

visual engineering
LIGHTWARE

User's Manual



DVI-OPT-TX220-Pro
DVI-OPT-TX220-ST-Pro
DVI-OPT-RX220-Pro
DVI-OPT-RX220-ST-Pro

Fiber Multimedia Extender

Important Safety Instructions

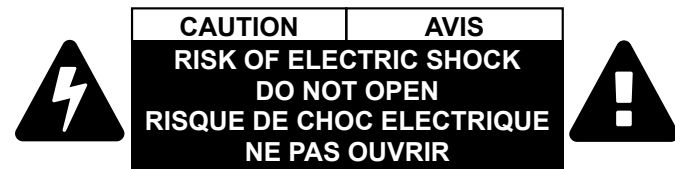
Class I Apparatus Construction.

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

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

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

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



Replacing the AC fuse

Unplug the AC power cord from the device. Locate the AC fuse on the rear panel. Replace only the AC fuse as indicated on the rear panel. Connect the power cord to the switcher and to the AC power source. Make sure the switcher is working properly.

Ventilation

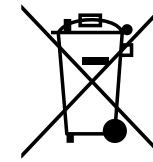
For the correct ventilation and to avoid overheating ensure enough free space around the appliance. Do not cover the appliance, let the ventilation holes free and never block or bypass the ventilators (if any).

WARNING

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

Waste Electrical & Electronic Equipment WEEE

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



Caution: Laser product



Common Safety Symbols

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

Symbol Legend

The following symbols and markings are used in the document:

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





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

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

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

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

Navigation Buttons

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

Document Information

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

Item	Version
Lightware Device Controller (LDC) software	1.22.1
Lightware Bootloader Software	3.3.2
Controller firmware DVI-OPT-TX220-Pro, DVI-OPT-TX220-ST-Pro	1.1.8
Controller firmware DVI-OPT-RX220-Pro, DVI-OPT-RX220-ST-Pro	1.1.3
Hardware DVI-OPT-TX220-Pro, DVI-OPT-TX220-ST-Pro	3.2
Hardware DVI-OPT-RX220-Pro, DVI-OPT-RX220-ST-Pro	3.1

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1

Introduction

Thank You for choosing Lightware's DVI-OPT-220-Pro series device. In the first chapter we would like to introduce the device highlighting the most important features in the below listed sections:

- ▶ DESCRIPTION
- ▶ BOX CONTENTS
- ▶ FEATURES OF THE DEVICE
- ▶ TYPICAL APPLICATION

1.1. Description

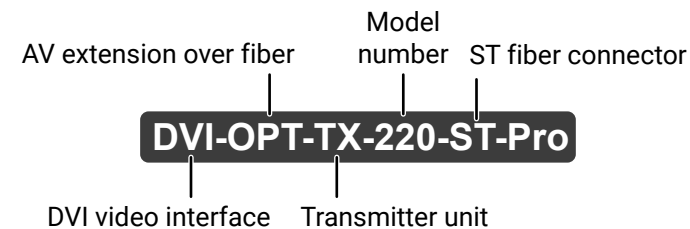
Lightware DVI-OPT-TX220-Pro is a Single Link DVI optical transmitter and DVI-OPT-RX220-Pro is a Single Link DVI optical receiver. They use a single multimode fiber to extend DVI signals.

DVI-OPT-TX220-Pro and DVI-OPT-RX220-Pro are assembled with Neutrik NO2-4FDW type LC duplex fiber connector, while DVI-OPT-TX220-ST-Pro and DVI-OPT-RX220-ST-Pro are assembled with ST fiber optical connector.

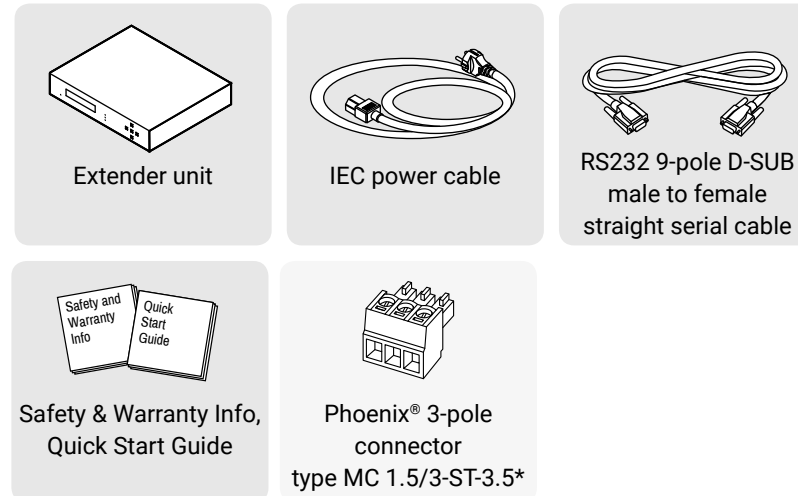
The extenders conform to DVI 1.0 specification, and handle signals between 25 - 165MHz pixel clock frequency: from 640x480@60Hz to 1920x1200@60Hz or 2048x1080@60Hz resolutions.

The extenders have an RS-232 serial port for remote control applications and firmware upgrade. The transmitter has a control panel for local control operation as well.

Model Denomination



1.2. Box Contents



*Only for the receiver devices.

1.3. Features of the Device



Advanced EDID Management

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



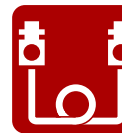
Pixel Accurate Reclocking

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



Supports all HDTV resolutions

720p, 1080i, 1080p etc. without HDCP encoding. Unencrypted signals up to 165 MHz pixel clock frequency - regardless of the resolution - are passed through.



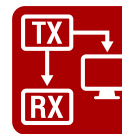
Single Fiber Technology

All of the high-speed TMDS data lanes are transmitted using only one multimode 50/125 fiber optical cable.



Break-out LC connector

A break-out LC fiber optical connector allows users to transmit the signal of two transmitters in one Neutrik OpticalCON Duo cable. For more details see the [Application Example of Break-out Connector](#) section.



Local Monitor Output

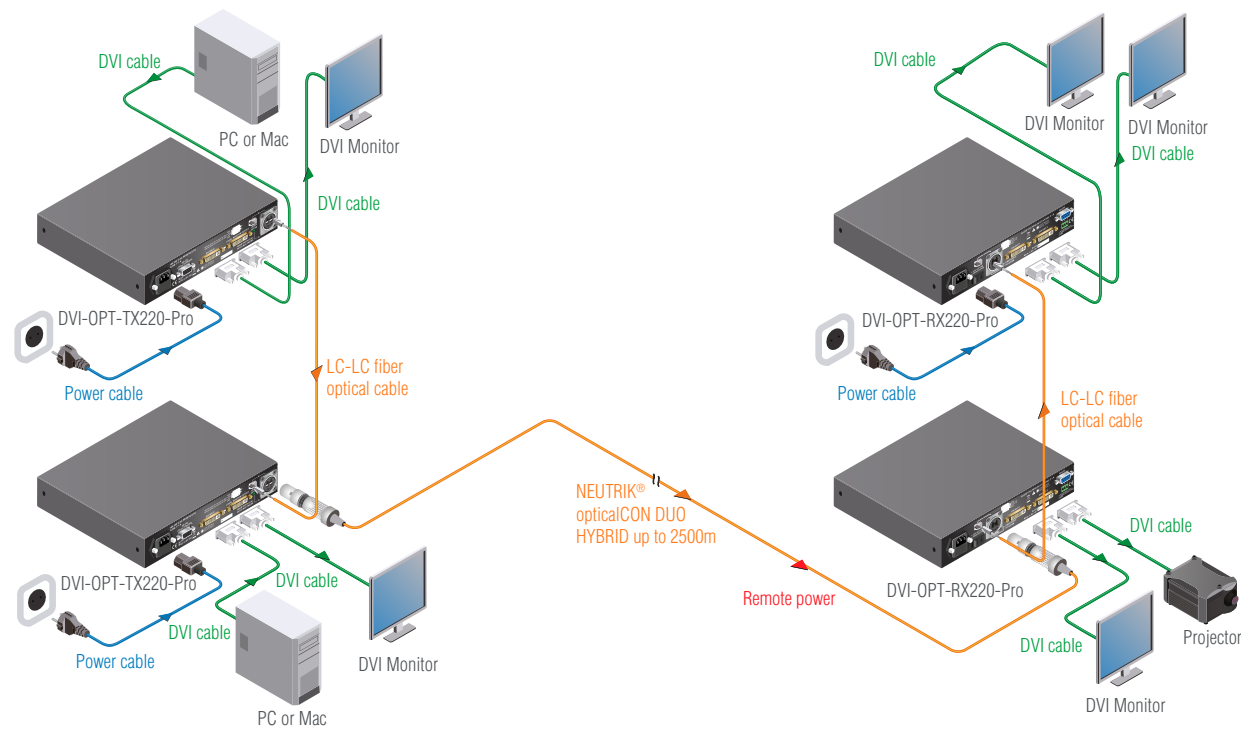
User can attach a local monitor to observe the video signal sent through the fiber optical cable. The resolution and clock frequency are the same on DVI and fiber optical connectors, no internal scaling or conversion is applied.

1.4. Typical Application

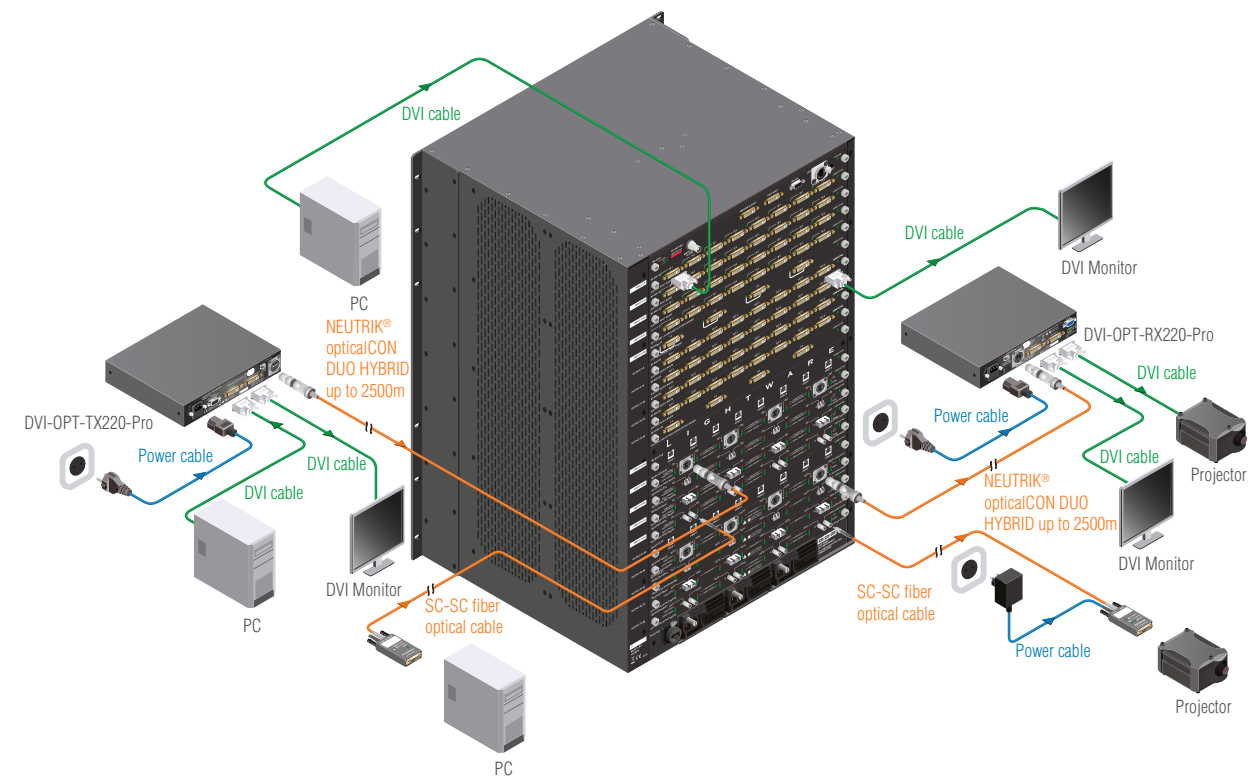
Application Examples

- Long distance lossless DVI signal transmission
- Ground loop isolation
- Multi-room video control
- Professional AV systems, conference rooms
- Rental and Staging
- Digital signage

1.4.1. Typical Stand-Alone Application with Break-Out Connection



1.4.2. Integrated System Operation for DVI Extenders



2

Installation

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

- ▶ [MOUNTING OPTIONS](#)
- ▶ [CONNECTING STEPS](#)
- ▶ [POWERING OPTIONS](#)

2.1. Mounting Options

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



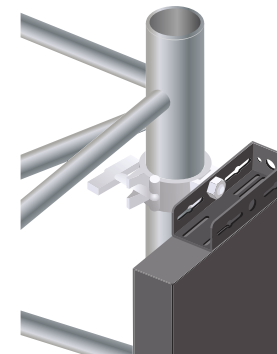
Under-desk double mounting kit



Mounting bracket

2.1.1. Truss Mounting

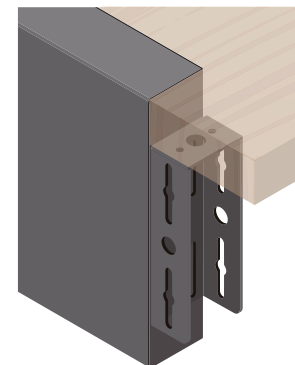
- Step 1.** Fasten the mounting bracket on the side of the unit with the provided screws.
- Step 2.** Use a bolt to attach a standard clamp. (The clamp is not supplied with the device)
- Step 3.** Mount the unit on the truss with the clamp.



2.1.2. Through Furniture Mounting

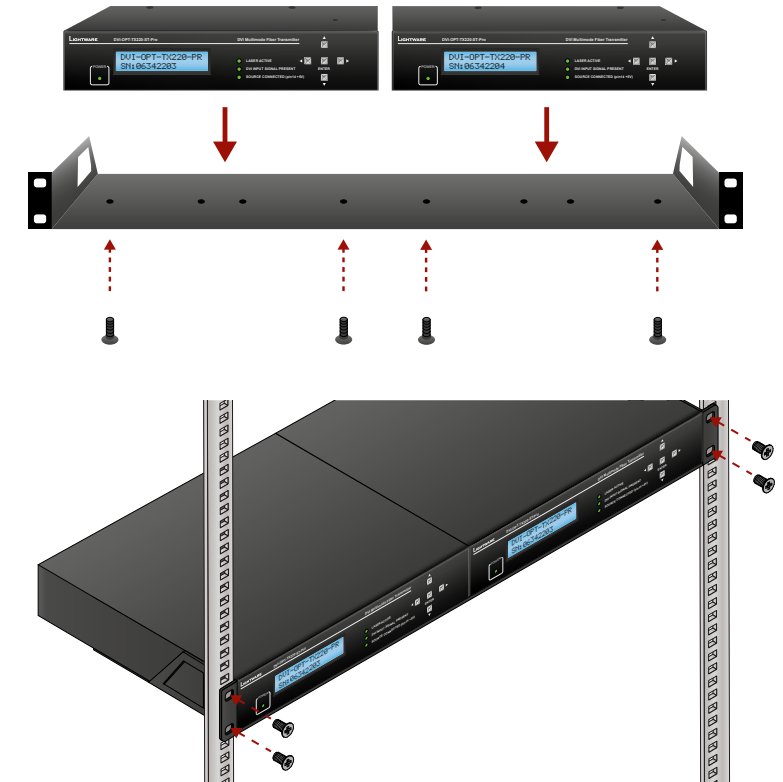
To get a good result, the thickness of the board should not exceed 60 millimeters.

- Step 1.** Cut a suitable hole in the board.
- Step 2.** Attach the mounting bracket on the side of the unit with the provided screws.
- Step 3.** Mount the unit on the board.
- Step 4.** Loosen the screws a little on the bracket and adjust the unit to line up with the front of the board.



2.1.3. Rack Shelf Mounting

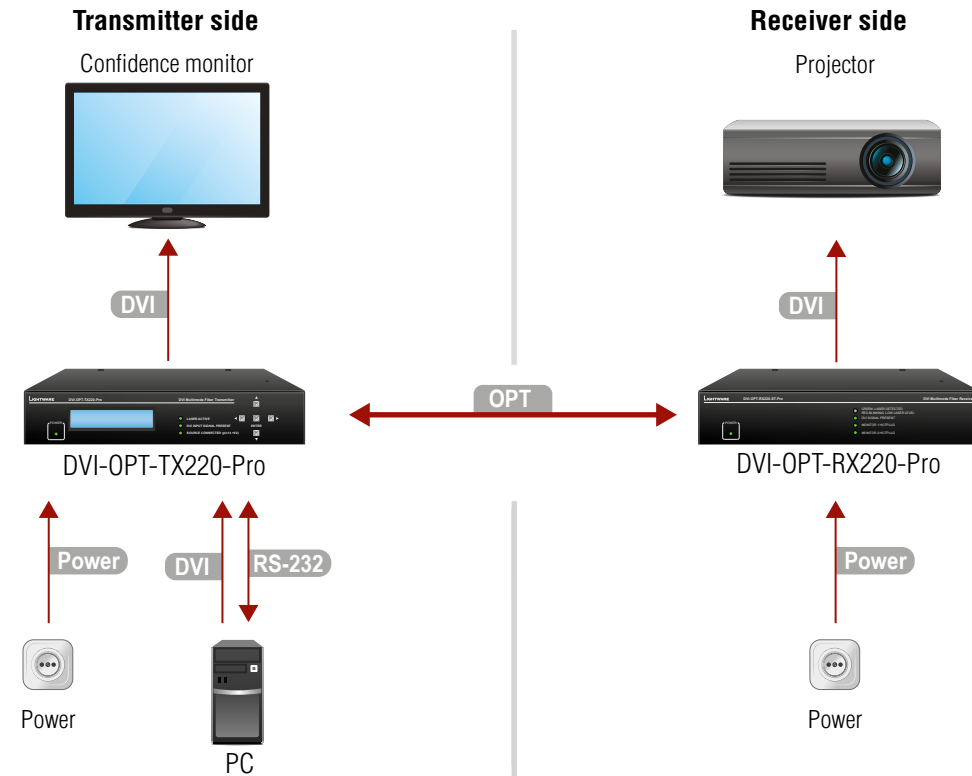
- Step 1.** Turn the unit upside down.
- Step 2.** Put the rack shelf upside down on the unit, and position it to get the mounting holes aligned.
- Step 3.** Fasten the unit on the rack shelf with the provided screws.
- Step 4.** Mount the rack shelf in the rack.



Standard rack installation

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

2.2. Connecting Steps



OPT Connect a compatible Lightware fiber receiver unit with a multimode fiber cable to the fiber output connector. Connect an LC optical cable to the **Channel A** LC connector, or use a Neutrik opticalCon Duo cable.

DVI Connect the DVI source (e.g. PC) to the **DVI INPUT** connector.

DVI Optionally connect a display device to the **LOCAL MONITOR OUTPUT** connector.

RS-232 Connect a straight serial cable to the RS-232 **LOCAL CONTROL** and the PC in order to control the transmitter.

Power Power on the fiber receiver and the connected display devices. They will display the picture from the DVI source (computer).

OPT Connect a compatible Lightware fiber transmitter unit with a multimode fiber cable to the **FIBER INPUT** connector. Connect an LC optical cable to the **Channel B** LC connector, or use a Neutrik opticalCON Duo cable.

DVI Connect the DVI display devices to the **DVI OUTPUT** connectors.

Power See the powering options in the next section.

WARNING! Please do not look directly into the fiber optical connector if the cable is connected to the transmitter only and the laser is active.

2.3. Powering Options

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.

Transmitter


After the system is complete, connect the IEC power cable to the extender unit and then to the power outlet. The unit is immediately powered on.

After the extender units are initialized, the attached DVI source and monitor can be powered on.

Receiver

Two power source can be chosen to supply the receiver unit:

To use the built-in power supply


- 1 Set the power selector switch to I (only on DVI-OPT-RX220-Pro) 

- 2 Connect IEC Power Cable 

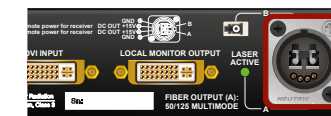


DVI-OPT-RX220-Pro

To power the unit remotely

- 1 Set the power selector switch to II (only on DVI-OPT-RX220-Pro) 

- 2 Connect a DVI-OPT-TX220-Pro with Neutrik hybrid fiber cable



DVI-OPT-TX220-Pro



DVI-OPT-RX220-Pro

INFO: The laser becomes enabled any time the transmitter is powered on, disregarding that it was disabled before or not. This is done to avoid accidental laser loss problems.

INFO: If neither the LEDs nor the LCD light up upon power-up, the unit is most likely damaged and further use is not advised. Please contact support@lightware.com.

3

Product Overview

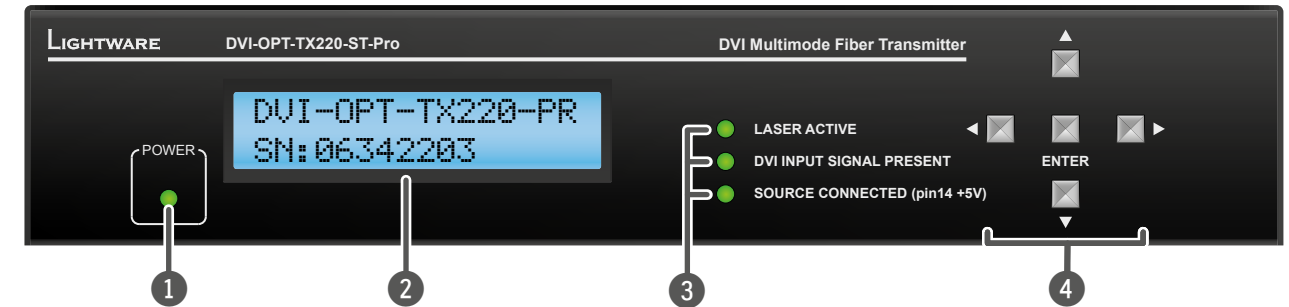
The following sections are about the physical structure of the device, input/output ports, and connectors:

- ▶ [TRANSMITTERS](#)
- ▶ [RECEIVERS](#)
- ▶ [ELECTRICAL CONNECTIONS](#)
- ▶ [MULTIMODE SINGLE FIBER EXTENDER CONCEPT](#)

3.1. Transmitters

3.1.1. Front View

INFO: The front view of DVI-OPT-TX220-Pro and DVI-OPT-TX220-ST-Pro is almost the same; the only difference is the type designation.



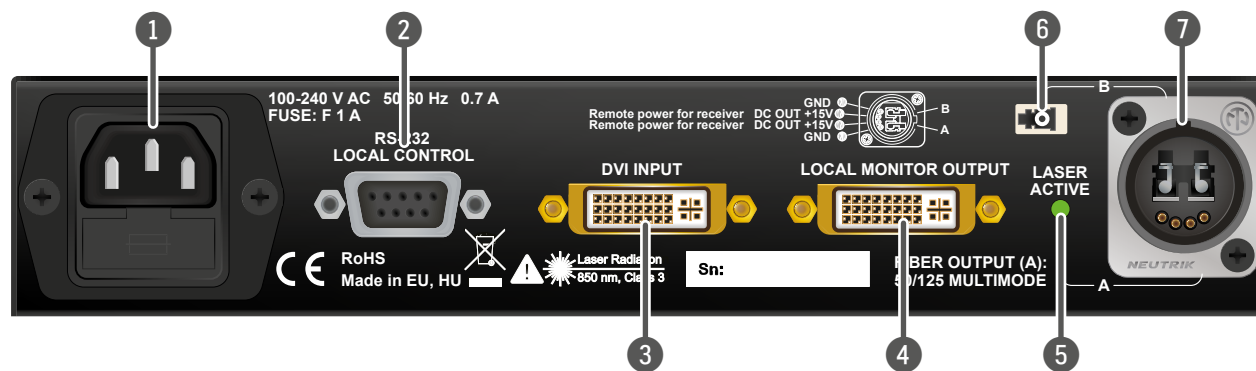
- 1 **Power LED** Power LED lights green when the unit is powered on.
- 2 **Menu display** Displays status information and menu operation. See [Front Panel LCD Menu Operations](#) section for more information.
- 3 **Status LEDs** For more details, see the legend for the [Status LEDs](#) below.
- 4 **Menu navigation** Up, down, left, right and enter buttons for menu navigation. See [Front Panel LCD Menu Operations](#) section for more information.

Status LEDs

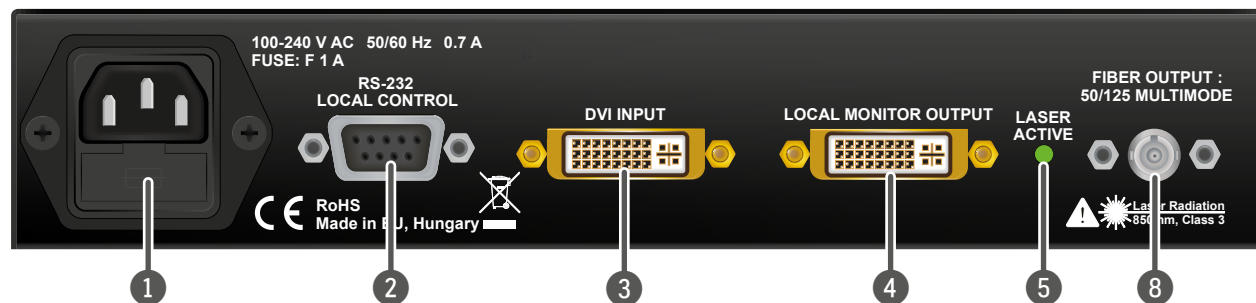
POWER			
<input checked="" type="radio"/>	green	on	The transmitter unit is powered and ready to use.
<input type="radio"/>		off	The transmitter unit is NOT powered on.
LASER ACTIVE			
<input checked="" type="radio"/>	green	on	It gives feedback about the operation of the optical module (laser is enabled), that means the laser radiates invisible waves. Avoid direct eye contact with the optical connectors!
<input type="radio"/>		off	Laser module is not active (laser is disabled on the output port).
DVI INPUT SIGNAL PRESENT			
<input checked="" type="radio"/>	green	on	Indicates when a valid DVI signal is detected on the DVI INPUT connector.
<input type="radio"/>		off	There is no valid DVI signal on the DVI INPUT connector.
SOURCE CONNECTED (pin14 +5V)			
<input checked="" type="radio"/>	green	on	Indicates if a DVI source is connected to the unit, it is powered on and sends +5V signal to pin 14 of the input DVI connector.
<input type="radio"/>		off	The source does not send +5V signal to the pin 14 of the input DVI connector.

3.1.2. Rear View

DVI-OPT-TX220-Pro



DVI-OPT-TX220-ST-Pro

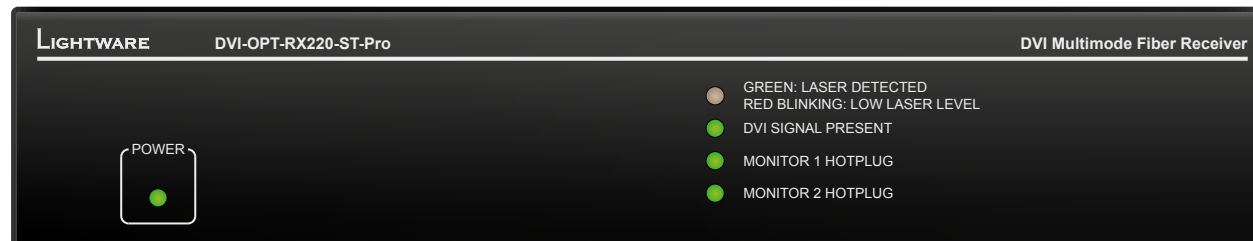


- ① **AC connector** Standard IEC power connector. Accepts 100 to 240 Volts, 50 or 60 Hz power sources.
- ② **Serial port** 9-pole D-SUB female connector for serial RS 232 communication; see [RS-232 Control Port](#) for more details.
- ③ **DVI input** 29-pole DVI-I connector, however only digital pins are internally connected. Connect single link DVI source. The unit has minimal cable compensation ability, hence the maximum recommended cable length – in compliance with the DVI standard – is 5 m. See [DVI Inputs and Outputs](#) section for more information.
- ④ **Monitor output** 29-pole DVI-I connector, however only digital pins are internally connected. A local display device can be connected to check the outgoing signal. The resolution and pixel clock frequency are the same on the DVI and Neutrik connectors, no internal scaling or conversion is applied to the signal. See [DVI Inputs and Outputs](#) section for more information.
- ⑤ **Laser Active LED**
 - **on** It gives feedback about the operation of the optical module (laser is enabled), that means the laser radiates invisible waves. Avoid direct eye contact with the optical connectors!
 - **off** Laser module is not active (laser is disabled on the output port).
- ⑥ **Break-out connector** The break-out LC connector is internally connected to output B of the Neutrik connector with a multimode 50/125 fiber optical patch cable. User can connect the signal of another fiber optical transmitter to pass it through a double-core Neutrik fiber optical cable. See [Typical Stand-Alone Application with Break-Out Connection](#) and [Application Example of Break-out Connector](#) section for more details.
- ⑦ **Neutrik connector** Neutrik NO2-4FDW type LC duplex connector; carrying the signals of up to two transmitters. See [Fiber Optical Connectors](#) section for more details.
- ⑧ **ST connector** ST fiber optical connector. Carrying the signals between transmitter and receiver. See [Fiber Optical Connectors](#) section for more information.

3.2. Receivers

3.2.1. Front View

INFO: The front view of DVI-OPT-RX220-Pro and DVI-OPT-RX220-ST-Pro is almost the same; the only difference is the type designation.

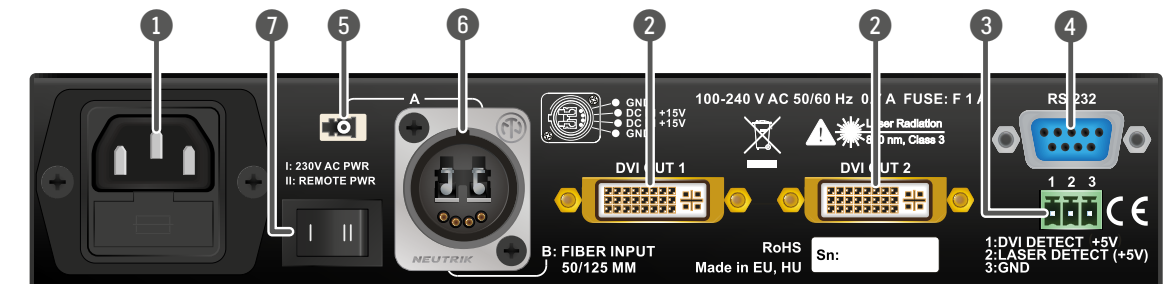


Status LEDs

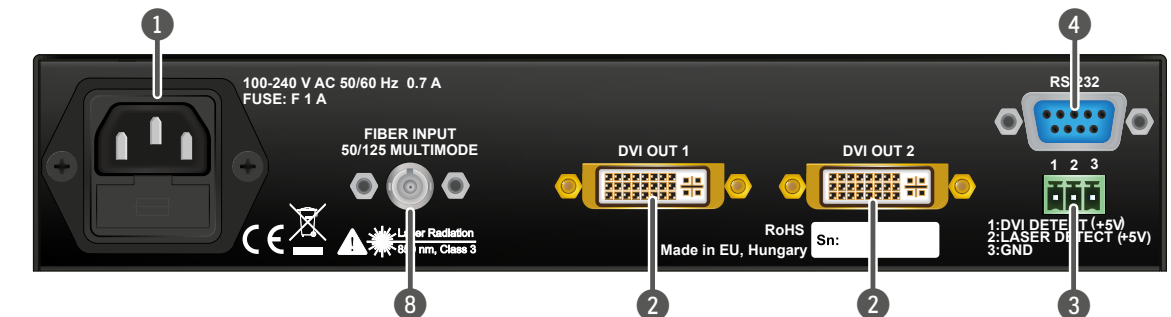
POWER LED			
<input checked="" type="checkbox"/>	green	on	The receiver unit is powered and ready to use. It does not indicate whether the device is operating properly.
<input type="checkbox"/>		off	The receiver unit is NOT powered on.
LASER LED			
<input checked="" type="checkbox"/>	green	on	It indicates if a laser beam is detected.
<input checked="" type="checkbox"/>	red	blinking	No laser beam is detected, or laser level is too low.
DVI SIGNAL PRESENT			
<input checked="" type="checkbox"/>	green	on	Indicates if a valid DVI clock signal can be recovered from the fiber optical signal.
<input type="checkbox"/>		off	No valid DVI signal on the fiber input.
MONITOR 1 HOTPLUG, MONITOR 2 HOTPLUG			
<input checked="" type="checkbox"/>	green	on	Each LED indicates if a display device (or repeater, etc.) is connected to the corresponding DVI output and they send a valid Hot Plug Signal on Pin 16 through the DVI cables.
<input type="checkbox"/>		off	The connected sink does not send +5V signal to the pin 14 of the DVI output.

3.2.2. Rear View

DVI-OPT-RX220-Pro



DVI-OPT-RX220-ST-Pro



- 1 **AC connector** Standard IEC power connector. Accepts 100 to 240 Volts, 50 or 60 Hz power sources.
- 2 **DVI outputs** 29-pole DVI-I connector, however only digital pins are internally connected. The resolution and pixel clock frequency are the same on both DVI connectors; no internal scaling or conversion is applied to the signal.
- 3 **Alarm outputs** DVI signal detection and laser detection signals with ground reference are available on a 3-pole Phoenix connector. See [Alarm Outputs \(Receiver\)](#) section for more information.
- 4 **Serial port** 9-pole D-SUB female connector for serial RS-232 communication; see [RS-232 Control Port](#) for more details.
- 5 **Break-out connector** The break-out LC connector is internally connected to output B of the Neutrik connector with a multimode 50/125 fiber optical patch cable. The user can connect the signal of another fiber optical transmitter to pass it through a double-core Neutrik fiber optical cable. See [Fiber Optical Connectors and Application Example of Break-out Connector](#) section for more details.
- 6 **Neutrik connector** Neutrik NO2-4FDW type LC duplex connector. Carrying the signals of up to two transmitters. See [Fiber Optical Connectors](#) section for more details.
- 7 **Power selector** The receiver's power source can be selected with this switch. In position I the receiver unit is powered with its own built-in power supply. In position II the receiver unit is powered through hybrid fiber cable. See [Powering Options](#) section for more information.
- 8 **ST connector** ST fiber optical connector. Carrying the signals between transmitter and receiver. See [Fiber Optical Connectors](#) section for more information.

3.3. Electrical Connections

3.3.1. Fiber Optical Connectors

DVI-OPT220-Pro series devices transmit the video signal via multimode 50/125 fiber optical cable.

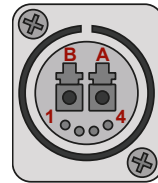
Neutrik OpticalCON Duo Connector

DVI-OPT-RX220-Pro and DVI-OPT-TX220-Pro models have Neutrik opticalCON connector (NO2-4FDW type LC duplex) and LC ODVA connector have two fiber channels, channel A and channel B. Only one channel is used (from channel A on the transmitter to channel B on the receiver). Neutrik opticalCON DUO is compatible with 2x LC connector.



Pin Assignment of Neutrik OpticalCON Duo Connector

Pin	Signal
1	GND
2	Remote power for receiver DC out +15V
3	Remote power for receiver DC out +15V
4	GND
A	Channel A
B	Channel B



LC Connector

One channel of the Neutrik connector is not used by the extenders for signal transmission and it is internally connected to the LC break-out connector. For more information about break-out connector see [Application Example of Break-out Connector](#) section.



SC Connector

DVI-OPT-RX220-ST-Pro and DVI-OPT-TX220-ST-Pro models supplied with ST optical connectors.



3.3.2. DVI Inputs and Outputs

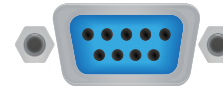
29-pole DVI-I connectors, however only digital pins are internally connected. This way, user can plug in any DVI connector, but keep in mind that analog signals (such as VGA or RGBHV) are NOT processed.



INFO: Always use high quality DVI cable for connecting sources and displays!

3.3.3. RS-232 Control Port

Devices can be remote controlled through industry standard 9-pin D-SUB female connector located on the rear panel of the unit. Please use a standard RS-232 Male to Female cable (straight through).



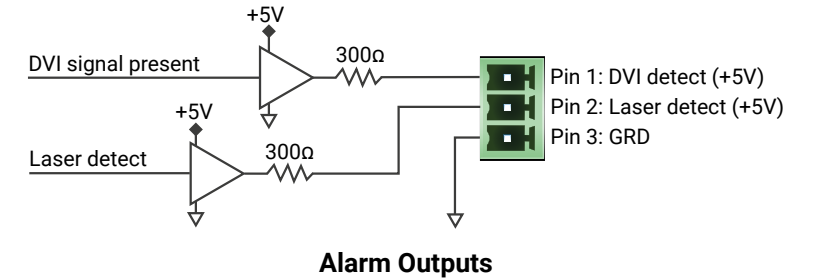
D-sub connector pin assignment for standard RS-232	
Pin nr.	Pinout
1	NC - non-connected
2	TX data transmit (output)
3	RX data receive (input)
4	DTR (Internally connected to Pin 6)
5	GND signal ground (shield)
6	DSR (Internally connected to Pin 4)
7	RTS (Internally connected to Pin 8)
8	CTS (Internally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

INFO: DVI-OPT-220-Pro extenders are DCE unit according to its pin-out. For more information see [Serial Management](#) section.

INFO: Factory default settings are the same in the transmitter and receiver: 9600 Baud, 8 data bit, 1 stop bit, no parity.

3.3.4. Alarm Outputs (Receiver)

TTL outputs can be used to give a signal to any third-party device. Separate signals indicate the detected laser and the presence of the received DVI signal.



DVI Detect: Indicates when a valid DVI clock signal is extracted from the fiber optical signal. Logic 1 (+5V) means that a DVI signal is detected. Logic 0 (GND) means that a valid DVI signal cannot be extracted from the optical signal.

Laser Detect: Indicates when a laser beam is detected at the Neutrik connector. Logic 1 (+5V) means that a laser beam with the appropriate wavelength is detected. Logic 0 (GND) means that either there is no laser signal or its level is too low to be recognized.

GND: Ground reference signal for alarm outputs. Connected to chassis ground.

Compatible Plug Type

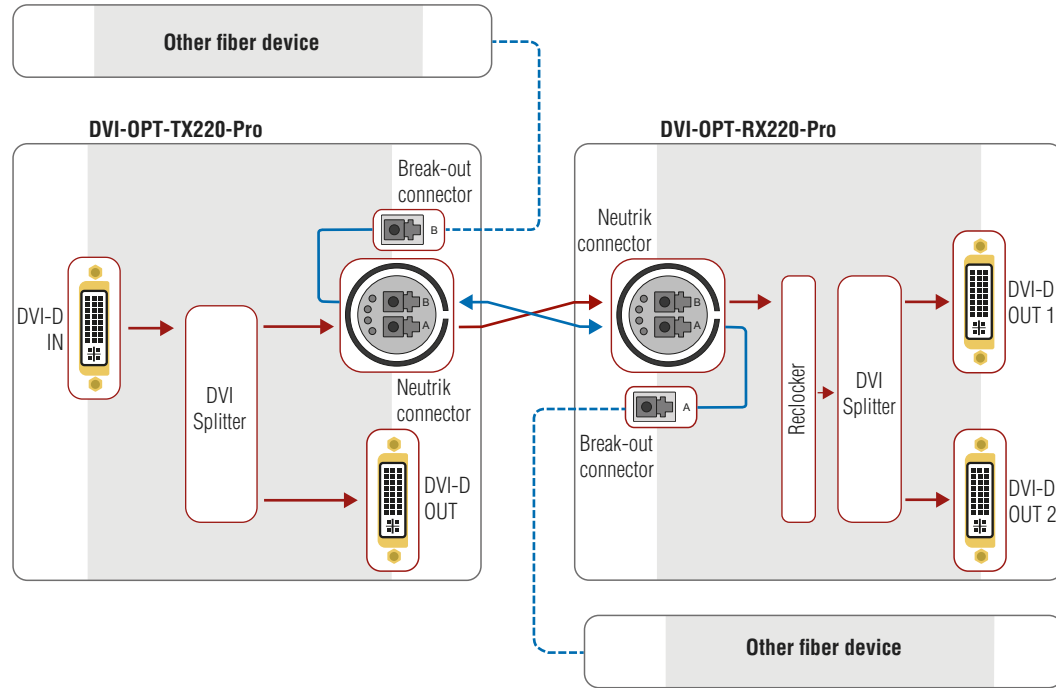
Phoenix® Combicon series (3.5mm pitch), type: MC 1.5/3-ST-3.5

3.4. Multimode Single Fiber Extender Concept

DVI-OPT-220Pro series extenders support multimode fiber optical interface to transmit digital A/V signals. For more details about the supported cable extension see [Maximum Extension Distances](#) section.

Port Diagram of Optical Interface

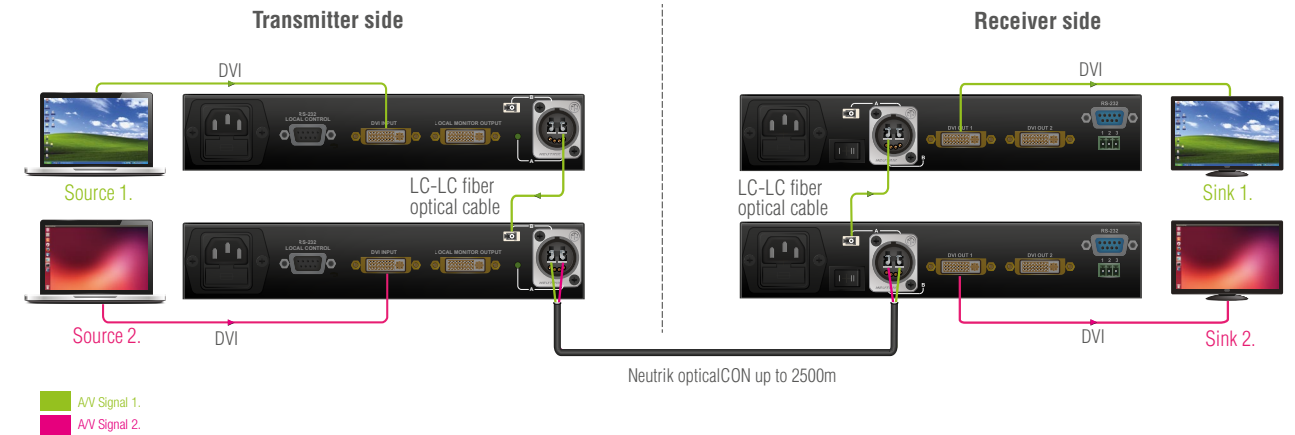
The Neutrik opticalCON DUO cable has two fiber channels, named channel **A** and channel **B**. Since Lightware fiber extenders use only one fiber for signal transmission, the other fiber can be used by other optical devices. The unused fiber channel is accessible by the break-out connector.



INFO: Red line shows the main direction of the video signal. The blue line represents the optical signal via break-out connector, which direction is not specified.

Application Example of Break-out Connector

Using this feature, it is possible to transmit two different A/V signal from one transmitter pair to another receiver pair with only one Neutrik opticalCON DUO cable. See the application example below.

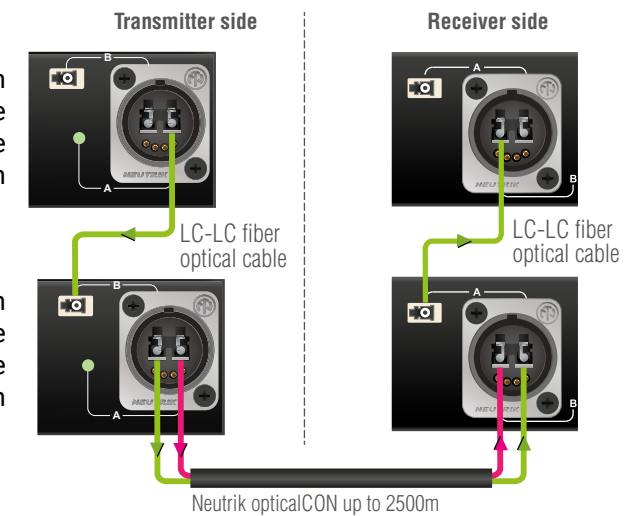


Transmitter Unit (DVI-OPT-TX220-Pro)

The transmitter's laser driver sends the signal through **Channel A**. **Channel B** is directly connected to the break-out connector with a fiber optical cable inside the unit. Any optical signal can be transferred through this channel in any direction.

Receiver Unit (DVI-OPT-RX220-Pro)

The receiver's laser sensor gets the signal through **Channel B**. **Channel A** is directly connected to the break-out connector with a fiber optical cable inside the unit. Any optical signal can be transferred through this channel in any direction.



4

Operation

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

- ▶ [POWERING ON](#)
- ▶ [FRONT PANEL LCD MENU OPERATIONS](#)

4.1. Powering on

Connect the power cord to the AC input connector; the extender is immediately powered on. After the self-test, the last configuration is loaded automatically.

The receiver has more powering possibilities. For more details, see [Powering Options](#) section.

4.2. Front Panel LCD Menu Operations

The extenders have an LCD menu and navigation buttons which make the possibility to change certain settings and display basic information via the front panel.

Display

Front panel LCD has 2 lines and 16 characters in each line. The name of the menu item is always displayed in the first line.

```
Learn EDID U01
1920x1200@60.0Hz
```

Navigation

Buttons	Functions
▲ up	Toggle between menu items.
▼ down	
◀ left	Modify the settings in each menu item.
▶ right	
ENTER	Execute changes.

Idle state

If no button is pressed for 10 seconds, the display returns to its idle state and the Emulated EDID is shown.

```
EmulatedEDID F49
Uni versaLEDID
```

LCD menu structure

- Emulated EDID
- Learn EDID
- Attached Monitor
- Switch EDID
- Delete EDID
- Laser Enable
- Factory Reset
- Device Information

4.2.1. Viewing Emulated EDID

This is the default display in idle state. If needed use the left ◀ and right ▶ buttons to select the EMULATED EDID menu. The currently emulated EDID is shown. Three screens toggle automatically showing the preferred resolution, the name of the display and a three letter abbreviation assigned to the manufacturer. Lightware factory presets have LWR as the manufacturer.

```
EmulatedEDID F49
1920x1200@59.55H
```

```
EmulatedEDID F49
Uni versaLEDID
```

```
EmulatedEDID F49
LWR
```

4.2.2. Learning EDID

The EDID of the display device that is attached to the local monitor output can be stored in one of the 49 user memory slots.

Step 1. Use the left ◀ and right ▶ buttons to select the **LEARN EDID** menu.

```
Learn EDID U01
1920x1200@60.0Hz
```

Step 2. Select a memory address using the up ▲ and down ▼ buttons. Hold down the up ▲ and down ▼ buttons to scroll faster. Three screens toggle automatically showing the preferred resolution, the name of the display and a three letter abbreviation assigned to the manufacturer.

```
Learn EDID U01
24WVGX3
```

```
Learn EDID U01
NEC
```

Step 3. Press **ENTER** to store the EDID in the selected slot. If a filled slot is selected, then the **ENTER** button will overwrite the previously stored EDID.

```
EDID Learned!
```

INFO: The factory preset EDIDs cannot be changed by the user. Only addresses from U1 to U49 are user programmable.

INFO: EDIDs are stored in a multiple programmable non-volatile memory, the saved EDID's will not be lost after switching off the transmitter. Please note that if you upgrade the firmware, the saved EDID's will be deleted from the user memory.

INFO: If the selected user memory is not empty, the new EDID will overwrite the previously stored EDID.

4.2.3. Viewing Attached Monitor

Use the left ◀ and right ▶ buttons to select the **ATTACHED MONITOR** menu.

```
Attached Monitor
1920x1200@60.0Hz
```

Information about the monitor that is attached to the local monitor output is shown. If no monitor is connected, then the last attached monitor's information is displayed. Three screens toggle automatically showing the preferred resolution, the name of the display and a three letter abbreviation assigned to the manufacturer.

```
Attached Monitor
24WVGX3
```

```
Attached Monitor
NEC
```

4.2.4. Switching EDID

Step 1. Use the left ◀ and right ▶ buttons to select the **SWITCH EDID** menu.

```
Switch EDID F33
1440x288@50.6Hz
```

Step 2. Use the up ▲ and down ▼ buttons to select a filled memory slot. Hold down the up ▲ and down ▼ buttons to scroll faster. Three screens toggle automatically showing the preferred resolution, the name of the display and a three letter abbreviation assigned to the manufacturer.

```
Switch EDID F33
1440x576i@50
```

```
Switch EDID F33
LWR
```

```
EDID Switched!
```

Step 3. Press **ENTER** to emulate selected EDID.

After every EDID change, the transmitter toggles the HOT PLUG signal for approx. 1 sec. 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.

INFO: Location D02 has a special function. If a monitor is connected to LOCAL MONITOR OUT, then its EDID is copied to location D02. If no monitor is connected to the output then the last connected monitor's EDID is shown.

INFO: Lightware factory presets have LWR as the manufacturer.

4.2.5. Deleting EDID

Step 1. Use the left ◀ and right ▶ buttons to select the **Delete EDID** menu.

```
Delete EDID U51
1280x1024@60.1Hz
```

Step 2. Use the up ▲ and down ▼ buttons to select a filled memory slot. Hold down the up ▲ and down ▼ buttons to scroll faster. Three screens toggle automatically showing the preferred resolution, the name of the display and a three letter abbreviation assigned to the manufacturer.

```
Delete EDID U51
LCD1970NXP
```

```
Delete EDID U51
NEC
```

Step 3. Press **ENTER** to delete selected EDID, then use the up ▲ and down ▼ buttons to change **YES/NO**.

```
Confirm Delete?
YES
```

Step 4. Press **Enter** to execute **YES/NO** switch.

```
EDID Deleted!
```

INFO: The factory preset EDIDs cannot be deleted by the user.

INFO: If such an EDID is deleted that is currently emulated on the input, the EDID will be deleted from the location (e.g. from the user memory). But the EDID on the input will not be changed until a new, valid EDID is selected to emulate.

4.2.6. Laser Enabling

Step 1. Use the left ◀ and right ▶ buttons to select the **LASER ENABLE** menu.

```
Laser Enable
ON
```

Step 2. Use the up ▲ and down ▼ buttons to change **ON/OFF**. The selected value will blink.

```
Laser Changed!
```

Step 3. Press **ENTER** to execute **ON/OFF** switch.

4.2.7. Factory Reset

Step 1. Use the left ◀ and right ▶ buttons to select the **FACTORY RESET** menu.

```
Factory Reset
OK
```

Step 2. Press the **ENTER** button to reset the device to the factory preset values.

Step 3. A completion message will appear, and then the unit reboots.

```
Factory Defaults
Reloaded!!!
```

This action sets all parameters to factory default values:

- Emulated EDID: F49 – Universal EDID
- Learn EDID: U01
- Switch EDID: D02
- Delete EDID: U01
- Laser Enable: ON

4.2.8. Device Information

The device name is displayed in the first line. Two screens toggle automatically showing the firmware/hardware versions and the serial number.

```
DVI-OPT-TX220-PR
FW:1.1.8 HW:3.2
```

```
DVI-OPT-TX220-PR
SN:06342203
```

5

Software Control – Using Lightware Device Controller

The extender can be controlled by a computer through the LAN, RS-232 and USB ports using Lightware Device Controller (LDC). The software can be installed on a Windows PC or Mac OS X. The application can be downloaded from www.lightware.com. The Windows and the Mac versions have the same look and functionality.

- ▶ [INSTALL AND UPGRADE](#)
- ▶ [ESTABLISHING THE CONNECTION](#)
- ▶ [I/O PARAMETERS MENU](#)
- ▶ [EDID MENU](#)
- ▶ [SETTINGS](#)
- ▶ [LOG TAB](#)
- ▶ [TERMINAL MENU](#)

5.1. Install and Upgrade

Installation for Windows OS

- Step 1.** Run the installer. If the User Account Control drops a pop-up message click Yes.
- Step 2.** During the installation you will be prompted to select the type of the installation: **normal** and the **snapshot** install:

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

Comparison of the Installation Types

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

Installation for Mac OS X

INFO: After the installation, the Windows and the Mac application has the same look and functionality. This type of the installer is equal with the Normal install in the case of Windows and results an updateable version with the same attributes.

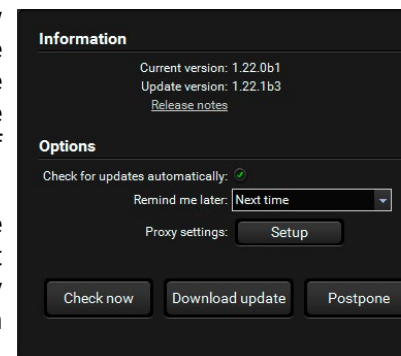
Mount the DMG file with double clicking on it and drag the LDC icon over the Applications icon to copy the program into the Applications folder. If you want to copy the LDC into another location just drag the icon over the desired folder.

The Upgrading of the LDC

- Step 1.** Run the application.

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

The current and the update version number can be seen at the top of the window and they are shown in this window even with the snapshot install.



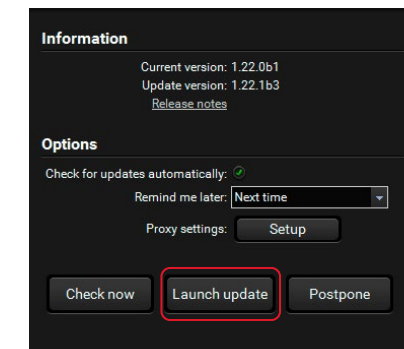
The **Update** window can be opened manually by clicking the **question mark** and the **Update** button.

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

- When the **Check for updates automatically** option is marked, the LDC tries to find a new version after startup.
- If you want to postpone the update, set the reminder by the **drop down list**.
- If necessary, the proxy settings are available by clicking the **Setup** button.

- Step 3.** Click the **Download update** button to start the downloading.

- Step 4.** When the download process finished, the **Download Update** button changes to **Launch update**. Click it on to install the new version.



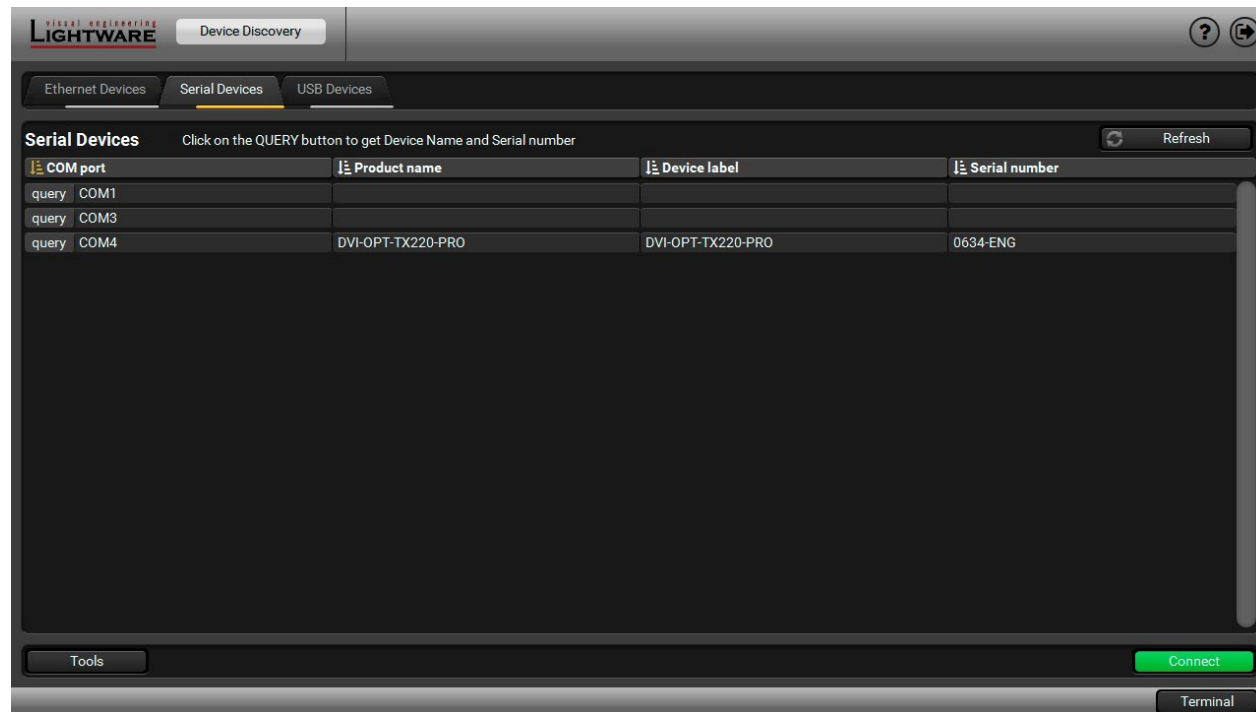
5.2. Establishing the Connection

The extenders can be controlled from a Windows or OS X based computer using the LDC through RS 232 connection.

Step 1. Connect the appliance and the computer via RS-232 port with standard Male to Female cable (straight through).

Step 2. Run the controller software.

Step 3. Device discovery window appears automatically.



Device Discovery Window

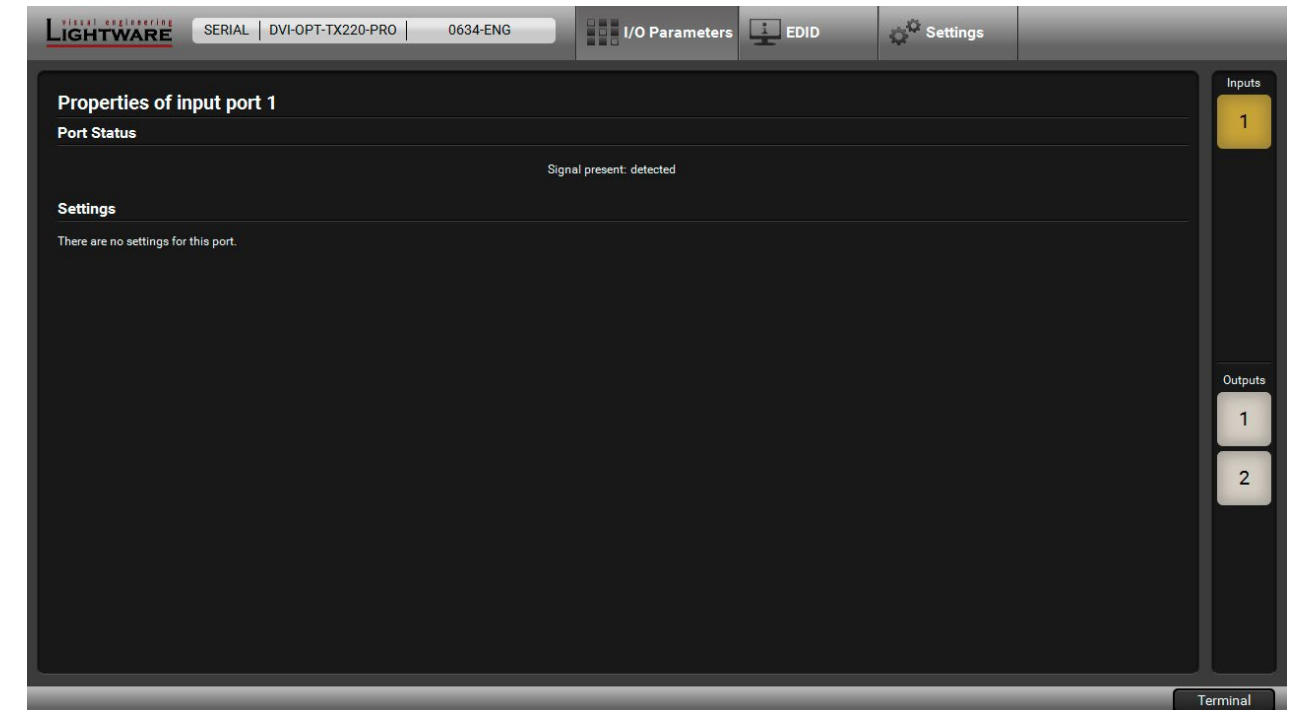
Step 4. Click on the Serial Devices tab to reach the list of the devices which are connected via serial port.

Step 5. The device name and serial number can be inquired by pressing the **query** button next to the appropriate COM port.

Step 6. Select the device and click on the **Connect** button.

5.3. I/O Parameters Menu

After connecting to the device, this menu appears by default showing the current state of input and output ports. The port bar on the right side shows the available input and output ports.



I/O Parameters Menu

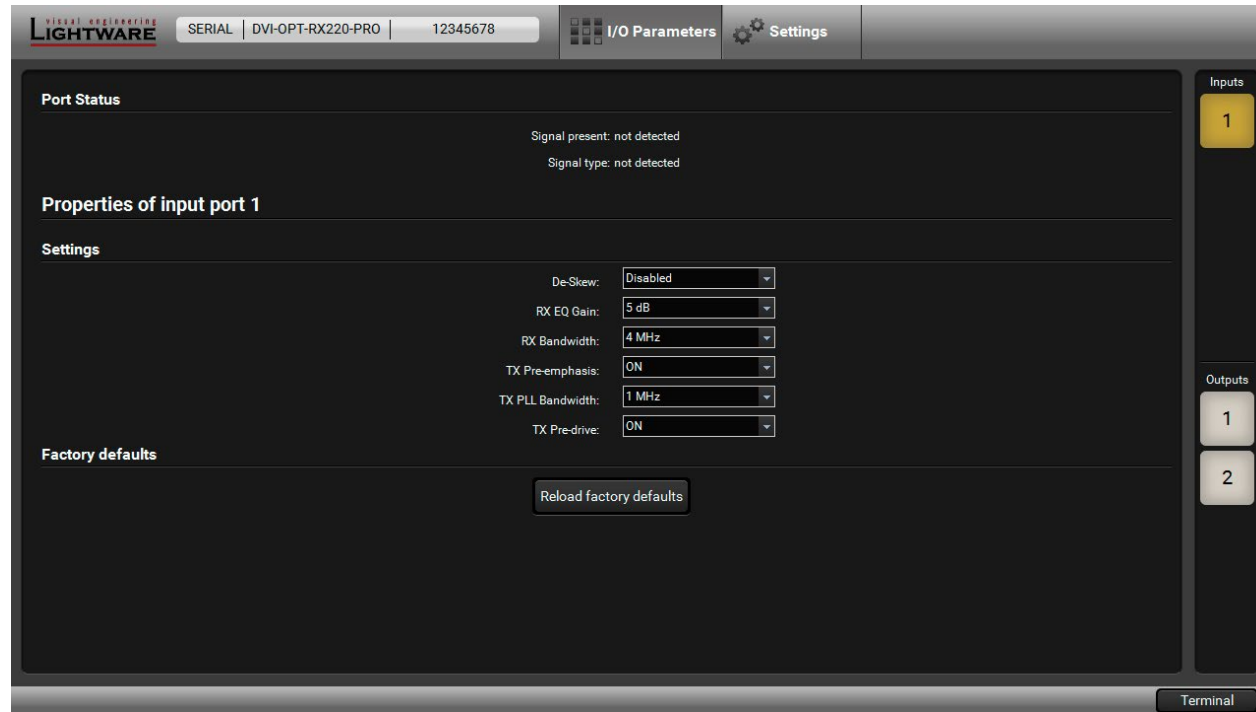
Port settings (transmitter)

- Input1:** The state of the incoming signal is displayed.
- Output1:** The port represents the fiber output. The laser can be enabled or disabled. This setting has the same effect as changing it on the front panel.
- Output2:** Connected local monitor's state is displayed (hotplug detected or not).

Port settings (receiver)

Input1: The window shows the adjustable parameters for the input.

Output1 and 2: Connected monitors' state are displayed (hotplug detected or not).



Input Parameters

Parameters

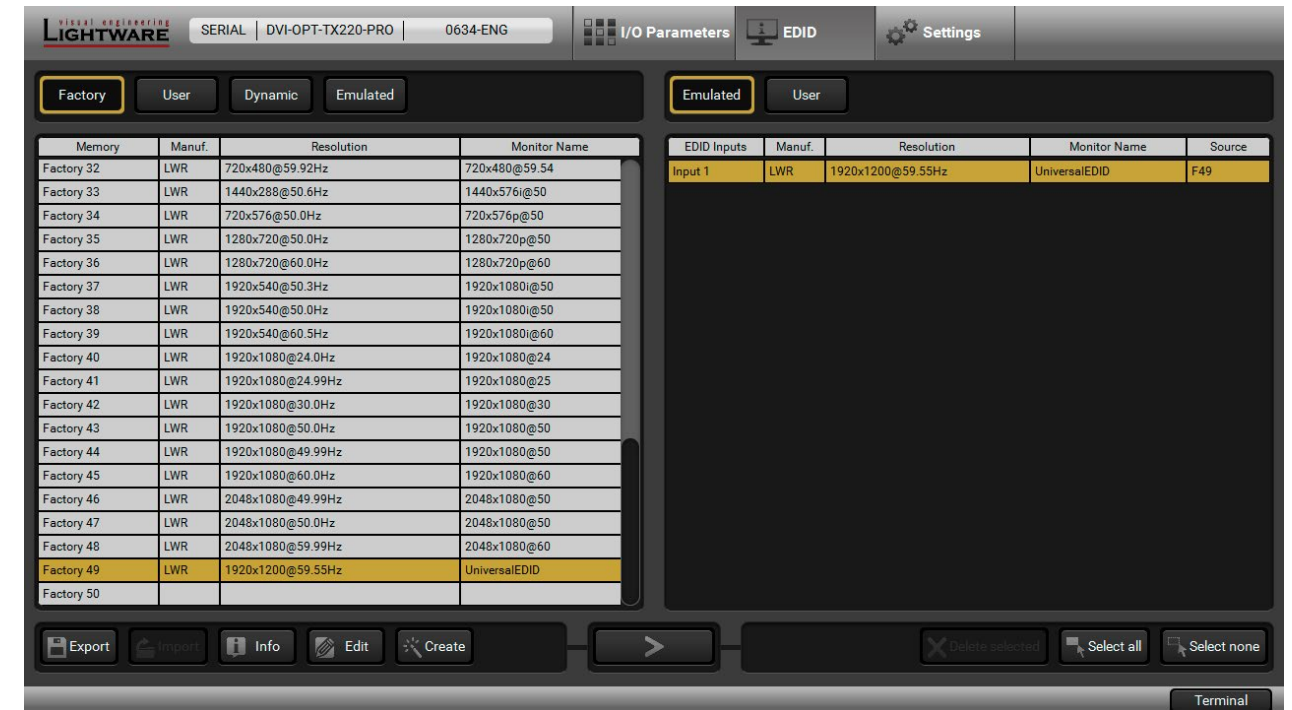
The factory default settings give good results in most cases. Please consult [Lightware support](#) for further information if encountering problems with signal quality.

Reload factory defaults

Default values are reloaded to the input.

5.4. EDID Menu

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



Control buttons

- | | | | |
|---|---|---|--|
|  | Exporting an EDID (save to a file) |  | Executing EDID emulation or copying (Transfer button) |
|  | Importing an EDID (load from a file) |  | Deleting EDID (from User memory) |
|  | Display EDID Summary window |  | Selecting all memory places in the right panel |
|  | Opening Advanced EDID Editor with the selected EDID |  | Selecting none of the memory places in the right panel |
|  | Opening Easy EDID Creator | | |

5.4.1. Sources and Destinations

The EDID memory consists of four parts:

- **Factory EDID list (F1-F49)** the pre-programmed EDIDs, see the [Factory EDID List](#) in the Appendix section.
INFO Factory EDIDs do not include HDMI support.
- **Dynamic EDID list (D1-D2)**: the EDID of the last attached display device. The extender stores the last EDID from the previously connected sink on each output port. Thus, an EDID can be shown even if there is no device is connected to the output port at that moment.
- **User memory locations (U1 – U49)**: they can be used to save custom EDIDs. Any EDID from the User/Factory/Dynamic EDID lists can be copied to the user memory.
- **Emulated EDID list (E1)**: the currently emulated EDID for the input. The source column displays the memory location that the current EDID was routed from. The source reads the EDID from the Emulated EDID memory on the input port.


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

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

INFO DVI-OPT-TX220-Pro can handle both 128 Byte EDID and 256 Byte extended EDID structures.

5.4.2. EDID Operations

Changing the Emulated EDID

Step 1. Choose the desired tab (**Factory**, **Dynamic**, or **User** EDID list) on the left panel and select an EDID. 

Step 2. Select the **Emulated** tab on the right panel.

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

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

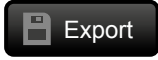
Learning an EDID

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


Exporting an EDID

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

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

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

Importing an EDID

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


Step 1. Select the **User** tab in the left panel and select a memory slot.

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

Step 3. Browse the file in the opening window then press the **Open** button. Browsed EDID is imported into the selected User memory.

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

Deleting EDID(s)

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

Step 1. Select the **User** tab in the left panel.

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

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

5.4.3. EDID Summary Window

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



General	
EDID version:	1
EDID revision:	3
Manufacturer ID:	GSM (Goldstar Company Ltd)
Product ID:	085B
Monitor serial number:	356928
Year of manufacture:	2017
Week of manufacture:	3
Signal interface:	Digital
Separate Sync H&V:	-
Composite sync on H:	-
Sync on green:	-
Serration on VS:	-
Color depth:	Undefined
Interface standard:	Not defined
Color spaces:	RGB 4:4:4 & YCrCb 4:4:4
Aspect ratio:	0.57
Display size:	60 cm X 34 cm

5.4.4. Editing an EDID

Select an EDID from the left panel and press the **Edit** button to display Advanced EDID Editor window. The editor can read and write all descriptors, which are defined in the standards, including the additional CEA extension. Any EDID from the device's memory or a saved EDID file can be loaded into the editor. The software resolves the raw EDID and displays it as readable information to the user. All descriptors can be edited, and saved in an EDID file, or uploaded to the User memory. For more details about EDID Editor please visit our website (www.lightware.com) and download the EDID Editor User's Manual.

Basic EDID

- Vendor / Product Information
- Display Parameters
- Power Management and Features
- Gamma / Color and Established Timings
- Standard Timings
- Preferred Timing Mode
- 2nd Descriptor Field
- 3rd Descriptor Field
- 4th Descriptor Field
- CEA Extension
- General
- Video Data
- Audio Data
- Speaker Allocation Data
- HDMI VSDB
- HDMI Forum VSDB
- YCbCr 4:2:0 VDB
- YCbCr 4:2:0 Capability Map
- Colorimetry
- High Dynamic Range
- Detailed Timing Descriptor #1
- Detailed Timing Descriptor #2
- Detailed Timing Descriptor #3
- Detailed Timing Descriptor #4
- Detailed Timing Descriptor #5
- Detailed Timing Descriptor #6
- Save EDID

EDID Byte Editor

	0	1	2	3	4	5	6	7	8	9
0	00	FF	FF	FF	FF	FF	FF	00	1E	6D
10	08	5B	40	72	05	00	03	1B	01	03
20	80	3C	22	78	EA	30	35	A7	55	4E
30	A3	26	0F	50	54	21	08	00	71	40
40	81	80	81	C0	A9	C0	D1	C0	81	00
50	01	01	01	01	04	74	00	30	F2	70
60	5A	80	B0	58	8A	00	58	54	21	00
70	00	1E	56	5E	00	A0	A0	A0	29	50
80	30	20	35	00	58	54	21	00	00	1A
90	00	00	00	FD	00	38	3D	1E	87	1E
100	00	0A	20	20	20	20	20	20	00	00
110	00	FC	00	4C	47	20	55	6C	74	72
120	61	20	48	44	0A	20	01	D2		

EDID Editor Window

5.4.5. Creating an EDID

Since above mentioned Advanced EDID Editor needs more complex knowledge about EDID, Lightware introduced a wizard-like interface for fast and easy EDID creation. With Easy EDID Creator it is possible to create custom EDIDs in four simple steps. By clicking on the **Create** button below the left panel, Easy EDID Creator is opened in a new window.

Select Resolution & Interface

Welcome to the Easy EDID Creator!

With this software you are able to create a unique EDID according to your demands. Details can be added or changed in the Advanced EDID Editor later if needed.

Please select the format type and the preferred resolution. If you don't find the proper mode in the list, use the Custom format type setting, enter the resolution and the program will estimate the best blanking times.

Important notes:

- If you want to send audio then you must select HDMI or DisplayPort. DVI and VGA do not support audio transmission.
- Most DVI displays are not able to process HDMI signals. If you have a DVI display, please check its specifications.
- The supported color depth will be 24bits/pixel by default.

Format type:

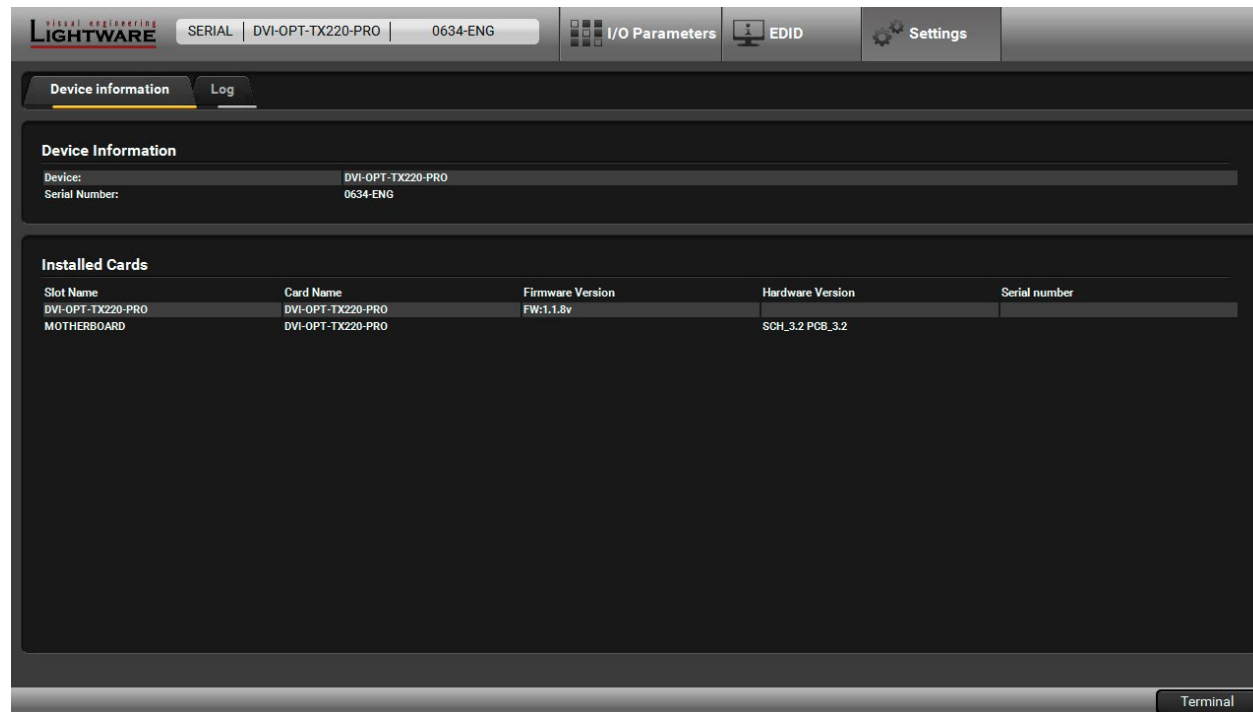
Resolution:

Interface type: VGA DVI HDMI DisplayPort

Easy EDID Creator Wizard

5.5. Settings

Basic information about the extender, such as type, serial number, installed cards' firmware and hardware revisions are displayed on this tab.



The screenshot shows the 'Device Information' tab in the Lightware Device Controller settings. The top navigation bar includes 'SERIAL', 'DVI-OPT-TX220-PRO', '0634-ENG', 'I/O Parameters', 'EDID', and 'Settings'. Below the navigation, there are tabs for 'Device information' and 'Log'. The 'Device Information' section displays the following details:

- Device: DVI-OPT-TX220-PRO
- Serial Number: 0634-ENG

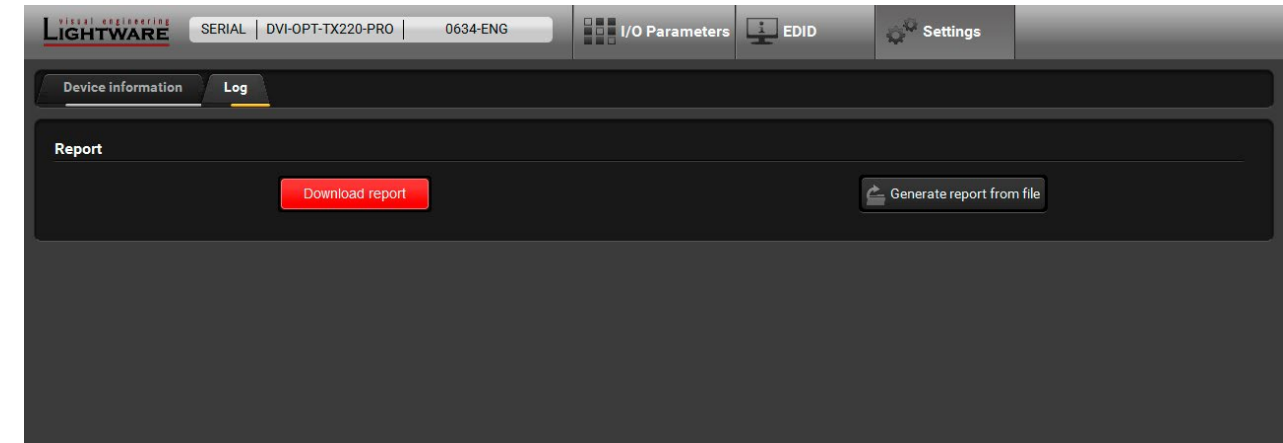
The 'Installed Cards' section contains a table with the following data:

Slot Name	Card Name	Firmware Version	Hardware Version	Serial number
DVI-OPT-TX220-PRO	DVI-OPT-TX220-PRO	FW:1.1.8v		
MOTHERBOARD	DVI-OPT-TX220-PRO		SCH_3.2 PCB_3.2	

A 'Terminal' button is visible at the bottom right of the interface.

Device Information Tab

5.6. Log Tab



The screenshot shows the 'Log' tab in the Lightware Device Controller settings. The top navigation bar is the same as in the previous screenshot. Below the navigation, there are tabs for 'Device information' and 'Log'. The 'Log' section displays a 'Report' section with two buttons: 'Download report' (a prominent red button) and 'Generate report from file'.

Log Tab

Download report

LDC is able to collect information from the extender and save it to a report file. This information package can be sent to Lightware support team when a problem may arise with the extender.

INFO: When a report is necessary to generate, always let the devices be connected to the extenders, do not disconnect them. The Controller Software will collect information about the USB devices and about their status.

Step 1. Press the big red **Download report** button on the Log tab in Settings menu.

Step 2. A **Save as** dialog box appears. Select the place where you want to save the report file. The default file name can be changed.

Step 3. LDC collects the needed information. This may take up to 5 minutes.

Step 4. When the process is finished, the folder is opened, where the file was saved.

The report contains the following information:

- Current command protocol
- The equipment type and serial number
- Firmware version of the controller
- Installed I/O board type and version
- All EDID headers and status (emulated, dynamic, factory, user)

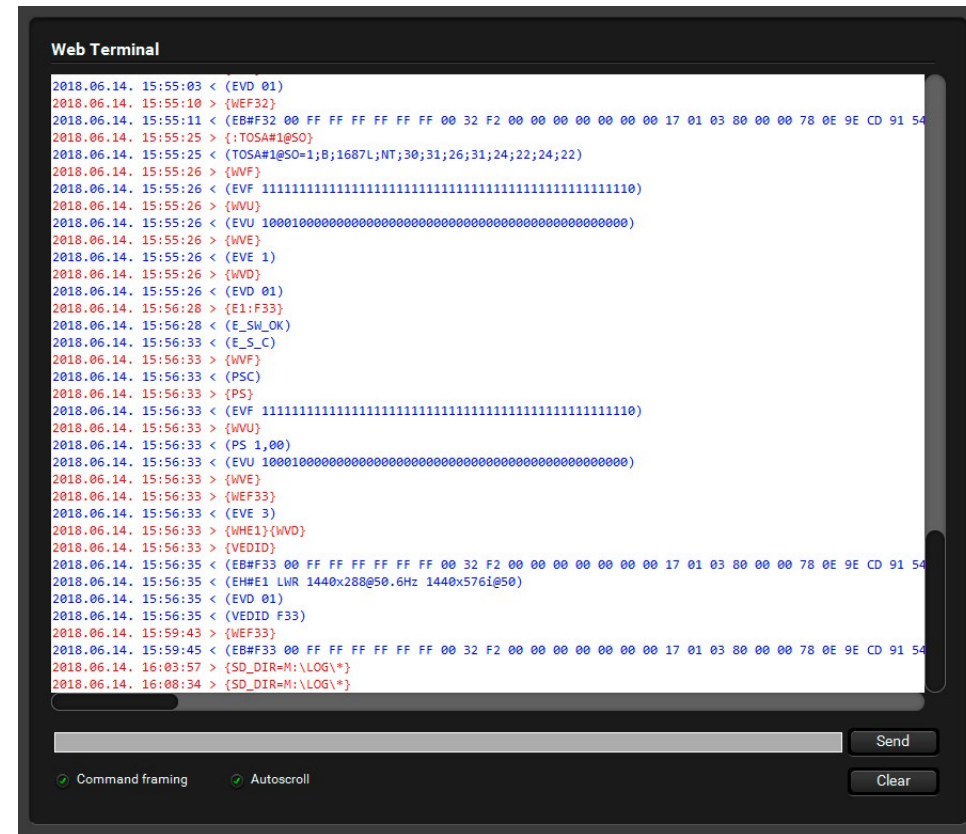
Browse command file

The LDC is able to send a custom command file to the extender. The command file can be generated by Lightware support. This is needed when some special commands has to be used for configuring or troubleshooting.

INFO: This function is only for special troubleshooting cases.

5.7. Terminal Menu

The general-purpose of this serial terminal is intended mainly for testing and debugging purposes. All commands can be used here that are discussed in [LW2 Programmers' Reference](#) chapter, and can be typed directly. The command text can be typed directly. Press **Terminal** button in the right bottom corner to open the window.



Terminal Window

Commands are automatically surrounded by framing brackets as a default setting. Every sent command is red-colored and gets a '>' prefix. Received responses are blue-colored and starts with '<'. Commands can be sent by pressing enter, or the **Send** button.

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.

If the **Autoscroll** checkbox is checked, the window is scrolled down automatically when a new row is added.

The window can be emptied by pressing the **Clear** button.

6

LW2 Programmers' Reference

Lightware DVI-OPT-220-Pro series extenders can be controlled with external devices which can communicate according to the extender protocol. The supported LW2 commands are described in this chapter.

- ▶ [LW2 PROTOCOL DESCRIPTION](#)
- ▶ [GENERAL LW2 COMMANDS](#)
- ▶ [EDID MANAGEMENT](#)
- ▶ [EXTENDER INITIATED COMMANDS](#)
- ▶ [QUICK SUMMARY](#)

6.1. LW2 Protocol Description

The device accepts commands surrounded by curly brackets - { } - and responds data surrounded by round brackets - () - only if a command was successfully executed.

Format	Explanation
<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
<in ² >	Input number in 2 digit ASCII format (01, 02, 10, 12 etc.)
<out ² >	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
<id ² >	id number in 2 digit ASCII format
CrLf	Carriage return, Line feed (0x0D, 0x0A)
•	Space character (0x20)
→	Each command issued by the controller
←	Each response received from the router

6.2. General LW2 Commands

6.2.1. Query Control Protocol

Description: This command queries the active protocol for the used control interface.

INFO: The response shows only the active protocol for the interface that was used to send the command!

Format	Example
Command {P_?}	→ {P_?}
Response CURRENT•PROTOCOL•=•#<protocol>CrLf	← (CURRENT PROTOCOL = #1)CrLf

Explanation: The extender communicates with Lightware protocol (#1).

6.2.2. View Product Type

Description: The device responds its name.

Format	Example
Command {i}	→ {i}
Response (<PRODUCT_TYPE>)CrLf	← (I: DVI-OPT-TX220-PRO)CrLf

Explanation: The connected device is a DVI-OPT-TX220-Pro.

Legend: <PRODUCT_TYPE> shows type.

6.2.3. View Serial Number

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

Format	Example
Command {s}	→ {s}
Response (SN:<SERIAL_N>)CrLf	← (SN:06342203)CrLf

INFO: Old devices may have only the last 4 numbers written onto the back of the extender.

6.2.4. View Firmware Version of the CPU

Description: View the CPU firmware revision.

Format	Example
Command {f}	→ {f}
Response (FW:<FW_VER><s>)CrLf	← (FW:1.1.8v)<CR><LF>

Legend: <FW_VER> is the firmware version.

6.2.5. View Installed Board(s)

Description: Shows the hardware name and revision of the installed boards.

Format	Example
Command {is}	→ {is}
Response (SL#0●<MB_DESC>)CrLf	← (SL# 0 DVI-OPT-TX220-PRO SCH_3.2 PCB_3.2)
(SL●END)CrLf	← (SL END)<CR><LF>

Explanation: The device reports its motherboard (slot 0).

6.2.6. View Firmware for all Controllers'

Description: Shows the firmware versions of all installed controllers.

Format	Example
Command {FC}	→ {fc}
Response (CF●<DESC>)CrLf	← (CF DVI-OPT-TX220-PRO FW:1.1.8)
(CF●<DESC>)CrLf	
...	
(CF END)CrLf	← (CF END)<CR><LF>

Explanation: The device has one control panel.

6.2.7. 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 1,01)

Explanation: DVI signal is present on the input, display device is connected to the second output.

Legend for transmitter:

Bit values	0	1
INPUT_D	No signal	Signal detect
OUTPUT_D	No signal	Hotplug detect

Legend for receiver:

Bit values	0	1	2
INPUT_D	No signal	-	Signal detect
OUTPUT_D	No signal	Hotplug detect	-

Signal detect: Video signal is present (TMDS stream can be recognized).

Hotplug detect: Sink is connected to the output.

6.3. EDID Management

6.3.1. View Emulated EDID on the Input

Description: Shows the currently emulated EDID for the input. The value at the given index <loc1> shows which EDID is used on the input.

Format	Example
Command {VEDID}	→ {VEDID}
Response (VEDID●<loc1>)CrLf	← (VEDID F33)

Explanation: F45 (Factory preset EDID #45) is emulated on the input.

Legend: <loc1> can be **Fxx** or **Uxx** or **Dxx**.

6.3.2. Save EDID to User Memory (Learn EDID)

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

Format	Example
Command {<loc1>:<loc2>}	→ {U4:D2}
Response (E_SW_OK)CrLf (E_S_C) CrLf	← (E_SW_OK)CrLf (E_S_C) CrLf

Explanation: EDID from output 2 is saved to user EDID #4.

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

<loc2> can be **Fxx** or **Uxx** or **Dxx** or **Exx**.

INFO: If the selected user memory is not empty, the new EDID will overwrite the previous EDID.

6.3.3. Change EDID on Input

Description: Copy EDID to the input port <loc1> from memory location <loc2>.

Format	Example
Command {<loc1>:<loc2>}	→ {E1:F10}
Response (E_SW_OK)CrLf ...delay... (E_S_C) CrLf	← (E_SW_OK)CrLf ...delay... ← (E_S_C) CrLf

Explanation: Factory EDID #10 is emulated on input 1.

Legend: <loc1> has to be **Exx**.

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

Location	EDID type	Description
<loc1>	EA	That is valid to all inputs, but since the transmitter has one input, the result will be the same as typing E1 .
<loc2>	Fxx or Uxx	Static EDID routing occurs. In this case the extender will keep the same EDID on the input until it is changed with another command.
<loc2>	Dxx	Dynamic EDID routing occurs. In this case the extender will follow the EDID changes on the output. Every time a different EDID is recognized on the output, it is copied instantly to the input.

INFO: The extender sends (E_S_C) only if the new EDID is different from the earlier one.

6.3.4. 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 110000000000000000000000)CrLf ← (EVD 01) CrLf ← (EVE 3) CrLf

Explanation: First and second locations contain valid EDID in the user memory. The second dynamic location and the input contain valid EDID.

Legend:

<type>	Result	Response length
F	Factory preset EDIDs	49
U	User saved EDIDs	49
D	Dynamic EDIDs	2
E	Emulated EDIDs	1
*	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
4	deleted EDID

INFO: If a changed EDID is queried by the {WH} command (see the next section), its value returns to 1. The status of a deleted EDID returns to 0 after query.

6.3.5. View EDID Header

Description: Shows basic information about EDIDs in the memory.

Format	Example
Command {WH<loc>}	→ {WHD2}
Response (EH#<loc> • <EDID_HEADER>)CrLf	← (EH#D2 NEC 1920x1200@60.0Hz 24WMGX3)CrLf

Explanation: Shows the EDID from location D2.

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 Factory EDIDs
U*	All User saved EDIDs	headers for 49 user EDIDs
D*	All Dynamic EDIDs	headers from all outputs
E*	All Emulated EDIDs	headers from all inputs

<EDID_HEADER> consists of 3 fields separated by spaces:

PNPID code	Preferred resolution	Name
The three letter abbreviation of the manufacturer.	The resolution and refresh rate stored in the preferred detailed timing block.	The name of display device stored in product descriptor.
The <EDID_HEADER> is "-" for invalid EDIDs.		

6.3.6. Download EDID Content from a Location

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

Format	Example
Command {WE<loc>}	→ {WEF1}
Response (EB#<loc>•<B1>•<B2>•... • <B256> CrLf	← (EB#F1 00 FF FF FF FF FF FF 00 32 F2 00 00 00 ... 00 00) CrLf

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

Explanation: Full EDID from memory location F1 is downloaded.

6.3.7. Upload EDID Content to a Location

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

Sequence

- Step 1.** Prepare the extender to accept EDID bytes to the specified location <loc> with command {WL#<loc>}
- Step 2.** Extender 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 extender 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 extender 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. It is between 1 and 32.
<B1>..<>B256> are the bytes of EDID.

Explanation: Full EDID uploaded to memory location U3.

INFO: The uploaded EDID content is checked and saved only if it is a valid EDID.

6.3.8. Delete EDID from Memory

Description: Clear EDID from memory location <loc>.

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

Explanation: All user EDIDs are cleared from memory.

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.
Uxx	Specified User EDID is deleted.
Dxx	Specified Dynamic EDID is deleted. It will be empty until a new monitor is connected.
Exx	Not valid! The EDID of the only one input cannot be deleted.
F*	Not valid! Factory EDID cannot be deleted.
U*	All User EDIDs are deleted.
D*	All Dynamic EDIDs are deleted. They will be empty until a new monitor is connected.
E*	Not valid! The EDID of the only one input cannot be deleted.

INFO: If not valid EDID is tried to delete, the response will be "ERR03".

6.3.9. Restart the Extender

Description: The transmitter can be restarted without unplugging power.

Format	Example
Command {RST}	→ {RST}
Response -	← Booting commands run...

Explanation: The extender reboots and executes the booting commands.

6.4. Extender Initiated Commands

6.4.1. EDID Status Changed (Transmitter)

Description: This is sent after any command which changed the EDID table (EDID copy, EDID switch), or after a new EDID source e.g. a new display device is connected to the extender.

Format	Example
Command various	→ a new monitor is connected to an output
Response (E_S_C) CrLf	← (E_S_C) CrLf

Explanation: When a new monitor is connected to an output port, its EDID is read. The message from the extender shows that an EDID has changed.

INFO: The extender stores the last attached display device's EDID connected to the local monitor output. After disconnecting this device its EDID is still present at the extender's memory, therefore no status change message is issued by the device if a display device having the same EDID is connected to that output. (The same display device is connected again).

INFO: To keep your application in sync with the extender it is recommended to issue a watch validity ({wvd}, {wvu}, {wve}) commands after receiving an EDID status changed response, and read all location indicating "3" or "4" in the table, as the change of these EDIDs triggered the (E_S_C) message.

6.4.2. Port Status Changed

Description: This message is sent when any value changes in the response for the {PS} command. The message means that an input or output port's state has changed e.g. a source or display device is connected or disconnected.

Format	Example
Command none	→ an input port loses signal
Response (PSC) CrLf	← (PSC)CrLf

Explanation: An input port (which had signal present before) detects no signal. The extender sends a message to indicate port status change.

INFO: The (PSC) message can be omitted by third party controller, or it can be used to trigger a {PS} command. In the latter case, the controller can be up to date with the port status without continuous queries.

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

INFO: Old devices may have only the last 4 numbers written onto the back of the extender.

6.5. Quick Summary

General LW2 Commands

Operation	See in section	Command
Query Control Protocol	6.2.1	{P_?}
View Product Type	6.2.2	{i}
View Serial Number	6.2.3	{s}
View Firmware Version of the CPU	6.2.4	{f}
View Installed Board(s)	6.2.5	{is}
View Firmware for all Controllers'	6.2.6	{fc}
All Port Status	6.2.7	{ps}

EDID Management

Operation	See in section	Command
View Emulated EDID on the Input	6.3.1	{VEDID}
Save EDID to User Memory (Learn EDID)	6.3.2	{<loc1>:<loc2>}
Change EDID on Input	6.3.3	{<loc1>:<loc2>}
Watch EDID Validity Table	6.3.4	{WV*}
View EDID Header	6.3.5	{WHD2}
Download EDID Content from a Location	6.3.6	{WEF1>}
Upload EDID Content to a Location	6.3.7	{WL#<loc>}
Delete EDID from Memory	6.3.8	{DE<loc>}
Restart the Extender	6.3.9	{RST}

Extender Initiated Commands

Operation	See in section	Command
EDID Status Changed (Transmitter)	6.4.1	<i>various - a new monitor is connected to an output</i>
Port Status Changed	6.4.2	<i>none - an input port looses signal</i>

7

Firmware Upgrade

This chapter is meant to help customers perform firmware upgrades on our products with Lightware Bootloader software. To get the latest software and firmware pack, please contact support@lightware.com.

- ▶ [SHORT INSTRUCTIONS](#)
- ▶ [INSTALL THE BOOTLOADER](#)
- ▶ [DETAILED INSTRUCTIONS](#)

DVI-OPT-TX220-Pro and DVI-OPT-RX220-Pro can be upgraded using Lightware Bootloader from a Windows based PC or Laptop through RS-232 connection.

ATTENTION! The firmware upgrade will delete the EDID's from the user memory. If you need the EDID(s) from the user memory, first save as a file, then load it after firmware upgrade. See section [EDID Operations](#) for more information about saving and loading processes.

Setting or parameter	After firmware upgrade
Serial number	Remain unchanged
I/O port and preset names	Remain unchanged
EDID lists (F, U, D)	User EDIDs are deleted
EDID emulation table (E)	F49 will be set on the input
Input port settings	Set to factory defaults
Output port settings	Set to factory defaults

7.1. Short Instructions

- Step 1.** Get the firmware pack and the Lightware Bootloader application.
- Step 2.** Install the Lightware Bootloader application.
- Step 3.** Establish the connection between the computer and the device(s).
- Step 4.** Start the Lightware Bootloader and follow the instructions.

7.2. Install the Bootloader

- Step 1.** Run `Installer_LW_bootloader_v3_2_9.exe` (3_2_9 means the 3-digit software version of the Bootloader).
- Step 2.** Select destination folder and click on **Install** button (using the default path is highly recommended).
- Step 3.** To create a desktop icon click on **Yes** button in the pop-up window.
- Step 4.** After the message **Installation was successful**, please click on the **Close** button to finish the process.

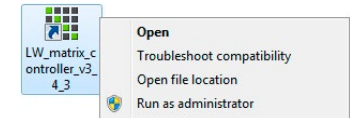
7.3. Detailed Instructions

7.3.1. Establish the Connection between the Computer and the Device

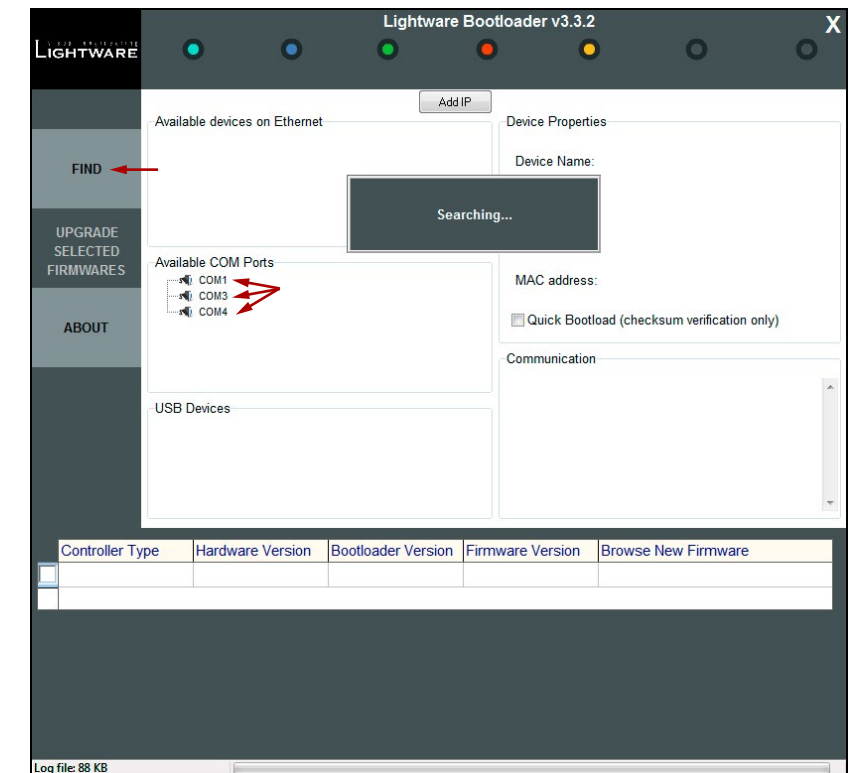
Connect the appliance and the computer via RS-232 port with standard Male to Female cable (straight through).

7.3.2. Start the Bootloader Software and Follow the Instructions

Step 1. Run Lightware Bootloader as an administrator.



Step 2. Click **FIND** Button!



Step 3. Select the desired device. Double click on the desired COM port.

When the connection is established, the device is switched to Bootload-mode and the display shows **Firmware upgrade in progress...**

(if the extender is switched off and on again, the display will be empty).

ATTENTION! The extender cannot be switched back manually to normal operation mode, it will be done automatically after successful firmware upgrade. Do not interrupt the upgrade, let the software finish the process.

If you wish to connect, click **YES** to establish connection with the extender. It will take 10-15 seconds to get all information.

INFO: The bootloader application will restart the extender when it establishes the connection. All connected DVI source and monitors will act as if the extender was powered down.

Step 4. Review the firmware versions

After the connection is made, the device properties, and the installed controller modules are displayed. Select the controller type that needs firmware upgrade by clicking the checkbox next to it.

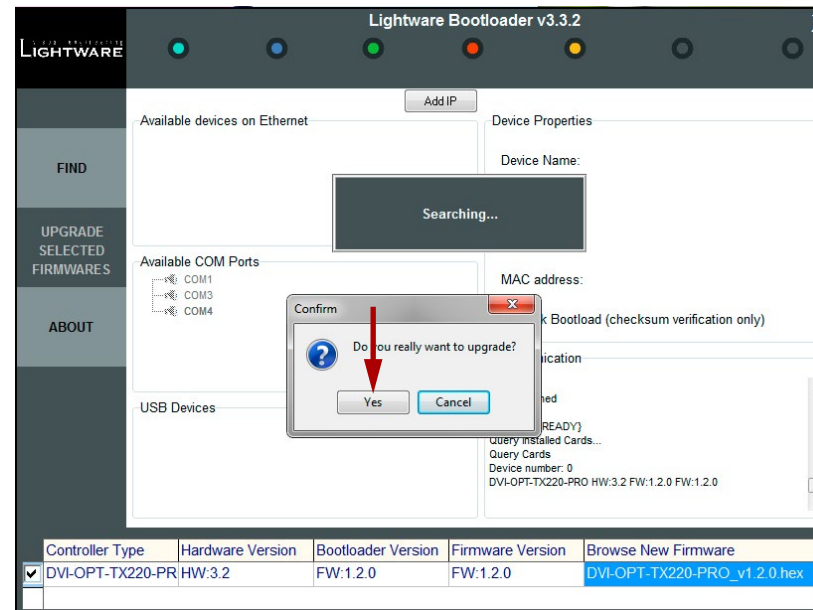
Step 5. Browse for the new firmware(s).

Controller Type	Hardware Version	Bootloader Version	Firmware Version	Browse New Firmware
<input checked="" type="checkbox"/>	DVI-OPT-TX220-PR:HW:3.2	FW:1.2.0	FW:1.1.5	DVI-OPT-TX220-Pro 1.1.8.hex

Click the corresponding cell in the **Browse New Firmware** column. A dialog pops up, to confirm if you really want to modify the path. Now you can browse for the new firmware file to upload. After opening the new file, the new firmware field will contain the name of the firmware file.

Step 6. Upgrade firmware(s)

Click **UPGRADE SELECTED FIRMWARES** button on the left side. A confirmation message appears.



After clicking the **YES** button the selected controller is being reprogrammed, with the firmware you selected. If you select a file that doesn't fit for the selected controller, you will get an information message about which file is wrong. If you selected a controller to upgrade, but you had not selected a file for it, then you will also get an information message about which file is missing.

Quick Bootload mode can be switched on or off any time. It makes the bootloader software faster by only checking the checksum of the controller. No data verification is done after writing if the checksum was correct.

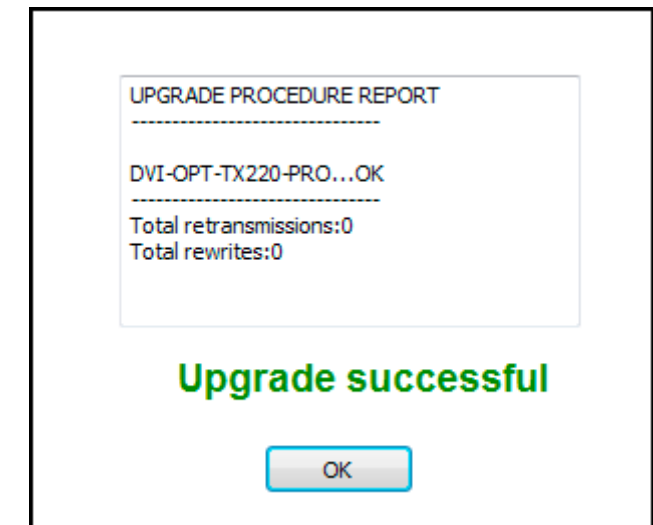
INFO: The reprogramming can take between 3-8 minutes.

A progress bar will show the current state of the reprogramming. With some controller type an erasing process will take place first, and then the programming is done, so the progress bar runs up twice.

When the reprogramming is finished, a **Done!** message will appear in the bottom left corner. The application closes the connection, and the extender restarts.

Step 7. Done!

If the upgrade was successful, the following window pops up:



Now you can close the application, or you can select another device to upgrade.





After closing the bootloader application, switch the upgraded device off and then on. Now the device is ready to be used with the new firmware!

INFO: Please note that after firmware upgrade F49 (Universal EDID) will be set as emulated EDID on the input.







8

Troubleshooting

Usually, if the system seems not to transport the signal as expected, the best strategy for troubleshooting is to check signal integrity through the whole signal chain starting from source side and moving forward to receiver end.

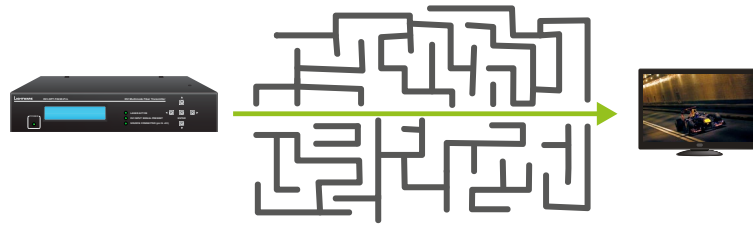
-  Link to connections/cabling section.
-  Link to front panel operation section.
-  Link to LDC software section.
-  Link to LW2 protocol commands section

At first, check front panel LEDs and take the necessary steps according to their states. For more information about status, LEDs refer to the [Front View](#) and [Rear View](#) sections.

Symptom	Root cause	Action	Refer to
Video signal			
No picture on the video output	Device(s) not powered properly.	Check the extenders and the other devices if they are properly powered; try to unplug and reconnect them.	 3.3
	Cable connection problem.	Due to the high data rates cables must fit very well, check all the connectors. If your source or display has more connectors then make sure that the proper port is selected.	 3.3
	Cable quality problem.	Due to the high data rates, high quality cables must be used. It is recommended to use OM3 or OM4 fiber cables.	 10.3
	Endface surface of the fiber optical cable became contaminated.	Use special fiber optical cable cleaning equipment to clean it carefully.	
	Display is not capable of receiving the sent video format.	Try emulating your display device's EDID to the source.	 4.2.4  5.4  6.3.3
	Source power and configuration problems.	Check the Source Connected LED on the front side of the transmitter. This LED indicates the presence of the +5V signal coming from the DVI source, which means the DVI source device is powered on and the cable link is well connected. If it is not illuminated, then your DVI source is either powered off or not working properly. The HDMI output can be turned off on most DVD players. Please refer to the user's manual of your DVI source. The other option is that the cable is damaged, test the system it with another one. If the source is a computer, then verify that the DVI output is selected and active. Try restarting your computer; if you only get a picture during the booting process, you have to review the driver settings.	

How to Speed up the Troubleshooting Process?

Lightware's technical support team is always working hard to provide the fastest support possible. Our team's response time is one of the best in the industry and in the toughest of cases we can directly consult with the hardware or software engineer who designed the product to get the information from the most reliable source.



However, the troubleshooting process can be even faster... with your help.

There are certain pieces of information that push us in the right direction to finding the root cause of the problem. If we receive most of this information in the first e-mail or it is gathered at the time when you call us, then there is a pretty high chance that we will be able to respond with the final solution right away.

This information is the following:

- Schematic (a pdf version is preferred, but a hand drawing is sufficient).
- Serial number(s) of the device(s) (it is either printed somewhere on the box or you can query it in the Device Controller software or on the built-in website).
- Firmware versions of the devices (please note that there may be multiple CPUs or controllers in the device and we need to know all of their firmware versions, a screenshot is the best option).
- Cable lengths and types (in our experience, it's usually the cable).
- Patch panels, gender changers or anything else in the signal path that can affect the transmission.
- Signal type (resolution, refresh rate, color space, deep color).
- Emulated EDID(s) (please save them as file and send them to us).
- Actions to take in order to re-create the problem (if we cannot reproduce the problem, it is hard for us to find the cause).
- Photo or video about the problem ('image noise' can mean many different things, it's better if we see it too).
- Error logs and backup files from the Lightware Device Controller software.

The more of the above information you can give us the better. Please send these information to the Lightware [Support Team](#) to speed up the troubleshooting process.

9

Technologies

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

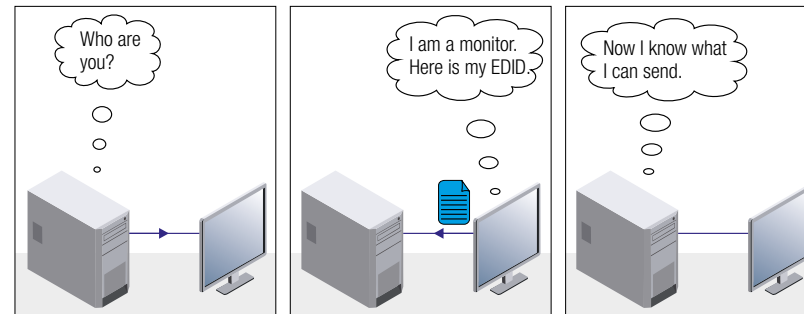
- ▶ EDID MANAGEMENT
- ▶ PIXEL ACCURATE RECLOCKING
- ▶ SERIAL MANAGEMENT

9.1. EDID Management

9.1.1. Understanding the EDID

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

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



EDID Communication

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

Common Problems Related to EDID

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

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

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

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

9.1.2. Advanced EDID Management

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

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

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

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

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

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

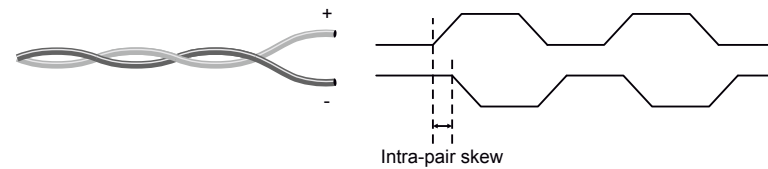
9.2. Pixel Accurate Reclocking

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

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

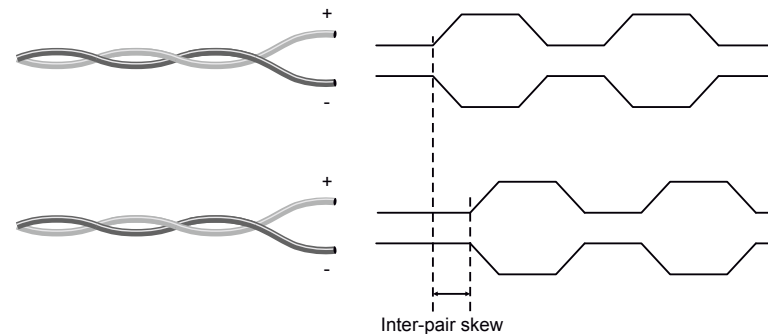
Intra-pair skew

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



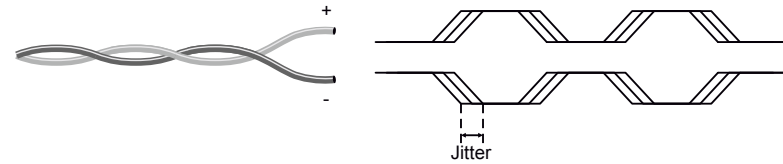
Inter-pair skew

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



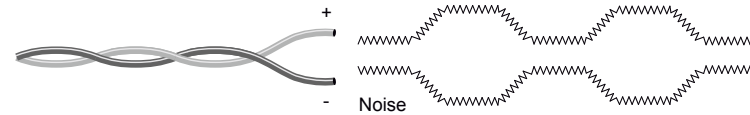
Jitter

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



Noise

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



9.3. Serial Management

9.3.1. General Information

There are two types of devices in general serial communication:

- **Data Terminal Equipment:** Data Terminal Equipment (DTE) is an end instrument that converts user information into signals or reconverts received signals. Typical DTE devices: computers, LCD touch panels and control systems.
- **Data Circuit-terminating Equipment:** Data Circuit-terminating Equipment (DCE) is a device that sits between the DTE and a data transmission circuit. It is also called data communication equipment and data carrier equipment. Typical DCE devices: projectors, industrial monitors and amplifiers.

Among others the pin assignment is different between DTE and DCE.

	DTE	DCE
Pin 2:	RD	TD
Pin 3:	TD	RD



RD: Received Data (digital input)
TD: Transmitted Data (digital output)

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

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

* In general contact DCE with DCE by tail-circuit serial cable.

9.3.2. Types of Serial Cables

Straight Serial Cable	Null-modem Serial Cable
Straight pin-outs both ends.	Straight pin-out at the one end and cross pin-out at the other end (interchange lines of TX and RX).
	

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

ATTENTION! The cable type does not depend on the plug type.

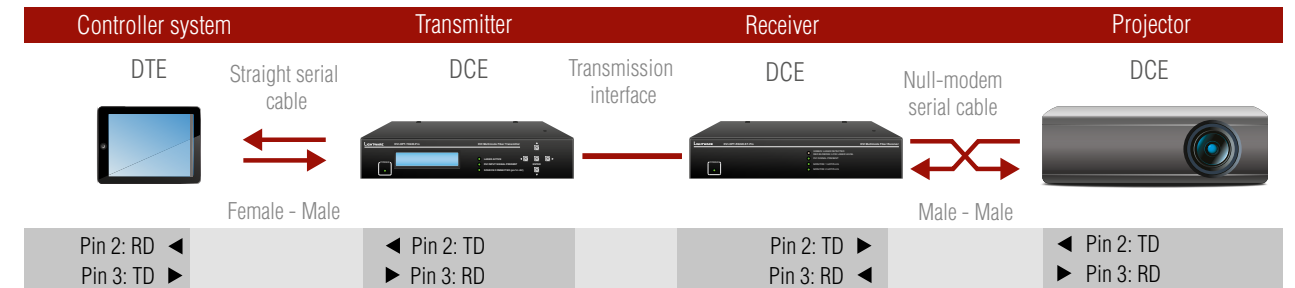
9.3.3. RS-232 Signal Transmission over Lightware Extender Devices

The following examples describe the detailed integration of Lightware devices between different RS-232 pin assignment units.

INFO: DVI-OPT-220-Pro series extenders are DCE units (according to their pinouts) with female plugs.

Extending RS-232 between DTE and DCE Third-party Devices

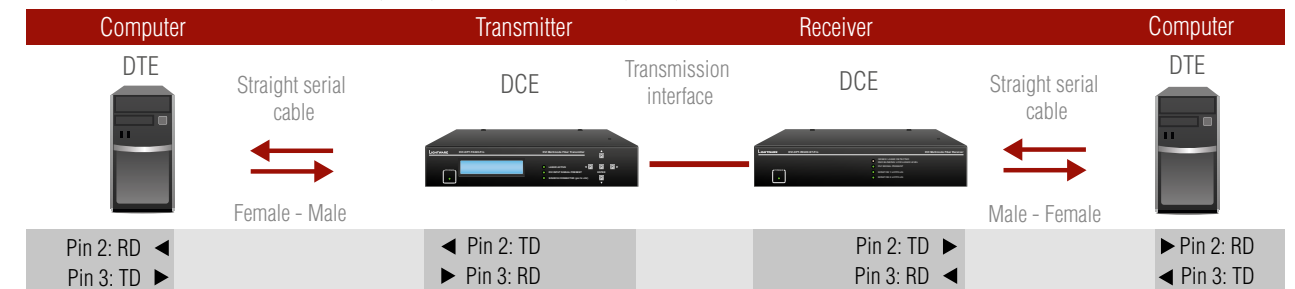
Connect straight serial cable between controller system (DTE) and the transmitter (DCE) and null-modem serial cable between receiver (DCE) and projector (DCE).



RS-232 Connection Example between a Controller System and a Projector

Extending RS-232 between DTE and DTE Third-party Devices

Connect straight serial cable between controller system (DTE) and the transmitter (DTE) and straight serial cable between receiver (DTE) and computer (DTE).



RS-232 Connection Example between Two Computers

10

Appendix

- ▶ SPECIFICATION
- ▶ FACTORY EDID LIST
- ▶ MAXIMUM EXTENSION DISTANCES
- ▶ MECHANICAL DRAWINGS

10.1. Specification

General

Compliance	CE
EMI/EMC compliance	EN 55035:2017, EN 55032:2015
Safety	EN 60065 Class I
Cooling.....	Passive
Operating temperature	0 to +55°C (+32 to +122°F)
Storage temperature.....	-40 to +85°C (-40 to +185°F)
Operating humidity	10% to 90%, non-condensing
Warranty	3 years

Power

Power source.....	100-240V AC, 50/60Hz
Power supply.....	Internal
Power consumption: (TX220)	3.5 W*
Power consumption: (RX220)	4 W*

* Self-consumption; remote powering not included

Enclosure

Rack mountable	Yes
Mounting	1U high half rack shelf (optional)
.....	Double UD-kit (optional)
.....	Mounting bracket (optional)
Material.....	1 mm steel
Dimensions in mm (excluding connectors)	
.....	221W x 181D x 42.2H mm
Net Weight (TX220-Pro)	1420 g / product
Net Weight (RX220-Pro)	1340 g / product
Net Weight (TX220-ST-Pro)	1400 g / product
Net Weight (RX220-ST-Pro)	1320 g / product

Control Ports

Serial port	RS-232
Direction	Bi-directional
Baud rate	9600

Optical Port

Fiber type.....	50/125 SC Multimode fiber
Laser wavelengths	4ch. CWDM: 778; 800; 825; 850 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 OM3e type fiber)

*OMA: Optical Modulation Amplitude

Digital video signal

Standard	DVI 1.0
Color depth.....	maximum 24 bits, 8 bit/color
Color Format	RGB
Colorspace conversion.....	No
Maximum data rates.....	4.95 Gbps (1.65 Gbps /TMDS channel)
Video delay.....	0 frame
Resolutions.....	from 640x480 to 1920x1200
Reclocking (RX220)	Pixel Accurate Reclocking
EDID emulation (TX220).....	yes, Advanced EDID Management
EDID memory (TX220). yes, 50 factory preset, 49 user programmable	
EDID support (TX220).....	256 byte extended EDID v1.3
HDCP compliant.....	No

Connectors / ESD protection (HBM EIA/JESD22-A114F)

DVI input/output.....	29-pole DVI-I digital only/8 kV
Optical fiber input/output (-Pro).....	
.....	Neutrik NO2-4FDW type LC duplex/n.a.
.....	LC simplex for B channel breakout/n.a.
Optical fiber input/output (-ST-Pro)	ST connector/n.a.
RS-232 port	DE-9F (9-pole D-sub Female)/15 kV
Alarm (only on receiver)	3 pole Phoenix® Combicon, series/2 kV
Power connector.....	Standard IEC receptacle/n.a.

10.2. Factory EDID List

Mem.	Resolution			
F1	640 x	480	@ 60.0	Hz
F2	640 x	480	@ 75.0	Hz
F3	848 x	480	@ 60.0	Hz
F4	800 x	600	@ 50.0	Hz
F5	800 x	600	@ 60.30	Hz
F6	800 x	600	@ 74.99	Hz
F7	1024 x	768	@ 49.98	Hz
F8	1024 x	768	@ 60.0	Hz
F9	1024 x	768	@ 75.2	Hz
F10	1152 x	864	@ 75.0	Hz
F11	1280 x	768	@ 50.0	Hz
F12	1280 x	768	@ 59.92	Hz
F13	1280 x	768	@ 75.0	Hz
F14	1360 x	768	@ 60.1	Hz
F15	1364 x	768	@ 50.0	Hz
F16	1364 x	768	@ 59.93	Hz
F17	1364 x	768	@ 74.98	Hz
F18	1280 x	1024	@ 50.0	Hz
F19	1280 x	1024	@ 60.1	Hz
F20	1280 x	1024	@ 75.1	Hz
F21	1366 x	1024	@ 59.99	Hz
F22	1400 x	1050	@ 49.99	Hz
F23	1400 x	1050	@ 59.99	Hz
F24	1400 x	1050	@ 75.0	Hz
F25	1680 x	1050	@ 59.99	Hz
F26	1600 x	1200	@ 50.0	Hz
F27	1600 x	1200	@ 60.0	Hz
F28	1920 x	1200	@ 59.55	Hz
F29	1920 x	1200	@ 50.0	Hz
F30	1440 x	480i	@ 60.3	Hz

Mem.	Resolution			
F31	640 x	480	@ 59.94	Hz
F32	720 x	480	@ 59.92	Hz
F33	1440 x	576i	@ 50.6	Hz
F34	720 x	576p	@ 50.0	Hz
F35	1280 x	720p	@ 50.0	Hz
F36	1280 x	720p	@ 60.0	Hz
F37	1920 x	1080i	@ 50.3	Hz
F38	1920 x	1080i	@ 50.0	Hz
F39	1920 x	1080i	@ 60.5	Hz
F40	1920 x	1080	@ 24.0	Hz
F41	1920 x	1080	@ 24.99	Hz
F42	1920 x	1080	@ 30.0	Hz
F43	1920 x	1080	@ 50.0	Hz
F44	1920 x	1080	@ 49.99	Hz
F45	1920 x	1080	@ 60.0	Hz
F46	2048 x	1080	@ 49.99	Hz
F47	2048 x	1080	@ 50.0	Hz
F48	2048 x	1080	@ 59.99	Hz
F49	1920 x	1200	@ 59.55	Hz

INFO: Factory EDIDs do not include HDMI support.

10.3. Maximum Extension Distances

The below table shows the transmission distances via optical cable between the DVI-OPT-220-Pro series extenders depending on the cable quality and pixel clock frequency

Resolution, pixel clock rate	OM1 (62.5/125)	OM2 (50/125)	OM3 (50/125)	OM4 (50/125)
1080p@60Hz 24 bpp	Not supported	600 m	1200 m	2500 m

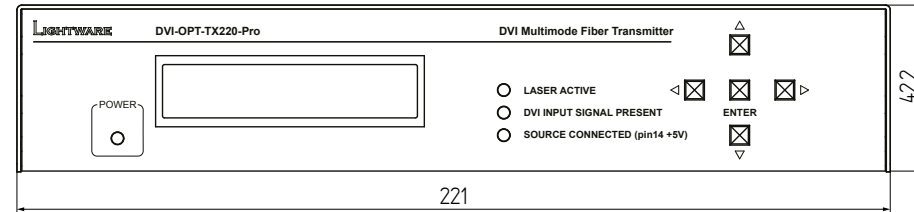
10.4. Factory Default Settings

Parameter	Setting/Value
RS-232 settings	9600 Baud, 8 data bit, 1 stop bit, no parity
Emulated EDID	F49 (1920x120059.55Hz Universal EDID)
Laser enabled	Yes

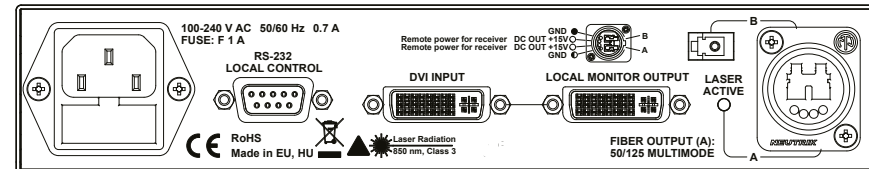
10.5. Mechanical Drawings

INFO: DVI-OPT-TX220-pro can be seen on the pictures; the external dimensions and the fixing holes of all units are the same.

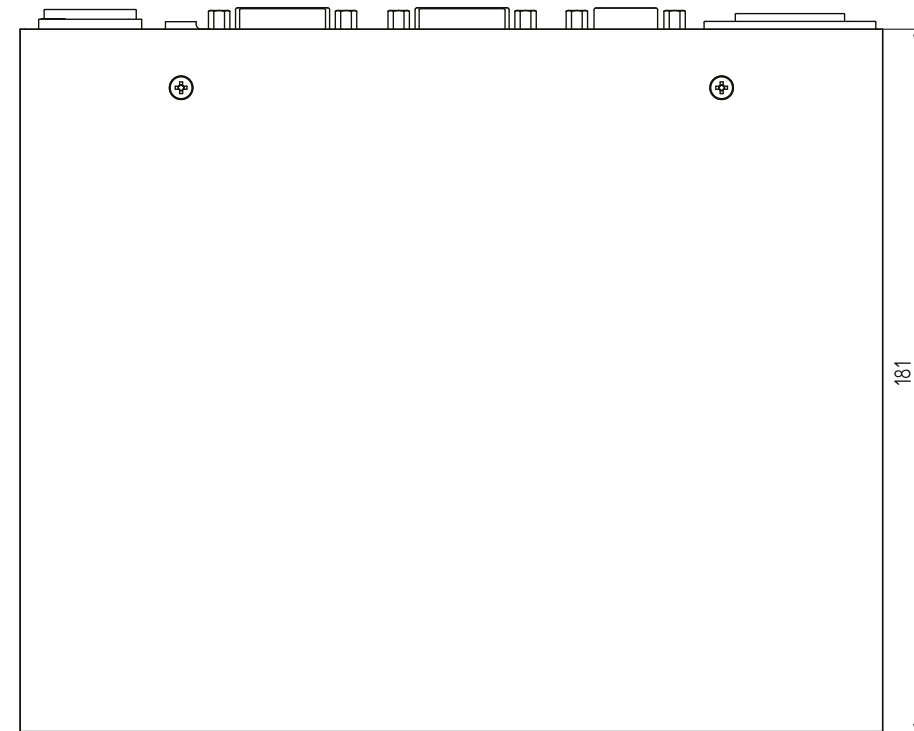
Front View



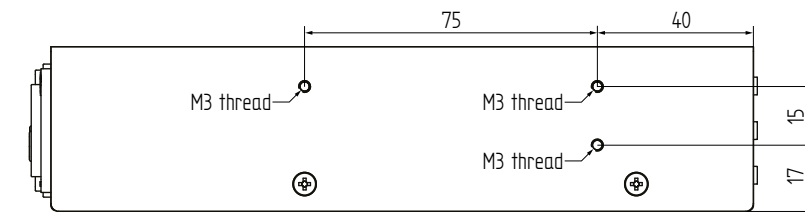
Rear View



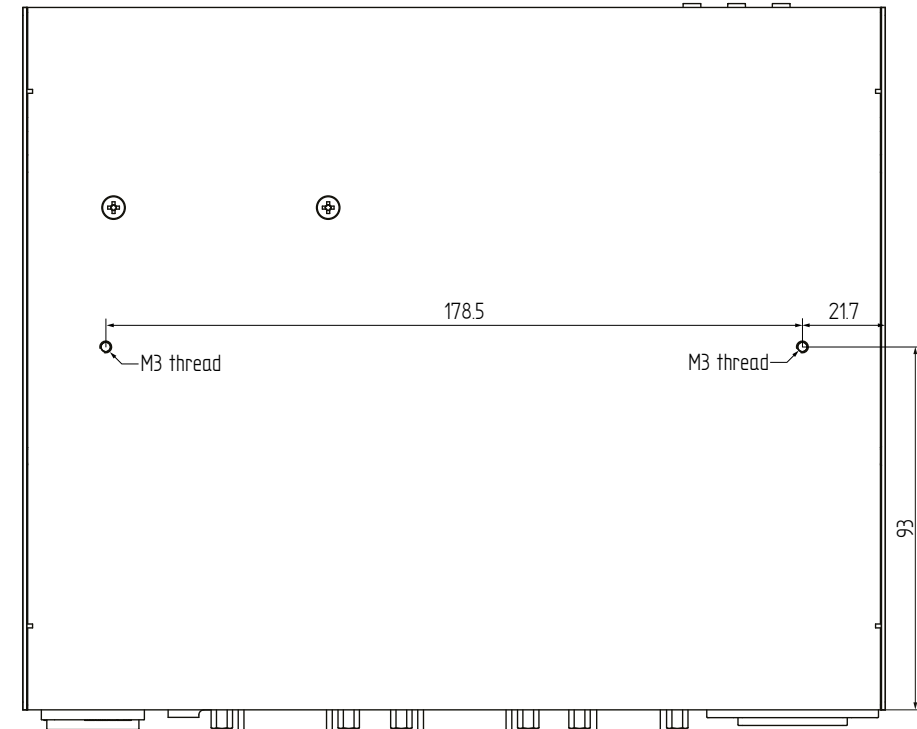
Top View



Left View



Bottom View



10.6. Further Information

Limited Warranty Statement

1. Lightware Visual Engineering LLC (Lightware) warrants to all trade and end user customers that any Lightware product purchased will be free from manufacturing defects in both material and workmanship for three (3) years from purchase unless stated otherwise below. The warranty period will begin on the latest possible date where proof of purchase/delivery can be provided by the customer. In the event that no proof can be provided (empty 'Date of purchase' field or a copy of invoice), the warranty period will begin from the point of delivery from Lightware.

1.1. 25G and MODEX product series will be subject to a seven (7) year warranty period under the same terms as outlined in this document.

1.2. If during the first three (3) months of purchase, the customer is unhappy with any aspect of a Lightware product, Lightware will accept a return for full credit.

1.3. Any product that fails in the first six (6) months of the warranty period will automatically be eligible for replacement and advanced replacement where available. Any replacements provided will be warranted for the remainder of the original unit's warranty period.

1.4. Product failures from six (6) months to the end of the warranty period will either be repaired or replaced at the discretion of Lightware. If Lightware chooses to replace the product then the replacement will be warranted for the remainder of the original unit's warranty period.

2. The above-stated warranty and procedures will not apply to any product that has been:

2.1. Modified, repaired or altered by anyone other than a certified Lightware engineer unless expressly agreed beforehand.

2.2. Used in any application other than that for which it was intended.

2.3. Subjected to any mechanical or electrical abuse or accidental damage.

2.4. Any costs incurred for repair/replacement of goods that fall into the above categories (2.1., 2.2., 2.3.) will be borne by the customer at a pre-agreed figure.

3. All products to be returned to Lightware require a return material authorization number (RMA) prior to shipment and this number must be clearly marked on the box. If an RMA number is not obtained or is not clearly marked on the box, Lightware will refuse the shipment.

3.1. The customer will be responsible for in-bound and Lightware will be responsible for out-bound shipping costs.

3.2. Newly repaired or replaced products will be warranted to the end of the originally purchased products warranty period.

Document Revision History

Rev.	Release date	Changes	Editor
1.0	11-12-2014	Initial version	Laszlo Zsedenyi
1.1	15-12-2015	Safety instructions updated, CE page pulled out	Laszlo Zsedenyi
1.2	14-06-2017	New chapters: Port diagrams, Two video signals through one Neutrik OpticalCON Duo hybrid cable	Judit Barsony
2.0	22-06-2018	New format introduced, minor corrections	Judit Barsony

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