;<DF_CHC>;* *<G_CHA>;<G_CHB>;<G_CHC>;* *<O_CHA>;<O_CHB>;<O_CHC>;* *<CONT>;<SAT>;<BRIGHT>;<HUE>;)*	→ {:picture#2@si= *1023;1023;1023;* *1023;1023;1023;* *1023;1023;1023;* *128;128;0;0;)CrLf*
Response	(PICTURE#<in>@<S/A>I= *<DF_CHA>;<DF_CHB>;<DF_CHC>;* *<G_CHA>;<G_CHB>;<G_CHC>;* *<O_CHA>;<O_CHB>;<O_CHC>;* *<CONT>;<SAT>;<BRIGHT>;<HUE>;)CrLf*	← (PICTURE#2@SI= 1023;1023;1023; 1023;1023;1023; 1023;1023;1023; 128;128;0;0;)CrLf

Legend:

<S/A>: **Affected ports:**
S = single selected input
A = all inputs

<DF_CHA> **Digital fine-clamp for CH-A:**
0-4096

<DF_CHB> **Digital fine-clamp for CH-B:**
0-4095

<DF_CHC> **Digital fine-clamp for CH-C:**
0-4095

<G_CHA> **Gain for CH-A:**
0-1023

<G_CHB> **Gain for CH-B:**
0-1023

<G_CHC> **Gain for CH-C:**
0-1023

<O_CHA> **Offset for CH-A:**
0-1023

<O_CHB> **Offset for CH-B:**
0-1023

<O_CHC> **Offset for CH-C:**

	0-1023
<CONT>	**Contrast:**
	0-255
<SAT>	**Saturation:**
	0-255
<BRIGHT>	**Brightness:**
	0-255
<HUE>	**Hue:**
	0-127

Info: *Analog color setting will not be saved automatically. User can save it with the next command.*

10.8.7. Save analog color properties

Description: Save analog color properties of the input ports.

Format		Example
Command	{:PICTURE#<in>@<S/A>I=SAVE}	→ {:picture#3@si=save*)CrLf*
Response	(P SAVED)*CrLf* (PICTURE#<in>@<S/A>I= *<DF_CHA>;<DF_CHB>;<DF_CHC>;* *<G_CHA>;<G_CHB>;<G_CHC>;* *<O_CHA>;<O_CHB>;<O_CHC>;* *<CONT>;<SAT>;<BRIGHT>;<HUE>;)CrLf*	← (P SAVED)CrLf ← (PICTURE#3@SI= 1023;1023;1023; 1023;1023;1023; 1023;1023;1023; 128;128;0;0;)CrLf

Legend: Please read section *10.8.6* on page *88*.

10.8.8. Query analog color properties

Description: Check analog color properties data of the input ports.

Format		Example
Command	{:PICTURE#<in>@<S/A>I=?}	→ {:picture#2@si=?}
Response	(PICTURE#<in>@<S/A>I= *<DF_CHA>;<DF_CHB>;<DF_CHC>;* *<G_CHA>;<G_CHB>;<G_CHC>;* *<O_CHA>;<O_CHB>;<O_CHC>;* *<CONT>;<SAT>;<BRIGHT>;<HUE>;)CrLf*	← (PICTURE#2@SI= 1023;1023;1023; 1023;1023;1023; 1023;1023;1023; 128;128;0;0;)CrLf

Legend: Please read section *10.8.6* on page *88*.

10.8.9. Reset analog color properties

Description: Reset analog color properties of the input ports.

Format		Example
Command	{:PICTURE#<in>@<S/A>I=FACTORY}	→ {:picture#2@si=factory}
Response	(P SAVED)*CrLf* (PICTURE#<in>@<S/A>I= *<DF_CHA>;<DF_CHB>;<DF_CHC>;* *<G_CHA>;<G_CHB>;<G_CHC>;* *<O_CHA>;<O_CHB>;<O_CHC>;* *<CONT>;<SAT>;<BRIGHT>;<HUE>;)CrLf*	← (P SAVED)*CrLf* ← (PICTURE#2@SI= 1023;1023;1023; 1023;1023;1023; 1023;1023;1023; 128;128;0;0;)CrLf

Legend: Please read section *10.8.6* on page *88*.

10.8.10. Set analog input audio parameters

Description: This command changes the setup of the ADC on the audio board.

Format		Example
Command	{:AUDIN#<in>@<S/A>I=<VOL>;<BAL>;<GAIN>;<PHS>;<DCF>}	→ {:audin#2@si=0;50;0;0;0;}
Response	(:AUDIN#<in>@<S/A>I=<VOL>;<BAL>;<GAIN>;<PHS>;<DCF>)CrLf	← (AUDIN#2@SI=0;50;0;0;0;)CrLf

Legend:

<S/A>: **Affected ports:**
S = single selected output
A = all outputs

<VOL>: **Volume:** (default 0}
0, 100, 200, .. , 6200, 6300
where 0 = 0 dB, 6300 = - 63 dB

<BAL>: **Balance:** (default 50)
0 .. 100 %

<GAIN>: **Gain:** (default 0)
0, 3, 6, .. , 21, 24 dB

<POL>: **Polarity inversion:** (default 0)
0 = Normal (phase=0°),
1= Inverted (phase=180°)

<DCF>: **Audio DC filter:** (default 0)
0 = DC filter off,
1 = DC filter on.

10.8.11. Query analog input audio properties

Description: This command reads the setup of the ADC on the audio board.

Format		Example
Command	{:AUDIN#<in>@<S/A>I=?}	→ {:audin#2@si=?}
Response	(:AUDIN#<in>@<S/A>I=<VOL>;<BAL>;<GAIN>;<PHS>;<DCF>)CrLf	← (AUDIN#2@SI=0;50;0;0;0;)CrLf

Legend: Please read section *10.8.10* on page *90*.

10.8.12. Set the no sync picture properties

Description: If there is no incoming video signal on the selected input and this function is enabled the device gives a monochrome 640x480p60 picture to the output. This command enables/disables this function and sets the color of the no sync picture with an RGB value on the active input port.

Format		Example
Command	{:SETBG#<in>@<S/A>I=<RED>;<GREEN>;<BLUE>;<nss>}	→ {:setbg#1@si=255;255;0;1}
Response	(SETBG#1@SI=<RED>;<GREEN>;<BLUE>;<nss>)CrLf	← (SETBG#1@SI=255;255;0;1)CrLf

Legend:

<S/A>: **Affected ports:**
S = single selected input
A = all outputs

<RED> Red component of RGB value.

<GREEN> Green component of RGB value.

<BLUE> Blue component of RGB value.

<nss> **No Sync screen enable**
0 = No Sync screen disable
1 = No Sync screen enable

Explanation: The example shows how to enable and set yellow colored monochrome no sync picture on the DVI-D input port.

Info: *Enabling/Disabling or setting of the color of no sync picture is available only on the selected active input.*

10.8.13. Query the no sync picture properties

Description: This command reads the enabling status and the RGB color code of the no sync picture on the active input port.

Format		Example
Command	{:SETBG#<in>@<S/A>I=?}	→ {:SETBG#1@SI=?}
Response	(SETBG#1@SI= <RED>;<GREEN>;<BLUE>;1)CrLf	← (SETBG#1@SI=255;255;0;1)CrLf

Legend: Please read section *10.8.12* on page *90*.

Explanation: The no sync picture is enabled and its color is the (255, 255, 0) RGB coded yellow on the DVI-D input port.

Info: *Querying of the color of no sync picture is available only on the selected active input.*

10.8.14. Query timings of the incoming signal

Description: This command reads out the properties of the incoming signal on the selected input ports.

Format		Example
Command	{:GETTIMINGS#<in>@<S/A>=?}	→ {:GETTIMINGS#1@SI=?}
Response	(GETTIMINGS#<in>@<S/A>= <TLW>; <LW>; <HFP>; <HW>; <HBP>; <TH>; <H>; <VFP>; <VW>; <VBP>; <TMDS>; <BPP>;)CrLf	← (GETTIMINGS#1@SI= 2200; 1920; 89; 44; 147; 1125; 1080; 4; 5; 36; 148352; 24;)CrLf

Legend: <S/A>: **Affected ports:**
S = single selected input
A = all inputs
<TLW>: *Total Line Width*
<LW>: *Line Width*
<HFP>: *Hsync Front Porch*
<HW>: *Hsync Width*
<HBP> *Hsync Back Porch*
<TH> *Total Height*
<H> *Height*
<VFP> *Vsync Front Porch*
<VW> *Vsync Width*
<VBP> *Vsync Back Porch*
<TMDS> *TMDS clock in kHz*
<BPP> *Bit/Pixel*

10.8.15. Save preset

Description: This command saves the actual analog timing properties for the current resolution as a preset.

Format		Example
Command	{:AF#<in>@SI=<IPS>}	→ {:af#2@si=s}
Response	(AF SAVED)CrLf	← (AF SAVED)CrLf

Legend: <IPS> **Input port selector:**
S = Properties will be saved to the current input port.
A = Properties will be saved to all of the input ports.
(This option is reserved for compatibility reasons.)

10.8.16. Delete preset

Description: This command deletes the desired preset from the analog input port.

Format		Example
Command	{:AF#<in>@SI=DEL;<PID>}	→ {:af#2@si=DEL;2}
Response	(AF DELETED)CrLf	← (AF DELETED)CrLf

Legend: <PID> Preset ID number:
Explanation: The command deletes the numbered 2 preset.

10.8.17. Delete all presets

Description: This command deletes all the presets from the analog input port.

Format		Example
Command	{:AF#<in>@SI=DEL;255}	→ {:af#2@si=DEL;255}
Response	(AF DELETED)CrLf	← (AF DELETED)CrLf

Explanation: The command deletes all the presets.

10.8.18. Clone preset

Description: This command clones the desired preset to all of the input ports.

Format		Example
Command	{:AF#<in>@SI=CL;<PID>}	→ {:af#2@si=CL;1}
Response	(AF CLONED)CrLf	← (AF CLONED)CrLf

Legend: <PID> Preset ID number
Explanation: This command is reserved for compatibility reasons.

10.8.19. List presets

Description: This command reads and lists all the saved presets from the analog VGA input port.

Format		Example
Command	{:AF#<in>@<S/A>I=LIST}	→ {:af#2@si=list}
Response	(AF#<in>:<PID>= <BL>;<LCF>;<FCL>;<LCVS>; <SCN>;<VSPP>;<HSPP>; <VPL>;<HPP>;<VSL>;<HSP>; <FHSP>;<PHS>;)CrLf (AF END)	← (AF#2:1= 3045;1249;1864;3; 0;1;1; 50;495;1200;1600; 2161;23;)CrLf ← (AF END)

Legend: <S/A>: **Affected ports:**
S = single selected input
A = all inputs
<PID> Preset ID number
<BL>: (8 x 28.6363M) / fhsync

<LCF>:	28.6363M / (256 * fvsync)
<FCL>:	Number of lines in a whole picture
<LCVS>	Number of lines during v.sync
<SCN>	Screen scan type: 0 = progressive 1 = interlaced
<*VSPP*>	*V.sync polarity* 0 = negative 1 = positive
<*HSPP*>	H.sync polarity 0 = negative 1 = positive
<*VPL*>	Vertical position in lines
<*HPP*>	Horizontal position in pixels
<*VSL*>	Vertical size in lines
<HSP>	Horizontal size in pixels
<*FHSP*>	Full horizontal size in pixels
<*PHS*>	Phase (0 .. 31)

Explanation: One preset was saved to the input port 2.

10.8.20. Delete preset from all input ports

Description: This command deletes the desired from all analog input ports.

Format		Example
Command	{:AF#<in>@SI=DELALL;<PID>}	→ {:af#2@si=delall;1}
Response	(AF DELETED)CrLf	← (AF DELETED)CrLf

Legend: <PID> Preset ID number
Explanation: This command is reserved for compatibility reasons.

10.9. Output properties

The following commands are setting up the properties of the output ports. If only one or a few parameters have to be modified, the protocol enables to mask the other parameters, so they can stay untouched. To mask a parameter use "x" or "X" as its value.

Example: {:HDMI#1@SO=H;x;x;x;1;} Set output port no. 2 to HDMI 24 bit.

Info: *If the input port is not a selected, active port and this port is affected by an input command the response will be N/A.*

10.9.1. Set output video properties

Description: This command is for configuring output port settings.

Format		Example
Command	{:HDMI#<out>@<S/A>O= <MODE>; <CSPAC>; <CRANG>; <SUBS>; <HDCP>;}	→ {:HDMI#1@SO=H;x;x;x;1;}
Response	(HDMI#<out>@<S/A>O= **G**<CON><MODE><SIG> <HDCP><HPD>; **O**<MODE><CSPAC> <CRANG>;<SUBS> <HDCP>) **M**<HSUP><AUTH><REP> <YUV4><YUV2> <AUD><PCM><DC>CrLf	← (HDMI#1@SO=G0H100;OHAAA1;)CrLf

Legend for command:

<S/A>: **Affected ports:**
S = single-selected output
A = all outputs
<MODE>: **Output signal mode:**
A = Automatic (this setting gives a response as D/H/1/2),
D = DVI,
H = HDMI 24bit,
1 = HDMI 30bit deepcolor,
2 = HDMI 36bit deepcolor.
<CSPAC>: Reserved for legacy reasons. Set 'X' here.
<CRANG>: Reserved for legacy reasons. Set 'X' here.
<SUBS>: Reserved for legacy reasons. Set 'X' here.
<HDCP>: **HDCP encryption:**
A = automatic,
1 = always use.

Legend for response:

G block: General status information

<CON>: **Connection sense:**
0 = There is no attached sink device,
1 = Sink device attached (termination is present)

<MODE>: **Output signal mode**
D = DVI,
H = HDMI 24bit,
1 = HDMI 30bit deepcolor
2 = HDMI 36bit deepcolor

<SIG>: **Signal present**
0 = No valid signal is routed to this port,
1 = Valid video signal is present.

<HDCP>: **HDCP encryption status**
0 = HDCP encryption is inactive,
1 = HDCP encryption is active.

<HPD>: **Hotplug detection**
0 = Hotplug detect signal is low,
1 = Hotplug detect signal is high.

O block: Actual output settings

<MODE>: Same as in G block.
<CSPAC>: Reserved for legacy reasons. Response is always 'A'.
<CRANG>: Reserved for legacy reasons. Response is always 'A'.
<SUBS>: Reserved for legacy reasons. Response is always 'A'.
<HDCP>: Same as in G block.

M block: Attached device (monitor) information

<HSUP>: 0 = Sink device does not support HDMI
1 = Sink device supports HDMI

<AUTH>: 0 = HDCP authentication failed
1 = HDCP authentication is successful

<REP>: 0 = Attached device is not an HDCP repeater
1 = Attached device is an HDCP repeater

<YUV4>: 0 = Attached device does not support YUV 4:4:4
1 = Attached device supports YUV 4:4:4

<YUV2>: 0 = Attached device does not support YUV 4:2:2
1 = Attached device supports YUV 4:2:2

<AUD>: 0 = Attached device has no audio capabilities
1 = Attached device has audio capabilities

<PCM>: This field represents a byte in hexadecimal format.
The binary bits show support for different audio bit rates.
bit 0 - Sink device supports 32kHz PCM audio
bit 1 - Sink device supports 44kHz PCM audio
bit 2 - Sink device supports 48kHz PCM audio
bit 3 - Sink device supports 88kHz PCM audio
bit 4 - Sink device supports 96kHz PCM audio
bit 5 - Sink device supports 176kHz PCM audio
bit 6 - Sink device supports 192kHz PCM audio
bit 7 - Reserved (Always 0 in this version of protocol)

<DC>: This field is a number is decimal format.
The binary bits show support for different color modes.
bit 2 - HDMI deep color 30bits/pixel mode is supported
bit 1 - HDMI deep color 36bits/pixel mode is supported
bit 0 - YUV444 color space is supported in DC modes

Info: *The M block can be missing if there is no attached device on output.*

10.9.2. Query output video properties

Description: Displays the status for output port.

Format		Example	
Command	{:HDMI#<out>@<S/A>O=?}	→	{:hdmi#1@so=?}
Response	(HDMI#<out>@<S/A>O= **G**<CON><MODE><SIG> <HDCP><HPD>; **O**<MODE><CSPAC> <CRANG>;<SUBS> <HDCP>) **M**<HSUP><AUTH><REP> <YUV4><YUV2> <AUD><PCM><DC>CrLf	←	(HDMI#1@SO= G1H111; OAAAAA; M100111070;)CrLf

Legend: Please read section *10.9.1* on page *93*.

10.10. Error responses

Invalid input number

Description: Given input number exceeds the maximum number of inputs or equals zero.

Response	(ERR01)CrLf

Invalid output number

Description: Given output number exceeds the installed number of outputs or equals zero.

Response	(ERR02)CrLf

Invalid value

Description: Given value exceeds the maximum allowed value can be sent.

Response	(ERR03)CrLf

Invalid preset number

Description: Given preset number exceeds the maximum allowed preset number.

Response	(ERR04)CrLf

11. Commands – Quick summary

Device Status commands	Section	Command
View product type	10.3.1	{I}
View serial number	10.3.2	{S}
View Firmware version of the CPU	10.3.3	{F}
View installed controllers' firmware	10.3.4	{FC}
View device's temperature	10.3.5	{ST}
View CPU firmware compile time	10.3.6	{CT}
View installed I/O boards	10.3.7	{IS}
Query all port status	10.3.8	{PS}

System commands	Section	Command
Query current control protocol	10.4.1	{P_?}
Change RS-232 baud rate	10.4.2	{RS232BAUD=<rate>}
Query RS-232 baud rate	10.4.3	{RS232BAUD=?}
Reload factory defaults	10.4.4	{FACTORY=<f1>;<f2>;…;<fx>}
Set the RS-232 operation mode	10.4.5	{RS232=<mode>}
Query the RS-232 operation mode	10.4.6	{RS232=?}
Clear HDCP key cache	10.4.7	{:HDCPRESET}
Count HDCP keys	10.4.8	{:HDCPTEST<in>@<num>}
Restart	10.4.9	{RST}
View error list	10.4.10	{ELIST=?}
Configure remote alerts	10.4.11	{ELEVELSEND#<p>=<0>;<1>;<2>;<3>;<4>}
Query level of remote alerts	10.4.12	{ELEVELSEND#<p>=?}
Set the video priority settings	10.4.13	{VIDEOPRIORITY=<vpmode>}
Query the video priority settings	10.4.14	{VIDEOPRIORITY=?}
Set the audio priority settings	10.4.15	{AUDIOPRIORITY=<apmode>}
Query the audio priority settings	10.4.16	{AUDIOPRIORITY=?}

EDID router commands	Section	Command
Save EDID to user memory (Learn EDID)	10.5.1	{<loc1>:<loc2>}
View emulated EDIDs on all inputs	10.5.2	{VEDID}
Watch EDID validity table	10.5.3	{WV<type>}
View EDID header	10.5.4	{WH<loc>}
Download EDID content from the	10.5.5	{WE<loc>}
Upload EDID content to the	10.5.6	{WL#<loc>}
Delete EDID from memory	10.5.7	{DE<loc>}

Input settings	Section	Command
Set input port properties	*10.8.1*	{:DVII#<in>@<S/A>I=<VIDEO>;<X1>;<X2>;<HDCP>}
Query input port properties	*0*	{:DVII#<in>@<S/A>I=?}
Set analog timing properties	*10.8.3*	{:ANALOG#<in>@<S/A>I=<PHS>;<FHS>;<HS>;<VS>;<HP>;<VP>;}
Query analog timing properties	*0*	{:ANALOG#<in>@<S/A>I=?}
Reset analog timing properties	*10.8.5*	{:ANALOG#<in>@<S/A>I=RESET}
Set analog color properties	*10.8.6*	{:PICTURE#<in>@<S/A>I=*<DF_CHA>;<DF_CHB>;<DF_CHC>;<G_CHA>;<G_CHB>;<G_CHC>;<O_CHA>;<O_CHB>;<O_CHC>;<CONT>;<SAT>;<BRIGHT>;<HUE>;)*
Save analog color properties	*10.8.7*	{:PICTURE#<in>@<S/A>I=SAVE}
Query analog color properties	*10.8.8*	{:PICTURE#<in>@<S/A>I=?}
Reset analog color properties	*10.8.9*	{:PICTURE#<in>@<S/A>I=FACTORY}
Set analog input audio parameters	*10.8.10*	{:AUDIN#<in>@<S/A>I=<VOL>;<BAL>;<GAIN>;<PHS>;<DCF>}
Query analog input audio properties	*10.8.11*	{:AUDIN#<in>@<S/A>I=?}
Set the no sync picture properties	*10.8.12*	{:SETBG#<in>@<S/A>I=<RED>;<GREEN>;<BLUE>;<nss>}
Query the no sync picture properties	*10.8.13*	{:SETBG#<in>@<S/A>I=?}
Query timings of the incoming signal	*10.8.14*	{GETTIMINGS#<in>@<S/A>=?}
Save preset	*10.8.15*	{:AF#<in>@SI=<IPS>}
Delete preset	*10.8.16*	{:AF#<in>@SI=DEL;<PID>}
Delete all presets	*10.8.17*	{:AF#<in>@SI=DEL;255}
Clone preset	*10.8.18*	{:AF#<in>@SI=CL;<PID>}
List presets	*10.8.19*	{:AF#<in>@<S/A>I=LIST}
Delete preset from all input ports	*10.8.20*	{:AF#<in>@SI=DELALL;<PID>}

Output settings	Section	Command
Set output video properties	*10.9.1*	{:HDMI#<out>@<S/A>O=<MODE>;<CSPAC>;<CRANG>;<SUBS>;<HDCP>;}
Query output video properties	*10.9.2*	{:HDMI#<out>@<S/A>O=?}

Control commands	Section	Command
Switch one input to one output	*10.6.1*	{<in>@<out>●<*A/V/AV*>}
Disconnect any inputs from output	*10.6.2*	{<in>@<out>}
View all connections on the output	*10.6.3*	{VC●<*A/V/AV*>}
Query the autoselect state	*10.6.4*	{AUTOSELECT=?}

Error log related commands	Section	Command
List a directory	*10.7.1*	{SD_DIR=<path>}
List the log file	*10.7.2*	{SD_GETT=<path>}
Clear the log file	*10.7.3*	{SD_FORMAT}

12. Firmware upgrade

For firmware upgrade please contact Lightware technical support:

Lightware Visual Engineering

15 Peterdy Street, Budapest H-1071, HUNGARY

Tel.: +36 1 889 6177

Fax.: +36 1 342 9903

E-mail: support@lightware.eu

Info: *Do not use the Lightware Bootloader Software version 3.2.9 or earlier for UMX-OPT-TX150R.*

13. Basic troubleshooting

General problems

Check the device

Check whether the device is properly powered. Try performing a reset through the controller software, or push the device's reset button.

Serial connection problems

Check the cable and the software settings

Check whether your serial cable is properly connected. In most cases there are more COM ports present in the operating system. Please verify the connection settings of your software. The extender communicates by default with 57**600** Baud, **8** data bit, **N**o parity, **1** stop bit.

Picture is not displayed or distorted

Check the cables (HDMI, DVI, VGA)

Due to the high data rates, the cables must fit very well. If your source or display has more connectors then make sure that the proper input port is selected.

Check the cables (fiber)

Due to the high data rates, high quality cables must be used. It is recommended to use OM3 or OM4 cables.

Check the crosspoint state

Check the connection between the inputs and the output port.

Check EDID related problems

Maybe your display device is not capable of receiving the sent video format. Try emulating your display device's EDID to the source.

Check the source

Check whether your source is powered on and configured properly. The HDMI output can be turned off on most DVD players. If the source is a computer, then verify that the VGA output is selected and active. Try restarting your computer; if you get a picture during the booting process, you have to review the driver settings.

HDCP issues

Non HDCP compliant display

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 a HDCP capable device (for example optical extender) is connected between the source and the display. In this case the content can't be viewed on non-HDCP capable displays.

Disable HDCP function. For further information please see section *6.13* on page *46*.

14. Specifications

General

Compliance ..... CE, UL

EMI/EMC ..... EN 55022 Class B

Safety ..... UL, CUL, GS, CR, RCM, PSE, Class II

Warranty ..... 3 years

Cooling ..... Convention only

Operating temperature ..... -20°C ~ +50°C (-4°F to +122°F)

Operating humidity ..... 10 ~ 90% RH, noncondensing

Power

Power adaptor ..... External

Input ..... 100-240 V AC 50/60 Hz

Output ..... +5V DC 2.5 A

Power consumption ..... 3.5 W (typ.) / 5 W (max.)

Heat dissipation ..... 11.9 BTU/h (typ.) / 17 BTU/h (max.)

Enclosure

Rack mountable ..... Yes

Material ..... 1 mm steel

Dimensions in mm ..... 221 W x 100.4 D x 26 H*

Dimensions in inch ..... 8.70 W x 3.95 D x 1.02 H*

Net Weight ..... 650 g

* Excluding connectors.

Control

Panel buttons ..... Yes, 4 buttons and 5 rotary switches

Serial port connector ..... DE-9F (9 pole D-SUB female for RS-232)

Available baud rates ..... 9600, 19200, 38400, 57600 Baud

Default baud rate for control ..... 57600 Baud, 8 bit, 1stop bit, no parity

USB port connector ..... Mini USB-B receptacle

Service menu ..... Yes

Audio and video inputs

HDMI input ..... 19-pole HDMI Type A receptacle
Reclocking on HDMI input ..... Yes, Pixel Accurate Reclocking
DVI-I connector ..... 29-pole, DVI-I digital and analog
Reclocking on DVI digital input ..... Yes, Pixel Accurate Reclocking
Input cable equalization ..... Yes, digital only, max 20 m
VGA (YPbPr or RGB) input ..... DE-15F (15-pole D-sub Female)
EDID emulation on video inputs ..... Yes, analog and digital
S/PDIF Digital audio input ..... RCA receptacle
Analog audio 1 input ..... 3.5mm TRS connector (approx. 1/8'' jack)
Analog audio 1 signal type ..... analog stereo, unbalanced
Analog audio 2 input ..... 3.5mm TRS connector (approx. 1/8'' jack)
Analog audio 2 signal type ..... analog stereo, unbalanced
EDID read from optical output ..... Yes, analog and digital
Power connector ..... locking DC connector (2.5/5.5 mm)

Optical output

Fiber ..... 50/125 SC Multimode preferred or 62.5/125 SC Multimode
Laser wavelengths - high speed ..... 4ch. CWDM: 778; 800; 825; 850 nm
Laser wavelengths - low speed ..... 2ch. CWDM: 911; 980 nm
Laser class specification ..... Class 3R
Transmitter output OMA* ..... -6.25 dBm (worst case)
Receiver OMA* sensitivity ..... -14.25 dBm (worst case)
Optical loss budget ..... 8 dBm (worst case)
Transmission distance ..... 2500 meters (using OM4 type fiber)
OMA*:..... Optical Modulation Amplitude

Digital video signal

Signal standard ..... HDMI standard which supports:
..... Deep color,
..... Embedded audio
..... Dolby TrueHD bitstream capable,
Color depth ..... maximum 36 bits, 12 bit/color
Color format ..... RGB, YCbCr 4:4:4, xvYCC digital video
Color space conversion ..... Yes, always from any to RGB
Maximum data rates ..... 6.75 Gbps (2.25 Gbps /TMDS channel)
Maximum pixel clock ..... 225 MHz
Video delay ..... 0 frame
Resolutions ..... all between 640x480 and 2048x1080@60 Hz deep color
HDTV resolutions 720p, 1080i, 1080p
Reclocking ..... Pixel Accurate Reclocking

EDID Support ..... Advanced EDID management (analog and digital)

EDID Emulation ..... Yes, 20 factory preset, 16 user programmable

Output mode ..... Automatic or manual (DVI or HDMI)

HDCP compliant ..... Yes

RGB input signal

RGB amplitude ..... 0.7 V_{p-p}

Impedance ..... 75 Ω

G.Sync ..... 1.0 V_{p-p}

Impedance ..... 75 Ω

H.Sync, V.Sync .....TTL high impedance, automatic pos/neg polarity

Scanning frequency, H.Sync ..... 15 ~ 100 kHz

Scanning frequency, V.Sync ..... 50 ~ 100 Hz

YPbPr input signal

Y (luminance) amplitude, including sync ..... 1.0 V_{p-p}

Impedance ..... 75 Ω

PbPr/CbCr (chroma) amplitude ..... 0.7 V_{p-p}

Impedance ..... 75 Ω

H.Sync, V.Sync .....TTL high impedance, automatic pos/neg polarity

Scanning frequency, H.Sync ..... 15 ~ 100 kHz

Scanning frequency, V.Sync ..... 50 ~ 100 Hz

General analog audio signal

Overall system gain ..... -1.3 dB

Frequency response ..... 20 Hz – 0.45 fs (e.g. 21.6 kHz @ 48 kHz)

S/N ..... > 66 dB

Analog audio input

Impedance ..... >10 kOhm

Coupling mode ..... AC (capacitive) coupled

Nominal level ..... 0 dBu

Maximum level ..... 1VRMS (~2dBu)

Input gain adjustment ..... + 0 dB ... + 24 dB in 3 dB steps

A/D resolution ..... 24 bits

A/D sample rate ..... 48 kHz, 96 kHz

Software supported resolutions

	Scan type	HS	VS	Resolution		Scan type	HS	VS	Resolution
1	progressive	pos	pos	1440 x 288 @ p 50	76	progressive	pos	pos	1024 x 768 @ p 75
2	progressive	pos	pos	1440 x 288 @ p 50	77	progressive	neg	pos	1280 x 768 @ p 75
3	progressive	pos	pos	1440 x 288 @ p 50	78	progressive	pos	pos	1024 x 768 @ p 85
4	progressive	pos	neg	640 x 350 @ p 85	79	progressive	neg	pos	1280 x 768 @ p 85
5	progressive	pos	neg	640 x 400 @ p 85	80	interlaced	pos	pos	1024 x 768 @ i 90
6	progressive	neg	pos	720 x 400 @ p 85	81	progressive	pos	neg	1024 x 768 @ p 120
7	progressive	neg	pos	640 x 400 @ p 85	82	progressive	pos	neg	1280 x 768 @ p 120
8	progressive	neg	pos	720 x 400 @ p 85	83	progressive	pos	neg	1360 x 768 @ p 120
9	progressive	neg	neg	640 x 480 @ p 60	84	progressive	neg	neg	1360 x 768 @ p 60
10	progressive	neg	neg	720 x 480 @ p 60	85	progressive	pos	neg	1280 x 800 @ p 60
11	progressive	pos	pos	848 x 480 @ p 60	86	progressive	neg	pos	1280 x 800 @ p 60
12	progressive	neg	neg	640 x 480 @ p 73	87	progressive	neg	pos	1280 x 800 @ p 75
13	progressive	neg	neg	640 x 480 @ p 75	88	progressive	neg	pos	1280 x 800 @ p 85
14	progressive	neg	neg	640 x 480 @ p 85	89	progressive	pos	neg	1280 x 800 @ p 120
15	progressive	neg	neg	640 x 480 @ p 60	90	progressive	pos	pos	1152 x 864 @ p 75
16	interlaced	neg	neg	640 x 480 @ i 60	91	progressive	pos	neg	1440 x 900 @ p 60
17	interlaced	neg	neg	640 x 480 @ i 60	92	progressive	neg	pos	1440 x 900 @ p 60
18	progressive	neg	neg	640 x 480 @ p 60	93	progressive	pos	pos	1600 x 900 @ p 60
19	progressive	neg	neg	640 x 480 @ p 60	94	progressive	neg	pos	1440 x 900 @ p 75
20	interlaced	neg	neg	640 x 480 @ i 60	95	progressive	neg	pos	1440 x 900 @ p 85
21	progressive	neg	neg	640 x 480 @ p 60	96	progressive	pos	neg	1440 x 900 @ p 120
22	progressive	neg	neg	640 x 480 @ p 60	97	progressive	pos	pos	1280 x 960 @ p 60
23	progressive	neg	neg	640 x 480 @ p 72	98	progressive	pos	pos	1280 x 960 @ p 85
24	progressive	neg	neg	640 x 480 @ p 72	99	progressive	pos	neg	1280 x 960 @ p 120
25	progressive	neg	neg	640 x 480 @ p 120	100	progressive	pos	pos	1280 x 960 @ p 60
26	progressive	neg	neg	640 x 480 @ p 120	101	progressive	pos	pos	1280 x 1024 @ p 60
27	interlaced	neg	neg	720 x 480 @ i 60	102	progressive	pos	pos	1280 x 1024 @ p 75
28	interlaced	neg	neg	720 x 480 @ i 60	103	progressive	pos	pos	1280 x 1024 @ p 85
29	progressive	neg	neg	720 x 480 @ p 60	104	progressive	pos	neg	1280 x 1024 @ p 120
30	progressive	neg	neg	720 x 480 @ p 60	105	progressive	neg	neg	1360 x 1024 @ p 48
31	progressive	neg	neg	720 x 480 @ p 72	106	progressive	neg	neg	1360 x 1024 @ p 48
32	progressive	neg	neg	720 x 480 @ p 72	107	progressive	neg	neg	1360 x 1024 @ p 50
33	progressive	neg	neg	720 x 480 @ p 120	108	progressive	neg	neg	1360 x 1024 @ p 60
34	progressive	neg	neg	720 x 480 @ p 120	109	progressive	neg	neg	1360 x 1024 @ p 60
35	progressive	neg	neg	640 x 480 @ p 60	110	progressive	neg	neg	1360 x 1024 @ p 72
36	interlaced	neg	neg	720 x 480 @ i 60	111	progressive	neg	neg	1360 x 1024 @ p 72
37	progressive	neg	neg	720 x 480 @ p 60	112	progressive	neg	neg	1360 x 1024 @ p 72
38	interlaced	neg	neg	1440 x 480 @ i 60	113	progressive	pos	neg	1400 x 1050 @ p 60
39	progressive	neg	neg	704 x 480 @ p 30	114	progressive	neg	pos	1400 x 1050 @ p 60
40	progressive	neg	neg	720 x 480 @ p 30	115	progressive	pos	neg	1680 x 1050 @ p 60
41	progressive	neg	neg	712 x 486 @ p 30	116	progressive	neg	pos	1680 x 1050 @ p 60
42	progressive	pos	pos	720 x 576 @ p 50	117	progressive	neg	pos	1400 x 1050 @ p 75
43	interlaced	pos	pos	1440 x 576 @ i 52	118	progressive	neg	pos	1680 x 1050 @ p 75
44	interlaced	pos	pos	2880 x 576 @ i 52	119	progressive	neg	pos	1400 x 1050 @ p 85
45	interlaced	neg	neg	720 x 576 @ i 50	120	progressive	neg	pos	1680 x 1050 @ p 85
46	interlaced	neg	neg	1440 x 576 @ i 50	121	progressive	pos	neg	1400 x 1050 @ p 120
47	progressive	neg	neg	702 x 576 @ p 25	122	progressive	pos	pos	1920 x 1080 @ p 24
48	progressive	neg	neg	704 x 576 @ p 25	123	progressive	pos	pos	1920 x 1080 @ p 24
49	progressive	neg	neg	720 x 576 @ p 25	124	progressive	pos	pos	1920 x 1080 @ p 25
50	progressive	neg	neg	768 x 576 @ p 25	125	progressive	pos	pos	1920 x 1080 @ p 30
51	progressive	neg	neg	720 x 576 @ p 50	126	progressive	pos	pos	1920 x 1080 @ p 30
52	progressive	neg	neg	768 x 576 @ p 50	127	interlaced	pos	pos	1920 x 1080 @ i 52
53	progressive	neg	neg	768 x 576 @ p 50	128	progressive	pos	pos	1920 x 1080 @ p 60
54	interlaced	neg	neg	1440 x 576 @ i 50	129	interlaced	neg	neg	1920 x 1080 @ i 60
55	progressive	pos	pos	800 x 600 @ p 56	130	interlaced	neg	neg	1920 x 1080 @ i 60
56	progressive	pos	pos	800 x 600 @ p 60	131	progressive	neg	neg	1920 x 1080 @ p 60
57	progressive	pos	pos	800 x 600 @ p 72	132	progressive	neg	neg	1920 x 1080 @ p 60
58	progressive	pos	pos	800 x 600 @ p 75	133	progressive	neg	neg	1920 x 1080 @ p 72
59	progressive	pos	pos	800 x 600 @ p 85	134	progressive	neg	neg	1920 x 1080 @ p 72
60	progressive	pos	neg	800 x 600 @ p 120	135	progressive	pos	pos	1920 x 1080 @ p 24
61	progressive	pos	pos	1280 x 720 @ p 50	136	progressive	pos	pos	1920 x 1080 @ p 30
62	progressive	pos	pos	1280 x 720 @ p 60	137	progressive	pos	pos	1920 x 1080 @ p 50
63	progressive	neg	neg	1280 x 720 @ p 60	138	interlaced	pos	pos	1920 x 1080 @ i 50
64	progressive	neg	neg	1280 x 720 @ p 60	139	progressive	pos	pos	1920 x 1080 @ p 60
65	progressive	neg	neg	1280 x 720 @ p 72	140	progressive	neg	neg	1920 x 1080 @ p 60
66	progressive	neg	neg	1280 x 720 @ p 72	141	interlaced	pos	pos	1920 x 1080 @ i 60
67	progressive	neg	neg	1280 x 720 @ p 120	142	progressive	pos	pos	2048 x 1152 @ p 60
68	progressive	neg	neg	1280 x 720 @ p 120	143	progressive	pos	pos	1600 x 1200 @ p 60
69	progressive	neg	neg	1024 x 768 @ p 60	144	progressive	pos	neg	1920 x 1200 @ p 60
70	progressive	pos	neg	1280 x 768 @ p 60	145	progressive	neg	pos	1920 x 1200 @ p 60
71	progressive	neg	pos	1280 x 768 @ p 60	146	progressive	pos	pos	1600 x 1200 @ p 65
72	progressive	pos	pos	1360 x 768 @ p 60	147	progressive	pos	pos	1600 x 1200 @ p 70
73	progressive	pos	pos	1366 x 768 @ p 60	148	progressive	pos	pos	1600 x 1200 @ p 75
74	progressive	pos	pos	1366 x 768 @ p 60	149	progressive	neg	pos	1792 x 1344 @ p 60
75	progressive	neg	neg	1024 x 768 @ p 70	150	progressive	neg	pos	1856 x 1392 @ p 60

Hardware supported resolutions

Videos Standard	Lines per Frame	Active Pixels per Line/Frame	Vertical Frequency (Hz)	Horizontal Frequency (KHz)	Sampling Frequency (MHz)
480i 2x1	526	720 x 480	60	15,734	27,000
480i 4x1	525	720 x 480	60	15,734	54,000
480p 2x1	525	720 x 483	60	31,469	54,000
576p 2x1	526	720 x 576	50	31,250	54,000
576i 2x1	527	720 x 576	50	15,625	27,000
576i 4x1	525	720 x 576	50	15,625	54,000
720p	750	1280 x 720	60	45,000	74,250
720p	750	1280 x 720	50	37,500	74,250
1080p	1125	1920 x 1080	60	67,500	148,500
1080p	1125	1920 x 1080	50	56,250	148,500
1080i	1125	1920 x 1080	60	33,750	74,250
1080i	1125	1920 x 1080	50	28,125	74,250

Graphics Standard	Active Pixels per Line/Frame	Vertical Frequency (Hz)	Horizontal Frequency (KHz)	Sampling Frequency (MHz)
VGA	640 x 480	59,930	31,460	25,170
VGA	640 x 480	72,810	37,860	31,500
VGA	640 x 480	75,000	37,500	31,500
VGA	640 x 480	85,010	43,270	36,000
SVGA	800 x 600	56,250	35,160	36,000
SVGA	800 x 600	60,320	37,880	40,000
SVGA	800 x 600	72,190	48,080	50,000
SVGA	800 x 600	75,000	46,880	49,500
SVGA	800 x 600	85,060	53,670	56,250
XGA	1024 x 768	60,000	48,360	65,000
XGA	1024 x 768	70,070	56,480	75,000
XGA	1024 x 768	75,030	60,020	78,750
XGA	1024 x 768	85,000	68,680	94,500
SXGA	1280 x 1024	60,020	63,980	108,000
SXGA	1280 x 1024	75,025	79,976	135,000

Maximum extension distances

Resolution	OM1 (62,5/125)	OM2 (50/125)	OM3 (50/125)	OM4 (50/125)
1920 x 1080p@60Hz 24bpp	250 m	600 m	1200 m	2500 m
1920 x 1080p@60Hz 36bpp	150 m	400 m	800 m	1300 m

Info: *The actual achievable distances may differ, depending on the topology of the whole system. The use of OM3 or OM4 category cables is always recommended.*

EDID list

The Emulated EDIDs on the video inputs can be chosen by rotary switches only:

	DVI-D EDID rotary
#0	Copy from SC MM OUT (Dynamic EDID)
#1	Factory EDID Universal HDMI (default)
#2	Factory EDID (DVI) 1024x768@60
#3	Factory EDID (HDMI) 1280x720p@60
#4	Factory EDID (HDMI) 1920x1080p@60
#5	Factory EDID (DVI) 1920x1200@60
#6	User EDID (def.: Univ. HDMI EDID)
#7	User EDID (def.: Univ. HDMI EDID)
#8	User EDID (def.: Univ. HDMI EDID)
#9	User EDID (def.: Univ. HDMI EDID)

	DVI-A EDID rotary
#0	Copy from SC MM OUT (Dynamic EDID)
#1	Factory EDID Universal Analog (default)
#2	Factory EDID (Analog) 1024x768@60
#3	Factory EDID (Analog) 1280x720@60
#4	Factory EDID (Analog) 1920x1080@60
#5	Factory EDID (Analog) 1920x1200@60
#6	User EDID (def.: Univ. Analog EDID)
#7	User EDID (def.: Univ. Analog EDID)
#8	User EDID (def.: Univ. Analog EDID)
#9	User EDID (def.: Univ. Analog EDID)

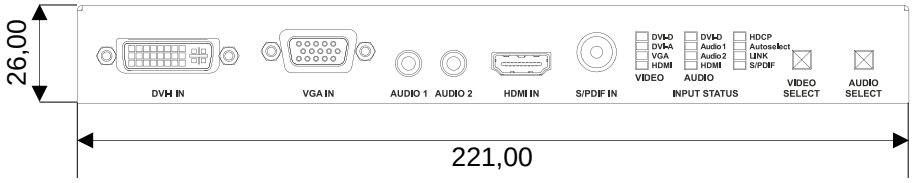
	VGA EDID rotary
#0	Copy from SC MM OUT (Dynamic EDID)
#1	Factory EDID Universal Analog (default)
#2	Factory EDID (Analog) 1024x768@60
#3	Factory EDID (Analog) 1280x720@60
#4	Factory EDID (Analog) 1920x1080@60
#5	Factory EDID (Analog) 1920x1200@60
#6	User EDID (def.: Univ. Analog EDID)
#7	User EDID (def.: Univ. Analog EDID)
#8	User EDID (def.: Univ. Analog EDID)
#9	User EDID (def.: Univ. Analog EDID)

	HDMI EDID rotary
#0	Copy from SC MM OUT (Dynamic EDID)
#1	Factory EDID Universal HDMI (default)
#2	Factory EDID (DVI) 1024x768@60
#3	Factory EDID (HDMI) 1280x720p@60
#4	Factory EDID (HDMI) 1920x1080p@60
#5	Factory EDID (DVI) 1920x1200@60
#6	User EDID (def.: Univ. HDMI EDID)
#7	User EDID (def.: Univ. HDMI EDID)
#8	User EDID (def.: Univ. HDMI EDID)
#9	User EDID (def.: Univ. HDMI EDID)

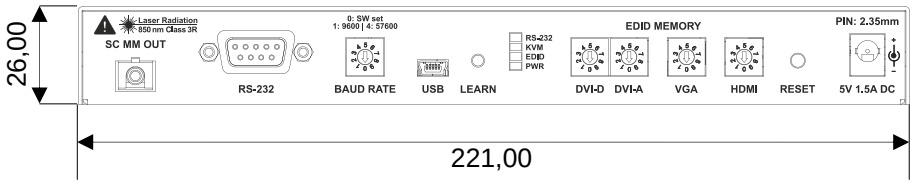
15. Mechanical Drawings

The given values are in mm.

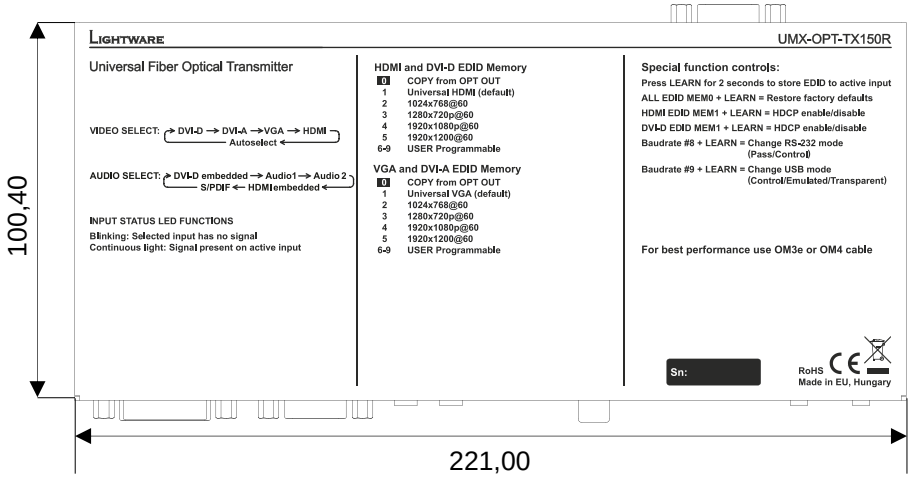
Front view



Rear view

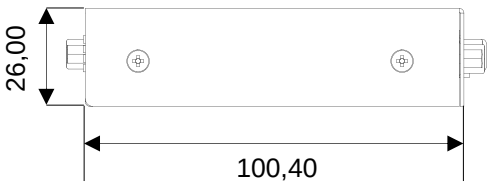


Top view



Bottom view

Left view



16. Version applicability

This User's Manual applies to the following versions of the mentioned software, firmware and hardware:

	version
Lightware Matrix Controller software	3.4.5
Lightware Bootloader software	3.2.9
Firmware	1.0.1r
Hardware	PCB 1.1
Enclosure	230-101-110

17. Warranty

Lightware Visual Engineering warrants this product against defects in materials and workmanship for a period of three years from the date of purchase.

The customer shall pay shipping charges when unit is returned for repair. Lightware will cover shipping charges for return shipments to customers.

In case of defect please call your local representative, or Lightware at

Lightware Visual Engineering

15 Peterdy Street, Budapest H-1071, HUNGARY

Tel.: +36 1 889 6177

Fax.: +36 1 342 9903

E-mail: support@lightware.eu

18. Document revision history

Document	Release Date	Changes	Checked by
Rev. 1.0	10-09-2013	Initial version	Zsolt Markó