WiFi House Automation System
Smart Home, Flat, Building

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http://www.isys.pl/download/eHouseWiFiEN.pdf

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1.Introduction

"Smart home" term means all sort of home, building automation systems for controlling, driving of independent systems and installations incorporated in the building. Home automation systems can manage many different building types: house, flat, offices, hotels, etc.

Home automation currently are most important system for tuning and equipping of the house.
Along with more and more expensive energy prices, ecology restrictions for new buildings, adjusting to investment expectations these system are practically inestimable.
Flexibility of some home automation systems allow to reconfigure it together with changes of expectations during usage of the building, without necessity of changing traditional electric installations together with drastic renovation of the house.
Home automation systems allow increase comfort of living, security, economy, save energy, reduce price of living in the house or flat.

eHouse Smart Home is advanced and versatile home automation system for any type of building, installation, budget. Currently it is available in 6 versions which can work together as one system taking advantage of various communication method, installation types, functionality and individual algorithms development.

1.1. Variants of eHouse home automation system

eHouse home automation system can operate in six basic versions:

- **eHouse RS-485** - **WIRED** working on the industrial serial bus under PC, eHouse.PRO or CommManager supervision (based on large controller RoomManager for room mini-switch-boards). Dedicated especially for hotels, pensions, offices installations and access control applications

- **eHouse LAN (Ethernet)** - **WIRED** working directly in Ethernet (LAN) network topology (based on large controller EthernetRoomManager for room mini-switch-boards). Dedicated especially for homes, buildings, apartments installations

- **eHouse.PRO** – centralized version for Main Switch-Board for whole building. Very large controller (128 inputs on/off with security system functionality, 128 on/off outputs with drive control, integrated security system) under Linux based micro-computer

- **eHouse WiFi** – **WIRELESS** working directly in WiFi architecture (full cooperation with eHouse LAN, PRO in the same LAN/WiFi networks) – based on small All-In-One controller. Do not require devastation of building during installation. Can be used as standalone system or as extension of eHouse Wired installations

- **eHouse CAN** – **WIRED** working on a Controller Area Network serial bus under the supervision of Linux micro-computer. Installable in electric socket cans. Dedicated for small wired installation up to 100m mostly in flats and apartments

- **eHouse RF** – **WIRELESS** based on radio MESH network working in one of Sub-GHz (868MHz, 902MHz or 915MHz) bands under Linux micro-computer supervision. Installable in electric socket cans. Dedicated for small wireless installations in finished flats and apartments

- **eHouse HYBRID -** based on eHouse.PRO Server for any combination and integration of all eHouse communication, installation and functional variants

Management from:

- IR Controller
- Smartphone, PADs, PODs, Mobile Phone, Smart TV
- Web Browser
- PC, micro-computers, micro-controllers

Software:

- Windows
- Linux
- Android
- Web Browser
- Java
- Programming Libraries: Java, Delphi, C, C#, PHP, JavaScript, SVG, Android, HTML, etc.

Control:

- Home, building, apartment, flat, hotel, office, campers, boat, yachts, premises
- via Ethernet, Internet, WiFi, IR, BlueTooth, Email, FTP, file system, web browser
- Lighting: ON/OFF, LED / RGB dimming, Scenes, Programs
- Heating (Central / Individual): boiler room, fireplace, ventilation, convection, floor, heat-pump, solar system, recuperation, electric
- Audio-Video, HiFi, TV Systems via IR, WiFi, LAN
- Alarm, Security System with SMS control and notification, any sensors, imitate the presence of humans
- Drives: Actuators, Rollers, Gateways, Gates, Windows, cutoffs, Servomotor
- Scheduler, Calendar, advanced programs, scenes

Installations:

- Economic / comfort / VIP
- Wired (Ethernet, RS-485, CAN)
- Wireless (RF 863 / 902 / 915MHz, WiFi, GSM)
- Central switch-board
- Room switch-boards
- Socket cans

- Third party hosting (lights covers, sockets)

1.2. All eHouse smart home modules

- Room controller - RoomManager (RM) {eHouse RS-485}
- Ethernet Room controller - EthernetRoomManager (ERM) {eHouse LAN}
- Rollers, gateways, gates controller - ExternalManager (EM) {eHouse RS-485}
- Flat controller - LevelManager (CM / LM) {eHouse LAN}
- Boiler Room, ventilation, recuperation controller - HeatManager (HM) {eHouse RS-485}
- Rollers, gateways, gates controller with Ethernet, GSM and integrated security system - CommManager (CM) {eHouse LAN}
- Smart I/O controller CAN (Controller Area Network) { eHouse CAN}
- Smart I/O controller RF (MESH wireless network 868 or 915 MHz) {eHouse RF}
- RS232/RS485 Converter {eHouse RS-485}
- RS232/CAN gateway {eHouse CAN}
- RS232/RF gateway and PAN RF network coordinator {eHouse RF}
- eHouse PRO centralized installation I/O modules

The modular nature of the eHouse system installation allows you to select individual variant of installation, which will be suitable for every investor such persons installing the system in homes that do not require shutters security system controller, driver or CO boiler installations intelligent building. These people can resign out of these modules and install only the modules: RoomManager or LevelManager to control lighting, multi-point heating, Audio / Video equipment, etc.

Alternatively, a smaller eHouse WiFi Intelligent Home modules can be used for placing in neighborhood of controlled devices whenever we need without devastation of building. eHouse WiFi directly cooperate with eHouse LAN, PRO installations in the same network infrastructure WiFi/LAN.

It is possible to create any hybrid installation using one of following eHouse system components:

- LAN
- PRO
- RS-485
- CAN
- RF
- WiFi

and integrate them in one eHouse system with eHouse.PRO server application for Linux. This gives possibility eg. to use wired LAN controllers (in the rooms) and WiFi controllers outside or far from building where it is not economical or easy to put cables. WiFi controllers additionally gives workaround to add anything to the system, if we missed something on stage of creating wired installation.

2. eHouse WiFi

eHouse WiFi system is an advanced solution of smart/electronic home, allows you to control and integrate multiple devices of various types.

eHouse WiFi devices are small all-in-one controllers which use existing WiFi network infrastructure (2.4GHz b/g/n) not requiring any other cabling except connecting power supply and controlled devices. Up to 250 controllers can be installed in single installation (network mask 255.255.255.0). WiFi coverage is required for wireless working all over controlled area (up to 3 different SSIDs).

eHouse WiFi can work in home, building, hotels, offices and other building and object types. eHouse WiFi controllers can work standalone and with PC/microcomputer support (eg. Raspberry Pi, RPI 2, Banana PRO, x86, x64). It is 100% compatible with eHouse LAN, eHouse PRO home automation systems and can be workaround in case of expanding systems or use wireless variants where cables are uneconomic or can't be placed. eHouse WiFi can also create new home automation systems without devastation of the building as in wired systems. eHouse WiFi controllers are much more functional than eHouse LAN, eHouse RS-485 controllers (comparing to outputs, inputs, dimmers, measurement inputs).

eHouse WiFi can be supported with PC or any microcomputer system based on Linux (eg. Raspberry Pi, Raspberry Pi 2, Banana Pi / PRO) operating system. Bundled software eHouse4cServer (partially Open Source) allows full control and system integration of eHouse WiFi with other versions of eHouse system: RS-485, LAN, PRO, CAN, RF and future products.

Apache web server software with eHouse4Apache module enables integration eHouse4CServer, eHouse.PRO which allows complete control, management from a Web browser. This way, the user has full choice of control panels, smartphones, Pads, Pods, Smart TV or web browser.

eHouse System is a modular, enabling optimal use of controllers, adjusting the installation to suit your needs and the planned budget. eHouse WiFi system is made in a decentralized wide area network architecture, allowing local control of individual points and minimizing electrical 230V wires length several times and repeatedly reduces the financial outlay for the installation compared to centralized systems.

eHouse WiFi are all-in-one smart controllers - have small dimensions (61*52*27mm) and can be mounted directly in light covers or near other devices. eHouse WiFi controller may contain up to 4 relays 230V/5A for direct switching of electrical appliances or power. It can contain up to 3 LED Dimmers 12V/2.5A each. It also may contain 230V power supply on board.

"**eHouse WiFi**" controllers are wireless, using standard WiFi 2.4GHz b/g/n architecture which makes it ideal for installation in old building without any devastation. It is also very suitable for outside installations (sensors, outputs) - where putting wires would be very difficult, impossible, unsafe and very expensive. eHouse WiFi architecture is very suitable for system expansion in the future whenever new control, management, measurement device is necessary to extend the system.

WiFi network coverage is assured by proper amount (one or more depending of size and architecture of object) and location of WiFi routers connected together with Ethernet cable for best results and stability. eHouse WiFi controller can use up to 3 independent network infrastructure

(SSIDs/Passwords connecting to nearest/strongest). Before configuration of WiFi routers user should test busy WiFi channels with WiFi scanner application eg. for smartphone in various places. Busy channels shouldn't be used by eHouse WiFi for best stability, traffic. Channels should be set manually on the routers at least 2 channels space each (disable auto channel control which may break WiFi links between routers and controllers). Some routers may use 2 channels where set to higher speed/transfer operation. The best way is to set free (odd) channels - different for each WiFi router.

Connecting routers in repeater mode is much less stable than with Ethernet LAN cables. Repeater mode can cause problems with automatic reset/reconnect of the routers (may break WiFi links between routers and controllers and force multiple restarts of devices). When using different channels for each router there won't be collisions between them and networks, routers with the same SSID may exists in infrastructure (however more intuitive way is naming all WiFi router with unique SSID). Creating WiFi infrastructure as on image will ensure most stable work of eHouse WiFi controllers. Controllers will connect to strongest WiFi router in its location.

Very important issue during designing wireless installations is limiting effective distance crossing the walls, chimneys and other obstacles. For angles other than 90 degrees effective distance (in walls) will rise seriously, which is much more critical than in free air and strongly limit wireless range. The best way is observe signal strength for each device and keep it in range (-70dB, 1dB).

eHouse -WiFi - Smart Home, Home Automation System
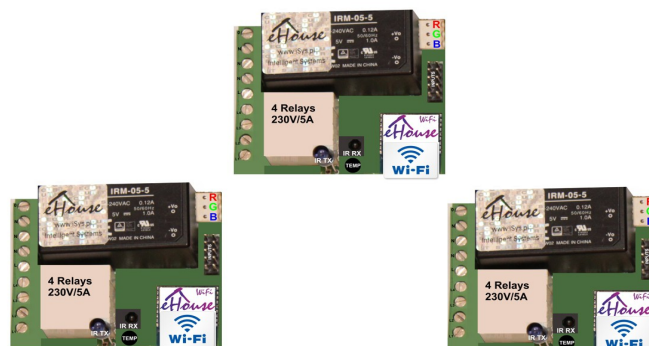

SSID1
CH 1
WiFi 2.4GHz b/g/n
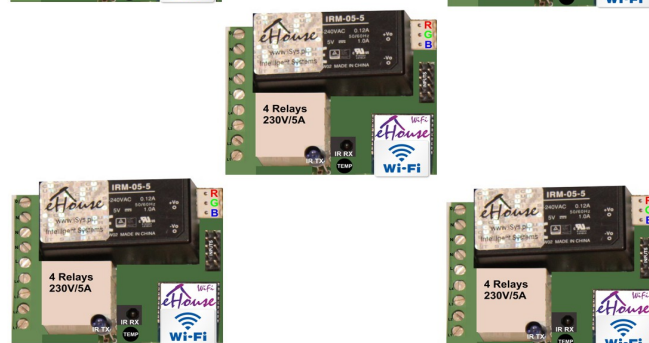Ethernet (UTP-8)

SSID2
CH 3
WiFi 2.4GHz b/g/n
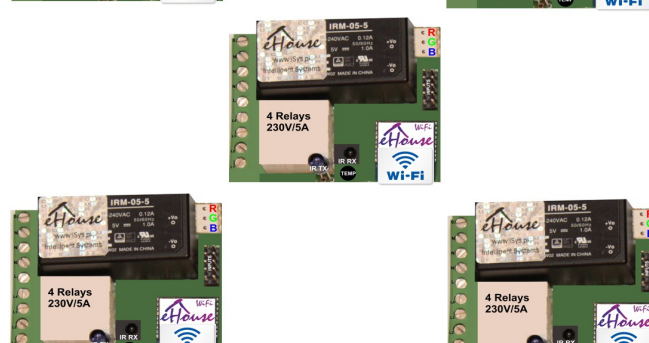Ethernet (UTP-8)

SSID3
CH 5
WiFi 2.4GHz b/g/n
Ethernet (UTP-8)

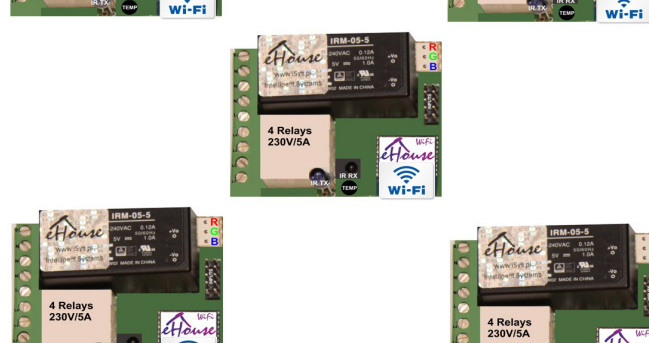SSID1
CH 7
WiFi 2.4GHz b/g/n
Ethernet (UTP-8)

SSID2
CH 9
WiFi 2.4GHz b/g/n
Ethernet (UTP-8)

SSID3
CH 11
WiFi 2.4GHz b/g/n

WiFi coverage over the building & premises / Pokrycie zasięgu WiFi dla budynku i działki

2.1. Features and capabilities of eHouse WiFi system

eHouse WiFi system is based on a small electronic controller with WiFi transceiver and 32b low power processor, which also has a much greater variety of system events and its spectrum, in principle, cover all functions of drivers eHouse RS-485 and Ethernet eHouse controllers.

This architecture is particularly advantageous in the case of:

- low-budget installation - a small amount of controlled points
- highly dispersed controlled points in installation
- installations performed during the renovation (not in the raw state of the building) or in finished buildings – no devastation
- installations where previously laid cables 230V and the investor before plastering the building decided at the last minute for building automation
- very small amount of roller shutters, doors, awnings, and other drives and unprofitable CommManager or eHouse PRO controller installation
- there is no need to use advanced boiler control HeatManager
- wireless radio home automation WiFi version
- expansion of eHouse LAN, eHouse PRO home automation variants with wireless functionality

eHouse WiFi Smart Controller has the following possibilities:

- complete control of electrical equipment, electro-mechanical, electronic (on/off)
- control Audio - Video equipment (learning and emulation of IR RC signals)
- measurement and control of light level
- measurement and control of heating - temperature
- multi-point, hybrid control of heating - individual heating by various sources in the rooms
- control of boiler and central heating
- ventilation control, recuperation, intakes, heat exchangers
- boiler control
- control of the fireplace with a water jacket and/or the distribution of hot air
- control of solar systems
- control of a heat buffer - tank and DHW
- graphical visualization of events - individually created images of rooms and devices (web browser, Java or Android)
- control system, roller shutters, awnings, gates , windows, servos and other drives in many standards
- creation of logs in the system (PC)
- the use of third-party actuators, components and systems (such as water valves, electronic locks, gateways, gates , electronic controlled awnings and blinds, etc.)
- the use of analog and digital sensors , third-party devices (eg. motion detectors, gas, humidity, wet, fire, etc.)
- control system via a Web browser from any device and operating system
- remote control of the system via the IR remote controllers (Sony standard)

- text and graphical remote control via LAN , WiFi , Internet from Web browser
- graphical remote control by mobile phone PDA, smartphones, Pads/Pods, Smart TV or other device with a touch panel (Android application WiFi, SMS or eMail, JAVA, Web browser)
- notification of alarms via SMS and change zones (to preset groups of people) (eHouse4cServer, eHouse.PRO)

eHouse system has built-in self-monitoring and the creation of logs, which ensure reliable operation of the system and allows rapid recovery in the event of problems.

2.2. eHouse WiFi Intelligent home - electronic controller

eHouse WiFi controllers works directly in WiFi 2.4GHz b/g/n network:

- can work in AP (Access Point Mode) – create its own WiFi network (SSID)
- can work as WiFi station – connected to WiFi infrastructure (up to 3 WiFi networks SSIDs considering signal strength – taking the strongest one)
- send their statuses via UDP protocol for external devices and software
- contain TCP/IP client/server for direct communication to eHouse LAN/PRO controllers and eHouse Software in common LAN/WiFi network
- contain WWW server (REST) for direct control/integration to other systems
- can send log data to UART port or via UDP protocol
- configuration can be performed by eHouseWiFi.exe (Windows) intuitive application for eHouse LAN/WiFi management
- contains SNTP client for time synchronization

2.3. eHouse WiFi smart home system controller hardware resources

eHouse WiFi smart controller is a "32bit micro computer" with power drivers, for control electrical appliances, electronic and electromechanical in its close location. It can be remotely controlled from IR RC controller and manage Audio-Video systems via IR. It also can measure and regulate eg. temperature or other physical parameters.

eHouse WiFi smart controller has the following hardware resources:

- 4 smart/programmable outputs with relays (230V/5A AC/DC) to turn on/off devices (resistive load)
- 0..4 smart/programmable inputs (on/off), which can be connected to external sensors, switches or mechanical switches for information of opening doors, windows, etc. These inputs, can be assigned to specific events, triggered on by change of state
- 1 analog inputs - measurement (0..1V) range with programmable thresholds (min, max), which can be assigned to specific events (when crossing the threshold). ADC input can be connected to the temperature sensor (-50C,+50C), lighting, wind strength, humidity, voltage, etc.
- 3 smart/programmable dimmers PWM / DC (Pulse Width Modulation) with 12VDC/2.5A drivers, regulating the level of decorative LED / RGB LED lighting

- WiFi 2.4GHz b/g/n module
- 32b RISC Tensilica CPU
- RS232-TTL, SPI, I2C ports to install system extensions - future and dedicated applications
- built-in RTC clock
- infrared receiver (IR) to control eHouse from IR RC / panel (in Sony – SIRC standard)
- infrared transmitter (IR) to control external audio/video devices, with learned IR remote control signals (tents of standards)
- the ability to connect up to 100 (theoretically 250) of **eHouse WiFi** controllers
- 230V/12V Switching power supply (optional)
- 12V/3v3 linear stabilizer / optionally 12V/3v3 DC/DC power supply

Any eHouse WiFi smart home controller is configured via eHouseWiFi.exe (Windows) application compatible with eHouse LAN system (formerly CommanagerCfg.exe) that allows you to program all the parameters of the module and to program the startup conditions of all signals. Each signal has a number of events and options dependent on signal type and are discussed later in this document.

Relay Contacts max 230V/5A

WiFi PCB Antenna

Relays

Only Resistive Load

WiFi 2.4GHz b/g/n
TX/RX

VCC RELAY

VCC RELAY

VCC RELAY

VCC RELAY

L1
230V/5A
REL 1

L2
230V/5A
REL 2

L3
230V/5A
REL 3

L4
230V/5A
REL 4

L1
L2
L3
L4
N
N
N

P3
1
2
3
4
5
6
7
8
9
230V

Load
Load
Load
Load

Power
0-230V AC/DC

SW Power Supply
230V / 12V & 3v3

Back Light

max 20mA

10 RESET
9   OUT4
8   PGM
7   3v3
6   0 V
5   0 V
4   100 IN 2 / IRRX
3   100 IN 4 / TX
2   100 IN 1 / IRTX
1   100 IN 3 / RX
INPUTS

PROGRAM

GND

Switches

TEMP (-50..+50C)

1   VCC
2   ADC1
3   GND

LED DRIVER

3*PWM 12VDC/2.5A

Fuse

GND

3*2.5A

VCC RELAY

DIMM+PW
1
2
3
4
5
DIMM

Blue
Green
Red
+12V
Common Anodes

LED RGB Strip 12VDC
max 2.5A/Channel

LED POWER Supply
12V/8A

eHouse WiFi Controller
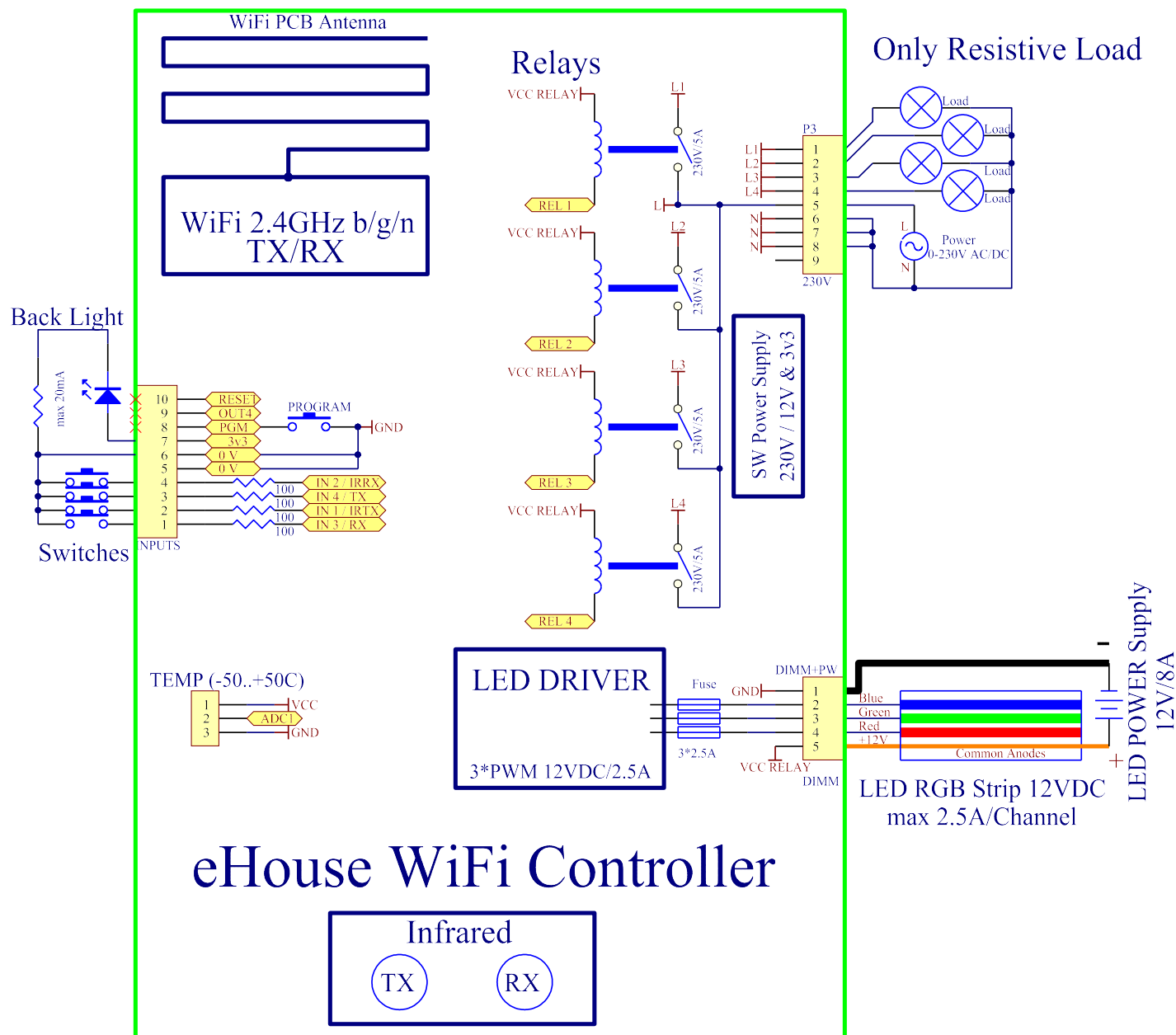
Infrared

TX   RX

Figure 2 Functional diagram of the smart eHouse WiFi controller.

The signals are divided into input and output signals.

The input signals are:

- all analog inputs (measuring)
- all inputs (on/off)
- infrared receiver (IR RX)

The output signals are:

- digital outputs (on/off)
- dimmers (PWM output)
- infrared transmitter (IR TX)

Although smart "**eHouse WiFi**" can work in local network (WIFI) independently from the PC (acting all programmed functions and control other units {eHouse WiFi/LAN/PRO} in the WiFi network) PC (micro-computer) increase its functionality and integration possibility.

The PC also allows you to:

- the creation of logs in the system
- receiving control commands from the Internet
- receiving control commands via TCP/IP
- receiving UDP statuses and logs
- receiving control commands via SMS
- send SMS alerts through GSM modem
- future receive control commands from other media of communication
- visualization control of your PC and the Internet
- playing acoustic communicates from the system
- monitoring operation of the system and information about errors and problems
- perform dedicated algorithms to expand eHouse system functionality
- increase its functionality (with the user's own algorithms)
- multimedia features – VideoLAN
- integration with external systems, Audio-Video, TV
- control and configuration from a web browser
- advanced support for IR and related events
- graphical visualization and control from Web browser
- transmission of data and events to other versions of eHouse system: RS-485, LAN, PRO, RF, CAN
- WWW server, control, management and integration from web browser or Html Request
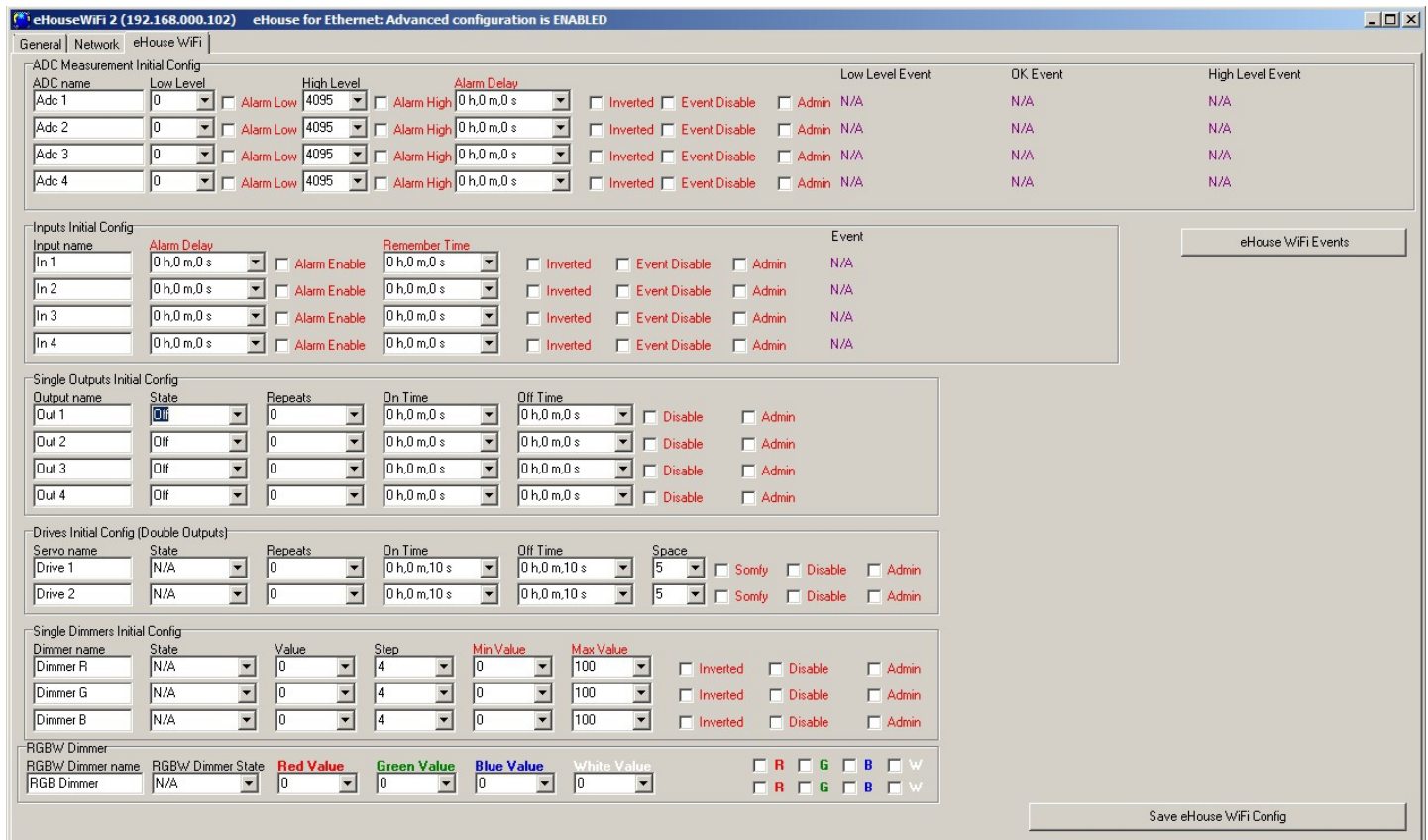
2.4. Description signals and configuration

eHouse WiFi system is configured with the same application as eHouse LAN system eHouseWiFi.exe (formerly CommManagerCfg.exe) for compatibility.
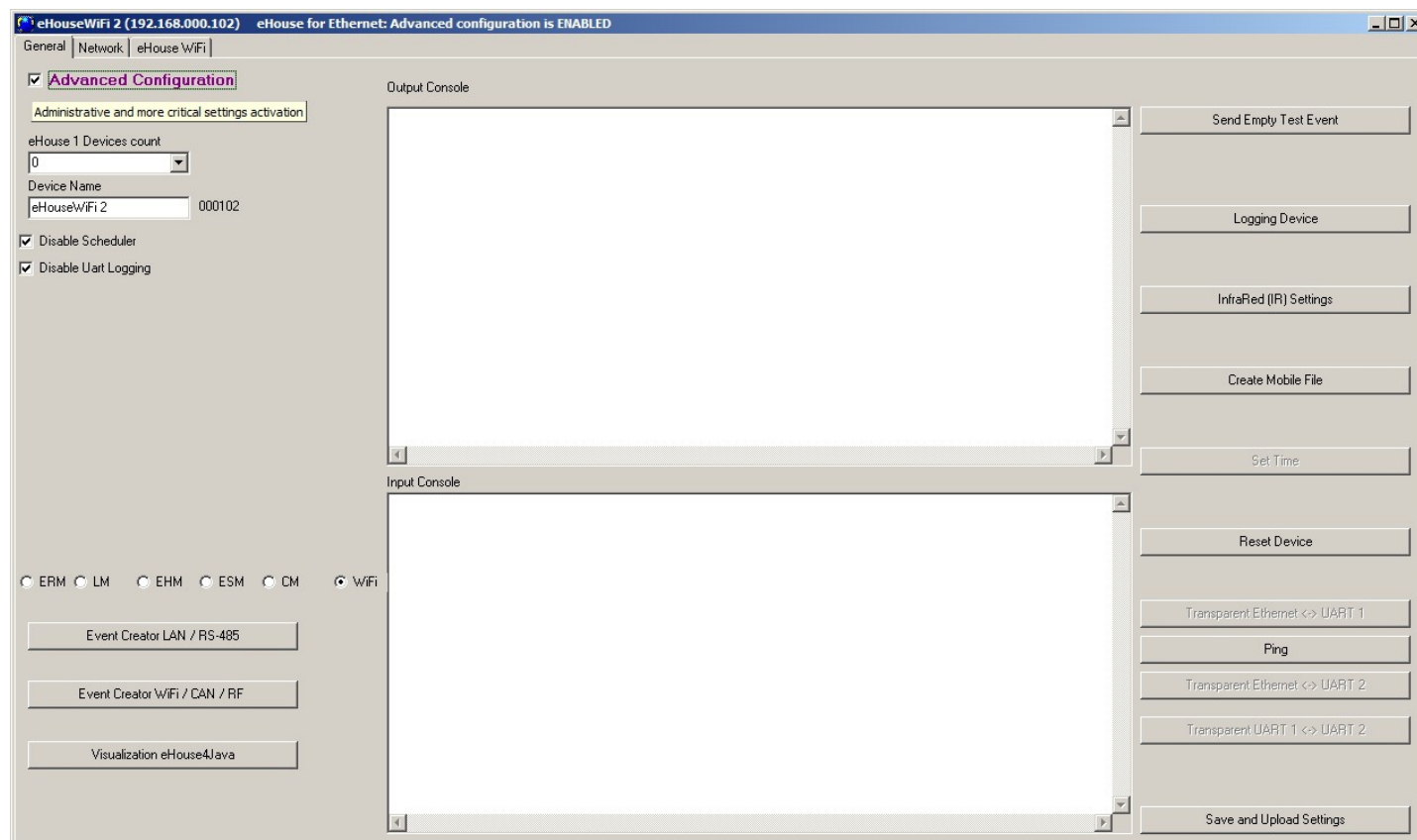
For **eHouse WiFi Controllers** address contains 2 bytes.

1. Higher byte should be the same as for LAN, PRO installation (shouldn't be 1,2,55,127,128) because eHouse applications recognize controller type by high address (as other communication versions RS-485,CAN, RF)

2. Lower byte should be in range 101..199 for WiFi intelligent home controllers (Address above 199 are recognized as eHouse PRO or eHouse LAN controllers. For larger installations 1..250). Higher addresses are reserved for special function devices. Controllers should be addressed sequentially 101,102,103....

This convention enables recognition of any eHouse controllers by address (in any combination of hybrid installation) and transmit events to different installation types from eHouse visualization/control panel applications.

Initial Configuration settings for eHouse WiFi controllers (eHouseWiFi.exe application)

2.4.1. Analog measurement inputs (ADC)

eHouse WiFi Controller contains one analog input which has a measuring range <0..1V). Resolution of measurement is 10 bits (1024 levels). It gives about 1mV step for measurement. There are 2 thresholds (Low {Umin} and High {Umax}) for operations

Depending on the input voltage (Ux) there are 3 cases:

- Ux < Umin when crossing threshold (downwards) the event is triggered, programmed in eHouseWiFi.exe application in "LOW Level Event" field
- Umin = < Ux < = Umax when crossing one of thresholds (in direction Ux) the event is triggered, programmed in eHouseWiFi.exe application in "OK Event" field
- Ux > Umax when crossing threshold (upwards) the event is triggered, programmed in eHouseWiFi.exe application in "HIGH Level Event" field

It should be noted that these are event codes "Direct Event" managed in Event Creator.

Another point is the thresholds of minimum (Umin) and maximum (Umax) measurement for inputs in the fields: "Low Level" and "High Level". If you cross the value of these thresholds by the sensors will be running events associated with them respectively.

These inputs in relation to eHouse RS-485 or eHouse LAN controllers have a much more features and functionality.

Additional options for analog inputs:

- **Invert (*)** - the input is an negative scale mapping i.e. 100%-x

- **Alarm Delay** - delay issue alarm by the programmed time. This feature is very helpful for example when we measure a parameter, and run the event "to control" parameter. After the time of alarm delay if the value is not corrected (regulated) by the actuator the alarm is issued

- **Alarm LOW** - activating an alarm in the event of dropping measured value below the lower threshold. The alarm is activated with delay set in the "Alarm Delay" if the value is not corrected (regulated) before this time

- **Alarm HIGH** - activate the alarm in case of increase measured value above the upper threshold. The alarm is activated with delay set in the "Alarm Delay" if the value is not corrected (regulated) before this time

- **Disable Event** - blocking action thresholds related to events such as: if it is winter it is not necessary to control the solar collectors etc.

- **Admin (*)** - administrative settings. Some parameters can be changed only after setting "Admin" flag to protect against accidental erroneous controller configurations such as changing the flag "Invert". Fields required Admin flag to be set are marked with red color in eHouseWiFi.exe application

(*) - Requires setting a flag Admin to modify this parameter.

Although eHouse WiFi controller contains only one real analog input, "eHouseWiFi.exe" application contains 4 ADC inputs to configure (future solutions and variants). It could be used for referencing analog sensors with digital serial interfaces like I2C, SPI, UART.

2.4.2. Digital inputs (on/off)

Input has 2 logical states (inverted logic for safety – shortening to 0V for activation): low (0) left open and high when short to the 0V. With the change of state from low to high - controller run event programmed in the "Event" field for the appropriate input programmed in eHouseWiFi.exe application.

There are 4 on/off inputs internally connected to some other controller resources (IR RX, IR TX, UART).

The Count of available inputs depends on hardware implementation, configuration and usage of

other hardware resources (IR Transmitter {I1}/ IR Receiver{I2} , UART TX {I3}/ RX {I4}). Digital inputs (on/off) available for usage are internally connected to +3.3V by setting configuration of microprocessor inputs for inverted logic – activation by connecting to 0V (I2, I4). I1 input is internally connected to 0V by resistor of IR TX driver (has positive logic – should be connected to 3.3V for changing its state). I3 input depends on controller configuration.

Do not connect I1, I2 inputs if IR receiver or Transmitter is installed or output is configured for IR RX/TX.

To change normal input state (inverted) it should be shorted to ground (0V) through switches, sensors, etc.

There must be potential free contacts (without the applied external voltage), otherwise the voltage differences between grounds of the two systems or sensor damage, may result in exceeding the absolute maximum ratings of the system and damage the controller or make it unstable (eg. Reset without reason).

With the change of state from high to low to execute event programmed in "Direct Event" field for the appropriate input set in the web browser on the form of the controller configuration. This should be performed as discussed in the section on measurement inputs. Each input has an inertia about 0.5s to protect from responding to electromagnetic, electrostatic interference. It is therefore necessary to hold switch for more then 0.5s, to run programmed event. The same applies to the contact release: requires a pause between switching on and off about 0.5s, otherwise controllers treat the pulses as interference and ignore them. This protects output devices controlled by inputs from repeated turn on/off of the supply voltage (for example, children playing), thereby reducing the risk of damage to the device connected to the system.

Digital inputs are also much more functional in relation to eHouse RS-485 & LAN controllers inputs. In addition to the event assigned to run, a number of parameters associated with the inputs which are used for the advanced configuration:

- **Inverted** - negated input event is triggered when you release the switch, if you use contactors normally closed (eg. alarm detectors, reed confirming the closing of windows, doors, gates, etc.)

- **Alarm Enable –** when flag is set to raise an alarm associated with the input, the time set in the "Alarm Delay" if the input is still active after this time

- **Alarm Delay** - delay of the alarm for a programmed time. This parameter is especially valuable when you want to run the event, along with the inclusion of the switch or sensor which removing the cause of alarm during alarm delay time. An example might be a situation when we apply sensor for water level in the drainage wells to dry the building, associated with the event inclusion drain pump wells. In normal situations, when the pump will empty wells before the expiration of "Alarm Delay" time, the alarm will not be triggered. However, in case of failure, power failure or pump failure we will get an alarm

- **Remember State** - time of memorize the state of input, not to overlook the state change, as long as we are dealing with an important input or sensor

- **Event Disable** – Disable Event launch (if not necessary eg. season period)

- **Admin** – administration flag is necessary for changing serious input configuration parameters eg. inversion. Fields required setting admin flag are marked with red color on eHouseWiFi.exe application

2.4.3. Digital outputs with relays

eHouse WiFi controller has 4 digital output and up to 4 relays can be installed directly on its PCB.

Digital outputs turn on/off electrical equipment – by shorting (1 - closing) and open (0) relay contacts. It can be run as event automatically, manually from the control panel, assigned to the inputs (on/off), IR remote control, or as a consequence of the particular state of the system (eg low temperature, change input state, etc.). Digital outputs scheme is analogous to the eHouse RS-484 & LAN controllers, except that implementing relays are mounted on the controller board. Digital outputs are directly connected to relays 230V/5A. Relay contacts has all **Common** contacts shorten together for ease of connection.

Digital outputs have much more functionality than eHouse RS-485 or Ethernet controllers and have integrated functions available in all types of drivers (RoomManager, CommManager, HeatManager, ExternalManager).

Digital outputs switch on/off - can operate in the following modes:

- **single** (individual) outputs (switching standard electrical devices on/off)
- **dual outputs** (actuators control shutters, doors, awnings, windows, solenoids, actuators adjustable in both directions – open/close/stop)
- **quad outputs** - all outputs working together, such as power control vents, heat recovery ventilators, fans, etc.

In addition, the settings are implemented functions:

- cyclic repetition of events
- count of repetitions
- on time
- off time
- control output in the operating mode (single, double, quadruple)

Modes are set independently for each output.

Single output mode:

- **Disable (*)** - blocking the output in single mode, if you use another operating mode for outputs. All events related to the individual output are ignored. Mostly for safety reasons (eg. when using in dual mode {drives control} – protection against accidental launch of event)

- **Admin** - Administrative flag unlocks advanced features for the security and safety configuration of external devices. Fields marked with red color on eHouseWiFi.exe application requires setting Admin flag

- **State** - The state of the output (Off/On/Toggle)

- **Repeats** - number of repetitions of the event beyond the initial start-up

- **On Time** – keeping output on for this time, after the expiration, the output will turn off automatically (if 0 output will be ON permanently)

- **Off Time** - output off time. This parameter is relevant if the "Repeats" is greater than 0, the output will be turned on again after the expiry of the above time

Dual outputs mode (one output direction Down (-), the other Up (+) - for safety we suggest to disable all outputs for single events):

- **Disable (*)** - blocking the outputs pairs working in dual mode, if you use another operating mode outputs. All events related to the dual outputs are ignored

- **Admin** - Administrative flag unlocks advanced features for security and safety configuration of external devices. Fields required setting of Admin flag are marked with red color in eHouseWiFi.exe application

- **Somfy (*)** - set "Somfy" drive standard mode

- **State** - The state of the output (N/A, Down, Up, Stop) for Somfy. (Stop, Down, Up, Stop) for all other drives

- **On Time** - Time on before stop the Up / Down outputs, after the expiration of the output will turn off automatically

- **Off Time** - time off for Up / Down outputs. If it is greater than 2 this time is treated as a "Disable Time" (**Space)** (Used for cyclic operations **Repeats**>0)

- **Space (*)** - the time for disabling outputs when changing movement direction of the drive. Protection against drive damage as a result of too rapid changes in direction or attempt to run simultaneously in both directions. The driver waits before turning on any output - this time causing delay in change of state. If the "Time Off" is greater than 2 - "Disable Time" is ignored

- **Repeats** - number of repetitions of the event beyond the initial start-up

(*) - Parameter change requires setting a flag "Admin"

2.4.4. PWM output (LED Dimmers)

PWM outputs are DC dimmers (Pulse Width Modulation), in which the duty ratio of square wave is controlled from 0..100%.
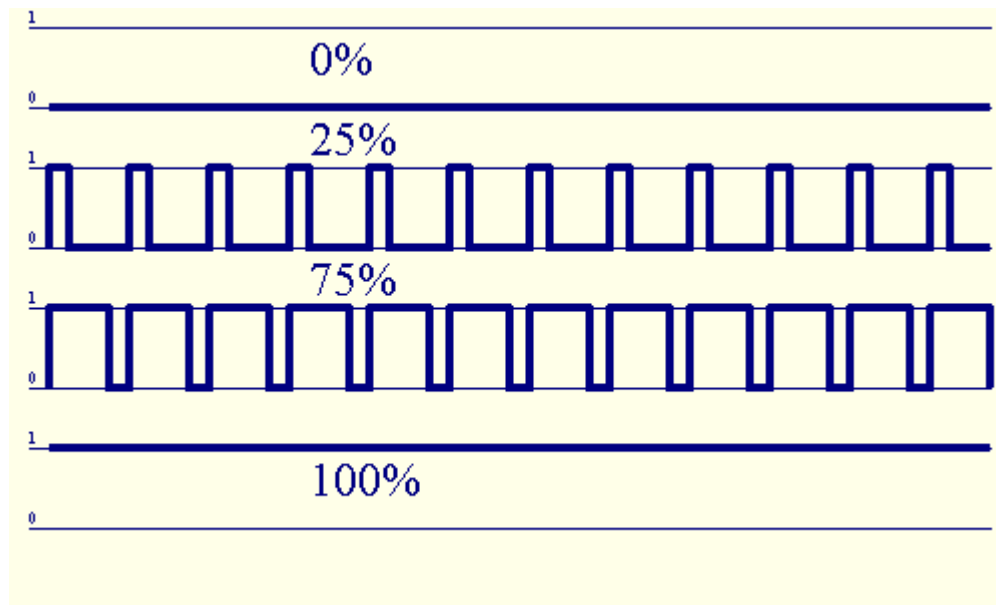
Figure 7 Pulse width modulation (PWM Pulse With Modulation).

These outputs contains 12VDC/2.5A power drivers can smoothly adjust the LED or LED RGB lighting. It can be directly connected to LED/RGB stripes 12VDC (for multi color – Common Anode {+}). **Up to 2.5A from each channel can be sink for LED Dimming. Bigger current than specified may cause permanent damage of internal fuse, led power driver, socket or even eHouse WiFi controller.**

LED Stripe length should be limited so as not to exceed the current for one channel above 2.5A. Larger current may cause damage to the fuse which protects the controller or power supply.

Dimmers can work individually (3) or together as one RGBW (Red, Green , Blue) dimmer. Dimmers are much more functional than in eHouse RS-485, Ethernet controllers and compatible with CAN/RF controllers.

There are events and configuration control for individual dimmer and RGB dimmer together.

Individual dimmers have the following operating parameters:

- **Value** - the lighting level 0 .. 100 (scale is converted to human eye level thresholds)
- **Min Value (*)** - the minimum recommended lighting levels 0 - permanently OFF
- **Max Value (*)** - the maximum recommended level of illumination 100 - permanently ON
- **State** - Mode (N/A, Stop, +, -, Set)
- **Step** - change step for +, -
- **Admin** - administration flag to activate the advanced settings. Fields required setting Admin flag are marked with red color in "eHouseWiFi.exe" application
- **Disable (*)** - blocking dimmer. Events for the dimmer are ignored
- **Inverted (*)** - inverts output dimmer - the lighting level is inverted (100-x). This setting depends on the connected external driver or dimmer has an input inverting or not

(*) Change option requires setting "Admin" flag

Multiple dimmer (3 - RGB) working parameters:

- Settings **Value Min, Value Max, Step, Invert, Disable, Value** are taken from the individual settings of individual dimmers
- **RGB Dimmer State** - (N/A, Stop, +, -, Set) for all (unblocked channels) channel dimmers at once
- Values: **Red, Green, Blue, White** – target value for each dimmers respectively (White – only for eHouse CAN/RF controllers - event creator)
- **Continuous dimmer 1 (Red)** - the value of the light level changes between (min, max) with a programmed step for the dimmer - decorative lighting
- **Continuous dimmer 2 (Green)** - the value of the light level changes between (min, max) with a programmed step for the dimmer - decorative lighting
- **Continuous dimmer 3 (Blue)** - the value of the light level changes between (min, max) with a programmed step for the dimmer - decorative lighting
- Continuous dimmer 4 (White) - the value of the light level changes between (min, max) with a programmed step for the dimmer - decorative lighting (only for CAN/RF controllers – event creator)

2.4.5. IR Remote Control for eHouse WiFi Controller – (SONY Standard)

Any eHouse WiFi intelligent controller can be controlled by IR remote control in Sony (SIRC) standard - if infrared receiver is installed and "can see" IR remote controller.

Remote control allows you to change the state of the digital outputs, programs, temperature, light level thresholds (min, max) analog inputs (ADC), reboot the controller and run a specific event associated with remote control buttons. The default remote deployed to control eHouse WiFi intelligent home controller is Sony IR Controller, for example, RMT-V260 (equipped with a switch to select the VCR number - VIDEO 2 mode for eHouse default settings). Due to the large number of functions in the system, it is recommended to use the remote control to maximize the number of buttons to allow a greater range of infrared remote control of eHouse system.

The following buttons are predefined (by default – for compatibility with eHouse RS-485, LAN, CAN/RF controllers) and can be changed individually:

RC button	Function
Clear	cancel
0-9	0-9 channel selection, the number of inputs, outputs
Play	turn on
Stop	turn off
+	scroll wheel (clockwise) increase
-	scroll Wheel (counter clockwise) decrease
TV/Video	temperature (shift thresholds)

Display	lighting (level)
Input Select	digital output
Audio Monitor	analog input (thresholds)
Rec	reset the device (requires confirmation "OK" button)
OK	confirmation required for reset and program selection
Power	switch (change in signal state of the outputs)
Smart File	program selection (preset max. 24)
Menu	control other driver (only turn on/off outputs)

["Menu" + ControllerNo + "OK" + "Input Select " + OutputNr

on/off/toggle]

Pause	VideoLan (Play)
SAT	VideoLan (Stop)
Index Next	VideoLan (Next Track)
Index Prev	VideoLan (Prev Track)
SP/LP	VideoLan (Shuffle)
Wide	VideoLan (Repeat)
Vol +	VideoLan (Volume +)
Vol-	VideoLan (Volume -)

Physical code numbers can be check in "eHouseWiFi.exe" application when pressing "**InfraRed (IR) Settings**" button. It is also possible to change this codes for other remote type by capturing new one and update to eHouse Controllers.

The use of infrared remote control allows you to perform almost all operations by RC controller, even send configured event to another controller. All codes are sent to eHouse4cServer, eHouse.PRO server software where they can be linked to any external events. They can be independently defined for the remote control code, and for each individual controller.

Remote control is as follows:

1) Selecting the operating mode:

- temperature
- lighting / dimming
- digital output
- analog input (ADC)

- profile (eHouse LAN only)

2) Selecting a channel number

3) Changing a parameter for the current channel:

- +
- -
- turn off
- turn on
- toggle

(eg. lighting, channel 1, +, +, +)

Note: Drivers ignore long press of the button, and detects them as a single signal. It requires repeatedly press the + or - to change the value to the required level.

You can purchase also almost any universal remote (programmable - that support SONY SIRC), RC Controller with touch panel LCD or even SmartPhone with Infrared support. Remote Control of this type allow you to program descriptions for the buttons on the remote controller display, the corresponding control codes and controller settings, so that we get wireless touch panel for control of eHouse system.

In addition to built-in remote control discussed above, it is possible to assign IR code to any event processed by eHouse4cServer, eHouse.PRO such as hardware control of Audio/Video.

Additionally Events may be assigned directly to IR remote controller key directly on eHouse Controller (to be launch when user press programmed key).

2.4.5.1. Change the state of the digital output (relay controlled device).

1. on IR remote controller, press the button (Input Select)

2. press the number of output (1..4 for eHouse WiFi/CAN/RF controller)

3. press one of the buttons:

- (POWER) to change the state (ON->OFF or OFF->ON)

- (Play) - on

- (Stop) - off

Examples:

(Input Select) -> (3) - > (Play) = turn on output 3

(Input Select) - > (2) -> (Stop) = turn off output 2

(Input Select) -> (1) -> (Power) = change (toggle) output 1

2.4.5.2. Change user profile (program) – eHouse LAN only.

1. on IR remote controller, press the button (Smart File)
2. no program
3. (OK)

Examples:

(Smart File) -> (1) -> (OK) = program "1" selection

(Smart File) -> (7) - > (OK) = select the program 7

2.4.5.3. Moving thresholds of measurement inputs.

1. on IR remote controller, press the button (Monitor Audio)
2. analog input number
3. scroll wheel clockwise (+) opposite (-) (one pulse = shift by (1V * 1/1024) of full scale measuring about 1 mV voltage, temperature about 0.1 st)

For example, an increase of 0.5 degrees of heating, controlled by a temperature sensor connected to the input of the ADC 2.

(Audio Monitor) -> (2) -> (Scroll Wheel +) -> (Scroll Wheel +) -> (Scroll Wheel +) -> (Scroll Wheel +) -> (Scroll Wheel +)

2.4.5.4. Control the level of lighting

Step 1. on IR remote controller, press the button (Display)

Step 2. dimmer number command:

- 1-3 -> for single dimmer - number (1..3) PWM
- 9 -> all PWM dimmers
- 0 -> to on/off the following digital outputs (lighting groups)

Step 3. select one of the control functions, turn off (Stop), turn on (Play), toggle (Power), "+" (turn the knob in order to increase), "-" (turn the knob counter to reduce the level of light) – one of step 4. is alternative

Step 4. (turn off) - command

for the dimmer number:

- 1-3 - > For single PWM dimmers (to stop the increase or decrease) when the dimmer is currently changing its settings. If the dimmer does not change the settings, you can press this button initiates dimming
- 9 -> if you change the setting stops dimmers change all dimmers

If you do not change the settings (to single dimmer) dimmers dimming initiates all dimmers.

Step 4. (toggle) - command

for the dimmer number:

1-3 -> if the dimmer level is zero initiates lighting up the dimmer

Otherwise, it initiates dimming

Step 4. (ON) - command

for the dimmer number:

- 1-3 -> initiates an increase in the level of light on the dimmer (for maximal lightening or manual stop)
- 9 -> initiates an increase in the level of all dimmers (the total lighten or manual stop)

Step 4. (-) - decrements

for the dimmer number:

- 0 => off last switched output (lighting group)
- 1-3 => initiates reducing the level of the dimmer (completely extinguish or manual stop)
- 9 => initiates a reduction in the light of all the dimmers (completely extinguish or manual stop)

Step 4. (+) - increments

for the dimmer number:

- 0 => activates the next output (lighting group)
- 1-3 => initiates increasing the level of the dimmer (for total lightening or manual stop)
- 9 => initiates increasing the level of all dimmers (the total lightening or manual stop)

For example:

(Display) => (1) -> (+) => ...... (waiting eg 10s) .... => (Stop) - start increasing the level of light dimmer 1 and stopping the growth of the 10s

(Display) => (9) => (+) - start brightening all dimmers (until you press Stop button or reach the maximum level of illumination)

(Display) => {0} => (+) - increase the next group of lighting (next output on) {0 is optional – automatically back to 0 after some period of time}

(Display) => {0} => (-) - decrease current lighting group (last output off) {0 is optional – automatically back to 0 after some period of time}

(Display) => (9) => (-) => (wait..) =>(Display) => (1) => (Stop) – the dimmer one stop in the desired position, the other

Dimmers will be extinguished after a certain time

2.4.5.5. Controlling the output of another controller

1. press the button on IR remote controller (Menu)

2. select eHouse WiFi/LAN controller number (Address Low)

3. confirm by pressing (OK)

4. proceed as in the case of local lighting control driver eHouse WiFi (Input Select) -> (output number) => (Power / Play / Stop - buttons)

5. support for local controller will be restored automatically after 2 minutes of inactivity, the remote control or select the device number (controller address) 0

eg.:

(Menu) => (2) => (OK) selecting a second controller (base address = ADRH,2)

(Input Select) => (2) => (Power) change state of output 2 on the selected driver

(Input Select) => (1) => (Play) output 1 turn on the selected driver

(Input Select) => (4) => (Stop) turn off output 4 on the selected driver

(Menu) => (OK) to select the current controller

2.4.5.6. VideoLAN application control

eHouse WiFi system can cooperate with VideoLAN software and will be managed by the IR RC controller and any eHouse WiFi controller, sending control codes to the computer where the eHouse4cServer, eHouse.PRO together with VideoLAN application are located and running. This means that from any room, in which the eHouse WiFi controller exists (with activated VideoLAN control codes), you can control music from your PC.

At the moment, you can run the following VideoLAN functions (play, stop, next track, previous track, repeat, shuffle, volume +, volume -, <<, >>).

VideoLAN application must be installed and running on eHouse.PRO server computer system.

Pre-defined buttons for VideoLAN application and the corresponding functions:

- Pause   VideoLAN (Play) or(Replay) of the current track

- SAT   VideoLAN (Stop) mute and stop the current track

- Index Next   VideoLAN (Next Track)

- Index Prev   VideoLAN (Previous Track)

- >>   VideoLAN (FF) fast forward a few seconds

- <<   VideoLAN (Rew) rewinds a few seconds

- SP/LP   VideoLAN (Shuffle) on/off random playback tracks

- Wide   VideoLAN (Repeat) enable/disable repeat playback of the track list

- Vol+   VideoLAN (Volume+) to increase the volume by 1%

- Vol-   VideoLAN (Volume-) decrease the volume by 1%

Predefined buttons can be changed with eHouseWiFi application under "InfraRed (IR) Settings".
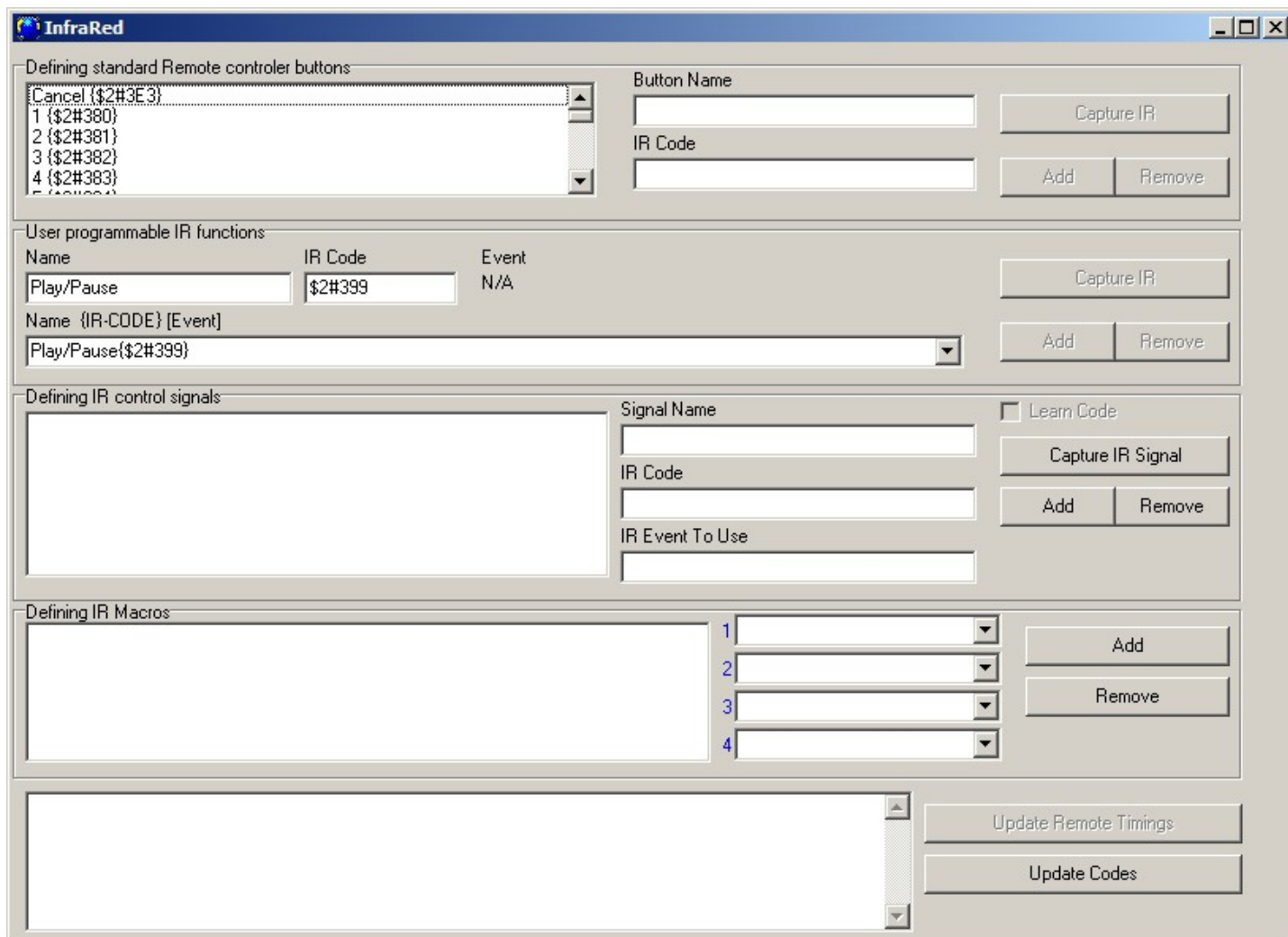
2.4.6. Control of external Audio-Video devices by emulating IR RC control signals in various standards

IR emitters (transmitter) can be mounted in eHouse WiFi controllers to control external devices with the IR remote control signals. IR transmitter must be located in front of controlled Audio/Video device and "must see" its IR sensor. The distance range should be tested individually and may depends on A/V device type/model and IR standard (could be less then 5m).

Each eHouse WiFi controller can control a lot of Audio/Video/HiFi devices by emulating remote control infrared signal (learned from eHouseWiFi.exe application during sending the signal from the remote control). It is possible to scan, up to 248 signal codes (buttons) of RC controllers of different types (tens standard of infrared remotes implemented). Before buying an electronic device (eg. TV, Video, HiFi) you should test the device compatibility and the remote control is working with IR control of eHouse WiFi intelligent controller). We didn't found of any problems in controlling selected devices manufacturers such as Sony, Mitsubishi, Aiwa, Samsung, Daewoo, Panasonic, Matsushita, LG. However the safest method is to apply the principle of choosing one company such as Sony, and is definitely not recommended to use devices and exotic little-known companies, which may have their own standards for infrared control, unacceptable by the driver.

Some companies use other standard than its own so it should be tested empirically before buying device.

Controllers have implemented events for running IR transmissions containing the manufacturer code and command code.

Defining the RC Controller signals for IR control of external devices

To add a remote control signal to control external devices (TV, HiFi, Video, DVD, etc.) under the control of eHouse Controller, you should:

1. initiate IR scan from eHouseWiFi.exe application "**IR Settings**" for required controller
2. press IR remote controller button towards required controller
3. captured IR code will be displayed in the application
4. add to eHouseWiFi.exe application as an event with intuitive description

2.4.7. Expansion modules of eHouse WiFi intelligent controller

eHouse WiFi controllers have implemented RS-232 TTL, SPI, I2C which can be connected to a dedicated peripherals (sensors, expanders, audio out, etc). For larger projects, it is possible to implement a firmware which supports external devices with this interfaces.

2.5. Startup settings of eHouse WiFi intelligent controller.

Startup settings of eHouse WiFi controller include initial configuration of the controller. Setup is run as a standard eHouse system events after the start/reset the controller: for all inputs, outputs, multiple outputs, individual/multiple dimmers, analog/measurement sensors.

Parameters were explained earlier during each signals description.

Configuration is done from eHouseWiFi.exe application on "eHouse WiFi" form:

It should be set to the required value of the parameters of all elements:

- parameters for all digital inputs
- parameters for all measuring inputs
- options and states of all digital outputs
- options and levels of all individual dimmers
- RGBW dimmer options (White – only for event generation for eHouse CAN/RF)

Then press the "Save WiFi Config" button to save the configuration of the controller.

At the end, press the "Save and Update settings" button on General form to send the configuration to the controller (and verify in editor window it configuration was loaded to the controller).
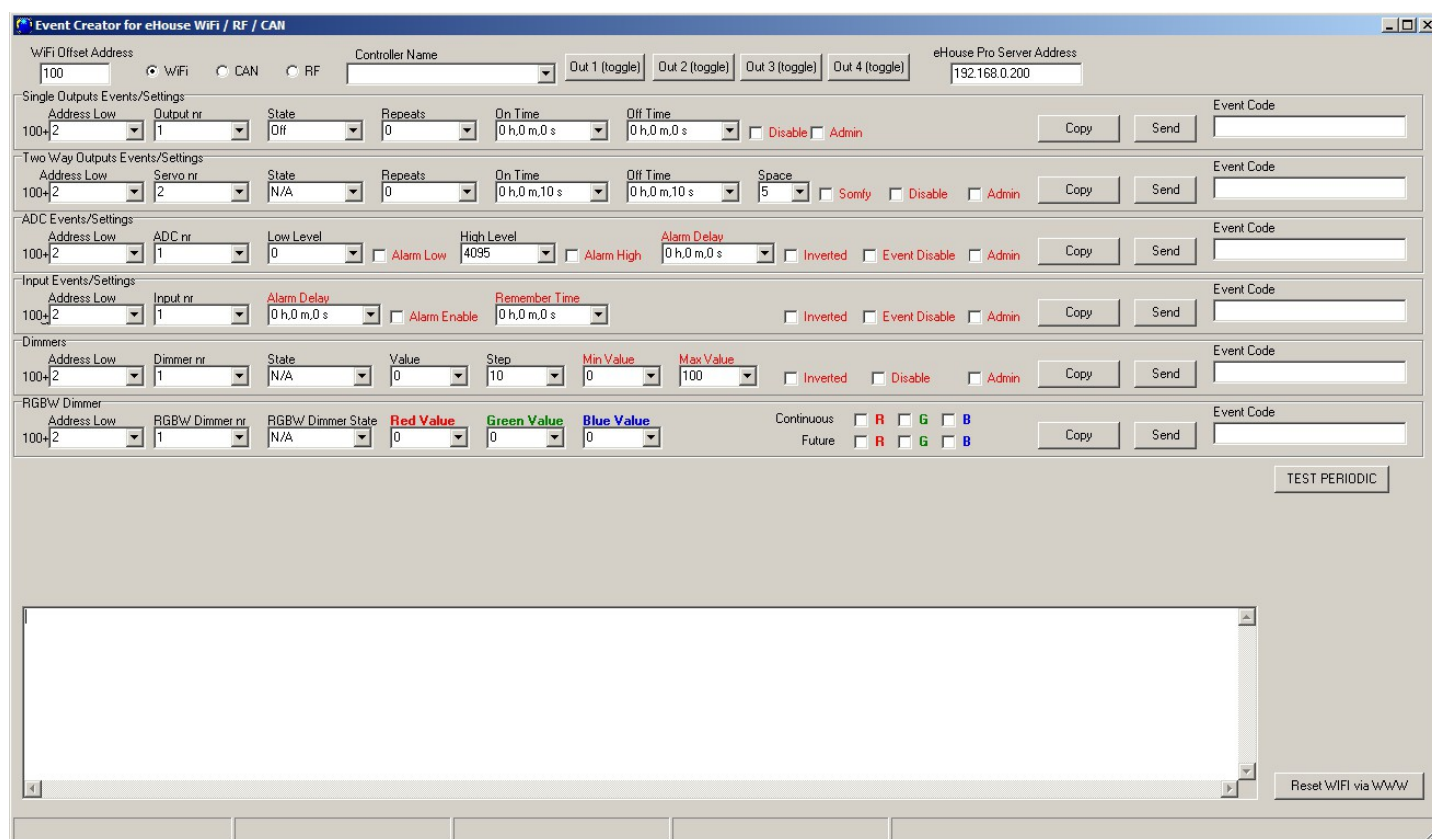
2.6. Changing the configuration (ad-hoc) of eHouse WiFi, CAN/RF intelligent controllers

Configuration of eHouse WiFi (CAN/RF too) smart home is carried out in the form of standard events eHouse and can be started at any time by sending an advanced events from event creator form (see picture below).

Changing configuration parameters (mark with red color) is possible only when the "admin" flag is on. In another case, part of the parameters may be ignored. Be particularly careful, if you change the settings of outputs connected to drives, solenoid valves, gates, etc. as incorrect configuration can cause damage of them.

Ad-Hoc configuration is especially valuable for initial testing of system with new actuators (checking drives ranges, timing, etc) before loading permanent configuration to controller for standard production work.

The configuration can be changed by re-sending the event changing the signal option again. Configuration also returns to the startup settings (default) after the reset controller.

Events for Inputs, Output, Drives, ADC, Dimmers are compatible for each WiFi, RF, CAN controllers. Controller type is chosen with Radio-button field "WiFi / CAN / RF". In case of different controller address low should be changed.

For WiFi controllers (which are normally addressed not from 1) WiFi offset Address is specified for ease.

Event creator enables both copy event codes "Direct Event" for eHouse WiFi/CAN/RF controllers and send them to selected controller. eHouse WiFi events are sent with TCP/IP client directly to target controller via WiFi/LAN. eHouse CAN/RF events differs only with address and are sent via eHouse.PRO server which address is specified in "**eHouse PRO Srv Address**" field.

Text area shows UDP logs from controller for detecting problems or evaluating controller on first stage of work with them.

3. Connection of eHouse WiFi intelligent home controller
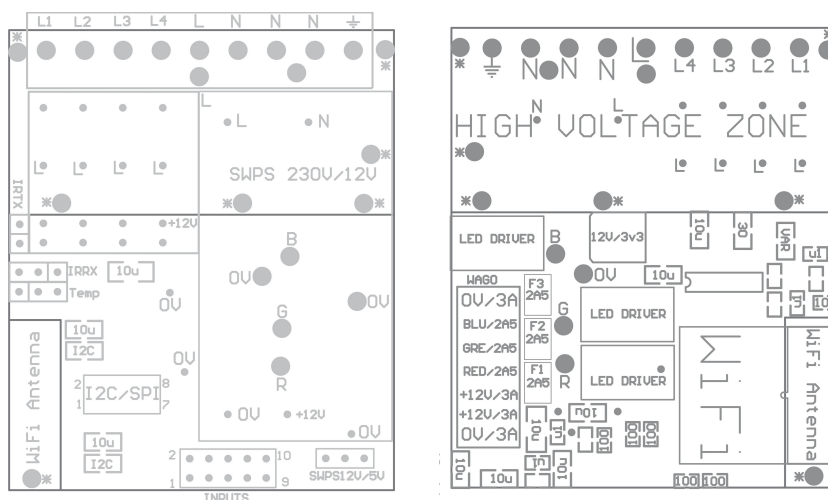
3.1. Digital inputs (on/off) - socket IDC-10 pin male (INPUTS)

All digital inputs are connected through internal processor logic to 3v3 (Pull Up) and there are normally at high state (negative logic).

Switches or sensors connected between the input X and the ground (0V) of the system will activate input in this case.

All inputs are internally connected to other resources (IR, UART) which is mutually exclusive to use input and other functionality.

No..	Name	Features mutually exclusive	Description
1	IN 3	UART RX (Reception)	Input 3 (square soldering pad)
2	IN 1	IR TX (infrared transmission)	Input 1 (positive logic – PULL down via IR TX)
3	IN 2	IR RX (infrared reception)	Input 2 (not critical)
4	IN 4	UART TX (transmission)	Input 4
5	GND	-	0V
6	GND	-	0V
7	3v3		PS for electronic (Back-light LED max 20mA)
8	PGM		Third party Firmware upgrade via UART
9	OUT4		DON'T Connect
10	Reset		Restart of controller (shorten to 0V)

3.2. Analog sensors - 3-pin SIP socket (TEMP x)

Analog input can measure voltage relative to the ground (0V) of eHouse controller.

Measurement range (0..1V) is available on this input. MCP9700 pining temperature sensors is compatible with this socket.

No.	Pin.	TEMP x Description
1	VCC	(+3.3V regulated output from the controller)
2	AN x	analog input x
3	GND	0V

For the best result considering self-heating temperature sensor should be used with additional cables to maintain some distance from sensor to eHouse Controller.

3.3. PWM Dimmers – WAGO 6-7 pin socket (DIMM) Rev. A

All Dimmer outputs are Open Drain (OD) the maximum recommended output current is 2.5A (sinking to the GND - 0V). Do not connect external voltages only for connection LED stripes cathodes (-). Current larger than 2.5A may cause damage internal fuse, LED Power Driver or socket.

No.	SIGNAL	Description
1	GND	0V/3A max – power supply for controller
2	DIMM1	Dimmer 1 output max 12V/2.5A **(RED)**
3	DIMM2	Dimmer 2 output max 12V/2.5A **(GREEN)**
4	DIMM3	Dimmer 3 output max 12V/2.5A **(BLUE)**
5	VPOWER	+12V/3A max – power supply for controller
6	VPOWER	+12V/3A max – power supply for controller
7	GND	0V/3A max – power supply for controller

3.4. PWM Dimmers – 5 pin socket with screws (DIMM) Rev. B

All Dimmer outputs are Open Drain (OD) the maximum recommended output current is 2.5A (sinking to the GND - 0V). Do not connect external voltages only for connection LED stripes cathodes (-). Current larger than 2.5A may cause damage internal fuse, LED Power Driver or socket.

No.	SIGNAL	Description
1	GND	0V/8A max – power supply for controller
2	DIMM1	Dimmer 1 output 12V/2.5A **(RED)**
3	DIMM2	Dimmer 2 output 12V/2.5A **(GREEN)**
4	DIMM3	Dimmer 3 output 12V/2.5A **(BLUE)**
5	VPOWER	+12V/8A max – power supply for controller

Common anodes for dimmers are connected to +12V/8A power supply for RGB LED strip.

3.5. Relay contacts and 230V power supply – 9 pin screw socket (Relays)

Pin No. Signal Description

1	Relay 1 contact	L1 (phase 1)
2	Relay 2 contact	L2 (phase 2)
3	Relay 3 contact	L3 (phase 3)
4	Relay 4 contact	L4 (phase 4)
5	Relay COM contacts	L (phase 230V - hot)
6	Neutral	N (230V neutral / cold)
7	Neutral	N (230V neutral / cold)
8	Neutral	N (230V neutral / cold)
9	SAFETY	Not Connected internally

Powering from 230V requires internally mounted 230V/12V dedicated switching power supply.

Any connections to 230V and usage and devices with larger voltages than 12V on your own responsibility.

4. Software

4.1. Application ConfigAux (ConfigAux.exe)

This application is used for:
- initial system configuration
- eHouse software panels on all hardware/software platforms setup
- auxiliary applications that require simple setup
- defines the most important parameters for the eHouse installation
- create defaults and security settings for LAN, WiFi controllers

To perform a full configuration, run with the parameters "ConfigAux.exe /ChangeHashKey".

Parameters:

- **Mobile Phone Number** – Number of SMS gateway (for CommManager) (It is necessary to load the configuration for all controllers and control panels)
- **Hash Table** - hashing code for authentication algorithm to controllers and panels (in hexadecimal code) (After changing the configuration, it is necessary to load new settings to all the controllers and control panels)
- Remote Controller E-Mail Address - The email address for all applications, panels – Broadcasting (*)
- Reception eMailGate Address - The email address for all applications, panels – for reception (*)
- SMTP User Name (eMailGate) - SMTP user for eMailGate application also used by the control panels for different platforms (*)
- POP3 User Name (eMailGate) - POP3 user for eMailGate application also used by the control panels for different platforms (*)
- Iterations after Resent Logs - do not use (*)
- Local Host Name - the name of the local host for SMTP client (*)
- Login type - Use only plain for CM (*)
- Password SMTP, POP3 Password - password for the SMTP client, POP3 (*)
- SMTP Server Address, POP3 Server Address - SMTP and POP3 address - enter the IP address if possible (*)
- SMTP Port , POP3 port - SMTP and POP3 servers ports (*)
- Subject - Message Title (No change) (*)
- **CommManager IP Address** - IP address of CommManager
- **CommManager TCP Port** - TCP port of CommManager
- **Internet Side Address** - Public TCP / IP or DDNS dynamic (service must be set on internet router)
- **Internet Side Port** - TCP port from Internet side
- FTP Server, FTP Directory, User, Password - the application's parameters for synchronization
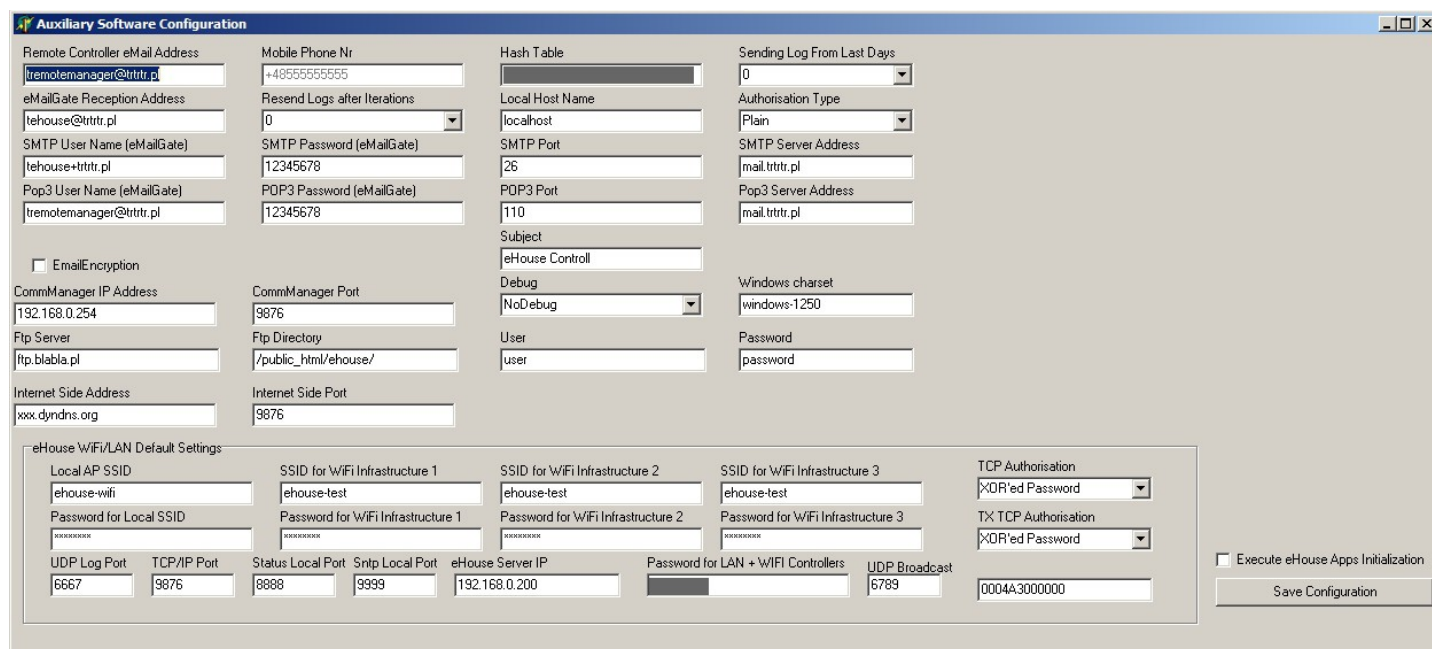
Logs to an FTP server (FTPGateway.exe).
- Email Encryption - do not use, it is not supported by CommManager (*)

(*) - obsolete versions (eHouse RS-485 under PC supervision) used mostly by eMailGateway.exe - do not change.

eHouse WiFi Controllers default settings (can be changed individually in **eHouseWiFi.exe** application):

- **Local AP SSID** – Local Access Point SSID name (up to 30 chars)
- **Password for Local SSID** – Password for local Access Point (up to 60 chars)
- **SSID for WiFi Infrastructure X** – up to 3 WiFi infrastructures for connection (for backup and redundancy)
- **Password for WiFi Infrastructure X** – passwords for each WiFi network Infrastructures
- **TCP Authorization** – Authorization method for current eHouse WiFi (Challange-response, XOR Password, Plain Password, None) – for command reception. Set to **XOR Password for direct control from eHouse Android, Java Application.**
- **TX Authorization** – Authorization type for sending commands to other controllers.
- **UDP LOG Port** – Wireless logging controller to UDP port
- **TCP/IP Port** – eHouse TCP/IP Server for command reception (all eHouse LAN, WiFi must have the same port set)
- **UDP Broadcast Port** – for sending statuses via UDP (all eHouse LAN, WiFi, Pro should have the same port set unless we not want filter statuses in eHouse panels software)
- **eHouse Server IP** – Linux Server IP hosting: eHouse Pro, eHouse4cServer application for sending events to other eHouse System variants (RF/CAN, RS-485, etc.)
- **MAC Address** – WiFi network adapter MAC address hex coded (2 LSB automatically set for each controller depending on IP address)
- xxx **Local Port** – local ports of servers - don't change if there is no problem
- **Password for LAN and WiFi controllers** – common eHouse LAN, WiFi, PRO password for **XOR password** or **Password** authorization types.

4.2. eHouseWiFi.exe - Configure Ethernet/WiFi controllers (formerly CommManagerCfg.exe)

eHouseWiFi.exe application is used to:

- perform complete configuration of eHouse LAN (eHouse4Ethernet) controllers
- perform complete configuration of eHouse WiFi controllers
- manually send events to eHouse Controllers (LAN, WiFi, CAN, RF)
- automatic sending event from the queue (PC Windows directory captured by auxiliary gateways)
- running transparent mode between Ethernet and serial interfaces to configure the extension modules and detect problems
- generate software configuration of all control panels, PADs, smartphones, Web Browser and any hardware platform
- checking logs for eHouse WiFi controllers (UDP logging)

For configuration of any Ethernet Controller, Application must be run in following way "eHouseWiFi.exe / a:000201", with the IP address of the controller parameter (6 characters - filled with zeros). In the absence of default parameter opens for CommManager configuration (address 000254).

Configuring CommManager, EthernetRoomManager with eHouseWiFi application, was discussed in eHouse LAN documentation.

Current description is limited for eHouse WiFi configuration.
The application has a number of tabs that group the settings depending on type of Ethernet/WiFi Controller.

4.2.1 General Tab – General Settings.

The General tab contains the following elements:

- **Report Level** - Level Reporting Logs 0 - no, 1 – all, then (the higher the number, the less displayed information) (eHouse LAN only)
- **Devs eHouse 1 Count** - Number of RM (for CommManager cooperation in hybrid mode of eHouse (eHouse 1 under CommManager supervision). Select 0 for ERMs.
- **Device Name** - The name of the Ethernet/WiFi Controller
- **Logging UART Disabled** - Disables send logs via RS-232 (the flag must be checked for normal operation) (eHouse LAN only)
- **WiFi** - select the type of controller (radio button) – eHouse WiFi (other types explained in eHouse LAN documentation)
- **Infrared Settings** - Infrared Transmission/Reception Settings for eHouse WiFi
- **Set Time** - Set the time of current Controller (eHouse LAN only)
- **Transparent Ethernet / UART 1** - transparent mode between the Ethernet and serial port 1 To validate the configuration and proper operation of peripheral devices (eHouse LAN only)
- **Transparent Ethernet / UART 2** - transparent mode between the Ethernet and serial port 2 To validate the configuration and proper operation of peripheral devices (eHouse LAN only)
- **Reset Device** - Force reset controller
- **Create Mobile File** - Generate configuration files for control panels (eHouse LAN only)
- **Save and Update Settings** - write configuration, settings and upload to the controller.
- **Logging Device** - Launching TCPLogger.exe application to check the controller logs in case of problems. (eHouse LAN only)
- **Send Empty Test Event** - Test Sends an event to the controller for checking connection, authorization, etc. (eHouse LAN only)
- **Event Creator** - Edit and run system events
- **Event Creator WiFi/CAN/RF** – creating advanced events for eHouse WiFi, CAN, RF controllers
- **Disable Scheduler** – disable calendar/scheduler for smaller CPU utilization (eHouse LAN only)
- **Advanced Configuration** – Enables more advanced features
- The first message window is used to display text logs
- The second text box is used for transparent mode putting text to be sent to the controller. Pressing "Enter" Sends data to the controller. For ASCII text only
- **Ping** – check ping to current device

Description/text of button may change during software update or language versions.
Language versions can be edit in "%eHouse%/lang/" directory for each windows code page and application revision individually.
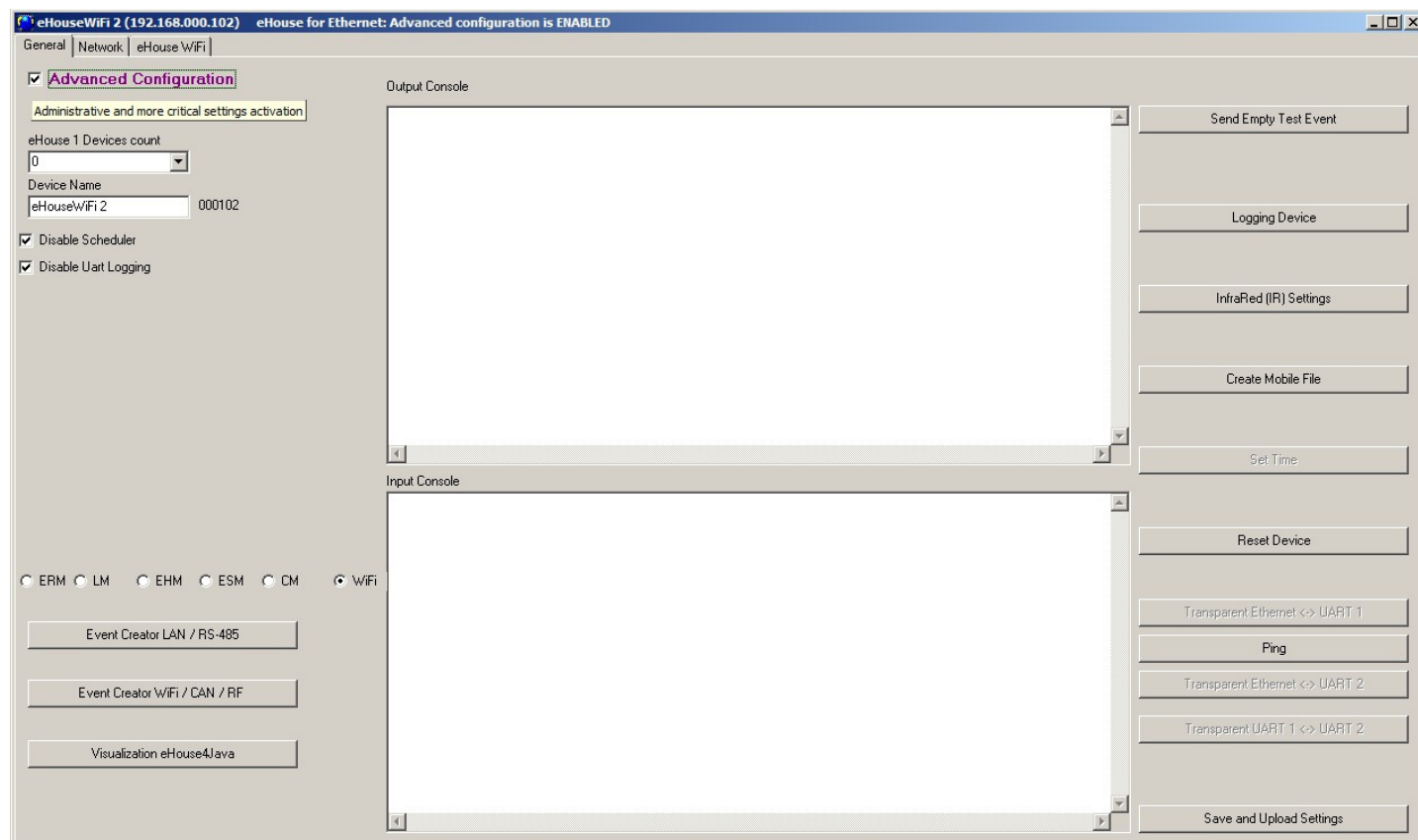
eHouse WiFi Inputs, outputs, signal settings

eHouse WiFi controller is much smaller than ERM and all initial settings are located on single form "eHouse WiFi" (picture below).
All signals (Single outputs, double output, dimmers, RGB dimmer, inputs, ADC input) and their options were explained earlier.
To Change main settings, it is necessary to check activation flag "Advanced Configuration" from "General" Form.
Each signal has some individual parameters. Initial configuration for each I/O is set by running proper event, combined from all of these parameters. Running event (changing ad-hoc configuration) is also possible the same way as running initial settings (start condition) on restart controller. Some of parameters require setting of Admin flag. Parameters requiring Admin flag are marked with red color.
eHouseWiFi.exe application enables naming each input/output individually for each controller.
Edition of each name can be performed in edit fields. After setting all names "**Save WiFi Config"** button should be pressed.

eHouse -WiFi - Smart Home, Home Automation System

- eHouse WiFi has only one true analog (0..1v) input for measurement (voltage, temperature, etc). In most cases MCP9700 is installed or socket to connect it outside the cover for better measurement results of free air. Other analog inputs are virtual for future usage in case of connection measurement sensors with digital interfaces (SPI, I2C, UART)

- number of available measuring inputs depends on the type of controller, hardware version, connected to the internal sensors and the controller firmware. It may therefore happen that a part of the input is occupied and can not be used. For busy inputs must not be connected in parallel or shorted sensors as this may skew the measurements or damage the controller

- events can be assigned to the upper and lower thresholds of the relevant system events, eg. (adjustment of physical value or signaling the exceeded limit). This is done by clicking on the label "Low Level Event" - wizard, selecting from a list of events and the corresponding event by clicking "Accept"

- the upper threshold is set by clicking "High Level Event" label, by selecting desired event and clicking "Accept"

- valid range event is set by clicking "OK Event" label, by selecting desired event and clicking "Accept"

- after these steps, it is necessary to press the "Save eHouse WiFi Config" and on "General" Form "Save and upload settings" close / reopen application is required to update names, events, choice list values

- when you enter a value of thresholds in selectable data field, be sure to press the down arrow to select the closest value from the list

4.2.3. Digital Input Settings

Input count (0..4) depends of other resources used or implemented in the eHouse WiFi Controllers (eg. enabling **UART** takes 2 digital inputs: **I3, I4,**
IR Receiver takes: **I1,**
IR transmitter takes: **I2.**

Please refer to following table for more information:

Function	Utilization	Description	Trigger	Conditions
IR RX	I1	Inverted (pull up)	0V	installed IR Receiver
IR TX	I2	Non Inverted (pull down)	3,3V	don't use enabled IR Transmitter
UART TX	I3	Inverted (pull up)	0V	enable UART or UART Logging
UART RX	I4	Non Inverted (pull down)	3,3V	enable UART
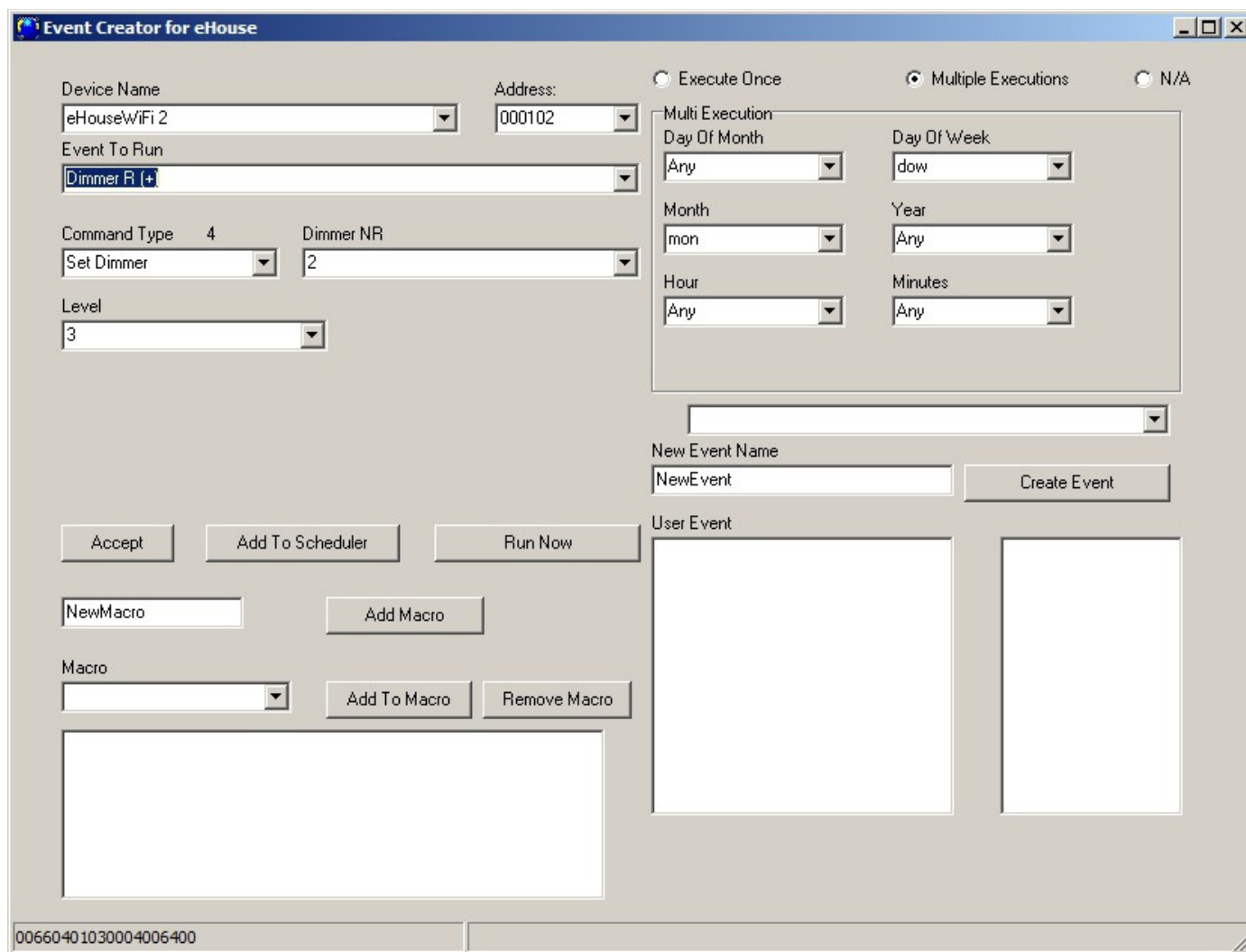
Shorten input to 0V or 3v3 may damage it, if allocated internally for alternate functions.
UART pins are not internally connected with additional hardware so usage as inputs only depend on configuration not installed hardware.

Configuration of inputs:
- the names of digital inputs can be enter or change after activation of "Advanced Configuration" option on General Form. For WiFi Controller it is available in "eHouse WiFi" Tabs
- the names shall be entered in editable field for input and put new short, descriptive and unique value
- set Invert Flag regarding to table above and sensor type (normal / invert), changing the flag **Invert**
- in the case of inverted (pull up) inputs controller react for short input to ground. Non inverted (pull down) input are trigger on connecting input for microprocessor power supply (3.3V)
- then you can assign any event of eHouse system to each input (pressing Event label)
- this is done by clicking on the labels marked as 'N/A' (not programmed for input), and select from the list of events on corresponding wizard, and press the "Accept" (picture below)
- When all changes are made press "Save WiFi Config" button and "Save and update Settings" on "General" form , to save the configuration and upload it to controller.

The number of available inputs depend on the type of controller, hardware version, firmware, etc. User has to realize how many inputs are available for current type of controller and do not try to program or connect more than the available quantity as it can lead to resource conflicts with other inputs, on-board sensors, communication interfaces or resources, damage inputs or whole controller.

4.2.4. Network Settings

In the "Net Settings" you can also define a controller configuration valid options. For new controller default setting is copied from ConfigAux.exe application for all controllers in the installation.

IP Address - (not recommended to change after initial initialization of controller - it must be the same as the address of the controller configuration) must be in network address 192.168.x.x
IP Mask (not recommended to change should be as low as possible: 255.255.255.0)
IP Gateway (gateway for Internet access)
SNTP Server IP - IP address of the time server SNTP services
GMT Shift - Time Offset from GMT / time zone
Season Daily Savings - Activate seasonal time changes
SNTP IP – Use IP of SNTP server address instead of the DNS name. For best results use local (inside LAN) SNTP server.
MAC Address - Do not change (Mac address is assigned automatically - the last byte taken from the youngest byte of IP address)
Host Name - not used
Broadcast UDP Port - Port for distribute data from the controller status via UDP (0 blocks UDP Broadcasting)
TCP Authorization – Minimal Method of Authorization to the TCP/IP server of controllers (for further entries from the list imply earlier, safer ways). Used for third party applications including eHouse4Java, eHouseAndroid, eHouse4WindowsMobile
DNS 1, DNS 2 - DNS server addresses
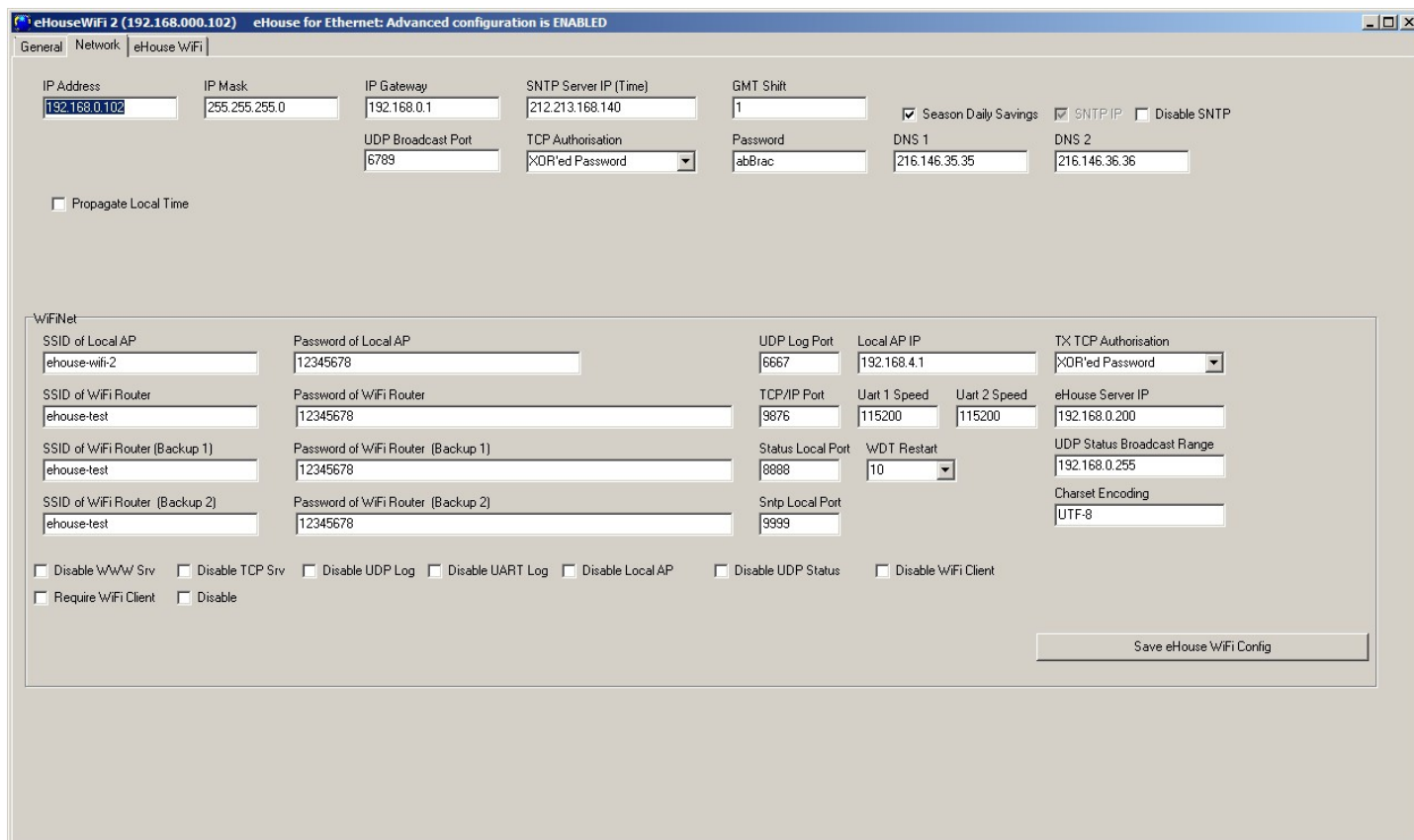
eHouse WiFi Controllers settings (taken automatically from ConfigAux.exe application for new controller):
- **Local AP SSID** – Local Access Point SSID name (up to 30 chars)
- **Password for Local SSID** – Password for local Access Point (up to 60 chars)
- **SSID for WiFi Infrastructure X** – up to 3 WiFi infrastructures to connect (for backup and redundancy)
- **Password for WiFi Infrastructure X** – passwords for each WiFi network Infrastructures
- **TX Authorization** – Authorization type for sending commands to other controllers (use Challange-response).
- **UDP LOG Port** – Wireless logging of controller to UDP port
- **TCP/IP Port** – eHouse TCP/IP Server port for command reception (all eHouse LAN, WiFi must have the same port set)
- **UDP Broadcast Port** – for sending statuses via UDP (all eHouse LAN, WiFi, Pro should have the same port set unless we not want filter statuses in eHouse panels software)
- **eHouse Server IP** – Linux Server IP hosting: eHouse Pro, eHouse4cServer application for sending events to other eHouse System variants (RF/CAN, RS-485, etc.)
- **MAC Address** – WiFi network adapter MAC adres hex coded (2 LSB automatically set for each controller depending on IP address)
- xxx **Local Port** – local ports of servers - don't change if there is no problem

- **Password for LAN and WiFi controllers** – common eHouse LAN, WiFi, PRO password for **XOR password** or **Password** Authorization types.
- **UART 1,2 Speed** – speed for available UARTs (default 115200)
- **UDP Status Broadcast Range** – broadcasting range for UDP status
- **Charset Encoding** – for internal WWW Server (default UTF-8)
- **Disable WWW Server** – Disable local WWW (REST) (increase efficiency and security)
- **Disable TCP Server** – Disable local eHouse TCP/IP server (don't change)
- **Disable UDP Log** – disable sending wireless logs via UDP protocol from eHouse WiFi (increase efficiency)
- **Disable UART Log** – disable sending Logs to serial port from eHouse WiFi (increase efficiency)
- **Disable local AP** – disable local Access Point (increase efficiency and security)
- **Disable UDP Status** – disable UDP status for eHouse system (only for usage outside eHouse home automation system infrastructure)
- **Disable WiFi Client** – disable WiFi Station ode (only local Access Point mode – outside eHouse)
- **Require WiFi Client** – requires WiFi Router (infrastructure) for connection

4.2.5. New eHouse Controller initialization

1. run ConfigAux.exe application and configure default WiFi / LAN settings

2. all New (factory released) eHouse WiFi controllers has the same IP address **192.168.0.100**, AP: **eHouse-xxxx**, password:**ehouseehouse,** AP IP: **192.168.4.1**

3. **computer must use DHCP settings (**in case of problems force static **IP: 192.168.4.4** and **gateway: 192.168.4.1)**

4. power up uninitialized eHouse WiFi controller new WiFi network should be available - **„eHouse-xxxx"**

5. connect to this WiFi network with „**ehouseehouse"** password

6. test if controller is visible in web browser with ip address „**http://192.168.4.1/**"

7. execute **„eHouseWiFi.exe /ForceWiFi /a:000100"** (or relevant shortcut „c:\e-house\bin\eHouseWiFi - 100"+ select Advanced Settings on main form

8. goto „Network" tab and enter new sequential IP Address started from **192.168.0.101**

9. press **Save WiFi Config** button and then on General Form press „**Save and Upload Settings**" button. Results on editor field shows if initialized properly

10. test if controller is visible in web browser with its new ip address „**http://192.168.4.1/**" (changing WiFi network an password may be necessary)

11. disconnect initialized eHouse WiFi controller from power and write IP last byte on sticker for information

12. close **eHouseWiFi.exe** aplication

13. repeat for each eHouse WiFi fresh controllers from point no. **4**

14. **if finished initializing all eHouse WiFi controllers for your installation close eHouseWiFi.exe application**

15. **configuring each controllers xxx=101**

16. connect to one of WiFi Infrastructure configured for eHouse WiFi (SSID1, SSID2, SSID3 – must be connected together). If static IP 192.168.4.4 address was set change it back to previous settings

17. run „eHouseWiFi.exe /ForceWiFi /a:000xxx" where xxx is sequential address started from 101 or from next shortcut icon: **c:\e-house\bin\eHouseWiFi.exe – xxx**"

18. power on relevant eHouse WiFi controller with the same address as xxx

19. press „Event Creator WiFi/CAN/RF". In editor window UDP logs should be displayed if controller was successfully connected to WiFi infrastructure (otherwise check SSID (max 30), password (max 60), mac address restrictions, disable firewall and antivirus protections)

20. make all configurations for new controller than press „**Save WiFi Config**" button than on General Form press „**Save and Upload settings**"

21. check upload results in editor window

22. check if after some time controller resent UDP logs with desired IP address (Event Creator WiFi/CAN/RF form)

23. power off eHouse WiFi controller and exit „**eHouseWiFi.exe**" application

24. **xxx=xxx+1** (increase xxx by 1 for next sequential number) and go to point **17**

25. after proper installation in desired places of all controllers and production tests (UDP logging can be disabled for each controllers)

4.3. eHouse WiFi - software package for Linux.

eHouse WiFi software package consists of the following components:

- Linux x86 , x64, Raspberry Pi, RPI2, Banana Pi/PRO, Orange Pi
- Apache web server and the communication module eHouse4Apache
- eHouse4cServer, eHouse.PRO - management software for eHouse smart home controllers

4.3.1. Linux operating system.

eHouse WiFi, LAN, PRO software runs on the Linux operating system and is available in binary form in several versions.

- x86 (32b)
- x64 (64b)
- ARM 6 (32b) such as Raspberry Pi
- ARM 7 (32b) 1,2,4 core CPU (Banana Pi, Pro, Raspberry PI 2)

It can be build on other hardware platforms based on demand, development and market availability.

Part of eHouse4cServer software is available as Open Source for individual development. It includes algorithms for all types of communication including eHouse CAN / RF / RS-485 / LAN / PRO controllers. This enables independent software development and compilation on any hardware platform and Linux version.

eHouse4cServer, eHouse.PRO software work as a server integrating multiple building automation systems (eHouse LAN, RS-485, CAN, RF, PRO creating any hybrid combination of the system), and external intelligent equipment. Therefore, for maximum efficiency does not work in a graphical environment.

Depending on whether eHouse4cServer, eHouse.PRO will operate only as building automation Server or Media Server / Player will also need to decide what hardware platform to choose to reach efficient and sufficient performance. For simple building automation in any version, 1-4 core processor board can be used (eg. Raspberry PI). For playing audio files the best low cost solution

Banana PRO (2-4 core CPU) with HDD connected to internal SATA for media storage is the best issue or PC computer. If you need the best performance with decent price, some 4 core CPU board can be used which implement SATA and HDD.

Without any compromising Standard PC x86, x64 can be used as eHouse4cServer host. Unfortunately eHouse.PRO algorithms (for central switch board installation I/Os) is not supported on PC hardware due to lack of I2C, SPI interfaces and I/O.

4.3.2. Apache Web Server Software with the eHouse4Apache module

Apache web server software is free and is the standard when advanced and secure Web server is necessary.

Allows the use of internal Apache security: SSL, certificates, user authentication and other mechanisms currently available and developed in the future.

With the Apache web server can be implemented to control, configure, visualize, manage eHouse system with web browser.

This solution has several advantages:

- does not depend on the hardware and software control panels , smartphones, PADs , smart TV
- configuration is in one place - on the server (no need to update the configuration to panels, smartphones, PADs, computers, etc.)
- we have the possibility of central management , administration , users, access rights
- graphical visualization and control looks pretty much the same regardless of the hardware and operating system control panels
- there is no need to write individual software for each operating system and the type of control device
- have a single unified tool for everything "All In One"

For Apache Web Server works properly with eHouse4cServer, it requires the installation of a communication module, which is only a "gateway" between Apache and eHouse server application.

This module only sends information between them, and does not contain any logic.

The module must be installed with eHouse4cServer in the directory "/usr/local/ehouse/".

In order to enable it in the Apache configuration file "/etc/apache2/apache2.conf " add two lines:

LoadModule eh /usr/local/ehouse/ehouse4apache.so

AddHandler eh .x

In newer versions of Apache, you must create two files in the directories "/etc/apache2/mods-enabled/" and "/etc/apache2/mods-available/":

"eh.conf" - contains one line "AddHandler eh .x"

"eh.load" - contains 2 lines:

- LoadModule eh /usr/local/ehouse/ehouse4apache.so
- AddHandler eh .x

Then restart the Apache service: "service apache2 restart".

To the directory "/var/www/" , upload all eHouse the files. In the operating system website and give them necessary rights including sub-directories to eHouse4cServer application can save data.

Apache module "/usr/local/ehouse/ehouse4apache.so" should have the right X - execute.

4.3.3. eHouse4cServer, eHouse.PRO Software

eHouse4cServer software is constantly developed server application that serves eHouse system. Its mission is to integrate all versions of eHouse: eHouse 1, Ethernet eHouse, eHouse CAN, eHouse RF.

In addition, the system integrates eHouse with external systems, subsystems, equipment, Audio-Video Media players. It has the task of logical control and management in the form of smart home "All in One" - from a single point. Working together with Web Server Apache module ehouse4apache.so responding to his requests and sending data so that all system functions can be controlled, managed and configured from a web browser on any operating hardware, operating system.

the main features and capabilities eHouse4cServer:

- communication with the system eHouse 1 (RS-485) - USB / RS-232 (reception status of controllers, transfer events, transparent mode for update configuration and firmware)
- communication to system eHouse Ethernet (LAN) TCP/UDP (receive controllers status and transfer events)
- communication to eHouse CAN system - USB / RS-232 (reception status of controllers, transfer events, configuration, update the firmware, complete management and control)
- communication to eHouse RF system - USB / RS-232 (reception status of drivers, transmission events, configuration, complete management and control)
- communication with the Apache Web Server (dedicated TCP/IP server). This server can also be used to integrate eHouse4cServer to external applications and systems without going through Apache. Transmits coded status of all eHouse controllers in text format. It contains a number of useful commands to control application send events to eHouse controlers, reset software, etc.
- built-in TCP server compatible with eHouse Ethernet servers of controllers, can serve as a "gateway" for external control panels (smartphones, PADs, PCs)
- supports hardware GSM/SMS (USB) gateway for SMS service messaging (notification and control)
- built-in support for SMS messaging for Polish operators Orange, Plus, T-Mobile via web

gateways
- built-in "database" of statuses of all eHouse controllers and continuous online update
- the ability to process status, measurements and the creation of dedicated algorithms
- TCP client to send "HTML Requests" to control external applications, hardware, electronics, software, Audio-Video systems, Media Players, etc.
- multi-threaded TCP client to control Audio-Video, HiFi Onkyo, Denon, Marantz allowing full control and online update of device status
- advanced handling and processing of the infrared signal (received by controllers) and assign/run eHouse system event
- create automatic HTML panels for eHouse system visualization from a Web browser. Processing RS-485 , LAN, CAN, RF controller, system signals of eHouse
- the ability to create their own sophisticated algorithms in a separate module for dedicated services of smart home

eHouse4cServer software is still updated with new algorithms based on current trends, standards available on the market.

Software should be uploaded into the directory "/usr/local/ehouse/" giving as the highest access rights to the directory:

- "/usr/local/ehouse/" - software directory of eHouse4cServer
- "/usr/local/e-house/" - data directory , system configuration eHouse CAN , eHouse RS-485, eHouse LAN, eHouse RF
- "/var/www/" - web directory for Apache web server, which automatically creates documentation eHouse4cServer

File "ehouse4c" and "ehousepro" must be set to X attribute - "execute".

It is important to select the user that is running the software eHouse4cServer because the application can run external applications and control them. If the permissions are too low to run and manage applications, eHouse4cServer may not work properly.

eHouse4cServer application should work on the user "root" - full ownership.

This also applies to drivers USB/RS -232, I2C, SPI, MEM (DMA) that are created by default with low rights for users. If you work on a different user than root , it is necessary each time change access rights to RW for all users. In case of problems with USB/RS-232 driver and trying to restart the application or system of these rights disappear.

eHouse4cServer application should be run after Linux startup scripts when you boot the appropriate "text" mode. It does not require a graphics mode and the system is many times more efficient and faster at the server versions of Linux.

eHouse4cServer configuration is automatically created "/usr/local/ehouse/eHouseServerC.cfg" and should be edited first time when you start the software to set up appropriate values. Configuration values are separated by a tab from the descriptions that intuitively explain the meaning of the

individual parameters and options. The application is in constant development time, we do not discuss these parameters here.

When uploading a new version of the software before running eHouse4cServer, you should move the configuration file "/usr/local/ehouse/eHouseServerC.cfg" to another location and run the server software that will create the file with all the current and default settings.

Then compare with the old configuration file and correct all the old settings and enter the correct new settings.

Starting the application first time after the update manually with the parameter "ehouse4c -docs" will generate documentation and help in the directory "/var/www/docs/", so you know what new features are in the server software.

For external serial interfaces connected to the USB ports, such as:

- SMS gateway hardware (GSM)
- RS-232/485 converter (for eHouse RS-485)
- RS-232/CAN converter (for eHouse CAN)
- RS-232/RF gateway (for eHouse RF)

It is the best way to choose producer driver name instead of port ("/dev/ttyUSBx") because devices connected to USB ports can change number during discovering on system start.

eHouse.PRO server software is a variant of eHouse4cServer application which support additionally local I/O of eHouse.PRO Hardware (only for Raspberry Pi, RPI 2, Banana PRO and future PC boards – limited by appropriate hardware resources).

Requires additional hardware:

- Interface board with RS-485, CAN, 2*SPI, 2*I2C ports
- Input expansion modules (up to 256) implementing also alarm relay outputs (Silent, warning, monitoring, horn, early warning)
- Output expansion modules (up to 256)
- Power supply (only for raspberry Pi and eHouse.PRO I/O hardware)

4.4. eHouse Android Application and libraries

eHouse Android - is a software application that allows control of eHouse system from touch screen graphic panels, mobile phones, PDAs, smartphones, PADs, Smart TVs running on Android operating system (4.0 or higher). It provides a graphical control with simultaneous visualization of the controllers state and actual work parameters. Each view can be individually created in the CorelDRW application after generating the names of objects and events from eHouse system package.

In the empty template file "*.Cdr", there are useful macros for eHouse, to import data from eHouse

system application and export to any visualization panel system. Create views will be discussed later in this documentation.

eHouse Android application enables on-line reading controllers status and perform graphical visualization of objects, when connected to a TCP / IP server running on the communication module, eHouse.PRO server or eHouse application for PC supervision. It is possible to control the system via WiFi or Internet (on-line), SMS, or e-mail.
eHouse Android can receive broadcast status from controllers via UDP (without permanent connection to TCP/IP server).

The application also allows you to control the system with human speaking using "speech recognition".

For third-party developers software libraries / templates for Android are available:
- supports direct communication with controllers
- automatic and personalized visualization
- continuous status updates and online visualization
- direct graphical control of controllers or from intuitive form
- allows you to create your own graphic software and control panels
- supports "speech recognition"
- supports "speech synthesis"

4.4. eHouse JAVA Application and libraries

eHouse JAVA is a software application allows control of eHouse system from pc computers supported with Java Virtual Machine (based on any operating system eg.: Windows, Linux, etc.). It provides a graphical control with simultaneous visualization of the controllers state and actual work parameters. Each view can be individually created in the CorelDRW application after generating the names of objects and events from eHouse system package.

In the empty template file "*.Cdr" file for eHouse visualization, there are useful macros, to import data from eHouse system applications and export to any visualization and graphical control panel type. Create views will be discussed later in this documentation.

eHouse JAVA application enables on-line reading controllers status and perform graphical visualization of objects, when connected to CommManager or eHouse.PRO TCP/IP server. It is possible to control the system via WiFi or Internet (on-line).
eHouse JAVA can also receive broadcast status from controllers via UDP (without permanent connection to TCP/IP server).

For third-party developers templates and software libraries are available for JAVA:
- supports direct communication with controllers
- automatic and personalized visualization

- continuous status updates and online visualization
- direct graphical control of controllers or from intuitive form
- allows you to create your own graphic software control panels

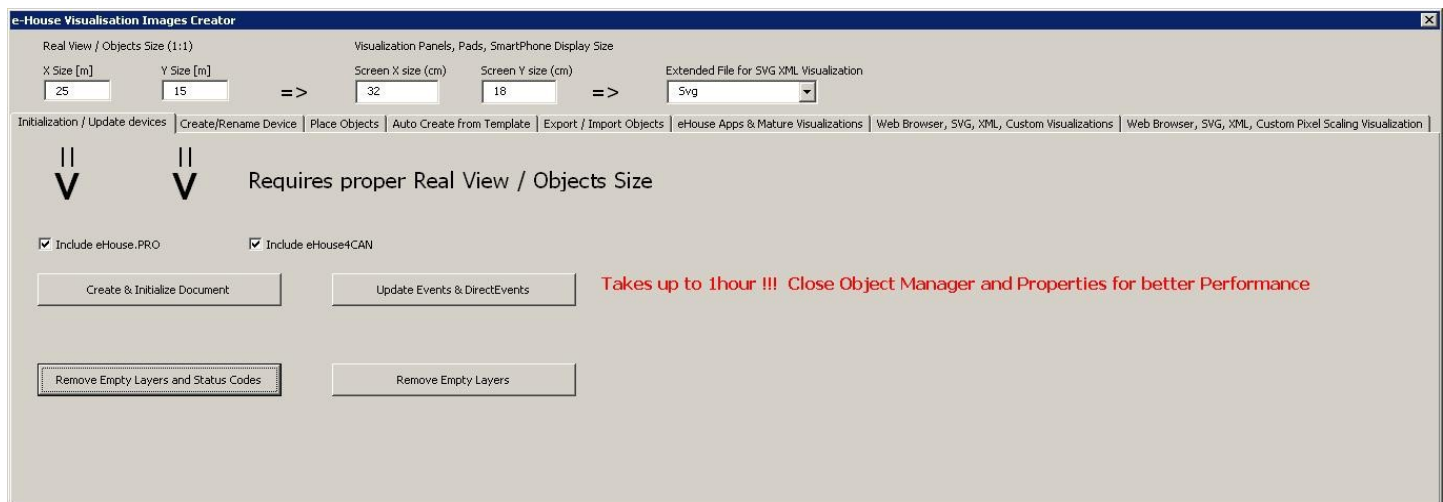## *4.5. Visualization and Graphical Control - Views and objects creation*

eHouse smart home graphical visualization and control. Creating visualization in Corel Draw with eHouse Scripts. It is very important to complete configuration of all controllers, names, signals before starting with creation individual visualization views. Otherwise all names will have to be performed manually which is very time consuming and uncomfortable.

After final configuration of all devices in eHouse application: naming devices, signals (analog sensors,digital inputs, outputs, programs, alarm sensors, and creation event, eHouse.exe should be execute with "/cdr" parameter for extracting all names and events for Corel Draw VBA eHouse macros, to import it to the empty view file.

Views with proper name should be created (in case of usage visualization or graphical control - by copying empty file "empty.cdr" to new one named as future View Name). Views can be created in Corel Draw application (ver. 12 or greater) - may be evaluation or demo version.

Afterwards file should be opened by Corel Draw application, by double click the file from "File Explorer" and chose macro (tools->visual basic->play chose from list eHouse and finally Visualization.createform). X,Y sizes in meters should be entered then press "**Create Document**" button. This will creates page with specified size and layers for each devices and each events. One layer will be created with name {device name (event name)}. Then script should be closed and sizes of view and units (in meter) should be verified. Views edition can be achieved in two ways: manual drawing directly on created, empty canvas or automatic via auxiliary macro function.

4.5.1. Creating Visualization - Initialization

- to create and initialize objects "**Object Manager**" must be completely closed which will accelerate the formation of thousands layers, objects
- in "X Size [m]", "Y Size [m]", enter the actual dimensions of the view in meters.
- setting "Include eHouse.PRO" flag allows you to add eHouse.PRO intelligent home system configuration for visualization
- setting "Include eHouse4CAN" flag allows you to add eHouse4CAN smart home system configuration for visualization
- setting "Include eHouse RF" flag allows you to add eHouse RF smart home system configuration for visualization
- setting "Include eHouse WiFi" flag allows you to add eHouse WiFi smart home system configuration for visualization
- then press the "Create & Initialize Document" which will automatically create all the objects of eHouse system. This can take up to one hour because the system can have many thousands of objects. If signal name at eHouse applications starts with "@" (unused I/O) it is not performed and not added to visualization.

On this form there are also buttons (for update to newer versions and parameters of visualization):
- "**Remove Empty Layers**" - remove empty layers without graphical objects
- "**Remove Empty Layers and Status Codes**" - remove empty layers without any graphics and event codes of eHouse system
- "**Update Events & DirectEvents**" - update eHouse control codes for all graphic objects created. Upon completion of visualization

4.5.2. Automatic drawing with support of Macro Function

This mode is especially helpful when we need precise dimension and locations e.g. draw plan of the building. It also assures compatibility with any available visualization or graphical control method in eHouse system. This method actually put specified object with precisely defined parameters on selected layer.
For automatic drawing objects open (tools->visual basic->play choose from list eHouse and finally Visualization.NewObject).
- set offsetx, offsety parameters which is movement from point (0,0) defined globally
- chose from list **Device Name** and event (Layer) and then "Create/Activate Device"
- chose object from list to draw (ellipse, poly-line, rectangle, round-rectangle, label)
- set requested parameters (x1, y1, x2, y2, width ,color, fill color, roundness)
- press "Place Object" button
- in case of undesired result "Undo" can be executed
- repeat these steps for every object and each layer
- after creation all objects "Generate Files" should be pressed, and other views creation methods, which will create files for many different visualization types (Visual.exe, eHouseMobile, SVG, XML+SVG, HTML+maps)

4.5.3. Manual drawing of objects

Objects are created manually on canvas of view, using Corel methods of drawing. Due to system consistency unknown figures and parameters are ignored and only known figures (for eHouse visualization) can be draw.

To achieve good images and scalability for various panels (Java, Windows, WWW, Android, .Net) only following object can be draw:

Drawing Ellipsis put in rectangle coordinates diagonal (X1, Y1) (X2, Y2). Accepted parameters are:
- outline width
- outline color
- fill color

Drawing Rectangle with coordinates diagonal (X1, Y1) (X2, Y2). Accepted parameters are:
- outline width
- outline color
- fill color

Drawing line between 2 points (X1,Y1) (X2,Y2). Accepted parameters are:
- outline width
- outline color
- fill color

Drawing Rounded Rectangle (X1,Y1) (X2,Y2). Accepted parameters are:
- outline width
- outline color
- fill color
- radius - in % (must be equal for all corners)

Placing Label (X1,Y1):
- outline width
- outline color
- fill color
- text
- {Type and size of font can be changed, but it should be verified on other computer without Corel Draw and TCP panels (Windows mobile, Android, Java, WWW) Common fonts should be used as **Arial**, **Times New Roman,** etc to ensure proper work on many platforms (Windows XP, Windows Mobile, Many Web Browsers on different operating systems)}

Drawing filled Polygons – closed path filled with color:
- outline width
- outline color
- fill color

Object should be created on required layer assigned to the state of device.
All colors must be RGB colors, otherwise it will be converted to RGB if it possible. If Conversion is not possible they will be set to default color (fill black, outline Red). It could be then replaced by valid colors from RGB palette.
For usage of Web Browser graphic control or visualization, browser safe colors should be used.

In the most current version of script capabilities to create individual graphic visualization and control it includes:

- automatic import of names: devices, events, signals of eHouse variants: eHouse.Pro, Ethernet eHouse (LAN), eHouse 1 (RS-485) eHouse4CAN (into independent layers)
- automatic update of changes - names, events, system events
- automatic cleaning of empty layers - without visualization objects
- manually add new devices, layers, or a change in case of change of name
- precision manual creation of graphical objects (by entering the coordinates and parameters)
- create template images, export, import options for creating views, the outline of the building, repeating objects, etc.
- automatic creation views of objects from image templates for inputs, outputs, alarms
- support shapes: line, circle, ellipse, polygon, rectangle, rounded rectangle
- create a visualization to control applications on any eHouse platform (Android, Java, Windows, Linux)
- create multiple variants of graphical visualization and control for web browsers allowing usage of any browser on any operating systems and devices: SVG, XML, HTML, SVG + JavaScript, Maps HTML, HTML Form, Custom (individually created based on individual templates)
- create a visualization dedicated to any hardware panels - any screen size (which is a parameter in centimeters)
- create a visualization dedicated to any hardware panels - any screen size (which is a parameter in pixels)

In order to utilize the functionality of macros, open a blank template file "*.CDR" and select "Enable Macro" allowing usage VBA scripting. In case of old template files you can open old "*.CDR" file with existing view and then open eHouse macro from newest empty CDR template downloaded from eHouse web page.

Then select the menu Tools-> Macros-> Run Macros-> eHouseVis.

4.5.4. Manually creating visualization objects

Another form allows you to manually create new layers and change their names (for events):
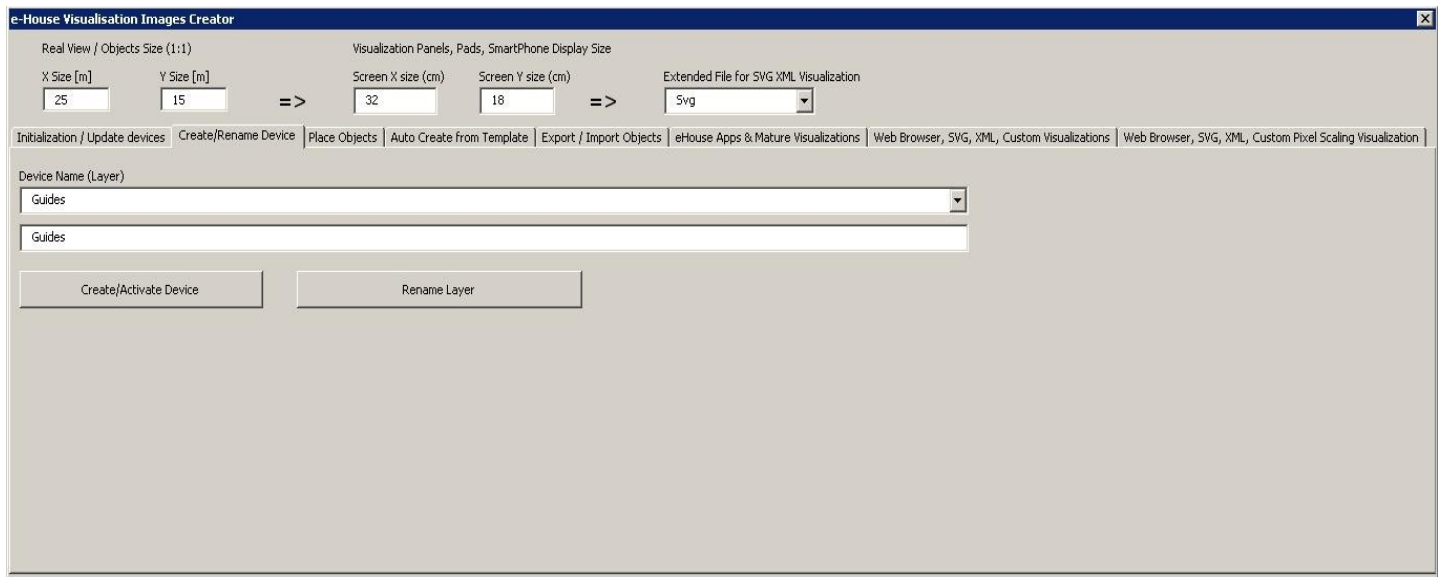
- **"Create / Activate device"** - creating a new layer. The name entered in the edit box, and then presses the button.
- **"Rename Layer"** - Change the name of the layer. In the **"Device Name (Layer)"** to select the layer. Then, in the edit box change the name and presses the button.

4.5.5. Automatic creation of graphical objects from templates

Repetitive graphical objects can be created from pre-defined templates for layers with names containing 'TEMPLATE_'.
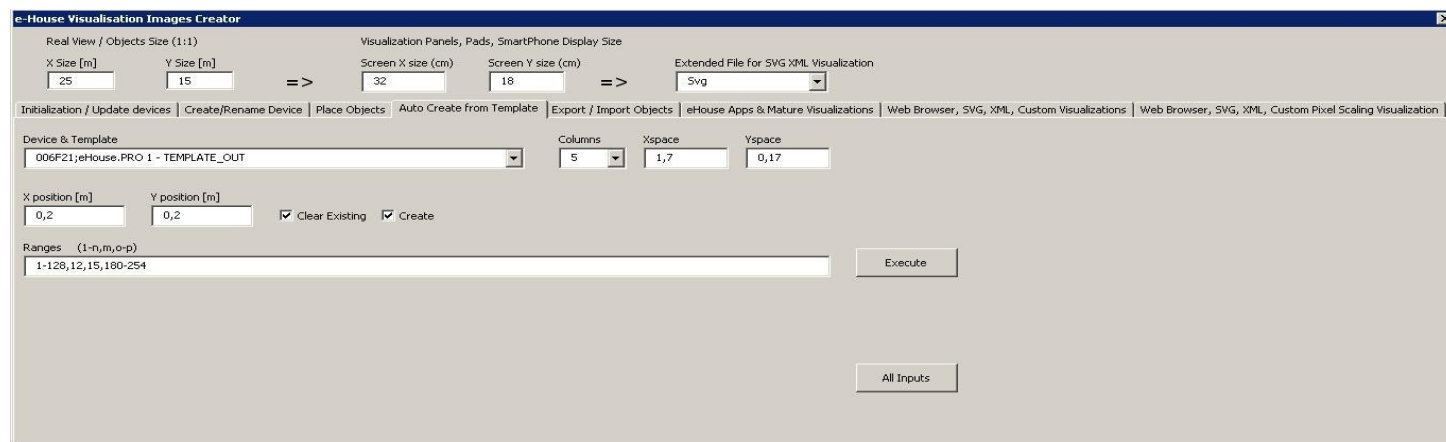Individual templates are on layers with the addition of:
For each alarm input (on/off)
- **"TEMPLATE_Active"** - for active inputs
- **"TEMPLATE_Alarm"** - for alarm signals
- **"TEMPLATE_Warning"** - for warning signals
- **"TEMPLATE_Monitoring"** - for monitoring signals
- **"TEMPLATE_Horn"** - for siren signals
- **"TEMPLATE_Silent"** - for silent alarm signals
- **"TEMPLATE_Early"** - for early warning signals
- **"TEMPLATE_SMS"** - for SMS signals
- **"TEMPLATE_Input"** - for input signals (for standard inputs)

For other signals:
- **"TEMPLATE_OUT"** - for digital outputs
- **"TEMPLATE_PROGRAM"** - for outputs programs
- **"TEMPLATE_ZONES"** - for security zones
- **"TEMPLATE_SECUPROGRAMS"** - for security programs/drives

- **"TEMPLATE_ADCPROGRAMS"** - for programs regulating/measurement

Form "**Auto Create from Template**" contains the necessary elements for the automatic creation of graphical objects such as inputs/alarms, outputs, buttons, programs, etc.
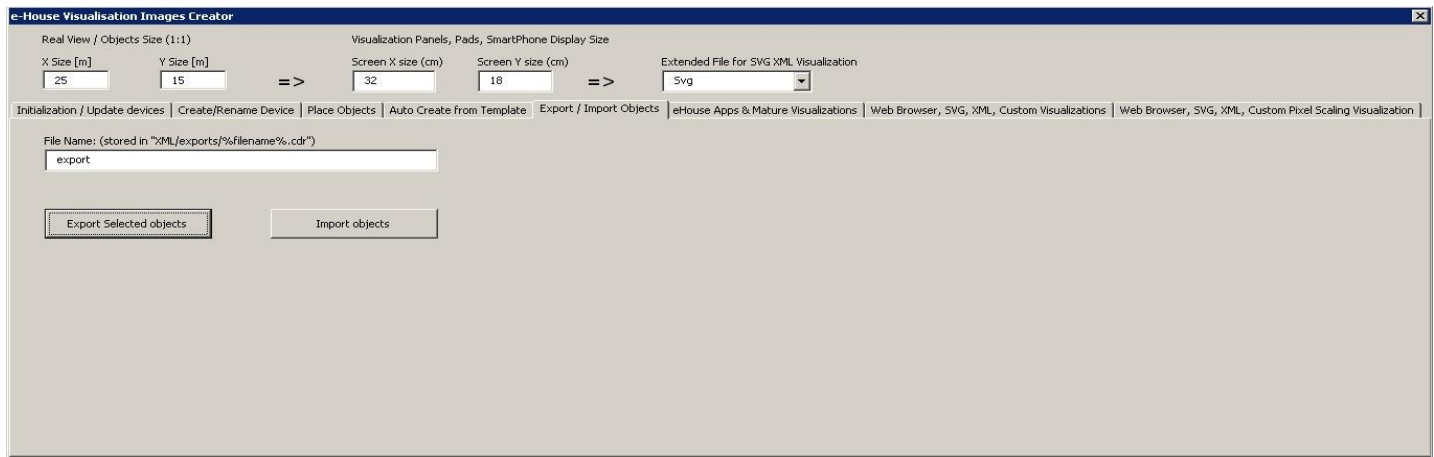

- in the "**Device & Template**" field - select the appropriate template
- in the "**Column**" field - is the number of objects in each row
- in the "**X space**" field - is located in the X-axis spacing between successive objects
- in the "**Y space**" field - is located in the Y-axis interval between successive rows
- "**Clear Existing**" - allows the removal of layers of graphics in which the templates are copied
- "**Create**" - allows you to create graphic elements of the template
- Edit box "**Ranges**" - contains a list of items that will be processed during the creation, deletion of graphical objects. It is permissible to calculate the elements separated by a comma "," or ranges separated by a semicolon "-" eg "1-12,15,17,21-32,38-45"
- "**Execute**" - start the creation of graphical objects for the selected template from the list of "**Device & Template**"
- "**All Inputs**" - launches the creation of facilities for all input signals / alarms

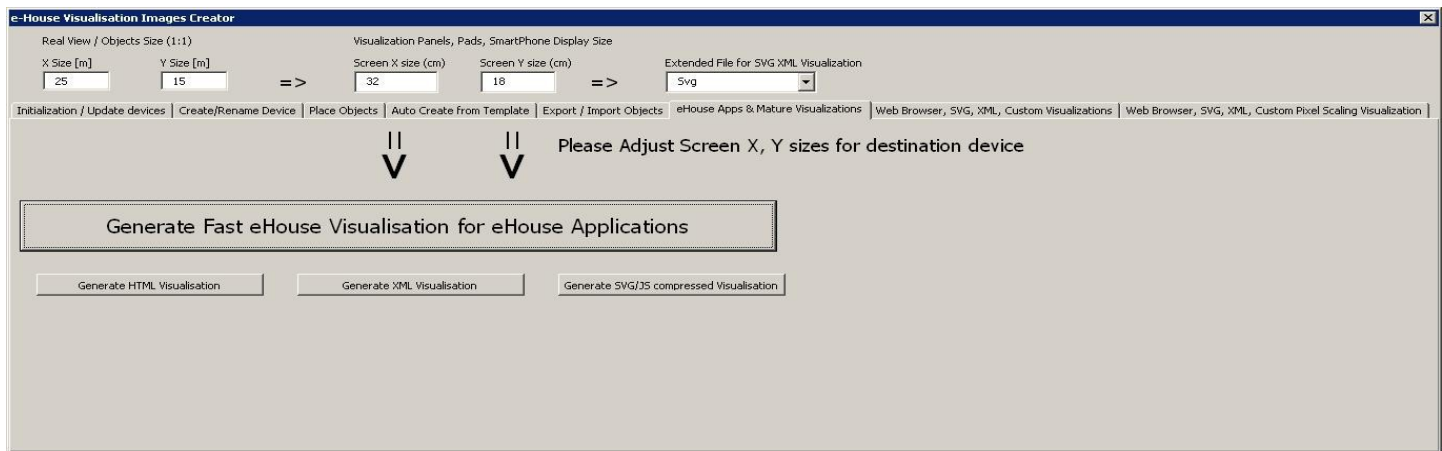## 4.5.5. Exporting/Importing graphics objects

Export/Import allows you to easily and quickly copy portions of visualization to create different variants, views, such as a separate for children by limiting their functionality. Export/import fully copies the graphic objects with layers and their location. To perform the export should be noted in the image (choose - "Select" button while holding down the Shift to add more or select all and copy then delete unwanted) objects to copy.
Then, in the "File name" enter the name of the export file that will be created in the "XML/exports/" with the extension ".CDR" and will be in "Corel Draw" format.

- "**File Name**" - the name of the file export/import without extension
- "**Export Selected Objects**" - export selected graphic elements and layers
- "**Import Objects**" - import graphic elements and layers of exports

4.5.6. Creating Application Visualization for eHouse System panels

This form allows you to generate a file ready for eHouse visualization and control native applications for:

- Java - Any platforms and operating systems with the Java virtual machine
- Android - any devices running Android: smartphones, PADs, PODs, SmartTV
- Windows mobile, phone, .Net, .Net CF

To generate a visualization for any eHouse panels:

- enter the dimensions of the display panel in centimeters in the fields: "X Screen size", "Y Screen size"
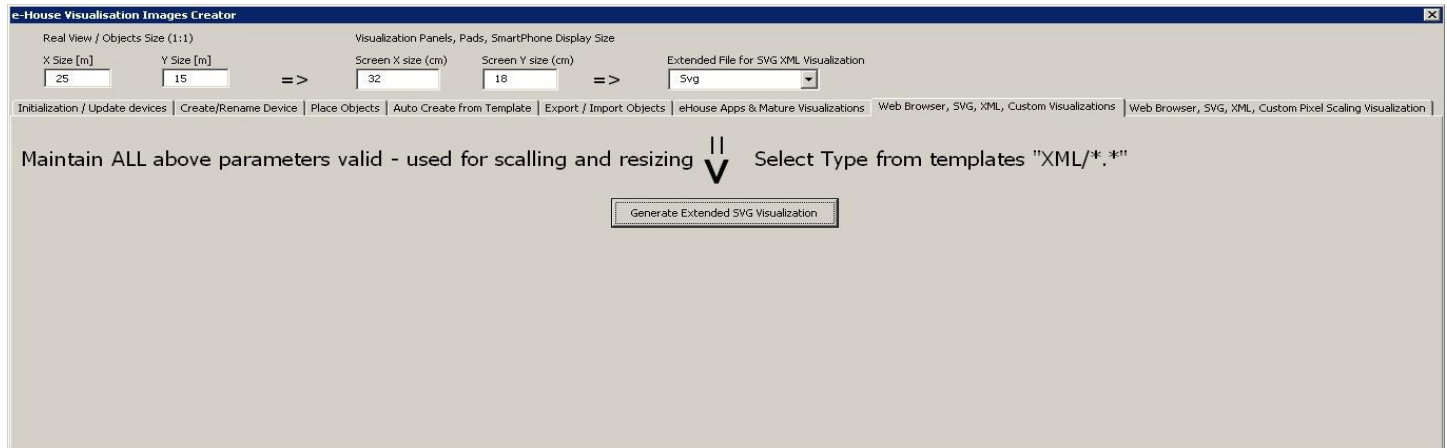- press "Generate fast eHouse Visualization for eHouse Applications"

- for the older methods of controlling the graphics for web browsers can generate images
- maps HTML - "Generate HTML Visualization"
- XML/SVG - "Generate XML Visualization"
- SVG compressed with Javascript - "Generate SVG/JS compressed Visualization"

For different panels/displays/screens sizes to be generated independently by changing the size (scale to fill up screen) of the visualization screens and pressing the creation of visualization. After generating the views of data must be moved to another location or change the name that has not been overwritten with new settings, because the visualization is always created with the same name as corel draw (.cdr) file name.

Visualization files: html form, svg, xml is stored in the "XML/" with the appropriate extension. Visualization files for eHouse application form root directory where the current file CDR.

4.5.7. Creating graphical visualization and control of Web browsers for panels with programmable screen size in centimeters

This form allows you to generate complete files, exports for graphical visualization and control for Web browsers, third party applications:

- SVG/JS - Visualization and graphic control + JavaScript compression
- XML/SVG - Visualization and graphic control without JavaScript compression
- custom format export - based on individually created template
- ability to add new individual export formats of visualization objects

To generate a visualization for any eHouse panels include:

- check the dimensions in meters in the fields: "X Size [m]", "Y Size [m]"
- enter the dimensions of the display panel in centimeters in the fields: "X Screen size", "Y Screen size"
- select the export format in the "Extended SVG XML Visualization"
- XML – SVG/XML without compression

- SVG - SVG compression JavaScript
- custom format
- you can add your own files to create the templates in the "XML /"
- press "Generate Extended SVG Visualization"

For different panels/displays/screens to be generated independently by changing the size (scaling for optimal fill up of screen) of the visualization screens and pressing "create visualization". After generating data, views file must be immediately moved to another location or change the name that has not been overwritten with new settings, because the visualization is always created with the same name as corel draw file name.

Visualization files form html, svg, xml in the "XML/" with the appropriate extension.

Creating graphical visualization and control for Web browsers based panels with programmable screen size in pixels.

This form allows you to generate the finished files for graphical visualization and control for Web browsers:

- SVG / JS - Visualization and graphic control + JavaScript compression
- XML / SVG - Visualization and graphic control without compression JavaScript
- custom format - individually created template
- ability to add new individual export formats of visualization objects

To generate a visualization for any eHouse panels:

- check the dimensions in meters in the fields: "X Size [m]", "Y Size [m]"
- select the resolution in pixels of the display panel in the "Display Screen Resolution"
- optional screen making it possible to reduce the margin in the fields: "X deviation", "Y deviation" for both axis
- select the export format in the "Extended SVG XML Visualization"
- XML – SVG/XML
- SVG - SVG compression JavaScript

- custom format
- you can add your own configuration files to create the templates in the "XML/"
- press the "Generate Extended SVG Visualization"

For different panels/displays/screens, generate visualization, regardless changing the size of the screen and pressing the creation of visualization. After generating the views of data must be moved to another location or change the name that has not been overwritten with new settings, because the visualization is always created with the same name as the file name corel draw.
Visualization files: html, svg, xml in the "XML/" with the appropriate extension.

## 4.5.8. Manual - Precise creation of graphical objects

It is possible to precisely draw simple figures available and accepted by eHouse software, which was specifically discussed in earlier desciption.
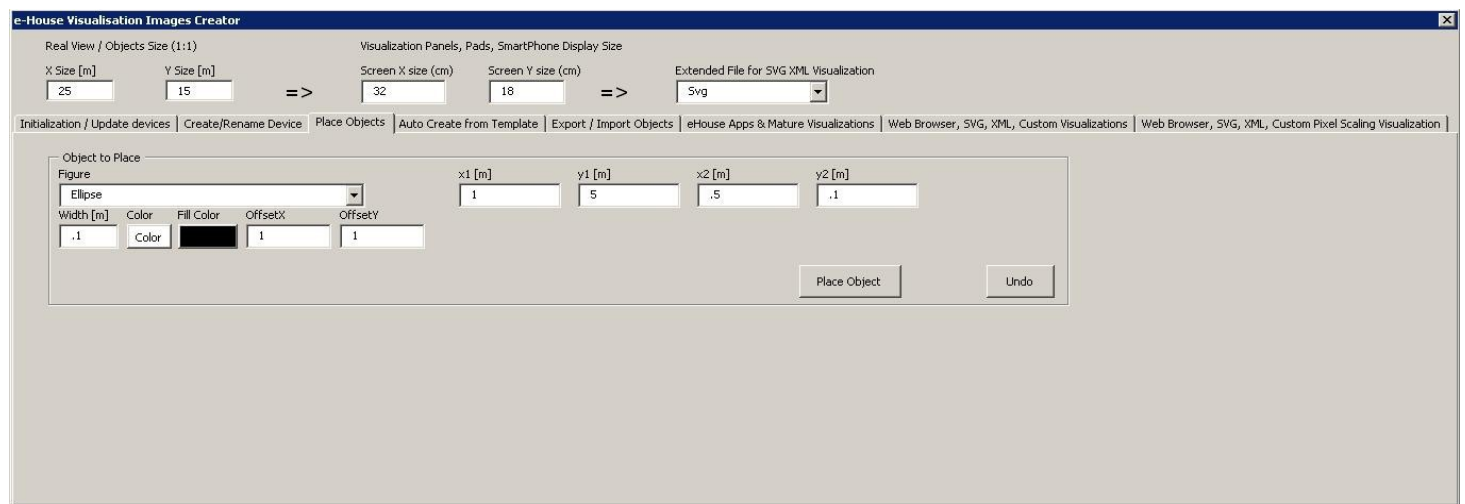

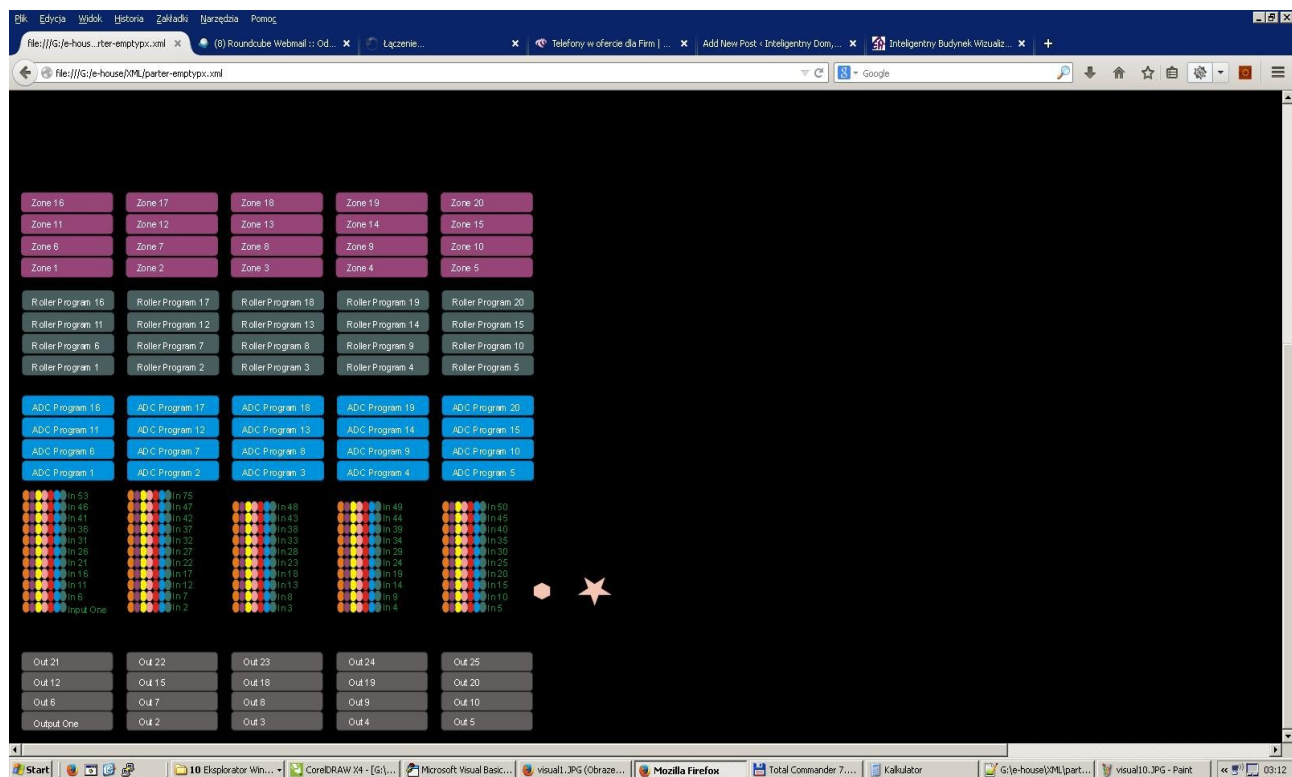To create a figure on the current layer (active):
- select the figure (shape) in the field: "Figure"
- enter the points (x1, y1), (x2, y2) coordinates
- select the thickness of the line - "Width [m]"
- select the color of the line – "Color"
- select the fill color - "Fill Color"
- enter "X Offset", "Y Offset" for each axis
- press "Place Object"
- in the case of wrong place, you can press the "Undo"

Automatically generated visualization of objects based on templates:
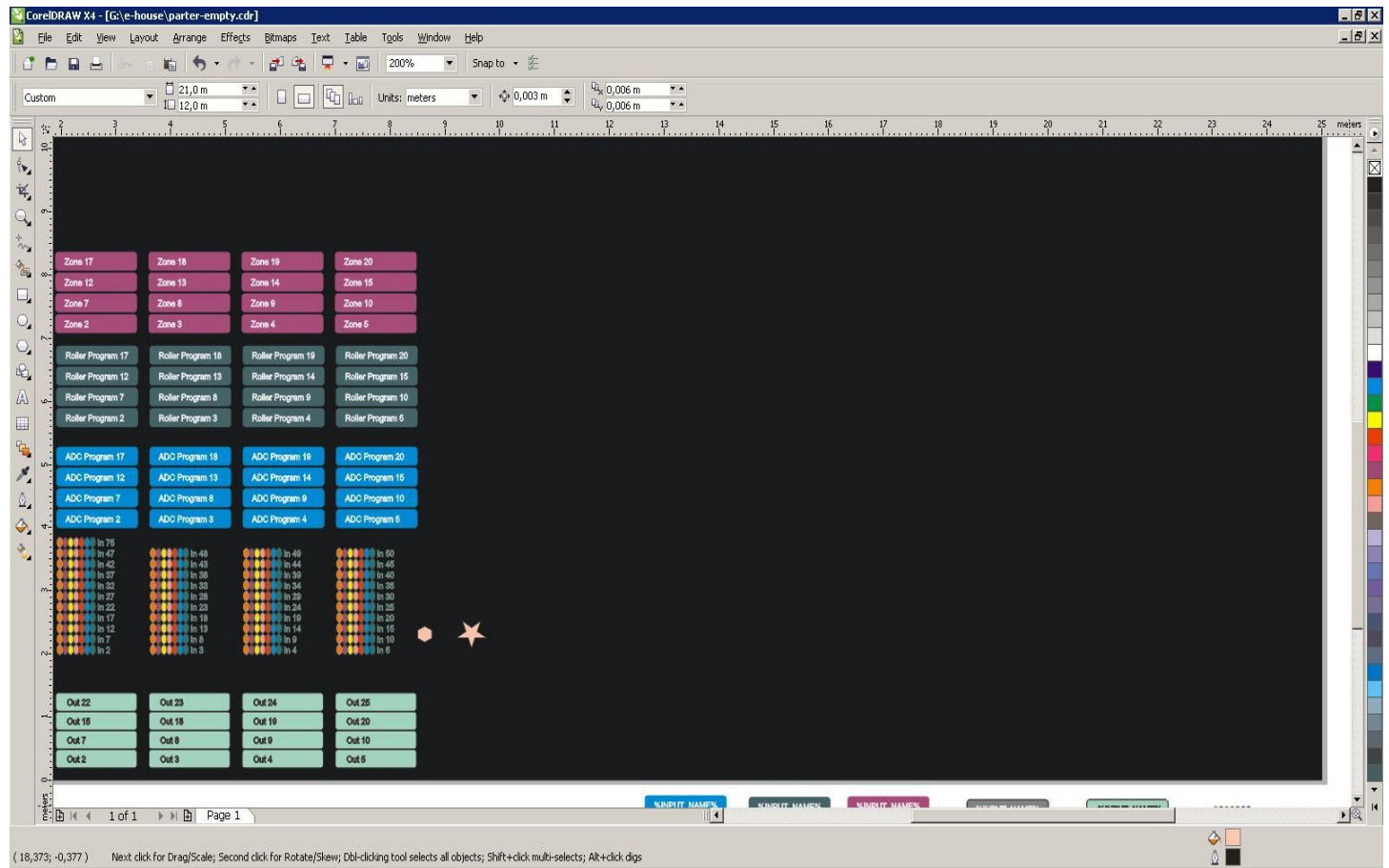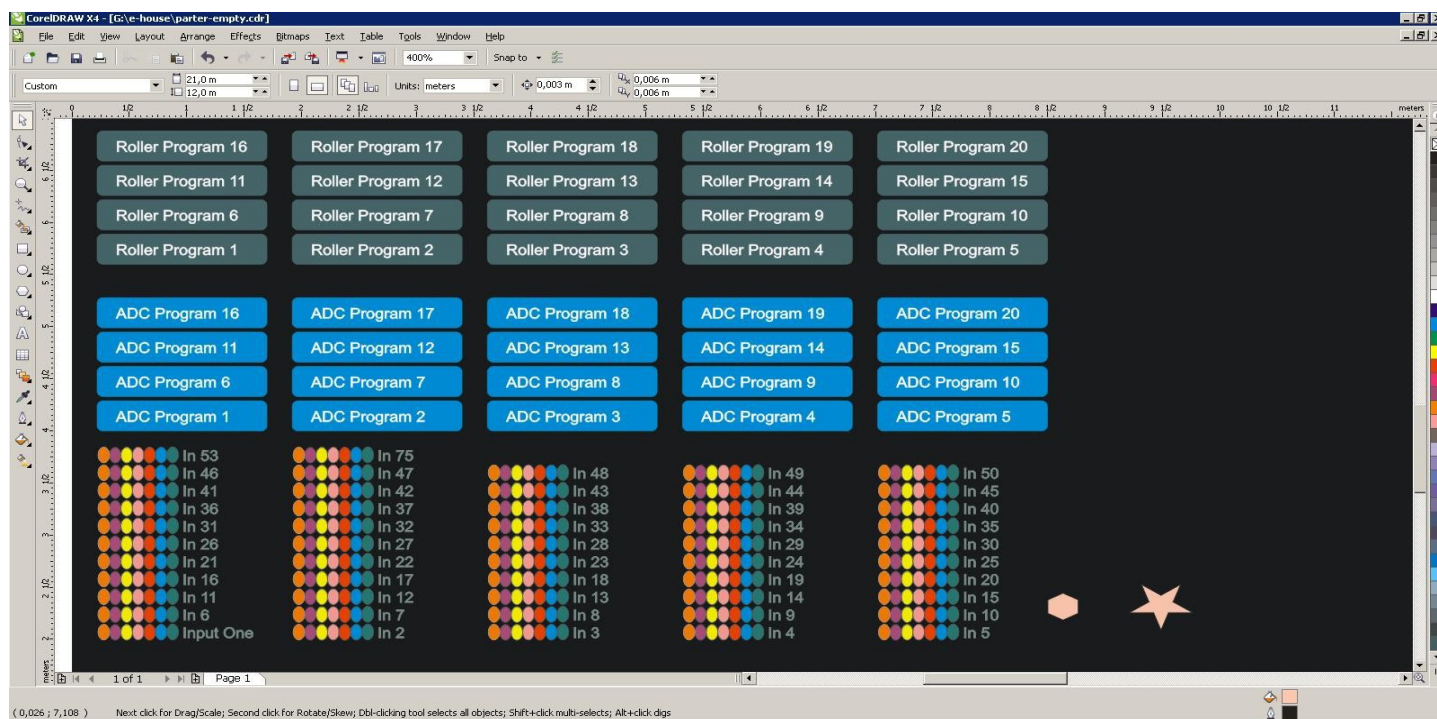
Effects in FireFox browser:

5. References:

English:

Most current version is located (EN):	http://www.isys.pl/download/eHouseWiFiEN.pdf
Do It Yourself information (EN):	http://smart.eHouse.Pro/
Producer Web Page (EN):	http://home-automation.isys.pl/
Producer Internet Shop (EN):	http://eHouse.biz/

Polish:

Najnowsza wersja tego dokumentu (PL):	http://www.isys.pl/download/eHouseWiFiPL.pdf
Informacje do samodzielnego montażu (PL):	http://inteligentny-dom.eHouse.Pro/
Strona producenta (PL):	http://www.isys.pl/