Modbus Communication Tool

User manual

08/2015

1   Contents

Any comments, questions and improvement suggestions to this manual are welcome at **support@domat.cz**. Thank you for your feedback.

www.domat.cz

2 Introduction

The configuration software **ModComTool** is a free multipurpose Modbus RTU / TCP client. It is primarily used for addressing and configuring of all Modbus-based Domat Control System I/O modules, room units, and room controllers. It is based on domat.exe, the tool used since 2005.

It is also an **universal Modbus RTU and Modbus TCP multichannel client** to test variable speed drives, communicative sensors, AHU controllers, and many other communicative devices.

It is used by system engineers for pre-configuration in the office as well as by commissioning staff for I/O check and controller settings.

ModComTool runs in the Microsoft.NET V2.0 environment; the .NET files must be installed prior to running the software. No installation of **ModComTool** is necessary, just unzip the files and folders into any suitable directory with write access so that the program is able to write into its configuration file, where user settings are stored.

Display V2.dll	12.4.2013 10:04	Rozšíření aplikace	184 kB
ESG.Graphs.Implementation.Base.dll	12.4.2013 10:04	Rozšíření aplikace	64 kB
ESG.Graphs.Implementation.dll	12.4.2013 10:04	Rozšíření aplikace	64 kB
ESG.RcWare.SCADA.Runtime.Drivers.Modbu...	12.4.2013 10:04	Rozšíření aplikace	40 kB
ESG.RcWare.SCADA.Runtime.Channels.Clie...	12.4.2013 10:04	Rozšíření aplikace	32 kB
ESG.RcWare.SCADA.Runtime.Shared.dll	12.4.2013 10:04	Rozšíření aplikace	68 kB
ESG.WinControls.Graphs.dll	12.4.2013 10:04	Rozšíření aplikace	64 kB
ModComTool.exe	20.2.2014 9:23	Aplikace	7 839 kB
NewICSharpCode.SharpZipLib.dll	25.5.2010 14:55	Rozšíření aplikace	196 kB
NewUpdateModComTool.exe	1.7.2013 17:35	Aplikace	26 kB

3 Hardware configuration

Connect the room unit, I/O module, or IRC controller to serial port of your PC through a RS232/RS485 converter, e.g. Domat **M012**. Power all components by 10..30V DC or 12..24 V AC.

The most convenient is Domat **M080**, a USB to RS485 converter, which does not require external power supply – it is powered from the USB port.
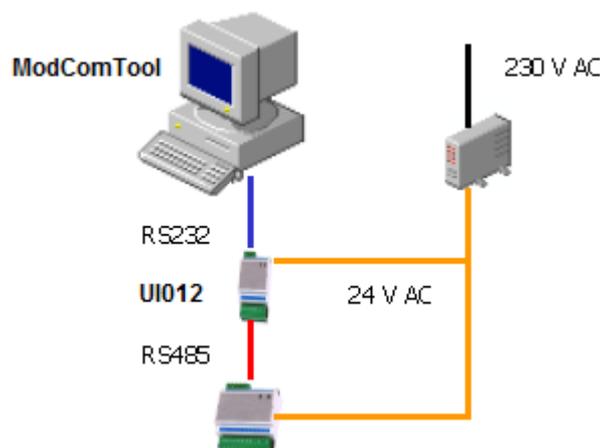
See data sheets for terminals and correct module connection (bus end etc.). The Domat converters are optically insulated at the RS485 side, and thus very suitable for field

operation. Any RS232 or USB to RS485 converter type can be used, however, galvanic separation issues must be considered.

4   Login, channel configuration

Run ModComTool.exe. The code prompt opens.
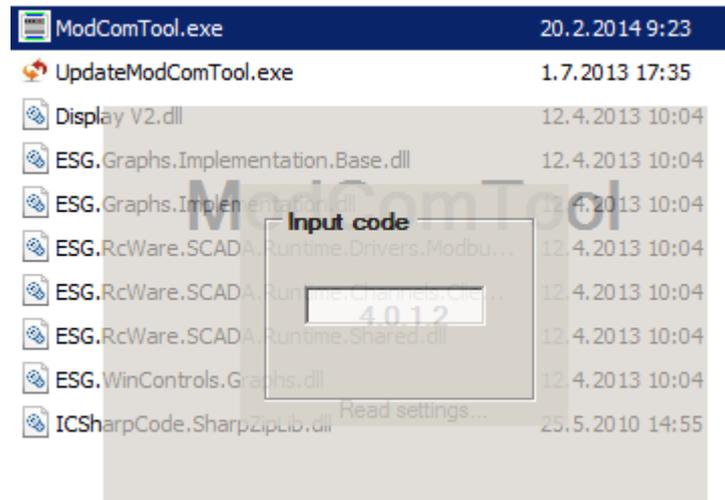
By entering the code, the program is unlocked and set into the corresponding access level. **Ask for the code at your distributor**.

The code only has to be entered for the first time, it is saved in the configuration file.

There are three modes:

- **Light mode**: It is only possible to scan and adress modules and read data. No internal settings are available.

- **User mode**: Most of the functions are available, it is possible to change address, parameters, setpoints, and all internal settings.

- **Service mode**: Same as **User mode**, but also possible to bring controllers to default state (factory settings) and perform analogue input calibration (special hardware tool needed).

For Domat I/O modules and controllers, the passwords are:

- light mode: domat
- user mode: domat123
- service mode: domatservice

It is recommended to use the User mode for daily work. All descriptions and screenshots below are based on User mode.

The main window opens.
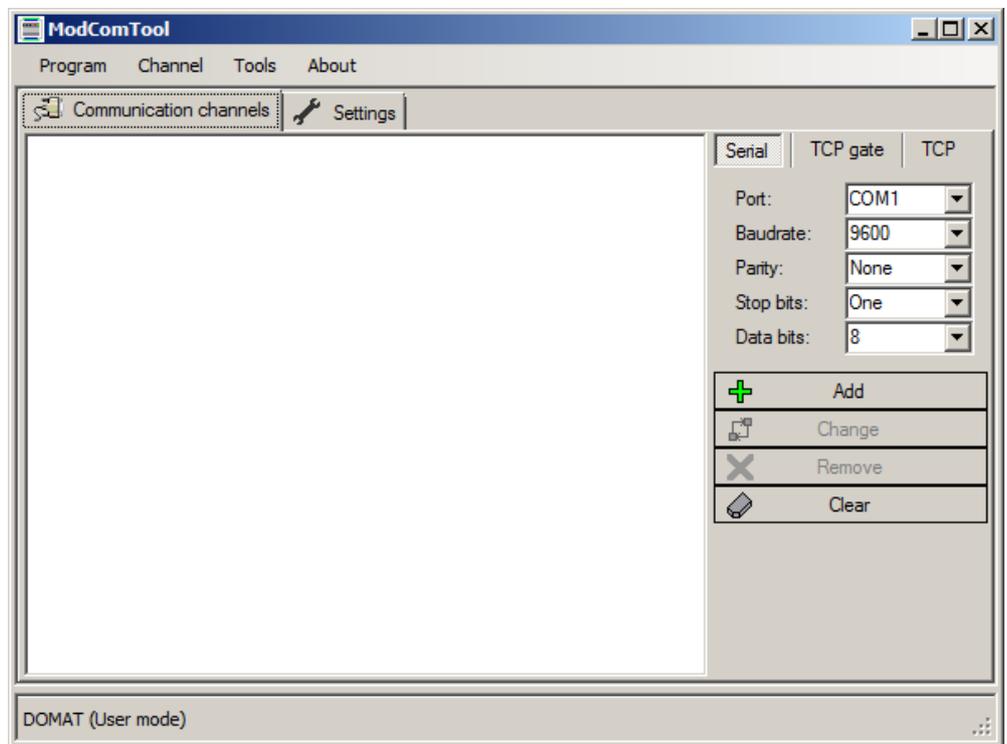
4.1   Communication settings

Choose the connection type: Serial, TCP Gate, or TCP.

Serial: Modbus RTU over a serial port. Select the serial port of your PC which is connected to the communication bus. Default communication parameters are 9600, N, 1, 8; this is also the factory setting of all modules and room units.

If you use a USB to RS485 converter, e.g. **M080**, please make sure that its drivers are installed prior to launching ModComTool. The COM port must be ready and recognized by the operating system before the ModComTool is started.

TCP Gate: Modbus TCP with multiple Modbus addresses behind the IP address, typically a bus with room controllers (UC...) connected over a Modbus RTU to TCP router (e.g. Domat M035). Default Modbus TCP port is 502.

TCP: Modbus TCP, no Modbus address resolution behind the IP address. Default Modbus TCP port is 502.

1. Select the appropriate connection type and the communication parameters (port number, IP address etc.)

2. Click **Add** to add the connection into the channel list. The configured communication channel appears in the left pane.
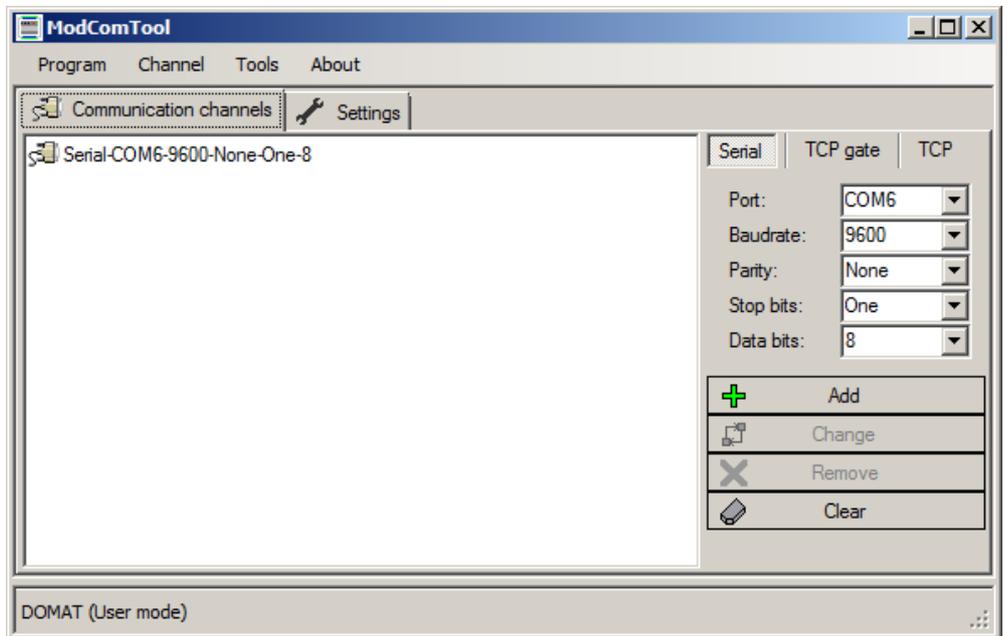
3. Use the **Channel** / **Save channel list** command to save the channel for future program execution.

4. In the **Settings** tab, you may define automatic loading of the saved channel list at program start:
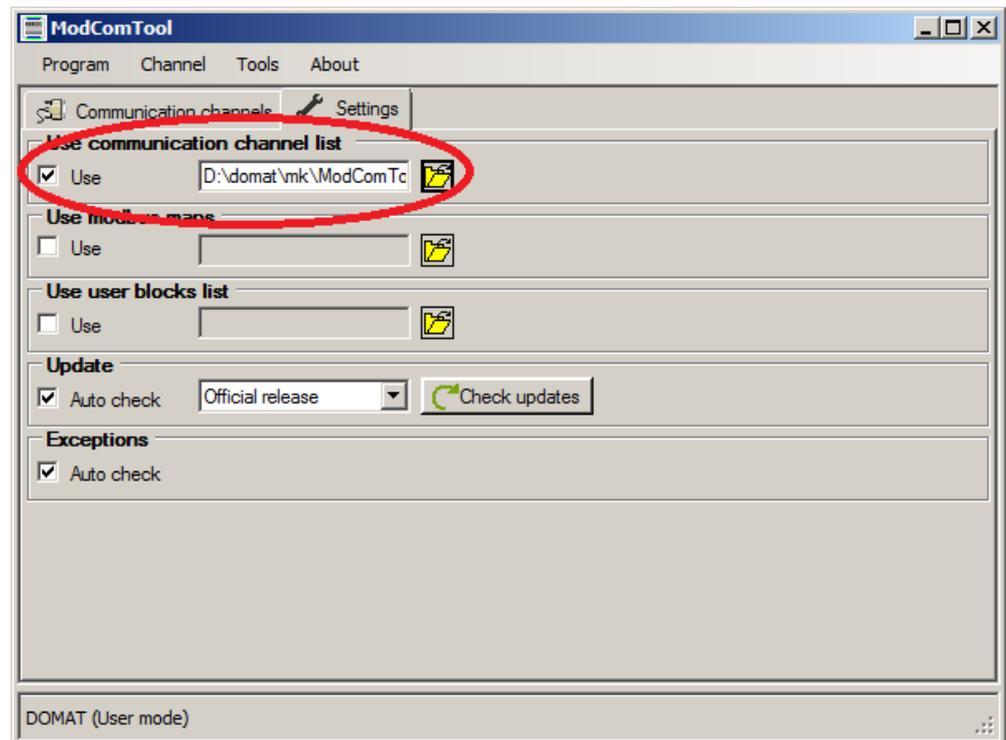
5   Module detection

5.1   Scanning the bus

Double click the channel. The channel window opens:
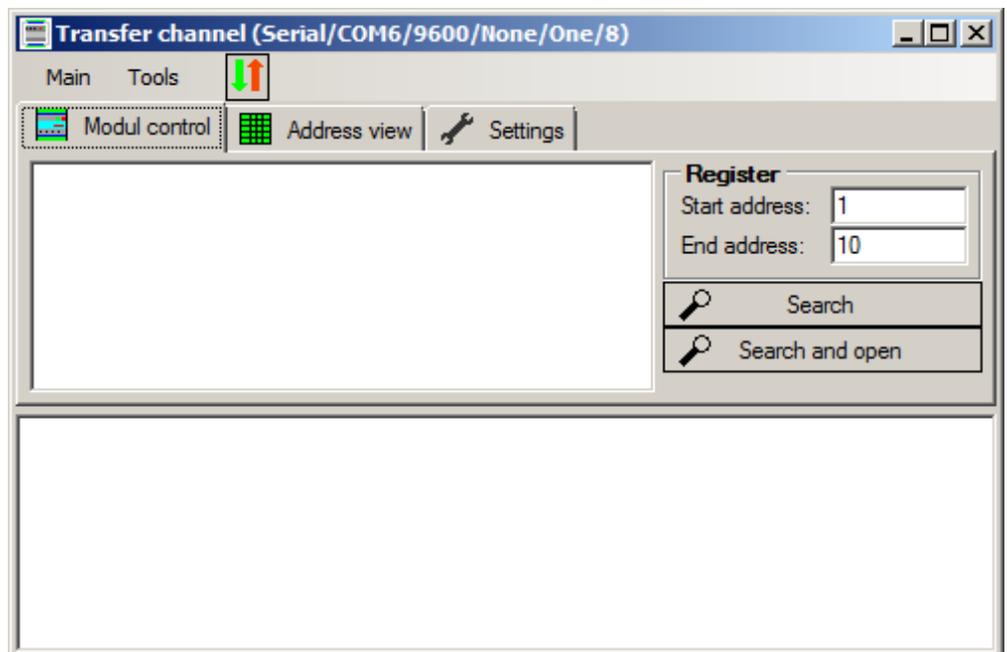
Click the **Search** button. The address range specified in the **Register** frame (default 1 to 10) is scanned for present modules. All modules found in this range are listed in the window.
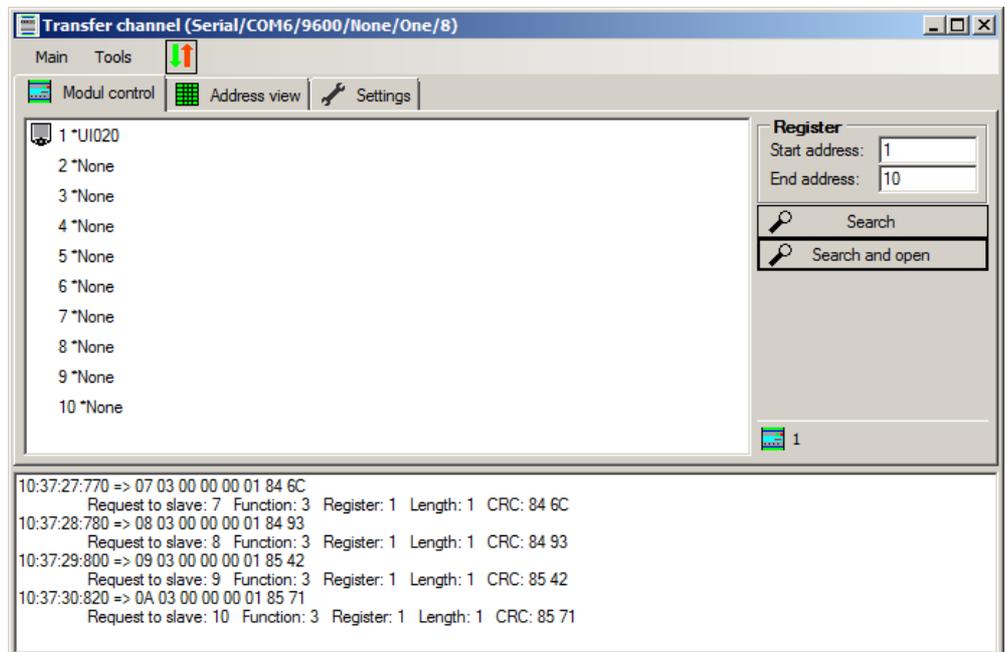
5.2   Possible problems

No modules scanned, TxD / RxD LED at M012 / M080 (if used) dark

Check COM port number and settings. Check serial cable (must be nullmodem). Check if COM port works with other software / hardware.

No modules scanned, TxD LED at M012 / M080 flashing, RxD LED dark

Check I/O bus cabling and polarity. Check if the internal setting of M012 (if used) is 9600, 8 bit (DIPs 1,2 ON, 3,4 OFF – default setting). Check if the communication parameters in the channel settings are 9600, N, One, 8.

Try to bring the module / room unit into INIT mode (power off, INIT switch to ON, power on). The slave should respond at 9600, N, 8, 1 at address 1. Try to communicate with

another (working) module or room unit to see if the converter, cabling, and software is set properly.

Another reason may be a non-standard type of RS232/RS485 converter. Try M012 or M080 if not used.

No modules scanned or communication dropouts, TxD / RxD LEDs flashing

Improperly terminated I/O bus (check bus termination switches at both ends), loose wires in the connectors, or EMC disturbances. Check the communication with one module only, apart from the cabinet and field wiring, preferably powered by a separate power source (transformer or stabilized power supply, eg. that supplied with IPCT.1).

This may also happen with the most recent notebooks which do not have serial ports over classical UART but over an internal USB interface (even if the notebook has the CANNON 9 Male connector). The driver may not catch the fast responses of the modules, typically of M4xx, M300 etc. Try another notebook or use a USB to RS485 converter.

Another reason may be a non-standard type of RS232/RS485 converter. Try M012 or M080 if not used.

Unknown module type

May appear when using older versions of ModComTool which do not support certain module / room unit types. Download the latest version at www.domat.cz, use the AutoUpdate function or report the module ID together with version number of your software to support@domat.cz.

NB. The default I/O module and room unit setting is:

Address: 1
Communication: 9600, 8, N, 1

6   UI... settings

The UI... are room units with no control function. They only provide actual temperature and other user-entered data to a master device (PLC or any controller) and display operation statuses, alarms etc. If they contain inputs and outputs, these may be read and controlled from the Modbus master (same function as that of an I/O module). For full description of the master to UI... communication, see the *Room units and controllers: Communication protocol description* document which contains the Modbus table with explanations of the register values.

Scan the bus and double click the listed controller in the field with scan results. The properties window opens.

6.1   General

In the upper bar there is module type and address.

The screens below may not contain all elements for all modules; only those relevant for a particular

6.1.1   Settings

Communication parameters.

In the upper part of the frame there is unit type (here UI011), and unit ID; each device (module / controller / room unit) type has its own ID, UI011 = 201hex.

Firmware version: please report if you experience problems.

Address: Modbus slave address (1..255) of the device.

New address: select or enter the new address here when readdressing the unit.

Baudrate: 1200...19200 bps.

Com. errors: Communication error counter.

Com. OK: Number of correctly received packets.

Connected/Disconnected – Connection status / comunication with the unit

6.1.2   Temp

Set temp: Temperature setpoint set by user. The setpoint can be changed in the *Min...Max* limits defined in the *Temperature* tab – see below.

Actual temp: Actual measured room temperature inclusive correction *Corr* defined in the *Temperature* tab – see below

6.1.3   Digital

Push: status of the pushbutton. Goes green when the pushbutton is pressed.
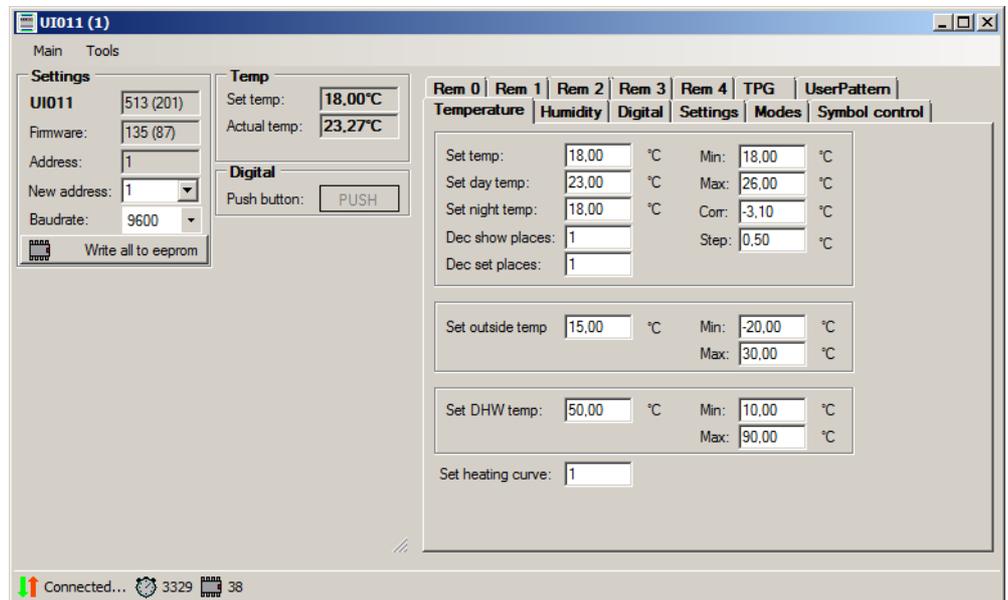
6.1.4   Others

Write all to EEPROM: writes all the changed values (address, parameters etc.) to permanent memory. To make new address and baudrate active, power off and power on the device again. All other parameters are effective immediately.

NB. This button also stores all settings which are in the tabs on the right (operation modes, setpoints, etc.)

Tools / Create register list: Saves the actual settings of the unit to a file. The settings can be retrieved for download of the same configuration to more units.

Tools / Open register list: Loads settings from a file. **The loaded settings are written to the device's memory (as if they were entered manually) immediately**. For permanent saving, click **Write all to EEPROM**.

6.2 Tabs with setpoints and parameters

At the right of the window, there are tabs with advanced controller settings. All settings are effective immediately and written to RAM. Permanent writing to EEPROM follows by clicking the **Write all to EEPROM** button, see above, *Others*.

6.2.1 Temperature

Set temp: Temperature setpoint, for writing only. Actual temperature setpoint is displayed and continuously updated in the *Temp* section – see above. Writing to this variable has the same effect as changing the setpoint by turning the knob.

The temperature may be

- **absolute**, e.g. 18...24 °C, ready for direct inserting into your control algorithm in the PLC, or

- **relative**, e.g. -3.5 ... 3.5 K, to be added to a basic setpoint and then processed in the control algorithm.

No other settings except for **Min, Max** (see below) are necessary, as the temperature here is only a number, and has to be interpreted in the PLC (Modbus master).

Set day temp: Setpoint for day mode.

Set night temp: Setpoint for night mode.

Both those setpoints can be set and read by the master device.

Dec show places: may be 0, 1, or 2 – number of decimal places to display the actual temperature. Example:

0 23 °C
1 23.2 °C
2 23.27 °C

Dec set places: may be 0, 1, or 2 – number of decimal places to display when changing a setpoint.

Min, Max: Minimum and maximum limits for user changing of the temperature setpoint. May also be relative, such as Min: -3.5, Max: +3.5 °C. The interpretation must be programmed at the master device.

Corr: Internal correction; adds to the measured temperature before it is displayed and send to the Modbus table. The default value of 1.5 °C compensates the internal heat dissipation within the room unit.

Step: Value to change setpoint on one step of the knob. The knob has 24 steps to complete one turn.

Set outside temp: Outside temperature at which heating mode starts. Symbols: Thermometer, Empty house. This temperature can be set by the user and then read by master for further processing in the primary heating circuits. It is set in whole degrees (no decimals) in the *Min.. Max* range:

Min, Max: Minimum and maximum limits for changing the outside temperature to start heating.

Set DHW temperature: Setpoint of domestic hot water. Symbols: Water tap. This temperature can be set by the user and then read by master for further processing in the DHW preparation circuit. It is set in whole degrees (no decimals) in the *Min.. Max* range:

Min, Max: Minimum and maximum limits for changing the DHW temperature setpoint.

Set heating curve: Type of heating curve (relation between outside temperature and heating water setpoint). Symbols: Heating, Boiler. Can be set to 1, 2, 3, or 4. It may be read by master for further processing in the heating circuit.

6.2.2   Humidity

Parameters for setting relative humidity setpoint.

Set RH: Humidity setpoint set by user.

Min RH, Max RH: Minimum and maximum rH values the user is allowed to set by turning the knob.

Corr RH: Internal correction; adds to the measured relative humidity before it is displayed and send to the Modbus table. Not relevant now as UI01x does not contain humidity sensor.

Dec show places: may be 0, 1, or 2 – number of decimal places to display the actual relative humidity. Example:

0	45 %rH
1	45.2 %rH
2	45.25 %rH

Not relevant here as UI01x does not contain humidity sensor.

Dec set places: may be 0, 1, or 2 – number of decimal places to display when changing the relative humidity setpoint.

Step1: Value to change relative humidity setpoint on one step of the knob. The knob has 24 steps to complete one turn.

6.2.3 Digital
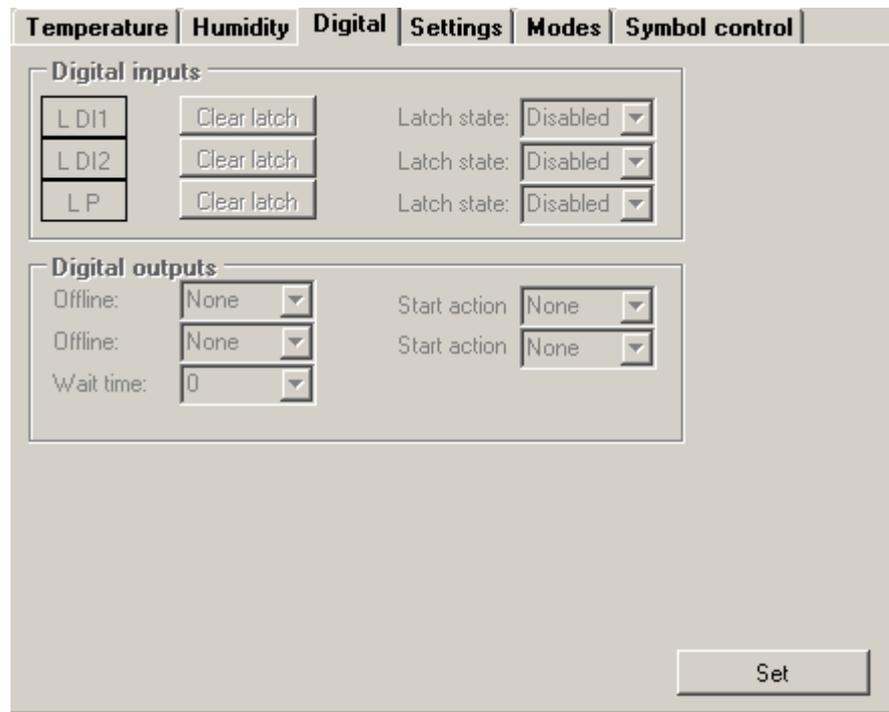
Not relevant here as UI010 and UI011 have no digital inputs and outputs.

6.2.4 Settings

The Show mode defines swapping of displayed values. There may be up to 5 different values periodically displayed:

Temperature – actual (measured) temperature incl. correction
Humidity - actual (measured) humidity incl. correction (not relevant for UI01x)
Time – real time of the internal clock (not relevant for UI010, UI011)
Remote 0 – any value sent from the master, see below
Remote 1 – any value sent from the master, see below.

The checked values are periodically changed at the display. By pushing the button the unit goes from Show mode to Quick edit mode or Edit mode.

Show time: period to display each of the values selected in Show mode. Default: 2 secs.

Edit return time: Timeout – if user inactivity in the Edit mode is longer than the *Edit return time*, the unit automatically goes to Show mode.

Long push time: if the button is pushed for *Long push time* or longer, the unit switches to Edit mode. In the Edit mode it is possible to change selected setpoints (values) and states.

Quick edit mode: by pushing the button shortly (less than Long push time) the value selected in the Quick edit mode is changed according to its enabled states – see below.

None: if the unit is given a short push, nothing happens.

6.2.5 Modes

Probably the most important part of the functionality of the unit.

After the unit is given a long push, it switches to the *Edit mode*. In the *Edit mode* it is possible to select different parameters and change them. The selection follows by turning the knob. The active parameter together with its symbol set is flashing. If you want to change a particular parameter, give a short push. The symbols stop flashing and the parameter can be changed by turning the knob.

Confirm the parameter by a short push, and select another parameter to change. As soon as you have finished settings, give a long push which switches the unit back to the Show mode. Inactivity time longer than *Edit return time* also switches back to Show mode.

Here in the *Modes* tab the engineer selects which modes are relevant for his application and what the user will be able to change. E.g. it apparently makes no sense to enable humidity setpoint if no humidity control is installed.

The *Modes* tab incorporates several subtabs. Switch between the subtabs clicking on the lower brink of the *Modes* tab.

In the main tab, *Others*, there are parameters and values which do not require any additional settings, such as selection of the enabled states. They are:
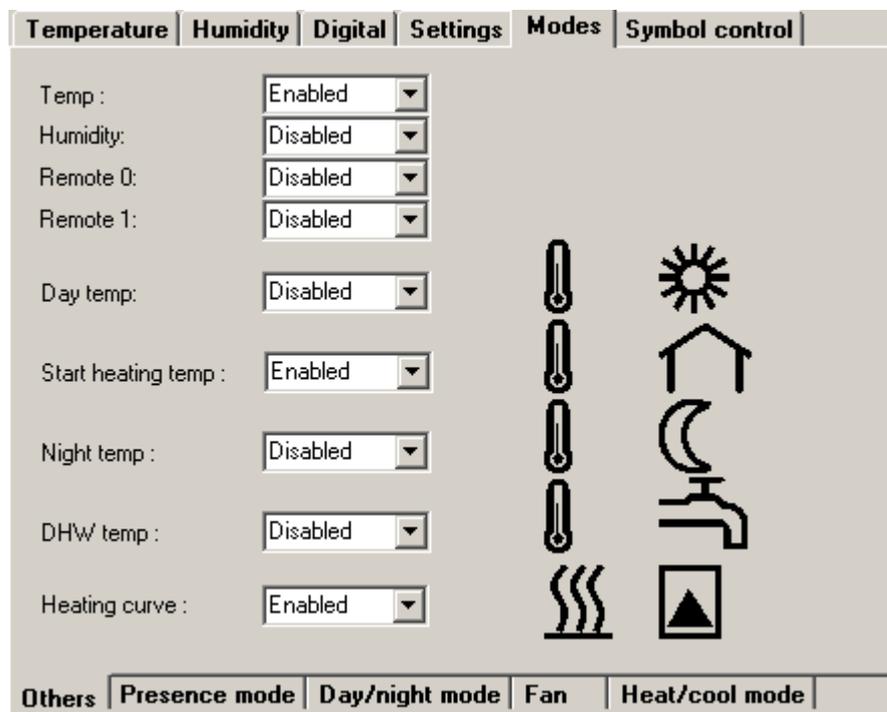
Temp: Temperature setpoint. If disabled, it can not be changed even by turning the knob in the Show mode. Symbols: °C/°F

Humidity: Relative humidity setpoint. Symbols:%rH.

Remote 0: Any value read and written by master. See the *Remote 0* tab.

Remote 1: Any value read and written by master. See the *Remote 1* tab.

Day temp: Temperature setpoint for Day mode. Symbols: Thermometer, Sun.

Start heating temp: Outside temperature at which heating mode starts. Symbols: Thermometer (outside the) Empty house.

Night temp: Temperature setpoint for Night mode. Symbols: Thermometer, Moon.

DHW Temp: Domestic hot water setpoint. Symbols: Thermometer, Water tap.

Heating curve: Heating curve type (1..4). Symbols: Heating, Boiler.

At the screenshot above, the modes Temperature setpoint (room), Start heating at..., and Heating curve are enabled. This means that the user can change room temperature setpoint, outside temperature at which heating is enabled or disabled, and heating curve type. Those values can be read out by the master. No other values are available for the user except those for display selected in the *Show mode*.

Another modes are in the other subtabs. Enable each of those modes if the user is allowed to change it. Enable the mode also if it should be changed in the *Quick edit mode*.

Check the states that the user may select from. For instance on the screenshot below the user only can select between *Comfort* and *Standby* modes, however, the presence mode can be set to *Off* remotely from the master.

6.2.6 Presence mode

Comfort: maximum heating and minimum cooling temperature, all aggregates are functional. Symbols: Occupied house.

Standby: Temporary absence. Symbols: Empty house.

Off: Long-term absence, holidays, weekend, room unoccupied etc. Symbols: Off symbol.

Party: Temporary occupancy, long office hours etc. Should be set back to Standby after a certain time (usually 2 hours) by master.
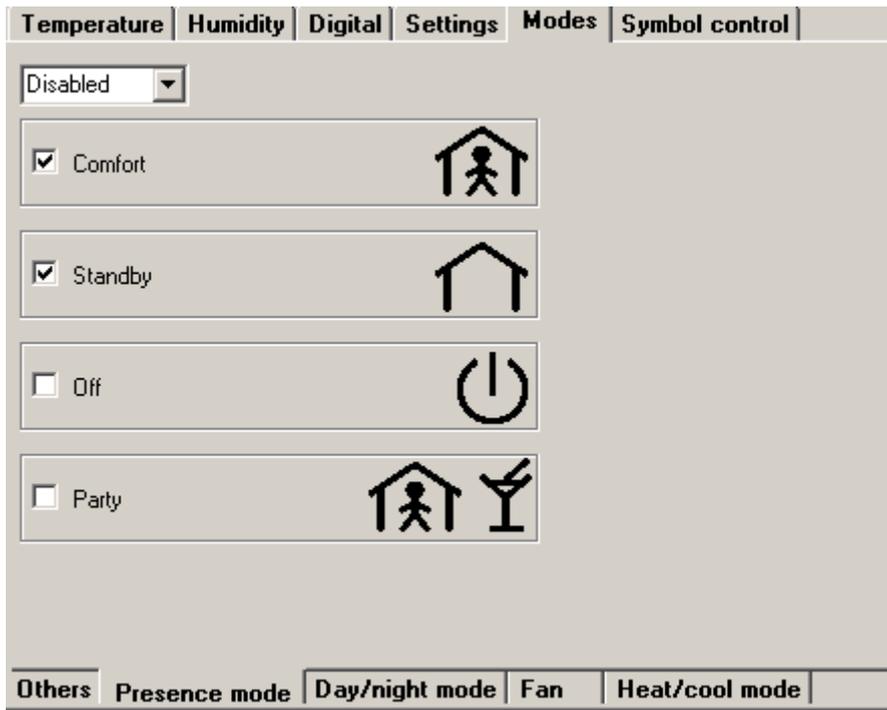
6.2.7 Day / night mode
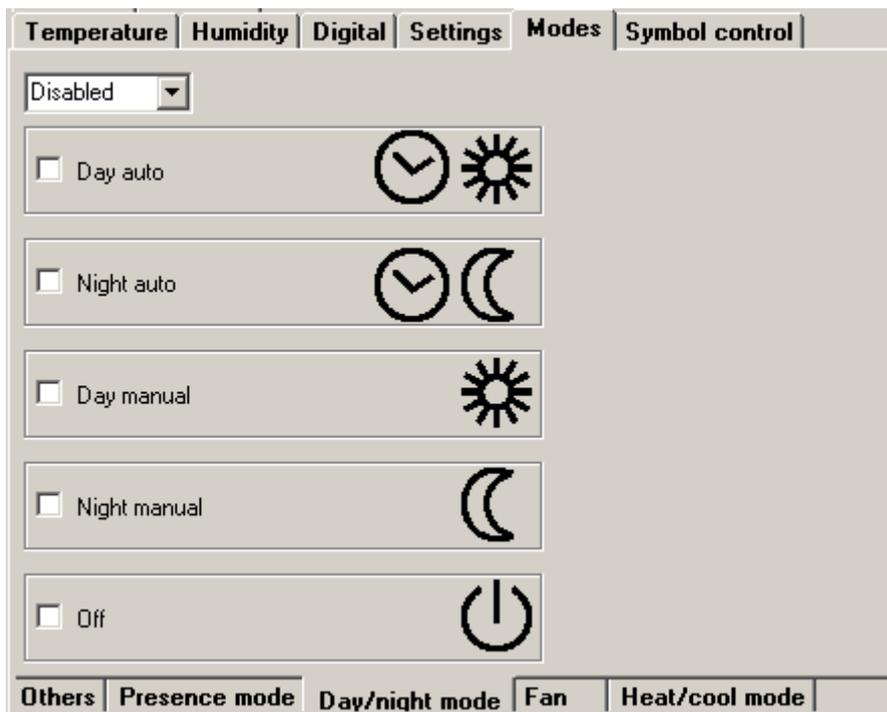
The *Day / night mode* is mainly used for residential applications.

Day auto: Day mode set by a time scheduler (this is done by master; the UI010 and UI011 do not possess real time clock). Symbols: Clock, Sun.

Night auto: Night mode set by a time scheduler. Symbols: Clock, Moon.

Day manual: Manual override to Day mode, or just Day mode if scheduler not present. Symbols: Sun.

Night manual: Manual override to Night mode, or just Night mode if scheduler not present. Symbols: Moon.

Off: Energy savings mode, long-term unoccupancy.

6.2.8   Fan
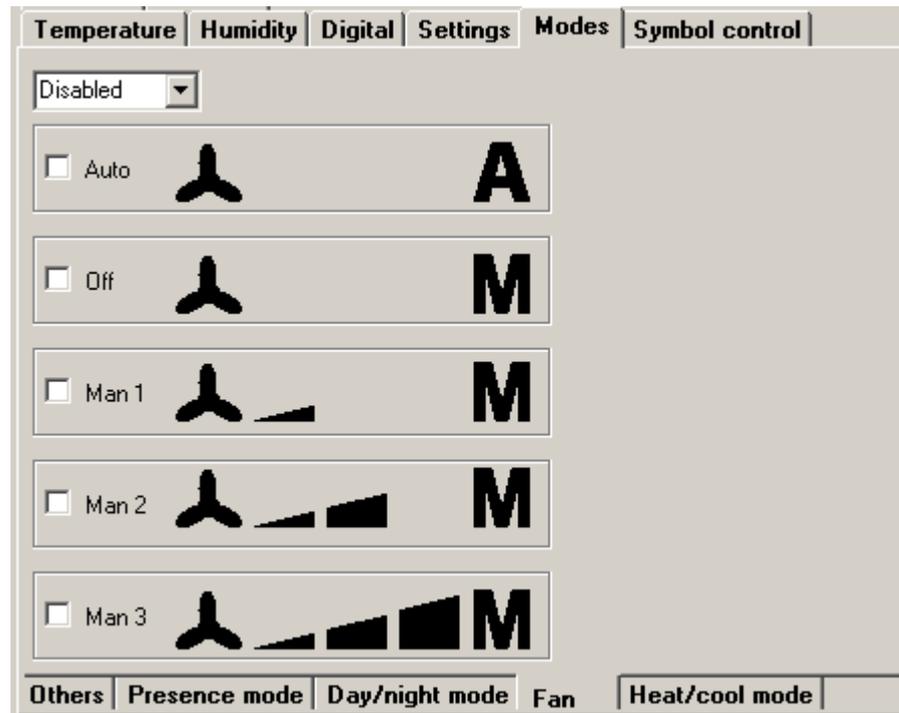
For applications where manual fan control is required (fancoils, split units, convectors).

Auto: Fan stages controlled by the master. Will probably also display actual fan stage (written by master, see the Modbus table). Symbols: Fan, A.

Off: Manual off. Symbols: Fan, M.

Man1: Fan manually on Stage 1. Symbols: Fan, M, Stage1.

Man2: Fan manually on Stage 2. Symbols: Fan, M, Stage2.

Man3: Fan manually on Stage 3. Symbols: Fan, M, Stage3.

6.2.9   Heat / cool mode

For split units, heat pumps etc.

Off: Unit is off, no operation. Symbols: Off.

Heat only: Heat only mode, cooling disabled. Symbols: Heat.

Cool only: Cool only mode, heating disabled. Symbols: Cool.

Fan only: Brings fresh air in or air circulation without energy (heating / cooling). Symbols: Fan.

Auto: Heating or cooling according to actual energy demand, both functions enabled. Symbols: Heat, Cool.
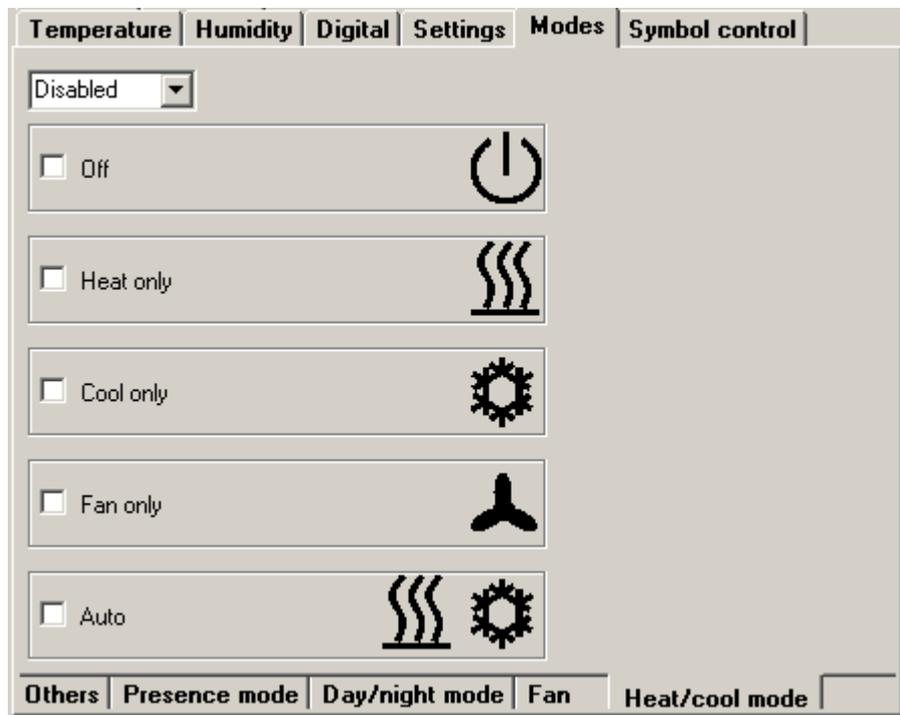
6.2.10 Symbol control

Not relevant here.

6.2.11 Remote 0

Defines the way Remote value 0 is displayed and set.
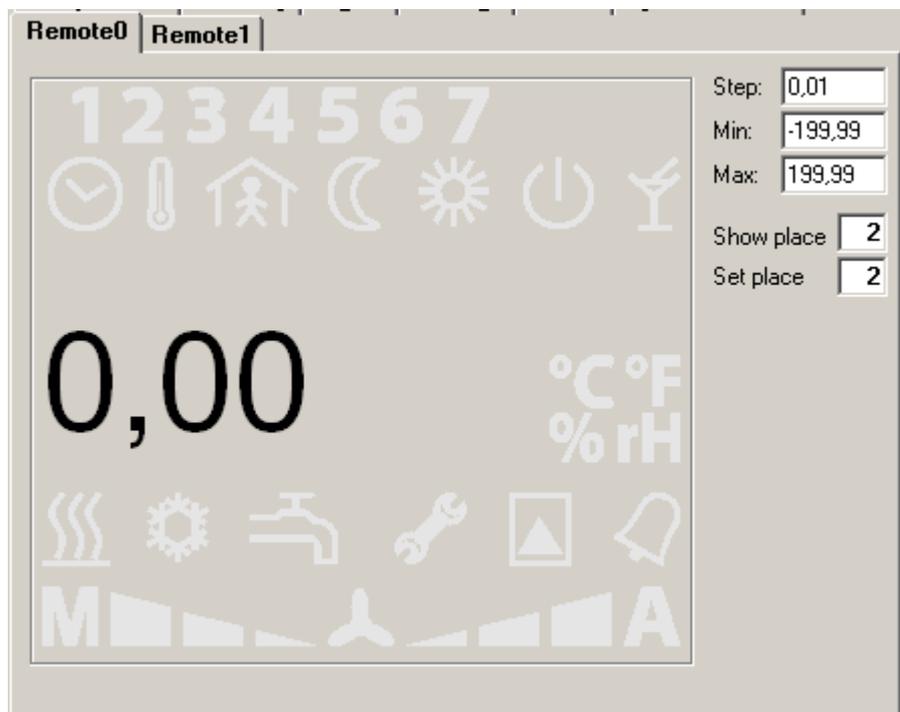
Step: Value to change setpoint on one step of the knob. The knob has 24 steps to complete one turn.

Min, Max: Minimum and maximum limits for changing the value by user.

Show place: Number of decimal places to display.

Set place: Number of decimal places to display when setting the value.

See the Modbus table for a detailed overview of values to read wnd write the Remote value 0 by master.

6.2.12 Remote 1

Same as Remote 0, but defines the way Remote value 1 is displayed and set.

7 UC100 settings

Scan the bus and double click the listed controller in the field with scan results. The properties window opens.

7.1 General settings

In the upper bar there is module type and address.

7.1.1 Digital inputs

DI1, DI2: not relevant here; UC100 has no digital inputs

Push: status of the pushbutton. Goes green when the pushbutton is pressed.

7.1.2 RTC

Parameters of the real time clock (which control the weekly scheduler).

Time, Day, Date: current data in the controller

PC Time: tick if you want to synchronize according to the time of your PC. Untick if you want to set a special time (e.g. if the controller is being configured for supplies to another time zone).

Synchronize: writes the PC or given time, date, and weekday into the controller. All changes are immediately active.

7.1.3 Settings

Communication parameters.

In the upper part of the frame there is unit type (here UC100), and unit ID; each device (module / controller / room unit) type has its own ID, UC100 = 300 hex.

Firmware version: please report if you experience problems.

Address: Modbus slave address (1..255) of the device.

New address: select or enter the new address here when readdressing the unit.

Baudrate: for information only, can not be changed.

Write all to EEPROM: writes all the changed values (address, parameters etc.) to permanent memory. To make new address (and baudrate) active, power off and power on the device again. All other parameters are effective immediately.

NB. This button also stores all settings which are in the tabs on the right (operation modes, setpoints, etc.)

7.1.4   Communication

Communication statistics (sent and received telegrams). Only relevant for Service mode.

7.1.5   Others

Actual values

Set temp: current set temperature (PI controller setpoint) – selected temperature for actual operation and heating / cooling mode plus manual setpoint correction

Actual temp: measured temperature by the internal sensor plus sensor compensation

Outside temp: outdoor temperature optionally writable over Modbus to the room unit or controller; used just for display. See *Controller settings, Show mode.*

PID Output:: internal value of the room controller output: –100% (cooling) to 100% (heating). This value is processed in interlocking sequences and PWM modulators before it is sent to the outputs. For information and service only.

Other buttons and information

Connected/Disconnected – Connection status / comunication with the unit

Close: Closes the unit window and returns to main program window

<<: Switches to simplified view (no tabs with values)

Time schedule: Opens the weekly scheduler window; see below

Open/close initialization: only relevant for initialization process, see below.

7.2   Tabs with setpoints and parameters

At the right of the window, there are tabs with advanced controller settings. Only use those settings when necessary. All settings are effective immediately and written to RAM. Permanent writing to EEPROM follows by clicking the „Write all to EEPROM" button, see above, *Settings*.

7.2.1 Temperatures

Set temp: Actual set temperature. It is updated only when the properties window is opened. For information only.

Set day temp.: Heating setpoint for Day/Comfort mode

Set night temp.: Heating setpoint for Night/Standby mode

Set depress.temp: Heating setpoint for Off/Depression mode

Set day cool temp.: Cooling setpoint for Day/Comfort mode

Set night cool temp.: Cooling setpoint for Night/Standby mode

Set depress. cool temp: Cooling setpoint for Off/Depression mode

Min. temp: Minimum temperature that can be set as corrected temperature (turning the knob overrides actual setpoint until next operation mode change)

Max. temp: Maximum temperature that can be set as corrected temperature

Min d.n.d. temp: Low limit for setpoint for all modes (Day, Night, Depression)

Max d.n.d. temp: High limit for setpoint for all modes (Day, Night, Depression)

Corr temp: Temperature correction which adds to the measured temperature (to compensate external influences). Default value is 1.5 °C which compensates internal heat losses

Corr out temp: Optional parameter which adds to the Outside temperature before sending to display

Step temp: Step for temperature settings when turning the knob.

7.2.2   Digital

Digital inputs

Optional latch function is implemented to keep even short signals at digital inputs readable: as soon as the signal appears on the input, it is written to the Modbus register. The latched state is then kept in the Modbus register until it is read out by the master.

Latch state:	Disabled	no function
	Log(0)	the input is normally closed, log.0 is latched
	Log(1)	the input is normally open, log.1 is latched

Clear latch: Reads out the register and sets the optional latch to its normal state

Offline action: Requested status of the digital output if the controller is offline (no communication from the Modbus master for a definable time). Usually None to let the controller do its job even if offline.

Wait time: Time of non-communication (no datagrams from master to slave) which is recognized as communication failure. It results in setting the outputs to the "Offline action" state (if defined). Entered in seconds, 1 to 255. Select from the drop-down box or write the value directly. If a value larger than 255 is entered, the default of 50 seconds is set.

Start action: Requested status of the digital output between power-up and the first datagram from master. Usually None.

7.2.3   Presence mode

The Presence mode configuration tab allows to enable and disable various operation modes. It is possible to switch between those modes either remotely, or in the controller menu (after long push), or pressing the button shortly (short push, see *the Controller settings* tab, *Quick edit mode*). Unchecked states are not available for the user. However, they can be set remotely over Modbus, so that the user can switch between

Day, Night, and Auto, while a central unit can – on top of that - set the controller to Depression (Central Off).

Day: Comfort mode, Day temperature setpoints apply, room occupied.

Night: Reduced mode, Night temperature setpoints apply.

Depress: Depression mode, the room is unoccupied for a longer time, energy savings temperature setpoints apply.

Auto: Temperature setpoints change according to the time scheduler between Day, Night and Depress modes. Together with the Clock symbol, the current mode symbol(s) is displayed.

Party: Controller goes to Comfort mode for a predefined time of 2 hours. Then it goes back to previous mode.

7.2.4 Symbol control

Not relevant here, just to check if the symbols of spanner, boiler and alarm bell are displayed properly.

Those symbols may be switched on and off by the Modbus master and indicate various system statuses and system and maintenance alarms.

Click the symbol to make it active at the display. Click it again to disable it.

7.2.5   Controller settings

Change over – this signal is usually sent to the controler over the bus according to available media temperature; if there is hot water available, the controler should be in the Heating mode. The default value is Heating and usually there is no need to change this.

Heating: sets the controller to Heating mode (valve opens if actual setpoint is above measured temperature

Cooling: sets the controller to Cooling mode (valve opens if actual setpoint is below measured temperature.

Sense of heat/cool symbols:

Energy: the heating and cooling symbols display the status of the change-over signal, which actually means the type of energy which is available for heating or cooling, regardless of the actual valve status (i.e. may be that the heating symbol is on – hot water in the piping - but the valve is closed, as there is no need to heat the room now)

Valve: the symbol appears as soon as the valve in the corresponding mode starts to open. This is used most, and also is the default settings.

Quick edit mode: defines the function of short push of the button.

None: short push has no effect

Presence mode: short push of the button changes between the modes predefined (checked) in the Presence mode.

Allowed operation modes: functions and values available in the settings menu after a super long push. This is what the user actually can control at the device.

Temperature correction: change of the actual setpoint, sets back to 0 with presence mode change. If disabled here, even turning the knob has no effect.

Day temp ... **Cooling depress temp**: Setpoints for heating and cooling for Day, Night, and Depression mode – see the *Temperature* tab.

Time: real time clock setting (hours, minutes, weekday).

Actual regulation mode: displays the current operation mode (Day / Night / Depression)

Show mode: select values which periodically swap at the display in the Show mode.

Temperature: actual room temperature

Outside temp.: outside temperature – must be communicated to the controller by a Modbus master, use as an option only

Time: real time (hh.mm, day of week together with the clock symbol)

Show time: period of swapping the values of Show mode.

Long push time: time to push the button to select the Time schedule menu.

Super long push time: time to push the button to select the Settings menu (and get access to the settings enabled in *Allowed operation modes*).

Change over period: time of inactivity after the change-over signal comes, 1 to 255 mins. Intended to let the hydronic system adapt and deliver proper media temperature.

P band: proportional band of the controller; control deviation (setpoint – actual value) to open the valve at 100 %.

I const: integrating part, time to increase the output by the P contribution at constant deviation.

Step minutes: time resolution for time schedule settings.

Edit return time: time to return to the basic display (show mode) in case of user inactivity.

7.2.6   Serial port settings

Baudrate: for information only, to be changed in the main window (see above: *General setings, Settings*)

Parity: None, Even, Odd, default is None.

Stopbits: One or Two, default is One.

7.3 Time schedule

The weekly time schedule in the controller is stored in EEPROM and controls the operation modes according to real time clock and the defined settings. Each of the 7 days has 6 events which either can be disabled or set the controller into a particular operation mode (Day / Night / Depression). A disabled event does not influence the operation mode and it does not matter what time (hh:mm) it is set to.

Click the *Time schedule* button in the main window to open the Time schedule window.

There are predefined events. The *Edit* button at each weekday copies this particular weekday to the *Schedule settings* frame. Then it is possible to modify the events of the day:

Time: for your comfort, type "1205" to set 12h 05m. No colon necessary.

Value: select from the drop-down box (Day, Night, Depression, Disabled).

After all six events are defined, click *Set schedule* to write the schedule to the controller.

If multiple days are marked (ticked) prior to pressing the *Set schedule* button, the same schedule is written to all of them.

In the graphic pan on the left there is the complete weekly list of changes; the closer the blue and red setpoint lines are, the more comfortable the mode is. The graph does not reflect real temperature values, it is just a symbolic representation of the operation modes.

After you have finished the editing, click the *Write all to EEPROM* button. The data is written permanently to the controller's memory. The progress bar above the button shows the writing progress, in the end of the process there comes a pop-up window *Writing complete*.

Click *Close* to close the Time schedule window and return to the main controller window.

8 FC010 settings

Scan the bus and double click the listed controller in the field with scan results. The properties window opens.

The FC010 should have the room unit, UC010, connected to its K2 terminals; otherwise no relevant values are displayed.

8.1 General settings
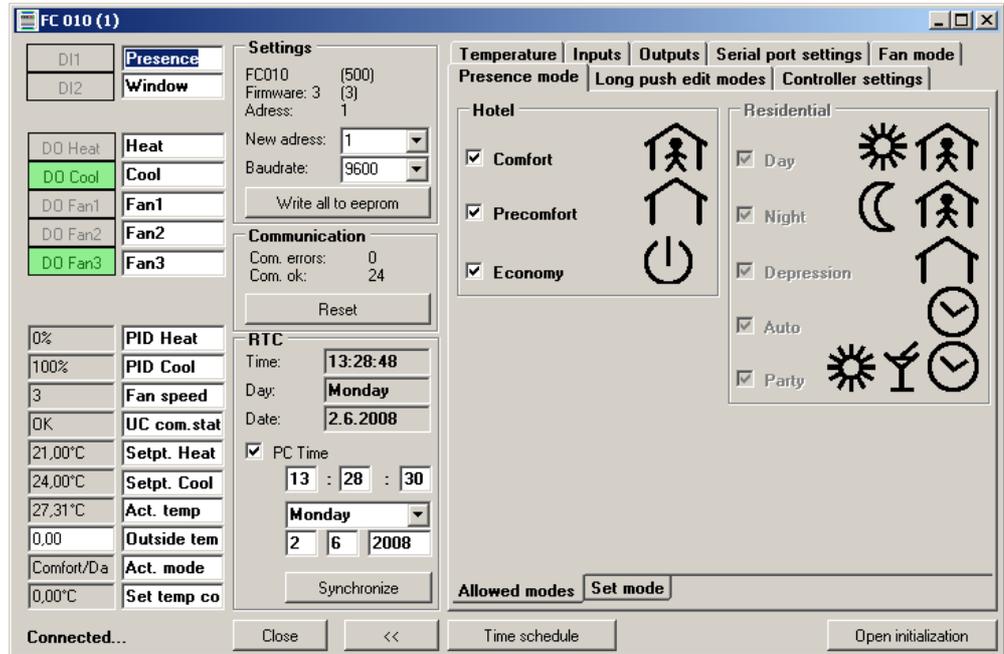
In the upper bar there is module type and address (FC010, address 1).

8.1.1 Digital inputs

DI1: Presence input (if active, sets to Comfort mode).

DI2: Window / dewpoint sensor input. If inactive, switches to Economy mode.

8.1.2 Digital outputs

DO Heat: Heating valve; actual state of the triac. NB. The triac is PWM controlled, and this value has no big importance here.

DO Cool: Cooling valve; actual state of the triac. NB. The triac is PWM controlled, and this value has no big importance here.

DO Fan 1: Stage 1 of the fan. There is always only one of the Fan outputs active at a time. There is a 500 ms pause between the stages if switched up or down to prevent fan damage.

DO Fan 2: Stage 2 of the fan.

DO Fan 3: Stage 3 of the fan.

8.1.3 Analogue values

PID Heat: Output of the PI controller for heating. This signal is blocked by the heating/cooling switching sequence, and brought to the PWM modulating block.

PID Cool: Output of the PI controller for cooling. This signal is blocked by the heating/cooling switching sequence, and brought to the PWM modulating block.

Fan speed: Actual fan stage; 0 (Off) to 3 (Maximum).

UC comm stat.: *OK* if the UC010 room unit communicates properly, *Timeout* if no communication has taken part for the last 60 secs

Setpt. Heat: Actual heating setpoint (basic setpoint according to operation mode + knob correction)

Setpt. Cool: Actual cooling setpoint (basic setpoint according to operation mode + knob correction)

Act. temp: Actual measured room temperature (internal sensor) incl. *User temperature correction* (see the *Temperature* tab)

Outside temp: Outside temperature written into the controller for optional display and summer / winter compensation. Not implemented now.

Act. mode: Currently active operation mode: *Comfort/Day* / *Precomfort/Night* / *Economy/Off,* depending on digital inputs and internal setting.

Set temp corr.: User temperature correction set by the knob. Can also be set or reset remotely from the BMS (e.g. when room goes to Unoccupied or each day in the evening).

Other buttons and information

Connected/Disconnected – Connection status / comunication with the unit

Close: Closes the unit window and returns to main program window

<<: Switches to simplified view (no tabs with values)

Time schedule: Opens the weekly scheduler window; see below

Open/close initialization: only relevant for initialization process, see below.

8.1.4   Settings

Communication parameters.

In the upper part of the frame there is unit type (here UC010), and unit ID; each device (module / controller / room unit) type has its own ID, UC010 = 300 hex.

Firmware version: please report if you experience problems.

Address: Modbus slave address (1..255) of the device.

New address: select or enter the new address here when readdressing the unit.

Baudrate: for information only, can not be changed.

Write all to EEPROM: writes all the changed values (address, parameters etc.) to permanent memory. To make new address (and baudrate) active, power off and power on the device again. All other parameters are effective immediately.

NB. This button also stores all settings which are in the tabs on the right (operation modes, setpoints, etc.)

8.1.5   Communication

Communication statistics (sent and received telegrams). Only relevant for Service mode.

8.1.6   RTC

Parameters of the real time clock (which control the weekly scheduler).

Time, Day, Date: current data in the controller

PC Time: tick if you want to synchronize according to the time of your PC. Untick if you want to set a special time (e.g. if the controller is being configured for supplies to another time zone).

Synchronize: writes the PC or given time, date, and weekday into the controller. All changes are immediately active.

8.2 Tabs with setpoints and parameters

At the right of the window, there are tabs with advanced controller settings. Only use those settings when necessary. All settings are effective immediately and written to RAM. Permanent writing to EEPROM follows by clicking the „Write all to EEPROM" button, see above, *Settings*.

8.2.1 Temperatures

Presence mode	Long push edit modes	Controller settings		
Temperature	Inputs	Outputs	Serial port settings	Fan mode

User temp correction:	2	°C
Set day heating temp	21,00	°C
Set night heating temp	19,00	°C
Set depression heating temp	12,00	°C
Set day cooling temp	24,00	°C
Set night cooling temp	26,00	°C
Set depression cooling temp	35,00	°C
Min relative temp correction	-3,50	°C
Max relative temp correction	3,50	°C
Min user settings temp	10,00	°C
Max user settings temp	40,00	°C

User temp correction: User temperature correction set by the knob. Can also be set or reset remotely from the BMS (e.g. when room goes to Unoccupied or each day in the evening). This value is set to 0 automatically at each operation mode change.

Set day heating temp.: Heating setpoint for Comfort/Day mode

Set night heating temp.: Heating setpoint for Precomfort/Night mode

Set depression heating temp: Heating setpoint for Off/Depression mode

Set day cooling temp.: Cooling setpoint for Comfort/Day mode

Set night cooling temp.: Cooling setpoint for Precomfort/Night mode

Set depression cooling temp: Cooling setpoint for Off/Depression mode

Min. relative temp. correction: Minimum by which the setpoints can be decreased (turning the knob adds the correction to the setpoint until next operation mode change)

Max. relative temp. correction: Maximum by which the setpoints can be increased

Min user settings temp: Low limit for setpoint for all modes (Day, Night, Depression) to be set both in the long push menu, remotely (BMS) and above (*Set day/night/depression heating/cooling temp.*)

Max user settings temp: High limit for setpoint for all modes

8.2.2   Inputs

Digital inputs

Each input may be enabled or disabled.

Enable: the operating mode depends on the input status.

Disable: the operating mode is determined by user (short push if enabled) and / or remotely (BMS).

8.2.3   Outputs

This tab helps at I/O check to manual override outputs regardless of the controller status.

Manual override fan: Check this field to switch the Fan Stage 1 to On. Select fan speed to activate the corresponding relay. Uncheck the field to switch the fan back to automatic mode.

Manual override heat: Sets the heating output to 100% (by default) or any other value.

Manual override cool: Sets the cooling output to 100% (by default) or any other value.

```
┌─────────────────────────────────────────────────────────────┐
│ Presence mode │ Long push edit modes │ Controller settings │  │
│ Temperature │ Inputs │ Outputs │ Serial port settings │ Fan mode │
│                                                              │
│  ☐  Manual override fan        [Off      ▼]                  │
│  ☐  Manual override heat       [0        ]  %               │
│  ☐  Manual override cool       [0        ]  %               │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
└─────────────────────────────────────────────────────────────┘
```

Remember to set the outputs back into automatic mode after the I/O check is finished. However, restart (power off / on) resets all manual overrides back to automatic mode.

8.2.4   Serial port settings

All communication setting changes are active only after restart of the controller.

```
┌─────────────────────────────────────────────────────────────┐
│ Presence mode │ Long push edit modes │ Controller settings │  │
│ Temperature │ Inputs │ Outputs │ Serial port settings │ Fan mode │
│                                                              │
│   Baudrate   [9600   ▼]                                      │
│   Parity     [None    ▼]                                      │
│   Stop bits  [One     ▼]                                      │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
└─────────────────────────────────────────────────────────────┘
```

Baudrate: for information only, to be changed in the main window (see above: *General setings, Settings*)

Parity: None, Even, Odd, default is None.

Stopbits: One or Two, default is One.

8.2.5   Fan mode
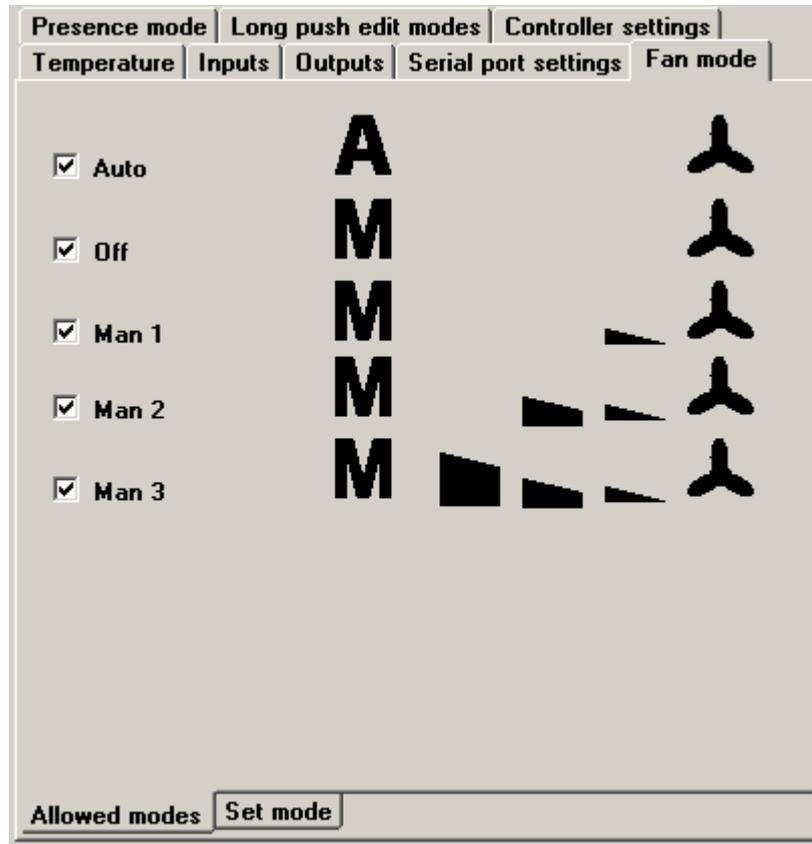
In the *Allowed modes* subtab select all modes which the user should be able to change in the Quick edit or Long push edit modes. This setting does **not** specify the number of fan stages for automatic control according to control deviation; see the *Controller settings* tab, *Number of fan stages*.

8.2.6   Presence mode

The Presence mode configuration tab allows to enable and disable various operation modes. It is possible to switch between those modes either remotely, or in the controller menu (after long push), or pressing the button shortly (short push, see *the Controller settings* tab, *Quick edit mode*). Unchecked states are not available for the user. However, they can be set remotely over Modbus, so that the user can switch between Day, Night, and Auto, while a central unit can – on top of that - set the controller to Depression (Central Off).

Day: Comfort mode, Day temperature setpoints apply, room occupied.

Night: Reduced mode, Night temperature setpoints apply.

Depress: Depression mode, the room is unoccupied for a longer time, energy savings temperature setpoints apply.

Auto: Temperature setpoints change according to the time scheduler between Day, Night and Depress modes. Together with the Clock symbol, the current mode symbol(s) is displayed.

Party: Controller goes to Comfort mode for a predefined time of 2 hours. Then it goes back to previous mode.

8.2.7   Symbol control

Not relevant here, just to check if the symbols of spanner, boiler and alarm bell are displayed properly.

Those symbols may be switched on and off by the Modbus master and indicate various system statuses and system and maintenance alarms.

Click the symbol to make it active at the display. Click it again to disable it.

8.2.8 Controller settings

Change over – this signal is usually sent to the controler over the bus according to available media temperature; if there is hot water available, the controler should be in the Heating mode. The default value is Heating and usually there is no need to change this.

Heating: sets the controller to Heating mode (valve opens if actual setpoint is above measured temperature

ModComTool   35

Cooling: sets the controller to Cooling mode (valve opens if actual setpoint is below measured temperature.

Sense of heat/cool symbols:

Energy: the heating and cooling symbols display the status of the change-over signal, which actually means the type of energy which is available for heating or cooling, regardless of the actual valve status (i.e. may be that the heating symbol is on – hot water in the piping - but the valve is closed, as there is no need to heat the room now)

Valve: the symbol appears as soon as the valve in the corresponding mode starts to open. This is used most, and also is the default settings.

Quick edit mode: defines the function of short push of the button.

None: short push has no effect

Presence mode: short push of the button changes between the modes predefined (checked) in the Presence mode.

Allowed operation modes: functions and values available in the settings menu after a super long push. This is what the user actually can control at the device.

Temperature correction: change of the actual setpoint, sets back to 0 with presence mode change. If disabled here, even turning the knob has no effect.

Day temp ... **Cooling depress temp**: Setpoints for heating and cooling for Day, Night, and Depression mode – see the *Temperature* tab.

Time: real time clock setting (hours, minutes, weekday).

Actual regulation mode: displays the current operation mode (Day / Night / Depression)

Show mode: select values which periodically swap at the display in the Show mode.

Temperature: actual room temperature

Outside temp.: outside temperature – must be communicated to the controller by a Modbus master, use as an option only

Time: real time (hh.mm, day of week together with the clock symbol)

Show time: period of swapping the values of Show mode.

Long push time: time to push the button to select the Time schedule menu.

Super long push time: time to push the button to select the Settings menu (and get access to the settings enabled in *Allowed operation modes*).

Change over period: time of inactivity after the change-over signal comes, 1 to 255 mins. Intended to let the hydronic system adapt and deliver proper media temperature.

P band: proportional band of the controller; control deviation (setpoint – actual value) to open the valve at 100 %.

I const: integrating part, time to increase the output by the P contribution at constant deviation.

Step minutes: time resolution for time schedule settings.

Edit return time: time to return to the basic display (show mode) in case of user inactivity.

8.3   Time schedule

The weekly time schedule in the controller is stored in EEPROM and controls the operation modes according to real time clock and the defined settings. Each of the 7 days has 6 events which either can be disabled or set the controller into a particular operation mode (Day / Night / Depression). A disabled event does not influence the operation mode and it does not matter what time (hh:mm) it is set to.

Click the *Time schedule* button in the main window to open the Time schedule window.

There are predefined events. The *Edit* button at each weekday copies this particular weekday to the *Schedule settings* frame. Then it is possible to modify the events of the day:

Time: for your comfort, type "1205" to set 12h 05m. No colon necessary.

Value: select from the drop-down box (Day, Night, Depression, Disabled).

After all six events are defined, click *Set schedule* to write the schedule to the controller.

If multiple days are marked (ticked) prior to pressing the *Set schedule* button, the same schedule is written to all of them.

In the graphic pan on the left there is the complete weekly list of changes; the closer the blue and red setpoint lines are, the more comfortable the mode is. The graph does not reflect real temperature values, it is just a symbolic representation of the operation modes.

After you have finished the editing, click the *Write all to EEPROM* button. The data is written permanently to the controller's memory. The progress bar above the button shows the writing progress, in the end of the process there comes a pop-up window *Writing complete*.

Click *Close* to close the Time schedule window and return to the main controller window.

9　Advanced functions

9.1　Modbus table view

The ModComTool also brings Modbus register table access functions. This is used for non-Domat devices where the editing masks as used above are not available.

1. Start the tool in User mode.

2. Check if the modules are connected by scanning the bus. A 3rd party module would appear as an Unknown device in case it contains registers 1 and 2 in its Modbus table. If these register numbers are not supported, the module may not be listed in the result list.

3. Instead of clicking directly to the module address, click the *Address* tab.

4. Enter a valid module address in the *Address* field.

5. Enter start register number based on the valid Modbus table of the connected device into the *Start reg* field.

6. Enter the number of registers to be read into the *Length* field.

7. Click *Connect*.

A table with read values from the controller or room unit opens. Here it is possible to read and write directly to the Modbus registers of the device.

Please keep in mind that this is an activity which requires advanced knowledge of the register table. By improper writing, the device may be damaged.

1. Click a register row to open a window for writing.

2. Enter a new value in your favorite format.

3. Click Set if you want to set the new value and leave the dialog open. Click Set and close to set the new value and close the dialog. Click Close to cancel the operation.

More register blocks from one or more devices can be read in the same window. Just extend the *Module* table by more records. Remember to stop the communication to edit the table.

9.2   Replicating values

If there are more devices on the bus which should be written the same value into the same register number, the *Replicate selected value* function may be used. It reads the value from the current register and writes it to the same register numbers of different Modbus devices on the bus.

1 .Right click the value to be replicated.

2. Select *Replicate selected value*. A dialogue window opens.
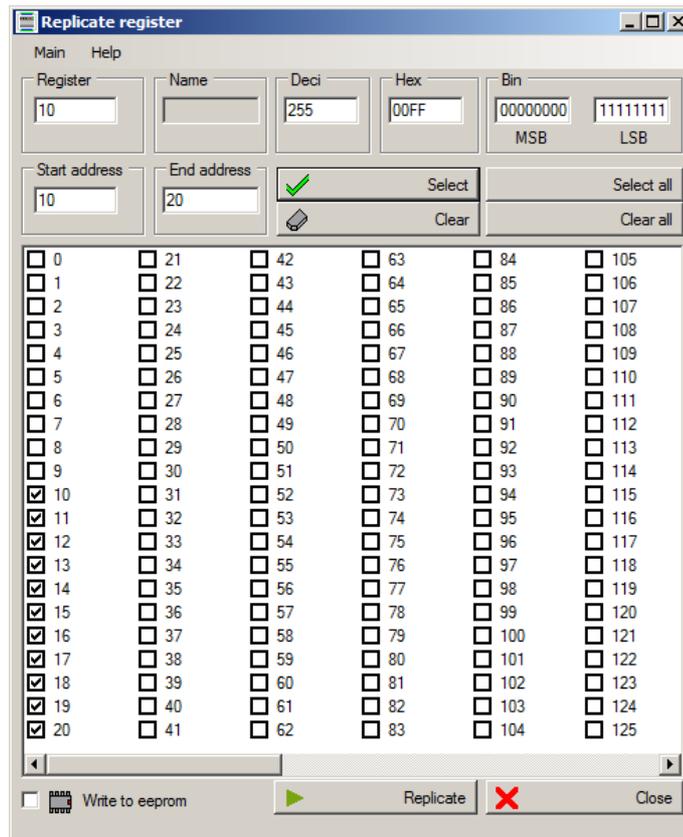
3. Check the register number and value to be replicated.

4. Select the addresses to be written to. Use the *Start address* and *End address* parameters and the *Select (all)* and *Clear (all)* buttons.

5. For Domat devices, check *Write to EEPROM* if the parameter has to be written permanently.

6. Click the *Replicate* button.

7. The successfully written addresses turn green, the failed addresses turn red.

8. The process can be repeated for another register number.

9. Click *Close* when finished.

9.3 Modbus scan - serial

A function that can speed up the commissioning process. For a device where the communication parameters are not known, the function tries all predefined combinations automatically, and stops if the device responds on any of the combination.

To scan the bus, proceed as follows:

1. Open the Modbus scanning function over serial in the *Tools – Serial scanner* menu:
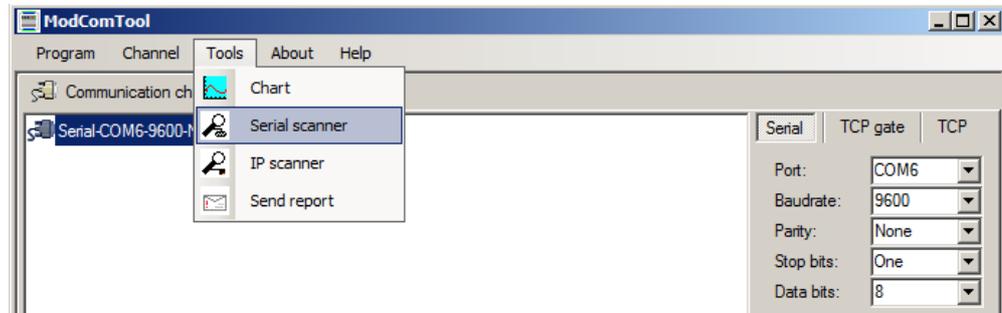
2. Select the parameters you want to include. The estimated test time is shown in the status bar. Click Test.

3. Set the Modbus address range to be scanned and a register number which must exist in the target device. Remember that a large address range may increase the scan time considerably.

4. The results of the scan are displayed in the left window. The last line reads successful Modbus scan with the communication parameters used.

Remember to check the Read timeout parameter – by decreasing it, the scanning time is shorter, but there is a risk of missing the Modbus response.
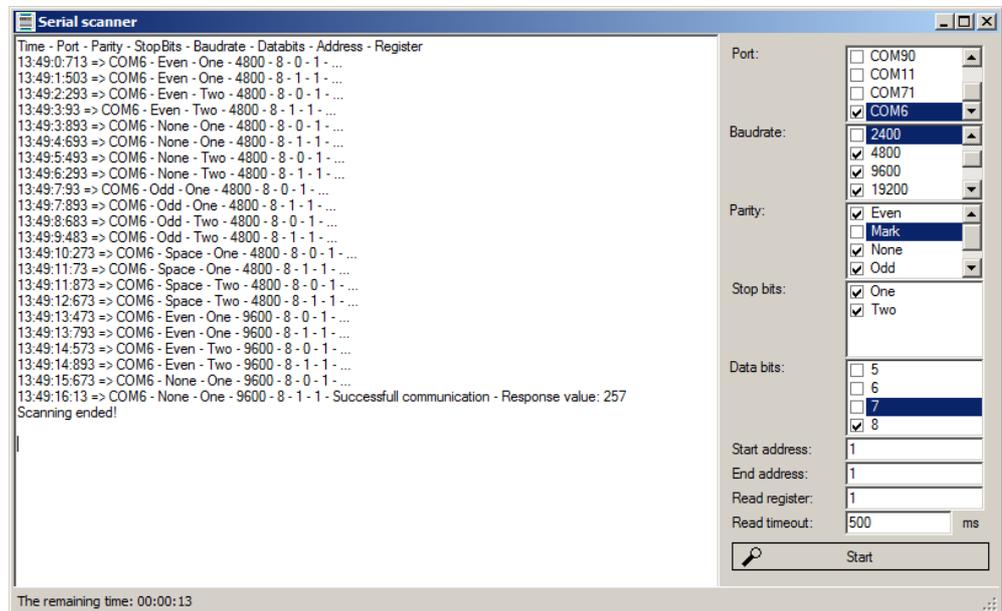
9.4 Modbus scan – IP

The Modbus IP scanner works in a similar way. It scans a IP address range for Modbus TCP devices.

Modbus TCP/RTU routing function is not supported, i.e. it is not possible to search for more Modbus addresses within a single IP address.
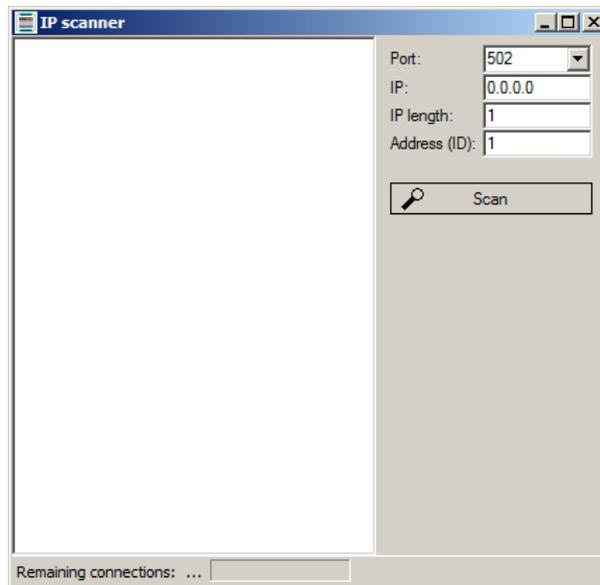
Port: TCP port to connect to, 502 by default

IP: the starting IP address (e.g. 192.168.1.11)

IP length: how many addresses shall be scanned
(e.g. 50 for the range of 192.168.1.11....192.168.1.61)

Address (ID): Modbus address, shall not matter because a Modbus IP device normally does not take this parameter into consideration.

9.1 Info

In the main program window, click the *Info* button.

In the window there is a list of all the supported modules. Check here if the tool is not able to detect your module / room unit / controller.