



Wireless subsystem repeater

U-PROX HW

Installation and programming manual

About this document

This manual covers installation, adjustment and use of U-PROX HW (hereinafter repeater) wireless access control system repeater. Read this manual carefully prior to installing the system.

Characteristics, Intended use and parameters of the repeater are described in the section "Summary". Section "Terms" provides an explanation of terms found in this document.

The look of the repeater, the pins and the mode of work are described in the "Description section". Order of installation, adjustment of external devices and repeater configuration are described in "Working with the device" section.

Attention! Read this manual carefully prior to installing the system. Installation, adjustment and utilization of repeater is allowed only to persons or organizations with the appropriate authority from the manufacturer

Technical support

To get warranty and technical support you can apply to authorized service centers, situated on the territory of countries, enlisted in the warranty card.

Warranty and technical support are performed on the territory of the country, where the customer applied for warranty or free service.

Technical information is available on the system website

www.u-prox.com

Contents

About this document.....2

Technical support.....2

Brief description of the repeater4

Intended use.....4

Summary.....4

Terms5

 Identifiers5

 Access point (AP)5

 Downloading5

Description and operation.....6

 Repeater6

 Assignment of the repeater contacts and indication.....6

 Light emitting diode.....7

Repeater operation.....7

Communicator operation7

Wireless lock system architecture10

Wireless lock system deployment11

 Server addresses automatic configuration for U-Prox IC L12

 U-Prox IC L addresses automatic configuration for repeaters.....13

 U-Prox IP500 automatic configuration.....14

How to work with the device14

 Connection procedure.....14

 Mount recommendations.....15

 Communication15

 Wireless computer network (Wi-Fi)15

 Repeater program order.....16

 Service maintenance.....17

 Switching to programming mode.....17

 Replacing the device firmware17

 Factory settings.....17

Brief description of the repeater

U-PROX HW repeater - a device designed to extend the range of the wireless subsystem of U-Prox IP access control system.

Repeater operates with U-Prox IC L access control panel and U-Prox IP500 wireless battery powered escutcheons.

Wi-Fi (wireless LAN) used for U-Prox HW connection to U-PROX IC L.

The network settings of the repeater programming and firmware upgrade performed via a standard USB port (micro USB B).

U-Prox HW supports power supply external 12V DC (+E, GND) or standard micro USB power supply adaptor

Intended use

U-PROX HW repeater is designated for work in U-Prox access control system for U-PROX IP500 control panel network range extension.

Summary

- Power:
 - **External power supply, 12V:**
 - Current consumption max 150 mA @ 12V
 - Maximum voltage ripple 500 ma peak to peak
 - **Micro USB B** standard power supply
- Direct operation with U-Prox IP500 panels
 - ISM band device with bi-directional communication
 - ITU Region 1 (EU): 868.0-868.6 MHz
 - ITU Region 2 (USA): 902.5-914.5 MHz
 - ITU Region 3 (AUS): 915.5-927.5 MHz
 - Guaranteed range of 20 m
 - U-Prox IC L connection interface – wireless computer network Wi-Fi
- One micro USB B port for network settings configuring and firmware upgrade
- Communication interface IEEE 802.11b/g/n (Open, WPA-PSK, WPA2-PSK)
- Adjusted with U-Prox IP software. Supports automatic configuration for one-range network.
- Overall dimensions of device enclosure – 120 x 40 x 355 mm
- Temperature range: 0 - +55 °C at 80.% relative humidity.
- Maximum relative humidity 80% without condensation

Terms

Identifiers

In access control systems each user has a unique RF ID. Identifiers can take the form of a plastic card, key FOB etc.

Access point (AP)

Access point is a logical concept of the access control system implying control of passing through a door in one direction. It consists of reader, access control repeater (or its part), door supervision devices (like door contact, RTE button etc.) and door locking device. For instance, the turnstile with two-way passes has two Access points – one for entrance and the other one for exit, door of this type is called double-sided door. A door with a reader on one side has only one Access point – Entry point, and it is called single-sided door.

Downloading

Control repeater is to be downloaded after all parameters are set – modes of inputs, outputs, access rights and others. During downloading parameters are rewritten into access control repeater.

Description and operation

Repeater

The look of the repeater is shown in Fig. 1

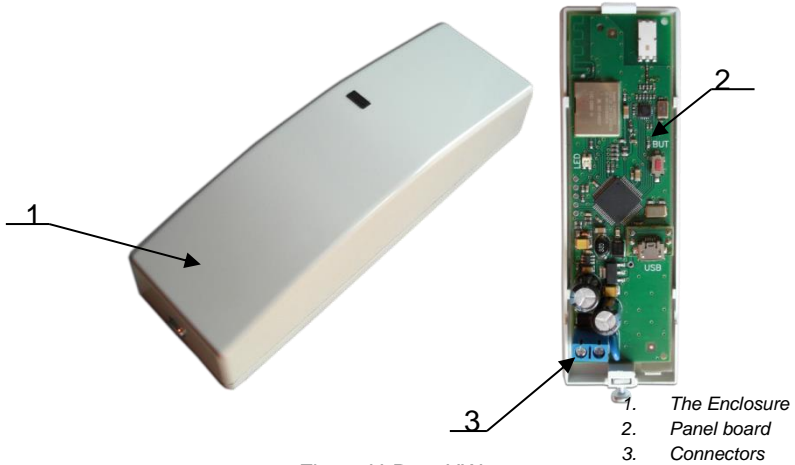


Fig. 1. U-Prox HW repeater

Location of connectors on repeater board and their function is shown in Fig. 2

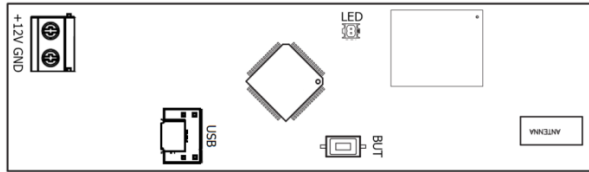


Figure 2. U-Prox HW board

Assignment of the repeater contacts and indication

Contact	Name	Purpose
+12V	+12V	External 12V power supply connection
GND	GND	
USB Connector		
Micro USB B	USB Connector	For network settings configuration and firmware upgrade
Button		
FUNK	FUNK	Service button

Light emitting diode

LED – bi-color light emitting diode

- No connection to the Wi-Fi access point - **Yellow flashes**
- Wi-Fi module malfunction – **Yellow lights steadily**
- Normal mode
 - No connection to the U-Prox IC L – red flashes 2 times per second
 - Connected to the U-Prox IC L – green flashes once per second
- Firmware upgrade - red flashes frequently

Repeater operation

The repeaters supplied unloaded with factory settings below in document. In this state, the bi-color LED on the repeater flashes red twice per second. To make the repeater work in access control system (ACS) you have to download a network setting using the "Configurator" software and USB port or use the automatic adjustment mode.

Repeater goes to the "Normal" mode after downloading the configuration.

To return to the factory settings use the command from the U-Prox software or with the routine described in Service Maintenance section.

In the Normal mode repeater processes information from U-Prox IP500 panels received through the built-in wireless ISM band interface and transmits it to U-Prox IC L through Wi-Fi and local computer network.

Communicator operation

U-Prox HW repeater operates automatically. After the download from the U-Prox IC L the data from U-Prox IP500 wireless control repeaters processed and access event messages are sent to the U-Prox IC L.

Repeater Communicator operates in **notification** mode that means that data transmission to the U-Prox IC L is initiated on the access event.

U-Prox HW repeater connected to the computer network with wireless network (Wi-Fi).

Both **local** enterprise computer network operation (see Fig.3) and **Internet network** (see Fig.4) operation via repeaters provided. This allows the distributed systems of any scale construction.

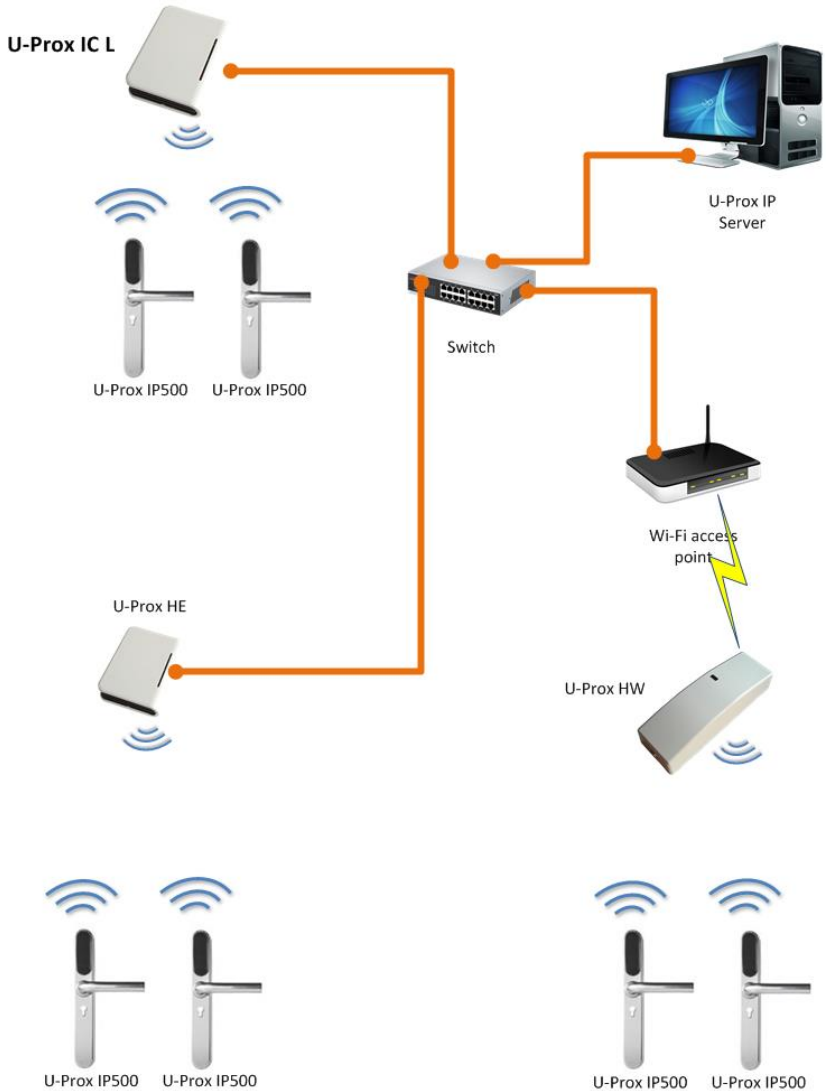


Fig. 3. Mixed type (Ethernet & Wi-Fi) local network connection example

Where U-Prox HE - repeater designed to expand the scope of the ISM band wireless interface. To connect to the network use Ethernet (wired computer network).

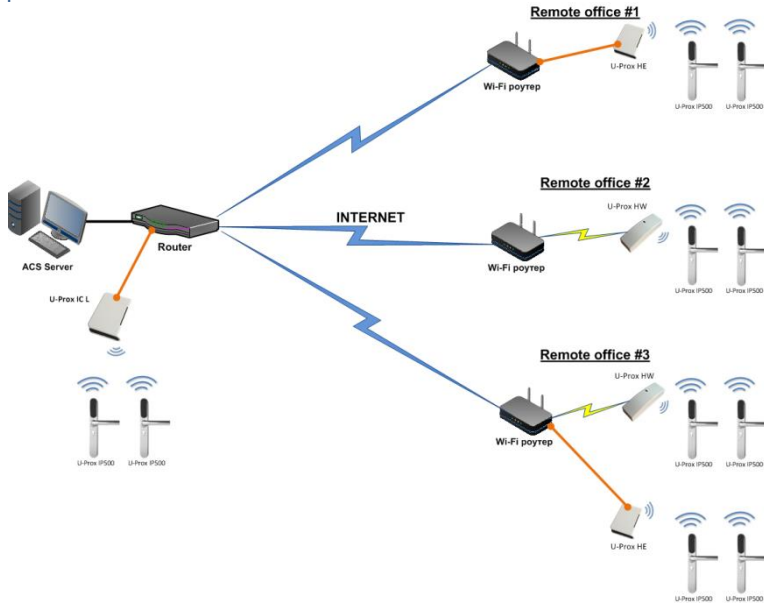


Fig. 4. Distributed network example

It is highly recommended to use VPN technology for computer network connecting central office with sites for additional security.
It is highly recommended to use routers with two different technology Internet access channels for redundancy.

For wireless communication channel (Wi-Fi) redundancy U-Prox HW supports operation with two Wi-Fi access points (main and backup) see Fig. 5.

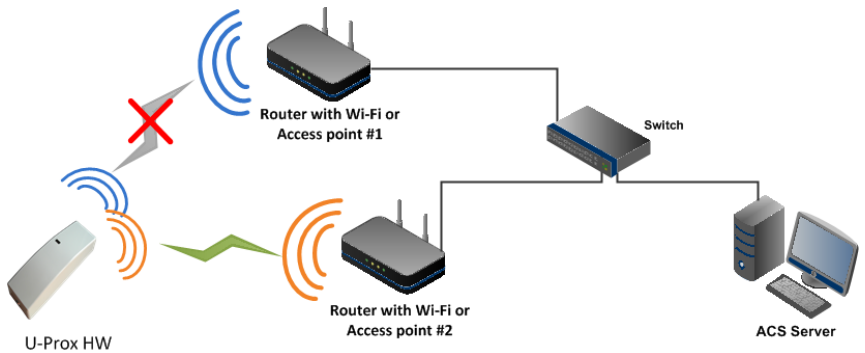


Fig.5 Redundancy in Wi-Fi network

Algorithm of working in LAN

1. Wi-Fi network accessibility determination
2. Connection to the programmed SSID#1
3. If DHCP - obtaining IP address with the start of the repeater
4. Update of IP status of address (announcement and extension of reserved IP, if DHCP)
5. Determine accessibility of U-Prox IC L (IP or DNS name)
6. Periodic sending of test signals
7. Sending events if there is. Waiting for server commands.
8. Failure - switch to the another SSID programmed

Algorithm of operation on the Internet (local wire net)

1. Wi-Fi network accessibility determination
2. Connection to the programmed SSID#1
3. If DHCP - obtaining of IP address within local network affiliate at repeater launch
4. Update of status of IP addresses (announcement and extension of reserved IP, if DHCP)
5. Determine possibility of access to the Internet (accessibility of given IP address of router)
6. Determine accessibility of U-Prox IC L (IP or DNS name)
7. Periodic sending of test signals
8. If there is, send the events. Waiting for server commands.
9. Failure - switching to the second specified IP address of router.
10. Repeated failure - switch to the another SSID programmed

Wireless lock system architecture

The architecture of the wireless locks system has definitely hierarchic structure. All U-Prox IP500 control panels operate in the automatic mode, i.e. make decision about the access using data downloaded beforehand.

U-Prox IP control panel routes data from the allowed U-Prox IP500 wireless panels via U-Prox HE and U-Prox HW repeaters. The U-Prox access control system server, U-Prox IC L, U-Prox HE and U-Prox HW communicate each other via the computer network. The U-Prox IC L, U-Prox HE and U-Prox HW communicate to the U-Prox IP500 wireless panels via the ISM band radio.

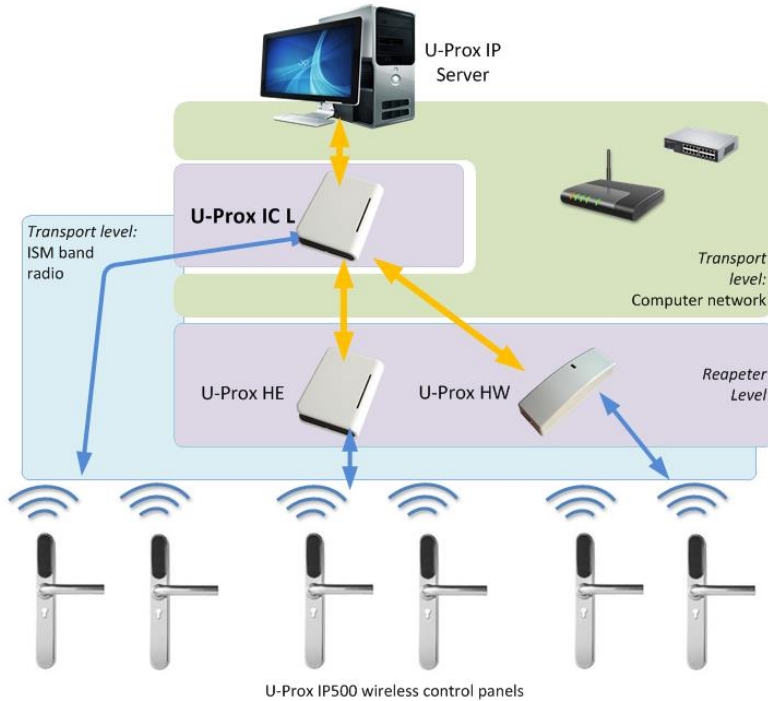


Fig. 6. Wireless lock system architecture

Wireless lock system deployment

The use of the existing computer network infrastructure, standard network protocols (DHCP for instance) allowed to provide the “plug-and-play” principle. The mode of the automatic server address configuration in the repeaters eases the wireless lock system deployment significantly.

The deployment is made in three steps (see Fig. 7.):

1. U-Prox IC L control panel connection
2. U-Prox HW repeaters connection
3. U-Prox IP500 wireless panels connection

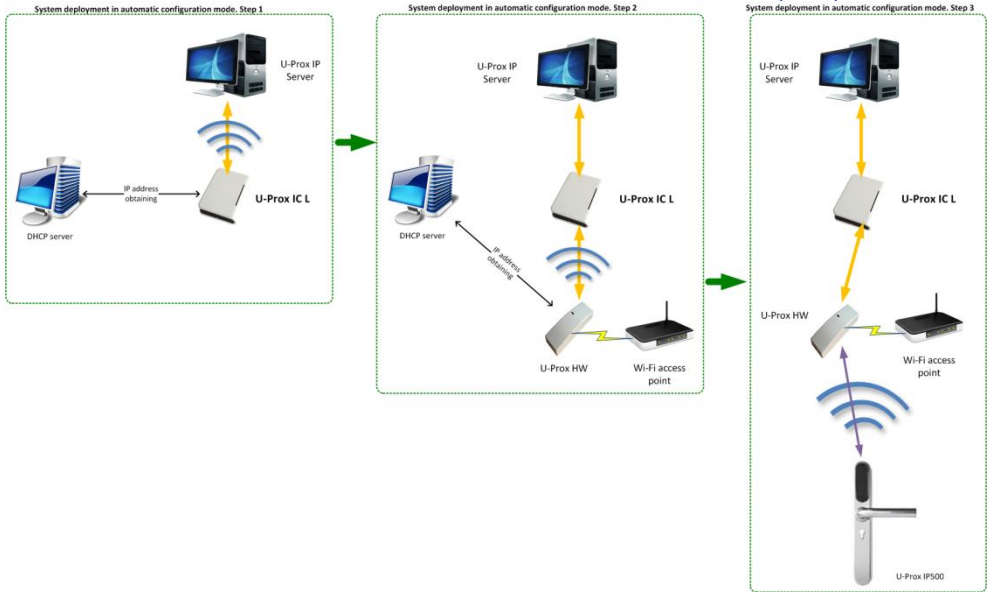


Fig. 7. Wireless lock system deployment

The algorithms for operation on each step described below

Server addresses automatic configuration for U-Prox IC L

1. Panel checks for DHCP mode ON (panel address 0.0.0.0) or static IP
2. If DHCP mode is ON, the dynamic IP address obtain routine will start
3. The panel automatic configuration mode starts if the access control system IP address (IP or DNS name) is not set:
 - a. Panel sends data packages announcing access control system server about itself as a new device in the local network

Despite it is broadcast announcement, it is limited with single range local network and active network equipment. That's why the IP addresses of the access control system server are to be set manually for networks with sophisticated topology.

- b. The system will warn operator after the receiving of the data package from the new panel. Than operator must add panel to the system database (DB).
- c. After the panel added to the DB it receives the answer from the access control system server. The address of the access control system server recorded into the control panel and it stops to broadcast.

- d. Operator has to download panel after its adjustment recorded into the DB. Panel will be connected to the certain access control system server, eliminating panel control capture with another system.

Return panel to the factory settings to eliminate the panel connection to the system

- e. In the case of access control system IP address change panel will initiate the automatic configuration routine, but the data exchange will be possible with previously connected system only.

U-Prox IC L addresses automatic configuration for repeaters

- 1. Repeater checks for DHCP mode ON (repeater address 0.0.0.0) or static IP
- 2. If DHCP mode is ON, the dynamic IP address obtain routine will start
- 3. The repeater automatic configuration mode starts if the U-Prox IC L panel IP address (IP or DNS name) is not set:
 - a. Repeater sends data packages announcing U-Prox IC L panel about itself as a new device in the local network

Despite it is broadcast announcement, it is limited with one range local network and active network equipment. That's why the IP addresses of the U-Prox IC L panel are to be set manually for networks with sophisticated topology.

- b. The system will warn operator after the receiving of the data package from the new repeater through the U-Prox IC L panel. Than operator must add repeater to the system database (DB).
- c. Operator has to download U-Prox IC L panel after repeater recorded into the DB.
- d. After the U-Prox IC L panel downloaded repeater, it receives the answer from the U-Prox IC L panel. The address of the U-Prox IC L panel recorded into the repeater and it stops to broadcast. Repeater will be connected to the certain access control system server, eliminating repeater control capture with another system.

Return repeater to the factory settings to eliminate the repeater connection to the system

- e. In the case of the U-Prox IC L panel IP address change repeater will initiate the automatic configuration routine, but the data exchange will be possible with previously connected system only.

U-Prox IP500 automatic configuration

1. U-Prox IP500 announces itself in the ISM band after the power-up
2. If U-Prox IP500 does not connected to anyone U-Prox IC L the automatic configuration mode will start:
 - a. Panel will broadcast data packages announcing itself as a new panel
 - b. Data packages are received with U-Prox HW repeaters and send to the U-Prox IC L control panel
 - c. U-Prox IC L panel sends event message to the access control system server
 - d. Access control system server warns operator about the new panel. Operator must add panel to the system database
 - e. Operator must download U-Prox IC L control panel after the U-Prox IP500 panel added to the DB
 - f. Operator must download U-Prox IP500 panel after the adjustment it in the DB. U-Prox IP500 panel will be connected to the certain access control system, eliminating panel control capture with another system.

Return panel to the factory settings to eliminate the panel connection to the system

3. U-Prox IP500 returns to the normal operation mode

How to work with the device

U-Prox HW repeater shipped in the plastic enclosure without the power supply. Dimensions marked on the Fig. 8.

Connection procedure

1. Perform initial network setup of repeater (that specifies settings of network parameters) with utility "Configurator" via USB port before installation, if it is impossible to adjust them automatically
2. Prepare the place for installation mark and drill mounting holes (see **Mount recommendations**)
3. Perform power wiring
4. Remove the repeater board from the enclosure
5. Install and fix the repeater enclosure back
6. Install the board into the enclosure
7. Connect the power wiring

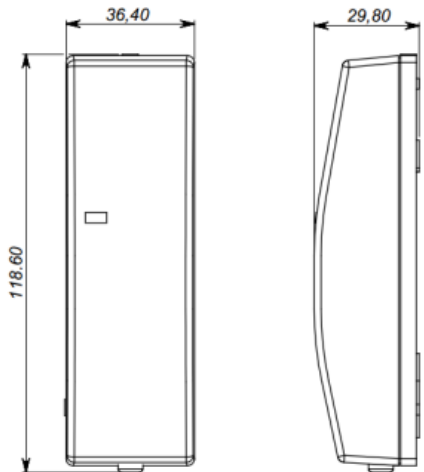


Fig. 8. Dimensions

8. Install and fix the enclosure cover with screw
9. Connect the repeater in the U-Prox IP software (according to the software manual)
10. Download the repeater
11. The repeater is ready for operation

Mount recommendations

Place the repeater in the place, convenient for service.

To mount the repeater on the wall (see Fig 9.) perform actions:

- Open the enclosure cover, remove the board and mark fixing holes using the enclosure bottom as template
- Pull the power wiring through the opening in the enclosure
- Fix the enclosure bottom
- Connect the power wiring

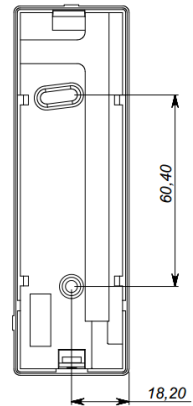


Fig. 9. Fixing holes marking

Communication

U-Prox HW uses wireless computer network and local computer network for connection to U-Prox IC L. Device setup is possible with using autoconfiguration or manually with a PC using the software "Configurator".

Appropriate configuration provides:

- static or dynamic (DHCP) IP address assign to the repeater
- operation with two (main and backup) IP or DNS (computer domain name) U-Prox IC L addresses
- operation in the Internet network with route backup possibility via the second redundant router

U-Prox HW repeater operates in automatic mode. It routes event message data from the allowed U-Prox IP500 wireless panels to U-Prox IC L panels connected to the Ethernet computer network after the configuration data download.

The repeater communicator operates in the **notification** mode that means that data transmission to U-Prox IC L panel is initiated on the access event.

Operating in the computer network U-Prox HW repeater provides encryption protection of the data and commands with 256 bit key, unique serial number supervision and communication channel supervision with periodical test messages.

Wireless computer network (Wi-Fi)

Repeater operates in wireless computer networks compliant to IEEE 802.11b/g/n (frequency 2.4GHz, encryption WEP (Open), WPA, WPA2). Repeater supports operation with two Wi-Fi access points (main and backup)

To adjust repeater Wi-Fi communicator perform:

- Adjust repeater Wi-Fi settings (for each Wi-Fi access point):
 - Network name – SSID
 - Password
 - Encryption mode
- Adjust repeater network settings (don't adjust when use DHCP):
 - IP address
 - Subnet mask
 - Gateway (router) Internet 1 IP address (no need in local network)
 - Gateway (router) Internet 2 IP address (miscellaneous)
 - DNS server 1 IP address (if data send to the domain name)
 - DNS server 2 IP address (miscellaneous; if data send to the domain name)
- Adjust communication to the server (no need in automatic configuration mode):
 - Server 1 IP or DNS name of U-Prox IC L control panel
 - Access ports (write port and read port)
 - Test message frequency

Repeater program order

Software	Actions
<p>“Configurator” through the USB</p>	<ol style="list-style-type: none"> 1. Define desirable adjustment mode: automatic or manual 2. Adjust initial settings if manual configuration used: <ol style="list-style-type: none"> a. Wi-Fi password, SSID, encryption mode (repeat for backup Wi-Fi access point) b. Server settings: IP address or server DNS name, access ports (write and read ports) <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Do not proceed paragraph c. if there is DHCP in the network</p> </div> <ol style="list-style-type: none"> c. Repeater settings: repeater IP address in the computer network, subnet mask, DNS server IP address, Internet gateway
<p>U-Prox IP software</p>	<ol style="list-style-type: none"> 3. Repeater connection and enrollment in access control system database (see U-Prox IP software instruction manual) 4. Repeater adjustment with U-Prox IP software <ol style="list-style-type: none"> a. Repeaters enrollment b. U-Prox IP500 wireless repeaters enrollment 5. Download repeater from U-Prox IP software

Service maintenance

Return to factory settings

To return to factory settings:

1. De-power repeater
2. Press and hold FUNC button
3. Supply power to repeater
4. Wait for 10 seconds, until LED diode lights and release FUNC button
5. LED diode will flash 6 times that means factory settings restored

Switching to programming mode

To switch repeater into the programming mode do the following:

1. Do not turn off the power.
2. Open enclosure
3. Connect cable to the USB and configure the device using the software "Configurator"

Replacing the device firmware

1. De-power the repeater
2. Remove the top cover of repeater
3. Connect the notebook with USB cable to the repeater
4. Using special software, do the replacement of repeater firmware
5. After downloading the software to the access control repeater WAIT for or 40-50 seconds. (If readers are connected wait for 6 short beeps)

Factory settings

Communicator

Wi-Fi is not set, DHCP enabled (no device IP set), no server set