

MX-RCP16
MX-RCP32



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 apparatus shall not be exposed to dripping or splashing and that no objects filled with liquids, such as vases, shall be placed on the apparatus. No naked flame sources, such as lighted candles, should be placed on the apparatus.

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

Ventilation

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

WARNING

To prevent injury, the apparatus is recommended to securely attach to the floor/wall or mount in accordance with the installation instructions.

WEEE (Waste Electrical & Electronic Equipment)

Correct Disposal of This Product



This marking shown on the product or its literature, indicates that it should not be disposed with other household wastes at the end of its working life. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources.



Household users should contact either the retailer where they purchased this product, or their local government office, for details of where and how they can take this item for environmentally safe recycling.

Business users should contact their supplier and check the terms and conditions of the purchase contract. This product should not be mixed with other commercial wastes for disposal.

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1. Introduction

Thank you for choosing Lightware Control Panels. MX-RCP16 and MX-RCP32 are remote control panels for controlling Lightware matrix routers remotely through LAN connection.

1.1. Box contents

- Remote Control Panel
- Universal DC adaptor with interchangeable plug
- UTP cross-link cable

1.2. Description

The RCPs can be used just like the front panel buttons on matrix routers to make crosspoint changes, or they can be programmed for special functions like salvo mode or universal device control.

The salvo mode allows storing a group of commands for each button. This function makes possible to send out multiple commands with a single press of a button.

The universal device control mode transforms the RCP to a simple button array to control any device through a simple protocol. The control panels have illuminated front panel buttons and an Ethernet LAN port for configuration and connecting to the controlled device.

The remote control panels can communicate with different protocols, and they have several operational modes. The communication protocol can be set with a DIP switch on the rear of the unit. Using different protocols depends on the application and the device that has to be controlled.

In X-Y mode the remote control panel functions just as if it would be the front side control panel of a matrix. Each button is dedicated to an input or an output of the matrix router that the RCP is connected to.

The salvo mode makes possible to execute a sequence of commands with a single button. In this mode the buttons are not dedicated to I/O ports, but each button can have its own command sequence that is executed if the button is pressed.

1.3. Features

- **Remote access to Lightware matrix switchers** – Lightware matrices can be remotely controlled through Ethernet connection.
- **16+16 and 32+32 button version** – Remote Control Panel is available with two layouts in 16+16 and 32+32 button version.
- **Salvo functions** – Salvos (group commands) can be created and saved into the RCPs which can be run by front panel buttons.
- **Lightware Matrix Controller Software** - Setup and programming in Lightware Software via Ethernet connection.
- **X-Y mode** – The device can be used just as if it would be the front panel of a matrix.
- **UDC mode** – Controlling a third party device via UDC protocol.
- **Universal power adaptor** – Equipped with a universal +5V DC power adaptor, which accepts AC voltages from 100 to 240 Volts with 50 or 60 Hz line frequency (or use Lightware's rack mountable power supply).
- **Locking DC connector** – Special plug of wall adaptor ensures safe power supply. This type of connector prevents unwanted extractions.

1.4. Applications

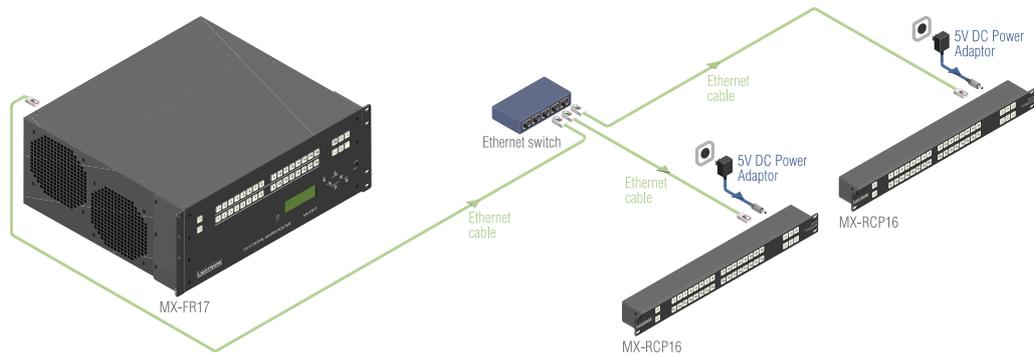


Figure 1-1. Typical application diagram

1.5. Device-compatibility

MX-RCP16 and MX-RCP32 are able to control most of the Lightware matrices:

FW 1.3.0		FW 1.3.3
MX-FR65R ¹ MX-FR33R MX-FR17 MX-FR9	MX8x8DVI-Pro MX8x4DVI-Pro MX8x8DVI-HDCP-Pro MX8x8HDMI-Pro MX8x8-3GSDI-Pro MX16x16DVI-Slim MX12x12DVI-Slim MX9x9DVI-Slim MX16x16DVI-Plus MX12x12DVI-Plus MX9x9DVI-Plus	Devices listed at FW 1.3.0 and MX-FR33L

Table 1-1. Supported Lightware devices

The matrix is identified by the RCP based on its name according to the following coding system:

- **MX[n]x[m][*]** e.g. **MX8x8DVI-HDCP-Pro**
- **MX-FR[n][r]** e.g. **MX-FR33R**

Legend:

- n, m: integer
- *: any string
- r: 'R' or 'L' character²

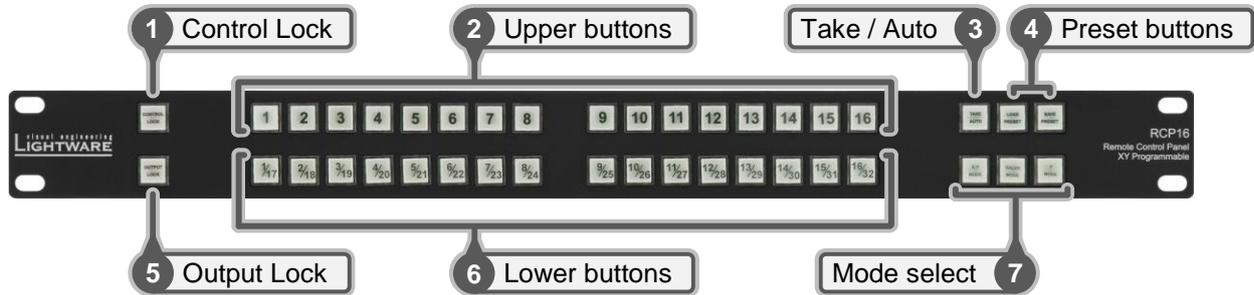
Info: [Table 1-1](#) contains those matrices that are supported when this User's manual is released. If you are not sure whether your device is supported after checking the coding, please contact support@lightware.com.

¹ Supported by MX-RCP32

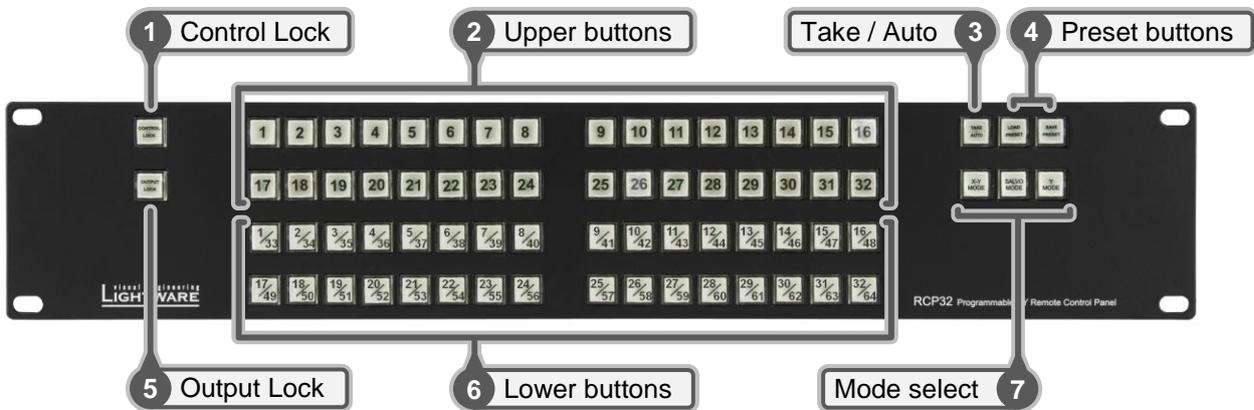
² Firmware-related, see [Table 1-1](#)

2. Controls and connections

2.1. Front view of MX-RCP16



2.2. Front view of MX-RCP32



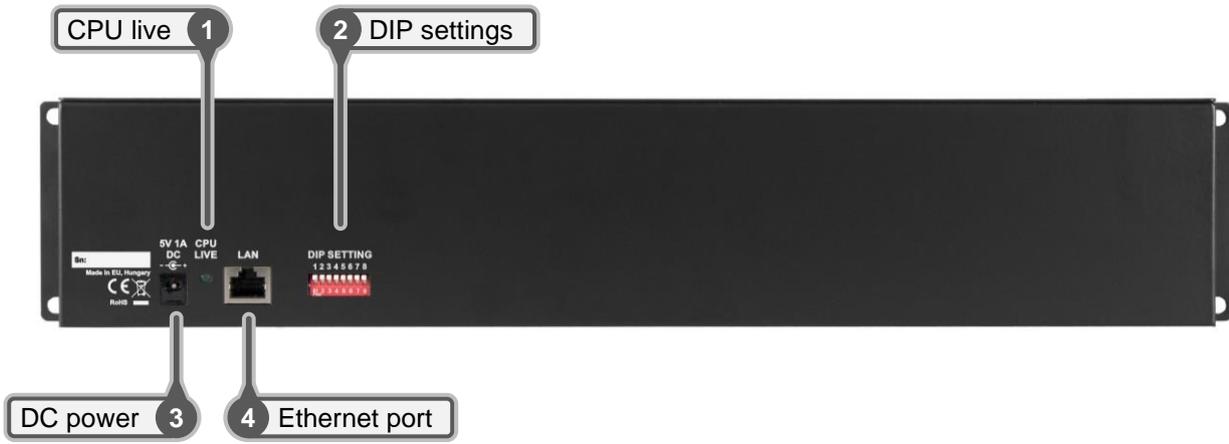
2.3. Front view legend

- 1 Control lock** Disables or enables front panel operation. When red is illuminated, all operations on front panel are prohibited. See section [5.2](#) on page [16](#) for more information.
- 2 Upper buttons** Upper buttons may refer to input/output ports, presets or salvo commands, depending on the mode of operation.
- 3 Take / Auto** Displays the actual switching mode of the router (available only in X-Y operation mode). Long press toggles the switching mode, short press executes switching and preset operations in TAKE mode.
- 4 Preset buttons** Load preset button loads a saved crosspoint configuration. Save preset button stores actual matrix state in one of the preset memories. (Available only in X-Y operation mode.)
- 5 Output lock** Locks and protects one (or more) outputs, inhibits accidental input changing on protected output. (Available only in X-Y operation mode.) The button is blinking red when there is no active connection to a matrix.
- 6 Lower buttons** Lower buttons may refer to input/output ports, presets or salvo commands, depending on the mode of operation.
- 7 Mode select** Operation mode selector; the button of the active mode is illuminated green.

2.4. Rear view of MX-RCP16



2.5. Rear view of MX-RCP32



2.6. Rear view legend

- | | |
|-------------------------------|---|
| <p>1 CPU live</p> | CPU live LED blinks during normal operation. |
| <p>2 DIP settings</p> | Communication protocol and other special settings can be configured with this switch. See more information in section 4.1 on page 13 . |
| <p>3 DC power</p> | Connect the output of the supplied +5V power adaptor or use Lightware's rack mountable power supply with the appropriate cable. |
| <p>4 Ethernet port</p> | RJ45 connector; remote control port for connecting the unit to Local Area Network (LAN). See more information in section 2.7.1 on page 11 . |

2.7. Electrical connections

2.7.1. Ethernet port

The Ethernet port can be connected to a LAN hub, switch or router with a UTP patch cable. Use a cross UTP cable when connecting to a computer directly!

	LED1	LED2
OFF	no activity	no link
Amber	half duplex	10 Mbps
Green	full duplex	100 Mbps
Blink	activity	N/A

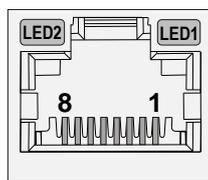


Table 2-1. RJ45 connector

Pin nr.	Name	Wire color
1	TX +	Green stripe
2	TX -	Green
3	RX +	Orange stripe
4	Not used	Blue
5	Not used	Blue stripe
6	RX -	Orange
7	Not used	Brown stripe
8	Not used	Brown

Table 2-2. Ethernet pin connections

2.7.2. DC +5V connection

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

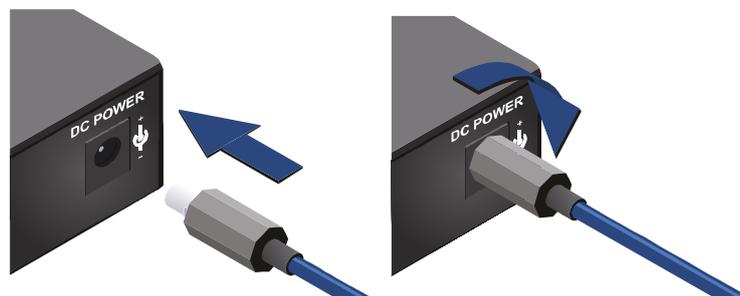


Figure 2-1. Locking DC connector

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

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

Always use the supplied +5V power adaptor or Lightware's rack mountable power supply.

3. Installation

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

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

After powered on, the unit performs a self-test and then the OUTPUT LOCK buttons starts blinking red.

Info: At switching ON, the router reloads the latest settings which were used before it was turning off. The unit has an internal emergency memory which stores all current settings. This memory is independent from presets and invisible for the user. This built-in feature helps the system to be ready immediately in case of power failure or accidentally powering down.

Info: If the CPU LIVE LED at the rear of the unit does not start blinking green, the unit is most likely damaged and further use is not advised. Please contact support@lightware.com.

The RCPs can be used to remote control matrix routers, or as a simple button array to control any device through a simple protocol. The below guide describes how to build and configure these systems.

3.1. Remote control matrix routers

- Step 1.** Install a Lightware matrix router with sources and displays as needed.
- Step 2.** Connect the matrix to a network hub, switch or router with its Ethernet port by an Ethernet patch cable.
- Step 3.** Connect the RCP to the same network as the matrix.
 - a) One RCP unit can connect to one matrix router
 - b) More RCP units can connect to the same matrix router depending on the router's Webserver firmware version.
- Step 4.** Set the RCP unit's protocol to 0, 1, 2, 4 or 5 with the DIP switch.
- Step 5.** Power up the devices.
- Step 6.** Set the IP address as described in section [4.2.1](#) on page [13](#).

3.2. Universal device control system

The RCP can operate as a universal device controller (UDC). In this mode the RCP sends a command regarding each button press or release. These commands can be processed by a third party device. On the other hand, the RCP can take commands to control its built-in LEDs.

- Step 1.** Prepare a device that implements the UDC protocol (UDC server).
- Step 2.** Connect the UDC server to a network hub, switch or router by an Ethernet patch cable.
- Step 3.** Connect one or more RCP units to the same network. (One RCP can connect to one UDC server at a time, but several RCPs could connect to the UDC server depending on its configuration.)
- Step 4.** Set the RCP unit's protocol to 3 with the DIP switch.
- Step 5.** Power up the devices.
- Step 6.** Set the IP address as described in section [4.2.2](#) on page [14](#).

4. Configuration

4.1. Communication protocol settings

The RCPs can communicate with different protocols, and they have several operational modes. The protocol can be set with a DIP switch on the rear of the unit. The use of different protocols depends on the application and the device that has to be controlled.

4.1.1. Viewing the protocol

Step 1. Press and hold the Control Lock button for 4 seconds. (Control Lock button lights up in red continuously).

Step 2. Press and keep pressed the Output Lock button. The current protocol indication will light up: (the numbers are the binary representation of the protocol)

0	1	2	3	4	5
Lightware	Lightware	Secondary	UDC	Lightware (free salvo)	Secondary (free salvo)
					
1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8

- Lightware protocol – used between Lightware devices
- Secondary (Extron) protocol – Ensure the compatibility in systems where third party device is installed running Extron protocol.
- UDC protocol – Protocol for UDC mode

4.1.2. Changing the protocol

The communication protocol can be changed on the rear of the unit:

Step 1. Set the DIP switch as a binary representation of the protocol number.

Step 2. Check the protocol on the front panel as described above.

Info: Protocol can be changed at any time, no restart or power off is required.

4.2. IP address settings

4.2.1. Remote control matrix routers

Step 1. Check that the RCP unit protocol is set to 0, 1, 2, 4 or 5.

Step 2. Set the controlled matrix to fix IP configuration, and set the IP address manually. Remember the IP address and the port number.

Step 3. Connect to the RCP with the Matrix Controller software.

- a) The RCP has a fix IP address as factory default: 192.168.254.254. To change this, use a crosslink UTP cable and connect the unit directly to your computer's Ethernet port. Or enable DHCP through the front panel buttons. See more information in section [4.2.3](#) on page [14](#).
- b) The three operation mode buttons will blink green while the RCP unit is in configuration mode (Matrix Controller Software is connected).

Step 4. Set the IP address and port of the matrix as the target IP address and port.

Step 5. Close the Matrix Controller software to disconnect from the RCP.

Step 6. The RCP tries to connect to the matrix on the set IP address. (If the connection cannot be established, the 'OUTPUT LOCK' button blinks continuously.)

Step 7. The system is ready to use. The RCP will function just as it would be the front panel control of the connected matrix router.

4.2.2. Universal device control system

- Step 1.** Check that the RCP unit protocol is set to 3.
- Step 2.** Set the UDC server to a fix IP address and port number.
- Step 3.** Connect to the RCP with the Matrix Controller software.
 - a) The RCP has a fix IP address as factory default: 192.168.254.254. To change this, use a crosslink UTP cable and connect the unit directly to your computer's Ethernet port. Or enable DHCP through the front panel buttons. See more information in section [4.2.3](#) on page [14](#).
 - b) The three operation mode buttons will blink green until the RCP unit is in configuration mode.
- Step 4.** Set the IP address and port number of the UDC server as the target IP address and port number.
- Step 5.** Close the Matrix Controller software to disconnect from the RCP.
- Step 6.** The RCP automatically tries to connect to the UDC server on the set IP address. (There is no automatic indication to show whether the connection is established or not. The server should detect the connection and send some commands for the RCP unit to generate indication.)
- Step 7.** The system is ready to use. The RCP will send a command if a button is pressed down or released. The LEDs can be switched ON/OFF/BLINK by sending command to the RCP.

4.2.3. Resetting the IP address

The unit's Ethernet port can be set to factory default IP configuration or to DHCP mode with front panel buttons. To set the IP configuration perform the following:

- Step 1.** Ensure that there is no active connection on the Ethernet port. You have to unplug the LAN cable.
- Step 2.** Lock the front panel buttons: press and hold the Control Lock button for 4 seconds (Control Lock button lights in up red continuously).
- Step 3.** Press and keep pressed the Output Lock button (the current protocol indication will light up).
- Step 4.** Press and release the
 - a) **Load Preset** button to set the **factory default fix IP** settings

IP address:	192.168.254.254
port number:	10001
subnet mask:	255.255.0.0
gateway:	0.0.0.0
 - b) **Save Preset** button to set **DHCP enabled**

IP address:	Acquired with DHCP
port number:	unchanged
subnet mask:	unchanged
gateway:	unchanged
- Step 5.** A light sequence will occur to confirm the command. (Save Preset, Load Preset and Take/Auto buttons will light up one after the other.)
- Step 6.** Reinsert the LAN cable to the Ethernet port.
- Step 7.** The RCP unit will restart, and try to connect to the set target IP address.

Info: If there is no active connection between the RCP and the matrix, 'OUTPUT LOCK' button starts to blink.

5. Operation

5.1. Operational modes – Overview

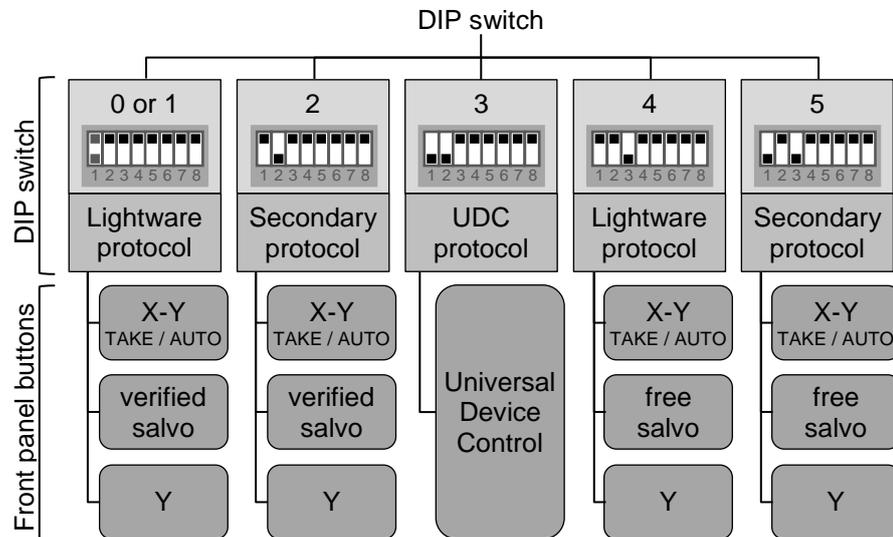


Figure 5-1. Protocols and working modes

X-Y mode

In this mode, the remote control panel functions just as if it would be the front side control panel of a matrix. Upper buttons are dedicated to the inputs, lower buttons to the outputs of the matrix router that the RCP is connected to. This operation mode has two switching modes: TAKE and AUTOTAKE.

Y mode

The Y mode is similar to X-Y mode but in this mode upper and lower buttons have the same function. Upper and lower buttons represents the inputs of the connected matrix router. While the Y button is pressed, the affected output can be selected. This way an MX-RCP16 can control a matrix with 32 inputs and 32 outputs, an MX-RCP32 can control a matrix with up to 64 inputs and 64 outputs.

Salvo modes

The salvo mode makes possible to execute a sequence of commands with a single button. In this mode the buttons are not dedicated to I/O ports, but each button can have its own command sequence that is executed if the button is pressed.

MX-RCP16: 32 pcs. salvos in Lightware protocol + 32 pcs. salvos in Secondary protocol

MX-RCP32: 64 pcs. salvos in Lightware protocol + 64 pcs. salvos in Secondary protocol

Verified salvo mode

The command sequence can contain any switching command. The RCP checks the response from the matrix and verifies if the crosspoint state matches with the issued commands. If the command has not been verified by the matrix, the button starts to blink.

Free salvo mode

The command sequence can contain anything. The response is not monitored, the last pressed salvo button lights until another is pressed.

Universal device control

UDC protocol is developed to create a simple button array that can be used as a universal device controller. The RCP sends a command regarding each button press or release. These commands can be processed by a third party device. On the other hand, the RCP can take commands to control its built-in LEDs, see chapter [7](#) on page [28](#).

5.2. Control lock

Front panel button operations on the RCP unit can be enabled or disabled using CONTROL LOCK button. This does not affect the front panel control on the router itself. If the button is not illuminated, front panel button operations are enabled. If it illuminates red continuously, front panel operations are inhibited.

Press and hold the CONTROL LOCK button for 3 seconds to toggle the control lock state.

Info: Control lock function is not available when UDC protocol is selected or Salvo mode is selected.

5.3. Front panel operations in X-Y mode

The X-Y mode is active when the 'X-Y MODE' button lights on the front panel. In this mode, the remote control panel functions almost the same as if it would be the front side control panel of a matrix. There are minor differences due to the remote communication delay and because the RCP may have more I/O buttons as the controlled matrix.

Each button is dedicated to an input or an output of the matrix router that the RCP is connected to. The upper buttons refer to inputs and the lower buttons refer to outputs. This way the MX-RCP16 has 16 source buttons and 16 destination buttons, while the MX-RCP32 has 32 source buttons and 32 destination buttons. In this manner, this mode is most efficient when the RCP has at least as much buttons as the controlled router. (The upper numbered ports of a 32x32 matrix will be unreachable with this mode when using an MX-RCP16.)

If a button is pressed on the RCP that refers to a higher numbered I/O port than the matrix frame size, the button gives a short flash to indicate press, but otherwise it is ignored.

5.3.1. TAKE / AUTOTAKE modes

The RCP has two switching modes in X-Y operation mode: TAKE and AUTOTAKE. If the TAKE / AUTO button is unlit, TAKE mode is active. When the TAKE / AUTO button continuously lights green, AUTOTAKE mode is selected.

Press and hold the TAKE button for three seconds to toggle between TAKE and AUTOTAKE modes.

TAKE mode allows the user to make multiple connections and disconnections at once. This mode is useful when time delay is not allowed between multiple switching. The commands are only realized when the TAKE button is pressed. If no button is pressed for two seconds, all preselected actions (which were not realized with pressing TAKE) will be ignored, and the RCP returns to its idle state.

AUTOTAKE mode is useful when immediate actions must be done or fast switching is needed between sources on a particular destination. In this mode switching occurs immediately upon pressing one of the input selector buttons.

5.3.2. Viewing crosspoint state

User can check the current crosspoint status of the connected router on the RCP unit. This status view feature is slightly different in TAKE or AUTOTAKE modes because of different approach of the two modes.

Info: Status view occurs whenever the router has to be switched. After entering the view state, the user can change the routing configuration. Viewing and switching can be done after each other, or if nothing is pressed for three seconds, the RCP returns to idle state.

View current state in TAKE mode

If all source and destination buttons and TAKE button are unlit (the unit is in TAKE mode, and no input was selected in last 3 seconds), user can verify both input and output connections. This informative display will remain for 3 seconds, and then all button lamps go out. In TAKE mode no accidental change can be done unless TAKE button is pressed.

For viewing input connections, press and release a source button. Now the selected source button and all destination buttons will light up which are currently connected to the selected source.

For viewing output connections, press and release a destination button. Now the source button which is connected to the selected destination will light up. If no source button is lighting, the selected destination is disconnected from any source, or is in muted state.

View current state in AUTOTAKE mode

In AUTOTAKE mode only states of destinations can be viewed.

Press and release the required destination button. Now the source button which is connected to the selected destination will light up. If no source button is lighting, the selected destination is disconnected from any source, or is in muted state. By pressing another destination button, the state of that destination can be seen.

Info: Be careful, as in AUTOTAKE mode if a source button is pressed, it is immediately connected to the last selected destination.

5.3.3. Switching

Creating connections and disconnections in TAKE mode

- Step 1.** First press and release the desired source button. The pressed source button and all destination buttons which are currently connected to this source will light up. The dark destination buttons are not connected to this source. This is an informative display about current status of the selected input (view only).
- Step 2.** Press and release the desired destination button(s) which has to be **connected** to the selected source. The preselected destination button(s) start(s) blinking.
- Step 3.** Press and release any green lighting destination button which has to be **disconnected** from the selected source. The pressed destination(s) turn(s) dark.
- Step 4.** Press and release TAKE button to execute the tie(s). Now the selected input is switched to the selected output(s) and disconnected from the deselected output(s).

Info: Deselected destinations are disconnected from any source, thus output devices will display black image or "no signal" message, or automatically will turn off.

Creating a connection or disconnection in AUTOTAKE mode

- Step 1.** Press and release the desired destination button. The pressed destination button and the actually connected source button light up green. If no source is connected (the output is muted) no source button will light up.
- Step 2.** To **connect** another source, press and release the desired input button. The switch action will be executed immediately. Switching between sources to the selected destination can be done directly.
- Step 3.** To **disconnect** the output from any sources, press and release the current input button that lights green. The switch action will be executed immediately and the output is disconnected.

Info: Deselected destinations are disconnected from any source, thus output devices will display black or blue image or "no signal" message and may automatically turn off.

5.3.4. OUTPUT LOCK

Lightware routers can lock a destination's state. This feature prevents an accidental switching to the locked destination in case of important signal. Locking a destination means, that no input selection or muting can be executed on that particular destination.

Destinations can be independently locked or unlocked through an RCP unit. Locking a destination does not affect other destinations.

Viewing or changing output lock states in TAKE mode

- Step 1.** Press and release the Output Lock button.
- Step 2.** The Output Lock button and all the buttons of any locked destinations light up, and remain illuminated for two seconds (view state).
- Step 3.** If no button is pressed for three seconds, the RCP returns to idle state.
- Step 4.** To change an output's lock state:
 - a) If an unlit output button is pressed, it starts to blink, to indicate that it is preselected for output locking.
 - b) If an illuminating output button is pressed, it goes off, to indicate that it is preselected for unlocking.
- Step 5.** Press and release TAKE button. The preselected output lock states are changed.

Viewing or changing output lock states in AUTOTAKE mode

In AUTOTAKE mode a destination is selected all the time. Therefore the currently selected output and input buttons are illuminated. The Output Lock button illuminates regarding to the lock state of the current output.

Viewing all locked outputs is not possible in AUTOTAKE mode, as pressing the Output Lock button instantly locks or unlocks the current output.

- Step 1.** Press and release the desired destination button. Now the selected destination button and the currently connected source button light up (view mode).
- Step 2.** The Output Lock button lights if the selected output is locked.
- Step 3.** Press and release the Output Lock button to toggle lock state on the selected output.
 - a) If the output was previously unlocked, the Output Lock button was not illuminated. Pressing the Output Lock button activates the lock function at once.
 - b) If the output was previously locked, the Output Lock button was illuminated. Pressing the Output Lock button deactivates the lock function at once.

5.3.5. Switching operations flowchart

To better understand the viewing and switching sequence in TAKE and AUTOTAKE modes, please study the below diagrams.

TAKE mode

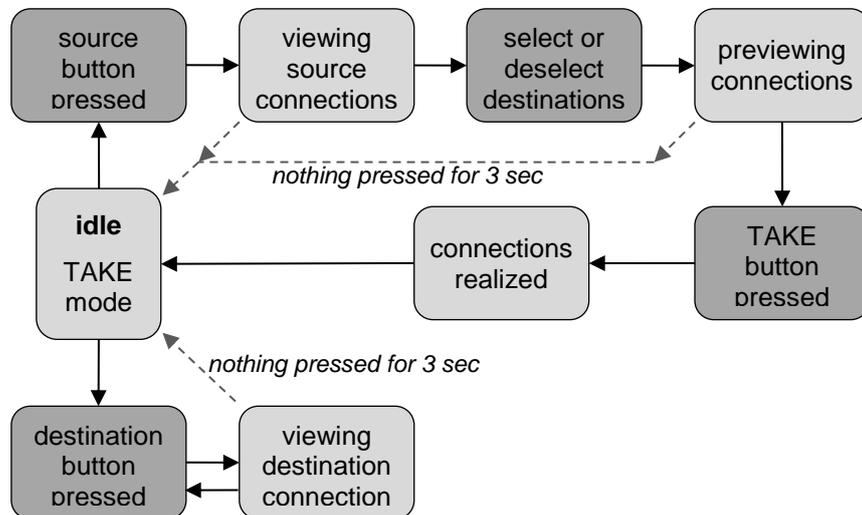


Figure 5-2. Switching flowchart in TAKE mode

AUTOTAKE mode

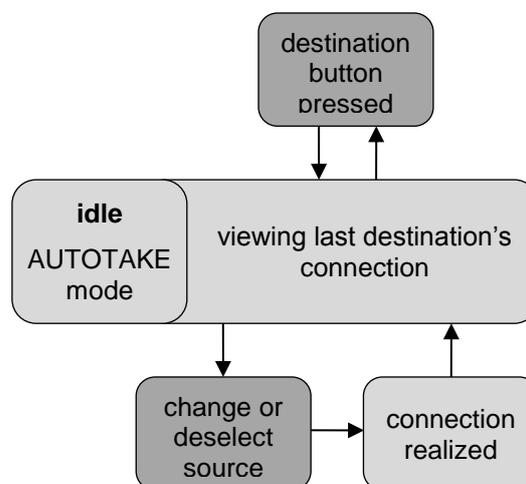


Figure 5-3. Switching flowchart in AUTOTAKE mode

5.3.6. Preset operations

Lightware matrix routers have 32 user programmable presets. Each preset stores a configuration regarding all input connections and mute state for all outputs. All presets are stored in a non-volatile memory; the router keeps presets even in case of power down. Memory numbers are assigned to source buttons 1..16 on MX-RCP16 and 1..32 on MX-RCP32. The presets are stored in the memory of the router, not in the control panel.

Saving a Preset in TAKE mode

- Step 1.** Create the desired connections which have to be saved.
- Step 2.** Press and release the SAVE PRESET button.
- Step 3.** Press and release a source button according to the desired memory address (source 1 to 16 or to 32).
- Step 4.** Press and release TAKE button. Now the current configuration is stored in the selected memory.

Info: Preset save action always stores the current configuration for all outputs including mute state, but ignoring lock state.

Loading a Preset in TAKE mode

- Step 1.** Press and release LOAD PRESET button.
- Step 2.** Press and release a source button according to the desired memory address (source 1 to 16 or to 32).
- Step 3.** Press and release TAKE button. Now the selected preset is loaded.

Info: Loading a preset modifies all output states that are not currently locked.

Saving a Preset in AUTOTAKE mode

- Step 1.** Create the desired connections which have to be saved.
- Step 2.** Press and release SAVE PRESET button.
- Step 3.** Press and release a source button according to the desired memory address (source 1 to 16 or to 32). Now the current configuration is stored in the selected memory.

Info: Preset save action always stores the current configuration for all outputs including mute state, but ignoring lock state.

Loading a Preset in AUTOTAKE mode

- Step 1.** Press and release LOAD PRESET button.
- Step 2.** Press and release a source button according to the desired memory address (source 1 to 16 or to 32). Now the selected preset is loaded.

Info: Loading a preset modifies all output states that are not currently locked.

5.4. Front panel operations in Y mode

The Y mode is active when the 'Y MODE' button lights on the front panel. While the 'Y MODE' button is pressed, the affected output can be selected. After the button is released, every button is dedicated to inputs of the matrix router that the RCP is connected to. Pressing an I/O button while the 'Y MODE' button is released executes the switching at once on the last selected output. The affected output can be easily changed by pressing and holding the 'Y MODE' button, and pressing the port number of the desired output.

All buttons are dedicated to inputs when the 'Y MODE' button is released. All buttons are dedicated to outputs while the 'Y MODE' button is pressed.

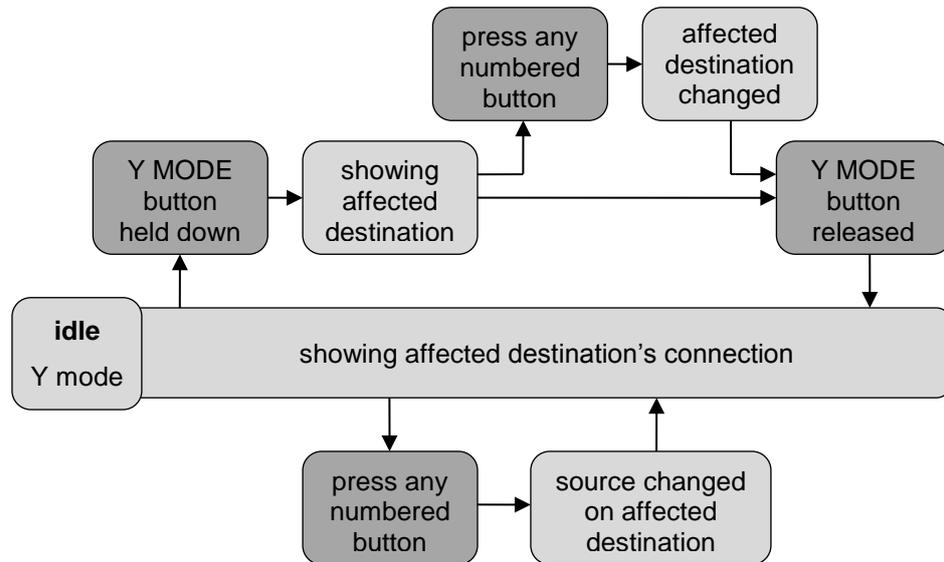
Info: TAKE / AUTO, Load Preset and Save Preset buttons are disabled in this mode.

5.4.1. Switching

- Step 1.** Press and keep pressed the Y-mode button. The button of the affected output port lights.
- Step 2.** To change the affected output port, hold the Y-mode button down and press the desired output number.

- Step 3.** Release the Y-mode button. The button of the currently connected input port lights up.
- Step 4.** To change the source, press any of the numbered buttons. (1..32 on MX-RCP16 and 1..64 on MX-RCP32.)
- Step 5.** The switching is done at once. The newly selected source is connected to the affected destination.

5.4.2. Switching operations flowchart



5.5. Front panel operations in SALVO mode

Salvo mode is active when the SALVO button lights on the front panel. In this mode the buttons are not dedicated to an input or an output port of the connected matrix. Each button can have its own command sequence that is executed if the button is pressed. The command sequences can be programmed to the RCP with the Matrix Controller software.

Info: TAKE / AUTO, Load Preset and Save Preset buttons are disabled in this mode.

Verified salvo mode

The command sequence can contain any switching command according to the selected protocol (Lightware or secondary protocol). The RCP checks the response from the matrix and verifies if the crosspoint state matches with the issued commands. The button will light only if all the commands were successfully executed, and the matrix configuration is in accordance with the command sequence. If the crosspoint configuration does not match with the sent commands, the button blinks.

Free salvo mode

The command sequence can contain anything. The response is not monitored, the last pressed salvo button lights until another is pressed.

5.5.1. Executing salvo

- Step 1.** Press and release the 'SALVO MODE' button to enter Salvo mode.
- Step 2.** Press and release the desired salvo button. (1..32 on MX-RCP16 and 1..64 on MX-RCP32.)

Step 3. The button flashes to indicate the pressing and the stored command sequence is sent to the matrix router.

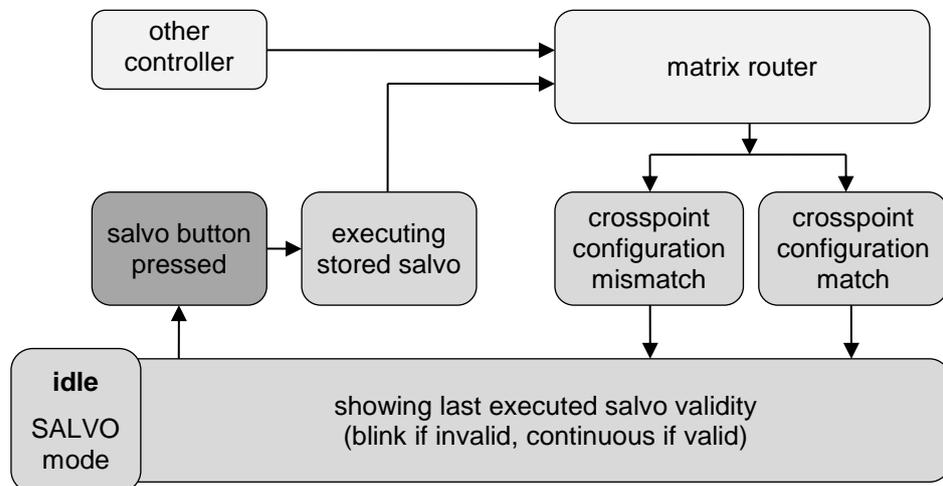
- a) In verified salvo mode the pressed button stays illuminated if the command sequence contained only switch commands, and the response from the matrix meets the required configuration. Otherwise the pressed button blinks.

If the salvo was executed correctly, but later the matrix configuration is changed (e.g. switching is done directly on the router's front panel), then the salvo button starts to blink. This indicates that the current crosspoint configuration does not match the previously selected salvo.

If the crosspoint configuration changes to a state that meets the last executed salvo, then the salvo button changes to continuous illumination.

- b) In free salvo mode the pressed button stays illuminated disregarding the response.

5.5.2. Verified salvo operations flow chart



5.6. Operation modes – quick summary

Button/function	X-Y mode	Salvo mode	Y mode	UDC
Main function	Working as a matrix front panel	Executing salvos	Working as a matrix front panel	Control a third party device
Control lock	✓	–	✓	–
Output lock	✓	–	✓	–
Upper buttons	Source selecting	Salvo executing	Source and destination selecting	Pre-defined command executing
Lower buttons	Destination selecting			
TAKE / AUTO	✓	–	–	–
Load / Save preset	✓	–	–	–
Switching operation	The same as on a matrix	–	By 'Y MODE' button	–

6. Software control – Using Lightware Controller Software

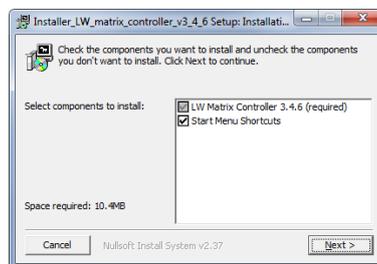
The extenders can be controlled using Lightware Matrix Controller software from a Windows PC or Laptop through Ethernet port. The application can be downloaded from the following link: https://lightware.com/media/lightware/filedownloader/file/MXC_347.zip

Minimum system requirements:

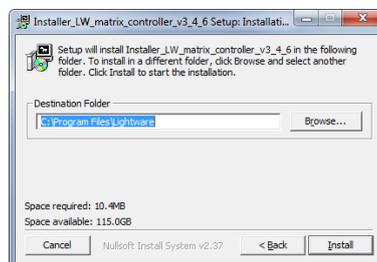
- Intel® Pentium® 4 or AMD Athlon® 64 processor
- 512 MB of RAM
- Microsoft Windows XP
- 1024 x 768 display resolution
- USB 2.0 interface

6.1. Installing the Controller Software

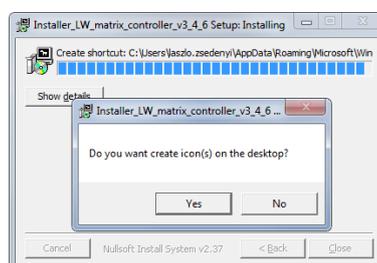
Step 1. Run *Installer_LW_matrix_controller_vX_X_X.exe* and Click on Next button (X_X_X means the three-digit software version of the Controller).



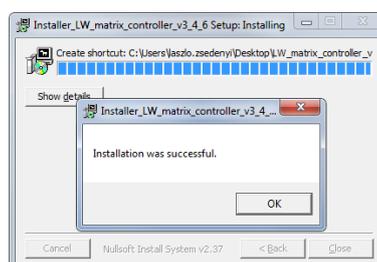
Step 2. Select destination folder and click Install (using the default path is recommended).



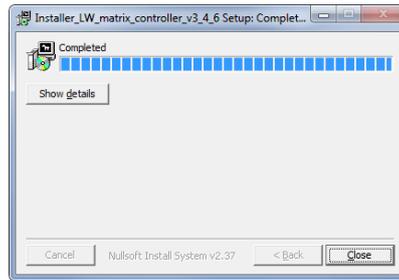
Step 3. If you want to create desktop icon click Yes in the next pop-up window:



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



Step 5. To finish installation process, click on the Close button.



Step 6. To run Lightware Matrix Controller Software find the shortcut icon in Start menu → Programs → Lightware → LW_matrix_controller..., or on your desktop, and double click on it.



Uninstalling

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

6.2. Establishing the connection

The unit can be controlled from a Windows computer using Lightware Matrix Controller software through Ethernet port.

Step 1. Connect the matrix switcher and the computer via

- Ethernet through a LAN hub, switch or router
- Ethernet directly (with cross UTP cable).

Info: If the connection is made through the router's Ethernet port, be sure that the computer is in the same network as the router.

Info: If the computer has multiple Ethernet connections (for example Wi-Fi and LAN connections are used simultaneously) you will have to know the IP address for the one that is used for controlling the RCP.

Step 2. Start the application.

To run the Control Software double click on the icon on the desktop or select proper shortcut from Start Menu → Programs → Lightware folder.



Step 3. The Find dialog appears automatically.

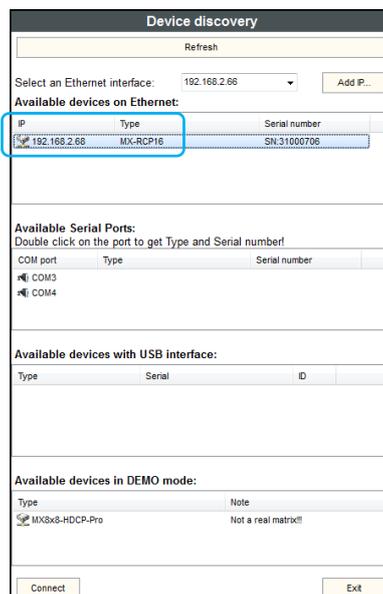


Figure 6-1. Ethernet connection

The software picks the primary Ethernet interface, and shows the available Lightware devices on that port. The device type and the serial number are displayed automatically. Click the desired device, to highlight it.

If the computer has more Ethernet ports (for example Wi-Fi and LAN connections are used simultaneously), you have to select the one that is used to control the router from the drop-down list. If you are unsure which one to use, try to search for devices on all of them.

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

Info: If the router is not listed in the “available devices on Ethernet” box, try searching again, or see check the other Ethernet interfaces as well.

Info: Only one user is allowed to connect to the RCP unit via Ethernet.

Info: Be sure that the firewall is not blocking the application!

The RCP enters configuration mode when the software connects to it. The three operation mode buttons are blinking simultaneously to indicate this. While in configuration mode, the front panel operations are ignored on the RCP unit. When the Lightware Matrix Controller finds the hardware, it determines the product type, and the control menu appears.

6.3. Control menu

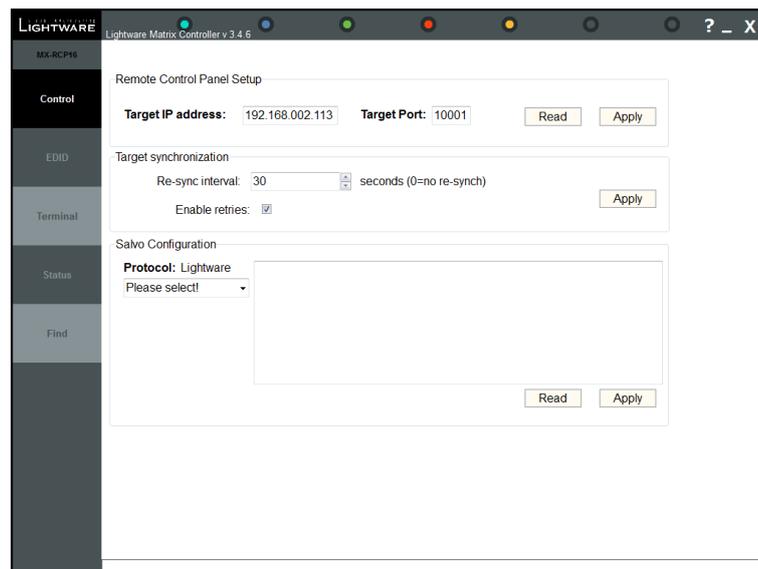


Figure 6-2. RCP control menu

In the upper frame, the target IP address and port number of the matrix router or the UDC server is displayed. The currently set target is inquired and displayed upon connection.

To change the controlled target, type the IP address and port, then press Apply. The IP address must be typed with all leading zeros in the dot-decimal notation. (e.g. write 192.168.002.113 instead of 192.168.2.113)

The IP address and port of a matrix router can be checked on the front panel LCD on the matrices or the devices can be discovered with the FIND dialog in the Matrix Controller software.

Salvo configuration

In the lower frame the SALVO command sequences can be set up. Salvo commands can be used to execute a sequence of commands with one press of a button. One command sequence is stored for each button.

The RCP stores a total of 128 command sequences: 64 for Lightware protocol and another 64 for the secondary protocol. The control software displays if Lightware or Secondary protocol is active for remote controlling, and shows only the 64 salvos that belong to the actual protocol. The other 64 salvos are not accessible and not affected.

Storing salvos

Each salvo memory can store a maximum 512 character long command sequence. Each command has to be typed including { } brackets. Any commands can be stored, but when verified salvo mode is used, only switching commands are sent. If a stored salvo contains switching and other commands as well, the non-switching commands are omitted. When using free salvo mode, any string in the salvo memory is sent to the matrix.

Salvo commands are sent as a batch. In most cases, batch commands are processed just as if they were sent one by one, but for switching commands, the router groups them, and executes switching in one step. The grouping is done only if the switching commands are received after each other, without any interruption (e.g. other command sent between switch commands). For example the salvo {02@01}{05@04} results in group switching but the salvo {02@01}{+06}{05@04} does not result in group switching, because another command gets between.

6.4. Status menu

Basic device information, such as the installed cards' firmware versions are displayed in this window.

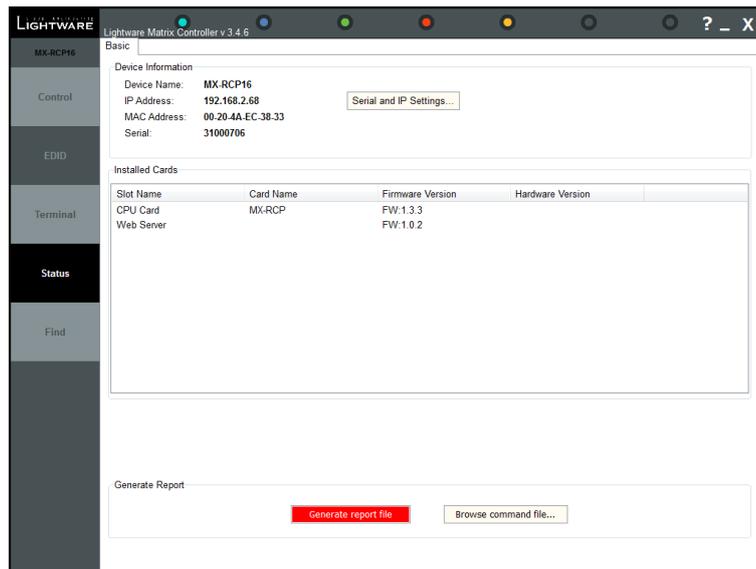


Figure 6-3. Status menu

6.4.1. IP settings

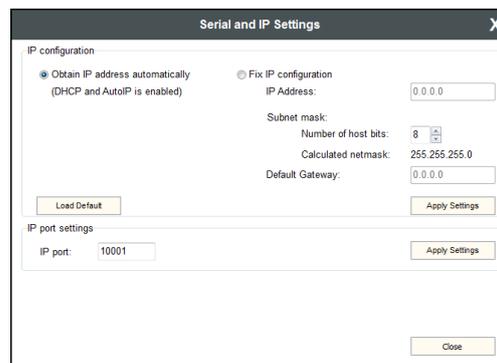


Figure 6-4. IP settings

Obtain IP address automatically

By selecting the “Obtain IP address automatically” option, the RCP gets the IP address from the DHCP server on the LAN, or if DHCP server is not present, it gets an AutoIP address from the 169.254.xxx.xxx domain.

Fix IP configuration

In this case, the IP address configuration of the RCP is set up manually by the user/administrator. The earlier saved configuration is shown in brackets.

Step 1. Select the “Fix IP configuration” option.

Step 2. Type in the IP address, select the desired subnet mask and type in the gateway IP address.

Step 3. Click on “Apply Settings” button. Depending on the modified settings, you might need to restart the RCP and the Matrix Controller Software.

Info: The “Load Default” button loads the factory default IP settings to the fields, which contain a fix configuration:

IP Address:	192.168.254.254
Subnet Mask:	255.255.0.0
Default Gateway:	0.0.0.0

IP port settings

The RCP can be accessed via this TCP/IP port number with TCP connection. This number can be modified to any number between 1025 - 65535 except the followings: 9999, 14000 - 14009, 30704, and 30718.

Info: The IP port number is 10001 by default.

6.5. Find menu

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

Clicking “Yes” will open the Find window. See section [6.2](#) on page [24](#) for more information about establishing the connection.

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

7. Programmer's reference

7.1. Matrix control protocols

When protocol 0, 1, 2, 4 or 5 are set, the RCP unit sends and accepts commands that are described in the user's manual of Lightware matrix routers.

7.2. UDC protocol

In UDC mode the RCP unit connects to a TCP server on a specified IP address and port. See section [3.2](#) on page [12](#) about configuring the target. The RCP unit sends a command if a button is pressed down or released. The LEDs can be switched ON/OFF/BLINK by sending command to the RCP.

Buttons and LEDs are referred with their number as 1..32 on MX-RCP16 and 1..64 on MX-RCP32. The special function buttons and LEDs are referred as F1..F8 on both units.

Legend for protocol:

- <BTN> = button name 1..64 or F1..F8 (in ASCII format)
- <LED> = LED name 1..64 or F1..F8 (in ASCII format)
- CrLf = Carriage return, Line feed (0x0D, 0x0A)
- = space character (0x20)
- = each command issued by the TCP server, sent to the RCP unit
- ← = each response received by the TCP server, sent by the RCP unit

7.2.1. Sent responses

Button pressed down

Format	Example
Response {D<BTN>}CrLf	← (D5)

Button released up

Format	Example
Response {U<BTN>}CrLf	← (UF3)

7.2.2. Accepted commands

Turn LED on

Format	Example
Command {on@<LED>}CrLf	→ {ON@6}

Turn LED off

Format	Example
Command {off@<LED>}CrLf	→ {OFF@4}

Blink LED

Format	Example
Command {blink@<LED>}CrLf	→ {BLINK@F2}

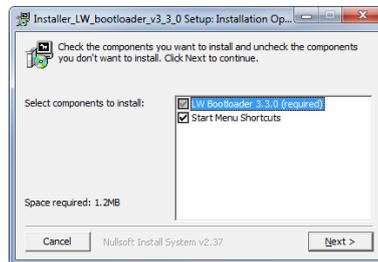
8. Firmware upgrade

The RCP can be upgraded via LAN connecting to the local subnet. But to avoid packet loss caused by an overloaded network, it is recommended to use cross UTP connection directly from the upgrading PC to the Lightware device. Be sure that there is no other active connection with the RCP via Ethernet, close the Controller Software if that is open.

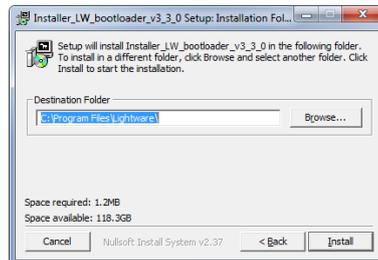
8.1. Install the Bootloader

RCP can be upgraded using Lightware Bootloader from a Windows based PC or Laptop via Ethernet.

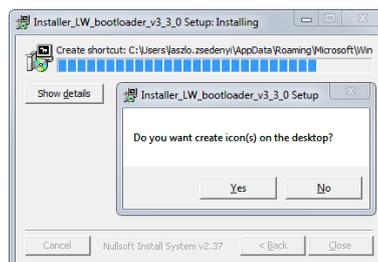
Step 1. Run `Installer_LW_bootloader_vX_X_X.exe` (X_X_X is the three-digit software version of the Bootloader).



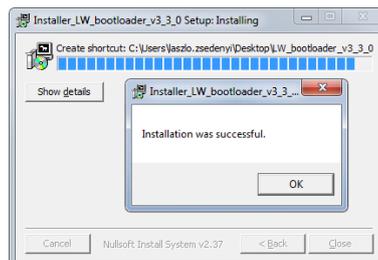
Step 2. Select destination folder and click on Install button (using the default path is highly recommended).



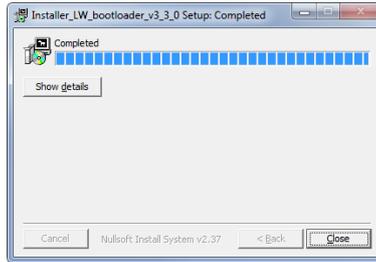
Step 3. If you want to create desktop icon click on Yes button in the following pop-up window.



Step 4. After the files have been copied the following message appears:



Step 5. To finish the installation process, click on the Close button.



Step 6. To run Lightware Bootloader, find the shortcut icon in Start menu → Programs → Lightware → LW_bootloader_vX_X_X or on the desktop and double click on it.



Uninstalling

To uninstall the Bootloader software double click on Start menu → Programs → Lightware → Uninstall_LW_bootloader_vX_X_X.

8.2. Upgrade process

The RCP can only be upgraded via LAN by Lightware’s Bootloader Software, so connect the matrix router to the local subnet or use a cross-link cable for a direct connection between PC and the RCP. Be sure that there is no other active connection with the device via Ethernet.

Step 1. Run the application from Start Menu → Programs → Lightware → LW_bootloader_vX_X_X!



Step 2. Click ‘*FIND*’ Button!

If the bootloader finds one or more Lightware devices, their IP addresses, types and serial numbers are listed in the tree view window.

Info: Make sure that the PC and the RCP are in the same subnet. You have to wait until all the devices on the network completely start up, before pressing *FIND* button.

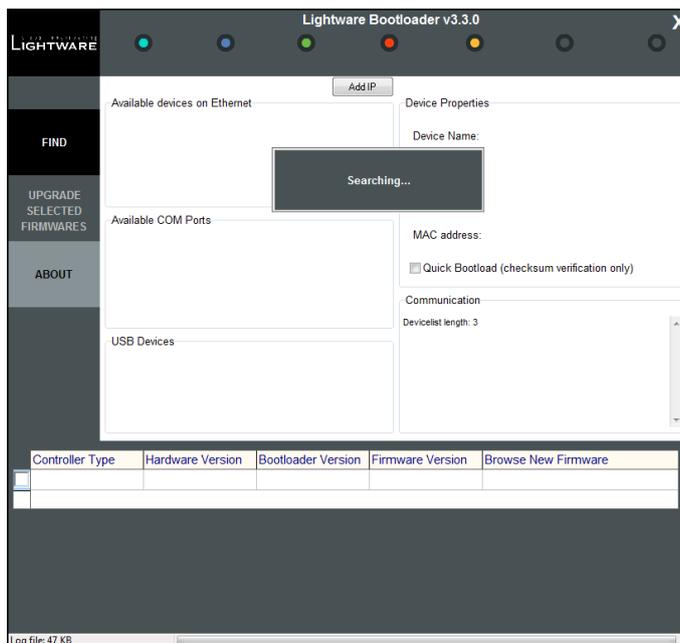
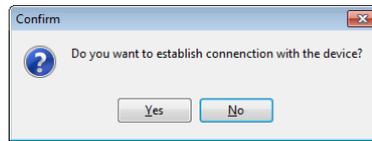


Figure 8-1. Bootloader searches for devices

Step 3. Select the desired device!

Double click on the IP address, then click 'YES' to establish connection with the RCP. It will take 10-15 seconds to get all information from the device.



Info: The bootloader application will restart the RCP when it establishes the connection. The RCP beeps when it is rebooted.

Step 4. Review the firmware versions!

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

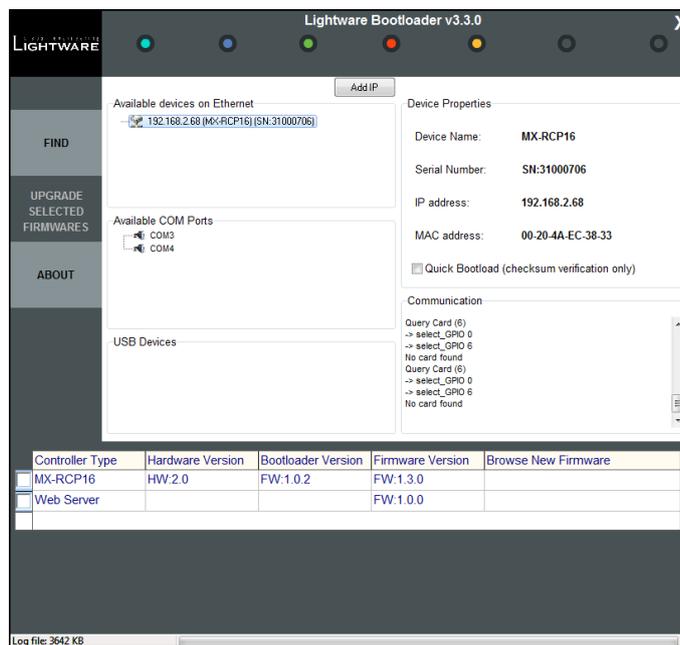


Figure 8-2. Bootloader main screen

Select one or more controllers that need firmware upgrade by clicking the checkbox next to it.

'MX-RCP16' is the main processor's firmware, the 'Web Server' module handles the LAN connection.

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

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

Controller Type	Hardware Version	Bootloader Version	Firmware Version	Browse New Firmware
<input checked="" type="checkbox"/> MX-RCP16	HW:2.0	FW:1.0.2	FW:1.3.0	MX-RCP16-v1.3.3.hex
<input checked="" type="checkbox"/> Web Server			FW:1.0.0	RCP102-1_0_2_rom

Figure 8-3. Bootloader – Select controllers to upgrade

Step 6. Upgrade firmware(s)

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

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

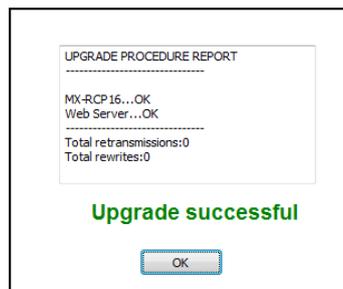
Info: The reprogramming can take between 3-8 minutes per controller.

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

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

Step 7. Done!

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



Now you can close the application, or you can select another device to upgrade. After closing the Bootloader application, switch the upgraded devices off and then on. Now it is ready to be used with the new firmware!

9. Specifications

General

Compliance	CE
EMC (Emission)	EN 55032:2015
EMC (Immunity)	EN 55035:2017
Safety	EN 60065:2014
Warranty	3 years
Operating temperature	0 to +55°C (+32 to +122°F)
Operating humidity	10% to 90%, noncondensing
Cooling	Convection only

Power

Power supply	external power adaptor
Power adaptor	input 100-240 V AC 50/60 Hz, Output 5V DC, 1 A
Power consumption:	max. 2 W (7 BTU/hour)
Power connector	Locking DC connector (2.35 mm pin)

Enclosure (MX-RCP16)

Rack mountable	Yes, 1U high
Material	1 mm steel
Dimensions in mm	446 (482*)W x 55D x 44H
Dimensions in inch	17.6 (19*)W x 2.2D x 1.7H
Net weight	1080 g

* With rack mounting ears

Enclosure (MX-RCP32)

Rack mountable	Yes, 2U high
Material	1 mm steel
Dimensions in mm	446 (482*)W x 55D x 89H
Dimensions in inch	17.6 (19*)W x 2.2D x 3.5H
Net weight	1720 g

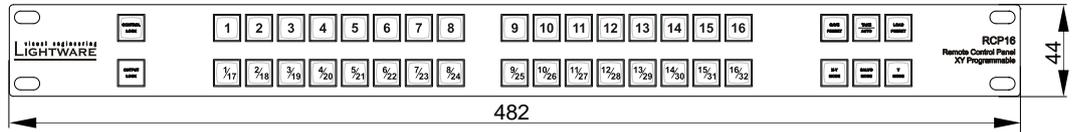
* With rack mounting ears

9.1. Mechanical drawings

9.1.1. MX-RCP16

Dimensions are in mm.

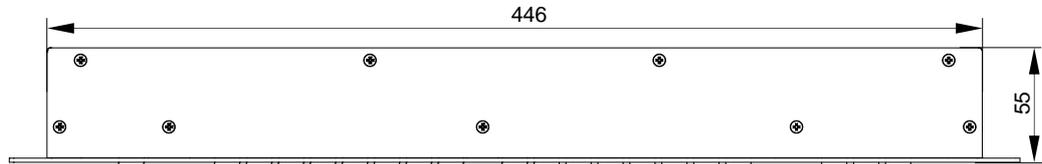
Front view



Rear view



Top view



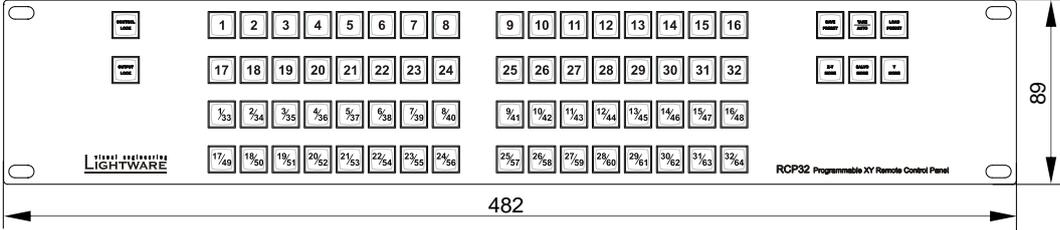
Side view



9.1.2. MX-RCP32

Dimensions are in mm.

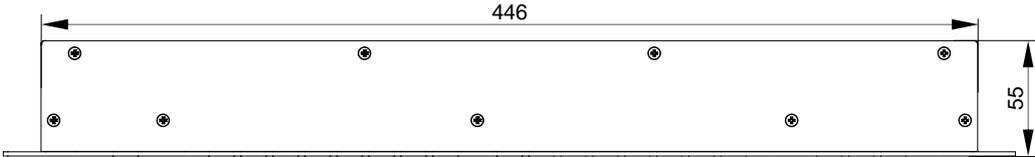
Front view



Rear view



Top view



Side view



10. Version applicability

This User's Manual applies to the following versions of the mentioned software, firmware and hardware: (MX-RCP16)

	version
Lightware Matrix Controller software	3.4.6
Lightware Bootloader software	3.3.0
MX-RCP16 firmware	1.3.3
Web Server	1.0.2
MX-RCP card hardware	PCB 1.1

11. Warranty

Lightware Visual Engineering warrants this product against defects in materials and workmanship for a period of three years from the date of purchase.

The customer shall pay shipping charges when unit is returned for repair. Lightware will cover shipping charges for return shipments to customers.

In case of defect please call your local representative, or Lightware at

Lightware Visual Engineering
H-1071 Budapest, Peterdy Street 15, HUNGARY

E-mail: support@lightware.com

12. Document revision history

Document	Release Date	Changes	Editor
Rev. 1.0	01-10-2013	Initial version	Laszlo Zsedenyi
Rev. 1.1	16-12-2015	Safety instructions updated, CE page pulled out	Laszlo Zsedenyi
Rev. 1.2	12-03-2019	Download link added for Matrix Controller SW	Laszlo Zsedenyi