

eHouse System - Intelligent House, Building, Flat.

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1. Introduction.

"Intelligent house" term means all sort of home 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 systems currently are most important system for trimming 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.

1.1. *Ease, comfort, automation.*

eHouse system usage enables complex, local and remote controlling of light, temperature, electric and electronic devices in the house, flat, office, hotel, etc. It creates possibility of controlling Audio - Video, HiFi systems by emulating infrared remote controller signals which can be learn and executed by eHouse system. There is possibility of managing very advanced boiler room installation: heating, cooling, recuperation, ventilation, solar, boiler, heat buffer, bonfire with water jacket and hot air distribution system.

eHouse enables controlling system by common switches, IR remote controller, GSM mobile phone, PC, graphic touch panels working based on Windows XP, Windows Mobile 6 and their successors, internet browser, windows explorer, ftp client application.

eHouse system graphics control panel are realized on standard PDA or PC with supplied software. Visualization images can be created individually for any end user installation.

eHouse Controllers consist of large, advanced scheduler which can be programmed to run service, frequent, postponed and season task automatically. PC support enables creating own software which works together with eHouse package, performing logs and run advanced users algorithms which can be necessary or appear in the future.

1.2. *Security.*

House is much more endangered then flat, due to large distance to the neighbors and has also much more weak points. It concerns possibility of burglary, attack, theft, fire, flood, sabotage. In case of week or lack of efficient security system and alarm sensors monitoring any possible events in the house and premisses, counting on neighbors a few dozen meters from us or police reaction is rather too optimistic.

Usage of eHouse system increases security of house and building, because it incorporates build-in security system with GSM/SMS notification of events. It enables connecting any kind of alarm sensors (movement, wet, cold, heat, fire, wind, gas, switches for confirmation of closing doors, windows, rollers, gates, etc.). Security system is activated outside secured zone which do not give additional time for action to intruders. eHouse gives opportunity to perform automatic task on sensor activation, programed in the system.

eHouse integrates automatic multi-channel driving rollers, gates, doors, shadow awnings etc.

eHouse system enables imitating presence of human in the house by running scheduled events, changing TV channels, which can discourage intruders watching the house from break-in.

1.3. Economy, energy savings.

eHouse System incorporates advanced controller to manage heat, cool, ventilation, recuperation, boiler room, solar system, heat buffer, bonfire with water jacket and hot air distribution, which saves a lot of energy by buffering and using free (solar) or cheapest energy sources (wood, solid fuels). It can be programmed to run fully automatically without human interaction. It enables possibility to limit expenses of heating, cooling, ventilation a few times depending on prices of used fuels.

Individual control of rooms temperatures and maintain them independently, generates additional savings of about several dozens percents, and efficient usage of energy. In this case all temperatures in controlled rooms are maintained automatically on programmed level, without overheating some rooms to keep requested temperature in other one. The weather, sun, wind, climatic events, time and season, architecture issues, window size and locations do not have such huge influence, as it is on central heating systems. There is not big gradient between the rooms which changes due to weather conditions, solar heating, wind direction, and many other unpredictable issues.

Additional savings can be achieved by automatic switching off light by setting them to turn off automatically after some time or turn them on, for a period of time as the result of movement detection.

This possibilities of eHouse system gives opportunity to refund costs of installation during 1-3 years (depending on costs of used fuels).

2. eHouse system versions.

eHouse System is advanced solution of home automation which enable controlling and integration many devices of different type. eHouse enables monitoring and control temperature, light level, heating, cooling, humidity.

eHouse System can be installed in flats, houses, public buildings, offices, hotels and can be used as access control system.

eHouse system installation can be economic, comfort or maximal.

Many configuration variants of eHouse system creates possibility of decentralized, centralized, managed by PC or independent installation.

eHouse is modular system which gives opportunity to resign from not used parts and trim application directly to end user needs (e.g. HeatManager can be dropped in flat installation).

eHouse installation can be designed as centralized and one controller per level (LevelManager) or decentralized with many controllers spread over the rooms. In second case there are much less 230V cabling and their total length are a few times shorter and makes installation much cheaper, which partially make up for larger costs of controllers.

eHouse System enables control practically every device which can be controlled electrically or electronically, constantly developed and opened on news on the market.

eHouse can be controlled by IR remote controller (SONY standard), PC, PDA, Mobile Phones (Windows Mobile 6.0 or Java MIDP 2.0), Touch panels based on (Windows mobile 6.0, Windows XP and successors) or by common wall mounted switches. Control can be achieved via BlueTooth, Infra-Red (IR), Ethernet, WiFi, eMail, SMS, ftp, file copy.

eHouse use common devices (switched on/off by relays e.g. lamps, pumps, cutouts, heaters), without internal controlling logic and do not require expensive and dedicated devices (e.g. graphic panels, switch panels).

eHouse cooperates and can be managed by PC, which gives opportunity to create own software overlays for implementation advanced and individual algorithms by analyzing logs and performing data in desired way.

eHouse system consists of :

- RoomManager (RM) - Controlling one or more rooms,
- ExternalManager (EM) - Controlling rollers, gates, doors, shade awnings drives,
- LevelManager (LM) - Controlling whole flat or house storey,
- HeatManager (HM) - Controlling central heat system, ventilation, recuperation, boiler room, bonfire with water jacket and hot air distribution, solar, heat buffer, etc,
- InputExtender (IE) - Security system extension module for ExternalManager,
- CommManager (CM) Ethernet, GSM - Integrated security system, Rollers controller,
- Relay Module (MP) - Consist all relays for controller and PWM dimmers (optional),
- MultiHeatManager (MHM) - integrated multi-channel (16) individual room heating manager,
- BlueTooth (BT) - extension module for RoomManager for spreading range of BT usage,
- Mifare Access Card Reader (ACR) - extension module for RoomManager used in access control systems, hotel applications, public buildings,
- Converter RS232 /RS485 - module for connection eHouse 1 bus to PC via RS232.

Modular character of eHouse system enables choosing individual variant of installation which would be most efficient, desired by owner, and cost effective.

E.g. persons who creates eHouse installation in flat or apartment do not need HeatManager controller, Roller controller. They generally need LevelManager or CommManager to directly control flat, or RoomManagers for individual controlling heat in the rooms and Audio/Video systems.

eHouse system enables:

- Integrated control of electric and electronic devices (on / off) (RM).
- Controlling Audio / Video, HiFi system (via IR remote controller emulation) (RM).
- Measurement and control of light level (RM, EM).
- Measurement and control of temperature (RM, HM, EM, IHM, LM).
- Multi point and individual heat control (RM, MHM, LM).
- Integrated control of boiler room (HM).
- Management of ventilation, recuperation, heat exchangers, air handling units (HM).

- Boiler control (HM).
- Bonfire control with water jacket and / or hot air distribution (HM).
- Solar system control (HM).
- Heat buffer control (HM).
- Security system with GSM notification activated outside monitored zone (EM + IE + PC, CM).
- Graphical Visualization (individually created for end user installation in Corel Draw) (PC, PDA - Windows Mobile 6, Windows XP, Vista).
- Acoustic signalization playing messages (can be recorded individually) (PC).
- Rollers, gates, doors, shade awnings control (EM,CM).
- Creating logs in eHouse system (PC).
- Usage of third party components and executive devices (without any build-in logic to control) , sensors, switches, pumps, motors, cutouts, rollers drivers etc.
- Usage of analog sensors from the market (<0;5V) measurement range.
- Controlling system by **eHouse** application.
- IR Remote Control of system (Sony standard SIRC) (RM).
- Controlling by miniature electronic key (remote controllers IR {changing user programs for RM} / RF {changing security settings and zones for EM+IE}).
- Remote control via internet and Ethernet.
- Local control by graphics panels (Windows Mobile 6.0 and successors), or PC compatible with touch screen (Windows XP and successors).
- Remote control by mobile phones, PDA with touch screen (Windows Mobile 6.0 application controlling system via WiFi, SMS or eMail).
- SMS notification of security violations, zone changes, deactivation (to defined groups) (PC, CM).
- Authorization with Mifare access card (hotels, access control applications, public buildings, offices) (RM).
- Individual access rights definitions for RoomManager's resources assigned to Mifare access cards (e.g. hotels, offices, access control applications) (RM).
- eHouse has implemented functions of self control, logging, to maintain continuous and efficient work.

2.1 eHouse 1 under PC supervision.

Although all controllers of the system can work individually without PC connected to the system, PC increases system functionality and control.

eHouse 1 uses PC together with supplied software "eHouse package" (Windows XP and successors), installed and works as server of system and multi-media communication gateway. Applications enable controlling via Internet, TCP/IP, WiFi (eHouse.exe), BlueTooth (BlueGate.exe), Email (EmailGate.exe), FTP (FtpGate.exe), SMS (SmsGate.exe). Additionally system can be controlled by Windows Explorer (direct event file copy). eHouse system can play recorded audio notifications of system state and events (Player.exe). Attached visualization application (Visual.exe) can control, visualize, and show states of devices as a scalable graphics with active controls. Views can be individually created in Corel Draw application with support of build macro functions for importing names from eHouse system and generating images for many visualization methods from one drawing.

Ehouse.exe application is heart of intelligent house system on PC. Most important function of the applications are:

- built-in TCP/IP server, for cooperation with TCP/IP panels, for visualization and control via Ethernet, WiFi, Internet.
- Intuitive adding, configuring, creating names of devices, inputs, outputs, sensors.
- Firmware upgrade for devices.
- Automatic generation of configuration for controlling devices, mobile phones, TCP/IP panels etc.
- Online logging states of devices, decoding data to file format.
- Exchanging data between controllers.
- Receiving commands via build-in multi-connection TCP/IP Server.
- Enabling connecting TCP/IP graphics panels for controlling, visualizing state of all devices (based on Windows XP, Windows Mobile 6.0).
- Constant monitoring device states and communication and restarting devices if communication failed.
- Reporting problems.
- Creating data for visualization, graphical control and audio notification.
- Generating files named as all sensors, inputs, outputs for fast checking of eHouse system state from any operating system or other application.

Additional functions of software package

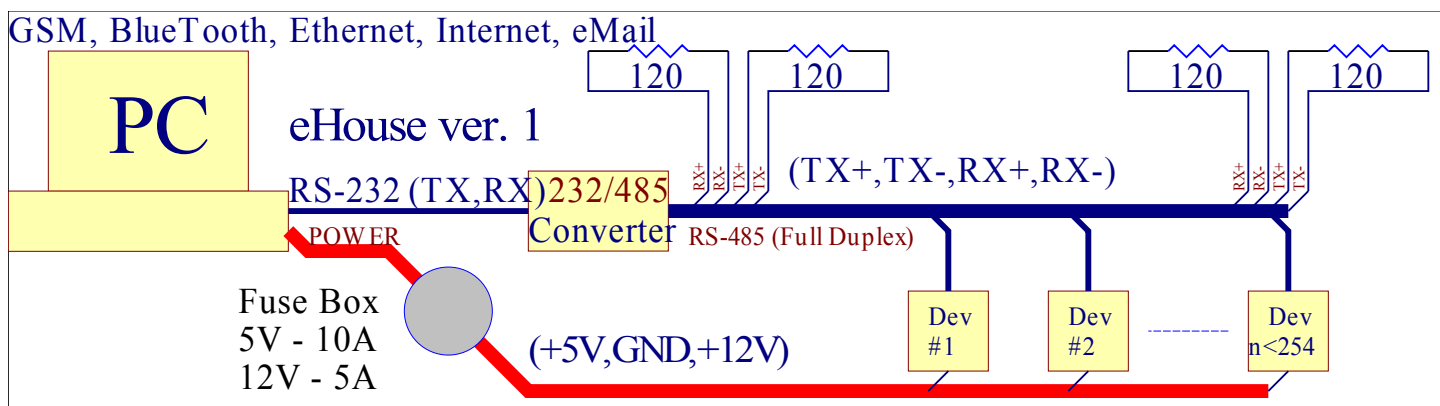
- Receiving SMS commands,
- Sending security system notifications, zone change, sensors violation, deactivation,
- Receiving commands via BlueTooth,
- Receiving commands via eMail.
- Sending logs via eMail.
- Receiving commands via FTP.
- Synchronize logs and file pointers to FTP server for remote, online status.
- Receiving commands from other media (in the future).
- Visualization of system state with scalable vector graphic views, active controls with touch screen (Windows XP).
- Visualization over TCP/IP on Windows Mobile 6.0 touch screen Mobile Phones or PDA. Control via SMS, TCP/IP (WiFi, Internet), eMail.
- Text panels on mobile phone (Java MIDP 2.0). Controlling over SMS, eMail, BlueTooth (on Nokia).
- Playing acoustic notifications on PC.
- Support for overlay applications written by users, log analyzers increasing eHouse system functionality by users algorithms.
- Controlling Winamp application for playing music via RoomManagers from Remote Controller.

- Monitoring all eHouse applications and resetting them if some problems were encountered.

2.1.1. Data and power buses of eHouse 1 System.

All eHouse 1 devices are working on data bus (RS-485 Full Duplex). Only devices from eHouse system can be connected to the bus. PC computer is connected to eHouse 1 bus via converter RS232 / RS485, which translates TX, RX signals to differential (TX+, TX-, RX+, RX-) for increasing range (to 4 kilometers), maintaining high speed of transmissions (115200).

Full duplex mode increase data throughput and limit conflicts on the bus. On each pair ends of differential bus terminations must be installed (120 OM resistor).



As many as 254 eHouse 1 devices can be connected to eHouse 1 bus. Devices must have unique address. Each device has 2 byte address for identification (ADRH, ADRL). Each device is pre-programmed with default address (55,55). Devices must be connected to the bus one by one, and address should be changed from default, immediately after connection to unique value.

By the default (1,1) must be assigned to HeatManager, (2,1) must be assigned to ExternalManager, devices (55,1..249) must be assigned to RoomManagers. Address (254,254) is allocated by CommManager. Digits 0,255,254,253,252,251 should never be used by eHouse Controllers.

eHouse 1 bus uses standard UTP-8 cable. 4 lines are dedicated for communication (RX+,RX-,TX+,TX-). The other 4 are for powering low power devices (2*GND,2 * 5V). Usage of this voltage is not recommended and value could be changed in other versions of system. This lines can only be used for powering RS232 / RS485 Converter .

The bus should be distributed serially not in star infrastructure.

Power bus uses 3*2.5mm² cable for distributing power supply between all eHouse 1 devices with voltage (+5V,GND,+12V).

Best source of power is PC Power supply (at least 500W) protected by 10A fuses on 12V and 5V lines. Current should be calculated for worst case (every relay is turned on) counting 20mA per relay and 300mA per Controller.

In case of too small current of source another power supply can be connected on opposite end of bus. Power supply should be properly grounded to protect eHouse system against damage. The best way is connecting start and end of power bus to limit connection resistance and voltage drops. Good ventilation of powering PC should be ensured to prevent from overheating power supply or switching it off by thermal protection.

Controllers should be powered with 12V and GND lines on power socket. 5V lines on power line and data bus must be cut off.

5V can be only used for powering relays (if 5V version was used).

In case of leading buses outside house, under ground, or in places with increased humidity both cables should use PE pipe as water protection.

Before starting installation detailed project should be created consisting locations of each system devices, cable traces, sensors, controllers, relay modules, switches and panels.

Most critical pieces of cables should be doubled for security reasons.

PC should be powered from UPS for ensuring continuous working even if power fails.

Additionally it could be powered parallelly from 12V car accumulator. However this connection should have diodes installed between Power supply and eHouse Power bus, and between accumulator and eHouse power bus. Usage car accumulator allows long power supply for Controllers, Security system, Alarm Sensors.

2.2. eHouse 1 under CommManager supervision.

In this configuration CommManager replaces PC, RS232 / RS485 Converter, ExternalManager, InputExtenders, Expander.

CommManager has build in GSM module and Ethernet socket. This variant of system enables full control via TCP/IP panels working on Windows XP, and Windows Mobile 6.0 and their successors (without PC attendance). GSM module enables direct SMS notifications from security system and controlling eHouse system through SMS, eMail via GPRS (dial-up network).

Additionally system can be controlled through WiFi, LAN or WAN from eHouse TCP/IP panels.

Connection of CommManager to eHouse 1 bus must be performed by RS-485 crossing cable.

The signals must be connected as in the table:

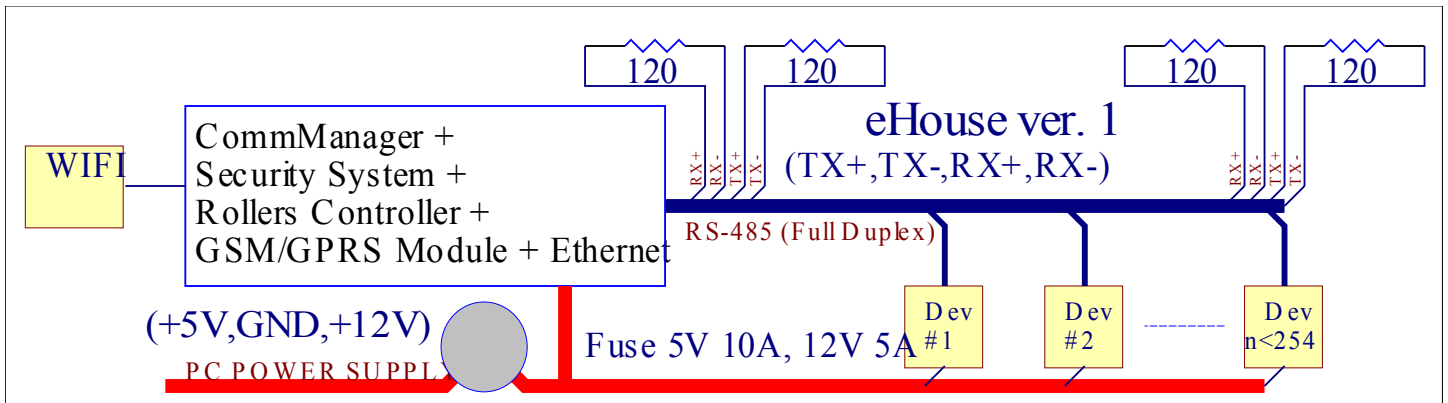
<u>CommManager</u>	<u>eHouse 1</u>
RX+	TX+
RX-	TX-
TX+	RX+
TX-	RX-
GND	GND
GND	GND

eHouse 1 Modules can still be configured by eHouse.exe application with additional parameters /viatcp /extendedaddress /tcpquery.

/viatcp - eHouse application switching on Transparent mode between Ethernet and eHouse 1 bus. All other functions of CommManager are disabled. Transparent mode is deactivated automatically after timeout (4 min) or hardware restart of CommManager. eHouse application works as TCP/IP client against on RS-485 UART.

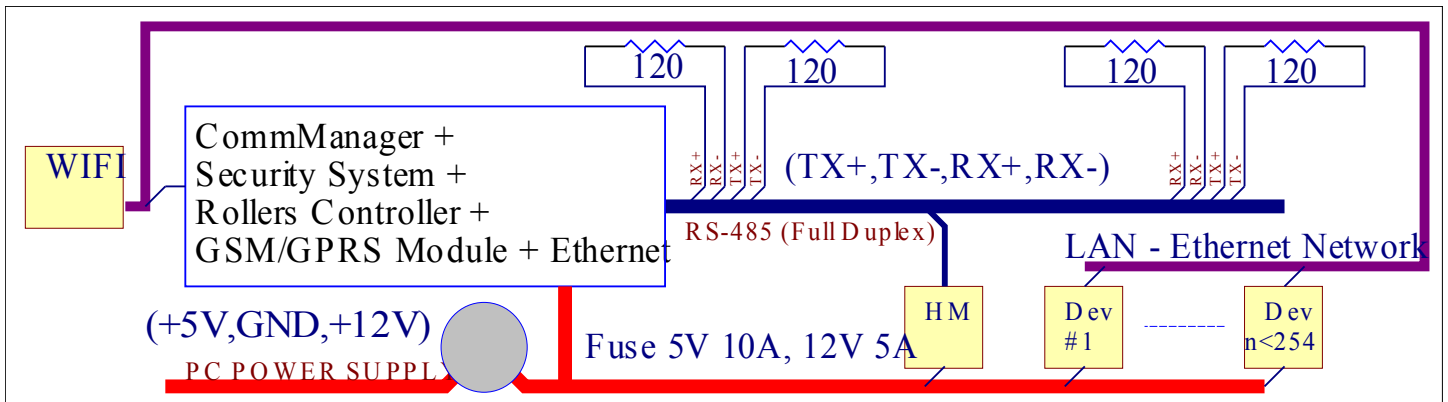
/extendedaddress - turning on extended address mode for eHouse 1 modules (every module must have option "Via Communication Module" enabled in eHouse.exe application.

/tcpquery enable full support of eHouse.exe application over TCP/IP including running events, querying devices, storing their status (the same functionality as work on RS-485 interface).



2.3. Ethernet eHouse (eHouse 2)

This variant of installation works under TCP/IP Ethernet (10Mbit) infrastructure. Only one exception is HeatManager which is still connected via RS-485 through crossing cable. CommManager cooperates with LevelManagers, EthernetRoomManager's, TCP/IP panels (Windows XP, Windows Mobile 6.0) using eHouse protocol with challenge-response authentication for security reasons.



3. eHouse System Controllers.

3.1 RoomManager (RM).

RoomManager (RM) is self contained Microcontroller with build in peripherals for managing electric, electronic devices in the room. Comfort and maximal installations uses 1 RM per major room (defined by user which room is important). In low budget installation at least 1 RM per storey is required. This solution put some restriction on

Infrared Control and program sets.

Main Functions of RoomManager:

- 24 digital outputs (directly for driving Relays build on MP) for turning on / off external devices powered up to 230V-AC/10A (maximal values for current and voltage).
- 12 digital inputs for connecting sensors, switches, etc. Two events are defined for changing state from 1->0 and 0->1. Assignment of desired events can be performed in eHouse application.
- 8 analog inputs (10bit resolution) with individually programmed levels (min,max). Three events are defined for changing from one level to another $x < \min, \min \leq x \leq \max, x > \max$.
- 3 PWM (Pulse width modulation) outputs for controlling light level (DC dimmer). RoomManager's PWM output is capable to drive single LED (for opto couple pair) and need power driver. Dimmer drivers up to 30W can be installed optionally on MP.
- RS485 interface for communication over eHouse 1 bus.
- RS232-TTL interface for installation extension modules to controllers.
- Programmable clock and scheduler (248 positions) for running events stored in flash memory of RM.
- IR infra red receiver compatible with Sony (SIRC) system for controlling RoomManager's by Sony or universal remote controllers.
- IR Infra red transmitter for controlling Audio / Video / HiFi systems by remote controller signal emulation.
- Controlling Winamp application installed on PC (eHouse system server) via Sony IR Remote Controller.
- Possibility of connecting BlueTooth module for spreading BT range.
- Possibility of connecting Mifare Access Card Reader module for identification and access control or right limitation for users (e.g. in hotels, public building, offices applications etc.).
- Up to 250 RM can be installed in eHouse System.

RoomManager can be configured and managed by PC with installed “eHouse.exe” application, which enables programming all functions and options controller to become self contained independent module and all local functions can be performed locally without attendance of PC.

RoomManager consists of a few different signal types (which are inputs or outputs).

Each signal contains a few individual events and options associated to it, based on type of signal.

Input signals are:

- All analog inputs,
- All digital inputs,
- IR receiver (for remote control).

Output signals are:

- All digital outputs,
- All PWM outputs,
- IR transmitter (for controlling external devices).

3.1.1. Signals Description.

3.1.1.1. Analog Inputs (ADC).

Each analog input has working range $<0; 5V$) with 10 bit resolution. It has individually assigned voltage levels minimal and

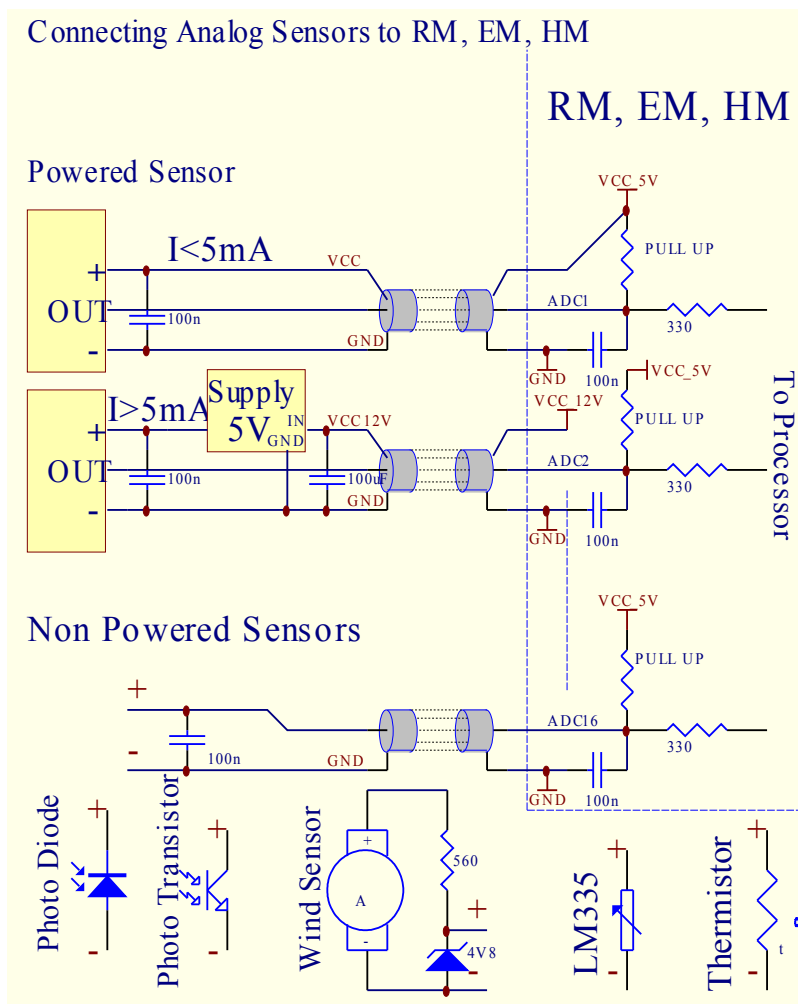
maximal (which gives 3 ranges of ADC operation). Crossing this levels will initiate automatic event run defined and programmed by “eHouse.exe” application. These levels are individual for each ADC channel and each program of RoomManager.

Three events are associated to each ADC for crossing levels by measured values:

- If $U_x < \text{“Min Value”}$ * programmed in application for current program, event assigned in “Event Min” * field in eHouse application is launched.
- If “Max Value” * $\geq U_x \geq \text{“Min Value”}$ * programmed in application for current program, event assigned in “Event OK” * field is launched.
- If $U_x > \text{“Max Value”}$ * programmed in application for current program, event assigned in “Event Max” * field in eHouse application is launched.

First input is assigned to Light level sensor (photo transistor) or other with inverted scale, second to temperature sensor Channel 3-8 be used by temperature sensor or other working in operating range 0-5V.

(*) Naming convention from “eHouse.exe” application.



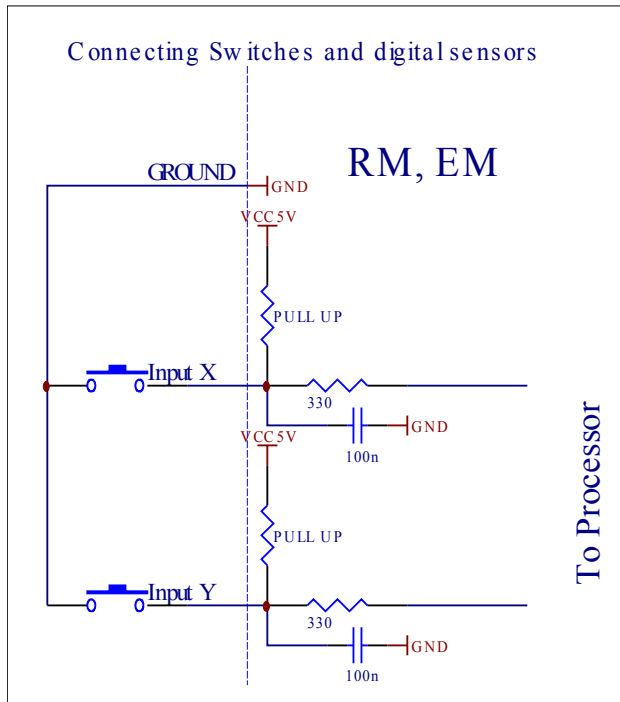
3.1.1.2. Digital Inputs.

Digital inputs detect two logic levels (1 and 0). In order to assure proper error margin inputs has 1V hysteresis.

For safety reason input are Pull Up to 5V power supply, and shorting input to controller ground signal activate current input. Electronic sensors and any kind of switches must assure this levels over the long lines and the best solution is when devices has build in relay with not connected contact (which are connected to Controller Inputs as common switch). This situation assures proper voltage levels and separate devices which could be powered from other supplies securely. Otherwise, supply value difference or sensor malfunction may cause permanent damage of input or whole controller.

There are two event defined for each input upon changing state:

- Level 0 assigned event in field “Event (0)” * of “eHouse.exe” application.
- Level 1 assigned event in field “Event (1)” *.



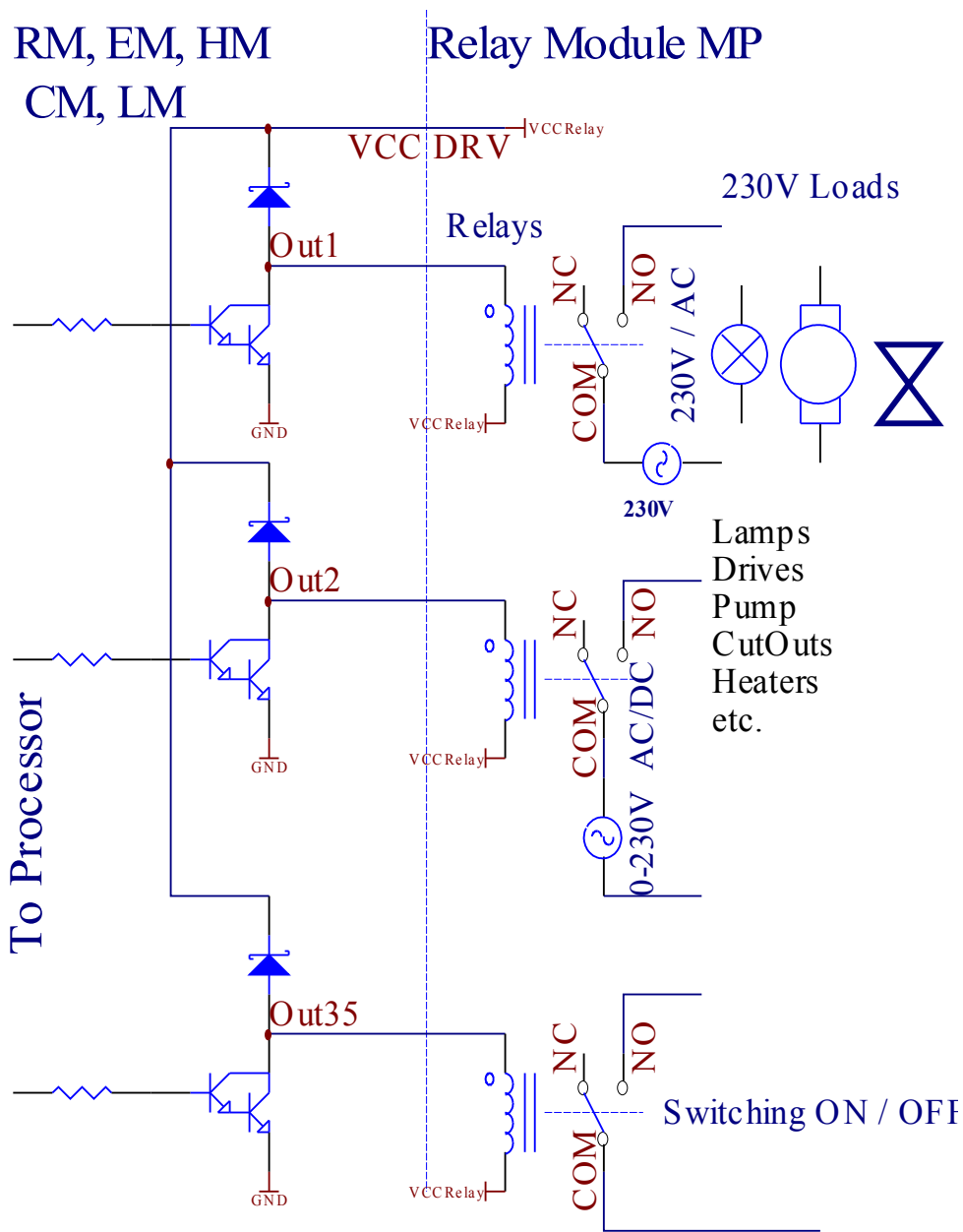
3.1.1.3. Digital Outputs

Digital outputs can directly drive Relays Module and are can be set to logical states 0 and 1 (turn off and on relay contacts). Event assigned to outputs are:

- ON,
- OFF,
- Toggle,
- ON (for programmed time),

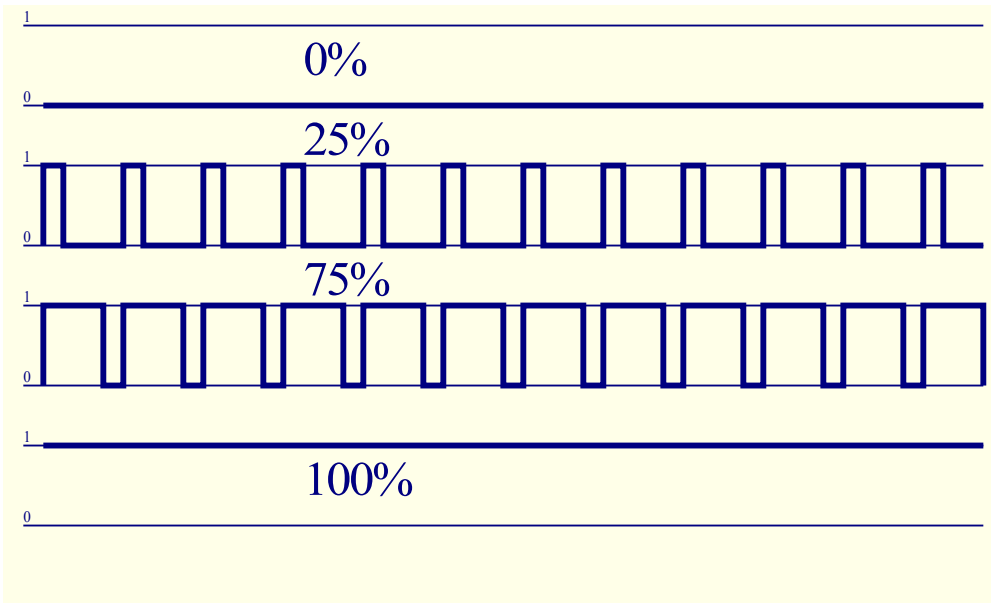
It can be run as:

- an event of ADC level cross,
- input event,
- scheduler event,
- manual event.



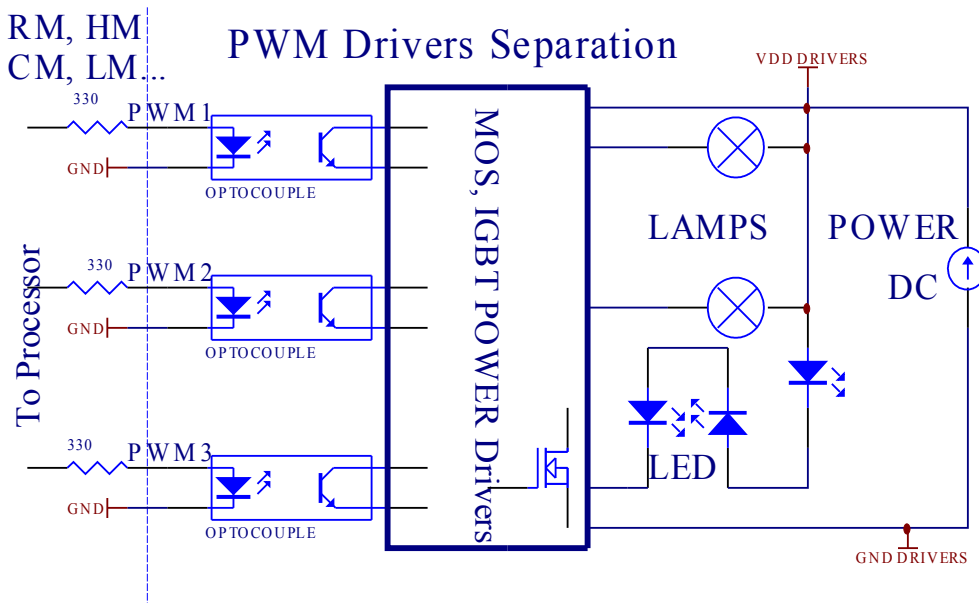
3.1.1.5. PWM (Pulse Width Modulated) Outputs.

PWM Output are DC dimmers, which have variable duty cycle (with 8 bits resolution).



PWM outputs along to Power drivers installed optionally on Relay Module, can regulate fluently (255 positions) light level of lamps powered 12V/DC - 30W. Eventually external power drivers with opto-isolator on input, can be used to drive high power and inductive loads (e.g. DC motors, ventilators, pumps). PWM output of RM, EM, HM is capable to drive 1 LED connected directly as an element of opto-isolator. Opto-isolator is a must to protect Controller against permanent damages of whole system caused by breakdowns.

Connection example of external PWM power drivers to eHouse System.



Connection should be realized as short as possible.

3.1.1.6. IR Remote Control of RoomManager.

Each RoomManager can be controlled by standard IR Sony remote controller (SIRC). Remote Controller enables:

- change outputs states,
- change temperature levels,
- change ADC levels,
- change light levels,
- reset RoomManager,
- Control Winamp application installed on PC eHouse server.

assign of direct local event to Remote Controller buttons can be performed individually.

Default Remote Controller type is SONY RMT-V260A (uses VIDEO 2 setting).

Considering huge number of function in the system, remote controller should have as many buttons as possible (with internal switch for changing devices).

Default remote controller button functions (pre-configured setting VIDEO 2).

Button	Functions
Clear	Cancel
0-9	0-9 choosing nr of input, output, ADC channel, PWM channel
Play	ON
Stop	OFF
wheel +	+
wheel -	-
TV/Video	Temperature (levels)
Display	Light (levels)
Input Select	Digital Outs
Audio Monitor	Analog Input (Levels)
Rec	Reset current RoomManager (require pressing OK as well)
OK	Confirmation of reset and changing program
Power	Toggle (Switch to other level)
Smart File	Program Selection (global definition for current RM max 24 programs)
Menu	Controlling other RoomManager (only output can be changed) ["Menu" +
Nr_of_RoomManager	+ "OK" + "Input Select" + OutputNr + ON / OFF / Toggle]
Pause	Winamp (Play)
SAT	Winamp (Stop)
Index Next	Winamp (Next Track)
Index Previous	Winamp (Previous Track)
SP/LP	Winamp (Shuffle)
Wide	Winamp (Repeat)
Vol+	Winamp (Volume+)
Vol-	Winamp (Volume-)

Remote Controller usage enables execution of any event, except changing configuration and scheduler edition.

Steps for IR control:

1. Choosing Mode:
 - Temperature,
 - Light,
 - Digital Output,
 - Analog Input (ADC),
 - Program.

2. Choosing channel nr:

0..max

3. Value Change

- +,
- -,
- On,
- Off,
- Toggle.

(e.g. Light Level, channel 1, +, +, +)

RoomManager ignores long pressing of button so + must be pressed multiple times to switch to expected level.

There is possibility of usage universal remote controllers (with built-in SONY standard support), with LCD touch panel (e.g. Genius, Logitech {Harmony}) and create desired configuration and descriptions in remote controller to create IR Control Panel for eHouse Management.

Besides dedicated buttons for control, there is possibility to assign any local RoomManager event to free buttons available on Remote Controller (max 200). There is possibility to control various Audio / Video, HiFi system via Single Sony Remote controller, and assigning many functions to buttons.

Changing output state (ON / OFF).

1. Press (Input Select) button on remote controller
2. Press nr 0..24
3. Select desired state
 - (POWER) Toggle (ON->OFF or OFF->ON),
 - (Play) – ON,
 - (Stop) - OFF.

Examples:

(Input Select) -> (1) -> (3) -> (Play)	= Output 13 ON
(Input Select) -> (7) -> (Stop)	= Output 7 OFF
(Input Select) -> (1) -> (7) -> (Power)	= Output 17 Change State

Change RoomManager Program.

1. Press (Smart File)
2. Select NR 1..24
3. Press (OK)

Examples:

(Smart File) -> (1) -> (3) -> (OK) = Select Program 13

(Smart File) -> (7) -> (OK) = Select Program 7
(Smart File) -> (1) -> (7) -> (OK) = Select Program 17

Shifting ADC Levels.

1. Press (Audio Monitor)
2. Select channel 1..8
3. Turn wheel (+) or (-) (1 pulse = shift approx 5mV, for temp approx 0.5 degree).

Example increase heating about 1.5 degree, controlled by ADC channel 2

1. (Audio monitor) -> (2) -> (Wheel +) -> (Wheel +) -> (Wheel +)

Light Level Control.

1. Press (Display)
2. Chose Dimmer channel:
 - 1-3 -> For PWM dimmers (1..3),
 - 9 -> for all PWM Dimmers,
 - 0 -> for turning on / off successive outputs (light groups if used)

3. Choose mode,
 - OFF (Stop),
 - ON (Play),
 - Toggle (Power),
 - "+" (wheel),
 - "-" (wheel).

4. (OFF).

For Dimmer number:

- 1-3 -> PWM Dimmers (to stop dimmer change) if dimmer currently increases or decreases , if Dimmer is stopped pressing this button initiate dimming (until stop or off).
- 9 -> all PWM Dimmers if dimmers changing values stops all dimmers otherwise start dimming.

- 4 (Toggle).

For Dimmer Number:

1-3 -> if Light Level is 0 start brightening selected dimmer otherwise initiate dimming.

- 4 (ON).

For Dimmer Number:

- 1-3 -> Start brightening selected PWM Dimmer (up to Max Value or manual stop),
- 9 -> all PWM Dimmers start brightening (up to Max Value or manual stop).

- 4 (-).

For Dimmer Number:

0 -> switch off last output (light group),
1-3 -> start dimming of selected PWM Dimmer (down to Min Value or manual stop),
9 -> start dimming All PWM Dimmers (down to Min value or manual stop)

4. (+).

For Dimmer Number:

- 0 -> switch on next output (light group),
- 1-3 -> start brightening of selected PWM Dimmer (up to Max Value or manual stop),
- 9 -> start brightening of all PWM Dimmers (up to Max Value or manual stop).

Examples:

(Display) -> (1) -> (+) ->.....(delay e.g. 10s)....-> (Stop) - Start brightening PWM Dimmer 1 and stop after 10s
(Display) -> (9) -> (+) - Start Brightening all PWM Dimmers up to Max Values.
(Display) -> (+) - Turn on next output nr (next light group)
(Display) -> (-) - Turn off current output nr (current light group)
(Display) -> (9) -> (-) -> (delay) -> (Display) -> (1) -> (Stop) - start dimming all PWM Dimmers, stop PWM Dimmer 1, in desired position other PWM Dimmers will fade out down to Minimal Value.

Controlling other RoomManager outputs.

Control is possible only over PC eHouse server.

1. Press (Menu),
2. Choose (Address Low) of desired RoomManager,
3. Press (OK),
4. Perform steps as for local RoomManager
(Input Select -> (Output NR) - (Power or Play or Stop)
5. Control for local RM will be restored after 2 minutes inactivity of remote controller or manual selection of RoomManager nr 0.

Examples

(Menu) -> (2) -> (OK) Selecting RoomManager (with address = 55,2)
(Input Select) -> (1) -> (2) -> (Power) Change state for Output 12 of selected RM
(Input Select) -> (1) -> (0) -> (Play) Turn On Output 10 of selected RM
(Input Select) -> (4) -> (Stop) Turn Off Output 4 of selected RM
(Menu) -> (OK) Restoring local RM selection.

During changing function, Nr of out, input, program, etc is always reset to 0, so it is not necessary selecting 0 like these (Menu)- > (0) -> (OK)

Managing Winamp Application.

Winamp application must be installed and running on eHouse PC Server. eHouse application must be working continuously. Winamp is controlled via IR (Sony remote controller) through RoomManager.

Predefined remote controller buttons and their functions:

RC button	Function
Pause	Winamp (Play) or repeat current track,
SAT	Winamp (Stop) fade out and stop,
Index Next	Winamp (Next Track),
Index Previous	Winamp (Previous Track)
>>	Winamp (FF) Forward few seconds
<<	Winamp (Rewind) Rewind few seconds
SP/LP	Winamp (Shuffle) Toggle Shuffle mode
Wide	Winamp (Repeat) Toggle Repeat

Vol+	Winamp (Volume+) Increase Volume 1%
Vol-	Winamp (Volume-) Decrease Volume 1%

2. Assigning events of local RoomManager to Remote Controller Buttons.

RoomManager has build in function for execution local event upon pressing programmed button of remote controller (max. 200 events to buttons assignment is possible).

To create definitions of remote controller buttons:

- desired RoomManager should be chosen and "RC Type" * should be set to SONY.
- In "Remote Control" * Tab ("User programmable IR Functions" *) proper position should be chosen from combo-box control "Name IR-CODE) [Event]" *.
- Name can be changed in name field, event should be select from "Event" * combo-box control.
- "Capture IR" * button should be pressed and then Remote Control Button directed to selected RoomManager.
- IR code should be displayed on face of button "Capture IR" *.
- Again The same button should be pressed and afterwards the same remote controller button.
- Results are shown in output window and when it is OK, next button assignment should be performed.
- After assignment all desired remote controller buttons to events press button "Update Codes" *

Controlling of external devices (Audio / Video / HiFi) via IR Remote controller code emulation.

RoomManager contain IR transmitter and build in logic for transmitting IR signals in many manufacturer standards.

They can be captured, learned and play (up to 248 codes per each RM). After IR code capture, eHouse events are created . This events could be executed by many ways.

3. Defining Remote codes, controlling external devices.

In order to create and add IR Remote Controller code for management of external devices (TV, HiFi, Video, DVD etc) under supervision of selected RoomManager, following steps should be performed:

- Select desired RoomManager name in "General" * Tab.
- Open "Remote Control" * Tab, and go to "Defining IR Control Signals".
- Put unique, short and descriptive name. (e.g. TV ON/OFF).
- Press "Capture IR Signal" * and then button of remote controller for external device (directed to selected RoomManager).
- IR Code should appear on a face of button in eHouse application.
- Again button "Capture IR Signal" * should be pressed and afterwards remote button for verification.
- Result are displayed in output window and if IR codes are equal it can be added to eHouse system with "Add" * button.
- After programming all needed IR Codes press button Update Codes.

4. Creating macros - subsequent 1 to 4 remote codes executions.

supervision of selected RoomManager, following steps should be performed:

- Select desired RoomManager name in "General" * Tab.
- Open "Remote Control" * Tab, and go to "Defining IR Macros" *.
- Press "Add" * button and go to the end of list (if you need to add new item) or choose item from list to replace.
- In 1, 2, 3, 4 * Combo-boxes choose sequentially IR Events defined in "IR Control Signals" * group.

- IR signals will be lunched from 1 to last one by RoomManager after loading configuration.
- After programming all needed macros press button "Update Codes" *.
- Finally in "General" * tab Press button "Save Settings" to create IR Events.

Few dozen standards IR Remote Controllers type are supported by RoomManager (should be verified by testing device and remote controller). Verified standards are (Sony, Mitsubishi, AIWA, Samsung, Daewoo, Panasonic, Matsumi, LG and many more). Best way is to decide on one Manufacturer of Audio/Video devices.

3.1.1.7. Controlling by sub-miniature IR/RF remote controller (electronic key)

eHouse system supports also electronic keys (IR Infra-Red and radio Frequency RF), containing 4 buttons. Pressing down buttons will launch IR code for changing program of current RoomManager (equal to pressing sequence of buttons in Sony RC (SmartFile > ProgramNR +1 > OK). Profiles must be created in RoomManager or "eHouse.exe" application.

3.1.2. Extension modules for RoomManager.

3.1.2.1 BlueTooth Module.

RoomManager can cooperate with BlueTooth, for receiving BlueTooth commands for eHouse 1 system. It can be used for spreading range of BlueTooth over the house. All used BT modules must be paired together with devices for sending BlueTooth command (PDA, mobile phones). Password ("BT Password" *) and prefix of device name ("BT Host" *) for BlueTooth module are defined in eHouse.exe application. It makes possibility to identify BT devices an enabling authorization and increasing security of connection.

3.1.2.2. Mifare Access Card Reader.

RoomManager can cooperate with Mifare Card Reader. This solution enables access control, right restrictions, control limitation. It is especially helpful in hotels, public buildings, offices, access control applications. Closing card to the reader is logged on eHouse Server PC and programmed event can be launched (e.g. unlock the door)

If the card was activated in eHouse system access right mask is change for current RoomManager.

Access right can be set on:

- Switching on / off outputs (individually for each output),
- Changing programs (globally all programs),
- Event activation upon input state change (e.g. switch individually set up for each input),
- Changing dimmer settings (individually each PWM output),
- Changing setting ADC levels (globally all channels),
- Running infra red events (globally for any transmission from RoomManager),
- Controlling RoomManager via IR remote controller (globally).

It is possible to set programmed outputs (for 10s) e.g. for unlocking electro-magnet, signal generation, confirmation lights.

Access rights together with dedicated outputs are individually programmed for each Mifare Card. Name for each card can be also defined.

3.2 ExternalManager - Roller Controller

ExternalManager is modification of RoomManager and allow control of rollers, gates, doors, shade awnings. Together with InputExtender protects house and premises in very secure way because it is controlled outside monitoring area (and do not give additional time for intruders). It can be controlled via secure remote controller (using KEELOQ dynamic code algorithm by Microchip), which is commonly used in good security systems. Alarm Events are initiated immediately, without delay what happens in systems equipped in keyboards, located in the house. Security system sends SMS notifications:

- on violated security sensor (which exclude fake alarms),
- zone changes,
- alarm deactivation.

for two group of persons (administrators and reporters).

Administrators group receive:

- sensors violation notifications,
- zone changes notifications.

Reporters group receive (could be neighbors, police, security, monitoring agency):

- notification of sensors violation,
- notification on Alarm deactivation by authorized users.

Main differences from RoomManager are:

- Built-in RF Receiver with support KEELOQ dynamic code algorithm from Microchip for miniature electronic keys (up to 31) for changing zones, and changing Rollers Programs.
- No IR Receiver.
- No IR Transmitter.
- Outputs works as rollers, gates, doors, shade awnings drives (SOMFY standard = Roller Open (1 sec pulse on A output), Roller Close (1 sec pulse on B output), Stop (1 sec pulse on both A and B outputs}).
- Otherwise outputs can be used for direct controlling of motor drives. **{Drives must have own built-in protection against turning on both directions, block rollers, end switches, accelerate protection etc. Otherwise in case of malfunction of relay, wrong configuration of module, blocking drive by frost or sabotage, it is possible to damage drive. System has build in Software protection against moving to both direction, but can't check if drive reaches and or wasn't blocked and isn't sufficient to protect rollers. This mode can only be used on own risk and iSys company is not responsible for damages of drives. Only Somfy system can be used securely because it incorporates own protection of drives.**
- Controlling electro-magnet.
- Consists ALARM HORN, WARNING LIGHT outputs for connection signalization devices and monitoring radio-line.
- Rollers program and zone individually defined for each RF electronic key, and each key combination (max 7).
- Against of RoomManager's programs rollers + security zones programs are defined (max.24).

- Cooperation with max 3 InputExtenders for direct connection of security sensors (max 28 per InputExtender).
- It is possible to define max 24 zones. In each zones and each sensor Light Output and Horn output behavior can be individually programmed, and SMS notifications are sent.
- It is possible to program HCSxxx (KEELOQ) remote controllers from the ExternalManager using own security code.

ExternalManager is also programmed and configured by “eHouse.exe” application. Device is self contained and can work locally without computer attendance.

Due to large similarity to RoomManager only differences will be explained.

3.2.1. Signals descriptions.

3.2.1.1. Rollers, gates, doors drives outputs.

These outputs are pairs of outputs for driving rollers, gates, doors drives in SOMFY standard (default setting) or direct drives.

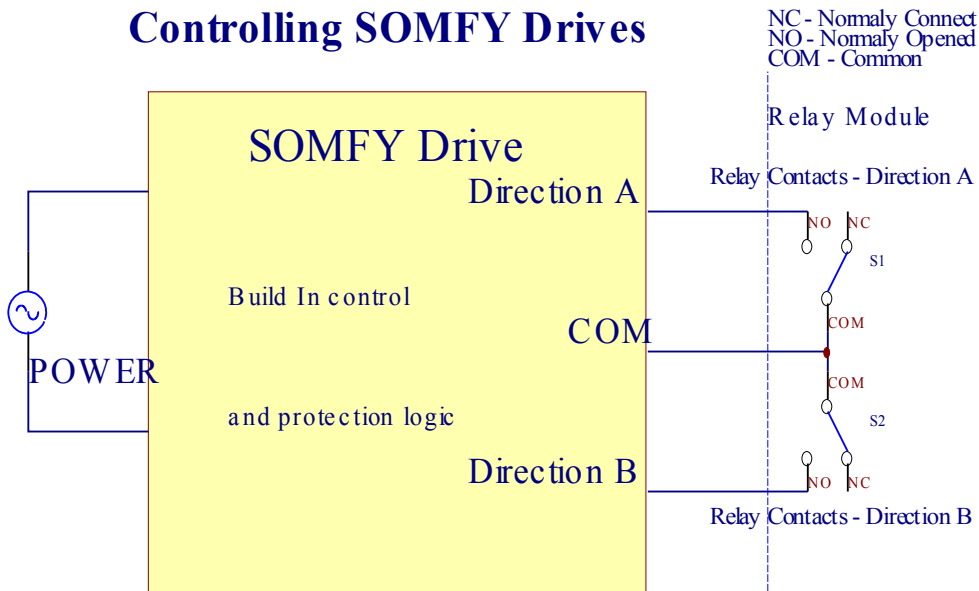
There is possibility to control up to 13 independent rollers, gates and doors systems.

Each roller channel in SOMFY standard = Roller Open (1 sec pulse on A output), Roller Close (1 sec pulse on B output), Stop (1 sec pulse on both A and B outputs}.

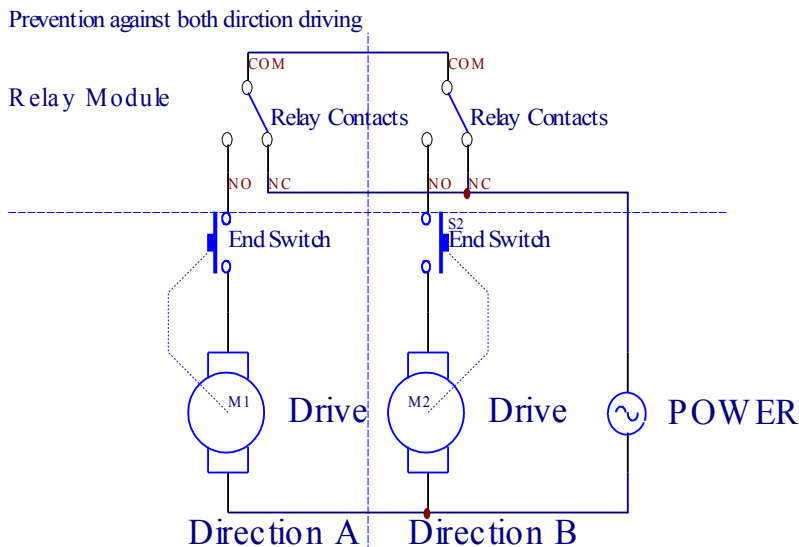
outputs can also be used for direct controlling of motor drives (driving line A for moving in one direction, driving line B for moving in the other direction). **Drives must have own build in protection against turning on both directions, block rollers, end switches, accelerate protection etc. Otherwise in case of malfunction of relay, wrong configuration of module, blocking drive by frost or sabotage, it is possible to damage drive. System has built-in Software protection against moving to both direction at the same time, but can't check if drive reaches the end or wasn't blocked and isn't sufficient to protect rollers. This mode can only be used on own risk and iSys company is not responsible for damages of drives. Only Somfy system can be used securely because it incorporates own protection of drives.**

Connection of Rollers, Gates, Doors Drives

Controlling SOMFY Drives



Direct Control of Drives



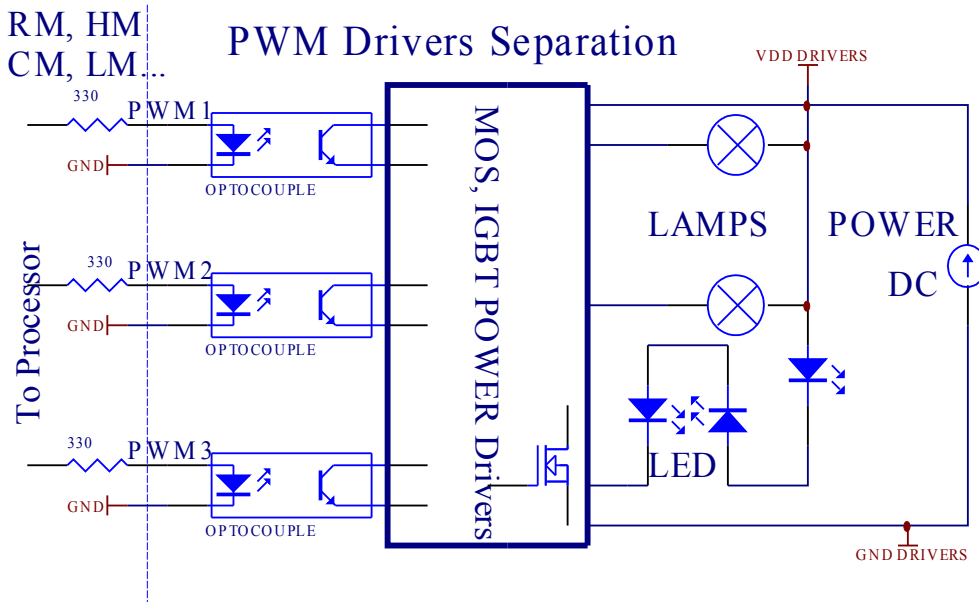
3.2.1.2. PWM (Pulse Width Modulated) Outputs.

PWM Output are DC dimmers outputs which have variable duty cycle (with 8 bits resolution).

PWM outputs along to Power drivers installed optionally on Relay Module, can regulate fluently (255 positions) light level of lamps powered 12V/DC - 30W. Eventually external Power drivers with opto-isolator on input can be used to drive High Power and inductive loads (e.g. DC Motors, Ventilators, Pumps).

PWM output of RM, EM, HM is capable to drive 1 LED connected directly as an element of opto-isolator. Opto-isolator is a must, to protect controller against permanent damages of whole system caused by breakdowns.

Connection example of external PWM power drivers to eHouse system.



Connection to Relays Module should be realized as short as possible.

3.2.1.3. Digital Outputs.

ExternalManager have 2 standard outputs similar to RoomManager. This output can be set to logical 1, 0, temporary 1 (about 2 sec) or do not change. It can be used for disabling external power supply sockets etc.

3.2.1.4. Digital Inputs.

ExternalManager consist of 12 digital inputs the same as RoomManager. Local events of ExternalManager may be assigned to states of this inputs.

3.2.1.5. Analog inputs.

Each analog input has working range $<0;5V$) with 10 bit resolution. It has individually assigned voltage levels minimal and maximal (which gives 3 ranges of ADC operation). Crossing this levels will initiate automatic event run, defined and programmed by “eHouse.exe” application. These levels are individual for each ADC channel and each program of RoomManager.

Three events are associated to each ADC for crossing measured values:

- if $U_x < \text{“Min Value”}$ * programmed in application for current program, event assigned in “Event Min” * field in “eHouse” application is launched.
- if “Max Value” $\ast \geq U_x \geq \text{“Min Value”}$ * programmed in application for current program, event assigned in “Event OK” * field is launched.
- if $U_x > \text{“Max Value”}$ * programmed in application for current program, event assigned in “Event Min”

* field in eHouse application is launched.

- First input is assigned to Light level sensor (photo-transistor) or other with inverted scale,
- Second to temperature sensor or other with normal scale,
- Channel 3-8 be used by temperature sensor or other, working in operating range 0-5V.

(*) Naming convention from “eHouse.exe application.

3.2.2. Direct local control with RF electronic key.

ExternalManager can be controlled locally by electronic key (RF remote controller - 100 m maximal range in open area).

RF Remote Controllers can be add and remove individually in eHouse application, what is very comfortable in case of lose or steal one remote. Range of RC is max.100 m in open field. For each buttons combinations and each Remote Controller, Rollers settings together with zone changes can be assigned.

Programs can be defined individually for each combination of buttons and remote controller (e.g. for children, security agency, gardener, etc.).

Sending of RF code is initiated when some combination of three other buttons are hold during pressing power button.

In case of RF signal electronic key uses KEELOQ dynamic code based on license of MICROCHIP corporation. Each electronic key must be added inside eHouse application in “External Manager” * Tab for ExternalManager device.

Following steps must be performed to do so:

- Select ExternalManager device in "General" * Tab.
- Open “External Manager” * Tab.
- Press “Learn RF” * button (scanning RF codes is valid for 30 sec).
- Press any RF combination for electronic key device for a few seconds, with a few seconds delays in case of no reception.
- If remote was captured successfully it will appear in “Code” * Field.
- A unique Name should be entered in field “Name” *.
- Then Press “Add” button.
- Previous 4 steps should be performed for all RF remote controllers.
- Finally Update * button should be pressed to load configuration to ExternalManager.

Additionally ExternalManager RF buttons programs (Rollers, outputs, zone settings) can be assigned to any combination of buttons individually for each electronic key.

Following steps must be performed to do so:

- Select Electronic Key from list "Defining RF Remote Controllers" *,
- Select keys combinations from list "Remote Controller Buttons Config" *,
- Change Rollers, Shade awnings, Output, Security Zone, PWM Dimmers From "RF Remote Controlled Events" * group,
- Press "Change Current" * button,
- Repeat All Steps for needed combinations for each RF remote controller.
- Press "Update All" * button.

Individual RF Button programs for each electronic key gives opportunity, to pass remote controllers to children, service staff, monitoring or security agency, gardener with very limited rights (e.g. only changing security zone and open the gate to enable entering premises and check if everything is OK).

3.3. HeatManager - Boiler Room and Central Heat controller

HeatManager is self contained controller to manage:

- all contents of boiler room,
- central heat system,
- ventilation,
- recuperation air handling systems.

Device can control very advanced heating and cooling installation and together with usage free and chip energy sources seriously reduces costs of heating and cooling, what make possible to refund costs of installation in 1-3 years.

Due to very large functionality HeatManager can be adopt to any heating / cooling installation configuration.

Main functions are:

- Boiler (any kind) ON/OFF control, disable fuel supply drive, disable power, override fuel supply from eHouse.
- Bonfire with water jacket and / or Hot Air Distribution (HAD) system, water pump, auxiliary fans, HAD blower control,
- Ventilation and Recuperation support for AMALVA REGO HV400 or compatible with C1 controller (advanced control over build in RS232 interface),
- Ground heat exchange (GHE) fan,
- Water Heater / Cooler Pump for ventilation,
- Auxiliary fan control for recuperation support,
- Basic control of other recuperator type (On/ OFF Speed 1, Speed 2, Speed 3 bypass heat exchanger, auxiliary fans, water cooler, heater, GHE, air deriver.
- Control servomotor Air Deriver / GHE.
- Water heater (for heating air blown up to rooms, control electrical tree ways cutout for adjusting air temperature).
- Hot water buffer management for central heating and hot water installation, Indicator of hot level,
- Solar System (controlling water pump),
- Alarm indicators over temperature: boiler, bonfire, solar system.

Controller measure and controlling following temperatures:

- Water jacket of bonfire (1) - for pump control,
- Water jacket of bonfire (2) (back up sensor),
- Bonfire convection (hot air temperature for HAD system),
- Boiler water jacket (for pump control),
- Hot water buffer top (90% of height),
- Hot water buffer middle (50% of height),
- Hot water buffer bottom (10% of height),
- Water in solar system (for pump control),

- Air Deriver external air temperature for ventilation,
- GHE air temperature for ventilation,
- Supply Air for recuperator temperature (Clean),
- Exhaust air from house temperature (Dirty),
- Recuperator output air temperature - blown to rooms (Clean),
- Hot air after water heater for controlling electric three ways cutout for temperature adjustments,

External North temperature (can be taken from programmed RoomManager)

External South temperature (can be taken from programmed RoomManager)

Internal Room temperature (can be taken from programmed RoomManager)

3.3.1. HeatManager Outputs.

3 Output - Status of bonfire (for status lamp) Green / Yellow / Red

Lamps combination depends of temperatures of water jacket and convection.

Tjacket - measured water jacket temperature (doubled)

Tconv - measured convection temperature above bonfire

All turn off - Tconv < "Conv. Off" *, and Tjacket < "Red" *.

Green Blinking - Empty bonfire or wither away (Tjacket < "Green" *) and ("Conv. Off" * < Tconv < "Conv. On" *)

Green continuous - "Green" * < Tjacket < "Yellow" * - "Margin" *

Green and Yellow - "Yellow" * - "Margin" * < Tjacket < "Yellow" * + "Margin" *

Yellow - "Yellow" * + "Margin" * < Tjacket < "Red" * - "Margin" *

Yellow and Red - "Red" * - "Margin" * < Tjacket < "Red" * + "Margin" *

Red - "Red" * + "Margin" * < Tjacket < "Alarm" *

Red Blinking - Tjacket >= "Alarm" *

Bonfire Water Pump (between bonfire water jacket and Hot Water Buffer).

Tjacket = Average (T jacket 1 and T jacket 2) measured

Tconv = measured convection temperature above bonfire

Tjacket > "Bonfire Pump" * and Tconv > "Conv. off" * (bonfire is heating)

(Pump On)

Tjacket < "Bonfire Pump" * - "Margin" *

(Pump Off)

Boiler Water Pump (between boiler water jacket and Hot Water Buffer)

Tboiler > "Boiler Pump" * **(Pump On)**

Tboiler < "Boiler Pump" * - "Margin" * **(Pump Off)**

Boiler ON / OFF controlled by Temperature of Hot Water Buffer.

Tbm - Measured temperature of buffer middle

Tbm > "Min T" * **(Boiler OFF)**

Tbm < "Min T" * - "Margin" * and solar off and bonfire off **(Boiler ON)**

Recuperator (Ventilation ON / OFF).

Tint - measured by sensor for Central Heating Internal Room Temperature

Tint > "T Requested" * **(Heating Mode - Vent OFF manual or full auto mode),**

Tint < "T Requested" * - "Margin" * **(Heating Mode - Vent ON manual or full auto mode),**

Tint > "T Requested" * (Cooling Mode - Vent ON manual or full auto mode),
Tint < "T Requested" * - "Margin" * (Cooling Mode - Vent OFF manual or full auto mode).

Recuperator (Level 1 / Level 2 / Level 3).

Controlling Ventilation Level manually or from scheduler.

Water Heater Pump (between buffer and Heater).

Tint - measured by sensor for Central Heating Internal Room Temperature

Tint < T Requested * -Margin * (Heating mode - Pump ON)

Tint > T Requested * (Pump OFF)

(* Water Heater / Cooler Pump for GHE.

Pump is turned on while ventilation, recuperation via GHE is running and additional conditions are met:

- Manual mode ("Cooler / Heater" * option is set for active program of HeatManager.
- Full Auto mode chosen automatically if it needed or gain some energy savings.
- Unconditional Ventilation chosen automatically if it needed or gain some energy savings.

Three ways cutout control (+) (between Hot Water Buffer and Water Heater).

Theat - Measured temperature of Air after Water Heater.

Theat > "T Heater" * (Off)

Theat < "T Heater" * - "Margin" * (Temporary on) during ventilation in heating mode.

Three ways cutout control (-) (between Hot Water Buffer and Water Heater).

Theat - Measured temperature of Air after Water Heater.

Theat > "T Heater" * (Temporary on) during ventilation in heating mode.

Theat < "T Heater" * - "T Hist" * (OFF)

Special approximation algorithm was implemented for control movement time of electric cutout to keep Heater temperature on desired level depending on Hot Water Buffer temperature, delta temperature and so on.

Solar System Water Pump (between solar system and Hot Water Buffer).

T Solar (measured) > "T Solar" * (ON),

T Solar (measured) < "T Solar" * - "Margin" * (OFF),

Boiler Power (On / Off).

Can be used for turning power of boiler in the summer, etc.

Boiler disabling fuel supply drive (On / Off).

Fuel supply drive can be externally disabled by HeatManager e.g. for flash out all fuel in the boiler fire place. Especially for solid fuels drives.

Override fuel supply drive (On / Off).

Fuel supply drive can be externally overridden by HeatManager e.g. for load fuel first time or after flash out. Especially for solid fuels drives.

Bonfire Hot Air Distribution Blower (HAD System)

Tconv = Measured temperature value of convection above the bonfire.

- Heater Pump OFF (Manual turning off pump for heater),
- Reset Alarm Boiler Clearing (Reset Alarm counter for usage of boiler from last purge),
- Reset Alarm Loading (Reset Alarm counter for usage of boiler from last fuel loading),
- Turn on Boiler Power Supply (Manual turn on Boiler Power Supply),
- Turn off Boiler Power Supply (Manual turn off Boiler Power Supply),
- PWM 1* + (Increase level on PWM 1 output),
- PWM 2* + (Increase level on PWM 2 output),
- PWM 3* + (Increase level on PWM 3 output),
- PWM 1* - (Decrease level on PWM 1 output),
- PWM 2* - (Decrease level on PWM 2 output),
- PWM 3* - (Decrease level on PWM 3 output),
- Execute program change (max 24, all parameters of HeatManager mode and temperature levels, can be programmed individually in each program).

* PWM can control additional fans DC or other devices controlled by (pulse width modulated input). Additional power driver is required with opto-isolation.

Dedicated Recuperator Events (AMALVA REGO-400) or other (*)

- Recuperator Stop (*) (Off),
- Recuperator Start (*) (On),
- Recuperator Summer (*) (Disable Heat Exchange),
- Recuperator Winter (*) (Enable Heat Exchange),
- Recuperator Auto (Automatic mode of recuperator - using internal settings and scheduler of Recuperator),
- Recuperator Manual (Manual mode - Recuperator controlled externally by **HeatManager**),
- Recuperator T. Internal 15 C (T requested in the room for installed additional temperature sensor to recuperator),
- Recuperator T. Internal 16 C,
- Recuperator T. Internal 17 C,
- Recuperator T. Internal 18 C,
- Recuperator T. Internal 19 C,
- Recuperator T. Internal 20 C,
- Recuperator T. Internal 21 C,
- Recuperator T. Internal 22 C,
- Recuperator T. Internal 23 C,
- Recuperator T. Internal 24 C,
- Recuperator T. Internal 25 C,
- Recuperator Level 1 (*) (Minimal),
- Recuperator Level 2 (*) (Middle),
- Recuperator Level 3 (*) (Maximal),
- Recuperator Level 0 (*) (OFF),
- Recuperator T. Out 0 C (Setting temperature blown to Rooms which will be controlled by turning on and off internal Rotor Heat Exchanger and internal Electric Heater if wasn't disabled or disconnected)

- Recuperator T. Out 1 C,
- Recuperator T. Out 2 C,
- Recuperator T. Out 3 C,
- Recuperator T. Out 4 C,
- Recuperator T. Out 5 C,
- Recuperator T. Out 6 C,
- Recuperator T. Out 7 C,
- Recuperator T. Out 8 C,
- Recuperator T. Out 9 C,
- Recuperator T. Out 10 C,
- Recuperator T. Out 11 C,
- Recuperator T. Out 12 C,
- Recuperator T. Out 13 C,
- Recuperator T. Out 14 C,
- Recuperator T. Out 15 C,
- Recuperator T. Out 16 C,
- Recuperator T. Out 17 C,
- Recuperator T. Out 18 C,
- Recuperator T. Out 19 C,
- Recuperator T. Out 20 C,
- Recuperator T. Out 21 C,
- Recuperator T. Out 22 C,
- Recuperator T. Out 23 C,
- Recuperator T. Out 24 C,
- Recuperator T. Out 25 C,
- Recuperator T. Out 26 C,
- Recuperator T. Out 27 C,
- Recuperator T. Out 28 C,
- Recuperator T. Out 29 C,
- Recuperator T. Out 30 C.

(*) Direct control of recuperator may require interference into internal circuit of recuperator (direct connection to fans, bypass, Speed Trafo, etc.

iSys company is not responsible for any damages which arise in this mode of work.

Recuperator Amalva need cable connection for HeatManager extension slot (UART2) to serial port built-in in REGO board.

Proper grounding must be created for both devices protection.

HeatManager supports 24 programs for unattended work. Each program consist all temperature levels, ventilation, recuperation modes. HeatManager automatically adjust heating and ventilation parameters to obtain desired temperature in most economic way. All pumps are automatically turn on / off monitoring programed levels of temperatures.

Programs can be run manually from “eHouse” application or run automatically from advanced scheduler allowing for season, month, time, etc adjustments for controlling central heating system and ventilation.

3.3.3. Ventilation, recuperation, heating, cooling modes.

Hot Air Distribution from bonfire (HAD) - Is turn on automatically and independently from other conditions of heating and cooling, if bonfire is heating and this option is active for current program of HeatManager.

Manual Mode - Each parameters: ventilation, recuperation, heating, cooling, are preset manually in program settings (ventilation level, cooling, heating, recuperator heat exchanger, ground heat exchanger, temperature of heating, temperature requested).

In case of overstep internal room temperature during heating - ventilation, heating recuperation, and auxiliary function are stopped and resume when internal room temperature drops below value “T requested” * - “Margin” *.

Full Auto Mode- Required level of ventilation and Heater temperatures are preset in program settings. All other settings are adjusted automatically to maintain requested temperature in room, by heating or cooling. During heating, HeatManager keeps heater temperature on programmed level, adjusting electric three ways cutout. HeatManager maintains required temperature with lowest costs of used energy, automatically switching on and off auxiliary devices as fans, ground heat exchanger, cooler, heater. In case of overstep requested temperature ventilation, heating and all auxiliary devices stops. Ventilation, recuperation, heating are resumed when internal room temperature drops below “T requested” * - “Margin” *.

In cooling mode in case of drop internal room temperature below “T requested” * - “Margin” * ventilation, recuperation, cooling and auxiliary devices stop as well. Their are resumed when temperature overstep “T requested” * value.

Unconditional Ventilation Mode. Unconditional ventilation mode is derived form full auto mode - with uninterrupted ventilation and recuperation. Ventilation, recuperation works all the time maintaining internal room temperature on desired level. In case of internal room temperature overstep during heating mode, or drop below during cooling mode heater, cooler, ventilation, auxiliary devices are set to energy saving mode, and ventilation blows clean air with optimal temperature approximately equal to T requested in the room. External temperatures are considered, to increase efficiency of system.

HeatManager Module pins location.

Connector J4 - Analog inputs (IDC-20) for direct connection temperature sensors (LM335)

<i>Sensor</i>	<i>Pin J4</i>	<i>Description temperature sensor</i>
Ground - GND (0V)	1	Common pin for connecting all LM335 temperature sensors
Ground - GND (0V)	2	Common pin for connecting all LM335 temperature sensors
ADC_Buffer_Middle	3	50% height of hot water buffer (for controlling heating process)
ADC_External_N*	4	External North (Can be taken from programmed room manager if sensor is not connected locally Requires Online PC connection and eHouse.exe application running continuously).
ADC_External_S*	5	External South (Can be taken from programmed RoomManager if sensor is not connected locally. Requires Online PC connection and eHouse.exe application support).
ADC_Solar	6	Solar system (highest point).
ADC_Buffer_Top	7	90% height of Hot Water Buffer (for controlling heating process).
ADC_Boiler	8	Water jacket of boiler - output pipe (for controlling boiler pump).
ADC_GHE	9	Ground Heat Exchanger (control of GHE in Full Auto or unconditional ventilation modes)
ADC_Buffer_Bottom	10	10% height of Hot Water Buffer (for controlling heating process)

ADC_Bonfire_Jacket	11	Water jacket of bonfire 1 (can be output pipe)
ADC_Recu_Input	12	Recuperator input clear air
ADC_Bonfire_Convection	13	Above bonfire (few cm from chimney pipe) (used for Hot Air Distribution and bonfire status)
ADC_Recu_Out	14	Recuperator Out (for supplying house in clear air)
ADC_Bonfire_Jacket 2	15	Water jacket of bonfire 2 (can be output pipe)
ADC_Heater	16	Located about 1 meter in air after Water Heater (for adjusting Heater temperature with electric three ways cutout)
ADC_Internal*	17	Internal Room (Can be taken from programmed room manager, if sensor is not connected locally. Requires Online PC connection and “eHouse.exe” application running continuously)
ADC_Recu_Exhaust	18	Air exhausted from house (located in air vent duct)
VCC (+5V - stabilized)	19	VCC (output +5V from build in stabilizer) for powering analog sensors (do not connect)
VCC (+5V - stabilized)	20	VCC (output +5V from build in stabilizer) for powering analog sensors (do not connect)

- *ADC_Internal Internal room temperature (in case of lack, this sensor temperature can be read from programmed sensor connected to any RoomManager, requires continuous working of eHouse.exe application on PC)
- *ADC_External_N External North temperature (in case of lack, this sensor temperature can be read from programmed sensor connected to any RoomManager, requires continuous working of eHouse.exe application on PC)
- *ADC_External_S External South temperature (in case of lack, this sensor temperature can be read from programmed sensor connected to any RoomManager, requires continuous working of eHouse application on PC)

Connector J5 - Outputs of HeatManager (IDC-40)

<i>Output Name</i>	<i>OUT Nr</i>	<i>NR Pin</i>	<i>Description</i>
<hr/>			
	<i>Relay</i>	<i>J5</i>	
Bonfire_Pump	1	3	Bonfire water pump connection
Heating_plus	2	4	electric three ways cutout control + (increasing temp)
Heating_minus	3	5	electric three ways cutout control - (decreasing temp)
Boiler_Power	4	6	Turn of boiler power supply
Fuel_supply_Control_Enable	5	7	Disable fuel supply drive
Heater_Pump	6	8	Water heater pump connection
Fuel_supply_Override	7	9	Overriding control of fuel supply drive
Boiler_Pump	8	10	Boiler water pump
FAN_HAD	9	11	Hot air distribution from bonfire (fan connection)
FAN_AUX_Recu	10	12	Additional auxiliary fan for recuperator (to increase efficiency of

ventilation)			
FAN_Bonfire	11	13	auxiliary fan for bonfire (if gravity drought is not sufficient)
Bypass_HE_Yes servomotor)	12	14	Recuperator heat exchanger off (or bypassed position of
Recu_Power_On	13	15	Recuperator power on for direct control of recuperator.
Cooler_Heater_Pump	14	16	Water heater / cooler pump connection for ventilation via ground heat exchanger.
FAN_GHE	15	17	Auxiliary fan for increasing air flow via ground heat exchanger.
Boiler_On	16	18	To boiler controlling input (on/off).
Solar_Pump	17	19	Solar system water pump .
Bypass_HE_No servomotor).	18	20	Recuperator heat exchanger on (or not bypassed position of
Servomotor_Recu_GHE	19	21	Air for ventilation taken from ground heat exchanger.
Servomotor_Recu_Driver	20	22	Air for ventilation taken from driver.
WENT_Fan_GHE	21	23	Auxiliary fan for ground heat exchanger 2.

Connector J3 - Status Outputs HeatManager (IDC-16)

Output	J3 Pin	Description
Recu Level 1	1 (arrow on socket)	Recuperator level 1 direct control **
Recu Level 2	2	Recuperator level 2 direct control **
Alarm Solar LED *	3	Alarm solar overheating (LED)
Recu Level 3	4	Recuperator level 3 direct control **
Red LED *	5	Bonfire status (Red LED + Anode)
Recu Heat Exchanger	6	Recuperator Heat Exchanger Direct control REGO **
Green *	7	Bonfire status (Green LED + Anode)
Recu ON Bis	8	Recuperator Power On Direct Control **
Yellow *	9	Bonfire status (Yellow LED + Anode)
NC	10	N/A
Ground - GND (0V)	11	Ground Cathodes (-) for LED
Ground- GND (0V)	12	Ground Cathodes (-) for LED
Boiler Alarm *	13	Boiler overheating (LED + Anode)
+5V (Built-in Stabilizer output)	14	Do not connect
Blue	15	Heat level for hot water buffer (Blue + LED)
Flash Erase	16	Firmware erase do not connect
Buzzer	-	Alarm buzzer 5V instead of IR transmitter out and +5V (VCC)

* Outputs capable to drive only single LED. Anode (+) must be connected to output, Cathode (-) to GND of HeatManager (0V - pin 12 or 11 connector J3)

** Connection to these outputs requires drivers ULN2003 and relays,

Connectors of RoomManager, ExternalManager Rev. 6.

Digital inputs - connector IDC-16 male (J3)

All digital output are connected by PULL UP resistors (10k) to VCC (+5V) Input are connected to processor via serial resistor 330 OM for protection. Normal state of input is logical 1 and should be short-circuit via switch to GND to change state to logical 0.

Sensors or switches NC pin (normally connected) should be connected to input X, Com pin (common) to GND.

Pin J3	PRC	Description
1	INT2	int 2 (digital input) (square pad on PCB)
2	INT3	int 3 (digital input)
3	INT1	int 1 (digital input)
4	INT4	int 4 (digital input)
5	IN1	in 1 (digital input)
6	INT5	int 5 (digital input)
7	IN2	in 2 (digital input)
8	INT6	int 6 (digital input)
9	IN3	in 3 (digital input)
10	INT7	int 7 (digital input)
11	GND	Ground GND (0V)
12	GND	Ground GND (0V)
13	IN4	in 4 (digital input)
14	VCC	Internal stabilizer output (+5V). Do not use
15	IN5	in 5 (digital input)
16	FL_CLR	Clear firmware (active 0V). Don't connect

Analog inputs - connector IDC-20 male (J4).

All analog inputs are connected via Pull-Up resistors 4k7 to +5V. Input are connected to processor via serial resistor 330 OM for protection. Unconnected input state is +5V.

All analog inputs measure voltage level between each channel input and GND of controller.

LM335 temperature sensors should be connected between GND and input. Third pin (Adjust) can be cut off.

Pin J4	PRC	Description
1	GND	Ground - GND (Common for temperature sensors, and light level)
2	GND	Ground - GND (Common for temperature sensors, and light level)
3	AN1	Analog Input 1 <0,VCC) (Do not use if on-board sensor is installed - photo transistor)
4	AN2	Analog Input 2 <0,VCC) (Do not use if on-board sensor is installed - LM335)
5	AN3	Analog Input 3 <0,VCC) (Do not use if on-board sensor is installed - LM335)
6	AN4	Analog Input 4 <0,VCC)
7	AN5	Analog Input 5 <0,VCC)
8	AN6	Analog Input 6 <0,VCC)
9	AN7	Analog Input 7 <0,VCC)
10	AN8	Analog Input 8 <0,VCC)
11	AN9	Analog Input 9 <0,VCC) Only for HeatManager, do NOT connect otherwise
12	AN10	Analog Input 10 <0,VCC) Only for HeatManager, do NOT connect otherwise
13	AN11	Analog Input 11 <0,VCC) Only for HeatManager, do NOT connect otherwise
14	AN12	Analog Input 12 <0,VCC) Only for HeatManager, do NOT connect otherwise
15	AN13	Analog Input 13 <0,VCC) Only for HeatManager, do NOT connect otherwise
16	AN14	Analog Input 14 <0,VCC) Only for HeatManager, do NOT connect otherwise
17	AN15	Analog Input 15 <0,VCC) Only for HeatManager, do NOT connect otherwise

18	AN16	Analog Input 16 <0,VCC) Only for HeatManager, do NOT connect otherwise
19	VCC	(+5V internal stabilizer output) do not connect
20	VCC	(+5V internal stabilizer output) do not connect

Digital Outputs - connector IDC-40 male (J5)

All outputs on controllers OUTxx are Open Collector (OC) type, max current 100mA, max voltage 20V, this values are sufficient for direct drive relays between output and positive power supply.

Nr	Signal RM	Relay	External Manager
1,2	VCCDRV		Relay power supply from MP (+5V independent from RoomManager) for drivers protection. Do not connect to +5V on the Controller
3	OUT1	1	Roller 1 Open
4	OUT2	2	Roller 1 Close
5	OUT3	3	Roller 2 Open
6	OUT4	4	Roller 2 Close
7	OUT5	5	Roller 3 Open
8	OUT6	6	Roller 3 Close
9	OUT7	7	Roller 4 Open
10	OUT8	8	Roller 4 Close
11	OUT9	9	Roller 5 Open
12	OUT10	10	Roller 5 Close
13	OUT11	11	Roller 6 Open
14	OUT12	12	Roller 6 Close
15	OUT13	13	Roller 7 Open
16	OUT14	14	Roller 7 Close
17	OUT15	15	Roller 8 Open
18	OUT16	16	Roller 8 Close
19	OUT17	17	External Gate Open
20	OUT18	18	External Gate Close
21	OUT19	19	Garage Door Open
22	OUT20	20	Garage Door Close
23	OUT21	21	Main Door Roller (Open)
24	OUT22	22	Main Door Roller (Close)
25	OUT23	23	Gate Open
26	OUT24	24	Digital Output 1
27	OUT25	25	Roller 9 Open RM-Reserved (future use)
28	OUT26	26	Roller 9 Close RM-Reserved (future use)
29	OUT27	27	Roller 10 Open RM-Reserved (future use)
30	OUT28	28	Roller 10 Close RM-Reserved (future use)
31	OUT29	29	Roller 11 Open RM-Reserved (future use)
32	OUT30	30	Roller 11 Close RM-Reserved (future use)
33	OUT31	31	Digital Output 2
34	OUT32	32	Alarm Lamp, RM-Reserved (future use)
35	OUT33	33	Alarm Horn, RM-Reserved (future use)
36	OUT34	34	(Diode 2)
37	OUT35	35	(Diode 1)
38	CPP3		(PWM output) to dimmer power driver 3
39	CPP2		(PWM output) to dimmer power driver 2
40	CPP1		(PWM output) to dimmer power driver 1

2 pins connectors (Temperature sensors T1, T2) J7,J8

4 pins connector (Power) J2

- 1 Output +5V (Internal stabilizer RM, EM, HM), do not connect to +5V power bus nor VCCDRV (on IDC-40 pin Socket).
- 2 GND (0V)
- 3 GND
- 4 Power supply +12V (input for +5V stabilizer) RM, EM, HM.

Connector RJ-45 eHouse 1 Data Bus (J1)

- 1 GND (0V)
- 2 GND
- 3 VCC (+5V) Internal stabilizer output must be disconnected.
- 4 VCC (+5V) Internal stabilizer output must be disconnected.
- 5 TX+ Transmitter differential output positive (+) eHouse 1 data bus RS-485.
- 6 TX- Transmitter differential output negative (-) eHouse 1 data bus RS-485.
- 7 RX+ Receiver differential input positive (+) eHouse 1 data bus RS-485.
- 8 RX- Receiver differential input negative (-) eHouse 1 data bus RS-485.

Connector 10pin male SIP-10 RS232 TTL - UART 2 (J6)

- 1 GND (0V)
- 2 VCC (+5V) Internal Stabilizer output HM, RM, EM for powering extension modules (BlueTooth, Mifare card reader),
- 3 RX2 Receiving input UART 2 (RS232 TTL) for connection to TX output on BlueTooth, InputExtender, Recuperator, Mifare Card Reader),
- 4 TX2 Transmitter output UART 2 (RS232 TTL) for connection to RX input on BlueTooth, InputExtender, Recuperator, Mifare Card Reader),
- 5 RX Receiving input UART 1 (RS232 TTL) do not connect (used by RS-485 driver),
- 6 TX Transmitter output UART 1 (RS232 TTL) do not connect (used by RS-485 driver),
- 7 RX2IN Receiver input UART 2 (RS232C standard) if installed MAX3232 instead of MAX3086,
- 8 TX2OUT Transmitter output UART 2 (RS232C standard) if installed MAX3232 instead of MAX3086,
- 9 RX1IN Receiver Input UART 1 (RS232C standard) if installed MAX3232 instead of MAX3086,
- 10 TX1OUT Transmitter output UART 1 (RS232C standard) if installed MAX3232 instead of MAX3086.

3.4. InputExtender I / II (Security System)

InputExtenders are part of eHouse security system together with ExternalManager. Each InputExtender I allows connecting up to 28 alarm sensors. Disconnecting input from ground will generate alarm or warning depending

on current zone definition and if sensor signal should be checked or not. InputExtender has 1 analog input which can work as TAMPER (sabotage) for detection sudden changes of voltage on it.

ExternalManager can cooperate with max. 3 InputExtenders. Maximal number of zones which can be defined is 25 changed together for each InputExtenders.

Each InputExtender's input (Sensor) unique name can be assigned in eHouse.exe application.

There is also possibility for creation intuitive names of zones which gives ease information in system logs and visualization and acoustic signalization of events.

InputExtender II (Bis) is alternation of InputExtender I, allowing automatic and direct turning on devices in response of sensor activation. Mask is individually created for each sensor and each zone.

InputExtender Bis allows connection of 14 alarm sensors. Disconnecting input from ground will generate alarm or warning depending on current zone definition and if sensor signal should be checked or not. InputExtender II has 1 analog input which can work as TAMPER (sabotage) for detection sudden changes of voltage on it.

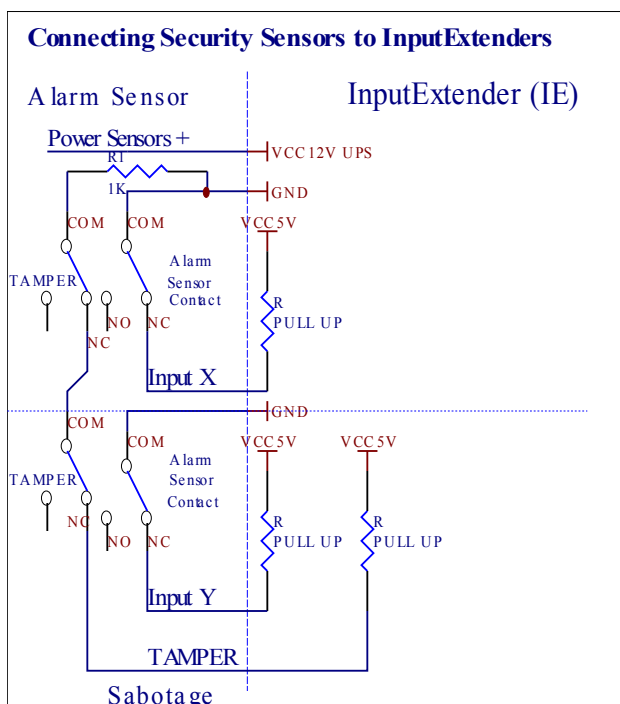
There are also 14 outputs directly assigned to inputs. Each output activation is perform if it is enabled for current zone and sensor activation was encountered activation time depends on sensor activation. Each output mask is set individually for each zone.

InputExtenders has Early Warning output -which is activated immediately in case of active sensor (monitored in current zone), and is deactivated 10sec after sensors deactivated.

Alarm horn, lamp are activated after 1 minute from changing zone, which gives possibility to remove source of alarm before sending signals to monitoring or security agency.

eHouse application after receiving signals sending SMS notification to two defined groups:

eHouse administrators - who are informed on each zone change and security sensors violations,
 reported users - who are informed on security sensors violations and alarm deactivation by authorized users (administrators, electronic RF keys, PDA, panels, or from eHouse application). This group may contain mobile phone numbers of neighbors, police, security agency, etc.



Connectors InputExtender IE1 / IE2

Connectors A1-A28 (A14*) (RJ-12 Alarm Sensors Connections)

Pin	Function	Description
1.	12V	Power for alarm sensor 12V
2.	0V	Ground GND of Alarm Sensor
3.	Sabotage1	contact NC (normally connected) sabotage switch (if not used shorten to Sabotage2 (pin 4)
4.	Sabotage2	contact Com (Common) sabotage switch (if not used shorten to Sabotage1 (pin 3)
5.	0V	GND (Ground) - Connect contact COM (Common) relay of Alarm Sensor
6.	IN1-28(14*)	Output of Sensor - Connect contact NC (Normally Connected) relay of Alarm Sensor. Contacts must be isolated from any voltage, in other case there is serious risk of damage circuit.

In case of problems with finding pin 1, voltage 12V should be measured with multimeter.

*For InputExtender Bis (IE2)

Connector SensIn (IDC-40 Global connector for all sensors installation - instead of A1-A28)

Pin	Function	Description
1.	0V	GND (Ground) Power for Security Sensors
2.	0V	GND (Ground) Power for Security Sensors
3.	0V	GND (Ground) Power for Security Sensors
4.	0V	GND (Ground) Power for Security Sensors
5.	Sabotage	Input for serially connected sabotage switches in alarm Sensors in normal condition it must be Normally Closed. Other side of Sabotage switches is connected to connection TAMPER If not used first column of TAMPER should be shorten with jumper.
6.	IN1	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
7.	IN2	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
8.	IN3	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
9.	IN4	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
10.	IN5	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
11.	IN6	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
12.	IN7	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
13.	IN8	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
14.	IN9	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
15.	IN10	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
16.	IN11	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
17.	IN12	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
18.	IN13	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
19.	IN14	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
20.	IN15	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch (do not connect * for IE2 - module can be damaged)
21.	IN16	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch (do not connect * for IE2 - module can be damaged)
22.	IN17	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch (do not connect * for IE2 - module can be damaged)

- 23. IN18 Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
(do not connect * for IE2 - module can be damaged)
- 24. IN19 Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
(do not connect * for IE2 - module can be damaged)
- 25. IN20 Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
(do not connect * for IE2 - module can be damaged)
- 26. IN21 Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
(do not connect * for IE2 - module can be damaged)
- 27. IN22 Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
(do not connect * for IE2 - module can be damaged)
- 28. IN23 Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
(do not connect * for IE2 - module can be damaged)
- 29. IN24 Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
(do not connect * for IE2 - module can be damaged)
- 30. IN25 Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
(do not connect * for IE2 - module can be damaged)
- 31. IN26 Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
(do not connect * for IE2 - module can be damaged)
- 32. IN27 Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
(do not connect * for IE2 - module can be damaged)
- 33. IN28 Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
(do not connect * for IE2 - module can be damaged)
- 34. N/C N/A
- 35. N/C N/A
- 36. N/C N/A
- 37. 12V +12V Power supply for Alarm Sensors (Do not connect to any inputs, it could damage modules)
- 38. 12V +12V Power supply for Alarm Sensors (Do not connect to any inputs, it could damage modules)
- 39. 12V +12V Power supply for Alarm Sensors (Do not connect to any inputs, it could damage modules)
- 40. 12V +12V Power supply for Alarm Sensors (Do not connect to any inputs, it could damage modules)

*For InputExtender Bis (IE2)

Connector TAMPER (Sabotage Count IDC-58 pin male) - Nr of sensors for checking sabotage (must be installed subsequently from A1 to A28)

<u>Nr</u>	<u>Column</u>	<u>Description (jumper)</u>	<u>Number of security sensors connected to sockets A1-28</u>
1		0 Alarm Sensors / No checking	
2		1	
3		2	
4		3	
5		4	
6		5	
7		6	
8		7	
9		8	
10		9	
11		10	

12	11
13	12
14	13
15	14
16	15
17	16
18	17
19	18
20	19
21	20
22	21
23	22
24	23
25	24
26	25
27	26
28	27
29	28

Connectors only for InputExtender II Bis (IE2)

**Connector INP2 (IDC-16 Global connection of alarm sensors - instead of A1-A14)
(Alternatively instead of INPUTS connector for IE)**

Pin	Function	Description
1.	0V	GND (Ground) Alarm Sensors
2.	Sabotage	Input for serially connected sabotage outputs of alarm sensors. It should be normally closed. Sabotage Input for serially connected sabotage switches in alarm Sensors in normal condition it must be Normally Closed. Other side of Sabotage switches is connected to connection TAMPER. If not used first column of TAMPER should be shorten with jumper.
3.	IN1	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
4.	IN2	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
5.	IN3	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
6.	IN4	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
7.	IN5	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
8.	IN6	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
9.	IN7	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
10.	IN8	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
11.	IN9	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
12.	IN10	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
13.	IN11	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
14.	IN12	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
15.	IN13	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch
16.	IN14	Output from Alarm Sensor - NC (Normally Closed) contact of sensor relay or switch

**Connector (Move Out) (IDC-16 connection for controlling outputs to Expander EX)
(Flat cable 16 pin, 1 to 1 connection).**

For information only - inverting connection may cause permanent damage of modules and power supplies.

Pin	Function	Description
1.	VCCDRV	Power Supply for Relays (+5V) not UPS'ed
2.	VCCDRV	Power Supply for Relays (+5V) not UPS'ed
3.	OUT1	Output controlled by input IN1 (**)
4.	OUT2	Output controlled by input IN2 (**)
5.	OUT3	Output controlled by input IN3 (**)
6.	OUT4	Output controlled by input IN4 (**)
7.	OUT5	Output controlled by input IN5 (**)
8.	OUT6	Output controlled by input IN6 (**)
9.	OUT7	Output controlled by input IN7 (**)
10.	OUT8	Output controlled by input IN8 (**)
11.	OUT9	Output controlled by input IN9 (**)
12.	OUT10	Output controlled by input IN10 (**)
13.	OUT11	Output controlled by input IN11 (**)
14.	OUT12	Output controlled by input IN12 (**)
15.	OUT13	Output controlled by input IN13 (**)
16.	OUT14	Output controlled by input IN14 (**)

(**) Output reacts directly on activation of alarm sensor

1 Row Connectors

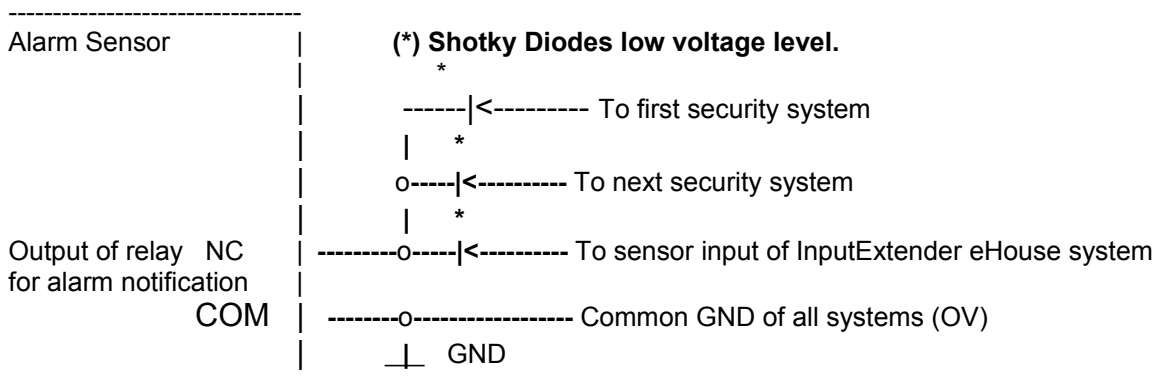
Pin 1 has square pad on PCB.

2 Row connectors

Pin 1 has square pad on PCB and arrow on the cover.

1	2
3	4
5	6
7	8
.	.
.	.
39	40

Parallel connection of alarm sensors to more then one security systems.



Sabotage outputs should be connected to only one system without any changes

Using Diodes for separation of multiple security systems causes decreasing margin of errors and

InputExtender can generate fake alarm in case of very strong disturbance (thunderbolt, close location to GSM antennas high power signals).

3.5. Expander (EX).

Module do not consist logic functions, only assures (+5V) UPS for eHouse security system (IE) and RS232-RS485 Converter. Power is taken from +12V UPS. Module enables easy connection of whole security system:

- ExternalManager,
- InputExtenders,
- Relay Module for ExternalManager,
- Relay Module for InputExtenders II (Bis),
- Connection between all modules requires only flat cables with IDC female sockets, what ease installation and service support.

Expander contains relays for direct switching on Alarm Horn, Light, Early Warning signal, Output 1 of ExternalManager, Output 2 of ExternalManager.

Only devices supplied by 15V power can be connected to the relay contacts. Connection of 230V devices may cause permanent damage of whole eHouse system.

3.5.1. Expander outputs and connectors for IE / IE2

Connector (Relays IDC - 40 pin) for connecting Relay Module and ExternalManager

Nr	Signal RM	Relay	External Manager
1,2	VCCDRV	Power supply from MP (+5V Independent from RoomManager) for drivers protection.	
3	OUT1	1	Roller 1 open
4	OUT2	2	Roller 1 close
5	OUT3	3	Roller 2 open
6	OUT4	4	Roller 2 close
7	OUT5	5	Roller 3 open
8	OUT6	6	Roller 3 close
9	OUT7	7	Roller 4 open
10	OUT8	8	Roller 4 close
11	OUT9	9	Roller 5 open
12	OUT10	10	Roller 5 close
13	OUT11	11	Roller 6 open
14	OUT12	12	Roller 6 close
15	OUT13	13	Roller 7 open
16	OUT14	14	Roller 7 close
17	OUT15	15	Roller 8 open
18	OUT16	16	Roller 8 close
19	OUT17	17	External gate open
20	OUT18	18	External gate close
21	OUT19	19	Garage door open
22	OUT20	20	Garage door close

23	OUT21	21	Main door roller (open)
24	OUT22	22	Main door roller (close)
25	OUT23	23	Gate open
26	OUT24	24	Digital output 1
27	OUT25	25	Roller 9 open RM-reserved (future use)
28	OUT26	26	Roller 9 close RM-reserved (future use)
29	OUT27	27	Roller 10 open RM-reserved (future use)
30	OUT28	28	Roller 10 close RM-reserved (future use)
31	OUT29	29	Roller 11 open RM-reserved (future use)
32	OUT30	30	Roller 11 close RM-reserved (future use)
33	OUT31	31	Digital output 2
34	OUT32	32	Alarm lamp RM-reserved (future use)
35	OUT33	33	Alarm horn RM-reserved(future use)
36	OUT34	34	(Diode 2)
37	OUT35	35	(Diode 1)
38	CPP3		(PWM output) to dimmer power driver 3
39	CPP2		(PWM output) to dimmer power driver 2
40	CPP1		(PWM output) to dimmer power driver 1

Connector for relay module driving by outputs of InputExtenders II (Bis) (Movement Relays, IDC - 40 pin)

Nr	Signal	Relay	Description
1,2	VCCDRV		Power supply from MP (+5V Independent from RoomManager) for drivers protection. Do not connect to +5V on the controller output
3	MOVE OUT1	1	output 1 of IE2 nr 1
4	MOVE OUT2	2	output 2 of IE2 nr 1
5	MOVE OUT3	3	output 3 of IE2 nr 1
6	MOVE OUT4	4	output 4 of IE2 nr 1
7	MOVE OUT5	5	output 5 of IE2 nr 1
8	MOVE OUT6	6	output 6 of IE2 nr 1
9	MOVE OUT7	7	output 7 of IE2 nr 1
10	MOVE OUT8	8	output 8 of IE2 nr 1
11	MOVE OUT9	9	output 9 of IE2 nr 1
12	MOVE OUT10	10	output 10 of IE2 nr 1
13	MOVE OUT11	11	output 11 of IE2 nr 1
14	MOVE OUT12	12	output 12 of IE2 nr 1
15	MOVE OUT13	13	output 13 of IE2 nr 1
16	MOVE OUT14	14	output 14 of IE2 nr 1
17	MOVE OUT15	15	output 1 of IE2 nr 2
18	MOVE OUT16	16	output 2 of IE2 nr 2
19	MOVE OUT17	17	output 3 of IE2 nr 2
20	MOVE OUT18	18	output 4 of IE2 nr 2
21	MOVE OUT19	19	output 5 of IE2 nr 2
22	MOVE OUT20	20	output 6 of IE2 nr 2
23	MOVE OUT21	21	output 7 of IE2 nr 2
24	MOVE OUT22	22	output 8 of IE2 nr 2
25	MOVE OUT23	23	output 9 of IE2 nr 2

26	MOVE OUT24	24	output 10 of IE2 nr 2
27	MOVE OUT25	25	output 11 of IE2 nr 2
28	MOVE OUT26	26	output 12 of IE2 nr 2
29	MOVE OUT27	27	output 13 of IE2 nr 2
30	MOVE OUT28	28	output 14 of IE2 nr 2
31	MOVE OUT29	29	output 1 of IE2 nr 3
32	MOVE OUT30	30	output 2 of IE2 nr 3
33	MOVE OUT31	31	output 3 of IE2 nr 3
34	MOVE OUT32	32	output 4 of IE2 nr 3
35	MOVE OUT33	33	output 5 of IE2 nr 3
36	MOVE OUT34	34	output 6 of IE2 nr 3
37	MOVE OUT35	35	output 7 of IE2 nr 3

Connectors IEx1, IEx2, IEx3 (IDC-20 Pin) InputExtenders connections to Expander (Flat cable 20 pin, 1 to 1).

For information only - inverting connection may cause permanent damage of modules and power supplies.

Pin	Function	Description
1	VCCDRV	Power for relays (+5V) not UPS
2	VCCDRV	Power for relays (+5V) not UPS
3	VCC	Power from internal stabilizer (+5V) from +12V (UPS)
4	VCC	Power from internal stabilizer (+5V) from +12V (UPS)
5	12V	Power supply +12V (UPS) for security sensors
6	12V	Power supply +12V (UPS) for security sensors
7	0V	GND (Ground)
8	0V	GND (Ground)
9	ALARM	Additional alarm horn IE / IE2
10	LIGHT	Additional alarm light IE / IE2
11	RX	UART - RX connected to EM
12	TX	UART - TX connected to EM
13	TX+	RS485 - exist with build in MAX3086 driver (transmission +)
14	TX-	RS485 - exist with build in MAX3086 driver (transmission -)
15	RX-	RS485 - exist with build in MAX3086 driver (reception -)
16	RX+	RS485 - exist with build in MAX3086 driver (reception +)
17	0V	GND (Ground)
18	0V	GND (Ground)
19	VCCDRV	Power for relays (+5V) not UPS
20	VCCDRV	Power for relays (+5V) not UPS

Connector RS485 - (RJ-45 optional for installed RS-485 driver)

For information only - inverting connection may cause permanent damage of modules and power supplies.

Pin	Function	Description
1.	0V	GND (Ground)
2.	0V	GND (Ground)
3.	NC	N/A
4.	NC	N/A
5.	TX+	RS485 - exist with build in MAX3086 driver (transmission +)
6.	TX-	RS485 - exist with build in MAX3086 driver (transmission -)

7. RX- RS485 - exist with build in MAX3086 driver (reception -)
 8. RX+ RS485 - exist with build in MAX3086 driver (reception -)

Connectors (Move 1, 2, 3) (IDC-16 connection of outputs controlled by inputs of Expander from InputExtender BIS) (Flat cable 16 pin, 1 to 1).

For information only - inverting connection may cause permanent damage of modules and power supplies.

Pin	Function	Description
1.	VCCDRV	Power for relays (+5V) not UPS
2.	VCCDRV	Power for relays (+5V) not UPS
3.	OUT1	Output controlled by line IN1 (**)
4.	OUT2	Output controlled by line IN2 (**)
5.	OUT3	Output controlled by line IN3 (**)
6.	OUT4	Output controlled by line IN4 (**)
7.	OUT5	Output controlled by line IN5 (**)
8.	OUT6	Output controlled by line IN6 (**)
9.	OUT7	Output controlled by line IN7 (**)
10.	OUT8	Output controlled by line IN8 (**)
11.	OUT9	Output controlled by line IN9 (**)
12.	OUT10	Output controlled by line IN10 (**)
13.	OUT11	Output controlled by line IN11 (**)
14.	OUT12	Output controlled by line IN12 (**)
15.	OUT13	Output controlled by line IN13 (**)
16.	OUT14	Output controlled by line IN14 (**)

(**) Output reacts directly on activation of alarm sensor

4 pin Connector male (Power Supply) J2

Pin	Function	Description
1	+5V	Power Supply +5V
2	GND	GND (Ground) (0V)
3	GND	GND (Ground) (0V)
4	+12V	Power supply +12V (UPS) RM, EM, HM and powering alarm sensors

10 pin connector SIP-10 male Serial Port - UART (J6)

(with mounted 2 row connector with crossing signals for ease of installation 1 to 1 pin)

Pin	Function	Description
1	GND	(0V)
2	NC	Not connected
3	TX	Transmit output of UART (InputExtender) for connection to ExternalManager
4	RX	Receive input of UART (InputExtender) for connection to ExternalManager

Connector (To EM) (IDC-10 {two rows} serial port RS232 TTL - UART) (J6)

(with build 2 row connector without crossing signals - do not connect)

Pin	Function	Description
1	GND	(0V)
2	NC	Not Connected
3	RX	Receive input of UART (InputExtender) for connection to ExternalManager
4	TX	Transmit output of UART (InputExtender) for connection to ExternalManager

1 Row connectors

Pin 1 has squared pad on PCB.

2 Row connectors

Pin 1 has square pad on PCB and arrow on the cover.

1	2
3	4
5	6
7	8
9	10
11	12
13	14
15	16
17	18
19	20
21	22
23	24
.	.
.	.
.	.
39	40

Built-in Relays:

Do not connect Voltages greater than 15V

Nr Relay	Description
1. (*)	ExternalManager (Alarm Light)
2.	ExternalManager (Alarm Horn)
3.	ExternalManager - Output 2
4.	InputExtenders Multiplexed (Additional Alarm Light)
5.	InputExtenders Multiplexed (Additional Alarm Horn)
6.	ExternalManager - Output 1

(*) Counting from power connectors

Relays contacts - 3 pin sockets, screwed.

Nr pin	Function	Description
1. (*)	NC	Normally close (shorten with COM),
2.	COM	Common,
3.	NO	Normally opened (unconnected to COM),

(*) Counting from power connectors (from right to left).

3.6. Relay Module.

Relay Module enables direct switch on / off executive devices with build in relays (with contacts 230V / 10A). Inductive load can't be connected to contacts except pumps, fans. Maximal amount of installed relays is 35. Final count depends of module type.

<u>Controller</u>	<u>Used count of relays</u>
HeatManager	21
RoomManager	24-35
ExternalManager	35
CommManager	35*2
InputExtender Bis	14

Relays Module enables easy installation of eHouse data and power buses. Power bus (3*2.5mm² electric cable) is ironed to the module for limitation of contact resistance and assure long lasting and proper working of system. Otherwise voltage drops, can cause limiting effective power supply and insufficient value to switch relays especially after few years of work.

Relays Module contains 3 socket RJ-45 for connecting neighboring fragments of eHouse Data Bus.

- 1) to previous Relays Module,
- 2) to RM, EM, HM controller,
- 3) to next Relays Module.

230V cables should be ironed directly to PCB (to contacts of relays) in order to assure long lasting and proper work of system, free from sparking, short resistance of contacts. In case of screwed connections sparking and large contact resistance could cause burning paths on module, shortcuts and permanent system damages. All ironed cables must have 50cm spare to enable easy service of module and changing relay in case of malfunction. Relays Module may contain optional power drivers of PWM (Pulse Width Modulated) Dimmers (up to 3), supplied from +12V to 15V DC and minimal power 50W per output. It can be used for fluent dimming of light DC (Direct current). Only 30W lamp can be connected to single dimmer output. Assuring good ventilation of module is a must. In case of not sufficient ventilation, fan must be installed to force air flow. This construction of dimmer allows avoiding discomfort of flashing and hum which appears in triac or thyristor dimmers under 230V/AC.

Drivers of dimmers can only be connected to lamps or LEDs. Other application may cause permanent damage of system including fire.

It is especially concerning to Inductive loads e.g. motors , high power fans.

3.7. CommManager - Integrated communication module, GSM, security system, roller manager, eHouse 1 server.

CommManager is module which can act as PC eHouse server with large system functionality, without continuous attendance of PC. CommManager is self contained security system with GSM (SMS) notification and control. It also contains built-in Roller Manager. CommManager can be connected to eHouse 1 data bus and work as server for eHouse 1 devices.

In this case CommManager replaces ExternalManager (EM), InputExtenders (IE), Expander(EX) and RS232-RS485 Converter. CommManager contains GSM module for direct control via SMS, eMail. Additionally it contains Ethernet interface for direct TCP/IP control (over LAN, WiFi or WAN). This enables multi-channel independent communication for most important subsystem in the house - Security System.

GSM/SMS is not liable on sabotage e.g. cutting telephone lines of dialer for monitoring purposes. GSM signal is much harder to disturb than monitoring radio-lines, working on amateur frequencies easy to distort by large power transmitters turned on during break in.

Main features of CommManager:

- Self contained security system with GSM / SMS notifications, controlled outside monitoring zone, managing by SMS, eMail, Ethernet,
- Allows connection alarm sensors (up to 48 without extension module, up to 96 with extension module,
- Incorporates built in roller, gates, shadow awnings, doors drives controller max 35 (27*) independent roller servomotors without extension module, and up to 56 with extension module. Each roller device is controlled by 2 lines and works in Somfy standard as default. Alternatively direct servomotor drive (containing full protections) can be controlled.
- Contains RS485 interface for direct connection to eHouse 1 data bus.
- Incorporates Ethernet interface for direct control (over LAN, WiFi, WAN).
- Contains GSM module for Security system notification and controlling system via SMS.
- Incorporates eMail Client POP3 (over GSM / GPRS dial up network), for controlling system via eMail.
- Do not require stand alone link to internet and works wherever is sufficient GSM / GPRS signal level.
- Enables direct connection of Alarm Horn, Alarm Lamp, Alarm Monitoring device.
- Allows programmable rollers, gates, doors working parameters: control time, full movement time (maximal of all rollers), delay time (for changing direction).
- Enables alternative usage of outputs as a single, standard (Compatible with RoomManager), if rollers system are not required.
- Contains RTC (Real Time Clock) for devices synchronization and valid scheduler usage.
- Contains Advanced Scheduler for frequent, automatic, service, unattended, programmed in time events execution,
- Incorporates TCP/IP server for controlling system with 5 concurrent connections accepted. Connections has equal priority and enables: receiving events from TCP/IP devices compliant to eHouse system, continuous transmitting logs to PC system, sending eHouse 1 devices status to TCP/IP panels for monitoring states and visualization purposes, achieve transparent TCP/IP to RS 485 interface, for loading configuration and serious problem detection.
- Contains TCP/IP client to control EthernetHouse (eHouse 2) devices directly via TCP/IP network.
- Servers and client uses secure logging and authentication between TCP/IP eHouse system devices.
- Enables eHouse 1 system devices control and distributing data among them.
- Enables setting required logging level (information, warning, errors) for solving any problems in the system.
- Contains software and hardware WDT (Watch Dog Timer) to reset device in case of hang up, or serious errors.
- Contains 3 groups of SMS notification from Security System:
 - 1) Change Zone notification group,
 - 2) Active sensor notification group,
 - 3) Alarm Deactivation notification group.
- Any Alarm signal timing can be individually programmed (Alarm horn, Warning light, monitoring, EarlyWarning).
- Supports 21 security zones.
- Supports 4 level mask individually defined for each activated Alarm Sensor and each security zone.
 - 1) Alarm Horn turn on (A),
 - 2) Alarm Light turn on (W),

3) Monitoring Output turn on (M),

4) Launch event associated with Alarm Sensor (E).

- Contains 16 channel Analog to Digital Converter (resolution 10b) for measurement analog signals (Voltage, Temperature, light, wind power, humidity value, Sabotage Alarm Sensors. Two threshold are defined Min and Max. Crossing this threshold by sensor for each channel can launch eHouse event assigned to it). Thresholds are individually defined in each ADC Program to maintain automatic adjustments and regulation. ADC contains (can be enabled) 16 outputs for direct control by ACD without event assigned to threshold.
- CommManager contains 24 ADC programs for individual thresholds definitions for each channel.
- CommManager contains 24 Rollers Program Definition (each rollers, gates, doors control together with security zone selection).
- Contains 50 position queue of events to run locally or send to other devices.

Some function of eHouse 1 system on PC server and auxiliary applications is not supported by CommManager:

- Controlling Winamp application and playing music from PC (on progress),
- Playing acoustic notification on PC,
- Creating detailed logs of eHouse 1 device connected to CommManager,
- Writing own algorithm on PC for system control (on progress),
- Controlling Security System by RF electronic keys (was replaced by direct control over WiFi, LAN, SMS).

CommManager Description

GSM / GPRS Module.

CommManager (CM) contains built in GSM / GPRS module enabling wireless remote control of eHouse 1 or EthernetHouse system via SMS and eMail reception. E-Mail client assures cyclic checking of POP3 post office dedicated for eHouse system using GSM / GPRS dial-up service. Control range is practically unlimited and can be done from any place where is sufficient GSM signal level.

This solution enables secure control of eHouse system and receiving notification from security system.

Dedicated link to internet, telephone lines are not required and is hard to acquired in new built houses, especially far from the city.

Security is much bigger due to wireless connection and there is no possibility to damage or sabotage link (as for telephones, dialers, internet access, etc). Damages of communication lines can be random (wind, weather condition, theft) or purpose (sabotage to disable control of the system, and notification of security system to monitoring, security agency, police, owner of a house.

Repairing of lines can take lot of time, which makes security system much more vulnerable to attacks and disable sending notifications to anybody about break in. Monitoring radio-lines works on amateur frequencies and specialized thieves can disturb them with more powerful transmitters during break in, to gain additional time.

GSM is much more difficult to disable and enables installation far from cities, practically at any time (before getting address of house, making telephone or other connection to new built house). Only sufficient GSM signal level is required to install this systems.

GSM module contains external antenna which can be installed in place, where GSM signal is strongest (e.g. on the roof). In this case GSM module can minimize transmission power during normal work to accomplish connection. Power margin is sufficient for counteracting of limited propagation micro-waves: bad weather condition, rain, snow, mist, leaves on the trees etc. GSM signal level can change in years due to new building arises, growing trees etc. On the other hand the bigger is signal level the less are distortion generated by GSM module and antenna. It is especially important for built-in ADC converter, because in worst cases measurement

can be crippled with few dozen percent errors, which makes them unusable. Antenna installation outside the building in direction to nearest GSM base station can increase signal level hundreds times what proportionally increases power margin for GSM transmission, limits emitting power of GSM transmission and distortions (errors) of built-in ADC measurement (and analog sensors located near the antenna).

GSM module require active SIM card installation and checking, if it not expired or empty (in case of prepaid activations). If card is expired or empty, various issues can appear:

- problems with sending SMS (especially for other operators),
- unable to connect GPRS sessions, etc.
- hanging up GSM modules,
- and can change in time and depend on operators options, tariffs).

Sending SMS or receiving eMail via GSM / GPRS module is very long (6-30 sec) and continuous failed retries (caused by inactive GPRS service or lack of resources on SIM card), brings on large CPU usage of CommManager, efficiency drops for any other functions and decreases stability of whole security system.

GSM configuration is performed by "CommManagerCfg.exe" application, which allows intuitive setting every option and parameters for this module. GSM Module options are in first three tabs.

- 1) General,
- 2) SMS Settings,
- 3) eMail Settings.

Report Level lets to chose level of logging sending to log grabber application (TCPLogger.exe) or to RS-485. It inform CommManager which log info should be send (info, warnings, errors). It is useful for detection and solving problems (e.g. no resources on SIM Card, No GSM Signal, etc and take some action to repair it). For Report Level=1 anything is sent to log grabber. This option should only be use to detect serious, unknown problems on the system. this option seriously utilize CommManager CPU and affect stability and system efficiency.

The bigger number in Report Level field, the less information will be send (only with higher priority than report Level).

In case we don not need generating logs 0 should be chosen here.

Disable UART Logging. This option disable sending logs to RS-485 UART. When this option is turned on only TCP/IP logging can be send, after connection TCP/IP Log grabber application (TCPLogger.exe) to CommManager. However in case of CommManager reset TCPLogger.exe is disconnected and log information to the next connection of log grabber to CommManager will be lost.

Enabling UART logging gives opportunity to log all information including this part which normally would be lost by TCPLogger.

This logging mode should only be use to solve very serious problem (which appear at very beginning of firmware execution) and TCP/IP communication problem.

Main disadvantage of UART logging is continuous sending to RS-485 and utilizing system resources, no matter if log grabber is connected or not (for TCP/IP logging logs information are sent only when TCPLogger is connected to Server).

The other problem is that UART logs are send to eHouse 1 Data Bus, utilize this connection and generate some traffic, sending information incompatible to eHouse 1 device framing and can disturb devices to work properly. In other to use this logging mode all eHouse 1 devices must be disconnected, by removing RS-485 crossing cable and connect via non crossing (1 to 1) to RS232-485 Converter. RS232-485 Converter must be connected to any

terminal application as hyper terminal working on 115200, even parity, 1 stop bit, no flow control. In case of connection TCPLogger RS-485 logging is dropped and is directed to TCP/IP grabber.

Disable GSM Module. This option enables permanent disable of all functions of GSM / GPRS module if it is not installed.

However the time for CommManager and all eHouse devices is taken from GSM Module, so it could lose some functionality as usage schedules (due to invalid date and time in the system). Theoretically time can be externally programmed by CommManagerCfg.exe application, but it will be reset together with Reset of CommManager from any reason.

GSM Module phone number field must consist of valid mobile phone number (e.g. +48501987654), which is used by GSM module. This number is used for authorization and cryptography calculation purposes, and changing this number will disable possibility of authorization TCP/IP devices to each other.

Pin Code. This field must consist of valid PIN number (assigned to SIM card). In case of putting wrong number, CommManager automatically disables SIM card, by multiple retries to establish connection. Due to stationary system installation it is strongly recommended to disable pin checking, which gains in speed up time of turning on GSM module and logging to GSM network.

Hashing Numbers. This field consists of additional information for cryptographic calculations and authorization and expects 18 hex digits (0,1,2,3,4,5,6,7,8,9,a,b,c,d,e,f) one by one without any separators. After change this number configuration should be loaded to each EthernetHouse device and TCP/IP panels. Usage of GSM phone number, together with hashing numbers as a part of cryptographic function arguments assures individual encryption / decryption algorithms for each eHouse installation. Additionally can be changed if it is necessary for all devices.

Authorized GSM Numbers. This field - consists of GSM phone numbers for system management by SMS. Any SMS from other numbers are automatically ignored and deleted.
e.g.: "+48504111111,+48504222222" - comma separated.

Zone Change - SMS Notification Numbers. This field - consists of GSM phone numbers for sending SMS notification about changing security zone together with zone name.
e.g.: "+48504111111,+48504222222" - comma separated.

Sensors Activation - SMS Notification Numbers. This field - consists of GSM phone numbers for sending SMS notification about active security sensors by name (which violate alarm, warning or monitoring in current zone).
e.g.: "+48504111111,+48504222222" comma separated.

Deactivation - SMS Notification Numbers. This field - consists of GSM phone numbers for sending SMS notification about alarm signals deactivation by authorized users (by changing security zone).
e.g.: "+48504111111,+48504222222" comma separated.

Zone Change Suffix. This field - consists of suffix added to zone name for zone change notification group.

Alarm Prefix. This field - consists of prefix added before active alarm sensor names for Sensor activation notification group.

Deactivation Alarm. This field – contains text sent to deactivation notification group.

Disable SMS Send. This option disables sending all notification SMS from security system.

Disable SMS Receive. This option disables SMS checking and reception for controlling eHouse system.

POP3 Client (eMail reception)

POP3 Client implemented in CommManager consists several protection mechanisms to assure continuous and stable work even during various attack on eHouse system.

In case of failure one of verification step message is deleted immediately from POP3 server, without further checking, downloading and reading message.

Only eMails dedicated to control eHouse system (prepared automatically by eHouse compatible management applications) can completely pass all mechanisms.

All mechanisms allows efficient fight with spam, attacks, accidental email, etc.

This steps are overtaken to maintain effective and efficient continuous work, do not generate unnecessary traffic over GSM / GPRS, do not overload POP3 client and CommManager.

Verification steps are as follows:

- Sender address must be the same as programmed in eHouse system.
- Total size of message must be less then 3KB (this eliminate accidental mails).
- Subject of a message must be the same as programmed in eHouse system.
- Message must contain valid header and footer around eHouse system compatible message.
- Headers and footers of internet providers, added to message body by POP3, SMTP servers are automatically discarded.

All POP3 client parameters and options are set in CommManagerCfg.exe application in **Email Settings** tab.

Accepted Email Address * field - consists address from which controlling message will be performed. Any messages from other addresses are automatically deleted from POP3 server.

POP3 Server IP * field consists IP address of POP3 server. DNS address is not supported.

POP3 Port Nr * field consists POP3 server port.

POP3 User Name * field consists user name for logging to post office (POP3 server).

POP3 Password * field consists password for user to authorize on POP3 server.

Message Subject * field consists programed subject valid for sending events to eHouse system via eMail. Other subject of message will cause automatic deletion without further performing.

Internet Connection Init * field consists command for initialize internet connection on via GSM / GPRS. For most of operators command is the same (session, user, password = "internet"). In case of problem with connection user should be advised by GSM operator for this parameters.

POP3 Server From String * field consists name of header where sender address is stored, in case of problems result should be checked directly on POP3 server using telnet application.

Message Header * and **Message Footer *** fields - consist header and footer for eHouse system. This protection is for discarding automatic headers and footers attached to the message by POP3 and SMTP servers and remove

accidental or damaged emails. Only part between eHouse header and footer are treated as eHouse message. The rest is ignored.

Disable POP3 Server / GPRS * field disables connection to GPRS and cyclic checking for eMails.

Following issues and problems (concerning to GSM systems not to eHouse system directly) should be considered, before enabling POP3 Client over GPRS:

- In locations where low level of GPRS signal is detected transmission may be impossible and for system efficiency and stability GPRS support should be permanently disabled. It could also happen seasonally.
- eMail reception over GPRS session seriously utilizes CommManager Microcontroller.
- While GPRS session is on progress (on mobile phone or GSM modules), operator does not send SMS to target device (which stays in Waiting Queue until GPRS session will be closed) and SMS could reach destination long time later.
- Even short disconnection from GPRS session by (GSM phone or modules) for checking incoming SMS do not guarantee SMS reception, because it can still await in operator queue due to large GSM system latency.
- SMS can be receive in large delay 0-60 sec and it depends on Operator network utilization and many other things.
- Expenses on GPRS and cyclic opening and closing GPRS sessions (for sequential queries eMails and SMSs) are several times bigger then usage SMS reception only.
- In case of disabling **GPRS / POP3 Server** GSM Module is notified immediately after reception SMS and latency between sending and receiving SMS is about 6 sec.

Security System.

Security System incorporated in CommManager is self contained and requires:

- Connection security sensors,
- Alarm horn,
- Alarm light,
- Early Warning horn,
- Notification device from monitoring or security agency (if required).
- Integrate ExternalManager and InputExtenders in one device.

RF control by electronic key was replaced by direct, unlimited management from Mobile Phones, PDA, wireless TCP/IP Panels via SMS, eMail, LAN, WiFi, WAN. It can be controlled outside protected and monitored area and alarm notification are immediate after sensor activation (no latency time is used as in security systems controlled by internal keyboards).

Up to 24 zones can be defined. Each zone consist 4 level mask for each sensor connected to security system. For each security sensor inputs, 4 options are defined, in case of activation alarm sensor (if option is enabled in current zone):

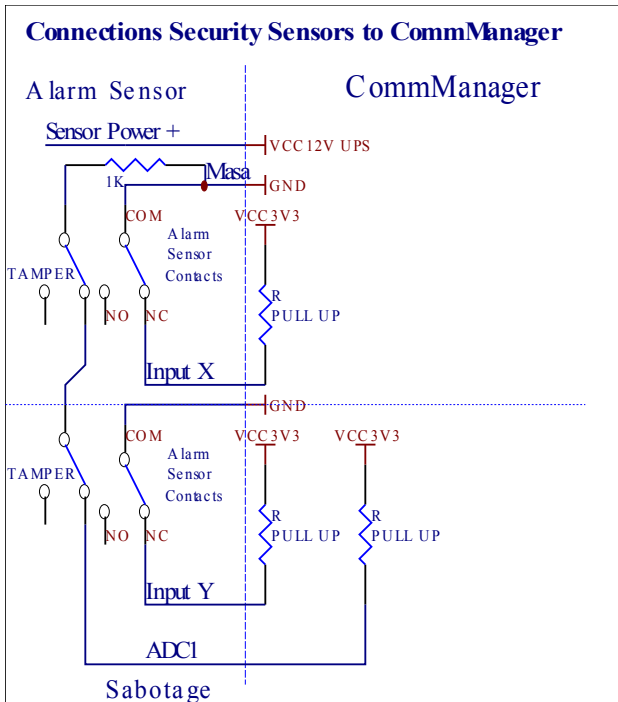
- Alarm horn on (**A * - Alarm**),
- Alarm light on (**W * - Warning**),
- Monitoring Notification on (for notification device of monitoring or security agency if required) (**M * - Monitoring**),
- Event execution assigned to Security Input (**E * - Event**).

* field name in "CommManagerCfg.exe" application

Alarm, warning, monitoring outputs are activate with programed delay set in field ("Zone Change Delay" *) from zone change initialize (if sensor activity was detected for new zone), giving chance to remove reason of alarm. Only "Early Warning" output is activated immediately. Outputs are turn off automatically after deactivation of all sensors which violate current security zone and delay set in fields: "Alarm Time" *, "Warning Time" *, "Monitoring Time" *, "Early Warning Time" *. All signals except "Early Warning Time" * are in minutes, "Early Warning Time" is in seconds.

Up to 48 security sensors can be connected to CommManager without extension module or up to 96 with extension module. Sensor must have contact isolated from any voltage outside eHouse system (relay or switch connectors). Contact should be normally closed (NC) and opened due to sensor activation.

One alarm sensor contact must be connected to sensor input of CommManager another to GND.



Apparently from setting hardware outputs (Alarm, Monitoring, Warning, Early Warning), CommManager sends SMS notification to 3 groups described above.

In case of violation alarm, warning or monitoring notification are send to group defined in field (**Sensors Activations - SMS Notification Numbers ***) including active alarm sensors names.

In case of zone change CommManager notify group defined in field (**Zone Change - SMS Notification Numbers ***) sending zone name.

In this case if alarm, warning or monitoring was active CommManager also notify group defined in field (**Deactivation - SMS Notification Numbers ***).

External Devices Manager (Rollers, gates, doors, shade awnings).

CommManager has implemented roller controller which is extended version of ExternalManager and allow controlling 27 (35**) independent rollers, gates, doors system, without extension module and 54 with the module.

** in case of disabling direct ADC outputs (described in Analog To Digital Converter chapter) 35 independent rollers (option should be unchecked {Use Direct Controlling (limit rollers to 27) - no Events definition Necessary

* } - in tab “Analog to Digital Converter Settings” of CommManagerCfg.exe application).

There are 2 ways of driving rollers: SOMFY mode or direct servomotor mode. Only driving using Somfy standard is secured and authorized because in this system rollers are equipped in controlling and protection module for rollers against overload, block, driving in both direction, assuring proper delay time before changing direction.

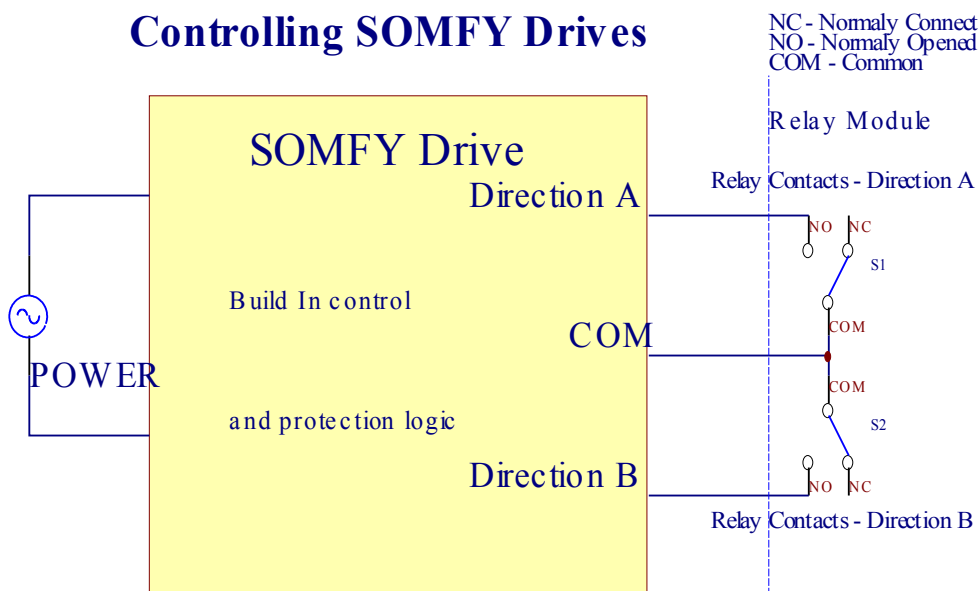
Rollers, gates, doors drives outputs.

These outputs are pairs of outputs for driving rollers, gates, doors drives in SOMFY standard (default setting) or direct drives.

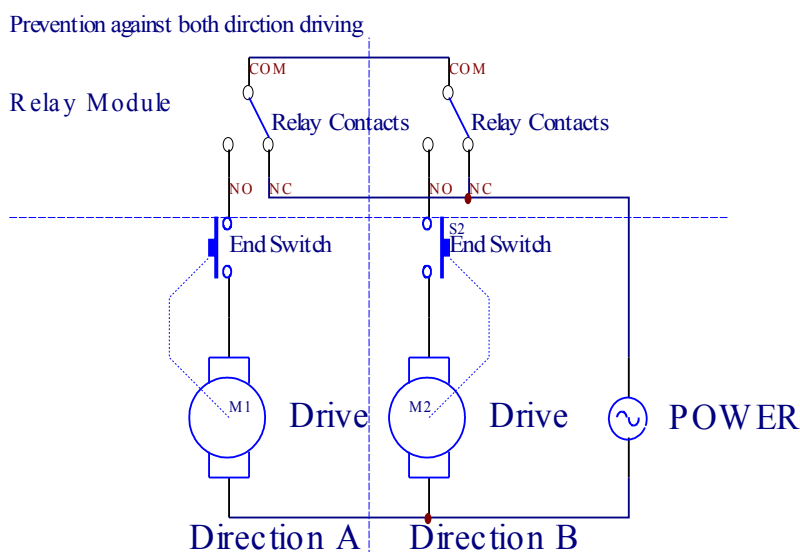
Each roller channel in SOMFY standard = roller open (1 sec pulse on A output), roller close (1 sec pulse on B output), stop (1 sec pulse on both A and B outputs}.

Otherwise outputs can be used for direct controlling of motor drives (driving line A for moving in one direction, driving line B for moving in the other direction). **Drives must have own build in protection against turning on both directions, block rollers, end switches, accelerate protection etc. Otherwise in case of malfunction of relay, wrong configuration of module, blocking drive by frost or sabotage, it is possible to damage drive. System has build in software protection against moving on both direction, but can't check if drive reaches end or wasn't blocked and isn't sufficient to protect rollers. This mode can only be used on own risk and iSys company is not responsible for damages of drives. Only Somfy system can be used securely because it incorporates own protection of drives.**

Controlling SOMFY Drives



Direct Control of Drives



Rollers mode can be set in “Rollers Settings” tab of CommManagerCfg.exe application.

One of free position can be select: Somfy (“Somfy System” *), Direct servomotor drive (“Direct Motors” *), Common Outputs (“Normal Outs” *- single outputs compatible with RoomManager's).

Additionally following parameters and options can be defined to adjust rollers settings:

- Delay for changing direction from one to another (“Delay on Change Direction” *) - software protection from immediate changing direction which could damage drives.
- Maximal Rollers full movement time (“Rollers Movement Time” *) - after this time (in seconds) system treat all rollers rollover to other direction (if it wasn't stop manually during movement). This time is also used for delay of zone change in case of Security Program execution (together with zone change). Main reason is not generating security alarm if rollers confirmation switches are installed. In case of rollers lack this option should be set to 0.
- Rollers control init time for initialize rollers movement on controlling input (Rollers Drive Time *) - (in

second). **This parameter is directly used in CommManager for choosing Rollers work mode (SOMFY / Direct). It should be set to real values (if time is less then 10 it is automatically selected Somfy mode, otherwise CommManager works in direct mode). If Somfy mode are chosen and direct servomotors are connected servomotors can be destroyed for Somfy value should be set to 2-4 sec. For direct control this time should be greater several second from slowest roller full movement.**

Each Roller has following events:

- Close,
- Open,
- Stop,
- Don't Change(N/A).

Closing and Opening roller will continue until stop in end position.

To stop roller in different position manual stop must be initiated during movement.

(“Additional Rollers” *) flag allows double count of rollers by connection extension module. **In case of lack extension module this option must be disabled. Otherwise CommManager will not work properly - internal protections will restart CommManager cyclically.**

Each roller, door, gate, shade awning can be named in CommManagerCfg application.

The names are taken for generating eHouse events.

Normal outputs mode.

In case of lack of rollers, gates, doors, etc, it is possible use CommManager's outputs as standard single output compatible with RoomManager. This enables to assign this outputs locally to Security Sensors activations or Analog to Digital Converter levels.

List of Events associated with normal digital outputs:

- Turn On,
- Toggle,
- Turn Off,
- Turn On for programmed time (afterwards off),
- Toggle (if it turn on - programmed time, afterwards off),
- Turn On after programed latency,
- Turn Off after programed latency,
- Toggle after programed latency,
- Turn On after programed latency for programmed time (afterwards off),
- Toggle after programed latency {if turning on for programmed time (afterwards off)}.

Each Output has individual timer. Timers can count seconds or minutes depending on option set in CommManagerCfg.exe application (“Minutes Time Out” * - in “Additional Outputs” * tab).

Each roller, door, gate, shade awning can be named in CommManagerCfg.exe application.

The names are taken for generating eHouse events.

Security Programs

Security programs allow grouping all rollers settings and security zone in one event.

Up to 24 Security programs can be defined for CommManager

In security programs for each rollers following events are possible :

- Close,
- Open,
- Stop,
- Do not change (N/A).

Additionally together with rollers settings needed zone can be selected.

Each security program can be named in CommManagerCfg.exe application.

The names are taken for generating eHouse events.

Zone change is activated with latency equal to maximal full rollers movement time (“Rollers Movement Time” *).

This latency is necessary, to assure that all rollers reach the end, before initiating zone change (otherwise switches confirming rollers closure may generate alarms).

To change Security Program settings:

- Select Security Program from list,
- Name can be change i field Change Security Program Name *),
- Change all rollers setting to desired values,
- Select zone if needed (Security Zone Assigned *),
- Press button (Update Security Program *),
- Repeat All steps for all needed Security Programs.

16 channel Analog To Digital Converter.

CommManager is equipped in 16 ADC input with resolution 10b (scale <0; 1023>), and voltage range <0; 3.3V>).

Any analog sensor, powered from 3.3V can be connected to ADC inputs. It can be any of: temperature, light level, humidity, pressure, gas, wind, etc.

System can be scaled for sensors with linear scale ($y=a*x+b$), which enables exact measure from analog sensors e.g. LM335, LM35, Voltage, percent %, percent inverted scale %, are automatically created in system.

Other sensors can be defined entering equation values in configuration file for sensor type. Nonlinear scale sensors can be described in table of conversion (between real value and percent value) consisting 1024 points e.g. generated from math applications.

Analog sensor must have small current of work and be supplied from 3.3V of CommManager. Some sensors do not require power supply e.g. LM335, photo diodes, photo transistors, photo resistors, thermistors, because are powered by Pull-Up resistors (4.7K), to power supply 3.3V.

To obtain maximal accuracy of sensors connection cable:

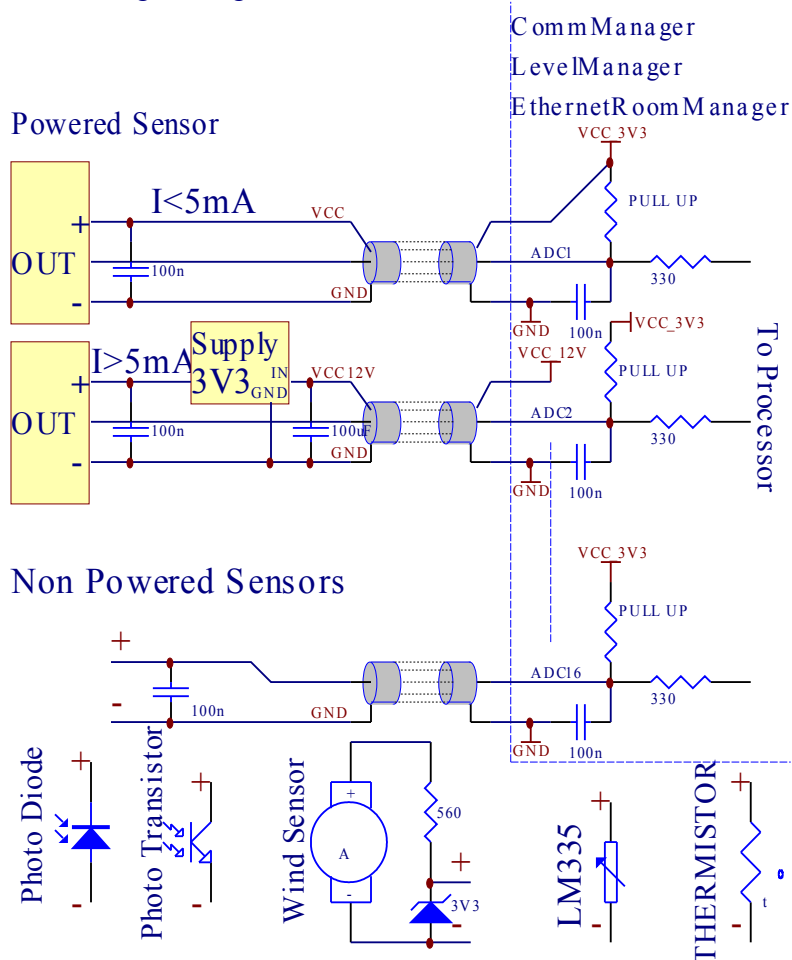
- must be shielded,
- as short as possible,
- far from distortion sources (GSM antennas, Monitoring radio notification, high power lines, etc).

CommManager contains GSM Module, which also can seriously distort proper measurement of analog sensors values increasing their errors.

Antenna of GSM module or whole CommManager should be installed in location where strong GSM signal was measured.

Best way is to check distortions level before plaster the building with active GSM module sending SMS and receiving eMails.

Connecting Analog Sensors to TCP/IP Controllers



Each channel configuration of Analog to Digital Converter is realized in CommManagerCfg.exe application in "Analog to Digital Converter Settings" * tabs.

To change ADC parameter ("Modification Enabled" *) on General * tab should be selected.

Most important option is global setting for direct output control ("Use Direct Controlling (limit rollers to 27) - no Events definition Necessary" *) assigned for each channel. This flag enables automatic switching on output dedicated to ADC channel and dropping below (Min Value *). Output will be switched off after overstep (Max Value *). These levels are individually defined for each ADC Program and each ADC channel.

Turning on this option allocates last 8 rollers system (remaining available 27) or 16 output in normal mode, which are dedicated to direct control of this output as ADC outputs. Choosing this option frees from assigning events to ADC levels, and ADC outputs are controlled on local device (without executing event of local controller or other one). In Rollers Output mode there is not other way to get local control of ADC outputs.

Each ADC channel has following parameters and options:

Sensor Name: can be change in field "Change Adc Input Name" *.

Sensor Type: Standard types are LM335, LM35, Voltage, %, % Inverted (% Inv). User can add new sensor type, by adding new name to file ADCSensorTypes.txt. Additionally files must be created with same name as sensor type name, then space and 1 to 16 and extension ".txt". In this file 1024 subsequent level must exist. Text doesn't matter for CommManager, only index are stored and loaded to controller.

Minimal Value ("Min Value" *) - Dropping below this value (once during crossing) - Event stored in (Under Event *) field will be launched and corresponding output will be set (in Direct Output mode for ADC).

Maximal Value (“Max Value” *) - overstep above this value (once during crossing) - Event stored in (Over Event *) field will be launched and corresponding output will be cleared (in Direct Output mode for ADC).
Event Min (Under Event *) - Event to run, if dropping below programmed minimum value (once during crossing) for current ADC program.
Event Max (Over Event *) - Event to run, if overstep above programmed maximum value (once during crossing) for current ADC program.

Analog to Digital Converter Programs.

ADC program consists all levels for each ADC channel. Up to 24 ADC programs can be created for CommManager.

It allows immediate change of all ADC channels levels, defined as ADC program (e.g. for individual heating in the house) by running event.

To modify ADC program:

- Choose program from list.
- name can be changed in field (“Change Program Name” *).
- Set all ADC levels (min, max) for current program.
- Press button (“Update Program” *).
- Repeat these steps for all Programs.

4. eHouse PC Package (eHouse 1 version)

Additionally to electronics modules eHouse system is equipped in auxiliary software working under Windows XP system and successors.

This package assure continuous, stable system work, monitoring devices state, communication to modules, gateways to communication links as Ethernet, BlueTooth, internet, SMS. It allows reception and decoding control signal received from various transmission links. Contains application for Visualization and graphic management of system. Allows easy, intuitive, secure configuration of whole eHouse system from PC.

4.1. eHouse Application

eHouse application allows communication between the modules and PC, and full management of eHouse devices. Is responsible for generating logs, device status, creating data for visualization, acoustic notification, device configuration, running events from PC. Application should be running all the time, to assure 100% system functionality and receiving control signals from outside. Application monitors devices state and in case of communication problems try reset device, and if it not possible will signal necessity to users. Apparently devices consists own Communication Watch Dog Timer and in case of communication problems for programmed time device can be restarted locally.

Main features of eHouse application:

- RoomManager's configuration and signal naming,
- ExternalManager configuration and signal naming,
- InputExtenders configuration and signal naming,
- HeatManager configuration,
- Devices and other parameters naming,
- eHouse system event editing and creating,
- scheduler editing and programming,

- continuous monitoring state of all devices (restart if necessary),
- generating images for visualization purposes,
- generating acoustic notifications,
- creating eHouse system logs,
- eHouse system device communication,
- decoding IR remote controller signals,
- remote running of event in each system device,
- updating time to devices and synchronization,
- data and control exchange between modules,
- updating new firmware to all devices,
- controlling Winamp application (playing Audios managed by IR remote controller),
- Receiving event from TCP (built in TCP/IP server),
- Sending devices status to TCP panels,

4.1. eHouse application units.

4.1.1. RoomManager Configuration.

This unit allows configuring and programing (uploading) any parameters, functions and option for eHouse 1 system controllers.

It contains following parts:

- General configuration,
- Analog to Digital converter settings,
- Digital Input settings,
- Digital Output settings,
- Infrared settings IR remote control,
- electronic RF key settings (for ExternalManager),
- InputExtenders settings (for ExternalManager),
- assignment automatic events to ADC levels and digital input states,
- HeatManager settings,
- Mifare Access Card (identification) settings - parameters and rights,
- scheduler parameters and items settings.

1. Device Name.

This field contains Name identifying device in eHouse system and must be unique. The name is used for generating events, logs, visualization objects, should be short and descriptive (e.g. Salon, George, Kitchen etc). Names must comply naming standard for files and directories in windows system.

2. Address High, Address Low.

Final address (2 byte) is sum of High and Low nibble. Address High must remain the same for devices group and eHouse convention is as follow:

Address	Device Type
(1,1)	HeatManager,
(2,1)	ExternalManager,
(55,x)	RoomManagers,
(254,254)	PC eHouse server or CommManager,

Address must be unique, so devices should be connect to system one by one, immediately changing default factory setting (55,55) to successive addresses in the system).

3. RS-485 Speed.

The speed should use default value 115200 and must be set on every devices on the system. Changing speed to lower value may cause insufficient system throughput over RS485 data bus. Configuration for application is performed indirectly in com.cfg file and the same speed for port need to be set. **DO NOT CHANGE THIS VALUE.**

4. Automatic reset.

This is automatic time (in minutes) of restart eHouse device in case of communication lack with eHouse application or CommManager. Timer is reset on receiving status query request from eHouse application or CommManager. If PC computer is not required to support eHouse system all the time, this value should be set to 0 to disable automatic reset or to e.g. 60 to reset devices for safety reason. On the other hand if no PC nor CommManager is used eHouse 1 device during restart loose their clock settings and scheduler application usage is incorrect.

5. Remote Controller Type.

For RoomManager this field allow to chose remote type for controlling RoomManager (only Sony, N/A are accepted).

For ExternalManager field describes number of InputExtenders connected to the controller.

6. LVD (Low Voltage Detection).

If this option is enabled device sends alarm signal to application informing power dropping below secure module operation.

Only one device should use this option (most far located from power supply). Receiving Alarm signal can be caused by power supply disturbance or malfunction, and in case of frequent alarms power supply should be changed for more effective and new one.

7. ExternalManager This flag must be only set for ExternalManager (ExternalManager address must be 2,1).

9. ?? Movement Output 1,2. Outputs assigned to movement sensors, e.g. for switching on light on movement detected in the room.

10. BT Host Name. For easy BlueTooth discovering. Whole name is "eHouse" + <BlueTooth_Device_Name> + ADRL.

11. BT Password. For authorization and pairing devices in eHouse system.

12. Via Communication Module. In case of eHouse 1 system connection via CommManager this option is required for all modules. Device will work in extended address mode (device sends target address of device together with own address). For further compliance with eHouse application additional parameter /extendedaddress must be added to command line.

13. Auto Status Send. In case of usage TCP/IP version and usage small amount of eHouse 1 controllers, this option may be select, and devices will send automatic queries in case of change parameters or after programmed latency. **(not recommended)**

14. eHouse 1 Devices Count. this field is important for setting synchronization between eHouse 1 device during Auto Status send mode. Must be greater than count of devices on eHouse 1 data bus (and the same for all modules).

4.1.2. Analog Input Settings

Analog inputs are used for measurement value of analog sensors with resolution 10b <0; 1023> and scale <0; 5V>).

Each input can be named in "Analog Input" tab. Windows file and directory naming convention rules must be

complied.

This names become base of events and logs names.

Each analog input has working range $<0; 5V$) with 10 bit resolution. It has individually assigned voltage levels minimal and maximal (which gives 3 ranges of ADC operation). Crossing this levels will initiate automatic event run, defined and programmed by eHouse.exe application. These levels are individual for every ADC channel and each program of RoomManager.

Three events are associated to each ADC for crossing measured values:

- if $U_x < \text{Min Value}$ * programmed in application for current program, event assigned in “Event Min” * field in eHouse application is launched.
- if $\text{Max Value} * \geq U_x \geq \text{Min Value}$ * programmed in application for current program, event assigned in “Event OK” * field is launched.
- if $U_x > \text{Max Value}$ * programmed in application for current program, event assigned in “Event Min” * field in eHouse application is launched.

First input is assigned to light level sensor (photo transistor) or other with inverted scale, second to temperature sensor.

Channel 3-8 can be used by temperature sensor or other working in operating range 0-5V.

(*) Naming convention from eHouse.exe application.

Event Names are created during save configuration (“Save Settings and Update” *) in first step all names should be created, and after saving configuration, ADC Events will become available (changing device to another and again may be necessary or exit application in some condition).

Minimal and Maximal values are individual for each RoomManager program and should be set up for each required profile before execution. In other case running event will cause setting initial values created during system initialization.

4.1.3. Digital Output Configuration

Digital output directly drive relays on Relay Module, and can be switch to ON (1) or OFF (0) can be run:

- as scheduler events,
- assigned to ADC channels levels,
- digital inputs,
- manually.

Names can be change to descriptive value for further events generation, and clear logging information in the system.

4.1.4. Infrared Settings (Remote Control).

Following Infrared control settings are available:

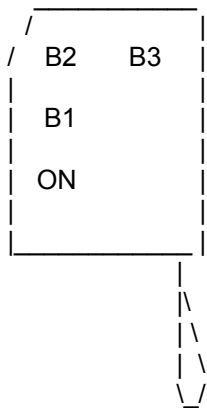
- defining standard remote buttons for control RoomManager directly,
- assigning system events to prograded buttons,

- defining external remote signals (capture and emulation in eHouse System),
- controlling external devices (Audio, Video, HiFi),
- creating macro - up to 4 IR command run sequentially.

Detailed information, how to configure Infra-red for eHouse system is located in RoomManager Description.

4.1.5. Electronic RF Key settings (for ExternalManager).

Electronic RF Key are small remote controllers dedicated to direct management of security system. Button function and location are shown below.



For Generating RF signal compliant with ExternalManager some combination of buttons (B1, B2, B3) must be depressed and afterwards button ON (power) must be pressed for a few second. Pressing ON button without depressed any of B1, B2, B3 buttons will generate infrared code for RoomManager instead of RF signal. Each usage of remote requires a few seconds break for discharge built-in capacitors.

Detailed information how to configure RF remote is located in ExternalManager description.

4.1.6. InputExtender Settings.

In other to configure InputExtenders connected to ExternalManager as extension modules:

- ExternalManager must be selected in General and "External Manager" flag must be activated. Remote Controller type must contain count of InputExtenders connected to system.
- Configuration must be saved by pressing "Save settings and update" * button. This will load configuration to ExternalManager and enable to see InputExtenders tab.
- "Input Extenders" tab should be selected.
- Every input of each InputExtender should be named (short and descriptive name), because these names are send via SMS as alarm notification and maximal size of SMS message is 140-160 chars. Name can be change by pressing right button of a mouse on required input name.
- Then security output (Alarm, Light) must be configured for each InputExtender and each Input. Checking W column will cause Light output activation on for marked alarm sensor for current zone. Checking A column will cause Alarm output activation on for marked alarm sensor for current zone.
- After complete this settings for current zone "Update Local" button must be pressed to save

configuration.

- These steps should be repeated for every security zone and each InputExtender selected in Radio button.
- After configuration, "Program Extender" button should be pressed for each selected InputExtender.

4.1.7. Scheduler Management.

Events are managed by choosing "Event Manager" menu item from eHouse icon in system tray (prism).

To add event "+" button should be pressed, and afterwards double click left mouse button on empty line, to show event editor.

To create event item following steps need to be performed.

- **Choose event type.** Three possibility of event creation exists:
 1. Event will be run once (set by calendar and clock) - choice field Execution Once. Select date from calendar and execution time.
 2. Multiple Execution (used advanced algorithm) - choice field Multiple Executions. Select run time algorithm year, month, day, day of week, hour, min (for each field option (Any) exists which can generate multiple execution of event with desired frequency or season. (e.g. Every January 1, at 12.00, every Monday on May, etc.).
 3. Without running (just creation of event Item) - choice field N/A.
- **Choose Device Name from list,**
- **Choose Event Name from list,**
- **Press Update Button.**

After changing scheduler for eHouse controller, device should be selected on list of events then update events to current device menu should be pressed to load events to controller and make it available to perform.

Besides eHouse 1 devices (controllers), PC device is defined for executions programs and functions of eHouse application. After selecting PC from list press right button of mouse on Event Name field to browse a file to run from eHouse PC.

After modification and loading events to devices Event Manager and Event Editor should be closed for database proper closure, system protection, increased efficiency and creation recovery backup for database.

In case of damage data base it can be restored from backup text file - menu "Recover Events Database" of Events Manager.

4.1.8. Authorization and access control.

RoomManager can cooperate with Mifare Card Reader. This solution enables access control, right restrictions, control limitation. It is especially helpful in hotels, public buildings, offices, access control applications.

Closing card to the reader is logged on eHouse Server PC and programmed event can be launched (e.g. unlock the door).

If the card was activated in eHouse system access right mask is change for current RoomManager.

Access right can be set on:

- Switching on / off outputs (individually for each output),
- Changing programs (globally all programs),

- Event activation upon input state change (e.g. switch individually set up for each input),
- Changing dimmer settings (individually each PWM output),
- Changing setting ADC levels (globally all channels),
- Running Infra Red events (globally for any transmission from RoomManager),
- Controlling RoomManager via IR Remote Controller (globally)

It is possible to set programmed outputs (for 10s) for unlocking electro-magnet, signal generate, confirmation lights.

Access rights together with dedicated outputs are individually programmed for each Mifare Card. Name for each card can be also defined.

Access rights is only applicable for local control of RoomManager (control via PC, BlueTooth devices, emails, SMS, TCP/IP are unaffected)

To achieve configuration for Mifare access cards following steps need to be undertaken for current RoomManager:

- Close card to the reader, Number of the card will appear in output window or logs and should be copied to Card Number field or can be enter manually,
- In field "Card Name" enter assigned name or user,
- Select each access rights desired for selected card,
- Press "Add button" (for adding card to eHouse system),
- Repeat previous steps for all required cards,
- Load access card settings to RoomManager by pressing "Update Button",

Only way to restore situation of full access rights is restore firmware in other case some events can be disabled or ignored by security restriction.

4.1.9. Additional functions of eHouse application.

Application has implemented TCP/IP server for reception commands via Ethernet, WiFi, Wan, Internet from graphic and text TCP/IP panels. TCP/IP Control require usage eHouseMobile application (for management from PDAs, Palms, Mobile Phones based on Windows Mobile 6.0). Windows mobile application is necessary for authorizing panel to eHouse system. Additionally graphical control panels supports visualization of events (status of devices are resent to each connected TCP/IP panels by eHouse application).

eHouse application contains implemented timers for run and monitor programs for cyclic action e.g. SMS reception, email reception etc.

configuration for programs are stored in directory "exec\" and consist parameters for running and checking applications. In case of hang up program, eHouse application can close it.

As default following application are executed:

- EmailGate.exe (eMail gateway for reception events from internet and resending logs to eHouse dedicated post office),
- SMSGate.exe (SMS gateway for reception events, and sending security systems notification).
- WDTTimer (Monitoring application assuring proper work of eHouse application, in case of communication lack, hangs up, Watch Dog application closes it and restart).

Own application may be added to maintain and support eHouse system.

Modification of configuration files, may cause unstable work of whole eHouse system or malfunction. Before making any changes, full backup is required.

eHouse application directory contents:

- **"aliases\RoomManager"** aliases of displayed messages from controllers - can be changed to adjust installation or obtain other languages support.
- **"Audio to play"** queue for playing acoustic messages by "player.exe" application.
- **"audios"** source file of acoustic messages (recorded notification, copied to queue in case of occurrence in the system. The name must be the same as signal name from controller or alias stored in "aliases" directory.
- **"backup-logs"** automatic backup is created to keep low sizes of logs. May be delete from time to time if not necessary for archive.
- **"batch"** system directory for multi events macro. Don't change (safe edition available on Run Event window).
- **"bin"** executive program directory.
- **"db"** contains system databases: events and IR settings (do not change manually).
- **"devices aliases"** contains settings of devices (do not change manually). Files *.cal contains calibration settings for analog to digital converters. first line consists power supply value in mV (5000) next lines offset*100 for temperature sensors (LM335) = -27315.
- **"devices aliases\x-y"** in sub-directories named {AddrH}-{AddrL} names of all signals are stored. (Do not change manually).
- **"heater events"** definitions of HeatManager events. Do not change Manually. Changes can be made safely on HeatManager form.
- **"html"** automatically generated files for HTML text control (form) of system (by eMail or FTP).
- **"emails"** queue for events received from communication gateways which will be sent to dedicated controllers. In this place events should be copied from other application " *.run ".
- **"eMobile"** contains automatically generated configuration for mobile phone or PDA applications. Do not change manually. Files are recreated automatically when "/mobile" parameter is supplied in command line.
- **"events"** Contains list of event for each devices in the system. Do not change Manually.
- **"ir"** contains Infrared configuration for each RoomManager. "*.txt" files contains definition of codes for control RoomManager. "*.ext" files with settings of external devices codes (Audio / Video / HiFi).
- **"*.mac"** files contains macros for controlling external devices via IR.
- **"killexec"** contains application settings for running and monitoring by "killehouse.exe" application.
- **"lang"** contains names and description of all fields in eHouse package. Descriptions can be changed for own purposes or to other languages. Especially for developers and companies designing own systems.
- **"logs"** contains devices, programs log and device statuses information *.log *.txt. In case of creation own log analyzer copy should be performed then read from copy in order do not generate write violation for eHouse application. Keep logs as small as possible automatic log archive size is in "logsize.cfg" file. Size of log is checking from time to time.
- **"maintanance"** do not use.
- **"mobile"** contains files to control via GSM phone or PDA, requires "/mobile" switch to be supplied.
- **"rf"** Contains security remote files definitions. Do not change.
- **"samples"** contains example of system installation, which can help to design new installation of own system.
- **"smsin"** contains received SMS with events, via GSM module or attached mobile phone connected to PC from authorized number for archive.

- **"smsin\unregistered\"** contains received SMS from unregistered numbers.
- **"smsin\unregistered\abc\"** contains receives SMS from unregistered numbers with number "abc". Directory should be created manually for SmsGate.exe application to sort unregistered SMS.
- **"smsout\"** queue for outgoing SMS for SmsGate.exe application to send via attached GSM Module or mobile phone. Own SMS to send can be stored here, for automatic distribution.
- **"views\"** system directory containing visualization settings for "Visual.exe" application.
- **"XML\"** contains automatically generated files for different methods of graphical control from browser:
 1. HTML + Maps + JavaScript,
 2. SVG + JavaScript (compression)
 3. XML + SVG.

4.2. BlueTooth Gateway (BlueGate.exe)

BlueTooth Gateway allow reception of events for eHouse system from mobile phone, PDA or BlueTooth panels. BlueGate.exe must be running all the time awaiting for messages via BlueTooth link. Devices must be paired, with enabled authorization an authentication, which is necessary to keep system secure.

Command received and performed by BlueGate are put to "emails\" directory for eHouse application.

BlueGate configuration is stored in bluetooth.cfg.

Before edition this file port location should be check with hyper terminal application, are assigned for service Serial Port SSP (BlueTooth) for sending data from PDA via BlueTooth.

If port number is greater then COM9 prefix "\\." is required.

parameters stored in bluetooth.cfg mean:

Line	Parameter
1	Serial port number of BlueTooth \\.\COM19
2	Valid port speed e.g. 115200

Application do not need any other configuration and maintenance.

4.3. eMail Gateway (EmailGate.exe).

EmailGate.exe is cyclically run by eHouse.exe application. This application enables eMail support for eHouse system.

It enables receiving commands (events) for eHouse system and sending logs cyclically, which can be received from internet. Logs are send in format accepted by Java application "Mobile Remote Controller" on mobile phone or PDA for management of eHouse system. Commands are received and stored in "emails\" directory for ehouse.exe application.

Configuration of eMailGate.exe is stored in file email.cfg.

Parameters are stored in each line and mean:

Line	Parameter
1	Reception address
2	Sender address
3	Host Name
4	POP3 Server IP Address: Port
5	N/A

- 6 N/A
- 7 SMTP Server IP Address: Port
- 8 SMTP User Name
- 9 SMTP Password
- 10 Message subject
- 11 N/A
- 12 N/A
- 13 Count of executions before sending logs via eMail

Application do not need any other configuration and maintenance.
 In case of problem "logs\email.log" should be checked.

4.4. SMS Gateway (SmsGate.exe).

SmsGate.exe is run cyclically by eHouse.exe application, which enable immediate sending SMS from eHouse system through attached mobile phone or GSM module. SmsGate.exe application sends and receives SMS. It automatically terminate after completion or timeout. Outgoing SMS are taken from Smsout directory of eHouse application. One SMS is stored in one file, (first line consists valid SMS number, second SMS message. Received SMS from authorized numbers (administrators of eHouse system) are performed and events are stored in "Emails\" directory for eHouse application and archived in "Smsin\". Unauthorized SMS from other numbers are stored in "Smsin\Others\", if exists otherwise are deleted. Unauthorized SMS can be sorted, if sub directory will be created manually, with the same name as mobile phone number. SmsGate.exe writes results to log file "LOGS\SMS.log".

GSM Module or Mobile Phone Installation.

For SmsGate.exe, GSM Module must be installed. It can be external or internal. Alternatively old Mobile Phone can be installed, with cable connection via usb or RS232. Only cable connection is acceptable due to importance of security system notification (BlueTooth or IRDA may drop connections). Mobile phone shouldn't work on operating system (Windows Mobile, Symbian, etc.) and it shouldn't be Palm, PDA, Smart phone. In this case, receiving SMS problems can be observed, because SMSs can be automatically captured by operational system and messaging application. PC should be powered by UPS to assure continuous work eHouse system, SMS reception and security notifications.

Serial port number should be checked using hyper terminal. If port number is greater then COM9 prefix "\\.\\" is required. Telephone should be connected permanently to power supply, for charging (5V chargers can be replaced by connection to internal PC voltage which is much better solution.

In case of transmission problems with GSM RS232 speed should be set to lower value.

Other options can be set in file SMS.cfg (experimentally) to obtain short time of transmissions and stable, faultless work.

SMS Gateway configuration.

Two files are used for configuration of the module: SMS.cfg i SMS.body.

Description of subsequent lines of SMS.cfg:

<u>Line Nr</u>	<u>Default Value</u>	<u>Range</u>	<u>Parameter</u>
1	COM1-9		Com Port Number for nr greater then 9 prefix "\\.\\" is

2	9600	0-115200	requested. Speed (Baud Rate).
3	TEXT		Mode: PDU or TEXT (depends on supported modes of by GSM module or phone).
4	NODEBUG		Logging: DEBUG or NODEBUG (Debug mode should be used only for configuration GSM AT command verification and parameters).
5	5	0-100	Minimal Signal Level (if drop below this value notification is send by SMS).
6	100	0-200	Minimal Battery Level (if drop below this value notification is send by SMS).
7	50	1-60000	Cyclic time for checking response on request, sent to GSM [ms].
8	50	1-60000	Time of send request (command) to GSM [ms].
9	30000	0-300000	Time out for complete application run – if overstep, will be terminated immediately [ms]. Timer is reset at application start, sending and receiving message.
10	60	0-1000	Count of program execution for sending next notification of signal or battery low. Counter is reset when phone is charged and signal level value is above minimum and message or notification was sent.
11			From this line authorized GSM numbers are listed (SmsGate accepts messages {commands} from this numbers).

Description of SMS.body file (AT Command list for GSM or SMS module).

Request sending to GSM must start with prefix char ">"

Response receiving from GSM must start with prefix char "<" And always be located after request to send (count request and response must be equal)

"%" after char "<" means result is put to phone.log file

lines without prefixes ">","<" are ignored.

GSM Commands should be stored in SMS.body. It should be checked in hyper terminal application, because commands may vary for different GSM telephones and modules.

Example:

Send AT command (ready) to GSM module and repeat until receive OK

>AT

AT Command Request

<OK

Expects OK Response

>AT+COPS?

Query Operator name

<%OK

Repeat until OK response received and put operator name to phone.log

Complete example for GSM in PDU Mode

Check GSM if Ready

>AT

<OK

Reset GSM to factory defaults and waiting for OK

>AT&F

<OK

Echo Off (Nokia, Siemens) do not change response (if unknown command ignoring)

>ATE

<

>ATE

<

Echo off (Ericsson) do not change response (if unknown command ignoring)

>ATE=0

<

>ATE=0

<

Set Asynchronous transmission RLP waiting for OK

>AT+CBST=0,0,1

<OK

Checking GSM battery level if below level sends SMS notification to authorized administrators and store result to phone.log file

>AT+CBC

<%OK

Query manufacturer name and add result to phone.log file, waiting for OK

>AT+CGMI

<%OK

Query Model Name and add result to phone.log file, waiting for OK

>AT+CGMM

<%OK

Check connected network operator add result to phone.log file, waiting for OK

>AT+COPS?

<%OK

Check signal level and add result to phone.log, waiting for OK if below level send notification SMS to authorized administrators

>AT+CSQ

<%OK

Check if Ready wait for OK

>AT

<OK

Set PDU mode, waiting for OK. in SMS.cfg PDU mode must be selected and GSM must support this mode

>AT+CMGF=0

<OK

// Alternative mode to PDU is TEXT

Set TEXT mode, waiting for OK in SMS.cfg TEXT mode must be selected and GSM must support this mode

//>AT+CMGF=1

//<OK

Sending SMS from "Smsout" directory one by one, waiting for OK

```

>AT+CMGS=
<OK
Check if ready, waiting for OK
>AT
<OK
Select memory "Sim", of GSM waiting for OK
>AT+CPMS="SM"
<OK
Check if ready, waiting for OK
>AT
<OK
Read all messages (for most of GSM in PDU and TEXT modes) waiting for OK, at the and delete read SMS
>AT+CMGL
<%OK
//for some GSM in PDU mode
//>AT+CMGL=4
//<%OK
//for some GSM in TEXT mode
//>AT+CMGL="REC ALL"
//<%OK
Check if ready, waiting for OK
>AT
<OK
Select Memory "Phone" in GSM, waiting for OK
>AT+CPMS="MT"
<OK
Check if ready, waiting for OK
>AT
<OK
Read all messages (for most of GSM in PDU and TEXT modes) waiting for OK, at the and delete read SMS
>AT+CMGL
<%OK
//for some GSM in PDU mode
//>AT+CMGL=4
//<%OK
//for some GSM in TEXT mode
//>AT+CMGL="REC ALL"
//<%OK
Check if ready, waiting for OK
>AT
<OK
Recheck new SMS messages to send from "Smsout\" and send if something new, waiting for OK
>AT+CMGS=
<OK
Check if ready, waiting for OK
>AT
<OK

```

4.5. WDT for eHouse (KillEhouse.exe)

Watch Dog Timer is monitoring application for eHouse system for running and checking eHouse.exe application for continuous work. In case of hang up, failures, communication lack between controllers and eHouse application, KillEhouse.exe closes application and restart again.

Configuration files are stored in "**killexec**\\" directory.

WDT for eHouse is configured during installation of eHouse system and is unattended if default settings is valid.

For eHouse.exe application by default age of "**logs\external.stp**" file is checked, which is marker of recent status received from ExternalManager, because this is most important and critical Controller in the system. In case of ExternalManager lack, HeatManager name (e.g. "logs\HeatManagerName.txt") log file should be used or RoomManager (e.g. "logs/Salon.txt"). In other case, WDT will reset eHouse.exe cyclically, looking for log of non existing controller.

Example for eHouse.exe with RoomManager's only and one of them has name Salon:

e-House Manager

ehouse.exe

/ne /nr /nt /nd

100000

120

c:\e-Comm\e-House\logs\Salon.txt

Subsequent lines parameters of *.runs file:

- 1 Application name in windows
- 2 executable file in "bin\\" directory of eHouse system
- 3 executable parameters
- 4 maximal time of working for application [s]
- 5 maximal time of inactivity [s]
- 6 file name, to check the age from creation / modification.

Files "**.runs**" for eHouse application stored in "**exec**\\" directory have the same structure.

Other application can be maintained by WDT by putting configuration files to this directory.

4.6. Acoustic notifications (Player.exe).

Application automatically plays audio files from queue - "Audio to play\\" directory. files are automatically delete after playing. Application do not need any configuration and maintenance. Application do not block possibility of parallel playing music from from Winamp, other sources from PC and audio card.

4.7. FTP Gateway (FtpGate.exe).

FTP gateway enables command receptions from FTP server. Additionally synchronizes logs and pointing files for online checking system state, active sensors, devices by standard Internet Browser.

In case of change, remove, add file in "logs\\" directory of local installation, remote files are copied or deleted, to maintain current status of the system, and log update. Files with extension size larger then 3 are ignored.

FTP gateway enables events transmission to local installation, stored by Internet browser control methods from any place. It also enables remote direct control of eHouse system, by copying events from one location to FTP queue.

Events are downloaded to “emails\” directory of eHouse package. Files must comply eHouse “*.run” file standard, are automatically generated by eHouse.exe application in „AllEvents\” directory and have to be copied to WWW / FTP remote location.

FtpGate.exe application is started with following parameters:

- /U: *username* - user of FTP server,
- /P: *password* - password of user FTP server,
- /W: *WWW* - address WWW,
- /D: *dir* - remote directory for data storage WWW,
- /FU: *fwusername* - user name for Firewall,
- /FP: *fwpassword* - password for Firewall,
- /FWAuth - Authorization to Firewall,
- /FWuser | FWsite | Fwopen - Authorization type for Firewall,
- /O: *port* - FTP port,
- /T: *timeout* - Time Out FTP,
- /X: *proxyaddr* - proxy server address,
- /Y: *proxyport* - proxy server port,
- /Mpassive or /A - passive mode,
- /RecreateDirs - Recreate directories on the server and delete obsolete files,
- /Interval: *RetryInSec* - repeat frequency,
- /debug - Debug mode.

Application is run and maintained by WDTTimer, and configured in „ftp.runs” file.

Example of config file:

```
Ftp Gateway for eHouse  
ftpgate.exe  
/U:UserName /P:UserPassword /W:HomePage /D:/DestinationDirectory /Interval:30  
1000  
120  
c:\e-Comm\e-House\ftpgate.stp
```

Configuration can also be performed in “ConfigAux.exe” application.

4.8. Internet browser control components.

eHouse system enables control directly from internet browser and ftp client using several different methods:

- Direct FTP control (copy events files remotely to ftp eHouse queue,
- Text control HTTP (HTML form), submission via FTP,
- Text control HTTP (HTML form), submission via eMail,
- Graphical Control, Image + HTML maps, submission via FTP,
- Graphical Control, Image + HTML maps, submission via eMail,
- Graphical Control, XML + SVG (scalable vector graphics), submission via FTP,
- Graphical Control, XML + SVG (scalable vector graphics), submission via eMail,
- Graphical Control, SVG (scalable vector graphics) + JavaScript compression, submission via FTP,
- Graphical Control, SVG (scalable vector graphics) + JavaScript compression, submission via eMail.

Various methods allows control of eHouse system from many different Internet Browsers, Operating systems. In case of limitations one method for internet browser or operating system, another method can be used. Control can be performed via eMail or FTP.

Even on Windows system, any Internet Browser has different functionality and limitations.

Three most important Internet Browsers were tested on Windows platform:

- Opera 10,
- FireFox 3.6,
- Internet Explorer 6.0, 8.0.

Control method	IE 6,8 +	Opera 10 +	FireFox 3.6 +
Direct FTP control	- (1) / +	- (1) / +	- (1) / +
Text control HTTP (HTML form)	+ / -	+ / -	+ / -
Graphical control (background image + HTML maps)	+ / -	+ / -	+ / -
Graphical control XML and SVG (Scalable Vector Graphics)	- (2) / -	+ / -	+ / -
Graphical control SVG (Scalable Vector Graphics) + JavaScript (compression)	- (3) / -	+ / -	+ / -

Meaning: (+ / +) => System Control (sending events) / checking logs, status of controllers, system, application, active sensors, outputs, inputs, etc.

- (1) Built-in FTP clients in IE, Opera and FireFox Internet Browsers, can't write data to FTP server. Only status checking (read) is possible from browser. Control can be performed by external FTP client or Windows Explorer.
- (2) IE Internet Browser do not have XML support.
- (3) IE Internet Browser has serious limitations, using application servers like Adobe SVG viewer. Open new window is not possible in JavaScript {function window.open(...)}. This issue could be repair in newer Internet Explorer version. Re-edition of eHouse execution script is possible to omit opening new window.

For valid control from browser a few step must be performed:

- On PC computer for control eHouse system by this components, Java machine must be installed (Sun 1.6.0_17 was tested).
- Execution of Java and JavaScript, must be enabled.
- Status bar should be enabled for application,
- pop-up window blocking must be disabled for server address, where eHouse files are stored.

Direct control files (for FTP) and text method (HTTP) – HTML form are automatically generated from eHouse application when “/html” parameter is used in command line. System configuration, assigning names and creating events must be performed prior names and event export.

Graphical methods are created in Corel Draw application by auxiliary VBA macro for extracting images for different formats.

Device names, events, text are extracted from eHouse.exe application, after configuration using “/cdr” command line parameter. All methods are generated from one image in Corel Draw application.

Creation of image (Views) is described in dedicated chapter. All Internet Browser files (html, svg, xml) are generated automatically by Visual Basic Macro, in order to obtain high similarity of views, independently of used method for graphical control:

- Visual.exe (windows XP visualization and control),
- eHouseMobile (Windows Mobile visualization and control),
- XML + SVG,
- SVG + JS,
- HTML + maps.

Together with attached JavaScript, PHP scripts, Java applet, components are ready to use, without manual interaction.

Java applet need to be configured before first execution and configuration file is generated from „ConfigAux.exe” application, which also configure: EmailGate.exe, Visual.exe, Mobile Remote Manager, eHouseMobile.

Contents of directories HTML i XML from eHouse system directory must be uploaded to WWW / FTP server to the same remote directory, set up for „FtpGate.exe”. „AllEvents\” directory should be copied to the same location, if direct FTP control will be used.

Conditions for internet server (the same address / machine) to assure full functionality of eHouse control:

- SMTP server,
- FTP server,
- WWW server,
- PHP support,
- regional charset support of desired language (*),
- long file names support and case sensitivity (*),
- Logging and authorization to HTTP, FTP, SMTP servers,
- Enabled owner and access rights setup for files directories on the server,

(*) script can be changed if this condition wasn't met.

Execute selected method in Internet Browser:

4.8.1. Text HTML Control.

- Open <http://AdresWWW/katalog/runner.htm> , ready to use example is located at <http://www.isys.pl/visual/easy/runner.htm>
- Choose Device name from list,
- Choose Event from list,
- Choose submitting method FTP or eMail,
- Press „Add Event” button,

- Wait for confirmation of successful submission from eHouse system.

4.8.2. Graphic Control HTML + Maps.

- Open <http://AdresWWW/katalog/NazwaWidoku.html> or http://AdresWWW/katalog/NazwaWidoku_ftp.html. Ready to use example is located at: http://www.isys.pl/visual/easy/Parter_ftp.html
- Move mouse pointer to object, which should be executed (toggled). Depending of Internet browser and options: hint with name of object can appear, mouse pointer change, name can appear in status bar.
- If object is valid user should click mouse to execute event.
- Wait for confirmation of successful submission from eHouse system.

4.8.3. Graphic control XML + SVG.

- Open <http://AdresWWW/katalog/NazwaWidoku.xml> or http://AdresWWW/katalog/NazwaWidoku_ftp.xml. Ready to use example is located at: <http://www.isys.pl/visual/easy/Parter.xml>.
- Move mouse pointer to object, which should be executed (toggled). Depending of Internet browser and options: hint with name of object can appear, mouse pointer change, name can appear in status bar.
- If object is valid user should click mouse to execute event.
- Wait for confirmation of successful submission from eHouse system.

4.8.4. Graphic Control SVG + JavaScript (compression).

- Open <http://AdresWWW/katalog/NazwaWidoku.svg> or http://AdresWWW/katalog/NazwaWidoku_ftp.svg. Ready to use example is located: <http://www.isys.pl/visual/easy/Parter.svg>
- Move mouse pointer to object, which should be executed (toggled). Depending of Internet browser and options: hint with name of object can appear, mouse pointer change, name can appear in status bar.
- If object is valid user should click mouse to execute event.
- Wait for confirmation of successful submission from eHouse system.

4.8.5. Direct FTP control (Windows Explorer or FTP client).

- In Windows Explorer open address: <ftp://AdresFTP/katalog/> ready to use example is located at: <ftp://isys.pl/easy/>
- Log in using credentials,

User: visual@isys.dmkhosting.net
Pass: 1324354657687980

- Copy direct event file from location („...../AllEvents/”).
- Paste to „...../emails/” directory.

Checking logs and states of devices via FTP:

- Open <ftp://AdresServerFTP/Katalog/> lub <ftp://UserName:Password@AdresServeraFTP/Katalog/>
Ready to use example is located at: <ftp://isys.pl/easy/> .
- Log in to the server using credentials,
User: visual@isys.dmkhosting.net
Pass: 1324354657687980
- Logs and pointing files can be observed across directory structure.

Following access rights for files and directories are necessary WWW / FTP, to achieve full functionality.

Directory / File	Owner ACL	Group ACL	Other
ehouse/	XRW	XR	---
ehouse/*.htm*	XRW	XR	---
ehouse/*.svg	XRW	XR	---
ehouse/*.xml	XRW	XR	---
ehouse/*.jar	XRW	XR	---
ehouse/*.js	XRW	XR	---
ehouse/*.php	XRW	XR	---
ehouse/*.*	XRW	R	---
ehouse/emails/	XRW	RW	---
ehouse/AllEvents/	XRW	R	---
ehouse/logs/	XRW	R	---

Additional scripts and applications:

- „em.php” script converts encoding type to requested value and prepare events to submit. POST and GET method are supported. Event can be combined (DevName + ' - ' +EventName) or separated. Script realize writing to FTP server. In case of errors, rights for writing files should be checked for „emails/” directory for active user.
- „ehouse.js” script send eMail via Java Applet. Additionally shows SVG images in Internet Browser which enables reduce of file size (more then 2 times). Draws all accepted objects and assigns events to them. Can be used for creating own visualization method for eHouse system.
- „ehouseftp.js” script is identical to “ehouse.js” except submitting data via FTP not eMail.
- Applet „se.jar” allows sending events via eMail, prepared for eHouse system. Encrypting of message is also possible for security improvement. Applet shows status on its body and browser status bar. After successful completion applet body changes color to green. Clicking applet body shows whole log of current transfer.

4.9. Mobile Remote Manager for eHouse.

Mobile Remote Manager is Java application (MIDP 2.0, CLDC 1.1), for mobile phone and it should be installed on Smart Phone or PDA for local (via BlueTooth link) and remote (SMS, eMail) control of eHouse system. It enables sending events to eHouse system and receiving system logs via email. It enables control by selecting device and event from the lists, add to the queue and finally send to eHouse System.

Choosing and checking Mobile Phone for eHouse system usage.

For eHouse system control PDA or Smart phones are recommended with build in BlueTooth transceiver, which increase comfort and enable free local control instead of paying for SMS or eMail. Mobile Phones working on operating systems like Symbian, Windows Mobile, etc, are much more comfortable, because application can work all the time in background and can be easily and fast accessed, due to multitasking of operation system.

Conditions for Mobile phone for comfortable usage and full functionality of Mobile Remote Manager application:

- Compatibility with Java (MIDP 2.0, CLDC 1.1),
- Build in BlueTooth device with full Java support (Class 2 or Class 1),
- Build in File System,
- Possibility of install security certificates for signing JAVA application,
- Mobile Phone - based on operating system (Symbian, Windows Mobile, etc).
- Qwerty keyboard is an advantage.

Before buying mobile phone for eHouse system test certificate and test version should be installed on desired device because many manufacturers limits some functionality of java support making usage of Mobile Remote Manager uncomfortable or even impossible. The other things is operator limitations as disabling installation of certificates, disabling installation of new applications, limit functionality of phone. The same mobile phone model purchased in shop without operator restriction may work correctly under eHouse application, and may not work in some operator due to restriction of operator (e.g. simlock, signing certificates, application installation). Limitations of the same model may be different from other operators.

Software was tested for instance on Nokia 9300 PDA.

Steps for checking Mobile Phone for eHouse usage:

1. Put SIM card and set date to 01 February 2008 (trial certificate validity).

2. Checking of sending SMS and eMail from mobile phone.

3. Installing test certificate to module.

Certificate should be copy to mobile phone and then add in Certificate Manager for Java application signing. In access rights for certificate following actions should be allowed (application installation, Java installation, secure network). Checking certificate online should be disabled.

If certificate can't be installed other model of telephone should be used.

4. Installing test application on mobile phone.

Copy installation files *.jar and *.jad to mobile phone with suffix "bt-signed" - for model with BlueTooth and installed certificate or "signed" - without BlueTooth and with certificate installed Install requested application. After installation enter Application Manager and set security settings for applications to highest available to eliminate continuous question of operating system. Settings names and rights can be different depending on

telephone model and operating system.

Following access rights used by Mobile Remote Manager:

- Access to internet: Session or once (for sending eMails),
- Messages: session or once (for sending SMS),
- Automatic running application (Session or once),
- Local Connection: Always (for BlueTooth),
- Access with data reading : Always (reading files from file system),
- Access with data writing: Always (writing files to file system).

5. Application configuration.

In **isys** directory supplied with test installation change destination telephone number for SMS sending in SMS.cfg file (leave empty line the end of file).

In "bluetooth.cfg" file change device address for reception BlueTooth command (if device should send commands by BlueTooth). BT Device with this address must be connected to PC with installed and configured BlueGate.exe application. Mobile phone must be paired to destination BlueTooth device.

Copy "isys" directory contents, to one of the following places:

"D:/isys/", "C:/isys/", "isys/", "Galeria/isys/", "Gallery/isys/", "predefgallery/isys/", "Moje Pliki/isys/", "My files/isys/".

6. Test of application working.

Run TestEhouse Application .

- Window with choice fields Device, Event with contents should appear (if fields are empty - application can't read files from "isys" directory and files should be copied to other location due to limitation of access. If in choose fields regional chars are not displayed code page should be set to Unicode, geographical region, language to requested value. If it doesn't help - telephone do not support language or code page.
- So far application shouldn't ask any question (if rights was defined as specified as described above). Other ways it means access rights wasn't activated for application, what means seriously limitation of system.

- Verifying email reception. Configuration of internet connection must be configured in the phone.

In menu choose option "Receive Files via eMail". 3 pluses should appear on screen and after 3 or 4 minutes "View Log" should be select from menu and check the contest of log.

It should looks like:

+OK Hello there

USER

+OK Password required.

PASS

+OK logged in

STAT

+OK

QUIT

This means email reception was successfully completed and log could be closed ("Close Log"). Otherwise internet connection should be verified, It could be reason of activation GPRS settings.

-Verifying email sending.

- Chose "Add Event" from menu, to add event to queue.
- Choose "Send via eMail" from menu.
- System asks for acceptance and User should confirm.
- "Sending Email" info appears and after any successive step + char appears and finally "eMail Sent OK".
- After completion log should be observed:

```

.....
>EHLO there
<250-***** Hello There [12.34.56.78]
...
...
...
...
AUTH PLAIN *****
<235 Authentication succeeded
>Mail FROM: 123@123.pl
<250 OK
>RCPT TO: 1312312@123.pl
<250 Accepted
>DATA
<354 end data with <CR><LF>.<CR><LF>
>Sending headers and message body
<250 OK id=*****
>QUIT
<221 ***** closing connection

```

In case of problems mobile phone signal should be verified. Several trials should be performed.

-Verification of sending SMS:

- Chose from main menu "Add Event", to add event to queue.
- Choose "Send via SMS" from menu.
- System asks for acceptance and User should confirm.
- "SMS Sent OK" info should appears on display, and message should be received on GSM mobile phone of programmed number.

-Verification of sending event via BlueTooth:

- In other to test BlueTooth transmission, device defined in file bluetooth.cfg must be near the phone.
- BlueGate.exe application must be running, which sends confirmation.
- BlueTooth devices must be paired.
- BlueGate must be configured as described for this application.
- Both devices must be switch on.
- Chose from main menu "Add Event", to add event to queue.
- Select from menu "Send via BlueTooth".
- After short time (up to 1 minute) message "Sent via BlueTooth OK" means everything was OK.
- Otherwise log should be examined ("View Log").

BlueTooth Log should looks like following:

```

Inquiry in Progress      (a)
Device Found: *****

```

Host ***** (*****) In Range
Searching for eHouse Service
eHouse Service Found
Connected to eHouse Service
Reading Response from Server (b)
Data performed Successfully by Server

If only part of log is displayed to point (a), this means device from list in bluetooth.cfg file wasn't founded, is turned off or is not in the range.

If part of log displayed end before point (b), this means is not authorized or not configured properly. Devices should be paired permanently, so any connection could be established, without any queries for confirmation.

If logs was displayed up to point (b), this means BlueGate do not running or is connected to wrong port.

Java software installation on PDA.

Several steps need to be performed manually to install application.

Certificate should be copy to mobile phone and then add in Certificate Manager for Java application signing. In access rights for certificate following actions should be allowed (application installation, Java installation, secure network), certificate online checking should be disabled.

If certificate can't be installed other model of telephone should be used.

4. Installing application on mobile phone.

Copy installation files *.jar and *.jad to mobile phone with suffix "bt-signed" - for model with BlueTooth and installed certificate or "signed" - without BlueTooth and with certificate installed Install requested application. After installation enter Application Manager and set security settings for applications to highest available to eliminate continuous question of operating system. Settings names and rights can be different depending on telephone model and operating system.

Following access rights used by Mobile Remote Manager:

- Access to internet: Session or once (for sending eMails).
- Messages: session or once (for sending SMS).
- Automatic running application (Session or once)
- Local Connection: Always (for BlueTooth)
- Access with data reading : Always (reading files from file system)
- Access with data writing: Always (writing files to file system)

If certificate can't be installed, installation version with suffix "notsigned" should be performed. However this application is unrecommended because System will ask user many times for acceptance before completion of any operations described above.

5. Application configuration.

- In **isys** directory supplied with the installation, change destination telephone number for SMS sending in SMS.cfg file (leave empty line the end of file).
- In "bluetooth.cfg" file change device address for reception BlueTooth command (if device should send commands by BlueTooth). BT Device with this address must be connected to PC with installed and configured BlueGate.exe application. Mobile phone must be paired to destination BlueTooth device.
- Copy "isys" directory contents, to one of the following places:
"D:/isys/", "C:/isys/", "isys/", "Galeria/isys/", "Gallery/isys/", "predefgallery/isys/", "Moje Pliki/isys/", "My files/isys".

BlueTooth configuration.

BT link configuration "bluetooth.cfg" file contains addresses of associated BlueTooth devices supporting eHouse system each address on one line (up to 10 addresses are accepted). Application before trial of BlueTooth transmission, run discovery function, and then sends events to first found device from list. BlueTooth devices other then compatible with eHouse system cant be add to configuration file because BlueTooth transmission requires confirmation from host. Mobile phone must be paired together with all devices from the list in "bluetooth.cfg" file (for automatic connection without any queries (transparent mode). The same is required from side of BlueTooth devices, which should be paired to mobile phone for automatic connection. For each BlueTooth Devices the same passkey should be assigned, and AUTHENTICATE+ENCRYPT option should be used.

Due to limited range of BlueTooth (especially for mobile phones with BT Class II - maximal range is about 10 meters on free air). In places where in direct line between Mobile phone and BlueTooth device thick wall exists, chimney, floor breaking connection may be observed due to disturbances from other systems WiFi, GSM, etc. Count of BlueTooth module should be increased to achieve expected range of control in the house and outside. One BT device can be installed on PC (eHouse server), rest can be connected to RoomManager's extension slot. Data transfer via BlueTooth is free and only local.

BlueTooth consideration.

BlueTooth must be manually turn on in Mobile Phone before initialize connection. Other application utilized BlueTooth shouldn't be configured for automatic connection to mobile phone, which often allocates all BlueTooth channels available on the phone (e.g. Nokia PC Suite, Dial Up over BlueTooth link, File Manager like BlueSoleil).

Example of bluetooth.cfg file

```
01078083035F
010780836B15
0011171E1167
```

SMS Configuration.

One file "SMS.cfg" need to be set up for SMS configuration. This file must contains valid mobile Phone number for SMS reception via eHouse system.

SMSGate on PC must be installed and configured properly, and cyclically run. Other solution is reception by CommManager, which incorporates GSM Module.

Example of SMS.cfg file

```
+48511129184
```

eMail Configuration.

Configuration of eMail POP3 and SMTP clients is stored in "email.cfg" file.

each subsequent line consist following setting:

<i>Line Nr</i>	<i>parameter</i>	<i>example value</i>
1	SMTP email address (sender)	tremotemanager@isys.pl
2	POP3 email address (receiver)	tehouse@isys.pl
3	host name for SMTP	there
4	IP address of POP3 server (faster then DNS):portnr	mail.isys.pl:110
5	POP3 User name	tremotemanager+isys.pl

6	password for POP3 User	123456
7	IP address of SMTP server (faster than DNS):portnr	mail.isys.pl:26
8	User name for SMTP server	tremotemanager+isys.pl
9	User password for SMTP server	123456
10	Message subject	eHouse Controll
11	Authorization for SMTP	y,Y,1 (if yes) ; n,N,0 (if no)
12	empty line	

This configuration enables sending commands to eHouse system, via eMail. GPRS service must be enabled by GSM operator and internet connection should be configured for automatic connection. Additionally EmailGate must be configured and run cyclically for checking eHouse dedicated post office and sending logs. Sending and receiving eMail is payable and costs depend from operator.

Mobile Remote Manager Usage.

Application has easy and intuitive user interface, to assure efficient and comfortable work on as many phones as possible. Due to many different display sizes and proportion, names and options are minimized, to be visible on any phones.

Data for Java application are recreated each time when eHouse application is executed with /mobile switch and must be recreated after name changes, new programs creation, etc, and copied to mobile phone (isys) directory.

Devices names are stored in devices.txt file and can be individually and manually sorted by user. In one line one device name must be contained , on the end of file.

Events names are located in files with the same name as stored in devices.txt file with changed polish regional chars to standard ASCII letters (and extension ".txt", to avoid problems with file creation on many operational systems on mobile phone. File contents can be sorted in desired way (1 line contains 1 event), one empty line at the end of file.

All configuration files are created on PC by eHouse.exe application with default windows code page (windows ...) and it shouldn't be changed. e.g. (usage other operating system). In other case regional chars will be replaced by other chars "hashes" or application will generate more serious errors.

3 Choice fields are available:

- Device,
- Event,
- Mode.

Following menu items available:

- Add Event,
- Send via BlueTooth,
- Send via SMS,
- Send via eMail,
- Receive files via eMail,
- Cancel Operation,
- Kill Application,
- View Log,
- Close Log,
- Exit.

Sending events to eHouse System.

- Device and Event must be select, and required mode then Add Event from menu must be executed.
- This step should be repeated for each desired event.
- From menu transmission mode should be executed: "Send via BlueTooth", "Send via SMS", "Send via eMail". Events in internal queue are automatically deleted after successful transmission

Receiving system logs via eMail.

If sending logs from eHouse via eMail is enabled, this logs can be received from mobile phone for checking device states, output and input activated, analogue channels values.

Menu Item should be execute "Receive files via eMail", Mobile phone download most recent logs, converting and store them as files in "isys/logs/" directory.

Canceling Current Transmission

Due to mobile features of mobile phone and possible problems with range, broken transmission, GSM system failures, additional safety mechanism is issued for canceling transmission. If transmission lasts too long or displayed shows problems, this function can be used for drop and finalize any connections by execution - "Cancel Operation" from main menu.

To resend events after failure new event must be add to enable it.

Application Log

Each current transmission is logged and in case of doubt if everything goes OK, this log can be checked by selecting

"View Log" from menu. Afterwards "Close Log" should be execute.

4.10. eHouseMobile (Windows Mobile 6.0 and successors)

eHouseMobile application allows online and offline control of eHouse system as graphic control panel and visualization of system state with individually created views and objects by user (All names are extracted from eHouse.exe application and imported to Corel Draw application with supportive Visual Basic functions). Online Support is realized via WiFi, LAN, WAN (TCP/IP support), offline via SMS or eMails.

4.11. Views and objects creation for visualization and graphical control.

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 Macro, 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 parter.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 are correct and unit is meter. Views edition can be achieved in two ways: manual drawing directly on created, empty canvas or automatic via auxiliary macro function.

4.11.1. 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).

4.11.2. 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 can be draw.

To achieve good imagery 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) 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}}

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 Internet Browser graphic control or visualization, browser safe colors should be used.

After setting all objects for each necessary devices, states and events. After all objects creation, visualization export macro has to be executed (tools->visual basic->play chose eHouse from list and finally Visualization.NewObject).

"Generate Files" should be pressed, and other views creation methods, which will create files for many different visualization types (Visual.exe, eHouseMobile, SVG, XML, HTML+maps). It gives possibility to change method of control or use many different ways of control.

4.12. Acoustic notification creation.

If user wants to use acoustic signaling of events occurrence, notifications must be recorded or created signals from audio track. Name is identical as creation layers {Name of device (shorten event name)} for notification end extension of proper audio format. All notification must be located in "audios\" directory of eHouse system. AudioGrabber application is very useful for recording own communicates enables conversion to mp3 format and stored under desired name.

Very helpful is eHouse.exe application feature run with single "/adl" parameter which generates automatic file for audiograbber to import names (eHouse uses files stored in "aliases\RoomManager\" directory) from list and then automatic record of all notification from list and store them under the name specified, can be perform automatically without any interaction except reading communicates one by one. Audio grabber detect silence and switch to next notification file. After completion of messages record must be stored to "audios\" directory. Up to 50 messages can be created in one cycle (via imported name). After completion this step "eHouse.exe /adl" application should be rerun until creating all audio notifications.