

visual engineering
LIGHTWARE

User's Manual



DA2DVI-DL

Multimedia Signal Distribution Amplifier

Important Safety Instructions

Class II apparatus construction.

The equipment should be operated only from the power source indicated on the product.

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

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

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

Ventilation

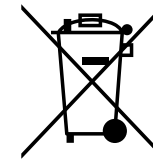
For the correct ventilation and to avoid overheating ensure enough free space around the appliance. Do not cover the appliance, let the ventilation holes free and never block or bypass the ventilators (if any).

WARNING

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

Waste Electrical & Electronic Equipment WEEE

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



Common Safety Symbols

Symbol	Description
	Direct current
	Alternating current
	Double insulation
	Caution, possibility of electric shock
	Caution

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 the button.

 Navigate to the Table of Contents.

 Step back one page.

 Step forward to the next page.

Document Information

This User's Manual applies to the following versions of the mentioned software, firmware, and hardware:

Item	Version
Lightware Device Controller (LDC) software	1.17.1b3
Lightware Bootloader Software	3.3.3
Controller firmware	1.2.1
Hardware	1.1

Document revision: **3.0**

Release date: 19-09-2017

Editor: Tamas Forgacs

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Introduction

Thank You for choosing Lightware's DA2DVI-DL 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
- ▶ TYPICAL APPLICATION

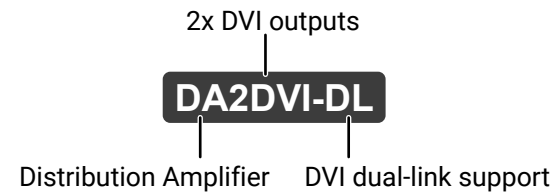
1.1. Description

Lightware's DA2DVI-DL is an EDID emulator and repeater that can store 79 EDIDs. It emulates and keeps a fixed EDID for the source, so it can provide stable signal which is distributed to the two outputs. Thanks to our Advanced EDID Management, the device can trick the DVI source (PC computer, laptop, etc.) by emulating any DVI/HDMI display (LCD monitor, projector) for continuous video output – even if the AV system is disconnected or powered down. With EDID emulation, the user can set up any DVI or HDMI output resolution, regardless of the used projector or monitor. This ensures that the overall system resolution can be controlled. There are 50 factory and 29 user programmable presets available, and the last attached display device's EDID is also stored separately on address #00, to be able to copy it to the input (repeater mode).

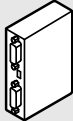
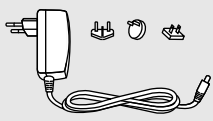

DA2DVI-DL can be rack mounted or used standalone. The unit is equipped with the highest grade gold plated connectors and gold plated printed circuit boards to ensure reliable connections and long-term operation.

With the Easy EDID Creator (that is built in Lightware Device Controller Software) users can create their own EDID by completing four simple steps. More experienced users can use the Advanced EDID Editor to manage every possible setting in the EDID, which they can upload to the memory of the DA2DVI-DL.

Model Denomination



1.2. Box Contents

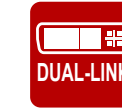
 <p>DA2DVI-DL distribution amplifier</p>	 <p>5V DC adaptor with interchangeable plugs</p>	 <p>Safety & warranty info, Quick Start Guide</p>
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1.3. Features



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.



Dual-Link Resolutions

Supports all Dual-Link signal resolutions up to 9.9 Gbit/s data rate, e.g. WUXGA (1.920 × 1.200) @ 120 Hz with CVT-RB blanking, WQXGA (2.560 × 1.600) @ 60 Hz with CVT-RB blanking.



Fiber Cable Support

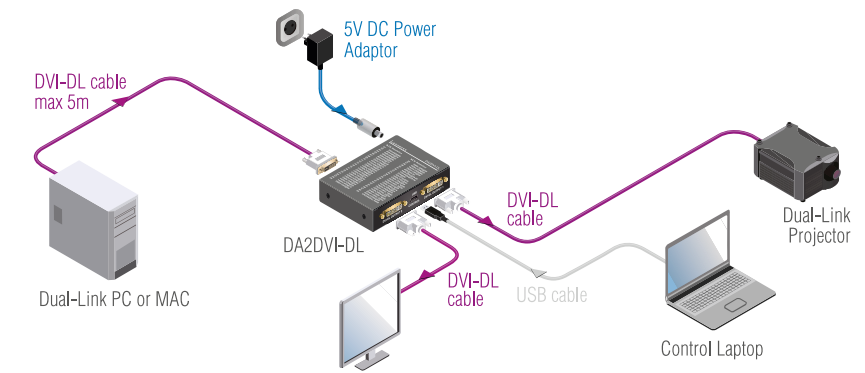
Self-powered DVI fiber cables using 5V from DVI sources (VGA cards, etc.) usually consuming more than 50 mA (maximum suggested by DVI 1.0 standard). Lightware devices support 5V 500 mA constant current output on both of its outputs to power long distance fiber optical cables.



Front Panel EDID Switching

EDID ADDRESS selection with two decimal rotary switches, LEARN EDID button is available for Advanced EDID Management.

1.4. Typical Application



2

Installation

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

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

2.1. Mounting Options

To mount the extenders Lightware supplies optional accessories for different usage. There are three kinds of mounting kits with similar fixing method:



*Under-desk
mounting kit*

*Under-desk double
mounting kit*

1U high rack shelf

The device has two mounting holes with inner thread on the bottom side; see the bottom view in the [Mechanical Drawings](#) section. Fasten the device by the screws enclosed to the accessory.

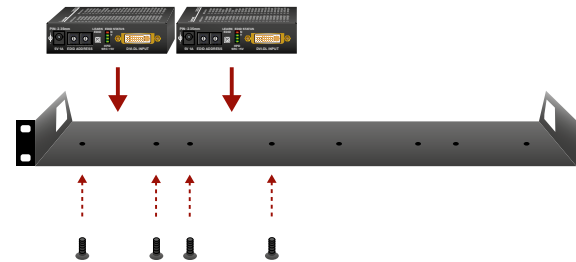
To order mounting accessory kits please contact sales@lightware.com.

WARNING! Always use the supplied screws. Using different (e.g. longer) ones may cause damage to the device.

INFO: The distribution amplifier is quarter-rack sized.

2.1.1. 1U High Rack Shelf

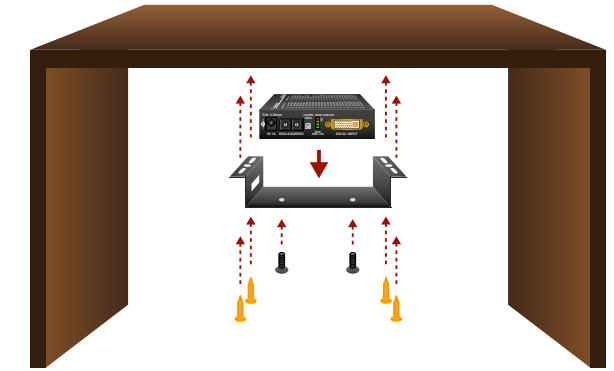
Allows rack mounting for half-rack, quarter-rack and pocket sized units.



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

2.1.2. Under-desk Mounting Kit

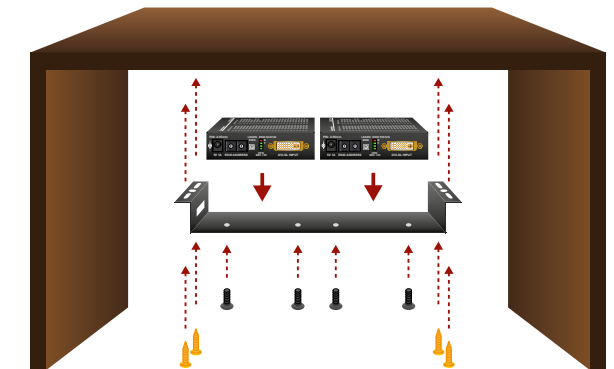
The UD kit allows a receiver to be easily mounted on any flat surface (e.g. furniture). Only quarter-rack sized units can be installed to the kit.



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

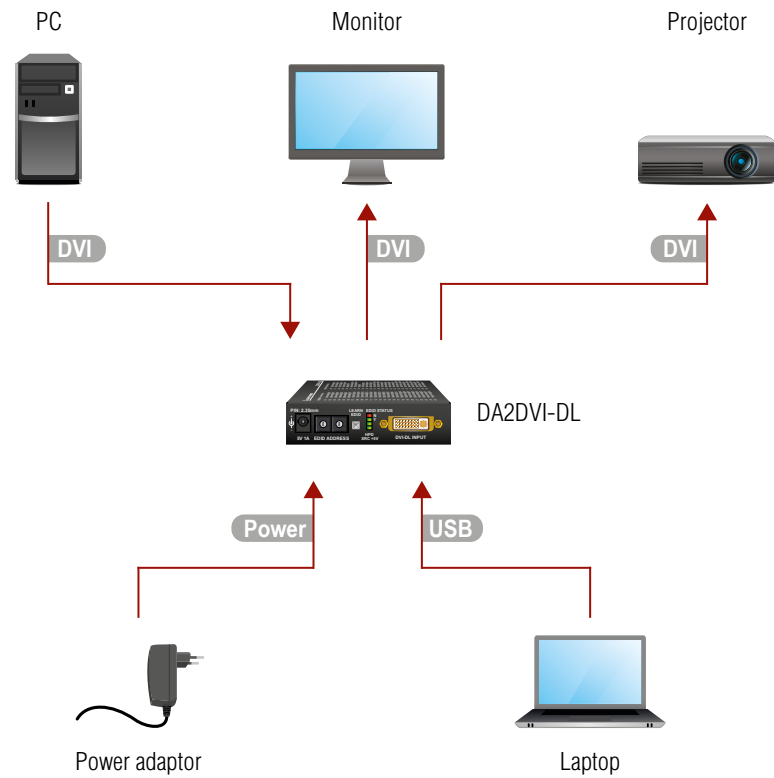
2.1.3. Under-desk Double Mounting Kit

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



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

2.2. Connecting Steps



-
- DVI** Connect the source device (e.g. a PC) to the distribution amplifier's input port by a dual-link DVI cable.

 - DVI** Connect the sink device(s) to the distribution amplifier's output port(s) by a dual-link DVI cable.

 - USB** Optionally connect the amplifier to a controller device (e.g. a laptop) by a USB cable.

 - Power** Connect the power adaptor to the DC input on the device first, then to the AC power socket.

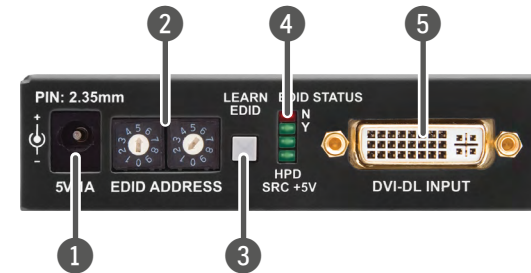
3

Product Overview

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





- ▶ [FRONT VIEW](#)
- ▶ [REAR VIEW](#)
- ▶ [ELECTRICAL CONNECTIONS](#)

3.1. Front View



- 1 **DC 5V input** Connect the output of the supplied 5V power adaptor or use Lightware's rack mountable power supply unit. See more information in the [DC 5V Connection](#) section.
- 2 **Rotary switches** The rotary switches select one of the EDID memory addresses. See more information in the [EDID Operations](#) section.
- 3 **Learn button** Stores the EDID of the display device attached to DVI-DL OUTPUT 1 in the selected memory address between #51..#79. For more information see the [Learning the EDID](#) section.
- 4 **Status LEDs** Display EDID information during operation and the installed firmware version during system boot up. See the details below.
- 5 **DVI-DL input** Connect one single or dual-link DVI cable (only digital pins are connected internally) between the DVI source and DA2DVI-DL. See more information in the [DVI-I Connector](#) section.

Status LEDs

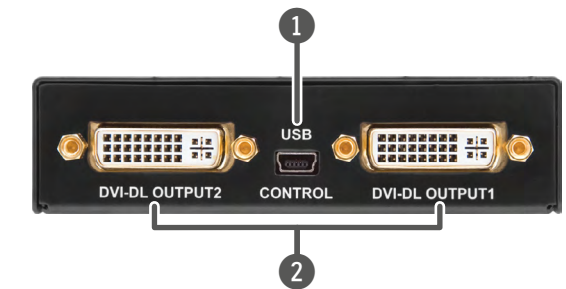
	EDID status N (red)
	EDID status Y (green)
	HPD (green)
	SRC +5V (green)

The LEDs display basic information about EDID and connected devices' status:

LED label	LED is illuminated	LED is blinking
EDID STATUS N	Selected EDID is invalid	EDID learn failure
EDID STATUS Y	Selected EDID is valid	EDID learn success
HPD	Hotplug detect: OUTPUT 1 is connected	-
SRC +5V	Source connected:+5V present on INPUT	-

INFO: LEDs display the installed firmware version during startup as described in the [Powering On](#) section.

3.2. Rear View



- 1 **USB control** Advanced EDID management and firmware upgrades are available via the USB interface.
- 2 **DVI-DL outputs** Connect single or dual-link DVI cables (only digital pins are connected internally) between DA2DVI-DL and the display devices. The output connectors are able to supply 500 mA current on pin 14 to power fiber optical DVI extenders like Lightware's DVI-OPT-TX110. See more information in the [DVI-I Connector](#) section.

3.3. Electrical Connections

3.3.1. DVI-I Connector

DA2DVI-DL provides 29 pole „digital only“ DVI-I Dual-Link connectors (only digital pins are internally connected). This way, users can plug in any DVI connector, but keep in mind that analog signals (such as VGA or RGBHV) are not processed.

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



Pin	Signal	Pin	Signal
1	TMDS Data2-	16	Hot Plug Detect
2	TMDS Data2+	17	TMDS Data0-
3	TMDS Data2/4 Shield	18	TMDS Data0+
4	TMDS Data4-	19	TMDS Data0/8 Shield
5	TMDS Data4+	20	TMDS Data5-
6	DDC Clock	21	TMDS Data5+
7	DDC Data	22	TMDS Clock Shield
8	not connected	23	TMDS Clock+
9	TMDS Data1-	24	TMDS Clock-
10	TMDS Data1+	C1	not connected
11	TMDS Data1/3 Shield	C2	not connected
12	TMDS Data3-	C3	not connected
13	TMDS Data3+	C4	not connected
14	+5V Power	C5	GND
15	GND (for +5V)		

DVI-DL Output

Monitor hotplug is detected on the DVI-DL OUTPUT 1 (HPD LED lights green). After a hotplug event, the DA2DVI-DL tries to read the EDID of the connected device.

No output relocking is provided. If a long DVI cable is connected then equalization and relocking may be necessary at the receiver end of the cable.

Fiber Cable Powering

As a special feature, the device is able to supply 500 mA current on DDC +5V output (pin 14 on the output connectors) to power fiber optical DVI transmitters. Standard DVI outputs or VGA cards supply only 55 mA current on +5V output, thus unable to power directly a fiber optical cable.

INFO: The device does not check if the connected sink (monitor, projector or other equipment) supports hotplug or EDID signals but outputs the input signal directly.

DVI-DL Input

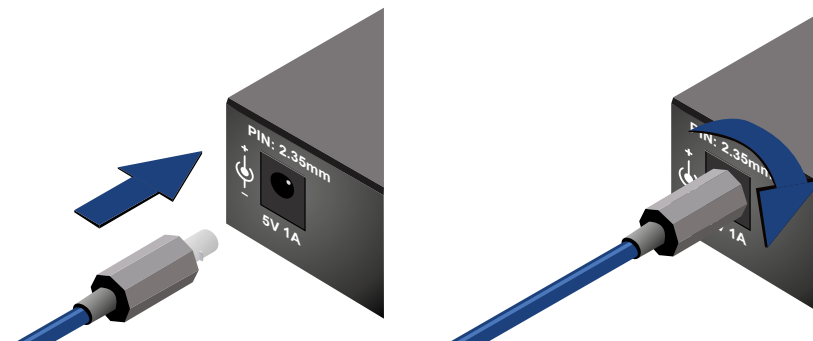
The input has Dual-Link disable option, which ensures Single-Link compatibility. Devices supporting Dual-Link output can confuse Single-Link inputs; disabling the Dual-Link TMDS channel distribution solves this problem. For more information see [Output Port Properties](#) section.

Cable length at inputs

DA2DVI-DL has no built-in cable equalization circuit. Be sure to use no longer than 5m cable. If there is more distance needs to be covered, please use one of our cable extender solutions, for example the Lightware DVIDL-Extender.

3.3.2. DC 5V Connection

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




Locking DC connector

Do not forget to turn the plug clockwise direction before disconnecting the power adaptor.

WARNING! Always use the supplied 5V power adaptor or Lightware's rack mountable power supply. Warranty void if damage occurs due to use of a different power source.

3.3.3. USB Connector

The device provides standard USB 2.0 mini B-type connector for software control and firmware upgrade purpose. 

You can find more details about software control in [Software Control – Lightware Device Controller](#) and in [Programmer's Reference](#) chapters. For more information about firmware upgrade see the [Firmware Upgrade](#) chapter.

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](#)
- ▶ [EDID OPERATIONS](#)

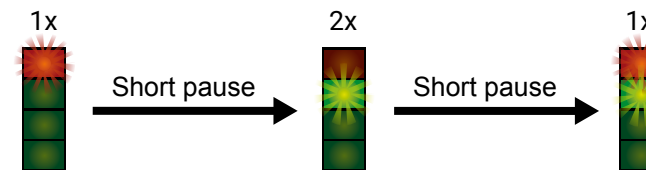
4.1. Powering On

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

After the system is complete, connect and fix the DC power cable to the unit and then to the power outlet. The unit is immediately powered ON.

Startup Process

Step 1. After being powered on, the DA2DVI-DL displays its firmware version using the **EDID Status LEDs**. The following example shows this process for a firmware version of 1.2.1:



Step 2. After indicating the firmware version, the red or green **EDID Status LED** lights up depending on the selected EDID's validity:

- Red – 'N': the selected EDID is invalid.
- Green – 'Y': the selected EDID is valid

Step 3. If a display device is connected to DVI-DL OUTPUT 1, the DA2DVI-DL reads the EDID from the attached monitor's EDID memory.

- If the read process is successful, the STATUS LED blinks green four times.
- If the read process is unsuccessful, the STATUS LED blinks red four times.

Step 4. The normal function of the LEDs is in effect.

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

4.2. EDID Operations

4.2.1. About EDID memory

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

Universal EDID (address 49#) allows multiple resolutions including all common VESA defined resolutions. In addition, it also features audio support. The use of universal EDID is advised for fast and easy system setup.

DA2DVI-DL contains a 79 block non-volatile memory bank. EDID memory is structured as follows:

Rotary switch state	Memory bank number	
#01..#50	F01..F50	Factory Preset EDID list
#51..#79	U01..U29	User programmable slots
#00	D01	Last attached monitor's EDID

Factory EDID list can be found in [Factory EDID List](#) section.

INFO: The Factory Preset EDID list cannot be modified. These are the most commonly used resolutions.

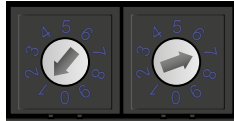
INFO: The device can handle both 128 Byte EDID and 256 Byte extended EDID structures.

INFO: The attached monitor's EDID is stored automatically, until a new monitor is connected to the OUTPUTS. In case of powering the unit off, the last attached monitor's EDID remains in non-volatile memory.

4.2.2. Switching the EDID

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

Step 1. Use a screwdriver to change the EDID ADDRESS by the rotary switches on the front panel of the DA2DVI-DL.



Location #17 is selected by the rotary switches

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

Step 3. Check the state of the device:

EDID LED	Description	State
	EDID status Y lights in green.	The selected LED is valid.
	EDID status N lights in red.	The selected EDID memory is invalid (wrong address / empty user memory).

The address #00 has a special function. If a monitor is connected to OUTPUT 1, then its EDID is copied to the DVI-DL INPUT connector. If no monitor is connected to the OUTPUT 1 then the EDID transmitted to the INPUT connector is the EDID of the last recognized monitor.

ATTENTION! If an invalid EDID is selected, DA2DVI-DL does NOT give a HOT PLUG signal to the source connected to DVI-DL INPUT.

INFO: After every EDID change, DA2DVI-DL toggles the HOT PLUG signal for approximately 2 seconds. Some graphics 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.

4.2.3. Learning the EDID

ATTENTION! The factory preset EDIDs cannot be changed by the user. Only addresses from #51 to #79 are user programmable.

Step 1. After connecting the sink device to DVI-DL OUTPUT 1, use a screwdriver to select a user programmable memory address. EDIDs are stored in multiple programmable non-volatile memories.

EDID LED	Description	State
	EDID status N lights in red.	The memory slot is empty and ready to be programmed.
	EDID status Y lights in green.	The memory was already used before, but still available for reprogramming.

Step 2. Push the **LEARN EDID** button on the front panel of the DA2DVI-DL and hold it down for approximately 2 seconds.

EDID LED	Description	State
	EDID status Y blinks in green four times.	The EDID has been learnt successfully.
	EDID status N blinks in red four times.	The EDID learning was unsuccessful.

Step 3. The normal function of the LEDs is in effect.

5

Software Control – Lightware Device Controller

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

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

5.1. Install and Upgrade

Installation for Windows OS

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

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

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

Comparison of installation types

Installation for Mac OS X

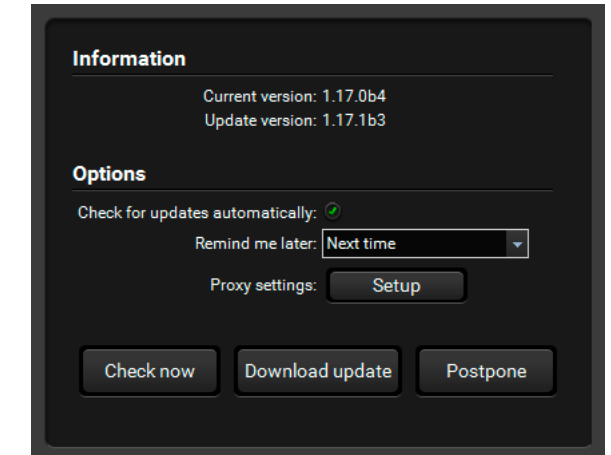
INFO: After the installation, the Windows and the Mac application has the same look and functionality. This type of the installer is equal with the Normal install in case of Windows and results an updateable version with the same attributes.

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.

Upgrading of LDC

Step 1. Run the application.

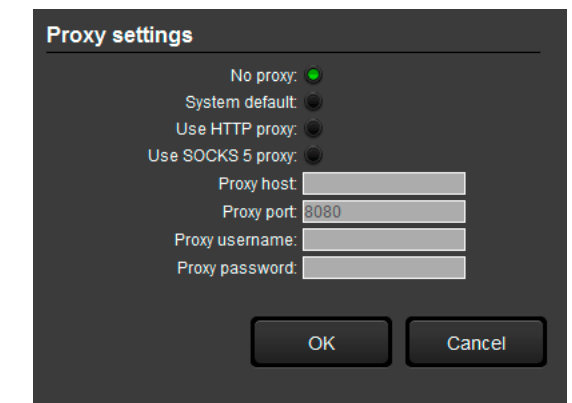
The **Device Discovery** window appears automatically and the program checks the available updates on Lightware's website and opens the update window if the LDC found updates.



The current and the update version number can be seen at the top of the window and they are shown in this window even with the snapshot install. The **Update** window can also be opened by clicking the **About** icon and the **Update** button.

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

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



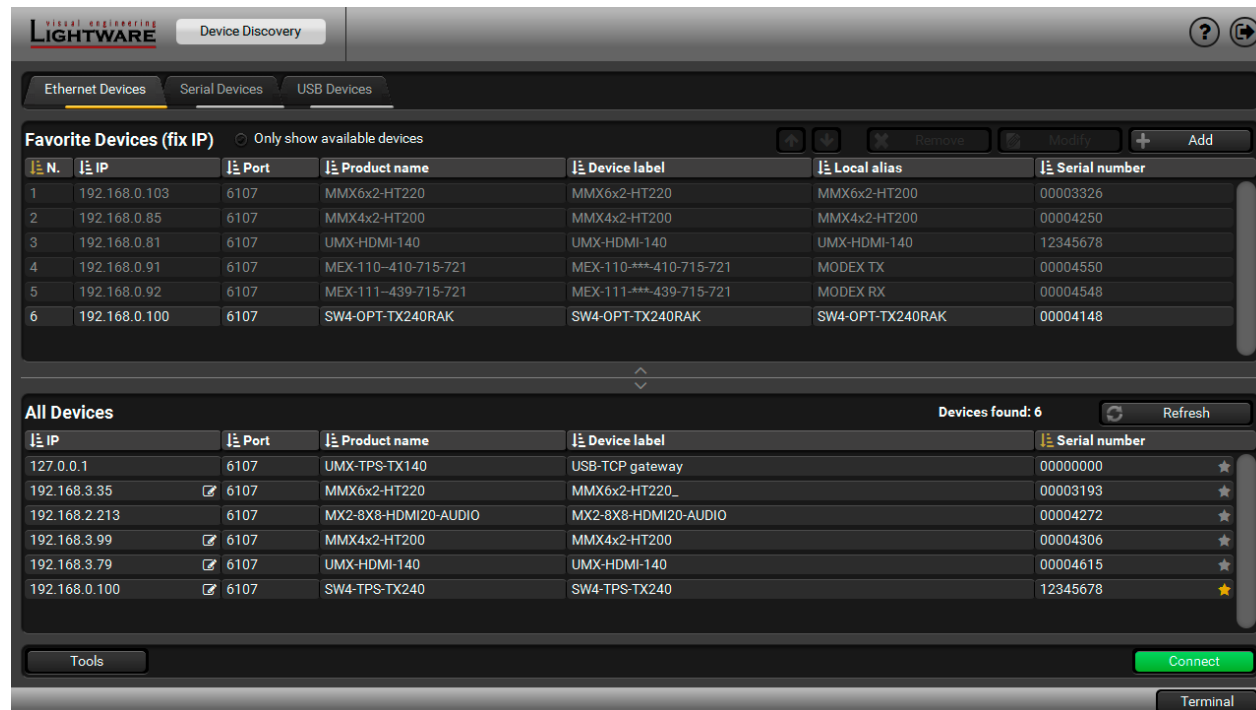
Step 3. Click the **Download update** button to start the upgrading.

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

5.2. Establishing the Connection

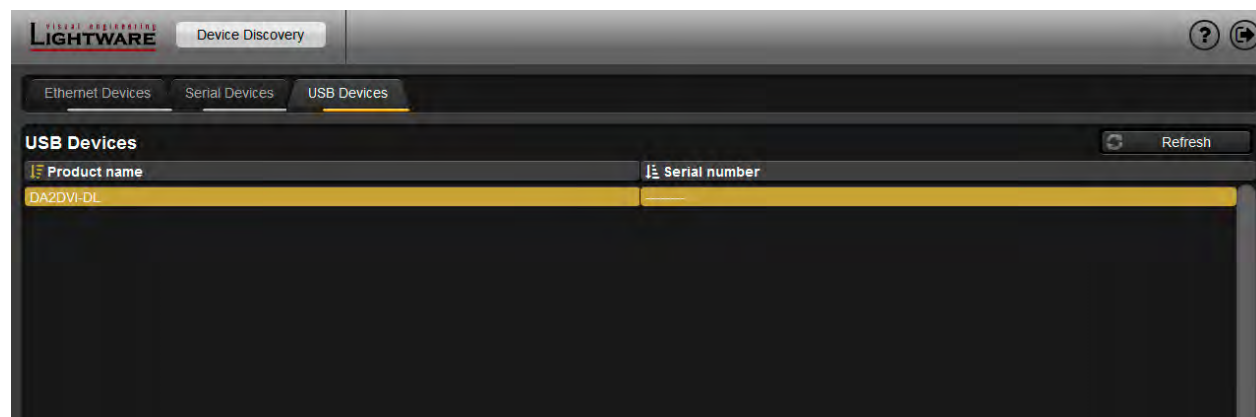
Step 1. Connect the device to a computer via USB.

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



Device Discovery window in LDC

Step 3. Select the USB Devices tab and pick the unit from the discovered USB devices. Double click on the name of the device or select it and click on the **Connect** button.

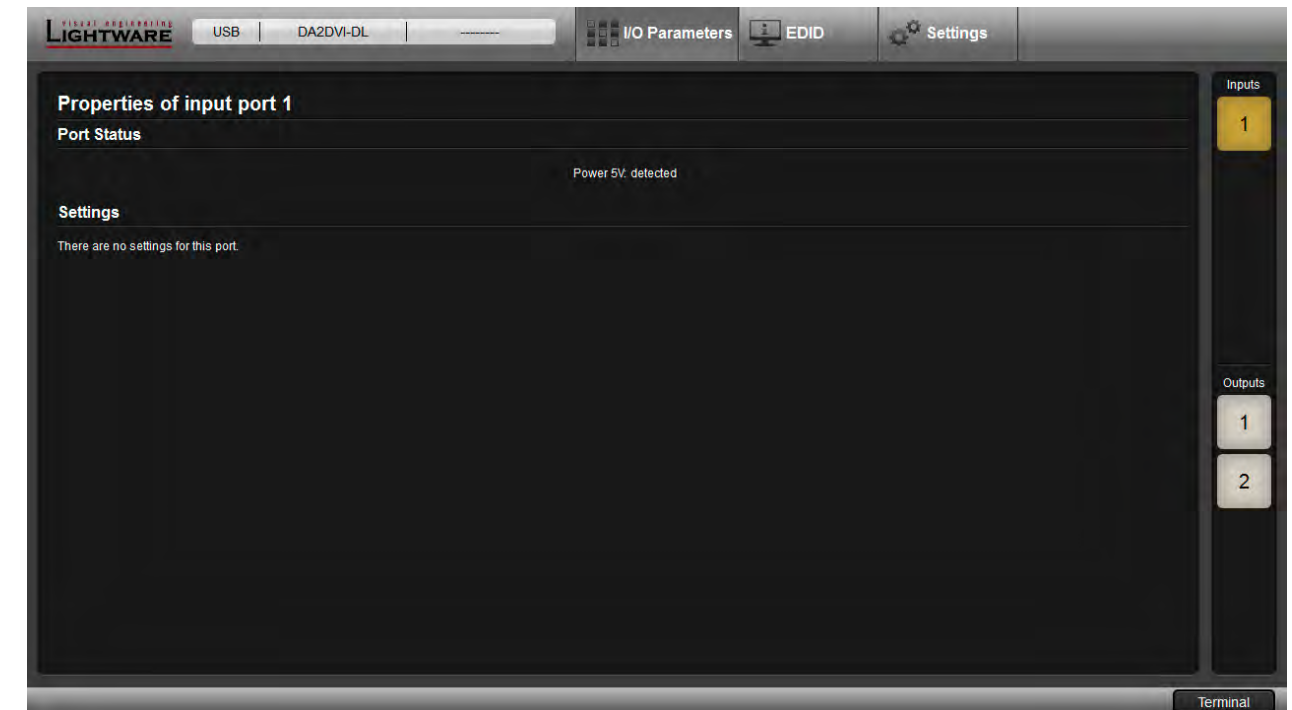


The USB devices tab in Device Discovery window

5.3. I/O Parameters Menu

The most important information and settings are available in the menu. There are three buttons on the right side of the panel: the input port and the two output ports properties window can be accessed by selecting them.

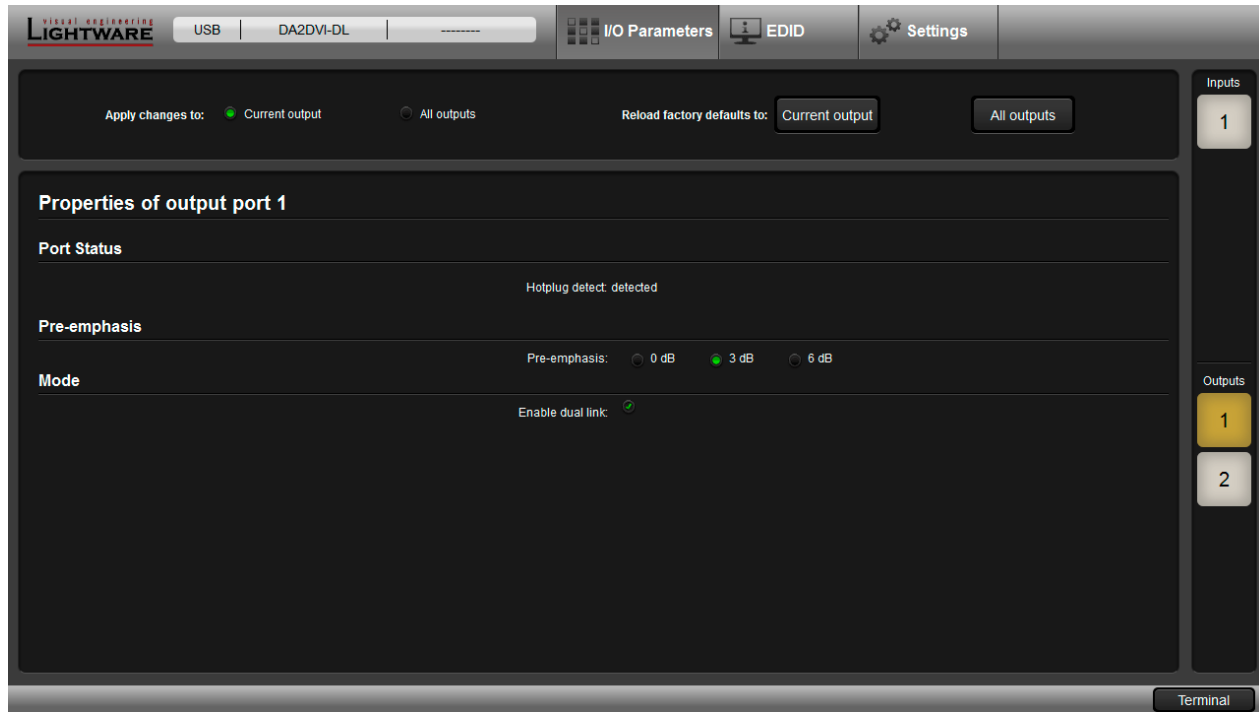
5.3.1. Input Port Properties



Input port properties tab

The Power 5V parameter is shown under the menu. If signal is detected on the DVI-DL Input Port, the parameter will be "detected".

5.3.2. Output Port Properties



Output port properties tab

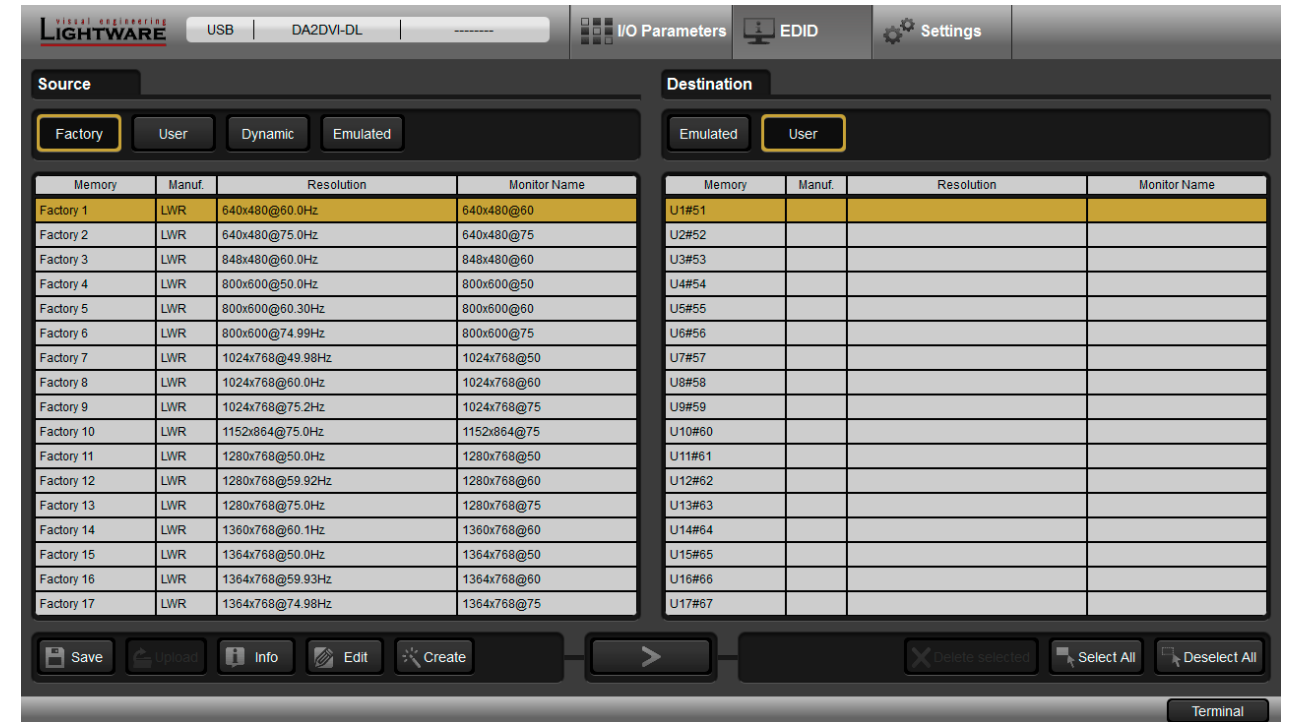
The Hotplug detect parameter is "detected" if the sink device is powered and connected to the DVI-DL output port of the distribution amplifier.

The following settings are available for the output ports:

- You can set if any parameter change is applied to the current output or to both outputs. (The factory default value is the current output.)
- **Pre-emphasis:** 0 db / 3 db / 6 db. (The factory default value is 3 db.);
- **Mode:** enable or disable DVI dual link. (The factory default value is enabled.);
- **Reload factory defaults:** Current output / All outputs.










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 places where the EDIDs can be emulated or copied.



EDID menu

Control Buttons

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

5.4.1. EDID Operations

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

ATTENTION! This function is working on Windows and Mac OS X operating systems and under Firefox or Chrome web browsers only.

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

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

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

Importing an EDID

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

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

Step 2. Press the **Upload** 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. Press **User** button on the top of the Destination panel.

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

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

5.4.2. EDID Summary Window

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

The screenshot shows the EDID summary window with a list of categories on the left and a detailed 'General' summary on the right.

General	
EDID version:	1
EDID revision:	3
Manufacturer ID:	SAM (Samsung Electric Company)
Product ID:	8E09
Monitor serial number:	Not present
Year of manufacture:	2012
Week of manufacture:	9
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:	0.56
Display size:	52 cm X 29 cm

EDID summary window

5.4.3. Editing an EDID

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

EDID Editor window

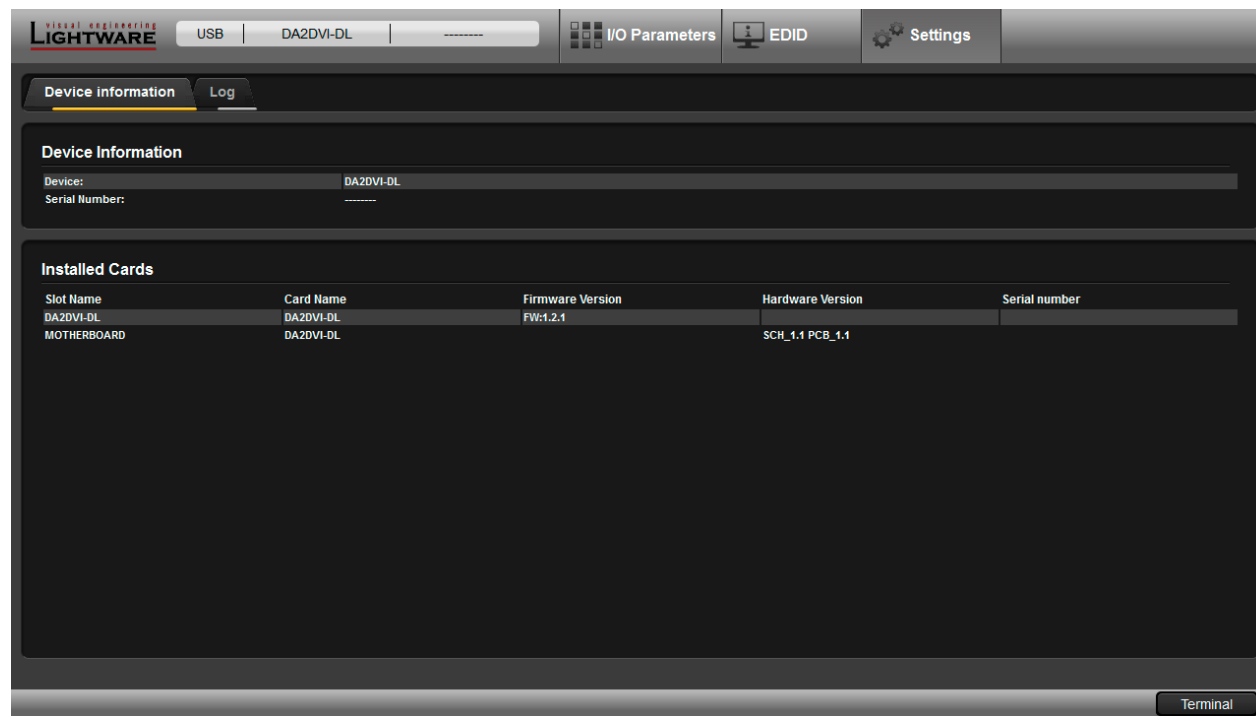
5.4.4. Creating an EDID - Easy EDID Creator

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 Source panel, **Easy EDID Creator** is opened in a new window. For more details about EDID Editor please visit our website (www.lightware.com) and download EDID Editor user's manual.

Easy EDID Creator window

5.5. Settings Menu

5.5.1. Device Information

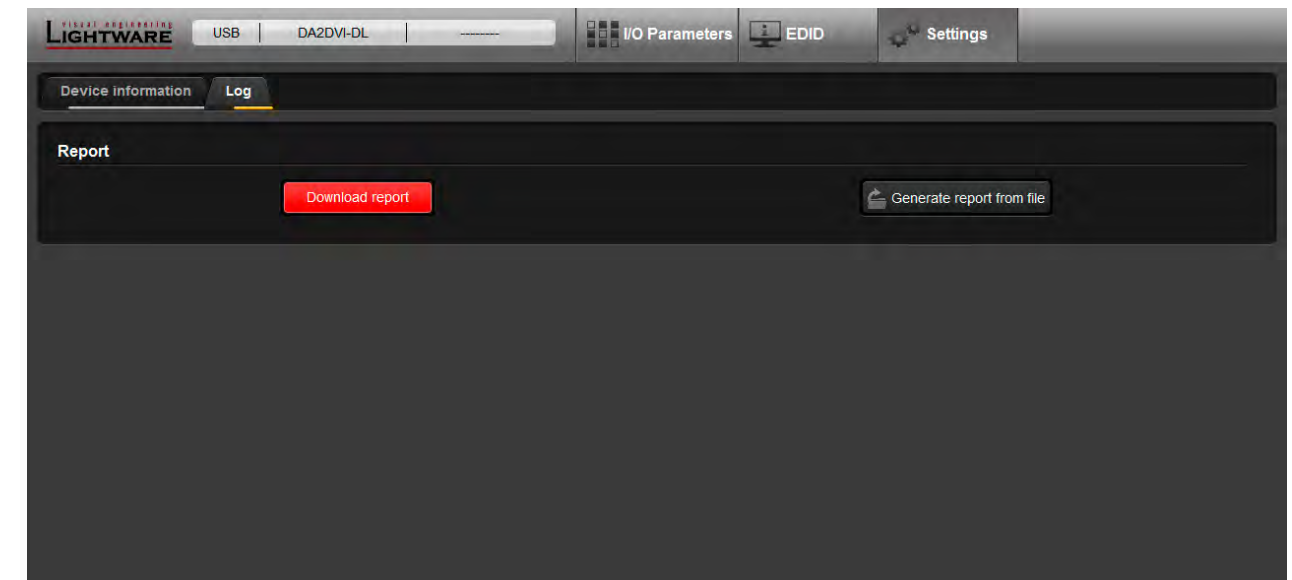


Device Information tab in the Settings menu

The serial number, installed firmware version and the hardware revision of the device is shown under the Device Information tab.

5.5.2. Log

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



Log tab in the Settings menu

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

Press the **red button**: Generate report file.

LDC collects the needed information; this may take up to 5 minutes.

After generating the report, a 'Save as' dialog box appears. Select the folder where you want to save the report file. The default file name can be changed.

The report contains the following device-dependent information (if available):

- Device type and serial number,
- Firmware versions of all the internal controllers,
- Hardware health status,
- All EDID headers and status (emulated, dynamic, factory, user),

Open Custom Report from File

The Controller Software is able to send a custom command file to other Lightware devices (e.g. another DA2DVI-DL). The command file can be generated by Lightware support. This is needed when some special commands have to be used for configuring the device or troubleshooting.

INFO: This function is only for special troubleshooting cases.

6

Programmer's Reference

The device can be controlled by a command set of protocol commands to ensure the compatibility with other Lightware products. The supported commands are described in this chapter.

Lightware devices can be controlled with external devices which can communicate according to the amplifier protocol. Lightware distribution amplifiers have a special protocol, but to interoperate with third-party devices, a secondary protocol is also provided.

- ▶ [PROTOCOL DESCRIPTION](#)
- ▶ [SYSTEM COMMANDS](#)
- ▶ [EDID ROUTER COMMANDS](#)
- ▶ [COMMANDS - QUICK SUMMARY](#)

6.1. Protocol Description

The protocol description hereinafter stands for Lightware protocol.

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

Legend for control commands:

<loc>	=	location number in 1, 2 or 3 digit ASCII format
<id>	=	id number in 1 or 2 digit ASCII format
<id²>	=	id number in 2 digit ASCII format
CrLf	=	Carriage return, Line feed (0x0D, 0x0A)
•	=	space character (0x20)
→	=	each command issued by the controller
←	=	each response received from the router

6.2. System Commands

6.2.1. View Product Type

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

Format		Example
Command	{i}	→ {i}
Response	(<PRODUCT_TYPE>)CrLf	← (I: DA2DVI-DL)

Explanation: The connected device is a DA2DVI-DL.

6.2.2. View Serial Number

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

Format		Example
Command	{S}	→ {s}
Response	(SN:<SERIAL_N>)CrLf	← (SN:3C019935)

Legend: < SERIAL_N > shows the serial number of the device.

Explanation: The connected device's serial number is 3C019935.

6.2.3. View Firmware Version

Description: View the CPU firmware revision. To view other controller's firmware version see the {FC} command.

Format		Example	
Command	{F}	→	{f}
Response	(FW:<FW_VER>)CrLf	←	(FW:1.2.1)

Legend: The firmware version is 1.2.1.

6.2.4. Compile Time

Description: Shows the CPU firmware compile time.

Format		Example	
Command	{CT}	→	{ct}
Response	(Compiled:<DATE>●<TIME>)CrLf	←	(Compiled: May 10 2012 16:36:35)

Legend:

Identifier	Parameter
<DATE>	Month, day and year
<TIME>	Hours, minutes and seconds

Explanation: The firmware was made on 10.04.2012 at 16:36:35.

6.2.5. View Installed Board

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

Format		Example	
Command	{IS}	→	{is}
Response	(SL#●0●<MB_DESC>)CrLf (SL●END)CrLf	←	(SL# 0 DA2DVI-DL SCH_1.1 PCB_1.1) ← (SL END)

Explanation: The device reports that it has an installed motherboard, the hardware revision is 1.1.

6.2.6. View Board Information

Description: Shows the firmware version and installed board together.

Format		Example	
Command	{FC}	→	{fc}
Response	(CF●<DESC>)CrLf (CF END)CrLf	←	(CF DA2DVI-DL FW:1.2.1) ← (CF END)

Explanation: The device has an installed motherboard, the firmware version is 1.2.1.

6.2.7. Restart the Device

Description: The distribution aplifier can be restarted without unplugging power.

Explanation: The device reboots without any response.

Format		Example	
Command	{RST}	→	{rst}
Response			

6.3. EDID Router Commands

6.3.1. Save EDID to User Memory

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

Format		Example	
Command	{<loc1>:<loc2>}	→	{u4:d3}
Response	(E_SW_OK)CrLf (E_S_C) CrLf	←	(E_SW_OK)CrLf ← (E_S_C) CrLf

Explanation: EDID from output 3 is saved to user EDID #4.

Legend: <loc1> has to be 'Uxx'.
<loc2> can be 'Fxx' or 'Uxx' or 'Dxx' or 'Exx'.

6.3.2. View Emulated EDID on Input

Description: Shows the currently emulated EDIDs for the input.

Format		Example	
Command	{VEDID}	→	{vedid}
Response	(VEDID●<IN>)CrLf	←	(VEDID D1)

Explanation: EDID from the output(s) is dynamically emulated on the input.

6.3.3. Watch EDID Validity Table

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

Format		Example
Command	{WV<type>}	→ {wv*}
Response	(EV<type>● <VALIDITY_TABLE>)CrLf	← (EVU 14444444444444444444444444444444) ← (EVD 10) ← (EVE 1)

Explanation: There is one '1' on the first position of the user EDID table. This means that the location 1 of the user EDID memory is filled out, the remain ones are empty.

Legend:

<type>		Response length
U	User saved EDIDs	29
D	Dynamic EDIDs	2
E	Emulated EDIDs	1

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

Value	Description
'0'	invalid EDID
'1'	valid EDID
'2'	deleted EDID
'3'	changed EDID
'4'	empty EDID slot

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.

6.3.4. View EDID Header

Description: Shows basic information about EDIDs in the memory.

Format		Example
Command	{WH<loc>}	→ {whu14}
Response	(EH#<loc>● <EDID_HEADER>)CrLf	← (EH#U14 NEC 1280x1024@60 LCD1970NXp)

Explanation: Shows the EDID from memory location U14 which is the EDID saved by the user to the location 14.

Legend: Depending on <loc> the query can be for one EDID or 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 50 user EDIDs
D*	All Dynamic EDIDs	headers from all outputs (frame size)
E*	All Emulated EDIDs	headers from all inputs (frame size)

<EDID_HEADER> consists of 3 fields separated by spaces:

<loc>	Result
PNPID code	The three letter abbreviation of the manufacturer
Preferred resolution	The resolution and refresh rate stored in the preferred detailed timing block.
Name	The name of display device stored in product descriptor.

The <EDID_HEADER> is '-' for invalid EDIDs.

6.3.5. 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) ← (E_S_C)

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. No response.
Uxx	Specified User EDID is deleted.
Dxx	Specified Dynamic EDID is deleted. It will be empty until a new monitor is connected.
Exx	Specified Emulated EDID cleared. By default F49 EDID is copied to it.
F*	Not valid! Factory EDID cannot be deleted. No response.
U*	All User EDIDs are deleted.
D*	All Dynamic EDIDs are deleted. They will be empty until a new monitor is connected.
E*	All Emulated EDIDs are cleared. By default F49 EDID is copied to them.

6.3.6. Download EDID Content

Description: EDID hex bytes can be read directly. The router 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)

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 the Router

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

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

Step 2. Router 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 router 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 router indicates that the EDID status changed by sending (E_S_C)CrLf

Format		Example
Command	{WL#<loc>}	→ {wl#U3}
Response	(E_L_S)CrLf	← (E_L_S) CrLf
Command	{WB#1●<B1>●<B2>●<B3> ●<B4>●<B5>●<B6>●<B7> ●<B8>}	→ {WB#1 00 FF FF FF FF FF FF 00}
Response	(EL#<num>)CrLf	← (EL#1) CrLf
Command	{WB#2●<B9>●<B10> ●<B11>●<B12>●<B13> ●<B14>●<B15>●<B16>}	→ {WB#2 38 A3 8E 66 01 01 01 01}
Response	(EL#<num>) CrLf	← (EL#2) CrLf
...
Command	{WB#32●<B249>●<B250> ●<B251>●<B252>●<B253> ●<B254>●<B255>●<B256>}	→ {WB#32 36 59 42 0A 20 20 00 96}
Response	(EL#<num>) CrLf	← (EL#32) CrLf
Response	(E_S_C) CrLf	← (E_S_C) CrLf

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

Explanation: Full EDID uploaded to memory location U3.

6.4. Commands - Quick Summary

System Commands

Operation	See in chapter	Command
View Product Type	6.2.1	{i}
View Serial Number	6.2.2	{S}
View Firmware Version	6.2.3	{F}
Compile Time	6.2.4	{CT}
View Installed Board	6.2.5	{IS}
View Board Information	6.2.6	{FC}
Restart the Device	6.2.7	{RST}

EDID router settings

Operation	See in chapter	Command
Save EDID to User Memory	6.3.1	{<loc1>:<loc2>}
View Emulated EDID on Input	6.3.2	{VEDID}
Watch EDID Validity Table	6.3.3	{WV<type>}
View EDID Header	6.3.4	{WH<loc>}
Delete EDID from Memory	6.3.5	{DE<loc>}
Download EDID Content	6.3.6	{WE#<loc>}
Upload EDID Content to the Router	6.3.7	{WL#<loc>}

7

Firmware Upgrade

This chapter is meant to help customers perform firmware upgrades on our products by giving a few tips on how to start and by explaining the features of the Bootloader software. To get the latest software and firmware pack please contact support@lightware.com.

- ▶ [UPGRADING STEPS IN A NUTSHELL](#)
- ▶ [DETAILED INSTRUCTIONS](#)

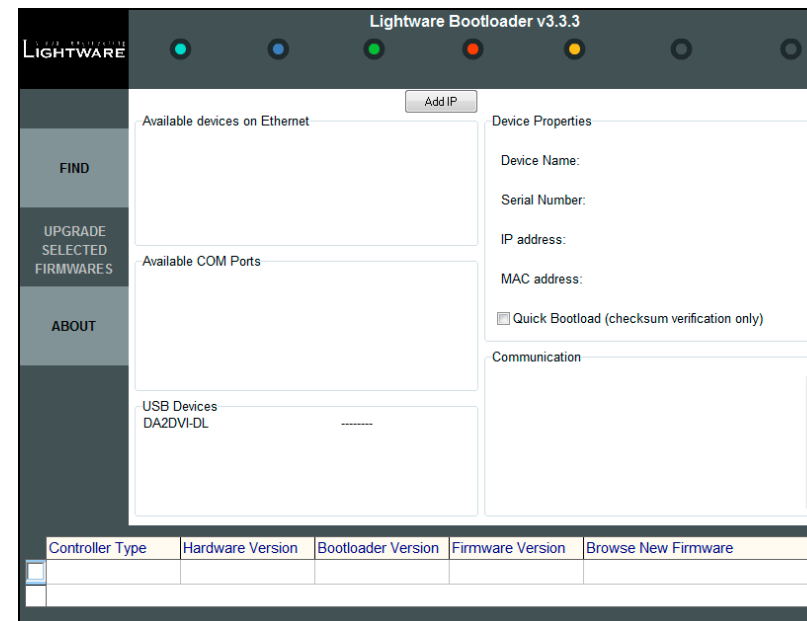
7.1. Upgrading Steps in a Nutshell

- Step 1.** Installing the Lightware Bootloader Software.
- Step 2.** Downloading and saving all the firmware files that you want to upgrade.
- Step 3.** Connecting the Lightware device and the computer via USB port.
- Step 4.** Starting the Lightware Bootloader application.
- Step 5.** Establishing the connection with the device.
- Step 6.** Selecting firmware to upgrade.
- Step 7.** Starting the upgrade process.
- Step 8.** Restarting the device.

7.2. Detailed Instructions

Use the Lightware Bootloader application to upgrade the device's firmware. The distribution amplifier can only be upgraded via USB, so connect the device directly to the Windows based computer with an USB cable.

- Step 1.** Installing the bootloader application.
- Step 2.** Downloading and saving all the firmware files that you want to upgrade. If you have a zipped archive, extract it.
- Step 3.** Connecting the Lightware device and the computer via USB port.
- Step 4.** Starting the Lightware Bootloader application.



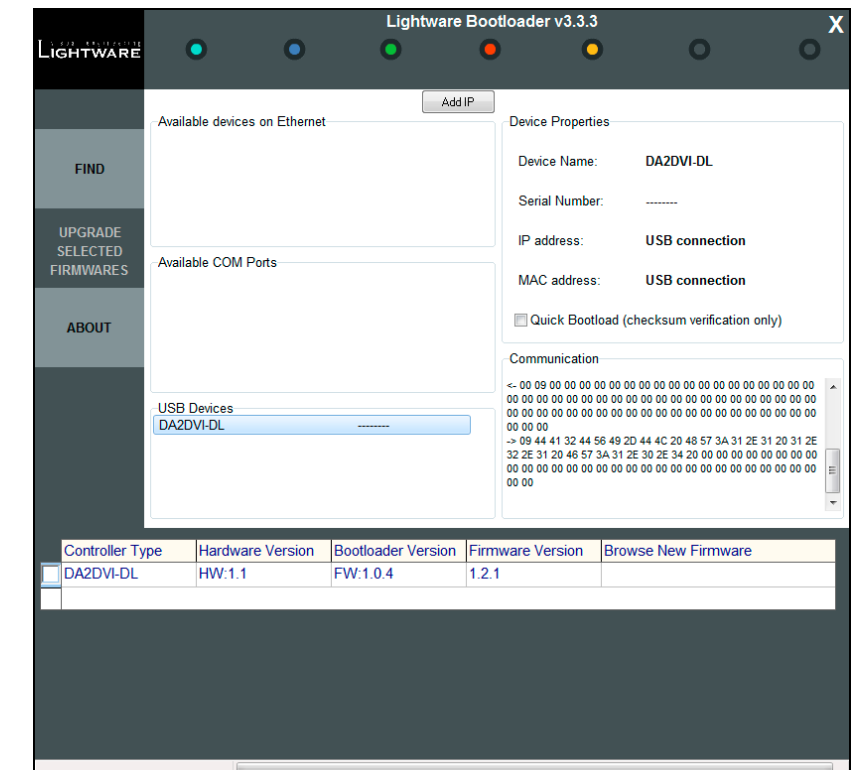
Step 5. Establishing the connection with the device.

Check the **USB Devices** panel to find your device. Double click on the name, then click **YES** to establish connection with the amplifier. It will take few seconds to get all information from the device.

ATTENTION! The bootloader application will restart the device when it establishes the connection. All connected DVI sources and monitors will act as if the device was powered down.

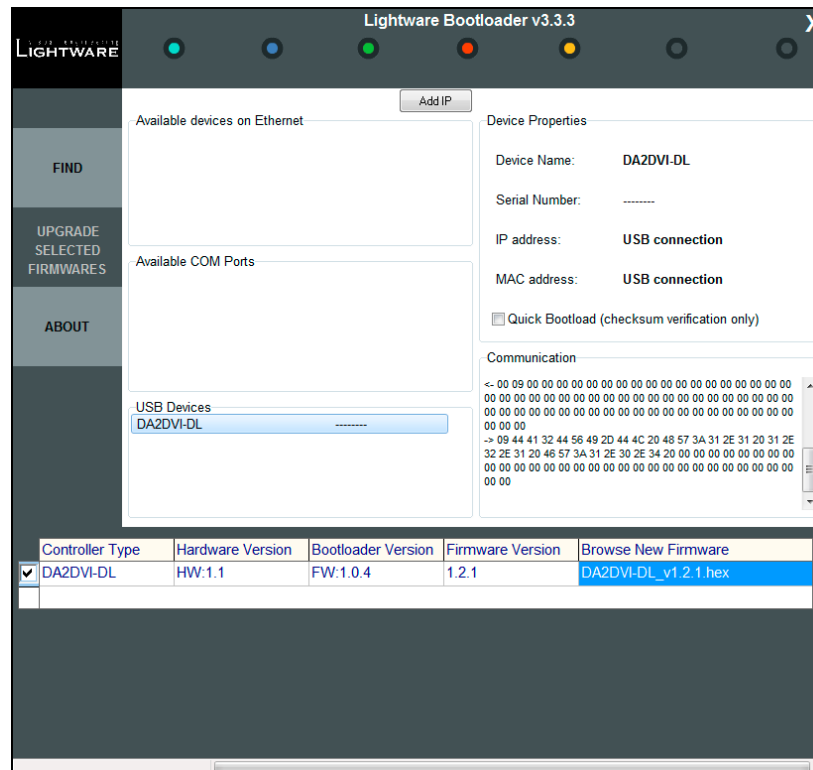
Step 6. Review the firmware versions

After the connection is made, the device properties, and the installed controller module is displayed.



Step 7. Browse for the new firmware.

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 8. Upgrade firmware.

Click **Upgrade selected firmwares** button. A confirmation message appears. After clicking the **Yes** button the selected controllers are being reprogrammed, with the firmware you selected. If you select a file that does not 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.

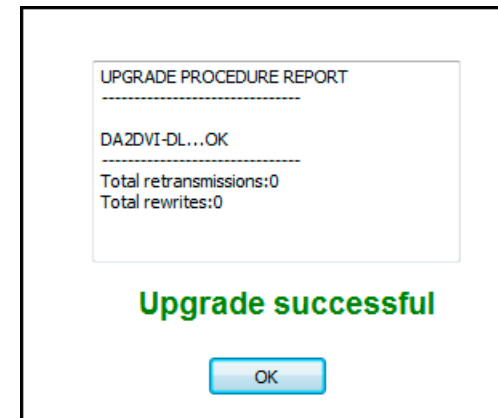
Quick Bootload mode can be switched on or off any time. It makes the bootloader software faster by only checking the checksum of the controller. No data verification is done after writing if the checksum was correct.

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 device restarts.

Step 9. 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 devices off and then on. Now the distribution amplifier is ready to be used with the new firmware!

8

Troubleshooting

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.

Symptom	Root cause	Action	Refer to
Video signal			
No picture on the video output	Device(s) not powered properly	Check the extender and the other devices if they are properly powered; try to unplug and reconnect them.	 3.3.2
	Cable connection problem	Cables must fit very well, check all the connectors.	 3.3
	No incoming signal	No video signal is present on the DVI-DL input port. Check the source device and the DVI cable.	 3.3
	Not the proper interface is the active one	If the source/display has more connectors, check if the proper interface is selected.	
	Display is not able to receive the video format	Check the emulated EDID and select another (e.g. emulate the display's EDID on the input port).	 4.2.2  5.4  6.3
	Signal is encrypted	The DA2DVI-DL does not provide HDCP functionality, because Dual-Link applications usually do not need encrypted distribution. If the system design makes encrypted distribution necessary please have a look at our Single-Link or HDMI HDCP compliant devices, for example DA2DVI-HDCP-Pro.	

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:

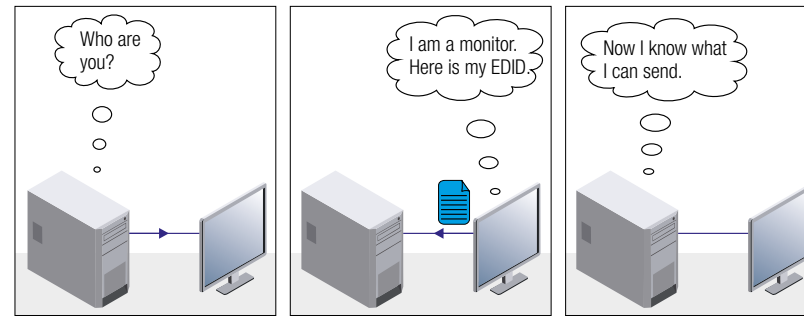
- ▶ EDID MANAGEMENT
- ▶ DUAL-LINK DVI SIGNAL

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.

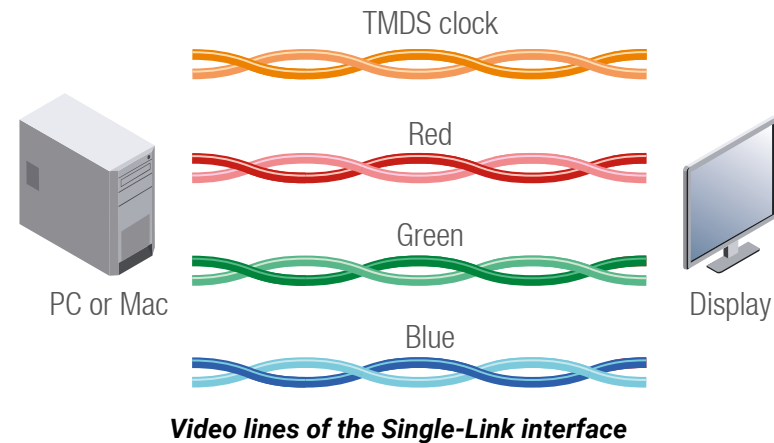
INFO: When EDID has been changed, the router toggles the HOTPLUG signal for 2 seconds. Some sources do not sense this signal. In such cases, the source device must be restarted or powered OFF and ON again.

9.2. Dual-Link DVI signal

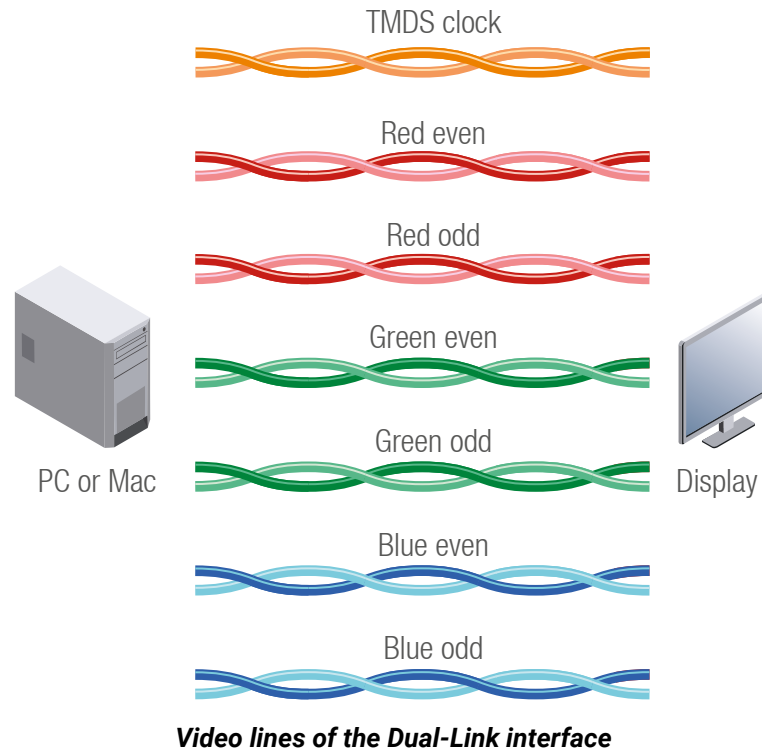
The Dual-Link DVI interface can operate in either Single-Link or Dual-Link mode. The chosen mode depends on the pixel clock frequency of the signal and it is selected by the hardware automatically. For pixel clock frequencies lower than 165 MHz, Single-Link mode is selected. For higher pixel clock frequencies (up to 330 MHz), Dual-Link mode is selected. It is important to know that pixel clock frequency is not the same as TMDS clock frequency when it comes to Dual-Link DVI.

The pixel clock frequency in Single-Link transmission is a 10th part of the data rate. The maximum data rate of the Single-Link transmission is 1.65 Gbps per TMDS channel and the maximum pixel clock frequency is 165 MHz. In this case the pixel clock frequency equals the TMDS clock frequency. The pixel clock frequency in Dual-Link transmission (when in Dual-Link mode) is a 5th part of the data rate. The maximum data rate of Dual-Link transmission is still 1.65 Gbps per TMDS channel but the maximum pixel clock frequency is 330 MHz. In this case the pixel clock frequency is two times the TMDS clock frequency.

The DVI standard maximizes the data rate of the TMDS channels in 1.65 Gbps. Dual-Link DVI interface enables a higher resolution compared to the Single-Link transmission by doubling the number of wire pairs to transmit the video signal. In Single-Link cables 3 wire pairs carry the color information (red, green and blue) and one wire pair carries the clock signal (TMDS clock).



In Dual-Link cables, 6 wire pairs carry the color information next to the TMDS clock signal. One color component is carried by two wire pairs, where one wire pair carries the odd pixels and the other wire pair carries the even pixels.



INFO: The colors of the wire pairs in the picture represent the color information they carry and not the color of the actual wires inside the cable.

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Appendix

Tables, drawings, and technical details as follows:

- ▶ [SPECIFICATION](#)
- ▶ [MECHANICAL DRAWINGS](#)
- ▶ [FACTORY EDID LIST](#)
- ▶ [FURTHER INFORMATION](#)

10.1. Specification

General

Compliance	CE
EMC compliance (emission)	EN 55032:2015
EMC compliance (immunity)	EN 55024:2011
Warranty	3 years
Cooling	Passive
Operating temperature	0 to +50°C (+32 to +122°F)
Operating humidity	10% to 90%, non-condensing

Power

Power supply	External power adaptor
Power adaptor	In 100-240 V AC 50/60 Hz, Out 5V DC, 1 A
Power connector	Locking DC connector (2.35 mm pin)
Power consumption	1.4 W (typ)

Enclosure

Rack mountable	Yes, with rack shelf (1U high)
Material	1 mm steel
Dimensions in mm	100.4W x 67.6D x 26H
Dimensions in inch	3.95W x 2.66D x 1.02H
Weight	235 g (0.496 lbs)

Input

Connector	29-pole DVI-I digital only
EDID emulation	Yes
Input cable equalization	No

Output

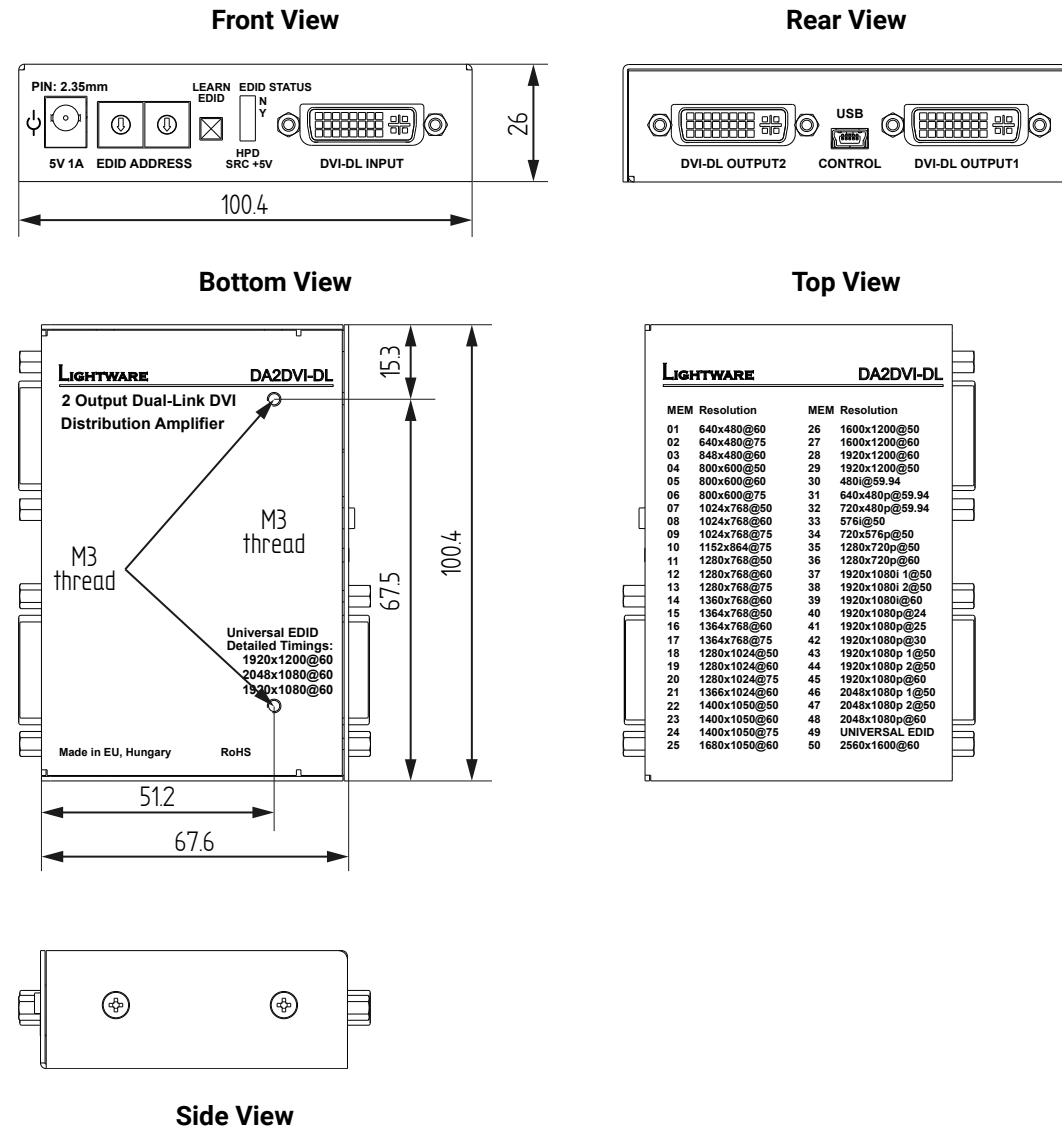
Connector	29-pole DVI-I digital only
Reclocking	No
5V output current	500 mA

Digital Video Signal

Data rate	all between 25 Mbps and 2.25 Gbps / TMDS channel
Channels	1x TMDS Clock + 6x TMDS Colors
Resolutions	all between 640x480 and 1920x1200@60Hz or 2560x1600@60Hz
Color depth	maximum 36 bits, 12 bit/color
Color format	RGB
HDTV resolutions	720p, 1080i, 1080p
HDCP compliant	No

10.2. Mechanical Drawings

The following drawings present the physical dimensions of the device. Dimensions are in mm.



10.3. Factory EDID List

Mem.	Resolution	Type	Mem.	Resolution	Type
F1	640 x 480 @ 60.00 Hz	D	F31	640 x 480 @ 59.94 Hz	H
F2	640 x 480 @ 75.00 Hz	D	F32	720 x 480 @ 59.92 Hz	H
F3	848 x 480 @ 60.00 Hz	D	F33	1440 x 288 @ 50.60 Hz	H
F4	800 x 600 @ 50.00 Hz	D	F34	720 x 576 @ 50.00 Hz	H
F5	800 x 600 @ 60.30 Hz	D	F35	1280 x 720 @ 50.00 Hz	H
F6	800 x 600 @ 74.99 Hz	D	F36	1280 x 720 @ 60.00 Hz	H
F7	1024 x 768 @ 49.98 Hz	D	F37	1920 x 540 @ 50.30 Hz	H
F8	1024 x 768 @ 60.00 Hz	D	F38	1920 x 540 @ 50.00 Hz	H
F9	1024 x 768 @ 75.20 Hz	D	F39	1920 x 540 @ 60.50 Hz	H
F10	1152 x 864 @ 75.00 Hz	D	F40	1920 x 1080 @ 24.00 Hz	H
F11	1280 x 768 @ 50.00 Hz	D	F41	1920 x 1080 @ 24.99 Hz	H
F12	1280 x 768 @ 59.92 Hz	D	F42	1920 x 1080 @ 30.00 Hz	H
F13	1280 x 768 @ 75.00 Hz	D	F43	1920 x 1080 @ 50.00 Hz	H
F14	1360 x 768 @ 60.10 Hz	D	F44	1920 x 1080 @ 49.99 Hz	H
F15	1364 x 768 @ 50.00 Hz	D	F45	1920 x 1080 @ 60.00 Hz	H
F16	1364 x 768 @ 59.93 Hz	D	F46	2048 x 1080 @ 49.99 Hz	H
F17	1364 x 768 @ 74.98 Hz	D	F47	2048 x 1080 @ 50.00 Hz	H
F18	1280 x 1024 @ 50.00 Hz	D	F48	2048 x 1080 @ 59.99 Hz	H
F19	1280 x 1024 @ 60.10 Hz	D	F49	1920 x 1200 @ 59.55 Hz	H
F20	1280 x 1024 @ 75.10 Hz	D	F50	2560 x 1600 @ 59.85 Hz	DL
F21	1366 x 1024 @ 59.99 Hz	D			
F22	1400 x 1050 @ 49.99 Hz	D			
F23	1400 x 1050 @ 59.99 Hz	D			
F24	1400 x 1050 @ 75.00 Hz	D			
F25	1680 x 1050 @ 59.99 Hz	D			
F26	1600 x 1200 @ 50.00 Hz	D			
F27	1600 x 1200 @ 60.00 Hz	D			
F28	1920 x 1200 @ 59.55 Hz	D			
F29	1920 x 1200 @ 50.00 Hz	D			
F30	1440 x 240 @ 60.30 Hz	H			

10.4. 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	15-01-2015	Initial version	Laszlo Zsedenyi
1.1	15-12-2015	Safety instructions updated, CE page pulled out	Laszlo Zsedenyi
2.0	22-12-2016	Minor updates to Software Control (LDC) section, programmer's reference chapter added	Tamas Forgacs
3.0	19-09-2017	New document format	Tamas Forgacs

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