LIGHTWARE
INNOVATIVE. RELIABLE. MADE IN EUROPE.

USER MANUAL

HDMI-TPS-RX220AK

HDBaseT™ Multimedia Extender

Bookmark Page

Applied Network Ports

Box Contents

Button Functionality

Maximum Cable Lengths

Mechanical Drawings

Mounting Options

Cable Wiring Guide

Connecting Steps

Electrical Connections

Port Diagrams

Port Numbering

Powering Options

Factory Default Settings

Front/Rear View

Lightware Device Controller

Specifi-cations

Status LEDs

Trouble-shooting

Important Safety Instructions

Class II apparatus construction.

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

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

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

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

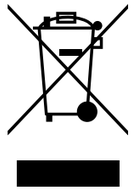
Ventilation

For the correct ventilation and to avoid overheating, ensure enough free space around the appliance. Do not cover the appliance, 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 attached 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.

Common Safety Symbols

Symbol	Description
	Direct current
	Alternating current
	Protective conductor terminal
	Equipotential Connector
	On (Power)
	Off (Power)
	Double insulation
	Caution, possibility of eletric shock
	Caution
	Laser radiation
	Warning, Rotating fan
	Caution: for indoor use only

Table of Contents

1. INTRODUCTION 9
1.1. Description 10
1.2. Compatible Devices 10
1.3. Box Contents 10
1.4. Features 11
1.5. Typical Application 12
2. PRODUCT OVERVIEW 13
2.1. Front View 14
2.2. Rear View 14
2.3. Status LEDs and Button Functions 15
2.3.1. Device Status LEDs 15
2.3.2. Crosspoint Status LEDs and Input Select Button Functionality 15
2.3.3. Function Button 16
2.3.4. Port Status LEDs 16
2.3.5. Ethernet Status LEDs 16
2.4. Special Button Functions 17
2.4.1. Programable Function Button 17
2.4.2. Enable DHCP (Dynamic IP Address) Setting 17
2.4.3. Reset to Factory Default Settings 17
2.4.4. Entering Bootload Mode 17
3. INSTALLATION 18
3.1. Mounting Options 19
3.1.1. 1U High Rack Shelf 19
3.1.2. Under-desk Double Mounting Kit 19
3.2. Electrical Connections 19
3.2.1. DC 12V Connection 19
3.2.2. HDMI Connector 19
3.2.3. Ethernet Connector (TPS and LAN Ports) 20
3.2.4. Analog Audio Output 20
3.2.5. IR Connector 20
3.2.6. USB-A Connector 20
3.2.7. RS-232 Connector 21
3.2.8. USB-mini Connector 21
3.3. Connecting Steps 22
4. DEVICE CONCEPT 23
4.1. Overview 24
4.2. TPS Interface 24
4.3. Video Interface 24
4.3.1. Port Diagram 24
4.3.2. The Autoselect Feature 25
4.3.3. Video Transmission - Example 25
4.4. Audio Interface 25
4.4.1. Port Diagram 25
4.4.2. Audio Transmission - Example 25
4.5. USB KVM Function 26
4.5.1. Port Diagram 26
4.5.2. USB KVM Extension - Example 26
4.6. Control Features 26
4.6.1. Serial Interface 26
4.6.2. RS-232 Recognizer 27
4.6.3. IR Interface 28
4.6.4. Consumer Electronics Control (CEC) Interface 29
4.6.5. USB Control Interface 29
4.7. Ethernet Interface 29
4.7.1. Device Control over Ethernet 29
4.7.2. Wake-on-Lan 29
4.7.3. TCP Recognizer 30
4.8. Batch Commands 30
4.9. Basic IT Security 30
4.10. Bulk Device Management 31
4.10.1. Network Settings 31
4.11. The Event Manager Feature 31
4.12. Further Built-in Features 32
4.12.1. Automatically Launched Actions – The Event Manager 32
4.12.2. Receiver Cloning – Configuration Backup and Restore 32
4.12.3. Remote Firmware Update of Connected Lightware Devices 32
4.13. Software Control Modes 32
5. SOFTWARE CONTROL - LIGHTWARE DEVICE CONTROLLER 33
5.1. Install and Update 34
5.2. Running the LDC 34
5.3. Establishing the Connection 35
5.3.1. Ethernet Tab 35
5.3.2. Serial Tab 36
5.3.3. USB Tab 36
5.3.4. Further Tools 36
5.4. Bulk Device Management 37
5.4.1. Network Settings 37
5.5. Crosspoint Menu 38
5.5.1. Video Layer 38
5.5.2. Audio Layer 38
5.5.3. Port Tiles 39
5.6. Port Properties Windows 39
5.6.1. Video - TPS In 1 39
5.6.2. Video - HDMI In 2 40
5.6.3. Video - HDMI Out 1 and 2 40
5.6.4. Audio - TPS In 1 and HDMI In 2 41
5.6.5. Audio - HDMI out 1 and 2 41
5.6.6. Audio - Analog Audio Out 41
5.6.7. Autoselect Feature 41
5.6.8. CEC Controller 42
5.7. Diagnostic Tools 43
5.7.1. Frame Detector 43
5.7.2. Cable Diagnostics 43
5.7.3. No Sync Screen (Test Pattern) 44
5.8. EDID Menu 45
5.8.1. EDID Operations 45
5.8.2. EDID Summary Window 46
5.8.3. Editing an EDID 46
5.8.4. Creating an EDID - Easy EDID Creator 47
5.9. Control Menu 47
5.9.1. RS-232 47
5.9.2. Ethernet 49
5.9.3. Infra 51
5.9.4. Macros 53
5.9.5. Variables 54
5.10. Event Manager 56
5.10.1. The Event Editor 56
5.10.2. Create or Modify an Event 57
5.10.3. Special Tools and Accessories 58
5.10.4. Clear One or More Event(s) 59
5.10.5. Export and Import Events 59
5.10.6. Event Creating - Example 59
5.11. Settings Menu 60
5.11.1. Status 60
5.11.2. Network 61
5.11.3. Front Panel 61
5.11.4. Backup 62
5.11.5. System 62
5.12. The Miniweb Room Control 63
5.12.1. Opening the Miniweb 63
5.12.2. Miniweb Customization 64
5.13. Configuration Cloning (Backup Tab) 65
5.13.1. Cloning Steps in a Nutshell 65
5.13.2. Save the Settings of a Device (Backup) 65
5.13.3. Upload the Settings to a Device (Restore) 66
5.13.4. Create and Restore Backups from the Device Memory 66
5.14. Advanced View Window 67

6. LW2 PROGRAMMER'S REFERENCE 68
6.1. Protocol Description 69
6.2. Instructions for the Terminal Application Usage 69
6.3. General LW2 Commands 70
6.3.1. List of All Available LW2 Commands 70
6.3.2. Querying the Product Type 70
6.3.3. Querying the Control Protocol 70
6.3.4. Querying the Firmware Version 70
6.3.5. Connection Test 70
6.3.6. Querying the Serial Number 70
6.3.7. Querying the Device Label 70
6.3.8. Querying the Installed Boards 71
6.3.9. Querying the Firmware Version for All Controllers 71
6.3.10. Querying the Compile Time 71
6.3.11. Querying the Health Status 71
6.3.12. Restarting of the Device 71
6.3.13. Recalling Factory Default Settings 71
6.4. Crosspoint and Port Settings 72
6.4.1. Switching an Input to an Output 72
6.4.2. Switching an Input to All Outputs 72
6.4.3. Muting an Output 72
6.4.4. Unmuting an Output 73
6.4.5. Locking an Output 73
6.4.6. Unlocking an Output 73
6.4.7. Viewing Connection State on the Outputs 73
6.4.8. Viewing Crosspoint Size 74
6.4.9. Querying the Autoselect Mode 74
6.4.10. Changing the Autoselect Mode 74
6.4.11. Querying the Autoselect Input Priority 75
6.4.12. Changing the Autoselect Input Priority 75
6.5. Network Configuration 75
6.5.1. Querying the IP Status 75
6.5.2. Querying the IP Address 76
6.5.3. Setting the IP Address 76
6.5.4. Querying the Subnet Mask 76
6.5.5. Setting the Subnet Mask 76
6.5.6. Querying the Gateway Address 77
6.5.7. Setting the Gateway Mask 77
6.5.8. Applying Network Settings 77
6.6. RS-232 Settings 77
6.6.1. Setting the RS-232 Mode 77
6.6.2. Setting the Local RS-232 Parameters 78
6.6.3. Setting the Link RS-232 Parameters 78
6.6.4. Setting the Control Protocol of the Local RS-232 Port 79
6.6.5. Setting the Control Protocol of the Link RS-232 Port 79
6.7. LW2 Protocol Commands – Quick Summary 80
7. LW3 PROGRAMMER'S REFERENCE 82
7.1. Overview 83
7.2. Instructions for the Terminal Application Usage 83
7.3. Protocol Rules 83
7.3.1. LW3 Tree Structure and Command Structure (examples) 83
7.3.2. General Rules 83
7.3.3. Command Types 84
7.3.4. Prefix Summary 84
7.3.5. Error Messages 84
7.3.6. Escaping 84
7.3.7. Signature 85
7.3.8. Subscription 85
7.3.9. Notifications about the Changes of the Properties 85
7.3.10. Legend for the Control Commands 85
7.4. System Commands 86
7.4.1. Querying the Product Name 86
7.4.2. Setting the Device Label 86
7.4.3. Querying the Serial Number 86
7.4.4. Querying the Firmware Version 86
7.4.5. Identifying the Device 86
7.4.6. Dark Mode 86
7.4.7. Control Lock 87
7.4.8. Restarting the Device 87
7.4.9. Restoring the Factory Default Settings 87
7.4.10. Running a Macro 87
7.5. Cleartext Login Protection 87
7.5.1. Setting the Login Password 87
7.5.2. Logging into the Device 88
7.5.3. Logging out of the Device 88
7.5.4. Enabling/Disabling the Cleartext Login Function 88
7.6. Video Port Settings 88
7.6.1. Querying the Status of the Source Ports 88
7.6.2. Querying the Status of the Destination Ports 89
7.6.3. Querying the Video Crosspoint Setting 89
7.6.4. Switching a Video Input to an Output 90
7.6.5. Switching a Video Input to All Outputs 90
7.6.6. Disconnecting a Video Output 90
7.6.7. Querying the Connected Input Port Number 90
7.6.8. Querying the Video Autoselect Settings 90
7.6.9. Changing the Autoselect Mode 91
7.6.10. Querying the Input Port Priority 91
7.6.11. Changing the Input Port Priority 91
7.6.12. Muting an Input 91
7.6.13. Unmuting an Input 91
7.6.14. Locking an Input 92
7.6.15. Unlocking an Input 92
7.6.16. Muting an Output 92
7.6.17. Unmuting an Output 92
7.6.18. Locking an Output 92
7.6.19. Unlocking an Output 92
7.6.20. HDCP Setting (Input Port) 92
7.6.21. HDCP Setting (Output Port) 93
7.6.22. Test Pattern Generator Mode 93
7.6.23. Test Pattern Generator Clock Source 93
7.6.24. Test Pattern Setting 93
7.6.25. HDMI Mode Settings (Output Port) 94
7.6.26. Querying the Recent TPS Mode 94
7.6.27. Setting the TPS Mode 94
7.7. Audio Port Settings 94
7.7.1. Querying the Status of the Source Ports 94
7.7.2. Querying the Status of the Destination Ports 95
7.7.3. Querying the Audio Crosspoint Setting 95
7.7.4. Switching an Audio Input to an Output 96
7.7.5. Switching an Audio Input to All Outputs 96
7.7.6. Querying the Audio Autoselect Settings 96
7.7.7. Changing the Autoselect Mode 97
7.7.8. Querying the Input Port Priority 97
7.7.9. Changing the Input Port Priority 97
7.7.10. Muting an Input 97
7.7.11. Unmuting an Input 97
7.7.12. Locking an Input 98
7.7.13. Unlocking an Input 98
7.7.14. Muting an Output 98
7.7.15. Unmuting an Output 98
7.7.16. Locking an Output 98
7.7.17. Unlocking an Output 98
7.8. Analog Audio Output Settings 98
7.8.1. Volume Setting (dB) 98
7.8.2. Volume Setting (dB) in Steps 99
7.8.3. Volume Setting (Percent) 99
7.8.4. Volume Setting (Percent) in Steps 99
7.8.5. Balance Setting 99
7.8.6. Balance Setting in Steps 99
7.9. Event Manager Basics 100
7.9.1. How to arrange an Event? 100
7.9.2. Setting a Condition by Linking Another Condition 100
7.9.3. Setting a Condition by Linking More Conditions 100
7.9.4. Setting an Action by Specifying a Direct Path 101
7.9.5. Setting an Action by Linking Another Action 101
7.9.6. Setting an Action by Linking a Macro 101

7.10. Event Manager Tool Kit 101
7.10.1. Setting the Delay 101
7.10.2. Setting the Name of the Event....102
7.10.3. Enabling/Disabling the Event....102
7.10.4. Triggering a Condition....102
7.10.5. Querying the Condition Counter....102
7.10.6. Querying the Condition Trigger Counter 103
7.10.7. Testing an Action 103
7.11. Variable-Management 103
7.11.1. Value Assignment 103
7.11.2. Addition and Subtraction (Add Method)....103
7.11.3. Addition and Subtraction (Cycle Method) 104
7.11.4. Value Change with Intervals (Case) 105
7.11.5. Scan and Store 105
7.11.6. Reformatting a Value 106
7.12. Ethernet Port Configuration 107
7.12.1. Querying the DHCP State....107
7.12.2. Changing the DHCP State....107
7.12.3. Querying the IP Address 107
7.12.4. Changing the IP Address (Static)....107
7.12.5. Querying the Subnet Mask....107
7.12.6. Changing the Subnet Mask (Static) 107
7.12.7. Querying the Gateway Address 107
7.12.8. Changing the Gateway Address (Static)....108
7.12.9. Querying the MAC Address 108
7.12.10. Applying Network Settings 108
7.13. Ethernet Tool Kit 108
7.13.1. Device Filter Based on MAC Address 108
7.13.2. Blocking the LW2 Control Port 109
7.13.3. Blocking the HTTP Port 109
7.13.4. Blocking the Reception of HTTP Posts....109
7.13.5. Powering on a Computer over Ethernet (Wake-on-LAN) 109
7.13.6. Setting the Host Name....109
7.14. Ethernet Message Sending 110
7.14.1. Sending a TCP Message (ASCII-format)....110
7.14.2. Sending a TCP Text (ASCII-format)....110
7.14.3. Sending a TCP Binary Message (HEX-format) 110
7.14.4. Sending a UDP Message (ASCII-format) 110
7.14.5. Sending a UDP Text (ASCII-format) 111
7.14.6. Sending a UDP Binary Message (HEX-format)....111
7.15. HTTP Messaging....112
7.15.1. Setting the Target IP Address....112
7.15.2. Setting the TCP Port....112
7.15.3. Setting the Target Path 112
7.15.4. Setting the Message Header 112
7.15.5. Sending a Post Message 112
7.15.6. Sending a Put Message 112
7.16. TCP Message Recognizer 113
7.16.1. Setting the IP Address of the TCP Server 113
7.16.2. Setting the TCP/IP Port Number of the TCP Server....113
7.16.3. Connecting to a TCP Server....113
7.16.4. Disconnecting from a TCP Server 113
7.16.5. Setting the Delimiter Hex 113
7.16.6. Setting the Timeout....114
7.16.7. Querying the Last Recognized Message (String)....114
7.16.8. Querying the Last Recognized Message (Hex) 114
7.16.9. Clearing the Last Recognized Stored Message 114
7.16.10. Querying the Last Recognized Active Message (String) 114
7.16.11. Querying the Last Recognized Active Message (Hex)....115
7.16.12. Setting the Active Timeout 115
7.16.13. Running an Immediate Event Action....115
7.17. RS-232 Port Configuration....116
7.17.1. Protocol Setting....116
7.17.2. RS-232 Operation Mode....116
7.17.3. BAUD Rate Setting....116
7.17.4. Databits Setting....116
7.17.5. Stopbits Setting....117
7.17.6. Parity Setting 117
7.17.7. Querying the Command Injection Mode 117
7.17.8. Changing the Command Injection Mode 117
7.18. RS-232 Message Sending....118
7.18.1. Sending a Message (ASCII-format) via RS-232....118
7.18.2. Sending a Text (ASCII-format) via RS-232 118
7.18.3. Sending a Binary Message (HEX-format) via RS-232 118
7.18.4. Using Hexadecimal Codes....118
7.19. RS-232 Recognizer 119
7.19.1. EnablING/Disabling the Recognizer....119
7.19.2. Setting the Delimiter Hex 119
7.19.3. Setting the Timeout....119
7.19.4. Querying the Last Recognized Serial Message in String Format119
7.19.5. Querying the Last Recognized Serial Message in Hex Format 120
7.19.6. Clearing the Stored Last Recognized Serial Message....120
7.19.7. Querying the Last Recognized Serial Message in String Format120
7.19.8. Querying the Last Recognized Serial Message in Hex Format 120
7.19.9. Setting the Active Timeout 121
7.20. Sending CEC Commands 121
7.20.1. Press&Release Commands 121
7.20.2. Further Commands 122
7.20.3. Sending an OSD String....122
7.20.4. Sending CEC Commands in Hex Format 122
7.20.5. Querying the Last Received CEC Message....122
7.21. Infrared Port Configuration 123
7.21.1. Enabling/Disabling Command Injection Mode....123
7.21.2. Changing the Command Injection Port Number....123
7.21.3. Enabling/Disabling Output Signal Modulation 123
7.22. Infrared Message Sending 124
7.22.1. Sending Pronto Hex Codes in Little-endian Format via IR Port 124
7.22.2. Sending Pronto Hex Codes in Big-endian Format via IR Port... 124
7.23. EDID Management 125
7.23.1. Querying the Emulated EDIDs....125
7.23.2. Querying the Validity of a Dynamic EDID 125
7.23.3. Querying the Preferred Resolution of a User EDID....125
7.23.4. Emulating an EDID to an Input Port....125
7.23.5. Emulating an EDID to All Input Ports 125
7.23.6. Copying an EDID to User Memory 125
7.23.7. Deleting an EDID from User Memory 126
7.23.8. Resetting the Emulated EDIDs....126
7.24. LW3 Protocol Commands - Quick Summary 127
8. FIRMWARE UPDATE....133
8.1. Introduction 134
8.2. Preparation 134
8.2.1. About the Firmware Package (LFP2 File) 134
8.2.2. LDU2 Installation 134
8.3. Running the Software 135
8.3.1. LDU2 Interfaces....135
8.3.2. The Updating Steps....136
8.4. Updating via GUI....137
8.5. Command Line Interface (CLI)....138
8.5.1. How to Run 138
8.5.2. How to Use....139
8.6. CLI Commands 139
8.6.1. Help 139
8.6.2. LDU2 Version 139
8.6.3. Check For New LDU2 Version....139
8.6.4. Device Info 140
8.6.5. Update....140
8.6.6. Restore....141
8.6.7. Package Options 141
8.6.8. Complex Examples....142
8.6.9. Exit Codes 143
8.7. If the Update is not successful....143
9. TROUBLESHOOTING 144
9.1. Use Case Studies 145
9.2. How to Speed Up the Troubleshooting Process 146
10. TECHNOLOGIES 147
10.1. EDID Management 148

10.1.1. Understanding the EDID 148
10.1.2. Advanced EDID Management 148
10.2. HDCP Management 149
10.2.1. Protected and Unprotected Content 149
10.2.2. Disable Unnecessary Encryption 149
10.3. Pixel Accurate Reclocking 150

11. APPENDIX 151

11.1. Specifications 152
11.2. Input/Output Port Numbering 154
11.3. Content of Backup File 154
11.4. Factory Default Settings 155
11.5. Maximum Extension Distances 155
11.6. Cable Wiring Guide 155
11.7. Factory EDID List 156
11.8. Applied Ports (Network Settings) 157
11.9. Mechanical Drawings 158
11.10. Firmware Release Notes 159
11.11. Hashtag Keyword List 160
11.12. Further Document Information 162
11.13. Limited Warranty Statement 162

Applied SW/FW/HW Environment

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
FW package	v1.5.0b3
HW version	1.3
Lightware Device Controller (LDC) version	v2.6.3b2
Lightware Device Updater V2 (LDU2) version	v2.17.0b2

Document Revision History

Rev.	Release date	Changes	Editor
v1.0	2020-04-27	Initial release.	Tamas Forgacs
...			
v3	2026-05-06	New User Manual template applied, minor corrections	Nikolett Keindl
v4	2026-09-03	ToC correction.	Laszlo Zsedenyi

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1

Introduction

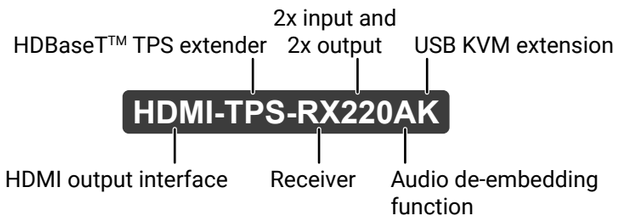
Thank you for choosing the Lightware HDMI-TPS-RX220AK device. In the first chapter we would like to introduce the device, highlighting the most important features in the sections listed below:

- Description **10**
- Compatible Devices **10**
- Box Contents **10**
- Features **11**
- Typical Application **12**

1.1. Description

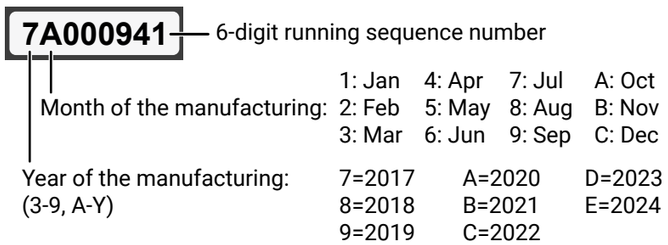
The Lightware HDMI-TPS-RX220AK receiver offers seamless HDBaseT™ integration with additional Lightware product lines and developments, including TPS matrices and 25G boards. The device receives digital video at a resolution up to 4K, as well as audio and control for up to 170 meters over a single CAT cable. Furthermore, the device utilizes control over USB KVM, and can be remotely powered over TPS link with PoE (IEEE 802.3af), a useful array of features to further simplify the operation for system integrators and users.

Model Denomination

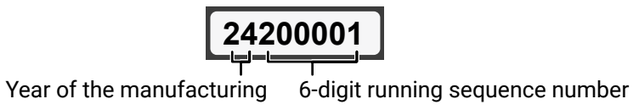


About the Serial Number

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.



1.2. Compatible Devices

The receiver is compatible with other Lightware TPS transmitters, matrix TPS and TPS2 boards, 25G TPS2 boards, as well as third-party HDBaseT-extenders and displays, but not compatible with the phased out TPS-90 extenders.

ATTENTION: The receiver is PoE-compatible (Power over Ethernet, can be powered remotely via using CATx cable), but the device can only receive power and cannot send power other PoE-compatible devices. Only the TPS connector is PoE-compatible, the Ethernet port cannot receive power.

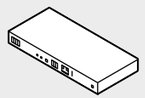
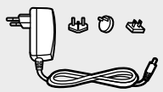
The receiver is compatible with any third-party HDBaseT™ device.

HDBaseT™ and the HDBaseT Alliance logo are trademarks of the HDBaseT Alliance.

USB KVM

The receiver is compatible only with the **UMX-TPS-TX140K** transmitter from the USB KVM extension point of view.

1.3. Box Contents

	Supplied device	Supplied accessories		
				
	Receiver device	12V DC power adaptor	Phoenix® Combicon 3-pole connector	Safety and warranty info, QSG
HDMI-TPS-RX220AK	✔	✔	✔	✔

1.4. Features

3D and 4K Support

High bandwidth allows extension of resolutions of up to 4K and even 3D sources and displays are supported.

Audio De-embedder Function

The embedded HDMI audio can be routed to the analog audio output port.

Bi-directional RS-232 Pass-through

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

Built-in Event Manager

The Event Manager tool takes care of all the necessary control in a smaller configuration by performing predefined actions in response to device status changes. Hence, in a less complex environment, there is no need to invest in additional control solutions, which makes the receiver the best choice for numerous applications.

Dark Mode

Rental application requires this function, which keeps the LEDs unlit to hide the device during an event.

Ethernet Control

Multiple simultaneous TCP/IP connections are available with a simple ASCII-based protocol for controlling, configuring the receiver or perform a firmware update.

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.

HDCP-compliant

The receiver fulfills the HDCP standard. HDCP capability on the digital video inputs can be disabled when non-protected content is extended.

Pixel Accurate Reclocking

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

Remote Power

The receiver is PoE-compatible and can be powered locally by the supplied power adaptor, or remotely via the TPS connection (through the CATx cable) with a compatible power source equipment, e.g. MMX6x2-HT series matrix switchers and TPS2 matrix boards.

Signal Transmission up to 170 m

Video and audio signal transmission (HDMI, Ethernet, RS-232, and Infra-Red over a single CAT5e…CAT7e cable.

USB KVM Extension

KVM extension for USB HID (Human Interface Devices, e.g. keyboard, mouse, presenter).

Advanced Control Features

Consumer Electronics Control

Supports transmitting standard CEC commands in order to remote control the source or sink device.

Infra Message Sending

Infrared (IR) is a wireless technology used for device communication over short ranges. Third party control systems may send IR control commands to endpoints turning them on and off or switching their inputs.

RS-232 Recognizer

Support recognizing incoming RS-232 messages to integrate with 3rd party devices like VC codec.

Advanced Control Pack v3

DIFFERENCE: This feature is available from FW package v1.5.0b3.

Basic IT-security

These entry-level network security improvements help prevent unauthorized access to the Lightware device: plain-text login, TCP port blocking and MAC address filtering.

Batch Commands

A batch of LW3 commands (salvo) can be run by the Lightware device either by a previously stored macro or by sending a file to the device with the desired commands.

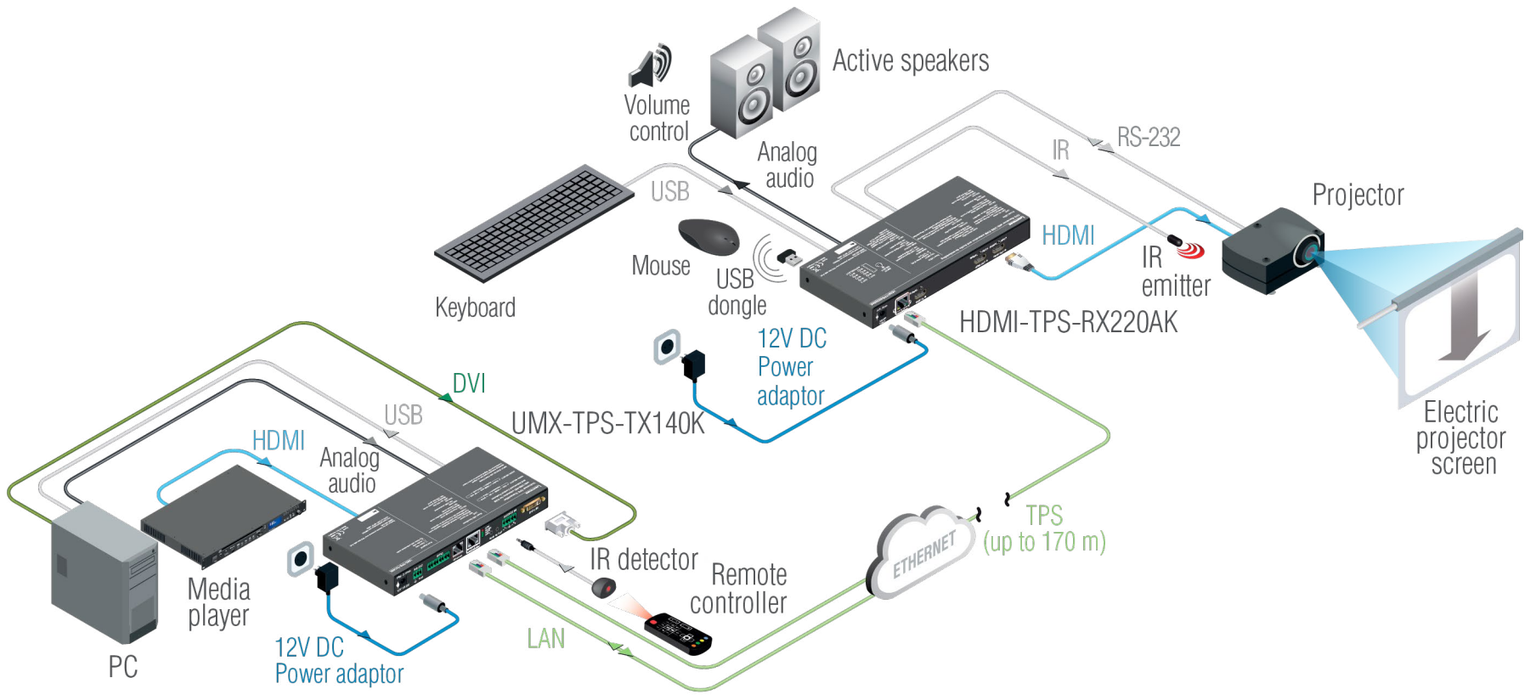
Event Manager +

Triggering a condition, defining variables and checking two conditions for an action – these features are available by the improved Event Manager.

TCP Recognizer

Supports recognizing the incoming TCP messages to integrate with 3rd party devices like the videoconference codec devices.

1.5. Typical Application



Typical application diagram

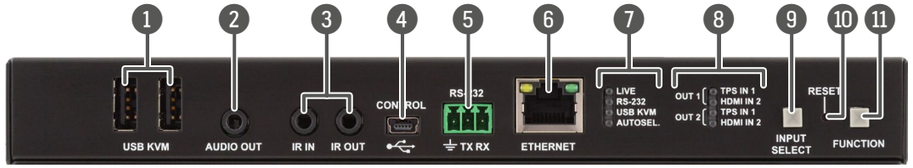
2

Product Overview

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

- Front View **14**
- Rear View **14**
- Status LEDs and Button Functions **15**
- Special Button Functions **17**

2.1. Front View



1	**USB A-type connectors**	USB KVM ports for HID-compatible devices (preferably keyboard and mouse).
2	**Analog audio output**	TRS (3.5mm jack) connector for unbalanced analog audio output. Pin assignments can be found in the Analog Audio Output section.
3	**Infrared connectors**	3-pole TRS connector, also known as 3.5 mm (1/8") jack plug for optional IR receiver (IR IN) and transmitter (IR OUT). Pin assignments can be found in the IR Connector section.
4	**USB mini-B connector**	USB interface for LDC connection to control and configure the device.
5	**RS-232 connector**	3-pole Phoenix connector for controlling the device with LDC or third-party control systems. Pin assignment can be found in the RS-232 Connector section.
6	**Ethernet**	Locking RJ45 connector for controlling the device with LDC or third-party control systems and LDU for firmware update.
7	**Device status LEDs**	The LEDs give immediate feedback about current state of the device. See the details in the Device Status LEDs section.
8	**Crosspoint status LEDs**	The LEDs give feedback about the current status of the AV crosspoint settings. See the details in the Crosspoint Status LEDs and Input Select Button Functionality section.
9	**Input select button**	Pushing the button selects the video source for HDMI out 1 and 2 ports. See the pre-programmed crosspoint states in the Crosspoint Status LEDs and Input Select Button Functionality section.
10	**Reset button**	Pressing the reset button reboots the extender.
11	**Function button**	Special functions are available with this button (bootload mode, DHCP settings, restore factory default settings, condition launching in Event Manager). For the details about special functions, see the Special Button Functions section.

2.2. Rear View

1	**12V DC input connector**	12V DC input for local powering.
2	**TPS input port**	TPS input port for the compatible transmitter device (extender / matrix / board). The port is PoE-compatible and is able to receive power
3	**HDMI input port**	HDMI input port for DVI or HDMI signal. Connect an HDMI cable between the receiver and the source device.
4	**HDMI out 1 port**	HDMI output 1 port for the sink device. The source of the port can be selected with the Input Select button. Connect HDMI cables between the receiver and the sink devices.
5	**HDMI out 2 port**	HDMI output 2 port for the sink device. The source of the port can be selected with the Input Select button. Connect HDMI cables between the receiver and the sink devices.

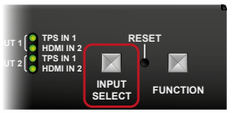
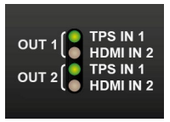
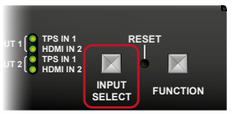
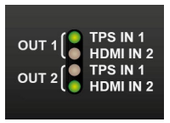
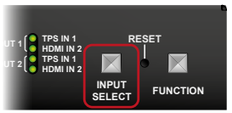
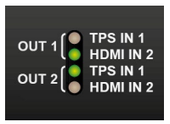
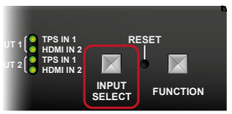
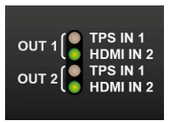
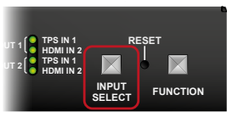
2.3. Status LEDs and Button Functions

2.3.1. Device Status LEDs

LIVE		
	off	The device is not powered or out of operation.
	blinking (slow, 1 sec)	The device is powered and operational.
	blinking (fast, 0,5 sec)	The device is in bootload (firmware update) mode.
	on	The device is powered but not operational.
RS-232		
	off	RS-232 ports (local and link) are in Pass-through mode.
	blinking	Command Injection mode is active.
	on	RS-232 ports (local and link) are in Control mode.
USB KVM		
	off	USB is not enumerated.
	on	USB is enumerated.
AUTOSEL. (AUTOSELECT)		
	off	Autoselect is disabled.
	blinking	Autoselect is enabled but no signal is present on the selected input.
	on	Autoselect is enabled and signal is present on the selected input.

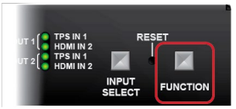
2.3.2. Crosspoint Status LEDs and Input Select Button Functionality

The source signal for the HDMI output ports can be selected by pushing the **Input Select** button. Five pre-programmed crosspoint states can be applied:

No.	Button operation	Crosspoint settings	Crosspoint status LEDs
1.	*1x short press* 	I1 -> O1 I1 -> O2	
2.	*1x short press* 	I1 -> O1 I2 -> O2	
3.	*1x short press* 	I2 -> O1 I1 -> O2	
4.	*1x short press* 	I2 -> O1 I2 -> O2	
5.	*1x short press* 	Autoselect See the details about this feature in the The Autoselect Feature section.	Depends on the current Autoselect mode.

2.3.3. Function Button

The source signal for the Analog audio output port can be selected by pushing the **Function** button as follows:

No.	Button operation	Crosspoint settings
1.	*1x short press* 	I1 -> O3
2.	*1x short press*	I2 -> O3

2.3.4. Port Status LEDs

TPS Input LEDs

PoE		
	off	Remote power receiving (PoE) is inactive.
	on	Remote power receiving (PoE) is active.
TPS LINK		
	off	No TPS link between transmitter and receiver.
	blinking	Device is in low power mode or in Ethernet fallback mode.
	on	TPS link is active.

2.3.5. Ethernet Status LEDs

Amber LED		
	off	Not linked.
	blinking	Linked but there is no activity.
	on	Linked and activity is present.
Green LED		
	off	0 Mbit/s
	on	100 Mbit/s

Signal LED

SIGNAL		
	off	Input or output signal is not present or muted.
	on	Signal is present.

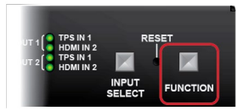
HDCP LED

HDCP		
	off	Output signal is not HDCP-encrypted.
	blinking	Non-HDCP capable device is connected, encrypted signal is replaced with red screen.
	on	Output signal is HDCP-encrypted.

2.4. Special Button Functions

2.4.1. Programable Function Button

1x short press



Action or an operation can be assigned to the **Function** button. "Function button pressed" is a condition that can be selected in the Event Manager. *#function*

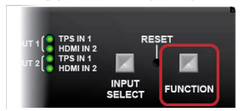
HighlightMe (Default Function)

DIFFERENCE: This feature is available from FW package v1.5.0b3.

This feature is to help finding the desired device in the Device discovery window of Lightware Device Controller software. Press the **Show Me** button for **5 seconds** until the front panel LEDs start to blink slowly, then release the button. In parallel, the device is **highlighted in green for 4 seconds** in the Device discovery window of the LDC, see the Highlighting the Device section. *#highlightme* *#new*

2.4.2. Enable DHCP (Dynamic IP Address) Setting

5s long press + 3x quick press



The device gets a static IP address as a factory default setting. If this setting does not fit the circumstances during install or usage, DHCP can be enabled from the front panel:

Step 1. Make sure the device is powered on and operational.

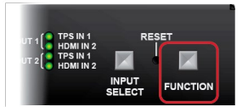
Step 2. Press and keep pressing the **Function** button for 5 seconds.

Step 3. After 5 seconds the front panel LEDs start blinking; release the button and press it 3 times again quickly (within 3 seconds).

Step 4. The LEDs get dark, DHCP gets enabled. *#dhcp*

2.4.3. Reset to Factory Default Settings

10s long press + 3x quick press



To restore factory default values, do the following steps:

Step 1. Make sure the device is powered on and operational.

Step 2. Press and keep pressing the **Function** button for 10 seconds. After 5 seconds the front panel LEDs start blinking, but keep on pressing the button.

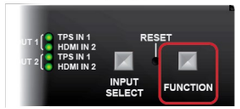
Step 3. After 10 seconds the blinking gets faster; release the button and press it 3 times again quickly (within 3 seconds).

Step 4. The LEDs get dark, the device restores the factory default settings and reboots.

Factory default settings are listed in the Factory Default Settings section. *#factory*

2.4.4. Entering Bootload Mode

Long press + plug power cord



It may happen that the firmware update process is not successful as the device cannot be switched to bootload mode automatically. In this case, the receiver device can be forced to switch to bootload mode as follows:

Step 1. Make sure the receiver is powered off.

Step 2. Press and keep pressing the **Function** button.

Step 3. Power on the receiver. If the device is switched to bootload mode, the LIVE LED is blinking quickly (less than 500 ms duty cycle). The other LEDs are off. *#bootload*

3

Installation

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

- Mounting Options **19**
- Electrical Connections **19**
- Connecting Steps **22**

3.1. Mounting Options

To mount the receiver, Lightware supplies optional accessories for different usages. There are two kinds of mounting kits with a similar fixing method. The receiver has two mounting holes with inner thread on the bottom side; see the bottom view in the Mechanical Drawings section. Fasten the device by the screws enclosed to the accessory:

Under-desk double mounting kit

1U high rack shelf

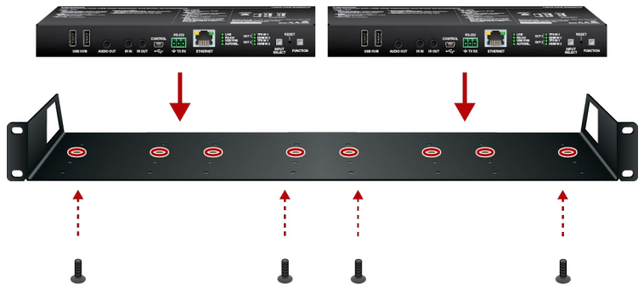
The Under-desk double mounting kit makes it easy to mount a single device on any flat surface, e.g. furniture. The 1U high rack shelf provides mounting holes for fastening two half-rack or four quarter-rack sized units. Pocket-sized devices can also be fastened to the shelf. To order mounting accessories, please contact sales@lightware.com.

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

INFO: The receiver is half-rack sized.

3.1.1. 1U High Rack Shelf

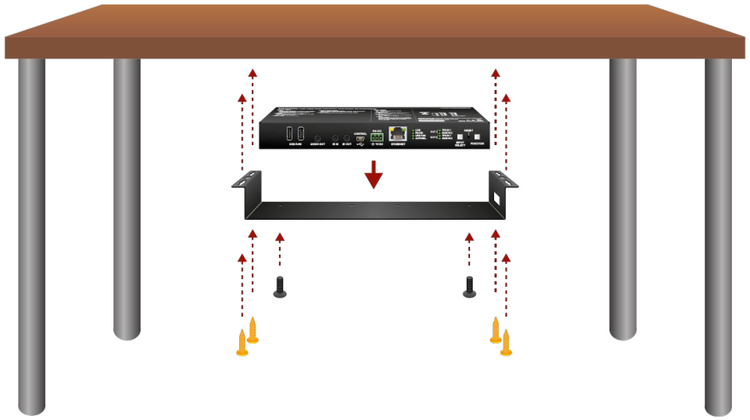
Allows rack mounting for half-rack, quarter-rack and pocket sized units.



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

3.1.2. Under-desk Double Mounting Kit

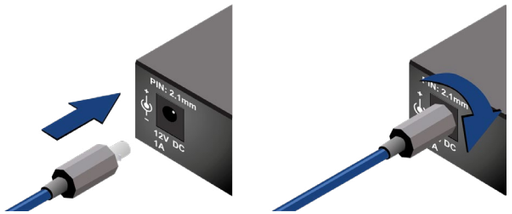
The UD-kit double makes it easy to mount a single receiver on any flat surface (e.g. furniture).



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

3.2. Electrical Connections

3.2.1. DC 12V Connection



Locking DC connector

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

WARNING! Always use the supplied 12V power adaptor. Warranty void if damage occurs due to use of a different power source.

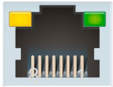
3.2.2. HDMI Connector

The extender provides standard 19 pole HDMI connectors for input and output. The connectors support HDMI 1.4 standard of up to 4K30 resolution. Always use high quality HDMI cables for connecting sources and displays.

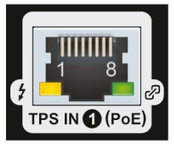
You can find more information about video functions in the Video Interface section.

3.2.3. Ethernet Connector (TPS and LAN Ports)

The extender provides standard RJ45 connectors for TPS IN 1 and LAN ports. Always use high quality Ethernet cables for connecting transmitters and receivers. Maximum CATx cable distances can be found in the Maximum Extension Distances section.



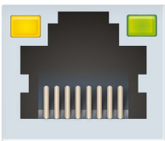
RJ45 connector for LAN port



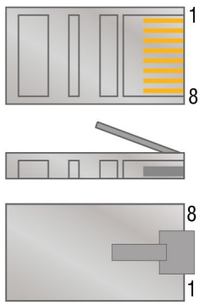
RJ45 connector for TPS input port

Wiring of TPS and LAN Cables

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



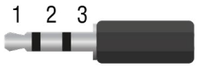
Pin	TIA/EIA T568A	TIA/EIA T568B
1	white/green	white/orange
2	green	orange
3	white/orange	white/green
4	blue	blue
5	white/blue	white/blue
6	orange	green
7	white/brown	white/brown
8	brown	brown



You can find more information about the TPS interface in the TPS Interface section.

3.2.4. Analog Audio Output

The connector is used for receiving unbalanced analog audio signal. It is also known as (3.5 mm or approx. 1/8”) audio jack, phone jack, phone plug and mini-jack plug.



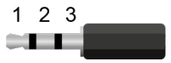
Pin nr.	Signal
1	Left
2	Right
3	Ground

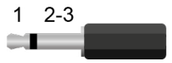
Jack audio plug pin assignments

You can find more information about audio functions in the Audio Interface section.

3.2.5. IR Connector

IR detector and IR emitter can be connected to the receiver with TRS (Tip, Ring, and Sleeve) connectors. They are also known as (3,5 mm or approx. 1/8”) audio jack, phone jack, phone plug, and mini-jack plug. The pin assignments are the following for the detector and the emitter:





Detector – 3-pole TRS		Emitter – 2-pole TS	
1 Tip	Signal (active low)	1 Tip	+5V
2 Ring	GND	2 Ring	Signal (active low)
3 Sleeve	+5V	3 Sleeve	

INFO: The ring pole of the emitter is optional. If your IR emitter has a three-pole TRS plug, then the Ring and the Sleeve are the same signal (Output -).

You can find more information about the Infrared interface in the IR Interface section.

3.2.6. USB-A Connector

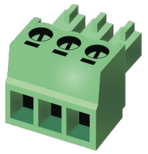
The extender provides USB connectors for supporting KVM functionality. The device has 2x USB 2.0 A-type connectors.

You can find more information about the USB KVM function in the USB KVM Function section.

3.2.7. RS-232 Connector

The receiver contains a 3-pole Phoenix connector, which is used for RS-232 serial connection.

Pin nr.	Signal
1	Ground
2	TX data
3	RX data



RS-232 connector pin assignments

Compatible Plug Type

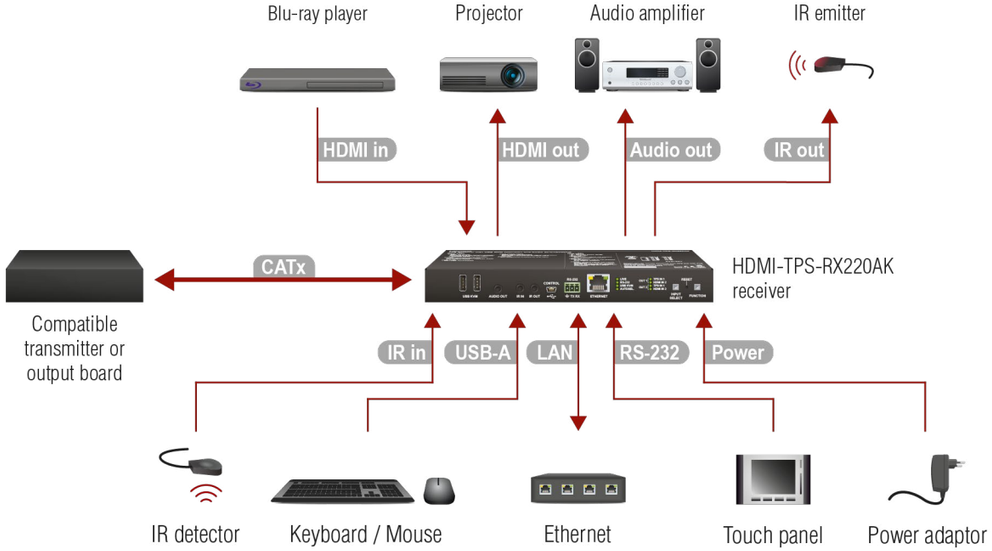
Phoenix® Combicon series (3.5mm pitch, 3-pole), type: MC 1.5/3-ST-3.5.

You can find more information about the RS-232 interface in the Serial Interface section and about the cable wiring in the Cable Wiring Guide section.

3.2.8. USB-mini Connector

The extender provides a standard USB 2.0 mini B-type connector for software control purpose.

3.3. Connecting Steps



CATx Connect the compatible transmitter or the matrix output board and the receiver unit by a CATx cable via the TPS connectors.

HDMI in Connect the receiver and the HDMI source device (e.g. Blu-ray player) by a HDMI cable via the HDMI input port.

HDMI out Connect the sink devices (e.g. projector) to the HDMI output 1 and 2 ports by HDMI cables.

Audio out Optionally connect an audio device (e.g. an audio amplifier) to the audio output port.

USB-A Optionally for USB HID extension: connect the USB HID devices to the receiver (preferably mouse and keyboard).

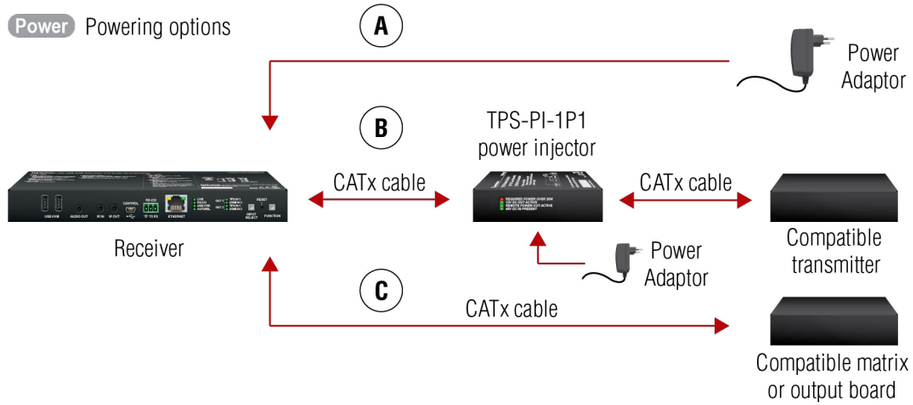
IR in **IR out** Optionally for Infrared extension:
- Connect the IR emitter to the IR OUT port of the receiver.
- Connect the IR detector to the IR IN port of the receiver.

RS-232 Optionally for RS-232 extension: connect a controller/controlled device (e.g. touch panel) to the RS-232 port. See the wiring guide for the Phoenix 3-pole connector in the Cable Wiring Guide section.

LAN Optionally connect the receiver to a LAN network in order to control the device.

Power See powering options on the next section.

Powering Options



A **Using local PSU** - connect the 12V power adaptor to the DC input on the receiver first, then to the AC power socket.

B **Using PoE with connecting a transmitter**: connect the TPS IN (PoE) port of the receiver to the TPS+PoE output port of the TPS-PI-1P1 power injector by a CATx cable, as well as connect the TPS output port of the transmitter to the TPS port of the TPS-PI-1P1 by a CATx cable.

C **Using PoE with connecting a matrix or an output board**: connect the TPS IN (PoE) port of the receiver to the PoE-compatible TPS output port of the matrix or output board by a CATx cable.

ATTENTION: In case of connecting the receiver to an output board of the matrix, always connect an external PSU to the board. For the detailed information, please read the user manual of the matrix.

ATTENTION: The Ethernet port does not support PoE. Only the TPS port supports PoE function.

INFO: If both remote and local power sources are connected, the remote power will be used.

4

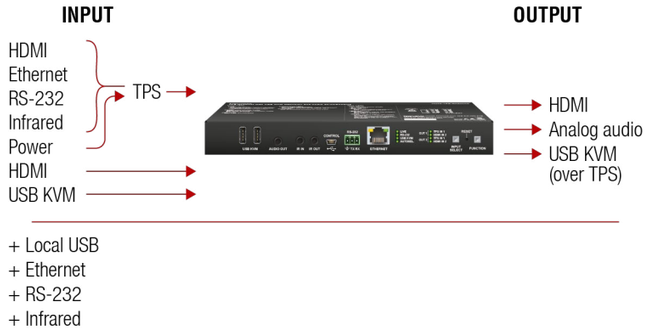
Device Concept

The following chapter describes the features of the device with a few real-life examples. The topics that are described:

- Overview 24
- TPS Interface 24
- Video Interface 24
- Audio Interface 25
- USB KVM Function 26
- Control Features 26
- Ethernet Interface 29
- Batch Commands 30
- Basic IT Security 30
- Bulk Device Management 31
- The Event Manager Feature 31
- Further Built-in Features 32
- Software Control Modes 32

4.1. Overview

The HDMI-TPS-RX220AK is a multifunctional TPS receiver with audio de-embedding function and USB KVM feature. The device receives audio/video, Ethernet, RS-232 and Infrared signals via the TPS input port and can be powered by another extender due to the PoE-capability. The receiver can be controlled via USB, Ethernet, RS-232 or Infrared, and is able to control third-party devices via the RS-232, Ethernet, Infrared and USB KVM.



Signal overview of HDMI-TPS-RX220AK receiver

4.2. TPS Interface

The device is built with TPS (Twisted Pair Single) interface, which is using HDBaseT™ technology. It means the unit receives **video, audio, Ethernet, RS-232 and Infrared signals** via a single CATx cable.

TPS Interface Working Modes

The TPS working mode between the transmitter and the receiver is determined by the mode set in them. Both devices' TPS mode settings together determine the finally established TPS transmission mode.

The following TPS modes are defined in the receiver:

- **Auto**: The TPS mode is determined automatically.
- **HDBaseT**: Ideal for high resolution signals of up to 4K.
- **Long reach**: Ideal for big distances, up to 1080p@60Hz with extended cable lengths.
- **LPPF1***: Only RS-232 communication is transmitted (@ 9600 baud).
- **LPPF2***: Only RS-232 (@ 9600 baud) and Ethernet communication are transmitted.

* LPPF: Low Power Partial Functionality.

		Selected mode on RX side				
		LPPF1	**LPPF2**	**HDBaseT**	**Long reach**	**Auto**
Selected mode on TX side	**LPPF1**	LPPF1	LPPF1	LPPF1	LPPF1	LPPF1
	LPPF2	LPPF1	LPPF2	LPPF2	LPPF2	LPPF2
	HDBaseT	LPPF1	LPPF2	HDBaseT	Long reach	HDBaseT
	Long reach	LPPF1	LPPF2	Long reach	Long reach	Long reach
	Auto	LPPF1	LPPF2	HDBaseT	Long reach	HDBaseT **

** If there is valid HDMI/DVI signal on the TX side, the TPS mode will be HDBaseT on both side. If the transmitter does not transmit HDMI/DVI signal, the TPS mode will automatically be changed to LPPF2 or LPPF1. Long reach mode is not available when both sides are set to Auto mode.

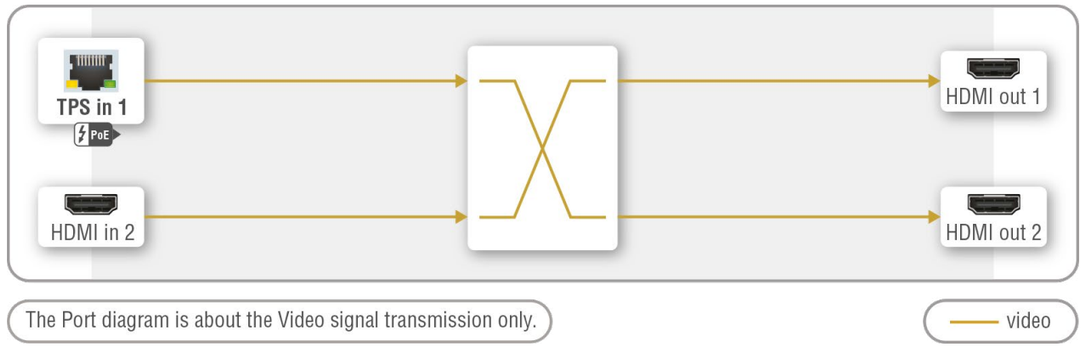
When using automatic operation mode selection, the device determines the mode of operation. If both halves are set to Auto mode, the source side is the initiator. It will negotiate each state transition with its sink side partner.

When one of the devices is configured to manual operation mode selection, the other device may be placed in automatic mode. In this case, the mode transition negotiation is initiated by the host-managed device and the auto-mode device follows through. The allowed cable lengths and resolutions are listed in the Maximum Extension Distances section.

4.3. Video Interface

4.3.1. Port Diagram

The following figure describes the video port diagram of the device:



Video port diagram of the device

The device can receive two HDMI or DVI signals of up to 4K30 (4096x2160@30Hz) resolution. The streams can be routed to any HDMI output ports over the 2x2 digital video crosspoint. The HDMI outputs can transmit HDMI or DVI signals of up to 4K UHD 30 Hz (3840x2160@30Hz) resolution.

Crosspoint Settings

The crosspoint can be set using four different methods:

- Using **Input Select button** on the front panel; see the details in the Crosspoint Status LEDs and Input Select Button Functionality section.
- Using the **Lightware Device Controller (LDC)** software; see the details in the Crosspoint Menu section.
- Using **LW2 protocol command**; see the details in the Crosspoint and Port Settings section.
- Using **LW3 protocol command**; see the details in the Video Port Settings section.

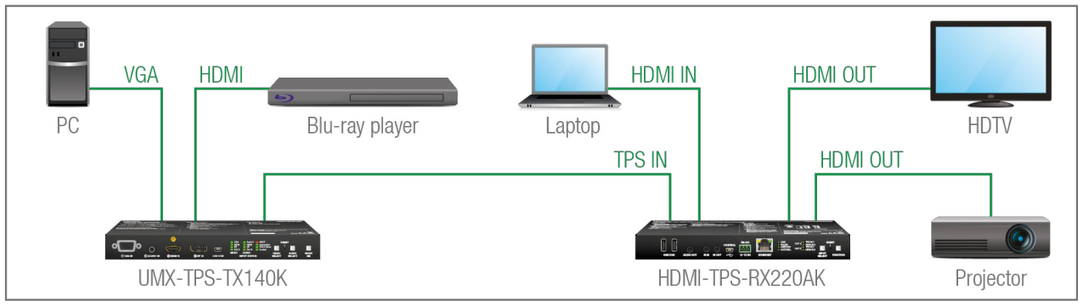
4.3.2. The Autoselect Feature

Beside manually selecting the crosspoints you can choose the Autoselect option both in case of audio and video ports.

There are three types of Autoselect as follows:

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

4.3.3. Video Transmission - Example



The Concept

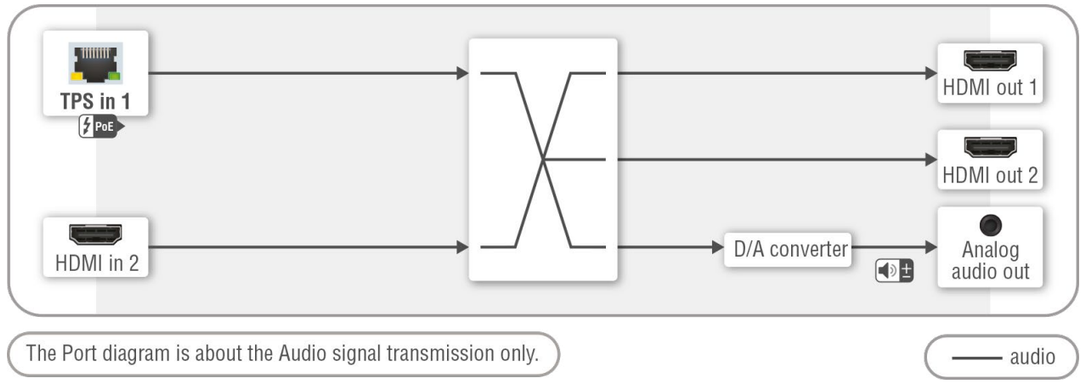
The UMX-TPS-TX140K transmitter device has two video sources: a PC that sends analog video signal over VGA and a Blu-ray player that sends digital video signals over HDMI. The transmitter transmits one of the video signals over the TPS interface to the receiver. The transmitted signal is always converted to digital HDMI with embedded audio signal.

The HDMI-TPS-RX220AK receiver has two source devices: the transmitter over TPS and a laptop over HDMI. The two video signals can be routed to any sink device that is connected to the device: the HDTV and the projector.

4.4. Audio Interface

4.4.1. Port Diagram

The following figure describes the audio port diagram of the device:

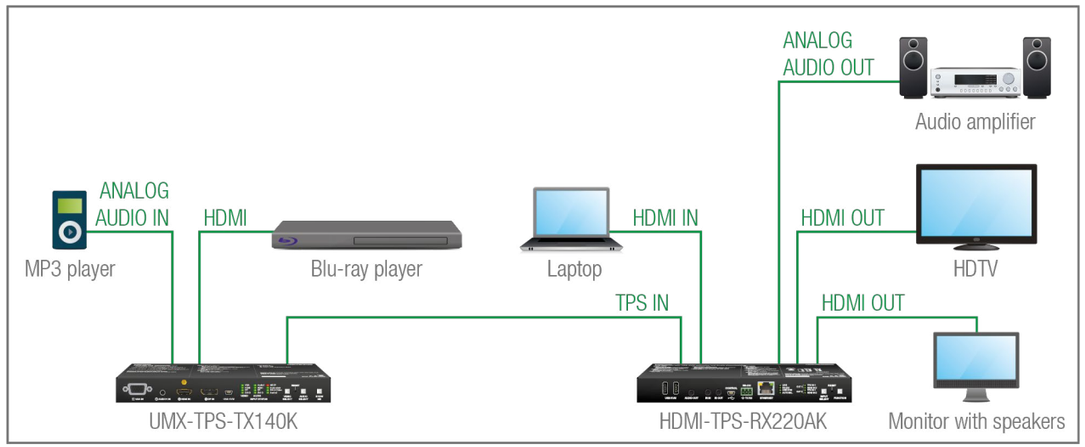


Audio port diagram of the device

The device can receive two digitial audio signals from the TPS and HDMI input ports. The signals are routed to a 2x3 digital audio crosspoint and can be transmitted to three outputs: the HDMI out 1 and 2 ports and the analog audio output.

The audio stream of both HDMI input signals can be de-embedded and can be routed to the analog audio output after a digital/analog conversion.

4.4.2. Audio Transmission - Example



The Concept

The UMX-TPS-TX140K transmitter device has two audio sources: an MP3 player with analog audio signal and a Blu-ray player with embedded HDMI audio. Any of these signals (one at a time) can be transmitted to the receiver over the TPS interface.

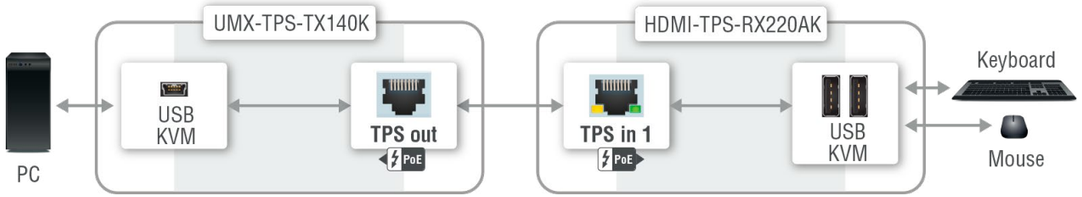
The HDMI-TPS-RX220AK receiver has two audio sources: the transmitter over the TPS interface and the laptop over HDMI. The receiver can transmit both audio signals to any of the three outputs: two HDMI outputs and the analog audio output.

4.5. USB KVM Function

ATTENTION: The USB KVM extension works with the **UMX-TPS-TX140K** transmitter model only.

4.5.1. Port Diagram

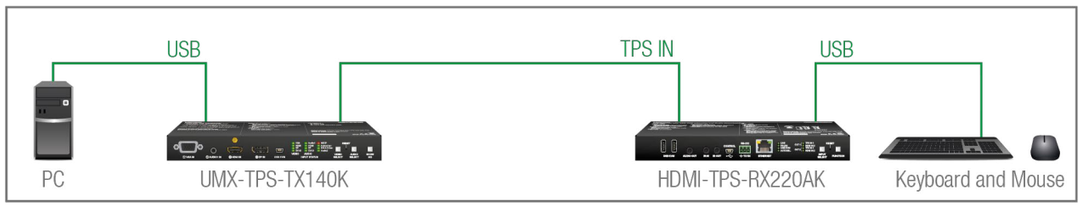
The following figure describes the port diagram of the USB KVM feature:



USB KVM port diagram of the receiver and the transmitter

The controller devices (e.g. keyboard, mouse) are connected to the HDMI-TPS-RX220AK receiver. The USB signals are transmitted to the transmitter over the TPS interface. The controlled device (e.g. PC) is connected to the UMX-TPS-TX140K transmitter.

4.5.2. USB KVM Extension - Example



The Concept

The HDMI-TPS-RX220AK device transmits the USB control signals of the keyboard and the mouse to the UMX-TPS-TX140K transmitter over the TPS interface. Thereby the PC can be controlled by the USB HID devices from a distance of up to 150 m.

4.6. Control Features

The HDMI-TPS-RX220AK receiver has several control functions. This section presents the possibilities of the different control interfaces, e.g. RS-232, Infrared, Ethernet, CEC and USB.

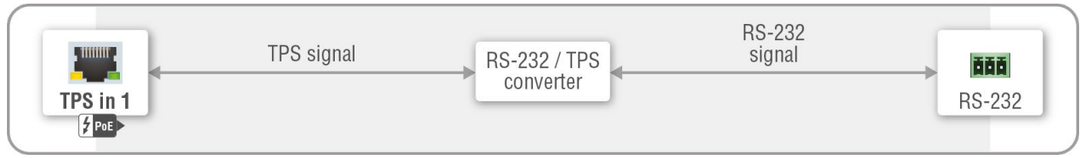
4.6.1. Serial Interface

Technical Background

Serial data communication can be established via the local RS-232 port (Phoenix connector) or via the TPS lines. The RS -232 ports – which are connected to the CPU – can be configured separately (e.g. if the Baud rates are different, the CPU does the conversion automatically between the ports). The RS-232 port can be switched to **Pass-through mode**, **Control mode**, or **Command Injection mode**; see the figure below.

ATTENTION: Only one mode can be used at the same time: Control mode, Pass-through mode, or Command Injection mode. If you choose one of them, the TPS serial link and local RS-232 port will operate in the same mode.

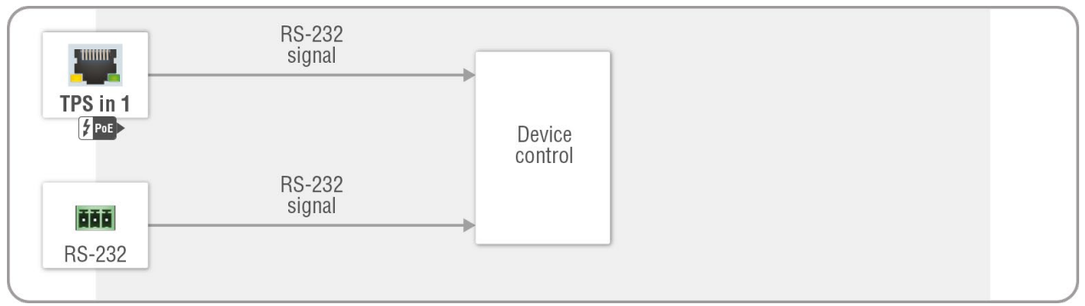
Pass-through Mode



Block diagram of the serial interface in pass-through mode

In pass-through mode, the given device forwards the data that is coming from one of its ports to another same type of port. The command is not processed by the CPU. Incoming serial data is forwarded from the TPS input port to the local RS-232 port and vice versa inside the receiver.

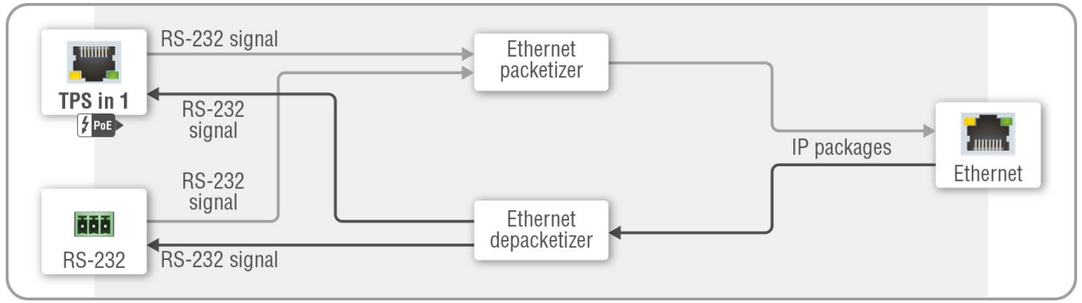
Control Mode



Block diagram of the serial interface in control mode

The incoming data from the given port is processed and interpreted by the CPU. The mode allows to control the receiver directly. LW2 or LW3 protocol commands are accepted – depending on the current port setting.

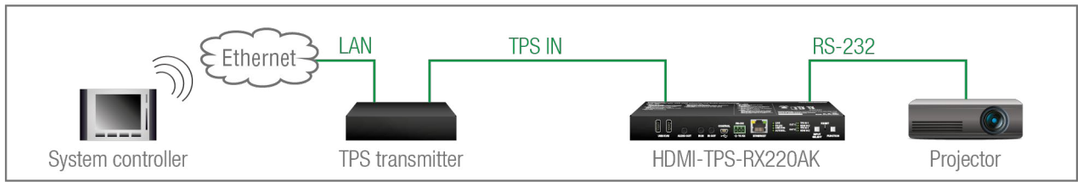
Command Injection Mode



Block diagram of the serial interface in command injection mode

In this mode, the receiver works as an RS-232 bidirectional converter. The TPS signal is converted to RS-232 data and vice versa. TCP/IP port numbers are defined for the serial ports (TPS and local) for this purpose. E.g. the default Command Injection port number of the local RS -232 port is 8001. If a command is coming from the TPS interface that is addressed to the port no. 8001, it will be transmitted to the Tx pin of the local RS-232 port. That works in the opposite direction as well, and the method is the same on the serial interface of the TPS port too.

RS-232 Signal Transmission – Example



The Concept

The System controller can send commands to the receiver through the TPS transmitter and is able to remote control the projector via RS-232.

Settings

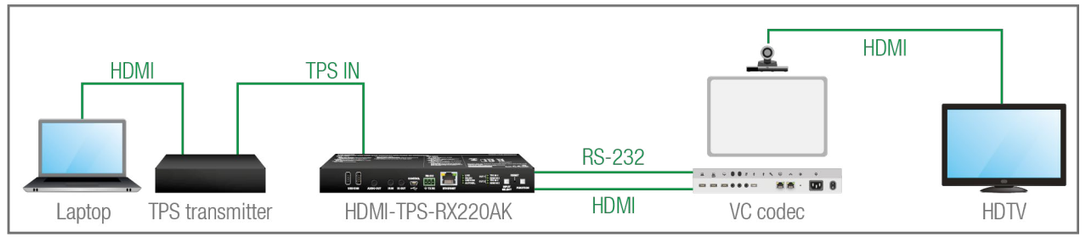
- **System controller**: wireless IP connection to the same Ethernet that the transmitter is connected to. Use a dedicated software tool (e.g. a terminal) that is suitable for sending commands via TCP/IP to a certain IP:port address.
- **Transmitter**: set the RS-232 mode to Command Injection on TPS output port. Set the further parameters (Baud rate, Data bits, etc.) in accordance with the specifications of the projector. The transmitter will transmit the RS-232 data toward the receiver.
- **Receiver**: set the RS-232 mode to Pass-through on RS-232 port.
- **Projector**: note the RS-232 port setting that is specified by the Manufacturer. Connect a suitable serial cable with the proper wiring.

4.6.2. RS-232 Recognizer

RS-232 Recognizer Example

When the **HDMI-TPS-RX220AK** has an active video signal, the receiver logs into the VC codec automatically.

Steps and Settings



Process	Settings
When signal presents on any HDMI input, the extender sends a message: '**ping**'.	This condition and the action is set in Event manager.
↓	
Video codec sends a message: '**Login name:**'.	The serial communication is scanned continuously by the recognizer in the extender and gets the '**Login name**' string.
↓	
When '**Login name:**' is detected in the string, the extender sends a message: '**Admin**'.	This condition and the action is set in Event manager.
↓	
Video codec sends a message: '**Password:**'.	The serial communication is scanned continuously by the recognizer in the extender and gets the '**Password**' string.
↓	
When '**Password:**' is detected in the string, the extender sends a message: '**Admin**'.	This condition and the action is set in Event manager.
↓	
Login is established, Video codec is ready to use.	

First, configure the recognizer for the serial communication, after that, set the events in the Event Manager (for more details, see the Event Manager section). The RS-232 recognizer settings need to be done with the Lightware Device Controller Software (see the Message Recognizer section) or with LW3 protocol commands (see the RS-232 Recognizer section).

Settings in the Event manager

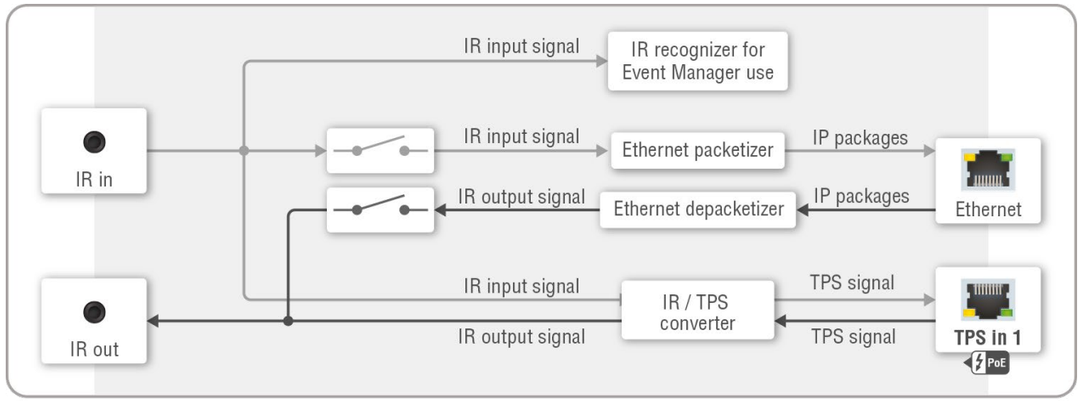
- **E1.** When the signal is present on the O1 port of the HDMI-TPS-RX220AK, it sends a message **'PING'** on P1 port of RS-232 to the VC codec. For more details, see the RS-232 Message Sendingsection.
- **E2**. Set a condition where '**Login name:**' is the recognized RS-232 message. Action is sending serial message ('Admin') on the P1 port to the VC codec.
- **E3**. Set a condition where '**Password:**' is the recognized RS-232 message. Action is sending serial message ('Admin') on the P1 port to the VC codec.

4.6.3. IR Interface

ATTENTION: For the complete usage attach an IR emitter unit to the IR OUT and an IR detector unit to the IR IN connectors.

Technical Background

The Infrared signal transmission is similar to the serial data communication. The receiver contains a dedicated IR I/O connection and also can transmit/receive IR signal via the TPS interface. The signal is in pronto HEX format in both cases.



The Port diagram shows the IR signal transmission only.

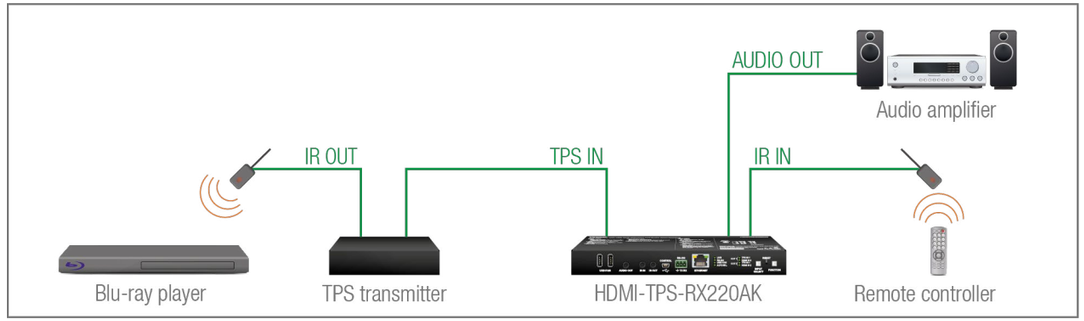
Block diagram of the IR interface

The most trivial usage of the IR interface is the transparent mode: signal received or sent on local IR ports are transmitted directly on the TPS IR link port and vice versa. Besides this there is an IR recognizer in the device to which you can assign actions in Event Manager. The third option is the command injection mode (like at serial interface in the previous section) where you can send IR commands over LAN. Command injection mode can be turned on and off by input/output ports.

INFO: All settings are available in the LDC software, see settings in the Infra section.

INFO: The modulation of output IR signal can be turned off or on by LW3 command, see the Enabling/Disabling Output Signal Modulation section.

IR Signal Transmission - Example



The Concept

An IR detector is attached to the Infrared input port of the Receiver and IR signals are sent by the Remote controller. The Receiver is connected to a compatible Transmitter built with an IR output port via a TPS line. An audio device is also connected to the audio output port of the receiver.

The following ways are available for controlling the devices:

- **Transparent mode**: IR signals are received over the local IR input port of the **Receiver** by the Remote controller. The signals are transmitted further over the TPS line to the **Transmitter**, which can control the **Blu-ray player** via an IR emitter.
- **Event Manager usage**: set an action in Event Manager that if the volume control buttons are pressed on the **Remote controller**, it increases or decreases the volume of the analog audio port of the **Receiver**. In this case you can control the audio device via the Receiver remotely. See the details about the Event Manager settings in the Event Manager section.

Advanced IR Functionality

The HDMI-TPS-RX220AK can send Little-endian pronto hex IR codes on its IR output port.

It is possible in the following ways:

- With the Lightware Device Controller software (for more details, see the Sending pronto hex codes (Little-endian format) section)
- With Event Manager (for more details, see the Sending pronto hex codes (Little-endian format) and Event Manager sections)
- With LW3 protocol commands (for more information, see the Sending Pronto Hex Codes in Little-endian Format via IR Port section)

Sending Bigger-endian pronto hex code is also available, see the Sending Pronto Hex Codes in Big-endian Format via IR Port section.

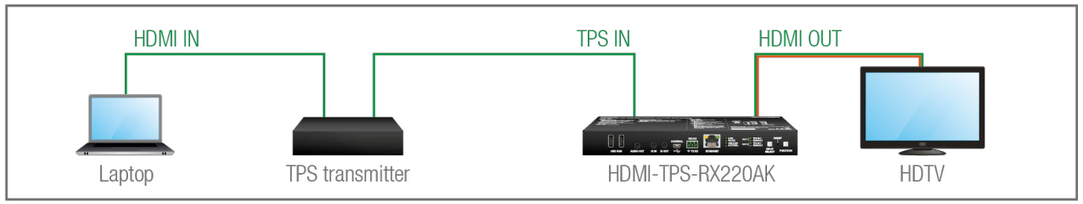
4.6.4. Consumer Electronics Control (CEC) Interface

Consumer Electronics Control (CEC) is a bi-directional communication, defined in the HDMI standard. This feature is for remote control of the source and sink devices in the AV system.

The HDMI-TPS-RX220AK is able to send and receive CEC commands from the input ports towards the source, and from the output ports towards the sink. For more information about sending CEC messages, see the CEC Controller (LDC) and the EDID Management (LW3 protocol commands) sections.

ATTENTION: CEC has a dedicated pin in the HDMI connector. The DVI connector does not contain this pin, so the CEC transmission brakes when a HDMI-DVI connector or adapter is in the signal route.

CEC Application Example



When an active signal is detected on the TPS in, the transmitter automatically sends a CEC message to the HDTV to wake up.

Create an event in the event manager:

- Set as a condition: the signal is present on the output (O1),
- Set as an action: send a CEC command 'Image view on' O1 output port.

See the details about the Event Manager settings in the Event Manager section.

ATTENTION: The CEC command sending over TPS interface is working only with CEC-transparent TPS transmitters. See more details in the CEC Application Notes document.

4.6.5. USB Control Interface

The device can be controlled over the front panel USB mini B-type connector. This interface only supports the LW3 protocol. The interface can be used to establish a connection to Lightware Device Controller software.

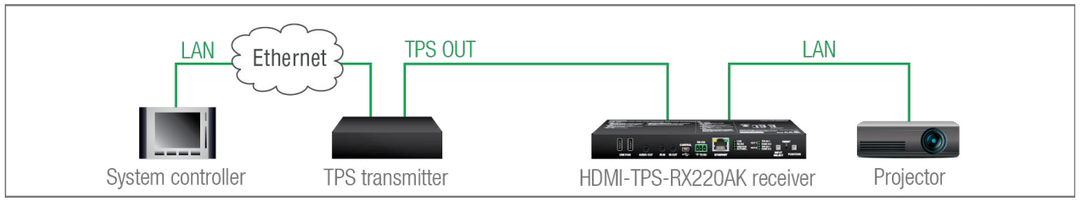
4.7. Ethernet Interface

The device can be controlled over the Ethernet port. This interface supports both LW2 and LW3 protocols.

4.7.1. Device Control over Ethernet

The interface can also be used to remote control a third-party device and establish the connection to the Lightware Device Updater software and perform firmware update.

Third-party Device Control via Local Ethernet (Example)



The following ways are available for device control:

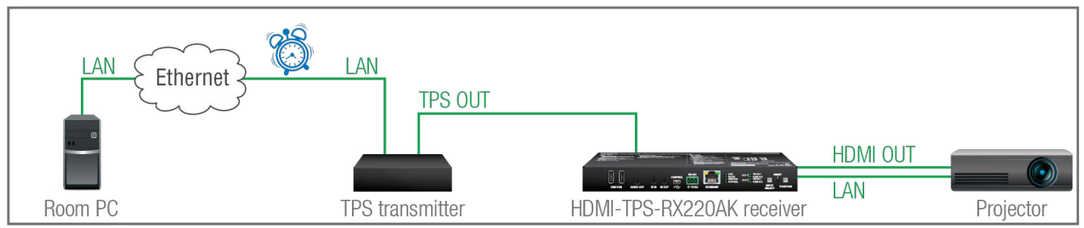
- The **system controller** can communicate with the **transmitter** via Ethernet using LW2/LW3 protocol commands.
- The **system controller** can communicate with the **projector** by its IP:port address.
- The **transmitter** can send commands (e.g. as an action by the Event Manager) to the IP:port address of the **projector** by using LW3 protocol commands. See Event Manager usage in the Event Manager section, and find the related LW3 protocol commands in the Ethernet Message Sending section.

4.7.2. Wake-on-Lan

DIFFERENCE: This feature is available from FW package v1.5.0b3.

The well-known wake-on-lan feature (sending a magic Packet to the target PC) is available. This can be used to power on a computer automatically: just send a simple LW3 command, see the Powering on a Computer over Ethernet (Wake-on-LAN) section. *#new*

INFO: Please make sure the feature is enabled in the target PC and it is powered (but switched off).



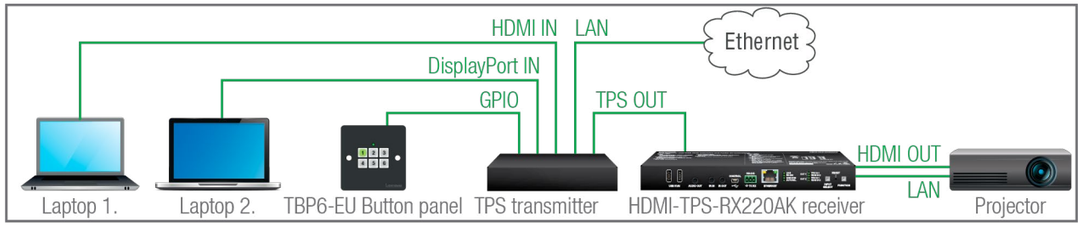
4.7.3. TCP Recognizer

DIFFERENCE: This feature is available from FW package v1.5.0b3.

The feature is almost the same as in case of the RS-232, but for the network interface: the incoming TCP messages can be processed, which may trigger actions. The combination of the TCP recognizer and the Event Manager gives numerous opportunities for creating automatic room solutions. *#tcprecognizer*

TCP Recognizer Example

When the Projector switches off, the button light (1) of the TBP6-EU button panel is turned off automatically.



When the power-off process is started in the projector, it will send a message over Ethernet. That message will be recognized by the **Switcher** and will be used as a Condition in Event Manager. *#new*

How to set up the transmitter?

Step 1. Configure the recognizer for the communication by the LDC, see the TCP Clients (TCP Message Recognizer) section, or by LW3 protocol commands (see the TCP Message Recognizer section). Define the desired device as a TCP client. (The Projector is saved as 'C1' in this example.)

Step 2. Create the following event in the Event manager:
E1. When the `(PWR!001 "On")` message is recognized from the C1 client, the GPIO pin 1 is set to low level.

4.8. Batch Commands

DIFFERENCE: This feature is available from FW package v1.5.0b3.

These features can be used to process a group of pre-defined commands. The commands can be stored in the device as macros or you can save the commands in a plain text file and send them to the device by an HTTP message. *#new*

LW3 over HTTP (Command Salvo)

This feature allows the LW device to be controlled over HTTP. In this case, a batch of commands is sent over HTTP to the Lightware device for processing. Save the LW3 commands into a file, post it to the <IP_address>/protocol.lw3 file and the commands are processed immediately. *#http*

Running Macros

In this case, the command sequences (macros) are stored in the device. You can create your custom macros in a file, upload them into the device and run at any time. The number of the macros depends on the device type, at most 50 macros can be saved in the receiver. See more information about the feature in the Macros section. *#macro*

4.9. Basic IT Security

DIFFERENCE: This feature is available from FW package v1.5.0b3.

These entry-level network security improvements help prevent unauthorized access to the Lightware device: *#new*

- **Cleartext login**
- **IP Port Block**
- **MAC Filtering**

The **Cleartext Login** tool allows setting a password for login, thus the device will not accept any command coming from an interface (RS-232, Ethernet, etc...), only the device type and the serial number can be queried without login. You can set all affected TCP/IP ports individually to enable or disable.

The **IP Port Block** feature is an additional protection for the Cleartext login. There are TCP/IP ports in Lightware devices that are not protected by the login, so you can disable them if necessary. Example: due to the working method of the LW2 communication, the Cleartext login does not provide protection when LW2 command is sent to the device, that is why the TCP port no.10001 shall be blocked manually.

Another level of security is the **MAC Filtering** tool. You can create an 'allowlist' of network devices based on the MAC address that are allowed:

- Controlling the device (Send option), or
- Querying parameters (Receive option) to/from the Lightware device.

The table below shows the protection levels of these features.

IP Port	Function	MAC Filter	Cleartext Login	IP Port Block
80	HTTP Post&Get	✓	-	✓
81	LW3 control (miniweb)	✓	✓	-
6107	LW3 protocol	✓	✓	-
800x	Command injection (RS-232)	✓	-	✓
900x	Command injection (IR)	✓	-	✓
10001	LW2 protocol	✓	-	✓

ATTENTION: Be careful when combining these functions; improper settings may cause malfunction.

Most of these features are available in LDC, see the Settings Menu section.

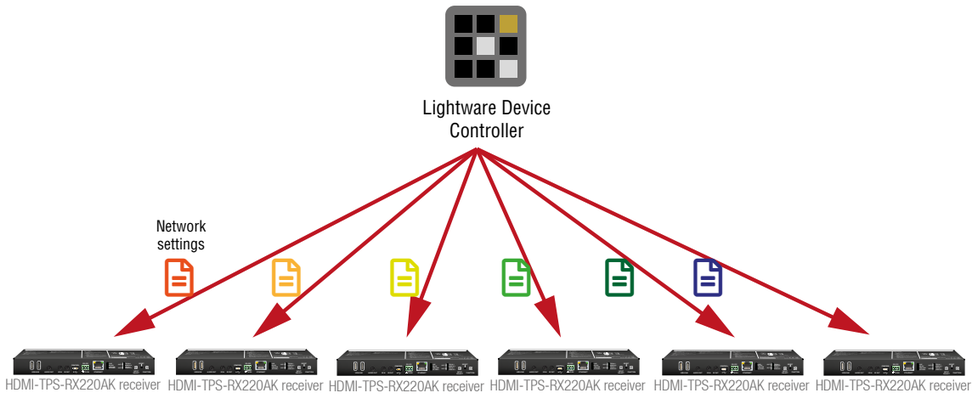
4.10. Bulk Device Management

It is possible to configure several devices at once with the Bulk Device Management tool. This feature can be accessed by clicking on the **Tools** button in the bottom left corner of the Device Discovery window of the LDC and choosing the Bulk Management option. *#new*

See the Bulk Device Management section for more details.

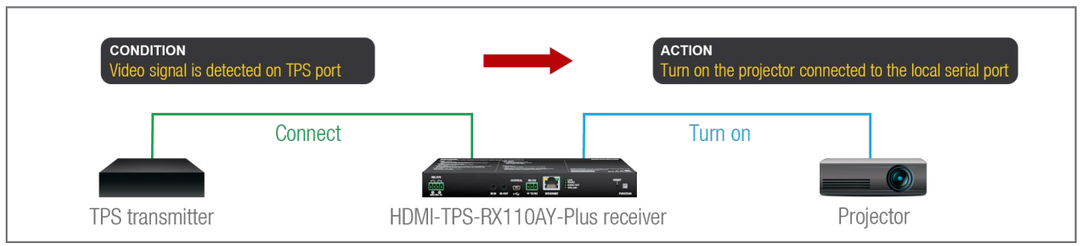
4.10.1. Network Settings

This function makes it possible to change and adjust the network settings of several devices at once (unique settings for each device), without having to set them at each device one by one. A .csv file can be created containing the list and desired settings of the devices and it can be uploaded into the LDC to be applied to the devices quickly.



4.11. The Event Manager Feature

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



Event Manager example

See more information about the settings in the Event Manager section.

Event Manager +

DIFFERENCE: These features are available from FW package v1.5.0b3.

The AND Operator *#new*

The practical experience has shown that there is a need to examine more conditions (up to four) as follows: if one of the set conditions becomes true (while the other conditions are fulfilled), then the set Action is launched. For example, in a meeting room we have the following situation:

- Signal is present on an input port,
- A GPIO pin state becomes 'low' (by an external device).

If the two **Conditions** are present at the same time, the **Action** is launched. Just create the two **Conditions** into separate Events, then create a third Event, select the two **Conditions** and define the **Action**.

See the Combine Links section for the settings in LDC.

Event Manager Variables

A brand new area is opened by implementing the variables. You can create custom variables in number or text format, which can be used in the Event Manager. The variables can have the following properties/ methods:

- Numeric (integer) type with min/max value setting, or string-type (determined automatically)
- Increment/step the numeric value,
- Value-dependent case operations,
- Reading and storing the value of an LW3 property into a string or a numeric variable.

The defined variables are stored in a non-volatile memory and the value is kept in case of a reboot. The new opportunities allow creating a monitoring/controlling system without connecting an additional control processor.

See the Variables section for the settings in LDC.

Condition Trigger

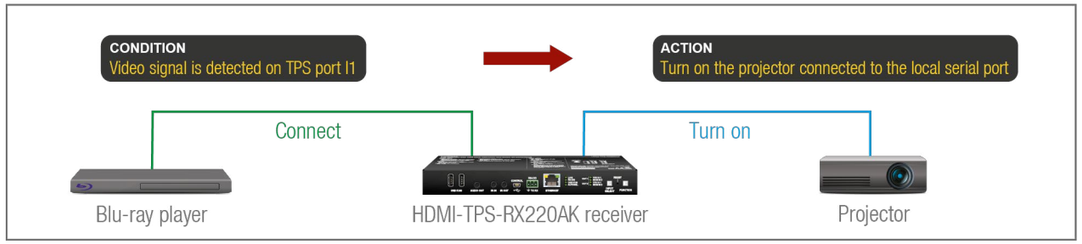
This improvement in the Event Manager works as if a condition is detected. When a complex control system is built, a Condition may trigger numerous Actions. A typical example is when a system is powered on and the 'ready-to-use' state has to be loaded. In this case, there could be many actions that are based on the same condition. In order to reduce the number of the commands, you can trigger one 'key' condition, which could start the whole process.

See the Condition Triggering section for the settings in LDC

4.12. Further Built-in Features

4.12.1. Automatically Launched Actions – The Event Manager

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



Event Manager example

See more information about the settings in the Event Manager section.

4.12.2. Receiver Cloning – Configuration Backup and Restore

The receiver (configuration) cloning of HDMI-TPS-RX220AK is a simple method that eliminates the need to repeatedly configure certain devices to have identical (non-factory) settings. If the devices are installed in the same type of system multiple times, then it is enough to set up only one device to fit the user's needs and then copy those settings to the others, thus saving time and resources.

See more information about the settings in the Configuration Cloning (Backup Tab) section.

4.12.3. Remote Firmware Update of Connected Lightware Devices

The firmware of the Lightware TPS devices can be updated individually by the Lightware Device Updater V2 (LDU2) software. HDMI-TPS-RX220AK contains a feature that allows having a faster and more comfortable firmware update process. When the firmware of the connected extenders has to be updated, the TPS connection is necessary towards the extenders – nothing else. The LDU2 will find the connected devices and update them.

4.13. Software Control Modes

The user has more possibilities to control the device besides the front panel buttons. The following list contains the software control modes:

- **Lightware Device Controller (LDC)**: you can connect to the device via our control software using USB, RS-232 or Ethernet interfaces and control or configure the device as you wish. For the details, see the Software Control - Lightware Device Controller chapter.
- **LW2 protocol commands**: you can configure the device by using the reduced command set of LW2 protocol. For more details, see the LW2 Programmer's Reference chapter.
- **LW3 protocol commands**: you can configure the device by using the full-range command set of LW3 protocol. For more details, see the LW3 Programmer's Reference chapter.

5

Software Control - Lightware Device Controller

The device can be controlled by a computer through RS-232, Ethernet, and USB interfaces by the Lightware Device Controller (LDC). The software can be installed on a Windows PC or macOS. The application and the User Manual can be downloaded from www.lightware.com.

- Install and Update **34**
- Running the LDC **34**
- Establishing the Connection **35**
- Bulk Device Management **37**
- Crosspoint Menu **38**
- Port Properties Windows **39**
- Diagnostic Tools **43**
- EDID Menu **45**
- Control Menu **47**
- Event Manager **56**
- Settings Menu **60**
- The Miniweb Room Control **63**
- Configuration Cloning (Backup Tab) **65**
- Advanced View Window **67**

5.1. Install and Update

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

Minimum System Requirement

RAM: 1 GB

Minimum display resolution: 1280x720

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 updateable instance can exist for all users	More than one different version can be installed for all users

Comparison of installation types

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

Installation for 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.

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.

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 the LDC found updates.

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

The **Update** window can also be opened by clicking on the **About** ? **icon** and the **Update** button.

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

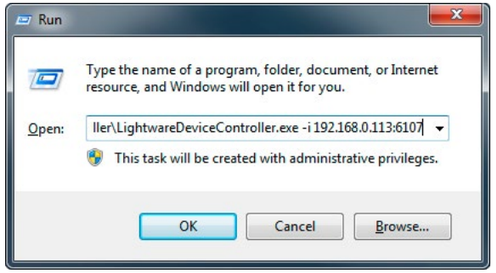
- If you do not want to check for updates automatically, uncheck **the circle** that contains the green tick.
- If you want to postpone the update, a reminder can be set with different delays from the **drop down list**.
- If the proxy settings traverse the update process, set the proper values, then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

5.2. 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: 10001 (LW2 protocol). For LW3, devices use the **6107** port number.

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

Example: `LightwareDeviceController -i 192.168.0.20:6107`

Connecting to a Device via a Serial Port

Format: `LightwareDeviceController -c <COM_port>:<Baud>`

Example: `LightwareDeviceController -c COM1:57600`

The LDC is connected to a device with the indicated COM port directly; the Device Discovery window is not displayed. If no Baud rate is set, the application will detect it automatically.

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

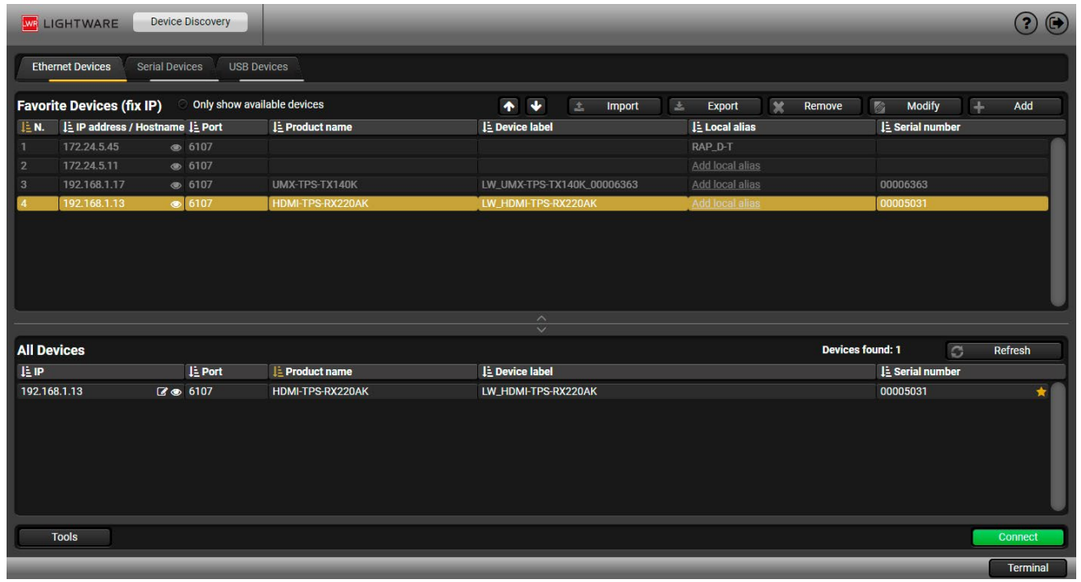
5.3. Establishing the Connection

Connecting Steps

Step 1. Connect the device to a computer via USB, RS-232 or Ethernet.

Step 2. Run the controller software; the device discovery window appears automatically. There are three tabs for the different type of interfaces: Ethernet, Serial, and USB.

Step 3. Select the desired unit and click on the green **Connect** button (or just double-click on the device).



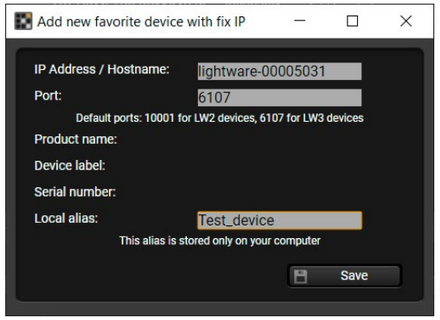
Device discovery window in LDC

5.3.1. Ethernet Tab

The Ethernet tab consists of two lists. The **All devices** list contains all Lightware devices that are available in the connected network (in the 255.255.0.0 subnet). 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 in 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.

Add New Favorite Device



Press the **Add** button; in the appearing window you can enter the **IP address**. The **host name** 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 host name property in the Setting the Host Name 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.

Changing the IP Address

To modify the IP address settings quickly, it is not necessary to enter the device's settings/network menu, you can set them by clicking on the pencil icon beside the IP address.

You can see the new settings only in this window. The device needs a few seconds to apply the new settings.

Identifying the Device

Clicking on the icon results in the blinking of the status LEDs for 10 seconds. The feature helps find the device itself physically.

Highlighting the Device

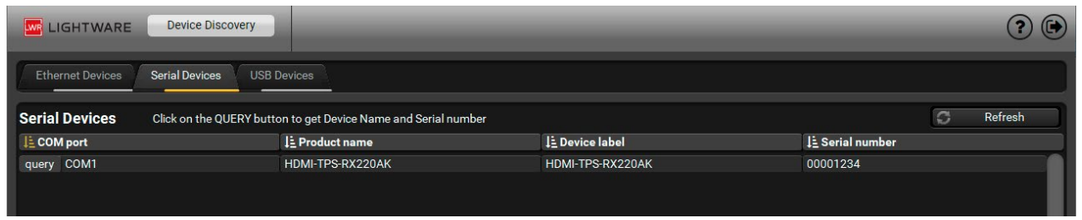
DIFFERENCE: This feature is available from FW package v1.5.0b3.

The opposite feature is also available to help finding the desired device. Press the **Show Me** button for **5 seconds** until the front panel LEDs start to blink slowly. In parallel, the device is **highlighted in green for 4 seconds** in the Device discovery window of the LDC. *#highlightme* *#new*

INFO: "Highlight Me" is the default function of the **Show Me** button. If you assign a different function to the button, the feature above will not be available.

5.3.2. Serial Tab

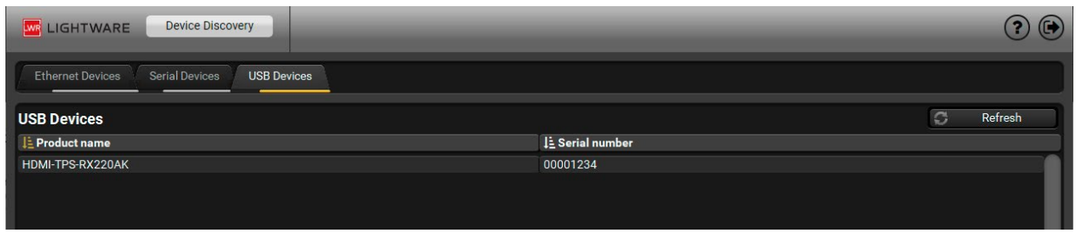
If the device is connected via the RS-232 port, click on the **Query** button next to the desired serial port to display the device's name and serial number. Double-click on the device or select it and click on the green **Connect** button.



ATTENTION: Before the device is connected via the local RS-232 port, make sure that the **Control mode** and **LW3 protocol** are set on the serial port. Furthermore, the RS-232 port must be free and other serial connection must not be established to the device over that port.

5.3.3. USB Tab

Connect the device to a PC/computer over the USB mini-B type connector. Refresh the list and double-click on the device or select it and click on the green **Connect** button.



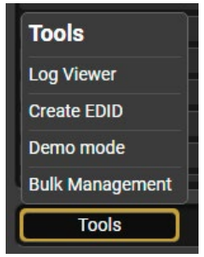
5.3.4. Further Tools

The **Tools** menu contains the following options:

- **Log Viewer:** The tool can be used for reviewing log files that have been saved previously.
- **Create EDID:** This tool opens the Easy EDID Creator wizard, which can be used for creating unique EDIDs in a few simple steps. Functionality is the same as that of the Easy EDID Creator.
- **Demo Mode:** This is a virtual MX-FR17 matrix router with full functionality built into the LDC. Functions and options are the same as that of a real MX-FR17 device.
- **Bulk Management**: This tool allows changing the network settings of several devices at once. See the details in the next section.

The **Terminal** window is also available by pressing its button on the bottom.

5.4. Bulk Device Management



It is possible to configure several devices at once with the Bulk Device Management tool. This feature can be accessed by clicking on the Tools button in the bottom left corner of the Device Discovery window and choosing the Bulk Management option.

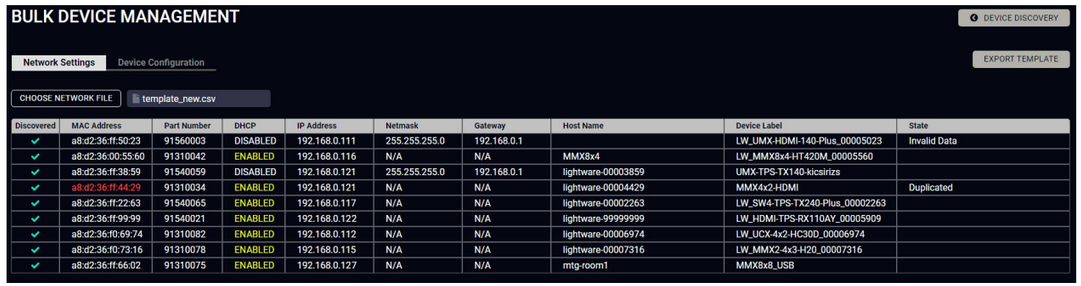
#new

DIFFERENCE: This function is available from the firmware version v2.6.0b6 of the LDC and v1.5.0b3 of the HDMI-TPS-TX220AK devices.

5.4.1. Network Settings

It is possible to set the network settings of several devices at once by using a .csv file that contains the list of the devices that we need to configure, then uploading it into the LDC.

Please note that if the data in the file is missing or incorrect, then the discovery of the affected device will fail and an '**Invalid data**' message will be displayed in the State column. In case of an IP or MAC address conflict, the message is '**Duplicated**'.



Discovered	MAC Address	Part Number	DHCP	IP Address	Netmask	Gateway	Host Name	Device Label	State
✔	a8:d2:36:ff:50:23	91560003	DISABLED	192.168.0.111	255.255.255.0	192.168.0.1		LW_UMX-HDMI-140-Plus_00005023	Invalid Data
✔	a8:d2:36:00:55:60	91310042	ENABLED	192.168.0.116	N/A	N/A	MMX8x4	LW_MMX8x4-HT420M_00005560	
✔	a8:d2:36:ff:38:59	91540059	DISABLED	192.168.0.121	255.255.255.0	192.168.0.1	lightware-00003859	UMX-TPS-TX140-kicsirizs	
✔	a8:d2:36:ff:44:29	91310034	ENABLED	192.168.0.121	N/A	N/A	lightware-00004429	MMX4x2-HDMI	Duplicated
✔	a8:d2:36:ff:22:63	91540065	ENABLED	192.168.0.117	N/A	N/A	lightware-00002263	LW_SW4-TPS-TX240-Plus_00002263	
✔	a8:d2:36:ff:99:99	91540021	ENABLED	192.168.0.122	N/A	N/A	lightware-99999999	LW_HDMI-TPS-RX110AY_00005909	
✔	a8:d2:36:f0:69:74	91310082	ENABLED	192.168.0.112	N/A	N/A	lightware-00006974	LW_UCX-4x2-HC30D_00006974	
✔	a8:d2:36:f0:73:16	91310078	ENABLED	192.168.0.115	N/A	N/A	lightware-00007316	LW_MMX2-4x3-H20_00007316	
✔	a8:d2:36:ff:66:02	91310075	ENABLED	192.168.0.127	N/A	N/A	mtg-room1	MMX8x8_USB	

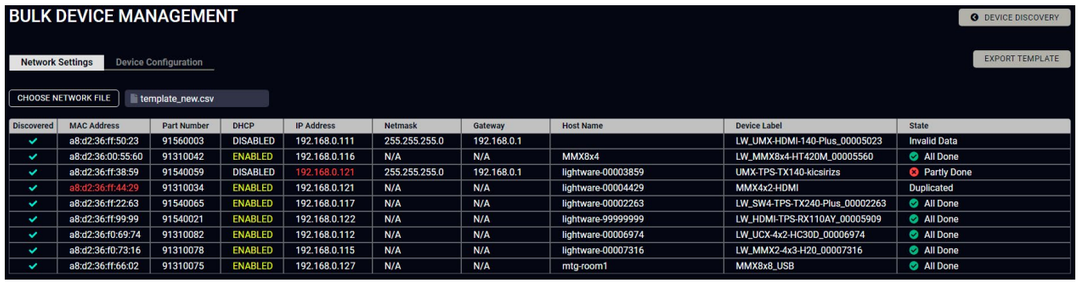
MACADDRESS	PARTNUMBER	DHCP	IP	NETMASK	GATEWAY	HOSTNAME	DEVICELABEL
a8:d2:36:ff:50:23	91560003	DISABLED	192.168.0.111	255.255.255.0	192.168.0.1	lightware-00005023	LW_UMX-HDMI-140-Plus_00005023
a8:d2:36:00:55:60	91310042	ENABLED	192.168.0.116	255.255.255.0	192.168.0.1	MMX8x4	LW_MMX8x4-HT420M_00005560
a8:d2:36:ff:38:59	91540059	DISABLED	192.168.0.121	255.255.255.0	192.168.0.1	lightware-00003859	UMX-TPS-TX140-kicsirizs
a8:d2:36:ff:44:29	91310034	ENABLED	192.168.0.120	255.255.255.0	192.168.0.1	lightware-00004429	MMX4x2-HDMI
a8:d2:36:ff:22:63	91540065	ENABLED	192.168.0.117	255.255.255.0	192.168.0.1	lightware-00002263	LW_SW4-TPS-TX240-Plus_00002263
a8:d2:36:ff:99:99	91540021	ENABLED	192.168.0.122	255.255.255.0	192.168.0.1	lightware-99999999	LW_HDMI-TPS-RX110AY_00005909
a8:d2:36:f0:69:74	91310082	ENABLED	192.168.0.112	255.255.255.0	192.168.0.1	lightware-00006974	LW_UCX-4x2-HC30D_00006974
a8:d2:36:f0:73:16	91310078	ENABLED	192.168.0.115	255.255.255.0	192.168.0.1	lightware-00007316	LW_MMX2-4x3-H20_00007316
a8:d2:36:ff:66:02	91310075	ENABLED	192.168.0.127	255.255.255.0	192.168.0.1	mtg-room1	MMX8x8_USB

Changing the network settings can be done in a few easy steps:

Step 1. First alter the settings you need to change in the .csv file that contains the devices. You can use a template file accessible via the **Export template** button and saving the file to your computer, then filling it out with the parameters of the devices. The file contains the MAC address, Partnumber, DHCP status, IP address, Netmask, Gateway, Hostname and Device label of each device.

Step 2. Upload the .csv file into the LDC by pressing the **Choose network file** button and browsing the file in the pop-up window. This will result in a list of the devices appearing on the screen.

Step 3. Finally, press the **Apply settings** button to execute the changes. This might take up to a minute to finish.



Discovered	MAC Address	Part Number	DHCP	IP Address	Netmask	Gateway	Host Name	Device Label	State
✔	a8:d2:36:ff:50:23	91560003	DISABLED	192.168.0.111	255.255.255.0	192.168.0.1		LW_UMX-HDMI-140-Plus_00005023	Invalid Data
✔	a8:d2:36:00:55:60	91310042	ENABLED	192.168.0.116	N/A	N/A	MMX8x4	LW_MMX8x4-HT420M_00005560	All Done
✔	a8:d2:36:ff:38:59	91540059	DISABLED	192.168.0.121	255.255.255.0	192.168.0.1	lightware-00003859	UMX-TPS-TX140-kicsirizs	Partly Done
✔	a8:d2:36:ff:44:29	91310034	ENABLED	192.168.0.121	N/A	N/A	lightware-00004429	MMX4x2-HDMI	Duplicated
✔	a8:d2:36:ff:22:63	91540065	ENABLED	192.168.0.117	N/A	N/A	lightware-00002263	LW_SW4-TPS-TX240-Plus_00002263	All Done
✔	a8:d2:36:ff:99:99	91540021	ENABLED	192.168.0.122	N/A	N/A	lightware-99999999	LW_HDMI-TPS-RX110AY_00005909	All Done
✔	a8:d2:36:f0:69:74	91310082	ENABLED	192.168.0.112	N/A	N/A	lightware-00006974	LW_UCX-4x2-HC30D_00006974	All Done
✔	a8:d2:36:f0:73:16	91310078	ENABLED	192.168.0.115	N/A	N/A	lightware-00007316	LW_MMX2-4x3-H20_00007316	All Done
✔	a8:d2:36:ff:66:02	91310075	ENABLED	192.168.0.127	N/A	N/A	mtg-room1	MMX8x8_USB	All Done

Message	DHCP enabled	DHCP disabled	Device discovered
All Done	Successful procedure		✔
Partly Done	Failure setting the Host name and/or the Device label		✘
Unavailable device	Host name **and** Device label missing	IP address, Network, **and/or** Gateway missing	✘
Failed	Host name **and** Device label incorrect	IP address, Network **and** Gateway incorrect	✔
IP mismatch	-	Host name **and** Device label incorrect	✘

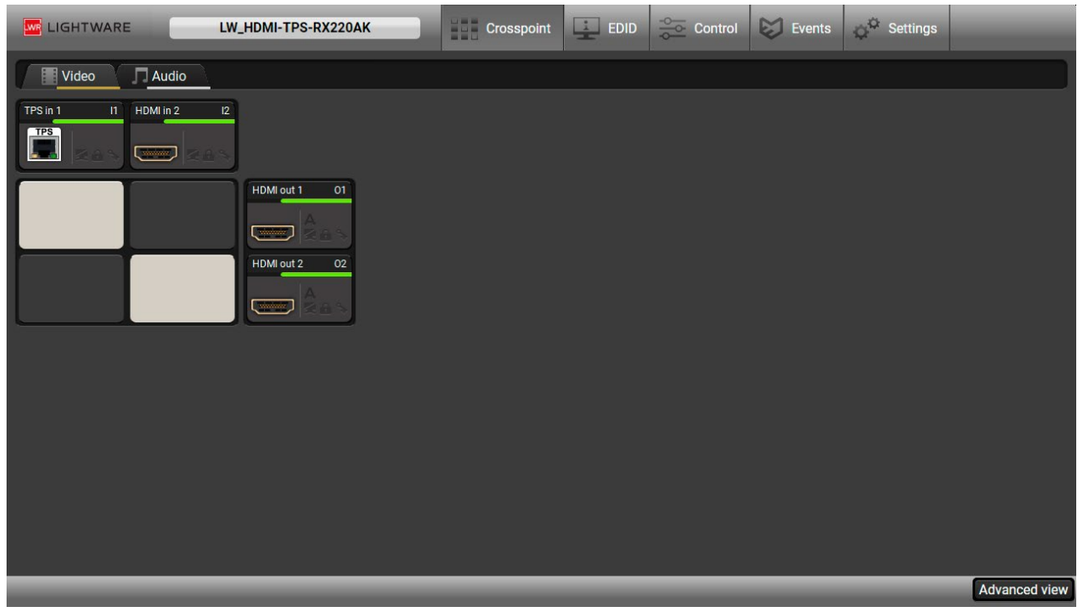
ATTENTION: The '**Failed**' and '**IP mismatch**' status indicators are not common, they appear when the multicast and/or the port used for LMDMP connection is disabled, or if the firmware version of the device is below the recommended (see the pop-up window when opening the Bulk Management or the beginning of this chapter).

5.5. Crosspoint Menu

The receiver is built with a 2x2 video crosspoint and a 2x3 audio crosspoint, which can be controlled in this menu. The section is about the available video and audio crosspoint settings. #crosspoint #switch

TIPS AND TRICKS: Hover the mouse cursor above the information ribbon; the product name and the IP address of the device will appear as a tooltip text.

5.5.1. Video Layer

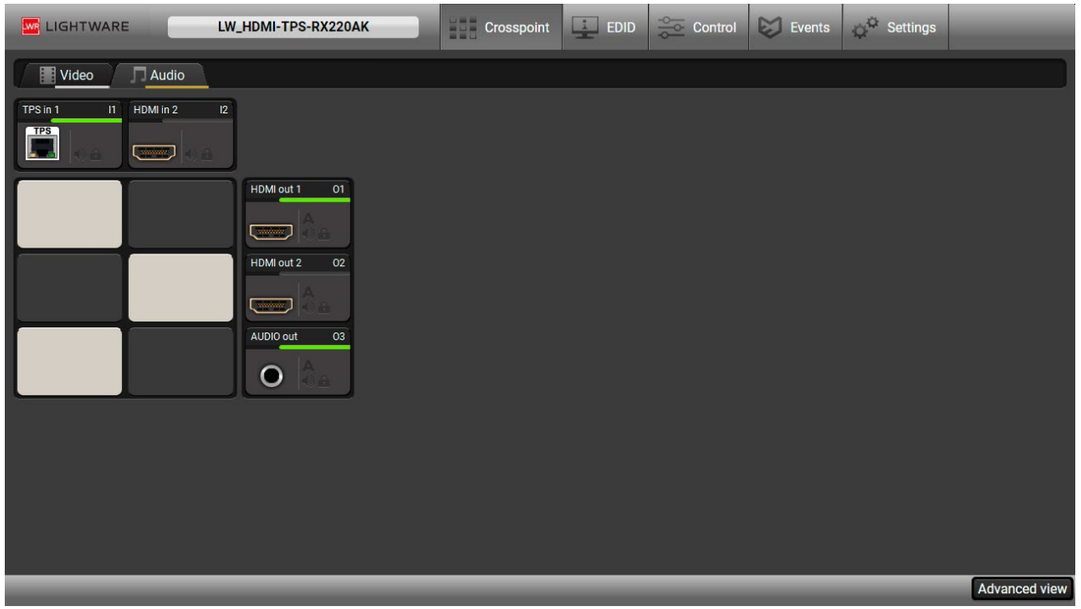


Crosspoint menu - Video layer

The two video input ports (**TPS in 1** and **HDMI in 2**) are the horizontal tiles and the two video output ports (**HDMI out 1** and **2**) are the vertical tiles. The **light grey tiles** mean the active crosspoint setting in the crosspoint area.

See the details about the video input ports in the Video - TPS In 1 and the Video - HDMI In 2 sections, and about the video output ports in the Video - HDMI Out 1 and 2 section.

5.5.2. Audio Layer



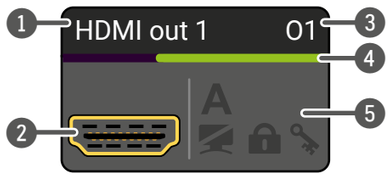
Crosspoint menu - Audio layer

The two audio input ports (**TPS in 1** and **HDMI in 2**) are the horizontal tiles and the three audio output ports (**HDMI out 1**, **HDMI out 2** and **Analog out**) are the vertical tiles. The **light grey tiles** mean the active crosspoint setting in the crosspoint area.

See the details about the input audio ports in the Audio - TPS In 1 and HDMI In 2 section, and about the audio output ports in the Audio - HDMI out 1 and 2 and the Audio - Analog Audio Out sections.

5.5.3. Port Tiles

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



1. Port name
2. Port icon
3. Port number
4. Signal present indicator
   green: present
   grey: not present
5. State indicators

State Indicators

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

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

5.6. Port Properties Windows

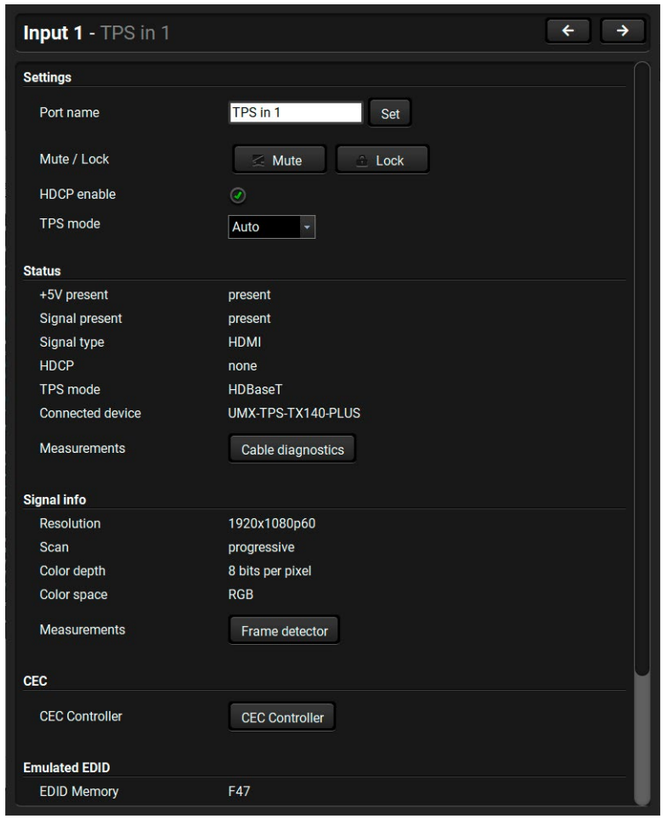
Clicking on a port tile opens the port properties in a pop-up window. This section is about the available audio and video related port information, settings and parameters. *#portstatus #hdcp #mute #unmute #lock #unlock #signaltype #tpsmode*

5.6.1. Video - TPS In 1

This is the TPS (HDBaseT™) video input signal of the receiver. Clicking on the port icon opens the settings panel in a pop-up window. You can check the status of the line, signal info and current emulated EDID.

Available Settings and Information:

- Port name: a unique name can be set for the port.
- **Mute/Unmute** port;
- **Lock/Unlock** the port;
- **HDCP setting** (enable / disable);
- **TPS mode** (see details in the TPS Interface section);
- Port status information;
- Signal information;
- Cable Diagnostics;
- Frame Detector;
- CEC Controller;
- Emulated EDID information;
- Reloading Factory Default Settings.

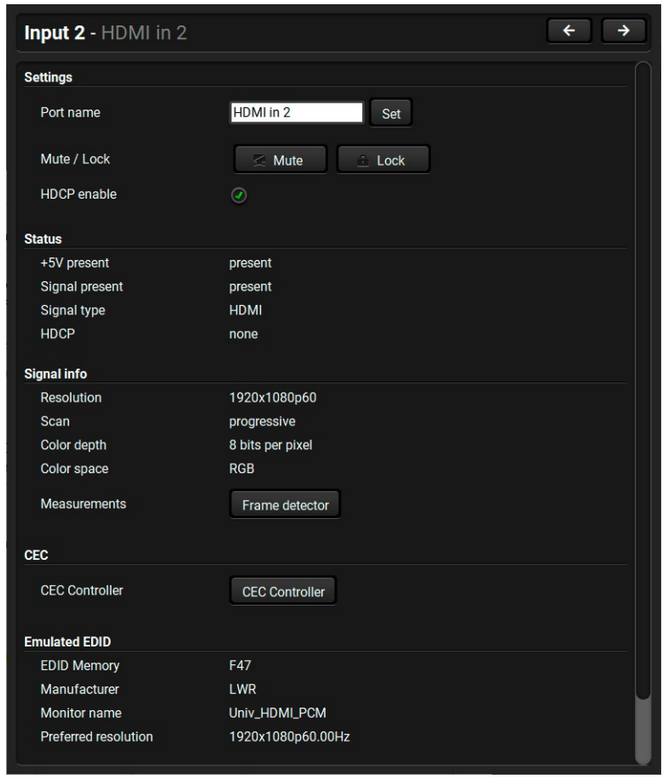


5.6.2. Video - HDMI In 2

This is the HDMI video input signal of the receiver. Clicking on the port icon opens the settings panel in a pop-up window. You can check the status of the line, signal info and current emulated EDID.

Available Settings and Information:

- Port name: a unique name can be set for the port.
- **Mute/Unmute** port;
- **Lock/Unlock** the port;
- **HDCP setting** (enable / disable);
- Port status information;
- Signal information;
- Frame Detector;
- CEC Controller;
- Emulated EDID information;
- Reloading Factory Default Settings.

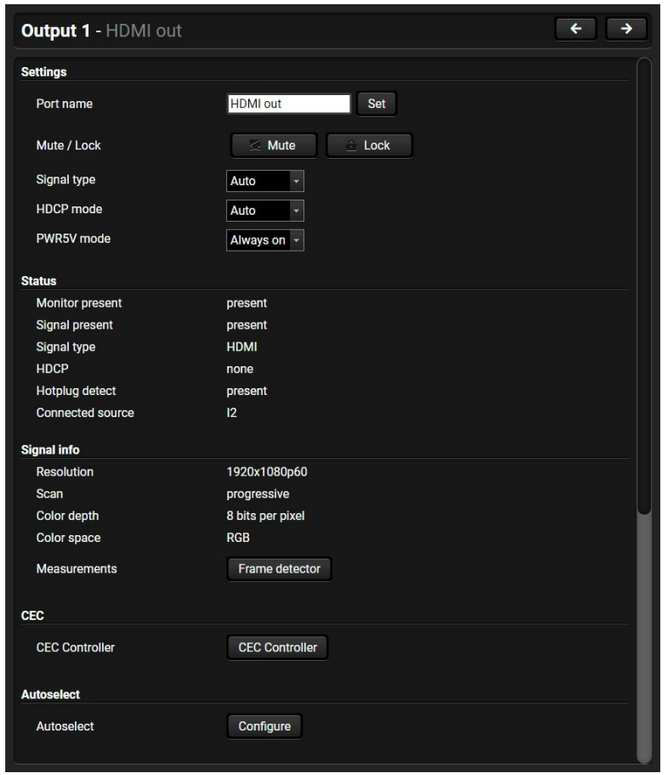


5.6.3. Video - HDMI Out 1 and 2

These are the video output signals of the receiver. Clicking on the port icon opens the settings panel in a pop-up window. You can check the status of the line, signal and display info.

Available Settings and Information:

- Port name: a unique name can be set for the port.
- **Mute/Unmute** port;
- **Lock/Unlock** the port;
- **Signal type**: Auto, DVI, or HDMI;
- **HDCP mode**: Auto or Always;
- **Power 5V mode**: Auto, Always on, or Always off;
- Port status information;
- Signal information;
- Frame Detector;
- CEC Controller;
- Autoselect Feature;
- No Sync Screen (Test Pattern) function;
- Display information;
- Reloading Factory Default Settings.

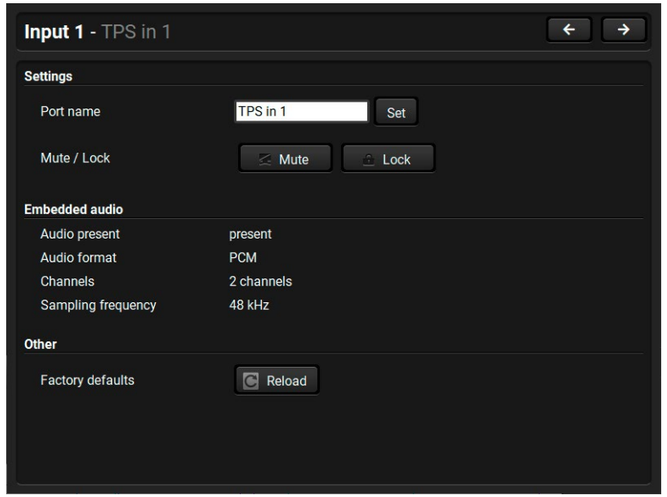


5.6.4. Audio - TPS In 1 and HDMI In 2

These are the audio input signals of the receiver. Clicking on the port icon opens the settings panel in a pop-up window. You can check the status of the line, signal and display info.

Available Settings and Information:

- Port name: a unique name can be set for the port.
- **Mute/Unmute** port;
- **Lock/Unlock** the port;
- Embedded audio information;
- Reloading Factory Default Settings.

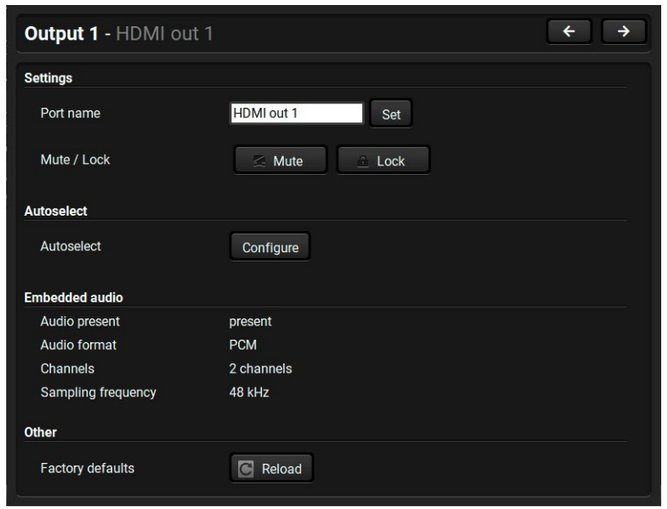


5.6.5. Audio - HDMI out 1 and 2

These are the HDMI audio output signals of the receiver. Clicking on the port icon opens the settings panel in a pop-up window. You can check the status of the line, signal and display info.

Available Settings and Information:

- Port name: a unique name can be set for the port.
- **Mute/Unmute** port;
- **Lock/Unlock** the port;
- Autoselect Feature;
- Embedded audio information;
- Reloading Factory Default Settings.



5.6.6. Audio - Analog Audio Out

This is the audio input signals of the receiver. Clicking on the port icon opens the settings panel in a pop-up window. You can check the status of the line, signal and display info.

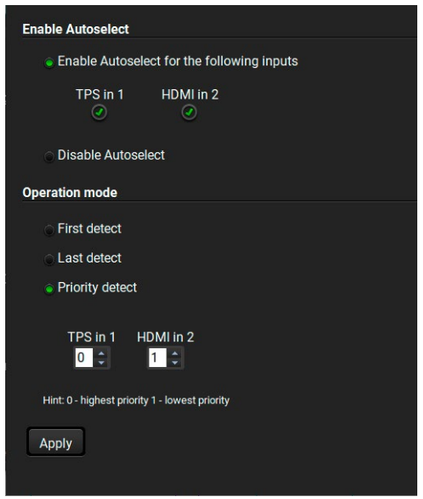
Available Settings and Information:

- Port name: a unique name can be set for the port.
- **Mute/Unmute** port;
- **Lock/Unlock** the port;
- **Volume**: the volume of the audio signal can be adjusted from 100 to 0%, in step 1% (0 dB to -57 dB, in step 0.375 dB (default is 0 dB));
- **Balance**: the balance of the left and right channel of the signal can be adjusted from -100 to 100, in step 1 (default is 0 = center);
- Autoselect Feature; *#analogaudio #volume #balance*
- Embedded audio information;
- Reloading Factory Default Settings.

5.6.7. Autoselect Feature

Clicking on the Autoselect **Configure** button on one of the output port properties window opens the Autoselect feature configurator. Pay attention to the following settings for the proper operation of Autoselect function: *#autoselect*

- Set the Autoselect settings to be **enabled** for the desired input ports;
- Set the desired **Operation mode** (see more details about it in The Autoselect Feature section);
- Set the **priority number** in case of Priority detect operation mode.
- Always click on the **Apply** button after the changes to launch the new settings.



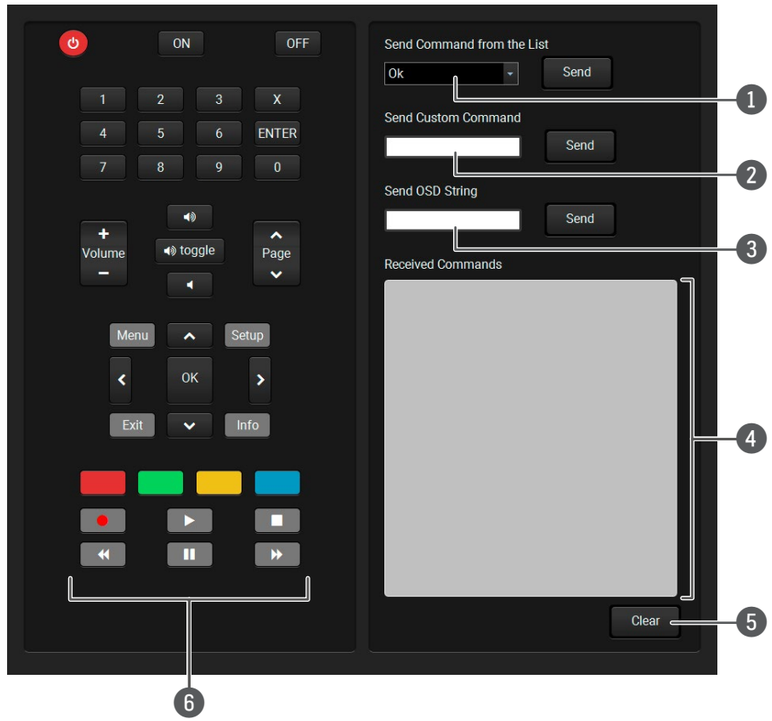
5.6.8. CEC Controller

The receiver is able to send and receive Consumer Electronics Control (CEC) commands. This feature is for remote control of the source or sink device. CEC is a bi-directional communication via HDMI cable.

ATTENTION: It can occur that the third-party device can receive, but not execute the command because it is not supported by the product. Check the accepted commands in the documentation of the device.

INFO: The first 2x2 bytes of the CEC commands contains identification data of the source and destination address. When the port is input, it is always 04 (from the TV to the Playback device 1.) when the port is output, it is always 40 (from the Playback device 1. to the TV).

The CEC panel is available on the port properties window of the **TPS / HDMI input** and **HDMI output** ports.



CEC control panel on the HDMI out port properties window

1	**Drop-down command list**	This list contains the basic CEC commands, most of them are displayed on the graphical interface, too (on the left side). Click on the **Send** button to execute sending the command.
2	**Custom command textbox**	The text field is for sending hexadecimal commands to the source. The maximum length of the message could be 30 characters (15 bytes). Click on the **Send** button to execute sending the command.
3	**OSD string textbox**	A max. 14-character-long text can be shown on the sink device. The send OSD (On-screen display) command textbox is the input field of the string. Alphanumeric characters, glyphs and space are accepted. Click on the **Send** button to execute the command.
4	**Received Command box**	Displays all the sent CEC commands (in red) and the received answers (in blue) with a timestamp. **Legend of the received message:** < [10:33:17] ACK Answer for the acknowledged command. < [10:35:01] NACK Answer for the not acknowledged command. < [10:33:17] IN PROGRESS The command is in progress at the moment. < [10:33:17] FAILED Answer for other failure. *< [10:35:40] feature_abort_<*>* This is the most common answer from the third-party devices when the command is delivered, but the execution is refused. The cause of the refusal stands after the 'feature_abort' expression.
5	**Clear button**	Click on the **Clear** button to erase the content of the terminal window.
6	**CEC command button panel**	This panel provides the quick and easy management of CEC commands. These buttons are pre-programmed with basic functions and send commands towards the sink. The communication is displayed in the Received Command box. For the list of the commands, see the Sending CEC Commands section. Both the layout and functionality are similar to the design of a remote control.

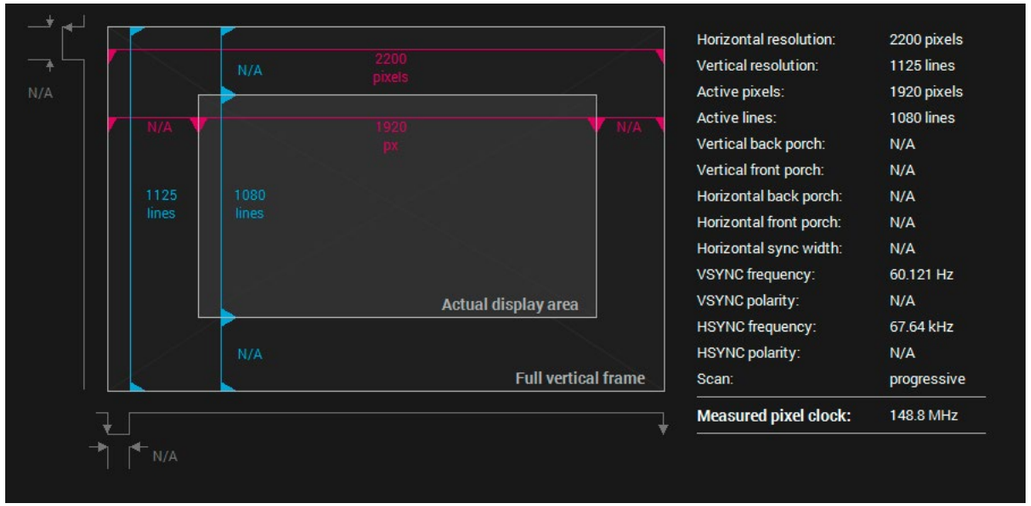
ATTENTION: Make sure that the controlled unit is CEC-capable and this function is enabled.

#cec

5.7. Diagnostic Tools

5.7.1. 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. To access this function, open the port properties window and click on the **Frame detector** button.



Frame detector window

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

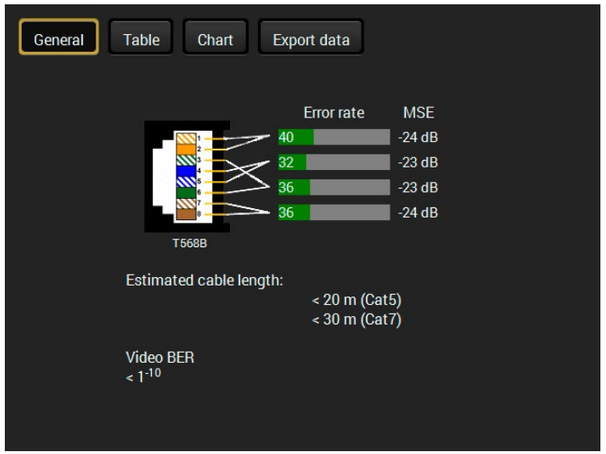
Frame Detector measures detailed timings on the video signals just like a built-in oscilloscope, but it is much easier to use. The actual display area shows the active video size (light grey). The dark grey area of the full frame is the blanking interval, which can contain the info frames and embedded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

#diagnostic #framedetector

5.7.2. Cable Diagnostics

The cable diagnostics is a useful tool to determine any cable related issues in case of TPS connection. The estimated cable length and the quality of the link are measured periodically and the diagnostic window shows the values in real-time. If the green bars hit the first line in the middle, they turn red. It means the number of the errors during the extension is higher than what is generally deemed acceptable. The link might be alive but recovering of the received data is not guaranteed. *#cablediagnostics*

INFO: Each bar represents a differential line in the CATx cable. The inappropriate termination of the cable usually causes high error rates. Check the cable terminations or change the cable.



Reference Values

Value	Explanation
1^{-10} - 1^{-9}	Excellent image quality
1^{-8}	Minor error, not recognizable by eyes
1^{-7}	Sometimes recognizable flash on a special test pattern
1^{-6}	Small noise can be seen
1^{-5}	Easy to recognize image error
1^{-4}	Bad image quality

The "Video BER < 1^{-10}" value displayed above means that on average there is 1 bad pixel after 10^{10} pixels, which means the number of the bit errors is about 1 pixel in every 80 seconds.

INFO: You can find more details about maximum twisted pair cable distances in the Maximum Extension Distances section.

Table and Chart Views

Cable diagnostics can be displayed in advanced modes as well. Two ways are available: **table view** and **chart view**. Data can be exported to a file by clicking on the **Export data** button.

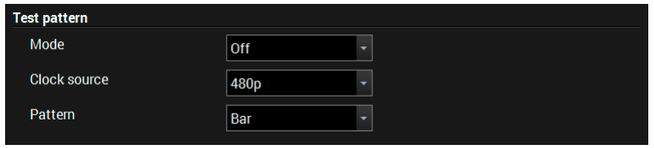
Date	MSE #1	MSE #2	MSE #3	MSE #4	Error rate #1	Error rate #2	Error rate #3	Error rate #4	Cable length
2016-11-12 09:57:23	-24	-22	-22	-22	28	52	32	34	< 20
2016-11-12 09:57:24	-24	-22	-22	-22	28	52	32	34	< 20
2016-11-12 09:57:25	-24	-22	-23	-23	28	46	30	34	< 20
2016-11-12 09:57:26	-24	-22	-22	-22	26	44	30	36	< 20
2016-11-12 09:57:27	-24	-22	-22	-22	26	44	30	36	< 20
2016-11-12 09:57:28	-24	-22	-23	-22	26	46	32	38	< 20
2016-11-12 09:57:29	-24	-22	-23	-22	26	46	32	38	< 20
2016-11-12 09:57:30	-24	-22	-23	-22	26	46	32	38	< 20

Table view of cable diagnostics

Chart view of cable diagnostics

5.7.3. No Sync Screen (Test Pattern)

The No sync screen feature generates an image that can be displayed when there is no incoming signal on the port. The following settings can be set for the Test Pattern function:



Mode

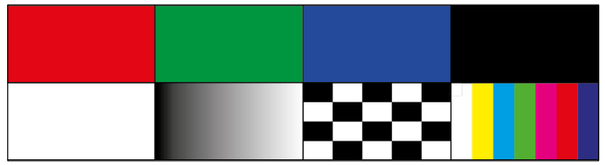
- **On**: the video output port always transmits the test pattern.
- **No signal**: the video output port transmits the test pattern if there is no incoming signal on the selected input port.
- **Off**: the test pattern function is disabled, the video output port transmits the video signal of the selected input port.

Clock Source

- 480p
- 576p
- Original video signal

Pattern

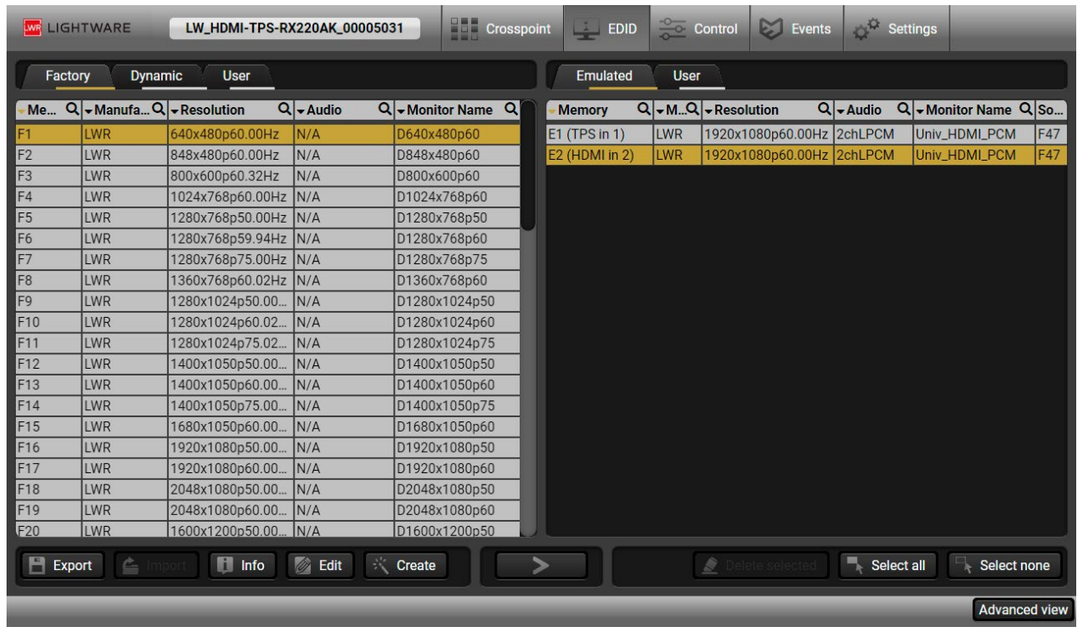
- Red
- Green
- Blue
- Black
- White
- Ramp
- Chess
- Bar
- Cycle - it means the previous eight patterns are repeated continously.



#nosyncscreen #testpattern

5.8. EDID Menu

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



EDID menu

Control Buttons

Export	Exporting an EDID (save to a file)	>	Transfer button: executing EDID emulation or copying
Import	Importing an EDID (load from a file)	Delete selected	Deleting EDID (from User memory)
Info	Display EDID Summary window	Select all	Selecting all memory places in the right panel
Edit	Opening Advanced EDID Editor with the selected EDID	Select none	Selecting none of the memory places in the right panel
Create	Opening Easy EDID Creator		

5.8.1. 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 in yellow.

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

Learning an EDID

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

Exporting an EDID

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

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

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

Importing an EDID

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

Step 1. Press the **User** button 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. Browsed EDID is imported into the selected User memory.

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

Deleting EDID(s)

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

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

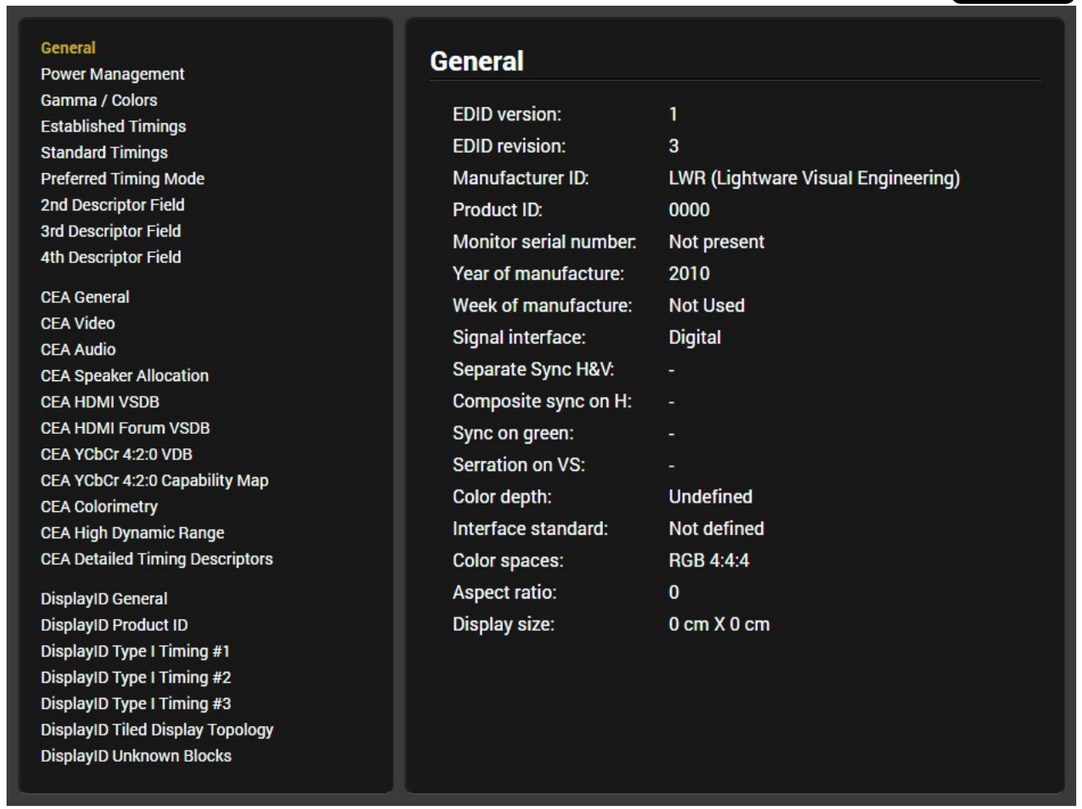
Step 2. Select the desired **memory** slot(s); one or more can be selected ("Select All" and "Select None" buttons can be used). The EDID(s) will be highlighted in yellow.

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

#edid

5.8.2. EDID Summary Window

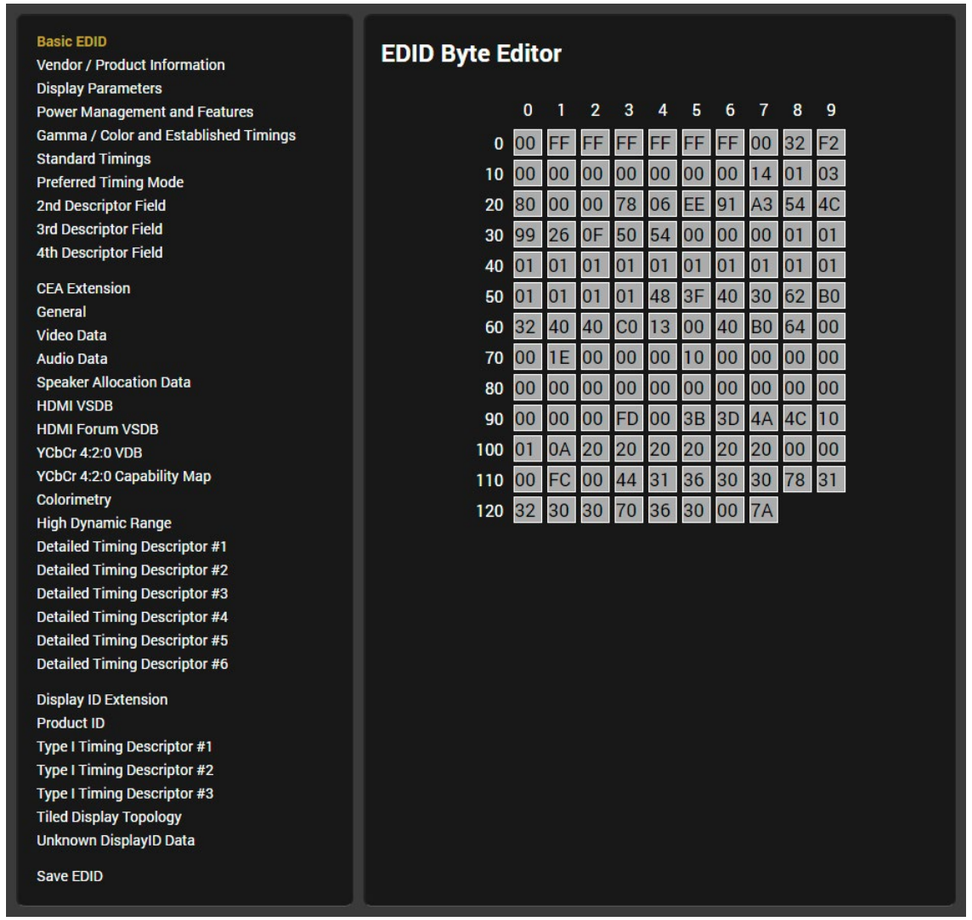
Select an EDID from the Source panel and press the **Info** button to display the EDID summary.



EDID summary window

5.8.3. Editing an EDID

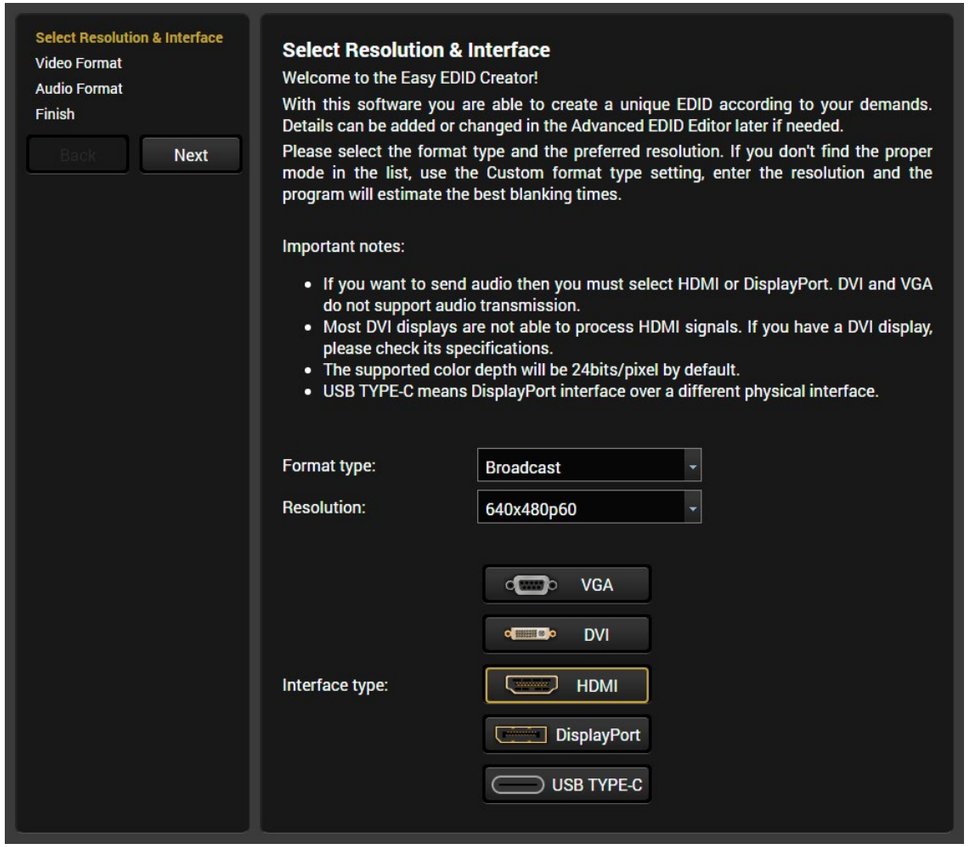
Select an EDID from the Source panel and press the **Edit** button to display the Advanced EDID Editor window. The editor can read and write all descriptors that are defined in the standards, including the additional CEA extensions. Any EDID from the device's memory or a saved EDID file can be loaded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



EDID Editor window

5.8.4. Creating an EDID - Easy EDID Creator

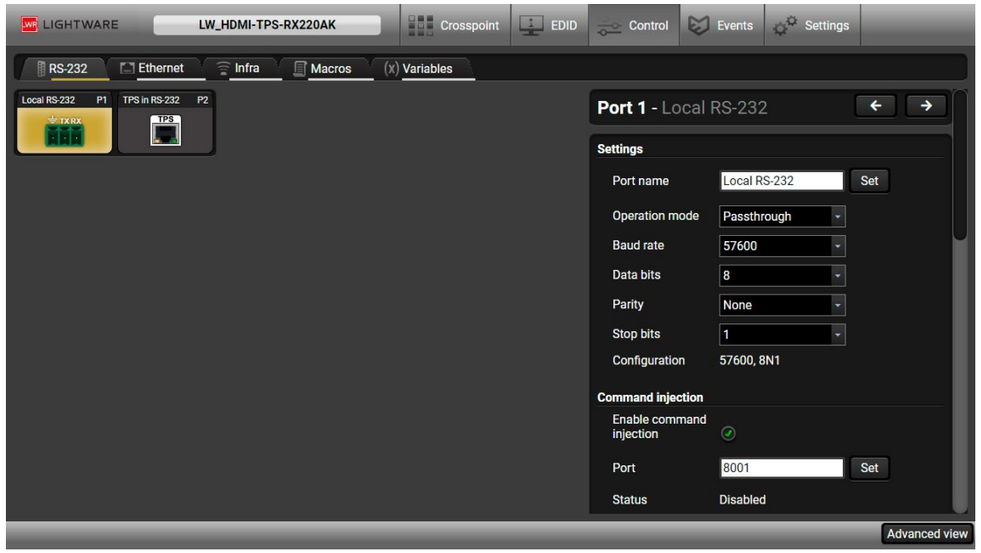
Since the Advanced EDID Editor mentioned above needs more complex knowledge about EDID, Lightware introduced a wizard-like interface for fast and easy EDID creation. With Easy EDID Creator it is possible to create custom EDIDs in four simple steps. By clicking on the **Create** button below the Source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



EDID Creator Window

5.9. Control Menu

5.9.1. RS-232



RS-232 tab in Control menu

The following settings and functions are available (both on local and TPS serial ports):

- **Operation mode**: Pass-through, Control, or Command Injection (for more details about serial interface modes, see the Serial Interface section);
- **Baud rate**: 4800, 7200, 9600, 14400, 19200, 38400, 57600, 115200;
- **Data bits**: 8 or 9;
- **Parity**: None, Odd, or Even;
- **Stop bits**: 1, 1.5, or 2;
- **Command injection**: enable or disable;
- **Command injection port number**;
- **Control protocol**: LW2 or LW3;
- **Message sending** via serial port;
- Reloading Factory Default Settings.

ATTENTION: Operation mode of the local and TPS serial ports can be set together only. It means if you set the local RS-232 port to Control mode, the TPS serial link will be automatically changed to Control mode as well.

ATTENTION: If the receiver is connected to a TPS2 output board of a matrix frame, the RS-232 configuration settings (baud rate, data bits, e.t.c.) will not be changeable on the receiver side.

#rs232 #rs-232 #serial #commandinjection #protocol #message

Message Recognizer

The receiver can analyze and store the received serial data. For more information, see the RS-232 Recognizer section.

Check **Enable message recognizer** on this port to switch the recognizer on.

Delimiter sequence text box is for setting the delimiter string in hex format. When this string is detected in the incoming serial data, the device saves the RS-232 message data from the first bit to the delimiter (or the data between the two delimiters).

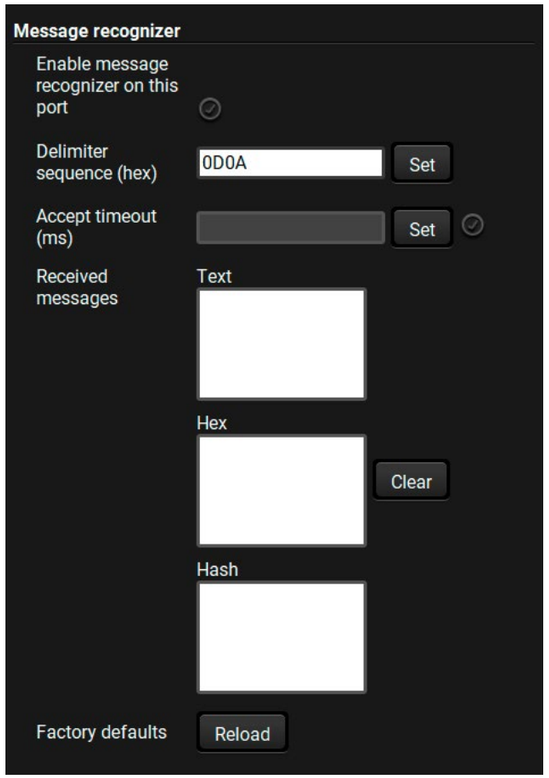
INFO: 0D0A is the factory default value, this is the hexadecimal code of Carriage Return and Line Feed. LW3 protocol commands end with this formula, so the default value support the recognition of the LW3 commands and the stored changes automatically.

If the **Timeout** is enabled and set, the received data is saved when the timeout has passed after the last received message.

The **Received messages** box shows the last received and stored message in Text (RECOGNIZER.Rx), Hex (RECOGNIZER.RxHex), and Hash (RECOGNIZER. Hash) format. The Hex and Hash contains the delimiter.

Press the **Clear** button to erase this storage.

Clicking on **Reload** restores the factory default values of the recognizer.



ATTENTION: The Message recognizer settings are mirrored on the Local and TPS in serial ports.

INFO: Message recognizer operates independently of the RS-232 mode.

#recognizer #rs232recognizer #rs-232recognizer

Configuration Example for the Message Recognizer

The detailed description below shows how to configure the message recognizer in RS-232 Recognizer Example.

When the HDMI-TPS-RX220AK has an active video signal, the switcher logs into the VC codec automatically. The signal presence triggers a bi-directional communication with the VC codec via RS-232:

Step 1. Turn on the recognizer: Enable it on the P1 serial port.

Step 2. Set the delimiter (in hex format). In this case, the delimiter character is ':', which is '**3a**' in hex format. When the delimiter string is detected in the incoming serial data, the serial message is stored in string (in Rx and ActiveRx property), hex (in RxHex and ActiveHex property) and hash (in Hash and ActiveHash property) format. These stored contents can be set as a condition in the event manager.

INFO: The stored content is the incoming data that arrives **before** the delimiter or **between** the two delimiters.

Step 3. Set the Active timeout to 100. This property is responsible for erasing the temporary storage (ActiveRx, ActiveRxHex, ActiveHash) after the elapsing time. In the example below, it can be seen how the recognizer properties change during the communication:

▸ HDMI-TPS-RX220AK: **PING**

Rx	RxHex	Hash	ActiveRx	ActiveRxHex	ActiveHash

◂ VC codec: **Login:**

Rx	RxHex	Hash	ActiveRx	ActiveRxHex	ActiveHash
Login:	4C6F67696E3A	2D8A5E38	Login:	4C6F67696E3A	2D8A5E38

▸ HDMI-TPS-RX220AK: **Admin**

Active timeout has passed, so the values of the Active- prefixed properties are deleted.

Rx	RxHex	Hash	ActiveRx	ActiveRxHex	ActiveHash
Login:	4C6F67696E3A	2D8A5E38			

◂ VC codec: **Password:**

Rx	RxHex	Hash	ActiveRx	ActiveRxHex	ActiveHash
Password:	50617373776F72643A	79059B26	Password:	50617373776F72643A	79059B26

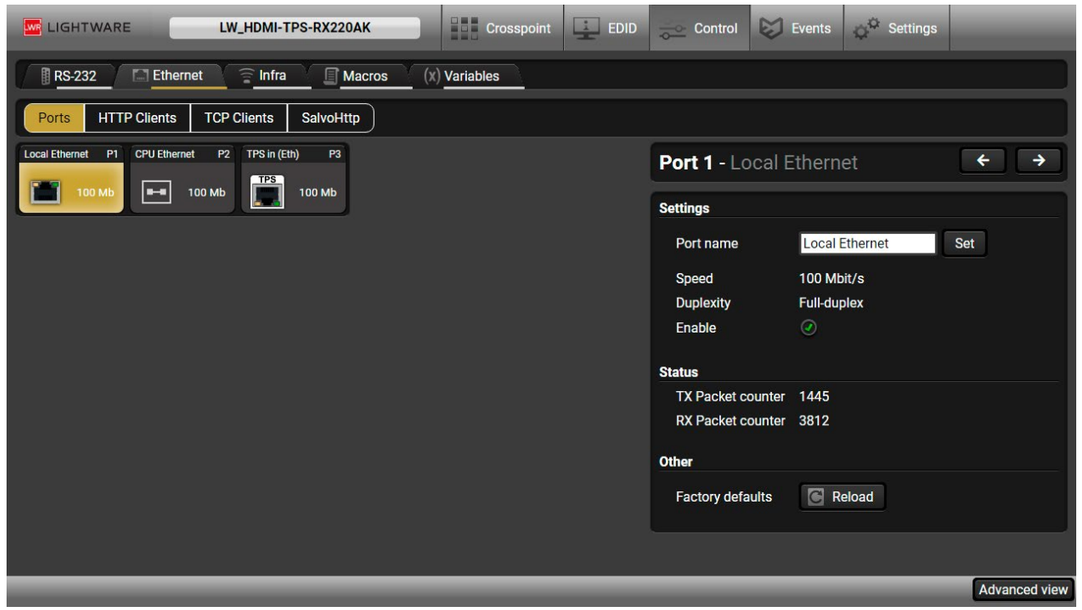
▸ HDMI-TPS-RX220AK: **Admin**

Active timeout has passed, so the values of the Active- prefixed properties are deleted.

Rx	RxHex	Hash	ActiveRx	ActiveRxHex	ActiveHash
Password:	50617373776F72643A	79059B26			

5.9.2. Ethernet

Ports



Ethernet Tab in the Control Menu

Two ports are displayed in the Ethernet settings: Local, CPU, and TPS. You can check the status of the Ethernet line by each port: the speed and the duplexity of the connection.

The following settings are available for the local port:

- Enable / disable the port;
- Reloading factory defaults.

ATTENTION: If the Ethernet port is set to disabled, this may break the connection with the device.

INFO: The CPU Ethernet port cannot be disabled.

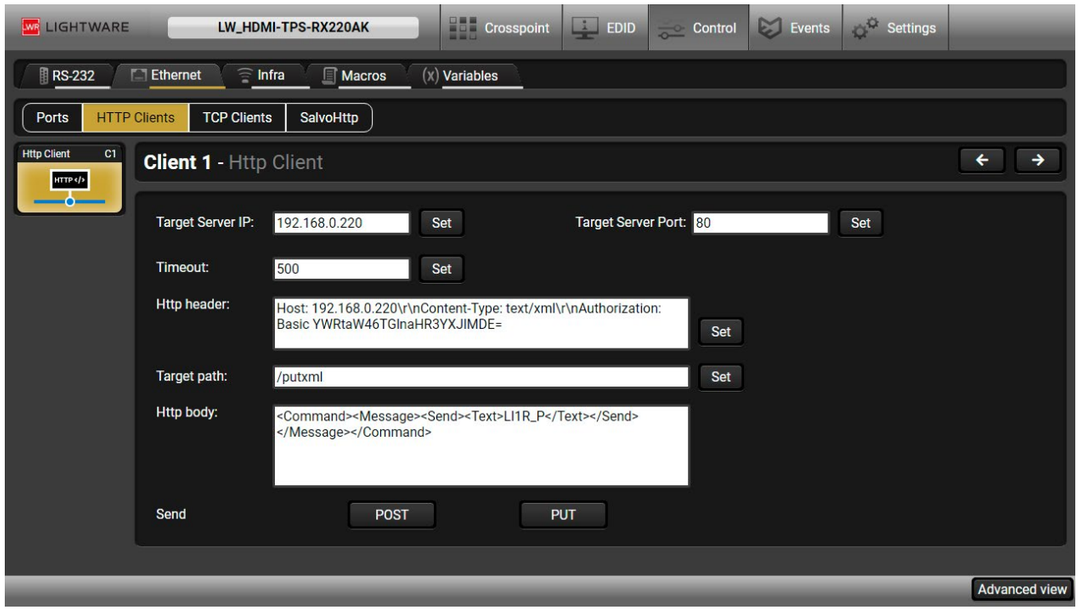
HTTP Clients (HTTP Post and Put Message Sending)

DIFFERENCE: This feature is available from FW package v1.5.0b3.

ATTENTION: This feature means posting or putting **HTTP** messages from the Lightware device to another device. Encrypted transmission (**HTTPS**) is not supported.

The HTTP Clients tab allows sending HTTP post and put messages to the desired server IP:port no. Control commands can be set to the target device, but it is not suitable for processing the response (e.g. querying a parameter/status) since the response is just an acknowledge (ACK). *#http #new*

The feature is available also by LW3 commands, see the HTTP Messaging section.



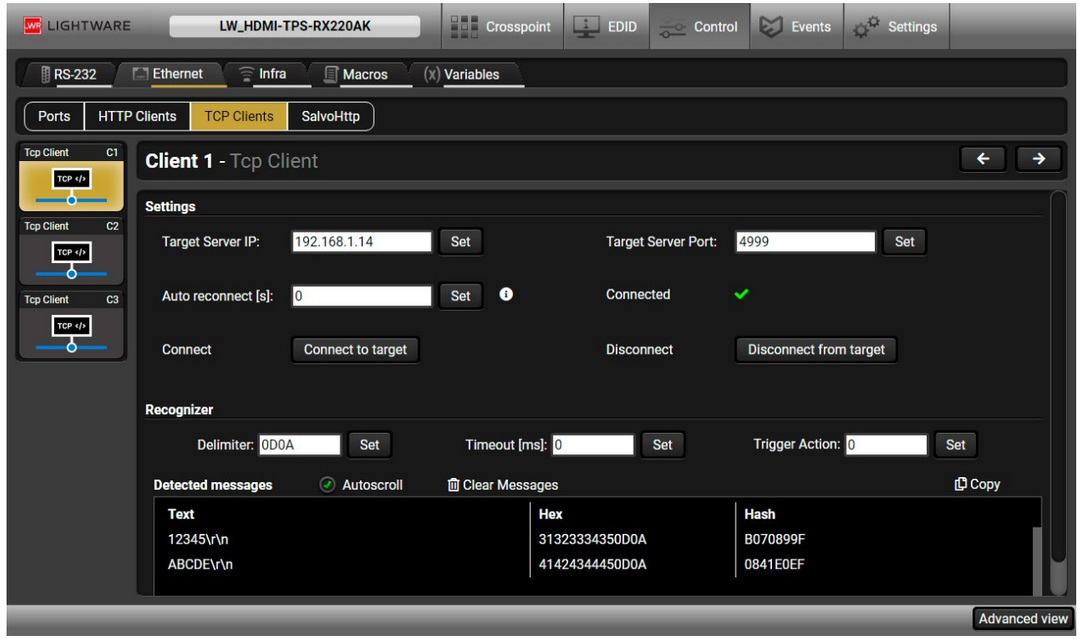
HTTP Clients tab in the Control/Ethernet menu

When you press the enter in the **Http header** or **Http body** text box, the \r\n is added automatically.

TCP Clients (TCP Message Recognizer)

DIFFERENCE: This feature is available from FW package v1.5.0b3.

This tab is the preparing and monitoring interface for the TCP recognizer, which may trigger Event Manager Actions. A simple example can be seen in the TCP Recognizer section.



TCP Clients tab in the Control/Ethernet menu

The target device has to be set as a TCP client (three clients can be set):

Step 1. Type and set the **Target IP address**.

Step 2. Type and set the **TCP port number**.

Step 3. Make sure the same **TCP port is opened** and Enabled in the target device.

Step 4. Press the **Connect to target** button.

Step 5. Make the target device send a message and check it in the Detected messages list.

- **Auto reconnect:** Numeric value; sets the time (seconds) between the automatic reconnections.
- **Delimiter:** When the delimiter hex string is detected in the incoming data, the message is saved from the first bit until the delimiter (or the data between the two delimiters).
- **Timeout:** If there is no response within the set time interval (milliseconds), the data that is received from the last delimiter will be accepted.
- **Trigger Action:** If data is received that is closed with the recognized delimiter, an Action can be run. Type the number of the Event (without the letter 'E'). *#tcprecognizer #message #new*

SalvoHttp Status Page (Receiving HTTP Message)

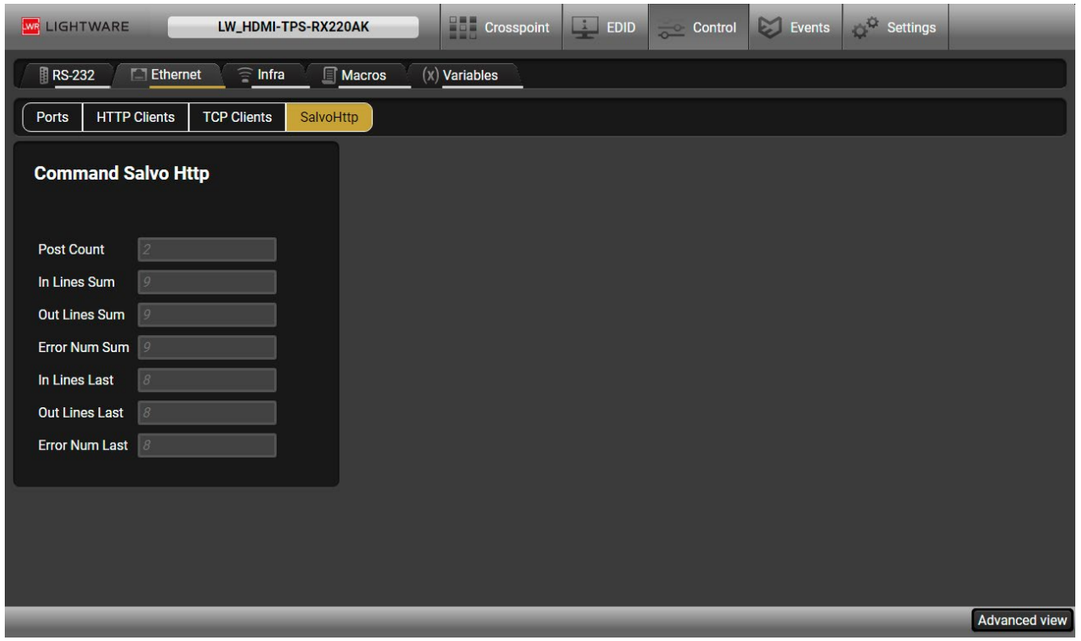
DIFFERENCE: This feature is available from FW package v1.5.0b3.

ATTENTION: This feature means sending **HTTP** messages from an external device to the Lightware device. Encrypted transmission (**HTTPS**) is not supported.

In this case, a batch of commands can be sent over HTTP to the Lightware device for processing. Post the commands to the <IP_address>/protocol.lw3 address and the commands are processed immediately and sequentially. *#http #new*

Control commands can be sent to the Lightware device, but it is not suitable for querying a parameter/status, since the LW3 responses are not sent back to the sender.

ATTENTION: If the Cleartext Login (Login Settings) is enabled in the device, the login has to be the first command. No commands will be processed without a successful login. See the syntax in the Cleartext Login Protection section.



SalvoHttp tab in the Control/Ethernet menu

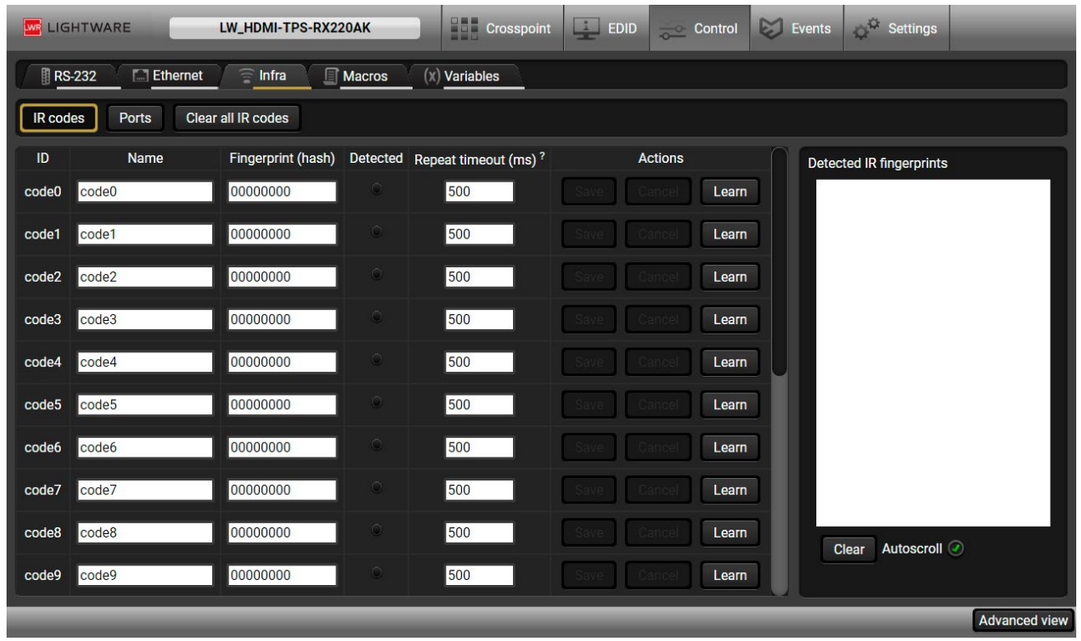
5.9.3. Infra

ATTENTION: The device has no built-in Infrared receiver and transmitter. For the complete usage attach an IR emitter unit to the IR OUT and an IR detector unit to the IR IN connectors.

Infrared (IR) receiver and transmitter options can be found on this tab. There are three submenus available under it: **IR codes**, **Ports**, and **Clear all IR codes**.

IR Codes

The user can set the name of the IR code, the fingerprint (hash), and the repeat timeout in ms, actions can be ordered to each IR code as well.



IR codes window in Control menu

#infra #infrared #message

Description	Function
ID	Code number.
Name	You can give an unique name for the desired code.
Fingerprint (hash)	Fingerprint code in pronto hexa format.
Detected	Indicator gives feedback whether the given IR code is detected currently.
Repeat timeout (ms)	You can set a timeout to avoid the involuntary code recurrence.
Actions	Action buttons for the desired IR code: **Save**: saving the fingerprint. **Cancel**: canceling the fingerprint. **Learn**: learning the detected IR code.
Detected IR fingerprints	You can check the detected IR codes in this panel. Pushing the **Clear** button deletes all current fingerprints and the automatic scrolling can be switched on or off with a tick in the **Autoscroll** option.

20 fingerprints can be stored in the device at the same time. Each of them can be ordered to an action in the Event Manager. For more details about events, see the Event Manager section.

Learning IR Codes

Step 1. Connect the IR detector unit to the IR IN port of the receiver.

Step 2. Click on the **Learn** button.

Step 3. Turn the remote controller to the IR detector. A pop-up window appears in LDC - press your remote button to learn.

Step 4. Once the code is received, a new window pops up in LDC - learning completed. Click on **OK** to continue.

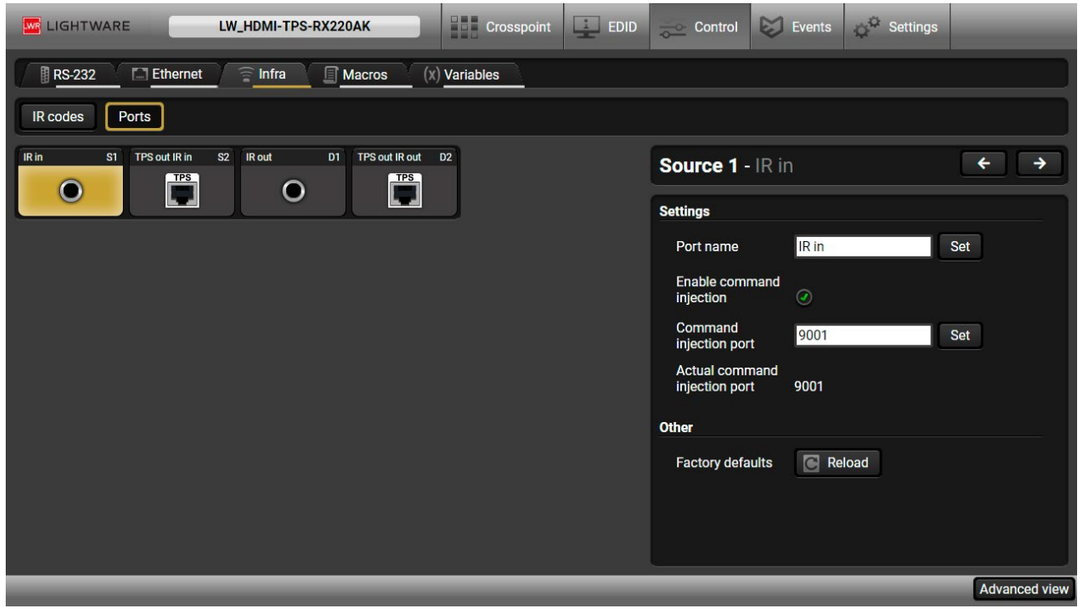
Step 5. Optionally type a unique name for the code in the **Name** text box. The default name is code#, e.g. code0.

Ports Section

The user can set the name and command injection port to each sources and destinations. For more details about the IR interface, see the IR Interface section.

The following settings are also available:

- Port name;
- Enable / disable the port;
- Port number;
- Enable / disable command injection;
- Message sending function (little-endian pronto hex code). For more details, see the next section;
- Reloading Factory Default Settings.



Infra tab - Ports window

Sending pronto hex codes (Little-endian format)

Copy the raw, little endian-format IR code into the **Send Pronto Hex** entry field and click on the **Send** button.

The maximum length of the code can be 765 characters (765 bytes). For more details about the accepted IR code formats, see the Sending Pronto Hex Codes in Little-endian Format via IR Port section.

This entry field does not store the code. The code can be saved into an action in the event manager with the following parameters: **Category:** Infra; **Expression:** Send pronto hex**; Port:** D1; **Pronto hex:** <custom_code>

In the Event Manager, the maximum length of the code can be 184 characters (184 bytes).

> INFO: Sending bigger endian-format code is available with LW3 protocol command, see the Sending Pronto Hex Codes in Big-endian Format via IR Port section.

Clear all IR codes

Clicking on the button deletes all stored IR fingerprints.

5.9.4. Macros

DIFFERENCE: This feature is available from FW package v1.5.0b3.

DEFINITION: A macro is a batch of pre-defined commands stored in the device. *#macro #new*

You can create your custom macros in a file, upload them to the device and run at any time. The number of the macros depends on the device type, the device can handle up to 50 macros.

Important Notes about Macros

- The macros are stored in the internal device presets.
- The commands of a macro are executed sequentially (even if error happens at a command).
- Macros allow long commands, which is suitable for e.g. infra code sending.
- Macros cannot be edited in the device.
- Macros are not saved when backup is created. See the Saving the Macros section.

Macro File Structure

Format:

```
;<preset_name>
;Begin <macro1_name>
<LW3_commands>
;End <macro1_name>
;Begin <macro2_name>
<LW3_commands>
;End <macro2_name>
```

Example:

```
;myDeviceMacros
;Begin myMacro1
CALL /MEDIA/VIDEO/XP:unmuteSource(I1)
CALL /MEDIA/VIDEO/XP:unlockSource(I1)
;End myMacro1
;Begin myMacro2
SET /MEDIA/VIDEO/O1.HdcpModeSetting=1
SET /MEDIA/VIDEO/O1.HdmiModeSetting=2
;End myMacro2
```

`<preset_name>`: it will be displayed in the Settings/Backup submenu (device configurations list).

`<macro_name>`: each Macro must have a unique name.

`<LW3_commands>`: LW3 SET and CALL commands. Syntax is not checked, error is not reported.

ATTENTION: If you use the same name for a new macro, the existing one will be deleted.

Open a simple text editor and save the file with 'LW3' extension.

Uploading New Macros into the Internal Device Configuration Preset

The uploading steps are the following:

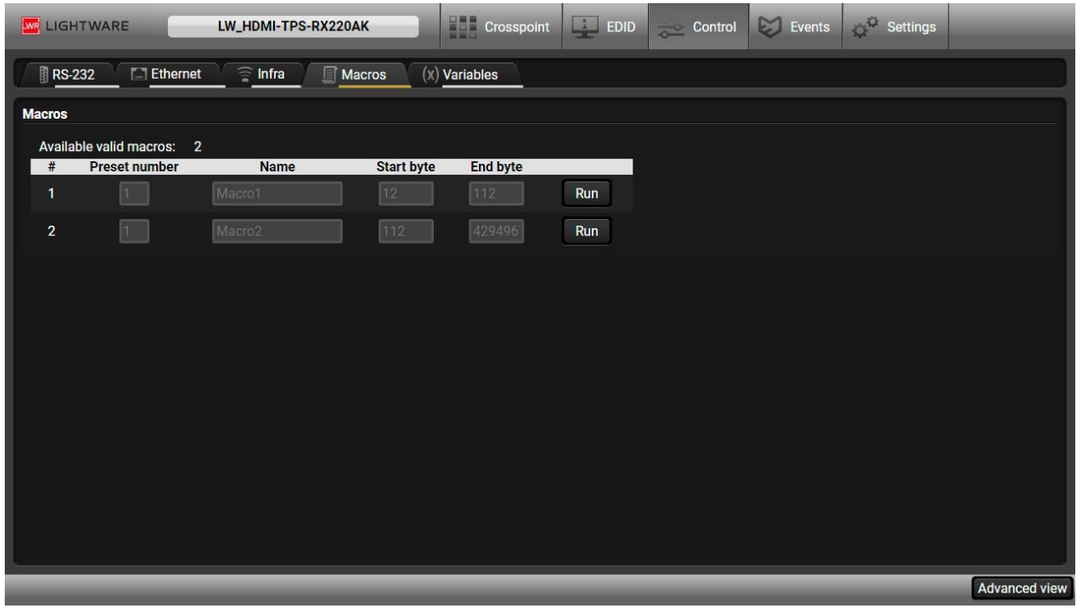
Step 1. Create the **file** with macros according to the macro file structure and save it.

Step 2. Navigate to the **Settings/Backup** submenu.

Step 3. Select the device configuration **preset** at the bottom of the page.

Step 4. Press the **Upload** button, browse the LW3 file and press **Open**.

ATTENTION: The preset and the macros of the selected slot will be erased. If there is a macro with the same name already in the device, it will be removed and the new one will be available.



Discovered Macros in the device shown under Control/Macros submenu

Adding Macros by Preserving the Current Preset and Macros

If you follow the steps below, the existing macros of the selected preset will be preserved. But if there is a macro with the same name already in the device, it will be removed and the new will be available.

Step 1. Navigate to the **Settings/Backup** submenu.

Step 2. Select the device configuration **preset** at the bottom of the page.

Step 3. Press the **Download** button and click on **Save** in the pop-up window.

Step 4. Open the **file** with a simple text editor and add the desired macros to the bottom of the commands between the `;Begin <macro_name>` and `;End <macro_name>` labels.

Step 5. Save the file and navigate to the **Settings/Backup** submenu.

Step 6. Select the device configuration **preset.**

Step 7. Press the **Upload** button, browse the LW3 file and press **Open**.

Saving the Macros

When you make a backup of the device, the macros are not saved in that file. Sometimes, it is necessary to save the macros into a file and for example apply them in another (same type of) device. Follow these steps:

Step 1. Navigate to the **Settings/Backup** submenu.

Step 2. Select the device configuration **preset** at the bottom of the page.

Step 3. Press the **Download** button and click on **Save** in the pop-up window.

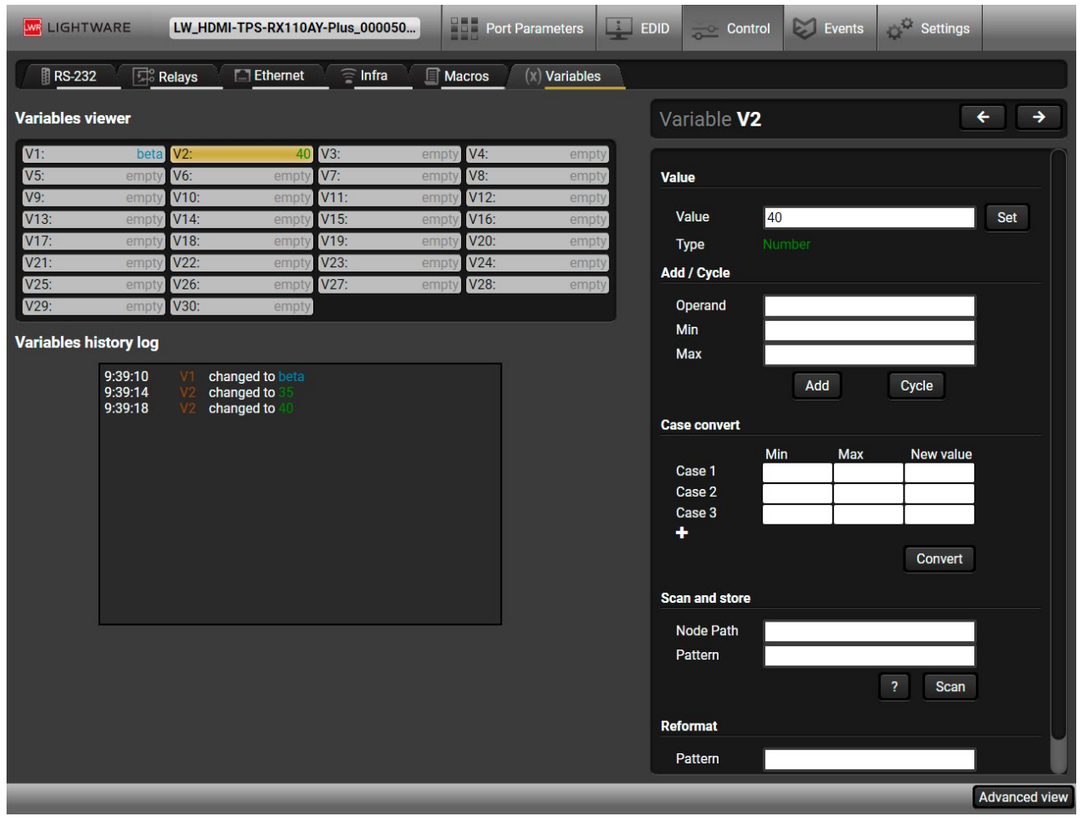
5.9.5. Variables

DIFFERENCE: This feature is available from FW package v1.5.0b3.

You can create custom variables in number or text format, which can be used in the Event Manager. The variables can have the following properties/methods: *#variables* *#new*

- Numeric (integer) type with min/max value setting, or string-type (determined automatically)
- Increment/step the numeric value,
- Value-dependent case operations,
- Reading and storing the values of LW3 properties into string or numeric variables.
- The max length of a string variable can be 15 characters. Numeric variable is defined between -2147483648 and 2147483647.

The defined variables are stored in a non-volatile memory and the value is kept in case of a reboot.



Variables tab in the Control menu

Value Section

You can set the value of the variable by the field. The type of the variable is determined automatically based on its value (numeric/string).

Add / Cycle Section

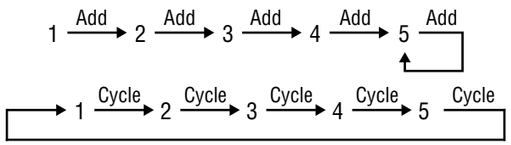
This section can be used for numeric types.

- **Operand**: the increment, the number that will be added to the current value (negative value is accepted).
- **Min (optional)**: the lowest allowed value
- **Max (optional)**: the highest allowed value
- **Add** button: the operand will be added to the current value. If the result would be higher than the max setting, the max will be valid; if the result would be lower than the min setting, the min will be valid
- **Cycle** button: the operand will be added to the current value. If the result would be beyond the limit (min/max), the value will be stepped to the other end of the interval.

Examples

The following shows the difference between the **Add** and the **Cycle** options. The input values are the same in both cases:

- **Min**: 1
- **Max**: 5
- **Operand**: 1



In **Add** case: when the value hits the limit (max), the operand will not increase the value any more.

In **Cycle** case: when the value hits the limit (max), the value will be stepped to the other end of the interval.

Similar case happens vice versa: when the operand is a negative number and the value hits the min value.

TIPS AND TRICKS: Set min=1, max=2, operand=1 and use the **cycle** method. Thus, the value of the variable can be toggled, which can be linked to a property with two states (e.g. low/high level) in Event manager.

Case Convert

This tool can be used to change the value of a variable if it fits in any of the defined intervals. The check and the change will be performed only if you press the **Convert** button. A typical example is when two different ranges of values have to meet:

Incoming values: between 0 and 255 (e.g. the slider of a controller can have these values).

Outgoing values: between 0 and 100 (e.g. the controlled device accepts these values).

Defined cases:

	Min	Max	New value
Case 1	1	25	10
Case 2	26	50	20
Case 3	51	75	30
Case 4	76	100	40
Case 5	101	125	50

	Min	Max	New value
Case 6	126	150	60
Case 7	151	175	70
Case 8	176	200	80
Case 9	201	225	90
Case 10	226	255	100

Scan and Store

This tool can be used to get the value (or a part) of an LW3 property. The defined path will be checked according to the pattern and the result will be saved into the variable (number or string type). Press the **?** button to open the pattern options:

Pattern	Pattern description
%s	String of characters stopping at the first whitespace character
%<number>s	The next <number> of characters (string) stopping at the first whitespace
%c	One character
%<number>c	The next <number> of characters
%[<characters>]	Defined character set, specified between brackets
%[^<characters>]	Negated character set that will be skipped, specified between brackets
%*	Ignored part
<custom_text>	User-defined text

Examples

Node Path [1]	Property Value	Pattern [1]	Scanned result
/MANAGEMENT/STATUS.CpuTemperature	32 C; 0;75; 0;79;21;34;	%s	32
/MANAGEMENT/STATUS.CpuFirmware	1.3.0b0 r1	%12s	1.3.0b0
/MEDIA/VIDEO/I6.Resolution	640x480p60	%3c	640
/MEDIA/UART/P1.Rs232Configuration	57600, 8N1	%*[^,], %s	8N1
/MEDIA/AUDIO/XP.SourcePortStatus	T000A;T000A;T0008;T000A;T000C	%*6c%5c	T000A
/MEDIA/VIDEO/I6.Resolution	640x480p60	%[^b]%*	640
/MANAGEMENT/NETWORK.HostName	lightware-00005031	lightware-	00005031

[1] defined by the user

Reformat

The value of the variable can be changed by adding text as prefix and/or postfix. Type **%s** to indicate where to insert the original value.

Example

- **Original value**: 3
- **Pattern**: input%s
- **Modified value**: input3

5.10. Event Manager

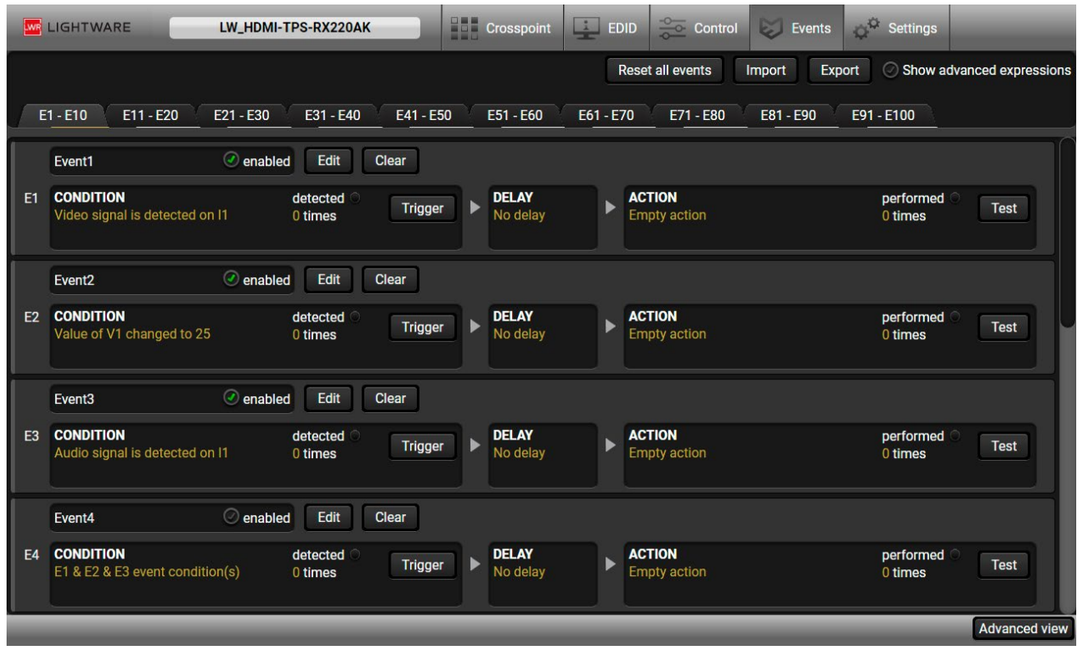
The feature means that the device can sense changes on its ports and able to react according to the pre-defined settings. The development idea of the Event manager is based on users' feedbacks. In many cases internal events (such as signal present or HDCP active) are necessary for displaying but it is not easy when the device is hard to access (e.g. built under the desk). #eventmanager

> INFO: For tips and tricks and detailed description about the application of Event Manager, please download the Event Manager Application Notes.

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

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

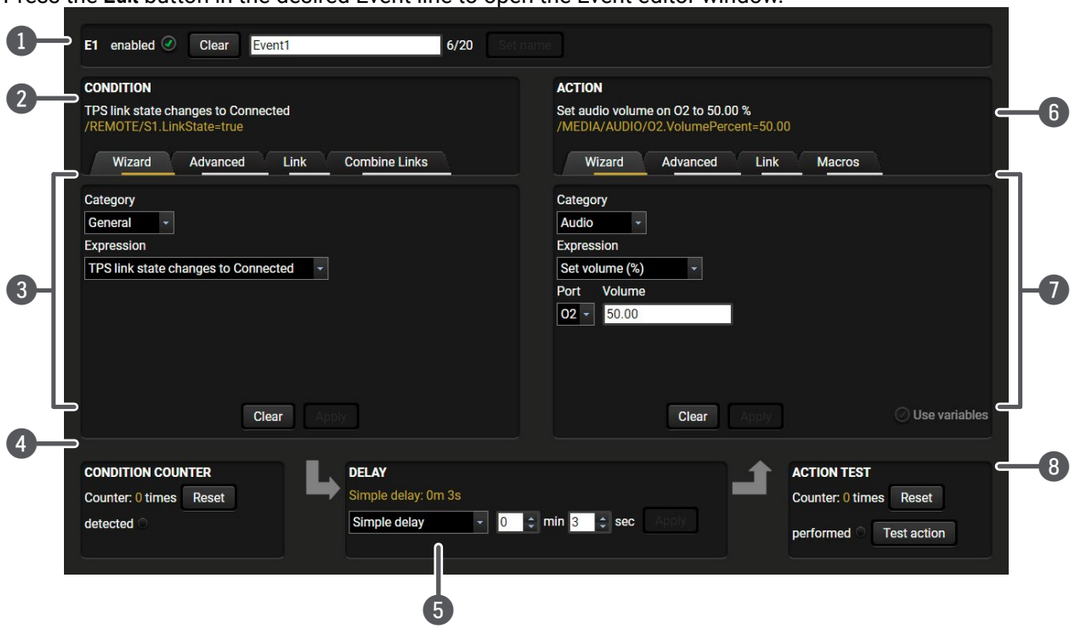
There is a **grey bar** on the left of the Event panel in each line. If a condition and an action are set and the Event is enabled, the bar is displayed **in green**.



Control menu, Event Manager tab

5.10.1. The Event Editor

Press the **Edit** button in the desired Event line to open the Event editor window.



1	**Event header**	The name of the Event is displayed. Type the desired name and press the Set name button. The Event can be cleared by the Clear button. Use the tick mark to enable/disable the Event.
2	**Condition header**	If the condition is set, the description (white colored text) and the exact LW3 protocol expression (yellow colored text) can be seen. If the advanced mode was used, the description is "Custom condition".
3	**Condition panel**	Different tools are available at the tabs for setting the desired Condition. The parameters and settings are displayed below the buttons.
4	**Condition counter**	The set condition can be tested to see the working method in the practice.
5	**Delay settings**	The action can be scheduled to follow the condition after the set time value.
6	**Action header**	If the action is set, the description (white colored text) and the exact LW3 protocol expression (yellow colored text) can be seen. If the advanced mode was used, the description is "Custom action".
7	**Action panel**	Different tools are available at the tabs for setting the desired Condition. The parameters and settings are displayed below the buttons.
8	**Action test**	The set action can be tested to see the working method in the practice.

5.10.2. Create or Modify an Event

Wizard Mode

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

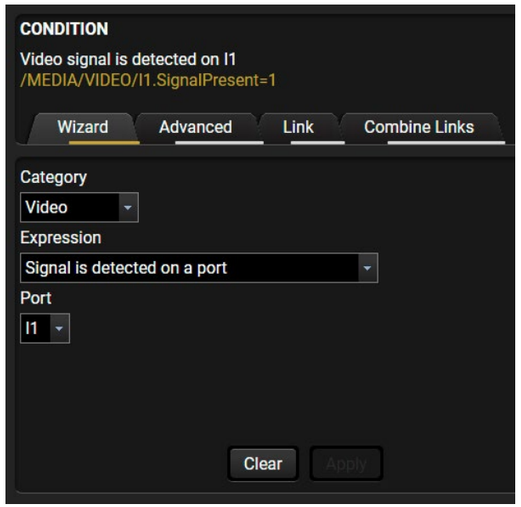
Step 1. Click on the **Edit** button of the desired Event; the **Event editor** is displayed.

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

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

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

INFO: This mode is also available for setting the **Action**.



Advanced Mode

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

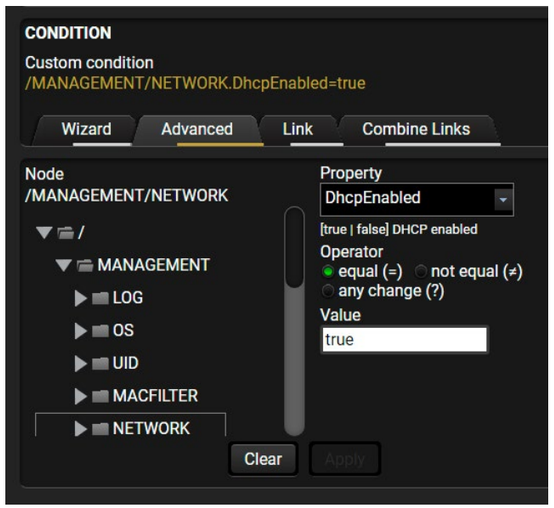
Step 1. Click on the **Edit** button of the desired Event; the **Event editor** is displayed.

Step 2. The wizard mode is the default, press the **Advanced** button. The LW3 protocol tree is displayed showing the list of the properties in the drop-down menu. Navigate to the desired node.

Step 3. Select the desired **Property** from the menu. The **manual** of the property is displayed below to help select the necessary property and set the value.

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

INFO: This mode is also available for setting the **Action**.



The Link Tool

The new interface allows creating more actions for the same condition. In that case, a condition can trigger more actions. To set such an Event, the Link tool has been introduced.

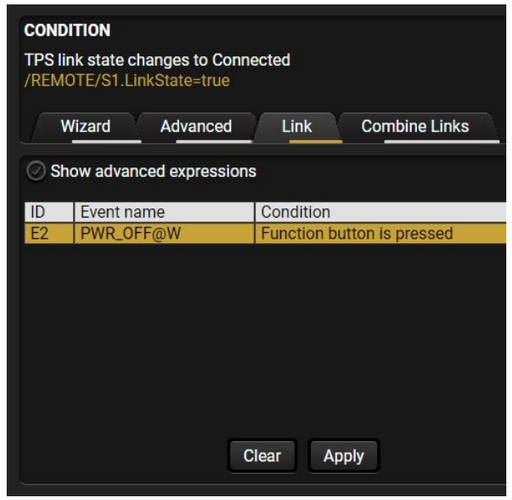
Step 1. Click on the **Edit** button of the desired Event; the **Event editor** is displayed.

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

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

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

INFO: This mode is also available for setting the **Action**.



Combine Links

DIFFERENCE: This feature is available from FW package v1.5.0b3.

The first generation of the Event Manager is able to sense a change (one condition), but in some cases that is not enough. The practical experience has shown there is a need to examine more conditions as follows: if one of the set conditions becomes true (while the other conditions are fulfilled), then the set Action is launched. The **Combine Links** tool allows setting these Conditions. Follow the steps below:

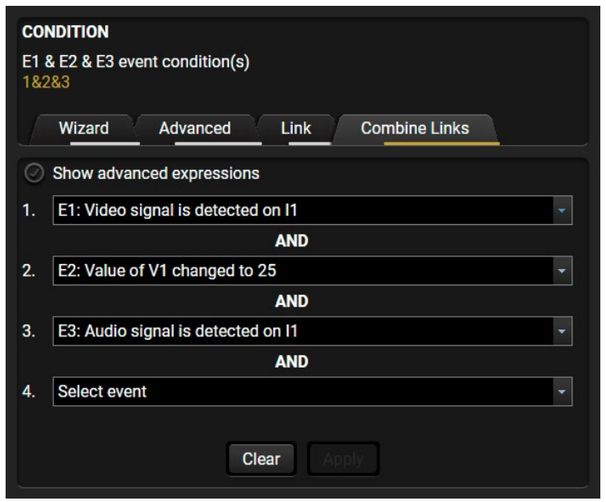
Step 1. Create individual **Conditions** in separate Events.

Step 2. Create a new Event and navigate to the **Combine Links** tab in the Editor.

Step 3. Select up to four **Conditions** in the **left** panel.

Step 4. Set the desired **Action** (and do not forget to **enable** the Events).

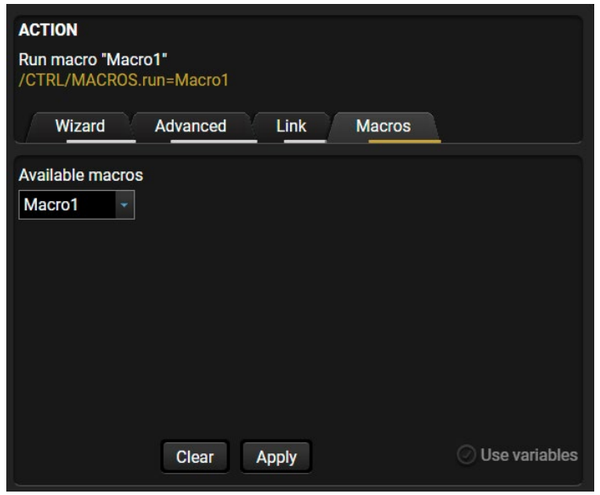
INFO: This mode is available for setting the **Condition only**. *#new*



Linking a Macro (Action)

DIFFERENCE: This feature is available from FW package v1.5.0b3.

Macros stored in the device can be run as Actions. Thus, a lot of commands can be run by using only one Event. The commands will be processed one-by-one after each other. #macro



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

Step 2. The wizard mode is the default, press the **Macros** button in the **Action** panel.

Step 3. Select the desired **Macro** from the list then press the **Apply** button to store settings.

If the **Use variables** option is enabled, you can link a variable by the **$** character. If you do so (e.g. $1), the device will handle it as the V1 variable. You can send the value of the variable e.g. as a TCP message. See more information about the Macro settings in the Macros section. #new

5.10.3. Special Tools and Accessories

The Name of the Event

The name of a port can be changed by typing the new name and clicking on the **Set** button. The following characters are allowed when naming:

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

Enable or Disable an Event

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

Testing the Condition

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

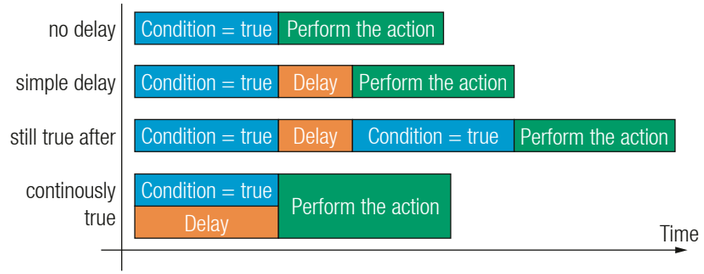
Testing the Action

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

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

Delay the Action

In most cases the Action is performed immediately after the Condition is detected. But sometimes a delay is necessary between the Condition and the Action. Therefore, the new Event manager contains the Delay panel that allows that feature with the settings below:



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

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

Variables

DIFFERENCE: This feature is available from FW package v1.5.0b3.

The variables and the tools (shown in the Control/Variables tab) can be used in the Event Manager.

Condition Wizard #variables #new

The desired variable can be checked if its value is changed to a specific value.

Action Wizard

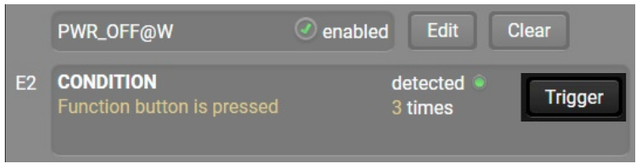
The value of a variable can be set/changed by the same methods as in the Control/Variables tab:

- Setting the exact value
- Increasing the value with/without limits
- Converting the value (e.g. interval change)
- Scanning and storing, or reformatting a property/parameter

If the **Use variables** option is enabled, you can link a variable by the **$** character. If you do so (e.g. $1), the device will handle it as the V1 variable. You can send the value of the variable e.g. as a TCP message.

Condition Triggering

DIFFERENCE: This feature is available from FW package v1.5.0b3.



This improvement works as if a condition is detected. When a complex control system is built, a Condition may trigger numerous Actions. A typical example is when a system is powered on and the 'ready-to-use' state has to be loaded. In this case, there could be many actions that are based on the same condition. In order to reduce the number of the commands, you can trigger one 'key' condition, which could start the whole process.

5.10.4. Clear One or More Event(s)

Clear an Event

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

Clear all Events

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

5.10.5. Export and Import Events

The feature allows saving all the Events. The backup file can be uploaded to another HDMI-TPS-RX220AK receiver.

Export all the Events

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

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

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

ATTENTION: Editing the file is recommended only for expert users.

Import all the Events

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

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

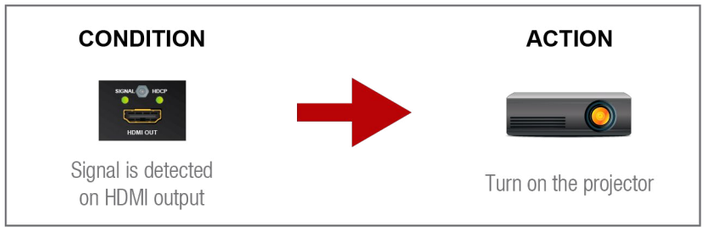
5.10.6. Event Creating - Example

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

The Concept

The HDMI-TPS-RX220AK receiver is connected to a projector by the HDMI output port. The receiver is also connected to the projector by the RS-232 port and can send commands via the serial line.

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



RS-232 Settings

Make sure that the serial line is established between the receiver and the projector. Check that the RS-232 settings of the receiver is set exactly the same as required for the projector: baud rate, data bits, parity, stop bits. The receiver needs to be set to: Control protocol: LW3; and RS-232 mode: Pass-through. See the relevant LDC settings in the RS-232 section.

Setting the Event

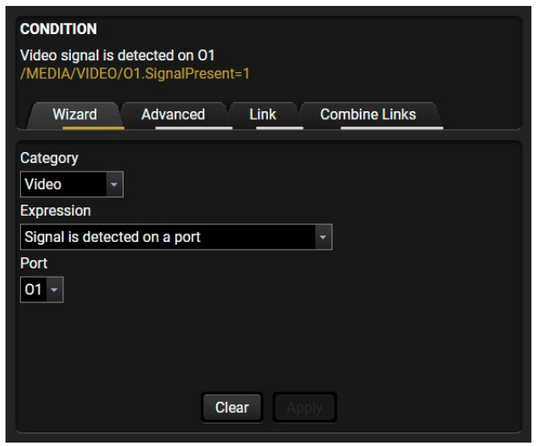
You can create the Event in the Wizard in few simple steps:

Step 1. Set the condition.

Select the required parameters to set the condition:

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

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



Step 2. Set the action.

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

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

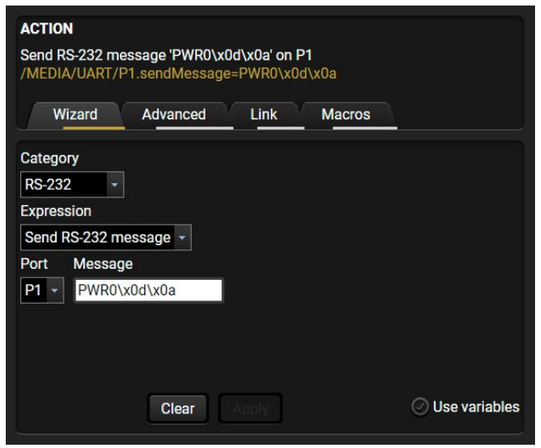
For this instance the command has to be closed with the <CR><LF> characters so they need to be escaped. You can use the following format for escaping:

<command$_1$><\x0d\x0a><command$_2$><\x0d\x0a>...
...<command$_n$><\x0d\x0a>

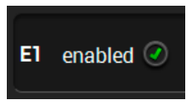
In the current case the command is: PWR0\x0d\x0a

Select the required parameters to set the action:

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



Step 3. Enable the Event.

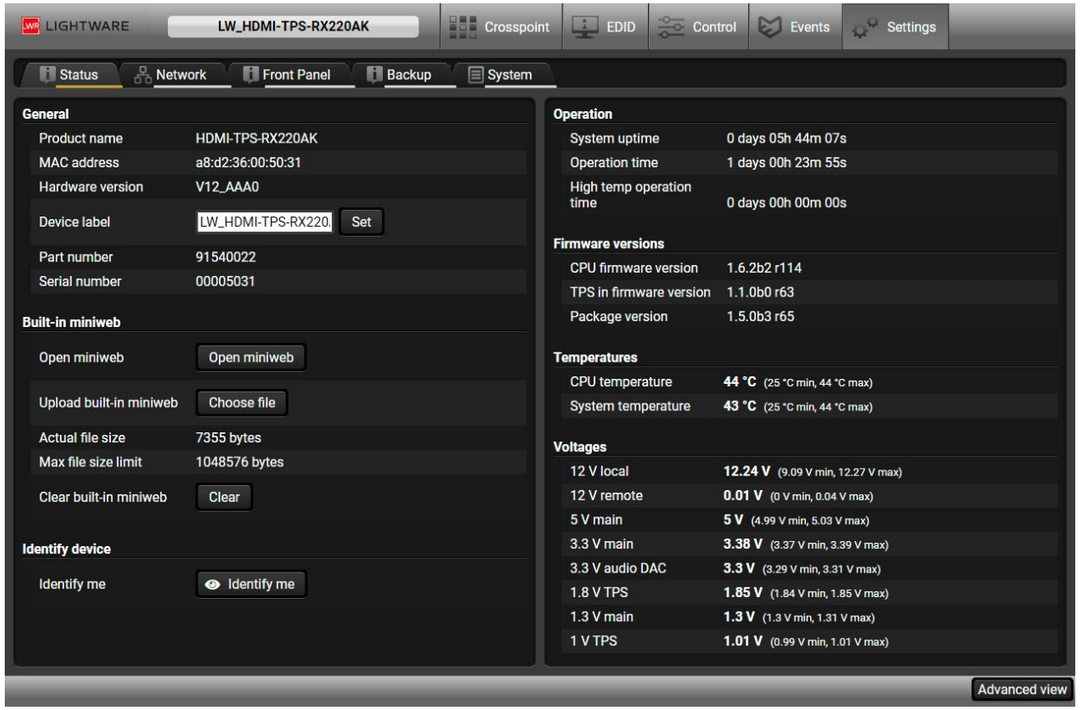


Select the **E1 enabled** option in the upper left corner to set the Event as enabled.

INFO: If you do not find the required category/expression/etc that you need, choose the Advanced mode in the Wizard where the entire LW3 structure tree is available. For example, instead of signal detection you can set a specified resolution or color range too as a condition.

5.11. Settings Menu

5.11.1. Status



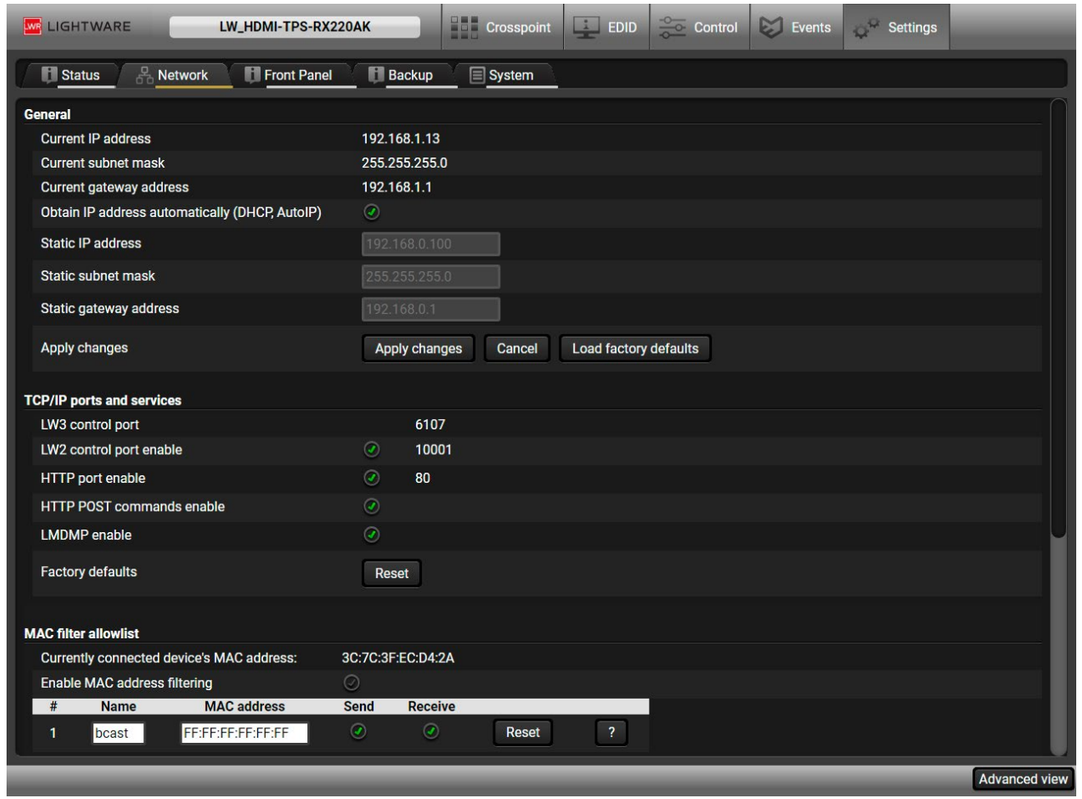
Status tab in Settings menu

The most important hardware and software related information can be found on this tab: hardware and firmware version, serial numbers, temperatures, operation time, and voltage information. The device label can be changed to a unique description by the **Set** button. The **Device label** is a user-editable name displayed next to the main menu. The **Product name** is a read-only property. Please note that the Miniweb-related descriptions can be found in The Miniweb Room Control section. *#firmwareversion #status #devicelabel #label #serialnumber #miniweb #builtinweb #web #producttype*

Identify Me Feature

Clicking on the **Identify me** button results the blinking of the status LEDs (in green) for 10 seconds. The feature helps identify the device itself in the rack shelf. *#identifyme #new*

5.11.2. Network



Network tab in Settings menu

General

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

TCP/IP Ports and Services

DIFFERENCE: This feature is available from FW package v1.5.0b3.

The IP Port Block feature is an additional protection for the Cleartext login, see the Cleartext Login (Login Settings) section. There are TCP/IP ports in Lightware devices that are not protected by the login, so you can disable them if necessary. For example, due to the working method of the LW2 communication, the Cleartext login does not provide protection when an LW2 command is sent to the device, that is why the TCP port no.10001 shall be blocked manually. *#dhcp #ipaddress #network #portblock #new*

MAC Filter Allowlist

DIFFERENCE: This feature is available from FW package v1.5.0b3.

Another level of the security is the MAC Filtering tool. You can create a list of network devices based on the MAC address that are allowed: *#macfilter #new*

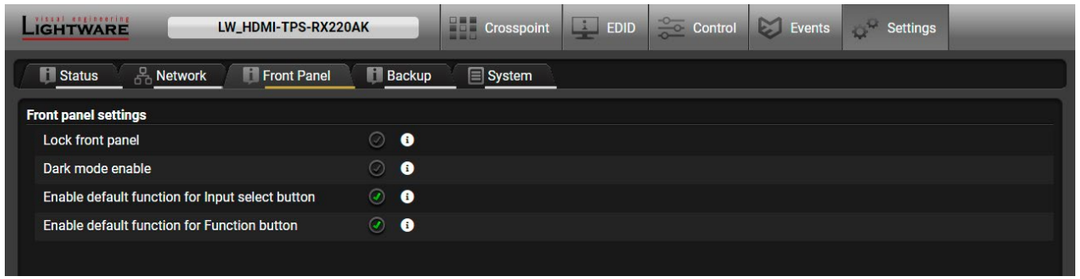
- Controlling the device (Send option), or
- Querying parameters (Receive option) to/from the Lightware device.

Do not forget to press the **Apply changes** button to store the new settings.

ATTENTION: The first three lines are factory default values and they are necessary for the proper working.

ATTENTION: If the device is installed in a network where it gets the IP address from a DHCP server and you plan to use the MAC filtering, make sure the MAC address of the DHCP server is added to the white list. Otherwise, the device will not get an IP address and will be unreachable.

5.11.3. Front Panel



Front panel tab in Settings menu

Available settings:

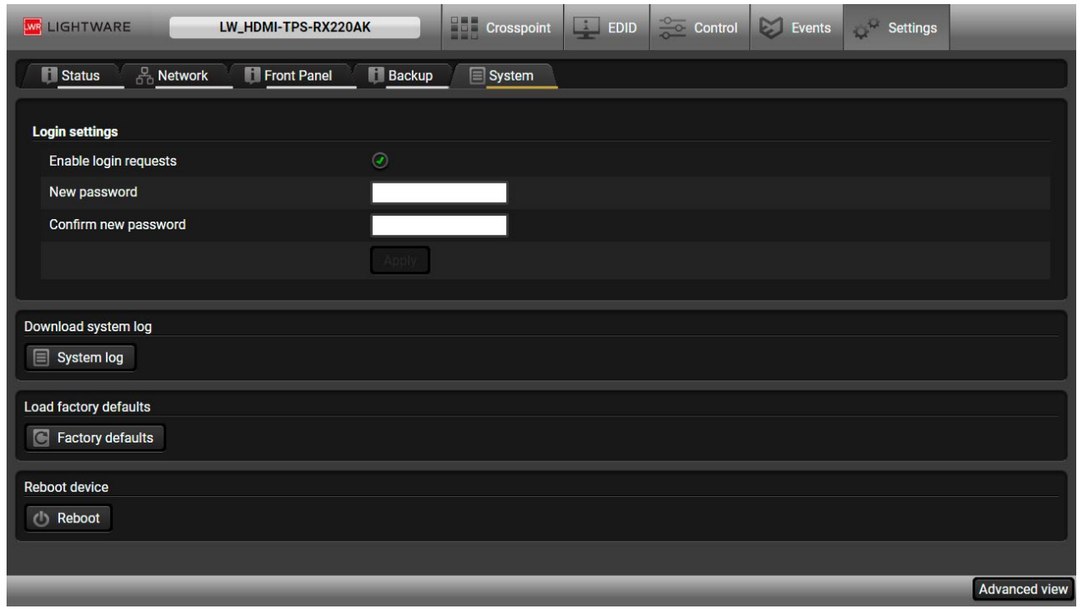
- **Lock front panel**: the Function button functionality can be disabled with the option is marked.
- **Dark mode enable**: when dark mode is enabled, all status LEDs are switched off after one minute, if no button pressed. Pressing the Function button brings back status info on the LEDs without performing the function of the button itself.
- **Enable default function for Input select button**: enabling the option results the default function of the Function button. See the details about the default function in the Crosspoint Status LEDs and Input Select Button Functionality section.
- **Enable default function for Function button**: enabling the option results in the default function of the Input select button. See the details about the default function in the Function Button section.

#buttonlock #lockbutton #darkmode

5.11.4. Backup

The details about this function can be found in the Configuration Cloning (Backup Tab) section.

5.11.5. System



System tab in Settings menu

Cleartext Login (Login Settings)

DIFFERENCE: This feature is available from FW package v1.5.0b3.

This cleartext login tool allows setting a password, thus the device will not accept any command coming from a control interface (RS-232, Ethernet, etc…) without login. The device will be visible in the Device Discovery window (as the device type and the serial number can be queried without login) but connection can be established only after successful login. The login is valid until a TCP socket break in case of Ethernet connection. *#login*

ATTENTION: If the login is enabled, the password will be asked when opening The Miniweb Room Control.

INFO: The login password is erased and the login is disabled when restoring the factory default values.

Three functions are available under System tab: *#log #systemlog #factory #restart #reboot #new*

- **Download system log** - saving the file of the device.
- **Load factory defaults** - recalling Factory Default Settings and values.
- **Reboot** - rebooting the system.

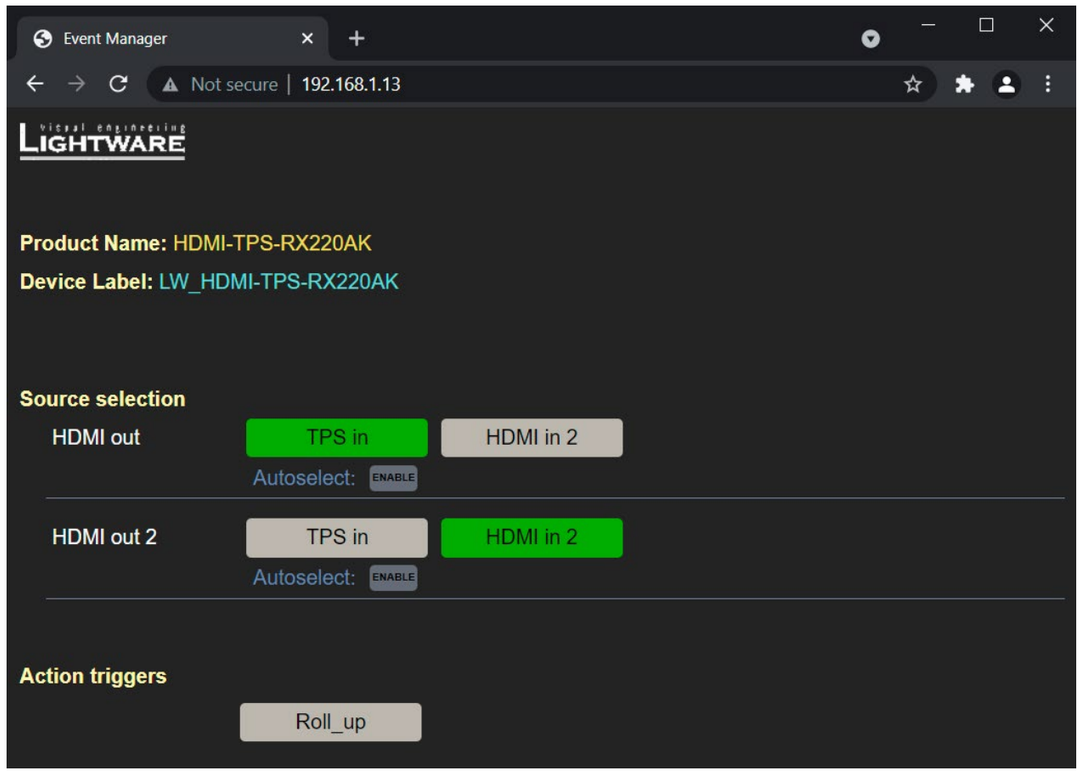
5.12. The Miniweb Room Control

DEFINITION: The miniweb is a dedicated location in the memory where an HTML file can be uploaded to. If the `http://<IP_address>/index.html` page or the `http://<host_name>/index.html` is opened in a web browser, the file is displayed.

ATTENTION: The default control page can installed in the device during the first firmware update process by the user if the necessary parameter is enabled. See the Step 3. Check the update parameters section.

The default control page allows the following:

- **Source selection:** This block can be used to select an input or enable/disable the Autoselect remotely e.g. from a mobile device.
- **Action triggers:** The action trigger buttons can be used to perform a configured Event Action without waiting for the condition to occur. This can be done remotely from a mobile device, too.



The Control Page Displayed in a Desktop Browser (with Action Trigger Buttons)

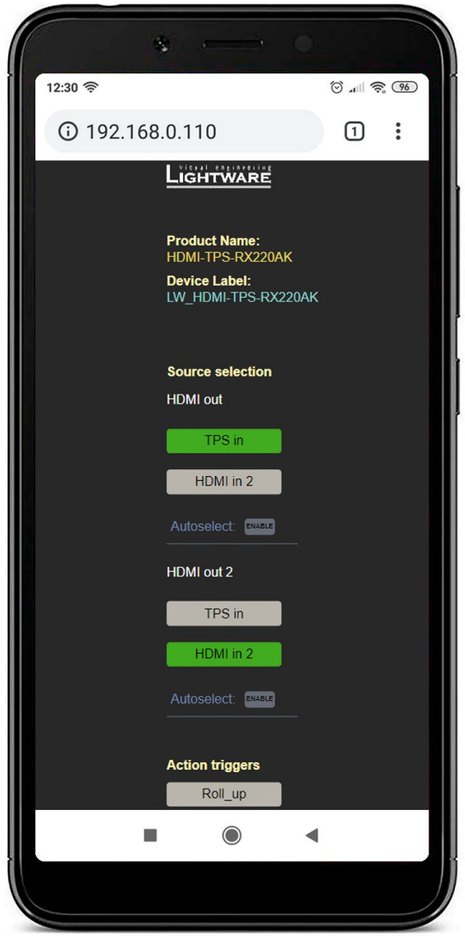
#miniweb #builtinweb #web

5.12.1. Opening the Miniweb

The Miniweb is available by:

- Opening a **web browser** and typing the **http://<IP_address>.index.html** or the **http://<IP_address>** in the address line, or
- Launching the **LDC**, connecting to the device, navigating to **Settings/Status** and pressing the **Open miniweb** button.

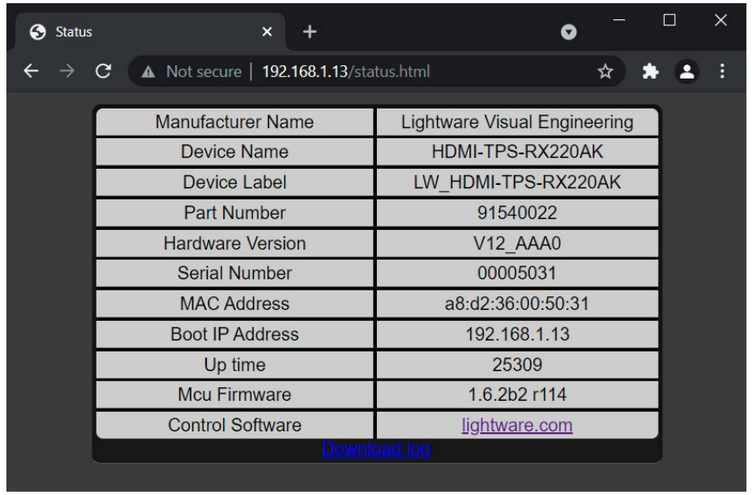
INFO: The host name can be used instead of the IP address; see the Setting the Host Name section.



The Control Page Displayed in a Smartphone Browser

The Default Status Page

If there is no control page uploaded, the default status page will be displayed (which is also available by opening the **<IP_address>/status.html** address.



The Factory Default Status Page (status.html)

5.12.2. Miniweb Customization

The buttons of the **Action triggers** section are linked to Actions of certain Events in the Event Manager. These buttons are displayed **only** for specific events:

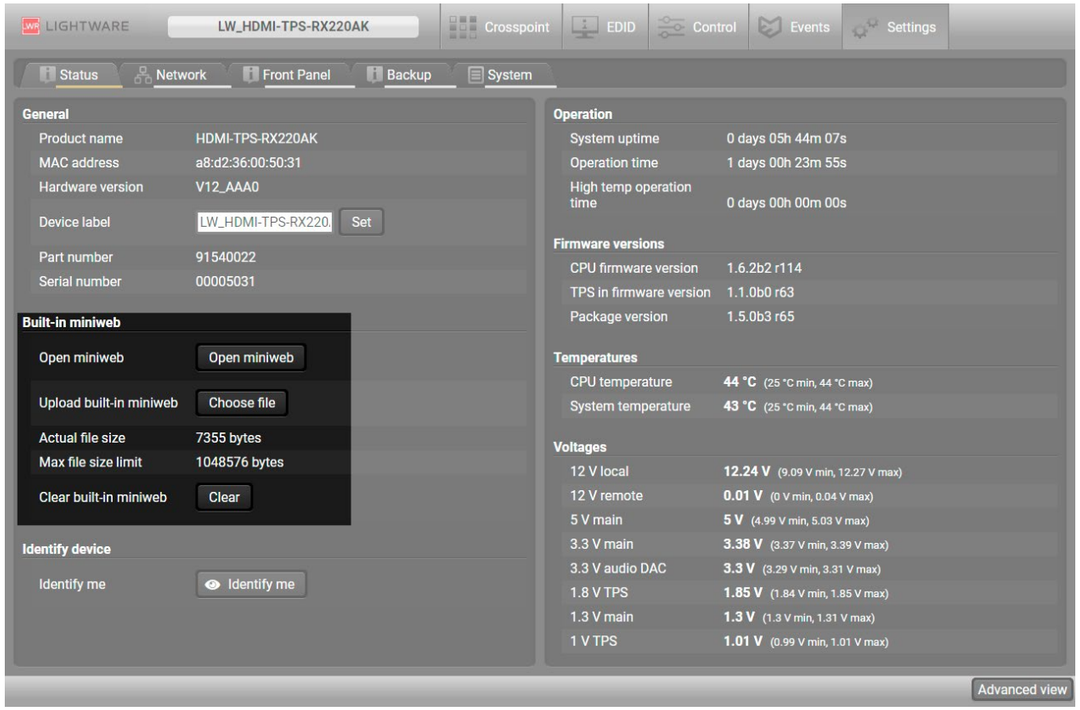
- Any Event which does **not** have the **@W** suffix in its name will **not** be displayed as a trigger button.
- The displayed trigger buttons will get a **text label** with the **event name** except the suffix.

To add the desired Action as a button, **append the name** of the desired Event with the **@W** characters - see below (type uppercase for 'W' as it is case-sensitive):

Customized HTML

The default control page can be replaced in the LDC; navigate to the **Settings/Status** page. A custom HTML file can be uploaded by pressing the **Choose file** button. Pay attention to the size of the HTML file. Only one file is allowed, and the maximum file size is 10 KB.

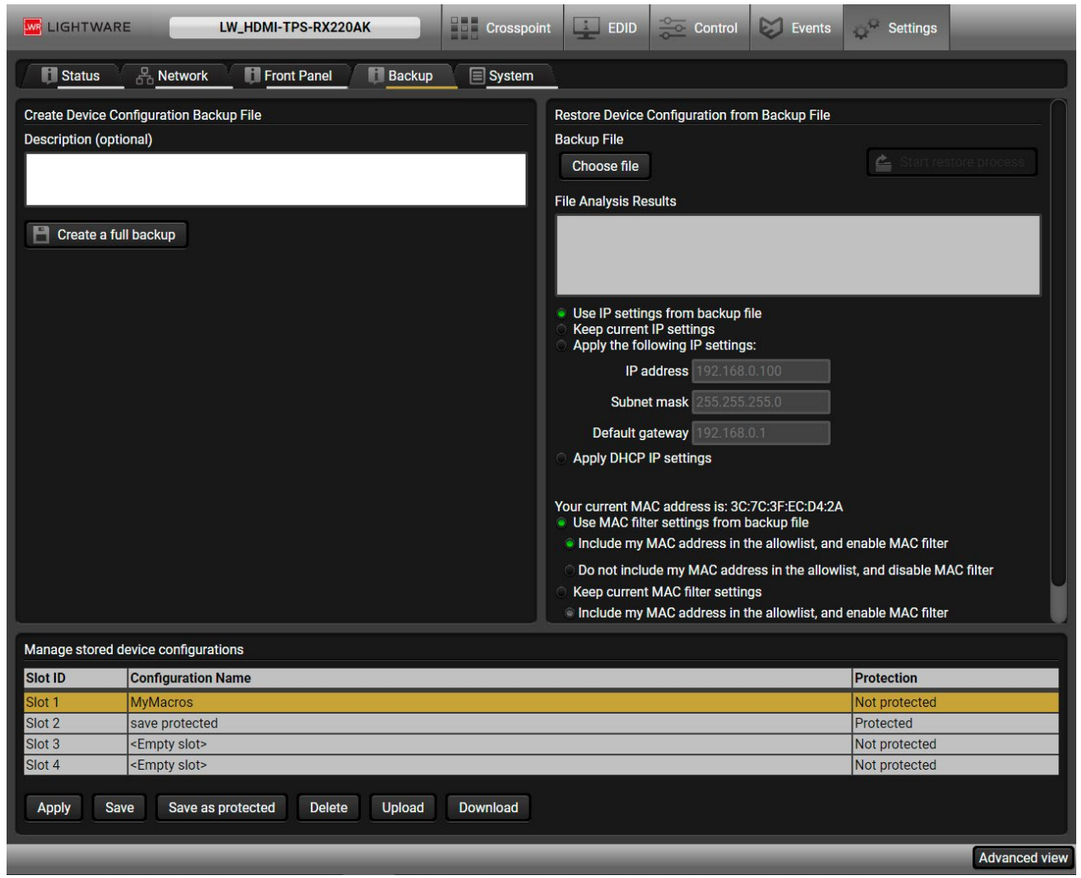
Press the **Reset** button to remove the control page. The default control page can be restored during a firmware update process, see the Step 3. Check the update parameters section.



The Miniweb Room Control Section in LDC

5.13. Configuration Cloning (Backup Tab)

The configuration cloning of Lightware LW3 devices is a simple method that eliminates the need to repeatedly configure certain devices to have identical (non-factory) settings. If the devices are installed in the same type of system multiple times, then it is enough to set up only one device to fit the user's needs and then copy those settings to the others, thus saving time and resources.



Backup tab

5.13.1. Cloning Steps in a Nutshell

Installing multiple devices with the same customized configuration settings can be done in a few easy steps:

Step 1. Configure one device with all your desired settings using the LDC software.

Step 2. Backup the full configuration file to your computer.

Step 3. If needed, make some modifications to the configuration file using a text editor (e.g. Notepad). E.g. modifying the static IP address is necessary when DHCP is not used.

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

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

ATTENTION: Macros cannot be saved into the backup file. If you have macros stored in a Configuration slot, download it separately and upload it in the target device.

5.13.2. Save the Settings of a Device (Backup)

Step 1. Apply the desired settings in the device (port settings, parameters, etc.)

Step 2. Select the **Settings** / **Backup** tab from the menu.

Step 3. Write a short **description** in the text box on the left (optional).

Step 4. Press the **Create a full backup** button. You will be prompted to save the file to the computer. The default file name is the following:

```
BACKUP_<DEVICE TYPE>_SN<SERIAL NUMBER>.LW3
```

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

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

About the Backup File

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

See the entire list of saved data in the Content of Backup File section.

ATTENTION: Editing the command lines is only recommended for expert users.

5.13.3. Upload the Settings to a Device (Restore)

WARNING! Please note that the settings will be permanently overwritten with the restored parameters in the device. Withdrawal is not possible.

ATTENTION: The cloning can be successful if the backup file is downloaded from the same type of source device as the destination device.

The Restoring Process

Step 1. Select the **Settings** / **Backup** tab from the menu.

Step 2. Click on the **Choose file** button on the right panel and **browse** the desired file.

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

Step 4. Choose **IP settings** that you want to use after backup. You can apply settings from the backup file, keep actual settings, set it manually in a dialog box or apply DHCP.

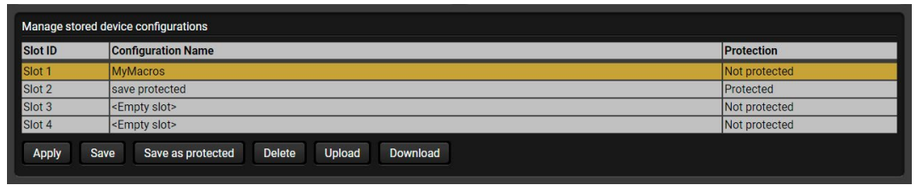
Step 5. Select the desired **MAC filter settings** to be applied in the device. See more information about this feature in the MAC Filter Allowlist section.

Step 6. Press the **Start restore process** button and click on the **Yes** button when asked.

Step 7. Reboot the device to apply the network settings after finishing.

5.13.4. Create and Restore Backups from the Device Memory

The device can store configurations in its own memory, four internal slots are available for this purpose.



You can save the configuration to the internal slot:

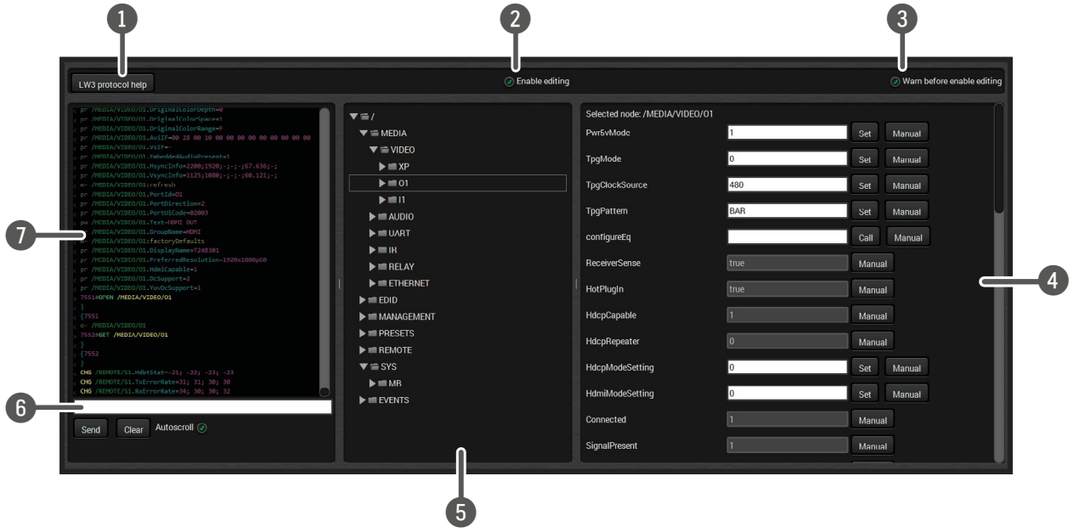
- **without protection:** it can be easily applied/deleted, or
- **with protection:** it can be protected by a password to apply or delete the configuration.

Apply	Loading the selected configuration	Delete	Deleting the selected configuration
Save	Saving the current configuration to the selected slot without protection	Upload	Loading a configuration from a file to the selected slot
Save as protected	Saving the current configuration to the selected slot with a password	Download	Saving the selected configuration as a file

The preset can be used for the macros as well, please see the Macros section.

WARNING! Loading factory default settings will erase the internal preset in the device memory!

5.14. Advanced View Window



1. **LW3 protocol help** — Pushing the button opens a help window that describes the most important information about LW3 protocol commands in HTML format.

2. **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.

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

4. **Node list** — Correspondent parameters and nodes are shown that are connected to the selected item in the protocol tree. The commands typed in these fields are escaped automatically.
   - **Manual** button: Manual (short description) of the node can be called and displayed in the terminal window.
   - **Set** button: Saves the value/parameter typed in the textbox.
   - **Call** button: Calls the method, e.g. reloads factory default settings.

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

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. The command typed in this line are not escaped automatically.

7. **Terminal window** — Commands and responses with time and date are listed in this window. The sent command starts with '>' character, the received response starts with '<' character. 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.

#terminal #advancedview

6

LW2 Programmer's Reference

The device can be controlled through a reduced command set of LW2 protocol commands to ensure the compatibility with other Lightware products. The supported LW2 commands are described in this chapter.

- Protocol Description **69**
- Instructions for the Terminal Application Usage **69**
- General LW2 Commands **70**
- Crosspoint and Port Settings **72**
- Network Configuration **75**
- RS-232 Settings **77**
- LW2 Protocol Commands – Quick Summary **80**

6.1. Protocol Description

The protocol description hereinafter stands for Lightware protocol 2. The commands below can be sent to the device in RAW format via the TCP/IP port no. 10001.

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

Legend for Control Commands

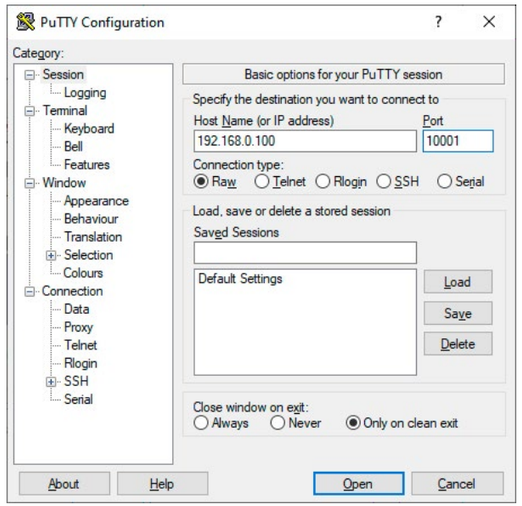
Format	Explanation
<in>	Input number in 1- or 2-digit ASCII format (01, 5, 07, 16, etc.)
<out>	Output number in 1- or 2-digit ASCII format
<in/out>	Input or output port number in 1- or 2-digit ASCII format *
<in2>	Input number in 2-digit ASCII format (01, 02, 10, 12 etc.)
<out2>	Output number in 2-digit ASCII format (01, 02, 10, 12 etc.)
<in2/out2>	Input or output number in 2-digit ASCII format*
<loc>	Location number in 1-, 2- or 3-digit ASCII format
<id>	ID number in 1- or 2-digit ASCII format
<id2>	ID number in 2-digit ASCII format
CrLf	Carriage return, Line feed (0x0D, 0x0A)
·	Space character (0x20)
→	Each command issued by the controller
←	Each response received from the router

* The command has the same arguments on the input ports and the output port, as well.

6.2. Instructions for the Terminal Application Usage

Terminal Application

The LW2 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:

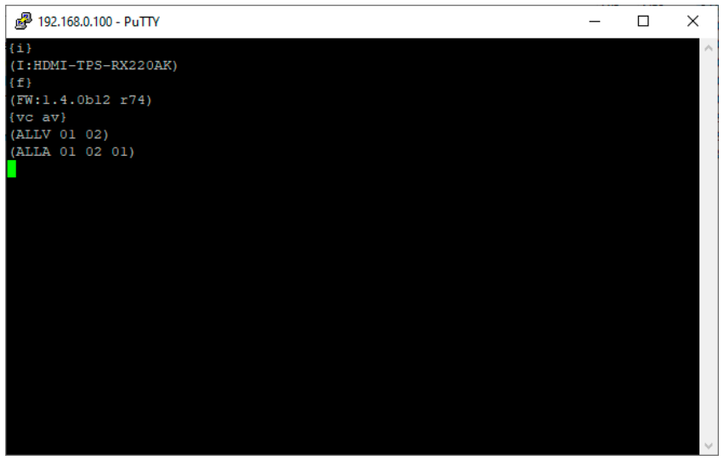
Step 1. Connect the receiver to a LAN over Ethernet (see the details in the Connecting Steps section).

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 (10001)**.

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

Once the terminal window is opened, you can enter the LW2 protocol commands, which are listed in the following sections.



LW2 protocol command communication in a terminal window

6.3. General LW2 Commands

6.3.1. List of All Available LW2 Commands

Command and Response

→ {lcmd}
← (LCMD# LCMD: List all commands)CrLf
← <LW2_commands>CrLf
← (LCMD END)CrLf

Example

→ {lcmd}
← (LCMD# LCMD: List all commands)
← (LCMD# PING: Always response PONG)
← (LCMD# CT: Compile time)
← ...
← (LCMD END)

6.3.2. Querying the Product Type

The device responds its name. *#producttype*

Command and Response

→ {i}
← (I:<product_type>)CrLf

Example

→ {i}
← (I:HDMI-TPS-RX220AK)

6.3.3. Querying the Control Protocol

The device can be controlled with different control protocols. This command queries the active protocol of the currently used control interface. *#protocol*

Command and Response

→ {p_?}
← (CURRENT·PROTOCOL·=·#<protocol>)CrLf

Example

→ {p_?}
← (CURRENT PROTOCOL = #1)

Explanation

The device communicates with LW2 protocol.

6.3.4. Querying the Firmware Version

Command and Response *#firmwareversion*

→ {f}
← (FW:<firmware_version>)CrLf

Example

→ {f}
← (FW:1.4.0b12 r74)

6.3.5. Connection Test

Simple test to see if the connection is established successfully.

Command and Response

→ {ping}
← (PONG!)CrLf

Example

→ {ping}
← (PONG!)

6.3.6. Querying the Serial Number

The device responds its 8-digit serial number. *#serialnumber*

Command and Response

→ {s}
← (SN:<serial_number>)CrLf

Example

→ {s}
← (SN:A2000274)

6.3.7. Querying the Device Label

Command and Response

→ {label}
← (LABEL=<device_label>)CrLf

Example

→ {label}
← (LABEL=RX220AK_ConferenceRoom)

6.3.8. Querying the Installed Boards

Shows the hardware name and revision of the installed cards.

Command and Response

→ {is}
← (SL#·0·<mb_desc>)CrLf
← (SL·END)CrLf

Example

→ {is}
← (SL# 0 HDMI-TPS-RX220AK)
← (SL END)

6.3.9. Querying the Firmware Version for All Controllers

Shows the firmware versions of all installed controllers. *#firmwareversion*

Command and Response

→ {fc}
← (CF·<device>·<firmware_version>)CrLf
← (CF·END)CrLf

Example

→ {fc}
← (CF HDMI-TPS-RX220AK 1.4.0b12 r74)
← (CF END)

6.3.10. Querying the Compile Time

Returns the date when the CPU firmware was compiled.

Command and Response

→ {ct}
← (COMPILED:·<date>·<time>)CrLf

Example

→ {ct}
← (Compiled: Jan 29 2020 17:16:28)

6.3.11. Querying the Health Status

Internal voltages and measured temperature values are shown. *#status*

Command and Response

→ {st}
← (ST·<health_status>)CrLf

Example

→ {st}
← (ST CPU 12.18V 5.03V 3.30V 0.01V 3.38V 1.30V 1.86V 0.99V 0.01V 53.67C 53.67C)

6.3.12. Restarting of the Device

The device can be restarted without unplugging power. *#restart #reboot*

Command and Response

→ {rst}
←

Example

→ {rst}
←

6.3.13. Recalling Factory Default Settings

All settings and parameters are reset to factory default, see the table in the Factory Default Settings section. *#factory*

Command and Response

→ {factory=all}
← (FACTOR Y ALL…)CrLf

Example

→ {factory=all}
← (FACTORY ALL…)

6.4. Crosspoint and Port Settings

Port Numbering

Port type	Port	LW2 port number	Applicable media layers		
			Audio	Video	Audio + Video
Input	TPS in 1	**01**	A	V	AV
	HDMI in 2	**02**	A	V	AV
Output	HDMI out 1	**01**	A	V	AV
	HDMI out 2	**02**	A	V	AV
	Analog audio out	**03**	A	-	-

6.4.1. Switching an Input to an Output

Command and Response *#switch #crosspoint*

→ {<in>@<out>·<layer>}
← (O<in>·I<out>·<layer>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<layer>	The layer of the HDMI signal	**A**	Audio layer
		V	Video layer
		AV	Audio and video layers together
<out>	Output port	**O1**	
<in>	Input port	**I1, I2**	
		0	Using the '0' (zero) value, the input will be disconnected and no signal will appear on the output.

Example

→ {2@1 AV}
← (O01 I02 AV)

The audio and video signals of the HDMI in 2 (02) are selected to the HDMI out 1 (01) port.

Example 2

→ {0@1}
← (O01 I00)

Input is disconnected from HDMI out 1 (01) port, no signal is present.

ATTENTION: The response of this command does not show if the output is muted. To check the mute status, a separate query has to be used, like {VC}.

6.4.2. Switching an Input to All Outputs

Command and Response

→ {<in>@O·<layer>}
← (I<in>·ALL·<layer>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<layer>	The layer of the HDMI signal	**A**	Audio layer
		V	Video layer
		AV	Audio and video layers together

Example

→ {1@O A}
← (I01 ALL A)

Explanation

The audio signal of the TPS in 1 (01) is selected to the HDMI out 1, HDMI out 2 and Analog audio out audio ports.

ATTENTION: The response of this command does not show if the output is muted. To check the mute status, a separate query has to be used, like {VC}.

6.4.3. Muting an Output

Command and Response *#mute*

→ {#<out>·<layer>}
← (1MT<out>·<layer>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<layer>	The layer of the HDMI signal	**A**	Audio layer
		V	Video layer
		AV	Audio and video layers together

Example

→ {#3 A}
← (1MT03 A)

Explanation

The audio signal of the Analog audio out (03) is muted.

6.4.4. Unmuting an Output

Command and Response *#unmute*

→ {+<out>·<layer>}
← (0MT<out>·<layer>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<layer>	The layer of the HDMI signal	**A**	Audio layer
		V	Video layer
		AV	Audio and video layers together

Example

→ {+1}
← (0MT01)

Explanation

The audio and video signals of the HDMI out 1 (01) is unmuted.

6.4.5. Locking an Output

Lock an output port. The state of the output cannot be changed until unlocking.

Command and Response *#lock*

→ {#><out>·<layer>}
← (1LO<out>·<layer>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<layer>	The layer of the HDMI signal	**A**	Audio layer
		V	Video layer
		AV	Audio and video layers together

Example

→ {#>2 V}
← (1LO02 V)

Explanation

The video signal of the HDMI out 2 (02) is locked.

6.4.6. Unlocking an Output

Command and Response *#unlock*

→ {+<<out>·<layer>}
← (0LO<out>·<layer>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<layer>	The layer of the HDMI signal	**A**	Audio layer
		V	Video layer
		AV	Audio and video layers together

Example

→ {+<1}
← (0LO01)

Explanation

The audio and video signals of the HDMI out 1 (01) is unlocked.

6.4.7. Viewing Connection State on the Outputs

Command and Response *#portstatus*

→ {VC·<layer>}
← (ALL<layer>·<state_letter><in>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<layer>	The layer of the HDMI signal	**A**	Audio layer
		V	Video layer
		AV	Audio and video layers together
<state_letter>	The mute and lock state of the output port.	**L**	The output port is locked.
		M	The output port is muted.
		U	The output port is locked and muted.

Example

→ {vc av}
← (ALLV 01 02)
← (ALLA 01 01 01)

Explanation

The TPS in 1 (01) video input port is connected to the HDMI out 1 video output port; the HDMI in 2 (02) video input port is connected to the HDMI out 2 video output port; the HDMI in 1 (01) audio input port is connected to all the audio output ports (HDMI out 1, HDMI out 2, Analog audio out).

6.4.8. Viewing Crosspoint Size

Shows the physical crosspoint size.

Command and Response

→ {GETSIZE·<layer>}
← (SIZE=<size>·<layer>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<size>	The size of the crosspoint	<in>**x**<out>	The number input ports and the number of output ports separated with an "x".
<layer>	The layer of the HDMI signal	**A**	Audio layer
		V	Video layer
		AV	Audio and video layers together

Example

→ {getsize av}
← (SIZE=2x2 V)
← (SIZE=2x3 A)

Explanation

The device reports that it has a video crosspoint with 2 inputs and 2 outputs and an audio crosspoint with 2 inputs and 3 outputs.

6.4.9. Querying the Autoselect Mode

The autoselect mode of the audio or video outputs can be changed.

Command and Response *#autoselect*

→ {AS_<layer><out>=?}
← (AS_<layer><out>=<state>;<mode>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<layer>	The layer of the HDMI signal	**A**	Audio layer
		V	Video layer
<state>	Autoselect state	**E**	Autoselect mode is enabled.
		D	Autoselect mode is disabled.
<mode>	Autoselect mode	**F**	First detect mode
		L	Last detect mode
		P	Priority detect mode

Example

→ {as_v1=?}
← (AS_V1=D;P)

Explanation

The Autoselect function is disabled on the video signal of the HDMI out 1 (1) port.

6.4.10. Changing the Autoselect Mode

The autoselect mode of the audio or video outputs can be changed.

Command and Response

→ {AS_<layer><out>=<state>;<mode>}
← (AS_<layer><out>=<state>;<mode>)CrLf

Parameters

See at the previous section.

Example

→ {as_a2=E;F}
← (AS_A2=E;F)

Explanation

The Autoselect function is enabled in first detect mode on the audio signal of the HDMI out 2 (2) port.

6.4.11. Querying the Autoselect Input Priority

The settings of audio or video autoselect input priority can be queried as follows.

Command and Response

→ {PRIO_<layer><out>=?}

← (PRIO_<layer><out>=<in1_prio>;<in2_prio>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<layer>	The layer of the HDMI signal	**A**	Audio layer
		V	Video layer
<in1_prio> <in2_prio>	Priority number of the input ports.	**0**	Higher priority
		1	Lower priority

Example

→ {prio_v1=?}

← (PRIO_V1=0;1)

Explanation

The video signal of the TPS in 1 port has the higher priority, the HDMI in 2 has the lower priority.

6.4.12. Changing the Autoselect Input Priority

The settings of audio or video autoselect input priority can be changed as follows.

Command and Response

→ {PRIO_<layer><out>=<in1_prio>;<in2_prio>}

← (PRIO_<layer><out>=<in1_prio>;<in2_prio>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<layer>	The layer of the HDMI signal	**A**	Audio layer
		V	Video layer
<in1_prio> <in2_prio>	Priority number of the input ports.	**0**	Highest priority
		1	Lowest priority

Example

→ {prio_a2=1;0}

← (PRIO_A2=1;0)

ATTENTION: Always set all the priority of the ports when changing, otherwise the change will not be executed and the response will be the current setting (like querying the priority setting).

6.5. Network Configuration

6.5.1. Querying the IP Status

The network configuration of the device can be queried as follows. *#network #ipaddress #dhcp*

Command and Response

→ {IP_STAT=?}

← (IP_STAT=<mode>;<ip_address>;<subnet_mask>;<gateway_addr>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<mode>	Static IP address setting or DHCP (dynamic IP address)	**0**	Static IP address
		1	DHCP
<ip_address>	Current IP address of the device		IP address (four decimal octets separated by dots).
<subnet_mask>	Current subnet mask of the device		Subnet mask (four decimal octets separated by dots).
<gateway_address>	Current gateway address of the device		Gateway address (four decimal octets separated by dots).

Example

→ {ip_stat=?}

← (IP_STAT=0;192.168.0.75;255.255.255.0;192.168.0.1)

Explanation

The device has a static (fix) IP address: 192.168.0.75; the subnet mask is 255.255.255.0, the gateway address is 192.168.0.1.

6.5.2. Querying the IP Address

IP address can be queried as follows.

Command and Response

→ {IP_ADDRESS=?}
← (IP_ADDRESS=<mode>;<ip_address>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<mode>	Static IP address setting or DHCP (dynamic IP address)	**0**	Static IP address
		1	DHCP
<ip_address>	Current IP address of the device		IP address (four decimal octets separated by dots).

Example

→ {ip_address=?}
← (IP_ADDRESS=1;192.168.2.118)

Explanation

The device has a DHCP (dynamic) IP address: 192.168.2.118.

6.5.3. Setting the IP Address

IP address can be set as follows.

Command and Response

→ {IP_ADDRESS=<mode>;<ip_address>}
← (IP_ADDRESS=<mode>;<ip_address>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<mode>	Static IP address setting or DHCP (dynamic IP address)	**0**	Static IP address
		1	DHCP
<ip_address>	IP address of the device		IP address (four decimal octets separated by dots).

Example

→ {ip_address=1;}
← (IP_ADDRESS=1;192.168.2.118)

Explanation

The device is set to DHCP (dynamic) IP address and got 192.168.2.118.

6.5.4. Querying the Subnet Mask

IP address can be queried as follows.

Command and Response

→ {IP_NETMASK=?}
← (IP_NETMASK=<subnet_mask>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<subnet_mask>	Current subnet mask of the device		Subnet mask (four decimal octets separated by dots).

Example

→ {ip_netmask=?}
← (IP_NETMASK=255.255.255.0)

6.5.5. Setting the Subnet Mask

IP address can be set as follows.

Command and Response

→ {IP_NETMASK=<subnet_mask>}
← (IP_NETMASK=<subnet_mask>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<subnet_mask>	Subnet mask of the device		Subnet mask (four decimal octets separated by dots).

Example

→ {ip_netmask=255.255.0.0}
← (IP_NETMASK=255.255.0.0)

6.5.6. Querying the Gateway Address

Gateway address can be queried as follows.

Command and Response

→ {IP_GATEWAY=?}
← (IP_GATEWAY=<gateway_address>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<gateway_address>	Current gateway address of the device		Gateway address (four decimal octets separated by dots).

Example

→ {ip_gateway=?}
← (IP_GATEWAY=192.168.0.1)

6.5.7. Setting the Gateway Mask

Gateway address can be set as follows.

Command and Response

→ {IP_GATEWAY=<gateway_address>}
← (IP_GATEWAY=<gateway_address>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<gateway_address>	Current gateway address of the device		Gateway address (four decimal octets separated by dots).

Example

→ {ip_gateway=192.168.0.1}
← (IP_GATEWAY=192.168.0.1)

6.5.8. Applying Network Settings

Applying the network settings and restarting the network interface.

ATTENTION: The command is always requires as the last step for applying the modified network settings.

Command and Response

→ {IP_APPLY}
← (IP_APPLY)CrLf

Example

→ {ip_apply}
← (IP_APPLY)

6.6. RS-232 Settings

6.6.1. Setting the RS-232 Mode

RS-232 mode can be set as follows. See more details about RS-232 modes in the Serial Interface section.

Command and Response

→ {RS232=<mode>}
← (RS232=<mode>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<mode>	RS-232 operation mode	**CONTROL**	Control mode
		CI	Command injection mode
		PASS	Pass-through mode

Example

→ {rs232=control}
← (RS232=CONTROL)

INFO: The current RS-232 mode can be queried by the {RS232=?} command.

#rs232 #rs-232 #serial #commandinjection #protocol

6.6.2. Setting the Local RS-232 Parameters

The parameters of local RS-232 port can be set as follows.

Command and Response

→ {RS232_LOCAL_FORMAT=<BaudRate>;<DataBit>;<Parity>;<StopBit>}

← (RS232_LOCAL_FORMAT=<BaudRate>;<DataBit>;<Parity>;<StopBit>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<BaudRate>	Baud rate	**X**	No change
		4800	4800
		7200	7200
		9600	9600
		14400	14400
		19200	19200
		38400	38400
		57600	57600
		115200	115200
<DataBit>	Data bit	**X**	No change
		8	8
		9	9
<Parity>	Parity	**X**	No change
		N	None
		E	Even
		O	Odd
<StopBit>	Stop Bit	**X**	No change
		1	1
		1,5	1,5
		2	2

Example

→ {rs232_local_format=9600;8;O;X}

← (RS232_LOCAL_FORMAT=9600;8;O;X)

Explanation

The local RS-232 port is set as the following: the baud rate to 9600, data bit to 8, parity to odd, and stop bit is not changed, remained 1.

INFO: The current local RS-232 parameters can be queried by the {RS232_LOCAL_FORMAT=?} command.

6.6.3. Setting the Link RS-232 Parameters

The parameters of link RS-232 (TPS) port can be set as follows.

Command and Response

→ {RS232_LINK_FORMAT=<BaudRate>;<DataBit>;<Parity>;<StopBit>}

← (RS232_LINK_FORMAT=<BaudRate>;<DataBit>;<Parity>;<StopBit>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<BaudRate>	Baud rate	**X**	No change
		4800	4800
		7200	7200
		9600	9600
		14400	14400
		19200	19200
		38400	38400
		57600	57600
		115200	115200
<DataBit>	Data bit	**X**	No change
		8	8
		9	9
<Parity>	Parity	**X**	No change
		N	None
		E	Even
		O	Odd
<StopBit>	Stop Bit	**X**	No change
		1	1
		1,5	1,5
		2	2

Example

→ {rs232_link_format=9600;8;O;X}

← (RS232_LINK_FORMAT=9600;8;O;X)

Explanation

The link RS-232 port is set as the following: the baud rate to 9600, data bit to 8, parity to odd, and stop bit is not changed, remained 1.

INFO: The current link RS-232 parameters can be queried by the {RS232_LINK_FORMAT=?} command.

6.6.4. Setting the Control Protocol of the Local RS-232 Port

The control protocol of local RS-232 port can be set as follows.

Command and Response

→ {RS232_LOCAL_PROT=<protocol>}
← (RS232_LOCAL_PROT=<protocol>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<protocol>	RS-232 control protocol	**LW2**	LW2 control protocol
		LW3	LW3 control protocol

Example

→ {rs232_local_prot=lw2}
← (RS232_LOCAL_PROT=LW2)

INFO: The current local RS-232 parameters can be queried by the {RS232_LOCAL_PROT=?} command.

6.6.5. Setting the Control Protocol of the Link RS-232 Port

The control protocol of link RS-232 (TPS) port can be set as follows.

Command and Response

→ {RS232_LINK_PROT=<protocol>}
← (RS232_LINK_PROT=<protocol>)CrLf

Parameters

Identifier	Parameter description	Value	Parameter value
<protocol>	RS-232 control protocol	**LW2**	LW2 control protocol
		LW3	LW3 control protocol

Example

→ {rs232_link_prot=lw2}
← (RS232_LINK_PROT=LW2)

INFO: The current local RS-232 parameters can be queried by the {RS232_LINK_PROT=?} command.

6.7. LW2 Protocol Commands – Quick Summary

General LW2 Commands

List of All Available LW2 Commands

→ {lcmd}

Querying the Product Type

→ {i}

Querying the Control Protocol

→ {p_?}

Querying the Firmware Version

→ {f}

Connection Test

→ {ping}

Querying the Serial Number

→ {s}

Querying the Device Label

→ {label}

Querying the Installed Boards

→ {is}

Querying the Firmware Version for All Controllers

→ {fc}

Querying the Compile Time

→ {ct}

Querying the Health Status

→ {st}

Restarting of the Device

→ {rst}

Recalling Factory Default Settings

→ {factory=all}

Crosspoint and Port Settings

Switching an Input to an Output

→ {<in>@<out>·<layer>}

Switching an Input to All Outputs

→ {<in>@O·<layer>}

Muting an Output

→ {#<out>·<layer>}

Unmuting an Output

→ {+<out>·<layer>}

Locking an Output

→ {#><out>·<layer>}

Unlocking an Output

→ {+<<out>·<layer>}

Viewing Connection State on the Outputs

→ {VC·<layer>}

Viewing Crosspoint Size

→ {GETSIZE·<layer>}

Querying the Autoselect Mode

→ {AS_<layer><out>=?}

Changing the Autoselect Mode

→ {AS_<layer><out>=<state>;<mode>}

Querying the Autoselect Input Priority

→ {PRIO_<layer><out>=?}

Changing the Autoselect Input Priority

→ {PRIO_<layer><out>=<in1_prio>;<in2_prio>}

Network Configuration

Querying the IP Status

→ {IP_STAT=?}

Querying the IP Address

→ {IP_ADDRESS=?}

Setting the IP Address

→ {IP_ADDRESS=<mode>;<ip_address>}

Querying the Subnet Mask

→ {IP_NETMASK=?}

Setting the Subnet Mask

→ {IP_NETMASK=<subnet_mask>}

Querying the Gateway Address

→ {IP_GATEWAY=?}

Setting the Gateway Mask

→ {IP_GATEWAY=<gateway_address>}

Applying Network Settings

→ {IP_APPLY}

RS-232 Settings

Setting the RS-232 Mode

→ {RS232=<mode>}

Setting the Local RS-232 Parameters

→ {RS232_LOCAL_FORMAT=<BaudRate>;<DataBit>;<Parity>;<StopBit>}

Setting the Link RS-232 Parameters

→ {RS232_LINK_FORMAT=<BaudRate>;<DataBit>;<Parity>;<StopBit>}

Setting the Control Protocol of the Local RS-232 Port

→ {RS232_LOCAL_PROT=<protocol>}

Setting the Control Protocol of the Link RS-232 Port

→ {RS232_LINK_PROT=<protocol>}

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

- Overview 83
- Instructions for the Terminal Application Usage 83
- Protocol Rules 83
- System Commands 86
- Cleartext Login Protection 87
- Video Port Settings 88
- Audio Port Settings 94
- Analog Audio Output Settings 98
- Event Manager Basics 100
- Event Manager Tool Kit 101
- Variable-Management 103
- Ethernet Port Configuration 107
- Ethernet Tool Kit 108
- Ethernet Message Sending 110
- HTTP Messaging 112
- TCP Message Recognizer 113
- RS-232 Port Configuration 116
- RS-232 Message Sending 118
- RS-232 Recognizer 119
- Sending CEC Commands 121
- Infrared Port Configuration 123
- Infrared Message Sending 124
- EDID Management 125
- LW3 Protocol Commands - Quick Summary 127

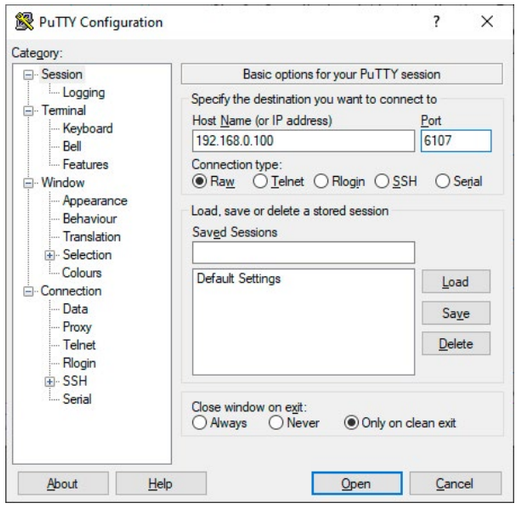
7.1. Overview

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 for establishing connection to the receiver:

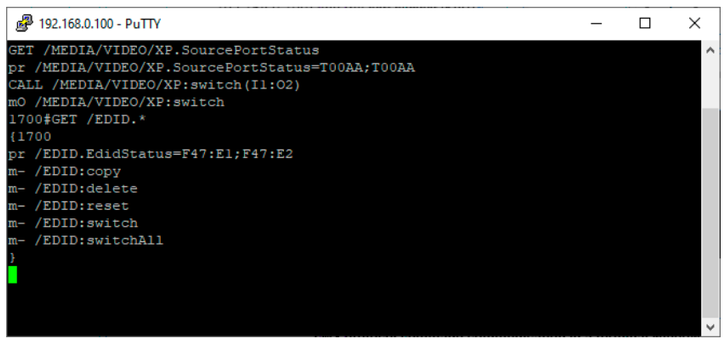
Step 1. Connect the receiver to a LAN over Ethernet (see the details in the Connecting Steps section).

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.

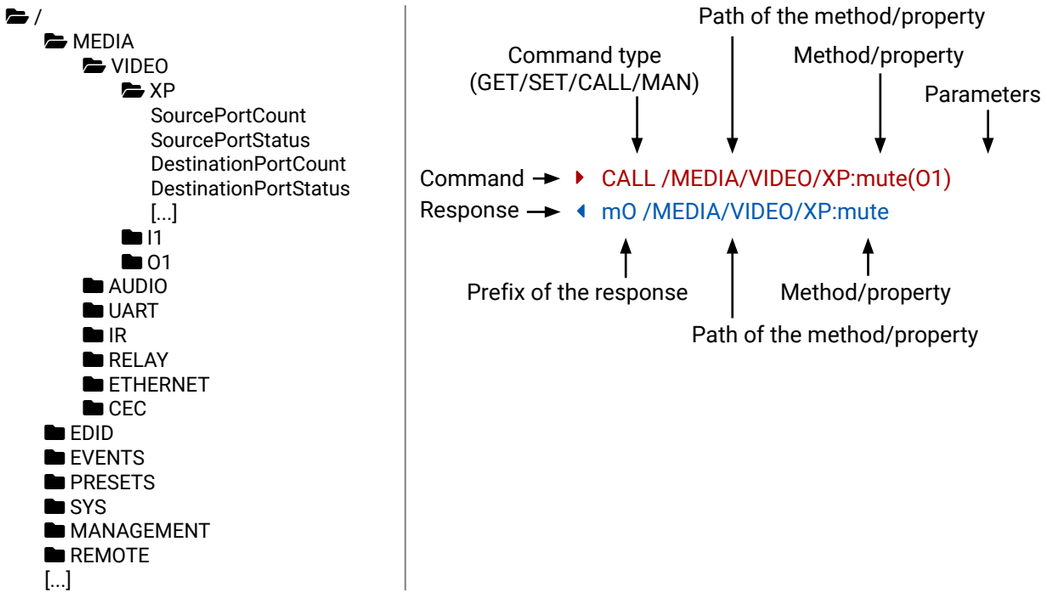
Once the terminal window is opened, you can enter the LW3 protocol commands, which are listed in the following sections.



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 **length of a line** (command/response, command type/prefix, path, method/property and parameters together) can be **max. 800 bytes**.
- 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.
- 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.

7.3.3. 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/UART
- ◂ ns /MEDIA/UART/RECOGNIZER
- ◂ ns /MEDIA/UART/P1
- ◂ ns /MEDIA/UART/P2
- ◂ pr /MEDIA/UART.PortCount=2
- ◂ pr /MEDIA/UART.PortUi=P1:12209;P2:12224
- ◂ pr /MEDIA/UART.P1=Local RS-232
- ◂ pr /MEDIA/UART.P2=TPS in RS-232

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/O1.TpgPattern=CYCLE
- ◂ pw /MEDIA/VIDEO/O1.TpgPattern=CYCLE

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 on 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/O1.Pwr5vMode
- ◂ pm /MEDIA/VIDEO/O1.Pwr5vMode ["0" | "1" | "2"] 0 - Auto, 1 - Always On, 2 - Always Off

7.3.4. Prefix Summary

DEFINITION: The prefix is a 2-character-long code that describes the type of the response.

The following prefixes are defined in the LW3 protocol:

Prefix	Description
n-	a node
nE	an error for a node
nm	a manual for a node
ns	a child node of a node
pr	a read-only property
pw	read-write property
pE	an error for the property

Prefix	Description
pm	a manual for the property
m-	a method
mO	a response after a successful method execution
mF	a response after a failed method execution
mE	an error for a method
mm	a manual for a method

7.3.5. 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

7.3.6. Escaping

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

Property values and method parameters can contain characters which 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\(01\))**

7.3.7. Signature

DEFINITION: The signature is a 4-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:E1;F47:E2
◂ 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.

7.3.8. 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
```

Get the Active Subscriptions

```
▸ OPEN
◂ o- /MEDIA/VIDEO
◂ o- /EDID
◂ o- /DISCOVERY
```

Subscribe to Multiple Nodes

```
▸ OPEN /MEDIA/VIDEO/*
◂ o- /MEDIA/VIDEO/*
```

Unsubscribe from a Node

```
▸ CLOSE /MEDIA/VIDEO
◂ c- /MEDIA/VIDEO
```

Unsubscribe from Multiple Nodes

```
▸ CLOSE /MEDIA/VIDEO/*
◂ c- /MEDIA/VIDEO/*
```

7.3.9. Notifications about the Changes of the Properties

When the value of a property is changed and the user is subscribed to the node that 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:E1
```

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 /V1/MEDIA/AUDIO/O3 ◂ o- /V1/MEDIA/AUDIO/O3 ▸ GET /V1/MEDIA/AUDIO/O3.VolumePercent ◂ pm /V1/MEDIA/AUDIO/O3.VolumePercent=100.00	**connection #1**
▸ GET /V1/MEDIA/AUDIO/O3.VolumePercent ◂ pw /V1/MEDIA/AUDIO/O3.VolumePercent=100.00 ◂ SET /V1/MEDIA/AUDIO/O3.VolumePercent=50.00 ◂ pw /V1/MEDIA/AUDIO/O3.VolumePercent=50.00	**connection #2**
◂ CHG /V1/MEDIA/AUDIO/O3.VolumePercent=50.00	**connection #1**

Explanation: 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.

7.3.10. Legend for the Control Commands

Format	Description
<in>	Input port number
<out>	Output port number
<port>	Input or output port number
<loc>	Location number
<parameter>	Specific parameter, which is 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. **O1;O2** or **F27:U1;F47:U2**
▸	Sent command
◂	Received response
·	Space character

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

7.4. System Commands

7.4.1. Querying the Product Name

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

Command and Response *#producttype*

- GET·/.ProductName
- pr·/.ProductName=<Product_name>

Example

- GET /.ProductName
- pr /.ProductName=HDMI-TPS-RX220AK

7.4.2. Setting the Device Label

ATTENTION: The device label can be changed to a custom text in the Status tab of the LDC software. This writable parameter is not the same as the ProductName parameter.

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

Command and Response *#devicelabel #label*

- SET·/MANAGEMENT/UID/DeviceLabel=<Custom_name>
- pw·/MANAGEMENT/UID/DeviceLabel=<Custom_name>

The Device Label can be 39 characters long and ASCII characters are allowed. Longer names are truncated.

Example

- SET /MANAGEMENT/UID.DeviceLabel=RX220_Conference1
- pw /MANAGEMENT/UID.DeviceLabel=RX220_Conference1

7.4.3. Querying the Serial Number

Command and Response *#serialnumber*

- GET·/.SerialNumber
- pr·/.SerialNumber=<serial_number>

Example

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

7.4.4. Querying the Firmware Version

Command and Response *#firmwareversion*

- GET·/SYS/MB.FirmwareVersion
- pr·/SYS/MB.FirmwareVersion=<firmware_version>

Example

- GET /SYS/MB.FirmwareVersion
- pr /SYS/MB.FirmwareVersion=1.4.0b12 r74

7.4.5. Identifying the Device

Calling the method results in the blinking of the status LEDs for 10 seconds. The feature helps identify the device itself in the rack shelf.

Command and Response *#identifyme*

- CALL·/MANAGEMENT/UI:identifyMe()
- mO·/MANAGEMENT/UI:identifyMe=

Example

- CALL /MANAGEMENT/UI:identifyMe()
- mO /MANAGEMENT/UI:identifyMe

7.4.6. Dark Mode

This command turns LEDs off the on the transmitter.

Command and Response *#darkmode*

- SET·/MANAGEMENT/UI/DARKMODE.DarkModeEnable=<logical_value>
- pw·/MANAGEMENT/UI/DARKMODE.DarkModeEnable=<logical_value>

Parameters

Identifier	Parameter description	Value	Explanation
<logical_value>	Status of the dark mode	**true**	Dark mode is enabled.
		false	Dark mode is disabled.

Example

- SET /MANAGEMENT/UI/DARKMODE.DarkModeEnable=true
- pw /MANAGEMENT/UI/DARKMODE.DarkModeEnable=true

7.4.7. Control Lock

Enable/disable the operation of the front panel buttons.

Command and Response *#controllock*

- SET·/MANAGEMENT/UI.ControlLock=<mode>
- pw·/MANAGEMENT/UI.ControlLock=<mode>

Parameters

Identifier	Parameter description	Value	Explanation
<mode>	Control lock mode	0	Disabled
		1	Locked
		2	Force locked.

Example

- SET /MANAGEMENT/UI.ControlLock=1
- pw /MANAGEMENT/UI.ControlLock=1

7.4.8. Restarting the Device

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

Command and Response *#restart #reboot*

- CALL·/SYS:reset()
- mO·/SYS:reset=

Example

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

7.4.9. Restoring the Factory Default Settings

Command and Response *#factory*

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

Example

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

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

7.4.10. Running a Macro

DIFFERENCE: This feature is available from FW package v1.5.0b3.

DEFINITION: A macro is a batch of pre-defined commands stored in the device. *#macro #new*

You can create your custom macros in a file, upload them to the device and run at any time. The uploading can be done over LDC, see the Uploading New Macros into the Internal Device Configuration Preset section. The following LW3 command is suitable only for running a macro.

Command and Response

- CALL·/CTRL/MACROS:run(<macro_name>)
- mO·/CTRL/MACROS:run

Example

- CALL /CTRL/MACROS:run(Macro1)
- mO /CTRL/MACROS:run

7.5. Cleartext Login Protection

DIFFERENCE: This feature is available from FW package v1.5.0b3.

This cleartext login tool allows setting a password for login, thus any change in the device can be performed only after a successful login – coming from any control interface (RS-232, Ethernet, etc…). The login is valid until a TCP socket break in case of Ethernet connection. *#login #new*

ATTENTION: If the login is enabled, the miniweb is not available.

INFO: The login password is erased and the login is disabled when restoring the factory default values.

The following can be queried without login:

- ProductName
- PartNumber
- SerialNumber
- FirmwareVersion
- PackageVersion
- MacAddress

7.5.1. Setting the Login Password

Command and Response

- CALL·/LOGIN:setPassword(<password>)
- mO·/LOGIN:setPassword

Example

- CALL /LOGIN:setPassword(pr0t3ctED)
- mO /LOGIN:setPassword

7.5.2. Logging into the Device

Command and Response

- ▸ CALL·/LOGIN:login(<password>)
- ◂ mO·/LOGIN:login

Example

- ▸ CALL /LOGIN:login(pr0t3ctED)
- ◂ mO /LOGIN:login

After a successful login, the **LoggedIn** property becomes **true** and the LW3 tree is available.

7.5.3. Logging out of the Device

Command and Response

- ▸ CALL·/LOGIN:logout(<password>)
- ◂ mO·/LOGIN:logout

Example

- ▸ CALL /LOGIN:logout(pr0t3ctED)
- ◂ mO /LOGIN:logout

After a successful logout, the **LoggedIn** property becomes **false** and the LW3 tree is protected.

7.5.4. Enabling/Disabling the Cleartext Login Function

ATTENTION: This property can be changed only, if the **LoggedIn** property is **true**.

Command and Response

- ▸ SET·/LOGIN:LoginEnable=<login_state>
- ◂ pw·/LOGIN.LoginEnable=<login_state>

Parameters

If the <login_state> parameter is **true** (or **1**), the Cleartext login function is **enabled**, if the parameter is **false** (or **0**), the function is **disabled**. Please note that the function can be enabled without setting a password by the **setPassword** method.

Example

- ▸ SET /LOGIN.LoginEnable=true
- ◂ pw /LOGIN.LoginEnable=true

7.6. Video Port Settings

Port Numbering

Video port type	Parameter	Video port	LW3 port number
Input	<in>	TPS in 1	**I1**
		HDMI in 2	**I2**
Output	<out>	HDMI out 1	**O1**
		HDMI out 2	**O2**

7.6.1. Querying the Status of the Source Ports

Command and Response *#portstatus*

- ▸ GET·/MEDIA/VIDEO/XP.SourcePortStatus
- ◂ pr·/MEDIA/VIDEO/XP.SourcePortStatus=<in_state>

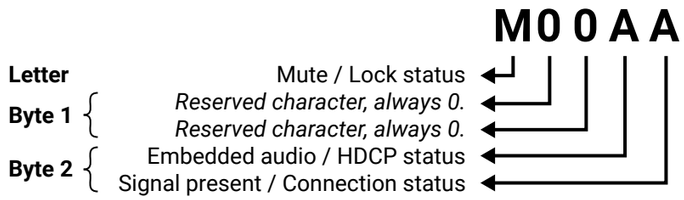
The response contains 5 ASCII characters for each port. The first character indicates the mute/lock state, the next four characters represent a 2-byte HEX code, showing the current state of the input ports.

Example

- ▸ GET /MEDIA/VIDEO/XP.SourcePortStatus
- ◂ pr /MEDIA/VIDEO/XP.SourcePortStatus=M00AA;T00FF

Parameters

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



	Byte 1				Byte 2			
	Character 2		Character 3		Character 4		Character 5	
	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0
	Reserved	Reserved	Reserved	Reserved	Embedded audio status	HDCP status	Signal present status	Connection status
0 0	Reserved	Reserved	Reserved	Reserved	Unknown			
0 1					Reserved			
1 0					No embedded audio	Not encrypted	No signal	Not connected
1 1					Embedded audio presents	Encrypted	Signal presents	Connected

The Most Common Received Port Status Responses

	T	0		0		A		A	
T00AA	Unlocked, Unmuted	0 0	0 0	0 0	0 0	1 0	1 0	1 0	1 0
		Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	No signal	Not connected

	T	0		0		A		B	
T00AB	Unlocked, Unmuted	0 0	0 0	0 0	0 0	1 0	1 0	1 0	1 1
		Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	No signal	Connected

	T	0		0		A		F	
T00AF	Unlocked, Unmuted	0 0	0 0	0 0	0 0	1 0	1 0	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	No embedded audio	Not encrypted	Signal presents	Connected

	T	0		0		E		F	
T00EF	Unlocked, Unmuted	0 0	0 0	0 0	0 0	1 1	1 0	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	Embedded audio presents	Not encrypted	Signal presents	Connected

	T	0		0		B		F	
T00BF	Unlocked, Unmuted	0 0	0 0	0 0	0 0	1 0	1 1	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	No embedded audio	Encrypted	Signal presents	Connected

	T	0		0		F		F	
T00FF	Unlocked, Unmuted	0 0	0 0	0 0	0 0	1 1	1 1	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	Embedded audio presents	Encrypted	Signal presents	Connected

7.6.2. Querying the Status of the Destination Ports

Command and Response *#portstatus*

- GET·/MEDIA/VIDEO/XP.DestinationPortStatus
- pr·/MEDIA/VIDEO/XP.DestinationPortStatus=<out_state>

Parameters

<out_state>: the response contains 5 ASCII characters for each port. The first character indicates the mute/lock state, the next 2-byte long HEX code shows the current state of the output port.

Example

- GET /MEDIA/VIDEO/XP.DestinationPortStatus
- pr /MEDIA/VIDEO/XP.DestinationPortStatus=M00BF;T00FF

Legend

See at previous section.

Explanation

M	0		0		B		F	
Unlocked, Muted	0 0	0 0	0 0	0 0	1 0	1 1	1 1	1 1
	Reserved	Reserved	Reserved	Reserved	No embedded audio	Encrypted	Signal presents	Connected

7.6.3. Querying the Video Crosspoint Setting

Command and Response

- GET·/MEDIA/VIDEO/XP.DestinationConnectionList
- pr·/MEDIA/VIDEO/XP.DestinationConnectionList=<in>

Example

- GET /MEDIA/VIDEO/XP.DestinationConnectionList
- pr /MEDIA/VIDEO/XP.DestinationConnectionList=I1;I2

I1 input port is connected to the O1 output port, I2 input port is connected to the O2 output port.

7.6.4. Switching a Video Input to an Output

Command and Response *#switch #crosspoint*

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

Example

- CALL /MEDIA/VIDEO/XP:switch(I2:O1)
- mO /MEDIA/VIDEO/XP:switch

I2 port is connected to O1 port.

7.6.5. Switching a Video Input to All Outputs

Command and Response

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

Example

- CALL /MEDIA/VIDEO/XP:switchAll(I1)
- mO /MEDIA/VIDEO/XP:switchAll

I1 port is connected to the O1 and O2 ports.

7.6.6. Disconnecting a Video Output

Command and Response

- CALL·/MEDIA/VIDEO/XP:switch(0:<out>)
- mO·/MEDIA/VIDEO/XP:switch

Example

- CALL /MEDIA/VIDEO/XP:switch(0:O1)
- mO /MEDIA/VIDEO/XP:switch

O1 port is disconnected from the input source.

7.6.7. Querying the Connected Input Port Number

DIFFERENCE: This feature is available from FW package v1.5.0b3.

The response of this command shows the input port that is connected to the queried output port.

Command and Response *#crosspoint #new*

- GET·/MEDIA/VIDEO/<out>.ConnectedSource
- pr·/MEDIA/VIDEO/<out>.ConnectedSource=<in>

Example

- GET /MEDIA/VIDEO/O1.ConnectedSource
- pr /MEDIA/VIDEO/O1.ConnectedSource=I1

7.6.8. Querying the Video Autoselect Settings

Command and Response *#autoselect*

- GET·/MEDIA/VIDEO/XP.DestinationPortAutoselect
- pr·/MEDIA/VIDEO/XP.DestinationPortAutoselect=<out_set>

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

Parameters

Identifier	Parameter description	Value	Explanation
<out_set>	Two-letter code of the Autoselect settings 1st letter	**E**	Autoselect is **enabled.**
		D	Autoselect is **disabled.**
	Two-letter code of the Autoselect settings 2nd letter	**F**	**First** detect mode: the first active video input is selected.
		P	**Priority** detect: it isalways the highest priority active video input that will be selected.
		L	**Last** detect: it is always the last attached input that is automatically switched to the output.

Example

- GET /MEDIA/VIDEO/XP.DestinationPortAutoselect
- pr /MEDIA/VIDEO/XP.DestinationPortAutoselect=EL;DP

Explanation

EL: the Autoselect is **E**nabled on output 1, selected mode is Last detect.

DP: the Autoselect is **D**isabled on output 2.

INFO: For more information, see The Autoselect Feature section.

7.6.9. Changing the Autoselect Mode

Command and Response

- CALL·/MEDIA/VIDEO/XP:setDestinationPortAutoselect(<out>:<out_set>)
- mO·/MEDIA/VIDEO/XP:setDestinationPortAutoselect

Legend

See the previous section.

Example

- CALL /MEDIA/VIDEO/XP:setDestinationPortAutoselect(O1:EF)
- mO /MEDIA/VIDEO/XP:setDestinationPortAutoselect

Explanation

The Autoselect mode is Enabled on Output 1 in First detect mode.

7.6.10. Querying the Input Port Priority

Command and Response

- GET·/MEDIA/VIDEO/XP.PortPriorityList
- pr·/MEDIA/VIDEO/XP.PortPrioirtyList=<in1_prio>

Legend

<out_prio>: The input port priority order of the given output port: I1and I2.

Example

- GET /MEDIA/VIDEO/XP.PortPriorityList
- pr /MEDIA/VIDEO/XP.PortPriorityList=0,1;1,0

Explanation

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

The response: 0,1;1,0. Those values show the priority order of the video input ports:

Output 1		Output 2	
I1	I2	I1	I2
0	1	1	0

In the example above, the Input 1 has the higher priority on O1 output port and Input 2 has the lower priority. On O2 the setting is the opposite.

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

7.6.11. Changing the Input Port Priority

Command and Response

- CALL·/MEDIA/VIDEO/XP:setAutoselectionPriority(<in>(<out>):<prio>)
- mO·/MEDIA/VIDEO/XP:setAutoselectionPrioirty

Legend

Identifier	Parameter description
<prio>	Priority number from 0 to 1, equal numbers are not allowed.

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

Example

- CALL /MEDIA/VIDEO/XP:setAutoselectionPriority (I1(O1):1;I2(O1):0;I1(O2):0;I2(O2):1)
- mO /MEDIA/VIDEO/XP:setAutoselectionPriority

Explanation

The priority order of the inputs for O1 is: I2, I1; the priority order of the inputs for O2 is: I1, I2.

7.6.12. Muting an Input

Command and Response *#mute*

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

Example

- CALL /MEDIA/VIDEO/XP:muteSource(I1)
- mO /MEDIA/VIDEO/XP:muteSource

7.6.13. Unmuting an Input

Command and Response *#unmute*

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

Example

- CALL /MEDIA/VIDEO/XP:unmuteSource(I1)
- mO /MEDIA/VIDEO/XP:unmuteSource

7.6.14. Locking an Input

Command and Response *#lock*

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

Example

- CALL /MEDIA/VIDEO/XP:lockSource(I1)
- mO /MEDIA/VIDEO/XP:lockSource

7.6.15. Unlocking an Input

Command and Response *#unlock*

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

Example

- CALL /MEDIA/VIDEO/XP:unlockSource(I1)
- mO /MEDIA/VIDEO/XP:unlockSource

7.6.16. Muting an Output

Command and Response *#mute*

- CALL·/MEDIA/VIDEO/XP:muteDestination(<out>)
- mO·/MEDIA/VIDEO/XP:muteDestination

Example

- CALL /MEDIA/VIDEO/XP:muteDestination(O1)
- mO /MEDIA/VIDEO/XP:muteDestination

7.6.17. Unmuting an Output

Command and Response *#unmute*

- CALL·/MEDIA/VIDEO/XP:unmuteDestination(<out>)
- mO·/MEDIA/VIDEO/XP:unmuteDestination

Example

- CALL /MEDIA/VIDEO/XP:unmuteDestination(O1)
- mO /MEDIA/VIDEO/XP:unmuteDestination

7.6.18. Locking an Output

Command and Response *#lock*

- CALL·/MEDIA/VIDEO/XP:lockDestination(<out>)
- mO·/MEDIA/VIDEO/XP:lockDestination

Example

- CALL /MEDIA/VIDEO/XP:lockDestination(O1)
- mO /MEDIA/VIDEO/XP:lockDestination

7.6.19. Unlocking an Output

Command and Response *#unlock*

- CALL·/MEDIA/VIDEO/XP:unlockDestination(<out>)
- mO·/MEDIA/VIDEO/XP:unlockDestination

Example

- CALL /MEDIA/VIDEO/XP:unlockDestination(O1)
- mO /MEDIA/VIDEO/XP:unlockDestination

7.6.20. HDCP Setting (Input Port)

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

Command and Response *#hdcp*

- SET·/MEDIA/VIDEO/<in>.HdcpEnable=<logical_value>
- pw·/MEDIA/VIDEO/<in>.HdcpEnable=<logical_value>

Parameters

Identifier	Parameter description	Value	Parameter value
<logical_value>	HDCP enable/disable setting	**true**	HDCP encryption is enabled.
		false	HDCP encryption is disabled.

Example

- SET /MEDIA/VIDEO/I1.HdcpEnable=false
- pw /MEDIA/VIDEO/I1.HdcpEnable=false

7.6.21. HDCP Setting (Output Port)

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

Command and Response *#hdcp*

- SET·/MEDIA/VIDEO/<out>.HdcpModeSetting=<HDCP_mode>
- pw·/MEDIA/VIDEO/<out>.HdcpModeSetting=<HDCP_mode>

Parameters

Identifier	Parameter description	Value	Parameter value
<HDCP_mode>	HDCP mode	**0**	Auto
		1	Always

Example

- SET /MEDIA/VIDEO/O1.HdcpModeSetting=0
- pw /MEDIA/VIDEO/O1.HdcpModeSetting=0

7.6.22. Test Pattern Generator Mode

The output port can send a special image towards the sink device for testing purposes. The setting is available on the input ports with the parameters listed below.

Command and Response *#testpattern #nosyncscreen #diagnostic*

- SET·/MEDIA/VIDEO/<out>.TpgMode=<mode>
- pw·/MEDIA/VIDEO/<out>.TpgMode=<mode>

Parameters

Identifier	Parameter description	Value	Parameter value
<mode>	Test pattern generator mode	**0**	**Always off**: the test pattern is not displayed on the output.
		1	**Always on**: the test pattern is displayed on the output.
		2	**Auto**: the test pattern is displayed if there is no signal on the input port.

Example

- SET /MEDIA/VIDEO/O1.TpgMode=2
- pw /MEDIA/VIDEO/O1.TpgMode=2

7.6.23. Test Pattern Generator Clock Source

Command and Response

- SET·/MEDIA/VIDEO/<out>.TpgClockSource=<clock_frequency>
- pw·/MEDIA/VIDEO/<out>.TpgClockSource=<clock_frequency>

Parameters

Identifier	Parameter description	Value	Parameter value
<clock_frequency>	Clock frequency	**480**	480p
		576	576p
		EXT	External clock (from actual TMDS source)

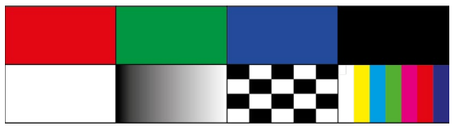
Example

- SET /MEDIA/VIDEO/O1.TpgClockSource=576
- pw /MEDIA/VIDEO/O1.TpgClockSource=576

7.6.24. Test Pattern Setting

Command and Response

- SET·/MEDIA/VIDEO/<out>.TpgPattern=<pattern>
- pw·/MEDIA/VIDEO/<out>.TpgPattern=<pattern>



Parameters

Identifier	Parameter description	Value	Parameter value
<pattern>	The test pattern displayed on the sink device	**RED**	Red
		GREEN	Green
		BLUE	Blue
		BLACK	Black
		WHITE	White
		RAMP	Ramp
		CHESS	Chess
		BAR	Bar
		CYCLE	Cycle setting means all the patterns are changed sequentially approx. in every 2 seconds

Example

- SET /MEDIA/VIDEO/O1.TpgPattern=GREEN
- pw /MEDIA/VIDEO/O1.TpgPattern=GREEN

7.6.25. HDMI Mode Settings (Output Port)

Command and Response *#signaltype*

- SET·/MEDIA/VIDEO/<out>.HdmiModeSetting=<mode>
- pw·/MEDIA/VIDEO/<out>.HdmiModeSetting=<mode>

Parameters

Identifier	Parameter description	Value	Parameter value
<mode>	HDMI mode	**0**	Auto
		1	DVI
		2	HDMI

Example

- SET /MEDIA/VIDEO/O1.HdmiModeSetting=2
- pw /MEDIA/VIDEO/O1.HdmiModeSetting=2

7.6.26. Querying the Recent TPS Mode

Command and Response *#tpsmode*

- GET·/REMOTE/<port>.tpsMode
- pr·/REMOTE/<port>.tpsMode=<TPS_mode>

Parameters

Identifier	Parameter description	Value	Parameter value
<TPS_mode>	TPS mode	**A**	Auto
		H	HDBaseT
		L	Long reach
		1	LPPF1
		2	LPPF2

Example

- GET /REMOTE/S1.tpsMode
- pr /REMOTE/S1.tpsMode=H

See more information about the TPS modes in the TPS Interface section.

7.6.27. Setting the TPS Mode

Command and Response

- SET·/REMOTE/<port>.tpsModeSetting=<TPS_mode>
- pw·/REMOTE/<port>.tpsModeSetting=<TPS_mode>

Parameters

Identifier	Parameter description	Value	Parameter value
<TPS_mode>	TPS mode	**A**	Auto
		H	HDBaseT
		L	Long reach
		1	LPPF1
		2	LPPF2

Example

- SET /REMOTE/S1.tpsModeSetting=A
- pw /REMOTE/S1.tpsModeSetting=A

See more information about the TPS modes in the TPS Interface section.

7.7. Audio Port Settings

Port Numbering

Audio port type	Parameter	Audio port	LW3 port number
Input	<in>	TPS in 1	**I1**
		HDMI in 2	**I2**
Output	<out>	HDMI out 1	**O1**
		HDMI out 2	**O2**
		Analog audio out	**O3**

7.7.1. Querying the Status of the Source Ports

Command and Response *#portstatus*

- GET·/MEDIA/AUDIO/XP.SourcePortStatus
- pr·/MEDIA/AUDIO/XP.SourcePortStatus=<in_state>

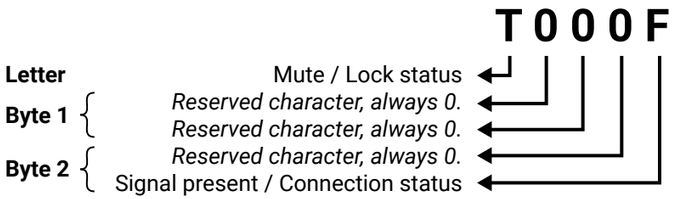
The response contains 5 ASCII characters for each port. The first character indicates the mute/lock state, the next four characters represent a 2-byte HEX code, showing the current state of the input port.

Example

- GET /MEDIA/AUDIO/XP.SourcePortStatus
- pr /MEDIA/AUDIO/XP.SourcePortStatus=T000F;T000A

Legend:

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



	Byte 1				Byte 2			
	Character 2		Character 3		Character 4		Character 5	
	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0	BIT 7-6	BIT 5-4	BIT 3-2	BIT 1-0
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Signal present status	Connection status
0 0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Unknown	
0 1							Reserved	
1 0							No signal	Not connected
1 1							Signal presents	Connected

The Most Common Received Port Status Responses

	T	0		0		0		A	
T000A	Unlocked, Unmuted	0 0	0 0	0 0	0 0	0 0	0 0	1 0	1 0
		Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	No signal	Not connected

	T	0		0		0		B	
T000B	Unlocked, Unmuted	0 0	0 0	0 0	0 0	0 0	0 0	1 0	1 1
		Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	No signal	Connected

	T	0		0		0		F	
T000F	Unlocked, Unmuted	0 0	0 0	0 0	0 0	0 0	0 0	1 1	1 1
		Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Signal presents	Connected

7.7.2. Querying the Status of the Destination Ports

Command and Response *#portstatus*

- GET·/MEDIA/AUDIO/XP.DestinationPortStatus
- pr·/MEDIA/AUDIO/XP.DestinationPortStatus=<out1_state>;<out2_state>

The response contains 5 ASCII characters for each port. The first character indicates the mute/lock state, the next 2-byte long HEX code shows the current state of the output port.

Example

- GET /MEDIA/AUDIO/XP.DestinationPortStatus
- pr /MEDIA/AUDIO/XP.DestinationPortStatus=T000F;T000A;T000F

Legend

See the previous section.

Example and Explanation

T	0		0		0		F	
Unlocked, Unmuted	0 0	0 0	0 0	0 0	0 0	0 0	1 1	1 1
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Signal presents	Connected

7.7.3. Querying the Audio Crosspoint Setting

Command and Response

- GET·/MEDIA/AUDIO/XP.DestinationConnectionList
- pr·/MEDIA/AUDIO/XP.DestinationConnectionList=<in>

Example

- GET /MEDIA/AUDIO/XP.DestinationConnectionList
- pr /MEDIA/AUDIO/XP.DestinationConnectionList=I1;I2;I1

I1 input port is connected to the O1 and O3 output ports, I2 input port is connected to the O2 output port.

7.7.4. Switching an Audio Input to an Output

Command and Response *#switch #crosspoint*

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

Example

- CALL /MEDIA/AUDIO/XP:switch(I2:O3)
- mO /MEDIA/AUDIO/XP:switch

I2 port is connected to O3 port.

7.7.5. Switching an Audio Input to All Outputs

Command and Response

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

Example

- CALL /MEDIA/AUDIO/XP:switchAll(I1)
- mO /MEDIA/AUDIO/XP:switchAll

I1 port is connected to the O1, O2 and O3 ports.

7.7.6. Querying the Audio Autoselect Settings

Command and Response *#autoselect*

- GET·/MEDIA/AUDIO/XP.DestinationPortAutoselect
- pr·/MEDIA/AUDIO/XP.DestinationPortAutoselect=<out_set>

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

Parameters

Identifier	Parameter description	Value	Explanation
<out_set>	Two-letter code of the Autoselect settings 1st letter	**E**	Autoselect is **enabled.**
		D	Autoselect is **disabled.**
	Two-letter code of the Autoselect settings 2nd letter	**F**	**First** detect mode: the first active audio input is selected.
		P	**Priority** detect: it is always the highest priority active video input that will be selected.
		L	**Last** detect: it is always the last attached input that is automatically switched to the output.
		S	**Static:** the audio input follows the selected video if the video signal contains embedded audio.

Example

- GET /MEDIA/AUDIO/XP.DestinationPortAutoselect
- pr /MEDIA/AUDIO/XP.DestinationPortAutoselect=EL;DP;EF

Explanation

EL: the Autoselect is **E**nabled on O1, selected mode is **L**ast detect.

DP: the Autoselect is **D**isabled on O2.

EF: the Autoselect is **E**nabled on O3, selected mode is **F**irst detect.

INFO: INFO: For more information, see The Autoselect Feature section.

7.7.7. Changing the Autoselect Mode

Command and Response

- CALL·/MEDIA/AUDIO/XP:setDestinationPortAutoselect(<out>:<out_set>)
- mO·/MEDIA/AUDIO/XP:setDestinationPortAutoselect

Legend

See the previous section.

Example

- CALL /MEDIA/AUDIO/XP:setDestinationPortAutoselect(O1:EF;O3:DP)
- mO /MEDIA/AUDIO/XP:setDestinationPortAutoselect

Explanation

The Autoselect mode is Enabled on Output 1 in First detect mode and it is disabled on the Output 3.

7.7.8. Querying the Input Port Priority

Command and Response

- GET·/MEDIA/AUDIO/XP.PortPriorityList
- pr·/MEDIA/AUDIO/XP.PortPrioirtyList=<in1_prio>

Legend

<out_prio>: The input port priority order of the given output port: I1 and I2.

Example

- GET /MEDIA/AUDIO/XP.PortPriorityList
- pr /MEDIA/AUDIO/XP.PortPriorityList=0,1;1,0

Explanation

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

The response: 0,1;1,0. Those values show the priority order of the audio input ports:

Output 1		Output 2	
I1	I2	I1	I2
0	1	1	0

In the example above, the Input 1 has the higher priority on O1 output port and Input 2 has the lower priority. On O2 the setting is the opposite.

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

7.7.9. Changing the Input Port Priority

Command and Response

- CALL·/MEDIA/AUDIO/XP:setAutoselectionPriority(<in>(<out>):<prio>)
- mO·/MEDIA/AUDIO/XP:setAutoselectionPrioirty

Legend

Identifier	Parameter description
<prio>	Priority number from 0 to 1, equal numbers are not allowed.

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

Example

- CALL /MEDIA/AUDIO/XP:setAutoselectionPriority (I1(O1):1;I2(O1):0;I1(O3):0;I2(O3):1)
- mO /MEDIA/AUDIO/XP:setAutoselectionPriority

Explanation

The priority order of the inputs for O1 is: I2, I1; the priority order of the inputs for O3 is: I1, I2.

7.7.10. Muting an Input

Command and Response *#mute*

- CALL·/MEDIA/AUDIO/XP:muteSource(<in>)
- mO·/MEDIA/AUDIO/XP:muteSource

Example

- CALL /MEDIA/AUDIO/XP:muteSource(I1)
- mO /MEDIA/AUDIO/XP:muteSource

7.7.11. Unmuting an Input

Command and Response *#unmute*

- CALL·/MEDIA/AUDIO/XP:unmuteSource(<in>)
- mO·/MEDIA/AUDIO/XP:unmuteSource

Example

- CALL /MEDIA/AUDIO/XP:unmuteSource(I1;I2)
- mO /MEDIA/AUDIO/XP:unmuteSource

7.7.12. Locking an Input

Command and Response *#lock*

- CALL·/MEDIA/AUDIO/XP:lockSource(<in>)
- mO·/MEDIA/AUDIO/XP:lockSource

Example

- CALL /MEDIA/AUDIO/XP:lockSource(I1)
- mO /MEDIA/AUDIO/XP:lockSource

7.7.13. Unlocking an Input

Command and Response *#unlock*

- CALL·/MEDIA/AUDIO/XP:unlockSource(<in>)
- mO·/MEDIA/AUDIO/XP:unlockSource

Example

- CALL /MEDIA/AUDIO/XP:unlockSource(I1)
- mO /MEDIA/AUDIO/XP:unlockSource

7.7.14. Muting an Output

Command and Response *#mute*

- CALL·/MEDIA/AUDIO/XP:muteDestination(<out>)
- mO·/MEDIA/AUDIO/XP:muteDestination

Example

- CALL /MEDIA/AUDIO/XP:muteDestination(O1)
- mO /MEDIA/AUDIO/XP:muteDestination

7.7.15. Unmuting an Output

Command and Response *#unmute*

- CALL·/MEDIA/AUDIO/XP:unmuteDestination(<out>)
- mO·/MEDIA/AUDIO/XP:unmuteDestination

Example

- CALL /MEDIA/AUDIO/XP:unmuteDestination(O1)
- mO /MEDIA/AUDIO/XP:unmuteDestination

7.7.16. Locking an Output

Command and Response *#lock*

- CALL·/MEDIA/AUDIO/XP:lockDestination(<out>)
- mO·/MEDIA/AUDIO/XP:lockDestination

Example

- CALL /MEDIA/AUDIO/XP:lockDestination(O1;O2;O3)
- mO /MEDIA/AUDIO/XP:lockDestination

7.7.17. Unlocking an Output

Command and Response *#unlock*

- CALL·/MEDIA/AUDIO/XP:unlockDestination(<out>)
- mO·/MEDIA/AUDIO/XP:unlockDestination

Example

- CALL /MEDIA/AUDIO/XP:unlockDestination(O1)
- mO /MEDIA/AUDIO/XP:unlockDestination

7.8. Analog Audio Output Settings

7.8.1. Volume Setting (dB)

Command and Response *#analogaudio #volume*

- SET·/MEDIA/AUDIO/<out>.VolumedB=<level>
- pw·/MEDIA/AUDIO/<out>.VolumedB=<level>

Parameters

Identifier	Parameter description
<level>	Sets the output volume (attenuation) between -95.625 dB and 0 dB in step of -0.375 dB. The value is rounded up if necessary, to match with the step value.

Example

- SET /MEDIA/AUDIO/O3.VolumedB=-15
- pw /MEDIA/AUDIO/O3.VolumedB=-15.00

7.8.2. Volume Setting (dB) in Steps

Command and Response

- CALL·/MEDIA/AUDIO/<out>:stepVolumedB(<step>)
- mO·/MEDIA/AUDIO/<out>:stepVolumedB

Parameters

Identifier	Parameter description
<level>	Sets the output volume (attenuation) between -95.625 dB and 0 dB in step of -0.375 dB. The value is rounded up if necessary, to match with the step value.

Example

- CALL /MEDIA/AUDIO/O3:stepVolumedB(5)
- mO /MEDIA/AUDIO/O3:stepVolumedB

7.8.3. Volume Setting (Percent)

Command and Response

- SET·/MEDIA/AUDIO/<out>.VolumePercent=<percent>
- pw·/MEDIA/AUDIO/<out>.VolumePercent=<percent>

Parameters

Identifier	Parameter description
<level>	Sets the output volume (attenuation) between 100% and 0%, in step of 1%. The value is rounded up if necessary, to match with the step value.

Example

- SET /MEDIA/AUDIO/O3.VolumePercent=50
- pw /MEDIA/AUDIO/O3.VolumePercent=50

7.8.4. Volume Setting (Percent) in Steps

Command and Response

- CALL·/MEDIA/AUDIO/<out>:stepVolumePercent(<percent>)
- pw·/MEDIA/AUDIO/<out>:stepVolumePercent

Parameters

Identifier	Parameter description
<level>	Sets the output volume (attenuation) between 100% and 0%, in step of 1%. The value is rounded up if necessary, to match with the step value.

Example

- CALL /MEDIA/AUDIO/O3:stepVolumePercent(15)
- mO /MEDIA/AUDIO/O3:stepVolumePercent

7.8.5. Balance Setting

Command and Response *#balance*

- SET·/MEDIA/AUDIO/<out>.Balance=<level>
- pw·/MEDIA/AUDIO/<out>.Balance=<level>

Parameters

Identifier	Parameter description
<level>	Sets the balance; -100 means left balance, 100 means right balance, step is 1. Center is 0 (default).

Example

- SET /MEDIA/AUDIO/O3.Balance=0
- pw /MEDIA/AUDIO/O3.Balance=0

7.8.6. Balance Setting in Steps

Command and Response

- CALL·/MEDIA/AUDIO/<out>:stepBalance(<level>)
- mO·/MEDIA/AUDIO/<out>:stepBalance

Parameters

Identifier	Parameter description
<level>	Sets the balance; -100 means left balance, 100 means right balance, step is 1. Center is 0 (default).

Example

- CALL /MEDIA/AUDIO/O3:stepBalance(1)
- mO /MEDIA/AUDIO/O3:stepBalance

7.9. Event Manager Basics

The graphical interface of the Event Manager can be found in the LDC, which allows creating any kind of Event. In certain cases, the Events have to be arranged or modified by LW3 commands from another device. These commands are detailed in the coming sections.

7.9.1. How to arrange an Event?

The following are necessary to have a successful event:

- Defining the **Condition**
- Defining the **Action**
- Setting the **Delay** (optional)
- **Name** the Event and set to **Enabled.** (Setting the Event to **Enabled** as the last step is recommended.)

Command and Response

▸ SET·/EVENTS/E<loc>.Condition=<expression>
◂ pw·/EVENTS/E<loc>.Condition=<expression>

Parameters

The structure of the <expression> is: <node_path>.<property>=<value>.

Example 1 – property changes to a set value

▸ SET /EVENTS/E1.Condition=/MEDIA/VIDEO/I1.SignalPresent=1
◂ pw /EVENTS/E1.Condition=/MEDIA/VIDEO/I1.SignalPresent=1

The Condition is fulfilled if the **SignalPresent** property changes to '1'.

Example 2 – property changes to anything but the set value

In some cases, the opposite is necessary: when the property does **not** equal with the value. If you need so, the **ConditionInverted** property must be set to **true**:

▸ SET /EVENTS/E2.Condition=/MEDIA/VIDEO/O1.ConnectedSource=I1
◂ pw /EVENTS/E2.Condition=/MEDIA/VIDEO/O1.ConnectedSource=I1
▸ SET /EVENTS/E2.ConditionInverted=true
◂ pw /EVENTS/E2.ConditionInverted=true

The Condition is fulfilled if the **ConnectedSource** property does not equal with 'I1' (in other words: if other input port is connected to O1 than I1).

Example 3 – property changes to anything *#new*

DIFFERENCE: This feature is available from FW package v1.5.0b3.

When it is not the property value that matters, but the change of the property value, the change can be set as a condition. In this case, put a **?** character to the end of the desired property:

▸ SET /EVENTS/E3.Condition=/MEDIA/VIDEO/O1.ConnectedSource?
◂ pw /EVENTS/E3.Condition=/MEDIA/VIDEO/O1.ConnectedSource?

If the **ConnectedSource** property changes (due to a crosspoint-switch), the set Condition is fulfilled.

7.9.2. Setting a Condition by Linking Another Condition

Command and Response

▸ SET·/EVENTS/E<loc>.Condition=<event_nr>
◂ pw·/EVENTS/E<loc>.Condition=<event_nr>

Parameters

The <event_nr> means the number (location) of the linked event without the letter 'E'.

Example

▸ SET /EVENTS/E2.Condition=1
◂ pw /EVENTS/E2.Condition=1

The Condition of the E2 Event is set to be the same as set at the E1 Event.

7.9.3. Setting a Condition by Linking More Conditions

DIFFERENCE: This feature is available from FW package v1.5.0b3.

The first generation of the Event Manager is able to sense a change (one condition), but in some cases that is not enough. The practical experience has shown there is a need to examine more conditions (up to four) as follows: if one of the set conditions becomes true (while the other conditions are fulfilled), then the set Action is launched.

Command and Response

▸ SET·/EVENTS/E<loc>.Condition=<event_nr>&<event_nr>&<event_nr>&<event_nr>
◂ pw·/EVENTS/E<loc>.Condition=<event_nr>&<event_nr>&<event_nr>&<event_nr>

Parameters

The <event_nr> parameters mean the numbers (locations) of the linked Events without the letter 'E'. Up to four event numbers can be set.

Example

▸ SET /EVENTS/E4.Condition=1&2&3
◂ pw /EVENTS/E4.Condition=1&2&3

If two Conditions exist and the third is detected (changes to true), the Condition of E4 will be fulfilled and the Action of E4 will be launched.

TIPS AND TRICKS: You do not have to define Actions for E1, E2 and E3 Events and you can leave those **Disabled**. *#new*

7.9.4. Setting an Action by Specifying a Direct Path

Command and Response

- SET·/EVENTS/E<loc>.Action=<expression>
- pw·/EVENTS/E<loc>.Action=<expression>

Parameters

The structure of the <expression> is: <node_path>.<property_or_method>=<value>. Properties and methods are handled in the same way: dot (.) stands after the path in both cases, colon (:) is not used. Do not use brackets for methods. The <value> parameter is optional in case of certain methods.

Example

- SET /EVENTS/E1.Action=/MEDIA/AUDIO/O3.VolumePercent=50
- pw /EVENTS/E1.Action=/MEDIA/AUDIO/O3.VolumePercent=50

7.9.5. Setting an Action by Linking Another Action

Command and Response

- SET·/EVENTS/E<loc>.Action=<event_nr>
- pw·/EVENTS/E<loc>.Action=<event_nr>

Parameters

The <event_nr> means the number (location) of the linked event without the letter 'E'.

Example

- SET /EVENTS/E2.Action=1
- pw /EVENTS/E2.Action=1

The Action of the E2 Event is set to be the same as set at E1 Event.

7.9.6. Setting an Action by Linking a Macro

DIFFERENCE: This feature is available from FW package v1.5.0b3.

Command and Response *#new*

- SET·/EVENTS/E<loc>.Action=<macro_name>
- pw·/EVENTS/E<loc>.Action=<macro_name>

Parameters

The <macro_name> means the name of the macro that can be seen in LDC (see the Macros section) or can be queried by the `GET /CTRL/MACROS.<id>` command.

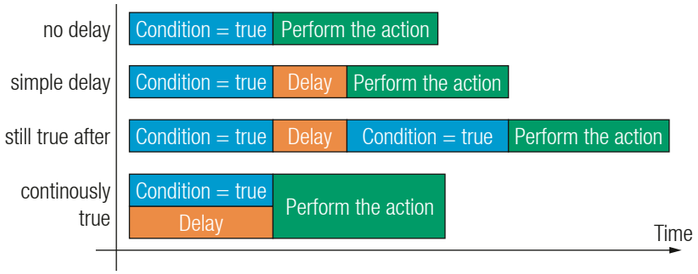
Example

- SET /EVENTS/E1.Action=Macro1
- pw /EVENTS/E2.Action=Macro1

7.10. Event Manager Tool Kit

7.10.1. Setting the Delay

In most cases, the Action is performed immediately after the Condition is detected. But sometimes a delay is necessary between the Condition and the Action, thus the following delay options are defined:



Command and Response (summary)

- SET·/EVENTS/E<loc>.ConditionTimeout=<time>
- pw·/EVENTS/E<loc>.ConditionTimeout=<time>
- SET·/EVENTS/E<loc>.ConditionEndCheck=<true/false>
- pw·/EVENTS/E<loc>.ConditionEndCheck=<true/false>
- SET·/EVENTS/E<loc>.ConditionTimeoutContinuous=<true/false>
- pw·/EVENTS/E<loc>.ConditionTimeoutContinuous=<true/false>

Parameters

The <time> parameter means seconds. Set the following properties for the desired delay type:

Delay type	Properties to set	Value	Result
no delay	/EVENTS/E<loc>.ConditionTimeout	**0**	The Action will be launched after the Condition is detected.
simple delay	/EVENTS/E<loc>.ConditionTimeout	<time>	If the Condition is detected, the action will be launched after the set time.
still true after	/EVENTS/E<loc>.ConditionTimeout	<time>	The Condition is fulfilled only if is detected after the set time **again**.
	/EVENTS/E<loc>.ConditionEndCheck	**true**	
continuously true	/EVENTS/E<loc>.ConditionTimeout	<time>	The Condition is fulfilled only if it is existing **continuously** during the set time.
	/EVENTS/E<loc>.ConditionEndCheck	**true**	
	/EVENTS/E<loc>.ConditionTimeoutContinuous	**true**	

Example 1 (simple delay)

- SET /EVENTS/E1.ConditionTimeout=10
- pw /EVENTS/E1.ConditionTimeout=10

If the Condition is detected (the **ConditionDetect** property becomes **true**), the **ConditionTimeoutPending** property becomes **true**. 10 seconds later the **ConditionTimeoutPending** property becomes **false** and the set Action is launched.

Example 2 ('still true after' delay type)

- SET /EVENTS/E1.ConditionTimeout=10
- pw /EVENTS/E1.ConditionTimeout=10
- SET /EVENTS/E1.ConditionTimeoutPending=true
- pw /EVENTS/E1.ConditionTimeoutPending=true

If the Condition is detected (the **ConditionDetect** property becomes **true**), the **ConditionTimeoutPending** property becomes **true**. 10 seconds later the Condition is checked again (the **ConditionTimeoutPending** property becomes **false**). If the Condition can be detected again (the **ConditionDetect** property becomes **true** again), the Condition is fulfilled and the set Action is launched.

Example 3 ('continuously true' delay type)

- SET /EVENTS/E1.ConditionTimeout=10
- pw /EVENTS/E1.ConditionTimeout=10
- SET /EVENTS/E1.ConditionTimeoutContinuous=true
- pw /EVENTS/E1.ConditionTimeoutContinuous=true

If the Condition is detected (the **ConditionDetect** property becomes **true**), the **ConditionTimeoutPending** property becomes **true**. If the Condition can be detected in the following 10 seconds continuously (the **ConditionDetect** property stays **true**), the Condition is fulfilled, the **ConditionTimeoutPending** property becomes **false**, and the set Action is launched.

7.10.2. Setting the Name of the Event

Command and Response

- SET·/EVENTS/E<loc>.Name=<string>
- pw·/EVENTS/E<loc>.Name=<string>

Parameters

The <string> may contain letters (A-Z) and (a-z), numbers (0-9), special characters: hyphen (-), underscore (_), and space ( ) up to 20 characters. A longer string results in an error, unaccepted characters are skipped.

Example

- SET /EVENTS/E1.Name=Projector_ON
- pw /EVENTS/E1.Name=Projector_ON

7.10.3. Enabling/Disabling the Event

Command and Response

- SET·/EVENTS/E<loc>.Enabled=<true/false>
- pw·/EVENTS/E<loc>.Enabled=<true/false>

Parameters

When the property value is **true** (or **1**), the Action will be launched if the Condition is detected. If the property is **false** (or **0**), the Action will not run, however, the Condition counter will be increased when detected.

Example

- SET /EVENTS/E1.Enabled=true
- pw /EVENTS/E1.Enabled=true

7.10.4. Triggering a Condition

DIFFERENCE: This feature is available from FW package v1.5.0b3.

This feature works like a condition is fulfilled. When a complex control system is built, a Condition may trigger numerous Actions. A typical example is when a system is powered on and the 'ready-to-use' state has to be loaded. In this case, there could be many actions that are based on the same condition. In order to reduce the number of the commands, you can trigger one 'key' condition, which starts the whole process.

Command and Response *#new*

- CALL·/EVENTS/E<loc>:triggerCondition(1)
- mO·/EVENTS/E<loc>:triggerCondition

Example

- CALL /EVENTS/E1:triggerCondition(1)
- mO /EVENTS/E1:triggerCondition

The Condition of Event1 is fulfilled, the set Action will be launched (after the delay if set).

7.10.5. Querying the Condition Counter

This property shows how many times the Condition has been detected and triggered altogether. The counter is reset at boot.

Command and Response

- GET·/EVENTS/E<loc>.ConditionCount
- pw·/EVENTS/E<loc>.ConditionCount=<num_value>

Example

- GET /EVENTS/E1.ConditionCount
- pw /EVENTS/E1>.ConditionCount=5

7.10.6. Querying the Condition Trigger Counter

DIFFERENCE: This feature is available from FW package v1.5.0b3.

This property shows how many times the Condition has been triggered, but does not contain the number of real detections. The counter is reset at boot.

Command and Response

- GET·/EVENTS/E<loc>.ExternalConditionTriggerCount
- pw·/EVENTS/E<loc>.ExternalConditionTriggerCount=<num_value>

Example

- GET /EVENTS/E1.ExternalConditionTriggerCount
- pw /EVENTS/E1.ExternalConditionTriggerCount=2

7.10.7. Testing an Action

This tool is for launching the Action without detecting or triggering the Condition.

Command and Response

- CALL·/EVENTS/E<loc>:ActionTest(1)
- mO·/EVENTS/E<loc>:ActionTest

Example

- CALL /EVENTS/E1:ActionTest(1)
- mO /EVENTS/E1:ActionTest

7.11. Variable-Management

DIFFERENCE: This feature is available from FW package v1.5.0b3.

Custom variables (up to 30 pcs.) can be defined in number or text format, which are available also in the Event Manager. The maximum length of a variable can be 15 characters and they are stored in a non-volatile memory, thus the value is kept in case of a reboot. The type of the variable (text or string) is determined automatically based on the value. If an operation cannot be performed (e.g. adding number value to a string-type variable), error will be the response. *#variables* *#new*

7.11.1. Value Assignment

Command and Response

- SET·/CTRL/VARS/V<loc>.Value=<value>
- pw·/CTRL/VARS/V<loc>.Value=<value>

Parameters

Parameter	Parameter description	Value	Value description
<loc>	The location of the variable	**1-30**	
<value>	The value of the variable	**Custom**	Length can be max 15 characters. Numeric variable is defined between -2147483648 and 2147483647.

Example

- SET /CTRL/VARS/V1.Value=120
- pw /CTRL/VARS/V1.Value=120

7.11.2. Addition and Subtraction (Add Method)

The value of a numeric variable can be increased by adding a positive value or it can be decreased by adding a negative value. Minimum and maximum values can be defined as limits.

Command and Response

- CALL·/CTRL/VARS/V<loc>:add(<operand>;<min>;<max>)
- mO·/CTRL/VARS/V<loc>:add

Parameters

Parameter	Parameter description	Value	Value description
<loc>	The location of the variable	**1-30**	
<operand>	The value that is added to the variable	**Integer**	Negative value is also accepted
<min>	The lowest allowed value (optional)	**Integer**	Negative value is also accepted
<max>	The highest allowed value (optional)	**Integer**	Negative value is also accepted

If the value of the variable is higher or equal to <max>, the new value will be <max>. Likewise, in case of <min> setting: if the value of the variable is lower or equal to <min>, the new value will be <min>.

Examples

Change messages (CHG) can be seen after each response for the better understanding, which are not part of the command, but they can be set as described in the Subscription section.

Example 1 – addition

- ▸ GET /CTRL/VARS/V1.Value
- ◂ pw /CTRL/VARS/V1.Value=6
- ▸ CALL /CTRL/VARS/V1:add(1)
- ◂ mO /CTRL/VARS/V1:add
- ◂ CHG /CTRL/VARS/V1.Value=7
- ▸ CALL /CTRL/VARS/V1:add(1)
- ◂ mO /CTRL/VARS/V1:add
- ◂ CHG /CTRL/VARS/V1.Value=8
- ▸ CALL /CTRL/VARS/V1:add(2)
- ◂ mO /CTRL/VARS/V1:add
- ◂ CHG /CTRL/VARS/V1.Value=10

Example 2 – subtraction

- ▸ GET /CTRL/VARS/V1.Value
- ◂ pw /CTRL/VARS/V1.Value=10
- ▸ CALL /CTRL/VARS/V1:add(-2)
- ◂ mO /CTRL/VARS/V1:add
- ◂ CHG /CTRL/VARS/V1.Value=8
- ▸ CALL /CTRL/VARS/V1:add(-2)
- ◂ mO /CTRL/VARS/V1:add
- ◂ CHG /CTRL/VARS/V1.Value=6
- ▸ CALL /CTRL/VARS/V1:add(-10)
- ◂ mO /CTRL/VARS/V1:add
- ◂ CHG /CTRL/VARS/V1.Value=-4

Example 3 – addition with 'max' value

- ▸ GET /CTRL/VARS/V1.Value
- ◂ pw /CTRL/VARS/V1.Value=16
- ▸ CALL /CTRL/VARS/V1:add(2;10;20)
- ◂ mO /CTRL/VARS/V1:add
- ◂ CHG /CTRL/VARS/V1.Value=18
- ▸ CALL /CTRL/VARS/V1:add(2;10;20)
- ◂ mO /CTRL/VARS/V1:add
- ◂ CHG /CTRL/VARS/V1.Value=20
- ▸ CALL /CTRL/VARS/V1:add(2;10;20)
- ◂ mO /CTRL/VARS/V1:add
- ◂ CHG /CTRL/VARS/V1.Value=20

Example 4 – subtraction with 'min' value

- ▸ GET /CTRL/VARS/V1.Value
- ◂ pw /CTRL/VARS/V1.Value=14
- ▸ CALL /CTRL/VARS/V1:add(-2;10;20)
- ◂ mO /CTRL/VARS/V1:add
- ◂ CHG /CTRL/VARS/V1.Value=12
- ▸ CALL /CTRL/VARS/V1:add(-2;10;20)
- ◂ mO /CTRL/VARS/V1:add
- ◂ CHG /CTRL/VARS/V1.Value=10
- ▸ CALL /CTRL/VARS/V1:add(-2;10;20)
- ◂ mO /CTRL/VARS/V1:add
- ◂ CHG /CTRL/VARS/V1.Value=10

7.11.3. Addition and Subtraction (Cycle Method)

The value of a numeric variable can be increased by adding a positive value or it can be decreased by adding a negative value. Minimum and maximum values can be defined as limits. This method has the feature that if the value hits the limit (min/max), the value will be stepped to the other end of the interval.

Command and Response

- ▸ CALL·/CTRL/VARS/V<loc>:cycle(<operand>;<min>;<max>)
- ◂ mO·/CTRL/VARS/V<loc>:cycle

Parameters

Parameter	Parameter description	Value	Value description
<loc>	The location of the variable	1-30	
<operand>	The value that is added to the variable	Integer	Negative value is also accepted
<min>	The lowest allowed value (optional)	Integer	Negative value is also accepted
<max>	The highest allowed value (optional)	Integer	Negative value is also accepted

If the calculated value is beyond the limit (min/max), the value will be stepped to the other end of the interval.

Examples

Change messages (CHG) can be seen after each response for the better understanding, which are not part of the command, but they can be set as described in the Subscription section.

Example 1 – addition

- ▸ GET /CTRL/VARS/V1.Value
- ◂ pw /CTRL/VARS/V1.Value=18
- ▸ CALL /CTRL/VARS/V1:cycle(1;10;20)
- ◂ mO /CTRL/VARS/V1:cycle
- ◂ CHG /CTRL/VARS/V1.Value=19
- ▸ CALL /CTRL/VARS/V1:cycle(1;10;20)
- ◂ mO /CTRL/VARS/V1:cycle
- ◂ CHG /CTRL/VARS/V1.Value=20
- ▸ CALL /CTRL/VARS/V1:cycle(1;10;20)
- ◂ mO /CTRL/VARS/V1:cycle
- ◂ CHG /CTRL/VARS/V1.Value=10
- ▸ CALL /CTRL/VARS/V1:cycle(1;10;20)
- ◂ mO /CTRL/VARS/V1:cycle
- ◂ CHG /CTRL/VARS/V1.Value=11

Example 2 – subtraction

- ▸ GET /CTRL/VARS/V1.Value
- ◂ pw /CTRL/VARS/V1.Value=13
- ▸ CALL /CTRL/VARS/V1:cycle(-2;10;20)
- ◂ mO /CTRL/VARS/V1:cycle
- ◂ CHG /CTRL/VARS/V1.Value=11
- ▸ CALL /CTRL/VARS/V1:cycle(-2;10;20)
- ◂ mO /CTRL/VARS/V1:cycle
- ◂ CHG /CTRL/VARS/V1.Value=20
- ▸ CALL /CTRL/VARS/V1:cycle(-2;10;20)
- ◂ mO /CTRL/VARS/V1:cycle
- ◂ CHG /CTRL/VARS/V1.Value=18

7.11.4. Value Change with Intervals (Case)

This command can be used to change the value of a variable if it fits in any of the defined intervals.

Command and Response

- CALL·/CTRL/VARS/V<loc>:case(<min> <max> <val>;)
- mO·/CTRL/VARS/V<loc>:case

Parameters

Parameter	Parameter description	Value
<loc>	The location of the variable	1-30
<min>	The lowest value of the interval	Integer
<max>	The highest value of the interval	Integer
<val>	The new value that will be valid if the current value is in the interval	Integer

The parameters are divided by a space character, and the interval groups are divided by semicolons. Up to 16 cases can be defined.

Examples

- CALL /CTRL/VARS/V1:case(10 20 15)
- mO /CTRL/VARS/V1:case

A typical example is when two different ranges of values have to meet:

Incoming values: between 0 and 255 (e.g. the slider of a controller can have these values).

Outgoing values: between 0 and 100 (e.g. the controlled device accepts these values).

Defined cases:

	Min	Max	New value
Case 1	1	25	10
Case 2	26	50	20
Case 3	51	75	30
Case 4	76	100	40
Case 5	101	125	50
Case 6	126	150	60
Case 7	151	175	70
Case 8	176	200	80
Case 9	201	225	90
Case 10	226	255	100

The command looks like:

- CALL /CTRL/VARS/V1:case(1 25 10;26 50 20;51 75 30;76 100 40;101 125 50;126 150 60;151 175 70; 176 200 80; 201 225 90; 226 255 100)
- mO /CTRL/VARS/V1:case

7.11.5. Scan and Store

This command can be used to get the value (or a part of the value) of an LW3 property. The defined path will be scanned according to the pattern and the result will be the value of the variable (number or string type).

Command and Response

- CALL·/CTRL/VARS/V<loc>:scanf(<path>.<property>;<pattern>)
- mO·/CTRL/VARS/V<loc>:scanf

Parameters

Parameter	Parameter description	Value
<loc>	The location of the variable	1-30
<path>.<property>	The LW3 property with node	
<pattern>	The pattern that scans the property for the desired result	see below

Pattern options

Pattern	Pattern description
%s	String of characters stopping at the first whitespace character
%<number>s	The next <number> of characters (string) stopping at the first whitespace
%c	One character
%<number>c	The next <number> of characters
%[<characters>]	Defined character set, specified between brackets
%[^<characters>]	Negated character set that will be skipped, specified between brackets
%*	Ignored part
<custom_text>	User-defined text

The patterns can be combined to get the desired result as shown in the examples.

ATTENTION: Do not forget to escape the % character as shown in the example below.

Examples

- CALL /CTRL/VARS/V1:scanf(/MEDIA/AUDIO/XP.SourcePortStatus;\%5c)
- mO /CTRL/VARS/V1:scanf
- GET /CTRL/VARS/V1.Value
- pw /CTRL/VARS/V1.Value=T00AA

A simple pattern has been applied: we need the first five characters from the property value.

Further Examples

<path>.<property>	Property Value	<pattern>	Scanned result
/MANAGEMENT/STATUS.CpuTemperature	42 C; 0;75; 0;7	%s	42
/MANAGEMENT/STATUS.CpuFirmware	1.3.0b3 r32	%12s	1.3.0b3
/MEDIA/VIDEO/XP.DestinationPortStatus	T00AA;T00AF	%6c	T00AA
/MEDIA/UART/P1.Rs232Configuration	57600, 8N1	%*[^,], %s	8N1
/MEDIA/AUDIO/XP.SourcePortStatus	T000A;T000B;T000F	%*6c%5c	T000B
/MANAGEMENT/NETWORK.HostName	lightware-00005031	lightware-%[0-9]	00005031

7.11.6. Reformatting a Value

The value of the variable can be changed by adding text as prefix and/or sufffix.

ATTENTION: Think about the length of the value: 15 characters are allowed, the others are truncated.

Command and Response

- CALL·/CTRL/VARS/V<loc>:printf(<prefix>%s<postfix>)
- mO·/CTRL/VARS/V<loc>:printf

Parameters

Parameter	Parameter description	Value	Value description
<loc>	The location of the variable	**1-30**	
<prefix>	The text before the original value of the property (optional)	**Custom**	ASCII characters
%s	The original value of the variable		
<postfix>	The text following the original value of the property (optional)	**Custom**	ASCII characters

Example

- GET /CTRL/VARS/V1.Value
- pw /CTRL/VARS/V1.Value=01
- CALL /CTRL/VARS/V1:printf(PWR%s)
- mO /CTRL/VARS/V1:printf
- GET /CTRL/VARS/V1.Value
- pw /CTRL/VARS/V1.Value=PWR01

The 'PWR' string has been inserted before the original value.

7.12. Ethernet Port Configuration

7.12.1. Querying the DHCP State

Command and Response *#network #ipaddress #dhcp*

- GET·/MANAGEMENT/NETWORK.DhcpEnabled
- pw·/MANAGEMENT/NETWORK.DhcpEnabled=<logical_value>

Parameters

Identifier	Parameter description	Value	Parameter value
<logical_value>	DHCP (dynamic IP address) setting	**true**	Dynamic IP address is set.
		false	Fix IP address is set.

Example

- GET /MANAGEMENT/NETWORK.DhcpEnabled
- pw /MANAGEMENT/NETWORK.DhcpEnabled=true

7.12.2. Changing the DHCP State

Command and Response

- SET·/MANAGEMENT/NETWORK.DhcpEnabled=<logical_value>
- pw·/MANAGEMENT/NETWORK.DhcpEnabled=<logical_value>

Parameters

See the previous section.

Example

- SET /MANAGEMENT/NETWORK.DhcpEnabled=false
- pw /MANAGEMENT/NETWORK.DhcpEnabled=false

7.12.3. Querying the IP Address

Command and Response

- GET·/MANAGEMENT/NETWORK.IpAddress
- pr·/MANAGEMENT/NETWORK.IpAddress=<IP_Address>

Example

- GET /MANAGEMENT/NETWORK.IpAddress
- pr /MANAGEMENT/NETWORK.IpAddress=192.168.0.100

7.12.4. Changing the IP Address (Static)

Command and Response

- SET·/MANAGEMENT/NETWORK.StaticIpAddress=<IP_address>
- pw·/MANAGEMENT/NETWORK.StaticIpAddress=<IP_address>

Example

- SET /MANAGEMENT/NETWORK.StaticIpAddress=192.168.0.85
- pw /MANAGEMENT/NETWORK.StaticIpAddress=192.168.0.85

7.12.5. Querying the Subnet Mask

Command and Response

- GET·/MANAGEMENT/NETWORK.NetworkMask
- pr·/MANAGEMENT/NETWORK.NetworkMask=<netmask>

Example

- GET /MANAGEMENT/NETWORK.NetworkMask
- pr /MANAGEMENT/NETWORK.NetworkMask=255.255.255.0

7.12.6. Changing the Subnet Mask (Static)

Command and Response

- SET·/MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>
- pw·/MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>

Example

- SET /MANAGEMENT/NETWORK.StaticNetworkMask=255.255.0.0
- pw /MANAGEMENT/NETWORK.StaticNetworkMask=255.255.0.0

7.12.7. Querying the Gateway Address

Command and Response

- GET·/MANAGEMENT/NETWORK.GatewayAddress
- pr·/MANAGEMENT/NETWORK.GatewayAddress=<gw_address>

Example

- GET /MANAGEMENT/NETWORK.GatewayAddress
- pr /MANAGEMENT/NETWORK.GatewayAddress=192.168.0.1

7.12.8. Changing the Gateway Address (Static)

Command and Response

- SET·/MANAGEMENT/NETWORK.StaticGatewayAddress=<gw_address>
- pw·/MANAGEMENT/NETWORK.StaticGatewayAddress=<gw_address>

Example

- SET /MANAGEMENT/NETWORK.StaticGatewayAddress=127.0.0.1
- pw /MANAGEMENT/NETWORK.StaticGatewayAddress=127.0.0.1

7.12.9. Querying the MAC Address

Command and Response

- GET·/MANAGEMENT/NETWORK.MacAddress
- pr·/MANAGEMENT/NETWORK.MacAddress=<MAC_address>

Example

- GET /MANAGEMENT/NETWORK.MacAddress
- pr /MANAGEMENT/NETWORK.MacAddress=A8:D2:36:00:43:12

7.12.10. Applying Network Settings

Calling the method applies all network settings to the device.

ATTENTION: The command is always required as the last step for applying the modified network settings.

Command and Response

- CALL·/MANAGEMENT/NETWORK:ApplySettings()
- mO·/MANAGEMENT/NETWORK:ApplySettings

Example

- CALL /MANAGEMENT/NETWORK:ApplySettings()
- mO /MANAGEMENT/NETWORK:ApplySettings

7.13. Ethernet Tool Kit

DIFFERENCE: These features are available from FW package v1.5.0b3. *#new*

7.13.1. Device Filter Based on MAC Address

You can create a list of network devices based on the MAC address that are allowed controlling the device, or querying parameters to/from the Lightware device. *#macfilter*

ATTENTION: If the device is installed in a network where it gets the IP address from a DHCP server and you plan to use the MAC filtering, make sure the MAC address of the DHCP server is added to the white list. Otherwise, the device will not get an IP address and will be unreachable.

Command and Response

- SET·/MANAGEMENT/MACFILTER.MACaddress<loc>=<MAC_address>;<receive>;<send>;<name>
- pw·/MANAGEMENT/MACFILTER.MACaddress<loc>=<MAC_address>;<receive>;<send>;<name>

The filter is disabled by default. Set the **FilterEnable** property to **true** as shown in the example.

Parameters

Parameter	Parameter description	Values	Value description
<loc>	Location of the address	**1-8**	The default values of **1**, **2** and **3** ensure that address resolution and device discovery continue to work after enabling the MAC filter
<MAC_address>	The MAC address of the device	Unique value	Hex format, divided by a colon
<receive>	Enable/disable the parameter querying option	**false** (or **0**)	The device is **not allowed** to query parameters from the LW device
		true (or **1**)	The device is **allowed** to query parameters from the LW device
<send>	Enable/disable the parameter setting option	**false** (or **0**)	The device is **not allowed** to change parameters in the LW device
		true (or **1**)	The device is **allowed** to change parameters in the LW device
<name>	Unique name for the better identification (optional)	Any string	Up to 5 ASCII characters (longer names are truncated)

Example

- SET /MANAGEMENT/MACFILTER/MACaddress4=(04:D4:C4:4D:01:43;1;1;Tech)
- pw /MANAGEMENT/MACFILTER/MACaddress4=(04:D4:C4:4D:01:43;1;1;Tech)
- SET /MANAGEMENT/MACFILTER.FilterEnable=true
- pw /MANAGEMENT/MACFILTER.FilterEnable=true

The new MAC address is saved into the 4th property with the name 'Tech', which may query/set parameters from/in the Lightware device. The **FilterEnable** property is set to **true**, thus the filter is enabled.

7.13.2. Blocking the LW2 Control Port

This command is for blocking the LW2 control port; it is an additional protection for the Cleartext login function.

Command and Response *#portblock*

- SET·/MANAGEMENT/SERVICEFILTER.Lw2Enabled=<port_mode>
- pw·/MANAGEMENT/SERVICEFILTER.Lw2Enabled=<port_mode>

Example

- SET /MANAGEMENT/SERVICEFILTER.Lw2Enabled=false
- pw /MANAGEMENT/SERVICEFILTER.Lw2Enabled=false

7.13.3. Blocking the HTTP Port

This command is for blocking the HTTP port (80); it is an additional protection for the Cleartext login function.

Command and Response

- SET·/MANAGEMENT/SERVICEFILTER.HttpEnabled=<port_mode>
- pw·/MANAGEMENT/SERVICEFILTER.HttpEnabled=<port_mode>

Example

- SET /MANAGEMENT/SERVICEFILTER.HttpEnabled=true
- pw /MANAGEMENT/SERVICEFILTER.HttpEnabled=true

7.13.4. Blocking the Reception of HTTP Posts

This command is for blocking HTTP posts; it is an additional protection for the Cleartext login function.

Command and Response

- SET·/MANAGEMENT/SERVICEFILTER.HttpEnabled=<port_mode>
- pw·/MANAGEMENT/SERVICEFILTER.HttpEnabled=<port_mode>

Example

- SET /MANAGEMENT/SERVICEFILTER.HttpEnabled=true
- pw /MANAGEMENT/SERVICEFILTER.HttpEnabled=true

7.13.5. Powering on a Computer over Ethernet (Wake-on-LAN)

The well-known wake-on-lan feature (sending a magic Packet to the target PC) is available by the following command:

Command and Response

- CALL·/MEDIA/ETHERNET:wakeOnLan(MAC_address)
- mO·/MEDIA/ETHERNET:wakeOnLan

Example

- CALL /MEDIA/ETHERNET:wakeOnLan(AA:BB:CC:22:14:FF)
- mO /MEDIA/ETHERNET:wakeOnLan

Please make sure the feature is enabled in the target PC and it is powered (but switched off).

7.13.6. Setting the Host Name

The host name is a property that can be used instead of the IP address when connecting to the device. It is also suitable for finding in the Device Discovery window of the LDC, see more details in the Add New Favorite Device section. Furthermore, it can be used to open The Miniweb Room Control. If the IP address of the device is changing, the host name can be used as a fixed property.

Command and Response

- SET·/MANAGEMENT/NETWORK.HostName=<unique_name>
- pw·/MANAGEMENT/NETWORK.HostName=<unique_name>

Parameters

The <unique_name> can be 1-64 characters long and the following are allowed for naming: the elements of the English alphabet and numbers. Hyphen (-) and dot (.) is also accepted, except as last character.

Example

- SET /MANAGEMENT/NETWORK.HostName=my-receiver
- pw /MANAGEMENT/NETWORK.HostName=my-receiver

7.14. Ethernet Message Sending

The device can be used for sending a message to a certain IP:port address. The three different commands allow controlling the connected (third-party) devices.

7.14.1. Sending a TCP Message (ASCII-format)

The command is for sending a command message in ASCII-format. This method allows escaping the control characters.

Command and Response

- CALL·/MEDIA/ETHERNET:tcpMessage(<IP_address>:<port_no>=<message>)
- mO·/MEDIA/ETHERNET:tcpMessage

Example

- CALL /MEDIA/ETHERNET:tcpMessage(192.168.0.103:6107=C00)
- mO /MEDIA/ETHERNET:tcpMessage

The 'C00' message is sent to the indicated IP:port address.

Example with HEX codes

- CALL /MEDIA/ETHERNET:tcpMessage(192.168.0.20:5555=C00\x0a\x0d)
- mO /MEDIA/ETHERNET:tcpMessage

The 'C00' message with CrLf (Carriage return and Line feed) is sent to the indicated IP:port address. The \x sequence indicates the HEXA code; see more information in the Escaping section.

7.14.2. Sending a TCP Text (ASCII-format)

The command is for sending a text message in ASCII-format. This method **does not allow** escaping or inserting control characters.

Command and Response

- CALL·/MEDIA/ETHERNET:tcpText(<IP_address>:<port_no>=<text>)
- mO·/MEDIA/ETHERNET:tcpText

Example

- CALL /MEDIA/ETHERNET:tcpText(192.168.0.103:6107=pwr_on)
- mO /MEDIA/ETHERNET:tcpText

The 'pwr_on' text is sent to the indicated IP:port address.

7.14.3. Sending a TCP Binary Message (HEX-format)

The command is for sending a binary message in Hexadecimal format. This method **does not require** escaping the control and non-printable characters.

Command and Response

- CALL·/MEDIA/ETHERNET.tcpBinary(<IP_address>:<port_no>=<HEX_message>)
- mO·/MEDIA/ETHERNET:tcpBinary

Example

- CALL /MEDIA/ETHERNET:tcpBinary(192.168.0.103:6107=0100000061620000cdcc2c40)
- mO /MEDIA/ETHERNET:tcpBinary

The '0100000061620000cdcc2c40' message is sent to the indicated IP:port address.

INFO: There is no need to insert a space or other separator character between the binary messages.

7.14.4. Sending a UDP Message (ASCII-format)

The command is for sending a UDP message in ASCII-format. This method allows escaping the control characters.

Command and Response

- CALL·/MEDIA/ETHERNET:udpMessage(<IP_address>:<port_no>=<message>)
- mO·/MEDIA/ETHERNET:udpMessage

Example

- CALL /MEDIA/ETHERNET:udpMessage(192.168.0.103:6107=C00)
- mO /MEDIA/ETHERNET:udpMessage

The 'C00' message is sent to the indicated IP:port address.

Example with HEX codes

- CALL /MEDIA/ETHERNET:udpMessage(192.168.0.20:9988=C00\x0a\x0d)
- mO /MEDIA/ETHERNET:udpMessage

The 'C00' message with CrLf (Carriage return and Line feed) is sent to the indicated IP:port address. The \x sequence indicates the HEXA code; see more information in the Escaping section.

7.14.5. Sending a UDP Text (ASCII-format)

The command is for sending a text message in ASCII-format via UDP-protocol. This method **does not allow** escaping or inserting control characters.

Command and Response

- CALL·/MEDIA/ETHERNET:udpText(<IP_address>:<port_no>=<text>)
- mO·/MEDIA/ETHERNET:udpText

Example

- CALL /MEDIA/ETHERNET:udpText(192.168.0.20:9988=open)
- mO /MEDIA/ETHERNET:udpText

The 'open' text is sent to the indicated IP:port address.

7.14.6. Sending a UDP Binary Message (HEX-format)

The command is for sending a binary message in Hexadecimal format. This method **does not require** escaping the control and non-printable characters.

Command and Response

- CALL·/MEDIA/ETHERNET:udpBinary(<IP_address>:<port_no>=<HEX_message>)
- mO·/MEDIA/ETHERNET:udpBinary

Example

- CALL /MEDIA/ETHERNET:udpBinary(192.168.0.20:9988=433030)
- mO /MEDIA/ETHERNET:udpBinary

The '433030' message is sent to the indicated IP:port address.

INFO: There is no need to insert a space or other separator character between the binary messages.

7.15. HTTP Messaging

DIFFERENCE: This feature is available from FW package v1.5.0b3.

Http **post** and **put** messages can be sent from the Lightware device for more integration with third-party devices. *#http* *#new*

ATTENTION: This feature means posting or putting **HTTP** messages from the Lightware device to another device. Encrypted transmission (**HTTPS**) is not supported.

7.15.1. Setting the Target IP Address

Command and Response

- SET·/CTRL/HTTP/C1.ServerIP=<IP_address>
- pw·/CTRL/HTTP/C1.ServerIP=<IP_address>

Example

- SET /CTRL/HTTP/C1.ServerIP=192.168.0.220
- pw /CTRL/HTTP/C1.ServerIP=192.168.0.220

7.15.2. Setting the TCP Port

Command and Response

- SET·/CTRL/HTTP/C1.ServerPort=<port_no>
- pw·/CTRL/HTTP/C1.ServerPort=<port_no>

Example

- SET /CTRL/HTTP/C1.ServerPort=80
- pw /CTRL/HTTP/C1.ServerIP=80

7.15.3. Setting the Target Path

This property sets the path in the target device where the post/put message is to be sent.

Command and Response

- SET·/CTRL/HTTP/C1.File=<path>
- pw·/CTRL/HTTP/C1.File=<path>

Example

- SET /CTRL/HTTP/C1.File=/putxml
- pw /CTRL/HTTP/C1.File=/putxml

7.15.4. Setting the Message Header

Command and Response

- SET·/CTRL/HTTP/C1.Header=<header_text>
- pw·/CTRL/HTTP/C1.Header=<header_text>

Example

- SET /CTRL/HTTP/C1.Header=Host: 192.168.0.220\r\nContent-Type: text/xml\r\nAuthorization: Basic YWRtaW46TGlnaHR3YXJlMDE=
- pw /CTRL/HTTP/C1.Header=Host: 192.168.0.220\r\nContent-Type: text/xml\r\nAuthorization: Basic YWRtaW46TGlnaHR3YXJlMDE=

7.15.5. Sending a Post Message

Command and Response

- CALL·/CTRL/HTTP/C1:post(<body_text>)
- mO·/CTRL/HTTP/C1:post

Example

- CALL /CTRL/HTTP/C1:post(<Command><Message><Send><Text>LI1R_P</Text></Send></Message></Command>)
- mO /CTRL/HTTP/C1:post

7.15.6. Sending a Put Message

Command and Response

- CALL·/CTRL/HTTP/C1:put(<body_text>)
- mO·/CTRL/HTTP/C1:put

Example

- CALL /CTRL/HTTP/C1:put(<Command><Message><Send><Text>LI1R_P</Text></Send></Message></Command>)
- mO /CTRL/HTTP/C1:put

7.16. TCP Message Recognizer

DIFFERENCE: This feature is available from FW package v1.5.0b3.

This tool can be used to recognize messages coming from a TCP server. You can link an immediate event Action that is run when a message is recognized, but you can also use it in Event manager.

#tcprecognizer #message #new

Preparation

Step 1. Set a TCP client in the Lightware device (three TCP clients can be run at the same time), set the properties of the target TCP server.

Step 2. Set the **DelimiterHex** and the **TimeOut** settings for the proper message processing

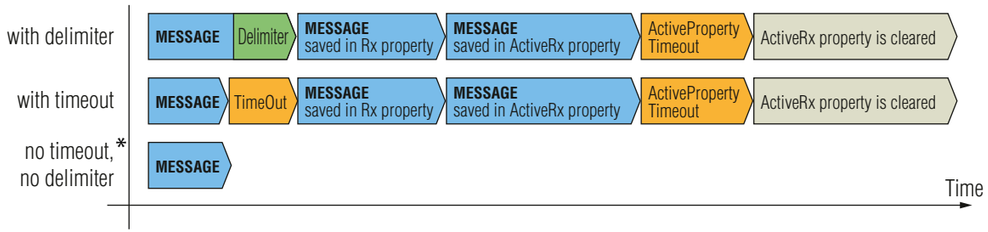
Step 3. Make sure the TCP/IP port is opened in the target device (think about Firewall settings in the network).

Step 4. Connect to the TCP server.

Working Method

A message gets recognized from the incoming data if one of the following occurs:

- The set **DelimiterHex** is detected in the message, or
- The set **TimeOut** has passed since receiving the last data bit.



* In that case, the not-recognized data is kept in the memory (up to 128 bytes). If the **DelimiterHex** is detected later, or the **TimeOut** parameter is set in the meantime, the data appears in the **Rx**, **RxHex, Hash** and **ActiveRx**, **ActiveRxHex, ActiveRxHash** properties.

7.16.1. Setting the IP Address of the TCP Server

Command and Response

- SET·/CTRL/TCP/C<loc>.ServerIP=<IP_address>
- pw·/CTRL/TCP/C<loc>.ServerIP=<IP_address>

Parameters

Identifier	Parameter description
<loc>	It can be 1, 2 or 3, as at most three TCP connections can be established at the same time.

Example

- SET /CTRL/TCP/C1.ServerIP=192.168.1.14
- pw /CTRL/TCP/C1.ServerIP=192.168.1.14

7.16.2. Setting the TCP/IP Port Number of the TCP Server

Command and Response

- SET·/CTRL/TCP/C<loc>.ServerPort=<port_no>
- pw·/CTRL/TCP/C<loc>.ServerPort=<port_no>

Example

- SET /CTRL/TCP/C1.ServerPort(4999)
- pw /CTRL/TCP/C1.ServerPort(4999)

7.16.3. Connecting to a TCP Server

Command and Response

- CALL·/CTRL/TCP/C<loc>:connect()
- mO·/CTRL/TCP/C<loc>:connect

Example

- CALL /CTRL/TCP/C1:connect()
- mO /CTRL/TCP/C1:connect

7.16.4. Disconnecting from a TCP Server

Command and Response

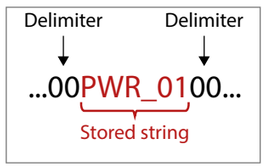
- CALL·/CTRL/TCP/C<loc>:disconnect()
- mO·/CTRL/TCP/C<loc>:disconnect

Example

- CALL /CTRL/TCP/C1:disconnect()
- mO /CTRL/TCP/C1:disconnect

7.16.5. Setting the Delimiter Hex

This property stores the delimiter that is between the messages (e.g. Cr, Lf, Space). The value has to be in hex format (e.g.0D, 0A, 20).



Command and Response

- SET·/CTRL/TCP/C<loc>.DelimiterHex=<delimiter>
- pw·/CTRL/TCP/C<loc>.DelimiterHex=<delimiter>

Parameters

Identifier	Parameter description
<delimiter>	It can be max. 8 characters long (16 hex digits) in hex format.

Example

- SET /CTRL/TCP/C1.DelimiterHex=00
- pw /CTRL/TCP/C1.DelimiterHex=00

7.16.6. Setting the Timeout

When the set time has passed after the last received message and delimiter was not detected, the device saves the data into the **Rx, RxHex, Hash** properties. The timeout setting is useful if there is no special or easily defined delimiter in the incoming data, but there is a time gap between the messages.

Command and Response

- SET·/CTRL/TCP/C<loc>.TimeOut=<timeout>
- pw·/CTRL/TCP/C<loc>.TimeOut=<timeout>

Parameters

Identifier	Parameter description
<timeout>	Timeout value in ms.; **0**: disable the timeout; minimum value: 10.

Example

- SET /CTRL/TCP/C1.TimeOut=20
- pw /CTRL/TCP/C1.TimeOut=20

7.16.7. Querying the Last Recognized Message (String)

The recognized message is stored as a string in the property below until the next recognized message or until the **clear()** method is called.

> TIPS AND TRICKS: When this property is set as a condition in the Event Manager and the same strings follow each other, the action **will execute once**. (A Condition can be detected in Event Manager if a change happens. But if the same string is saved into the property after each other, it will not cause a change.)

Command and Response

- GET·/CTRL/TCP/C<loc>.Rx
- pr·/CTRL/TCP/C<loc>.Rx=<recognized_string>

Parameters

Identifier	Parameter description
<recognized string>	It can be max. 128 bytes long.

Example

- GET /CTRL/TCP/C1.Rx
- pr /CTRL/TCP/C1.Rx=PWR_off

7.16.8. Querying the Last Recognized Message (Hex)

The recognized message is stored as a hex message in the property below until the next recognized message or until the **clear()** method is called.

Command and Response

- GET·/CTRL/TCP/C<loc>.RxHex
- pr·/CTRL/TCP/C<loc>.RxHex=<recognized_hex_data>

Example

- GET /CTRL/TCP/C1.RxHex
- pr /CTRL/TCP/C1.RxHex=5057525F6F6666

7.16.9. Clearing the Last Recognized Stored Message

This method clears the stored recognized messages from the **Rx**, **RxHex** and **Hash** properties.

Command and Response

- CALL·/CTRL/TCP/C<loc>:clear()
- mO·/CTRL/TCP/C<loc>:clear

Example

- CALL /CTRL/TCP/C1:clear()
- mO /CTRL/TCP/C1:clear

7.16.10. Querying the Last Recognized Active Message (String)

The recognized data is stored in string in the property below **temporarily**. When the time set in the **ActiveTimeout** property has passed, the property is cleared.

> TIPS AND TRICKS: When this property is set as a condition in the Event Manager, and the same strings follow each other, the action **will execute on every occasion.** (A Condition can be detected in Event Manager if a change happens. In this case, the string is stored in the property and after the **ActiveTimeout** it will be cleared. If the same string is saved into the (empty) property, it will cause a change.)

Command and Response

- GET·/CTRL/TCP/C<loc>.ActiveRx
- pr·/CTRL/TCP/C<loc>.ActiveRx=<recognized_string>

Parameters

Identifier	Parameter description
<recognized string>	It can be a max. 12-byte-long recognized data string.

Example

- GET /CTRL/TCP/C1.ActiveRx
- pr /CTRL/TCP/C1.ActiveRx=AudOut+

> INFO: Please note that the property contains the string until the **ActivePropertyTimeout** has passed only.

7.16.11. Querying the Last Recognized Active Message (Hex)

Command and Response

- GET·/CTRL/TCP/C<loc>.ActiveRxHex
- pr·/CTRL/TCP/C<loc>.ActiveRxHex=<recognized_hex>

Parameters

Identifier	Parameter description
<recognized hex>	It is the recognized data in hex format.

Example

- GET /CTRL/TCP/C1.ActiveRxHex
- pr /CTRL/TCP/C1.ActiveRxHex=4175644F75742B00

INFO: Please note that the property contains the data until the **ActivePropertyTimeout** has passed only.

7.16.12. Setting the Active Timeout

This property is responsible for clearing the **ActiveRx**, **ActiveRxHex**, **ActiveHash** properties after the elapsed time. Default value is 50ms.

Command and Response

- SET·/CTRL/TCP/C<loc>.ActivePropertyTimeout=<a_timeout>
- pw·/CTRL/TCP/C<loc>.ActivePropertyTimeout=<a_timeout>

Parameters

Identifier	Parameter description
<a_timeout>	It is the active timeout value (ms) between 0 and 255.

Example

- SET /CTRL/TCP/C1.ActivePropertyTimeout=255
- pw /CTRL/TCP/C1.ActivePropertyTimeout=255

7.16.13. Running an Immediate Event Action

When a message is recognized (DelimiterHex is detected in the message, or TimeOut has passed since receiving the last data bit) a specific Action of an Event can be run by the following command.

Command and Response

- SET·/CTRL/TCP/C<loc>.ActionTrigger=<event_nr>
- pw·/CTRL/TCP/C<loc>.ActionTrigger=<event_nr>

Parameters

Identifier	Parameter description
<event_nr>	It means the number (location) of the linked Event Action without the letter 'E'. (There is no need to define a Condition in the linked Event.)

Example

- SET /CTRL/TCP/C1.ActionTrigger=5
- pw /CTRL/TCP/C1.ActionTrigger=5

7.17. RS-232 Port Configuration

Port Numbering

Serial port	LW3 port number	Parameter
RS-232 (local)	**P1**	<port>
TPS in 1	**P2**	

7.17.1. Protocol Setting

Command and Response *#rs232 #rs-232 #serial #protocol #commandinjection*

- SET·/MEDIA/UART/<port>.ControlProtocol=<protocol>
- pw·/MEDIA/UART/<port>.ControlProtocol=<protocol>

Parameters

Identifier	Parameter description	Value	Parameter value
<protocol>	Control protocol which is applied on the selected port	**0**	LW2 protocol
		1	LW3 protocol

Example

- SET /MEDIA/UART/P1.ControlProtocol=1
- pw /MEDIA/UART/P1.ControlProtocol=1

7.17.2. RS-232 Operation Mode

Command and Response

- SET·/MEDIA/UART/<port>.Rs232Mode=<mode>
- pw·/MEDIA/UART/<port>.Rs232Mode=<mode>

Parameters

Identifier	Parameter description	Value	Parameter value
<stopbits>	Stopbits value	**0**	Pass-through
		1	Control
		2	Command injection

Example

- SET /MEDIA/UART/P1.Rs232Mode=1
- pw /MEDIA/UART/P1.Rs232Mode=1

7.17.3. BAUD Rate Setting

Command and Response

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

Parameters

Identifier	Parameter description	Value	Parameter value
<baudrate>	BAUD rate value	**0**	4800
		1	7200
		2	9600
		3	14400
		4	19200
		5	38400
		6	57600
		7	115200

Example

- SET /MEDIA/UART/P1.Baudrate=2
- pw /MEDIA/UART/P1.Baudrate=2

7.17.4. Databits Setting

Command and Response

- SET·/MEDIA/UART/<port>.DataBits=<databits>
- pw·/MEDIA/UART/<port>.DataBits=<databits>

Parameters

Identifier	Parameter description	Value	Parameter value
<databits>	Databits value	**8**	8
		9	9

Example

- SET /MEDIA/UART/P1.DataBits=8
- pw /MEDIA/UART/P1.DataBits=8

7.17.5. Stopbits Setting

Command and Response

- SET·/MEDIA/UART/<port>.StopBits=<stopbits>
- pw·/MEDIA/UART/<port>.StopBits=<stopbits>

Parameters

Identifier	Parameter description	Value	Parameter value
<stopbits>	Stopbits value	**0**	1
		1	1,5
		2	2

Example

- SET /MEDIA/UART/P1.StopBits=0
- pw /MEDIA/UART/P1.StopBits=0

7.17.6. Parity Setting

Command and Response

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

Parameters

Identifier	Parameter description	Value	Parameter value
<parity>	Parity setting	**0**	None
		1	Odd
		2	Even

Example

- SET /MEDIA/UART/P1.Parity=0
- pw /MEDIA/UART/P1.Parity=0

7.17.7. Querying the Command Injection Mode

Command and Response

- GET·/MEDIA/UART/<port>.CommandInjectionStatus
- pr·/MEDIA/UART/<port>.CommandInjectionStatus=<logical_value>

Parameters

Identifier	Parameter description	Value	Parameter value
<logical_value>	Command injection mode status	**true**	Command injection mode is enabled.
		false	Command injection mode is disabled.

Example

- SET /MEDIA/UART/P1.CommandInjection=true
- pw /MEDIA/UART/P1.CommandInjectionEnable=true

7.17.8. Changing the Command Injection Mode

Command and Response

- SET·/MEDIA/UART/<port>.CommandInjectionEnable=<logical_value>
- pw·/MEDIA/UART/<port>.CommandInjectionEnable=<logical_value>

Parameters

Identifier	Parameter description	Value	Parameter value
<logical_value>	Command injection mode setting	**true**	Command injection mode is enabled.
		false	Command injection mode is disabled.

Example

- SET /MEDIA/UART/P1.CommandInjectionEnable=true
- pw /MEDIA/UART/P1.CommandInjectionEnable=true

ATTENTION: The local RS-232 and TPS serial link are mirrored. If you change the RS-232 mode on the P1 (local) port, the P2 (TPS serial link) will also be changed.

7.18. RS-232 Message Sending

7.18.1. Sending a Message (ASCII-format) via RS-232

The command is for sending a command message in ASCII-format. This method **allows** escaping the control characters. For more information, see the Escaping section.

Command and Response *#message*

- CALL·/MEDIA/UART/P1:sendMessage(<message>)
- mO·/MEDIA/UART/P1:sendMessage

Example

- CALL /MEDIA/UART/P1:sendMessage(PWR0)
- mO /MEDIA/UART/P1:sendMessage

The 'PWR0' message is sent out via the P1 serial port.

7.18.2. Sending a Text (ASCII-format) via RS-232

The command is for sending a command message in ASCII-format. This method **does not require** escaping the control and non-printable characters.

Command and Response

- CALL·/MEDIA/UART/P1:sendText(<message>)
- mO·/MEDIA/UART/P1:sendText

Example

- CALL /MEDIA/UART/P1:sendText(open)
- mO /MEDIA/UART/P1:sendText

The 'open' text is sent out via the P1 serial port.

7.18.3. Sending a Binary Message (HEX-format) via RS-232

The command is for sending a binary message in Hexadecimal format. This method **does not require** escaping the control and non-printable characters.

Command and Response

- CALL·/MEDIA/UART/P1:sendBinaryMessage(<message>)
- mO·/MEDIA/UART/P1:sendBinaryMessage

Example

- CALL /MEDIA/UART/P1:sendBinaryMessage(433030)
- mO /MEDIA/UART/P1:sendBinaryMessage

The '433030' message is sent out via the P1 serial port.

7.18.4. Using Hexadecimal Codes

Hexadecimal codes can be inserted in the ASCII message when using:

sendMessage command: `CALL /MEDIA/UART/P1:sendMessage(C00\x0D)`

tcpMessage command: `CALL /MEDIA/ETHERNET:tcpMessage(C00\x0D)`

udpMessage command: `CALL /MEDIA/ETHERNET:udpMessage(C00\x0D)`

- **C00**: the message.
- **\x**: indicates that the following is a hexadecimal code.
- **0D**: the hexadecimal code (Carriage Return)

7.19. RS-232 Recognizer

This tool is able to recognize the incoming RS-232 message. It stores the incoming serial data from the first bit until the previously defined string (delimiter) or the elapsing timeout after the last bit. The last incoming serial string is saved in different formats (string, hex, and hash).

7.19.1. EnablING/Disabling the Recognizer

- SET·/MEDIA/UART/<port>.RecognizerEnable=<logical_value>
- pw·/MEDIA/UART/<port>.RecognizerEnable=<logical_value>

Parameters

Identifier	Parameter description	Value	Parameter value
<logical_value>	Recognizer enable/ disable setting	**true**	Enabled
		false	Disabled

Example

- SET /MEDIA/UART/P1.RecognizerEnable=true
- pw /MEDIA/UART/P1.RecognizerEnable=true

7.19.2. Setting the Delimiter Hex

When the delimiter hex string is detected in the incoming serial data, the device saves the RS-232 message data from the first bit until the delimiter (or the data between the two delimiters).

- SET·/MEDIA/UART/RECOGNIZER.DelimiterHex=<delimiter>
- pw·/MEDIA/UART/RECOGNIZER.DelimiterHex=<delimiter>

Parameters

Identifier	Parameter description
<delimiter>	It can be max. 8-character long (or 16 hex digit) in **hex** format.

Example

- SET /MEDIA/UART/RECOGNIZER.DelimiterHex=3a
- pw /MEDIA/UART/RECOGNIZER.DelimiterHex=3a

7.19.3. Setting the Timeout

When the set time has passed after the last received message, the device saves the data. It can be applied when there is no special or easily defined delimiter string in the incoming serial data, but there is a time gap between the messages.

- SET·/MEDIA/UART/RECOGNIZER.TimeOut=<timeout>
- pw·/MEDIA/UART/RECOGNIZER.TimeOut=<timeout>

Parameters

Identifier	Parameter description
<timeout>	Timeout value in ms.; **0**: disable the timeout; minimum value: 10.

Example

- SET /MEDIA/UART/RECOGNIZER.TimeOut=20
- pw /MEDIA/UART/RECOGNIZER.TimeOut=20

7.19.4. Querying the Last Recognized Serial Message in String Format

The recognized data is stored in string format. They are stored until the next incoming message or until the RECOGNIZER:clear() method is called.

> TIPS AND TRICKS: When one of these properties are set as a condition in the Event Manager, and the same strings follow each other, the action **will execute once**.

Command and Response

- GET·/MEDIA/UART/RECOGNIZER.Rx
- pr·/MEDIA/UART/RECOGNIZER.Rx=<recognized_string>

Parameters

Identifier	Parameter description
<recognized_string>	Max. 12-byte-long recognized data string.

Example

- GET /MEDIA/UART/RECOGNIZER.Rx
- pr /MEDIA/UART/RECOGNIZER.Rx=Login:

#recognizer #rs232recognizer #rs-232recognizer

7.19.5. Querying the Last Recognized Serial Message in Hex Format

The recognized data is stored in hex format. They are stored until the next incoming message or until the RECOGNIZER:clear() method is called.

> TIPS AND TRICKS: When one of these properties are set as a condition in the Event Manager, and the same strings follow each other, the action **will execute once**.

Command and Response

- GET·/MEDIA/UART/RECOGNIZER.RxHex
- pr·/MEDIA/UART/RECOGNIZER.RxHex=<recognized _hex>

Parameters

Identifier	Parameter description
<recognized_hex>	Recognized data in hex format.

Example

- GET /MEDIA/UART/RECOGNIZER.RxHex
- pr /MEDIA/UART/RECOGNIZER.RxHex=FF1F4C6F67696E3A

7.19.6. Clearing the Stored Last Recognized Serial Message

This method deletes all stored received serial messages.

Command and Response

- CALL·/MEDIA/UART/RECOGNIZER:clear()
- mO·/MEDIA/UART/RECOGNIZER:clear

Example

- CALL /MEDIA/UART/RECOGNIZER:clear()
- mO /MEDIA/UART/RECOGNIZER:clear

7.19.7. Querying the Last Recognized Serial Message in String Format

The recognized data is stored in string, hex and hash format in a **temporary** storage. They are erased when the Active Timeout has passed.

> TIPS AND TRICKS: When these properties are set as a condition in the Event Manager, and the same strings follow each other, the action will be executed every time if the active timeout has been set properly.

Command and Response

- GET·/MEDIA/UART/RECOGNIZER.ActiveRx
- pr·/MEDIA/UART/RECOGNIZER.ActiveRx=<recognized _string>

Parameters

Identifier	Parameter description
<recognized_string>	Max. 12-byte-long recognized data string.

Example

- GET /MEDIA/UART/RECOGNIZER.ActiveRx
- pr /MEDIA/UART/RECOGNIZER.ActiveRx=Login:

7.19.8. Querying the Last Recognized Serial Message in Hex Format

The recognized data is stored in string, hex and hash format in a **temporary** storage. They are erased when the Active Timeout has passed.

> TIPS AND TRICKS: When these properties are set as a condition in the Event Manager, and the same strings follow each other, the action **will execute on every occasion** if the active timeout is set properly.

Command and Response

- GET·/MEDIA/UART/RECOGNIZER.ActiveRxHex
- pr·/MEDIA/UART/RECOGNIZER.ActiveRxHex=<recognized _hex>

Parameters

Identifier	Parameter description
<recognized_hex>	Recognized data in hex format.

Example

- GET /MEDIA/UART/RECOGNIZER.ActiveRxHex
- pr /MEDIA/UART/RECOGNIZER.ActiveRxHex= 4C6F67696E3A

7.19.9. Setting the Active Timeout

This property is responsible for erasing the temporary storage (ActiveRx, ActiveRxHex, ActiveHash) after the elapsing time. Default value is 50ms.

Command and Response

- SET·/MEDIA/UART/RECOGNIZER.ActivePropertyTimeout=<a_timeout>
- pw·/MEDIA/UART/RECOGNIZER.ActivePropertyTimeout=<a_timeout>

Parameters

Identifier	Parameter description
<a_timeout>	Active timeout value (ms) between 0 and 255.

Example

- SET /MEDIA/UART/RECOGNIZER.ActivePropertyTimeout=255
- pw /MEDIA/UART/RECOGNIZER.ActivePropertyTimeout=255

7.20. Sending CEC Commands

The device is able to send and receive Consumer Electronics Control (CEC) commands. This feature is for remote controlling the source or sink device. CEC is a bi-directional communication **via the HDMI cable**.

INFO: The hidden first 2 bytes of the CEC command is static, it refers to the logical address of the sender and the addressee. If the port is input, it is always 04 (from the TV to the Playback device 1.), if the port is output, it is always 40 (from the Playback device 1. to the TV). Broadcast addressing is also possible (in this case it is 0F or 4F).

7.20.1. Press&Release Commands

DIFFERENCE: This feature is available from FW package v1.5.0b3.

The CEC commands below are called 'push-button commands' like a button in a remote controller, e.g. volume up/down. When the CEC command is sent, the 'release' command is also sent in the background. Certain devices require this feature for the proper working, but this is necessary only for push-button commands.

Command and Response#cec

- CALL·/MEDIA/CEC/<port>:sendClick(<command>)
- mO·/MEDIA/CEC/<port>:sendClick

Parameters

The <port> parameter means the video input or output port. The following are accepted as a <command>:

ok	number_2	input_select	rewind	select_media_4
back	number_3	display_info	fast_forward	select_media_5
up	number_4	power_legacy	eject	power_toggle
down	number_5	page_up	skip_forward	power_on
left	number_6	page_down	skip_backward	power_off
right	number_7	volume_up	3d_mode	stop_function
root_menu	number_8	volume_down	stop_record	f1
setup_menu	number_9	mute_toggle	pause_record	f2
contents_menu	dot	mute	play_forward	f3
favorite_menu	enter	unmute	play_reverse	f4
media_top_menu	clear	play	select_next_media	
media_context_menu	channel_up	stop	select_media_1	
number_0	channel_down	pause	select_media_2	
number_1	sound_select	record	select_media_3	

Example

- CALL /MEDIA/CEC/I2:sendClick(play)
- mO /MEDIA/CEC/I2:sendClick

7.20.2. Further Commands

Command and Response

- CALL·/MEDIA/CEC/<port>:send(<command>)
- mO·/MEDIA/CEC/<port>:send

Parameters

The <port> parameter means the video input (I1-I4) or video output (O1-O2) port. The following is accepted as a <command>:

image_view_on	standby	text_view_on	active_source
get_cec_version	set_osd	clear_osd	give_power_status

The **set_osd** command requires also sending another command, see the following section.

Example

- CALL /MEDIA/CEC/I2:send(standby)
- mO /MEDIA/CEC/I2:send

7.20.3. Sending an OSD String

The OSD string sending consists of two steps. First, set the **OsdString** property with the desired text, then call the **send** method.

Command and Response

- SET·/MEDIA/CEC/<port>.OsdString=<text>
- pw·/MEDIA/CEC/<port>.OsdString=<text>
- CALL·/MEDIA/CEC/<port>:send(set_osd)
- mO·/MEDIA/CEC/I2:send

Parameters

Parameter	Parameter description	Values	Value description
<port>	Video input or video output port	**I1-I4**	Video inputs
		O1-O2	Video outputs
<text>	The desired OSD string		Letters (A-Z) and (a-z), hyphen (-), underscore (_), numbers (0-9), and dot (.). Max length: 14 characters.

Example

- SET /MEDIA/CEC/I2.OsdString=Lightware
- pw /MEDIA/CEC/I2.OsdString=Lightware
- CALL /MEDIA/CEC/I2:send(set_osd)
- mO /MEDIA/CEC/I2:send

7.20.4. Sending CEC Commands in Hex Format

- CALL·/MEDIA/CEC/<port>:sendHex(<hex_code>)
- mO·/MEDIA/CEC/<port>:sendHex

Parameters

Parameter	Parameter description	Values	Value description
<port>	Video input or video output port	**I1-I4**	Video inputs
		O1-O2	Video outputs
<hex_code>	The desired CEC command		Max. 30 characters (15 bytes) in hexadecimal format.

Example

- CALL /MEDIA/CEC/I2:sendHex(8700E091)
- mO /MEDIA/CEC/I2:sendHex

7.20.5. Querying the Last Received CEC Message

- GET /MEDIA/CEC/<port>.LastReceivedMessage
- pr /MEDIA/CEC/<port>.LastReceivedMessage=<CEC_message>

Parameters

Parameter	Parameter description	Values	Value description
<port>	Video port	**I1-I4** or **O1-O2**	
<CEC_message>	The last incoming CEC message from the connected device.		

Example

- GET /MEDIA/CEC/I2.LastReceivedMessage
- pr /MEDIA/CEC/I2.LastReceivedMessage=give_power_status

TIPS AND TRICKS: This property can be a condition in the Event manager. When the connected device sends status information via CEC, it could be a trigger for an action.

7.21. Infrared Port Configuration

Port Numbering

Infrared port type	Parameter	Infrared port	LW3 port number
Input	<in>	IR in (local)	**S1**
		TPS in 1 (IR in)	**S2**
Output	<out>	IR out (local)	**D1**
		TPS in 1 (IR out)	**D2**

7.21.1. Enabling/Disabling Command Injection Mode

Command and Response *#infra #infrared*

- SET·/MEDIA/IR/<in|out>.CommandInjectionEnable=<logical_value>
- pw·/MEDIA/IR/<in|out>.CommandInjectionEnable=<logical_value>

Parameters

Identifier	Parameter description	Value	Explanation
<logical_value>	Command injection setting	**true**	Command injection is enabled.
		false	Command injection is disabled.

Example

- SET /MEDIA/IR/S1.CommandInjectionEnable=true
- pw /MEDIA/IR/S1.CommandInjectionEnable=true

7.21.2. Changing the Command Injection Port Number

Command and Response

- SET·/MEDIA/IR/<in|out>.CommandInjectionPort=<port_no>
- pw·/MEDIA/IR/<in|out>.CommandInjectionPort=<port_no>

Example

- SET /MEDIA/IR/S1.CommandInjectionPort=9001
- pw /MEDIA/IR/S1.CommandInjectionPort=9001

7.21.3. Enabling/Disabling Output Signal Modulation

Command and Response

- SET·/MEDIA/IR/<out>.EnableModulation=<logical_value>
- pw·/MEDIA/IR/<out>.EnableModulation=<logical_value>

Parameters

Identifier	Parameter description	Value	Explanation
<logical_value>	Signal modulation enable/ disable setting	**true**	The signal modulation is enabled.
		false	The signal modulation is disabled.

Example

- SET /MEDIA/IR/D1.EnableModulation=false
- pw /MEDIA/IR/D1.EnableModulation=false

Signal modulation is turned off on IR output (D1).

INFO: The default setting value is **true** (enabled).

7.22. Infrared Message Sending

7.22.1. Sending Pronto Hex Codes in Little-endian Format via IR Port

Command and Response

- CALL·/MEDIA/IR/<out>:sendProntoHex(<hex_code>)
- mO·/MEDIA/IR/<out>:sendProntoHex

Parameters

Identifier	Parameter description	Parameter values
<out>	Output port of the Infrared interface	Local Infra output: **D1**; TPS Infra output: **D2**
<hex_code>	Pronto hex format code	Accepts a maximum of 765-character-long code in hexadecimal format (0-9; A-F; a-f) without space character in little-endian system.

INFO: This command can send exactly one pronto hex message. The header of the IR code contains the length of the whole code in hexa format. If the code is deficient or duplicated, it causes a syntax error.

For more details about the pronto hex codes, see the IR Interface section.

Example

- CALL /MEDIA/IR/D1:sendProntoHex(00006D0025000300A900A80015 003F0015003F0015003F00150015001500150015001500150015001500150015003F0015003F0015003F001500150015001500150015001500150015001500150015001500150015003F0015003F001503F001500150015001500150015001500150015001500150015001500150015001500150015001500150015003F0015003F0015003F0015003F0015003F0015000207A900A8001501501500150 15006E0E)
- mO /MEDIA/IR/D1:sendProntoHex

TIPS AND TRICKS: Download a code that belongs to your controlled device from a web database from the Internet.

7.22.2. Sending Pronto Hex Codes in Big-endian Format via IR Port

Command and Response

- CALL·/MEDIA/IR/<out>:sendProntoHexBigEndian(<hex_code>)
- mO·/MEDIA/IR/<out>:sendProntoHexBigEndian

Parameters

Identifier	Parameter description	Parameter values
<out>	Output port of the Infrared interface	Local Infra output: **D1**; TPS Infra output: **D2**
<hex_code>	Pronto hex format code	Accepts a maximum of 765-character-long code in hexadecimal format (0-9; A-F; a-f) without space character in big-endian system.

INFO: This command can send exactly one pronto hex message. The header of the IR code contains the length of the whole code in hexa format. If the code is deficient or duplicated, it causes syntax error.

For more details about the pronto hex codes, see the IR Interface section.

Example

- CALL /MEDIA/IR/D1:sendProntoHexBigEndian(0000006d0025000300a900a80015 003f0015003f0015003f0015001500150015001500150015001500150015001500150015003f0015003f0015003f0015003f0015001500150015001500150015001500150015003f0015003f0015003f0015001500150015001500150015001500150015001500150015001500150015001500150015003f0015003f0015003f0015003f0015003f0015070200a900a80015001500150e6e)
- mO /MEDIA/IR/D1:sendProntoHexBigEndian

TIPS AND TRICKS: Learning raw IR code with a terminal program:

Step 1. Connect to the HDMI-TPS-RX220AK device with a terminal program (see the details in the Instructions for the Terminal Application Usage section).

Step 2. Push the desired button of the remote control to scan the raw IR code.

Step 3. Remove all non-hexadecimal characters (e.g. spaces, h characters etc.) from the code.

The pronto hex code that is learned by a Lightware device is in big-endian format.

7.23. EDID Management

Parameters

Parameter	Description
<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

See the list of all factory EDID tracks in the Factory EDID List section.

7.23.1. Querying the Emulated EDIDs

Command and Response *#edid*

- GET·/EDID.EdidStatus
- pr·/EDID.EdidStatus=<dynamic|user|factory>:<emulated>;...;<dynamic|user|factory>:<emulated>

Example

- GET /EDID.EdidStatus
- pr /EDID.EdidStatus=D1:E1;F47:E2

Emulated EDID memory for input port is listed with the EDID number that is currently emulated on the input.

7.23.2. Querying the Validity of a Dynamic EDID

Command and Response

- GET·/EDID/D/<dynamic>.Validity
- pr·/EDID/D/<dynamic>.Validity=<logical_value>

Parameters

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

Example

- GET /EDID/D/D1.Validity
- pr /EDID/D/D1.Validity=true

7.23.3. Querying the Preferred Resolution of a User EDID

Command and Response

- GET·/EDID/U/<user>.PreferredResolution
- pr·/EDID/U/<user>.PreferredResolution=<resolution>

Example

- GET /EDID/U/U2.PreferredResolution
- pr /EDID/U/U2.PreferredResolution=1920x1080p60.00Hz

7.23.4. Emulating an EDID to an Input Port

Command and Response

- CALL·/EDID:switch(<dynamic|user|factory>:<emulated>)
- mO·/EDID:switch

Example

- CALL /EDID:switch(F49:E1;F27:E2)
- mO /EDID:switch

7.23.5. Emulating an EDID to All Input Ports

Command and Response

- CALL·/EDID:switchAll(<dynamic|user|factory>)
- mO·/EDID:switchAll

Example

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

7.23.6. Copying an EDID to User Memory

Command and Response

- CALL·/EDID:copy(<dynamic|emulated|factory|user>:<user>)
- mO·/EDID:copy

Example

- CALL /EDID:copy(D1:U1)
- mO /EDID:copy

The EDID of the last connected sink of D1 (Output 1) has been copied to U1.

7.23.7. Deleting an EDID from User Memory

Command and Response

- CALL·/EDID:delete(<user>)
- mO·/EDID:delete

Example

- CALL /EDID:delete(U1;U2;U6)
- mO /EDID:delete

7.23.8. 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 Default Settings section.

7.24. LW3 Protocol Commands - Quick Summary

System Commands

Querying the Product Name
- GET·/.ProductName

Setting the Device Label
- SET·/MANAGEMENT/UID/DeviceLabel=<Custom_name>

Querying the Serial Number
- GET·/.SerialNumber

Querying the Firmware Version
- GET·/SYS/MB.FirmwareVersion

Identifying the Device
- CALL·/MANAGEMENT/UI:identifyMe()

Dark Mode
- SET·/MANAGEMENT/UI/DARKMODE.DarkModeEnable=<logical_value>

Control Lock
- SET·/MANAGEMENT/UI.ControlLock=<mode>

Restarting the Device
- CALL·/SYS:reset()

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

Running a Macro
- CALL·/CTRL/MACROS:run(<macro_name>)

Cleartext Login Protection

Setting the Login Password
- CALL·/LOGIN:setPassword(<password>)

Logging into the Device
- CALL·/LOGIN:login(<password>)

Logging out of the Device
- CALL·/LOGIN:logout(<password>)

Enabling/Disabling the Cleartext Login Function
- SET·/LOGIN:LoginEnable=<login_state>

Video Port Settings

Querying the Status of the Source Ports
- GET·/MEDIA/VIDEO/XP.SourcePortStatus

Querying the Status of the Destination Ports
- GET·/MEDIA/VIDEO/XP.DestinationPortStatus

Querying the Video Crosspoint Setting
- GET·/MEDIA/VIDEO/XP.DestinationConnectionList

Switching a Video Input to an Output
- CALL·/MEDIA/VIDEO/XP:switch(<in>:<out>)

Switching a Video Input to All Outputs
- CALL·/MEDIA/VIDEO/XP:switchAll(<in>)

Disconnecting a Video Output
- CALL·/MEDIA/VIDEO/XP:switch(0:<out>)

Querying the Connected Input Port Number
- GET·/MEDIA/VIDEO/<out>.ConnectedSource

Querying the Video Autoselect Settings
- GET·/MEDIA/VIDEO/XP.DestinationPortAutoselect

Changing the Autoselect Mode
- CALL·/MEDIA/VIDEO/XP:setDestinationPortAutoselect(<out>:<out_set>)

Querying the Input Port Priority
- GET·/MEDIA/VIDEO/XP.PortPriorityList

Changing the Input Port Priority
- CALL·/MEDIA/VIDEO/XP:setAutoselectionPriority(<in>(<out>):<prio>)

Muting an Input
- CALL·/MEDIA/VIDEO/XP:muteSource(<in>)

Unmuting an Input
- CALL·/MEDIA/VIDEO/XP:unmuteSource(<in>)

Locking an Input
- CALL·/MEDIA/VIDEO/XP:lockSource(<in>)

Unlocking an Input
- CALL·/MEDIA/VIDEO/XP:unlockSource(<in>)

Muting an Output
- CALL·/MEDIA/VIDEO/XP:muteDestination(<out>)

Unmuting an Output

- CALL·/MEDIA/VIDEO/XP:unmuteDestination(<out>)

Locking an Output

- CALL·/MEDIA/VIDEO/XP:lockDestination(<out>)

Unlocking an Output

- CALL·/MEDIA/VIDEO/XP:unlockDestination(<out>)

HDCP Setting (Input Port)

- SET·/MEDIA/VIDEO/<in>.HdcpEnable=<logical_value>

HDCP Setting (Output Port)

- SET·/MEDIA/VIDEO/<out>.HdcpModeSetting=<HDCP_mode>

Test Pattern Generator Mode

- SET·/MEDIA/VIDEO/<out>.TpgMode=<mode>

Test Pattern Generator Clock Source

- SET·/MEDIA/VIDEO/<out>.TpgClockSource=<clock_frequency>

Test Pattern Setting

- SET·/MEDIA/VIDEO/<out>.TpgPattern=<pattern>

HDMI Mode Settings (Output Port)

- SET·/MEDIA/VIDEO/<out>.HdmiModeSetting=<mode>

Querying the Recent TPS Mode

- GET·/REMOTE/<port>.tpsMode

Setting the TPS Mode

- SET·/REMOTE/<port>.tpsModeSetting=<TPS_mode>

Audio Port Settings

Querying the Status of the Source Ports

- GET·/MEDIA/AUDIO/XP.SourcePortStatus

Querying the Status of the Destination Ports

- GET·/MEDIA/AUDIO/XP.DestinationPortStatus

Querying the Audio Crosspoint Setting

- GET·/MEDIA/AUDIO/XP.DestinationConnectionList

Switching an Audio Input to an Output

- CALL·/MEDIA/AUDIO/XP:switch(<in>:<out>)

Switching an Audio Input to All Outputs

- CALL·/MEDIA/AUDIO/XP:switchAll(<in>)

Querying the Audio Autoselect Settings

- GET·/MEDIA/AUDIO/XP.DestinationPortAutoselect

Changing the Autoselect Mode

- CALL·/MEDIA/AUDIO/XP:setDestinationPortAutoselect(<out>:<out_set>)

Querying the Input Port Priority

- GET·/MEDIA/AUDIO/XP.PortPriorityList

Changing the Input Port Priority

- CALL·/MEDIA/AUDIO/XP:setAutoselectionPriority(<in>(<out>):<prio>)

Muting an Input

- CALL·/MEDIA/AUDIO/XP:muteSource(<in>)

Unmuting an Input

- CALL·/MEDIA/AUDIO/XP:unmuteSource(<in>)

Locking an Input

- CALL·/MEDIA/AUDIO/XP:lockSource(<in>)

Unlocking an Input

- CALL·/MEDIA/AUDIO/XP:unlockSource(<in>)

Muting an Output

- CALL·/MEDIA/AUDIO/XP:muteDestination(<out>)

Unmuting an Output

- CALL·/MEDIA/AUDIO/XP:unmuteDestination(<out>)

Locking an Output

- CALL·/MEDIA/AUDIO/XP:lockDestination(<out>)

Unlocking an Output

- CALL·/MEDIA/AUDIO/XP:unlockDestination(<out>)

Analog Audio Output Settings

Volume Setting (dB)

- SET·/MEDIA/AUDIO/<out>.VolumedB=<level>

Volume Setting (dB) in Steps

- CALL·/MEDIA/AUDIO/<out>:stepVolumedB(<step>)

Volume Setting (Percent)

- SET·/MEDIA/AUDIO/<out>.VolumePercent=<percent>

Volume Setting (Percent) in Steps

- CALL·/MEDIA/AUDIO/<out>:stepVolumePercent(<percent>)

Balance Setting

- SET·/MEDIA/AUDIO/<out>.Balance=<level>

Balance Setting in Steps

- CALL·/MEDIA/AUDIO/<out>:stepBalance(<level>)

Event Manager Basics

How to arrange an Event?

- SET·/EVENTS/E<loc>.Condition=<expression>

Setting a Condition by Linking Another Condition

- SET·/EVENTS/E<loc>.Condition=<event_nr>

Setting a Condition by Linking More Conditions

- SET·/EVENTS/E<loc>.Condition=<event_nr>&<event_nr>&<event_nr>&<event_nr>

Setting an Action by Specifying a Direct Path

- SET·/EVENTS/E<loc>.Action=<expression>

Setting an Action by Linking Another Action

- SET·/EVENTS/E<loc>.Action=<event_nr>

Setting an Action by Linking a Macro

- SET·/EVENTS/E<loc>.Action=<macro_name>

Event Manager Tool Kit

Setting the Delay

- SET·/EVENTS/E<loc>.ConditionTimeout=<time>
- SET·/EVENTS/E<loc>.ConditionEndCheck=<true/false>
- SET·/EVENTS/E<loc>.ConditionTimeoutContinuous=<true/false>

Setting the Name of the Event

- SET·/EVENTS/E<loc>.Name=<string>

Enabling/Disabling the Event

- SET·/EVENTS/E<loc>.Enabled=<true/false>

Triggering a Condition

- CALL·/EVENTS/E<loc>:triggerCondition(1)

Querying the Condition Counter

- GET·/EVENTS/E<loc>.ConditionCount

Querying the Condition Trigger Counter

- GET·/EVENTS/E<loc>.ExternalConditionTriggerCount

Testing an Action

- CALL·/EVENTS/E<loc>:ActionTest(1)

Variable-Management

Value Assignment

- SET·/CTRL/VARS/V<loc>.Value=<value>

Addition and Subtraction (Add Method)

- CALL·/CTRL/VARS/V<loc>:add(<operand>;<min>;<max>)

Addition and Subtraction (Cycle Method)

- CALL·/CTRL/VARS/V<loc>:cycle(<operand>;<min>;<max>)

Value Change with Intervals (Case)

- CALL·/CTRL/VARS/V<loc>:case(<min> <max> <val>;)

Scan and Store

- CALL·/CTRL/VARS/V<loc>:scanf(<path>.<property>;<pattern>)

Reformatting a Value

- CALL·/CTRL/VARS/V<loc>:printf(<prefix>%s<postfix>)

Ethernet Port Configuration

Querying the DHCP State

- GET·/MANAGEMENT/NETWORK.DhcpEnabled

Changing the DHCP State

- SET·/MANAGEMENT/NETWORK.DhcpEnabled=<logical_value>

Querying the IP Address

- GET·/MANAGEMENT/NETWORK.IpAddress

Changing the IP Address (Static)

- SET·/MANAGEMENT/NETWORK.StaticIpAddress=<IP_address>

Querying the Subnet Mask

- GET·/MANAGEMENT/NETWORK.NetworkMask

Changing the Subnet Mask (Static)

- SET·/MANAGEMENT/NETWORK.StaticNetworkMask=<netmask>

Querying the Gateway Address

- GET·/MANAGEMENT/NETWORK.GatewayAddress

Changing the Gateway Address (Static)

- SET·/MANAGEMENT/NETWORK.StaticGatewayAddress=<gw_address>

Querying the MAC Address

- GET·/MANAGEMENT/NETWORK.MacAddress

Applying Network Settings

- CALL·/MANAGEMENT/NETWORK:ApplySettings()

Ethernet Tool Kit

Device Filter Based on MAC Address

- SET·/MANAGEMENT/MACFILTER.MACaddress<loc>=<MAC_address>;<receive>;<send>;<name>

Blocking the LW2 Control Port

- SET·/MANAGEMENT/SERVICEFILTER.Lw2Enabled=<port_mode>

Blocking the HTTP Port

- SET·/MANAGEMENT/SERVICEFILTER.HttpEnabled=<port_mode>

Blocking the Reception of HTTP Posts

- SET·/MANAGEMENT/SERVICEFILTER.HttpEnabled=<port_mode>

Powering on a Computer over Ethernet (Wake-on-LAN)

- CALL·/MEDIA/ETHERNET:wakeOnLan(MAC_address)

Setting the Host Name

- SET·/MANAGEMENT/NETWORK.HostName=<unique_name>

Ethernet Message Sending

Sending a TCP Message (ASCII-format)

- CALL·/MEDIA/ETHERNET:tcpMessage(<IP_address>:<port_no>=<message>)

Sending a TCP Text (ASCII-format)

- CALL·/MEDIA/ETHERNET:tcpText(<IP_address>:<port_no>=<text>)

Sending a TCP Binary Message (HEX-format)

- CALL·/MEDIA/ETHERNET.tcpBinary(<IP_address>:<port_no>=<HEX_message>)

Sending a UDP Message (ASCII-format)

- CALL·/MEDIA/ETHERNET:udpMessage(<IP_address>:<port_no>=<message>)

Sending a UDP Text (ASCII-format)

- CALL·/MEDIA/ETHERNET:udpText(<IP_address>:<port_no>=<text>)

Sending a UDP Binary Message (HEX-format)

- CALL·/MEDIA/ETHERNET:udpBinary(<IP_address>:<port_no>=<HEX_message>)

HTTP Messaging

Setting the Target IP Address

- SET·/CTRL/HTTP/C1.ServerIP=<IP_address>

Setting the TCP Port

- SET·/CTRL/HTTP/C1.ServerPort=<port_no>

Setting the Target Path

- SET·/CTRL/HTTP/C1.File=<path>

Setting the Message Header

- SET·/CTRL/HTTP/C1.Header=<header_text>

Sending a Post Message

- CALL·/CTRL/HTTP/C1:post(<body_text>)

Sending a Put Message

- CALL·/CTRL/HTTP/C1:put(<body_text>)

TCP Message Recognizer

Setting the IP Address of the TCP Server

- SET·/CTRL/TCP/C<loc>.ServerIP=<IP_address>

Setting the TCP/IP Port Number of the TCP Server

- SET·/CTRL/TCP/C<loc>.ServerPort=<port_no>

Connecting to a TCP Server

- CALL·/CTRL/TCP/C<loc>:connect()

Disconnecting from a TCP Server

- CALL·/CTRL/TCP/C<loc>:disconnect()

Setting the Delimiter Hex

- SET·/CTRL/TCP/C<loc>.DelimiterHex=<delimiter>

Setting the Timeout

- SET·/CTRL/TCP/C<loc>.TimeOut=<timeout>

Querying the Last Recognized Message (String)

- GET·/CTRL/TCP/C<loc>.Rx

Querying the Last Recognized Message (Hex)

- GET·/CTRL/TCP/C<loc>.RxHex

Clearing the Last Recognized Stored Message

- CALL·/CTRL/TCP/C<loc>:clear()

Querying the Last Recognized Active Message (String)

- GET·/CTRL/TCP/C<loc>.ActiveRx

Querying the Last Recognized Active Message (Hex)

- GET·/CTRL/TCP/C<loc>.ActiveRxHex

Setting the Active Timeout

- SET·/CTRL/TCP/C<loc>.ActivePropertyTimeout=<a_timeout>

Running an Immediate Event Action

- SET·/CTRL/TCP/C<loc>.ActionTrigger=<event_nr>

RS-232 Port Configuration

Protocol Setting

- SET·/MEDIA/UART/<port>.ControlProtocol=<protocol>

RS-232 Operation Mode

- SET·/MEDIA/UART/<port>.Rs232Mode=<mode>

BAUD Rate Setting

- SET·/MEDIA/UART/<port>.Baudrate=<baudrate>

Databits Setting

- SET·/MEDIA/UART/<port>.DataBits=<databits>

Stopbits Setting

- SET·/MEDIA/UART/<port>.StopBits=<stopbits>

Parity Setting

- SET·/MEDIA/UART/ <port>.Parity=<parity>

Querying the Command Injection Mode

- GET·/MEDIA/UART/<port>.CommandInjectionStatus

Changing the Command Injection Mode

- SET·/MEDIA/UART/<port>.CommandInjectionEnable=<logical_value>

RS-232 Message Sending

Sending a Message (ASCII-format) via RS-232

- CALL·/MEDIA/UART/P1:sendMessage(<message>)

Sending a Text (ASCII-format) via RS-232

- CALL·/MEDIA/UART/P1:sendText(<message>)

Sending a Binary Message (HEX-format) via RS-232

- CALL·/MEDIA/UART/P1:sendBinaryMessage(<message>)

Using Hexadecimal Codes

RS-232 Recognizer

EnablING/Disabling the Recognizer

- SET·/MEDIA/UART/<port>.RecognizerEnable=<logical_value>

Setting the Delimiter Hex

- SET·/MEDIA/UART/RECOGNIZER.DelimiterHex=<delimiter>

Setting the Timeout

- SET·/MEDIA/UART/RECOGNIZER.TimeOut=<timeout>

Querying the Last Recognized Serial Message in String Format

- GET·/MEDIA/UART/RECOGNIZER.Rx

Querying the Last Recognized Serial Message in Hex Format

- GET·/MEDIA/UART/RECOGNIZER.RxHex

Clearing the Stored Last Recognized Serial Message

- CALL·/MEDIA/UART/RECOGNIZER:clear()

Querying the Last Recognized Serial Message in String Format

- GET·/MEDIA/UART/RECOGNIZER.ActiveRx

Querying the Last Recognized Serial Message in Hex Format

- GET·/MEDIA/UART/RECOGNIZER.ActiveRxHex

Setting the Active Timeout

- SET·/MEDIA/UART/RECOGNIZER.ActivePropertyTimeout=<a_timeout>

Sending CEC Commands

Press&Release Commands

- CALL·/MEDIA/CEC/<port>:sendClick(<command>)

Further Commands

- CALL·/MEDIA/CEC/<port>:send(<command>)

Sending an OSD String

- SET·/MEDIA/CEC/<port>.OsdString=<text>
- CALL·/MEDIA/CEC/<port>:send(set_osd)

Sending CEC Commands in Hex Format

- CALL·/MEDIA/CEC/<port>:sendHex(<hex_code>)

Querying the Last Received CEC Message

- GET /MEDIA/CEC/<port>.LastReceivedMessage

Infrared Port Configuration

Enabling/Disabling Command Injection Mode

- SET·/MEDIA/IR/<in|out>.CommandInjectionEnable=<logical_value>

Changing the Command Injection Port Number

- SET·/MEDIA/IR/<in|out>.CommandInjectionPort=<port_no>

Enabling/Disabling Output Signal Modulation

- SET·/MEDIA/IR/<out>.EnableModulation=<logical_value>

Infrared Message Sending

Sending Pronto Hex Codes in Little-endian Format via IR Port

- CALL·/MEDIA/IR/<out>:sendProntoHex(<hex_code>)

Sending Pronto Hex Codes in Big-endian Format via IR Port

- CALL·/MEDIA/IR/<out>:sendProntoHexBigEndian(<hex_code>)

EDID Management

Querying the Emulated EDIDs

- GET·/EDID.EdidStatus

Querying the Validity of a Dynamic EDID

- GET·/EDID/D/<dynamic>.Validity

Querying the Preferred Resolution of a User EDID

- GET·/EDID/U/<user>.PreferredResolution

Emulating an EDID to an Input Port

- CALL·/EDID:switch(<dynamic|user|factory>:<emulated>)

Emulating an EDID to All Input Ports

- CALL·/EDID:switchAll(<dynamic|user|factory>)

Copying an EDID to User Memory

- CALL·/EDID:copy(<dynamic|emulated|factory|user>:<user>)

Deleting an EDID from User Memory

- CALL·/EDID:delete(<user>)

Resetting the Emulated EDIDs

- CALL·/EDID:reset()

8

Firmware Update

The receiver can be updated by using Lightware Device Updater V2 (LDU2) software via Ethernet. The firmware pack with the necessary components (*.lfp2 file) for your specific product, the LDU2 application, and the User manual can be downloaded from the Support page of our website www.lightware.com.

- Introduction 134
- Preparation 134
- Running the Software 135
- Updating via GUI 137
- Command Line Interface (CLI) 138
- CLI Commands 139
- If the Update is not successful 143

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 device and restart the process. #new

8.1. Introduction

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

DIFFERENCE: The software can be used for uploading the packages with LFP2 extension only. LDU2 is not suitable for using LFP files, please use the LDU software for that firmware update.

LDU 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.

8.2.2. LDU2 Installation

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

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

Download the software from www.lightware.com.

Installation Modes

Normal install	Snapshot install
Available for Windows, macOS and Linux	Available for Windows only
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 Windows OS

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

Using the **Normal install** (default setting) is highly recommended.

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.

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

ATTENTION: Please check the firewall settings on the macOS device. LDU2 needs to be added to the exeptions of the blocked softwares for proper operation.

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** that can be used to start LDU2.

8.3. Running the Software

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 behind a firewall or gateway.

You have two options:

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

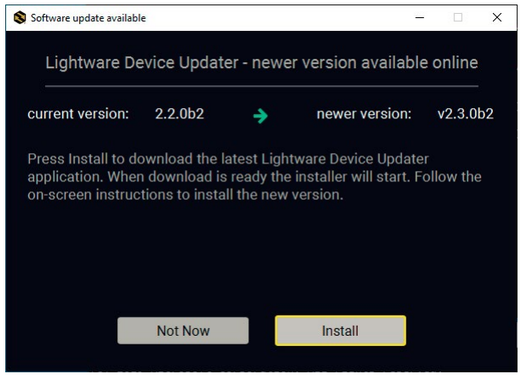
8.3.1. LDU2 Interfaces

The software can be used over:

- The Graphical User Interface (GUI), or by
- The Command Line Interface (CLI).

LDU2 Auto-Update

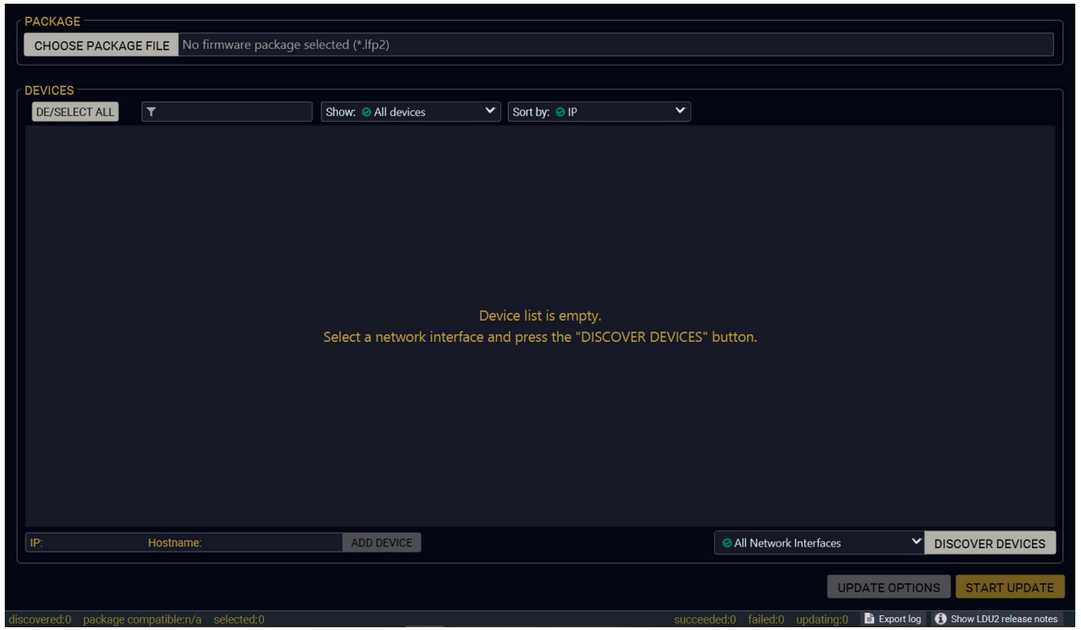
At startup, the software checks if a newer version is available on the web.



Main Screen

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

DISCOVER DEVICES



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

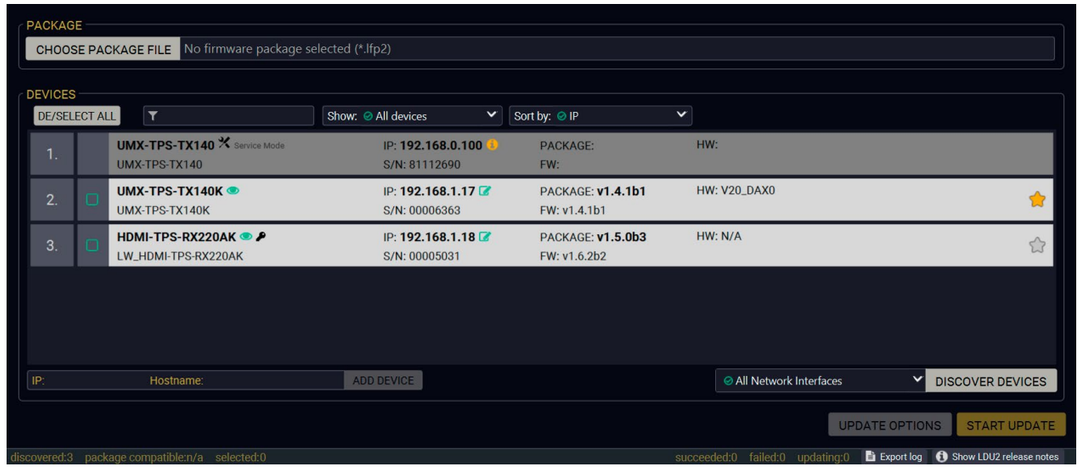
ATTENTION: If the device cannot be added by the hostname, please use the IP address.

If you start the software by double-clicking on the LFP2 file, the firmware will be loaded. Press the **Discover 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.



If the desired device is not discovered, you can add it by typing the IP address in the dedicated field and pressing the **Add device** button.

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 results in the front panel LEDs blinking for 10 seconds, which helps identify the device physically.
	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 by pressing the **IP address editor** icon or use the front panel buttons (if available).
	Cleartext login enabled	The password-protection is enabled. You have to enter the password to perform the firmware update in the **Parameters** window or in the appearing window in the beginning of the update.
	Service mode	The device is in bootload mode. Backup and restore cannot be performed in this case.

8.3.2. The Updating Steps

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.

Keeping the Configuration Settings

By default, device configuration settings are restored when firmware update is finished. If factory reset has been chosen in the parameters window, all device settings will be erased. In the case of factory reset, you can save the settings of the device in the Lightware Device Controller software and restore it later.

The following flow chart demonstrates how this function works in the background.

Step 1. Create a backup

The current configuration of the device is being saved into a configuration backup file on your computer.

Step 2. Start the Update

The device reboots and starts in bootload mode (firmware update mode).

Step 3. Update

The CPU firmware is changed to the new one.

Step 4. Factory reset

All configuration settings are restored to the factory default values.

Step 5. Conversion / Restore

The firmware package checks the backup data before the restoration procedure, and if it is necessary, a conversion is applied to avoid incompatibility problems between the firmware versions. All configuration settings are restored to the device after the conversion.

If the factory default option is selected in the Parameters window, the conversion / restoration procedure will not be performed!

Step 6. Finish

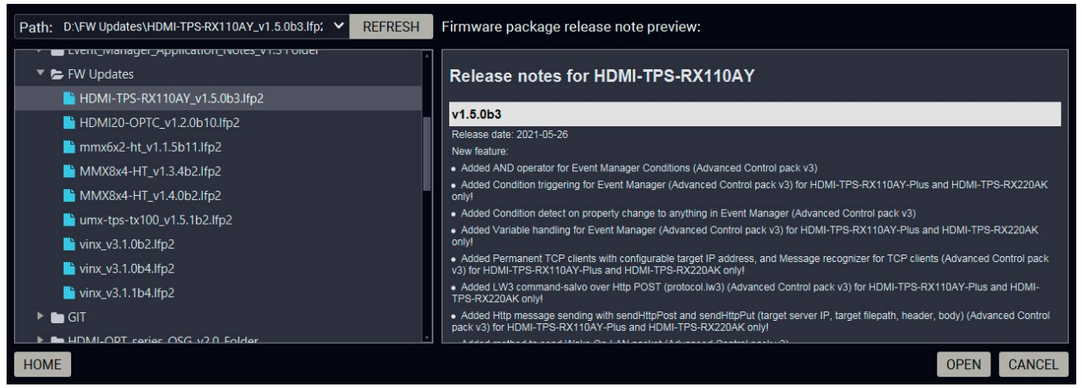
Once the firmware update procedure is finished, the device reboots and is ready for use.

8.4. Updating via GUI

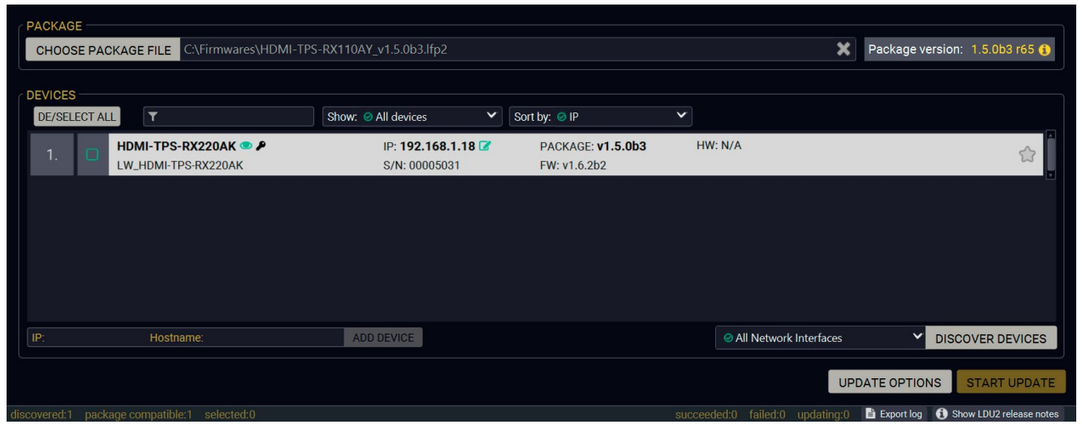
Step 1. Select the Firmware Package

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 package, the preview of the release notes are displayed in the right panel.

CHOOSE PACKAGE FILE



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.



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

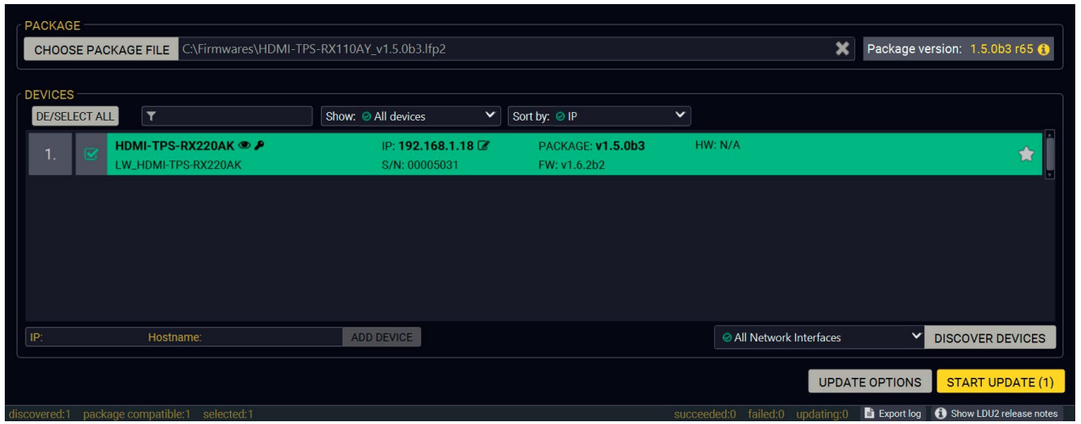
The Meaning of the Symbols

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.

If you are not sure which device to select, press the **Identify me** button. It makes the front panel LEDs blink for 10 seconds. The feature helps find the device physically.



Step 3. Check the update parameters

DIFFERENCE: The appearing settings are device-dependent and can be different from device to device.

Clicking on the **Update Options** button, special settings will be available like:

UPDATE OPTIONS

- Creating a backup about the configuration,
- Restoring the configuration or reloading the factory default settings after the firmware update,
- Uploading the default Miniweb (if available)
- Entering the password for the Cleartext login. *#builtinweb* *#miniweb* *#web*

INFO: The password entered here will be used for all the selected devices where the Cleartext login is enabled. If the password is incorrect, a window will appear to request the correct one at each device during the update.

Please arrange the settings carefully.

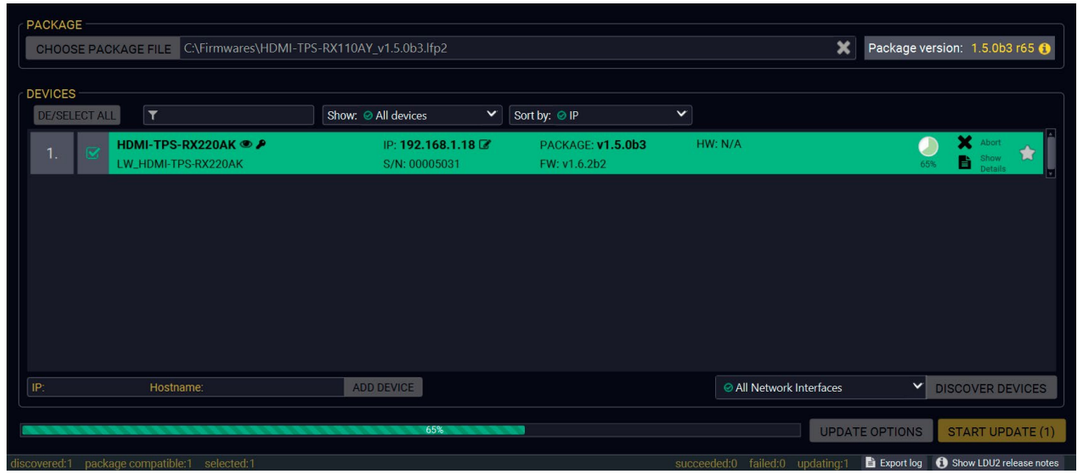
Step 4. Start the update and wait until it is finished

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.

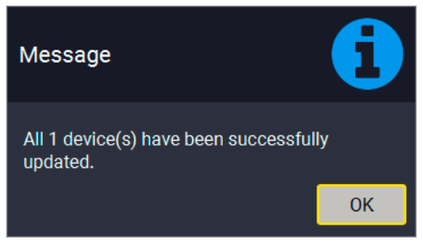
START UPDATE (1)

If the Cleartext login is enabled and you did not enter the password in the **Parameters** window (or it is incorrect), a window will appear to request the password at each device.

INFO: The device might reboot during the firmware update procedure.



The log about the updating process can be displayed in a new window by pressing the button. When the progress bar reaches 100% (**Done** is displayed at all devices), the update of all devices is finished successfully and a message appears; you can close the software.



Step 5. 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.

8.5. Command Line Interface (CLI)

DIFFERENCE: The Command Line Interface is available from LDU2 v2.9.0b9.

The CLI of the LDU2 software is a simple tool for creating scriptable device updates without the need for human interactions. It allows batch updating with the same features that are available in case of GUI usage. *#new*

8.5.1. How to Run

Running under Windows® OS

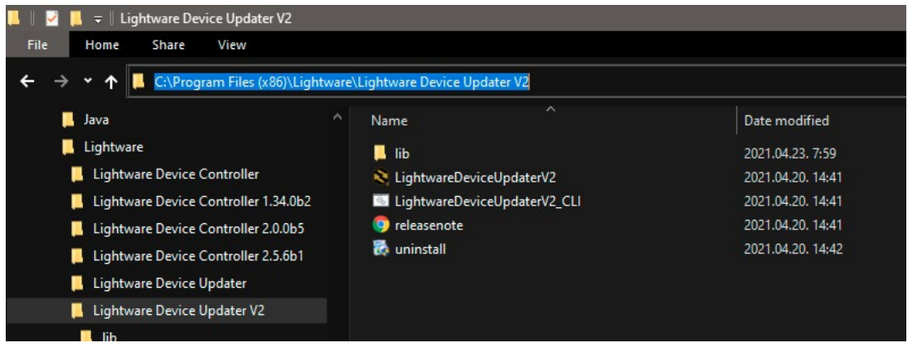
The installer of LDU2 puts the following file into the installation folder:

`LightwareDeviceUpdaterV2_CLI.cmd`

CLI is available via this file, the exe is not suitable for that purpose. Open a command line window to execute or test the features directly.

Step 1. Open an Explorer window where the cmd file is located, the default is: `c:\Program Files (x86)\Lightware\Lightware Device Updater V2\LightwareDeviceUpdaterV2_CLI.cmd`.

Step 2. Click on the address line (highlighted with blue in the picture), type **`cmd.exe`** and press enter. The command interpreter window of Windows is opened at the path of the LDU2 install folder.



Step 3. Now you can use the `LightwareDeviceUpdaterV2_CLI.cmd` file with the commands and options that are described in the coming sections:

Running under Linux

The Command Line Interface under Linux Operating Systems can be run by the following:

`LightwareDeviceUpdaterV2.sh`

Running an update:

```
bash LightwareDeviceUpdaterV2.sh update --ip 172.24.5.27 --package ~/Downloads/tps-tx200_1.3.1b3.lfp2
```

The commands and options are the same under Windows® and Linux, too. The following sections contain examples with **LightwareDeviceUpdaterV2_CLI.cmd**.

8.5.2. How to Use

Command Structure

The commands can be run over CLI in the following way:

`LightwareDeviceUpdaterV2_CLI.cmd [command] [options]`

`[Command]`: a certain command described in the coming sections; only one command can be run at a time

`[Options]`: mandatory and/or optional parameters of the command, if any. Optional parameters have a default value, which can be found at each affected command. You only have to define the parameter if you want to apply a different value. The **order of the options** is arbitrary.

Important Notes

- CLI is **case-sensitive** (including commands, options and other parameters).
- There is **no limit** regarding the number of the devices to update. At most 20 devices are updated simoultaneously, when one of them is finished, the following (21st) will be started automatically.
- If an update is failed, the IP address of the affected device(s) are listed at the end.

8.6. CLI Commands

INFO: The commands and options described in the following sections are the same under Windows® and Linux, too. The examples contain **LightwareDeviceUpdaterV2_CLI.cmd**.

About the Examples

- Sent command is in **blue**, response is in **grey**.
- If the response in practice is **longer than listed** in the example, this symbol can be seen: `[...]`.

8.6.1. Help

The defined commands and options can be listed by the **help** command.

Command

`LightwareDeviceUpdaterV2_CLI.cmd help`

Example

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd help

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\ldu2.jar help
Command line usage:
    Win: LightwareDeviceUpdaterV2_CLI.cmd [command] [options]
    Linux: LightwareDeviceUpdaterV2.sh [command] [options]

    Commands:
        * help
        * version
        * update
        * deviceInfo
        * restore
        * packageOptions
[...]
```

8.6.2. LDU2 Version

The response shows the version of the LDU2 and the version of the Script API (the Application Programming Interface that is used by the LDU2 and the script).

Command

`LightwareDeviceUpdaterV2_CLI.cmd version`

Example

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd version

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\ldu2.jar version
LDU2 version: 2.10.0b4
Script API version: 1.3.10
```

8.6.3. Check For New LDU2 Version

The following command can be used to check if an update of LDU2 is available. This is just a request, since the CLI is not suitable for handling the complete installer of the software.

Command

`LightwareDeviceUpdaterV2_CLI.cmd checkForUpdates`

Example 1

```
c:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd checkForUpdates

c:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\ldu2.jar checkForUpdates
Current LDU2 version: 2.9.1b1
LDU2 is up-to-date
```

Example 2

```
c:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd checkForUpdates

c:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\ldu2.jar checkForUpdates
Current LDU2 version: 2.9.1b1
New version is available online: v2.9.2b2
Download URL: http://update.lightware.hu/ldu2/lwr/v2.9.2b2/install_LDU2_v2.9.2b2.exe
```

8.6.4. Device Info

The most important information about the selected device is displayed; see the example for more details.

Command

```
LightwareDeviceUpdaterV2_CLI.cmd deviceInfo [options]
```

Options

Option	Description	Required?
-i or --ip	List of IP addresses of devices to be updated	one of them is mandatory
-n or --hostName	List of host names of devices to be updated	
-v or --packageVersion	Shows installed package version only	optional

Example 1

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd deviceInfo --ip
192.168.1.8

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\ldu2.jar deviceInfo --ip
192.168.1.8
Product name:    HDMI-TPS-RX220AK
IP address:      192.168.1.8
Serial number:   00005031
MAC address:     a8:d2:36:00:50:31
Part number:     91540022
Device label:    LW_HDMI-TPS-RX220AK
Package version: v1.5.0b3
CPU FW version:  v1.6.2b2
HW version:      V12_AAA0
Operation mode:  Application mode
```

Example 2

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd deviceInfo --ip
192.168.1.8 --packageVersion

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\ldu2.jar deviceInfo --ip
192.168.1.8 --packageVersion
v1.5.0b3
```

8.6.5. Update

This command can be used to update the firmware of the devices.

Command

```
LightwareDeviceUpdaterV2_CLI.cmd update [options]
```

Options

Option	Description	Required?
-p or --package	The path of the firmware package file	yes
-i or --ip	List of IP addresses of devices to be updated	one of them is mandatory
-n or --hostName	List of host names of devices to be updated	
-b or --backupFolder	Folder to create device configuration backup at. Default: USER_HOME/.ldu2/backup	optional
-f or --factoryDefault	Apply factory reset during device update. Default: false	optional
-r or --reportProgress	Report update progress in percentage form. Default: false	optional
Package-specific options	Certain LFP2 packages have features that can be applied at this command; see the Package Options section.	optional

ATTENTION: The configuration is restored automatically if the factory default option is not applied in the **update** command. In that case, there is no need to run the **restore** command after the update.

Example

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd update --ip
192.168.1.8 --package C:\Firmwares\HDMI-TPS-RX110AY_v1.5.0b3.lfp2 --reportProgress

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\ldu2.jar update --ip
192.168.1.8 --package C:\Firmwares\HDMI-TPS-RX110AY_v1.5.0b3.lfp2 --reportProgress
[2021-06-21 10:19:37.830] [ INFO] [            main] - Device IPs: [192.168.1.8]
[2021-06-21 10:19:42.154] [ INFO] [            main] - All the selected devices are accessible over the network.
[2021-06-21 10:19:42.383] [ INFO] [            main] - All the selected devices are compatible with the specified
package.
[2021-06-21 10:19:42.968] [ INFO] [     192.168.1.8] - Package version: 1.5.0b3
[2021-06-21 10:19:43.047] [ INFO] [     192.168.1.8] - Login functionality is currently not enabled.
[2021-06-21 10:19:43.089] [ INFO] [     192.168.1.8] - Creating backup of device settings...
[2021-06-21 10:19:46.553] [ INFO] [     192.168.1.8] - Backup HTTP enable properties
[2021-06-21 10:19:47.389] [ INFO] [ProgressReporter] - Progress: 2%
[2021-06-21 10:19:49.027] [ INFO] [     192.168.1.8] - HTTP and HTTP post have got enabled on port 80
[2021-06-21 10:19:49.238] [ INFO] [     192.168.1.8] - Backup of device preset  MyMacros (preset1) is queued
[2021-06-21 10:19:49.265] [ INFO] [     192.168.1.8] - Backup of device preset save protected (preset2) is queued
[2021-06-21 10:19:49.454] [ INFO] [     192.168.1.8] - Creating backup of device presets...
[2021-06-21 10:19:50.926] [ INFO] [     192.168.1.8] - Creating miniweb backup...
[2021-06-21 10:19:50.927] [ INFO] [     192.168.1.8] - Making backup of the miniweb file.
[2021-06-21 10:19:52.391] [ INFO] [ProgressReporter] - Progress: 5%
[...]
```

If the **ProgressReporter** option is enabled, the current state is displayed every 5 seconds.

8.6.6. Restore

Restores device configuration from a backup file.

> TIPS AND TRICKS: This command can be used for uploading a configuration to numerous devices (aka Configuration cloning by CLI).

Command

```
LightwareDeviceUpdaterV2_CLI.cmd restore [options]
```

Options

Option	Description	Required?
-i or --ip	List of IP addresses of devices to be updated	one of them is mandatory
-n or --hostName	List of host names of devices to be updated	
-b or --backupFile	The path of the configuration backup file	yes
-k or --keepOriginalIp	Do not override the network settings of the device with the ones in the backup file. It comes in handy when multiple devices' configuration is being restored from a single backup file. Default: false	optional

> **ATTENTION:** The configuration is restored automatically if the factory default option is not applied in the **update** command. In that case, there is no need to run the **restore** command after the update.

Example

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd restore --ip
192.168.1.8 --backupFile C:\My_backup\backup_91540022_00005031_2021-06-21_10-19-43_converted.lw3 --keepOriginalIp

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\ldu2.jar restore --ip
192.168.1.8 --backupFile C:\My_backup\backup_91540022_00005031_2021-06-21_10-19-43_converted.lw3 --keepOriginalIp
[2021-06-21 10:25:47.480] [ INFO] [            main] - Executing configuration restore...
[2021-06-21 10:25:47.496] [ INFO] [            main] - Device IPs: [192.168.1.8]
```

> INFO: The firmware package checks the backup data before the restoration procedure and if it is necessary, a conversion is applied to avoid incompatibility problems between the firmware versions. In that case, two backup files are created: the original and a new one with "_converted" suffix. Using the last one for restoring is recommended.

8.6.7. Package Options

Shows package-specific update options.

Command

```
LightwareDeviceUpdaterV2_CLI.cmd packageOptions [options]
```

Options

Option	Description	Required?
-p or --package	The path of the firmware package file	yes

Example

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd packageOptions
--package C:\Firmwares\HDMI-TPS-RX110AY_v1.5.0b3.lfp2

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\ldu2.jar packageOptions
--package C:\Firmwares\HDMI-TPS-RX110AY_v1.5.0b3.lfp2

Backup and restore options:
        --skipPresetsAtRestore : if true, device presets will not be restored. (Default: false)
        --uploadDefaultMiniWeb : if true and no custom miniweb is present on the device, the default built-in
miniweb will be uploaded to the device. (Default: false)

Login options:
        --clearTextLoginPw : The cleartext login password used when updating devices. (Default: empty string)

Test options:
        --test : if true, no update will be performed, communication with the device will be tested. (Default:
false)

Advanced (developer) options:

        --updateVs100 : If true, the VS100 Rx firmware will also be updated. (default: false)
```

Package option example can be seen in the following section.

8.6.8. Complex Examples

Example 1

The following options are applied:

- Firmware is updated
- Factory default settings are restored

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd update --ip
192.168.1.8 --factoryDefault --package C:\Firmwares\HDMI-TPS-RX110AY_v1.5.0b3.lfp2

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\ldu2.jar update --ip
192.168.1.8 --factoryDefault --package C:\Firmwares\HDMI-TPS-RX110AY_v1.5.0b3.lfp2
[2021-06-21 10:27:23.787] [ INFO] [            main] - Device IPs: [192.168.1.8]
[2021-06-21 10:27:28.000] [ INFO] [            main] - All the selected devices are accessible over the network.
[2021-06-21 10:27:28.264] [ INFO] [            main] - All the selected devices are compatible with the specified
package.
[2021-06-21 10:27:28.811] [ INFO] [     192.168.1.8] - Package version: 1.5.0b3
[2021-06-21 10:27:28.938] [ INFO] [     192.168.1.8] - Login functionality is currently not enabled.
[2021-06-21 10:27:29.007] [ INFO] [     192.168.1.8] - Switching device into bootload mode...
[2021-06-21 10:27:49.908] [ INFO] [     192.168.1.8] - Gathering UID information from device...
[2021-06-21 10:27:50.480] [ INFO] [     192.168.1.8] - UID info - Device IP: 192.168.1.8 Product name: HDMI-
TPS-RX220AK Product part number: 91540022 Serial number: 00005031 Hardware version: V12_AAA0 MAC address:
A8:D2:36:00:50:31
[2021-06-21 10:27:50.975] [ INFO] [     192.168.1.8] - Package version on device: 1.5.0b3 r65
[2021-06-21 10:27:51.031] [ INFO] [     192.168.1.8] - Updating Firmware of the MCU...
[2021-06-21 10:27:51.518] [ INFO] [     192.168.1.8] -  [tps_rx200.bin]'s current version on device: 1.6.2b2 r114
[2021-06-21 10:27:51.520] [ INFO] [     192.168.1.8] -  [tps_rx200.bin]'s version in the package: 1.6.2b2 r114
[2021-06-21 10:28:19.027] [ INFO] [     192.168.1.8] -  [tps_rx200.bin]'s firmware version updated in FVS EEPROM.
[2021-06-21 10:28:25.581] [ INFO] [     192.168.1.8] - Setting system information...
[2021-06-21 10:28:32.122] [ INFO] [     192.168.1.8] - Starting application...
[2021-06-21 10:30:19.668] [ INFO] [     192.168.1.8] - Done

All 1 update(s) finished successfully.
```

Example 2

The following options are applied:

- Cleartext login password is applied
- Custom backup folder is set
- Current configuration is saved
- Firmware is updated and saved configuration is restored

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd update --ip
192.168.1.8 --package C:\Firmwares\HDMI-TPS-RX110AY_v1.5.0b3.lfp2 --backupFolder C:\My_backup --clearTextLoginPw
qwer1234

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\ldu2.jar update --ip
192.168.1.8 --package C:\Firmwares\HDMI-TPS-RX110AY_v1.5.0b3.lfp2 --backupFolder C:\My_backup --clearTextLoginPw
qwer1234
[2021-06-21 10:38:05.799] [ INFO] [            main] - Device IPs: [192.168.1.8]
[2021-06-21 10:38:09.203] [ WARN] [ pool-2-thread-1] - NetworkMask property is not available. Cannot determine
whether the device is on the same network or not.
[2021-06-21 10:38:09.271] [ WARN] [ pool-2-thread-1] - Bonjour device builder error messages: [object Array]
[2021-06-21 10:38:09.307] [ INFO] [            main] - All the selected devices are accessible over the network.
[2021-06-21 10:38:09.577] [ INFO] [            main] - All the selected devices are compatible with the specified
package.
[2021-06-21 10:38:10.155] [ INFO] [     192.168.1.8] - Package version: 1.5.0b3
[2021-06-21 10:38:10.309] [ INFO] [     192.168.1.8] - Logged in successfully.
[2021-06-21 10:38:10.368] [ INFO] [     192.168.1.8] - Creating backup of device settings...
[2021-06-21 10:38:13.705] [ INFO] [     192.168.1.8] - Backup HTTP enable properties
[2021-06-21 10:38:16.184] [ INFO] [     192.168.1.8] - HTTP and HTTP post have got enabled on port 80
[2021-06-21 10:38:16.435] [ INFO] [     192.168.1.8] - Backup of device preset save protected (preset2) is queued
[2021-06-21 10:38:16.588] [ INFO] [     192.168.1.8] - Creating backup of device presets...
[2021-06-21 10:38:17.786] [ INFO] [     192.168.1.8] - No miniweb file is found on the device.
[2021-06-21 10:38:20.236] [ INFO] [     192.168.1.8] - HTTP and HTTP post properties have got restored on port 80
[2021-06-21 10:38:20.285] [ INFO] [     192.168.1.8] - Switching device into bootload mode...
[2021-06-21 10:38:41.076] [ INFO] [     192.168.1.8] - Gathering UID information from device...
[2021-06-21 10:38:41.645] [ INFO] [     192.168.1.8] - UID info - Device IP: 192.168.1.8 Product name: HDMI-
TPS-RX220AK Product part number: 91540022 Serial number: 00005031 Hardware version: V12_AAA0 MAC address:
A8:D2:36:00:50:31
[2021-06-21 10:38:42.150] [ INFO] [     192.168.1.8] - Package version on device: 1.5.0b3 r65
[2021-06-21 10:38:42.784] [ INFO] [     192.168.1.8] - Updating Firmware of the MCU...
[2021-06-21 10:38:43.264] [ INFO] [     192.168.1.8] -  [tps_rx200.bin]'s current version on device: 1.6.2b2 r114
[2021-06-21 10:38:43.266] [ INFO] [     192.168.1.8] -  [tps_rx200.bin]'s version in the package: 1.6.2b2 r114
[2021-06-21 10:39:10.906] [ INFO] [     192.168.1.8] -  [tps_rx200.bin]'s firmware version updated in FVS EEPROM.
[2021-06-21 10:39:17.476] [ INFO] [     192.168.1.8] - Setting system information...
[2021-06-21 10:39:24.020] [ INFO] [     192.168.1.8] - Starting application...
[2021-06-21 10:41:11.301] [ INFO] [     192.168.1.8] - Waiting for VS100...
[2021-06-21 10:41:12.978] [ INFO] [     192.168.1.8] - Restoring device presets...
[2021-06-21 10:41:12.998] [ INFO] [     192.168.1.8] - Deleting preset: preset2
[2021-06-21 10:41:14.939] [ INFO] [     192.168.1.8] - Restoring preset: save protected (preset2)
[2021-06-21 10:41:17.700] [ INFO] [     192.168.1.8] - Restoring device settings from the following backup file:
C:\My_backup\backup_91540022_00005031_2021-06-21_10-38-11_converted.lw3 ...
[2021-06-21 10:41:22.312] [ INFO] [     192.168.1.8] - Device settings have been restored
[2021-06-21 10:41:22.356] [ INFO] [     192.168.1.8] - Resetting device...
[2021-06-21 10:41:27.137] [ INFO] [     192.168.1.8] - Done

All 1 update(s) finished successfully.
```

Example 3

The following options are applied:

- Cleartext login password is applied
- Custom backup folder is set
- Current configuration is saved
- Firmware is **not updated** but the process and the connection is **tested**

```
C:\Program Files (x86)\Lightware\Lightware Device Updater V2>LightwareDeviceUpdaterV2_CLI.cmd update --test --ip
192.168.1.8 --package C:\Firmwares\HDMI-TPS-RX110AY_v1.5.0b3.lfp2 --backupFolder C:\My_backup --clearTextLoginPw
qwer1234

C:\Program Files (x86)\Lightware\Lightware Device Updater V2>lib\jre\bin\java.exe -jar lib\ldu2.jar update
--test --ip 192.168.1.8 --package C:\Firmwares\HDMI-TPS-RX110AY_v1.5.0b3.lfp2 --backupFolder C:\My_backup
--clearTextLoginPw qwer1234
[2021-06-21 10:49:52.162] [ INFO] [            main] - Device IPs: [192.168.1.8]
[2021-06-21 10:49:55.693] [ WARN] [ pool-2-thread-1] - NetworkMask property is not available. Cannot determine
whether the device is on the same network or not.
[2021-06-21 10:49:55.772] [ WARN] [ pool-2-thread-1] - Bonjour device builder error messages: [object Array]
[2021-06-21 10:49:55.822] [ INFO] [            main] - All the selected devices are accessible over the network.
[2021-06-21 10:49:56.145] [ INFO] [            main] - All the selected devices are compatible with the specified
package.
[2021-06-21 10:49:57.068] [ INFO] [     192.168.1.8] - PASSED - Test #01 - Communication over LW3
[2021-06-21 10:49:57.131] [ INFO] [     192.168.1.8] - PASSED - Test #02 - Cleartext login - PW is correct
[2021-06-21 10:49:57.177] [ INFO] [     192.168.1.8] - Creating backup of device settings...
[2021-06-21 10:50:00.782] [ INFO] [     192.168.1.8] - Backup HTTP enable properties
[2021-06-21 10:50:03.212] [ INFO] [     192.168.1.8] - HTTP and HTTP post have got enabled on port 80
[2021-06-21 10:50:03.427] [ INFO] [     192.168.1.8] - Backup of device preset save protected (preset2) is queued
[2021-06-21 10:50:03.624] [ INFO] [     192.168.1.8] - Creating backup of device presets...
[2021-06-21 10:50:05.240] [ INFO] [     192.168.1.8] - No miniweb file is found on the device.
[2021-06-21 10:50:07.674] [ INFO] [     192.168.1.8] - HTTP and HTTP post properties have got restored on port 80
[2021-06-21 10:50:07.677] [ INFO] [     192.168.1.8] - PASSED - Test #03 - Configuration and/or device preset
backup created
[2021-06-21 10:50:07.710] [ INFO] [     192.168.1.8] - Switching device into bootload mode...
[2021-06-21 10:50:09.427] [ INFO] [     192.168.1.8] - PASSED - Test #04 - Switch device into bootloader mode
[2021-06-21 10:50:20.544] [ INFO] [     192.168.1.8] - PASSED - Test #05 - Communication with bootloader
[2021-06-21 10:50:20.559] [ INFO] [     192.168.1.8] - Gathering UID information from device...
[2021-06-21 10:50:21.074] [ INFO] [     192.168.1.8] - PASSED - Test #06 - TFTP file transfer
[2021-06-21 10:50:36.271] [ INFO] [     192.168.1.8] - PASSED - Test #07 - Start application FW
[2021-06-21 10:50:36.290] [ INFO] [     192.168.1.8] - Done

All 1 update(s) finished successfully.
```

8.6.9. Exit Codes

There is a return value in all cases when a command run is finished. Currently, three codes are defined:

Code	Displayed text	Description
0	N/A	The update performed successfully
1	Update error (ErrorCode:1)	The error happened during the update
2	CLI error (ErrorCode:2	The error happened before starting the update

The error line contains further information about the error.

Querying the Exit Code under Windows®

```
c:\Program Files (x86)\Lightware\Lightware Device Updater V2\echo %errorlevel%
0
```

Querying the Exit Code under Linux

```
echo $?
0
```

If this value is queried after the update and it is 0, the update was performed successfully.

8.7. If the Update is not successful

- Restart the process and try the update again.
- If the device cannot be switched to bootload (firmware update) mode, you can do that manually as written in the User manual of the device. Please note that backup and restore cannot be performed in this case.
- If the backup cannot be created for some reason, you will get a message to continue the process without backup or stop the update. A root cause can be that the desired device is already in bootload (firmware update) mode, thus the normal operation mode is suspended and backup cannot be made.
- If an update is not successful, the **Export log** button becomes red. If you press the button, you can download the log file as a ZIP package, which can be sent to Lightware Support if needed. The log files contain useful information about the circumstances to find the root cause. *#bootload*

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. The following sections are available in the chapter:

- Use Case Studies **145**
- How to Speed Up the Troubleshooting Process **146**

Legend

- Link to the section of connections/cabling.
- Link to the section of front panel operation.
- Link to the section of LDC software.
- LW2 Link to the section of LW2 protocol commands.
- LW3 Link to the section of LW3 protocol commands.

9.1. Use Case Studies

At 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 and Button Functions section. #diagnostic

Symptom	Root cause	Action	Refer to
Video signal			
No picture on the video output	Device or devices are not powered properly	Check the receiver and the other devices if they are properly powered; try to unplug and reconnect them.	3.2.1
	Cable connection problem	Cables must fit very well, check all the connectors (video and TPS cables).	3.2
	No incoming signal	If the TPS LINK LED does not shine, no signal is present on the TPS input port. Check the source device and the CATx cable.	
	TPS mode problem	Check the current TPS mode and the selected modes of the extenders.	5.6.1 LW3 7.6.27
	The output is muted	Check the mute state of output port.	5.6.3 LW2 6.4.7 LW3 7.6.2
	Display is not able to receive the video format	Check the emulated EDID; select another (e.g. emulate the EDID of the display on the input port).	5.8 LW3 7.23
	HDCP is disabled	Enable HDCP on the input and output port.	5.6.1 5.6.2 5.6.3 LW3 7.6.20 LW3 7.6.21
Not the desired picture displayed on the video output	Video output is set to test pattern (no sync screen) statically	Check the Test Pattern settings in the HDMI output properties.	5.7.3 LW3 7.6.22
	Video output is set to test pattern (no sync screen) as there is no picture on video source	Check the video settings of the source.	

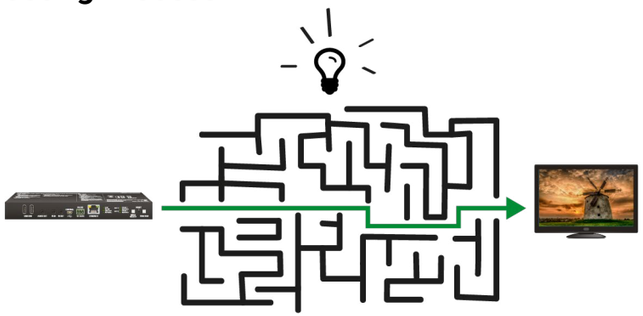
Symptom	Root cause	Action	Refer to
Audio signal			
No audio is present on output	Source audio volume is low or muted	Check the audio settings of the source.	
	Output port is muted	Check the output port properties.	5.6.5 5.6.6 LW2 6.4.7 LW3 7.7.2
	Analog audio volume is set low	Check the Analog audio output port settings (volume).	5.6.6 LW3 7.8.1
HDMI output signal contains no audio	HDMI mode is set to DVI	Check the properties of the output port and set to HDMI or Auto.	5.6.3 LW3 7.6.25
	DVI EDID is emulated	Check the EDID and select an HDMI EDID to emulate.	5.8 LW3 7.23
RS-232 signal			
Connected serial device does not respond	Cable connection problem	Make sure the connectors fit well; check the wiring of the plugs.	3.2.7
	RS-232 settings are different	Check the port settings of the transmitter and/or the receiver and the connected serial device(s). Pay attention to Link and/or Local ports.	5.9.1 LW2 6.6 LW3 7.17
	RS-232 mode is not right	Check the RS-232 mode settings (pass-through, control or command injection).	5.9.1 LW2 6.6.1 LW3 7.17.2

Symptom	Root cause	Action	Refer to
Network			
No LAN connection can be established	Incorrect IP address is set (fix IP)	Use dynamic IP address by enabling the DHCP option.	2.4.2 5.11.2 LW2 6.5.3 LW3 7.12.2
		Restore the factory default settings (with fix IP).	2.4.3 5.11.5 LW2 6.3.13 LW3 7.4.9
	IP address conflict	Check the IP address of the other devices.	

Symptom	Root cause	Action	Refer to
Miscellaneous			
Front panel buttons are out of operation	Front panel buttons are locked	Unlock the buttons.	5.11.3 LW3 7.4.7
Error messages received always	Different protocol is set	Check the port protocol settings (LW2 / LW3) and use the proper protocol commands.	5.9.1 LW2 6.6.4 LW2 6.6.5 LW3 7.17.1
I cannot find my device in the server room	All AV boxes and gadgets look the same	Use the "Identify Me" feature.	5.3 5.11.1 LW3 7.4.5

9.2. How to Speed Up the Troubleshooting Process

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



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

There are certain pieces of information that push us in the right direction to 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:

- 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).
- Error logs from the Device Controller software.
- 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:

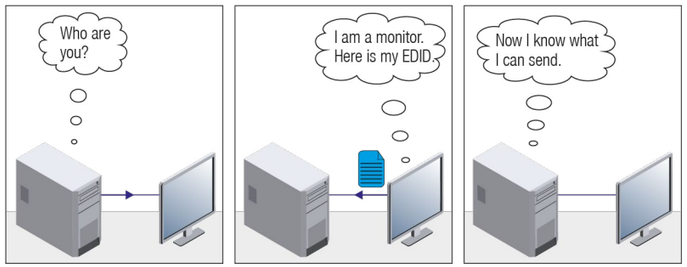
- EDID Management **148**
- HDCP Management **149**

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 is defined by CEA (Consumer Electronics Association). This extension contains information about additional Detailed Timings, audio capabilities, speaker allocation and HDMI capabilities. It is important to know that all HDMI capable devices must have CEA extension, but not all devices with CEA extension are HDMI capable.

Common Problems Related to EDID

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

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

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

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

10.1.2. Advanced EDID Management

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

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

Any EDID can be emulated on any input. An emulated EDID can be copied from the EDID router's memory (static EDID emulation), or from the last attached monitor's memory (dynamic EDID emulation). For example, the Lightware device can be set up to emulate a sink device 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).

The 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 which helps to solve HDCP related problems. Complex AV systems often have both HDCP and non-HDCP components. The matrix allows transmitting HDCP encrypted and unencrypted signals. The devices will be still HDCP compliant, as they will never output an encrypted signal to a non-HDCP compliant display device. If an encrypted signal is switched to a non-compliant output, a red screen alert or muted screen will appear.

10.2.1. Protected and Unprotected Content

Many video sources send HDCP protected signal if they detect that the sink is HDCP capable – even if the content is not copyrighted. This can cause trouble if an HDCP capable device is connected between the source and the display. In this case, the content cannot be viewed on non-HDCP capable displays and interfaces like event controllers. Rental and staging technicians often complain about certain laptops, which are always sending HDCP encrypted signals if the receiver device (display, matrix router, etc.) reports HDCP compliancy. 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 disable HDCP on the input port, the transmitted signal will not be encrypted if the content is not protected. Thus, non-HDCP compliant sinks will display non-encrypted signal.

Not HDCP-compliant Sink 2.

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

The sink is not HDCP compliant, thus it will display red 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.

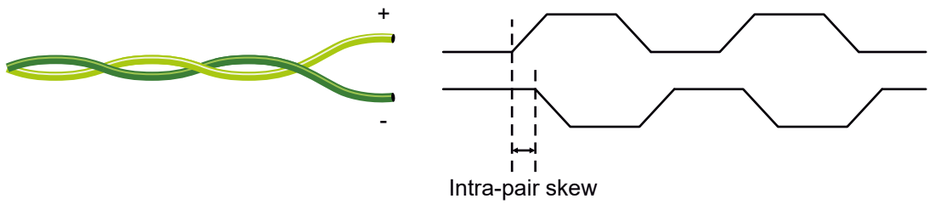
10.3. Pixel Accurate Reclocking

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

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

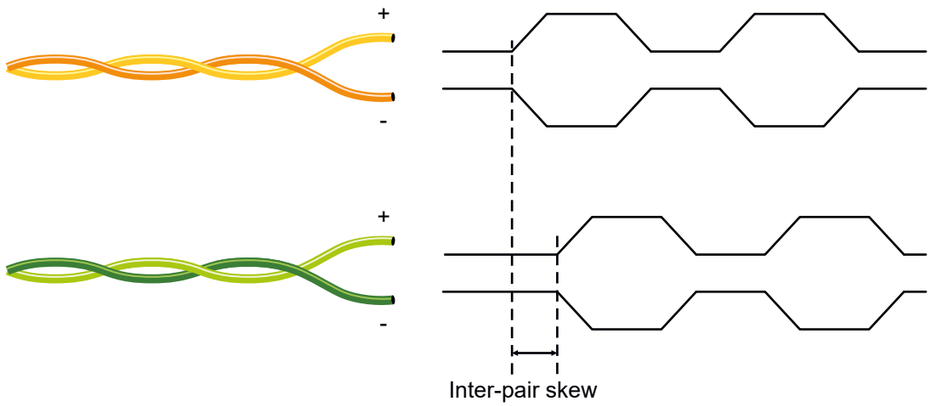
Intra-pair skew

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



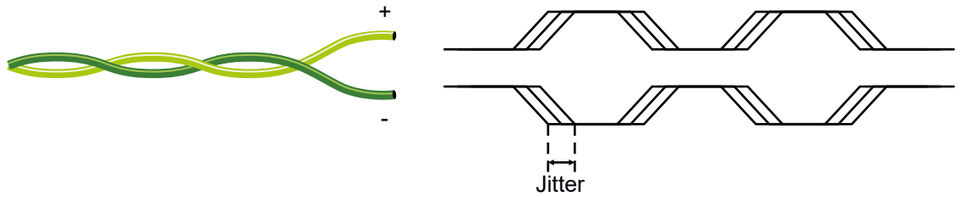
Inter-pair skew

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



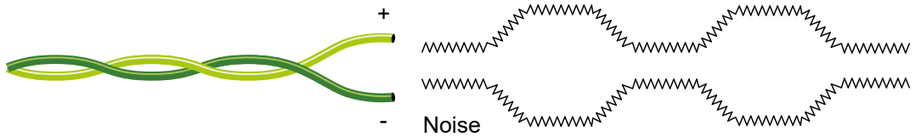
Jitter

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



Noise

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



11

Appendix

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

- Pixel Accurate Reclocking **150**
- Specifications **152**
- Input/Output Port Numbering **154**
- Content of Backup File **154**
- Factory Default Settings **155**
- Maximum Extension Distances **155**
- Cable Wiring Guide **155**
- Factory EDID List **156**
- Applied Ports (Network Settings) **157**
- Mechanical Drawings **158**
- Firmware Release Notes **159**
- Hashtag Keyword List **160**
- Further Document Information **162**
- Limited Warranty Statement **162**

11.1. Specifications

INFO: Specifications subject to change without notice.

General

Compliance	CE, UKCA
Electrical safety	EN 62368-1:2020, Class II
EMC (emission)	IEC/EN 55032:2015+A1:2020
EMC (immunity)	IEC/EN 55035:2017+A11:2020
RoHS	EN 63000:2018
Warranty	3 years
Operating temperature	0 to +50˚C (+32 to +122˚F)
Operating humidity	10% to 90%, non-condensing
Cooling	Passive

Power

Power supply option	Power adaptor / PoE
Power consumption (min/max)	4W / 9.2W
Heat dissipation (min/max)	14 BTU/h / 32 BTU/h
Power over Ethernet	via TPS input (IEEE802.3af)

Power Adaptor

Supported power source	100-240 V AC; 50/60 Hz
Supplied power	12V DC, 2A
AC power plug	Interchangable (EU, UK, JP/US, AUS/NZ)
DC power plug	Locking DC connector (2.1/5.5 mm pin)

Enclosure

Enclosure material	1 mm steel
Dimensions in mm	221 W x 100.4 D x 26 H
Dimensions in inch	8.7 W x 3.95 D x 1.02 H
Weight	607 g (1.34 lb)

Video Ports

TPS Input Port

Connector type	RJ45 connector
Power over Ethernet (PoE)	yes (IEEE 802.3af)
Compliance	HDBaseTTM
HDCP compliance	HDCP 1.4
Transferred signals	Video, Audio, RS-232, Infrared, Ethernet
Color space	RGB, YCbCr
Video delay	0 frame
Supported resolutions at 8 bits/color *	up to 4096x2048@30Hz (4:4:4) or 4096x2048@60Hz (4:2:0); up to 3840x2160@30Hz (4:4:4) or 3840x2160@60Hz (4:2:0); 1920x1080@60Hz (4:4:4) up to 12 bits/color
Audio formats	8 channel PCM; Dolby TrueHD, DTS-HD Master Audio 7.1

* All standard VESA, CEA and other custom resolutions up to 300MHz (HDMI1.4) are supported.

HDMI Output Port

Connector type	19-pole HDMI Type A receptacle
A/V standard	DVI 1.0, HDMI 1.4
HDCP compliance	HDCP 1.4
Color space	RGB, YCbCr
Supported resolutions at 8 bits/color *	up to 4096x2048@30Hz (4:4:4) or 4096x2048@60Hz (4:2:0); up to 3840x2160@30Hz (4:4:4) or 3840x2160@60Hz (4:2:0); 1920x1080@60Hz (4:4:4) up to 12 bits/color
Audio formats	8 channel PCM, Dolby TrueHD; DTS-HD Master Audio 7.1

* All standard VESA and CEA resolutions up to 300MHz (HDMI1.4) and other custom resolutions up to 300Mhz are supported.

HDMI Input Port

Connector type	19-pole HDMI Type A receptacle
A/V standard	DVI 1.0, HDMI 1.4
HDCP compliance	HDCP 1.4
Color space	RGB, YCbCr
Video delay	0 frame
Supported resolutions at 8 bits/color *	up to 4096x2048@30Hz (4:4:4) or 4096x2048@60Hz (4:2:0); up to 3840x2160@30Hz (4:4:4) or 3840x2160@60Hz (4:2:0); 1920x1080@60Hz (4:4:4) up to 12 bits/color
Reclocking	Pixel Accurate Reclocking
3D support	yes
Audio formats	8 channel PCM; Dolby TrueHD, DTS-HD Master Audio 7.1
Input cable equalization	Yes, +12dB fixed

* All standard VESA, CEA and other custom resolutions up to 300MHz (HDMI1.4) are supported.

Analog Audio Output Port

Connector type	3.5 mm TRS (1/8" jack)
Audio formats	2-ch PCM
Sampling frequency	48 kHz
Signal transmission	Balanced and unbalanced audio
Volume	-57 dB - 0 dB
Balance	0 - 100 (50 = center)
Nominal Differential Output Level @ 0 dB Volume setting	+6.72 dBu (balanced)

USB KVM Ports

Connector type	A-type receptacle
USB compliance	USB 2.0
Device class	USB HID class
Number of ports	2

Control Ports

RS-232 Port

Connector type	3-pole Phoenix connector
Baud rates	Between 4800 and 115200 Baud
Data bits	8 or 9
Parity	None / Odd / Even
Stop bits	1 / 1.5 / 2

USB Port

Connector type	mini B-type
Port capability	device control

Infrared Port

Input connector type	3.5 mm TRS (approx. 1/8" jack)
Output connector type	3.5 mm TS (approx. 1/8" jack)
Input carrier frequency	38 kHz
Output signal	modulated (38kHz)

Ethernet Port

Connector type	RJ45 female connector
Ethernet data rate	10/100Base-T, full duplex with autodetect
Power over Ethernet (PoE)	Not supported

11.2. Input/Output Port Numbering

The following table contains the input and output ports with their ID numbers that shall be used when sending LW2 / LW3 protocol commands or in the Lightware Device Controller (LDC) software.

Audio/Video Ports

Port name	Video port number		Emulated EDID memory	Audio port number	
	LW2	LW3		LW2	LW3
TPS in 1	1	I1	E1	1	I1
HDMI in 2	2	I2	E2	2	I2
HDMI out 1	1	O1	-	1	O1
HDMI out 2	2	O2	-	2	O2
Analog audio out	-	-	-	3	O3

RS-232 Ports

Port name	Description	Port nr. (LW3)
RS-232	Local serial port	P1
TPS in 1	TPS RS-232 link port	P2

Infrared Ports

Port name	Description	Port nr. (LW3)
IR in	Local IR input	S1
IR out	Local IR output	D1
TPS in 1	TPS IR link input	S2
TPS in 1	TPS IR link output	D2

11.3. Content of Backup File

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

TPS input port
Video port name, Audio port name, HDCP setting
Ethernet port name, Ethernet port status (enable / disable)
Remote port name, Remote port status (enable / disable)
HDMI input port
Video port name, Audio port name, HDCP setting
HDMI output port
Port name, HDCP mode, HDMI mode, Power +5V mode
Test pattern mode, clock source, and type
Audio port name, Audio output enabled, S/PDIF mode
Analog audio output port
Port name, Volume, Balance
Port parameters
Mute video ports
Mute audio ports, Lock audio ports
Local and TPS serial port
RS-232 mode, Control protocol, Baud rate, Data bits, Stop bits, Parity
Port name and CI (Command Injection) port number
Local and TPS IR port
Port status (enable / disable), Code length, Repetition code, Enable modulation
Input port name, Output port name
CI status (enable / disable), CI port number
USB port
Port name, Port status (enable / disable)
Network settings
DHCP status (enable / disable)
Static IP address, Network mask, Gateway address
Further settings
User EDID data (U1-U15)
Event manager: settings of all Events (E1-E100)

11.4. Factory Default Settings

Parameter	Setting/Value
Video port settings	
TPS mode	Auto
Signal type (HDMI/DVI)	Auto
HDCP	Enabled
Emulated EDID on input ports	F47 (1920x1080p60Hz, 2chLPCM)
Test pattern mode	Disabled
Test pattern clock source	480p
Test pattern	Bar
Output HDMI mode	Auto
Output HDCP mode	Auto
Power 5V mode	Always on
Analog audio port settings	
Volume	0.00 dB (100%)
Balance	0 (center)
Network settings	
IP address	192.168.0.100
Subnet mask	255.255.255.0
Static gateway	192.168.0.1
DHCP	Disabled
Port numbers (LW2 / LW3 / HTTP)	10001 / 6107 / 80
TPS Ethernet status	Enabled
RS-232 settings	
Control protocol	LW2
Baud rate	57600
Databits	8
Parity	No
Stopbits	1
Operation mode (Link and Local)	Pass-through
Command injection port nr. (Local / TPS)	8001 / 8002
IR port settings	
Command injection status	Enabled
Comm. inj. input port nr. (Local / TPS)	9001 / 9002
Comm. inj. output port nr. (Local / TPS)	9003 / 9004

11.5. Maximum Extension Distances

Resolution	Pixel clock rate	Cable lengths (Auto / Longreach TPS mode)		
		CAT5e AWG24	CAT7 AWG26**	CAT7 AWG23
1024x768@60Hz	65 MHz	100 m / 130 m*	90 m / 120 m*	120 m / 170 m*
1280x720p@60Hz	73.8 MHz	100 m / 130 m*	90 m / 120 m*	120 m / 170 m*
1920x1080p@60Hz / 24bpp	148.5 MHz	100 m / 130 m*	90 m / 120 m*	120 m / 170 m*
1920x1200@60Hz	152.9 MHz	100 m / NA	90 m / NA	120 m / NA
1600x1200@60Hz	162 MHz	100 m / NA	90 m / NA	120 m / NA
1920x1080@60Hz / 36bpp	223.6 MHz	70 m / NA	70 m / NA	100 m / NA
3840x2160@30Hz UHD	297 MHz	70 m / NA	70 m / NA	100 m / NA
4096x2160@30Hz 4K	297 MHz	70 m / NA	70 m / NA	100 m / NA

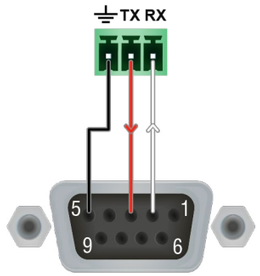
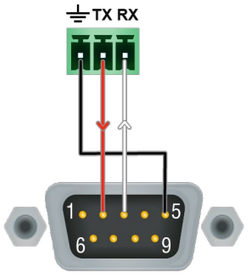
* With Long reach operation mode that supports pixel clock frequencies up to 148.5 MHz.

** When remote powering is used with AWG26 cables, distances are 20% shorter.

11.6. Cable Wiring Guide

Cable Wiring Guide for Serial Data Transmission

The receiver is built with a 3-pole Phoenix connector. See the two examples below of the most common assembling cases.

Receiver and a DCE (Data Circuit-terminating Equipment)	Receiver and a DTE (Data Terminal Equipment)
D-SUB 9 and Phoenix	**D-SUB 9 and Phoenix**
 2: TX data 3: RX data 5: Ground	 2: RX data 3: TX data 5: Ground

11.7. Factory EDID List

Mem	Resolution	Type	EDID features
F1	640 x 480p @ 60.00 Hz	D	
F2	848 x 480p @ 60.00 Hz	D	
F3	800 x 600p @ 60.32 Hz	D	
F4	1024 x 768p @ 60.00 Hz	D	
F5	1280 x 768p @ 50.00 Hz	D	
F6	1280 x 768p @ 59.94 Hz	D	
F7	1280 x 768p @ 75.00 Hz	D	
F8	1360 x 768p @ 60.02 Hz	D	
F9	1280 x 1024p @ 50.00 Hz	D	
F10	1280 x 1024p @ 60.02 Hz	D	
F11	1280 x 1024p @ 75.02 Hz	D	
F12	1400 x 1050p @ 50.00 Hz	D	
F13	1400 x 1050p @ 60.00 Hz	D	
F14	1400 x 1050p @ 75.00 Hz	D	
F15	1680 x 1050p @ 60.00 Hz	D	
F16	1920 x 1080p @ 50.00 Hz	D	
F17	1920 x 1080p @ 60.00 Hz	D	
F18	2048 x 1080p @ 50.00 Hz	D	
F19	2048 x 1080p @ 60.00 Hz	D	
F20	1600 x 1200p @ 50.00 Hz	D	
F21	1600 x 1200p @ 60.00 Hz	D	
F22	1920 x 1200p @ 50.00 Hz	D	
F23	1920 x 1200p @ 59.56 Hz	D	
F24	2048 x 1200p @ 59.96 Hz	D	
F29	1920 x 1080p @ 60.00 Hz	U	
F30	1440 x 480i @ 60.05 Hz	H	2chLPCM
F31	1440 x 576i @ 50.08 Hz	H	2chLPCM
F32	640 x 480p @ 59.95 Hz	H	2chLPCM
F33	720 x 480p @ 59.94 Hz	H	2chLPCM
F34	720 x 576p @ 50.00 Hz	H	2chLPCM

Mem	Resolution	Type	EDID features
F35	1280 x 720p @ 50.00 Hz	H	2chLPCM
F36	1280 x 720p @ 60.00 Hz	H	2chLPCM
F37	1920 x 1080i @ 50.04 Hz	H	2chLPCM
F38	1920 x 1080i @ 50.00 Hz	H	2chLPCM
F39	1920 x 1080i @ 60.05 Hz	H	2chLPCM
F40	1920 x 1080i @ 60.05 Hz	H	2chLPCM
F41	1920 x 1080p @ 24.00 Hz	H	2chLPCM
F42	1920 x 1080p @ 25.00 Hz	H	2chLPCM
F43	1920 x 1080p @ 30.00 Hz	H	2chLPCM
F44	1920 x 1080p @ 50.00 Hz	H	2chLPCM
F45	1920 x 1080p @ 59.94 Hz	H	2chLPCM
F46	1920 x 1080p @ 60.00 Hz	H	2chLPCM
F47	1920 x 1080p @ 60.00 Hz	U	2chLPCM
F48	1920 x 1080p @ 60.00 Hz	U	2chLPCM, 8chLPCM, DD, DTS, AAC, DD+, DTS-HD, MLP, DST, WMAP
F49	1920 x 1080p @ 60.00 Hz	U	2chLPCM, 8chLPCM, DD, DTS, AAC, DD+, DTS-HD, MLP, DST, WMAP
F90	1920 x 2160p @ 59.99 Hz	D	
F91	1024 x 2400p @ 60.01 Hz	D	
F94	2048 x 1536p @ 60.00 Hz	D	
F96	2560 x 1600p @ 59.86 Hz	D	
F97	3840 x 2400p @ 24.00 Hz	D	
F98	1280 x 720p @ 60.00 Hz	H	2chLPCM
F99	1920 x 1080p @ 60.00 Hz	H	2chLPCM
F100	1024 x 768p @ 60.00 Hz	H	2chLPCM
F101	1280 x 1024p @ 50.00 Hz	H	2chLPCM
F102	1280 x 1024p @ 60.02 Hz	H	2chLPCM
F103	1280 x 1024p @ 75.02 Hz	H	2chLPCM
F104	1600 x 1200p @ 50.00 Hz	H	2chLPCM
F105	1600 x 1200p @ 60.00 Hz	H	2chLPCM
F106	1920 x 1200p @ 59.56 Hz	H	2chLPCM
F107	2560 x 1440p @ 59.95 Hz	H	2chLPCM

Mem	Resolution	Type	EDID features
F108	2560 x 1600p @ 59.86 Hz	H	2chLPCM
F109	3840 x 2400p @ 24.00 Hz	H	2chLPCM
F110	3840 x 2160p @ 24.00 Hz	H	2chLPCM
F111	3840 x 2160p @ 25.00 Hz	H	2chLPCM
F112	3840 x 2160p @ 30.00 Hz	H	2chLPCM
F118	3840 x 2160p @ 30.00 Hz	U	2chLPCM
F119	3840 x 2160p @ 30.00 Hz	U	2chLPCM, 8chLPCM, DD, DTS, AAC, DD+, DTS-HD, MLP, DST, WMAP
F120	3840 x 2160p @ 60.00 Hz	H	2chLPCM

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.

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

11.8. Applied Ports (Network Settings)

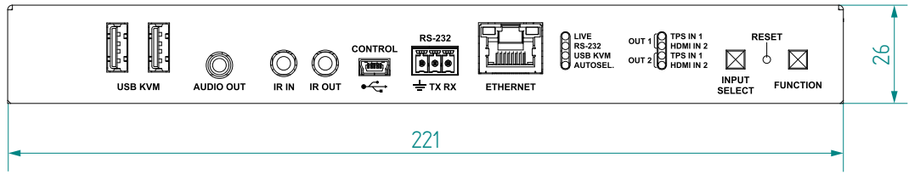
The following ports are necessary to pass via a network switch/firewall for a proper working between the device and the softwares:

Purpose/function	Affected software	Protocol	Port nr.
Firmware update TFTP	LDU2	UDP	69
		UDP	49990
		UDP	49995
Device Discovery	LDC	UDP	224.0.0.251:5353
Remote IP	LDC	UDP	230.76.87.82:37421
Find me (LMDMP)	-	UDP	230.76.87.82:37422
LW2 protocol	-	TCP	10001
LW3 protocol	-	TCP	6107
HTTP port	-	TCP	80
RS-232 command injection	-	TCP	8001
IR command injection	-	TCP	9001, 9002

11.9. Mechanical Drawings

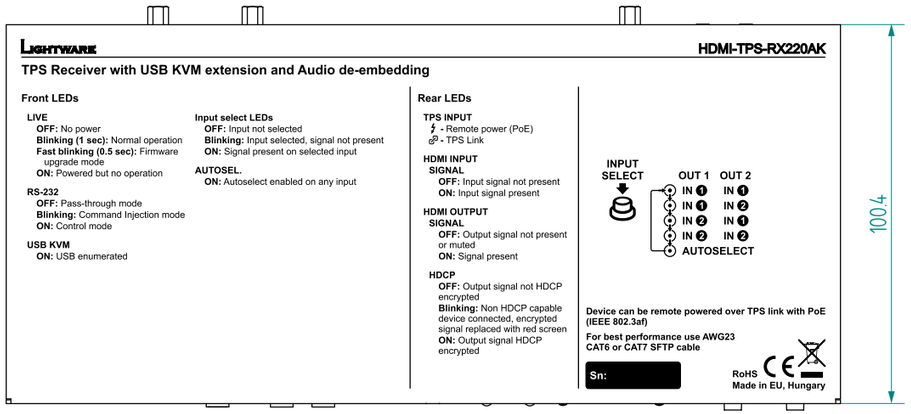
The following drawings present the physical dimensions of the receiver. Dimensions are in mm.

Front View

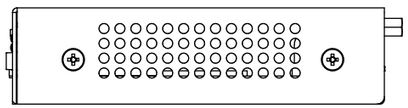


Rear View

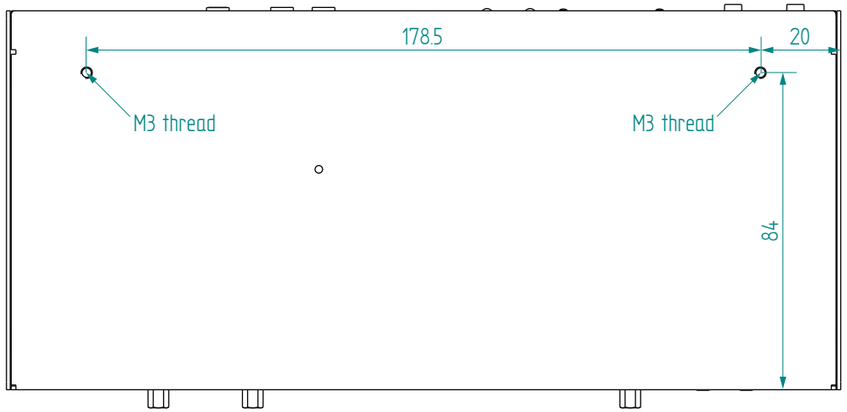
Top View



Side View



Bottom View



11.10. Firmware Release Notes

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

v1.5.0b3

Release date: 2021-05-26

New feature:

- Added AND operator for Event Manager Conditions (Advanced Control pack v3)
- Added Condition triggering for Event Manager (Advanced Control pack v3) for HDMI-TPS-RX110AY-Plus and HDMI-TPS-RX220AK only!
- Added Condition detect on property change to anything in Event Manager (Advanced Control pack v3)
- Added Variable handling for Event Manager (Advanced Control pack v3) for HDMI-TPS-RX110AY-Plus and HDMI-TPS-RX220AK only!
- Added Permanent TCP clients with configurable target IP address, and Message recognizer for TCP clients (Advanced Control pack v3) for HDMI-TPS-RX110AY-Plus and HDMI-TPS-RX220AK only!
- Added LW3 command-salvo over Http POST (protocol.lw3) (Advanced Control pack v3) for HDMI-TPS-RX110AY-Plus and HDMI-TPS-RX220AK only!
- Added Http message sending with sendHttpPost and sendHttpPut (target server IP, target filepath, header, body) (Advanced Control pack v3) for HDMI-TPS-RX110AY-Plus and HDMI-TPS-RX220AK only!
- Added method to send Wake On LAN packet (Advanced Control pack v3)
- Added cleartext login function (disabled by default) (Advanced Control pack v3) for HDMI-TPS-RX110AY-Plus and HDMI-TPS-RX220AK only!
- Added MAC filtering (Advanced Control pack v3) for HDMI-TPS-RX110AY-Plus and HDMI-TPS-RX220AK only!
- Added IP port and services filtering (Advanced Control pack v3) for HDMI-TPS-RX110AY-Plus and HDMI-TPS-RX220AK only!
- Added Macro capability (running partial device preset with tags) (Advanced Control pack v3) for HDMI-TPS-RX110AY-Plus and HDMI-TPS-RX220AK only!
- Added new method for CEC control button sendClick (Advanced Control pack v3) for HDMI-TPS-RX110AY-Plus and HDMI-TPS-RX220AK only!
- Added LMDMP (Lightware Multicast Device Management Protocol) feature.
- Modified DeviceLabel property default text to LW_<productname>_<serialnum>
- Added properties in root node: FirmwareVersion, PackageVersion, MacAddress.
- Minor performance improvements and modifications.
- Added Network HostName property (default: lightware-<serialnum>).
- Added new ConnectedSource property for media output nodes.
- Introduces \u201c--test\u201d option for the update CLI command. This \u201cupdate test mode\u201d checks communication with the device over various protocols. One can perform this verification step before actually starting the device update.

Bugfix:

- Update Control USB interface driver.
- Improved network compatibility with 10.x.x.x IP address range.
- Fixed issue with tick counter when the device is continuously operating for a very long time.

v1.4.0b14

Release date: 2020-02-07

New feature:

- KVM transmission between USB HID extension (Human Interface Devices, e.g. keyboard, mouse, presenter and a PC or a Laptop) for HDMI-TPS-RX220AK only! The device utilizes control over USB KVM, and can be remotely powered over TPS link with PoE (IEEE 802.3af), a useful array of features to further simplify the operation for system integrators and users.
- RX220AK works as a matrix.

11.11. 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
#autoselect	Autoselect feature settings
#backup	Configuration cloning (backup)
#balance	Balance (for analog audio) setting
#bootload	Bootload mode setting
#builtinweb	Built-in miniweb
#buttonlock	Front panel button lock setting
#cablediagnostics	Cable diagnostics tool in LDC
#cec	CEC related settings
#commandinjection	RS-232 command injection settings
#configurationcloning	Configuration cloning (backup)
#crosspoint	Crosspoint switch setting
#darkmode	Dark mode setting
#devicelabel	Device label
#dhcp	Dynamic IP address (DHCP) setting
#diagnostic	Failure diagnostic related tool/information
#edid	EDID related settings
#eventmanager	Event manager
#factory	Factory default settings

Hashtag Keyword	Description
#firmwareversion	Firmware version query
#framedetector	Frame detector in LDC
#function	Function button
#hdcp	HDCP-encryption related setting
#highlightme	Find the device in LDC Device discovery
#http	Http post and put messaging, salvo commands
#identifyme	Identify me (identify the device) feature
#infra	Infrared port related settings
#infrared	Infrared port related settings
#ipaddress	IP address related settings
#label	Device label
#lock	Port lock setting
#lockbutton	Front panel button lock setting
#log	System log
#login	Cleartext login feature
#macfilter	MAC filtering (IT security)
#macro	Macro-handling
#message	Message sending via communication ports
#miniweb	Built-in miniweb
#mute	Port mute setting
#network	Network (IP address) related settings
#nosyncscreen	Test pattern (no sync screen) settings
#portblock	IP port blocking (IT security)
#portstatus	Source/destination port status query
#producttype	Product type query
#protocol	RS-232 protocol setting
#reboot	Restarting the device
#recognizer	RS-232 recognizer related settings
#restart	Restarting the device
#rs232	RS-232 related settings
#rs-232	RS-232 related settings
#rs232recognizer	RS-232 recognizer related settings
#rs-232recognizer	RS-232 recognizer related settings
#serial	RS-232 related settings

Hashtag Keyword	Description
#serialnumber	Serial number query
#signaltype	HDMI/DVI signal type setting
#status	Status query
#switch	Crosspoint switch setting
#systemlog	System log
#tcprecognizer	TCP message recognizer-related settings
#terminal	Advanced view / Terminal window
#testpattern	Test pattern (no sync screen) settings
#tpsmode	TPS (HDBaseT) mode setting
#unlock	Port unlock setting
#unmute	Port unmute setting
#variables	Variable-management
#volume	Volume (for analog audio) setting
#web	Built-in miniweb

11.12. Further Document Information

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 contains 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.

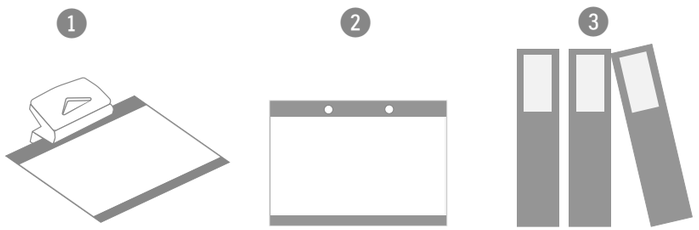
Navigation Buttons

Buttons in the PDF version	Buttons in the HTML version
Navigate to the **Table of Contents**.	Open the main **Table of Contents**.
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 **Online User Manuals** webpage.
Navigate to the **Bookmark page**.	Navigate to the **Bookmark page** in this User Manual.
Visit www.lightware.com.	Download the **PDF version** of the User Manual.

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.

11.13. 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.