

MODBUS CONFIGURATION SOFTWARE FOR GINEERS ELM-07S DECODER

USER MANUAL

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1. General information

The program is intended for quick and easy setup of IEC61107-to-modbus converter ELM-07S. The ModBus map is available from Gineers, but using this software the user of ELM-07 can quickly understand how this device works and how to set it.

Generally, the device itself has two separate interfaces:

- ✓ RS-232 or RS-485 interface for up to 32 meters connected to it (if 485)
- ✓ ModBus RTU and TCP interface for setting and reading data, retrieved from connected meters

Because IEC 62056-21 is heavy protocol for transmission through ethernet or GPRS connections, the idea of this device is to simplify the user to gather remotely data from electricity meters, having such interface.

In ELM-07 user can program/activate up to 32 different meters. This means that certain registers are associated with EXACT meter by meter serial number. Serial number is usually 8-digit identification (there are exceptions, which use 16-digit number), which should exist for every smart electricity meter.

Furthermore, user can set up to 63 registers (if 32-bit values should be decoded) to be converted from IEC 62056 protocol to simple modbus values. In IEC 62056 registers are named like this for example:

1.8.0
2.8.0
..
15.8.0
etc.

Described above is called SHORT OBIS code, there is also in some cases LONG OBIS codes, which looks like this:

1-1:1.8.0
1-1:2.8.0
1-2:1.8.0

and are used in some more advanced devices, which have more than one measuring channel. This way user can distinct different channels.

ELM-07 supports both Short and Long OBIS codes, although some advanced settings should be made when setting up the device.

With software for configuration user can connect register values from IEC 62056-21 to specific modbus registers. For each meter there is 128 register block, in which are defined meter data of interest. Then user can read certain INPUT register with converted value as a 32-bit integer, corresponding to IEC 62056-21 register of interest. User can also enable 64-bit values to be decoded, but then maximum number of OBIS codes will become 32 instead of 63.

Device reads periodically connected and activated meters and updates all values. This period can vary from 1 to 1440 minutes, user reads last read (actual) value through modbus RTU or TCP interface.

There is also another option - to read continuously all programmed meters. This means that ELM-07S reads consequently all activated meters for readout. When last meter is read, ELM-07S starts immediately to read again the list of meters, starting from first one.

Software for setting ELM-07 has three main TAB's:

- setting main parameters like baud, modbus address, readout interval
- activating ModBus devices and setting registers for readout
- diagnostic TAB, in which user can connect meter directly to a PC and see the readout. This helps in some special cases

Main parameters for setting are:

- set readout/update time of Modbus registers
- set ModBus address of ELM-07S
- set ModBus RTU serial port details – speed and parity
- set Modbus TCP settings - IP, Mask and gateway, or just enable DHCP
- set IEC serial port details – speed and parity for reading electricity meters
- select continuous readout or readout in pre-defined minutes period
- enable or disable LONG OBIS code programming (by default device works with SHORT OBIS codes)
- work with 8-digit serial numbers or 16-digit serial numbers
- enable 64-bit integer decoding of real values (default is 32-bit)

Software options for setting meters in modbus are:

- activating particular meter in ELM-07S memory
- setting which register will be read and updated periodically
- write of single or all registers for current meter activated
- reading single or all register for particular meter from ELM-07S
- read all meters data in ELM-07S
- read particular register data
- save configuration and load it at later time

Of course, all described can be accomplished with other software using ModBus map of the device. But it is good to have quick-start and to see capabilities of the device before starting to write your own code.

2. Starting the program

The program is started with double click on the main executable file – "ELM07.exe".

3. Main window

The program is divided in three TABs:

- setting main parameters
- setting meters for readout

- diagnostics

When logging in the first TAB will be active – main settings of ELM-07. The main look of the program is:

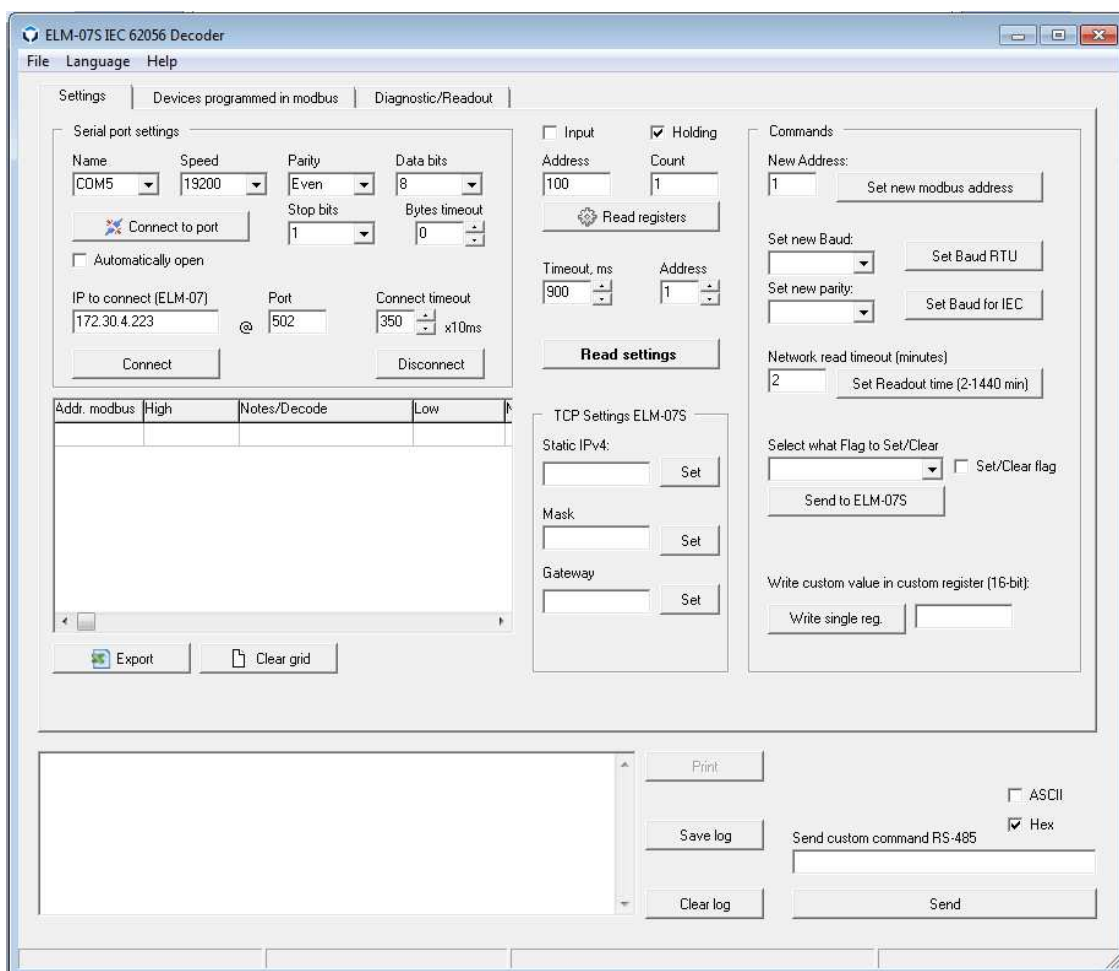


Fig. 1. Main settings window (TAB 'Settings')

From this window user can set serial port settings (ModBus interface) and all general settings, which affect normal work conditions.

3.1. Setting serial port of personal computer/notebook

To read and write to ELM-07 from serial port (modbus rTU) first of all user must set correctly PC serial RS-232/RS-485 port. Serial port settings affect name of the COM port, speed and parity. Possible speeds are from 300 to 115200 bps, with parity (even, odd) or no parity.

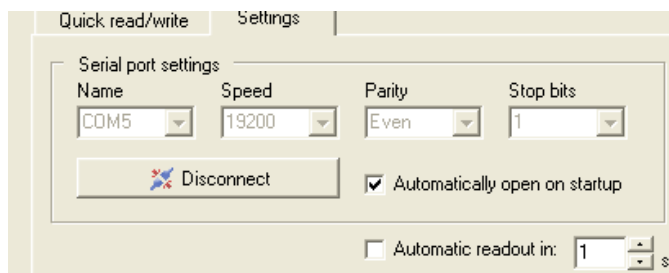


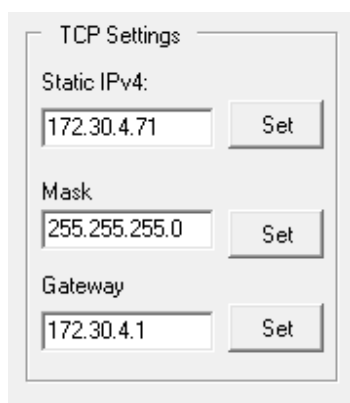
Fig. 2. PC serial port settings

Serial port of PC can be set for automatic opening when program starts. When settings of serial port are gray this notify that the port is open. Program works in mode Master-Slave. This means that program sends command to ModBus interface (reading or writing registers) and then waits for device response. How much time will wait the response can be set in "**Timeout, ms**" property, right to serial port settings. Since ModBus has no special stop byte in the protocol and you can not tell automatically how many registers will be returned user should set this timeout according to speed and reading registers. Something between **600ms** and **1000ms** should be enough for most of the commands.

Default settings of ELM-07S device are **19200, Even, 8, 1**.

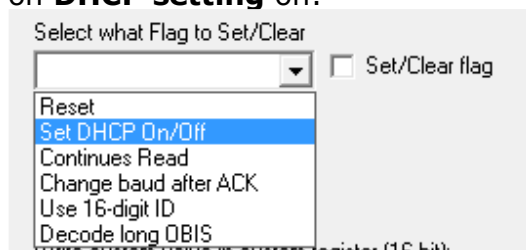
If user wishes to use Modbus TCP - then there are two options for setting the device:

- set static **IP, Mask and Gateway** for TCP conenction in ELM-07S memory:



or

- turn on **DHCP setting** on:



Turning On/Off DHCP and other additional settings are explained further in this document. This is made by special Flags, which can have two values - 0 (turned OFF), or 1 (Turned ON). This is selected with the CheckBox "Set/Clear flag", positioned on the right side of the selected flag.

Standard TCP port for modbus is 502. This can not be set for ELM-07S, it will always wait for connections on port 502.

3.2. Setting general flags

There are several global settings, which affect normal work mode. These are:

- Full readout time – time interval for reading all devices and update information – from 1 minute to 24 hours. This means that on every X minutes ELM-07 will perform read of all meters that are activated in its memory

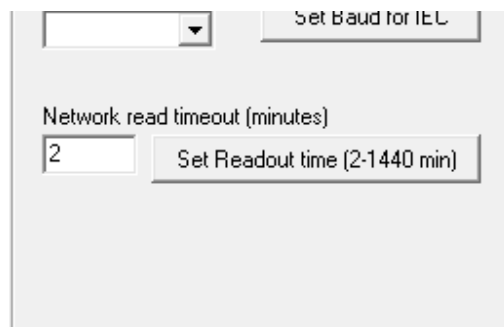


Fig.3. Readout

User should write desired readout interval in MINUTES and then press button **"Set Readout time (1-1440 min)"**.

- Setting different Flags, that can change way how ELM-07S works.

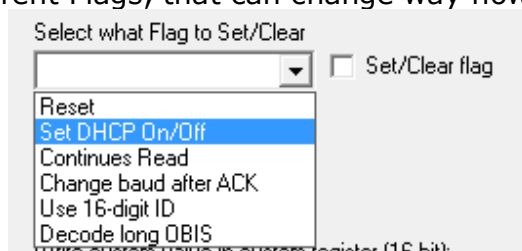


Fig. 4. Setting Flags

Flags, that can be set On or Off, are:

- **Reset** - resets device via software, not by turning it On and Off
- **Set DHCP On/Off** - if flag is SET (checkbox is checked), then ELM-07S works with DHCP enabled. If Off - then user should write in ELM-07S static IP address, Gateway and Mask
- **Continues Read** - if Set, ELM reads continuously all programmed meters, starting from No. 1. If set Off - then ELM-07S reads all

- meters in programmed interval in minutes. Then waits certain minutes to elapse, then reads again
- **Change baud after ACK** - some meters works with that option. If set, this means that after ELM asks the meter, meter responds with some parameters, that are telling next data serial speed. So ELM-07S needs to change the baud rate of IEC-62056 port automatically in order to gather data correctly
 - **Use 16-digit ID** - normally meters are with 8-digit serial number. But in practice we have saw some meters, that has 16-digit ID and ELM-07 should ask them with full 16-digit number in order to get response
 - **Decode long OBIS** - if set, ELM will decode LONG OBIS format, if not - will work only with short OBIS code. Note that if set in Long OBIS format, ELM-07S still will decode and save short OBIS code, but user has the ability to have also LONG OBIS values
 - **Save values in 64-bit integer** - if set, ELM will convert all read data for particular register in 64-bit unsigned integer. This means that one value will be in 4 Modbus registers, not 2.

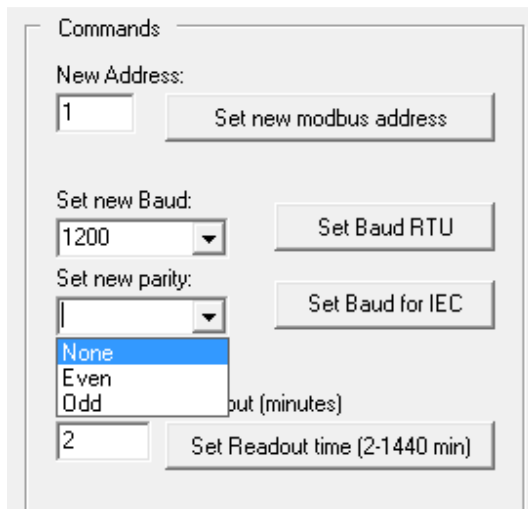
In order to set/clear some flag, user needs to do the following:

- select from the checkbox if flag should be **SET** (Checkbox should be "checked", or CLEARED (Checkbox should be "clear")
- select from the drop-down menu desired flag (for instance "Set DHCP On/Off")
- press button "**Send to ELM-07S**"

3.3. Setting ELM-07 interfaces

ModBus address of the device can be changed from **1 to 250**. Modbus and RS-485/RS-232 port settings also can be changed in speed and parity, but keep in mind that RS-232 serial port is always in mode 7 Data Bits. That is due to IEC 61107 specifics - usually meters come with 7-bit interface.

Both ports can be set from **300 to 115200** baud, Parity - **Even, Odd or None**.



Commands

New Address:
1 Set new modbus address

Set new Baud:
1200 Set Baud RTU

Set new parity:
None Set Baud for IEC
Even
Odd

Set Readout time (2-1440 min)
2 Set (minutes)

4. ModBus window for activating meters

The other TAB is intended for real modbus setting of ELM-07S. In this TAB user can set meters for reading, defining all register from IEC 62056 readout that he needs. Limitations is up to 60 registers for each meter, but this can be overcome by defining same meter as different device (and set different register to be read).

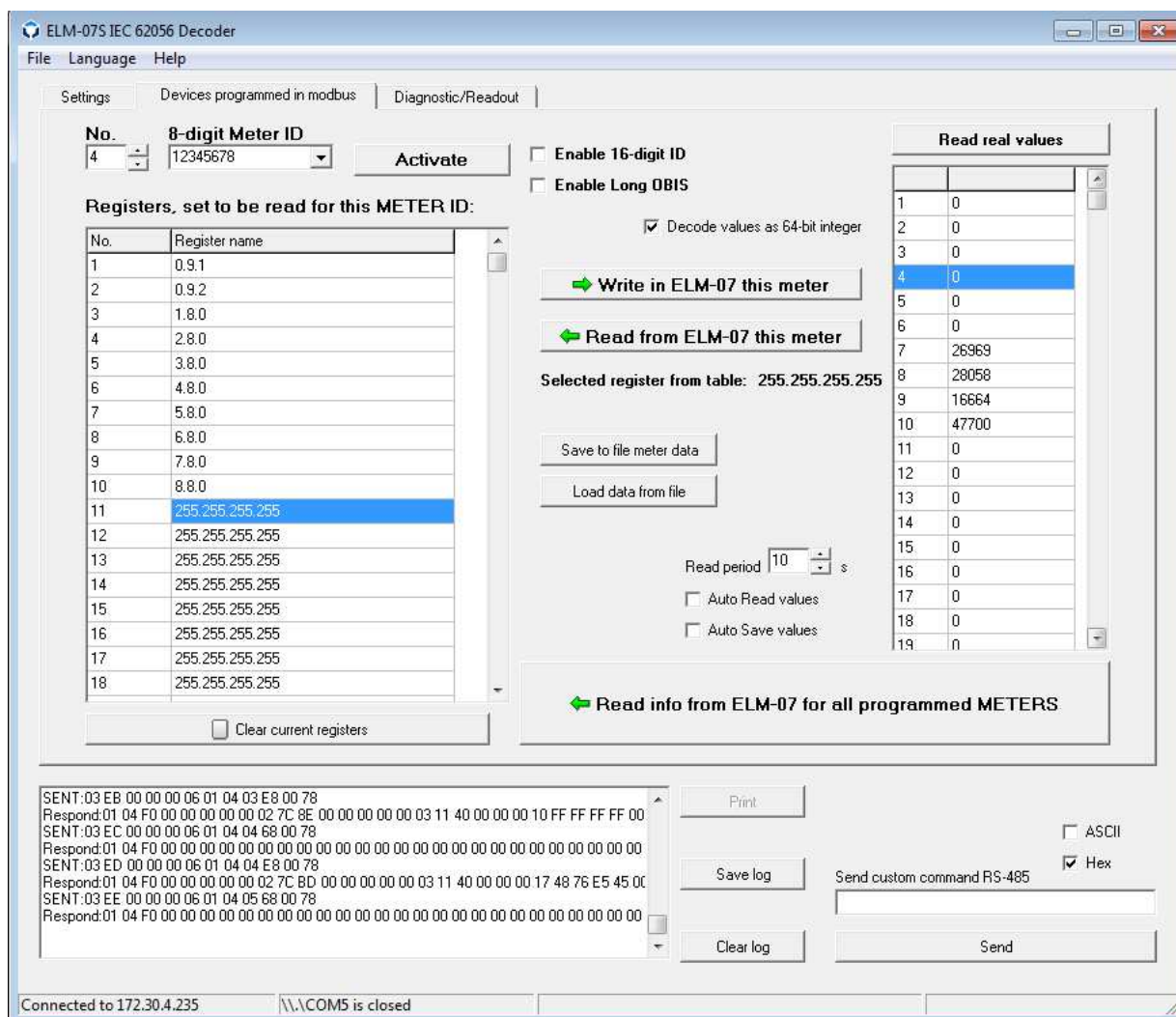


Fig. 5. ModBus window

Every meter in memory of ELM-07S has particular number from 1 to 32. This is important since every meter depending on his number has EXACT space in modbus map for his data.

For every meter user should do the following:

- activate the meter by writing and sending his ID number to ELM-07;
- define which registers from IEC/DLMS are needed for the readout

ID of the meter is usually (and should be) 8-digit number. This is written in ELM-07S as 2 x 16-bit registers - i.e. 4 BCD bytes. Each meter has space in modbus memory register area for 128 registers - 63 x IEC 62056 can be defined, each 2 registers (4 bytes). Details on modbus space can be seen in modbus map of the device, which we provide with each device.

There is an option also to go with 16-digit meter number. To do so, user should check the checkbox **"Use 16-digit number"**. Then ELM-07S will write properly and use 16-digit number.

Each IEC register is written in manner "X.X.X.X" where "X" in general case is a digit (but not always). For example, Total Active Energy register is 1.8.0.

So, if you want to read "1.8.0" register then you should do the following:

- first activate meter you want to read:
 - select meter number in modbus map (field "**No.**")
 - type Meter serial number in field "**Meter ID**"
 - press button "**Activate**"
- define register you want to read:
 - type manually in the grid a register you want to read - for example, if you want to be first register read and decode, then in first row of the table write "1.8.0"
 - click right mouse button and select "**Write in ELM-07**"

If you want what is set for exact register in ELM-07 - again press right mouse button and select "**Read from ELM-07**".

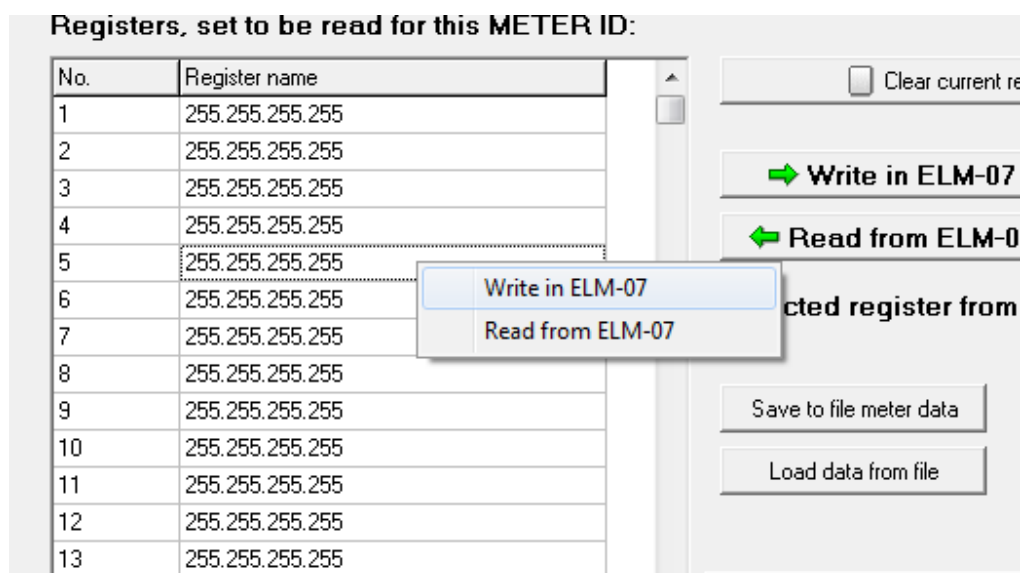


Fig. 6. Popup menu - read/write one register

It is possible to read from or write to ELM-07 all 60 registers for particular meter at once - this is done with buttons on the right side:



Fig. 7. Reading whole block of registers for a meter

There is also an option to read whole memory set from ELM-07S. Have in mind that doing this will clear ALL current meter and register setting in the program that you have been typing before that.

Here is also an option should user use **LONG OBIS** codes or **SHORT OBIS** codes. By default ELM-07S works with Short OBIS codes. If the user wants to go with LONG OBIS codes, he should the following:

- Set ELM-07S in mode for LONG OBIS codes - this means go to "Settings" TAB and set Flag to use LONG OBIS codes. To be sure if this iset - user can press button "Read settings"
- If ELM settings are read - in meters window Checkbox for LONG OBIS will be set accordingly. If not - then user should check the CheckBox **"Enable Long OBIS"** - just like on the picture:

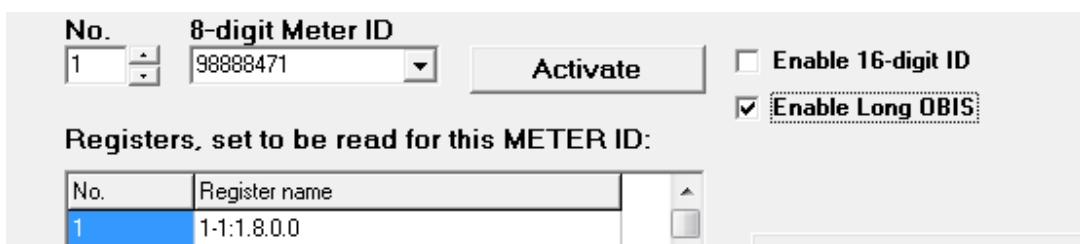


Fig. 8. Setting LONG OBIS

Last option here is to tell software how to decode values, read from ELM-07S. This can be 32-bit integer, or 64-bit integer, if checkbox **"Decode values as 64-bit integer"** is checked. Then user will see maximum of 30 registers decoded, because now each value is saved in 4 Modbus registers, not 2.

5. Log and additional tools

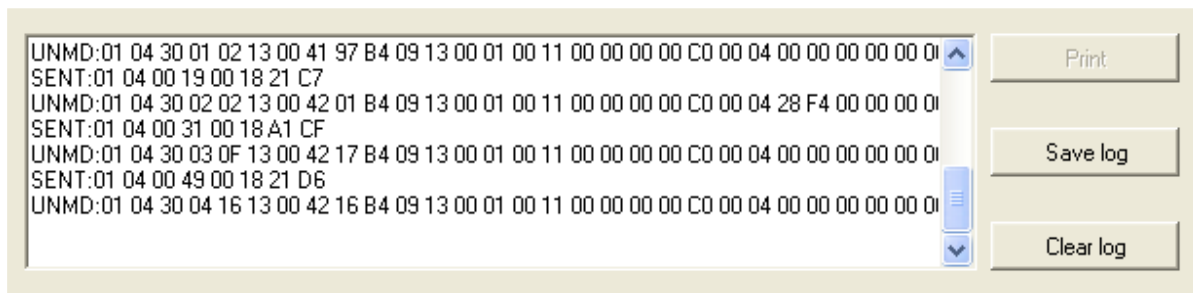


Fig. 9. Log window and direct write to serial port

Here user can see log window and direct write to the serial port. In the log window every operation is notified and also responds from the ModBus interface. This log can be saved, cleared or printed (print is disabled for now). On the right side user can send custom commands to desired device. There are two options for sending command:

- ASCII – sends the command as plain text, written in the box
- HEX – sends the command in hex values. For that purpose commands should be send in a manner of 'xx' with spaces between every byte.

For this device particularly all commands should be in ModBus protocol manner, so ASCII is not useful here.

The user must have in mind that he will see the respond in the log window in the same way he sends a command, in other words in hex or ASCII

6. Help

This menu contains two options:

About – shows information about the program

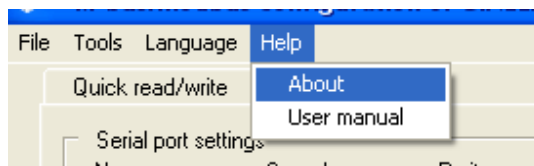


Fig. 10. Help

User manual – starts this user manual

7. Contacts

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