CONTROLLER MPC-374

USER'S MANUAL

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1 ABBREVIATIONS AND EXPLANATIONS

1.1 Markings

Xn – is a number of socket. This information are provided for manufacturer's purpose.

GSM – Global Standart for Mobile Communications. This interfaces is prepared for remote connections and data bidirectional data transfer over Global Standart Mobile network.

GPRS - a packet oriented mobile data service on the 2G and 3G cellular communication system's global system for mobile communications (GSM).

Ethernet - a family of computer networking technologies for local area networks (LANs) commercially introduced in 1980. Standardized in IEEE 802.3, Ethernet has largely replaced competing wired LAN technologies. This interfaces is prepared for connection LAN (Local Area Network).

GND – ground wire contact

RS232 - the traditional name for a series of standards for serial binary single-ended data and control signals connecting between a DTE (Data Terminal Equipment) and a DCE (Data Circuit-terminating Equipment). It is commonly used in computer serial ports. The standard defines the electrical characteristics and timing of signals, the meaning of signals, and the physical size and pin out of connectors. RS232 interfaces are prepared for connection of pheripherical devices (example energy meters, controllers, machines and etc.)**.**

TD – contact for transfer data wire of RS232 socket

RD – contact for read data wire of RS232 socket

DTR – contact for **Data Transmit Ready** wire of RS232 socket

RS485 - standard defining the electrical characteristics of drivers and receivers for use in balanced digital multipoint systems. The standard is published by the ANSI Telecommunications Industry Association/Electronic Industries Alliance (TIA/EIA). Digital communications networks implementing the EIA-485 standard can be used effectively over long distances and in electrically noisy environments. Multiple receivers may be connected to such a network in a linear, multi-drop configuration. RS485 interfaces are prepared for connection of pheripherical devices (example energy meters, controllers, machines and etc.).

A+ – contact for positive wire of RS485 socket

B- –contact for negative wire of RS485 socket

USB – Universal Serial Bus is an industry standard, that defines the cables, connectors and

protocols used for connection, communication and power supply between computer and electronic devices. USB type B socket is prepared for connection to PC(Personal Computer). USB type A socket is prepared for connection to pheripherical devices (example memory stick's and etc.).

M-Bus - a European standard (EN 13757-2 physical and link layer, EN 13757-3 application layer) for the remote reading of gas or electricity meters. The M-Bus interface is made for communication on two wire, making it very cost effective.

MBUS+ – contact for M-Bus positive wire

MBUS- – contact fot M-Bus negative wire

Socket – is an endpoint of a bidirectional inter-process communication flow across an Internet Protocol-based computer network, such as the Internet

Data/Req – are protocol used by Kamstrup, for data transfer over two wiresares

Data – contact for data wire

Req – contact for request wire

Current loop - are used where a device must be monitored or controlled remotely over a pair of conductors. Only one current level can be present at any time.

CL+ – contact for current loop positive wire

CL- – contact for current loop negative wire

1.2 LED indications

Status – device status indicating LED

Uoutput – status of power for external device indicating LED

TX/RX – data transfer/receive indicating LED

TXD – data transferring LED indicator

RXD – data receiving LED indicator

100Mbs – Ethernet High speed connection indicating LED

1.3 Explanations

"Alarm mode" – in state of alarm status Controller initiates an event notification for user selected discrete input mode (Alarm mode: unconnected, connected, both events)

Central computer – server or a computer, where data can be sent.

IP address - An **Internet Protocol** (**IP**) **address** is a numerical label that is assigned to devices participating in a network that uses the Internet Protocol for communication between its nodes.

TCP/IP – Transmission Control Protocol is for communication between computers, used as a

standard for transmitting data over networks and as the basis for standard Internet protocols.

MAC address –**Media Access Control** address is a unique identifier assigned to most network adapters.

UART – An **Universal Asynchronous Receiver/Transmitter** is a type of "asynchronous receiver/transmitter, a part of computer hardware that translates data between parallel an serial forms. UART are commonly used in conjunction with communication standards such as EIA RS-232, RS-422 or RS-485.

2 PREFACE

2.1 Symbols

Internatiol electrical symbol list. Some or all symbols can be used on controller marking or in this user manual.

Symbol	Explanation
CE	With the **CE** marking on a product the manufacturer ensures that the product conforms with the essential requirements of the applicable **EC** directives.
⎓	**DC** (Direct Current)
	Caution
	Grounding
	LED indicator
	Contact number on plug
RoHS	Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment 2002/95/EC. Commonly referred to as the Restriction of Hazardous Substances Directive or **RoHS**)

2.2 Saferty instructions

To install and setup device, special technical knowledges are needed. Call to seller or certified profesionals to connect and setup device !

Before connecting to power supply, be sure that:

1. Controller is not damaged (no cracks, melted, broken or exposed areas)
2. Controller is used with right and correct thickness cables.
3. Controller and antena are installed indoor.
4. The controller is intended for supply from a Limited Power Source (LPS) with current rating of overcurrent protective device not greater than 2A
5. The highest transients on the DC secondary circuite of LPS, derived from AC main supply, shall be less then 71V peak.
6. The associated equipments (AE): PC and PSU (LPS) shall comply with the requirements of Standard EN 69050-1.

7. Controller is dry.
8. Ambient temperature and humidity is in normal range and non-condensing.
9. Other types of devices (meters, etc.) are connected correctly by using manufacturer‘s regulations.
10. The end of stranded conductor shall not be consolidated by soft soldering and must to be terminated
11. Device, PC and other pheripherical devices are strictly connected through one double pole breaker (current break less than 5A and space between breaker contacts more than 3mm.) Pole breaker has to be in building‘s wiring and in reachable place with markings

Don‘t use:

1. Device under open water (in rain and if water are spalshing on controller or connected devices;
2. Device if enclosure, connected cables, or other connected devices are damaged;
3. External Back-Up batterys for powering of controller.

Use device by manufacturer‘s regulations otherwise you can damage controller or other devices. In that cace **manufacturer‘s warranty could not be obtained**.

If you suspect that device doesn‘t operate correctly or has visible violations, disconect from power supplier and contact manufacturer or your distributor to check or run maintanance.

Manufacturer does not affect and is not responsible for GSM/GPRS/Internet operators‘ provided network service pricing and costs.

2.3 Manufacturer’s warranty

Manufacturer guarantees to remove failure or to change in a new one (if the failure is irreparable) in two years period if user didn’t brake technical requirements and operating conditions named at chapters 2.2 and 3.

MANUFACTURER’S CONTACTS

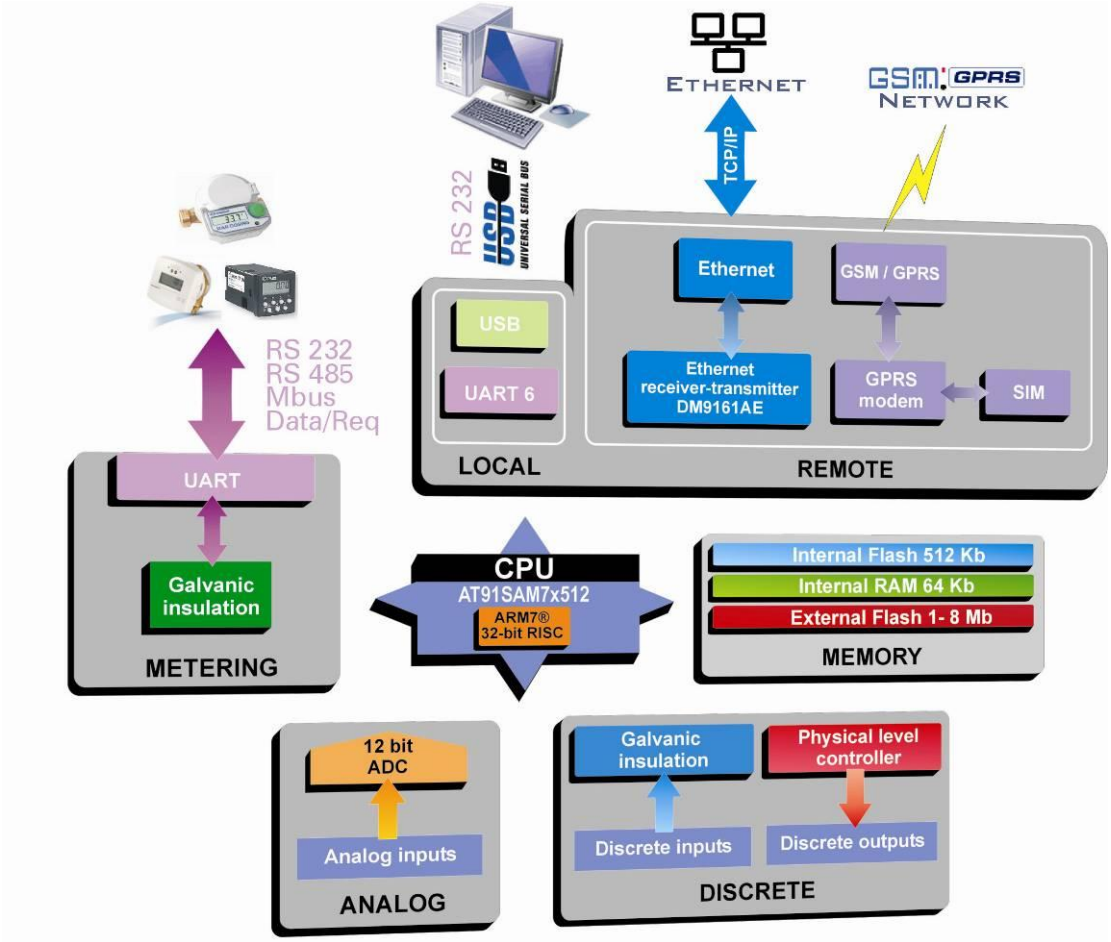
V. BARTKEVICIAUS ENTERPRISE “VALSENA”
SAVANORIŲ AVE. 271- 412,
LT50131 KAUNAS, LITHUANIA
PHONE : (+370) 37 310603,
FAX. (+370) 37 310648
E-MAIL: VALSENA@VALSENA.LT

3 TECHNICAL DATA

3.1 Purpose of device

Controller is designed to:

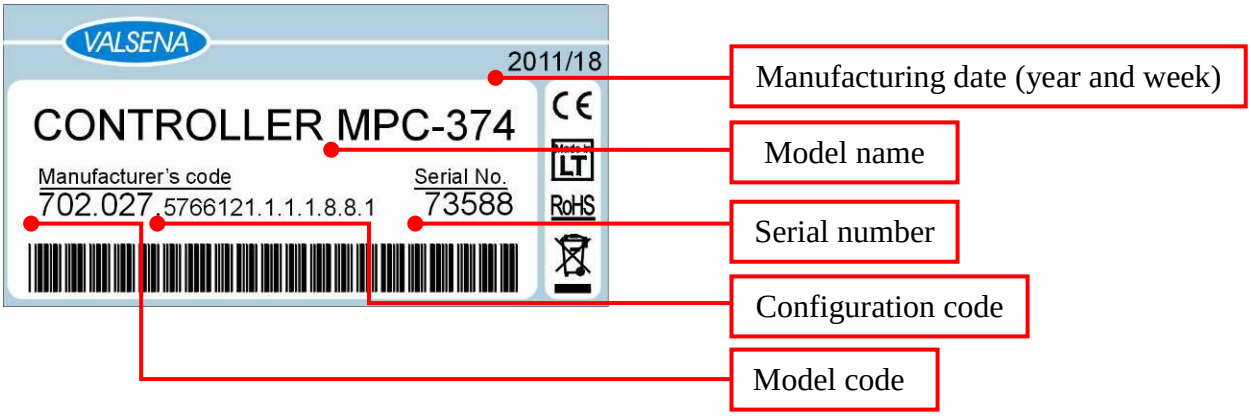
- Read out data from energy resources meters (electricity, heat, water, gas);
- Measure analog (current) signal values;
- Follow status of objects;
- Form control signals;
- Store accounting and measurement data;
- Carry out initial processing of data;
- Generate reports to service personnel at the limit of deviation from the preset parameters and status (discrete signals) change;
- Send all data through GSM/GPRS and Ethernet.



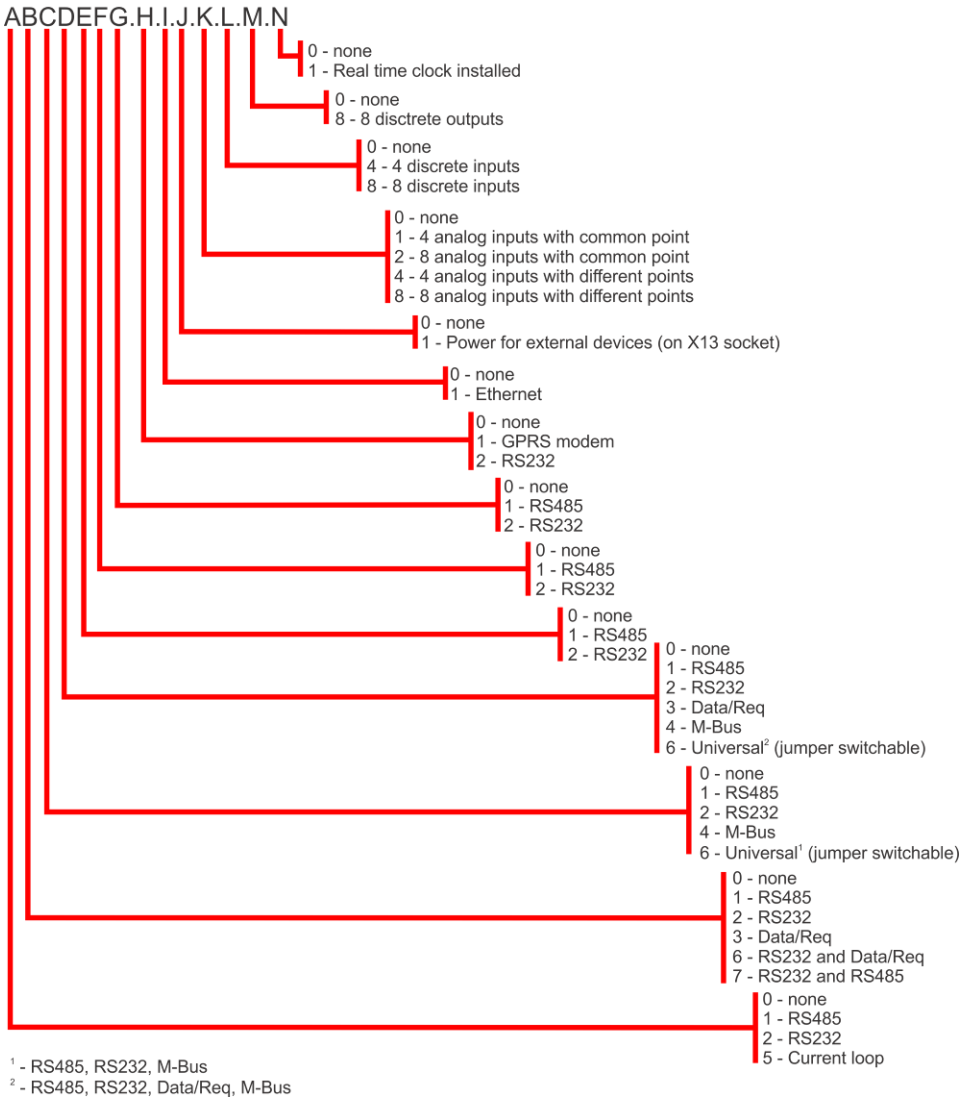
Pic 1 Controller's flowchart

3.2 Information on top label

This label provides common information about controller's and if you will need any consultations from technical center or manufacturer, please let them know full Manufacturer's code and Serial No.



Configuration code provides full information about installed interfaces, supported power and other technical information:



3.3 Communication interfaces

Interfaces	Technical data
RS485	up to 1.2 km, max 32 transivers, speed up to 19.2 Kbits/s
RS232	up to 15m, speed up to 19,2 Kbits/s
Data/Req	(KAMSTRUP) data transfer interface
Current loop	<30V, 14-20mA,up to 6 km, speed up to 19,2 Kbit/s
M-Bus	Up to 8 devices
GPRS	3 band 900/1800/1900 MHz
Ethernet	10/100 Mb twisted pair, up to 100m
USB	Type B, version 2.0
Discrete INPUTS	"Dry contact"
Discrete OUTPUTS	Open contact, up to 50V , up to 500mA
Analog INPUTS	0/4-20mA,0-5 mA ; (250Ω); error ±0,15%

3.4 Protection

Insulation voltage between powe supplier and second circuits	1500 V
Insulated interfaces	B, C, D (see Configuration code)
Analog INPUTS	Yes, insulation voltage 500V
Discrete INPUTS	Yes. Non-insulated from discrete outputs
Discrete OUTPUTS	Yes. Non-insulated from discrete inputs

3.5 Indication

Indication type	LED's
Indicated parameters	• Each discrete input and output status • Power for external devices • Serial interfaces Transfer and Receive • GSM/GPRS modem status, Transfer and Receive • Ethernet Full duplex, 100 Mbs, Transfer/Receive

3.6 Power supply

Power supply	9 ÷ 36 VDC ⎓
Power consumption	Up to 10VA

3.7 Construcition

Mounting	DIN35 rail
Dimensions	277 mm x 128 mm x 50 mm
Tightness	IP20

3.8 Working conditions

Working temperature	From - 25 ^{o}C to + 60^{o}C
Storage temperature	From - 40 ^{o}C to + 60^{o}C
Relative humidity	From 5 % to 95 % non-condensing

3.9 Safety parameters

Safety requirements	Meet requirements LST EN 61010-1:2002
Electromagnetic compatibility	Meets requirements of: LST EN 55022:2000+A1+AC:2002+A2:2003 LST EN 55024:2000+A1:2003+A2:2003 LST EN 61000-4-2+A1+A2:2002 LST EN 61000-4-3+A1:2004 LST EN 61000-4-4:2005 LST EN 61000-4-5:2002+A1:2003 LST EN 61000-4-6:2002+A1:2003

3.10 Other parameters

Archive storage memory	1 ÷ 8 MB (default – 2 MB)
Configuration settings storage without power supply	More than 5 years
Real time clock	Yes (optional)
Firmware loading	Yes. Through RS232 or/and Ethernet and GSM/GPRS. Through USB (under separate order).

4 SUPPORTED FUNCTIONS

4.1 Connection and communication functions

FUNCTION		DESCRIPTION
Routing	TCP/IP <> Serial (Request/answer)	Gateway TCP/IP <> Serial (Request) enables user to read devices data remotely. Controller with device communicates in sequence: Request <> Answer
	TCP/IP <> Serial (Full transparent)	Special transparent protocol, for remote data reading from variuos devices, especially from those, which have special manufacturer‘s protocol. Transparent data transfer protocol enables to use controller particulary with any device irrespective of its protocol.
	TCP/IP <> Modbus RTU	Gateway TCP/IP <> Modbus RTU enables controller to change Modbus TCP/IP protocol to Modbus RTU.
	TCP/IP <> Other protocols	Gateway TCP/IP <> Other protocols enables controller to change Modbus TCP/IP protocol to proprietary protocol.
	Ethernet <> GPRS GPRS <> Ethernet	Routing function let‘s to expand intranet‘s possibilities. Remote user can setup and access any device connected to intranet over GPRS or Ethernet.
Serial interfaces	Modbus RTU server	Modbus RTU server is used to establish local connection.
	Modbus RTU client	This function enables controller to get data from other devices connected to controller locally in modbus RTU protocol.
GPRS/Ethernet	Modbus TCP/IP server	Modbus TCP/IP server is used to establish remote connection with controller.
	Modbus TCP/IP client	This function enables controller to get data from other devices connected remotely in modbus TCP/IP protocol.

4.1.1 Modbus TCP/IP protocol

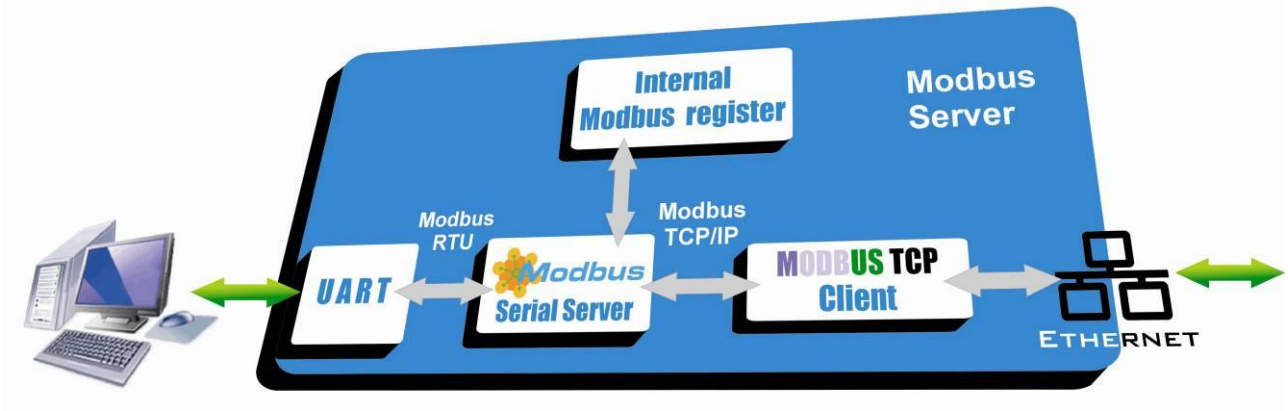
Modbus TCP/IP it is a Modbus RTU adapted for TCP. Modbus TCP/IP use TCP/IP protocol to transfer Modbus data packets over Ethernet network. Modbus RTU packet and all his functions (except Modbus control sum) is inserted into TCP frame and sent over 502 port, with is reserved for use with Modbus. All Modbus TCP/IP clients and servers query and accept Modbus data over 502 port. Data security is guaranteed by TCP (Transport Control Protocol). IP (Internet Protocol) takes care of addressing and data transferring.

Controller is using Modbus protocol for direct data exchange with PC, by using Ethernet.

Controller can work as Modbus Server and as Modbus Client at the same time. Modbus Client sends query to Modbus Server, the Server makes decision, to answer in to query (read/write data), or to send it to other Server.

4.1.2 Modbus Server

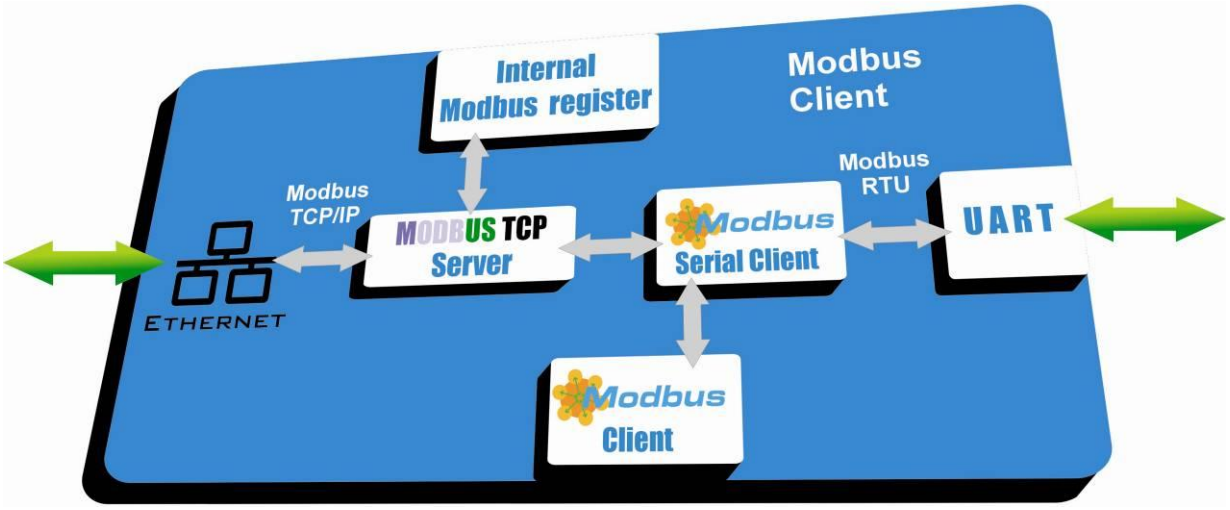
Controller use Modbus RTU protocol to communicate with client's PC. PC, over UART interface query Controller, with Modbus Server protocol. The Modbus Server make decision what to do with query, and query internal Modbus Server register or send query to next Server and so on…. Query contains TCP port, MAC address (every controller has unique MAC), controllers IP address. Then query is sent over Ethernet. Remote Server over Ethernet returns answer to Controllers Modbus Server.



Pic 2 Scheme, how controller sends data in Modbus Server mode

4.1.3 Modbus Client

The query received over Ethernet in to Controllers Modbus TCP Server, which contains TCP port, Clients IP and MAC address, are redirected to internal register of Modbus Server or to Modbus Serial Client. Modbus Serial Client answers to query, sends it to some UART interface, or redirect to Modbus client (temperature, pressure or other sensor, Mbus meter or other device).



Pic 3 Scheme of controller in Modbus Client mode

4.2 Measuring functions

FUNCTION		DESCRIPTION
Analog inputs	Measurement	Controller periodically 0.1 second intervals measures analog signal in default measurement scale of electrical signals (Voltage, current, resistance). To eliminate fluctations in measured signal controller uses time and amplitude filters.
	Conversion	Measured analog signal is converted into physical parameter value.
	Min/Max alarm limit	Accepted values controller compares with user-defined min/max alarm limit. If parameter value goes out of range or comes back (min/max alarm limit) deviation (event) fixed. For more information about events and alarms see chapter **4.4.**
Discrete inputs	Discrete IN purpose	Can be used for discrete IN state follow either as impulse meter or alarm signal.
	Current state	Controller periodically tracks all discrete inputs‘ status and during change on each channel it stores current changed state with real time value.
	Impulse meter	Each discrete channel can be used as impulse meter. All summed impulses are stored in controller’s memory. Physical value is converted from impulse quantity number multiplied by multiplier.
	Alarm state	By discrete channel‘s state (Open, Close, Both cases) function initiates alarm.
	Archive state	By discrete channel‘s state (Open, Close, Both cases) input can be written to archive. For more information about archive see chapter **4.3.**

Discrete outputs	Control impulse	Controller has posibility to send control impulses (variable control impulse duration) from every discrete output. Control signals can be initiate by user or can be programmed to send control signals if event occured.

4.3 Archive functions

FUNCTION	DESCRIPTION
Analog inputs	Analog input archive function stores all analog channels physical parameter value with a real time stamp.
Heat accounting	Heat accounting archive consist records of current heat meter parameters with real time stamp.
Gas accounting	Gas accounting archive consist records of current gas meter parameters with real time stamp.
Water accounting	Water accounting archive consist records of current water meter parameters with real time stamp.
Electricity accounting	Electricity accounting archive consist records of current electricity meter parameters with real time stamp.
Impulse	Impulse meter archive consists of discrete channel‘s number, total impulse count and real time stamp.
Discrete IN/OUT	Discrete IN/OUT archive consists of discrete channel‘s number, discrete channel‘s state and real time stamp.
Events (Alarms)	When permitable deviation is fixed, event occurs. Event can occur in two cases: ✓ Analog signal cross defined limits or comes back, ✓ Changed state of discrete signal. ✓ Satisfied one of the conditions in Alarm limits (See chapter **4.4**) Events archive field consists of time stamp, identifier, event source, deviation type and deviation value.
Diagnostic	Diagnostic or user archive store data about controller actions (reset, configuration change, time change, re-programming, archives delete and etc.)

4.4 Alarm functions

FUNCTION		DESCRIPTION
Alarms	Ethernet/GPRS report	When deviation fixed from set limits and event occured, controller itself connects to server and sends it‘s factory number, IP adress and identifier about deviation. After that, we recommend to connect to controller and read all information about deviations.
	SMS report	Controller has possibility to send SMS text messages on discrete channel‘s alarm state change or different events to several phones numbers. SMS message text can be entered for each discrete channel‘s state individually (ON and OFF) and individual text for different event code.

4.5 Meters and data collecting functions

FUNCTION	DESCRIPTION
Heat accounting	Controller can read data from heat meters: Meterman III, Multical 601, Elkora, FP-93, Supertrol II. If some meters are not supported – additional protocols can be implemented
Gas accounting	Controller can read data from gas meters: Unigas, Roots PTZ, TC-90, Uniflo. If some meters are not supported - additional protocols can be implemented
Mbus meters (water, electricity)	Mbus meters can be connected directly to Mbus or through Mbus/RS232 coverter. Controller has automatic device detection function.
Heat regulators	Controller has possibilty to read data from “Danfoss comfort” regulators ECL300 with all it‘s features.

4.6 Time functions

FUNCTION	DESCRIPTION
Real time clock RTC	Real time clock function in controller is used to keep track of current time. It‘s necessary to have real time records for alarms, reports, meters sent data and archives.
Time synchronization	3 types of time synchronization is supported: ✓ Using SEL-2401 Satellite synchronized-clock, ✓ GSM time, ✓ NTP (Network Time Protokol) server .

4.7 Other functions

FUNCTION		DESCRIPTION
Firmware & Setup	Locally	Firmware in controller can be updated locally, through UART or USB.
	Remotely	Firmware in controller can be updated remotely, over Ethernet and/or GSM/GPRS
Ethernet utilities	Firewall	Device has firewall function, incoming IP filter. Only allowed IP‘s can connect to controller.
	Ping	Controller sends ping message to IP adress, to comfirm it‘s reacheability.
Data reading	Modbus register field formation	User has possibility to form modbus register field manually. In defined registers data can be read only from formed modbus register block.
Limits verification	Modbus register check	Controller has possibility to check limits for any register (it can be analog value, meters data, time records, archives and etc.) Alarm limits, Data format (char, int, long, float), alarm conditions (over limit, under limit, equal, inside limits etc) can be defined for every register. Every alarm limit has own event code, which is used in diagnostic and for sending reports.

5 INSTALLING CONTROLLER

5.1 Fixing device

The device is prepared for fixing on DIN rail. Loosen the screws on both sides of controller's encloser. First hang on the rail the top part of enloser, then gently pressing down evently push the device to the DIN rail and tightly vice locking screws on both sides of device.

5.2 Connecting

Before starting be sure, that controller and all pheripherical devices, that you are going to connect over serial interfaces (RS232, RS485, Current loop, Data/Req, MBus and etc.), Discrete IN, Discrete OUT and Analog IN channels are switched off.

Connecting the polarity-sensitive interfaces – carefully follow the notations on contacts.

If you are connecting interfaces, that use separate channels for data transmission (TX) and reception (RX) – switch them, that TX from one device has go to RX from another, and RX to TX. If you connect TX to TX and RX to RX – data will not be send and received through these interfaces.

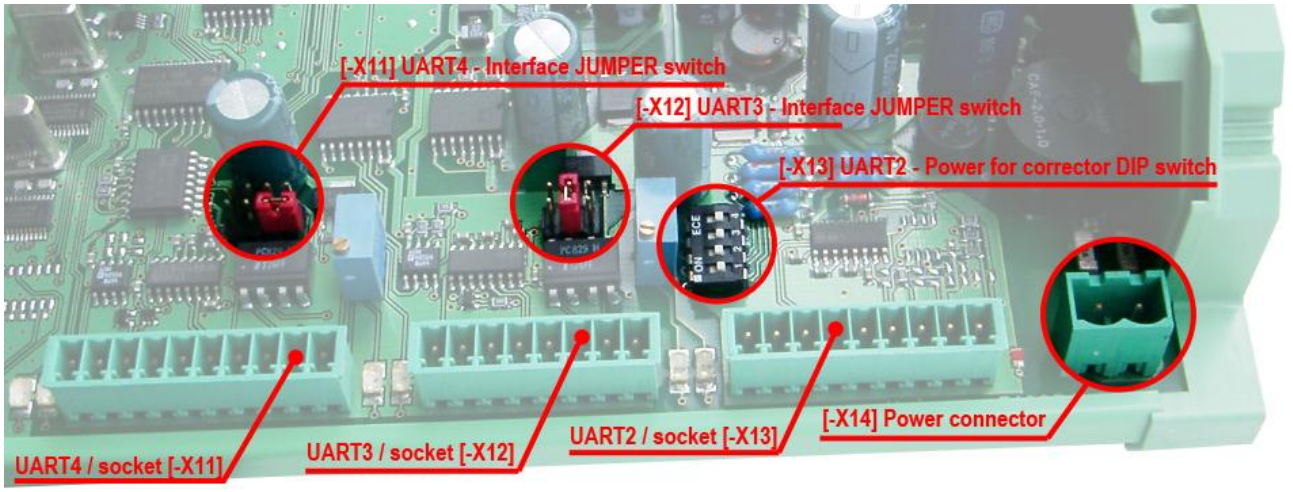
First turn ON the power on peripherical devices, and only when they boots-up – turn ON controller's power.

5.3 Switching

Devices has special interfaces which using jumpers can be swithed between few prepared interfaces – we call them Universal (it's an optional interfaces see "Manufacturer's code" and explanation on chapter **3.2** to find is your device support Universal interfaces**)**.

And some devices has Power for external devices – we call them "U Corrector" (it's an optional enhancement see "Manufacturer's code" and explanation on chapter **3.2** to find is your device support Universal interfaces**)**.

To find installed switches, unscrew 4 scews, that are keeping transparent front cover and take it off. See **Pic 4** to easier find installed switches on your controller

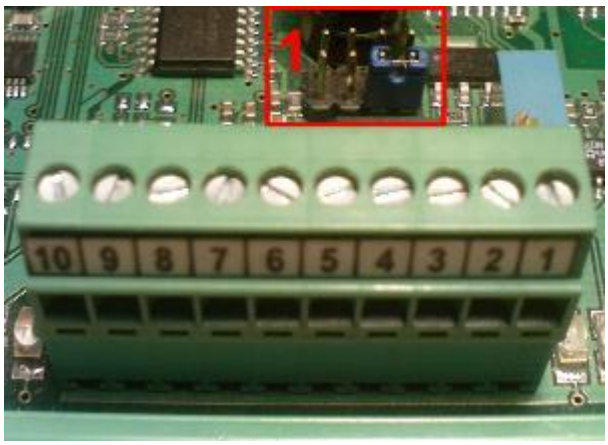


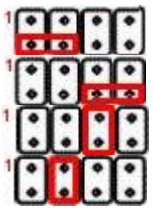
Pic 4 MPC-374 jumpers and switches

5.3.1 Universal interfaces

To change interface you need to switch jumper to correct posision (see pictures **Pic 5)**

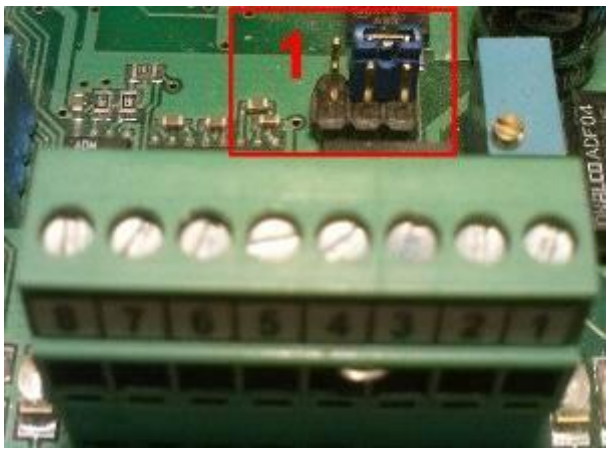
To setup UART4 / socket [-X11]

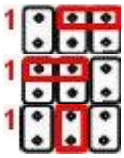




RS485
RS232
Data/Req
Mbus

To setup UART3 / socket [-X12]





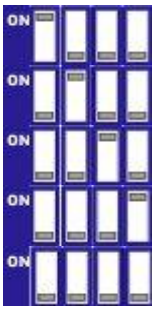
RS485
RS232
Mbus

Pic 5 Jumper posisions for Universal interfases

5.3.2 Power for external devices

“U Corrector” maximal supported current is 20 mA. Power for external device connection use UART2 (socket [-X13]) one wire connect to [GND] and other to [+U correct]. Device can supply 3.6/5/6/8/10 voltage. Set DIP switch into correct posisions to set voltage, that you need

(see **Pic 6**).



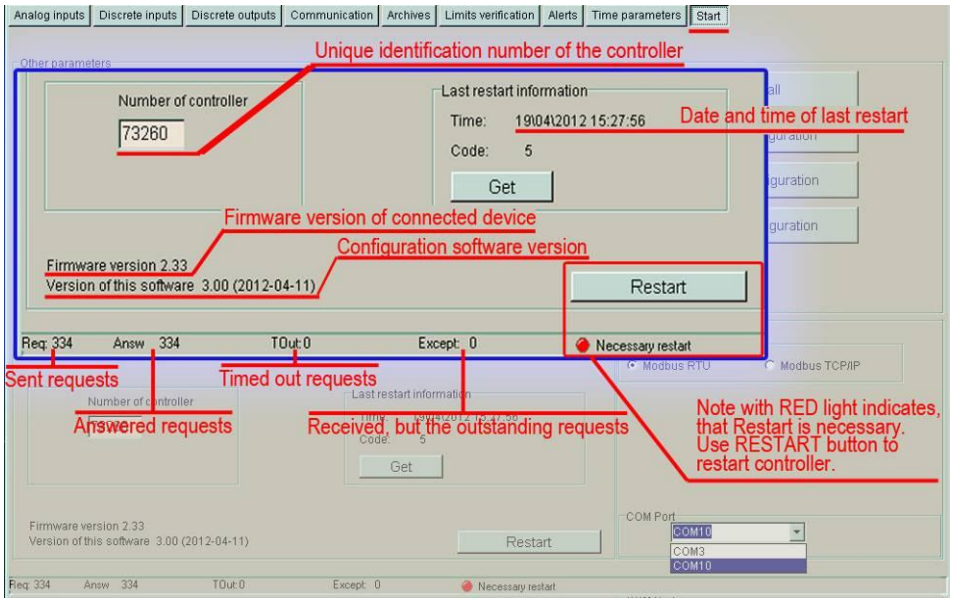
Pic 6 Power for external device (DIP switch)

6 BASIC OF VALSENA'S SOFTWARE

6.1 Operating principles

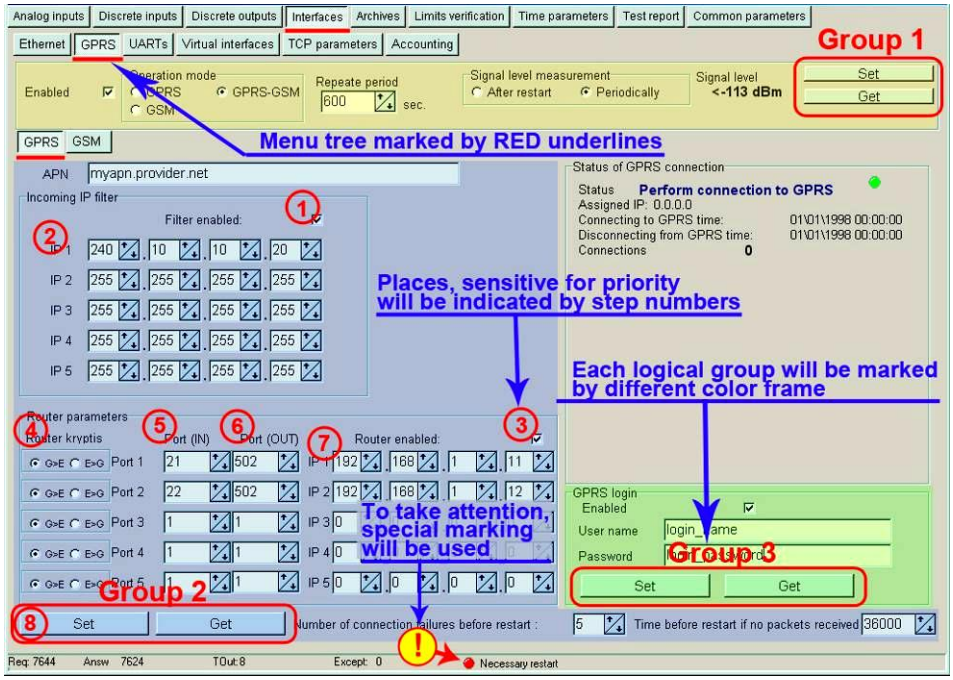
Valsena's made configuration program contains only basic functions of controller and his main purpose – high level administration (configuring and monitoring).

In main window you can find all basic information about controller - controler's unical number, firmware version, version of configuration program, last restart time. In status bar - amount of sent / received / time outed / exepted (but not answered) requests and notifications. If you need to restart controler "Necessary restart" will RED light, this means you have made some critical changes and to take action controller need to be restarted - restart by pushing "Restart" button on "Start" tab (see **Pic 7**).



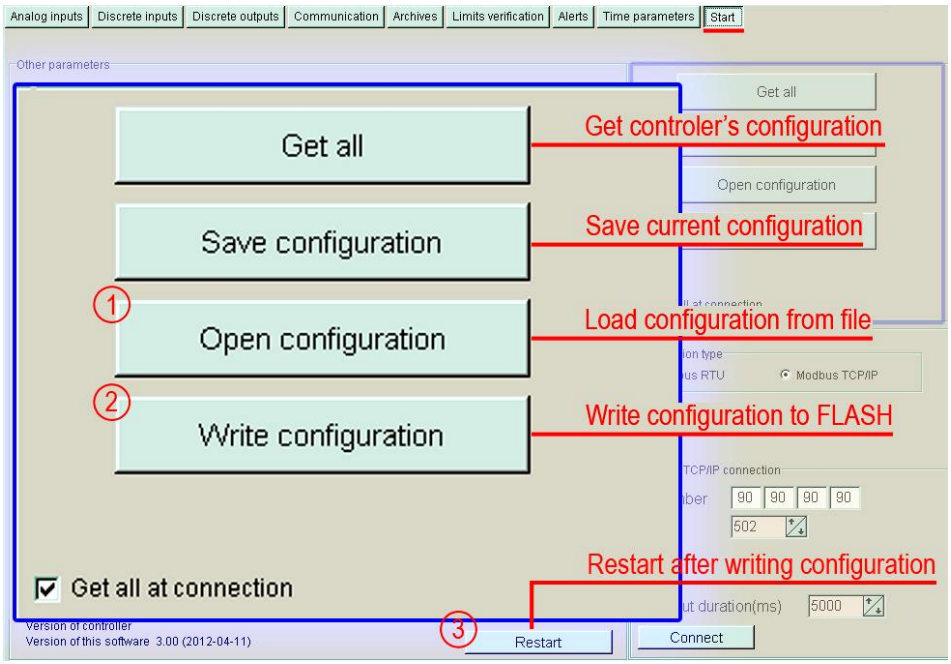
Pic 7 Common information [Start]

Program is prepared for slow speed GPRS connection. For that purpose you can Get and Set data of specific group, that you need to view or change. In each window you will find into logical groups grouped elements with "Get" and "Set" buttons on each group – use them to Get and Set data of that specific group (data of other groupes will not be taken or written) (see **Pic 8**).



Pic 8 In document used markings

If you have high speed connection, in tab "Start" select check box "Get all at connection" or use "Get all" button to read all data (see **Pic 9**).



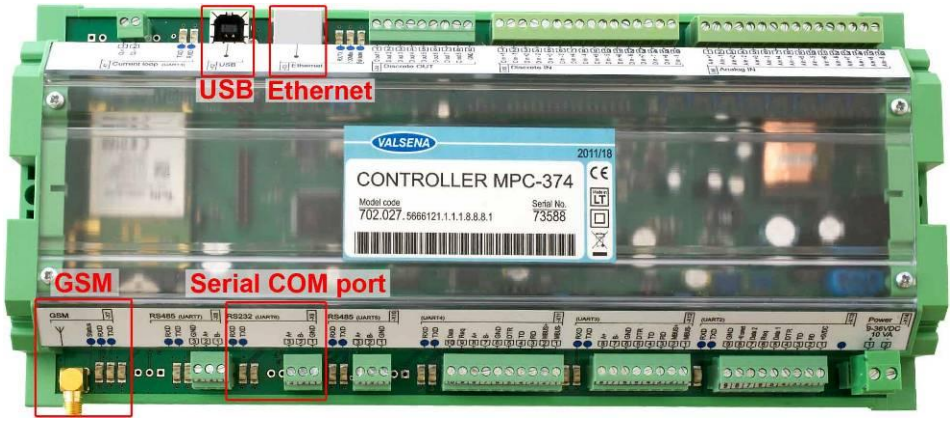
Pic 9 Preparing for high speed connection

6.2 Before connecting

To communicate with controller, you need to prepare cables and correctly setup your computer. Be sure your computer stands at least minimal requirements.

Depending on type of controller you can connect through RS232, Ethernet, GPRS or USB (see **Pic 10**).

Every controller has it's own connection default values and can be connected only using them.



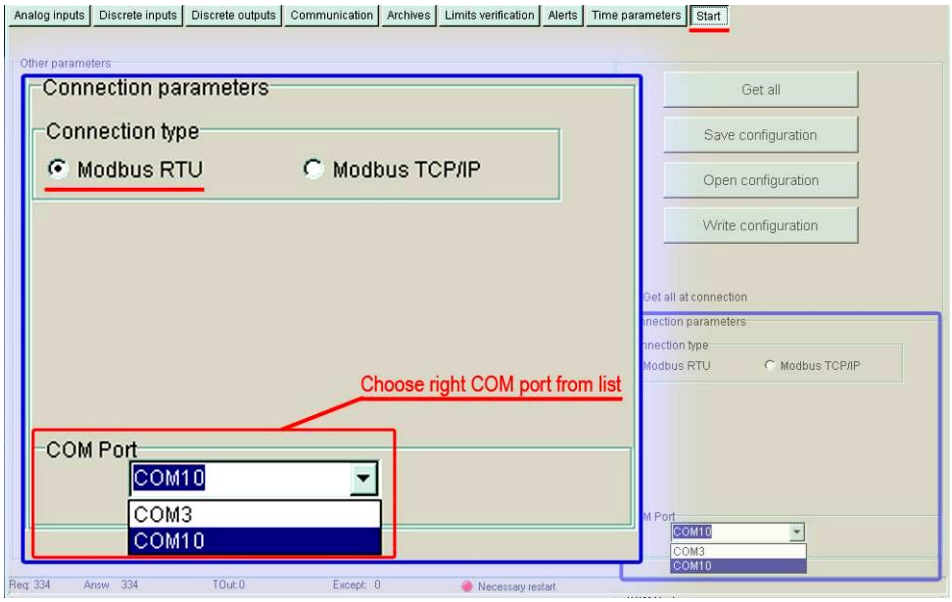
Pic 10 Connection interfaces

6.3 Connecting to controller over serial COM (device) port [Start]

Before connecting to controller over RS232 you need to choose correct RS232 cable, configure serial port and find number of serial port, that is connected to controller's serial com port. To establish connection, you need:

In "Start > Connection parameters" you need to choose Modbus RTU connection type.

Select Com port, that you will use for connection with PC. If connection fails, recheck cabling and COM port (see **Pic 11**).



Pic 11 Connecting over COM port

If your PC don't have com port, you can use USB-COM adapter to connect from PC's USB to

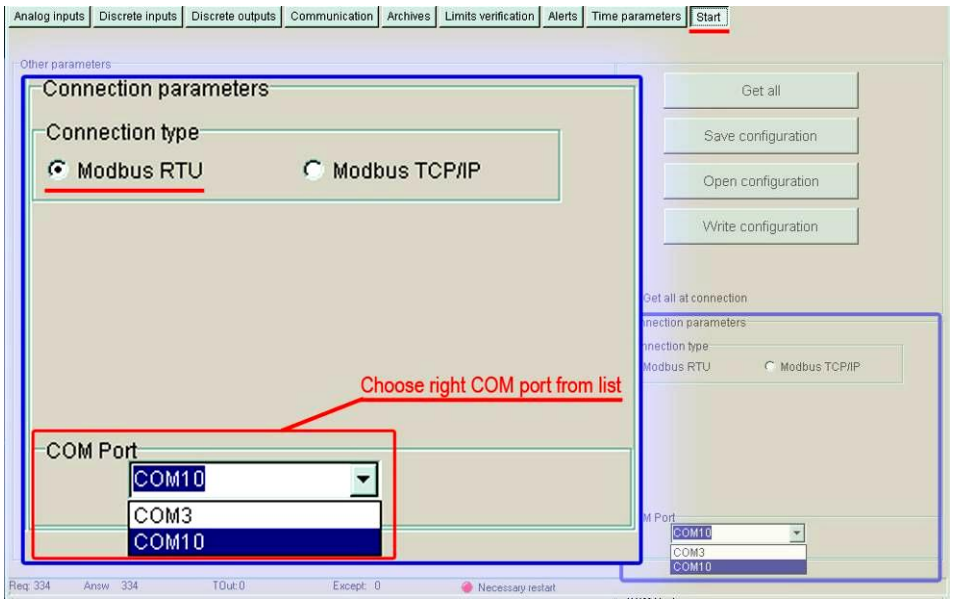
controller's COM port.

6.4 Connecting over USB (device) port [Start]

Connect to controller over USB port (see chapter 3.2 to find is USB interface installed) you need to choose correct USB cable. If you are using controller for the first time and after installing software you can't establish connection with device – try to manually install drivers from program folder or download driver from our product support page: www.valsena.lt/en/support.htm. Valsena controller inside has USB/COM converter. You just need to install driver on your PC. See chapter 9.7 (Valsena USB driver installion) guide, about how to install driver.

Connecting to controller through USB – virtual COM port, you need to choose Modbus RTU connection type.

Select Com port, that you will use for connection with PC. If connection fails, recheck cabling and COM port (see **Pic 12**).



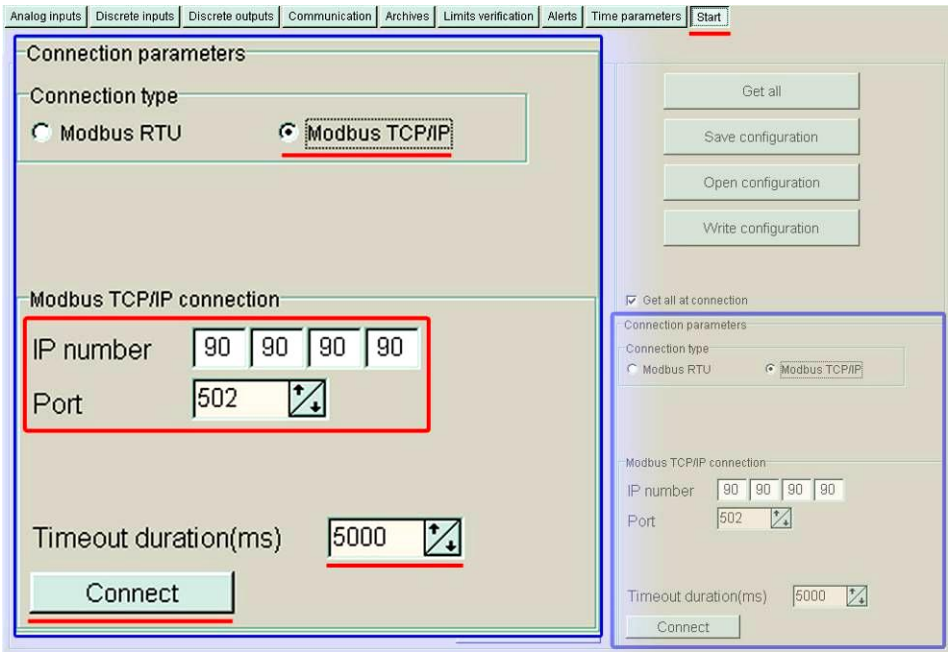
Pic 12 Connecting over USB

6.5 Connecting over Ethernet and GSM [Start]

To connect with controller over Ethernet (if Ethernet interface is installed, see chapter 3.2) you need to correctly setup your computer's IP address (see chapter 9.8), to access controller (if you are connecting for the first time, see chapter 9.2- default values). No matter if you use controller over network (switch, hub, etc.) or connecting directly to PC, controller automatically detects cable wiring.

Five steps to connect:

- You need to choose Modbus TCP/IP in “Connection type” area.
- Every controller has unique IP address which will be used to connect to device.
- By default controller is set to 502 Port (this is system standard Modbus TCP/IP port), change it if you need.
- If you have slow connection (for example you are using GPRS connection or etc.) set timeout time in msec, range from 400 to 20.000 (recommended – 3.000 ms).
- By pressing “Connect” you will be connected to controller. If connection fails, recheck cables, communication type, IP address and try to connect again (see **Pic 13**).



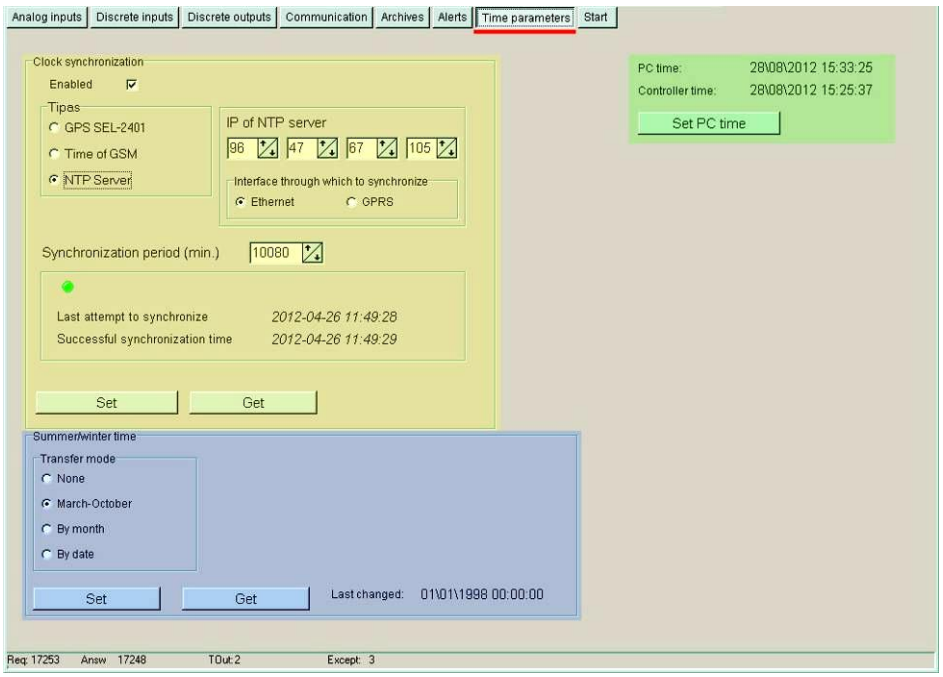
Pic 13 Connecting over Ethernet and GSM

7 SETTING UP

7.1 Set up clock [Time parameters]

In section “Time parameters” you will see current system (controller’s) time and three groups of settings:

- Clock synchronization - yellow zone (see Pic 14)
- Summer/winter time (day light saving) – blue zone (see Pic 14)
- Set current PC time – green zone (see Pic 14)



Pic 14 Groups of time parameters [Time parameters]

7.1.1 Set PC time

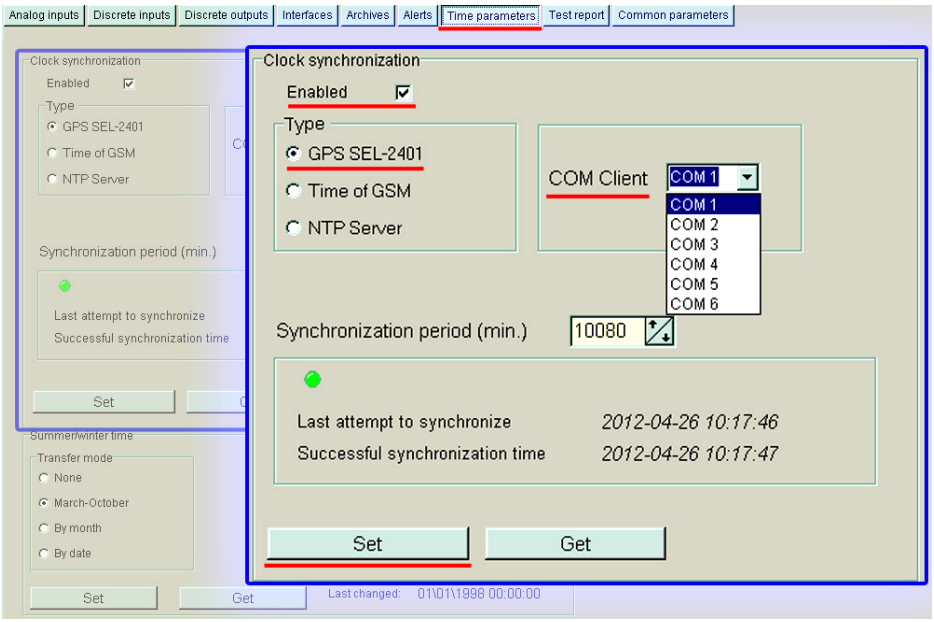
To synchronise PC and controller - press “Set PC time” button (see Pic 15).

Pic 15 Synchronise PC and controller’s time

7.1.2 Clock synchronization

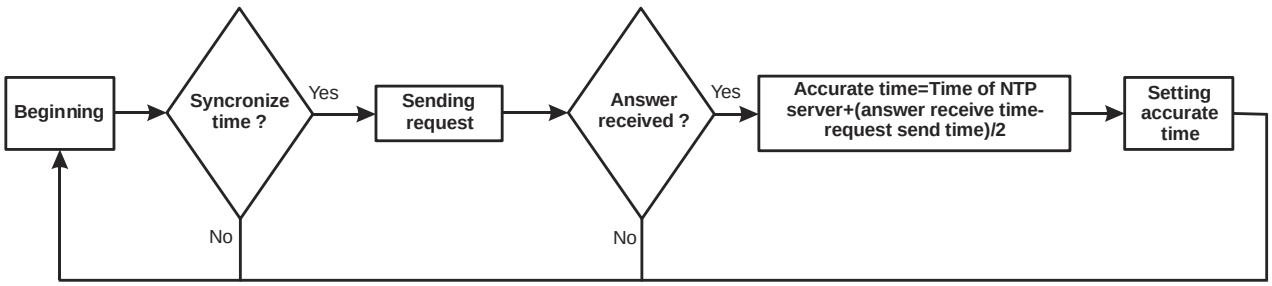
Controller has possibility to synchronize clock with GSM provider, GPS, local or public SNTP server.

- GPS – using SEL-2401

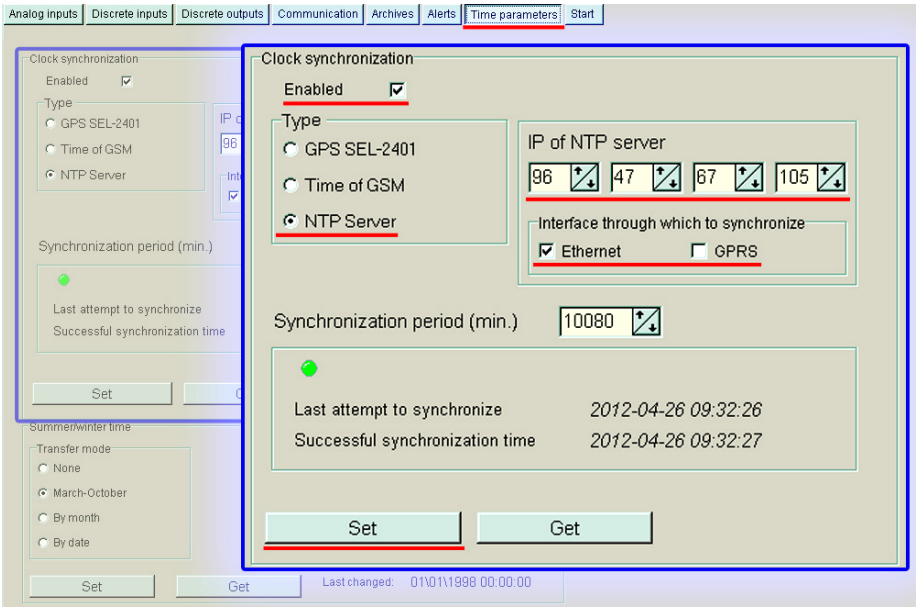


Pic 16 Clock synchronization with GPS

- GSM – time synchronization from GSM provider – every time when controller connects to GSM network
- NTP Server – you can add IP of local SNTP server or use public. Synchronization will be made in set periods of time.



Pic 17 NTP time synchronization algorithm



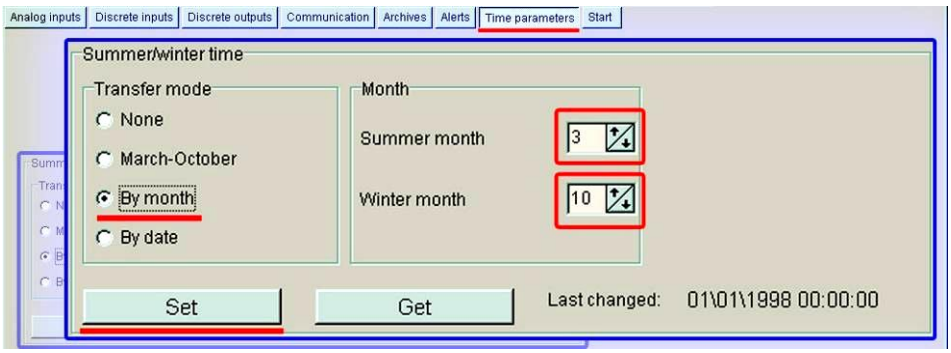
Pic 18 Clock synchronization with SNTP server

7.1.3 Automating day light saving - summer / winter time

None – to disable this function

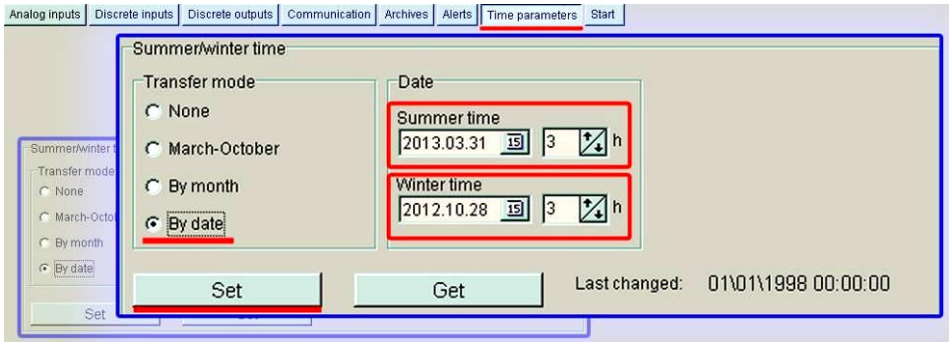
“March – October” this is common time changing parameter’s for most countries. If you select this option, summer time will be set at 3:00AM on the last Sunday of March and winter time – at 3:00AM on the last Sunday of October.

If you neet to change time on other month – use option “By month”, in that case time will be changed at 3:00AM of the last Sunday of your set months. If you will set months 3 and 10 - system time changes coincide with time changes in “Mach – October” option (see **Pic 19**).



Pic 19 Day light saving time “By month” [Time parameters]

Controller also has possibility to change time in specific day – option “By date”. In that case you can set exact date ant time for time changes (see **Pic 20**), but this option will not repeat next year. This is one time changes setup!



Pic 20 Day light saving time "By date" [Time parameters]

7.2 Analog measurements [Analog inputs]

Controller performed functions:

- Analog signal (current) measurement,
- Filtering,
- Conversion into physical parameter value (Current value),
- Storing Data (average value during a set period),
- Alarming in case of deviation,
- Calibration.

7.2.1 Configuration

Parameters:

- Channel usage,
- Current range,
- Filter averaging duration,
- Conversion into physical parameter range ("Min. value" and "Max. value") ,
- Alarm filter time,
- Alarm limits (upper and lower),
- Alarm case (Out of range, Out & return to range).

Controller periodically (analog measurement perod 0.1 seconds) measures current of all Analog channels and converts to physical value. User can chose from three (0-20mA, 4-20mA and 0-5mA, with accuracy 0,005mA) measurement ranges (see **Pic 21**).

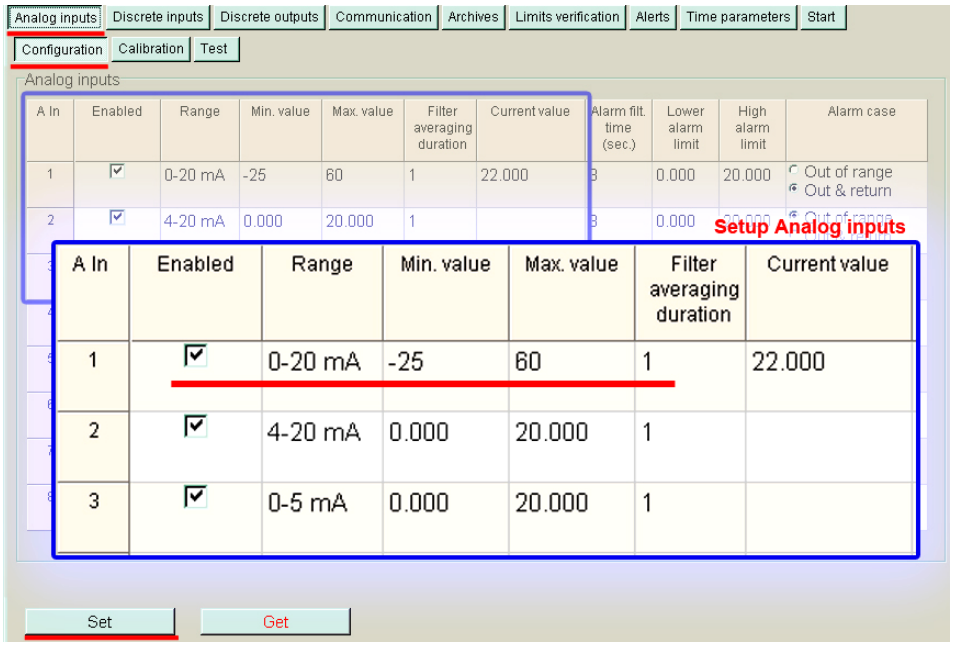
From current, using "Min. value" (float) and "Max. value" (float) range (formula: $\text{Currnet value} = Readed\_current * \frac{"Max.value" - "Min.value"}{Max\_current - Min\_current} + ("Min.value" - Min\_current * \frac{"Max.value" - "Min.value"}{Max\_current - Min\_current})$) is recalculated physical value.

Measured values can be filtered. For filtration is used liner filter – calculated average value of

analog measurements. Filter is configured by setting averaging duration in seconds. Averaging duration can be set from 0 to 2s, with 0,1s discretion (see **Pic 21**).

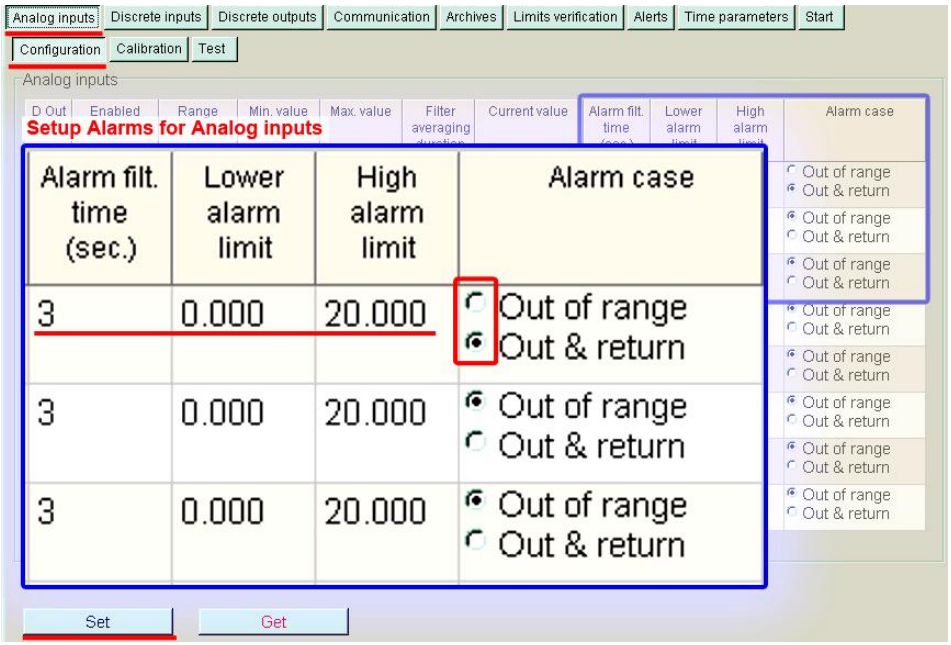
For example, if you set 1,5s averaging duration, then current value will be equal to the last 1,5s average value.

If averaging duration is set to 0, filtration will not be done.



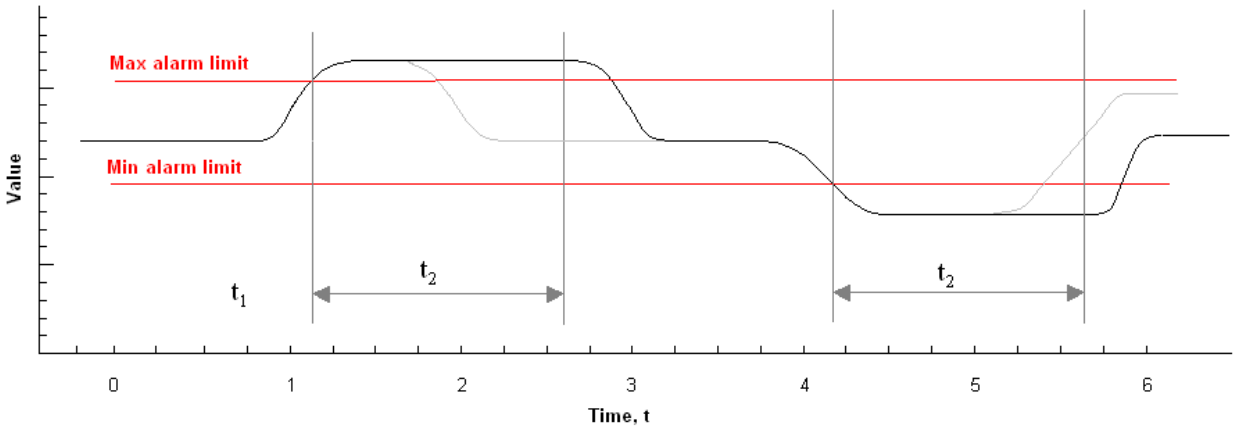
Pic 21 Setup Analog inputs

Current values, controller compares with user-defined minimum and maximum signal values. In case of deviation from minimum and maximum values that extends user-defined Alarm filtering time in seconds (see **Pic 22**) report is initiated about deviation.



Pic 22 Setup Alarm for Analog inputs

If the signal returned between minimum and maximum limits within user-defined Alarm filtering time (see **Pic 23**), notice is not initiated. Deviation filtering time (s) can be from 0 to 15 sec.



Pic 23 Signal deviation from minimum and maximum value limits.

In case of deviation controller initiates report via Ethernet and/or GSM/GPRS. Events about deviation is fixed by user-defined time intervals, when signal goes “out of range” and “out & return” case (see **Pic 22**). Also controller stores analogical measurement’s average values in user-defined periodicity.

7.2.2 Calibration parameters

Performed function:

- Calibration of Analog-to-Digital Converter (ADC),

- Saving and Loading ADC calibration data,
- Manualy adding of calibration data.

All new controllers are calibrated by manufacturer.

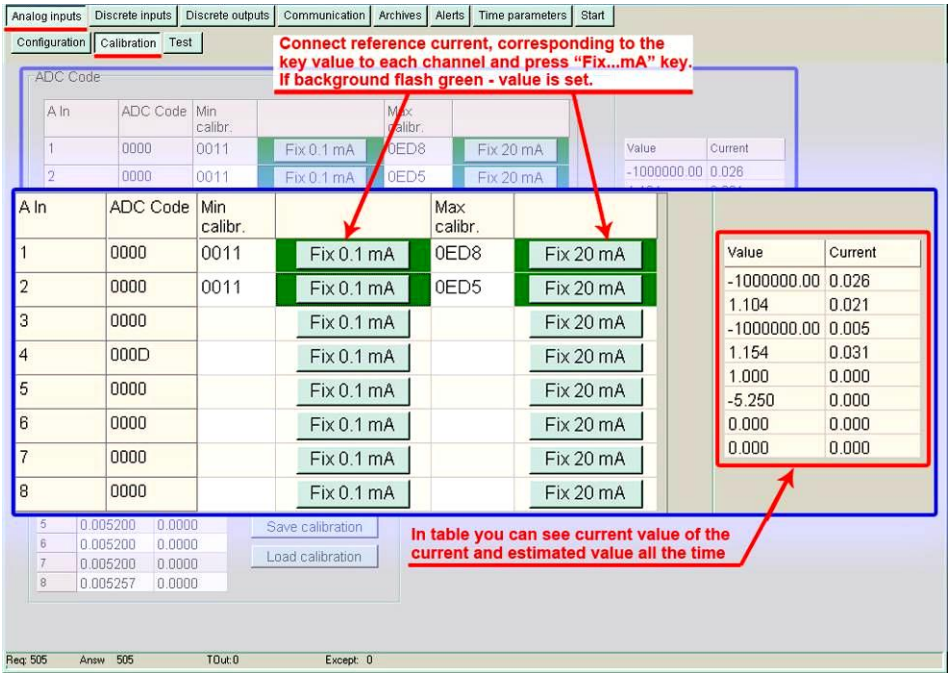
Calibration data are stored in flash and can't be lost by firmware update or other program changes.

Certification can be performed only by specially trained professionals, who use methrologicaly tested equipment.

If for any reason you need to change calibration data, we highly recommend to save calibration data to PC before performing calibration.

ADC calibration are performed by liner equation method. Data can be entered manual, loaded from file or calibrated using methrologicaly tested equipment.

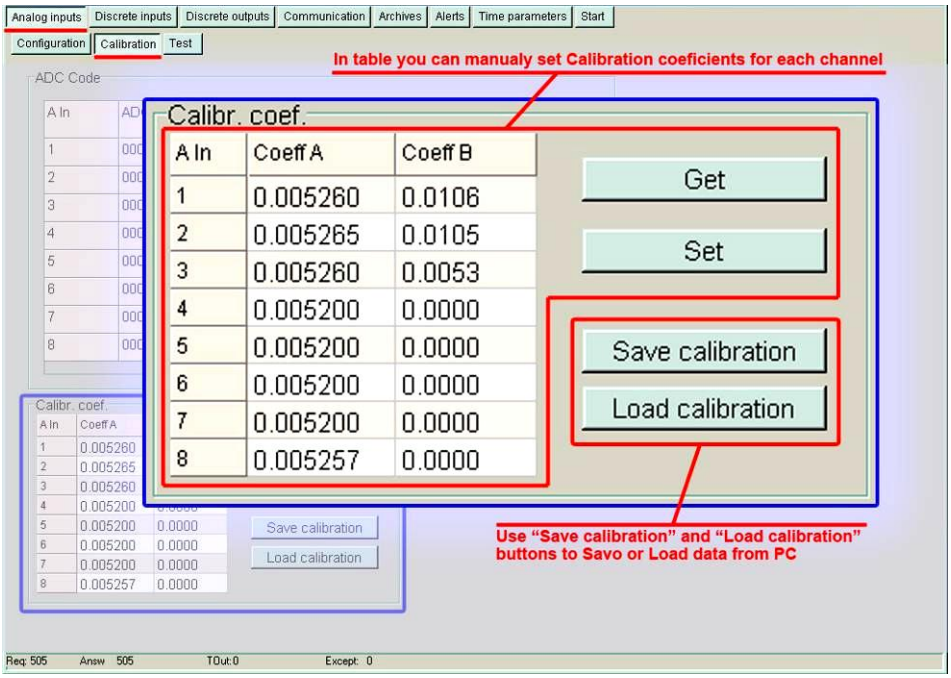
To calibrate with reference current, open screen "Analog inputs" > "Calibration", connect for the beginning 0.1mA current to first channel on Analog inputs (the current value you can see on column "ADC Code") and press "FIX 0.1 mA" button (see **Pic 24**). Background of color, under the key "FIX 0.1 mA" will change to green and lower calibration value will be seen in column "Min calibr.". Then connect 20mA current and press "FIX 20 mA" button. Background of color, under the key "FIX 20 mA" will change to green and high calibration value will be seen in column "Max calibr.". Repeat that on other Analog Inputs.



Pic 24 Calibration of Analog Inputs

You can save calibration data to PC and load saved data from PC to controller. Or enter data to

each channel manualy. To store entered data, press „SET“ key (see).



Pic 25 Manual calibration of Analog Inputs

7.3 Discrete measurements [Discrete inputs]

Performed functions:

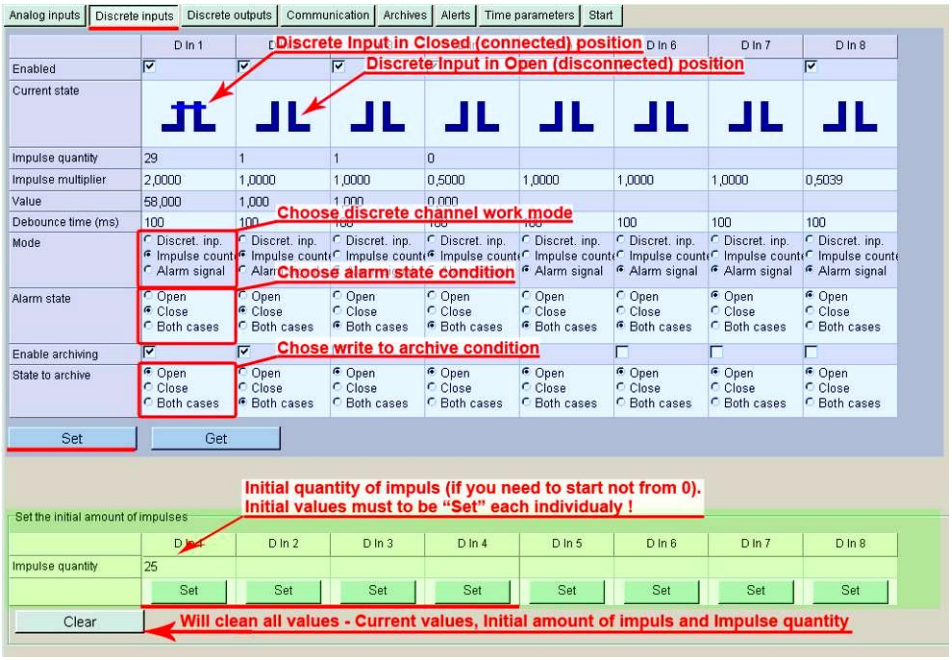
- Tracking of discrete signal status;
- Filtering from discrete signal fluctuations;
- Discrete signals changes storaging in archives;
- “Alarm” status (as events) fixation;
- Impulse aggregations and storing in archives.

Configurable parameters:

- D In channel usage;
- Debounce filtering time;
- Impulse counting mode;
- Impulse multipier (just to view multipliered impulse quantity, this parameter will not effect to Archive stored value);
- “Alarm” state (None (disabled), Input open, Input closed or in both cases);
- Archive state (None (disabled), Input open, Input closed or in both cases).

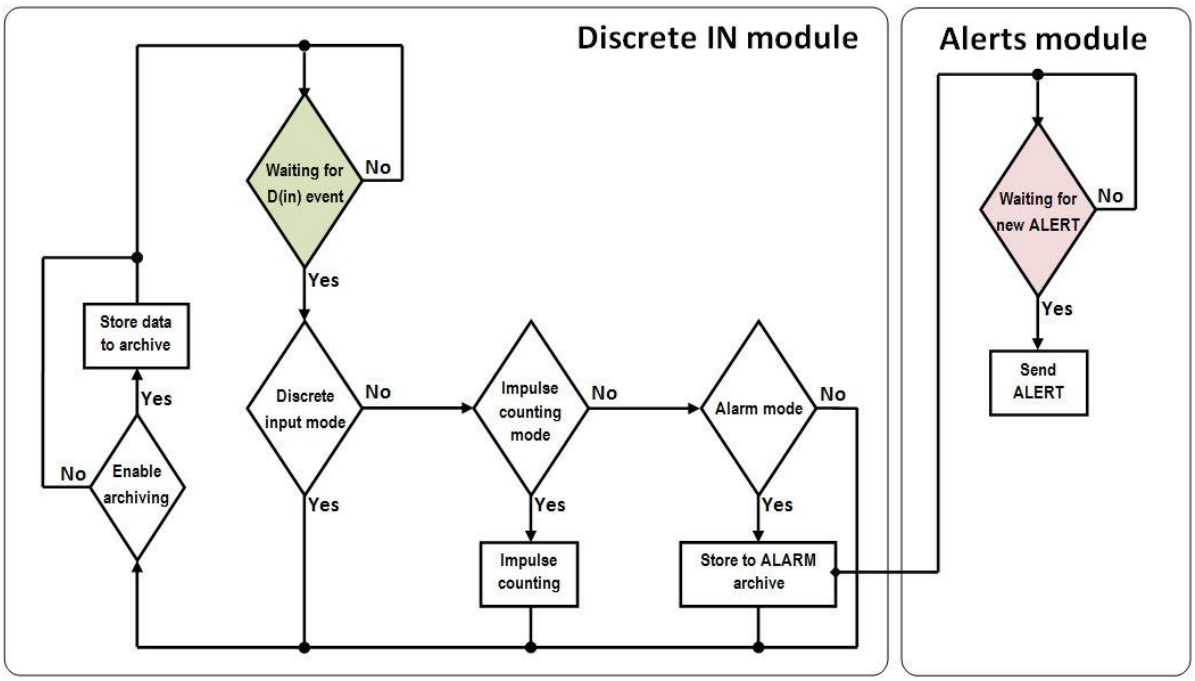
Current discrete channel’s states are shown by corresponding pictures Open and Close (see **Pic 26**). Using check box, up to the “Current state” pictures, you can Enable or Disable discrete channels. Discrete signal meanings are filtered by user-defined debounce times (debounce time

value can be set from 1 to 1000ms).



Pic 26 Discrete inputs configuration [Discrete inputs]

Controller periodically tracks status of all discrete channels and in case of changes takes action (see **Pic 27**).



Pic 27 Discrete IN channel data flow schema

Discrete channels can be used as impulse meters (see in Blue color marked group in **Pic 26**). With enabled impulse mode, counted impulses are periodically storred in to Impulse achive with a real time record (to setup period see chapter **7.15** Data storing to archive [Archives]).

Impulse meters can be configured to start from any initial amount of impuses. To do that – enter initial amount of Impuls for "Discrete IN" channel and Set it to controller (see in Green color marked group in **Pic 26**).

In some cases is needed to have changed values (not counted Impulses), to do that use "Impulse multiplier" (range from 0.001 to 1000) (see in Blue color marked group in **Pic 26**). For example, if Impulse meter takes impulses from water meter after each Liter of the water and you need to calculate cubic meters of the water, so you add "Impulse multiplier" = 0.001 and result of Current value will have value in cubic meter's dimmension.

With enabled "Alarm state", discrete channels can be used to indicate Alarm status and depending on Alarm status condition (Open, Close or in Both cases), controller will make a record to Event archive (see chapter **7.15** Data storing to archive [Archives]) and Alerts module will send warning message (see chapter **7.14.3.1** SMS Alert on Discrete Alarms).

If you just need to view status of Discrete channels select Discrete input mode. Like in other modes, by enabling archiving you can store changes of discrete channels to archive (choose when to save – on Open, on Close or in Both cases) how to manage Events see chapter **7.15** Data storing to archive [Archives], and to view see chapter **8.6** Discrete inputs log [Archives>Values>Discrete imputs].

Alarm mode will not work if "Impulse counting" mode is enabled!

"Clear" button will clear current Value, Initial amount and Impulse quantity fields – use it carefully.

7.4 Discrete outputs [Discrete outputs]

Performed functions:

Turning of relative Discrete Outputs ON and OFF over GPRS, Ethernet;

Archiving time of changed Discrete outputs states and new state;

Storing states to energy independent memory and restore their last status, after power-on.

Configurable parameters:

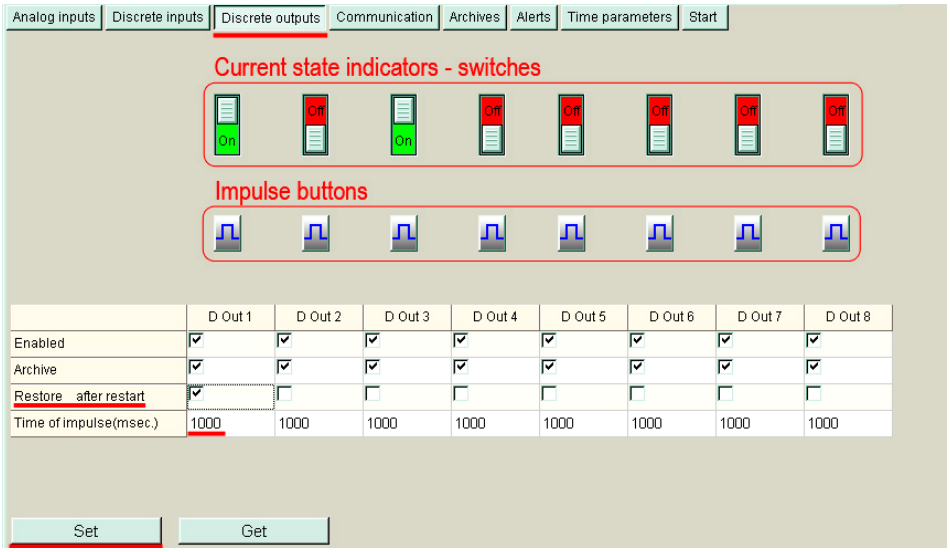
Enabling/Disabling Discrete Output usage;

Changes archiving Enabling/Disabling

Enabling/Disabling restoring of last state after power off;

Impulse duration in ms.

On/Off buttons are showing current stage of each Discrete OUT channels. By clicking on button, you can permanently change status, or using Impulse buttons - send impulse of given interval (see **Pic 28**).



Pic 28 Discrete outputs usage [Discrete outputs]

By using check box you can Enable/Disable each Discrete Out channel and changed status archiving. If you need to have last Discrete Out channel stage, even after restarting or power off – select “Restore after restart” (for example see Pic 28 , “D Out 1” channel), then last stage will be saved in energy independent memory and restored after restart.

Controler can make user-defined duration control impulse. In section “Time of impuse” set duration, value can be from 100 to 20 000 msec., (see Pic 28).

If some parameters was changed - press “Set”, to send data to controller.

7.5 USB (device)

USB (device) interface is not listed in Manufacturer’s code, but is installed by default. This interfaces is used for local configuration (how to connect to controller, using USB (device), see chapter **6.4**).

7.6 Ethernet

Ethernet interface is used for:

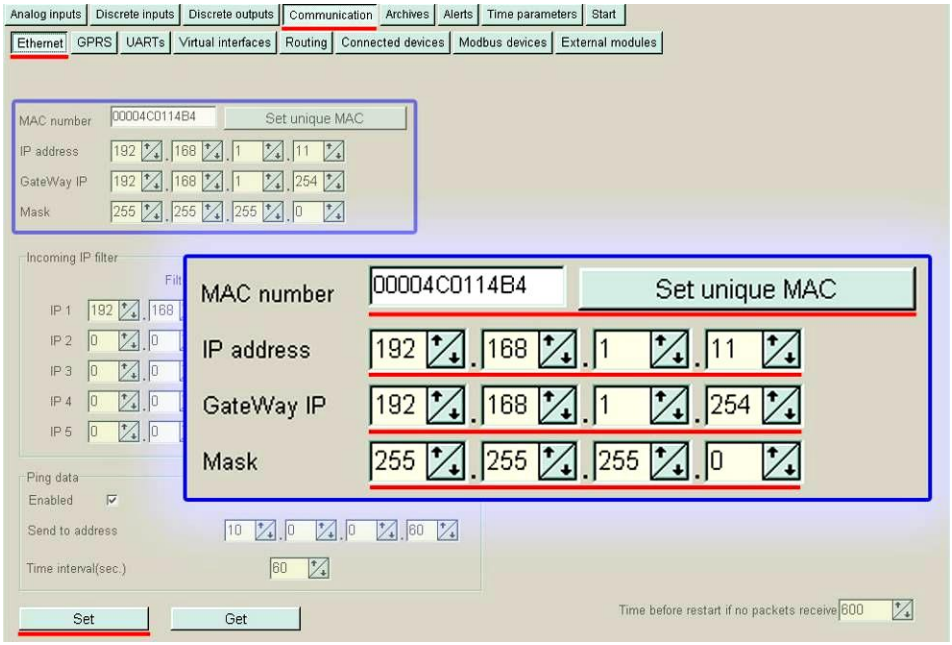
- controller setup;
- data transferring to central computer;
- firmware upgrade and update.

Supported protocols:

- Modbus TCP/IP Server – for data transfer;
- Modbus TCP/IP Client – for event allert;

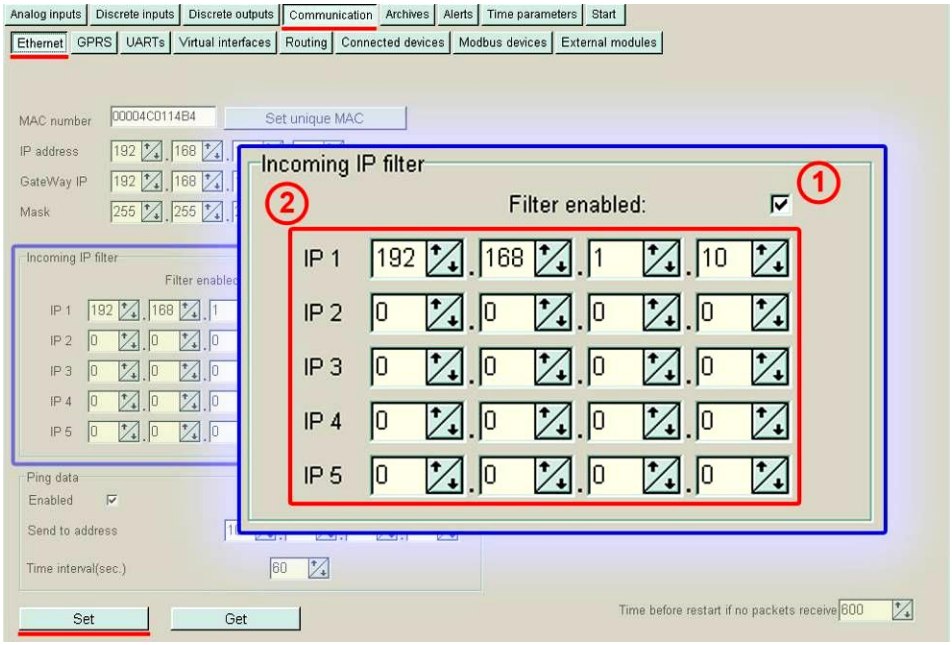
- TCP – for data transfer;
- UDP – for data transfer;
- ICMP – for connection quality testing.

To prepare controller for connection over Ethernet, you neet to setup IP address (DHCP is not used, because to establish connection with righ controller, server always need to know static address of controller). To setup connection, in Communication>Ethernet enter basic data (IP address, Gateway IP and Subnet mask), by pressing "Set" write data to controller and Restart controller (see chapter **7.12** Restarting).



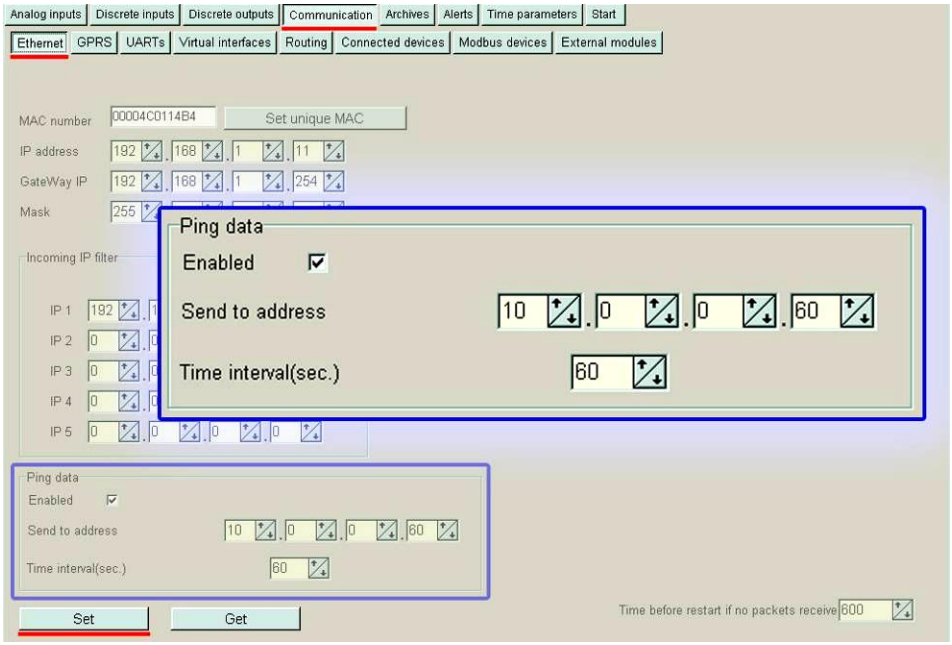
Pic 29 Setup Ethernet interface [Communication / Ethernet]

For security reasons is installed IP filtre (controller support up to 5 exeptions). Enable IP filtre and add at lease one IP address in list of exeptions. After you „Set" changes, device will not answer to clients from other IP adresses (see **Pic 30**)



Pic 30 Setup IP filter [Communication / Ethernet]

If you are reading data very rarely, some gateways can go to sleep mode, to avoid that controllers has „Ping data“ funtions (enable function, enter IP address of the device, that you are pinging-in and time interval in seconds) (see **Pic 31**).

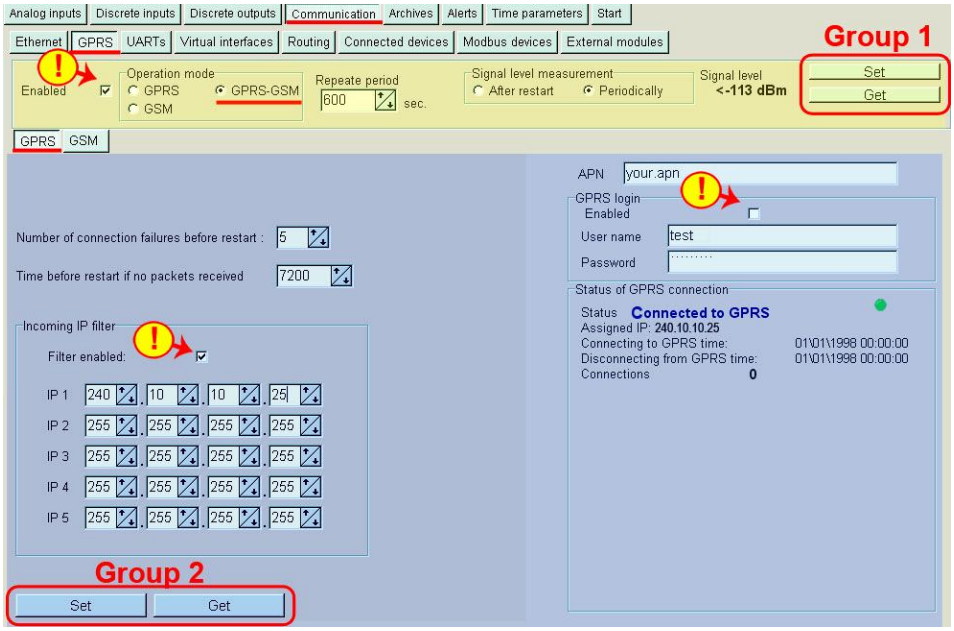


Pic 31 Ethernet PING setup [Communication / Ethernet]

To avoid hanging, controller can initiate self restart if packets over Ethernet was not received more then set time (you can enter any time in seconds from 600 to 3600) (see **Pic 31**).

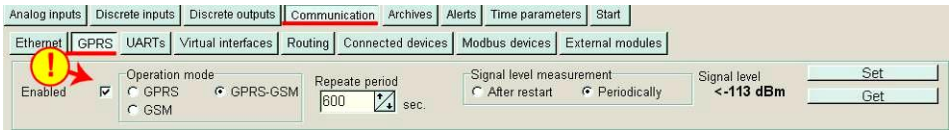
7.7 GPRS/GSM

GPRS (General Packet Radio Service) – it is a packet transfer over GSM protocol. By using GPRS sent/receive data is splitted into TCP/IP packets, and then in TCP/IP packets they will be transferred over GSM network. All network devices, has unique static IP addresses. By using APN (Access Point Name) identification your device will access an IP PDN (packet data network), that a mobile data user wants to communicate with. In addition, to identifying a PDN, an APN may also be used to define the type of service, and access private company network. GPRS devices cannot use dynamic addresses. Turned ON, controller is establishing connection (if SIM card is inserted), this takes about 30s.



Pic 32 Setup groups of GPRS/GSM settings

To use GPRS/GSM modem, you must enable device (by checking "Enable" box). Also you can choose data transfer protocol: GPRS; GSM; GPRS/GSM (see **Pic 33**).



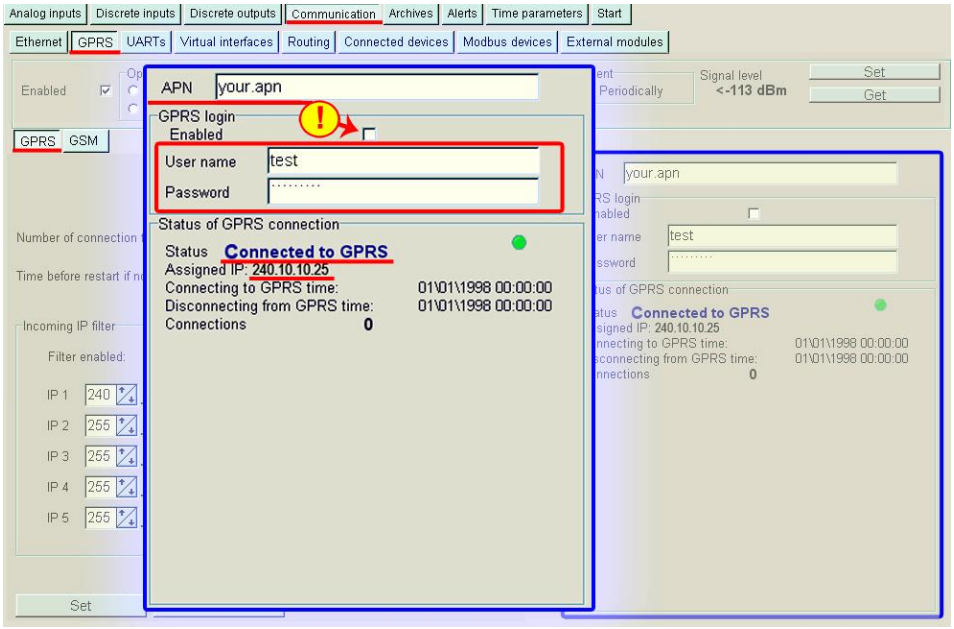
Pic 33 GPRS/GSM setup section

Some GPRS providers has additional security isues and to connect – you need login (enter login data – see **Pic 34**).

On GPRS status section You can see GPRS/GSM connection data (status, IP address, last connection date and time,last disconnection date and time, total connection value) (see **Pic 34**).

After restart, controller will establish GPRS/GSM connection automatically. Connection status

will show every connection step (disconnected, in progress, connected). After connection was established, controller receive GPRS IP address, you can see it in field Assigned IP (see **Pic 34**).



Pic 34 GPRS connection data and status

About routing parameters read in chapter GPRS-Ethernet (G>E)and Ethernet-GPRS(E>G) routing (see chapter 7.9.4).

7.8 Serial interfaces

Controller support all most popular Serial interfaces (RS485, RS232, Data/Req, MBus and Current loop). Information about installed serial interfaces on your controller you can find on Top label - Manufacturer's number (see chapter 3.2).

To setup Serial interfaces, you need to do few steps:

7.8.1 Setup UART's

Controller support up to 8 UART's and each of them can be configured individualy:

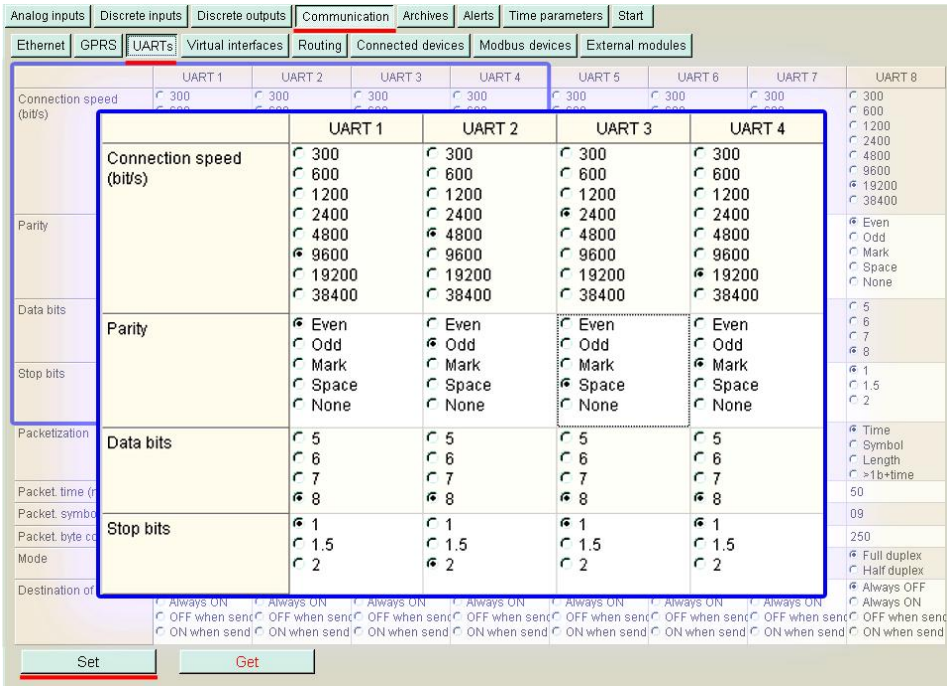
- Connection speed (300-38400 bit/s);
- Parity (Even, Odd, Mark, Space, None);
- Data bits (5, 6, 7, 8);
- Stop bits (1,1.5,2);

Packetization:

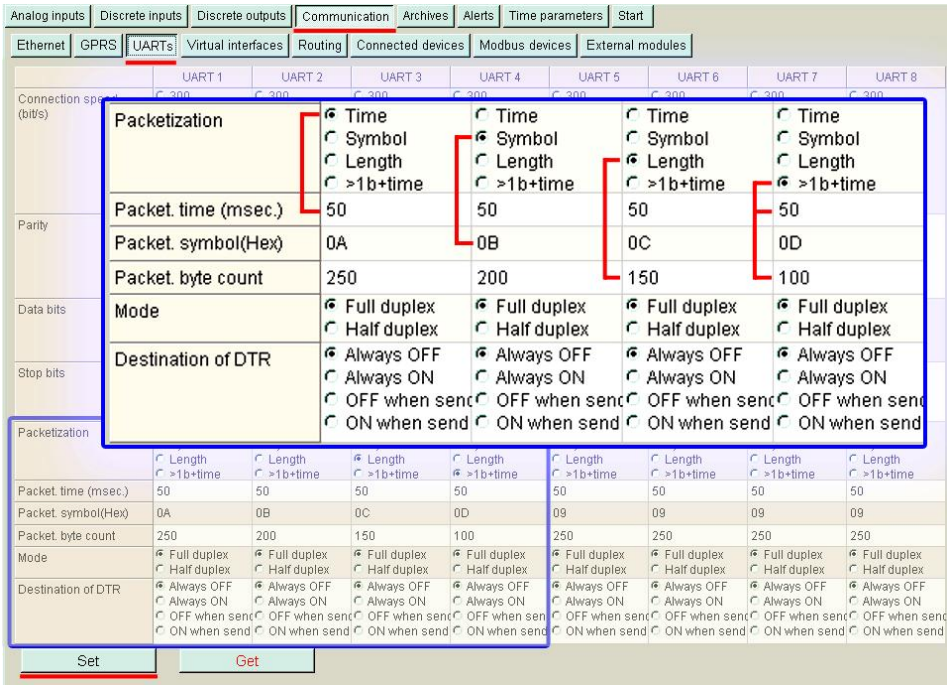
- Time – in field "Packet time" you can set packet interval (1 – 10000) msec;
- Symbol – if you use this packetization method, you need to write "Packet symbol" in HEX format;

- Length – if you select this packetization method, you need to write number of bytes per packet in field “Packet byte count”;
- “>1b+time” – is connecting packetization of methods “Length” and “Time” and you need to write values to the fiels “Packet time” and “Packet byte count”. End of packet will be the first met condition.
- Packet time (1-10000msec);
- Packet symbol (any Hex number, that will mean end of packet);
- Packet byte count;
- Mode (Full duplex, Half duplex);
- Destination of DTR (Always OFF, Always ON, OFF when sending, ON when sending);

For RS485 interfaces “Destination of DTR” must be set – “OFF when sending”



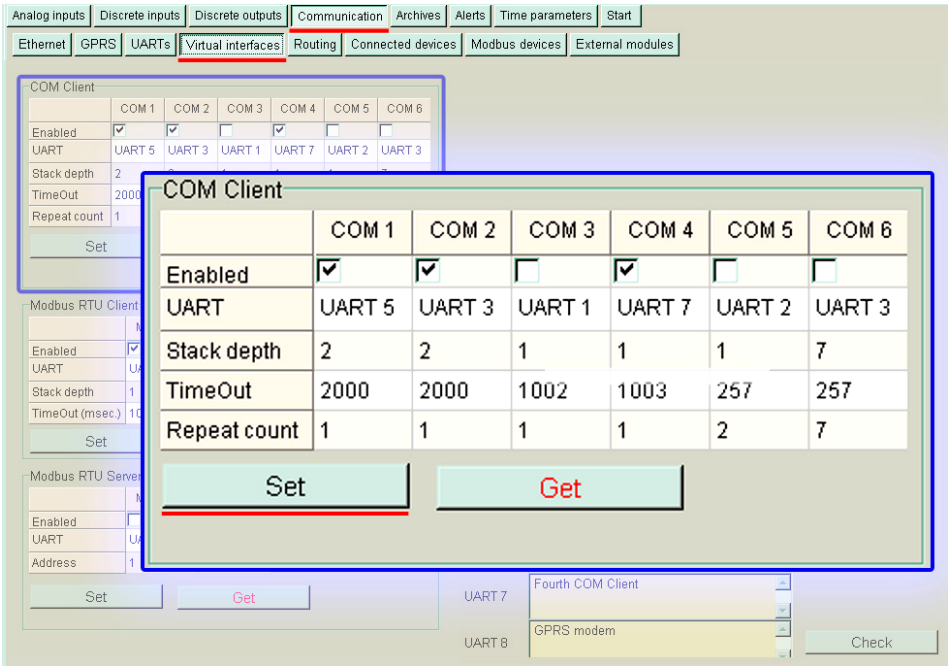
Pic 35 Setup UART (Basic)



Pic 36 Setup UART (Packetization)

7.8.2 Setup Virtual interfaces.

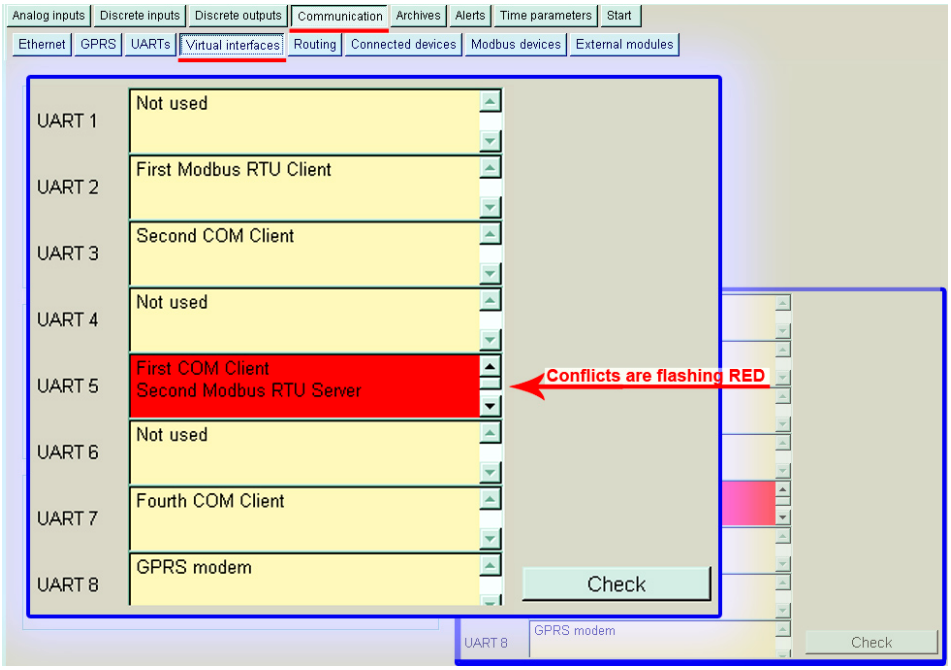
Use check box to Enable or Disable COM Clients (from COM1 to COM6). In the line „UART“, choose which UART (Universal Asynchronic Receiver Transmitter) port will be accessed by COM (values are from UART1 to UART5, and UART7). By default, UART6 is used by Modbus RTU Server and is used to configure controller. COM client is used, to read data from meter, and we need to set up COM client (not UART) (see **Pic 37**).



Pic 37 COM Client setup screen

After settingup COM clients, press “Check” button to test current UARTs for confflicts. In example (see **Pic 38**):

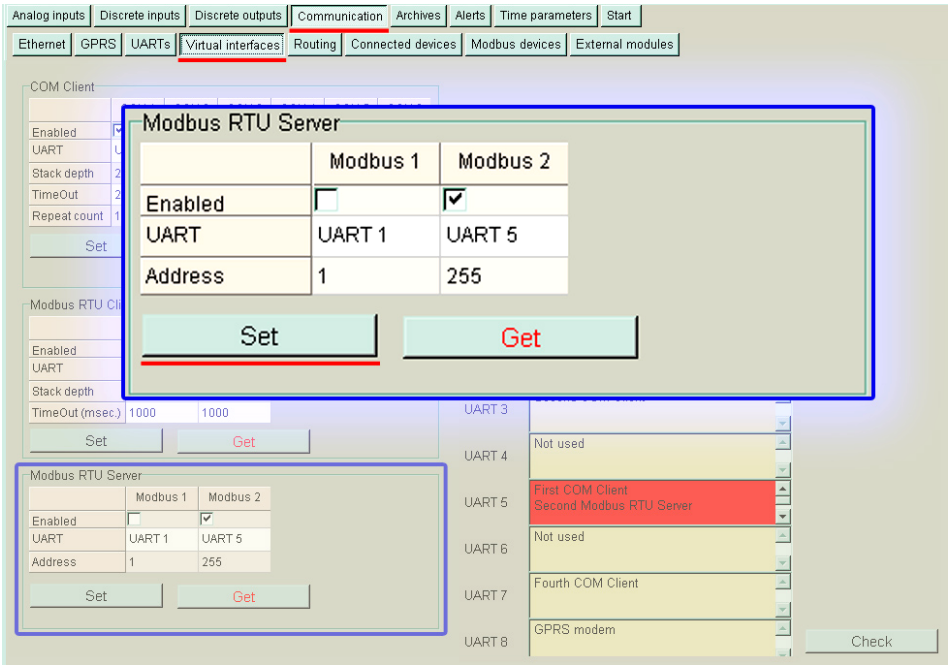
- UART1 – “Not used”;
- UART2 – “First Modbus RTU Client”;
- UART3 – “Second COM client”;
- UART4 – “Not used”;
- UART5 – has conflict “First COM Clients” and “Second Modbus RTU Server” is conflictin on the same UART and it mus t to be fixed by changing UART for one of them (for example to UART1, because he is not used;
- UART6 – “Not used”
- UART7 – “Fourth COM client”;
- UART8 – “GPRS modem”.



Pic 38 Monitoring of UART usage

Settingup Modbus RTU server:

In this section, you can change default controller’s configuration UART to any other.

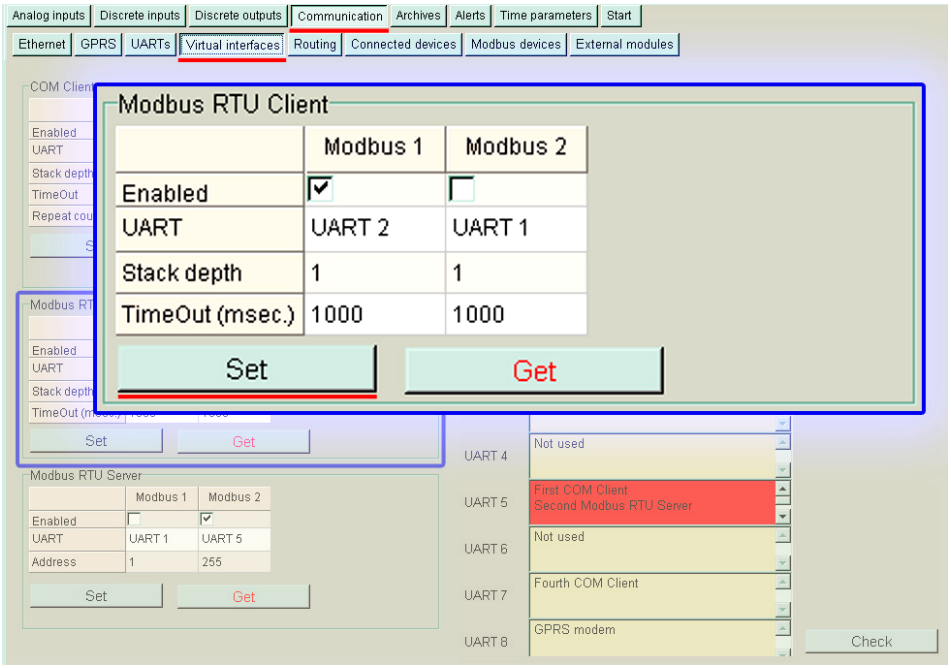


Pic 39 Setup Modbus RTU server

Settingup Modbus RTU client:

In this section, you can choose UART for Modbus RTU client.

Modbus RTU Clients usually are used for connection to other Modbus RTU devices (device must to support Modbus RTU server mode), like valves, heat correctors, controllers or etc.



Pic 40 Modbus RTU Client section [Interfaces>Virtual interfaces]

7.9 Routing

Controller support a few routing modes and all of them are independent. Each of routings can be used alone, or in any combination with other Valsena made devices.

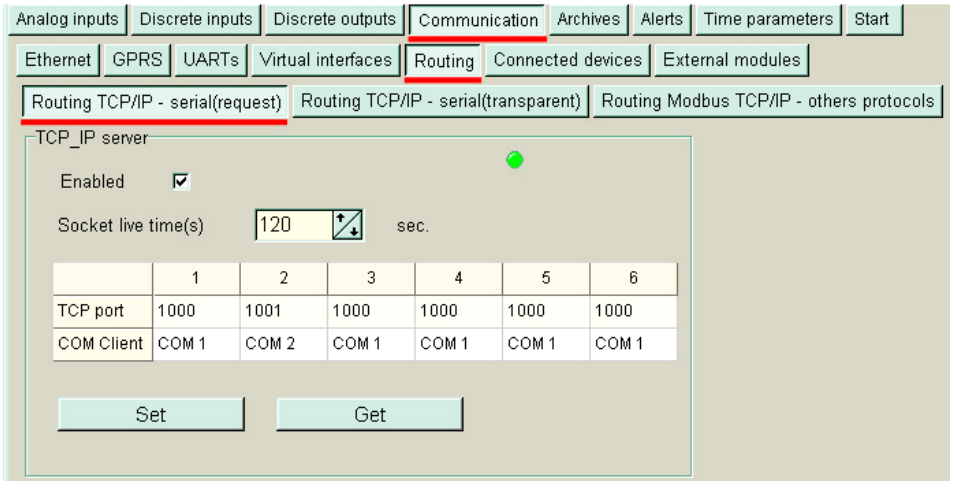
“GPRS-to-Ethernet and Ethernet-to-GPRS routing” - used to redirect TCP/IP packets between GPRS and Ethernet interfaces.

“TCP/IP – serial (transparent) routing“ - Data exchange between terminal device and high level system, when terminal device directly send data to a high level system (data from terminal device, witch is connected to one of serial interface, is added to the TCP packet and redirected to high level system) and/or vice versa is called "TRANSPARENT". Data transfer can be initiated from both sides. And can work bidirectionaly at the same time.

“TCP/IP – serial (request) routing” - Data exchange with terminal device, when terminal device directly answers (one by one (FIFO method), after the response to previous query or after a specified period of time (TimeOUT)) to a high level system's request is called “Routing TCP/IP-serial (request). Data transfer can be initiated only from high level system sides. At one time data can be send only in one direction (request or answer).

7.9.1 Routing TCP/IP - serial (request)

Data exchange with terminal device, when terminal device directly answers (one by one (FIFO method), after the response to previous query or after a specified period of time (TimeOUT)) to a high level system's request is called “Routing TCP/IP-serial (request). Data transfer can be initiated only from high level system sides. At one time data can be send only in one direction (request or answer).



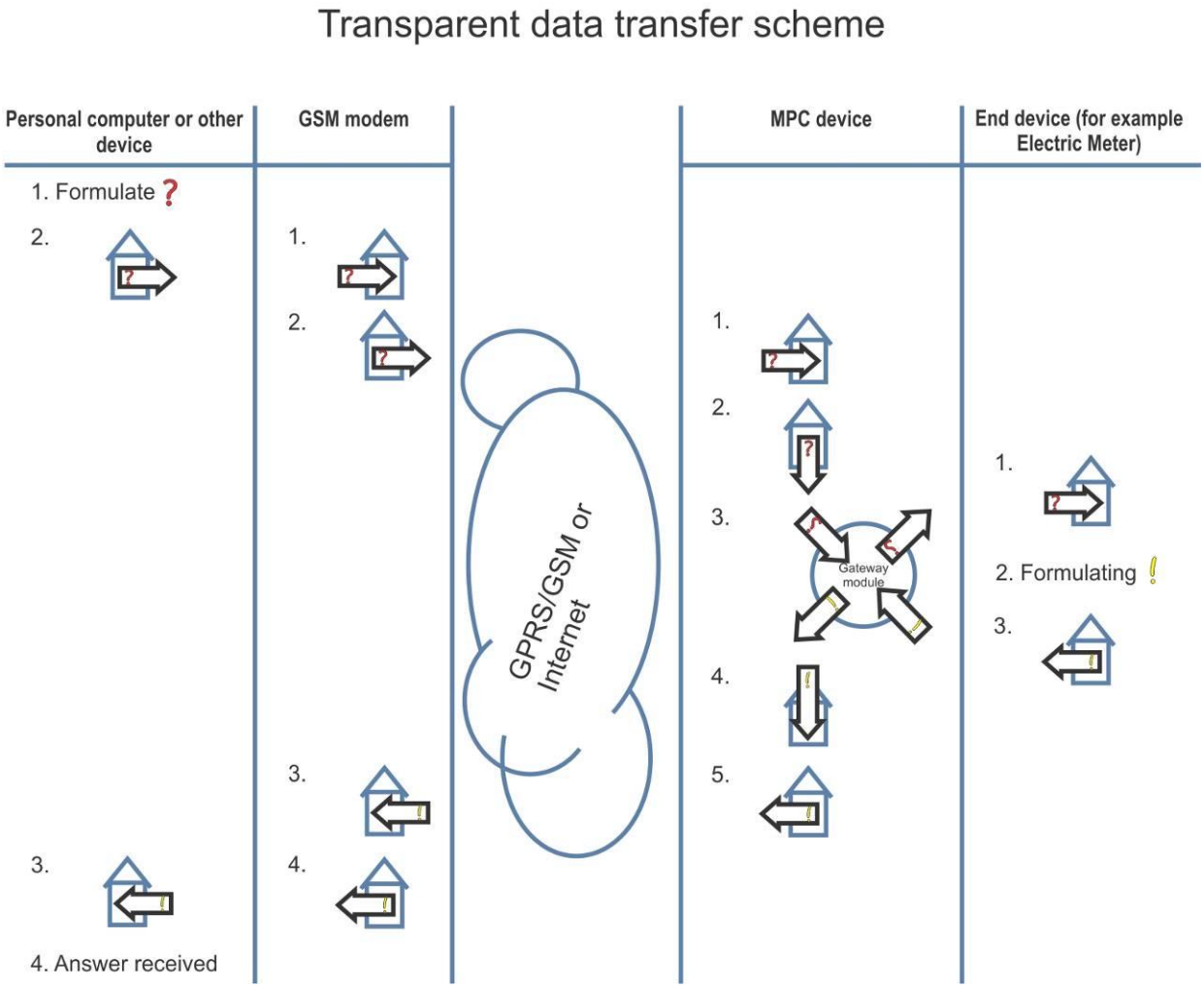
Pic 41 Routing TCP/IP – serial(request) [Communication>Routing>Routing… (request)]

Use check box to Enable or Disable TCP/IP Server. By default TCP/IP socket life time is set to

120 seconds, you can change if you need other time. Every COM client must have his one TCP port number.

7.9.2 Routing TCP/IP – Serial (transparent)

Data exchange betwean terminal device and high level system, when terminal device directly send data to a high level system (data from terminal device, witch is connected to one of serial interface, is added to the TCP packet and redirected to high level system) and/or vice versa is called "TRANSPARENT". Data transfer can be initiated from both sides. And can work bidirectionaly at the same time.



Pic 42 Schema of transparent mode

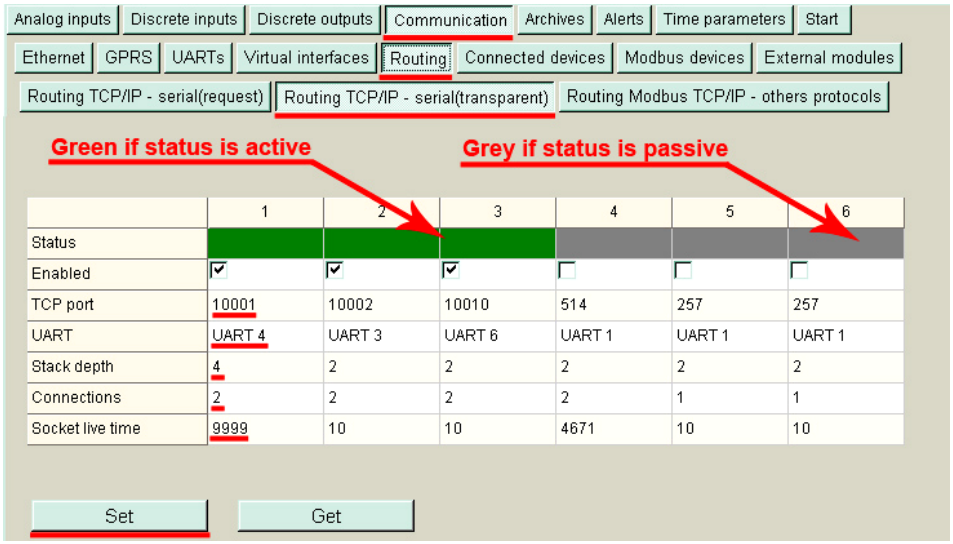
TRANSPARENT mode is used for direct connection between server and terminal device. This is useful if terminal device use special protocol, to setup or control terminal device, or if data must to be readed directly form terminal device.

Controller MPC-374 support up to 6 „TRANSPARENT“ channels.

Configurable parameters:

- TCP port;
- UART – where terminal device is connected;
- Stack depth – number of records keaped in stack from 1 to 10;
- Connection - number of connections, that controller will accept from 1 to 4;
- Socket life time(s) – time before socket will be closed from 10 to 65535 seconds.

In status window with colors are indicated current status – Green for active, Grey for passive (see **Pic 43**).



Pic 43 Routing TCP/IP-serial (transparent)

Using TRANSPARENT mode you accessing directly UART. To each TRANSPARENT channel can be established from up to 4 computers (PC).

Controller's answer, to request of one PC, will be sent to all to channel connected PC's. Even if request was sent from other PC.

7.9.3 Modbus TCP/IP routing

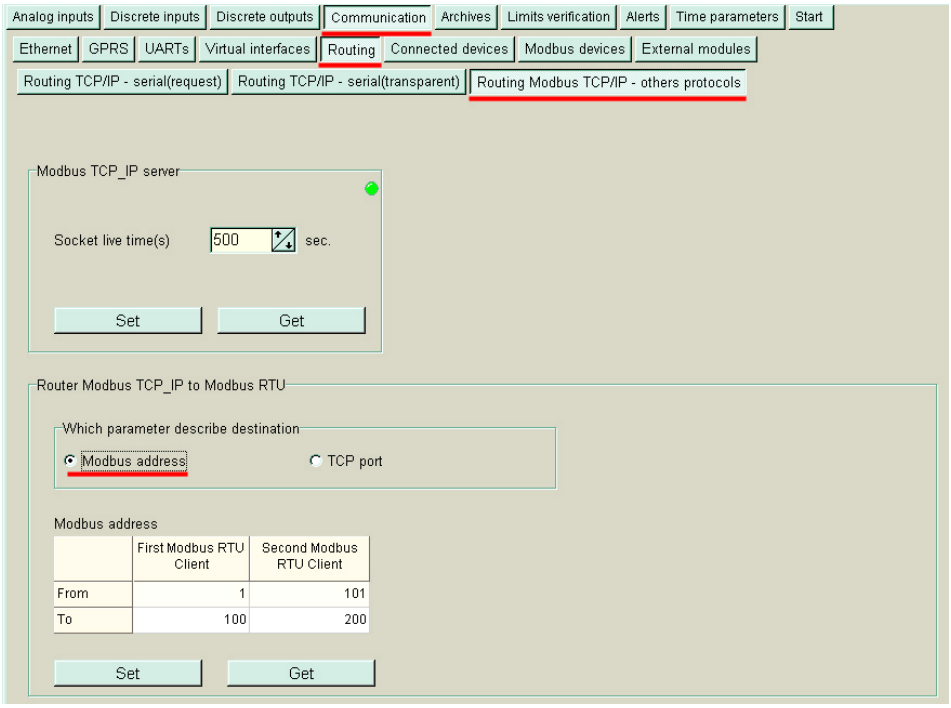
Is used for setting up Modbus TCP/IP routing.

To setup, you must to chose routing type (only one type can be used) – Modbus address or TCP port:

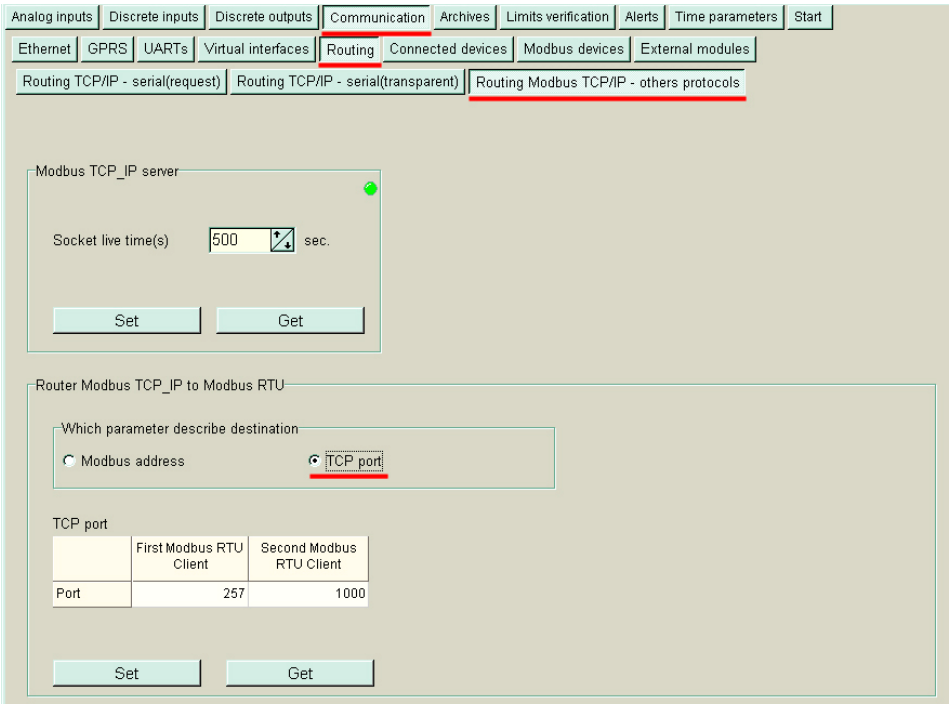
- Modbus addresses routing is used for range of addresses routing to Modbus RTU Client. This is used to route all data, that Modbus RTU address is in set range. If you know address of external Modbus RTU device, that is connected to Master controller, then connecting through Ethernet or GPRS you can assign connected devices (this can be any device, connected to controller through Modbus RTU client).
- TCP port routing – route data, depending on TCP port. For each Modbus RTU client

assign a separate port. This option is similar to Modbus address, using it, you can assign any to the controllers Modbus RTU client conned device throught set TCP port. Accessing this port you will automatically routed to set Modbus RTU client.

Modbus TCP/IP server is always enabled, you can change socket time in seconds. Modbus TCP/IP is used in External modules connection example (see chapter **7.9.4**, picture **Pic 61**).



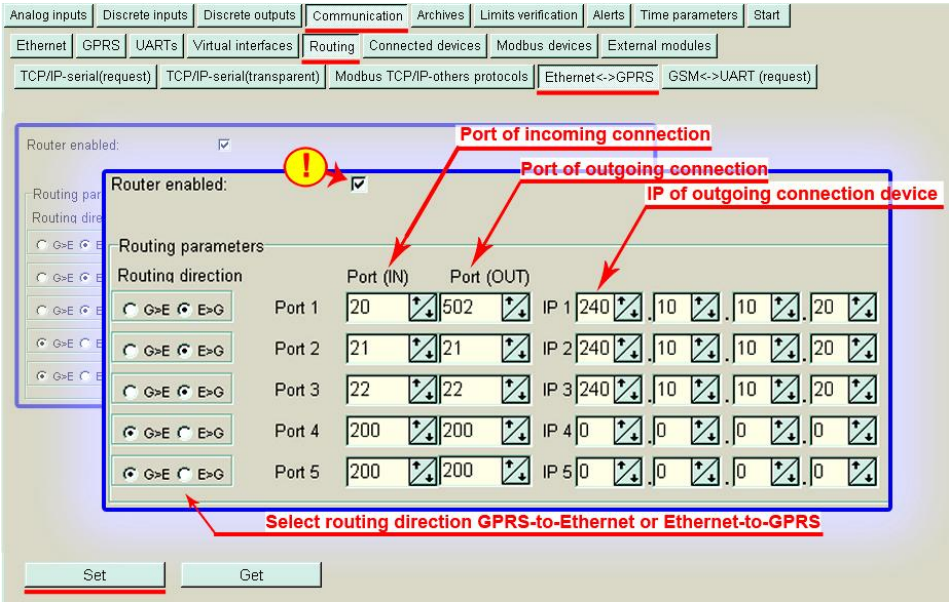
Pic 44 Modbus TCP/IP routing by Modbus address range



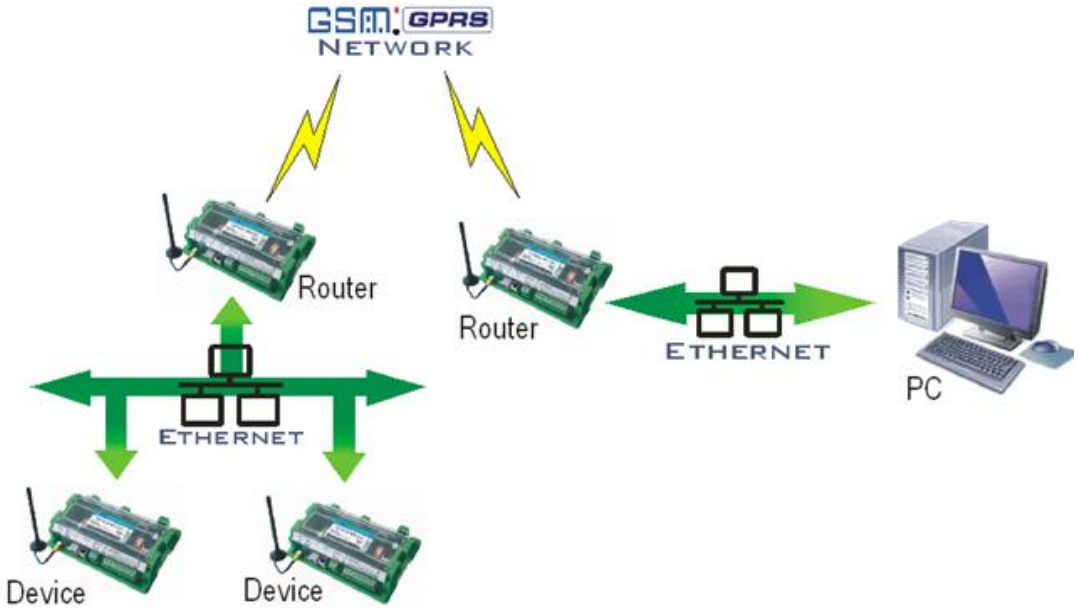
Pic 45 Modbus TCP/IP routing by TCP port

7.9.4 GPRS-Ethernet (G>E)and Ethernet-GPRS(E>G) routing

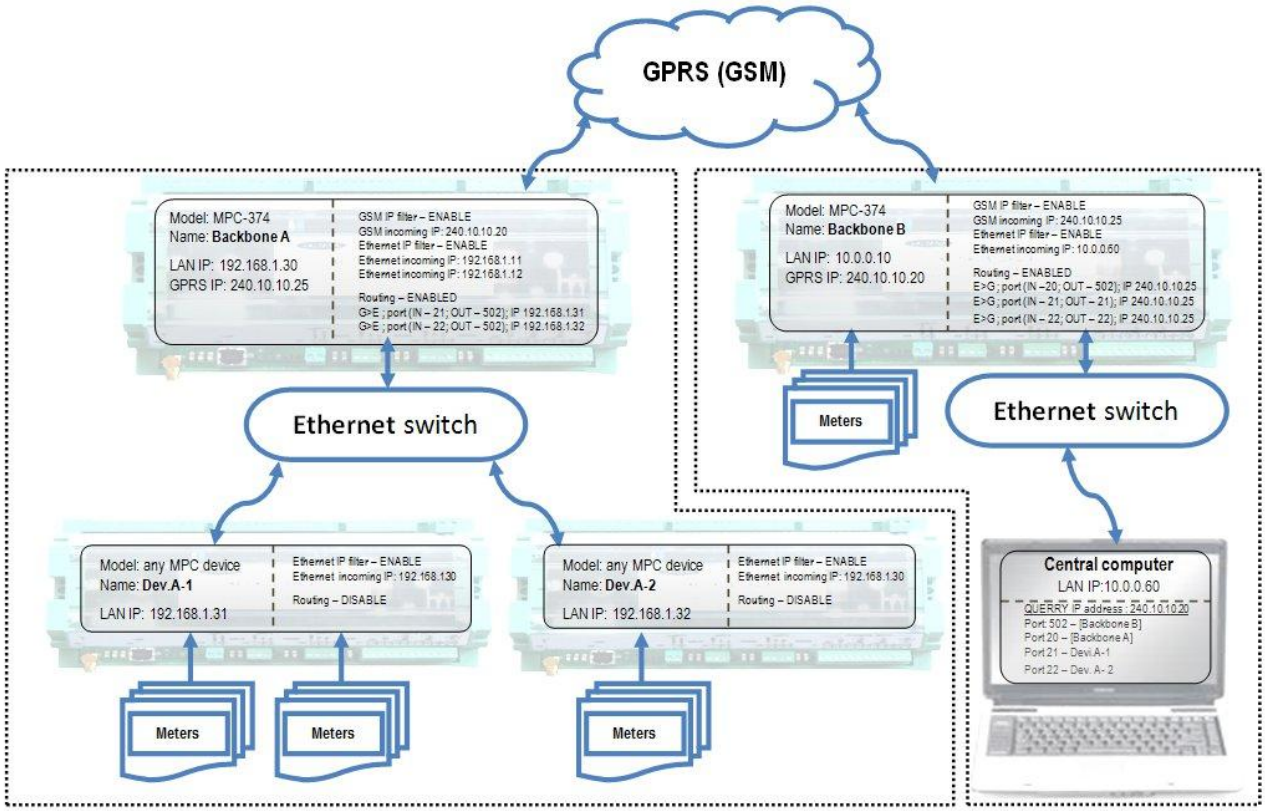
Controller can be used, as router, when you trying to access other MPC controllers, or sending packets to Ethernet network. If controller, in router mode, is establishing connection to GPRS network, incoming port (Port1–Port5) will be changed to outgoing port (Port1 – Port 2). The internal GPRS IP address will be changed in to configurable IP addresses (IP1 – IP5), will be checked Checksum and data will be sent over Ethernet port 502.



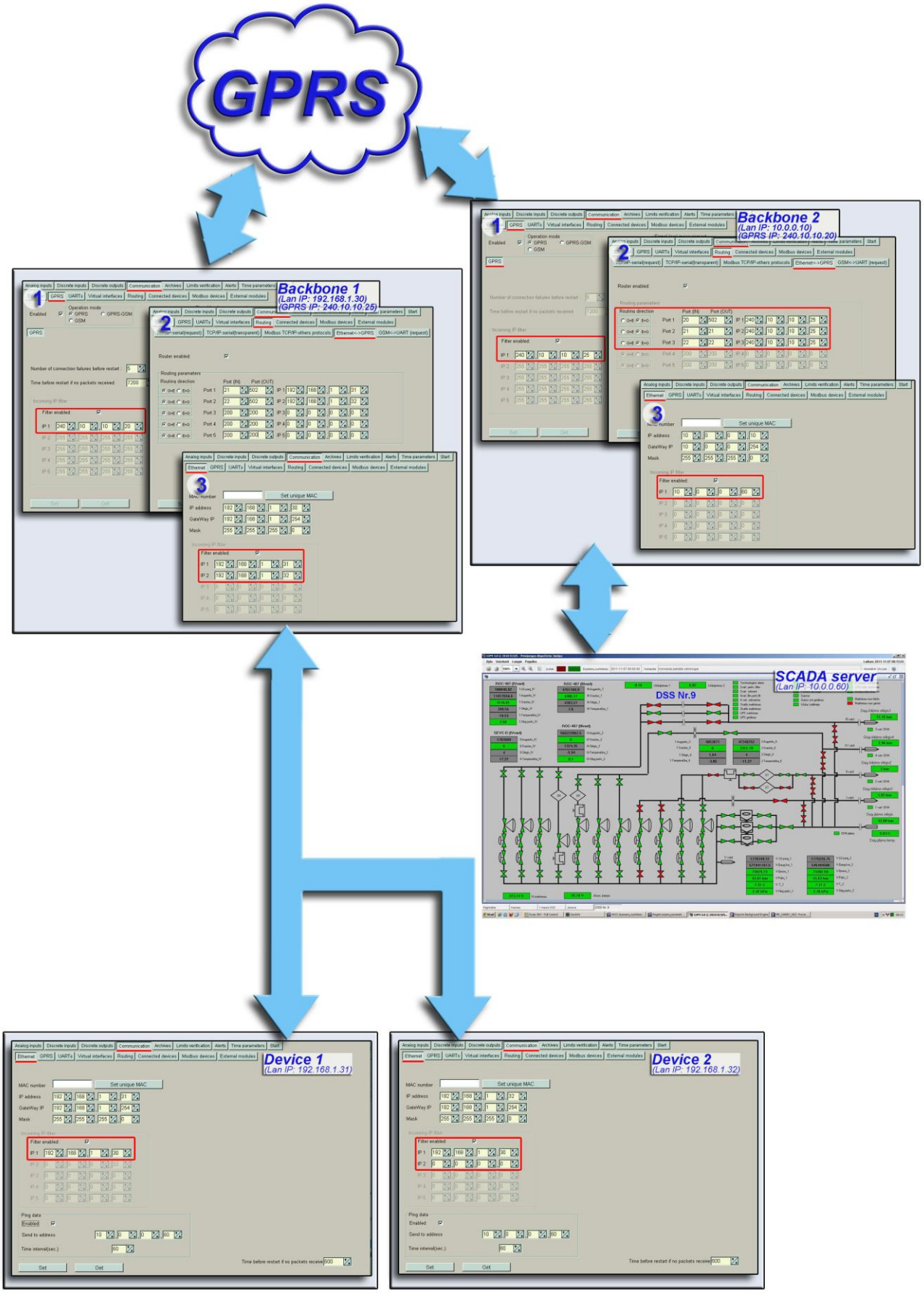
Pic 46 GPRS-Ethernet and Ethernet-GPRS routing [Communication>GPRS]



Pic 47 Simplified scheme of controllers in routing mode



Pic 48 Routing configuration example



Pic 49 Routing screenshots

Enable IP filter - you can enter up to 5 IP addresses that will have permission to connect. After enabling filtering, connection to controller can be established only from addresses listed in the table, for more information read chapter about setting up Ethernet (chapter 7.6).

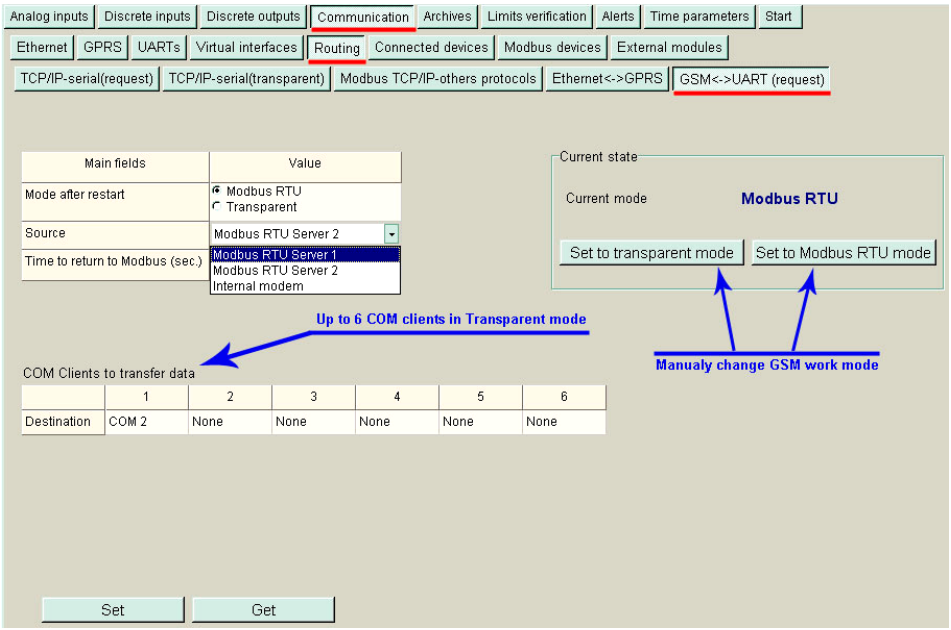
7.9.5 Routing GSM<->UART (request)

In GSM mode you can access UART‘s Transparently or over Modbus RTU. These modes can be changed manualy by pressing accordingly „Set to transparent mode“ or „Set to Modbus RTU mode“.

You also can choose default mode after device restart and return to Mobus RTU mode time (for automatic return). Time value can be from 10 to 65535 seconds or 0 – if you don‘t want to use automatic return (0 – disable auto return to Modbus RTU).

For Modbus RTU mode you need to chose Modbus RTU server.

For Transparent mode configure COM clients.



Pic 50 Routing GSM <->UART (request)

7.10 Accounting of energy carrier meters [Communication>Connected devices]

7.10.1 Heat meters [Communication>Connected devices>Heat meters]

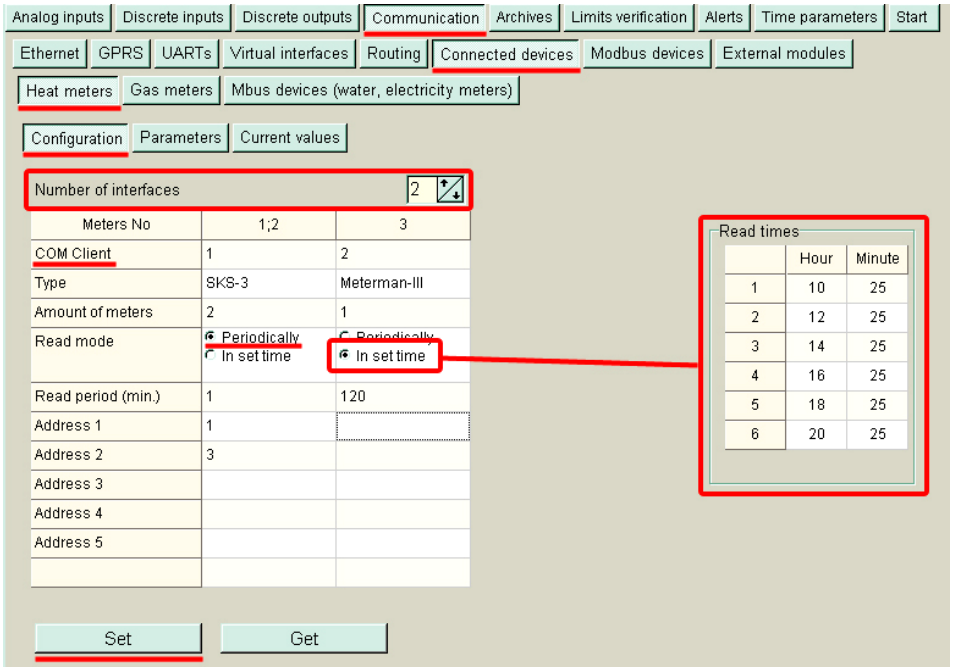
For the first, you need to understand 3 things:

1. Number of interfaces – it is number of physically used interfaces on controller.
2. Amount of meters – it is number of meters, connected to interface.

3. And mostly important is, that total number (sum) of interfaces and meters, per controller can be 5 devices. So, if to one interface you connect 4 meters, you can use 1 more interface, but to this interface you can connect only 1 meter, because 4+1 is 5 (MAX number) – you can't connect one more meter to any interface!

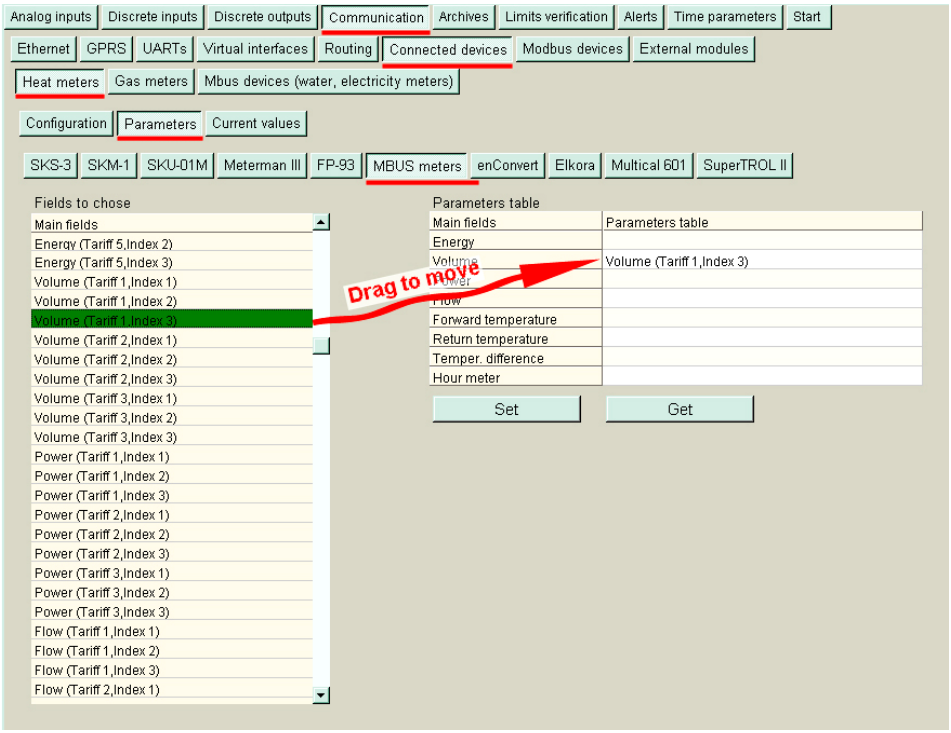
To *CONFIGURATE* HEAT meters, you need to setup (see **Pic 51**):

1. Number of interfaces;
2. Interface settings:
    a) COM client (UART port must be configured and assigned to COM client, how to do this, see chapter **7.7**);
    b) Type of meter's (choose from the list of supported meters, or contact manufacturer);
    c) Amount of meters, that you connect to this interface;
    d) Data read mode, "Periodically" or "In set time";
    e) Read period (min), if in previous section you selected "Periodically", now you need to set reading period in minutes, the value can be from 1 to 720 minutes (be default it is 120 min). If "Reading mode" is set to "In set time", this value is not important, because it is not used;
    f) In Address1 .. Address5 fields, you need to enter address of each connected meter (some address values is set by meter manufacturer, some models support custom addresses, read meter's manual, to get more information);
    g) If in "Read mode" you choose "In set time, then in right part appears "Data read time" table, you must enter up to 6 data read from meter times.



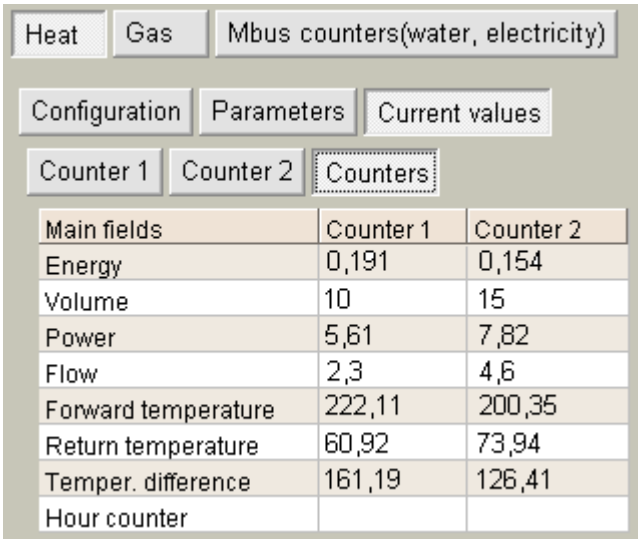
Pic 51 Heat meter configuration screen

To setup *PARAMETER*, you must choose type of meter, that you use. In All available fields table, you can see all Heat indicators for selected type of meter. In Data for logging tables left side you can see field name and by using Drag-and-Drop you can drag parameters form “All available fields” table to Data for logging table (you need to drag in to right side of table, and take care to drag into right row). By choosing data in Data for logging table, you will unify logged data values and in this case you can compare data from different type of meters. Do not forget to write data to controller, by pressing SET (see **Pic 52**).



Pic 52 Parameters of Heat meters

In [Communication>Connected devices>Gas meters>Current values] you will find current values of all heat meters (see **Pic 53**)



Main fields	Counter 1	Counter 2
Energy	0,191	0,154
Volume	10	15
Power	5,61	7,82
Flow	2,3	4,6
Forward temperature	222,11	200,35
Return temperature	60,92	73,94
Temper. difference	161,19	126,41
Hour counter		

Pic 53 Heat current values

7.10.2 GAS meters [Communication>Connected devices>GAS meters]

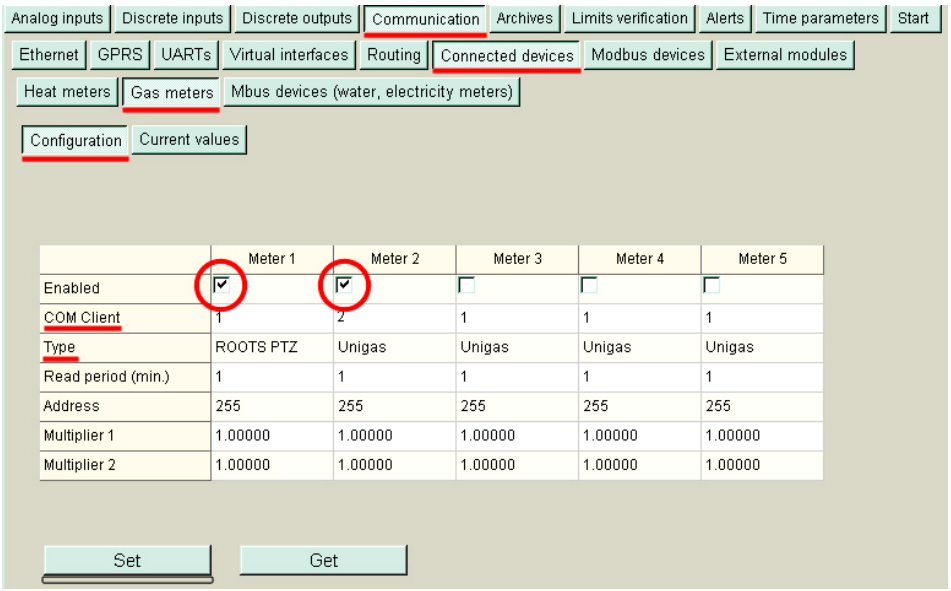
Controler can log data form 5 independent GAS meters.

To configure new GAS meter, (see **Pic 54**) you need to:

1. Enable meter;
2. Set COM port number (UART port must be configured and assigned to COM client, on

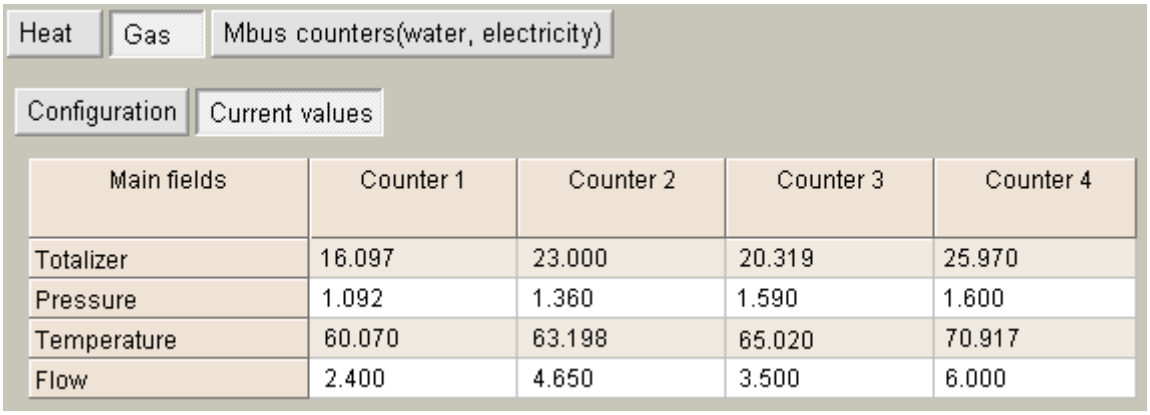
how to do this, see chapter 7.7);

3. Chose type of connected meter;
4. Enter meter data read period in minuters (time value can be from 1 to 60);
5. In Address field, you need to enter address of meter (some address values is set by meter manufacturer, some models support custom addresses, read meters manual, to get more information);
6. Multiplier 1 and Multiplier 2 – some meters gave values without the decimal point, and using Multiplier, you can correct value. Multiplier 1 is used for *Totalizer* value, Multiplier 2 – *Flow* value. Only meters, that doesn't use decimal point let you change values in this fields. If you can't enter new value, this meens multiplication is not needed.



Pic 54 GAS meters configuration screen

Currenty values of GAS's meters, you can find in [Interfaces>Accounting>GAS>Current values] (see **Pic 55**).



Main fields	Counter 1	Counter 2	Counter 3	Counter 4
Totalizer	16.097	23.000	20.319	25.970
Pressure	1.092	1.360	1.590	1.600
Temperature	60.070	63.198	65.020	70.917
Flow	2.400	4.650	3.500	6.000

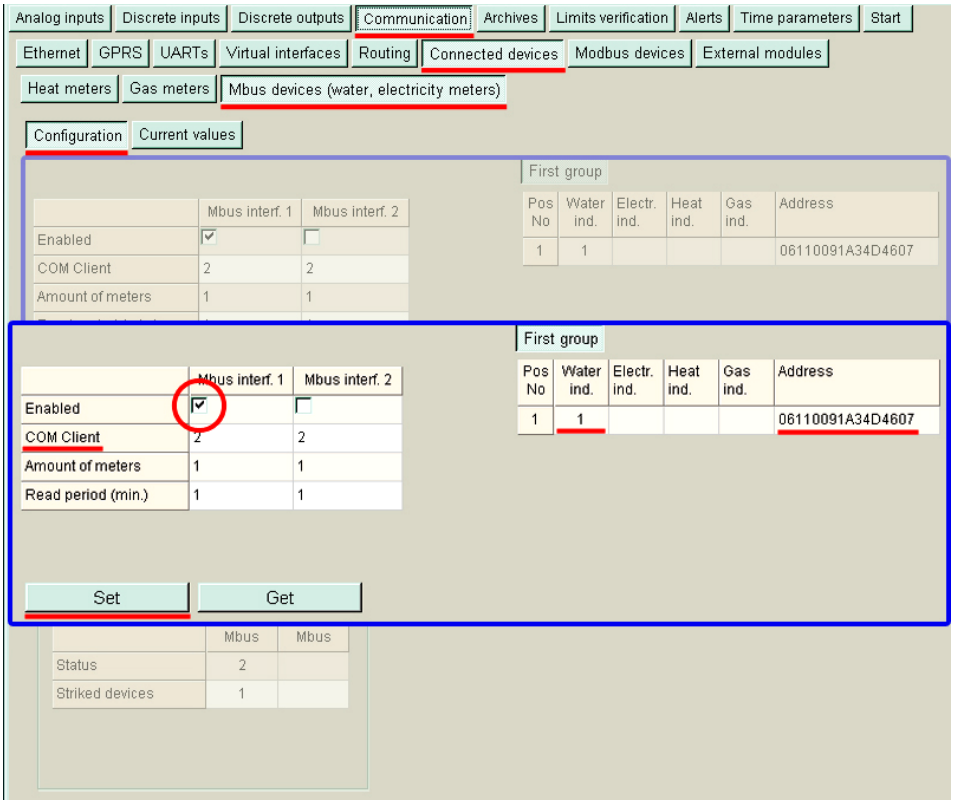
Pic 55 GAS current values screen [Communication>Connected devices>Gas meters>Current values]

7.10.3 MBus connected meters [COmmunication>Connected devices>MBus devices]

Controler support up to 2 Mbus interfaces, to each interface can be connected up to 200 Mbus meters (by using RS232/RS485 to Mbus converter you can extand range of supported devices), so total number meters per controller is 400 (see **Pic 56**).

Setting up Mbus interfaces:

1. Enable or Disabel interface by using check box.
2. Assign COM client by entering number of COM port (UART port must be configured and assigned to COM client, on how to do this, see chapter 7.7);
3. See and correct if you need Read period value in minutes. Field value can be form 1 to 720 minutes.
4. Send data to controller, to take action.

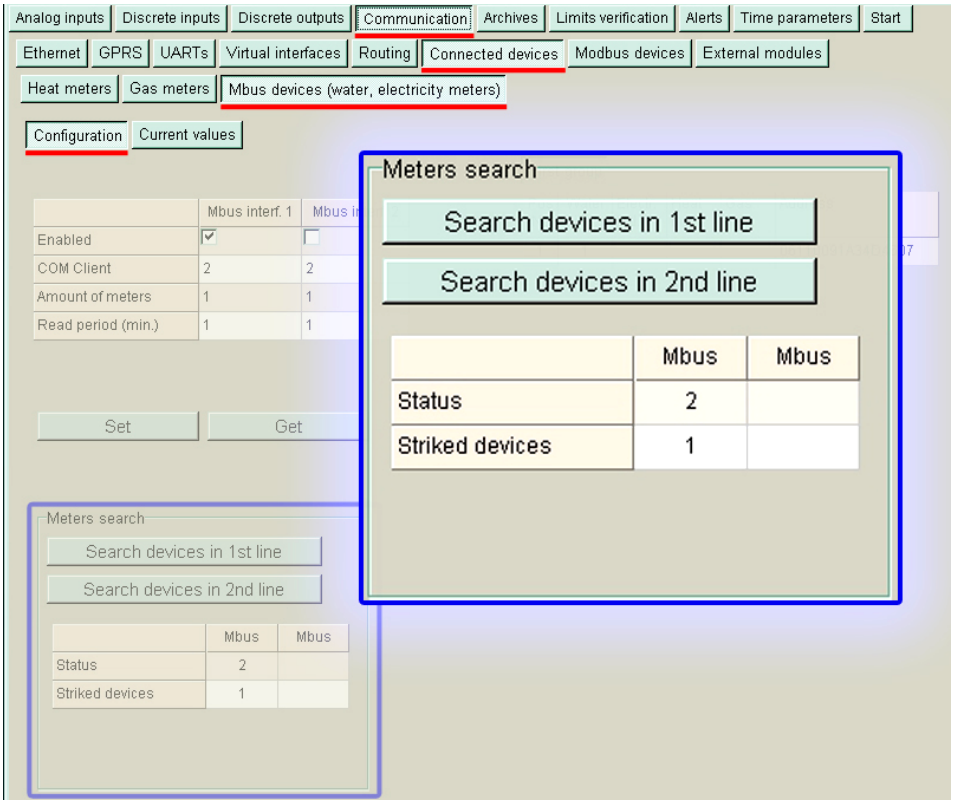


Pic 56 Mbus meter configuration screen

When you setup Mbus interface, you can use automatic Mbus device Search buttons for each interface (see **Pic 57**). Then controller will search and setup all to controller connected Mbus devices.

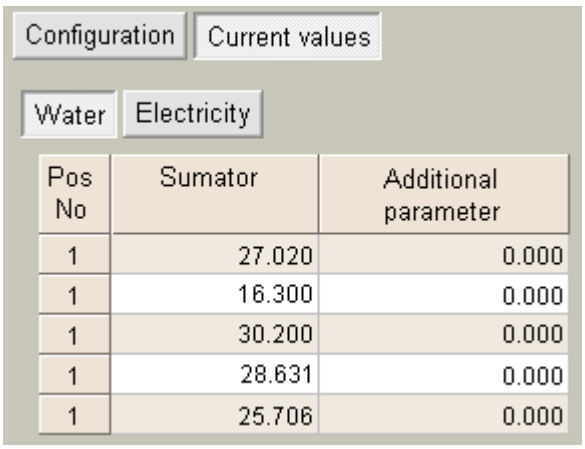
Meter will be grouped by type, depending on “Measured medium” values (1 - Oil, 2 - Electricity, 3 - GAS, 4 - Heat and so on)

Attention !: Do not use search function (or at lease be carefull), if system already has data, and some devices are already listed in Mbus device list, because Search will reindex all records and you will lose all saved data.



Pic 57 Mbus automatic Search section

Logged data you can read in [Communication>Connected devices>Mbus devices>Current values] window (see **Pic 58**).



Pic 58 Mbus Current values screen[Communication>Connected devices>Mbus devices>Current values>Water]

7.11 External modules [Communication>External module>DIN-32]

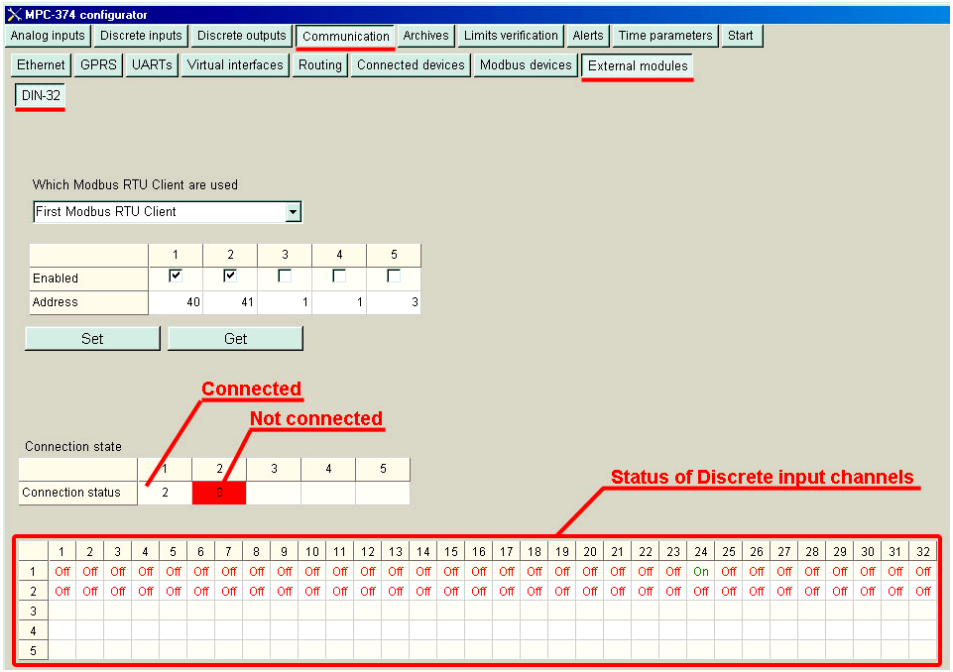
Controller has possibility to be expanded by connecting additional Discrete IN ports over a serial interfaces. To Controller MPC-374 over RS485, can be connected up to 32 Controllers DIN-32. And up to 5 Controllers DIN-32 (this means up to 160 Discrete Inputs for alarms

indication) can be used as Alarms. If connection to Master controller is established over Modbus TCP/IP (Ethernet or GPRS), then in table, at the bottom of page, you will see statys of each Discrete input (because of slow connection in Modbus RTU mode table will be invisible).

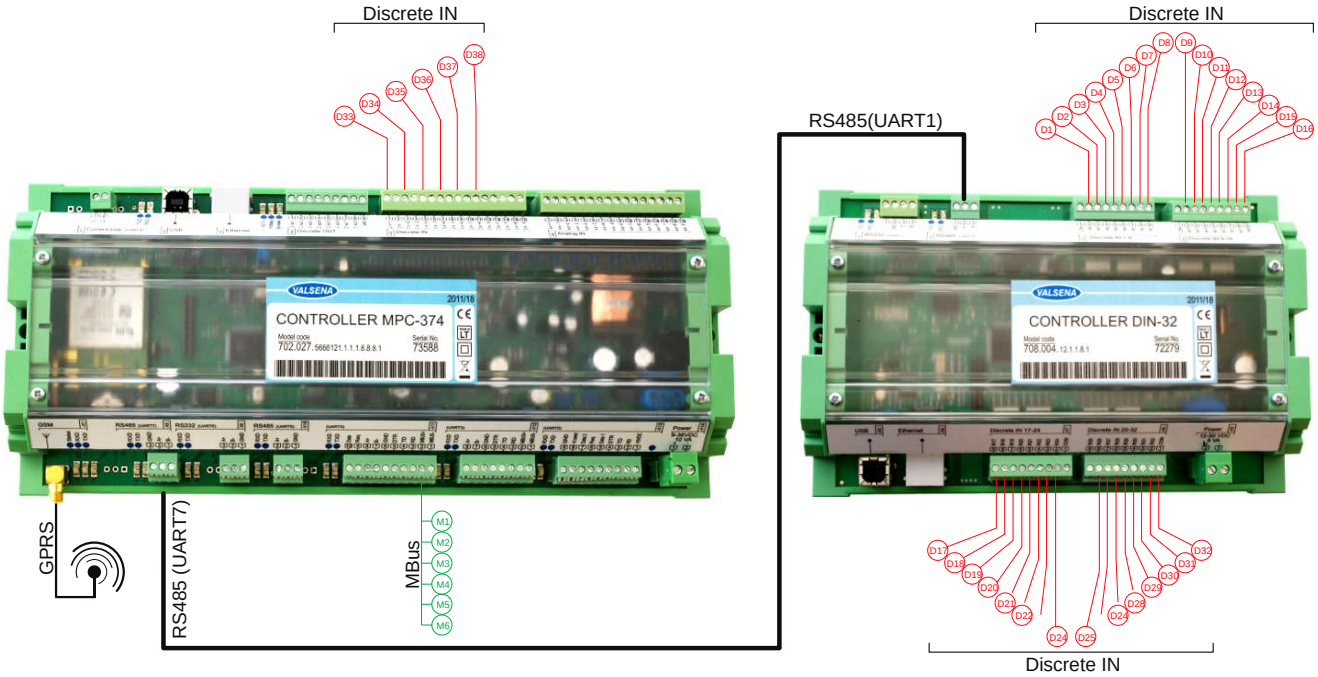
To setup connection you need (see **Pic 61**):

- Equal setup UARTs on bouth devices;
- Setup Modbus RTU client on master controller;
- Setup Modbus RTU server on Controller DIN-32;
- Configure DIN-32 as External mode;
- If to Controller DIN-32 with configuration program you will connect through Master controller (not directly), then additionaly you need to setup Modbus TCP_IP to Modbus RTU address routing range.

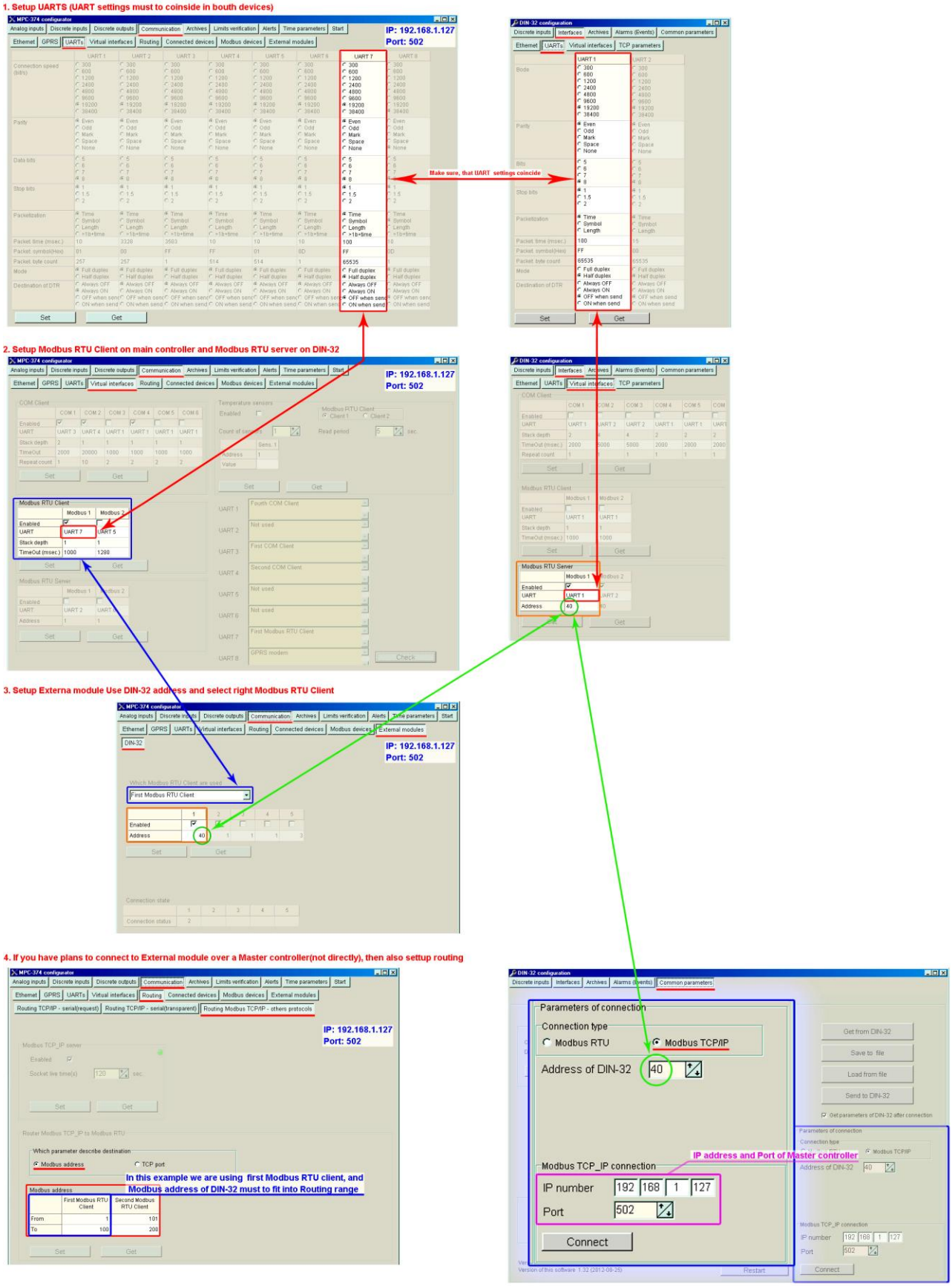
Attention!: Basic address of "Valsena" made devices is two last digits of serial number (for example, if serial number is 77715, then default address will be 15).



Pic 59 External device DIN-32 configuration screen



Pic 60 Controller MPC-374 and Controller DIN-32 connection example



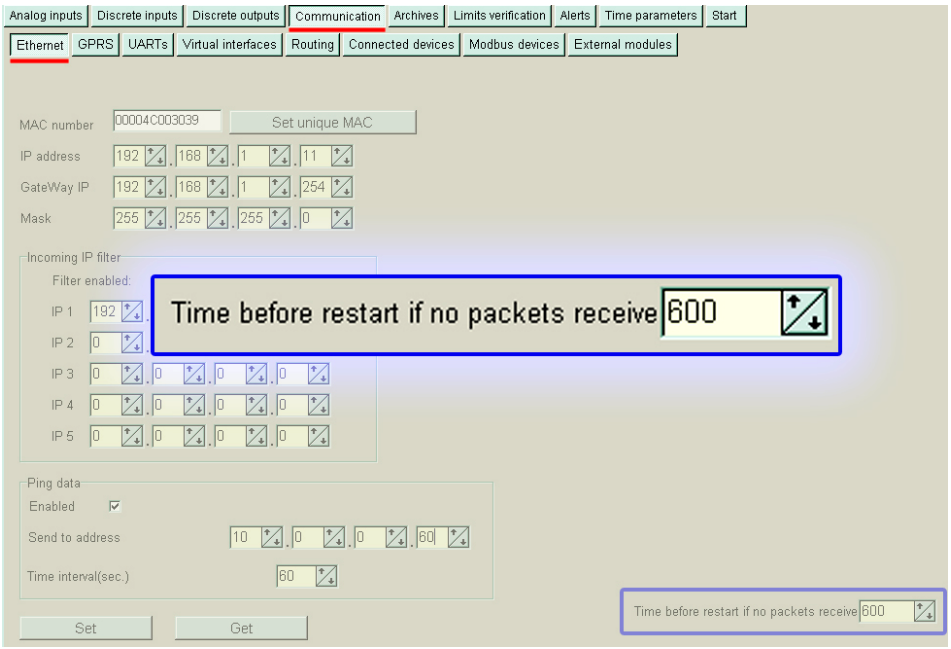
Pic 61 Setting up DIN-32 as External module (by exampe)

7.12 Restarting

To manually restart controller press RESTART key in [Start].

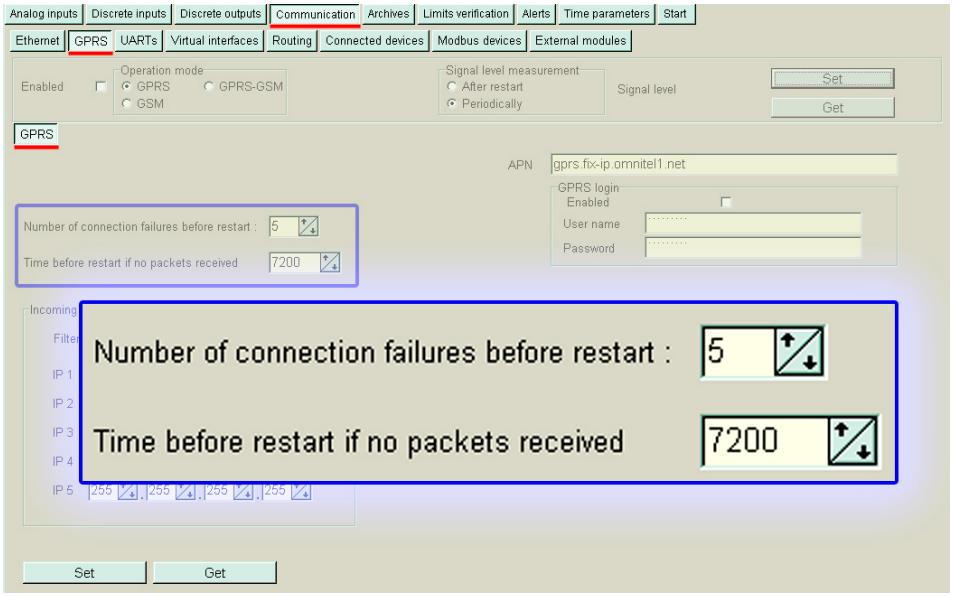
Also controller can be configured to makes automatic restart if:

- Ethernet loses some packets, number of lost Ethernet packets can be set in [Communication/Ethernet].



Pic 62 Restart if Ethernet packets was not received

- GPRS loses some packets, number of lost GPRS packets can be set in [Communication/GPRS].
- After several time GPRS/GSM connection fails, this value can be set in [Communication/GPRS].



Pic 63 Restart if GPRS connection failed or packets was not received

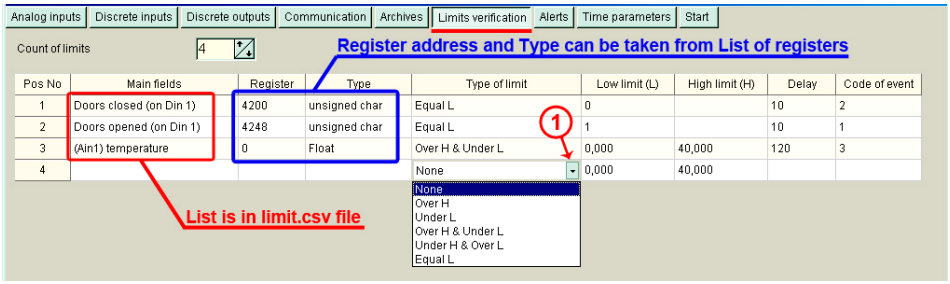
7.13 Limits verification

This option is used for customazing of alerts. To setup limits verification, you need:

1. Choose “Type of limit” (and this must to be done first);
2. Enter what register you want to control (see file “List of registers” to find correct register and format) or chose from Main fields list (on how to prepare the list, read down);
3. Enter data type, corresponding to data type of used register;
4. Chose limits;
5. Delay time, if you want to filter accidential ar short time events;
6. And a code of event (value must to be from 0 to 99 and will be used for alerts SMS sending)

If you need to get data not from the first register – you need to count address of register:

- One register takes 2 bytes;
- **Char** type argument takes – 1 register;
- **Int16** type argument takes – 1 regiter;
- **Int32** type argument takes – 2 registers;
- **Float** type argument takes – 2 registers



Pic 64 Limits verification

To create and/or edit list of limit's values use file limits.csv, that is in program's folder. This file can be edited by MS Excel.

Event code it is not analysed and can be used few tumes per system, so you can set setting for few limits. But form other side, if you will use the same code for a few register, this can mislead you by sending alerts on diggerent events, so use it carefully.

7.14 Alerts

7.14.1 Alert over Ethernet settings [Alerts>Configuration].

Select check box to Enable alert over Ethernet function. Enter destination Modbus TCP/IP servers IP address and Port, change time values if you need and set data.

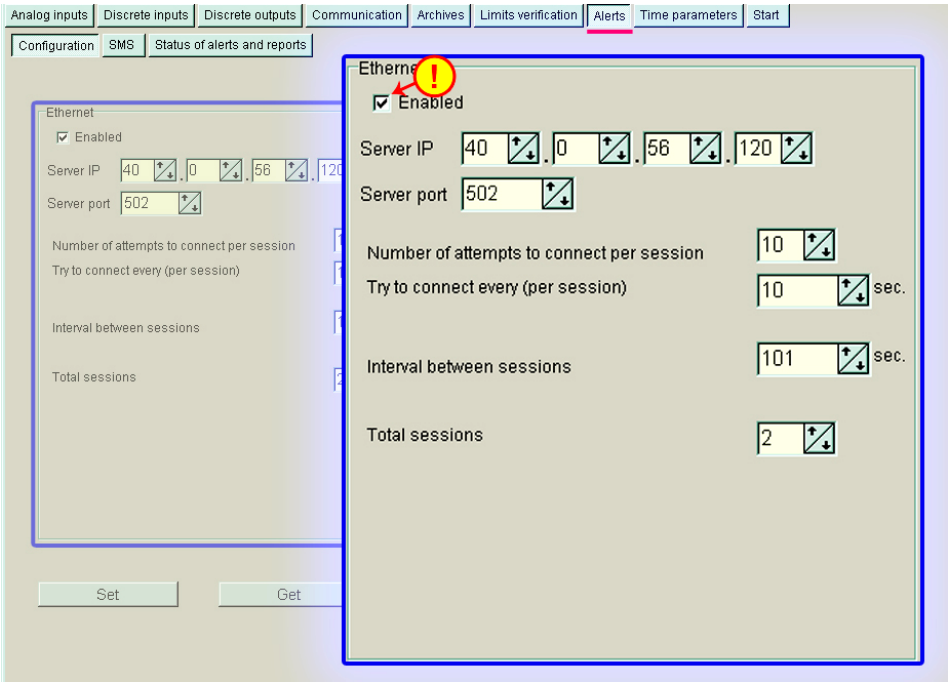
If you did everything correct, on every deviation, the alert message will be sent.

Information transfer algorithm:

1. Controller makes connection to server, over Ethernet TCP socket.
2. By Modbus TCP/IP protocol, using function nr. 16, deviation report will be sent to server (in register list, information is stored in registers, starting from address nr. 64000). Sent report contains:
    - Unique controller number;
    - Controller IP address;
    - Deviation identifier (see chapter 8.7)
3. When answer into function nr. 16 is received, controller disconnects from TCP socket.
4. When server get's deviation information, it initializes connection with controller and over Modbus TCP/IP read all details about deviation
5. If connection with server was not established over the set (connection to server time) number of tries, controller will try to connect after some time.

If opening of socket is succeeded, but server do not answer into Modbus function 16, controller

repeat once and on failure, closes TCP socket. After set time (wait between trial times) amount of time controller will try to send alert again.



Pic 65 Configure Alerts over Ethernet

7.14.2 Alert over GPRS [Alerts>Configuration].

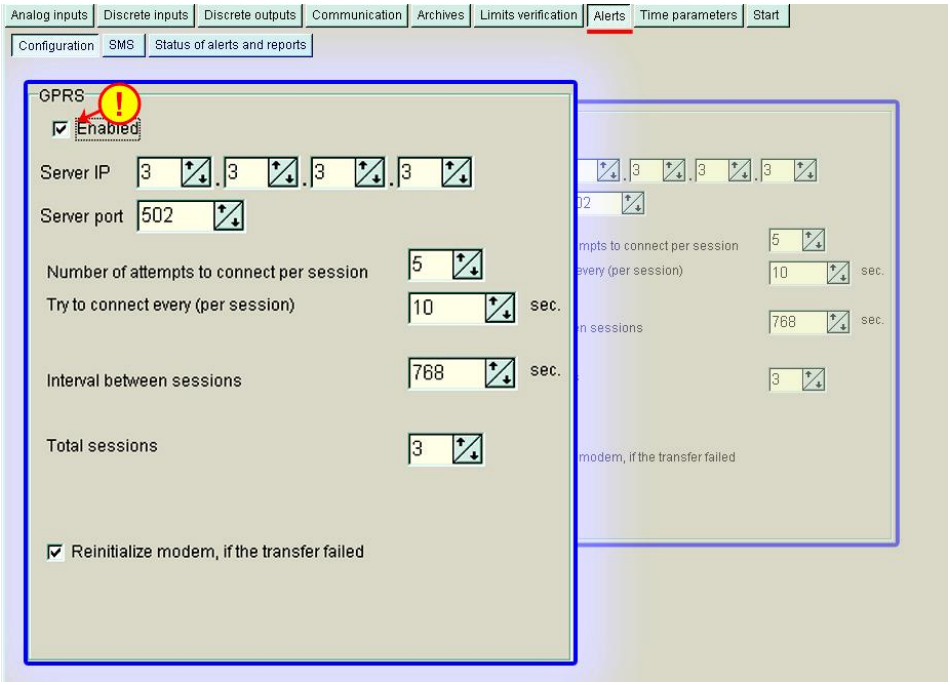
On input port change, controller generates event. Through GPRS, controller can send information to remote server (we call this Alert). To use Alerts over GPRS:

1. Check box Enable;
2. Enter remote server IP address (PC that you use to receive alerts IP address);
3. Use default, or change Modbus TCP/IP port address;
4. Setup connection intervals and other settings.

Information transfer algorithm:

1. Controller makes connection to server, over Ethernet TCP socket.
2. By Modbus TCP/IP protocol, using function nr. 16, deviation report will be sent to server. Report contains:
    - Unique controller number;
    - Controller IP address;
    - Deviation identifier (see chapter 8.7)
3. When answer into function nr. 16 is received, controller disconnect TCP socket;
4. When server get's deviation information, he initialize connection with controller and over Modbus TCP/IP read all details about deviation;

5. If connection with server was not established over the set (connection to server time) number of tries, controller will try to connect after some time (see **Pic 66**);
6. If opening of socket is succeeded, but server do not answer into Modbus function 16, controller repeat once and on failed, close TCP socket. After set time (wait between trail times) amount of time controller will try to send alert again. (see **Pic 66**).



Pic 66 Configure Alert over GPRS

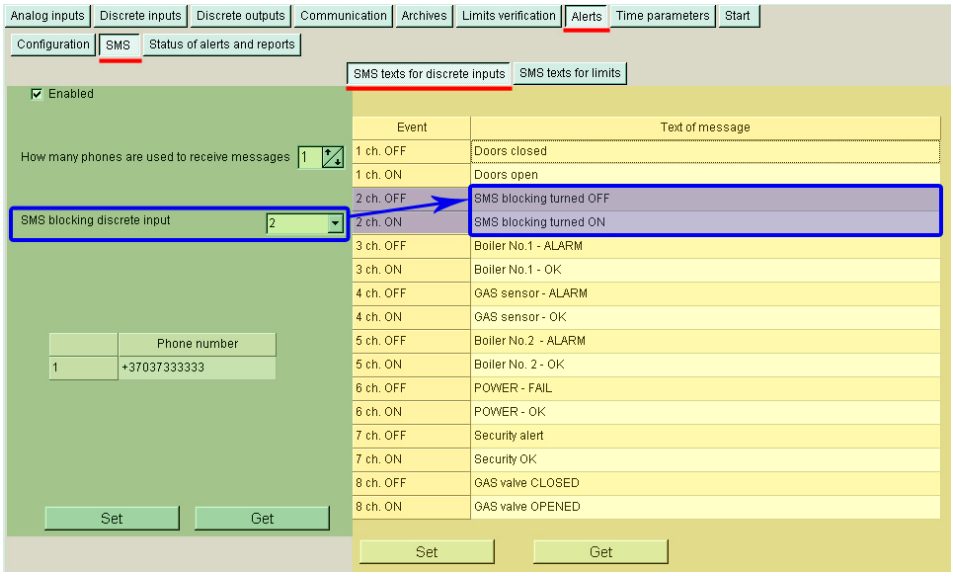
7.14.3 Sending alert over SMS

Controller has possibility to send short SMS text messages. Mark check box for enabled. Choose how many phone number will get SMS messages (max. 5 phone numbers). Fill table with phone numbers.

There is possibility to block SMS sending during controller testing procedures. From discrete input blocking list choose, which discrete input blocks SMS sending (if “none” is selected – SMS blocking is disabled). Closed discrete input disables SMS sending (see **Pic 67**).

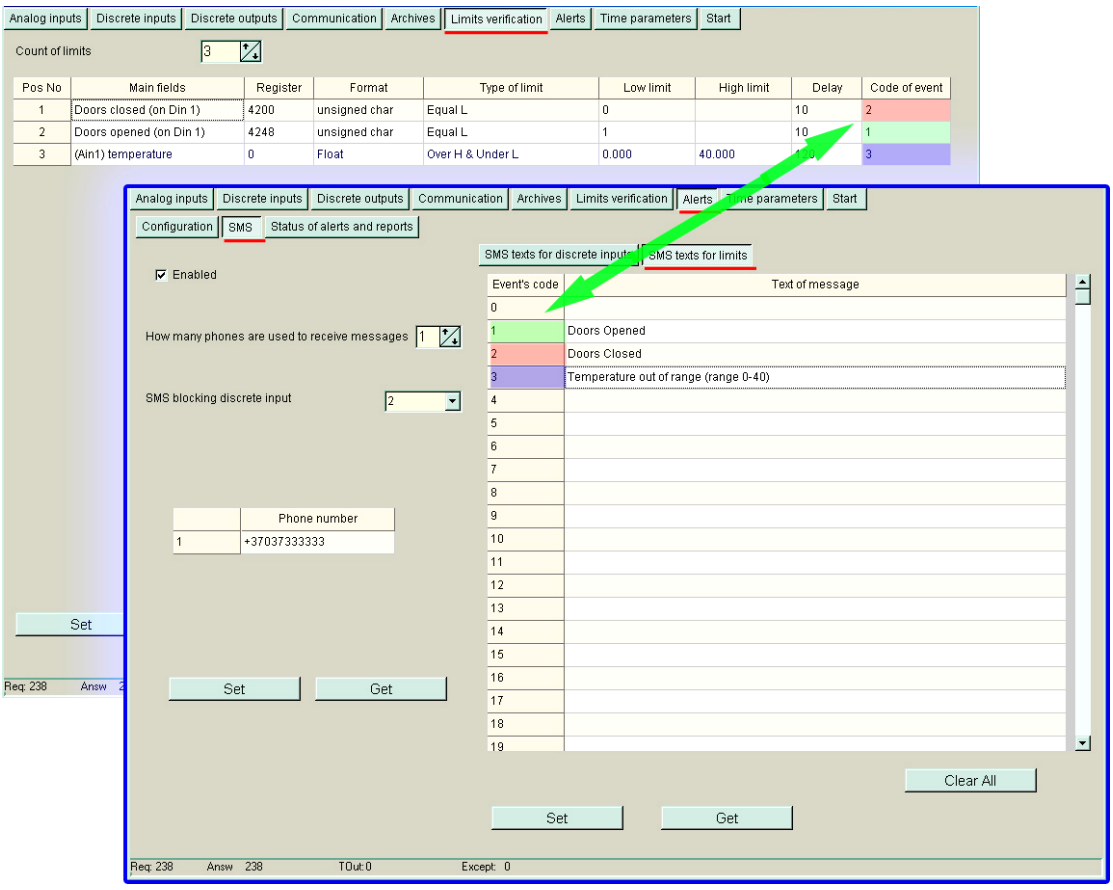
7.14.3.1 SMS Alert on Discrete Alarms

All 8 discrete inputs states (ON and OFF) are used for sending SMS alerts (see **Pic 67**). For each discrete channel‘s state you can add text, that you want to send (max. 160 symbols).



Pic 67 Send "Discrete inputs" alert over SMS

7.14.3.2 SMS Alert on Limit verification



Pic 68 Send "Limits verification" alerts over SMS

SMS alerts for limits is used for sending SMS alerts, when alert conditions is set in „Limit verification" screen. In „Limit verification" set Codes of events are used as ID (Event's code) for alert messages identification (see **Pic 68**).

On how to setup Limits verification read in chapter **7.9.3.**

7.14.4 Status of alerts and reports

In section Status of alerts and reports you can see:

- Current status of alerts over Ethernet;
- Current status of alerts over GPRS;
- Status of Modbus server;
- Modbus server information messages.

Pic 69 Status of alerts and reports

7.15 Data storing to archive [Archives]

All collecting data in controller are grouped into 9 groups:

1. Analog inputs
2. Discrete inputs
3. Heat
4. GAS
5. Water
6. Electricity
7. Discrete impulses
8. Events
9. Diagnostic

Controller, some data, writes to archive by default, but you can edit data storing time intervals (Period). Other data, like Analog inputs you need to enable.

To write analog inputs data to archive - enable it by selecting check box in [Archives>Configuration]. If you need, you can change data storing period (default analog intups period value is 900s).

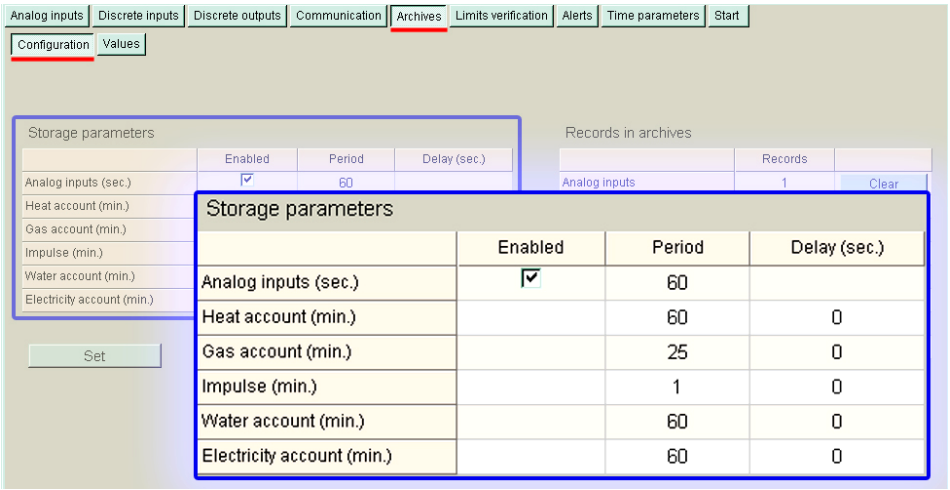
Dimensions of Analog inputs period is seconds, and periods for other devices is set in minutes.

Period time is always calculated from midnight (time 0:00), so if at 10:42 you will Set accounting period to 60 min - the first time data will be stored on 11:00, and then every 60 min..

If meter reading period coincist with data storing to archive period, then data reading and storing will start at the same time, this means to archive will be stored data of past period (not current, because data reading need more time to get data), so you need to make a short delay, to leave system time to get new data from meter – in section Delay (sec.) write delay time, usualy 15-20 sec. is enought (see **Pic 70**).

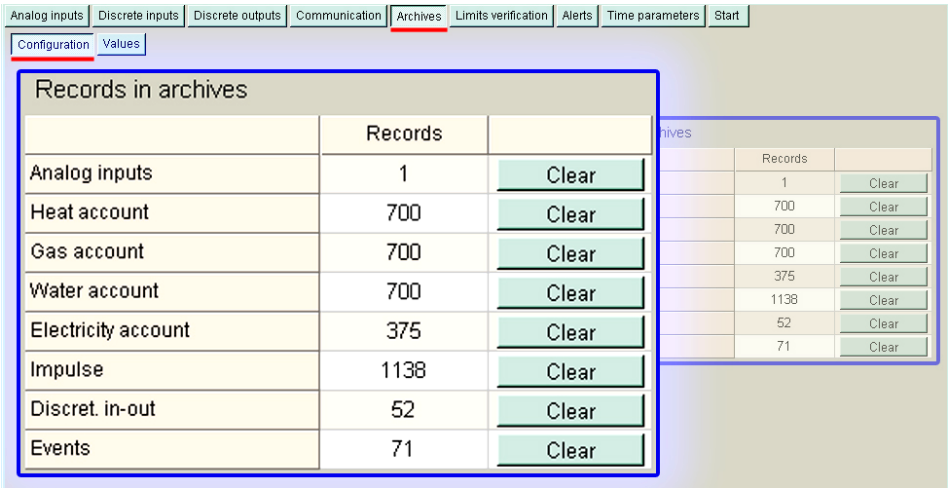
In Analog input group are also stored data from thermometers that can be connected to serial interface (up to 5 devices). More details on thermometers, you can read in chapter (**8.1)** Loging analog input channels [Archives>Values>Analog inputs].

To archive stored time stamp will coincist with meter (or other device) reading time, and storing to archive delay time will not be added !



Pic 70 Archive storage parameters section [Archives>Configutation]

In section RECORDS IN ARCHIVES, you can see total number of stored values in each group. By pressing clean, you can manually clean group's data from archive (see **Pic 71**).



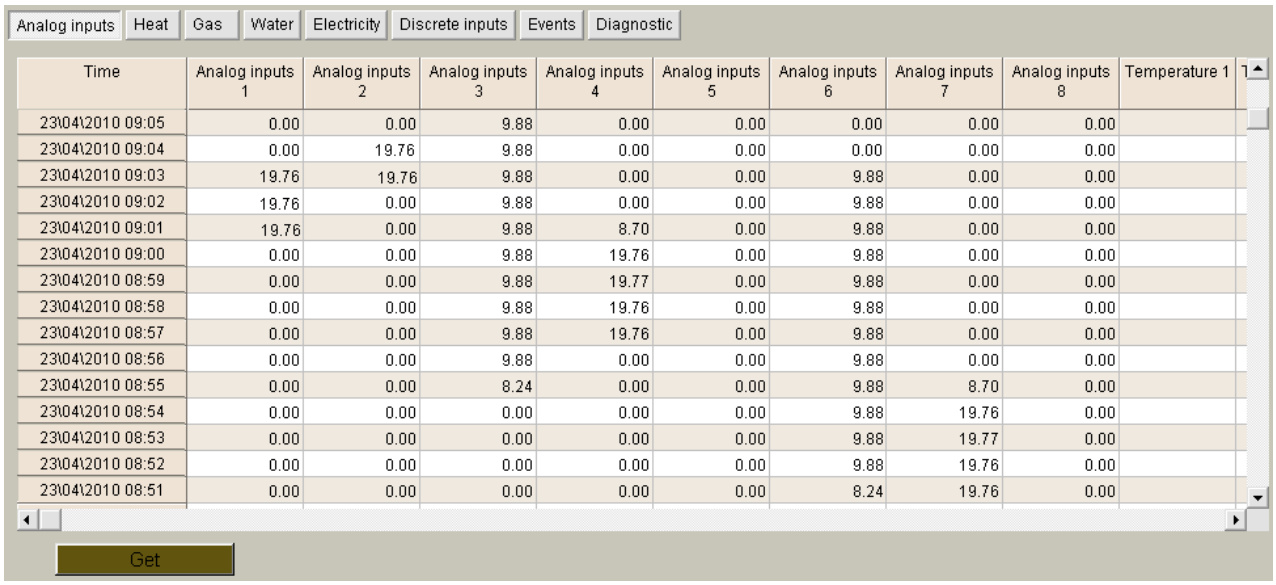
Pic 71 Records in archives section [Archives>Configutation]

8 STORED DATA

8.1 Loging analog input channels [Archives>Values>Analog inputs].

In Analog inputs archive you can find values of all 8 analog inputs and up to 5 temperature sensors, connected through serial interface. Every record contains time (long integer – 32 bits), and values (float 32 bits) of all analog and temperature inputs (see chapter **7.15 Data storing to archive [Archives]**).

By default analog inputs are stored every 900 seconds. In the [Archives/Configuration] window you can change this value to yours (see chapter **7.15**).

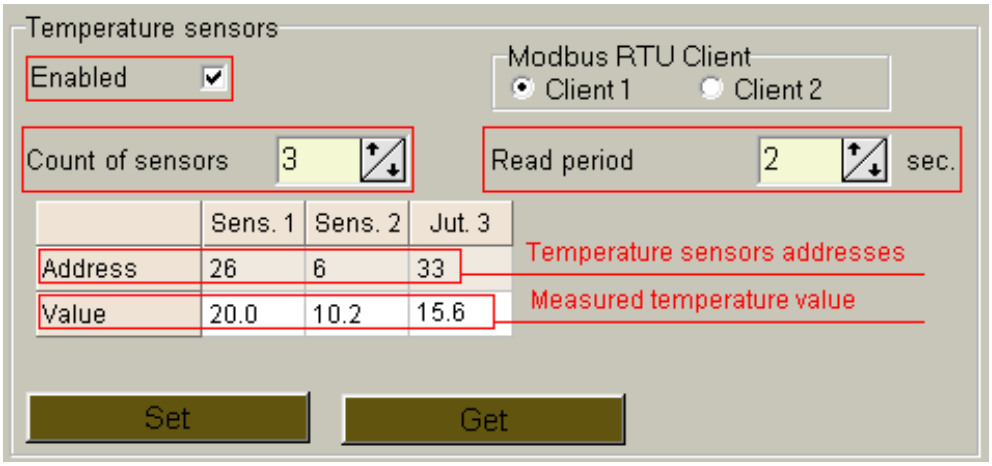


Time	Analog inputs 1	Analog inputs 2	Analog inputs 3	Analog inputs 4	Analog inputs 5	Analog inputs 6	Analog inputs 7	Analog inputs 8	Temperature 1
23\04\2010 09:05	0.00	0.00	9.88	0.00	0.00	0.00	0.00	0.00	
23\04\2010 09:04	0.00	19.76	9.88	0.00	0.00	0.00	0.00	0.00	
23\04\2010 09:03	19.76	19.76	9.88	0.00	0.00	9.88	0.00	0.00	
23\04\2010 09:02	19.76	0.00	9.88	0.00	0.00	9.88	0.00	0.00	
23\04\2010 09:01	19.76	0.00	9.88	8.70	0.00	9.88	0.00	0.00	
23\04\2010 09:00	0.00	0.00	9.88	19.76	0.00	9.88	0.00	0.00	
23\04\2010 08:59	0.00	0.00	9.88	19.77	0.00	9.88	0.00	0.00	
23\04\2010 08:58	0.00	0.00	9.88	19.76	0.00	9.88	0.00	0.00	
23\04\2010 08:57	0.00	0.00	9.88	19.76	0.00	9.88	0.00	0.00	
23\04\2010 08:56	0.00	0.00	9.88	0.00	0.00	9.88	0.00	0.00	
23\04\2010 08:55	0.00	0.00	8.24	0.00	0.00	9.88	8.70	0.00	
23\04\2010 08:54	0.00	0.00	0.00	0.00	0.00	9.88	19.76	0.00	
23\04\2010 08:53	0.00	0.00	0.00	0.00	0.00	9.88	19.77	0.00	
23\04\2010 08:52	0.00	0.00	0.00	0.00	0.00	9.88	19.76	0.00	
23\04\2010 08:51	0.00	0.00	0.00	0.00	0.00	8.24	19.76	0.00	

Pic 72 Structure of Analog input tabale [Archives>Values>Analog inputs]

Temperature sensors:

To controller can be connected up to 5 “Valsena” made temperature sensors. Temperature sensors use RS485, to connect to controller. Every sensor has it’s one number, two last symbols in sensor’s code is Modbus address. In thermometer configuration section Temperature sensors (on [Communication/Virtual interfaces]), you can enable temperature sensors (see chapter **7.8.2 Setup Virtual interfaces.**).



Pic 73 Temperature sensors section [Interfaces>Virtual interfaces]

Also you need to set:

- number of temperature sensors,
- read period (by default – 2s),
- sensor's Modbus address (two last digits of sensor number)

8.2 Heat couter data [Archives>Values>Heat]

Controller can log data from up to 5 meters. Logged parameters:

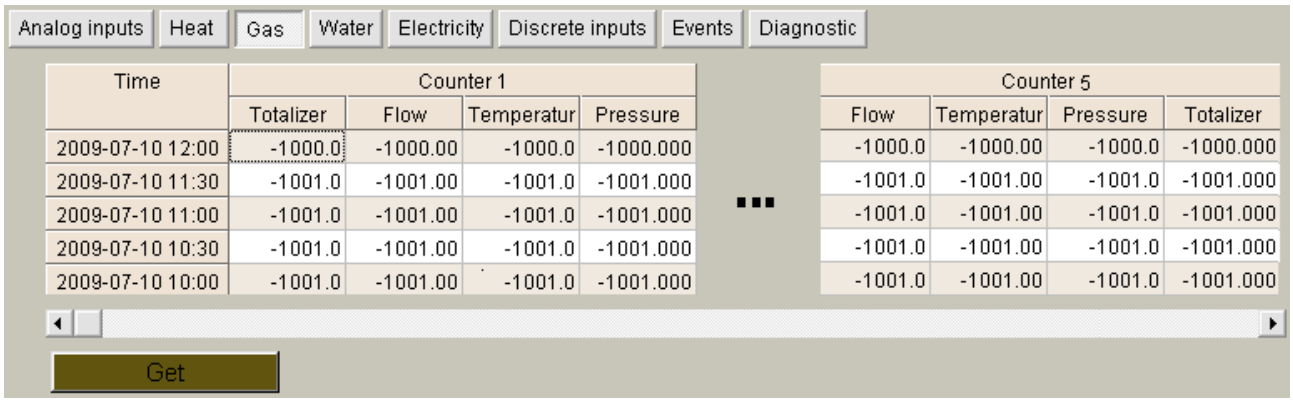
1. Energy;
2. Volume;
3. Power;
4. Flow;
5. Forward temperature;
6. Return temperature;
7. Temperture difference;
8. Hour meter;
9. Real time stamp.

8.3 GAS meter data [Archives>Values>GAS]

Controller can log data from up to 5 meters. Data are grouped by meter, in first group you can see all data form 1 meter, then 2 and up to 5 (see **Pic 74**). Data field type is float (32 bits) digit. Logged parameters:

10. Pressure
11. Temperature
12. Corrected factor

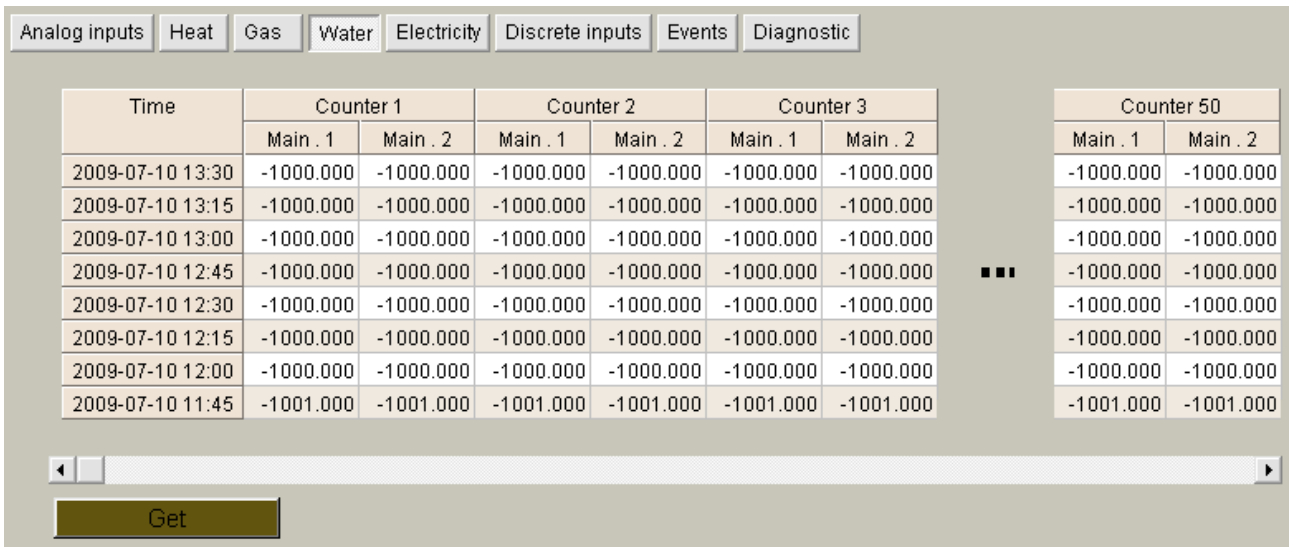
13. Uncorrected factor
14. Corrected volume
15. Uncorrected volume



Pic 74 GAS meter archive screen [Archives>GAS]

8.4 Logging water data [Archives>Values>Water]

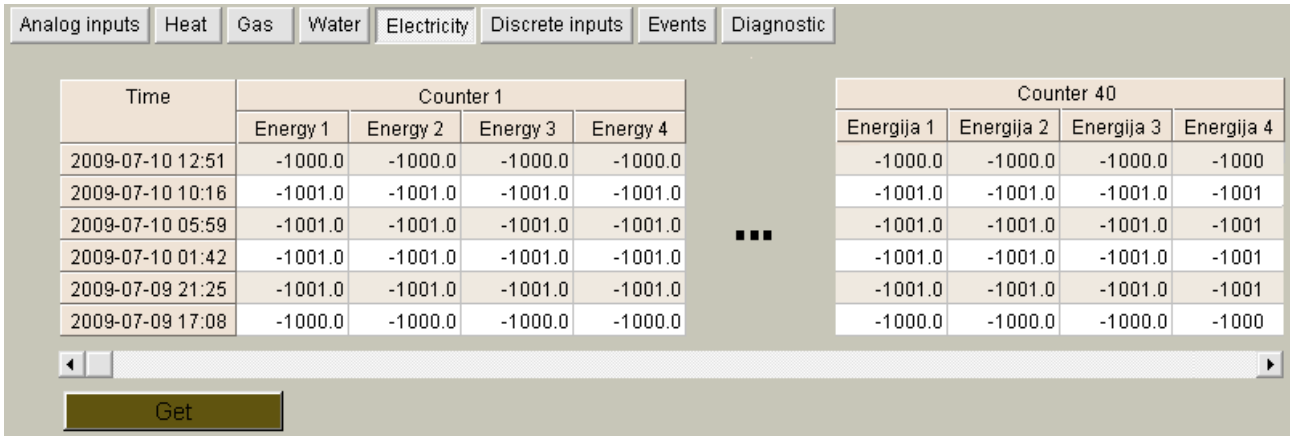
In water data log, can be stored up to 50 meters. All data are grouped by meters and each meter contains 2 value fields and time stamp.



Pic 75 Water data log screen [Archives>Water]

8.5 Electricity meter data logging [Archives>Values>Electricity].

To controller can be connected up to 40 electricity meters. All data are grouped by meterss. Each record of meters has 4 value fields and data stamp (see **Pic 76**).

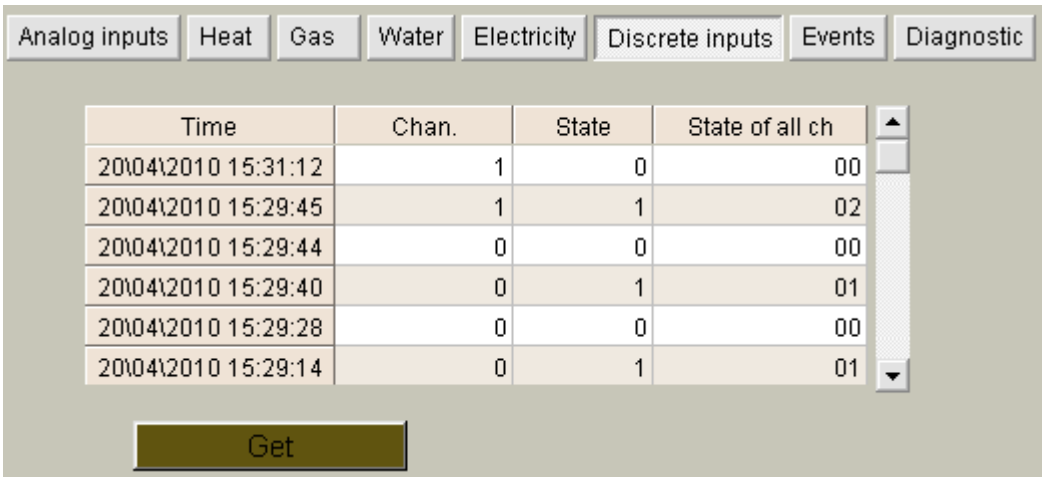


Pic 76 electric meters log screen [Archives>Electricity]

8.6 Discrete inputs log [Archives>Values>Discrete imputs]

Discrete input table contains records about discrete channel changes. Totally controller support 8 discrete channels.

Every record has time stamp, channel number (from 0 to 7, totally -8), state after changes (0 – open, 1 – closed contact) and state of all channels, in binary format you can see state of every channel (0 –open, 1 – closed contact), if value is two symbols, this means it is in HEX (you need to convert to binary manually) (see **Pic 77**).



Pic 77 screen of discrete inputs log [Archives>Discrete imputes]

8.7 Event logging [Archives>Values>Events]

Event conditions:

- Analog inputs value go out from set range,
- Discrete input channel change.

Every deviation can be set/changed by configuring controller. On deviation appears, it will be

saved in event log. Event log records fields:

- Time
- Identifier
- Parameters
- Chanel
- Event
- Value

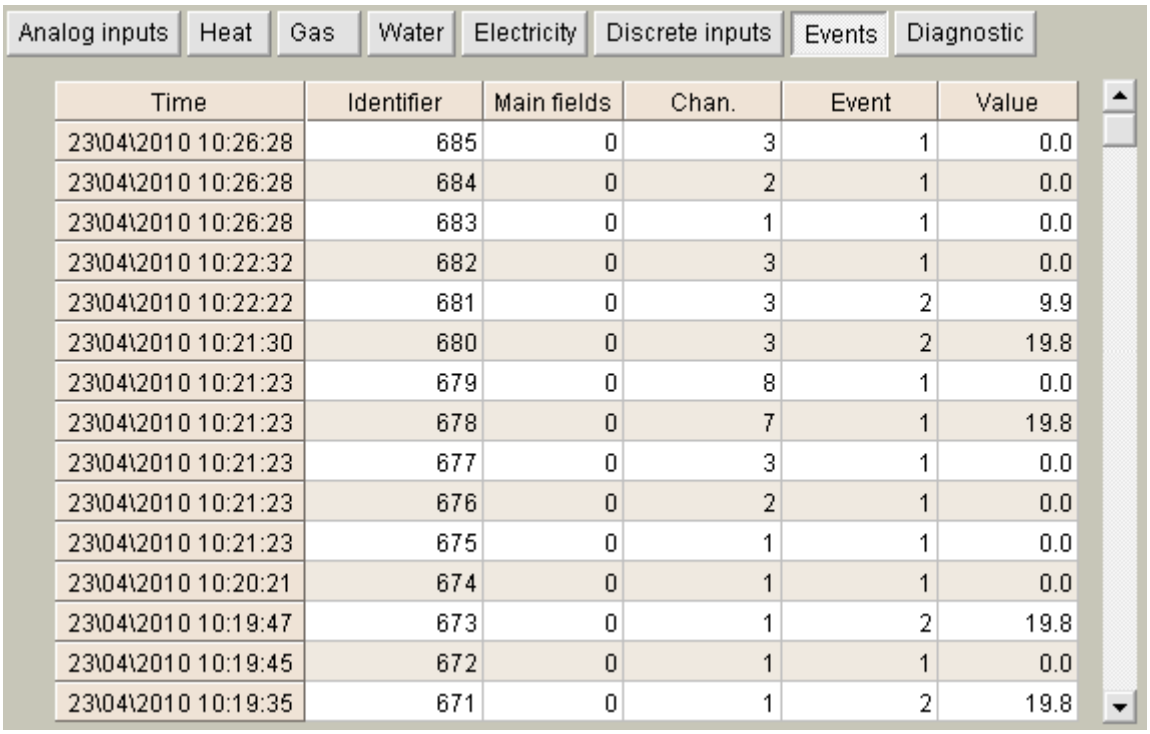
By parameters column, you can understand which device group send's this event :

0 – Analog inputs;

1 – Discrete inputs;

2 – Heat meter;

3 – Gas meter.



Time	Identifier	Main fields	Chan.	Event	Value
23\04\2010 10:26:28	685	0	3	1	0.0
23\04\2010 10:26:28	684	0	2	1	0.0
23\04\2010 10:26:28	683	0	1	1	0.0
23\04\2010 10:22:32	682	0	3	1	0.0
23\04\2010 10:22:22	681	0	3	2	9.9
23\04\2010 10:21:30	680	0	3	2	19.8
23\04\2010 10:21:23	679	0	8	1	0.0
23\04\2010 10:21:23	678	0	7	1	19.8
23\04\2010 10:21:23	677	0	3	1	0.0
23\04\2010 10:21:23	676	0	2	1	0.0
23\04\2010 10:21:23	675	0	1	1	0.0
23\04\2010 10:20:21	674	0	1	1	0.0
23\04\2010 10:19:47	673	0	1	2	19.8
23\04\2010 10:19:45	672	0	1	1	0.0
23\04\2010 10:19:35	671	0	1	2	19.8

Pic 78 Events log screen [Archives>Events]

9 SUPPLEMENT

9.1 System requirements

Minimal system requirements
PC with 1 gigahertz or high processor
512 megabytes (MB) of RAM
100 megabytes (MB) free hard disk space
Super VGA (800 x 600) or higher-resolution video adapter and monitor
Keyboard and Mouse or compatible pointing device
Free COM port, USB or Ethernet adapter (depending on your connection type)
Microsoft Windows XP or high Operating system

Recommended system requirements
PC with Intel I5 2 gigahertz processor
4 gigabytes (GB) of RAM
200 megabytes (MB) free hard disk space
Super VGA (1280 x 768) or higher-resolution video adapter and monitor
Keyboard and Mouse or compatible pointing device
Free COM port, USB or Ethernet adapter (depending on your connection type)
Microsoft Windows 7 or high Operating system

9.2 Default connection values

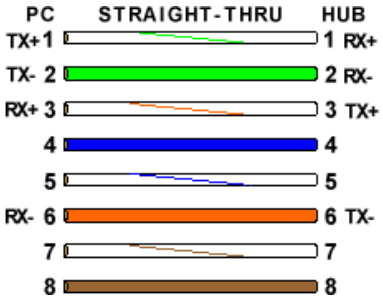
If Controller don't have USB installed, then configuration UART 6 which default values:
Bits per second **19200**
Data bite **8**
Parity **Even**
Stop bits **1**

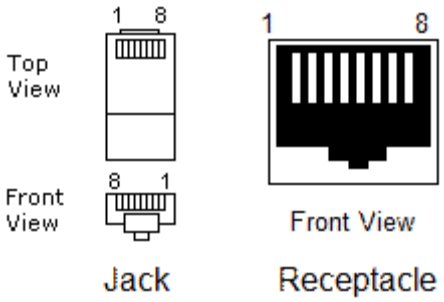
Default Ethernet settings are:
IP address **192.168.1.125**
number of bits **24** (this means MASK: 255.255.255.0)

9.3 Preparing UTP cable

You can connect computer to controller over network (switch, hub, etc.) or directly (controller is auto sensing) - using standart UTP or FTP cable. Cable must to be connected straightly – wiring of Jack must to be the same in bouth ends of cable.

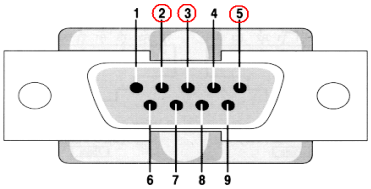
Ethernet uses 1, 2, 3 and 6 pins, see carefully cable colors of this pins.





9.4 RS232 cabling

Devices to controller is connected through terminal blocks. Exact configuration of pins are shown on the top of the case. For communication with computer controller is using only RD, TD and GND signals:

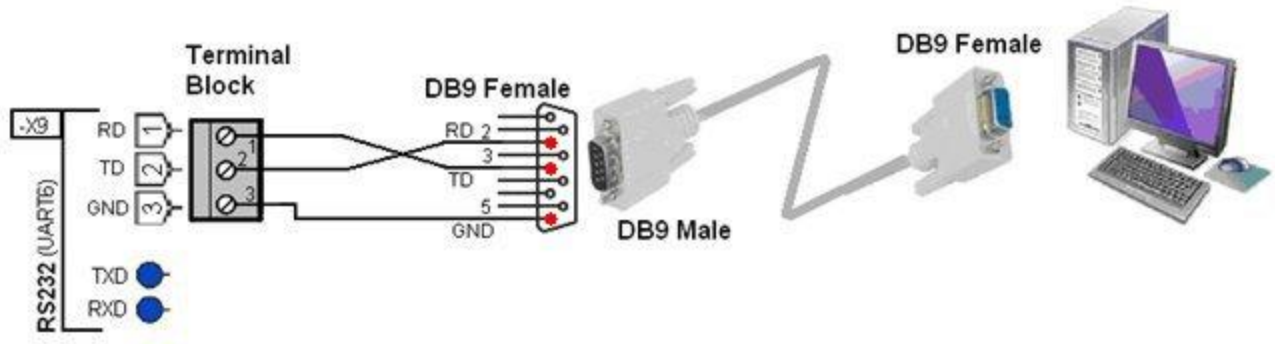


2 pin – RD (Received data)

3 pin – TD (Transmitted data)

5 pin – GND (Ground)

You can use existing Com port, or USB to Com port, PCMCIA to Com or etc. device.



9.5 Com port setup

If you are connecting for the very first time or after hardware reset, on top of device, you can find default manufacturers connection settings (in other case ask integrator or system administrator for current connection settings). You need to set correct your computers COM port settings - Speed (Bits per second), Data bits, Parity, Stop bits to connect to controller.

Depending on what USB port you plug in device or adapters, your COM port will change. Here is how to find out what the setting is and to change if necessary. Often such devices use common ports COM1 - COM8.

Depending on your computers operating system, COM port setting can be find:

Windows 98 COM port setting

1. Choose Start > Settings > Control Panle
2. In the Control Panel window, double-click the System icon and then click the Device Manager tab.
3. On the Device Manager card, determine the COM port settings for each COM port.
4. Double-click the Ports (COM&LPT) icon.

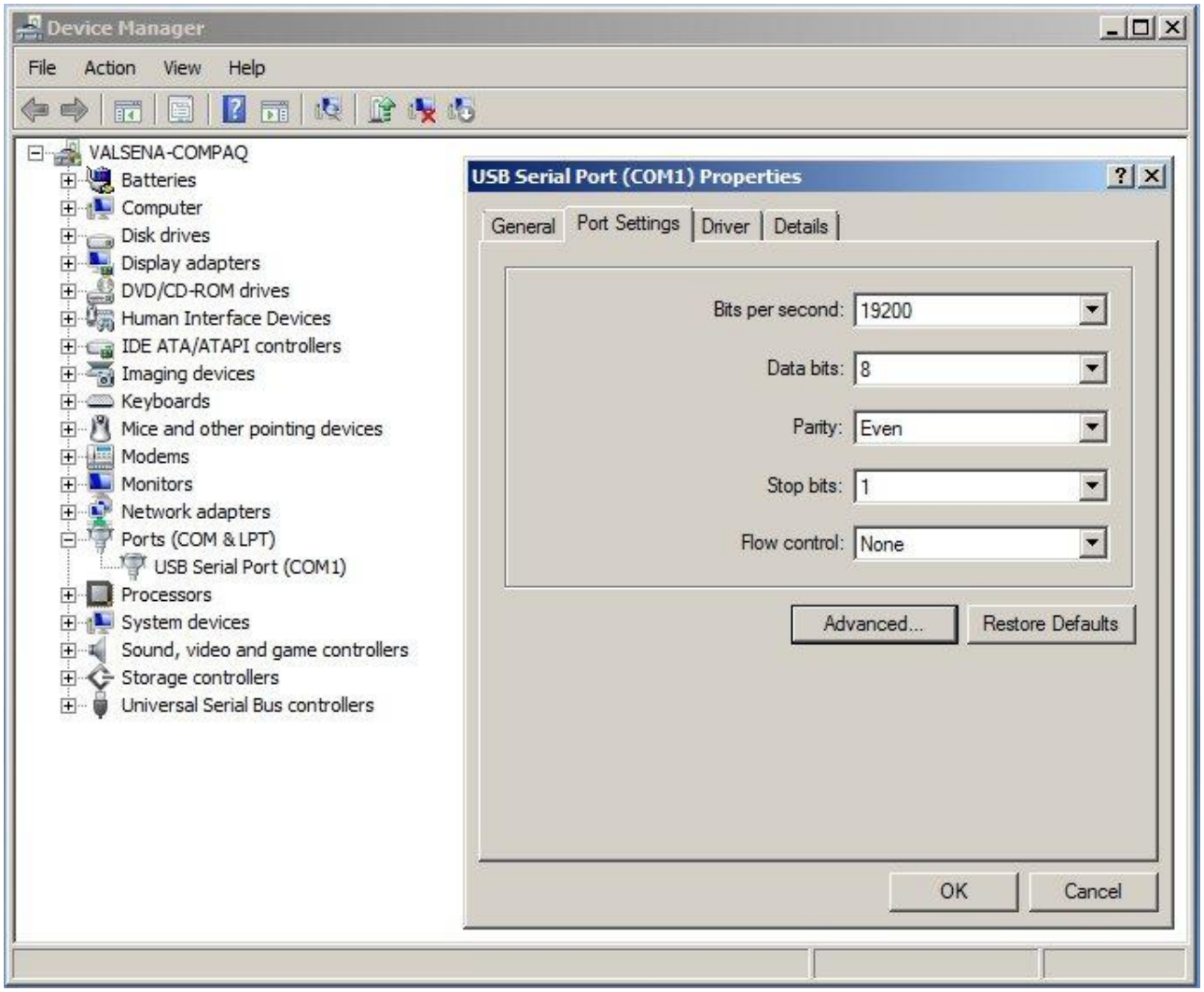
Windows XP COM port setting

1. Choose Start > Settings >Control Panel
2. Double-click Administrative Tools, double-click Computer Management, and then click Device Manager.
3. Double-click Ports (COM&LPT). Right-click the port for which you want to change settings, and then click Properties. On the Port Settings tab, make changes if necessary.

Windows Vista and Windows 7 COM port setting

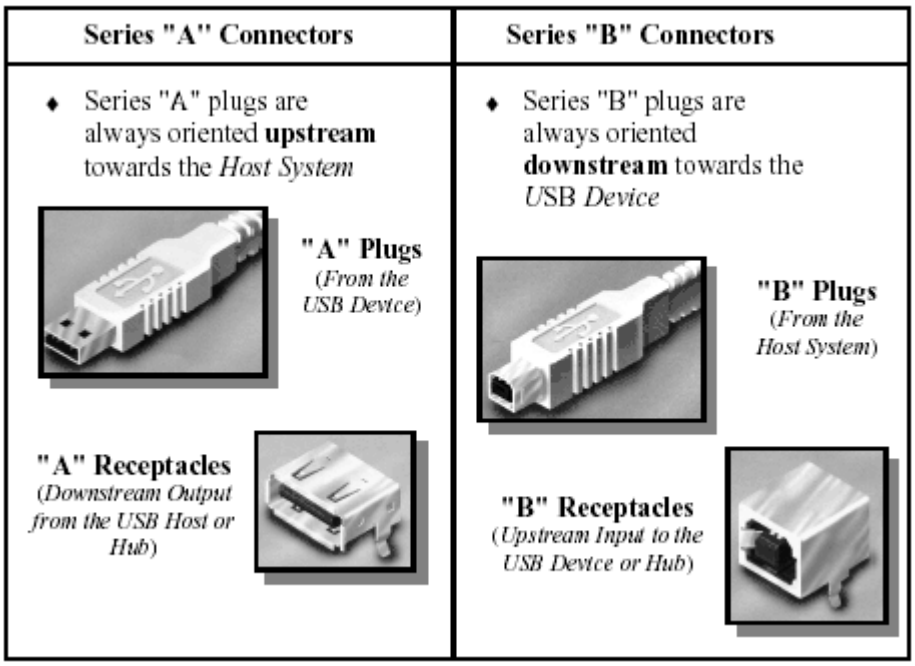
1. Chose Start > Control Panel > Device manager
2. Click continue if user permissions set up
3. Click plus sign next to Port

Look for your device and view COM port used



9.6 USB cable

Depending on controller's model, there can be used A or B type USB connector.



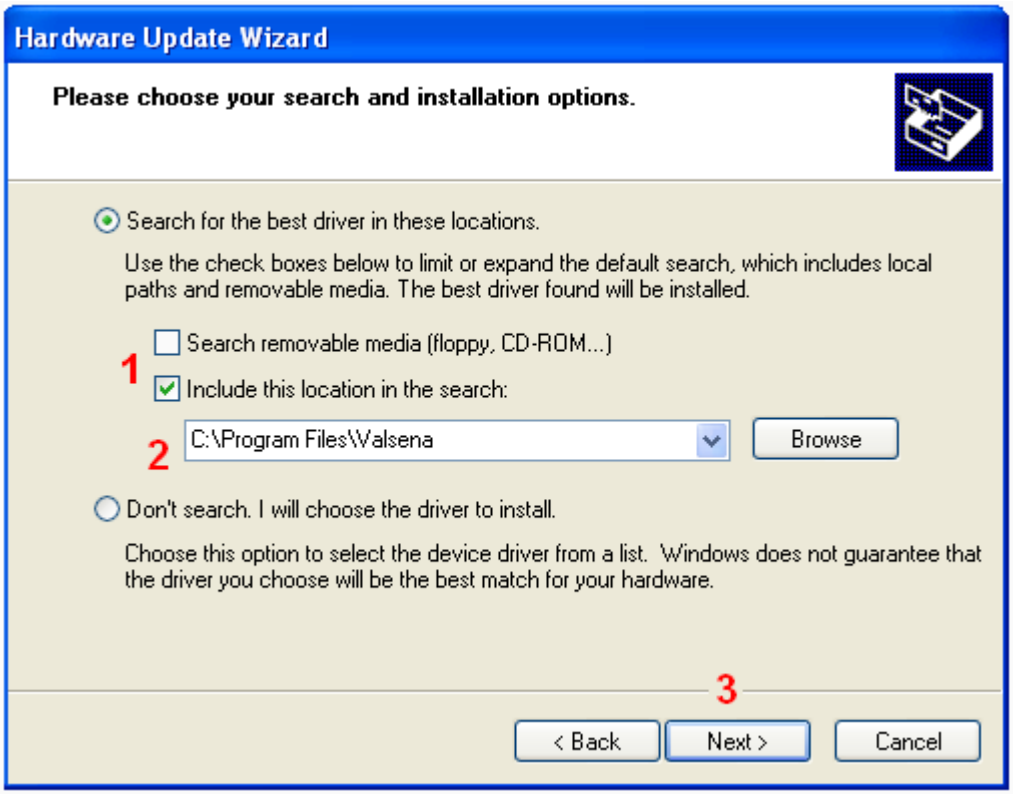
Pic 79 USB connectors

9.7 Installing VALSENA USB driver

Power up device and connect USB cable. Message pops out that New Hardware found: Automatically Setup Wizard window appears. Choose that the setup wizard intalls driver from a list or specific location and press **Next**.

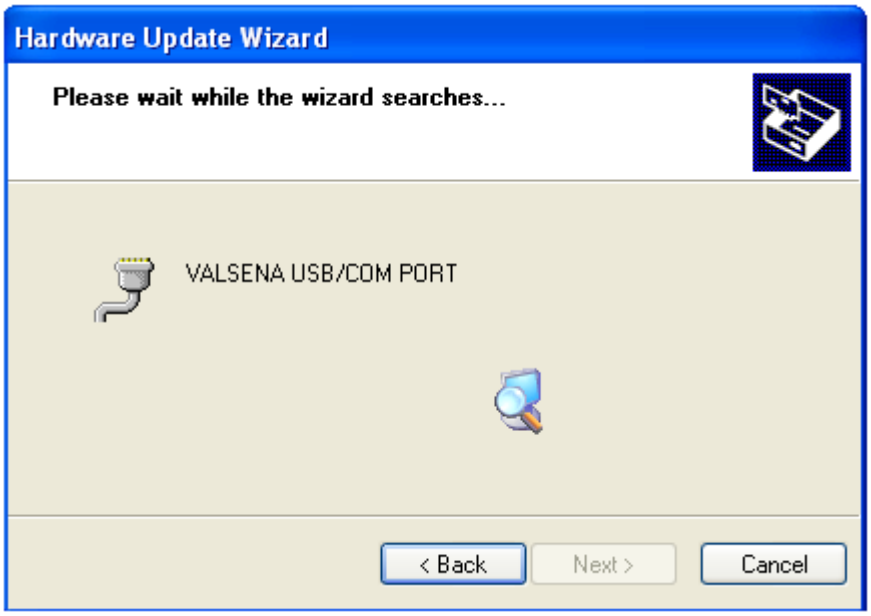
Pic 80 Installing USB - 1'st screen

Secondly, you need to point correct path to your downloaded driver directory and press **Next**.



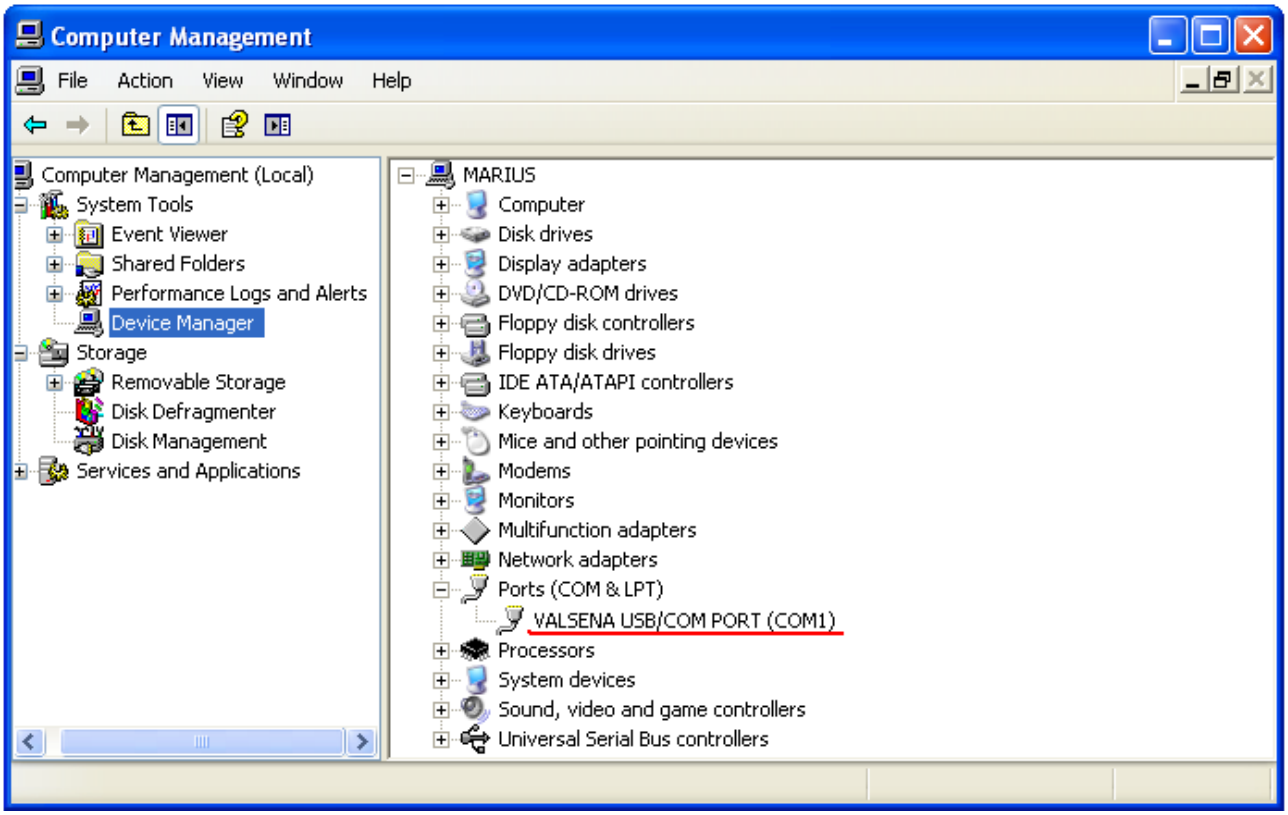
Pic 81 Installing USB - 2'nd screen

Wait a few minutes while install wizard searches for driver. After installer has finished installing driver press **Finish**.



Pic 82 Installing USB - 3'rd screen

If Valsena USB/COM port driver installed successfully in computer device manager Ports (COM & LPT) appears new device. How to change port number, see Com port setup.



Pic 83 Find COM port in Computer Manager

9.8 TCP/IP settings

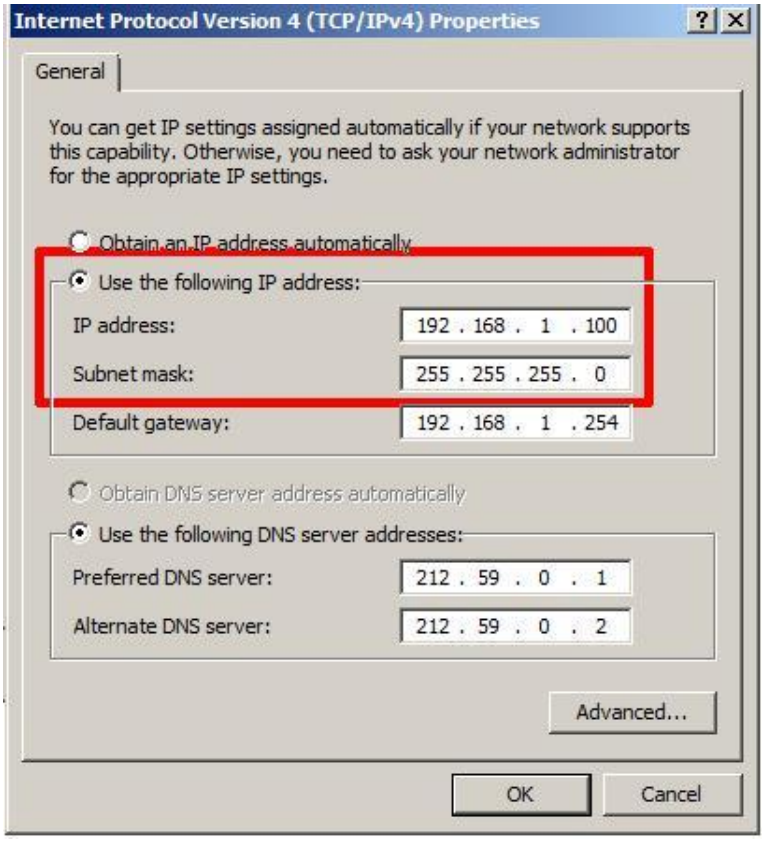
Windows XP, Vista, 7 TCP/IP settings

Choose **Start** > Settings > Control Panel > Network and Sharing connections

On the Network Connections window double click your network device, in mostly PC this is Local Area Connection, click Properties and Continue in new window.

On the Local Area Connections Properties window double click Internet Protocol Version 4 (TCP/IPv4).

On the Internet Protocol Version 4 (TCP/IP4) Properties window select Use the following IP addresses, Subnetmask (255.255.255.0) (and other addresses if you need). In that case I use: IP: 192.168.1.100, Subnet 255.255.255.0. IP addresses can't duplicate on the network



Pic 84 Set static IP on PC

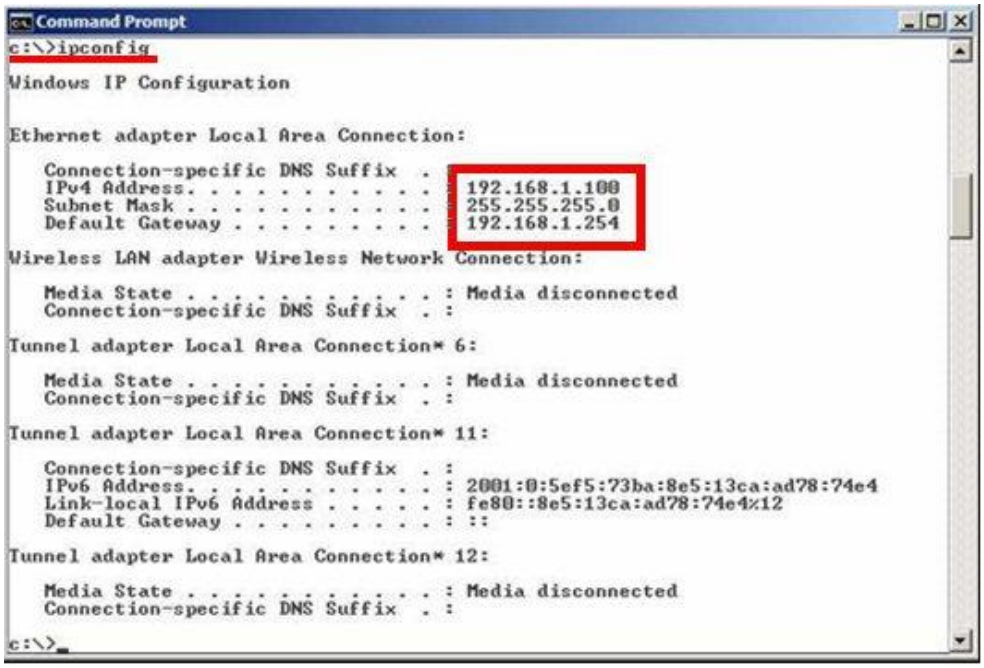
You can check your configuration:

Choose Start > Run

On the Run window type "cmd" and press OK

On the Command Prompt window type "ipconfig" and press Enter

Example: ipconfig screen



Pic 85 View current configuration on Command Prompt