DECODE
data communications

M-Bus Master

Readout software for M-Bus slave devices

User manual v1.3

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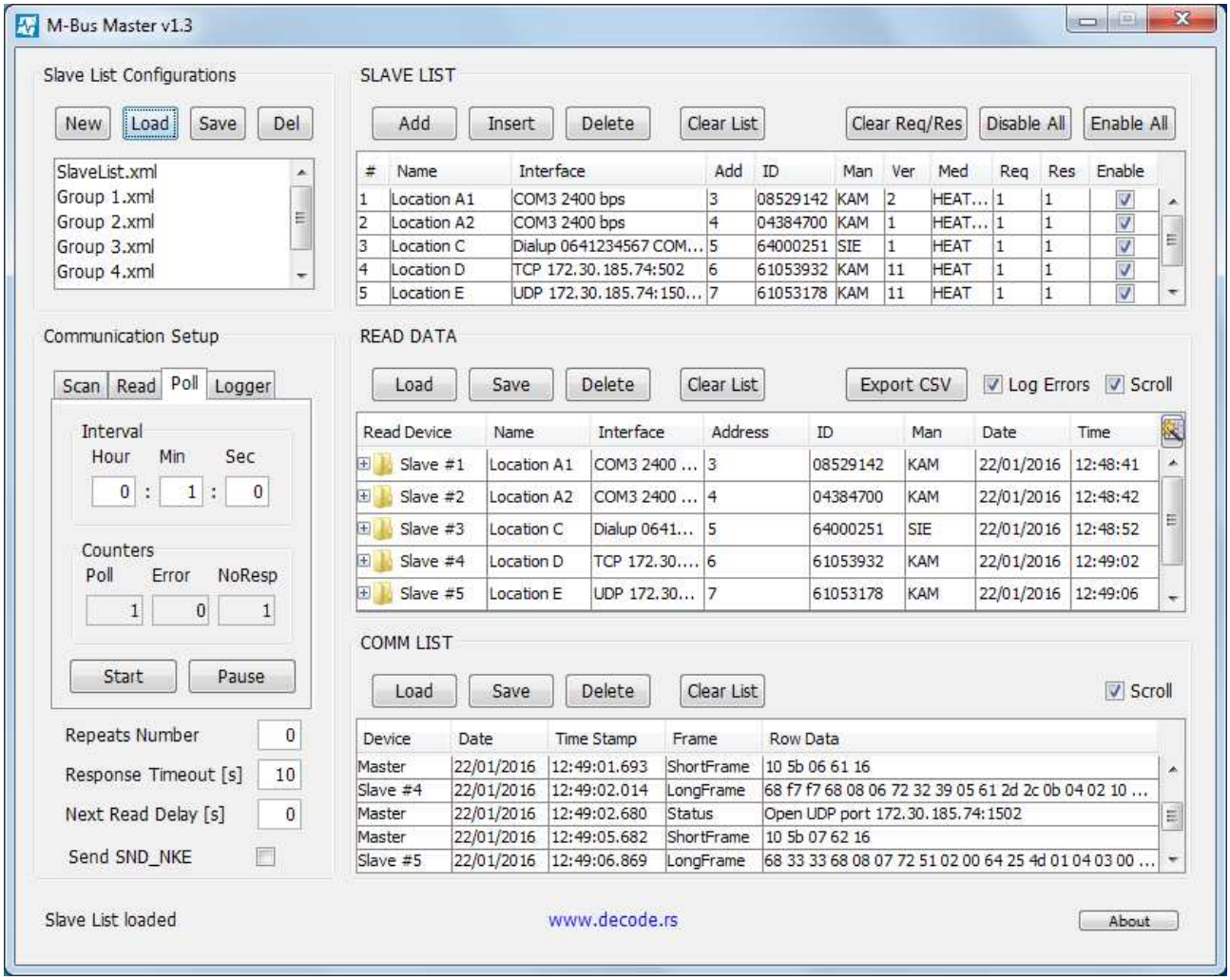
Document versions

Version of Document /Software	Date	Note
v1.0/v1.0	01/11/2014	First release
v1.1/v1.1	15/01/2015	Saving data to temporary files (*Communication Setup*, *Slave List*, *Read Data*, *Comm List*) after every reading and before exiting software. Exporting data (*Read Data*) in to CSV file. Changed the way of time choose for periodical reading of devices. Activated error counters for periodical reading of devices.
v1.2/v1.2	22/01/2016	Added icon, splash screen, page *About*, link to www.decode.rs and tooltips for fields and buttons. Corrected errors for scaled values. Temporary files are saved in directory „*My Documents\MbusMaster*“. Changed size and look of the software. Improved scrolling data. Added *Module*, *Storage*, *Tariff* for DataFields in *READ DATA table.* Added button for reset *Req/Res* counters. Added *Scroll* check box for *READ DATA* table. Single read data *Delete* button added. Added parameter *Repeats Number* which enables multiple read of devices with no response. Added parameter *Next Read Delay* which enables time delay before reading of next device. Added ability of logging errors with zero values for *Energy*, *Power*, *Volume*, *FlowTemp, ReturnTemp*. Improved export of read data to CSV file and enabled choice of data for export. Added option of reading only unread devices. Unread devices are marked with red color in coresponding *Res* filed in *SLAVE LIST* table. Added option of sending *SND_NKE* command before sending read command.
v1.3/v1.3	02/04/2018	Added new types of DIF and VIF fields. Added serial baudrate 600bps. Revised path to „Home“ directory for Linux OS. Revised error for export more than 32 *DataFields* . Incomplete message response is filled in CommList table. Added „ToolTips“ for columns in SlaveList, ReadData and CommList. Added Date column in CommList table. Added Slave number in Device column in CommList table. Changed Load/Save default directory to „My Documents\MbusMaster“.

1 Overview

M-Bus Master software is intended for readout of M-Bus slave devices according to EN1434 and EN13757 standards, such as heat, electric, water, gas meters...



M-Bus Master software

Single M-Bus devices or group of devices can be read once or periodically over serial port, dial-up modem or TCP/UDP network protocol. For examples of reading see chapter 4 of this document.

Setting of group of devices can be stored and saved in xml file. The readout data of individual M-Bus devices or group of devices can be stored in xml file, and additional csv file, for further analysis and processing. Also, data can be viewed as M-Bus packages written in hex format for advanced analysis, and can be stored in a csv file.

2 Installation

The software is written in Java programming environment, so it is necessary to install Java JRE7 (JRE8) virtual environment for Windows/Linux operating system.

2.1 Windows OS

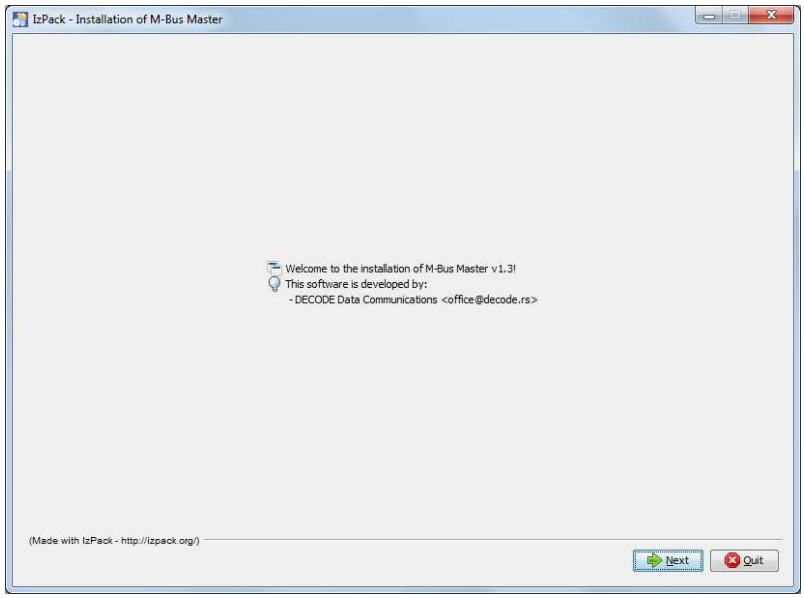
Installation package of Java JRE7 virtual environment can be downloaded from:

http://www.oracle.com/technetwork/java/javase/downloads/jre7-downloads-1880261.html

To install the program under Windows 32bit/64bit operating system, run the file *Setup_M-Bus_Master_v1.3.exe*. The file is located on the supplied installation CD or can be downloaded from the Internet. Some operating systems, such as Windows 7 Home Basic, do not allow access to system folders (*Program Files*), so it is required to run the file by right-clicking and selecting *Run as administrator*.

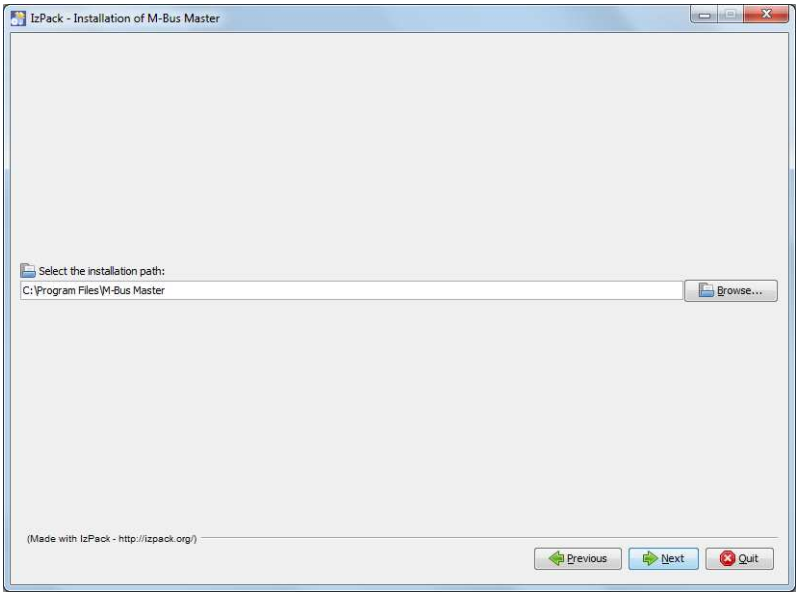
At first, language selection window will be shown:

Choose language and click *OK*.

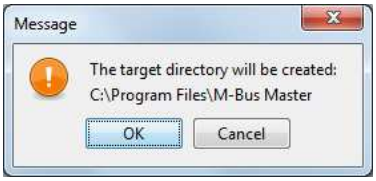


Click *Next*.

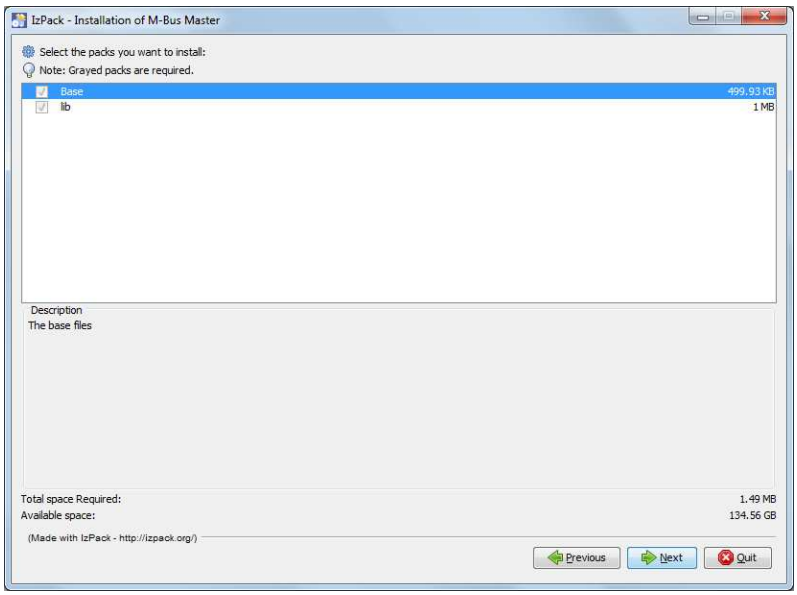
In the next window one can choose the location on computer where to install the software. Typically, it is C:\Program Files\M-Bus Master:



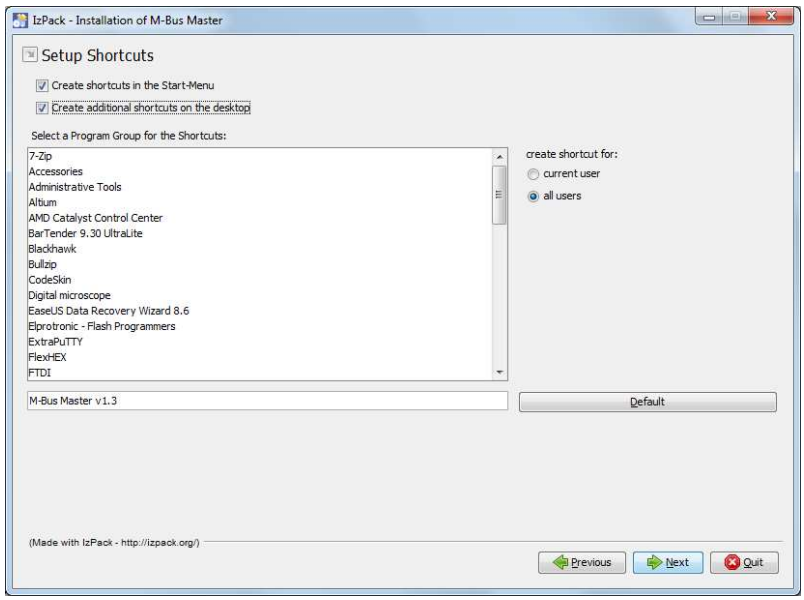
By clicking *Next*, a message appears that a new directory will be created:



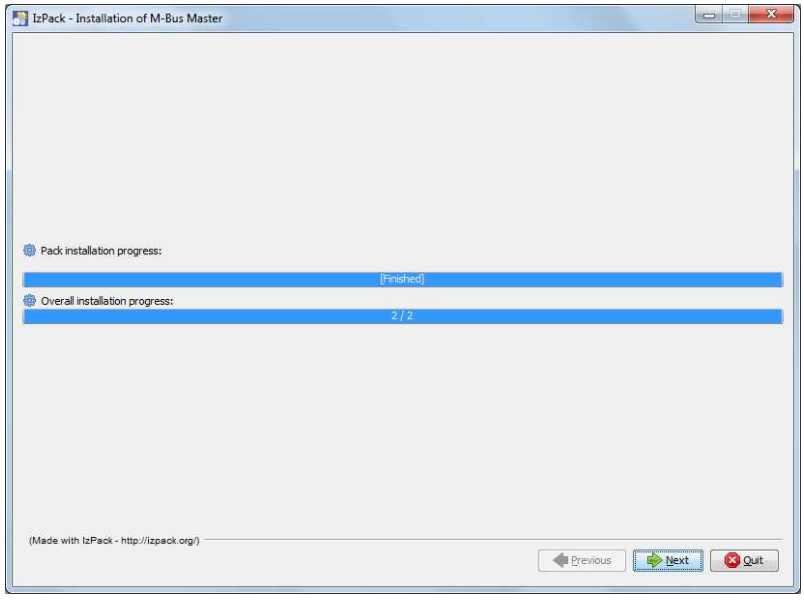
Confirm creating a new directory. The next window is a list of modules that will be installed. *Base* module contains the application itself, while the *lib* module contains the necessary libraries.



Click on *Next* opens a window in which one can choose to create shortcuts in the Start-Menu list and on the desktop:

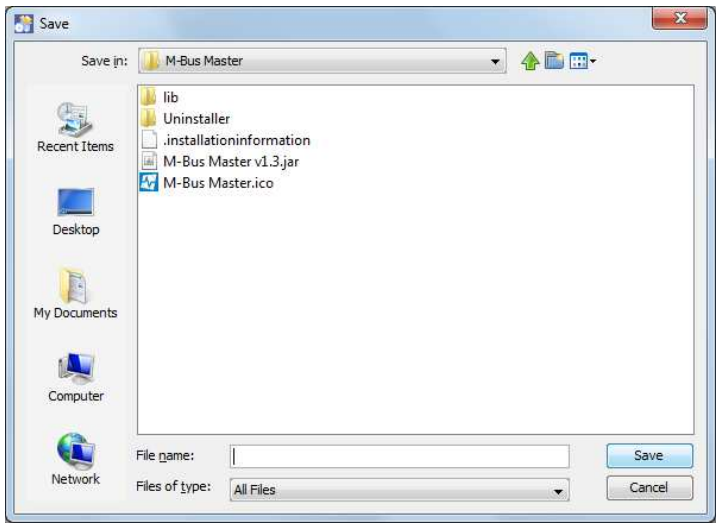


Click *Next* and start the installation of the software:



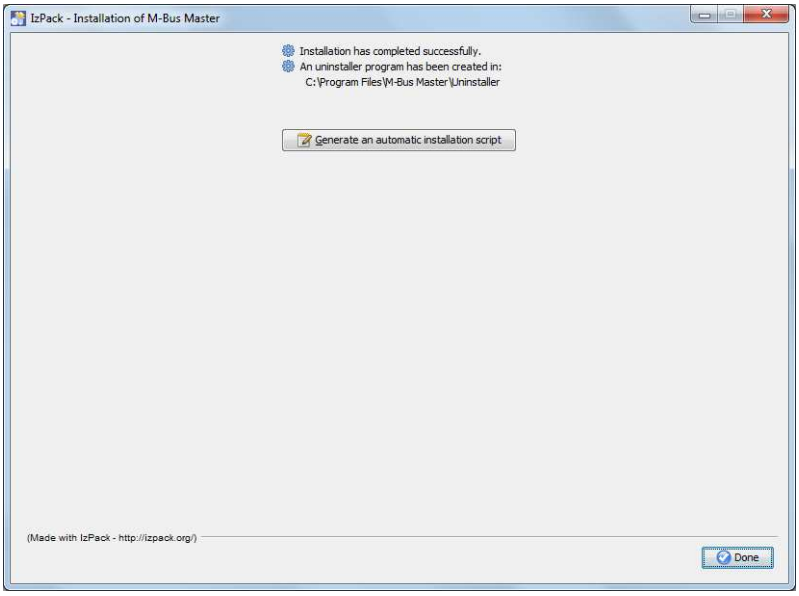
Click on *Next* opens a window with information about successfully installed software as well as the location of *Uninstaller* program.

It is possible to generate an automatic installation script xml file by clicking *Generate an automatic installation script*. The file contains the configuration selected by the user at installation and can be used to install the software on other computers.



The file name can be, for example *installscript.xml*. It will run from the command line:

```
java -jar Setup_M-Bus_Master_v1.3.jar installscript.xml
```



Click Done to end the installation of M-Bus Master software under Windows 32bit/64bit operating system.

Start the software by clicking on *M-Bus Master v1.3* desktop schortcut, or *Start->Programs->M-Bus Master v1.3->M-Bus Master v1.3*.

2.2 Ubuntu Linux OS

For succesful operation of M-Bus Master software, it is necessary that Java OpenJDK 1.7 environment (or newer) is installed. Oracle JRE or JDK environment under Linux operating system doesn't support communication with driver for serial port.

Check which versions of Java virtual environment are installed on PC. Type:

```
root@ubuntu:~$ sudo update-java-alternatives --list

java-1.7.0-openjdk-amd64 1071 /usr/lib/jvm/java-1.7.0-openjdk-amd64
java-8-oracle 1081 /usr/lib/jvm/java-8-oracle
java-gcj-4.8 /usr/lib/jvm/java-gcj-4.8
```

If Java OpenJDK 1.7 environment is not installed, or older version is installed, it is necessary to uninstall it and install the latest version by following command:

```
root@ubuntu:~$ sudo apt-get purge openjdk-\*

root@ubuntu:~$ sudo apt-get update
root@ubuntu:~$ sudo apt-get install default-jre
```

or explicitly OpenJDK JRE 1.7:

```
root@ubuntu:~$ sudo apt-get install openjdk-7-jre
```

Java virtual environment will be installed in directory */usr/lib/jvm/* .

Check which version of Java virtual environment is used by default. Type:

```
root@ubuntu:~$ java -version

java version "1.7.0_171"
OpenJDK Runtime Environment (IcedTea 2.6.13) (7u171-2.6.13-0ubuntu0.14.04.2)
OpenJDK 64-Bit Server VM (build 24.171-b02, mixed mode)
```

If OpenJDK is not default Java virtual environment, set it to the default by typing:

```
root@ubuntu:~$ sudo update-java-alternatives --set java-1.7.0-openjdk-amd64
```

Check if environment variable *JAVA_HOME* is properly set. Type:

```
root@ubuntu:~$ echo $JAVA_HOME

/usr/lib/jvm/java-7-openjdk-amd64
```

If it is needed, environment variable *JAVA_HOME* can be set in file */etc/profile*:

```
root@ubuntu:~$ sudo gedit /etc/profile
```

At the end of file type following:

```
JAVA_HOME=/usr/lib/jvm/java-7-openjdk-amd64
JRE_HOME=$JAVA_HOME/jre
PATH=$PATH:$JAVA_HOME/bin:$JRE_HOME/bin
export JAVA_HOME
export JRE_HOME
export PATH
```

Install serial port drivers. Type:

```
root@ubuntu:~$ sudo apt-get install librxtx-java
```

Drivers will be installed in */usr/lib/jni* directory. Verify that the */usr/lib/jni* directory is registered in *java.library.path*. Type:

```
root@ubuntu:~$ java -XshowSettings:properties

...
java.library.path = /usr/java/packages/lib/amd64
                    /usr/lib/x86_64-linux-gnu/jni
                    /lib/x86_64-linux-gnu
                    /usr/lib/x86_64-linux-gnu
                    /usr/lib/jni
                    /lib
                    /usr/lib
...
```

Check whether the user belongs to group *dialout* so the software could access to serial port as *non-root* user. Type (instead of `USER` type the name of PC user):

```
root@ubuntu:~$ groups USER

USER : USER adm dialout cdrom sudo dip plugdev lpadmin sambashare
```

If the user does not belong to the *dialout* group, add it to the group by typing:

```
root@ubuntu:~$ sudo usermod -a -G dialout $USER
```

NOTE: After changing the file */etc/profile* and/or adding the user to the *dialout* group, it is necessary to reset the computer.

Unpack the file *Setup_M-Bus_Master_v1.3-Linux.tar.bz2* in *Home* directory. The file is located on the supplied installation CD or can be downloaded from DECODE web site. Unpacked directory contains „*MbusMaster*“ directory and „*TahomaFont*“ directory.

M-Bus Master software uses Tahoma font to display the field names and labels. If PC doesn't have Tahoma font installed, copy this font to directory */usr/share/fonts/truetype*:

```
root@ubuntu:~$ sudo cp ~/Setup_M-Bus_Master_v1.3-Linux/TahomaFont/tahoma*ttf
/usr/share/fonts/truetype/
```

Change access permissions for Tahoma fonts:

```
root@ubuntu:~$ sudo chmod 644 /usr/share/fonts/truetype/tahoma*
```

Directory *MbusMaster*, which contains sub directory *lib* and file *M-Bus Master v1.3.jar*, copy to desired location, e.g. *Home* directory:

```
root@ubuntu:~$ sudo cp -R ~/Setup_M-Bus_Master_v1.3-Linux/MbusMaster ~/
```

NOTE: If it doesn't already exist, M-Bus Master software will create directory *MbusMaster* in *Home* directory for saving configuration file and temporary data.

Change access permissions for directory *MbusMaster* and containing files. Type:

```
root@ubuntu:~$ sudo chmod -R 777 ~/MbusMaster/
```

Directory *MbusMaster* contains „*Icon.png*“ file. Right click on the file *M-Bus Master v1.3.jar* and choose *Properties*. Click on the existing icon and choose *~/MbusMaster/Icon.png*.

The software can be run by typing:

```
root@ubuntu:~$ java -jar ~/MbusMaster/M-Bus\ Master\ v1.3.jar
```

Also, the software can be run by double click on the file *M-Bus Master v1.3.jar*, or right click on the file and choose „*Open With OpenJDK Java 7 Runtime*“.

NOTE: If the software runs as a *sudo* user, then the *MbusMaster* directory will be created in the *root* directory. There is no need to run the program as a *sudo* user.

3 Software description

The software is divided into several parts that will be individually explained.

Run the software by clicking on desktop schortcut *M-Bus Master v1.3* (Windows OS), i.e. right-clicking on *M-Bus Master v1.3.jar* and selecting *Open with Java* (Linux OS).

Splash screen will be shown during the initialization of the software and while searching serial ports (embedded and virtual):

Then, the main software window is shown, as it is shown in the introduction on page 1.

In the lower right corner is a button About. Clicking on it will show the window:

Clicking on the link www.decode.rs opens an Internet browser and the website of DECODE Data Communications.

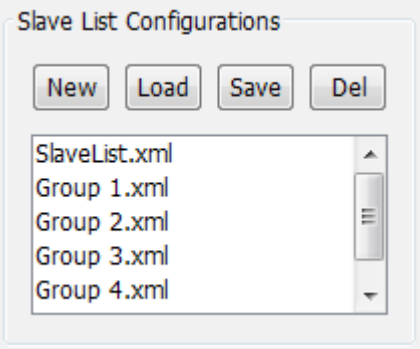
Description of buttons and input fields can be seen as tool tips, by hover the mouse over it.

3.1 Slave List Configurations

Settings of multiple M-Bus devices which are read together, or logically grouped, form groups that are saved in the form of xml files.

A list of files is kept in the system tray of the operating system, for example, for Windows OS as a registry key:

HKEY_CURRENT_USER->Software->JavaSoft->Prefs->mbusmaster



Clicking on the *New* button opens a window to select a location on the disk and the file name under which the new group of the M-Bus devices is going to be saved. The default location is the *My Documents\MbusMaster* folder and file name is *NewSlaveList.xml*. Confirming saving a new file, i.e. clicking on the *Save* button, new file name is added in the list of *Slave List Configurations* and thereby erases the window *Slave List* (see 3.3).

Clicking on the *Load* button opens a window to select the file that will load respective list of the M-Bus devices. The default location is the *My Documents\MbusMaster* folder, and file type xml. If the file already exists in the list of *Slave List Configurations*, it will be moved to the top of the list.

Clicking on the *Save* button opens a window to select a location on the disk and the file name under which the current group of M-Bus devices in *Slave List* window is going to be saved. The default location is the *My Documents\MbusMaster* folder and file name *SlaveList.xml*. Confirming saving a new file, i.e. clicking on the *Save* button, new file name is added in the list of *Slave List Configurations*.

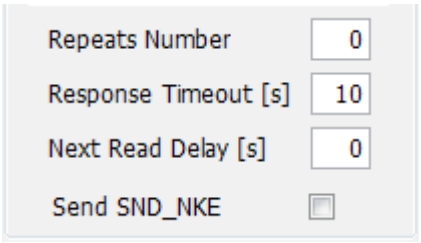
Del button is used to delete the selected file from the list of *Slave List Configurations*. Select the file to be deleted by clicking the left mouse button. When the file is deleted from list, it remains on disk of computer.

3.2 Communication Setup

Communication Setup panel contains four windows which can be accessed by clicking on the appropriate field.

Logger function is not supported in this version of the software.

In the lower part of the *Communication Setup* panel there are fields common to all four windows:

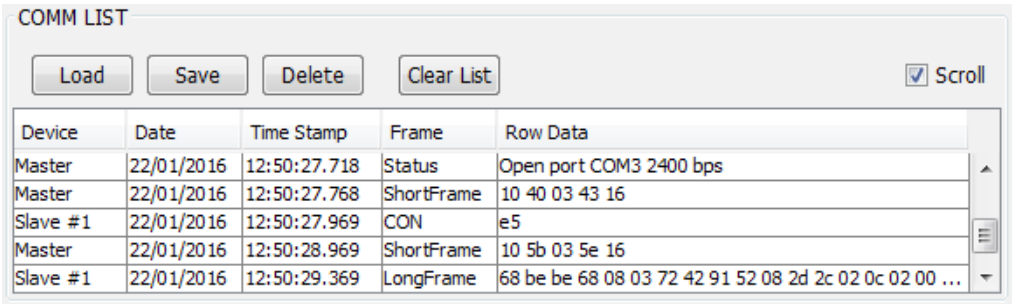


Field *Repeats Number* determines the number of retries reading M-Bus devices (0-3) in case it does not respond. The default value is 0, which means that the software will try to read M-Bus device only once, with no retries.

In the *Response Timeout* field can be entered the time to wait for a response (1-60 seconds). Waiting time is canceled after getting response. The default value is 10 seconds, which is usually enough for all forms of communication that are enabled by this software. The parameter can be set to e.g. 30 seconds in case of TCP/UDP interface.

In the field *Next Read Delay* can be entered pause time before sending the next query (0-10 seconds). When using dialup and/or TCP/UDP interface for reading M-Bus devices connected to one remote interface converter, it is possible that a remote interface converter requires some delay time before it is ready for a new query. Mostly there is no such request, so the default value of this parameter is 0. Otherwise, set the value of this parameter to one or more seconds.

Mark the field *Send SND_NKE* if it is necessary to send *SND_NKE* command before the command for reading of M-Bus devices. This command is used to reset the application layer in the majority of M-Bus devices. The software sends a command *SND_NKE* three times, expecting an answer *CON* (0xE5). If the M-Bus device does not respond to this command, the software does not send a read command *REQ_UD2*, but continue with reading the next M-Bus device.



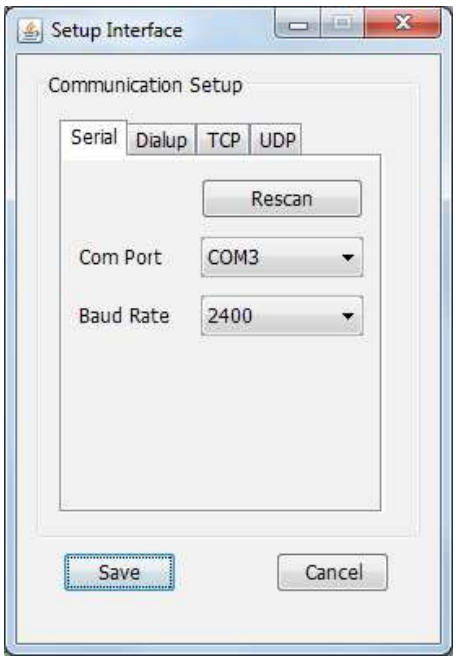
The settings of these fields are saved in the *Config.ini* file on the location of the *My Documents\MbusMaster* folder.

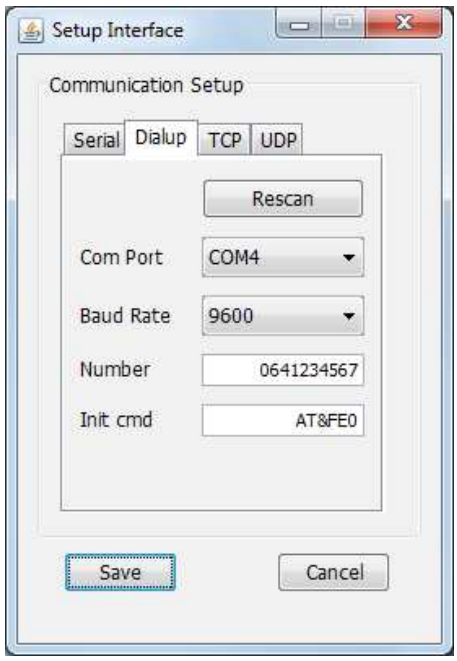
3.2.1 Scan

Scan window contains fields for setting the parameters for searching M-Bus devices. In this software version, only primary address search is supported.

By clicking on the *Setup* button opens the *Setup interface* window for selection of physical interfaces for accessing the M-Bus devices.

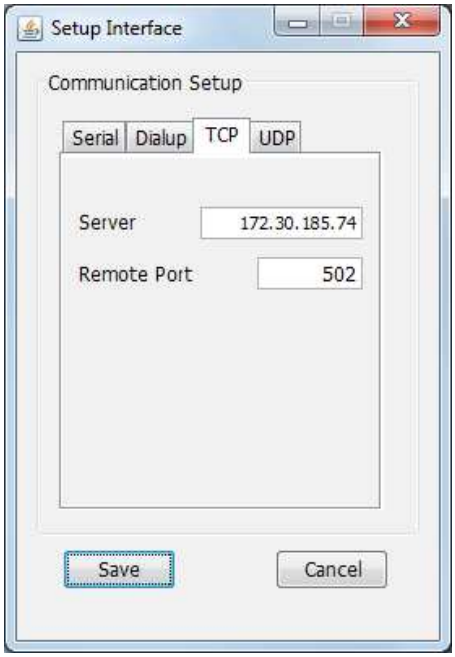
Serial interface provides access to the M-Bus devices through the serial port on the computer or virtual serial port that belongs to a USB or Ethernet adapter. In both cases it is necessary to connect transparent converter from RS232 to M-Bus physical interface. *Rescan* button refreshes the list of available *Com Ports*. It is necessary to choose the communication speed with M-Bus device, *Baud Rate* – 300, 600 ,1200, 2400 or 9600 bps.

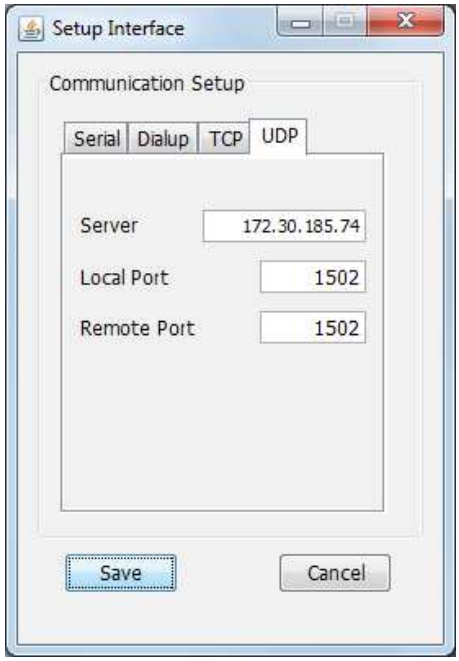




Dialup interface allows reading of M-Bus devices via a modem connected to the serial port of a computer. *Rescan* button refreshes the list of available *Com Ports*. It is necessary to choose the communication speed with the modem, *Baud Rate*, 1200, 2400, 4800, 9600, 19200, 38400, 57600 or 115200 bps. In the *Number* field, enter the phone number of the remote modem which is connected to the M-Bus device. Field *Init cmd* fill with commands for modem initialization. The default is command sequence *AT&FE0* which resets the modem (*AT&F*) and switches off the echo of commands that software sends to the modem (*ATE0*).

TCP interface enables the reading of M-Bus devices using the TCP network protocol. In the *Server* and *Remote Port* fields enter the IP address and port of the network adapter that is connected to the M-Bus device.





UDP interface allows reading of M-Bus devices using UDP network protocol. In the *Server* and *Remote Port* fields enter the IP address and port of the network adapter that is connected to the M-Bus device. In the *Local Port* field enter the port that will take the software on the local computer for sending and receiving UDP packets.

TCP/UDP interface allows the M-Bus request packed into TCP/UDP packet is sent to the network device connected to the M-Bus device. Network adapter should be transparent, i.e. to ensure the conversion of TCP/UDP network interface in to M-Bus interface.

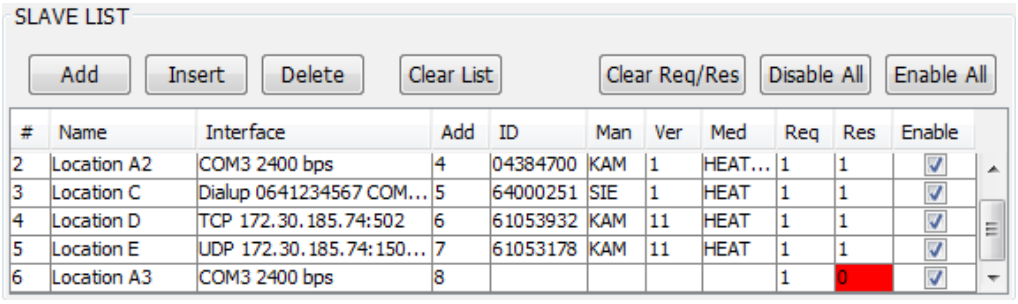
After the election of the physical interface click *Save*. Field *Interface not set* is automatically filled in with the parameters of the selected interface. By hovering the mouse on this field, appears on entire name of the interface.

Scan window has fields for the *Start* and *End* M-Bus address which define an address range of M-Bus devices (0-250). It is necessary to enter the *Start* address the same or smaller than the value of the *End* address, for search of the M-Bus devices to be launched.

Clicking the *Scan Meters* begins search of M-Bus devices on the selected interface. All found devices will be displayed in the *Slave List* window (see 3.3).

3.2.2 Read

Read window has the option of selecting reading *All Meters* or *Only Unread* M-Bus devices. Depending on the option selected, software will read all selected (*Enable* is checked) or only unread (*Enable* is checked) M-Bus devices. Unread M-Bus devices are highlighted in red in the field *Res* of *Slave List* window:



#	Name	Interface	Add	ID	Man	Ver	Med	Req	Res	Enable
2	Location A2	COM3 2400 bps	4	04384700	KAM	1	HEAT...	1	1	☑
3	Location C	Dialup 0641234567 COM...	5	64000251	SIE	1	HEAT	1	1	☑
4	Location D	TCP 172.30.185.74:502	6	61053932	KAM	11	HEAT	1	1	☑
5	Location E	UDP 172.30.185.74:150...	7	61053178	KAM	11	HEAT	1	1	☑
6	Location A3	COM3 2400 bps	8					1	0	☑

The default option is *All Meters*, because all devices must be read first, after which the devices that are not read are marked with red color in *Res* field.

Clicking the *Read Meters* begins read of M-Bus devices that are enabled in *Slave List* window. The readout data will be entered in the *Read Data* window (see 3.4).

3.2.3 Poll

Poll window has the following groups of fields:

- *Interval* determines the period of reading M-Bus devices (1 sec - 31 days) that are enabled in *Slave List* window (see 3.3)

- *Counters* contains:
  - *Poll* shows the number of reading M-Bus devices
  - *Error* shows the number of failed reading about the lack connections or incomplete response
  - *No Resp* shows the number of failed reading because the response timeout

With every new launch of periodic reading, by clicking on the *Start* button, the value of these fields is set to zero.

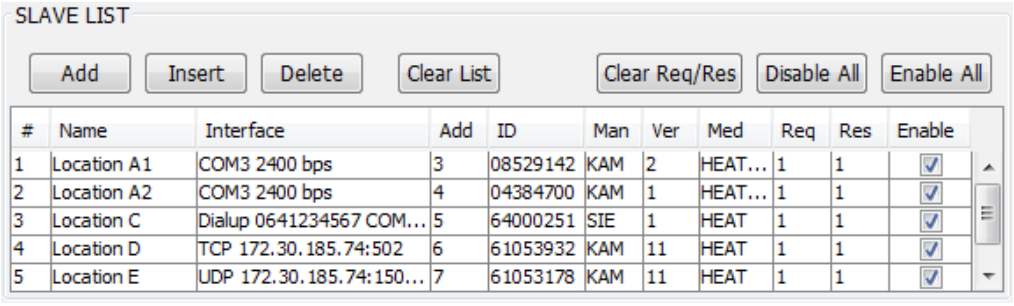
Clicking on *Start* starts periodic reading of enabled M-Bus devices. The readout data will be entered in the *Read Data* window (see 3.4). Name *Start* changes to *Stop* and serves to stop the periodic readings. Periodic reading may temporarily stop clicking the *Pause* and continue again by clicking the same button, which now has a name *Resume*.

3.2.4 Logger

Logger function is not supported in this version of the software.

3.3 SLAVE LIST

Slave List window contains a list of M-Bus devices that can be read once (*Read*) or periodically (*Poll*).



#	Name	Interface	Add	ID	Man	Ver	Med	Req	Res	Enable
1	Location A1	COM3 2400 bps	3	08529142	KAM	2	HEAT...	1	1	☑
2	Location A2	COM3 2400 bps	4	04384700	KAM	1	HEAT...	1	1	☑
3	Location C	Dialup 0641234567 COM...	5	64000251	SIE	1	HEAT	1	1	☑
4	Location D	TCP 172.30.185.74:502	6	61053932	KAM	11	HEAT	1	1	☑
5	Location E	UDP 172.30.185.74:150...	7	61053178	KAM	11	HEAT	1	1	☑

Add button allows adding a new M-Bus device to the end of the list. List moves to added M-Bus device. The default device name is a *New Slave*. To make this device ready to read, it is necessary to fill the fields *Interface* and *Add* (see 3.3.1).

Insert button allows adding a new M-Bus device above the selected M-Bus device in the list. If no M-Bus device is selected, the new M-Bus device is added to the end of the list. The default device name is a *New Slave*. To make this device ready to read, it is necessary to fill the fields *Interface* and *Add*.

Delete button allows deleting the selected M-Bus devices from the list.

Clear List button allows deleting all M-Bus devices from the list.

The *Clear Req/Res* allows clearing the request (*Req*) and response (*Res*) counters for enabled M-Bus devices (*Enable* is selected). Also, clicking on this button will erase the red color from all *Res* fields for enabled M-bus devices.

Disable All button disables all M-Bus devices in the list for read.

Enable All button enables all M-Bus devices in the list for read.

Slider (Scroll tab) on the right side of the list allows view of all M-Bus devices in the list.

3.3.1 Table description

Column # contains the ordinal number of M-Bus devices.

Column *Name* contains the name of the device that can be arbitrarily changed. Changing the name is enabled by double clicking the left mouse button on the appropriate field.

Interface column contains a description of the interface through which performs reading of M-Bus devices. Changing the interface is enabled by double clicking the left mouse button on the appropriate field, which opens the window *Setup Interface* identical to window described in section 3.2.1. If the field is empty, when read is started, error message "*Interface not set*" will be shown in the *Comm List* window (see 3.5) for the M-Bus device. By hovering the mouse on this field, appears on entire name of the interface.

Add column contains the address of M-Bus devices. Changing values is enabled by double clicking the left mouse button on the appropriate field. If the value of the address fields is outside of the range 0-255, when read is started, error message "*M-Bus address out of range*" will be shown in the *Comm List* window for the M-Bus device. If the field is empty, when read is started, error message "*M-Bus address missing or not an integer*" will be shown in the window *Comm List* for the M-Bus device.

ID column contains the identification number of manufacturer of M-Bus devices. This value can not be changed, it is automatically filled when scanning or reading device.

Man column contains a shortened label manufacturer of M-Bus devices. This value can not be changed, it is automatically filled when scanning or reading device.

Ver column contains the version of M-Bus devices. This value can not be changed, it is automatically filled when scanning or reading device.

Med column indicates the type of M-Bus devices. This value can not be changed, it is automatically filled when scanning or reading device.

Req column contains the number of queries sent to the M-Bus device. This value can not be changed, it automatically increases with every reading of device.

Res column contains the number of responses received from M-Bus devices. This value can not be changed, it automatically increases with every successful reading of device. *Res* field is colored red for all unread M-Bus devices.

Fields *Req* and *Res*, for all enabled M-Bus devices, can be set to zero by clicking the *Clear Req/Res*.

Enable column is used for marking M-Bus devices to be read once (Read) or periodically (Poll).

Slave List table is saved in a temporary file *TmpSlaveList.xml* on the location of the *My Documents\MbusMaster* folder after each reading and before closing the software.

3.3.2 Structure of XML file

A list of M-Bus devices can be saved in an XML file as described in 3.1. The structure of the XML file looks as follows:

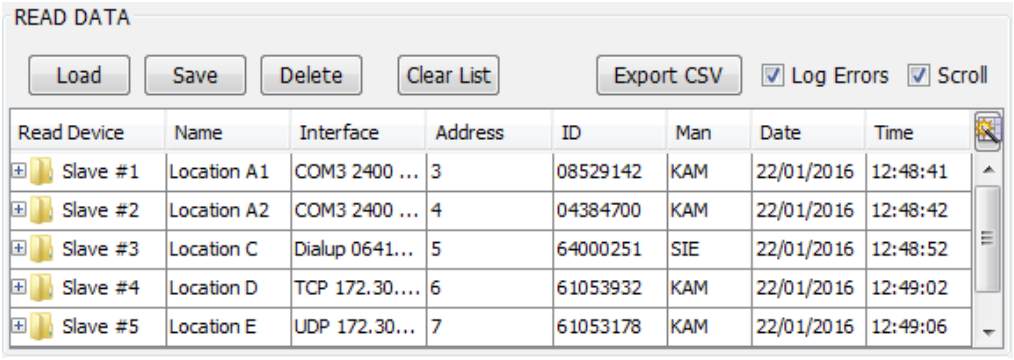
```
<mbusDevs>
  <slaveDev number="1">
    <name>Location A1</name>
    <interfacePort>COM3 2400 bps</interfacePort>
    <address>3</address>
    <id>08529142</id>
    <manufacturer>KAM</manufacturer>
    <version>2</version>
    <medium>HEAT_INLET</medium>
    <requestNo>1</requestNo>
    <responseNo>1</responseNo>
    <enable>true</enable>
    <readRequest>false</readRequest>
    <readResponse>true</readResponse>
    <exportFields>7fffffffffe000b6</exportFields>
  </slaveDev>
  <slaveDev number="2">
  ...
  </slaveDev>
  <slaveDev number="3">
  ...
  </slaveDev>
  <slaveDev number="4">
  ...
  </slaveDev>
  <slaveDev number="5">
  ...
  </slaveDev>
  <slaveDev number="6">
  ...
  </slaveDev>
</mbusDevs>
```

It is not advisable to manually change the file because of possible errors, which could result in the failure of loading it into the software.

The XML file can be used for further processing or entry in the database.

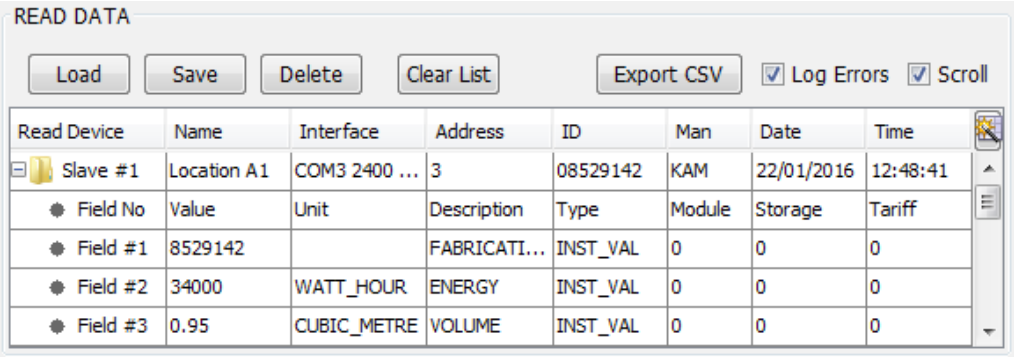
3.4 READ DATA

Read Data window contains a list of M-Bus devices enabled for reading with read data.



Read Device	Name	Interface	Address	ID	Man	Date	Time
Slave #1	Location A1	COM3 2400 ...	3	08529142	KAM	22/01/2016	12:48:41
Slave #2	Location A2	COM3 2400 ...	4	04384700	KAM	22/01/2016	12:48:42
Slave #3	Location C	Dialup 0641...	5	64000251	SIE	22/01/2016	12:48:52
Slave #4	Location D	TCP 172.30....	6	61053932	KAM	22/01/2016	12:49:02
Slave #5	Location E	UDP 172.30...	7	61053178	KAM	22/01/2016	12:49:06

The list can be expanded by clicking on the + sign next to each of the read M-Bus devices. Then it can be seen all the collected data belonging to the M-Bus device.



Read Device	Name	Interface	Address	ID	Man	Date	Time
Slave #1	Location A1	COM3 2400 ...	3	08529142	KAM	22/01/2016	12:48:41
Field No	Value	Unit	Description	Type	Module	Storage	Tariff
Field #1	8529142		FABRICATI...	INST_VAL	0	0	0
Field #2	34000	WATT_HOUR	ENERGY	INST_VAL	0	0	0
Field #3	0.95	CUBIC_METRE	VOLUME	INST_VAL	0	0	0

Clicking on the *Load* button opens a window to select the file that will load previously saved read data. The default location is the *My Documents\MbusMaster* folder, and file type xml.

By clicking on the *Save* button opens a window to select a location on the disk and the file name under which the currently read data is going to be saved. The default location is the *My Documents\MbusMaster* folder and file name *ReadData.xml*.

Delete button allows deleting the selected M-Bus device reading.

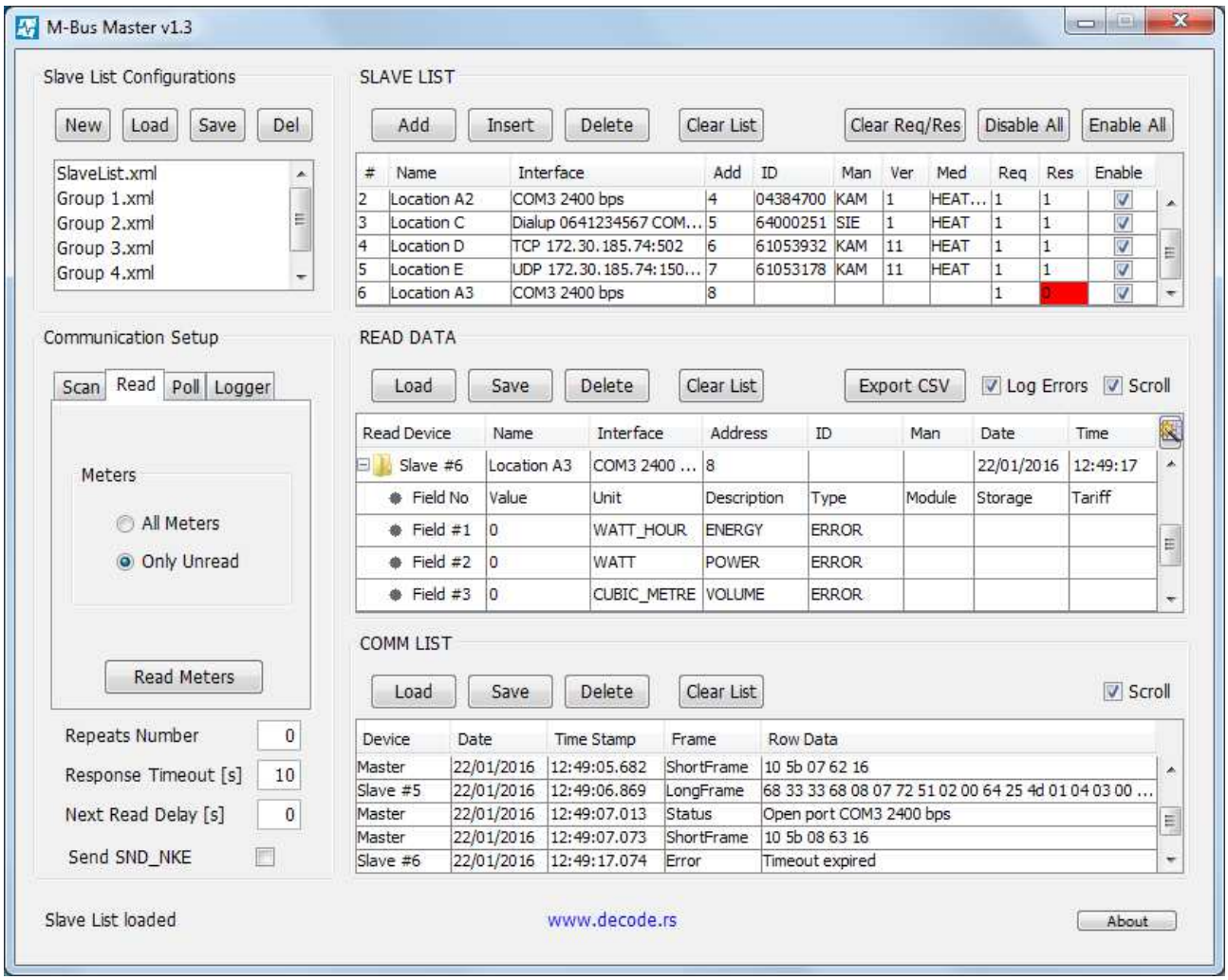
Clear List button allows deleting all readings from the list.

By checking the box *Log Errors* allows entry of zero values (Energy, Power, Volume, Flow temperature, Return temperature) for unread M-Bus device.

Automatic scrolling to the last of the read data enables check field *Scroll*.

Slider (Scroll tab) on the right side of the list allows view of all M-Bus devices with readings in the list.

The following figure shows an example of entry of zero values for non-read device (the check box Log Errors is enabled before reading):



Appropriate *Res* field in the *Slave List* is marked in red color. Table *Read Data* is populated with zero values for *Energy*, *Power*, *Volume*, *Flow temperature* and *Return temperature* and *Type* column is filled with an *ERROR* message.

3.4.1 Table description

Unexpanded list shows only a list of read M-Bus devices. Description of the column in this case is as follows:

- *Read Device* contains the ordinal number of the read M-Bus device from the *Slave List.*

- *Name* contains the name of the read M-Bus device from the *Slave List*.

- *Interface* contains a description of the interface through which performs reading of M-Bus device. By hovering the mouse on the appropriate field *Interface* in *Slave List*, appears on entire name of the interface.

- *Address* contains M-Bus address of M-Bus device.

- *ID* contains identification number of the manufacturer of M-Bus device from *Slave List*.

- *Man* contains a shortened label manufacturer of M-Bus device from *Slave List*.

- *Date* contains the date of reading of M-Bus device.

- *Time* contains the time of reading of M-Bus device.

The list can be expanded by clicking on the + sign next to each of the read M-Bus device. The expanded list displays a list of readings M-Bus devices with their readings data. Description of the column for M-Bus device is the same as in the previous case, while for the data is following:

- *Field No* contains the ordinal number of the read data of M-Bus device.

- *Value* contains the value of the read data of M-Bus device.

- *Unit* contains a unit of measurement of the read data of M-Bus device.

- *Description* contains a brief description of the type of the read data of M-Bus device.

- *Type* contains the type of the read data of M-Bus device.

- *Module* contains a label of module. M-Bus device may have multiple modules.

- *Storage* contains a label of memory block data in M-Bus device. Value 0 indicates the current value.

- *Tariff* contains a label of tariff data in M-Bus device. Value 0 usually means the sum of all tariffs.

Read Data table is saved in a temporary file *TmpReadData.xml* on the location of the *My Documents\MbusMaster* folder after each reading and before closing the software.

3.4.2 Structure of XML file

A list of readings of M-Bus devices can be saved in an XML file. The structure of the XML file looks as follows:

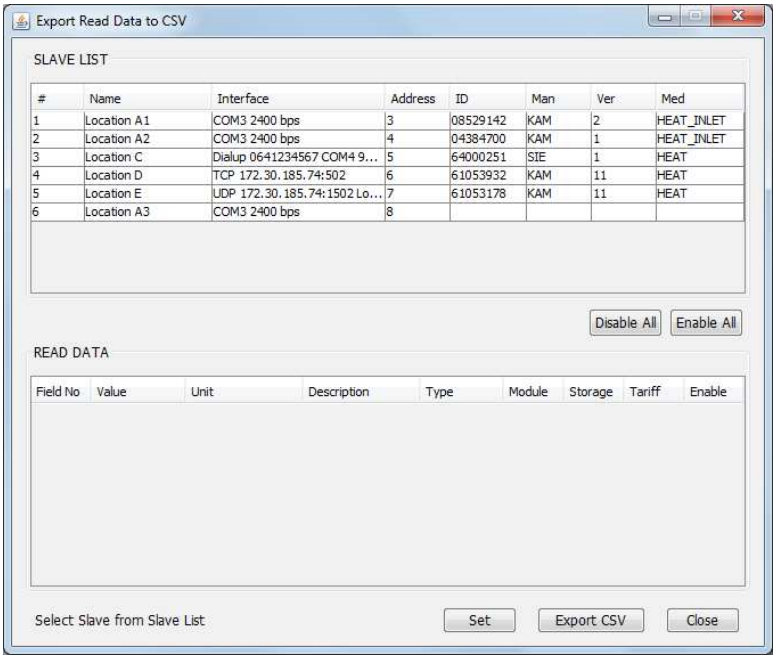
```
<readData>
  <readSlaveDev number="1">
    <name>Location A1</name>
    <interfacePort>COM3 2400 bps</interfacePort>
    <address>3</address>
    <id>08529142</id>
    <man>KAM</man>
    <date>22/01/2016</date>
    <time>12:48:40</time>
    <dataFields>
      <dataField number="1">
        <value>8529142</value>
        <unit></unit>
        <description>FABRICATION_NO</description>
        <type>INST_VAL</type>
        <module>0</module>
        <storage>0</storage>
        <tariff>0</tariff>
        <export>false</export>
      </dataField>
        ...
      <dataField number="21">
        <value>01/06/2010</value>
        <unit></unit>
        <description>DATE</description>
        <type>INST_VAL</type>
        <module>0</module>
        <storage>1</storage>
        <tariff>0</tariff>
        <export>false</export>
      </dataField>
    </dataFields>
  </readSlaveDev>
  ...
  <readSlaveDev number="6">
    ...
  </readSlaveDev>
</readData>
```

It is not advisable to manually change the file because of possible errors, which could result in the failure of loading it into the software.

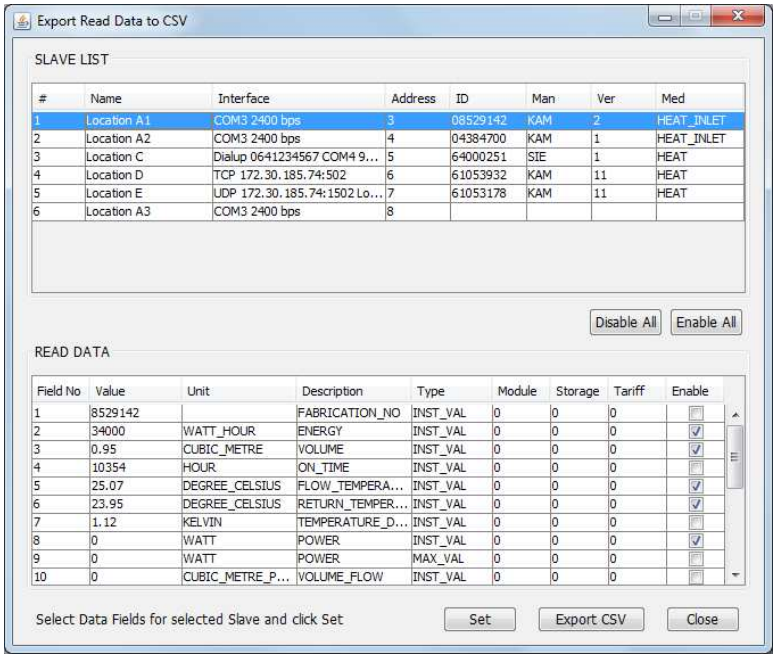
The XML file can be used for further processing or entry in the database.

3.4.3 Data export to CVS file

Clicking on the button *Export CSV* opens the configuration window for exporting data to a csv file.



Clicking on an individual M-Bus device in *Slave List* window, in the *Read Data* window last read data is shown. Mark the fields to be saved in the csv file and click *Set*. Repeat for all M-Bus devices from the *Slave List* window. *Enable All* button allows marking all fields for selected M-Bus device and the *Disable All* button allows unmarking all fields for the selected M-Bus device.



Clicking on *Export CSV* opens a window to select the location on the disk and the file name under which the currently read data is going to be saved in CSV format. The default location is the *My Documents\MbusMaster* folder and file name *ReadData.csv*.

In the next figure it can be seen the contents of the file *ReadData.csv* with tabulated selected data for all M-Bus devices from the *Slave List*.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2	Name	InterfacePort	Address	ID	Manufacturer	Date	Time	Value	Unit	Description	Type	Module	Storage	Tariff
3	Location A1	COM3 2400 bps	3	8529142	KAM	22/01/2016	12:48:41	34000	WATT_HOUR	ENERGY	INST_VAL	0	0	0
4	Location A1	COM3 2400 bps	3	8529142	KAM	22/01/2016	12:48:41	0.95	CUBIC_METRE	VOLUME	INST_VAL	0	0	0
5	Location A1	COM3 2400 bps	3	8529142	KAM	22/01/2016	12:48:41	25.07	DEGREE_CELSIUS	FLOW_TEMPERATURE	INST_VAL	0	0	0
6	Location A1	COM3 2400 bps	3	8529142	KAM	22/01/2016	12:48:41	23.95	DEGREE_CELSIUS	RETURN_TEMPERATURE	INST_VAL	0	0	0
7	Location A1	COM3 2400 bps	3	8529142	KAM	22/01/2016	12:48:41	0	WATT	POWER	INST_VAL	0	0	0
8	Location A2	COM3 2400 bps	4	4384700	KAM	22/01/2016	12:48:42	295803000	WATT_HOUR	ENERGY	INST_VAL	0	0	0
9	Location A2	COM3 2400 bps	4	4384700	KAM	22/01/2016	12:48:42	28694.22	CUBIC_METRE	VOLUME	INST_VAL	0	0	0
10	Location A2	COM3 2400 bps	4	4384700	KAM	22/01/2016	12:48:42	61.17	DEGREE_CELSIUS	FLOW_TEMPERATURE	INST_VAL	0	0	0
11	Location A2	COM3 2400 bps	4	4384700	KAM	22/01/2016	12:48:42	56.86	DEGREE_CELSIUS	RETURN_TEMPERATURE	INST_VAL	0	0	0
12	Location A2	COM3 2400 bps	4	4384700	KAM	22/01/2016	12:48:42	25200	WATT	POWER	INST_VAL	0	0	0
13	Location C	Dialup 0641234567 COM4 9600 bps InitCmd:AT&FE0	5	64000251	SIE	22/01/2016	12:48:52	3350070000	WATT_HOUR	ENERGY	INST_VAL	0	0	0
14	Location C	Dialup 0641234567 COM4 9600 bps InitCmd:AT&FE0	5	64000251	SIE	22/01/2016	12:48:52	40227.51	CUBIC_METRE	VOLUME	INST_VAL	0	0	0
15	Location C	Dialup 0641234567 COM4 9600 bps InitCmd:AT&FE0	5	64000251	SIE	22/01/2016	12:48:52	258600	WATT	POWER	INST_VAL	0	0	0
16	Location C	Dialup 0641234567 COM4 9600 bps InitCmd:AT&FE0	5	64000251	SIE	22/01/2016	12:48:52	58	DEGREE_CELSIUS	FLOW_TEMPERATURE	INST_VAL	0	0	0
17	Location C	Dialup 0641234567 COM4 9600 bps InitCmd:AT&FE0	5	64000251	SIE	22/01/2016	12:48:52	39	DEGREE_CELSIUS	RETURN_TEMPERATURE	INST_VAL	0	0	0
18	Location D	TCP 172.30.185.74:1502 Localhost:502	6	61053932	KAM	22/01/2016	12:49:02	0	WATT_HOUR	ENERGY	INST_VAL	0	0	0
19	Location D	TCP 172.30.185.74:1502 Localhost:502	6	61053932	KAM	22/01/2016	12:49:02	0	CUBIC_METRE	VOLUME	INST_VAL	0	0	0
20	Location D	TCP 172.30.185.74:1502 Localhost:502	6	61053932	KAM	22/01/2016	12:49:02	24.89	DEGREE_CELSIUS	FLOW_TEMPERATURE	INST_VAL	0	0	0
21	Location D	TCP 172.30.185.74:1502 Localhost:502	6	61053932	KAM	22/01/2016	12:49:02	25.16	DEGREE_CELSIUS	RETURN_TEMPERATURE	INST_VAL	0	0	0
22	Location D	TCP 172.30.185.74:1502 Localhost:502	6	61053932	KAM	22/01/2016	12:49:02	0	WATT	POWER	INST_VAL	0	0	0
23	Location E	UDP 172.30.185.74:1502 Localhost:1502	7	61053178	KAM	22/01/2016	12:49:06	33307000	WATT_HOUR	ENERGY	INST_VAL	0	0	0
24	Location E	UDP 172.30.185.74:1502 Localhost:1502	7	61053178	KAM	22/01/2016	12:49:06	2743.79	CUBIC_METRE	VOLUME	INST_VAL	0	0	0
25	Location E	UDP 172.30.185.74:1502 Localhost:1502	7	61053178	KAM	22/01/2016	12:49:06	24.99	DEGREE_CELSIUS	FLOW_TEMPERATURE	INST_VAL	0	0	0
26	Location E	UDP 172.30.185.74:1502 Localhost:1502	7	61053178	KAM	22/01/2016	12:49:06	24.64	DEGREE_CELSIUS	RETURN_TEMPERATURE	INST_VAL	0	0	0
27	Location E	UDP 172.30.185.74:1502 Localhost:1502	7	61053178	KAM	22/01/2016	12:49:06	0	WATT	POWER	INST_VAL	0	0	0
28	Location A3	COM3 2400 bps	8			22/01/2016	12:49:17	0	WATT_HOUR	ENERGY	ERROR			
29	Location A3	COM3 2400 bps	8			22/01/2016	12:49:17	0	WATT	POWER	ERROR			
30	Location A3	COM3 2400 bps	8			22/01/2016	12:49:17	0	CUBIC_METRE	VOLUME	ERROR			
31	Location A3	COM3 2400 bps	8			22/01/2016	12:49:17	0	DEGREE_CELSIUS	FLOW_TEMPERATURE	ERROR			
32	Location A3	COM3 2400 bps	8			22/01/2016	12:49:17	0	DEGREE_CELSIUS	RETURN_TEMPERATURE	ERROR			

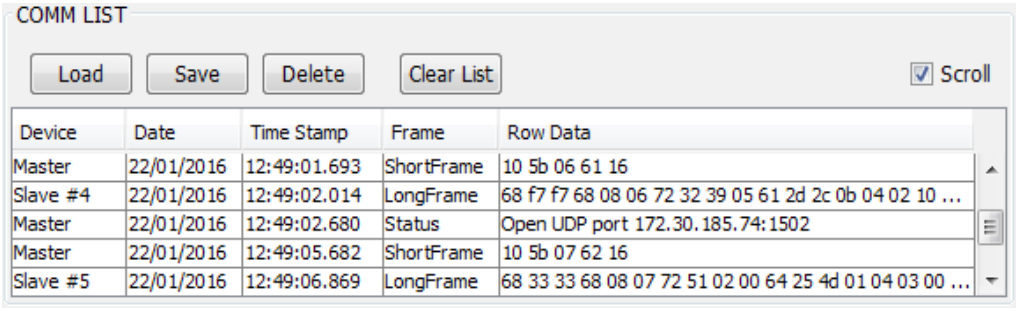
The choice of fields to export to a CSV file is enough to do once. Clicking on the *Set,* configuration for the selected M-Bus device is saved in a file *TmpSlaveList.xml* (field exportFields), and click on *Export CSV* configures *TmpReadData.xml* file (fields export).

TmpSlaveList.xml, *TmpReadData.xml*, *CommList.xml* and *Config.ini* files are saved on the location of the *My Documents\MbusMaster* folder. The files are updated during the operation and after the closure of the software.

It is recommended to save *Slave List* in the user file after setting the export of data to prevent accidental deletion of the list (by clicking the *Clear List*).

3.5 COMM LIST

Window *Comm List* contains information about communication between M-Bus Master software and M-Bus slave devices.



Clicking on the *Load* button opens a window to select the file from which to load previously saved information about communication. The default location is the *My Documents\MbusMaster* folder, and file type csv.

By clicking on the *Save* button opens a window to select a location on the disk and the file name under which the current communicating information is going to be saved. The default location is the *My Documents\MbusMaster* folder and file name *CommList.csv*.

Delete button allows deleting the selected row from *Comm List*.

Clear List button allows deleting all communicating information from the *Comm List*.

Automatic scrolling to the last of the read data enables check field *Scroll*.

Slider (Scroll tab) on the right side of the list allows view of all communicating information with M-Bus devices.

Comm List table is saved in a temporary file *TmpCommList.csv* on the location of the *My Documents\MbusMaster* folder after each reading and before closing the software.

3.5.1 Table description

Device column contains the name of "device" to which the command or response belongs. Label *Master* is linked to M-Bus Master software, and *Slave*, i.e. *Slave #X* is linked to the M-Bus device that is read, where *X* is the number of the M-Bus device in *Slave List*.

Date column contains the date when the command or response has been received.

TimeStamp column contains the time when the command or response has been received.

Column *Frame* contains information about the type of message that is sent or received:

- *Command* – M-Bus Master software sends command to modem
- *Response* – modem response
- *Status* – M-Bus Master software opens the interface
- *Status* – Connection not established with M-Bus device *Slave #X*
- *Error* – M-Bus Slave device didn‘t respond or response is incomplete
- *ShortFrame* – M-Bus Master software sends M-Bus command SND_NKE or REQ_UD2
- *CON* – M-Bus Slave device responds with M-Bus CON message (0xE5)
- *LongFrame* – M-Bus Slave device responds with M-Bus RES_UD message

Raw Data column contains the data communication in ASCII (commands for the modem, open interfaces) and HEX (M-Bus data) form. These data can be accessed in two ways, by copying the contents of table cells or saving all data in csv file.

Copy of the contents can be done by double clicking the left mouse button on certain cell in the column *Raw Data*, then select specific or all data (with the mouse or using the keyboard with CTRL+A) and copy to a temporary computer memory (clipboard) using the keyboard CTRL+C. Memory contents can be copied to some of the editing programs. An example of *LongFrame* (RSP_UD) answer of M-Bus device is shown in the form of:

```
68 33 33 68 08 07 72 51 02 00 64 25 4d 01 04 03 00 00 00 09 74 02 09 70 02 0c 07
07 50 33 00 0c 14 51 27 02 04 0b 2d 86 25 00 0b 3b 48 16 01 0a 5b 58 00 0a 5f 39
00 95 16
```

3.5.1 Structure of CSV file

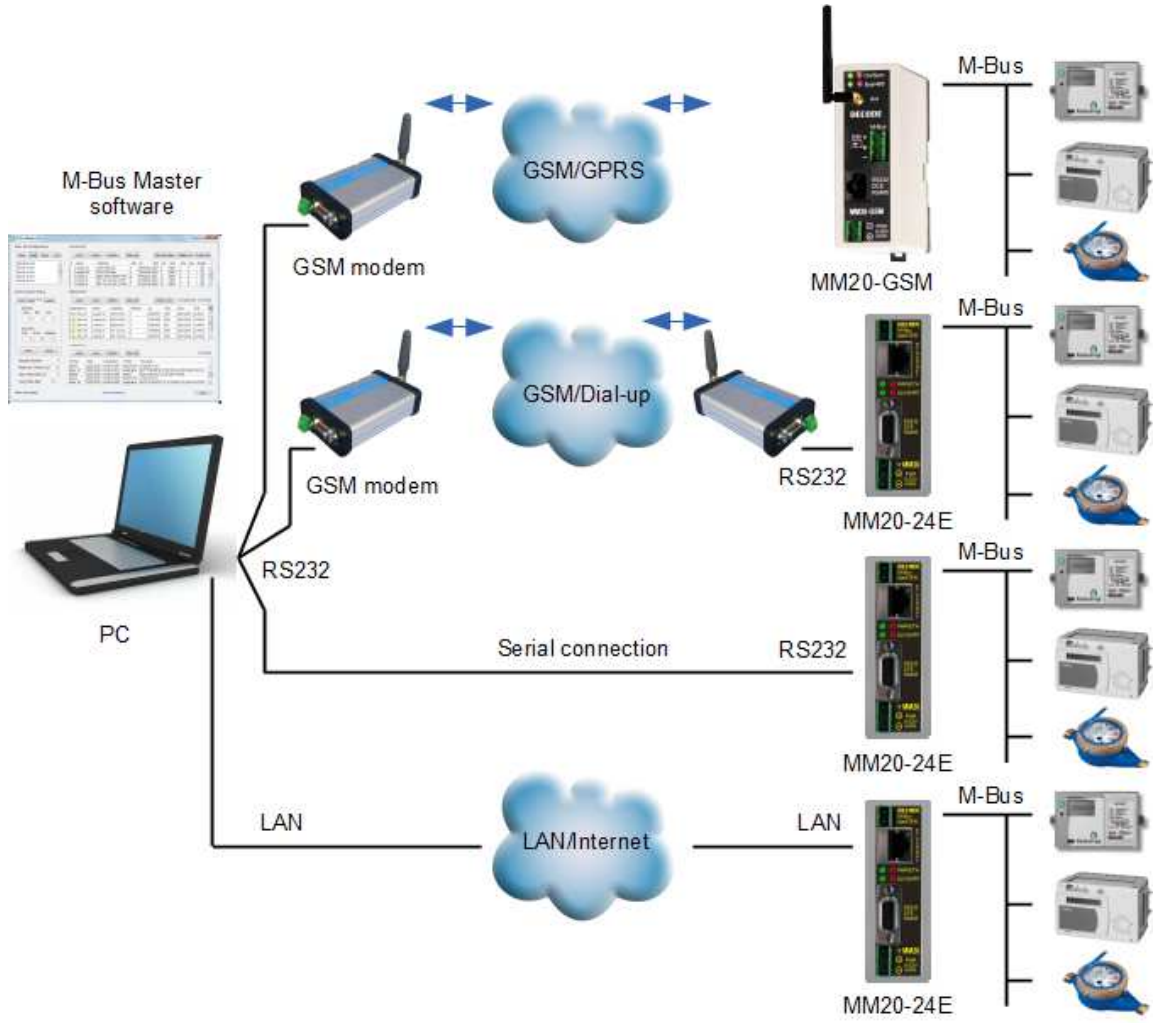
Saving all data in csv file has already been discussed on the previous page, by clicking on the *Save* button. The structure of data in a csv file is as follows:

```
Master,22/01/2016,12:49:02.680,Status,Open UDP port 172.30.185.74:1502
Master,22/01/2016,12:49:05.682,ShortFrame,10 5b 07 62 16
Slave #5,22/01/2016,12:49:06.869,LongFrame,68 33 33 68 08 07 72 51 02 00 64 25
4d 01 04 03 00 00 00 09 74 02 09 70 02 0c 07 07 50 33 00 0c 14 51 27 02 04 0b 2d
86 25 00 0b 3b 48 16 01 0a 5b 58 00 0a 5f 39 00 95 16
```

4 Connecting and readout examples

M-Bus devices can be read using the M-Bus protocol, which is implemented in the M-Bus Master software, via the M-Bus physical interface. Since personal computers don't have M-Bus port, it is necessary to ensure the conversion of the M-Bus physical interface to a particular interface that has a personal computer (RS232, USB, LAN). For this purpose, different converters are used, such as:

- DECODE MM20-24E – converter of M-Bus physical interface to Ethernet, RS232 and RS485 interface
- DECODE MM20-GSM – converter of M-Bus physical interface to GSM/GPRS TCP/UDP interface

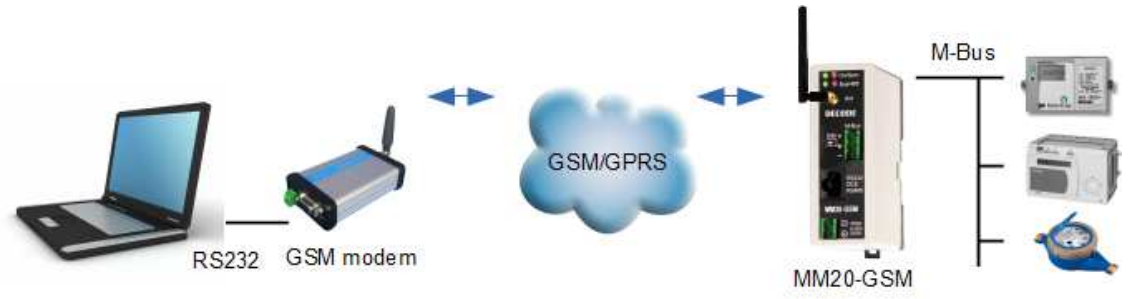


In the previous figure can be seen four types of connecting and reading M-Bus devices, and it will be explained in more detail below.

M-Bus Master software allows reading of M-Bus devices via all four ways simultaneously, i.e. it is possible to form groups of M-Bus devices in *Slave List* which are read by different interfaces.

4.1 GSM/GPRS connection

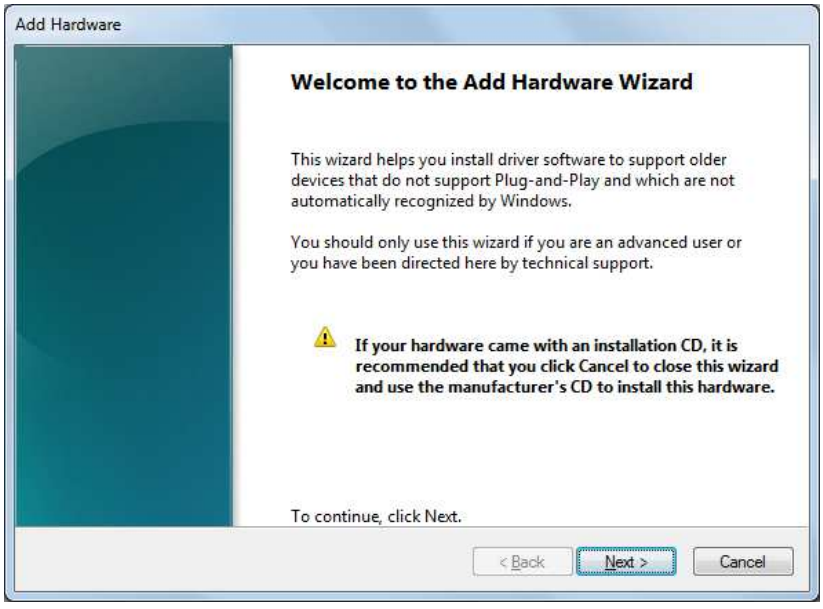
For data transmission via GSM/GPRS connection, there must be GSM modem connected to the computer, for example DECODE GSM Terminal GT900. M-Bus device (heat meter, heating substation controller, water meter, electric meter...) connect to DECODE MM20-GSM converter. It is necessary to provide GSM SIM cards with fixed IP addresses in a private VPN network.



The modem can be connected to the RS232 port or via DECODE DC USB/RS232 converter to the USB port.

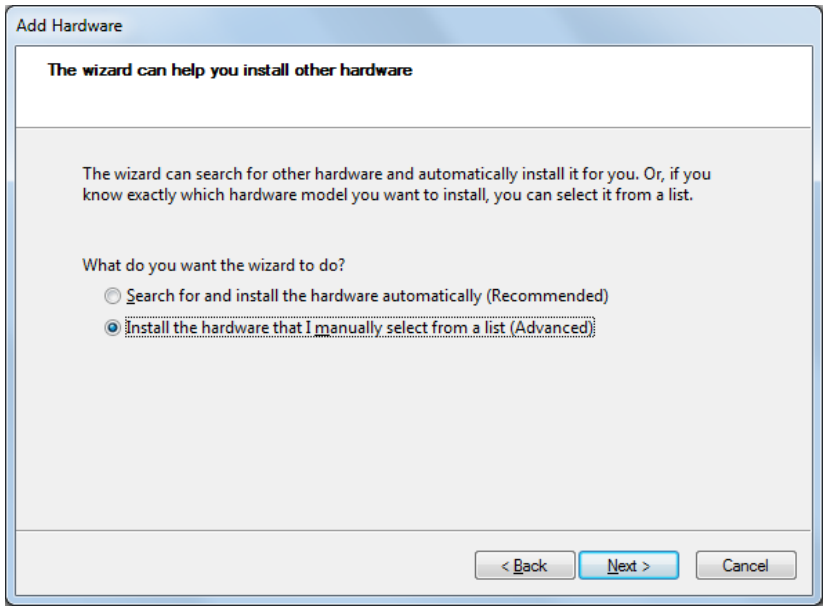
4.1.1 Modem driver installation

Install the modem driver (standard 9600 bps modem) using the *Control Panel -> Add New Hardware Wizard* (Windows XP), i.e. typing *hdwwiz* in the *Start Menu -> Search programs and files* (Windows 7):

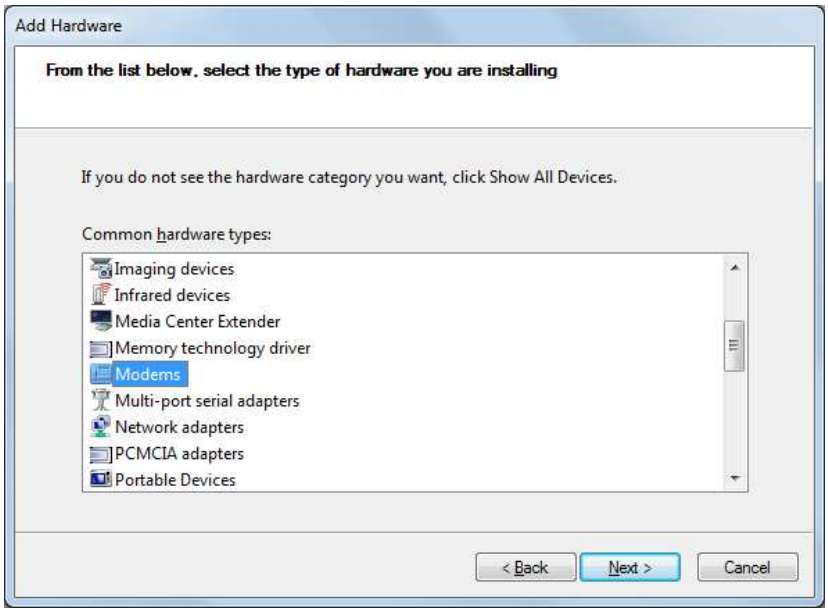


Click *Next*.

In the next window mark *Install the hardware that I manually select from a list (Advanced)*:

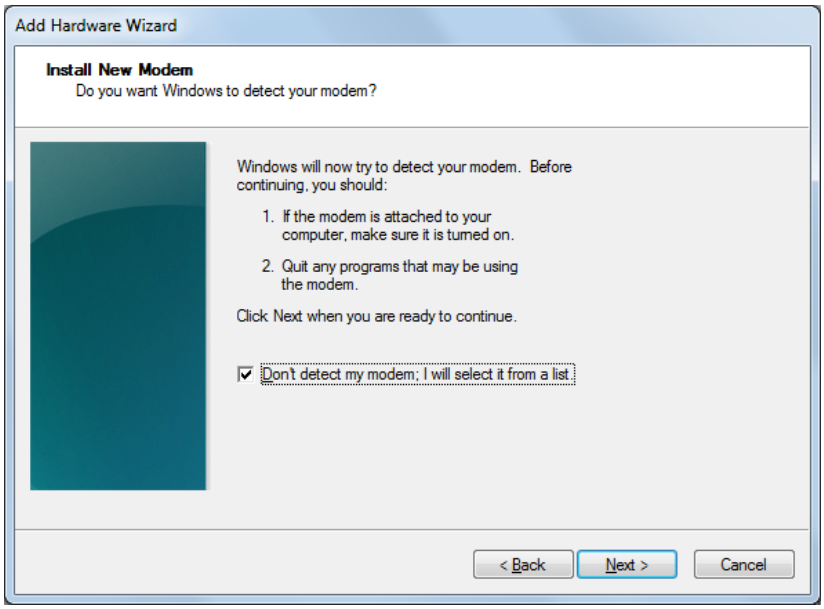


Click *Next*. In the next window choose *Modems*:

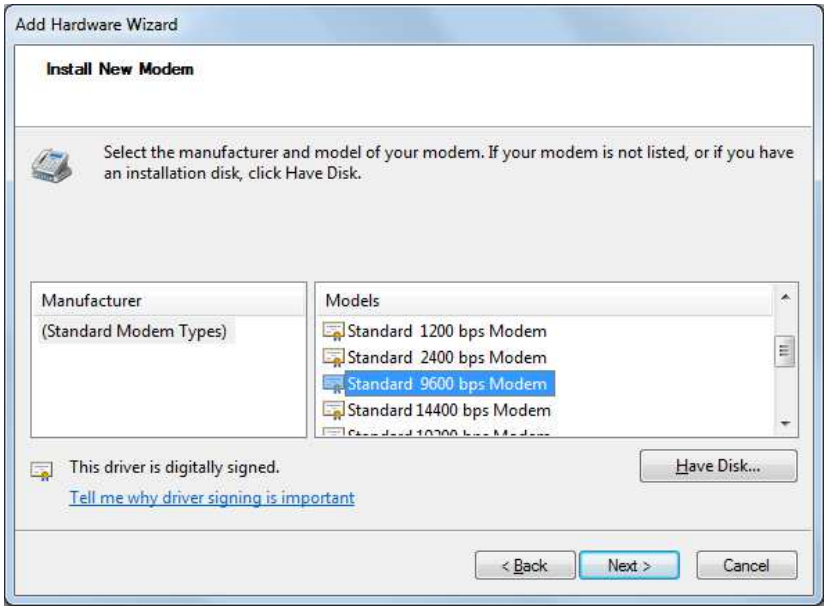


Click *Next*.

Mark field *Don't detect my modem; I will select it from list*.

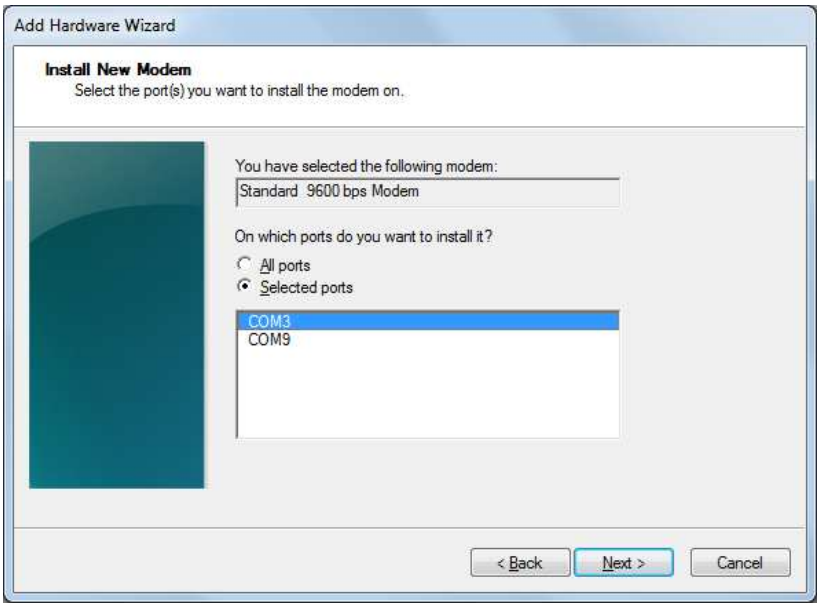


In the next window choose *Standard 9600 bps Modem*:

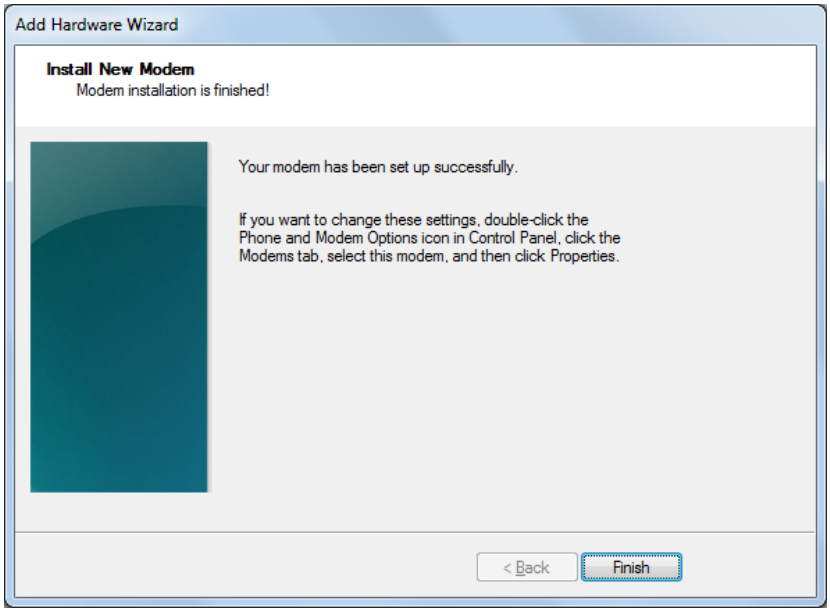


Click *Next*.

Choose serial port to which modem is connected:

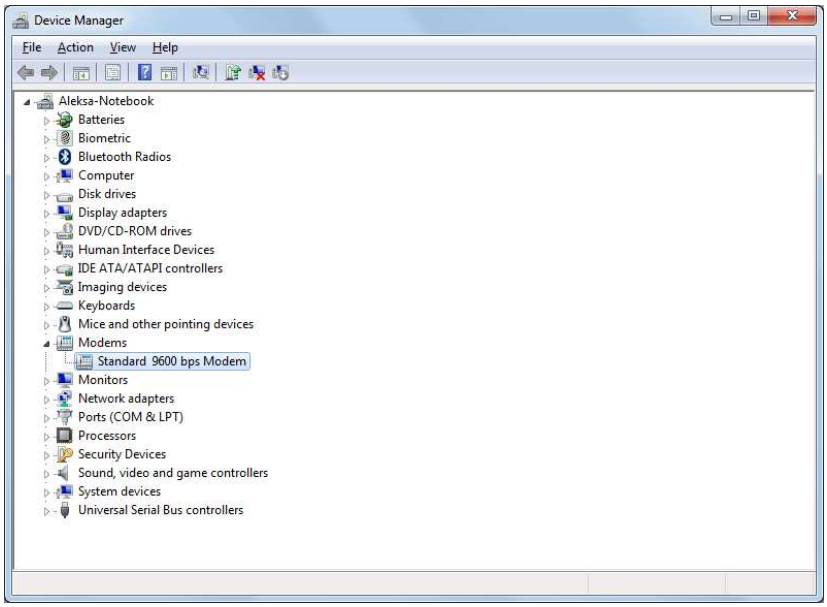


Click *Next*. Wait for installation of modem driver to be finished.

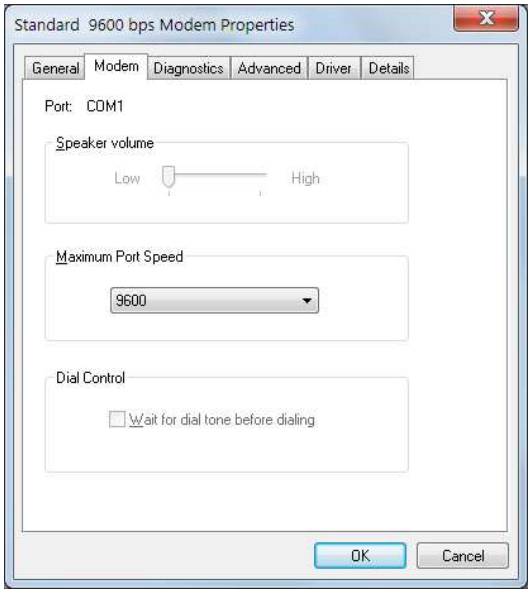


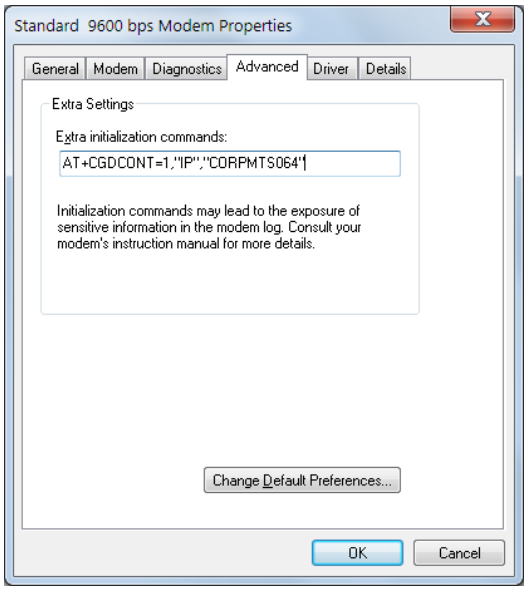
Click *Finish*.

Open *Device Manager* and expand *Modems* group:



Right click on *Standard 9600 bps Modem* and choose *Properties*.





In field *Extra initialization commands* enter APN name.

For example, for MTS provider, APN name is CORPMTS064. Enter next command:

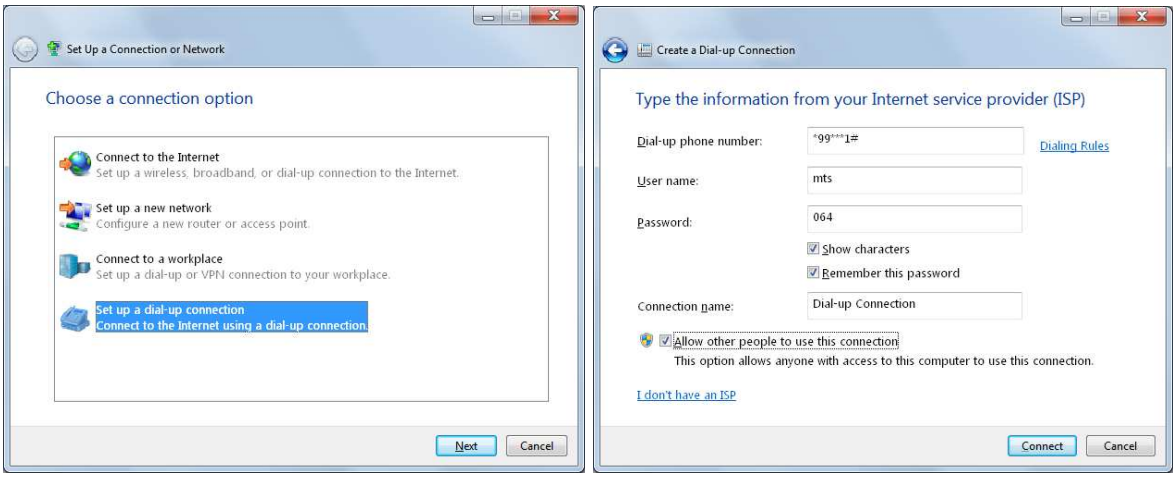
AT+CGDCONT=1,"IP","CORPMTS064"

4.1.2 Creating Dial-up connection

It is necessary to create a dial-up connection to a private VPN network on personal computer. On *Windows* operating system, open the *Control Panel*, then open the *Network and Sharing Center*, and finally click *Set up a new connection or network*. In this window, click on *Set up a dial-up connection*, and in the next window, enter the parameters for access to APN (*phone number*, *user name*, *password*).

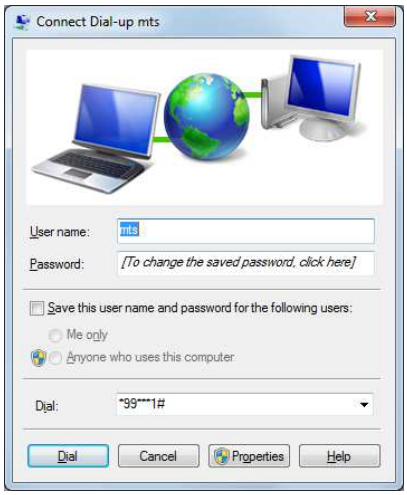
For example, for MTS provider, parameters are:

Dial-up phone number: *99***1#
User name: mts
Password: 064



Before connecting to the VPN, the internet connection needs to be turned off. Clicking on *Connect* a dial-up connection to a private VPN network will be established, in which the converter MM20-GSM is connected to M-Bus device.

Dial-up connection can be established by clicking on the *Dial-up connection* in the *Control Panel -> Network and Internet -> Network Connections*:



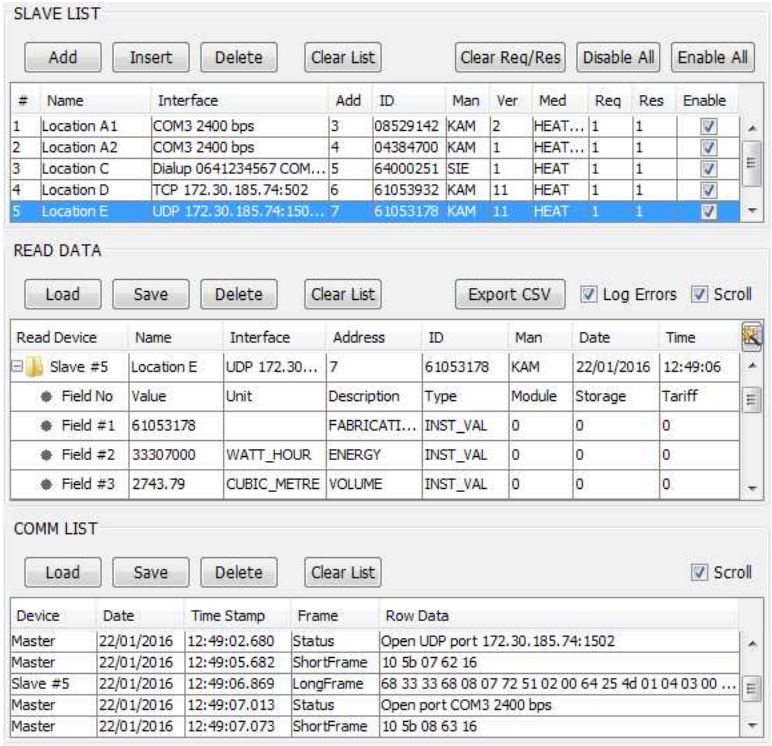
4.1.3 Readout

If the M-Bus address of the device is not known, in the *Communication Setup* window of the M-Bus Master software, choose *Scan* field. Click on the *Setup* button and enter the parameters for access to MM20-GSM converter. Enter range of M-Bus addresses for scan and click on the *Scan Meters* button. During the search, all read M-Bus devices will be added in the *Slave List*.

Also, If the M-Bus address of the device is not known, in the *Slave List* window of the M-Bus Master software click on *Add*, optionally change the name of M-Bus device in the *Name* field, set the field *Interface* to access MM20-GSM device and enter the *broadcast* M-Bus address 254 in the field *Add*. This is only possible if it is one M-Bus device attached to the MM20-GSM converter. After successful reading, the field *Add* will be populated with own address of M-Bus device.

If the M-Bus address of the device is known, in the *Slave List* window of the M-Bus Master software click on *Add*, optionally change the name of M-Bus device in the *Name* field, set the field *Interface* to access MM20-GSM device and enter M-Bus address in the field *Add*.

In the *Communication Setup* select *Read* tab. Click on the *Read Meters* button and wait for the data to be populated in the window *Read Data*.



4.2 GSM/Dial-up connection

For data transmission via GSM/Dial-up connection, there must be GSM modem connected to the computer, for example DECODE GSM Terminal GT900. M-Bus device (heat meter, heating substation controller, water meter, electric meter...) connect to DECODE MM20-24E converter, which is further connected via serial cable to a GSM modem. It is necessary to provide GSM SIM cards with the CSD service, i.e. with ability to establish *data call* connection.

The modem can be connected to the RS232 port or via DECODE DC USB/RS232 converter to the USB port. It is not necessary to install modem driver.

4.2.1 GSM modem setup

GSM modem connected to computer with M-Bus Master software will be initialized automatically, by sending a series of commands entered in the field *Init cmd*. The default is command sequence *AT&FE0* which resets the modem (*AT&F*) and switches off the echo of commands that software sends to the modem (*ATE0*).

Remote GSM modem must be set to automatically answer the call by sending the command *ATS0=1* (after one ring). Also, it is necessary to adjust the speed and data format of the serial port with the commands *AT+IPR=2400* (typical for M-Bus devices) and *AT+ICF=2.1* (8 data bits, even parity, 1 stop bit, typical for M BUS devices). Save parameters with command *AT&W*.

DECODE MM20-24E converter, connected to remote GSM modem, configure for RS232 interface with communication parameters, 2400bps, 8E1. The setting process is explained in the user manual for the converter.

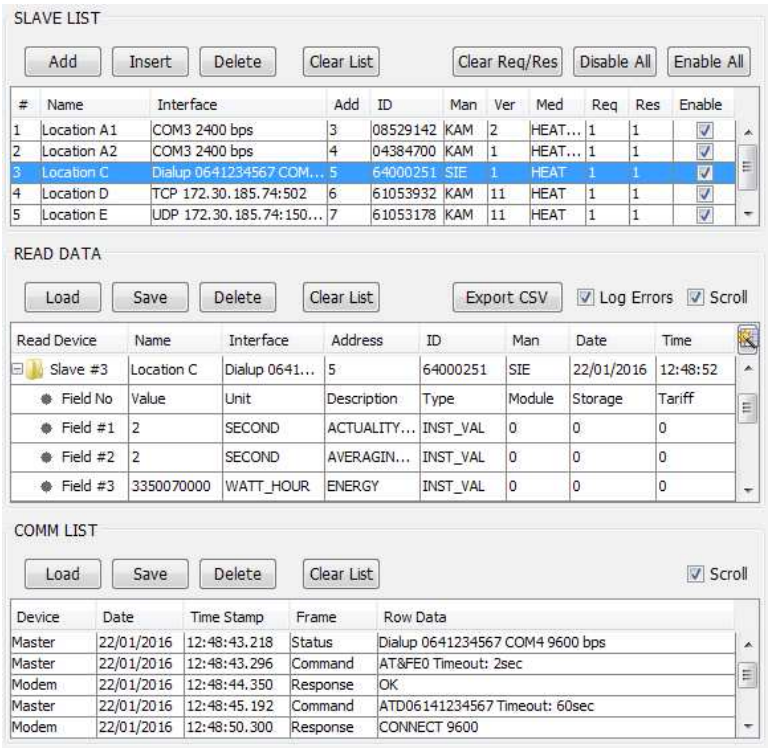
4.2.2 Readout

If the M-Bus address of the device is not known, in the *Communication Setup* window of the M-Bus Master software, choose *Scan* field. Click on the *Setup* button and enter the parameters for access to MM20-24E converter. Enter range of M-Bus addresses for scan and click on the *Scan Meters* button. During the search, all read M-Bus devices will be added in the *Slave List*.

Also, If the M-Bus address of the device is not known, in the *Slave List* window of the M-Bus Master software click on *Add*, optionally change the name of M-Bus device in the *Name* field, set the field *Interface* to access MM20-24E device and enter the *broadcast* M-Bus address 254 in the field *Add*. This is only possible if it is one M-Bus device attached to the MM20-24E converter. After successful reading, the field *Add* will be populated with own address of M-Bus device.

If the M-Bus address of the device is known, in the *Slave List* window of the M-Bus Master software click on *Add*, optionally change the name of M-Bus device in the *Name* field, set the field *Interface* to access MM20-24E device and enter M-Bus address in the field *Add*.

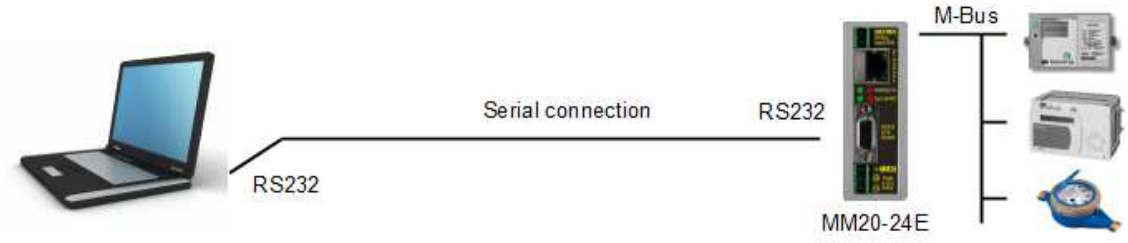
In the *Communication Setup* select *Read* tab. Click on the *Read Meters* button and wait for the data to be populated in the window *Read Data*.



In the *Comm List* window can be seen the establishment of a dial-up connection to a remote GSM modem. Establishing a connection and reading attempts *Repeats Number* of times. First, modem initialization commands are sent, and then the remote GSM modem is called. After the connection (Response CONNECT 9600), M-Bus Master software sends a query REQ_UD2 to read data from M-Bus device.

4.3 Serial connection

For data transmission via serial connection, there must be M-Bus converter connected to the computer, for example DECODE MM20-24E converter, which is designed for transparent data transmission. M-Bus device (heat meter, heating substation controller, water meter, electric meter...) connect to the M-Bus converter.



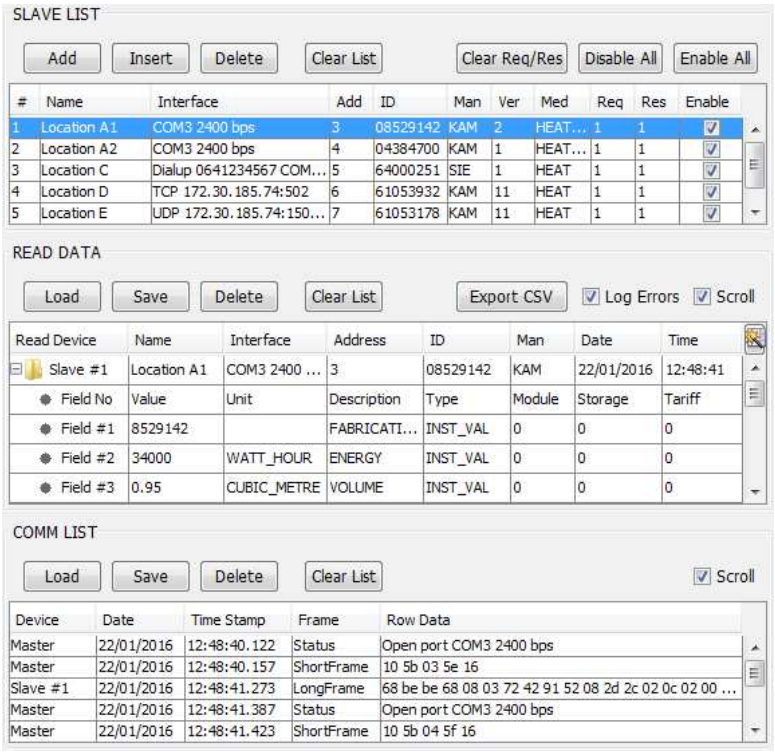
The converter can be connected to the RS232 port or via DECODE DC USB/RS232 converter to the USB port. DECODE MM20-24E converter configure for RS232 interface with communication parameters, 2400bps, 8E1 (typical for M-Bus devices). The setting process is explained in the user manual for the converter.

If the M-Bus address of the device is not known, in the *Communication Setup* window of the M-Bus Master software, choose *Scan* field. Click on the *Setup* button and enter the parameters for access to MM20-24E converter. Enter range of M-Bus addresses for scan and click on the *Scan Meters* button. During the search, all read M-Bus devices will be added in the *Slave List*.

Also, If the M-Bus address of the device is not known, in the *Slave List* window of the M-Bus Master software click on *Add*, optionally change the name of M-Bus device in the *Name* field, set the field *Interface* to access MM20-24E device and enter the *broadcast* M-Bus address 254 in the field *Add*. This is only possible if it is one M-Bus device attached to the MM20-24E converter. After successful reading, the field *Add* will be populated with own address of M-Bus device.

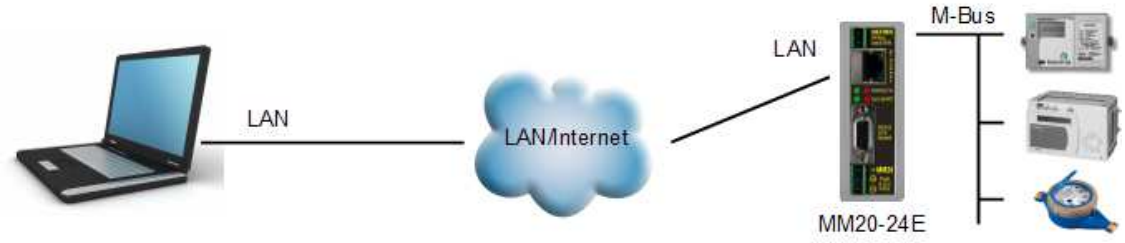
If the M-Bus address of the device is known, in the *Slave List* window of the M-Bus Master software click on *Add*, optionally change the name of M-Bus device in the *Name* field, set the field *Interface* to access MM20-24E device and enter M-Bus address in the field *Add*.

In the *Communication Setup* select *Read* tab. Click on the *Read Meters* button and wait for the data to be populated in the window *Read Data*.



4.4 LAN/Internet connection

For data transmission via LAN/Internet connection, there must be M-Bus converter connected to the computer, for example DECODE MM20-24E converter with Ethernet option, which is designed for transparent data transmission. M-Bus device (heat meter, heating substation controller, water meter, electric meter...) connect to the M-Bus converter.

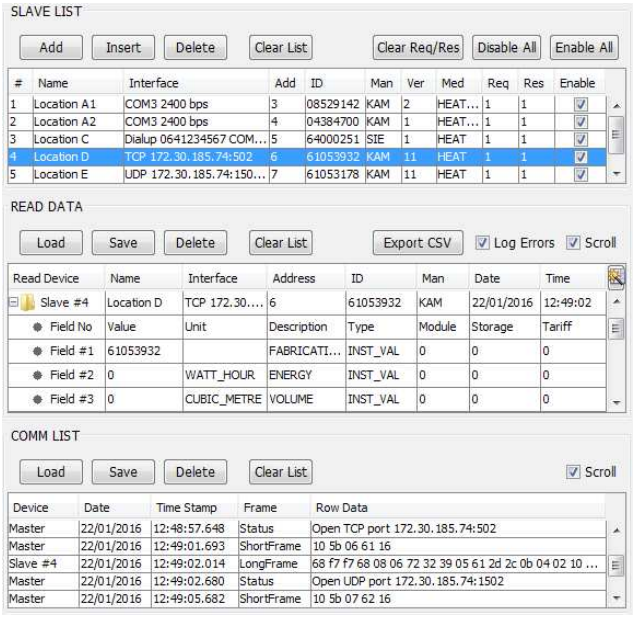


Converter can be connected to a local area network, or any other network that is available over the Internet. In the second case it is necessary that an IP address of the converter be static and public.

There are two ways of communication with the converter.

The first way is through a virtual serial port that gets on computer by installing the appropriate driver and setting the converter. Communication in this case is the same as in example from 4.3 whereby the COM port should be set as an installed virtual serial port.

Another method involves direct TCP/UDP connection between the computer and the converter. It is necessary to set the converter for this type of communication. Communication in this case is the same as in example from 4.1, without the need for a GSM modem and establishment of a dial-up connection. Setting the TCP connection is similar to UDP, where there is no adjustment of the local port.



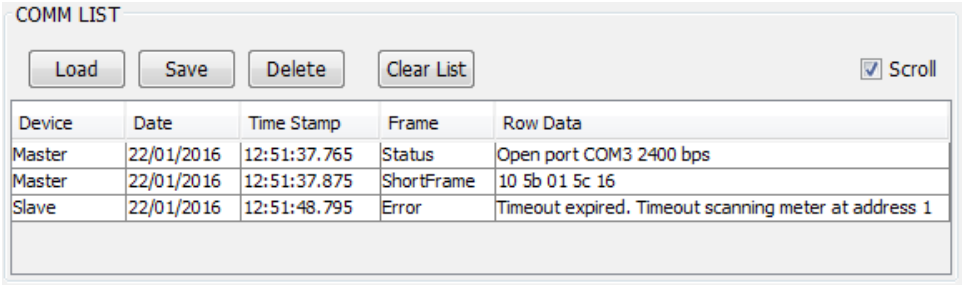
5 FAQ

The following table lists the most common problems that occur while reading the M-Bus devices, as well as proposals for solving them.

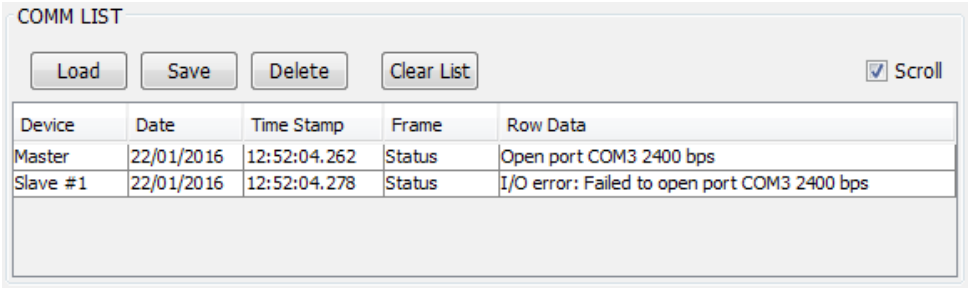
Connection	Problem/Message	Proposal of solution
GSM/GPRS	Don't know about server *IP address:Port*	Check whether the GSM modem is in dial-up connection. If not, check the parameters for accessing a VPN network. Check whether the remote converter is connected, i.e. whether it is registered in the VPN network. Check the IP address and Port of the remote converter. Check Local Port at UDP connections.
	Couldn't get I/O for the connection to *IP address:Port*	
GSM/Dial-up	I/O error: Failed to dialup *Number Port baudrate* bps	Check whether is selected appropriate serial port that is connected to a GSM modem. Check whether are the SIM cards in both GSM modems unlocked, i.e. the requirement for a PIN code is turned off. Check whether the SIM card is provided with the CSD call. Check the phone number of the SIM card which is located in the remote GSM modem.
	Timeout error: Failed to dialup *Number Port baudrate* bps	
	No Carrier	
Serial	I/O error: Failed to open port *COMx baudrate* bps	Check whether is selected appropriate serial port that is connected to the converter.
All types	No CON response. (Error scanning meter at address: x)	Check M-Bus address and baudrate.
	Timeout expired. (Timeout scanning meter at address: x)	
	M-Bus address out of range	M-Bus address is out of range
	M-Bus address missing or not an integer	M-Bus address not entered or not an integer value
	Interface not set	Choose physical interface

In order for successful remote readout of M-Bus devices it is recommended to first locally read M-Bus device to determine its M-Bus address and *baudrate* i.e. communication speed.

Connect the M-Bus device to computer via a serial line, as described in chapter 4.3. Configure the access parameters as explained in that chapter. Initiate scanning the M-Bus devices and wait for it to finish. If no M-Bus device is found, in the *Comm List* window will be displayed *Timeout expired*. *Timeout scanning meter at address: x*, where *x* is the address of M-Bus devices. Change baudrate i.e. communication speed and run a scan again. Repeat for all given communication speeds until M-Bus device is found.



If this procedure is completed unsuccessfully, check whether everything is properly connected and that the corresponding serial port is selected. If wrong serial port is selected or serial port is already open, in the window *Comm List* will be displayed *I/O error: Failed to open port COMx yyyy bps*, where *x* is the number of the selected serial port, and *yyyy* selected baudrate i.e. communication speed.



After the successful reading of M-Bus devices, note its M-Bus address and baudrate. Repeat for all M-Bus devices to be read in one of the ways described in chapter 4. Then create a group of M-Bus devices and assign them the M-Bus addresses and configure interfaces. Save setting of M-Bus devices in the xml file.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