LIGHTWARE
INNOVATIVE. RELIABLE. MADE IN EUROPE.

User Manual

GVN-HDMI-TX210AP
GVN-HDMI-RX110AP
GVN-MMU-X100

GVN-HDMI-TX210AP-DNT
GVN-HDMI-RX110AP-DNT

AV Over IP Multimedia Extender

v1.2 30-04-2025

Important Safety Instructions

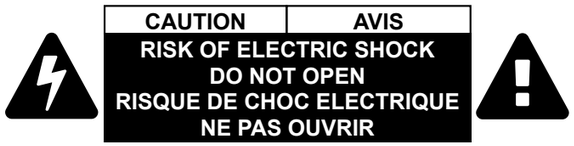
Class I apparatus construction.

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

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

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

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



Ventilation

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

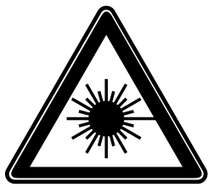
WARNING

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



CAUTION

The device contains a BR1632A button battery, which supplies power to the clock when the device is not powered on. Danger of explosion if battery is replaced incorrectly. Replace only with the same or equivalent type. Do not expose the (used or new) batteries to fire or other extremely high temperatures, or extremely low air pressure. Do not crush or damage the battery in any way, as it may result in an explosion.

WARNING

Do not ingest the battery, Chemical Burn Hazard. This product contains a coin/button cell battery. If the coin/button cell battery is swallowed, it can cause severe internal burns in just 2 hours, and can lead to death. Keep new and used batteries away from children. If the battery compartment does not close securely, stop using the product and keep it away from children. If you think batteries might have been swallowed or placed inside any part of the body, seek immediate medical attention.

Common Safety Symbols

Symbol	Description
	Direct current
	Alternating current
	Double insulation
	Caution, possibility of eletric shock
	Caution
	Laser radiation

Symbol Legend

The following symbols and markings are used in the document:

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

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

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

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

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

TIPS AND TRICKS: Ideas that 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 pressing 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 while testing these functions in accordance with the indicated Hardware/Firmware/Software environment:

Item	Version
Lightware Device Controller (LDC) software	2.16.0b2
Lightware Device Updater v2 (LDU2) Software	2.34.0b1
Firmware package (MMU)	1.4.0b14
Firmware package (Endpoints)	1.4.0b12

Document revision: **v1.2**

Release date: **30-04-2025**

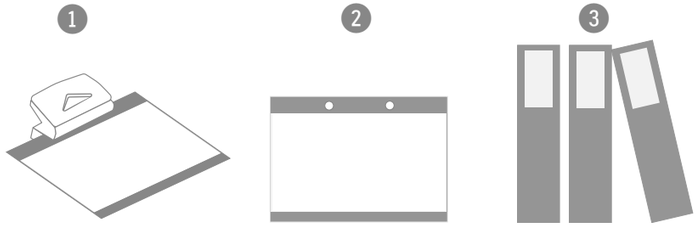
Editor:Nikolett Keindl

About Printing

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

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

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



Hashtag (#) Keywords in the Document

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

The format of the keywords is the following:

#<keyword>

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

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

Example

#dhcp

This keyword is placed at the DHCP setting command in the LW3 Programmer's reference section.

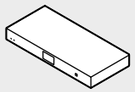
Table of Contents

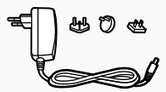
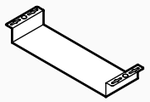
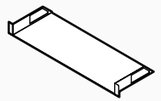
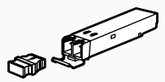
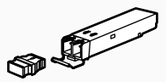
1

Startup of the System

Thank You for choosing Lightware's Gemini GVN series device. In the first chapter we would like to offer you the most crucial information to be able to get your system to work:

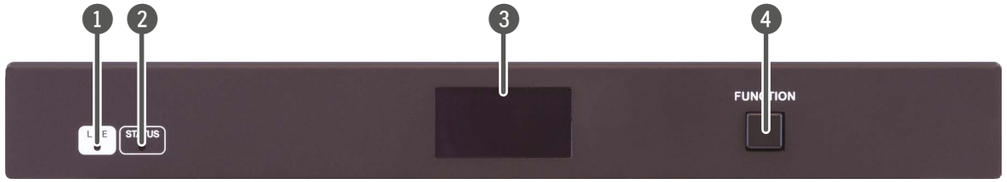
1.1. Box Contents

	Supplied accessories				
	 GVN Device	 Safety and warranty info, QSG	 Mounting screws (M3x4)	 Phoenix® Combicon 3-pole Connector	 Phoenix® Combicon 5-pole Connector
GVN-HDMI-TX210AP	✔	✔	✔(2 pcs.)	✔	✔
GVN-HDMI-RX110AP	✔	✔	✔(2 pcs.)	✔	✔
GVN-HDMI-TX210AP-DNT	✔	✔	✔(2 pcs.)	✔	✔
GVN-HDMI-RX110AP-DNT	✔	✔	✔(2 pcs.)	✔	✔
GVN-MMU-X100	✔	✔	✔(2 pcs.)	✔	-

	Optional accessories				
	 12 DC adaptor	 UD-kit double	 1U high rack shelf	 Singlemode SFP module	 Multimode SFP module
SKU	91340007	55400276	55401179	11800179	11800178
GVN-HDMI-TX210AP	✔	✔	✔	✔	✔
GVN-HDMI-RX110AP	✔	✔	✔	✔	✔
GVN-HDMI-TX210AP-DNT	✔	✔	✔	✔	✔
GVN-HDMI-RX110AP-DNT	✔	✔	✔	✔	✔
GVN-MMU-X100	✔	✔	✔	-	-

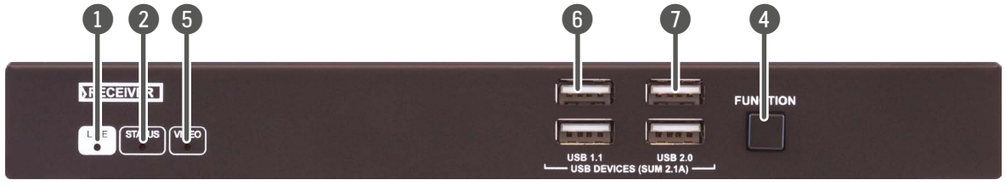
1.3. Front View

GVN-MMU-X100



GVN-HDMI-TX210AP, GVN-HDMI-TX210AP-DNT

GVN-HDMI-RX110AP, GVN-HDMI-RX110AP-DNT



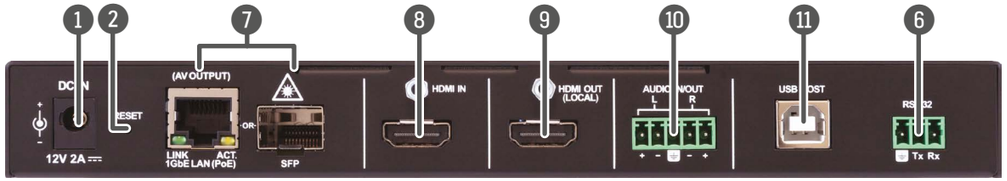
1. **LIVE LED** — For more information, please see the Status LEDs section.
2. **Status LED** — For more information, please see the Status LEDs section.
3. **OLED Display** — A screen displaying useful information such as the Product Name, the IP addresses and the package version.
4. **Function Button** — Button for physically controlling the device. For more information, please see the Button Functionality section.
5. **Video LED** — For more information, please see the Status LEDs section.
6. **USB-A Ports** — USB 1.1 A-type ports for transmitting USB HID devices.
7. **USB-A Ports** — USB 2.0 A-type ports for USB devices (e.g.: webcamera, touch screen or smart card reader, mass storage devices).

INFO: The hardware attributes of -DNT and non-DNT enpoints are the same.

1.4. Rear View

GVN-MMU-X100

GVN-HDMI-TX210AP, GVN-HDMI-TX210AP-DNT



GVN-HDMI-RX110AP, GVN-HDMI-RX110AP-DNT

INFO: GVN-HDMI-TX210AP-DNT and GVN-HDMI-RX110AP-DNT have a sticker on top to differentiate from non-DNT models:

1. **DC 12V Input** — 12V DC input in case of powering locally.
2. **Reset Button** — Reboots the device or resets factory default values. For more information, see the Button Functionality section.
3. **RJ45 Ports** — Separate 10/100/1000Mbps RJ45 connectors for Ethernet connection and control functions.One of the ports is for controlling the MMU, while the other is for Endpoint network control.
4. **HDMI Output Port** — HDMI connector for control purposes. This function will be implemented in a later firmware update.
5. **USB-A Ports** — USB 2.0 compatible A-type ports for local USB HID and mass storage devices. This function will be implemented in a later firmware update.
6. **RS-232 Port** — 3-pole Phoenix® connector. This function will be implemented in a later firmware update.
7. **AV Ports** — RJ45 connector and slot for an SFP module. One at a time is available for transmitting an AV signal. Applied cable shall be max. 100 m (at least CAT5e) in case of RJ45. **Please note that SFP module is not supplied with the device.**
   In case of the -DNT models, Dante audio is also transmitted through the RJ45 port alongside GVN video and audio**.**
8. **HDMI Input Port** — Video port for DVI or HDMI signal.
9. **Local HDMI Output Port** — For a local sink device (mirrored from the AV output).
10. **Analog Audio Port** — 5-pole Phoenix® connector for balanced analog audio **output** signal. The signal is de-embedded from the selected video signal. Input functionality will be added in a later firmware update.
11. **USB-B Port** — B-Type connector for USB pass-through application (e.g. for connecting the Encoder to a computer).
12. **HDMI Output Port** — HDMI output to a sink device.

INFO: The hardware attributes of the -DNT and non-DNT endpoints are the same.

1.5. Status LEDs

GVN-HDMI-TX210AP(-DNT) and GVN-HDMI-RX110AP(-DNT)

LIVE LED			
○		off	The device is not powered.
☀	**green**	blinking	The device is booting.
●	**green**	on	The device is powered and operational.

Status LED			
○		off	There is no network connection.
☀	**green**	blinking slow	Firmware update is in progress.
☀	**green**	blinking	There is network connection, but no video transmission happens.
☀	**green**	blinking fast	'Find me' function is activated.
●	**green**	on	There is network connection and video is being transmitted.

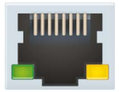
Video LED			
○		off	There is no video iput detected.
☀	**green**	blinking 2x	Device changes to DHCP mode.
☀	**green**	blinking 3x	Device changes to Static IP mode.
●	**green**	on	There is video input detected.

GVN-MMU-X100

LIVE LED			
○		off	The device is not powered.
●	**green**	on	The device is powered and operational.

Status LED			
○		off	The device is not working.
●	**green**	on	The device is working.

1.6. RJ45 LEDs

	Left LED, Green	Right LED, Yellow
	Link	Activity

1.7. Button Functionality

1.7.1. Function Button

GVN-HDMI-TX210AP(-DNT) and GVN-HDMI-RX110AP(-DNT)

Press and hold the button for 5 seconds to change between DHCP or Static IP mode. Please see the **Video LED** for checking the new active mode.

> **ATTENTION!** Please note that if the device is in DHCP mode, pressing the **Function** button will configure the device to the static IP address of **192.168.1.200** regardless of what is set as a static IP either by default or by the user. This is so that anything should happen that will make the device unreachable on any network, it may be reached again at this specific IP address to be reconfigured.

GVN-MMU-X100

By pressing the button, the OLED display can be activated.

1.7.2. Reset Button

GVN-HDMI-TX210AP and GVN-HDMI-RX110AP

This hidden button can be pressed using a long, thin object.

The following functions are available:

- **Short press**: Reboots the device.
- **Long press (10 seconds)**: Restores the device to factory default settings. *#factorydefault*

> INFO: The factory reset is only possible within the first 90 seconds after powering on the device.

GVN-MMU-X100

This button can be pressed using a long, thin object.

Pressing the button for **5 seconds** will restore the factory default settings.

For factory default settings please see the Factory Default Settings section.

1.8. Powering Options

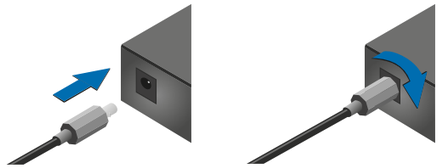
The devices can be powered either locally or via Power over Ethernet (PoE) through the RJ45 ports using a PoE-capable Ethernet switch or power injector. *#power #poe*

ATTENTION! The GVN-HDMI-TX210AP(-DNT) and GVN-HDMI-RX110AP(-DNT) models can only be powered locally or via a PoE (for TX) and PoE+ (for RX) capable Ethernet switch or power injector throughthe GVN Network RJ45 port.

1.8.1. Local Powering

ATTENTION! Please be aware that the power adaptor is not supplied.

For powering the device locally, plug in the 12V DC adapter into the AC power socket and twist it clockwise to lock it.



1.8.2. Power Over Ethernet (PoE)

The GVN-HDMI-RX110AP(-DNT) models can be powered by a PoE+ compatible (according to the standard IEEE802.3at) switch through the AV Output RJ45 port. Connect the devices to the switch with a CATx cable.

The GVN-MMU-X100 and GVN-HDMI-TX210AP(-DNT) models can be powered by a PoE compatible (according to the standard IEEE802.3af)switch through the GVN LAN RJ45 port (in case of the MMU) and the AV Output RJ45 port (in case of the TX). Connect the device to the switch with a CATx cable.

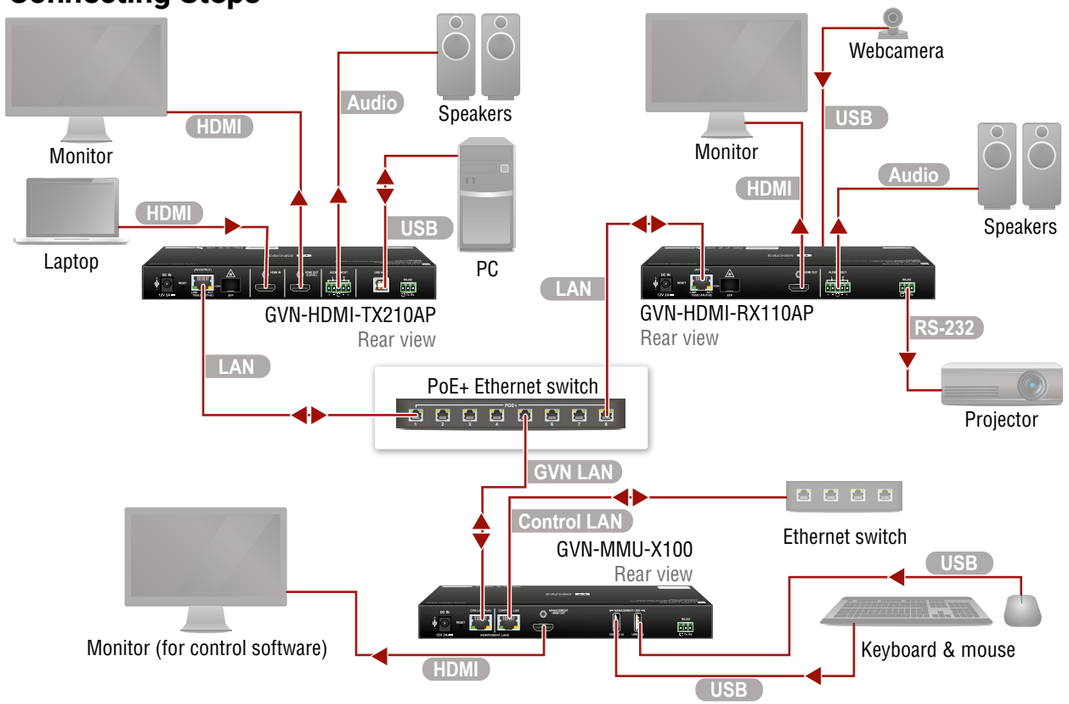
ATTENTION! Please be aware that the endpoints can only be powered over the RJ45 connectors, but not the SFP slots!

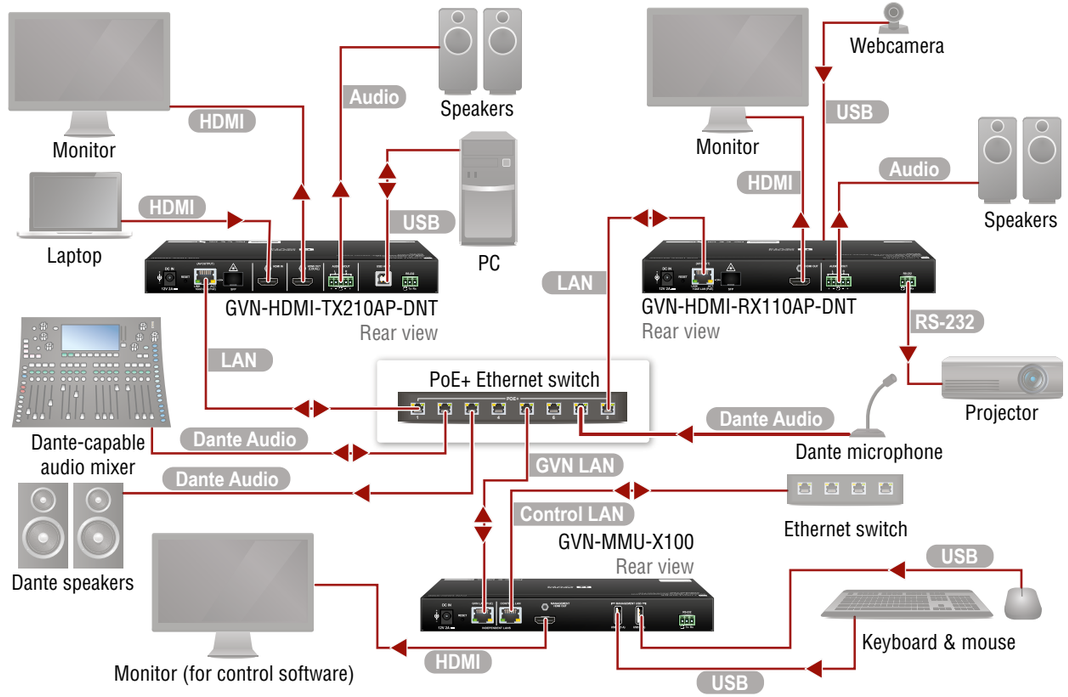
1.9. Factory Default Settings

Parameter	Value
IP acquisition mode (Endpoints)	DHCP
GVN network mode (MMU)	DHCP
Static IP address (Endpoints)	10.0.0.100/16
GVN network static IP address (MMU)	10.0.0.1/16
Static Gateway address (Endpoints)	10.0.0.1
GVN network static gateway address (MMU)	10.0.0.1
Control LAN static IP address (MMU)	192.168.0.100/24
Control LAN static gateway address (MMU)	192.168.0.1
Device label	LW_<device_name>_<serial_number>
Hostname	lightware-<serial_number>
Domain name	lightware-<serial_number>
Map (MMU)	empty
Automatic Addition Enabled (MMU)	true
Scaling setting (Receivers)	Passthrough (no scaling)
Emulated EDID (Transmitters)	F140
HDCP mode (Receivers)	Auto
Allowed HDCP version (Endpoints)	HDCP 2.2

For further factory default settings, see the Factory Default Settings section. *#factorydefault*

1.10. Connecting Steps





HDMI	Connect an HDMI source (e.g. BYOD laptop or room PC) to the HDMI input port of the Transmitter.
GVN LAN	Connect the extenders and the MMU to a Gigabit switch using CATx cables.
USB	**USB Type-A:** Optionally connect the USB device (e.g. webcamera). **USB Type-B:** Optionally connect the USB host (e.g. PC).
HDMI	Connect an HDMI sink (e.g monitor) to the HDMI output port.
RS-232	Optionally for RS-232 extension: connect a controller/controlled device (e.g. projector) to the RS-232 port of the Receiver.
Control LAN	Optionally connect the Control LAN port of the MMU to a Local Network Switch to provide Ethernet connection for device configuration and BYOD internet access.
Audio	Optionally connect an audio device (e.g. speakers) to the analog audio output port by an audio cable.
Power	Connect the external power supply to the AC power socket and the GVN device. Powering the device is recommended as the final step.

HDMI	Connect an HDMI source (e.g. BYOD laptop or room PC) to the HDMI input port of the Transmitter.
GVN LAN	Connect the extenders and the MMU to a Gigabit switch using CATx cables.
USB	**USB Type-A:** Optionally connect the USB device (e.g. webcamera). **USB Type-B:** Optionally connect the USB host (e.g. PC).
HDMI	Connect an HDMI sink (e.g monitor) to the HDMI output port.
RS-232	Optionally for RS-232 extension: connect a controller/controlled device (e.g. projector) to the RS-232 port of the Receiver.
Control LAN	Optionally connect the Control LAN port of the MMU to a Local Network Switch to provide Ethernet connection for device configuration and BYOD internet access.
Audio	Optionally connect an audio device (e.g. speakers) to the analog audio output port by an audio cable.
Dante Audio	Optionally connect Dante-capable audio devices (e.g. mixer, speaker, microphone, etc.) to the switch to make use of their capabilities via the endpoints.
Power	Connect the external power supply to the AC power socket and the GVN device. Powering the device is recommended as the final step.

2

Introduction

In this chapter we would like to introduce the device, highlighting the most important features in the sections listed below:

2.1. Description

Lightware's revolutionary GEMINI GVN 1Gb AV-over-IP extender family, where scalability, flexibility, and rapid deployment take center stage. Designed to meet the demands of modern audiovisual environments, the GEMINI GVN is a virtual matrix system that seamlessly switches audio, video, and USB transmission with unparalleled ease.

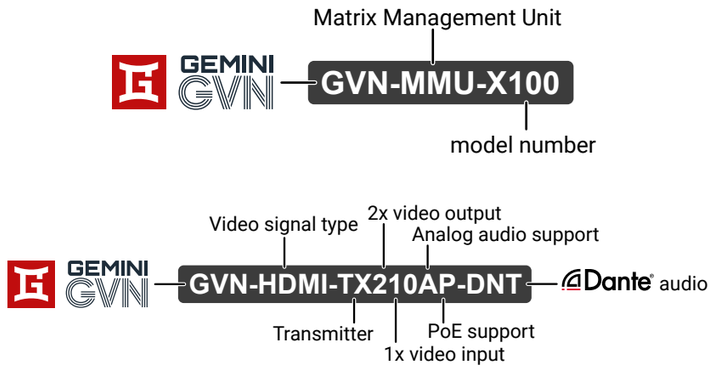
At the heart of the GEMINI GVN system is the Matrix Management Unit (MMU) device, providing full functionality from a centralized control point, eliminating the need for individual endpoint configurations. With seamless switching capabilities, users can effortlessly manage their audiovisual setup for optimal performance.

It supports LW3 API, LDU2, LDC, features embedded web with LW content and has Separate video and corporate networks on 2× RJ45 connectors.

The device has a dedicated HDMI output and USB connection (future functionality), e.g. for displaying embedded web or stream previews.

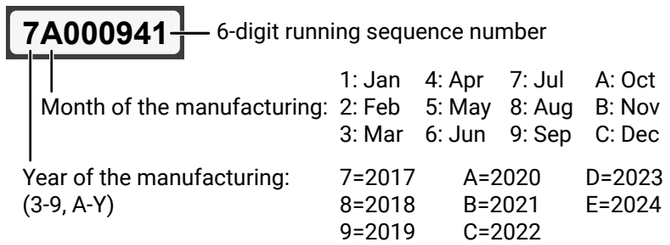
The -DNT models offer Dante functionality alongside the general GVN AV streams.

Model Denomination

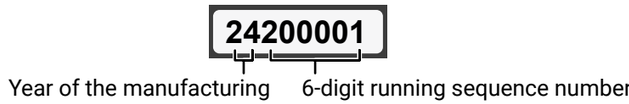


About the Serial Number

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



From 1st of October 2024, serial number format of Lightware devices is the following: the first two digits are of the year of manufacture, while the remaining digits make up the running sequence number.



2.2. Box Contents

See this content in the Box Contents section.

2.3. Features of the Device

4K Support

Up to HDMI 2.0 4K 2160p@60Hz 4:4:4 video input or 4096x2160@60Hz resolution over a 1 Gigabit network with ultra low latency.

Pixel Accurate Reclocking

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

Scaling the Output Image

Video scaling is the process of changing the size of a video frame in order to match the native resolution of a display sink. It involves converting the resolution to a higher or lower format, and also a change in aspect ratio; typically from 4:3 to 16:9.

HDCP 2.2 compliant

The GVN extenders comply to the HDCP 2.2 standard. HDCP capability on the digital video inputs can be disabled when non-protected content is extended.

SFP Module Support

The devices can be connected to the network switch over SFP modules.

Frame Detector and Signal Analysis

The exact video and audio signal format can be determined such as timing, frequencies, scan mode, HDCP encryption, color range, color space and audio sample rate.

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.

Local Video Output

User can attach a local monitor to observe the video signal sent through the AV Output RJ45 / SFP ports. The resolution and clock frequency are the same with the HDMI inputs, no internal scaling or conversion is applied.

RS-232 Interface

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

Built-in Website

Easy access from a web browser to control and configure the devices – even with a mobile device.

USB Extension

KVM extension for USB HID (Human Interface Devices, e.g. keyboard, mouse) and USB 2.0 devices such as webcams, touchscreens, smart card readers and mass storage devices (Flash drive, Hard drive, smart cards).

Remote Power (PoE)

The GVN-MMU-X100 and GVN-HDMI-TX210AP models can be Powered over Ethernet (according to IEEE 802.3af) by a compatible power source equipment.

Remote Power (PoE+)

The GVN-HDMI-RX110AP model can be Powered over Ethernet (according to IEEE 802.3at) by a compatible power source equipment.

Seamless Switching (Clean Cut)

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

GVN-HDMI-TX210AP-DNT, GVN-HDMI-RX110AP-DNT *#new*

Dante® Audio Transmission

GVN-DNT series extenders allow Dante audio layer to be transmitted alongside the GVN video and audio stream through the RJ45 port.

3

Product Overview

The following sections contain links to sections that describe the physical structure of the devices, input/output ports and connectors:

3.1. Front View

See this content in the Front View section.

3.2. Rear View

See this content in the Rear View section.

3.3. Status LEDs

See this content in the Status LEDs section.

3.4. RJ45 LEDs

See this content in the RJ45 LEDs section.

3.5. Button Functionality

See this content in the Button Functionality section.

3.6. Powering Options

See this content in the Powering Options section.

4

Installation

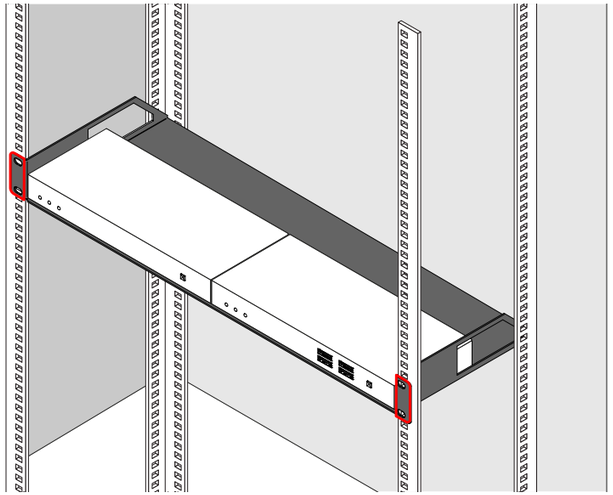
This chapter is about the installation of the devices and connecting to other appliances, also presenting the mounting options and further assembly steps:

4.1. Mounting Options

INFO: Gemini devices are half-rack sized.

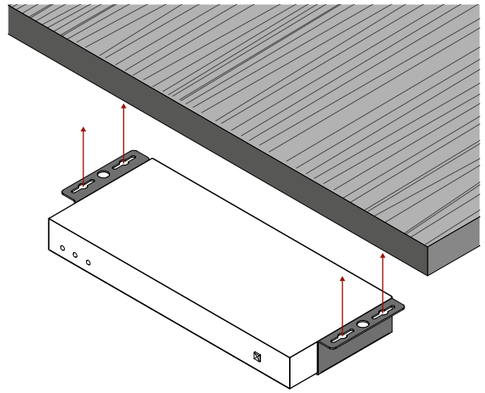
4.1.1. Rack Shelf Mounting

The 1U high rack shelf provides mounting holes for the fastening of up to two Gemini devices and putting them into a standard rack cabinet (width of the Rack shelf is 448 mm – without the ears). Fix the device to the Rack shelf as shown in the figure.



4.1.2. UD-kit Mounting

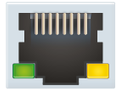
The **UD-kit double** makes mounting a single Gemini device under a flat surface (e.g. table) easy.



4.2. Electrical Connections

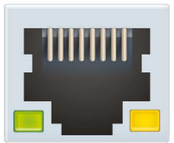
4.2.1. 1GbE LAN

The devices provide standard RJ45 connectors for outgoing/incoming AV/Control signals. Always use high quality Ethernet cables for connecting the devices.

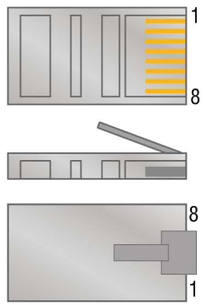


The Wiring of the Twisted Pair Cables

The recommended termination is based on TIA/EIA T 568 A or TIA/EIA T 568 B standards.



Pin	TIA/EIA T568A	TIA/EIA T568B
1	white/green	white/orange
2	green	orange
3	white/orange	white/green
4	blue	blue
5	white/blue	white/blue
6	orange	green
7	white/brown	white/brown
8	brown	brown



4.2.2. HDMI Input and Output Ports

The devices are assembled with standard 19-pole HDMI connectors for inputs and outputs. Special HDMI cables can be fastened to the housing by the nut.

4.2.3. USB-A Ports

The GVN-HDMI-RX110AP(-DNT) model provides USB-A connectors for supporting K+M functionality. The device has 4 pieces of USB 2.0 A-type connectors.

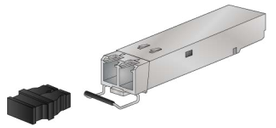
GVN-MMU-X100 offers 2 pieces of USB-A connectors for management purposes.

For more information about the USB extension see the Dante® Audio Interface section.

4.2.4. USB-B Port

The GVN-HDMI-TX210AP(-DNT) model provides a USB-B connector for supporting K+M functionality. The device has 1x USB 2.0 B-type connector.

4.2.5. SFP Slots



The module inserted in the SFP slot can be used for network connection (AV transmission).

DEFINITION: The small form-factor pluggable (SFP) is a compact, hot swappable optical module transceiver used for both telecommunication and data communication applications. It is a popular industry format jointly developed and supported by many network component vendors. The SFP interface supports data rates up to 1 Gbit/s. *

ATTENTION! Please note that only one of the network ports is available at the same time in a device: either the SFP or the RJ45. When SFP is connected to a network, the RJ45 port is disabled.

ATTENTION! The SFP port slot can handle SFP module up to 1 GbE support.

* Source: https://en.wikipedia.org/wiki/Small_form-factor_pluggable_transceiver

Maximum Allowed Optical Cable Length

The maximum allowed optical cable length depends on the installed SFP modules. Always check the specification of the optical modules before the fiber optical cabling.

Installation of SFP Modules

GVN endpoint devices use one SFP module slot for the fiber optical connection via the network switch. The optical module can be changed based on the recent application of the extender: it can be singlemode or multimode, or BiDi module, up to 1 GbE signal transmission.

Inserting and Cabling of SFP Modules

Step 1. Put up on the handle bar.
Step 2. Connect the module to the to one of the SFP port slot.
Step 3. Connect the LC connectors / RJ45 Ethernet cables to the SFP modules.

INFO: The SFP modules have a side that clips to the connector on the port of the switch, and is designed to prevent the module from being inserted the wrong way into the port. Do NOT force module into the port.

ATTENTION! Please note that SFP+ modules can also fit into the connector, however, transmission will not work. Make sure to use the correct modules.

Removing SFP Modules

Step 1. Disconnect the LC connectors / RJ45 Ethernet cables from the SFP module.
Step 2. Pull down on the handle bar.
Step 3. Gently slide out the SFP module from the slot.

Installation of DAC Cables

GVN endpoints can be connected via DAC (Direct Attach Copper) cables to the network switch. The cable type must support 1 GbE signal transmission.

Inserting the DAC Cables

Step 1. Push the plug of the DAC cable to one of the SFP port slot of the transmitter to stop.
Step 2. Push the other plug of the DAC cable to one of the SFP port slot of the receiver to stop.

Removing the DAC Cables

Pull the handle bar of the plug and gently slide out the cable from the slot.

INFO: See more details about the SFP interfaces in the SFP Interface section.

4.2.6. Analog Audio Ports

DIFFERENCE: The GVN-MMU-X100 model does not have an analog audio port.

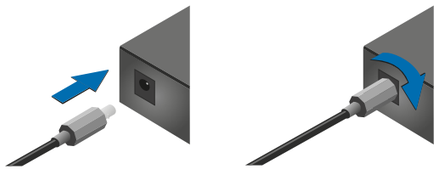
5-pole Phoenix connector is used for balanced analog audio output. Unbalanced audio signals can be connected as well. For asymmetrical output, connect only + and ground. For asymmetrical input connect + and ground to the source and connect – to the ground.

4.2.7. RS-232 Ports

GVN models contain a 3-pole Phoenix connector, which is used for RS-232 serial connection.

4.2.8. DC 12V Connection

GVN devices can be powered locally via a locking DC 12V connector.



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

4.3. Connecting Steps

See this content in the Connecting Steps section.

5

Device Concept

The following chapter describes the features of the devices:

5.1. Gemini Device Concept

The key feature of the GVN series is the AV signal transmission from a Transmitter to many Receiver devices. Another feature is the transmission of RS-232 and USB signals.

Many Receiver devices can be connected to the same Transmitter through a Gigabit switch.

The MMU can automatically discover all Endpoints and add them to the list of mapped devices.

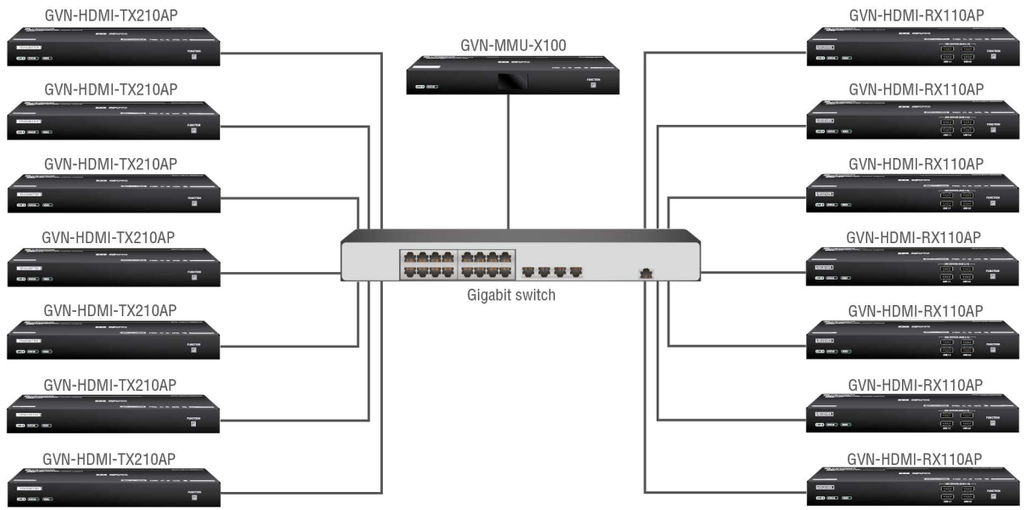
ATTENTION! Initially the video/audio/USB signals can only be transmitted together. The option to separate them will be implemented in a later firmware update.

5.2. Video Interface

The following section describes the modes of the video transmissions. When the necessary network settings are arranged, the following have to be set:

5.2.1. Video Stream Transmission

The Transmitter and Receiver devices are arranged in a LAN by connecting them to an **L3 Gigabit switch**. The stream of each of the transmitters may be switched to one or several receivers by setting the crosspoint in the MMU.



ATTENTION! Please keep in mind that AV transmission can only happen through either the RJ45 ports (Option 1) or the SFP modules (Option 2), not both.

5.3. Analog Audio Interface

The stream contains the audio signal along the video. The audio of the stream connected to the devices will be de-embedded to the analog audio ports.

5.4. Dante® Audio Interface

DIFFERENCE: This section refers to the GVN-HDMI-TX210AP-DNT and GVN-HDMI-RX110AP-DNT models only.

The Dante-capable GVN endpoints contain a special module that allows them to transmit Dante audio alongside the AV stream through the RJ45 connector. *#new*

The Dante audio is de-embedded from the HDMI stream in the transmitter automatically, and is transmitted alongside the GVN audio. Hence, it can be received by any Dante-capable device.

The receiver can transmit any incoming Dante audio source set in the Dante Controller towards the HDMI and analog audio outputs. Switching GVN or Dante audio to the outputs can be done as seen below.

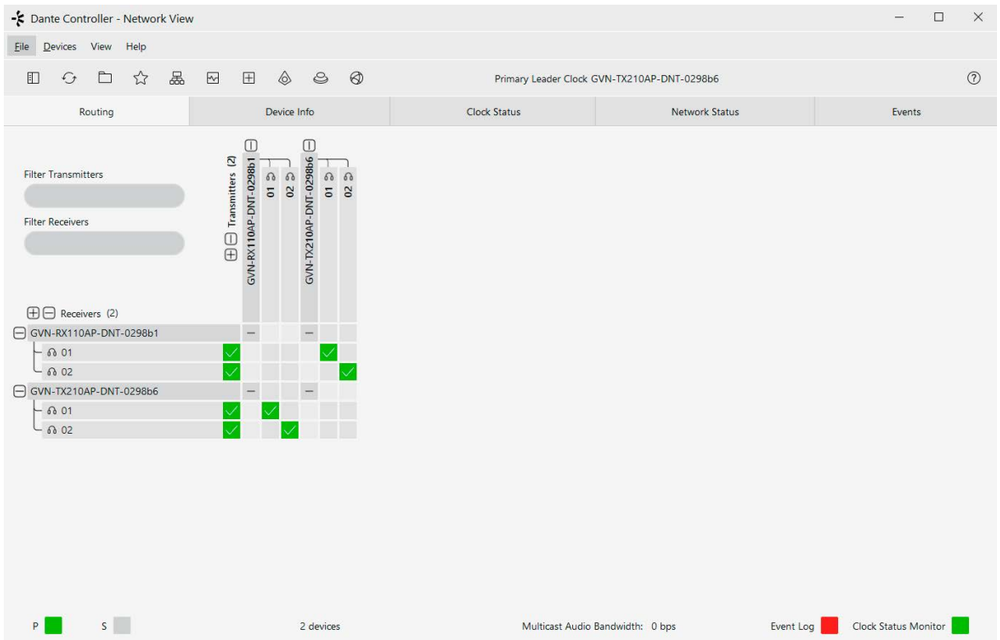
In case of the **transmitter**, Dante audio is automatically transmitted through the outputs.

Please be aware that switching the Dante audio stream to the **receiver** outputs requires two steps.

Step 1. Choosing the Dante audio stream to be transmitted in the receiver on the Port properties panel (see the Port Information section on the destination side)

Step 2. Setting the crosspoint using Dante Controller (see below)

Dante Contoller Crosspoint



5.5. USB Interface

USB 2.0 data transmission operates between the transmitter and receiver devices. Connect the host device (e.g. a computer) to the transmitter via the USB-B port and the USB devices to the receiver via the USB-A ports. Supported USB devices:

- **USB HID devices:** keyboard, mouse, presenter, webcamera.
- **Mass storage devices:** USB flash drive, external hard drive.

The signal of the mouse and the keyboard connected to a receiver will be transmitted towards the host in composite mode, and the signal of 6 further USB 2.0 device can be transmitted alongside it to the host simultaneously.

ATTENTION! Please keep in mind that in GVN-HDMI-RX110AP(-DNT) two USB-A ports are for USB 1.1 connection (HID devices), and two are for UBS 2.0 connection (e.g. webcamera, touchscreen, smart card readers, mass storage devices).

WARNING! Please be aware that if you have a USB device connected to an endpoint that you wish to disconnect from another endpoint or change crosspoints, it is highly advised to make sure the USB device is not being used actively and is properly disconnected on the host side. Otherwise, data loss may occur (e.g. there is active data transfer to/from a pendrive when the endpoints are switched/ disconnected. This might corrupt the file system on the pendrive and data might be lost.)

5.6. RS-232 Interface

Serial data transmission works between a Transmitter and a connected Receiver. To connect serial devices, please use the cables supplied with the extenders. *#serial*

ATTENTION! The serial data is transmitted only if video is transmitted between the affected devices.

Pass-through Mode

DEFINITION: The **Pass-through mode** means fully transparent bidirectional data transmission from an RS-232 port of a GVN transmitter to an RS-232 port of a GVN receiver – and vice versa.

All data received from the serial ports of the receivers is transmitted to the serial port of the transmitters and vice versa: the data received from the serial port of the transmitters is transmitted to the serial ports of the connected receivers.

Command Injection Mode *#new*

DEFINITION: The **Command Injection mode** is like an RS-232 - TCP/IP bidirectional converter. The mode allows data transmission between a TCP/IP device and a serial device.

ATTENTION! The TCP/IP port number is fixed on **6752**, and a direct connection to the endpoint (through the IP address of the endpoint) via this port is necessary for proper operation.

When a device is connected to the network (e.g. TCP/IP connection from a computer) and a serial device is connected to the RS-232 port of a GVN device, they can communicate with each other.

The mode can be enabled as described in the Setting the RS-232 Port Operation Mode section.

5.7. SFP Interface

DEFINITION: **SFP**: the small form-factor pluggable (SFP) is a compact, hot-pluggable optical module transceiver used for both telecommunication and data communications applications. It is a popular industry format jointly developed and supported by many network component vendors. *

* Source: https://en.wikipedia.org/wiki/Small_form-factor_pluggable_transceiver

GVN series endpoint devices contain standard 1x SFP slots for the fiber optical connections via SFP modules or DAC cables. The installed SFP modules can be singlemode or multimode as well.

The following methods can be applied to connect the endpoints to the switch:

- 1x SFP transceiver module up to 1 Gbps bandwidth. The module can be singlemode or multimode, built with LC duplex connectors or BiDi modules. The maximum allowed fiber optical cable length depends on the installed SFP modules. Always check the specification of the module.
- 1x 1 GbE DAC cable

ATTENTION! Please note that SFP+ modules can also fit into the connector, however, transmission will not work. Make sure to use the correct modules.

ATTENTION! Please note that Power over Ethernet is **not** available via the SFP slots, only the RJ45 ports!

5.8. Further Built-in Features

5.8.1. GVN Matrix Database Backup and Restore

The GVN matrix cloning is a simple method to save the database of the matrix and the configuration settings of the MMU to a backup file. This file can be saved to your computer and can be restored to the MMU later. See more information about the contents of the backup file in the Contents of the Backup File section.

You can find more information about the backup procedure in the System section. *#backup*

5.8.2. Advanced EDID Management

Factory Preset EDIDs

The factory EDIDs (F1-F148) are factory preprogrammed and cannot be modified. These are the most common signal formats. They are specially provided to force the graphic cards to output only the exact pixel resolution and refresh rate.

Universal EDID allows multiple signal formats, including all common VESA defined resolutions. The use of universal EDID is recommended for fast and easy system setup.

Sources and Destinations

The EDID memory consists of four parts:

- **Factory EDID** list shows the pre-programmed EDIDs (F1-F148).
- **Dynamic EDID** list shows the sinks connected to the device's outputs (D). The unit stores the last display devices' EDID on either output, so there is an EDID shown even if there is no display device attached to the output port at the moment.
- **User memory** locations (U1 – U100) can be used to save custom EDIDs.
- **Emulated EDID** list shows the currently emulated EDID for the inputs (E). The source column displays the memory location that the current EDID was routed from.

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

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

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

See more information about the settings in the EDID Management Menu section in the LDC software.

For the list of Factory EDIDs, please see the Factory EDID List section. *#edid*

5.8.3. Seamless Switching

The GVN series devices are capable of switching video signals to a transmitter seamlessly (with no black screen visible upon switching). However, in passthrough mode this is not available. To ensure that seamless switching works properly, make sure to set these parameters on the receiver: *#seamless*

- If you want to switch between HDCP signals, make sure to force HDCP in the device.
- Set the output resolution with the scaler function.
- The streams should have the **same scanning mode** (interlace/progressive mode)
- The streams should have the **same HDMI info frame**
  - The **audio format** of the incoming signals must be the same.
  - The **color dynamic range** of the incoming signals must be the same (limited range vs. full range)
  - Use **SDR signals**
- Force the color space.

INFO: The video signal gets priority during switching - it may happen that the other signals appear on the output 1-2 seconds later.

ATTENTION! If a transmitter has no connected receivers, it will enter a suspended state. When a receiver is connected to such a transmitter, the transmitter will take extra time to resume operation.

ATTENTION! In case of HDR signal the switching will not be seamless, because the HDR infoframe changes in each case.

5.9. Software Control Modes

The user has several possibilities to control the device. The following list contains the software control modes:

- **Lightware Device Controller (LDC)** - you can connect to the GVN matrix via our control software using Ethernet interface and control or configure the matrix as you wish. For the details see the Software Control chapter.
- **Built-in website of the MMU** - you can connect to the GVN matrix via a web browser application using Ethernet interface and control or configure the matrix as you wish. For the details, see the Built-in Web chapter.
- **LW3 protocol commands**: you can configure the matrix by using the full-range command set of LW3 protocol. For more details, see the LW3 Programmer's Reference chapter.

6

Software Control

GVN series devices allow setting all the parameters via a user-friendly interface. Open a web browser (Google Chrome or Mozilla Firefox is highly recommended) and connect to the device to access the parameters and settings. The other option is to use the Lightware Device Controller (LDC) software and connect to the device without a web browser. The features are described in the coming sections.

6.1. Built-in Web

The GVN-MMU-X100 model can be reached via a browser without downloading and installing the Lightware Device Controller (LDC) application. The look and functionality is the same, the only difference between the web LDC and the desktop application is that there is no button to reach the Device Discovery window in the first. *#web #builtinweb*

To connect to the MMU via a browser, simply type in the IP address of the device into the address bar. Also please make sure your computer is in the same subnet as the device you wish to control.

There are two possible ways to monitor chosen streams through the built-in web: the **Snapshot view** and the **Substream view**.

6.1.1. Snapshot View

It is possible to get a snapshot of the chosen stream with this setting. To utilize this function, type into your address bar of your browser the **IP address** of the chosen endpoint and the **port number** used to connect to the device in the following way: *#snapshot*

http://<endpoint_ip>:8080/?action=snapshot

This will show you a snapshot from the stream with the default settings (.jpeg format, 1024x576p resolution).

It is possible to configure the output image properties as seen in the following section:

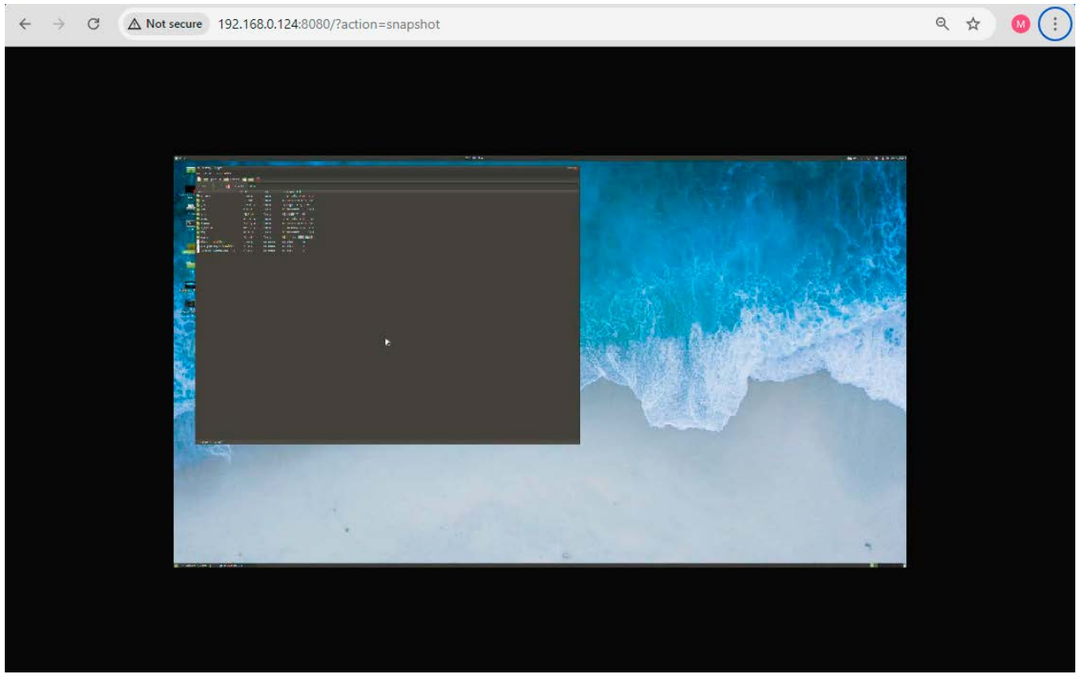
http://<ip_address>:8080/?action=snapshot&w=<width>&h=<height>&q=<quality>&as=<aspect_ratio>

Parameters

Parameter	Description	Default	Value
<endpoint_ip>	The IP address of the endpoint		
<width>	The width of the snapshot picture in pixels	1024	Max.: 1280*
<height>	The height of the snapshot picture in pixels	576	Max.: 720*
<quality>	The image quality of the snapshot image - higher setting means higher quality	60	**10-100** in steps of 10
<aspect_ratio>	Aspect ratio configuration	0	**0**: Extends to the configured **width** and **height** values
			1: Keeps the original aspect ratio and places the snapshot in the center of the output

* It is not possible to upscale the resolution of the input stream - it is only possible to downgrade it.

ATTENTION! Configuration over the built-in web will take effect immediately, however, it will not be saved. Hence it will revert to default values after a system reboot.



The snapshot function in action in a browser window

6.1.2. Substream View

It is possible to get a low-definition video from the chosen stream for management purposes. To utilize this function, type into the address bar of your browser the IP address of the chosen endpoint and the stream parameter. *#substream*

http://<ip_address>/stream

This will show you a **low-definition video** from the stream with the default settings (.mjpeg format, 960x540 resolution, 15fps).

It is possible to configure the output video properties as seen in the following section:

http://<endpoint_ip>:8080/stream&w=<width>&h=<height>&fps=<frame_rate>&bw=<bandwidth>&as=<aspect_ratio>&mq=<min_quality>

Parameters

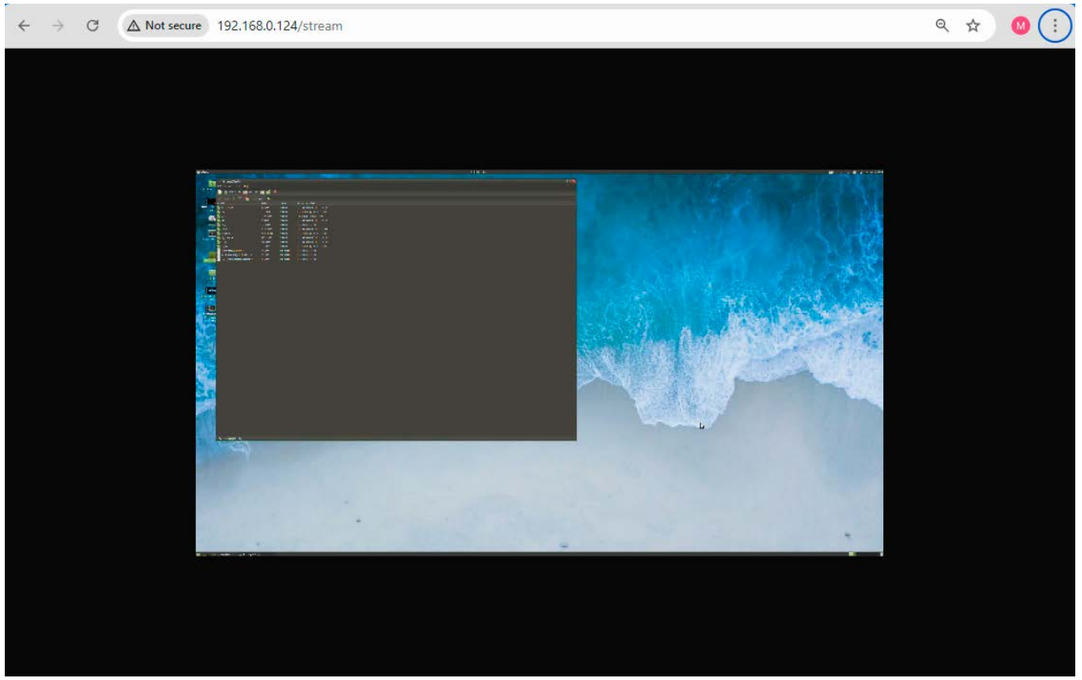
Parameter	Description	Default	Value
<endpoint_ip>	The IP address of the endpoint		
<width>	The width of the substream in pixels	960	Max.: 1280*
<height>	The height of the substream in pixels	540	Max.: 720*
<frame_rate>	The number of frames per second in the substream	15	
<bandwidth>	The **maximum** bandwidth of the substream (kb/s)	8000	
<aspect_ratio>	Aspect ratio configuration	0	**0**: Extends to the configured **width** and **height** values
			1: Keeps the original aspect ratio and places the snapshot in the center of the output
<min_quality>	Minimum image quality number - higher setting means better image quality	10	**10-100** in steps of 10**

* It is not possible to upscale the resolution of the input stream - it is only possible to downgrade it.

** The quality is limited by the bandwidth of the substream, lowering the quality if the data rate is over the maximum bandwidth. If the quality is lowered below the minimum quality value, the stream will drop frames.

ATTENTION! Configuration over the built-in web will take effect immediately, however, it will not be saved. Hence it will revert to default values after a system reboot.

ATTENTION! It is possible to have several previews of the same substream simultaneously, but please keep in mind that each open substream will add extra network bandwidth load. By default, substream network bandwith is not expected to exceed 8Mbps, which is the default maximum bandwidth for one substream. Another preview of the substream can add another 8Mbps. In such cases make sure to configure the substreams so that the network bandwidth of the substream does not impact the quality of the main stream. Adjusting the resolution, frame rate, maximum bandwidth, image quality or the number of simultaneous substreams are key to managing good transmission quality.



The substream function in action in a browser window

Bandwidth Control Function

In order to conserve as much bandwidth for the main stream as possible, the bandwidth control function will automatically adjust the JPEG quality of the substream. If the substream data rate is over the maximum, it will reduce the image quality to conserve bandwidth. If the bandwidth is sufficient, it will increase the image quality.

If the substream network bandwidth still exceeds the maximum bandwidth after reducing the image quality to minimum, the substream will start dropping frames.

INFO: If the user sets a high resolution for the substream, the bandwidth control function might not be able to limit the bandwidth to the target value. In such cases, reducing the resolution or frame rate is advised to ensure problem-free transmission.

INFO: The substream function does not support color space conversion for Dolby Vision, thus the output color may be distorted or unusual.

6.2. Install and Update the LDC

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

Installation for Windows OS

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

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

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

Comparison of installation types

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

Installation for macOS

Mount the DMG file by 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.

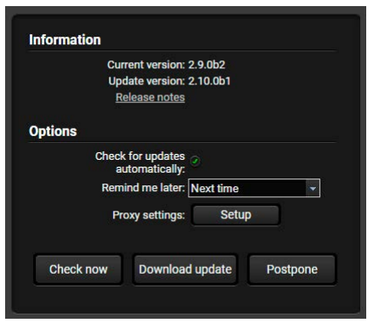
Updating of LDC

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 LDC updates are found.

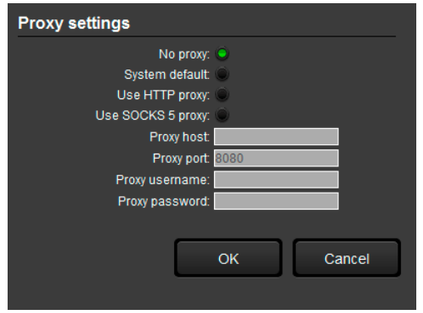
The current and the update version numbers can be seen at the top of the window and they are shown in this window even with the snapshot install.

The **Update** window can also be opened by clicking on 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** that 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 on the **OK** button.

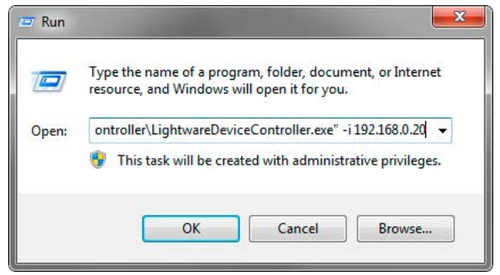


Step 3. Click on the **Download update** button to start the updating.

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

6.3. Running the LDC

The common way to start the software is to double-click on the LDC icon. But the LDC can be run by command line parameters as follows:



Connecting to a Device with Static IP Address

The LDC is connected to a device with the indicated static IP address directly; the Device Discovery window is not displayed. When the port number is not set, the default port is used: 6107 (LW3 protocol).

Format: `LightwareDeviceController -i <IP_address>:<port>`

Example: `LightwareDeviceController -i 192.168.0.20:6107`

Adjusting the Zoom

The window can be zoomed to a specific value to fit to the resolution of the desktop (higher/lower). '1' is the default value (100%).

Format: `LightwareDeviceController -z <magnifying_value>`

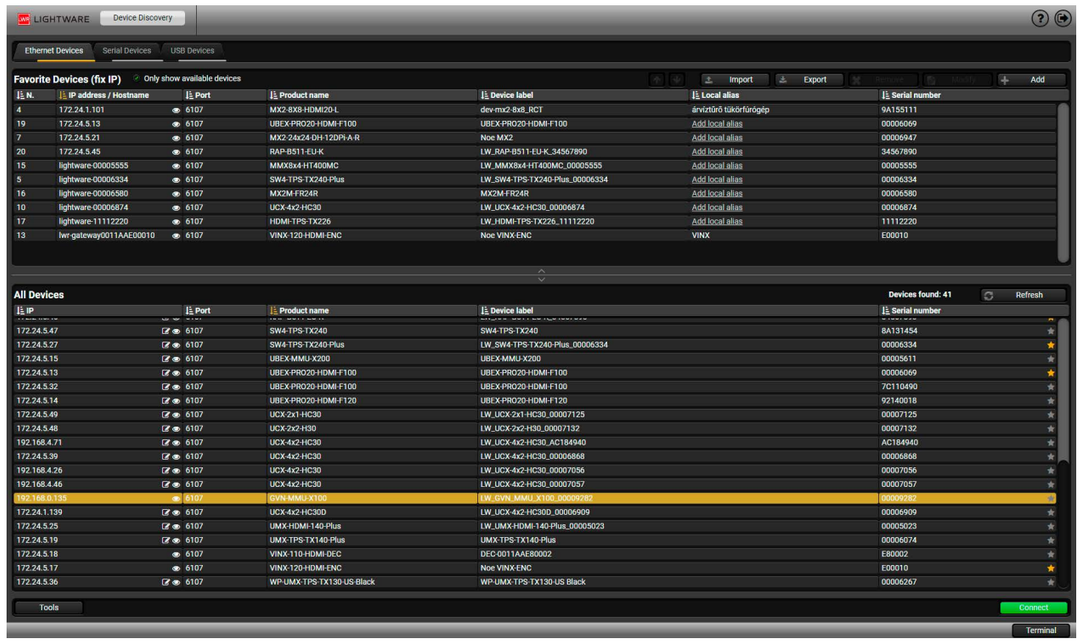
Example: `LightwareDeviceController -z 1.2`

ATTENTION! The last set value is stored and applied when LDC is started without a parameter.

6.4. Establishing the Connection

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

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



Device discovery window in LDC

The Ethernet tab consists of two lists. **All devices** list contains all Lightware devices that are available in the connected network. However, there is no need to browse all the available devices as you can expand the list of **Favorite devices** with any Lightware device that is connected via Ethernet by any of the following ways:

- Mark the desired device with the ★ symbol in the **All Devices** list,
- Press the **Add** button and add the device in the appearing window, or
- **Import** the list of favorite devices that was **exported** previously.

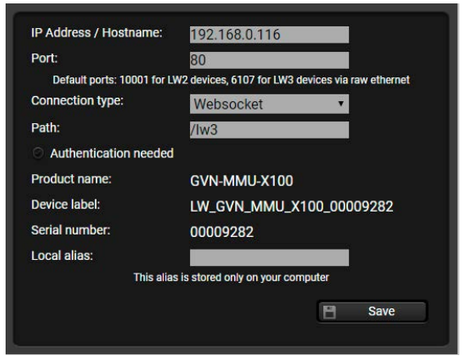
DIFFERENCE: In the initial release only GVN-MMU-X100 model appears in the All Devices list

Add New Favorite Device

Press the **Add** button; in the appearing window you can enter the **IP address**. The **hostname** of the desired device can be used instead, if it is supported. That allows setting a unique name to identify the device in a network. If the host name is saved in this window and the IP address is changing, the device will still be available and connectible.

ATTENTION! The host name connection-feature does not work when the target device is accessed over VPN.

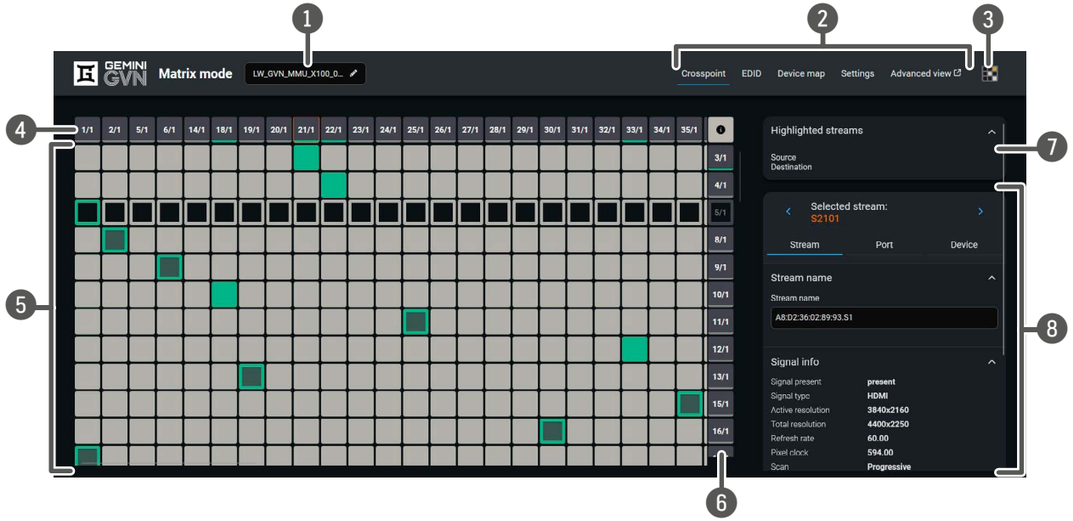
See more information about the hostname property in the Setting the Hostname section.



Import/Export the List of Favorite Devices

The list of favorite devices can be exported/imported by the dedicated buttons (saved as *.JSON file). The list can be imported later (in another computer, too), but please note that the current list will be overwritten by the imported list.

6.5. Video Stream Crosspoint

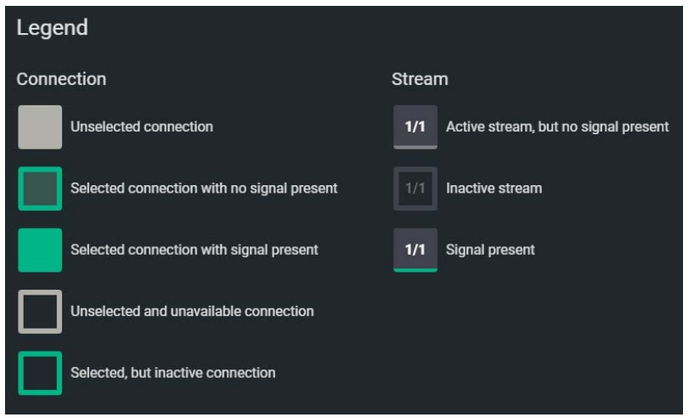


The Concept

The Crosspoint menu displays the **GVN network** in grid layout with all sources (the input ports of the transmitters) and destinations (the output ports of the receivers). Clicking on a source or destination panel, the properties and settings of the selected item appear on the right side. The selected source/destination is framed with orange. *#switch #crosspoint*

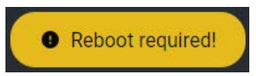
1. **Device label of the MMU** — The device label of the MMU is displayed here. It can be modified by the user to any unique name by clicking on the ✎ icon. The device label can be 39 characters long and ASCII characters are allowed. Longer names will be truncated.
2. **Main menu** — The available menu items are displayed. The active one is shown with blue underline.
3. **Navigation button** — The device discovery window can be displayed by clicking on this button.
4. **Source streams** — Each tile represents a stream coming from one of the input ports of the transmitter. The tiles below the streams show the current crosspoint setting; if the stream is switched to a receiver, the color of the tile is green, otherwise grey.
   Clicking on the tile opens the stream information panel on the right side of the screen.
5. **Connections** — The crosspoint connections can be selected in this table. The legend for the tile colors can be seen below.
6. **Destination streams** — Each tile represents an output port of a receiver.
   Clicking on the tile opens the stream information panel on the right side of the screen.
7. **Highlighted streams** — Showing the currently selected connections. Move the cursor above the desired crosspoint and the names of the source and destination are displayed in the field.
8. **Stream information panel** — Settings and status information of the selected stream are displayed in this section.

Tile Colors Legend



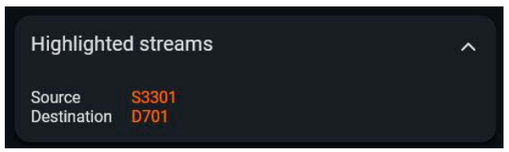
The MMU and the endpoints need to be rebooted following some changes (e.g. switching HDCP settings, Hostname settings, etc.). In this case a yellow circle with an exclamation mark will appear in the upper right-hand corner of the affected tile for the endpoints.

Reboot requirement for the MMU will appear as a yellow button at the top.



Highlighted Streams

This box helps you keep track of stream crosspoints in a big network with many endpoints. When you hover your cursor over a crosspoint setting, its source and destination streams will appear here.

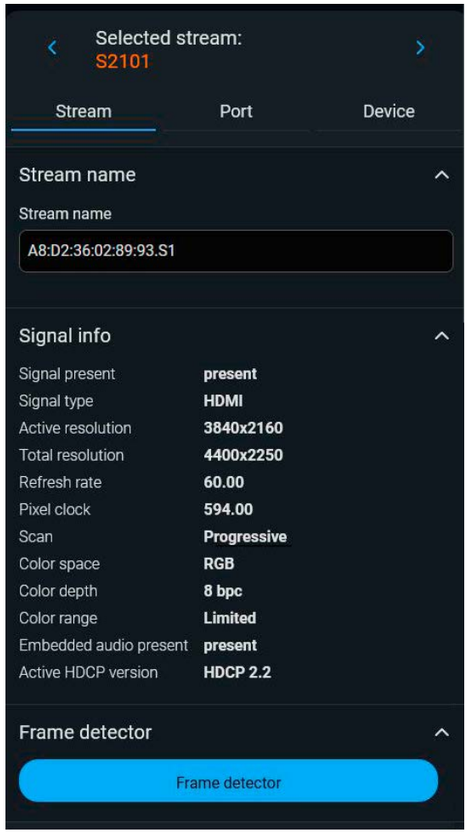


6.6. Video Source Port Properties Panel

Clicking on a source port, the properties panel opens on the right side.

6.6.1. Stream Information

The most important information and settings of the stream are available in the Stream information section.



Settings

- **Stream name**

Signal Info

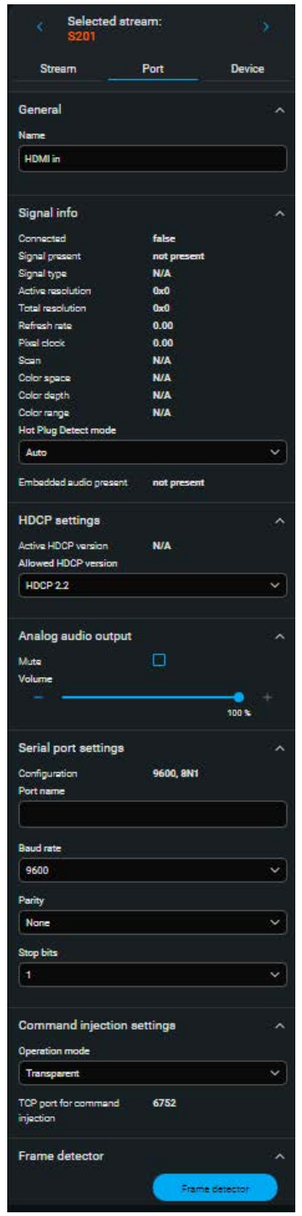
All important audio and video information (e.g. HDCP status, resolution, total size, pixel clock, color space, embedded audio information) are available in the signal info section.

Tools

- Frame Detector - The tool displays the frame information of the original stream coming from the input port before a possible rescaling / frame rate conversion. *#framedetector*

6.6.2. Port Information

The most important information and settings of the input port are available in the Port information section.



General

- **Port name**

Signal Info

All important audio and video information (e.g. HDCP status, resolution, total size, pixel clock, color space, embedded audio information) are available in the signal info section.

- **Hot Plug detect mode** (**Auto** / Off)

HDCP Settings

- **Active HDCP version**
- **Allowed HDCP version** (**HDCP 2.2** / Off) *#hdcp*

> INFO: HDCP setting in the transmitter is needed to force the source to send the signal according to the needs of the system. If the source sends unencrypted signal, but we need encryption for our system, setting this value to 2.2, the source will send encrypted signal. If the sink connected to the transmitter is not HDCP-capable, we can set this value to Off to force the source to send unencrypted signal. Protected content will not be transmitted in this scenario.

Analog Audio Output Settings

- **Mute state**
- **Volume:** You can set the volume of the audio in percent using the slider or the + / - buttons.

Serial Port Settings

- **Port name**
- **Baud rate** (**9600** / 19200 / 38400 / 57600 / 115200)
- **Parity** (**None** / Odd / Even)
- **Stop bits** (**1** / 2)

Command Injection Settings *#new*

- **Operation mode** (**Transparent** / AV Network Injection / None)
- **TCP port for command injection** (6752)

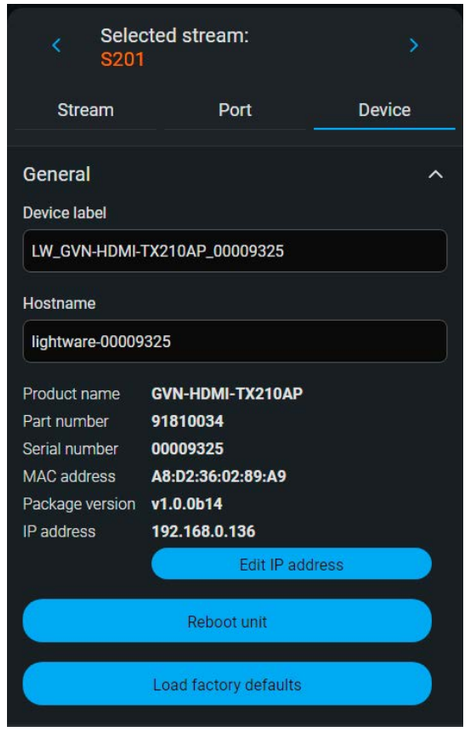
Tools

- Frame Detector - The tool displays the frame information of the original stream coming from the input port before a possible rescaling / frame rate conversion. *#framedetector*

> **DIFFERENCE:** The analog audio output and serial port settings are available from LDC version v2.12.0.

6.6.3. Device Information

The most important information and settings of the transmitter are available in the Device information section.



Settings

- **Device label**: the default label is the name and serial number of the device but it can be changed to any unique name. *#label #devicelabel*
- **Hostname**: the hostname can be set.
- **IP address**: the IP address can be changed by clicking on the **Edit IP address** button.
- **Reboot unit**: clicking on the button makes rebooting the device (the same as disconnecting from the power source and reconnecting again). *#reboot #restart*
- **Load factory defaults**: factory default setting can be called by clicking on the button.

General Info

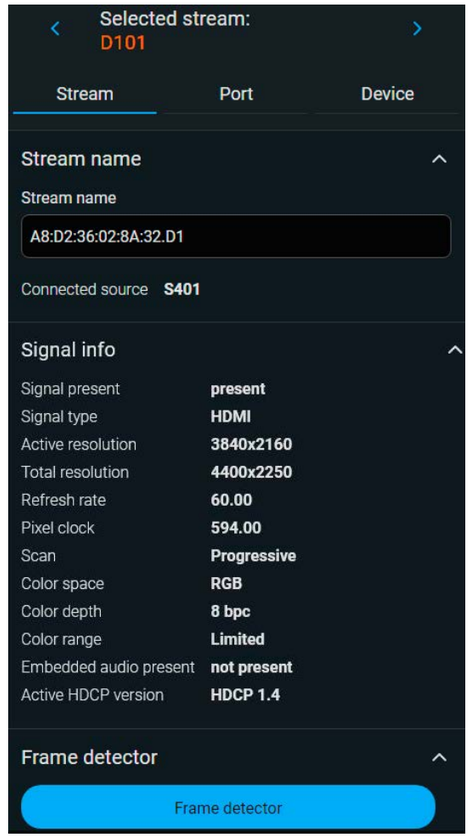
- Product name
- Part number
- Serial number
- MAC address *#mac*
- Package version

6.7. Video Destination Port Properties Panel

Clicking on a destination port, the properties panel opens on the right side.

6.7.1. Stream Information

The most important information and settings of the stream are available in the Stream information section.



Settings

- **Stream name**
- **Connected source**: information about the currently connected stream and the ID of the source device.

Signal Info

All important information (e.g. resolution, pixel clock, color space) are available in the signal info section.

Tools

- Frame Detector - The tool displays the frame information of the original stream coming from the connected source stream before a possible rescaling / frame rate conversion. *#framedetector*

6.7.2. Port Information

The most important information and settings of the input port are available in the Port information section.

General

- **Port name**

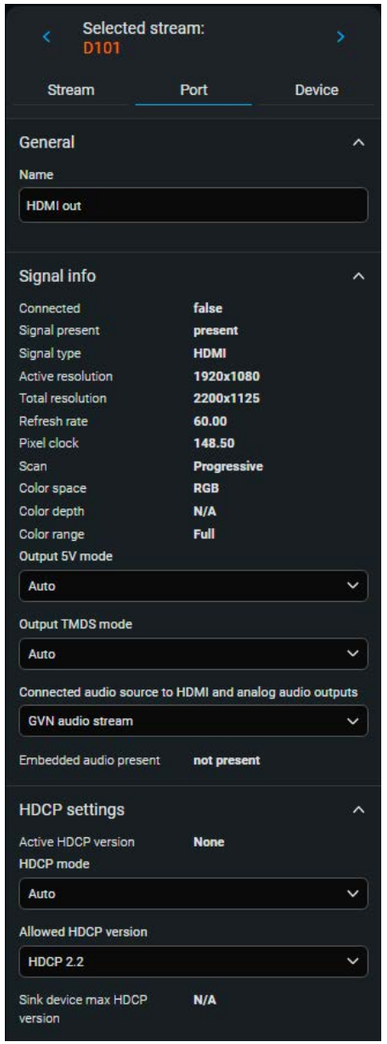
Signal Info

All important audio and video information (e.g. resolution, total size, pixel clock, color space, embedded audio information) are available in the signal info section.

- **Output 5V mode** (**Auto** / Off)
- **Output TMDS mode** (**Auto** / Off)
- **Connected audio source to HDMI and analog audio outputs** (**GVN** / Dante audio stream) *#new*

HDCP Settings

- **Active HDCP version**
- **HDCP mode** (**Auto** / Always) *#hdcp*
- **Allowed HDCP version** (HDCP 1.4 / **HDCP 2.2**)
- **Sink device max HDCP version**



Scaling and Conversion Settings

- **Scaling mode / Output resolution mode**: *#scaler*
  - **Passthrough**: the scaler is in pass-through mode.
  - Forced resolution: the scaling is active, the selected value in the forced resolution option will be applied to the video signal;
  - EDID based: the scaler forces the resolution that is read out from the EDID of the connected sink device.
- **Forced resolution**
- **Color space conversion** *#colorspace*
  - Pass (only in Passthrough mode)
  - RGB
  - YCbCr 4:4:4
  - YCbCr 4:2:2
  - YCbCr 4:2:0

Analog Audio Output Settings *#analogaudio #audio*

- **Mute state**
- **Volume:** You can set the volume of the audio in percent using the slider or the + / - buttons.
- **Connected audio source**

Serial Port Settings *#serial #rs-232*

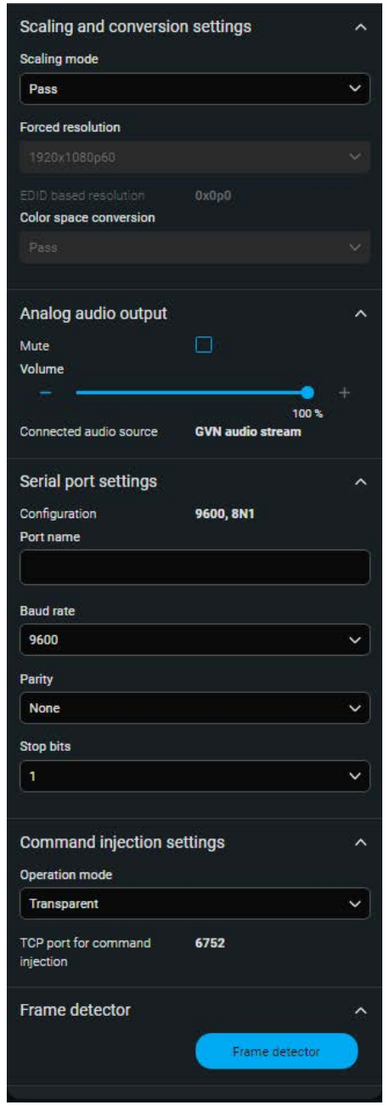
- **Port name**
- **Baud rate** (**9600** / 19200 / 38400 / 57600 / 115200)
- **Parity** (**None** / Odd / Even)
- **Stop bits** (**1** / 2)

Command Injection Settings *#new*

- **Operation mode** (**Transparent** / AV Network Injection / None)
- **TCP port for command injection** (6752)

Tools

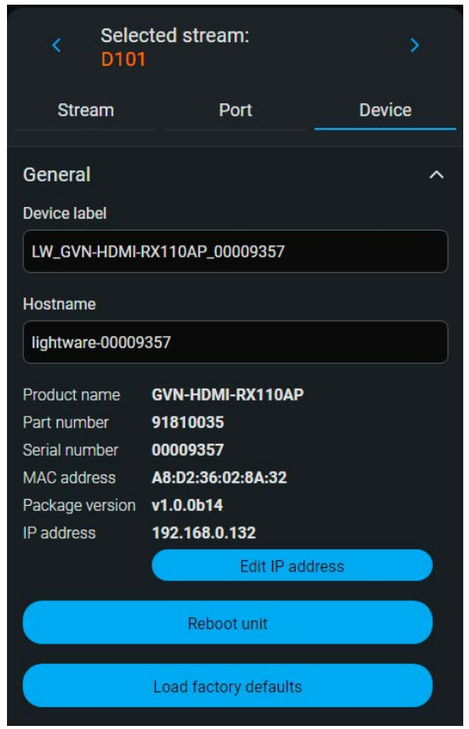
- Frame Detector - The tool displays the frame information of the original stream coming from the connected source stream before a possible rescaling / frame rate conversion. *#framedetector*



DIFFERENCE: The analog audio output and serial port settings are available from LDC version v2.12.0.

6.7.3. Device Information

The most important information and settings of the receiver are available in the Device information section.



Settings

- **Device label**: the default label is the name and serial number of the device but it can be changed to any unique name. *#label #devicelabel*
- **Hostname**: the hostname can be set.
- **IP address**: the IP address can be changed by clicking on the **Edit IP address** button. *#ip*
- **Reboot unit**: clicking on the button makes rebooting the device (the same as disconnecting from the power source and reconnecting again). *#reboot #restart*
- **Load factory defaults**: factory default setting can be called by clicking on the button. *#factorydefault*

General Info

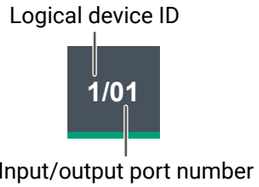
- Product name
- Part number
- Serial number
- MAC address *#mac*
- Package version

6.8. Default Naming / Numbering Explanation

The following section explains the default numbering of the sources/destinations and the default stream names of the endpoint devices.

6.8.1. Source and Destination Numbering

The source and destination ID contains two numbers: the logical device ID (it can be changed by the user) and the port number (it is fixed).



Logical device ID: It is created by the MMU based on the discovery order of the endpoints - independently of the operation mode. The first discovered endpoint gets the 1, the second one gets the 2, and so on.

INFO: The logical device ID can be reconfigured by the Device map feature. See the details in the EDID Management Menu section.

6.8.2. Default Naming of the Devices and the Streams

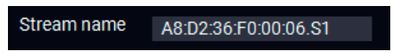
Device Name

The default name (label) of the device is the device name and the serial number. It can be changed freely in the **Device label** field by the user. *#devicelabel #label*

ATTENTION! There is a known issue in firmware version v1.0 regarding the device label. Please avoid using accentuated letters and spaces when setting this parameter in the endpoints, as this could cause applications being unable to detect the devices.

Stream Name

The default name of the stream is built from the MAC address and the S1 stream ID. The MAC address and the stream ID is separated by a dot character.

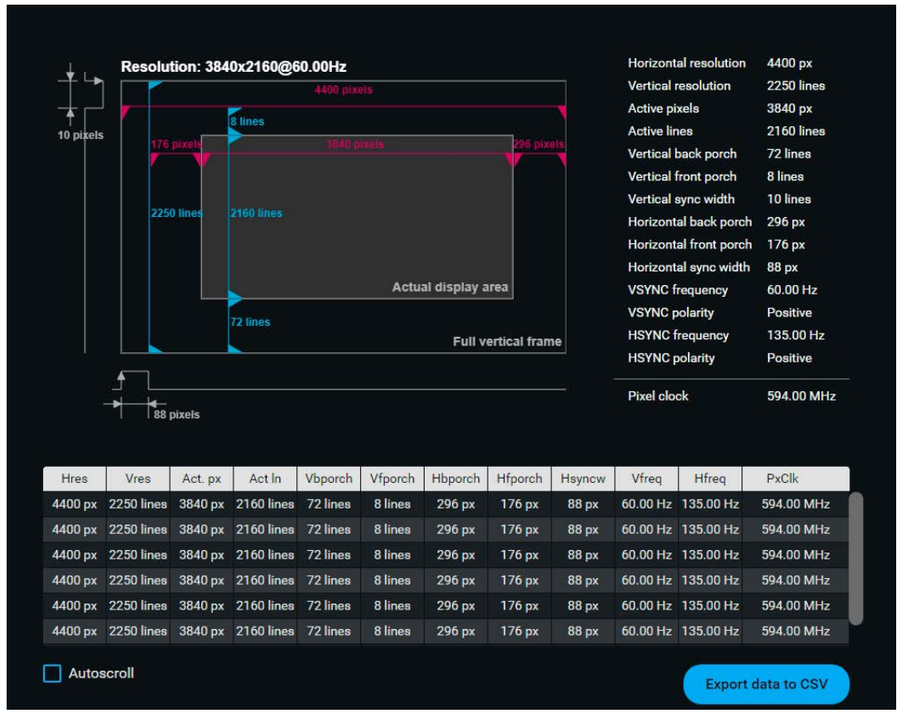


Example: A8:D2:36:F0:00:33.S1

The green characters are the MAC address of the device, the red characters are the stream ID numbers. The stream name can be changed freely in the **Stream name** field by the user.

Frame Detector

The ports can show detailed information about the signal, like blanking intervals and active video resolution. This feature is a good troubleshooter if compatibility problems occur during system installation. Lightware's Frame Detector function works like a signal analyzer and makes it possible to determine the exact video format that is present on the port, thus helping to identify many problems. E.g. actual timing parameters may differ from the expected and this may cause some displays to drop the picture. *#framedetector*



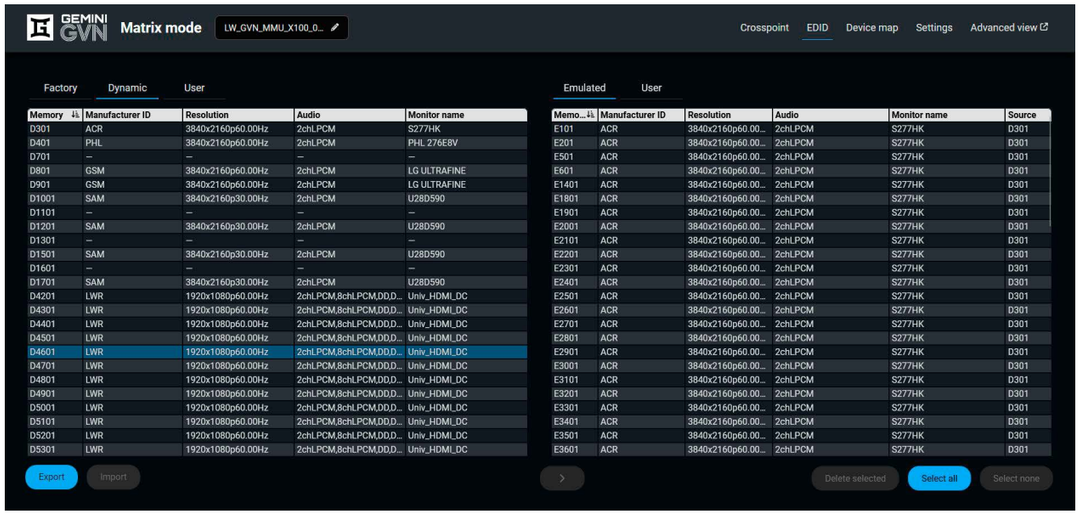
Frame Detector (Opened in a New Tab)

Frame Detector measures detailed timings on the video signals just like a built-in oscilloscope, but it is much more easy to use. Actual display area shows the active video size (light grey). Dark grey area of the full frame is the blanking interval, which can contain the info frames and embedded audio data for HDMI signals. Shown values are measured directly on the signal and not retrieved only from the HDMI info frames.

There is also an option to download the history of the measured data into a CSV file by clicking on the **Export data to CSV** button.

6.9. EDID Management Menu

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



EDID Management menu

Control Buttons

Export	Exporting an EDID (save to a file)
Import	Importing an EDID (load from a file)
>	Transfer button: executing EDID emulation or copying
Delete selected	Deleting EDID (from User memory)
Select all	Selecting all memory places in the right panel
Select none	Selecting none of the memory places in the right panel

6.9.1. EDID Operations

Changing Emulated EDID

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

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

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

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

Learning an EDID

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

Exporting an EDID

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

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

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

Importing an EDID

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

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

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

Step 3. Browse the file in the opening window, then press the **Open** button. The 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: Delete selected

Step 1. Press **User** button on the top of the Destination panel.

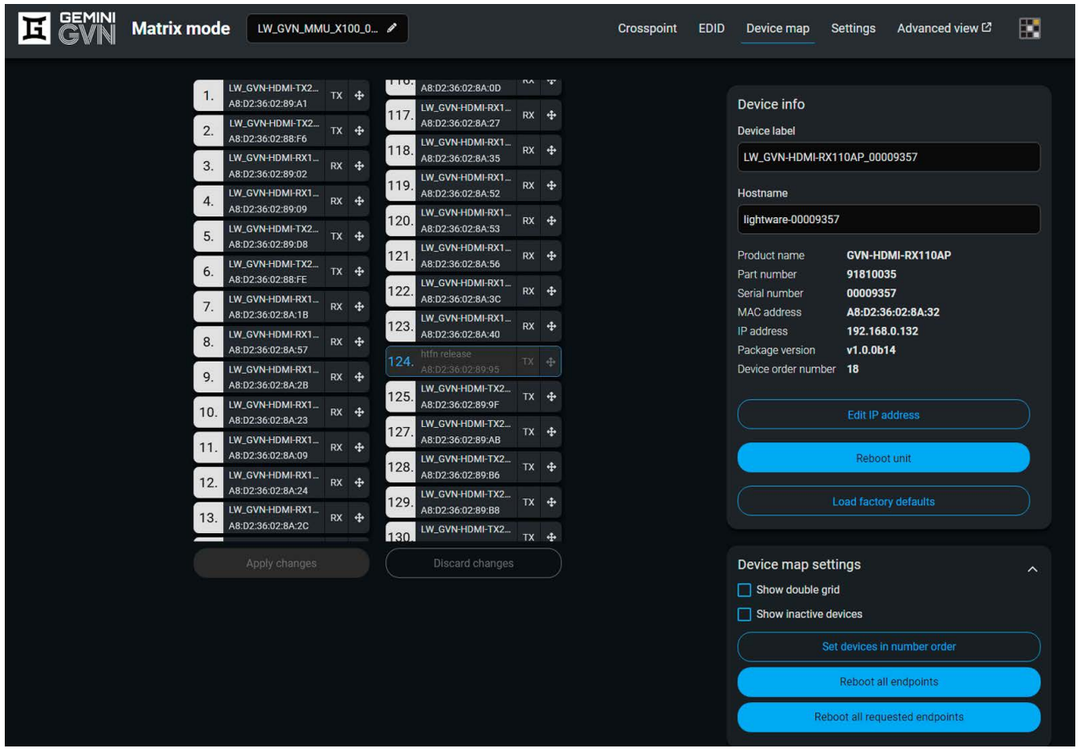
Step 2. Select the desired **memory** slot(s); one or more can be selected (“Select All” and “Select None” buttons can be used). The EDID(s) will be highlighted with yellow.

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

DIFFERENCE: The EDID export function is available from LDC version v2.12.0 and FW version v1.1.0.

6.10. Device Map

Clicking on the **Device map** submenu opens the Device map function window. The order list of the discovered transmitters and receivers can be changed to a custom list. The new order is saved in the MMU, the last applied order list will be loaded next time the device is restarted. *#devicemap*



Device Map menu of the GVN-MMU-X100

6.10.1. The Steps of Reordering

TIPS AND TRICKS: It is recommended to change the name of the devices to unique ones before the re-ordering process, it can help a lot to find the desired device in the matrix.

Step 1. **Select** the tile of the desired endpoint device by clicking with the left button of the mouse.

Step 2. **Drag and drop** the tile to the desired place.

Step 3. Select the **Apply Changes** button and confirm the selection.

6.10.2. Settings in the Device Map

Device Label

The device label can be changed by rewriting the text inside the text box. *#devicelabel #label*

Hostname

The hostname can be changed by rewriting the text inside the text box.

Edit IP Address

You can change the IP address of the endpoint by clicking on the button. *#ip*

Reboot Unit

Clicking on the button makes restarting the selected endpoint device (the same method as unplugging and reconnecting the power source). *#restart #reboot*

Load Factory Defaults

Factory defaults settings of the MMU can be recalled with a dedicated button. See the factory default values in the Factory Default Settings section. *#factory*

Show Double Grid

When it is enabled, the device list is duplicated for the better overseeing.

Show Inactive Devices

When it is enabled, the currently inactive endpoints appear in the list.

Set devices in number order

This button will reassign ID numbers to the devices in the set order, starting from 1.

Reboot All Endpoints *#new*

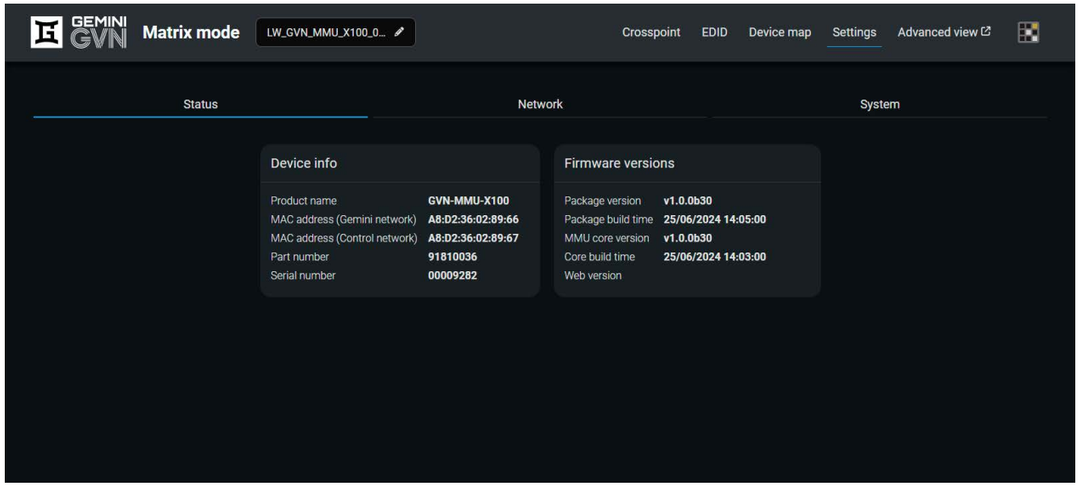
Clicking on this button reboots all endpoints in the system.

Reboot All Requested Endpoints *#new*

Clicking on this button reboots all endpoints that require it due to changes in settings.

6.11. Settings Menu

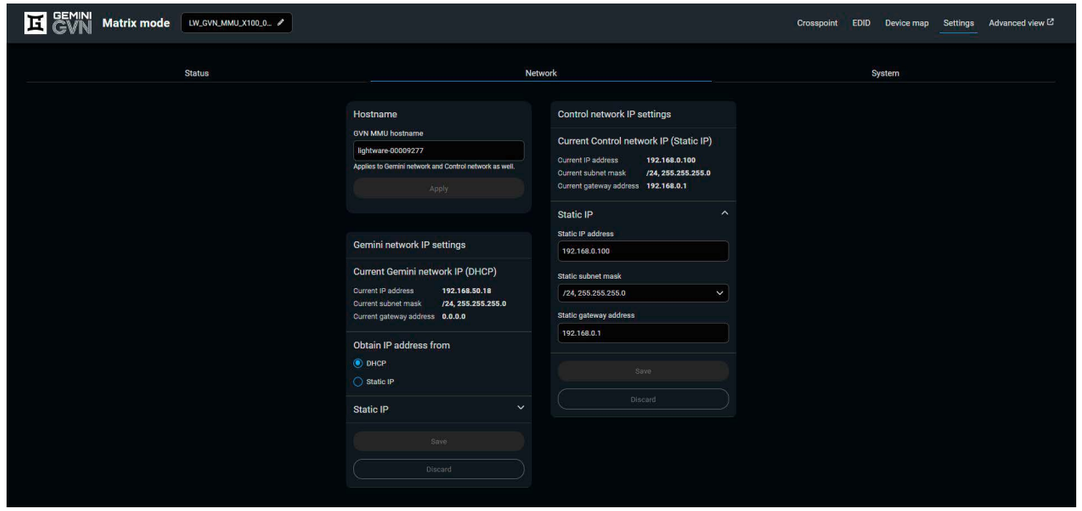
6.11.1. Status



Settings - Status tab of the GVN-MMU-X100

The most important software related information can be found on this tab: firmware version, serial number and MAC addresses. *#firmwareversion #mac*

6.11.2. Network



Settings - Network tab of the GVN-MMU-X100

IP address settings for both the Control network and the Gemini network can be set on this tab. Always press the **Save** button to save changes. *#network*

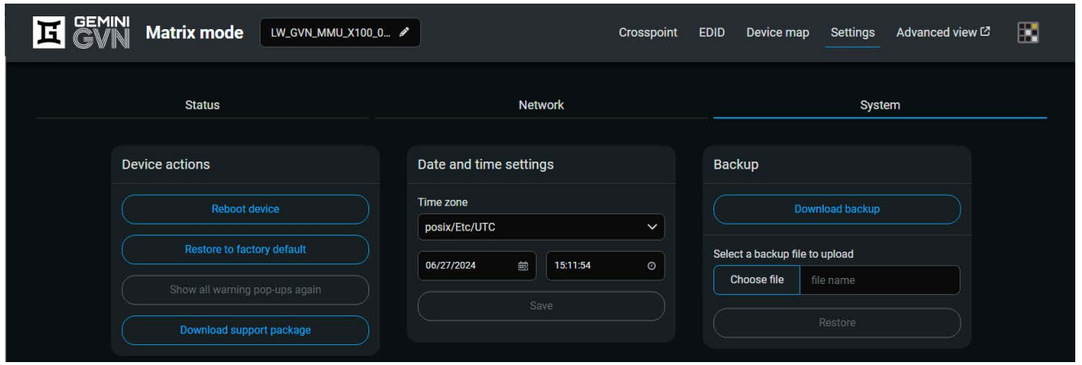
> INFO: GVN-MMU-X100 has separate network interfaces for controlling the Gemini network and the MMU Control network. Please make sure to adjust the correct interface.

The Control network can only have Static IP. The Gemini network may be set with Static IP or DHCP.

> INFO: Error messages will warn users if the given values are invalid or if the settings may cause a network subnet collision.

The Hostname of the MMU can also be changed here - this setting applies to both network interfaces available. Upon changing the Hostname, the device needs to be rebooted.

6.11.3. System

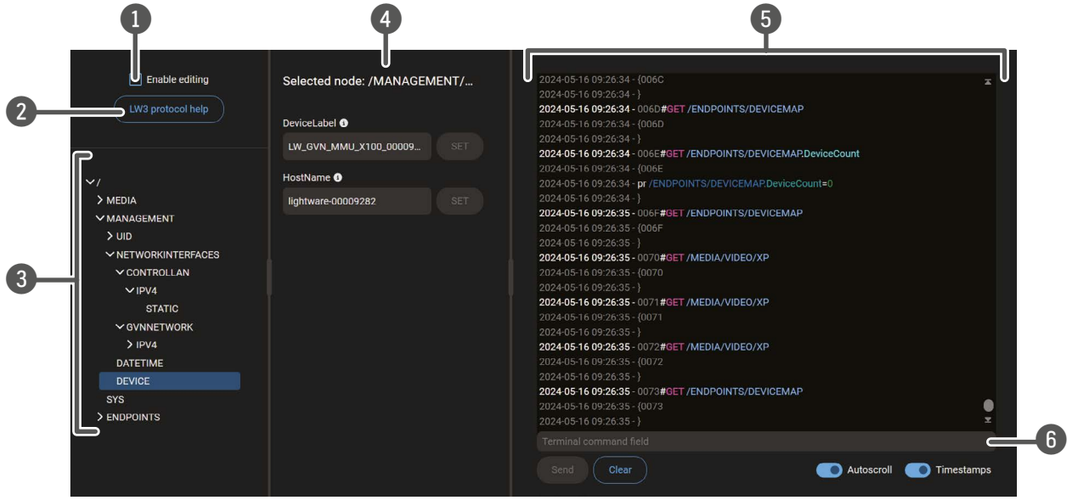


Settings - System tab of the GVN-MMU-X100

The following functions are available under the System tab:

- **Support package** - saving a log package of the device that helps during the troubleshooting process
- **Load factory defaults** - recalling factory default settings and values. All factory default settings are listed in the Factory Default Settings section. *#factorydefault*
- **Reboot** - rebooting the system. *#reboot #restart*
- **Show all warning pop-ups again** - reactivates all pop-up windows that had been closed with "Don't show again" ticked in.
- **Date and time settings** - internal clock of the MMU, which is used for debugging purposes. *#date #time*
- **Download and restore backup file** - makes it possible to save the configuration of the GVN system into a file and reupload it later. *#backup*

6.12. Advanced View



1 **Edit mode** — The default appearance is the read-only mode. If you want to modify the values or parameters, tick the option. You will be prompted to confirm your selection.

2 **LW3 protocol help** — Pushing the button results in a help window opening, which describes the most important information about LW3 protocol commands in HTML format.

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

4 **Node list** — Correspondent parameters and nodes are shown that are connected to the selected item in the protocol tree.

#advancedview
#terminal

Info bubble: Manual (short description) of the node can be called and displayed in the terminal window.

Set button: Saves the value/parameter typed in the textbox.

Call button: Calls the method, e.g. reloads factory default settings.

5 **Terminal window** — Commands and responses with time and date are listed in this window. The color of each item depends on the type of the command and response. The content of the window can be emptied by the **Clear** button. If the **Autoscroll** option is ticked, the list is scrolled automatically when a new line is added.

6 **Command line** — Type the desired command and execute it by the **Send** button. Clear all current commands and responses in the Terminal window by the **Clear** button.
You can also recall a previously sent command by pressing the **Up** arrow.

7

LW3 Programmer's Reference

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

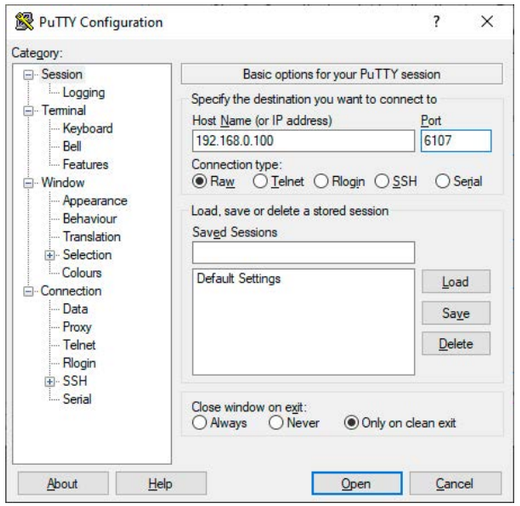
7.1. Overview

The Lightware Protocol #3 (LW3) is implemented in almost all new Lightware devices (matrix switchers, signal extenders and distribution amplifiers) since 2012. The protocol is ASCII-based and all commands are terminated with a carriage return (Cr, '\r') and line feed (Lf, '\n') pair. It is organized as a tree structure that provides outstanding flexibility and user-friendly handling with 'nodes', 'properties' and 'methods'. The **Advanced View** of the Lightware Device Controller software is the perfect tool for browsing and learning how the LW3 protocol can be used in practice.

7.2. Instructions for the Terminal Application Usage

Terminal Application

The LW3 protocol commands can be applied to the receiver using a terminal application. You need to install one of them on your control device, for example **Putty** or **CLI**. *#terminal*



Establishing Connection

Follow the steps to establish connection to the receiver:

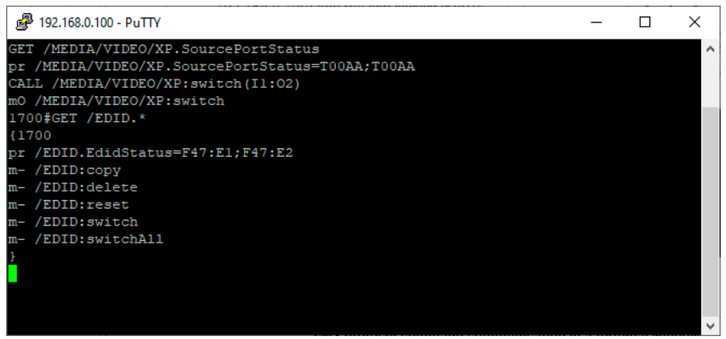
Step 1. Connect the receiver to a LAN over Ethernet.

Step 2. Open the terminal application (e.g. Putty).

Step 3. Add the **IP address** of the device (default: 192.168.0.100) and the **port number (6107)**.

Step 4. Select the **Raw** connection type, and open the connection.

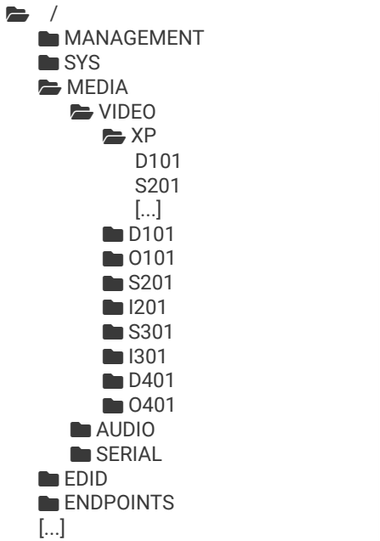
Once the terminal window is opened, you can enter the LW3 protocol commands, which are listed in the following sections.

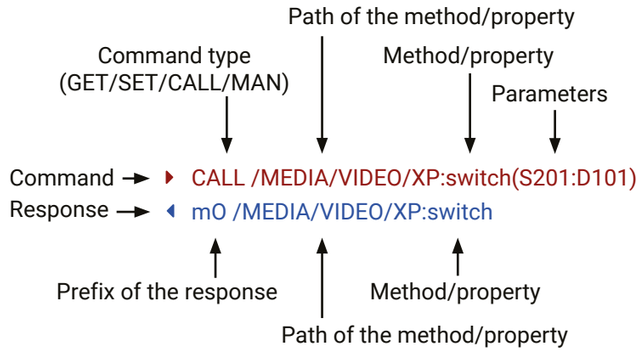


LW3 protocol command communication in a terminal window

7.3. Protocol Rules

7.3.1. LW3 Tree Structure and Command Structure (examples)





7.3.2. General Rules

- All names and parameters are **case-sensitive**.
- The nodes are separated by a slash ('/') character.
- The node name can contain the elements of the English alphabet and numbers.
- The command lines have to be closed by Carriage return and Line Feed (CrLf).
- Use the **TCP port no. 6107** when using LW3 protocol over Ethernet.
- The length of a line (command/response, command type / prefix, path, method/property and parameters together) can be **max. 800 bytes**.
- When a command is issued by the device, the received response cannot be processed by the CPU.
- The node paths describe the exact location of the node, listing each parent node up to the root.
- The maximum number of subscriptions is 512. This includes subscriptions by the LDC.
- The maximum number of updates that can be handled by the MMU is 128 (e.g. switchAll command). This **includes** the updates done in LDC.
- The maximum number of connected LW3 clients is 10. This **includes** the LDC Graphical User Interface.

7.3.3. Legend for the Control Commands

Command and Response – Example

- GET·/MEDIA/VIDEO/XP/D201.SignalPresent
- pr·/MEDIA/VIDEO/XP/D201.SignalPresent=<signal_present>

Format	Description
<in>	Input port number
<out>	Output port number
<port>	Input or output port number
<loc>	Location number
<parameter>	Specific parameter defined and described in the command
<expression>	Batched parameters: the underline means that more expressions or parameters can be placed by using a semicolon, e.g. **I2;I4;I5** or **F27:E201;F47:E301**
▸	Sent command
◂	Received response
·	Space character

Further not listed <parameters> are defined at each command.

7.3.4. Command Types

GET command

The **GET** command can be used to get the child nodes, properties and methods of a specific node. It can also be used to get the value of a property. Use the dot character (.) when addressing a property:

- GET /.SerialNumber
- pr /.SerialNumber=87654321

GETALL command

The **GETALL** command can be used to get all child nodes, properties and methods of a node with one command.

- GETALL /MEDIA/VIDEO/XP
- n /MEDIA/VIDEO/XP/D101
- n /MEDIA/VIDEO/XP/S201
- n /MEDIA/VIDEO/XP/S301
- m /MEDIA/VIDEO/XP:switch
- m /MEDIA/VIDEO/XP:switchAll

SET command

The **SET** command can be used to modify the value of a property. Use the dot character (.) when addressing the property:

- SET /MEDIA/VIDEO/D101.Name=MyDevice
- pw /MEDIA/VIDEO/D101.Name=MyDevice

CALL command

A method can be invoked by the **CALL** command. Use the colon character (:) when addressing the method:

- CALL /EDID:switchAll(F49)
- mO /EDID:switchAll

MAN command

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

- MAN /MEDIA/VIDEO/D101.Name
- pm /MEDIA/VIDEO/D101.Name User configurable name of the port. Avoid using special characters.

7.3.5. Prefix Summary

DEFINITION: The prefix is a two-character long code that describes the type of the response.

The following prefixes are defined in the LW3 protocol:

Prefix	Description	Prefix	Description
n-	a node	nr	remote node
nE	an error for a node	pm	a manual for the property
nm	a manual for a node	m-	a method
pr	a read-only property	mO	a response after a success method execution
pw	read-write property	mF	a response after a failed method execution
pE	an error for the property	mE	an error for a method
ns	symlink node	mm	a manual for a method
nv	virtual node		

7.3.6. Error Messages

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

- CALL /MEDIA/VIDEO/XP:lock(IA)
- mE /MEDIA/VIDEO/XP:lock %E002:Not exist

7.3.7. Escaping

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

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

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

The **original** message: **CALL /MEDIA/UART/P1:sendMessage(Set(01))**

The **escaped** message: **CALL /MEDIA/UART/P1:sendMessage(Set\(01\))**

7.3.8. Signature

DEFINITION: The signature is a four-digit-long hexadecimal value that can be optionally placed before every command to keep a command and the corresponding responses together as a group.

Each line is terminated with carriage return (Cr, '\r') and line feed (Lf, '\n') characters. In several cases the number of the lines in the response cannot be determined in advance, e.g. the client intends to receive the whole response and also wants to be sure that the received lines belong together and to the same command. In these cases, a special feature, the 'signature' can be used. The response to that particular command will also be preceded by the signature, and the corresponding lines will be between brackets:

- 1700#GET /EDID.*
- {1700
- pr /EDID.EdidStatus=F47:E201;F47:E301
- m- /EDID:copy
- m- /EDID:delete
- m- /EDID:reset
- m- /EDID:switch
- m- /EDID:switchAll
- }

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

7.3.9. Subscription

DEFINITION: Subscription to a node means that the user will get a notification if a property of the node changes.

A user can subscribe to any node. These notifications are asynchronous messages and are useful to keep the client application up to date, without having to periodically poll the node to detect a changed property. When the user does not want to be informed about the changes anymore, he can simply unsubscribe from the node.

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

Subscribe to a Node

- OPEN /MEDIA/VIDEO
- o- /MEDIA/VIDEO

Unsubscribe from a Node

- CLOSE /MEDIA/VIDEO
- c- /MEDIA/VIDEO

Subscribe to Multiple Nodes

- OPEN /MEDIA/VIDEO/*
- o- /MEDIA/VIDEO/*

Unsubscribe from Multiple Nodes

- CLOSE /MEDIA/VIDEO/*
- c- /MEDIA/VIDEO/*

Get the Active Subscriptions

- OPEN
- o- /MEDIA/VIDEO
- o- /EDID
- o- /DISCOVERY

7.3.10. Notifications about the Changes of the Properties

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

◀ CHG /EDID.EdidStatus=F48:E201

A Short Example of How to Use the Subscription

There are two independent users controlling the device through two independent connections (**Connection #1** and **Connection #2**). The events in the rows occur after each other.

▶ OPEN /MEDIA/AUDIO/O101 ◀ o- /MEDIA/AUDIO/O101 ▶ GET /MEDIA/AUDIO/O101.ConnectedSource ◀ pw /MEDIA/AUDIO/O101.ConnectedSource=D1	**connection #1**
▶ GET /MEDIA/AUDIO/O101.ConnectedSource ◀ pw /MEDIA/AUDIO/O101.ConnectedSource=D1 ▶ SET /MEDIA/AUDIO/O101.ConnectedSource=D4 ◀ pw /MEDIA/AUDIO/O101.ConnectedSource=D4	**connection #2**
◀ CHG /MEDIA/AUDIO/O101.ConnectedSource=D4	**connection #1**

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

7.4. System Commands - MMU

7.4.1. Querying the Product Name

Command and Response

▶ GET /.ProductName
◀ pr /.ProductName=<product_name>

Parameters

The <product_name> is the type of the device: it is a read-only parameter and cannot be modified.

Example

▶ GET /.ProductName
◀ pr /.ProductName=GVN-MMU-X100

7.4.2. Setting the Device Label

A unique name can be set that will be visible when the given device is listed in the built-in web page of other Gemini devices. Furthermore, the name is listed when browsing the client list of a DHCP server. *#label*

The default format of the device label is the following: LW_<product_name>_<serial_no>

> **ATTENTION!** There is a known issue in firmware version v1.0 regarding the device label. Please avoid using accentuated letters and spaces when setting this parameter in the endpoints, as this could cause applications being unable to detect the devices.

> **ATTENTION!** This property is a writable parameter and not the same as the **ProductName**.

Command and Response

▶ SET /MANAGEMENT/DEVICE.DeviceLabel
◀ pw /MANAGEMENT/DEVICE.DeviceLabel=<device_label>

Parameters

The <device_label> may consist of ASCII characters and can be 63 characters long. Longer names are truncated.

Example

▶ SET /MANAGEMENT/DEVICE.DeviceLabel
◀ pw /MANAGEMENT/DEVICE.DeviceLabel=LW_GVN-MMU-X100_00008084

7.4.3. Querying the Serial Number

Command and Response

▶ GET /.SerialNumber
◀ pr /.SerialNumber=<serial_no>

Example

▶ GET /.SerialNumber
◀ pr /.SerialNumber=00008084

7.4.4. Querying the Package Version

Command and Response

- GET /.PackageVersion
- pr /.PackageVersion=<package_version>

Example

- GET /.PackageVersion
- pr /.PackageVersion=v1.0.0

7.4.5. Querying the Current Date and Time of the System

The query returns with the current date and time that is set in the MMU. The format is based on the ISO 8601 standard.

Command and Response

- GET /MANAGEMENT/DATETIME.CurrentTime
- pr /MANAGEMENT/DATETIME.CurrentTime=<date_time>

Parameters

Parameter	Description	Formula
<date_time>	Current date and time	YYYY-MM-DDTHH:MM:SS

Example

- GET /MANAGEMENT/DATETIME.CurrentTime
- pr /MANAGEMENT/DATETIME.CurrentTime= 2024-05-10T06:23:37

7.4.6. Setting the Date and Time Manually

The date and time format is based on the ISO 8601 standard. *#date* *#time*

Command and Response

- CALL•/MANAGEMENT/DATETIME:setTime=<date_time>
- mO•/MANAGEMENT/DATETIME:setTime

Parameters

Parameter	Description	Formula
<date_time>	Current date and time	YYYY-MM-DDTHH:MM:SS

Example

- CALL /MANAGEMENT/DATETIME:setTime=2021-12-24T20:00:15
- mO /MANAGEMENT/DATETIME.setTime

7.4.7. Restarting the Device

The device can be restarted; the current connections (RS-232, USB, etc...) will be terminated. *#reboot* *#restart*

Command and Response

- CALL /SYS:reboot()
- mO /SYS:reboot

Example

- CALL /SYS:reboot()
- mO /SYS:reboot

7.4.8. Restoring the Factory Default Settings

> **ATTENTION!** Calling this command will restore factory default settings for all connected Endpoints as well.

Command and Response

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

Example

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

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

7.5. System Commands - Endpoints

7.5.1. Querying the Product Name

Command and Response

- GET /ENDPOINTS/DEVICEMAP/<endpoint>.ProductName
- pr /ENDPOINTS/DEVICEMAP/<endpoint>.ProductName=<product_name>

Parameters

The <product_name> is the type of the device: it is a read-only parameter and cannot be modified.

Example

- GET /ENDPOINTS/DEVICEMAP/X1.ProductName
- pr /ENDPOINTS/DEVICEMAP/X1.ProductName=GVN-HDMI-TX210AP

7.5.2. Setting the Device Label

A unique name can be set that will be visible when the given device is listed in the built-in web page of other Gemini devices. *#devicelabel #label*

The default format of the device label is the following: LW_<product_name>_<serial_no>

ATTENTION! This property is a writable parameter and not the same as the **ProductName**.

Command and Response

- SET /ENDPOINTS/DEVICEMAP/<endpoint>/MANAGEMENT.DeviceLabel=<device_label>
- pw /ENDPOINTS/DEVICEMAP/<endpoint>/MANAGEMENT.DeviceLabel=<device_label>

Example

- SET /ENDPOINTS/DEVICEMAP/X1/MANAGEMENT.DeviceLabel=MyGeminiTX
- pw /ENDPOINTS/DEVICEMAP/X1/MANAGEMENT.DeviceLabel=MyGeminiTX

7.5.3. Querying the Serial Number

Command and Response

- GET /ENDPOINTS/DEVICEMAP/<endpoint>.SerialNumber
- pr /ENDPOINTS/DEVICEMAP/<endpoint>.SerialNumber=<serial_no>

Example

- GET /ENDPOINTS/DEVICEMAP/X1.SerialNumber
- pr /ENDPOINTS/DEVICEMAP/X1.SerialNumber=92145512

7.5.4. Querying the MAC Address

Command and Response *#mac*

- GET /ENDPOINTS/DEVICEMAP/<endpoint>.MacAddress
- pr /ENDPOINTS/DEVICEMAP/<endpoint>.MacAddress=<mac_address>

Example

- GET /ENDPOINTS/DEVICEMAP/X1.MacAddress
- pr /ENDPOINTS/DEVICEMAP/X1.MacAddress= a8:d2:36:ef:ba:cd

7.5.5. Querying the Package Version

Command and Response *#firmwareversion*

- GET /ENDPOINTS/DEVICEMAP/<endpoint>.PackageVersion
- pr /ENDPOINTS/DEVICEMAP/<endpoint>.PackageVersion=<package_version>

Example

- GET /ENDPOINTS/DEVICEMAP/X1.PackageVersion
- pr /ENDPOINTS/DEVICEMAP/X1.PackageVersion=v1.1.0

7.5.6. Querying the Discovery ID

Discovery ID is a unique identifier of an endpoint, made up of the endpoint type (TX or RX) and the MAC address.

Command and Response

- GET /ENDPOINTS/DEVICEMAP/<device_map_id>.DiscoveryID
- pr /ENDPOINTS/DEVICEMAP/<device_map_id>.DiscoveryID=<discovery_id>

Example

- GET /ENDPOINTS/DEVICEMAP/X1.DiscoveryID
- pr /ENDPOINTS/DEVICEMAP/X1.DiscoveryID=RX-A8D2360298B1

7.5.7. Querying the Device Map ID

Device Map ID is the value of an endpoint within the device map. If a device is unmapped, this value is empty.

Command and Response

- GET /ENDPOINTS/DISCOVERY/ALL/<discovery_id>.DeviceMapId
- pr /ENDPOINT/DISCOVERY/ALL/<discovery_id>.DeviceMapId=<device_map_id>

Example

- GET /ENDPOINTS/DISCOVERY/ALL/RX-A8D2360298B1.DeviceMapId
- pr /ENDPOINTS/DISCOVERY/ALL/RX-A8D2360298B1.DeviceMapId=X1

7.5.8. Adding a Device to the Device Map

In case adding devices to the device map automatically is disabled, you can add devices manually via this command.

Command and Response

- CALL /ENDPOINTS/DISCOVERY/ALL/<discovery_id>:addToDeviceMap()
- mO /ENDPOINTS/DISCOVERY/ALL/<discovery_id>:addToDeviceMap=

Example

- CALL /ENDPOINTS/DISCOVERY/ALL/RX-A8D2360298B1:addToDeviceMap()
- mO /ENDPOINTS/DISCOVERY/ALL/RX-A8D2360298B1:addToDeviceMap=

7.5.9. Removing a Device from the Device Map

Command and Response

- CALL /ENDPOINTS/DEVICEMAP/<device_map_id>:removeFromDeviceMap()
- mO /ENDPOINTS/DEVICEMAP/<device_map_id>:removeFromDeviceMap=

Example

- CALL /ENDPOINTS/DEVICEMAP/X1:removeFromDeviceMap()
- mO /ENDPOINTS/DEVICEMAP/X1:removeFromDeviveMap=

7.5.10. Restarting the Device

Command and Response *#reboot #restart*

- CALL /ENDPOINTS/DEVICEMAP/<device_map_id>/SYS:reboot()
- mO /ENDPOINTS/DEVICEMAP/<device_map_id>/SYS:reboot

Example

- CALL /ENDPOINTS/DEVICEMAP/X1/SYS:reboot()
- mO /ENDPOINTS/DEVICEMAP/X1/SYS.reboot

7.5.11. Restoring the Factory Default Settings

Command and Response *#factorydefault*

- CALL /ENDPOINTS/DEVICEMAP/<device_map_id>/SYS:factoryDefaults()
- mO /ENDPOINTS/DEVICEMAP/<device_map_id>/SYS:factoryDefaults=

Example

- CALL /ENDPOINTS/DEVICEMAP/X1/SYS:factoryDefaults()
- mO /ENDPOINTS/DEVICEMAP/X1/SYS:factoryDefaults=

7.6. Endpoint Management Commands

7.6.1. Querying the Number of Discovered Devices

Command and Response

- GET /ENDPOINTS/DISCOVERY/ALL.DeviceCount
- pr /ENDPOINTS/DISCOVERY/ALL.DeviceCount=<no_of_devices>

Example

- GET /ENDPOINTS/DISCOVERY/ALL.DeviceCount
- pr /ENDPOINTS/DISCOVERY/ALL.DeviceCount=4

7.7. Video Crosspoint Settings

7.7.1. Switching the Video Stream to One Destination

> INFO: This command disconnects the previous connected source from the destination before connecting the desired source. *#switch #crosspoint*

Command and Response

- CALL /MEDIA/VIDEO/XP:switch(<in>:<out>)
- mO /MEDIA/VIDEO/XP:switch(<in>:<out>)

Example

- CALL /MEDIA/VIDEO/XP:switch(S201:D101)
- mO /MEDIA/VIDEO/XP:switch(S201:D101)

7.7.2. Switching a Video Sream to All Destinations

> INFO: This command disconnects all previous connections to the destinations before connecting the desired source. *#switch #crosspoint*

Command and Response

- CALL /MEDIA/VIDEO/XP:switchAll(<in>)
- mO /MEDIA/VIDEO/XP:switchAll

Example

- CALL /MEDIA/VIDEO/XP:switchAll(S201)
- mO /MEDIA/VIDEO/XP:switchAll

7.7.3. Disconnecting the Stream

Command and Response

- CALL•/MEDIA/VIDEO/XP:switch(0:<destination>)
- mO•/MEDIA/VIDEO/XP:switch

Example

- CALL /MEDIA/VIDEO/XP:switch(0:D101)
- mO /MEDIA/VIDEO/XP:switch

7.8. Analog Audio Port Settings

7.8.1. Setting the Volume in Percent

Command and Response *#analogaudio*

- SET /MEDIA/AUDIO/<audio_out>/VOLUME.VolumePercent=<volume>
- pw /MEDIA/AUDIO/<audio_out>/VOLUME.VolumePercent=<volume>

Example

- SET /MEDIA/AUDIO/O102/VOLUME.VolumePercent=50
- pw /MEDIA/AUDIO/O102/VOLUME.VolumePercent=50.00

7.8.2. Stepping the Volume in Percent

Command and Response

- CALL /MEDIA/AUDIO/<audio_out>/VOLUME:StepVolumePercent(<step_value>)
- mO /MEDIA/AUDIO/<audio_out>/VOLUME:StepVolumePercent

Example

- CALL /MEDIA/AUDIO/O102/VOLUME:StepVolumePercent(+15)
- mO /MEDIA/AUDIO/O102/VOLUME:StepVolumePercent

7.8.3. Muting/Unmuting the Analog Audio Output Port

Command and Response *#mute*

- SET /MEDIA/AUDIO/<audio_out>/VOLUME.Mute=<state>
- pw /MEDIA/AUDIO/<audio_out>/VOLUME.Mute=<state>

Example

- SET /MEDIA/AUDIO/O102/VOLUME.Mute=true
- pw /MEDIA/AUDIO/O102/VOLUME.Mute=true

7.9. Network Configuration

7.9.1. Querying the IP Address

Command and Response *#network*

- GET /MANAGEMENT/NETWORKINTERFACES/<netw_int>/IPV4/<IP_mode>.IpAddress
- pr /MANAGEMENT/NETWORKINTERFACES/<netw_int>/IPV4/<IP_mode>.IpAddress=<ip_address>

Parameters

Parameter	Value	Description
<netw_int>	**CONTROLLAN**	The control network interface of the MMU.
	GVNNETWORK	The network for controlling the endpoints.
<IP_mode>	**STATIC**	Static IP acquisition mode.
	DHCP	Dynamic IP acquisition mode.

Example

- GET /MANAGEMENT/NETWORKINTERFACES/GVNNETWORK/IPV4/DHCP.IpAddress
- pr /MANAGEMENT/NETWORKINTERFACES/GVNNETWORK/IPV4/DHCP.IpAddress=192.168.0.135/24

7.9.2. Enabling/Disabling Static IP Address Setting

INFO: Prior to setting a Static IP address, the Enabled property must be set to **true**.

Command and Response

- SET /MANAGEMENT/NETWORKINTERFACES/<netw_int>/IPV4/STATIC.Enabled=<status>
- pw /MANAGEMENT/NETWORKINTERFACES/<netw_int>/IPV4/STATIC.Enabled=<status>

Parameters

Parameter	Value	Description
<netw_int>	**CONTROLLAN**	The control network interface of the MMU.
	GVNNETWORK	The network for controlling the endpoints.
<status>	**true**	Static IP address can be set.
	false	Static IP address cannot be set.

Example

- SET /MANAGEMENT/NETWORKINTERFACES/GVNNETWORK/IPV4/STATIC.Enabled=true
- pw /MANAGEMENT/NETWORKINTERFACES/GVNNETWORK/IPV4/STATIC.Enabled=true

7.9.3. Setting a Static IP Address

INFO: Prior to setting a Static IP address, the Enabled property must be set to **true**.

INFO: Setting the subnet mask is also necessary when setting the IP address.

Command and Response *#ip*

- SET /MANAGEMENT/NETWORKINTERFACES/<netw_int>/IPV4/STATIC.ConfiguredIpAddress=<ip_add>/<mask>
- pw /MANAGEMENT/NETWORKINTERFACES/<netw_int>/IPV4/STATIC.ConfiguredIpAddress=<ip_add>/<mask>

Parameters

Parameter	Value	Description
<netw_int>	**CONTROLLAN**	The control network interface of the MMU.
	GVNNETWORK	The network for controlling the endpoints.
<mask>	**1-29**	The static subnet mask.

Example

- SET /MANAGEMENT/NETWORKINTERFACES/GVNNETWORK/IPV4/STATIC.ConfiguredIpAddress=192.168.0.115/24
- pw /MANAGEMENT/NETWORKINTERFACES/GVNNETWORK/IPV4/STATIC.ConfiguredIpAddress=192.168.0.115/24

7.9.4. Querying the Gateway Address

Command and Response

- GET /MANAGEMENT/NETWORKINTERFACES/<netw_int>/IPV4/<IP_mode>.GatewayAddress
- pr /MANAGEMENT/NETWORKINTERFACES/<netw_int>/IPV4/<IP_mode>.GatewayAddress=<gw_add>

Parameters

Parameter	Value	Description
<netw_int>	**CONTROLLAN**	The control network interface of the MMU.
	GVNNETWORK	The network for controlling the endpoints.
<IP_mode>	**STATIC**	Static IP acquisition mode.
	DHCP	Dynamic IP acquisition mode.

Example

- GET /MANAGEMENT/NETWORKINTERFACES/GVNNETWORK/IPV4/DHCP.GatewayAddress
- pr /MANAGEMENT/NETWORKINTERFACES/GVNNETWORK/IPV4/DHCP.GatewayAddress=192.168.0.1

7.9.5. Setting the Gateway Address

INFO: This command is only available in static mode.

Command and Response

- SET /MANAGEMENT/NETWORKINTERFACES/<netw_int>/IPV4/STATIC.ConfiguredGatewayAddress=<gw_add>
- pw /MANAGEMENT/NETWORKINTERFACES/<netw_int>/IPV4/STATIC.ConfiguredGatewayAddress=<gw_add>

Parameters

Parameter	Value	Description
<netw_int>	**CONTROLLAN**	The control network interface of the MMU.
	GVNNETWORK	The network for controlling the endpoints.

Example

- SET /MANAGEMENT/NETWORKINTERFACES/GVNNETWORK/IPV4/STATIC.ConfiguredGatewayAddress=192.168.0.5
- pw /MANAGEMENT/NETWORKINTERFACES/GVNNETWORK/IPV4/STATIC.ConfiguredGatewayAddress=192.168.0.5

7.9.6. Setting the Hostname

The hostname is a property that can be used instead of the IP address when connecting to the device. It is also suitable for finding it in the Device Discovery window of the LDC, see more details in the Add New Favorite Device section.

The hostname may contain uppercase (A-Z) and lowercase (a-z) letters of the English alphabet, as well as numbers (0-9) and the hyphen character (-).

Command and Response

- SET /MANAGEMENT/DEVICE.HostName=<hostname>
- pw /MANAGEMENT/DEVICE.HostName=<hostname>

Example

- SET /MANAGEMENT/DEVICE.HostName=MyGemini
- pw /MANAGEMENT/DEVICE.HostName=MyGemini

7.10. Serial Port Settings

7.10.1. Setting the BAUD Rate of the Port

Command and Response *#serial*

- SET /MEDIA/SERIAL/<port>.Baudrate=<baudrate>
- pw /MEDIA/SERIAL/<port>.Baudrate=<baudrate>

Example

- SET /MEDIA/SERIAL/P101.Baudrate=9600
- pw /MEDIA/SERIAL/P101.Baudrate=9600

7.10.2. Setting the Data Bits

Command and Response

- SET /MEDIA/SERIAL/<port>.DataBits=<data_bits>
- pw /MEDIA/SERIAL/<port>.DataBits=<data_bits>

Example

- SET /MEDIA/SERIAL/P101.DataBits=8
- pw /MEDIA/SERIAL/P101.DataBits=8

7.10.3. Setting the Stop Bits

Command and Response

- SET /MEDIA/SERIAL/<port>.StopBits=<stop_bits>
- pw /MEDIA/SERIAL/<port>.StopBits=<stop_bits>

Example

- SET /MEDIA/SERIAL/P101.StopBits=1
- pw /MEDIA/SERIAL/P101.StopBits=1

7.10.4. Setting the Parity

Command and Response

- SET /MEDIA/SERIAL/<port>.Parity=<parity>
- pw /MEDIA/SERIAL/<port>.Parity=<parity>

Example

- SET /MEDIA/SERIAL/P101.Parity=None
- pw /MEDIA/SERIAL/P101.Parity=None

7.10.5. Setting the RS-232 Port Operation Mode

> INFO: Changing this setting will automatically update the status of the **Transparent operation mode** and the **Serial over IP functionality** and vice versa.

This setting allows you to set the operation mode for the RS-232 port on the endpoint. *#new*

Command and Response

- SET /MEDIA/SERIAL/<port_id>.OperationMode=<operation_mode>
- pw /MEDIA/SERIAL/<port_id>.OperationMode=<operation_mode>

Parameters

Parameter	Value	Description
<port_id>	**P<map_id>01**	The ID of the serial port.
<operation_mode>	**Transparent**	Transparent RS-232 transmission between the endpoints that are crosspointed together.
	AvNetworkInjection	Provides serial over IP functionality inside the AV network from the endpoint IP address.
	None	The serial over IP feature is disabled for the port.
<map_id>		Device order number of the endpoint

Example

- SET /MEDIA/SERIAL/P201.OperationMode=AvNetworkInjection
- pw /MEDIA/SERIAL/P201.OperationMode=AvNetworkInjection

7.10.6. Enabling/Disabling the Transparent Operation Mode

> INFO: Changing this setting will automatically update the status of the **RS-232 port operation mode** and the **Serial over IP functionality** and vice versa.

Command and Response

- SET /MEDIA/SERIAL/<port_id>/TRANSPARENT.Enabled=<status>
- pw /MEDIA/SERIAL/<port_id>/TRANSPARENT.Enabled=<status>

Parameters

Parameter	Value	Description
<port_id>	**P<map_id>01**	The ID of the serial port.
<status>	**true**	Transparent operation mode is enabled.
	false	Transparent operation mode is disabled.
<map_id>		Device order number of the endpoint

Example

- SET /MEDIA/SERIAL/P201/TRANSPARENT.Enabled=true
- pw /MEDIA/SERIAL/P201/TRANSPARENT.Enabled=true

7.10.7. Enabling/Disabling the Serial Over IP Functionality

> INFO: Changing this setting will automatically update the status of the **RS-232 port operation mode** and the **Transparent operation mode** and vice versa.

For command injection you need to connect directly to TCP port 6752.

Command and Response

- SET /MEDIA/SERIAL/<port_id>/AVNETWORKINJECTION.Enabled=<status>
- pw /MEDIA/SERIAL/<port_id>/AVNETWORKINJECTION.Enabled=<status>

Parameters

Parameter	Value	Description
<port_id>	**P<map_id>01**	The ID of the serial port.
<status>	**true**	Transparent operation mode is enabled.
	false	Transparent operation mode is disabled.
<map_id>		Device order number of the endpoint

Example

- SET /MEDIA/SERIAL/P201/AVNETWORKINJECTION.Enabled=true
- pw /MEDIA/SERIAL/P201/AVNETWORKINJECTION.Enabled=true

7.11. EDID Management

Parameters *#edid*

Parameter	Value	Description
<edid_category>	E	The node for the Emulated EDIDs.
	D	The node for the Dynamic EDIDs.
	U	The node for the USer EDIDs.
	F	The node for the Factory EDIDs.
<edid_type>	<emulated>	The emulated EDID memory of the desired input port. Example: E1.
	<dynamic>	Dynamic EDID memory index. Example: D1
	<user>	User EDID memory index. Example: U1
	<factory>	Factory EDID memory index. Example: F1

7.11.1. Querying the Validity of a Dynamic EDID

Command and Response

- GET /EDID/<edid_category>/<edid_type>.Validity
- pr /EDID/<edid_category>/<edid_type>.Validity=<logical_value>

Parameters

The <logical_value> can be **true** or **false**.

Example

- GET /EDID/D/D1001.Validity
- pr /EDID/D/D1001.Validity=true

7.11.2. Querying the Preferred Resolution of an EDID

Command and Response

- GET /EDID/<edid_category>/<edid_type>.PreferredResolution
- pr /EDID/<edid_category>/<edid_type>.PreferredResolution=<resolution>

Example

- GET /EDID/F/F5.PreferredResolution
- pr /EDID/F/F5.PreferredResolution=1280x768p50.00Hz

7.11.3. Emulating an EDID to an Input Port

Command and Response

- CALL /EDID:switch(<source>:<destination>)
- mO /EDID:switch=

Parameters

Parameter	Parameter description	Value	Description
<source>	Source EDID memory place	**F1-F148**	Factory EDIDs
		U1-U100	User EDIDs
		D<map_id>01	Dynamic EDIDs
<destination>	The emulated EDID of the desired input port	**E<map_id>01**	Emulated EDIDs
<map_id>	Device order number of the endpoint		

Example

- CALL /EDID:switch(F49:E201)
- mO /EDID:switch=

7.11.4. Emulating an EDID to All Input Ports

Command and Response

- CALL /EDID:switchAll(<source>)
- mO /EDID:switchAll

Parameters

Parameter	Parameter description	Value	Description
<source>	Source EDID memory place	**F1-F148**	Factory EDIDs
		U1-U100	User EDIDs
		D<map_id>01	Dynamic EDIDs
<map_id>	Device order number of the endpoint		

Example

- CALL /EDID:switchAll(F47)
- mO /EDID:switchAll

7.11.5. Copying an EDID to User Memory

Command and Response *#new*

- CALL /EDID:copy(<source>:<destination>)
- mO /EDID:copy

Parameters

Parameter	Parameter description	Value	Description
<source>	Source EDID memory place	**F1-F148**	Factory EDIDs
		U1-U100	User EDIDs
		D<map_id>01	Dynamic EDIDs
<destination>	The desired user EDID spot	**U1-U100**	User EDIDs
<map_id>	Device order number of the endpoint		

Example

- CALL /EDID:copy(F1:U2)
- mO /EDID:copy

7.11.6. Deleting an EDID from User Memory

Command and Response

- CALL /EDID:delete(<user_edid>)
- mO /EDID:delete

Parameters

Parameter	Parameter description	Value	Description
<user_edid>	The emulated EDID memory of the desired input port.	**U1-U100**	User EDIDs

Example

- CALL /EDID:delete(U2)
- mO /EDID:delete

7.11.7. Resetting the Emulated EDIDs

Command and Response

- CALL /EDID:reset()
- mO /EDID:reset

Example

- CALL /EDID:reset()
- mO /EDID:reset

Calling this method switches all emulated EDIDs to a factory default one.See the table in the Factory EDID List section.

7.12. LW3 Commands - Quick Summary

System Commands - MMU

Querying the Product Name
- GET /.ProductName

Setting the Device Label
- SET /MANAGEMENT/DEVICE.DeviceLabel

Querying the Serial Number
- GET /.SerialNumber

Querying the Package Version
- GET /.PackageVersion

Querying the Current Date and Time of the System
- GET /MANAGEMENT/DATETIME.CurrentTime

Setting the Date and Time Manually
- CALL•/MANAGEMENT/DATETIME:setTime=<date_time>

Restarting the Device
- CALL /SYS:reboot()

Restoring the Factory Default Settings
- CALL /SYS:factoryDefaults()

System Commands - Endpoints

Querying the Product Name
- GET /ENDPOINTS/DEVICEMAP/<endpoint>.ProductName

Setting the Device Label
- SET /ENDPOINTS/DEVICEMAP/<endpoint>/MANAGEMENT.DeviceLabel=<device_label>

Querying the Serial Number
- GET /ENDPOINTS/DEVICEMAP/<endpoint>.SerialNumber

Querying the MAC Address
- GET /ENDPOINTS/DEVICEMAP/<endpoint>.MacAddress

Querying the Package Version
- GET /ENDPOINTS/DEVICEMAP/<endpoint>.PackageVersion

Querying the Discovery ID
- GET /ENDPOINTS/DEVICEMAP/<endpoint>.DiscoveryID

Querying the Device Map ID
- GET /ENDPOINTS/DEVICEMAP/<endpoint>.DeviceMapId

Adding a Device to the Device Map
- CALL /ENDPOINTS/DISCOVERY/<endpoint>:addToDeviceMap()

Removing a Device from the Device Map
- CALL /ENDPOINTS/DEVICEMAP/<endpoint>:removeFromDeviceMap()

Restarting the Device
- CALL /ENDPOINTS/DEVICEMAP/<endpoint>/SYS:reboot()

Restoring the Factory Default Settings
- CALL /ENDPOINTS/DEVICEMAP/<endpoint>/SYS:factoryDefaults()

Endpoint Management Commands

Querying the Number of Discovered Devices
- GET /ENDPOINTS/DISCOVERY/ALL.DeviceCount

Video Crosspoint Settings

Switching the Video Stream to One Destination
- CALL /MEDIA/VIDEO/XP:switch(<in>:<out>)

Switching a Video Sream to All Destinations
- CALL /MEDIA/VIDEO/XP:switchAll(<in>)

Disconnecting the Stream
- CALL•/MEDIA/VIDEO/XP:switch(0:<destination>)

Analog Audio Port Settings

Setting the Volume in Percent
- SET /MEDIA/AUDIO/<audio_out>/VOLUME.VolumePercent=<volume>

Stepping the Volume in Percent
- CALL /MEDIA/AUDIO/<audio_out>/VOLUME:StepVolumePercent(<step_value>)

Muting/Unmuting the Analog Audio Output Port
- SET /MEDIA/AUDIO/<audio_out>/VOLUME.Mute=<state>

Network Configuration

Querying the IP Address
- GET /MANAGEMENT/NETWORKINTERFACES/<netw_int>/IPV4/<IP_mode>.IpAddress

Enabling/Disabling Static IP Address Setting
- SET /MANAGEMENT/NETWORKINTERFACES/<netw_int>/IPV4/STATIC.Enabled=<status>

Setting a Static IP Address

- SET /MANAGEMENT/NETWORKINTERFACES/<netw_int>/IPV4/STATIC.ConfiguredIpAddress=<ip_add>/<mask>

Querying the Gateway Address

- GET /MANAGEMENT/NETWORKINTERFACES/<netw_int>/IPV4/<IP_mode>.GatewayAddress

Setting the Gateway Address

- SET /MANAGEMENT/NETWORKINTERFACES/<netw_int>/IPV4/STATIC.ConfiguredGatewayAddress=<gw_add>

Setting the Hostname

- SET /MANAGEMENT/DEVICE.HostName=<hostname>

Serial Port Settings

Setting the BAUD Rate of the Port

- SET /MANAGEMENT/MEDIA/SERIAL/<port>.Baudrate=<baudrate>

Setting the Data Bits

- SET /MANAGEMENT/MEDIA/SERIAL/<port>.DataBits=<data_bits>

Setting the Stop Bits

- SET /MANAGEMENT/MEDIA/SERIAL/<port>.StopBits=<stop_bits>

Setting the Parity

- SET /MANAGEMENT/MEDIA/SERIAL/<port>.Parity=<parity>

Setting the RS-232 Port Operation Mode

- SET /MEDIA/SERIAL/<port_id>.OperationMode=<operation_mode>

Enbling/Disabling the Transparent Command Injection Mode

- SET /MEDIA/SERIAL/<port_id>/TRANSPARENT.Enabled=<status>

Enabling/Disabling the Serial Over IP Functionality

- SET /MEDIA/SERIAL/<port_id>/AVNETWORKINJECTION.Enabled=<status>

EDID Management

Querying the Validity of a Dynamic EDID

- GET /EDID/<edid_category>/<edid_type>.Validity

Querying the Preferred Resolution of an EDID

- GET /EDID/<edid_category>/<edid_type>.PreferredResolution

Emulating an EDID to an Input Port

- CALL /EDID:switch(<source>:<destination>)

Emulating an EDID to All Input Ports

- CALL /EDID:switchAll(<source>)

Copying an EDID to User Memory

- CALL /EDID:copy(<source>:<destination>)

Deleting an EDID from User Memory

- CALL /EDID:delete(<user_edid>)

Resetting the Emulated EDIDs

- CALL /EDID:reset()

8

Firmware Update

This chapter is meant to help customers perform firmware updates on our products by giving a few tips on how to start and by explaining the features of the Lightware Device Updater v2 (LDU2) software. The latest software and firmware pack can be downloaded from www.lightware.com.

ATTENTION! While the firmware is being updated, the normal operation mode is suspended, as the transmitter is switched to bootload mode. Signal processing is not performed. Do not interrupt the firmware update. If any problem occurs, reboot the device and restart the process.

8.1. Introduction

Lightware Device Updater v2 (LDU2) software is the second generation of the LFP-based (Lightware Firmware Package) firmware update process.

LDU2

8.2. Preparation

Most Lightware devices can be controlled over several interfaces (e.g. Ethernet, USB, RS-232). But the firmware can be updated usually over one dedicated interface, which is the Ethernet in most cases.

If you want to update the firmware of one or more devices, you need the following:

- **LFP2 file**,
- **LDU2 software** installed on your PC or Mac.

Both can be downloaded from www.lightware.com.

Optionally, you can download the **release notes** file in HTML format.

8.2.1. About the Firmware Package (LFP2 File)

All the necessary tools and binary files are packed into the LFP2 package file. You only need this file to do the update on your device.

- This allows the use of the same LFP2 package for different devices.
- The package contains all the necessary components, binary, and other files.
- The release notes is included in the LFP2 file, which is displayed in the window where you select the firmware package file in LDU2.

INFO: The size of the LFP2 file is more than 300 MB due to the components of the package. That is not a fault: GVN runs embedded Linux inside that is necessary for the complex functions and features of the device.

8.2.2. LDU2 Installation

ATTENTION! Minimum system requirement: 2 GB RAM. The minimum display resolution is 1600x900.

INFO: The Windows and the Mac applications have the same look and functionality.

Download the software from www.lightware.com.

Installation in case of Windows OS

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

Installation Modes

Normal install	Snapshot install
Available for Windows, MacOS and Linux	Available for Windows
The installer can update only this instance	Cannot be updated
One updateable instance may exist for all users	Many different versions can be installed for all users

ATTENTION! Using the default Normal install is highly recommended.

INFO: If you have a previously installed version, you will be prompted to remove the old version before installing the new one.

Installation in case of macOS

Mount the DMG file by double clicking on it, and drag the LDU2 icon over the Applications icon to copy the program into the Applications folder. If you want to copy LDU2 into another location, just drag the icon over the desired folder.

ATTENTION! Please check the firewall settings on the macOS device. LDC needs to be added to the exceptions of the blocked software for the proper operation.

INFO: This type of installer is equal to the **Normal install** of Windows.

Installation in case of Linux

Step 1. Download the **archive file** (tar.gz) from www.lightware.com and unpack it to a temp folder.

Step 2. Run the **install_ldu2.sh** file in the temp folder. The script will install LDU2 into the following folder: HOME/.local/share/lightware/ldu2.

Step 3. The folder above will contain this file: **LightwareDeviceUpdaterV2.sh,** which can be used to start LDU2.

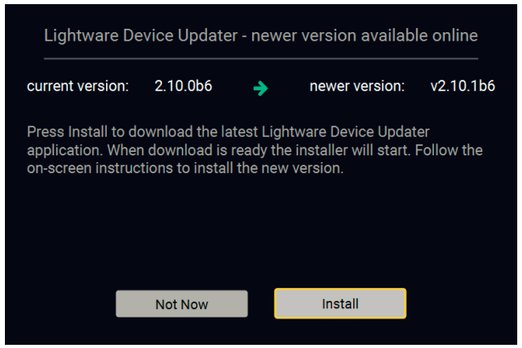
8.3. Running the Software

You have two options:

- **Starting the LDU2** by double-clicking on the shortcut/program file, or
- Double-clicking on an **LFP2 file**.

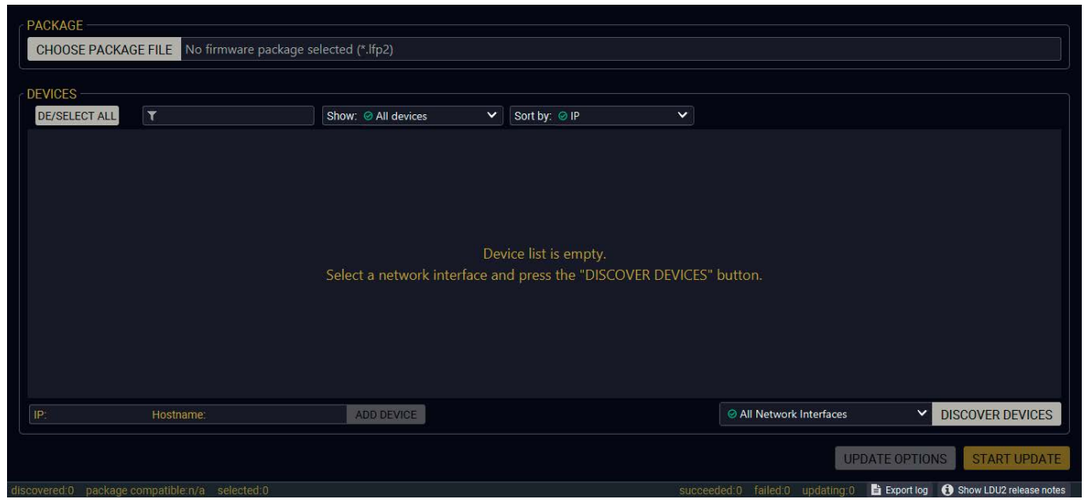
LDU2 Auto-Update

At startup, the software checks if a newer version is available on the web.



Main Screen

When the software is started by the shortcut, the device discovery screen appears. Press the **Discover devices** button to start finding the Lightware devices:



Devices may also be added manually by typing the IP address in the box near the bottom of the screen. From LDU2 version v2.16.1, manual addition of devices can also be done using the hostname.

ATTENTION! If the device cannot be added by the hostname, please use the IP address.

If you start the software by double-clicking on the LFP2 file, the firmware will be loaded. Press the **Search for devices** button; all the devices will be listed that are compatible with the selected firmware pack.

INFO: If you press the **Choose package file** button, the release notes of the LFP2 file will be displayed in the right panel; see the Step 1. Select the Firmware Package. section.

Device List

When the discovery has completed, the devices available on the network are listed in the application.

Legend of the Icons

	IP address editor	The IP address of the device can be changed in the pop-up window.
	Identify me	Clicking on the icon makes the front panel LEDs blink for 10 seconds, which helps identify the device physically.
	Authentication required	The password-protection is enabled. You have to enter the password to perform the firmware update in the pop-up window at the beginning of the update.
	Favorite device	The device has been marked, thus the IP address is stored. When a device is connected with that IP address, the star will be highlighted in that line.
	Further information available	Device is unreachable. Change the IP address using the front panel LCD menu or the IP address editor of the LDU2.

8.4. Updating Via GUI

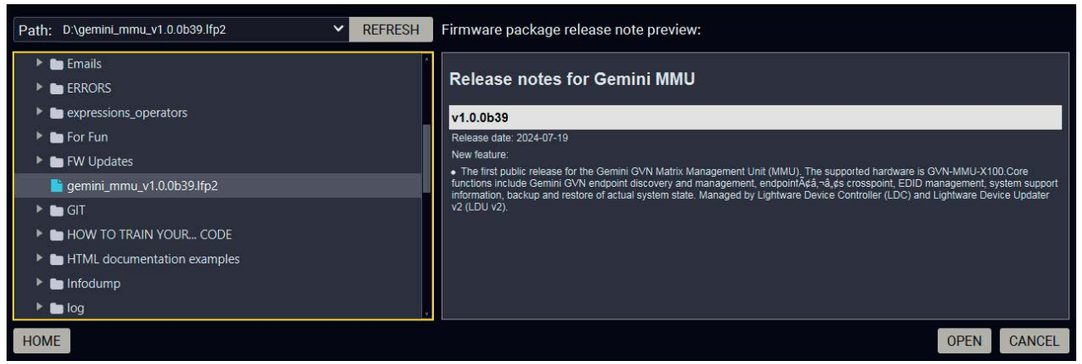
To update the desired device(s) via the Graphical User Interface, follow these steps.

ATTENTION! The computer that runs LDU2 and the target device (that will be updated) must be in the same subnet. The update cannot be performed from behind a firewall or gateway.

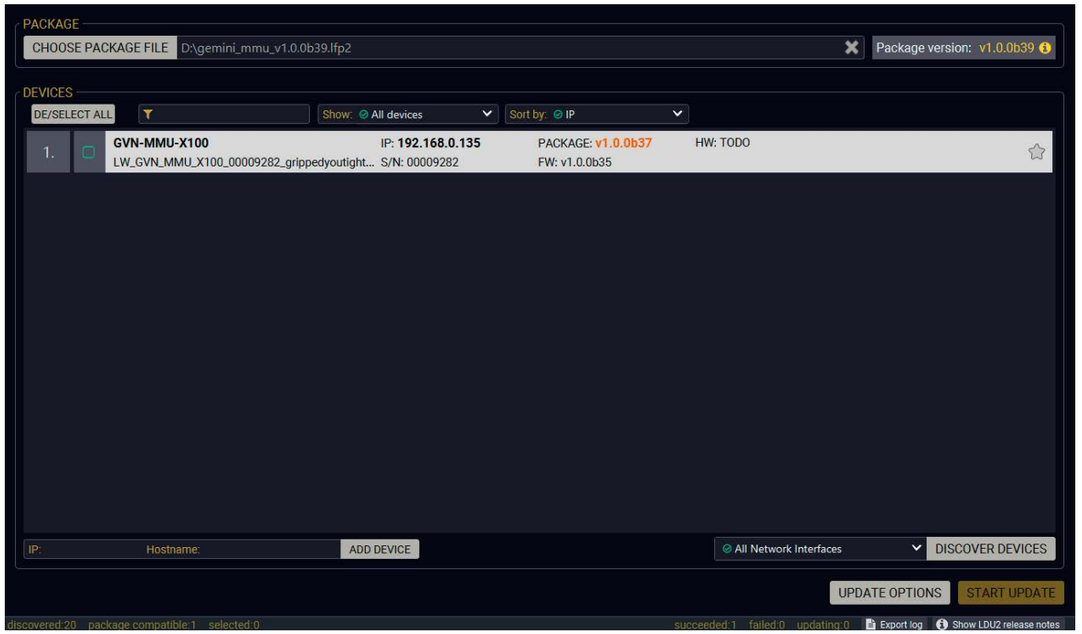
ATTENTION! While the firmware is being updated, the normal operation mode is suspended, as the device is switched to bootload mode. Signal processing is not performed. Do not interrupt the firmware update. If any problem occurs, reboot the unit and restart the process.

Step 1. Select the Firmware Package.

Click on the **Choose package file** button and navigate to the location where the LFP2 file was saved. When you click on the name of the package, the preview of the release notes is displayed in the right panel.



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



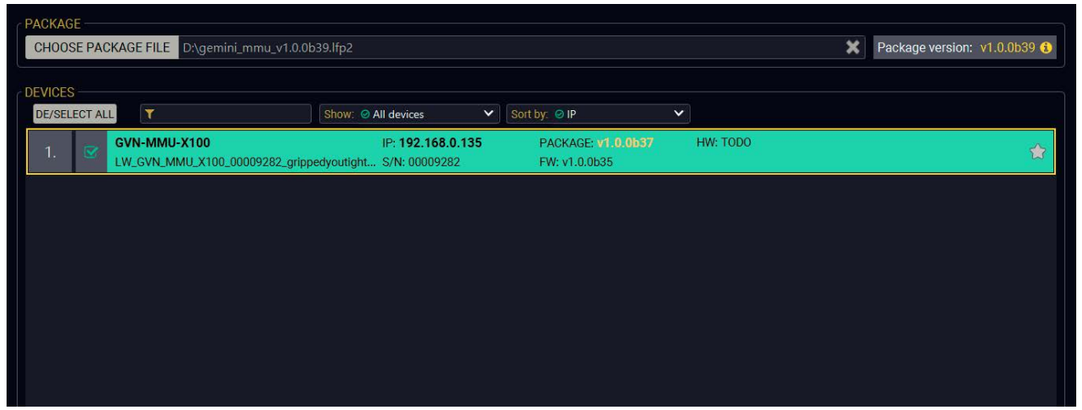
If you start the update by double-clicking on the LFP file, the screen above will be loaded right away.

The Meaning of the Symbols

Show details	The log about the updating process of the device can be displayed in a new window.
Service mode	The device is in bootload mode. Backup and restore cannot be performed in this case.

Step 2. Select the desired devices for updating

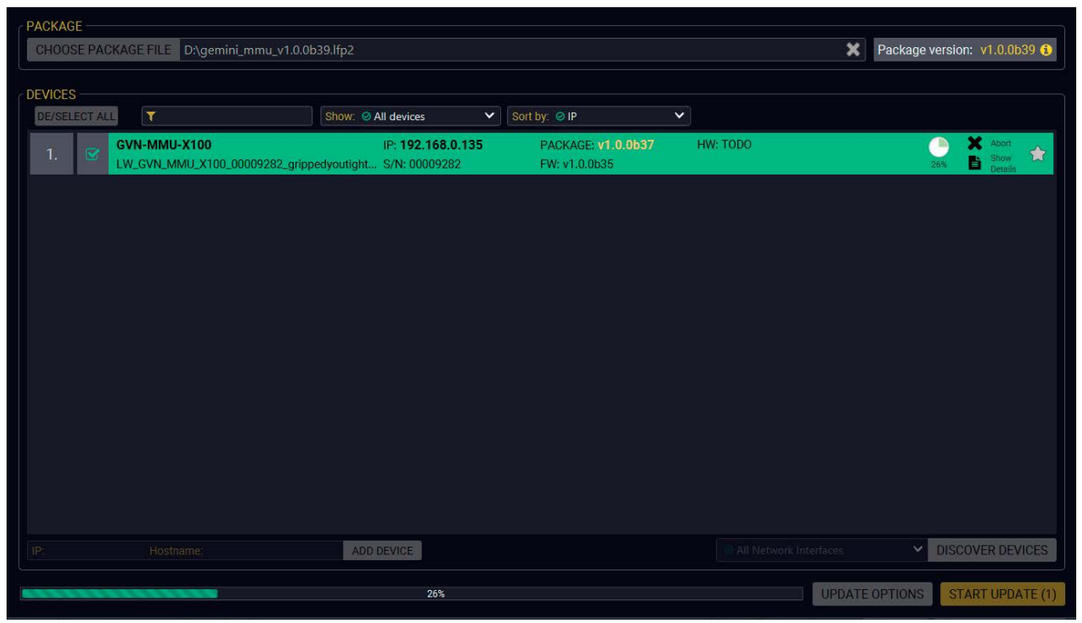
Select the devices for updating; the selected line will be highlighted in green.



Step 3. Start the update and wait until it is finished.

Click on the **Start Update** button to start the procedure. The status is shown in percent in the right side of the device line and the overall process in the bottom progress bar. The device might reboot during the firmware update procedure.

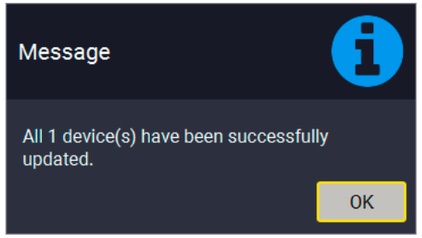
START UPDATE (1)



When the progress bar reaches 100% (**Done** is displayed at all devices), the update of all devices are finished successfully and a message appears; you can close the software.

Step 4. Wait until the unit reboots with the new firmware.

Once the firmware update procedure is completed, the device is rebooted with the new firmware. Shutting down and restarting the device is recommended.



ATTENTION! When updating the endpoints from firmware version v1.x to 1.4.0, or downgrading from v1.4 to v1.x, the endpoints will require one additional reboot to work properly. *#new*

ATTENTION! It is highly recommended to install the firmware released at the same time on the MMU and the endpoints to ensure compatibility.

9

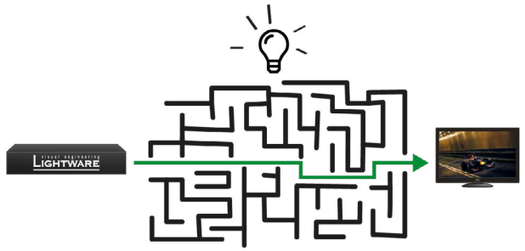
Troubleshooting

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

First, check the front panel LEDs and take the necessary steps according to their states. For more information about status LEDs, refer to the Status LEDs section.

- How to Speed Up the Troubleshooting Process

9.1. 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 find 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:

- **Support package** from the Device Controller software (containing information such as serial numbers, FW versions, EDIDs, error log, backup file - these do not need to be collected separately).
- 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 a file and send it 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).
- In the case of an Event Manager issue the event file and/or backup file from the Device Controller software.

The more of the information above you can give us, the better. Please send this information to the Lightware Support Team (support@lightware.com) to speed up the troubleshooting process.

10

Technologies

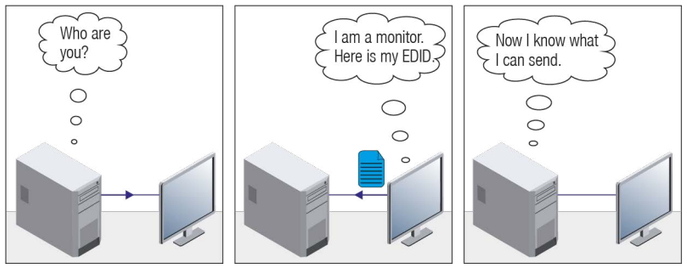
The following sections contain descriptions and useful technical information on how the devices work in the background. The content is based on experiences and cases we met in the practice. These sections help understand features and technical standards like the following:

10.1. EDID Management

10.1.1. Understanding the EDID

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

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



EDID Communication

Most DVI computer displays have a 128-byte long EDID structure. However, Digital Televisions and HDMI capable displays may have another 128 bytes, which is called E-EDID and defined is 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 the EDID has been changed. You need to restart your source to make it read out the EDID again.

10.1.2. Advanced EDID Management

Each DVI sink (e.g. monitors, projectors, plasma displays, etc...) must support the EDID data structure. Source BIOS and operating systems are likely to query the sink using DDC2B protocol to determine what pixel formats and interface are supported. The 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 is 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 that 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. The EDID can be changed even if a source is connected to the input and powered ON.

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

10.2. HDCP Management

Lightware Visual Engineering is a legal HDCP adopter. Several functions have been developed that help to solve HDCP related problems. Complex AV systems often have both HDCP and non-HDCP components. The endpoints allow transmitting HDCP encrypted and unencrypted signals. The devices will be still HDCP compliant, as they will never output an encrypted signal to a non-HDCP compliant display device. If an encrypted signal is switched to a non-compliant output, a red screen alert or muted screen will appear.

10.2.1. Protected and Unprotected Content

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

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

10.2.2. Disable Unnecessary Encryption

HDCP Compliant Sink

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

Not HDCP-compliant Sink 1.

Not-HDCP compliant sink is connected to the matrix. Some sources (e.g. computers) always send HDCP encrypted signals if the receiver device reports HDCP compliancy, however, HDCP encryption is not required all the time (e.g. computer desktop image). If HDCP is enabled in the matrix, the image will not be displayed on the sink.

Setting the HDCP parameter to Auto on the output port and disabling HDCP on the input port, the transmitted signal will not be encrypted if the content is not protected. Thus, non-HDCP compliant sinks will display non-encrypted signal.

Not HDCP-compliant Sink 2.

The layout is the same as in the previous case: non-HDCP compliant display device is connected to the matrix, but the source would send protected content with encryption. If HDCP is enabled on the input port of the matrix, the source will send encrypted signal.

The sink is not HDCP compliant, thus it will not display the video signal (but blank/red/muted/etc. screen). If HDCP is disabled on the input port of the matrix, the source will not send the signal. The solution is to replace the display device with an HDCP-capable one.

10.2.3. HDCP 2.2

HDCP 2.2 is the latest evolution of copy protection. It is designed to create a secure connection between a source and a display. The 2.x version of HDCP is not a continuation of HDCPv1, and is rather a completely different link protection. One of the main differences is the number of the allowed devices within a closed AV system: HDCP 2.2 allows 32 devices (HDCP 1.4 allows 128 devices). Further limit is that up to four level is allowed, which means the protected signal can be transmitted over at most four repeater/matrix/switcher device. HDCP content protection is activated only if an active video stream is transmitted from the source to the display. The encryption is not activated without a video signal.

HDCP 2.2 standard allows to apply a previous version of HDCP (e.g. HDCP 1.4) between the source and the display if the source device allows it. According to the standard, if the image content is protected with HDCP, the highest supported content protection level has to be applied. However, if the highest level of protection is not justified by the source content, the level may be decreased to avoid compatibility problems; this case is determined by the source.

HDCP 2.2 Source and HDCP 1.4 Sink

In this case the signal of an HDCP 2.2 compliant source is switched to an HDCP 1.4 compliant sink device. The signal is encrypted with HDCP 2.2 on the input and encrypted with HDCP 1.4 on the output of the Lightware device. A lower level of encryption may be applied only if the source device/content allows it - according to the HDCP standard. In this case the HDCP setting on the input port has to be set to HDCP 1.4 and Depends on input on the output port.

HDCP 1.4 Source and HDCP 2.2 Sink

The example below is the reversal of the previous case. An HDCP 1.4 compliant source sends a signal with HDCP 1.4 encryption. The signal is switched to an HDCP 2.2 compliant sink device. In this case the outgoing signal has to be encrypted with the highest supported encryption level towards the sink, as the Lightware device and the sink are both HDCP 2.2 compliant. The HDCP 2.2 standard does not allow keeping the original HDCP 1.4 encryption level on the output.

What Kind of Signal Will be on the Output of the Lightware Device?

See the table below summarizing the possible cases:

Incoming Signal	HDCP 1.4 Compatible Sink on the Output	HDCP 2.2. Compatible Sink on the Output
HDCP 1.4	HDCP 1.4	HDCP 2.2
HDCP 2.2 (convertable)*	HDCP 1.4	HDCP 2.2
HDCP 2.2 (not convertable)**	White noise	HDCP 2.2

* Stream type 0: the video stream allows to convert the signal to apply a lower level of encryption.

** Stream type 1: the video stream does not allow to convert the signal.

11

Appendix

Tables, drawings, guides, technical details and hashtag keyword list as follows:

11.1. Specifications

General

Compliance	CE, UKCA
EMC (emission)	EN 55032:2015+A1:2020
EMC (immunity)	EN 55035:2017+A11:2020
RoHS	EN 63000:2018
Electrical safety	EN 62368-1:2020
Laser safety	EN 60825-1:2014+A11:2021
Warranty	3 years
Operating temperature	0° to +45˚C (+32° to +113˚F)
Operating humidity	10% to 90%, non-condensing
Cooling	Passive

Power

Power Adaptor

Supported power source	100-240 V AC; 50/60 Hz
Supplied power	12V DC, 2A DC
AC power plug	Interchangable (EU, UK, JP/US, AUS/NZ)
DC power plug	Locking DC connector (2.1/5.5 mm pin)
Battery cell type	BR1632A
Power over Ethernet (PoE)*	48V DC via RJ45 connector (IEEE802.3af)
Power over Ethernet + (PoE+)**	48V DC via RJ45 connector (IEEE802.3at)

* In case of GVN-MMU-X100 and GVN-HDMI-TX210AP(-DNT) models.

** In case of GVN-HDMI-RX110AP(-DNT) models.

GVN-HDMI-TX210AP

Power consumption (max, measured)	11 W
Heat dissipation (max)	38 BTU/h

GVN-HDMI-RX110AP

Power consumption (max, measured)	11 W*
Heat dissipation (max)	38 BTU/h

* without USB devices

GVN-HDMI-TX210AP-DNT

Power consumption (max, measured)	14 W*
Heat dissipation (max)	48 BTU/h

* without USB devices

GVN-HDMI-RX110AP-DNT

Power consumption (max, measured)	12 W*
Heat dissipation (max)	41 BTU/h

* without USB devices

GVN-MMU-X100

Power consumption (max, measured)	4 W
Heat dissipation (max)	14 BTU/h

Enclosure

Enclosure Material	1 mm steel
Dimensions in mm	221W x 120D x 26H
Dimensions in inch	8.7W x 4.14D x 1.02H
Weight (GVN-MMU-X100)	698 g (1.54 lb)
Weight (GVN-HDMI-TX210AP, -DNT)	692 g (1.53 lb)
Weight (GVN-HDMI-RX110AP, -DNT)	694 g (1.53 lb)

Video Input (GVN-HDMI-TX210AP, GVN-HDMI-TX210AP-DNT)

HDMI Input Port

Connector type	19-pole HDMI type A receptacle
AV standard	DVI 1.0, HDMI 1.4, HDMI 2.0
HDCP Compliance	v2.2
Color space	RGB, YCbCr
Supported resolutions at 8 bits/color	up to 3840x2160@60Hz (4:4:4) or 3840x2160@60Hz (4:2:0), 1920x1080@60Hz (4:4:4) or 4096x2160@60Hz (4:2:0) up to 12 bits/color
Audio formats	Embedded LPCM, Dolby Digital 5.1 ch, Dolby Digital Plus, Dolby Digital Pro-Logic, Dolby TrueHD, DTS:X, Dolby Atmos, DTS 5.1 ch, DTS 96/24, DTS-ES Discrete, DTS-ES Matrix, DTS-HD High Resolution Audio, DTS-HD Master Audio

AV Input Port (GVN-HDMI-RX110AP, GVN-HDMI-RX110AP-DNT)

Connector type	RJ45 connector
Power Over Ethernet	yes (IEE 802.3at)
HDCP Compliance	v2.2
Color space	RGB, YCbCr
Supported resolutions at 8 bits/color	up to 4096x2160@60Hz (4:4:4) or 4096x2160@60Hz (4:2:0), up to 3840x2160@60Hz (4:4:4) or 3840x2160@60Hz (4:2:0); 1920x1080@60Hz (4:4:4) or 4096x2160@60Hz (4:2:0) up to 12 bits/color
Audio formats	8 channel PCM, Dolby TrueHD; DTS-HD Master Audio7.1 2-channel stereo (Dante)*

* Only in GVN-HDMI-RX110AP-DNT.

SFP Module Slot (GVN-HDMI-RX110AP, GVN-HDMI-RX110AP-DNT)

Number of ports	1
Supported data rate	1 Gbps
Accepted interfaces	SFP optical transceiver modules

Video Output (GVN-HDMI-TX210AP, GVN-HDMI-TX210AP-DNT)

HDMI Output Port

Connector type	19-pole HDMI type A receptacle
AV standard	DVI 1.0, HDMI 1.4, HDMI 2.0
HDCP Compliance	v2.2
Color space	RGB, YCbCr
Supported resolutions at 8 bits/color	up to 3840x2160@60Hz (4:4:4) or 3840x2160@60Hz (4:2:0), 1920x1080@60Hz (4:4:4) or 4096x2160@60Hz (4:2:0) up to 12 bits/color
Audio formats	Embedded LPCM, Dolby Digital 5.1 ch, Dolby Digital Plus, Dolby Digital Pro-Logic, Dolby TrueHD, DTS:X, Dolby Atmos, DTS 5.1 ch, DTS 96/24, DTS-ES Discrete, DTS-ES Matrix, DTS-HD High Resolution Audio, DTS-HD Master Audio

Video Output (GVN-MMU-X100)

HDMI Output Port

Connector type	19-pole HDMI type A receptacle
AV standard	DVI 1.0, HDMI 1.4, HDMI 2.0
HDCP Compliance	v2.2
Color space	RGB, YCbCr
Supported resolutions at 8 bits/color	up to 3840x2160@60Hz (4:4:4) or 3840x2160@60Hz (4:2:0), 1920x1080@60Hz (4:4:4) or 4096x2160@60Hz (4:2:0) up to 12 bits/color
Audio formats	Embedded LPCM, Dolby Digital 5.1 ch, Dolby Digital Plus, Dolby Digital Pro-Logic, Dolby TrueHD, DTS:X, Dolby Atmos, DTS 5.1 ch, DTS 96/24, DTS-ES Discrete, DTS-ES Matrix, DTS-HD High Resolution Audio, DTS-HD Master Audio

AV Output Port (GVN-HDMI-TX210AP, GVN-HDMI-TX210AP-DNT)

Connector type	RJ45 connector
Power Over Ethernet	yes (IEE 802.3af)
HDCP Compliance	v2.2
Color space	RGB, YCbCr
Supported resolutions at 8 bits/color	up to 4096x2160@60Hz (4:4:4) or 4096x2160@60Hz (4:2:0), up to 3840x2160@60Hz (4:4:4) or 3840x2160@60Hz (4:2:0); 1920x1080@60Hz (4:4:4) or 4096x2160@60Hz (4:2:0) up to 12 bits/color
Audio formats	8 channel PCM, Dolby TrueHD; DTS-HD Master Audio7.1 2-channel stereo (Dante)*

* Only in GVN-HDMI-TX210AP-DNT.

SFP Module Slot (GVN-HDMI-TX210AP, GVN-HDMI-TX210AP-DNT)

Number of ports	1
Supported data rate	1 Gbps
Accepted interfaces	SFP optical transceiver modules

Video Output (GVN-HDMI-RX110AP, GVN-HDMI-RX110AP-DNT)

HDMI Output Port

Connector type	19-pole HDMI type A receptacle
AV standard	DVI 1.0, HDMI 1.4, HDMI 2.0
HDCP Compliance	v2.2
Color space	RGB, YCbCr
Supported resolutions at 8 bits/color	up to 3840x2160@60Hz (4:4:4) or 3840x2160@60Hz (4:2:0), 1920x1080@60Hz (4:4:4) or 4096x2160@60Hz (4:2:0) up to 12 bits/color
Audio formats	Embedded LPCM, Dolby Digital 5.1 ch, Dolby Digital Plus, Dolby Digital Pro-Logic, Dolby TrueHD, DTS:X, Dolby Atmos, DTS 5.1 ch, DTS 96/24, DTS-ES Discrete, DTS-ES Matrix, DTS-HD High Resolution Audio, DTS-HD Master Audio

Control Ports

Ethernet Ports (GVN-MMU-X100)

Connector type	RJ45 female connector
Ethernet data rate	1 Gigabit, full duplex with autodetect
Power over Ethernet (PoE)	via GVN Network RJ45 connector (IEEE802.3af)

USB Ports

Connector type	A-type receptacle
USB compliance	USB 2.0 (5V DC)
Connector type	B-type receptacle
USB compliance	USB 2.0 (5V DC)

RS-232 Ports

Connector type	3-pole Phoenix connector
Baud rates	between 9600 and 115200 baud
Data bits	8
Parity	None / Odd / Even
Stop bits	1 / 2

Analog Audio Output

Connector type	5-pole Phoenix connector
Audio formats	2-ch LPCM
Sampling frequency	48 kHz

INFO: Specifications are subject to change without notice.

11.2. Factory EDID List

Mem	Resolution	Type	EDID features
F1	640 x 480p @ 60.00 Hz	D	DVI
F2	848 x 480p @ 60.00 Hz	D	DVI
F3	800 x 600p @ 60.32 Hz	D	DVI
F4	1024 x 768p @ 60.00 Hz	D	DVI
F5	1280 x 768p @ 50.00 Hz	D	DVI
F6	1280 x 768p @ 59.94 Hz	D	DVI
F7	1280 x 768p @ 75.00 Hz	D	DVI
F8	1360 x 768p @ 60.02 Hz	D	DVI
F9	1280 x 1024p @ 50.00 Hz	D	DVI
F10	1280 x 1024p @ 60.02 Hz	D	DVI
F11	1280 x 1024p @ 75.02 Hz	D	DVI
F12	1400 x 1050p @ 50.00 Hz	D	DVI
F13	1400 x 1050p @ 60.00 Hz	D	DVI
F14	1400 x 1050p @ 75.00 Hz	D	DVI
F15	1680 x 1050p @ 60.00 Hz	D	DVI
F16	1920 x 1080p @ 50.00 Hz	D	DVI
F17	1920 x 1080p @ 60.00 Hz	D	DVI
F18	2048 x 1080p @ 50.00 Hz	D	DVI
F19	2048 x 1080p @ 60.00 Hz	D	DVI
F20	1600 x 1200p @ 50.00 Hz	D	DVI
F21	1600 x 1200p @ 60.00 Hz	D	DVI
F22	1920 x 1200p @ 50.00 Hz	D	DVI
F23	1920 x 1200p @ 59.56 Hz	D	DVI
F24	2048 x 1200p @ 59.96 Hz	D	DVI
F29	1920 x 1080p @ 60.00 Hz	U	DVI
F32	640 x 480p @ 59.95 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F33	720 x 480p @ 59.94 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F34	720 x 576p @ 50.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F35	1280 x 720p @ 50.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F36	1280 x 720p @ 60.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F41	1920 x 1080p @ 24.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F42	1920 x 1080p @ 25.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F43	1920 x 1080p @ 30.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F44	1920 x 1080p @ 50.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F45	1920 x 1080p @ 59.94 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F46	1920 x 1080p @ 60.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F47	1920 x 1080p @ 60.00 Hz	U	HDMI; YUV444; YUV422; 2CH_AUD
F48	1920 x 1080p @ 60.00 Hz	U	HDMI; YUV444; YUV422; 8CH_AUD
F49	1920 x 1080p @ 60.00 Hz	U	HDMI; YUV444; YUV422; DC30; DC36; YUVDC; 8CH_AUD
F90	1920 x 2160p @ 59.99 Hz	D	DVI
F91	1024 x 2400p @ 60.01 Hz	D	DVI
F92	1920 x 2400p @ 59.97 Hz	D	DVI
F93	2048 x 2400p @ 59.98 Hz	D	DVI
F94	2048 x 1536p @ 60.00 Hz	D	DVI
F95	2048 x 1536p @ 75.00 Hz	D	DVI
F96	2560 x 1600p @ 59.86 Hz	D	DVI
F97	3840 x 2400p @ 24.00 Hz	D	DVI
F98	1280 x 720p @ 60.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD; 3D
F99	1920 x 1080p @ 60.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD; 3D
F100	1024 x 768p @ 60.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F101	1280 x 1024p @ 50.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F102	1280 x 1024p @ 60.02 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F103	1280 x 1024p @ 75.02 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F104	1600 x 1200p @ 50.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F105	1600 x 1200p @ 60.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F106	1920 x 1200p @ 59.56 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F107	2560 x 1440p @ 59.95 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F108	2560 x 1600p @ 59.86 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F109	3840 x 2400p @ 24.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F110	3840 x 2160p @ 24.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD

Mem	Resolution	Type	EDID features
F111	3840 x 2160p @ 25.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F112	3840 x 2160p @ 30.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F118	3840 x 2160p @ 30.00 Hz	U	HDMI; YUV444; YUV422; 2CH_AUD
F119	3840 x 2160p @ 30.00 Hz	U	HDMI; YUV444; YUV422; 8CH_AUD
F120	3840 x 2160p @ 60.00 Hz	H	HDMI; YUV444; YUV422; YUV420; 2CH_AUD
F121	1440 x 1080p @ 59.91 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F122	2560 x 2048p @ 59.98 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F123	1280 x 800p @ 59.91 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F124	1440 x 900p @ 59.90 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F125	1366 x 768p @ 60.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F126	1600 x 900p @ 59.98 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F127	2048 x 1080p @ 60.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F128	2560 x 1080p @ 60.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F129	3440 x 1440p @ 24.99 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F130	3440 x 1440p @ 29.99 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F131	4096 x 2160p @ 25.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F132	4096 x 2160p @ 30.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F133	4096 x 2160p @ 60.00 Hz	4	HDMI; YUV444; YUV422; YUV420; 2CH_AUD
F134	3440 x 1440p @ 23.99 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F135	4096 x 2160p @ 24.00 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F136	3840 x 2400p @ 29.99 Hz	H	HDMI; YUV444; YUV422; 2CH_AUD
F137	3840 x 2160p @ 60.00 Hz	H	HDMI; HDMI2; YUV444; YUV422; 2CH_AUD
F138	3840 x 2160p @ 50.00 Hz	H	HDMI; HDMI2; YUV444; YUV422; 2CH_AUD
F139	3840 x 2160p @ 60.00 Hz	H	HDMI; HDMI2; YUV444; YUV422; YUV420; 2CH_AUD
F140	3840 x 2160p @ 60.00 Hz	H	HDMI; HDMI2; YUV444; YUV422; YUV420; 8CH_AUD
F141	4096 x 2160p @ 60.00 Hz	H	HDMI; HDMI2; YUV444; YUV422; 2CH_AUD
F142	4096 x 2160p @ 50.00 Hz	H	HDMI; HDMI2; YUV444; YUV422; 2CH_AUD
F143	4096 x 2160p @ 60.00 Hz	H	HDMI; HDMI2; YUV444; YUV422; YUV420; 2CH_AUD
F144	4096 x 2160p @ 60.00 Hz	H	HDMI; HDMI2; YUV444; YUV422; YUV420; 8CH_AUD
F146	3840 x 2160p @ 60.00 Hz	H	HDMI; HDMI2; YUV420; DC30; DC36; YUVDC; YUV420_DC30; YUV420_DC36; 2CH_AUD; HDR
F147	3840 x 2160p @ 60.00 Hz	H	HDMI; HDMI2; YUV444; YUV422; 2CH_AUD
F148	3840 x 2160p @ 60.00 Hz	H	HDMI; HDMI2; YUV444; YUV422; 8CH_AUD

Legend

D: DVI EDID

H: HDMI EDID

U: Universal EDID, supporting many standard resolutions:

- **F29:** Universal EDID for DVI signals (no audio support).
- **F47:** HDMI EDID supporting PCM audio.
- **F48:** HDMI EDID supporting all type of audio.
- **F49:** HDMI EDID supporting all type of audio and deep color.
- **F89:** Universal EDID for analog signals (no audio support).
- **F118:** HDMI EDID supporting PCM audio and 4K@30 Hz signals.
- **F119:** HDMI EDID supporting all type of audio and 4K@30 Hz signals.
- F144:

DiD (in column EDID features): with Display ID support

Please note that minor changes in the factory EDID list may be applied in further firmware versions.

11.3. Factory Default Settings

11.3.1. Endpoint Factory Default Settings

Parameter	Value	
	GVN-HDMI-TX210AP(-DNT)	GVN-HDMI-RX110AP(-DNT)
IP acquisition mode	DHCP	
Static IP address	10.0.0.100/16	
Static Gateway address	10.0.0.1	
Device label	LW_GVN-HDMI-TX210AP (-DNT)_<serial_number>	LW_GVN-HDMI-RX110AP (-DNT)_<serial_number>
Hostname	lightware-<serial_number>	
Domain name	<hostname>	
Emulated EDID	F140	-
Allowed HDCP version	HDCP 2.2	
HPD mode	Auto	-
Output 5V mode	-	Auto
Output TMDS mode	-	Auto
Embedded audio muted	-	false
HDCP mode	-	Auto
Scaling setting	-	Passthrough (no scaling)

#factorydefault

11.3.2. MMU Factory Default Settings

Parameter	Value
GVN network mode	DHCP
GVN network static IP address	10.0.0.1/16
GVN network static gateway address	10.0.0.1
Control LAN static IP address	192.168.0.100/24
Control LAN static gateway address	192.168.0.1
Device label	LW_GVN-MMU-X100_<serial_number>
Hostname	lightware-<serial_number>
Domain name	<hostname>
Map	empty
Crosspoint	empty
User EDID	empty
Automatic Addition Enabled	true

#factorydefault

11.4. Contents of the Backup File

The backup file contains numerous settings and parameters saved from the device. When the file is uploaded to a device, the following will be overwritten: *#backup*

	GVN-MMU-X100	GVN-HDMI-TX210AP (-DNT)	GVN-HDMI-RX110AP (-DNT)
Audio / Video crosspoint settings	Crosspoint state Mute state	-	-
HDMI input ports	-	Video port name Audio port name Stream name HPD mode Allowed HDCP version	-
HDMI output ports	-	-	Video port name Audio port name Stream name HPD mode Allowed HDCP version HDCP mode Scaling setting Embedded audio mute setting Output TMDS mode Output 5V mode
Analog audio port	-	Volume Mute state	Volume Mute state
Local serial port	-	Port name Baud rate Data bits Stop bits Parity	Port name Baud rate Data bits Stop bits Parity
Network settings	IP settings Static IP settings (IP address, Subnet mask Gateway address) for each interface	IP setting (Last IP address, Last netmask address, Last IP mode)	IP setting (Last IP address, Last netmask address, Last IP mode)
Further settings	Device label Hostname Device map Device Mapping settings Dynamic, Emulated and User EDID data Package version	Device label Hostname Device type Package version EDID (Dynamic/Emulated)	Device label Hostname Device type Package version EDID (Dynamic/Emulated)

11.5. Video Latency

GVN endpoints transmit video signals with Ultra Low Latency (ULL). In the following table we describe how much latency is experienced while using the most common resolutions:

Resolution	Refresh Rate	Vertical Total Lines	Ultra Low Latency (in milliseconds)	
			Min.	Max.
3840x2160	60	2250	2.044	3.580
1080P	60	1125	3.822	5.358
720P	60	750	5.556	7.092
480P	60	525	8.095	9.631

11.6. Scaling

The following resolutions are available for scaling in the receiver devices: *#scaler*

1	640x480p60
2	720x480p60
3	720x576p50
4	800x600p60
5	848x480p60
6	1024x768p60
7	1280x720p50
8	1280x720p60
9	1280x768p50
10	1280x768p60
11	1280x768p75
12	1280x800p60
13	1280x1024p50
14	1280x1024p60
15	1280x1024p75
16	1360x768p60
17	1366x768p60
18	1400x1050p50
19	1400x1050p60
20	1400x1050p75
21	1440x900p60
23	1600x900p60
24	1600x1200p50
25	1600x1200p60

26	1920x1080p24
27	1920x1080p25
28	1920x1080p30
29	1920x1080p50
30	1920x1080p59
31	1920x1080p60
32	1920x1200p50
33	1920x1200p60
34	2048x1080p50
35	2048x1080p60
38	2560x1080p60
39	2560x1440p60
40	2560x1600p60
46	3840x2160p24
47	3840x2160p25
48	3840x2160p30
49	3840x2160p50
50	3840x2160p60
51	3840x2160p60_reduced
55	4096x2160p24
56	4096x2160p25
57	4096x2160p30
58	4096x2160p50
59	4096x2160p60

11.7. Known Limitations

In the initial release of the GVN family, there are a few limitations that will be fixed in future developments.

Such limitations are:

- Some features will only be available in a future firmware update (e.g. analog audio input, RS-232 command injection, MMU HDMI Output and USB port functions)
- The effect of the **Function** button might be modified in later updates. Currently it only changes the IP settings on the endpoints. For more information please see the Button Functionality section.
- The HDCP error signal is realized with a black screen and OSD display.
- In case the sink (e.g. monitor) only supports HDCP 1.4, but the incoming signal has HDCP 2.2 content with 4K resolution, the video will be converted to HDCP 1.4 encrypted 1080p resolution. This limitation only applies if the HDCP level of the sink is **lower** than that of the source signal. Under no circumstances will HDCP-encrypted content be displayed on non-HDCP-compliant displays.
- Certain parts of the firmware were created using previous codes that were not designed to properly support a larger AV system, resulting in limitations in LW3 connectivity, namely to the number of clients and subscriptions. For more information please see the General Rules section.
- In case of several LDC applications connecting to a GVN system, response times can increase. It is advised to only use one application at a time whenever possible.
- It is a known bug that when the HDCP setting for the HDMI output port on the receiver is set to Auto, the v1.4.0 firmware also encrypts unencrypted video if the sink is HDCP capable.

11.8. Cable Wiring Guide

Inputs and outputs of audio devices are symmetric or asymmetric. The main advantage of the symmetric lines is the better protection against the noise, therefore they are widely used in the professional audio industry. Symmetric audio is most often referred to as balanced audio, as opposed to asymmetric, which is referred to as unbalanced audio. Ligthware products are usually built with 5-pole Phoenix connectors, so we would like to help users assemble their own audio cables. See the most common cases below.

ATTENTION! Symmetric and asymmetric lines can be linked with passive accessories (e.g. special cables), but in this case half of the line level is lost.

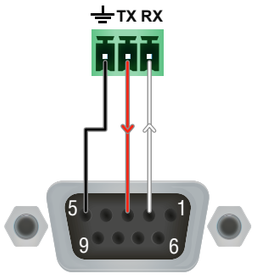
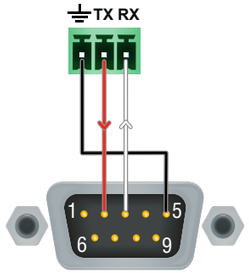
ATTENTION! There are numerous types of regularly used connector and cable types to connect audio devices. Please always make sure that a connector or cable fits your system before use.

ATTENTION! Never join the phase-inverted (negative, cold or -) poles (either right or left) to the ground or to each other on the output side, as this can damage the unit.

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

11.8.1. Serial Ports

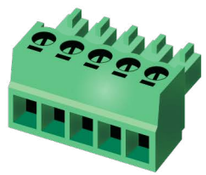
The device is built with a 3-pole Phoenix connector. See the examples below of connecting to a DCE (Data Circuit-terminating Equipment) or a DTE (Data Terminal Equipment) type device:

Lightware device and a DCE D-SUB 9 and Phoenix	Lightware device and a DTE D-SUB 9 and Phoenix
 2: TX data 3: RX data 5: Ground	 2: RX data 3: TX data 5: Ground

11.8.2. Audio Ports

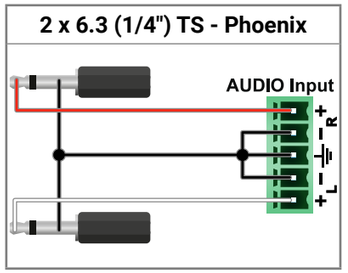
The Pinout of the 5-pole Phoenix Connector

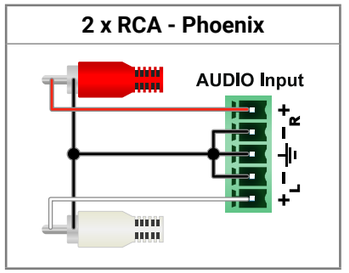
Pin nr.	Signal
1	Left+
2	Left-
3	Ground
4	Right-
5	Right+

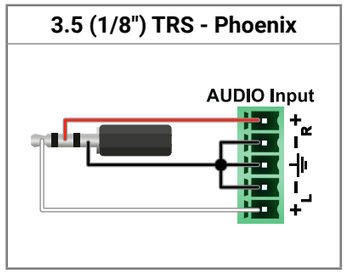


Compatible Plug Type: Phoenix® Combicon series (3.5mm pitch, 5-pole), type: MC 1.5/5-ST-3.5.

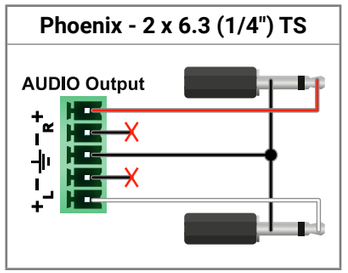
From Unbalanced Output to Balanced Input

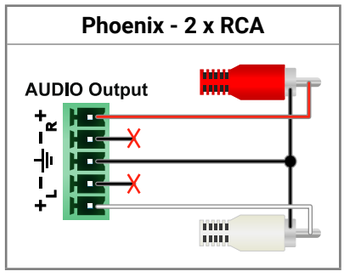


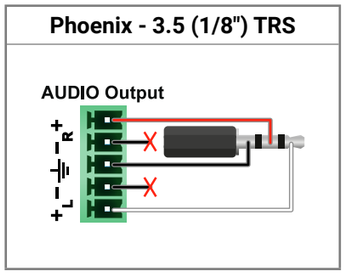




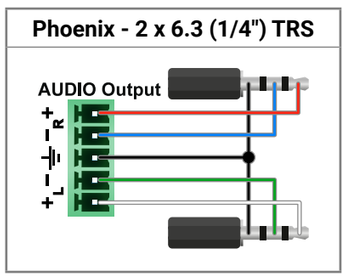
From Balanced Output to Unbalanced Input

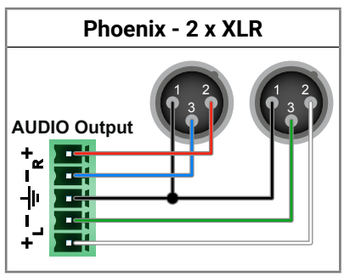


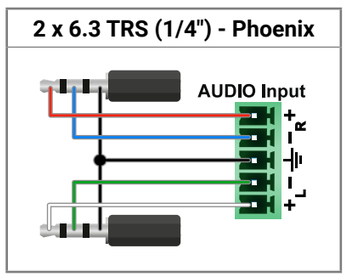


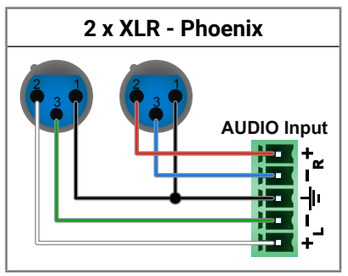


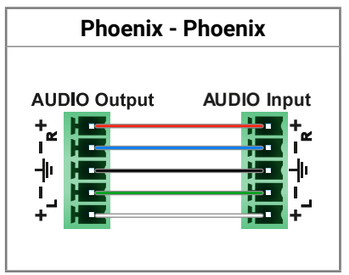
From Balanced Output to Balanced Input









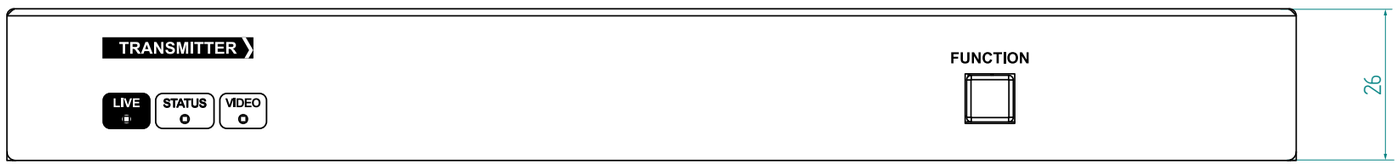


11.9. Mechanical drawings

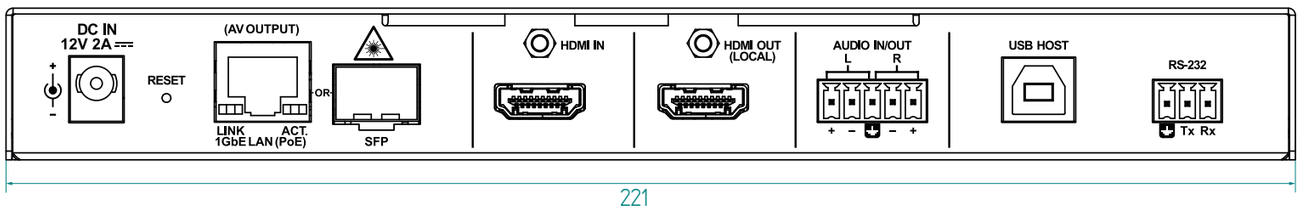
INFO: All models have the same size. Dimensions are in mm.

Top view

Front view



Top view



11.10. Firmware Release Notes - MMU

The list below shows the released firmware packages with important notes.

v1.4.0b14

Release date: 2025-04-09

New feature:

- We have updated the backend of the LW3 API, making it more robust and simplifying development and testing. It is a known bug that when the HDCP setting for the HDMI output port on the receiver is set to Auto, the v1.4.0 firmware also encrypts unencrypted video if the sink is HDCP capable.
- Discovery and support of Dante-capable endpoints. For full compatibility, we recommend that all elements of the system (MMU and endpoints) should be updated to the same firmware version (v1.4.0).

v1.3.0b4

Release date: 2024-12-12

New feature:

- Basic command injection support on MMU in LW3 and embedded-web. LDC support is not yet available in v2.14.0, it will be supported only in the next version (v2.15.0).

v1.1.0b2

Release date: 2024-09-05

New feature:

- Serial port and analog audio port related setting are now supported on the control UI. EDID export is now supported on the control UI. Fixed several bugs regarding UI and user workflow.

v1.0.0b39

Release date: 2024-07-19

New feature:

- The first public release for the Gemini GVN Matrix Management Unit (MMU). The supported hardware is GVN-MMU-X100. Core functions include Gemini GVN endpoint discovery and management, endpoint\u2019s crosspoint, EDID management, system support information, backup and restore of actual system state. Managed by Lightware Device Controller (LDC) and Lightware Device Updater v2 (LDU v2).

11.11. Firmware Release Notes - Endpoints

The list below shows the released firmware packages with important notes.

v1.4.0b12

Release date: 2025-04-09

New feature:

- Fixed an issue where technical information would flash after switching HDMI output
- Fix USB 2.0 incompatibility issue with macOS v15.
- We have updated the backend of the LW3 API, making it more robust and simplifying development and testing. It is a known bug that when the HDCP setting for the HDMI output port on the receiver is set to Auto, the v1.4.0 firmware also encrypts unencrypted video if the sink is HDCP capable.

Release the Dante capable RX endpoint (91810038, GVN-HDMI-RX110AP-DNT). The received Dante stream can be embedded into the HDMI output.

Release the Dante capable TX endpoint (91810037, GVN-HDMI-TX210AP-DNT). Embedded stereo uncompressed audio coming from the HDMI input is automatically sent to the Dante network.

v1.3.0b3

Release date: 2024-12-12

New feature:

- Basic command injection support with direct TCP connections to endpoints over port 6752

v1.0.0b36

Release date: 2024-07-15

New feature:

- The first public release for the Gemini GVN endpoints. Supported endpoints are GVN-HDMI-TX210AP and GVN-HDMI-RX110AP. Basic functionality with 4K60 4:4:4, seamless switching, scaling, EDID handling, analog audio output, USB HID and full USB 2.0 support, virtual HUB function up to six USB 2.0 devices, managed by Lightware Device Updater v2 (LDU v2).

11.12. Hashtag Keyword List

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

The format of the keywords is the following:

#<keyword>

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

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

Example

#dhcp

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

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

Hashtag Keyword	Description
#advancedview	Advanced view window
#analogaudio	Analog audio related settings
#audio	Audio related settings
#backup	Downloading and restoring backup file
#balance	Balance (for analog audio) setting
#builtinweb	Built-in Web for the MMU
#colorspace	Color space converter related settings
#crosspoint	Crosspoint switch setting
#date	Date setting in the MMU
#devicelabel	Device label
#devicemap	Device map in LDC
#dhcp	DHCP (Dynamic IP address) setting options
#edid	EDID related settings
#factorydefault	Setting factory default
#firmwareversion	Firmware version query
#framedetector	Frame detector in LDC
#hdcp	HDCP related settings
#ip	IP address related settings
#label	Device label
#mac	MAC address query
#mute	Mute (for analog audio) setting
#network	Network (IP address) related settings
#poe	PoE related information
#power	Powering information
#reboot	Restarting the device
#restart	Restarting the device
#rs-232	RS-232 related settings
#scaler	Scaler related settings
#seamless	Settings for seamless switching
#serial	RS-232 related settings
#snapshot	Snapshot function settings
#substream	Substream function settings
#switch	Crosspoint switch setting
#terminal	Advanced view window
#time	Time setting in the MMU
#web	Built-in web for the MMU

11.13. Further Information

Limited Warranty Statement

1. Lightware Visual Engineering PLC (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 categories above (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 product's warranty period.

Document Revision History

Rev.	Release date	Changes	Editor
1.0	24-07-2024	Initial release	Nikolett Keindl
1.1	13-09-2024	Port properties section updated, EDID section updated, LDC functions updated, minor corrections	Nikolett Keindl
1.2	30-04-2025	GVN-HDMI-TX210AP-DNT and GVN-HDMI-RX110AP-DNT models added, Command injection and EDID information and commands added, Device Map section updated, minor corrections	Nikolett Keindl

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