Automated data reading module

ESMB 3.1

User guide

Version 1.1 (2018-10-09)

UAB NAVITUS LT, Lithuania 2018

This user guide is an automated electricity meters reading module‘s ESMB 3.1 manual. Read this document, before starting to set up and run the controller. The manufacturer does not provide any warranty for controllers, who were corrupted or damaged, due to ignoring the requirements written in this guide and meter‘s passport, or violating the safety instruction’s requirements.

The manufacturer keeps the right to change the information given in this document at its own discretion without giving a warning. It is forbidden to duplicate, copy, hand over or publicize this document, or its part, without a written UAB NAVITUS LT authorization.

Document‘s and controller‘s software version history

Document version	**Date**	**Changes, comments**	**Controller‘s software version**
1.0		First edition	1.0

Contents

Markings and abbreviations

CL	Current loop interface
PC	Personal computer
COM	Communication port
TCP/IP	Transmission control protocol / Internet protocol
RTU	Remote terminal unit
LED	Light - emitting diode
CRC	Cyclic redundancy check

1. Safety instructions

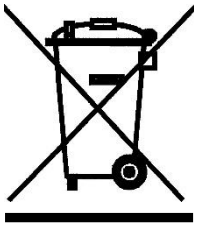
	Only the authorized service persons with adequate qualifications can perform installation, uninstallation and parameterization of the controller ESMB 3.1. National wiring rules should be followed while installing and using the controller.
	All equipment interconnected with this product should comply with the requirements of EN 60950-1:2006 (Personal computer, etc.) or other adequate safety standard applicable to the equipment (electricity meters).
	Read the installation instructions (Chapter 3) provided in this document before you connect the controller to the power source.
	Controller ESMB 3.1 should be mounted in restricted access locations only. It should only be available for the service persons to access this location.
	Do not open the device enclosure. There are no serviceable components inside. Some parts may remain energized even if the power is disconnected!
	Always disconnect the mains supply while installing or servicing the communication interfaces.

2. Technical specifications

Power supply	
Power voltage	AC / DC 90 - 264 V (alternate 50/60 Hz)
Current	50 mA
Power consumption	No more than 5 VA
Protection level	II
Galvanic isolation: Power supply <-> Connection interfaces	3000 V RMS, 1 min
Connection interfaces	
Ethernet network interface RJ45	10/100 Mbps
Up to two independent interfaces for meter readings	
Data transfer protocol	Transparent, IEC62056-31
20 mA current loop (for connecting meters)	Maximum connected meters per interface - up to 5 (24V open current loop voltage) - up to 2 (10V open current loop voltage)
Data transfer speed	300...19200 bauds
Cable type	Two-wire cable
RS485 (for connecting meters)	Maximum Connected meters per interface – up to 32
Data transfer speed	300...19200 bauds
Cable type	Two-wire cable
RS232 (for the reading device connection / configuration)	Data transfer speed 2400... 19200 bauds (default 9600 bauds)
RS485 (for the reading device connection / configuration)	300...19200 bauds
Galvanic isolation:	
Meter connection interfaces <-> readout interfaces	1000 V
Environment conditions, other	
Operating temperature	-20 … +50 ºC
Storing temperature	-40 … +80 ºC
Relative air humidity	<95 %, no condensation
Mounting	DIN rail
Dimensions	110 x 75 x 25 mm
Weight	115 g

Hereby, UAB NAVITUS LT, declares that controller ESMB 3.1 is in compliance with the essential requirements and other relevant provisions of:

- R&TTE Directive 1999/5/EC
- Low Voltage Directive 2006/95/EB
- EMC Directive 2004/108/EB



This sign indicates, that this product cannot be thrown out with any other waste, when its validity period is over if this sign is on the product or it is included in product's description. In order to prohibit possible harm for environment and human health because of uncontrolled waste elimination, please separate this product from other forms of waste, and if it is possible use this product or is parts repeatedly in recycling process. Home users can contact product manufacturer or local administration for information about product utilization and recycling without any harm to the environment. Enterprises must contact their own providers to revise product's validity terms and conditions stated in purchase agreements. This product cannot be thrown out with any other waste of different purpose.

3. Method of use

Universal communication protocol converter ESMB 3.1 is used for energy resources metering systems. Converter uses two independent interfaces to collect data from different meters and sends it only transparently.

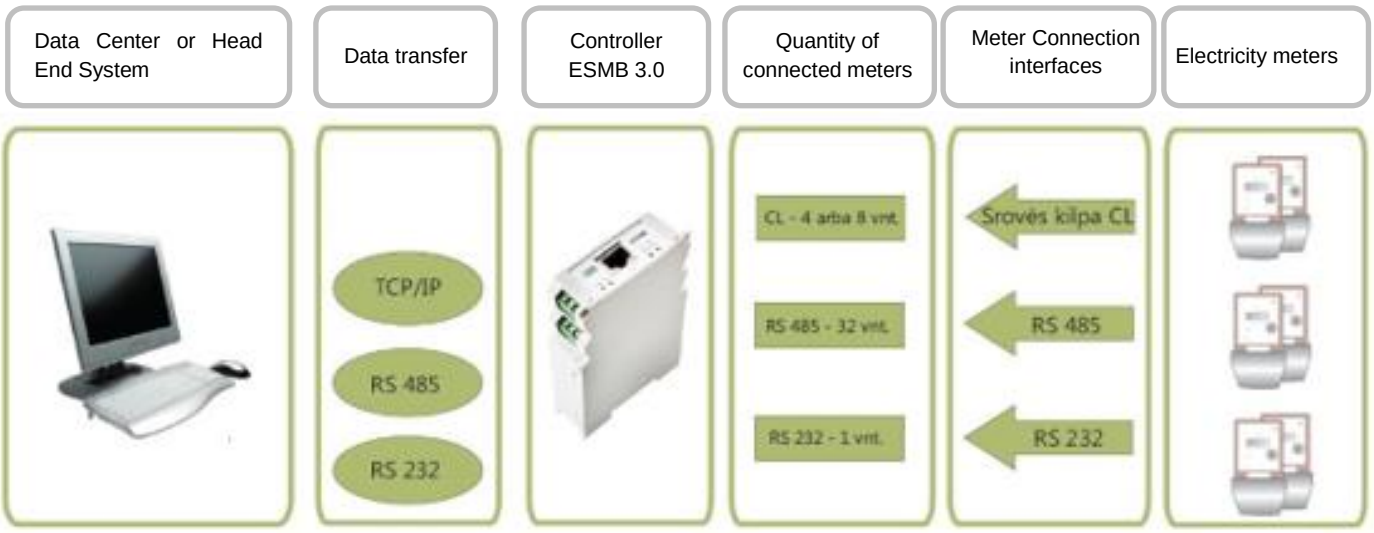


fig. 3.1 ESMB 3.1 controller's usage

3.2 Connection outputs

The controller's terminals are pictured below in figure 3.2, meanings are showed in table 3.2 and their numbers are illustrated in table 3.1.

fig. 3.2 ESMB 3.1 connection pin's numbers

table 3.1 ESMB 3.1 connection pins

Connection type	Pin number											
	1	2	3	4	5	6	7	8	9	10	11	12
Data (RS232)	Txd	Rxd	Gnd									
Power supply 230 V				L		N						
RS485 In							A(+)			B(-)		
CL2/RS485out								+/A(+)			-/B(-)	
CL1/RS485out									+/ A(+)			-/B(-)

3.3 Indicator meanings

The controller ESMB 3.0 has three light indication signals. Controller's state can be monitored by watching the LED signals on its front panel. Their meanings are explained in the table below. Two of them are made to indicate meter interfaces (CL1, CL2), another indicates turned on power and communication with client device (for example, PC).

table 3.2 ESMB 3.1 indicator meanings

Indicator	Indication	Meaning
PC	Continuous green	Controller is powered on
	Not periodically blinks green	Data transfer to computer through RS232 interface
	Blinks red	Data transfer from computer through RS485 interface
CL1, CL2	Continuous red	Open current loop circuit
	Blinks green	Query to the controlling (*slave*) unit is being sent through CLout/RS485out interface
	Blinks red	Data is being received from the controlling unit's (*slave*) CLout/RS485out interface
Ethernet	Yellow light on	Ethernet 100 Mbps
	Yellow light off	Ethernet 10 Mbps
	Green light blinks	Ethernet interface is active

3.4 Power connection

The controller is connected to an alternate voltage power supply, which nominal voltage is from 90 V to 264 V. Connection scheme is illustrated in figure 3.3.

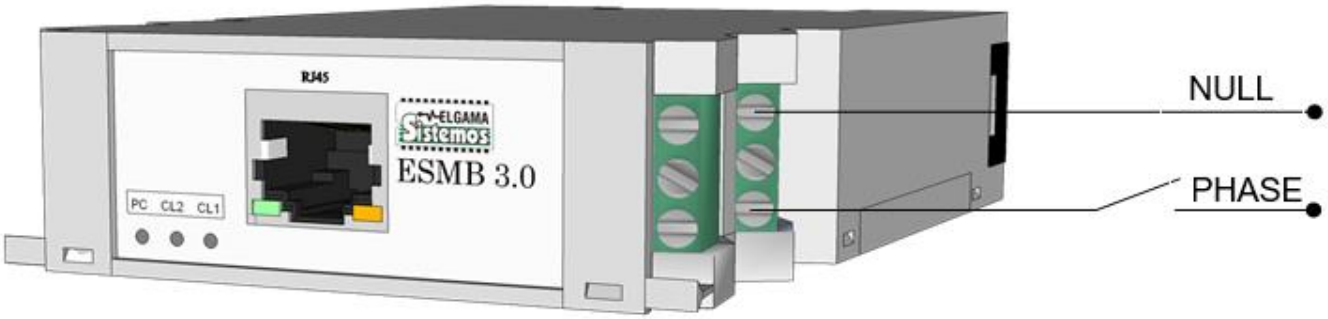


fig. 3.3 ESMB 3.1 connection to a power supply scheme

It is very important to make sure if the right wiring pins are being used while connecting the controller to the power supply. If the power supply is connected not in to correct outputs controller will be damaged.

A two wired cable for the controller‘s power supply, has to be connected to a switch nearby, which meets the following requirements:

- switch‘s nominal voltage and current has to meet the controllers nominal voltage and current;
- switch must be mounted close to the controller and easily reached to the operator;
- switch must be marked, as the controller‘s cut-off device;
- switch‘s pin separation must be no less than 3 mm.

3.5 Connecting the controller to PC through RS232 interface

The controller is connected to PC using *RS232* interface, connection scheme is showed at figure 3.4. It is necessary to notice, that the controller’s *RS232* interface output *TX* (*Transmitter*) sends data, while *RX* (*Receiver*) receives. The controller’s *TX* output is connected to the computer’s *COM* port by *RX* input, whereas the controller’s *RX* output with *COM* port’s *TX*.

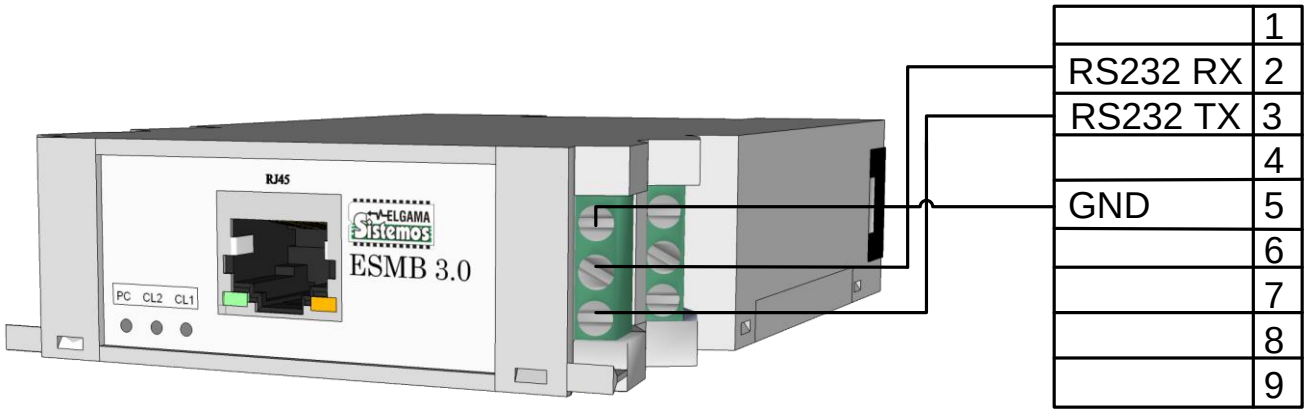


fig. 3.4 ESMB 3.1 connection to the computer using RS232 interface

3.6 CL interfaces

Controller ESMB 3.1, depending on its modification, can have up to two 20 mA current loop interfaces to which you can connect up to 8 meters, that is to say 4 meters for every current loop. Circuit of meters sequentially connected to the controller‘s current loop should be closed. Meters connection to a single current loop is illustrated in figure 3.5.

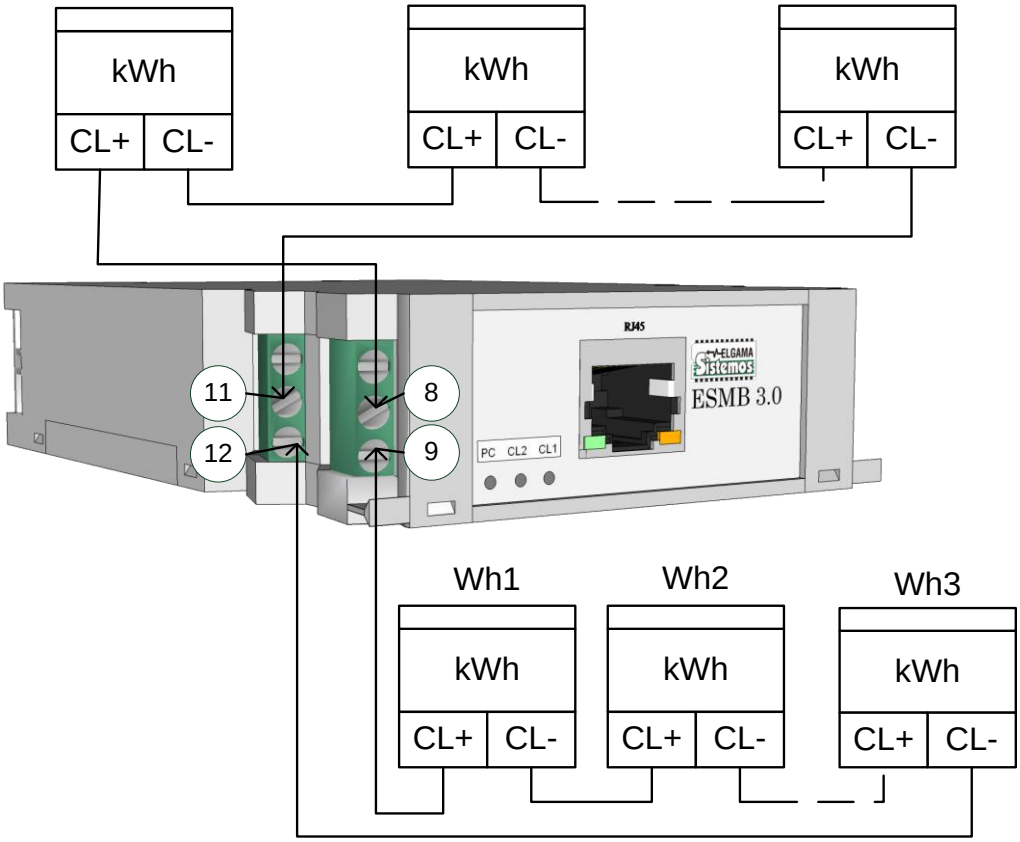


fig. 3.5 Meter connection to ESMB 3.1 through current loop interfaces

The maximum current loop interface conductor length can be up to 1000-2000m. However, the longer the lines are, the slower data transfer speed is. If the conductor’s length is more than 100m, it is recommended to set up an additional surge protection (type PROTEC 10). It is recommended to use a twisted-pair cable 2x0.5 or 2x0.64, also it can be shielded signal cable, for example LIYCY 2x0.5, J-Y(St)Y 1x2x0.6. If meters are connected correctly into chain, the voltage on every meter’s current loop connectors has to be 3,5...4 V (when no data is being transferred). The measured voltage on the controller’s *CL* outputs (9-10 or 11-12) has to be 3,5…4 V. If there is more than one meter connected to the same current loop interface, the measured voltage has to be multiplied by the quantity of connected meters. For example, if there are two meters connected to the controller’s *CL* outputs, the voltage will be 7-8V, if three – 9-12V and so on.

RS485 interface

Physically you can connect up to 32 meters to this interface, so if the controller's current loop is not being used, you can connect up to 64 meters. Interface conductors cannot be longer than 1000 m. It is recommended to use a twisted-pair cable 2x0.5 or 2x0.64, also it can be shielded signal cable, for example LIYCY 2x0.5, J-Y(St)Y 1x2x0.6. When connecting more than one meter to RS485 interface, RS485 network topology must be "lines", but not the "stars" or any other type, that is to say RS485 interface cable must go from one meter to another without long ramifications. Meter connection to RS485 interface is showed in figure 4.7. IMPORTANT. It is necessary to observe polarity! ("A" and "B")

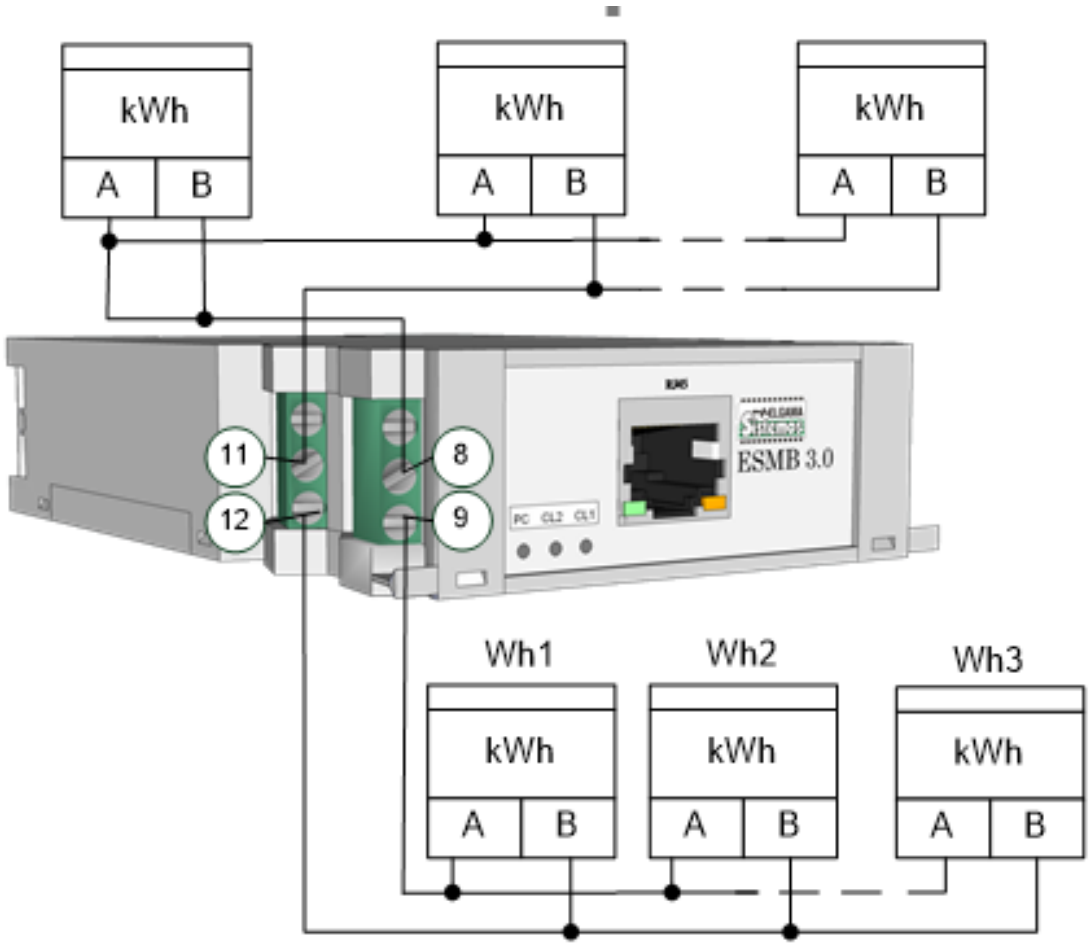


fig. 3.6 Meter connection to ESMB 3.1 through RS485 interface

4. ESMB 3.1 parameterization menu

ESMB 3.1 can be configured through all inputs (*Ethernet, COM*) using the PC's "HyperTerminal". Information about how to configure "HyperTerminal" software is explained in supplement 1. After the "HyperTerminal" (further terminal) is configured, ESMB 3.1 menu can be opened by pressing the <Esc> button three times. Some modifications might require entering the password to access the menu after pressing the <Esc> button. Menu window is displayed in figure 4.1.

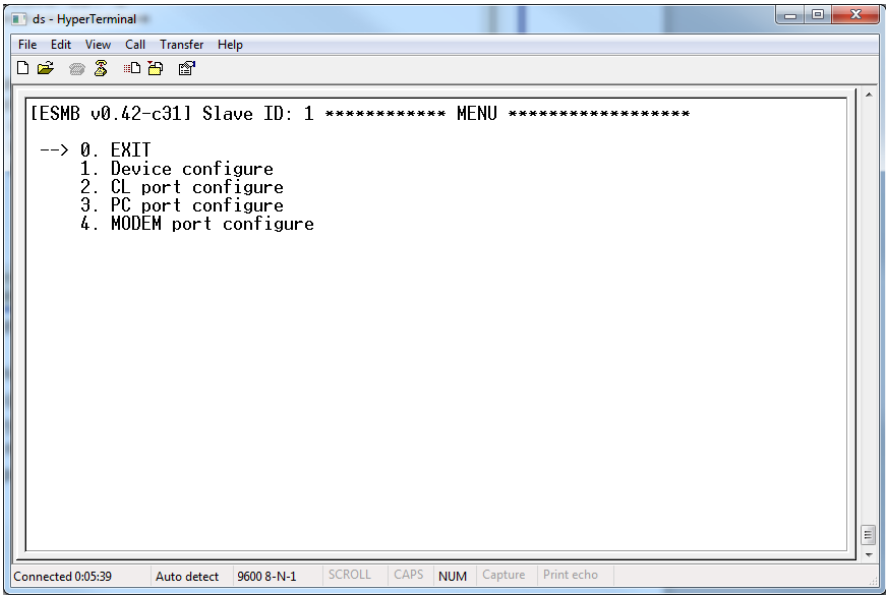


fig. 4.1 Main ESMB 3.1 menu window view

Symbol "-->" indicates menu item's selection. By pressing <ENTER> button you can enter the selected menu item. Menu item's selection is controlled by pressing the arrow keys <↓> and <↑>. If user does not make any changes for 60 seconds, the menu will close itself and display "Exit terminal mode" message. To exit from the menu, select the menu item "EXIT". Controller's menu hierarchy and detailed menu item's explanation are described in table 4.1.

table 4.1 ESMB 3.1 menu items description

Meniu item		**Description**
0. EXIT		Exit menu
1. Device configure	0. RETURN	Back to the main menu
	1. Device ID-SerialNumber	Unique device serial number
	2. Reboot time	Reboot time value in minutes. If there are no queries coming via Ethernet during specified time, controller will automatically reboot. After each Ethernet query by reboot time is set to initial value .
	3. Data protocol	Data transfer protocol: 0 – Transperent, 1 – Modbus, 2 – Modbus + Transperent. If the mode is transparent, the controller forwards all the data without interfering.
	4. Send query in transp. mode	Set to which interface transparent queries are sent. For controller ESMB 3.0 only.
	5. Transp. Queries priority	For controller ESMB 3.0 only.
	6. Modbus queries priority	For controller ESMB 3.0 only.
	7. Reboot	Restarts the controller immediately after pressing <Enter> key
2. RS232 port configure	0. RETURN	Back to the main menu
	1. PC (RS232 in) port data rate	RS232 IN baud rate configuration
	2. Byte w. timeout in X bytes	Timeout value defined in byte transfer time (it depends on baud rate) multiplied by this setting value. Timeout is set after each received byte in frame. If timeout expires after last received byte, the frame is accepted. This setting is for RS232 out interfaces
	3. Request proceed time out	During the specified time the received request has to be send to a meter (through RS232 out), if it times out the request will be discarded
3. RS485 in port configure	0. RETURN	Back to the main menu
	1. PC (RS485 in) port data rate	RS485 IN baud rate configuration
	2. Byte w. timeout in X bytes	Laiko intervalas po paskutinio paketo baito gavimo, kuriam suėjus, paketas bus persiųstas arba apdorotas. Šis nustatymas taikomas paketams gaunamiems per RS485 sąsają.
	3. Request proceed time out	During the specified time the received request has to be send to a meter (through RS485 out), if it times out the request will be discarded
4. CL/RS485 out1 port configure	0. RETURN	Back to the main menu
	1. CL/RS485 out1 data rate	Baud rate configuration for 1st interface out
	2. Byte w. timeout in X bytes	Timeout value defined in byte transfer time (it depends on baud rate) multiplied by this setting value. Timeout is set after each received byte in frame. If timeout expires after last received byte, the frame is accepted. This setting is for 1st out interface
	3. Data wait timeout	Time for waiting data (answer) in 1st interface out, after the request has been sent
	4. Pause before next req.	Time for waiting for the next frame in 1st interface out, after one frame has been received
5. CL/RS485 out2 port configure	0. RETURN	Back to the main menu
	1. CL/RS485 out2 data rate	Baud rate configuration for 2nd interface out
	2. Byte w. timeout in X bytes	Timeout value defined in byte transfer time (it depends on baud rate) multiplied by this setting value. Timeout is set after each received byte in frame. If timeout expires after last received byte, the frame is accepted. This setting is for 2nd out interface
	3. Data wait timeout	Time for waiting data (answer) in 2nd interface out, after the request has been sent
	4. Pause before next req.	Time for waiting for the next frame in 2nd interface out, after one frame has been received
6. LAN configuration	0. RETURN	Back to the main menu
	1. Dynamic IP (DHCP)	Dynamic IP address setting for the controller. Values: 0 – OFF, 1 – ON. If DHCP is enabled, the controller asks for the IP address from the Ethernet network.
	2. Static IP address	Static IP address oft he controller. Active only if DHCP function is disabled.
	3. Current IP address	Current IP address of the controller.
	4. Data port	TCP/IP Data port. When connecting to this port of the controller, the controller forwards the request to the out interfaces.

	5. Subnet mask	Network subnet mask
	6. Default gateway	Network default gateway address.
	7. DNS IP address	DNS server IP address
	8. TCP/IP session timeout	TCP / IP session expiration time in seconds. This is the time since the last data exchange or update session, when the controller will close the session.
	9. Request proceed timeout	During the specified time the received request has to be sent to the Ethernet interfaces, if it times out the request will be discarded
	10. External loop IP address	The external IP address is for the controller to diagnose if the Ethernet interface is working properly. If the controller within the specified period of time does not receive any packets, sends ping to an external IP address. If the controller receives a response, the check period resets. If no reply is received, the Ethernet interface is restarted.
	11. Ext. loop check period	Ethernet interface check time period
	12. MAC address	Controller's MAC address
6. Statistics*	0. RETURN	Back to the main menu
7. Diagnostics	0. RETURN	Back to the main menu
	1. CL out1 state	Curent Loop 1 state (open or closed)
	2. CL out2 state	Curent Loop 2 state (open or closed)
	3. LAN IP address	Network IP address

5. Manufacturer warranty

UAV NAVITUS LT, (further - manufacturer) guarantees, that materials and components used in the controllers' production, assembly and adjustment, are free from defects and that staff performed their duties qualitatively.

Technical characteristics are also guaranteed. Manufacturer guarantees, that produced controllers and other devices of same use, will remain the stored data in its memory when power is plugged off and plugged in again. All the gathered data in meters will remain unchanged and it will be possible to receive and analyze it again.

Controller warranty service time is described in the passport of the device. Warranty is valid if the user has followed the rules set out below:

- Controller\s installation was performed by manufacturer or his authorized representative, or manufacturer provided a written permission to a legal person, supplying him with all the needed technical documentation for the controller's installation;
- Electricity network and other independent connection lines were not cut off or shorten between the controller and meters;
- When changing the meters in the system, their parameterization or positioning, it is important to inform the system manufacturer and get its written agreement and necessary software updates-changes (when changing the meters in the system);
- Stamps and stickers of the controller box are unaffected.

6. Contact details

If you are experiencing difficulties setting up or operating our product and you have not managed to find the needed information in this document, please contact us by email - support@navitus.lt.

Manufacturer:

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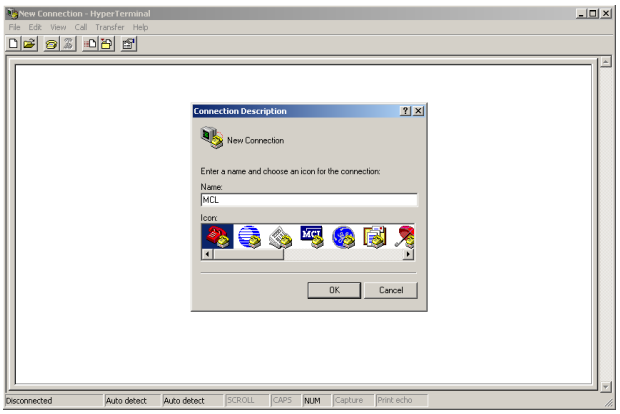
Telephone: +370 5 232 8000
Fax: +370 5 210 12 92
Information on technical issues: support@navitus.lt;
Sales, other information: info@navitus.lt.
www.navitus.lt

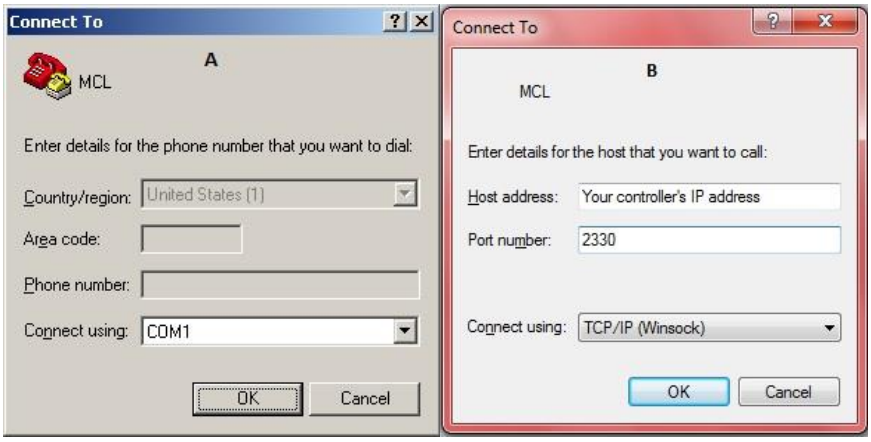
1 supplement HyperTerminal software configuration

"HyperTerminal" is software which can operate through *TCP/IP* and *RS232in* as well and it should be used for controller's ESMB 3.1 configuration (1 and 2 ex.) or other analog software, which allows connecting to the controller through these interfaces, for example, telnet client for TCP/IP connection. If you are using Operating System Windows 7 or later, the "HyperTerminal" software can be downloaded from this link: http://downloads.elgsis.com/hyperterm.zip, extract the files from the downloaded archive to a single folder and run the „hyperterm.exe". *COM* interface settings for parameterization is **independent from settings which are used for data reading and must be set in this way: 4800 (2400, 9600, 19200 and etc., depending on the controller interface's speed) bits per second, parity - none, 8 data bits, 1 stop bit, flow control - none.**

Please note, that using TCP/IP connection the controllers default data port is 502, but the configuration port is 23.

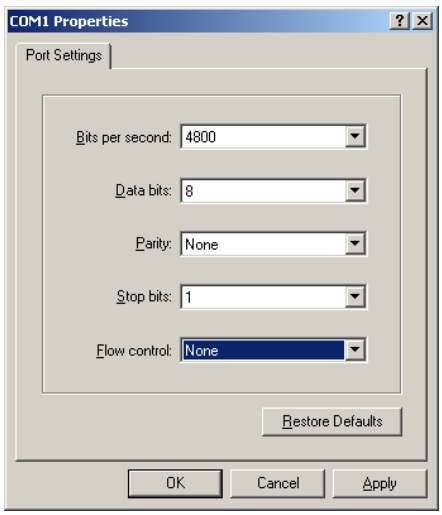


1 ex. Enter the new connection name



2 ex. Case a: If you are connecting through RS232in interface, select an interface to which ESMB 3.1 is connected and continue configuration

Case b: If you are connecting through TCP/IP interface, enter your controller's IP address and port (default "23") and skip next steps

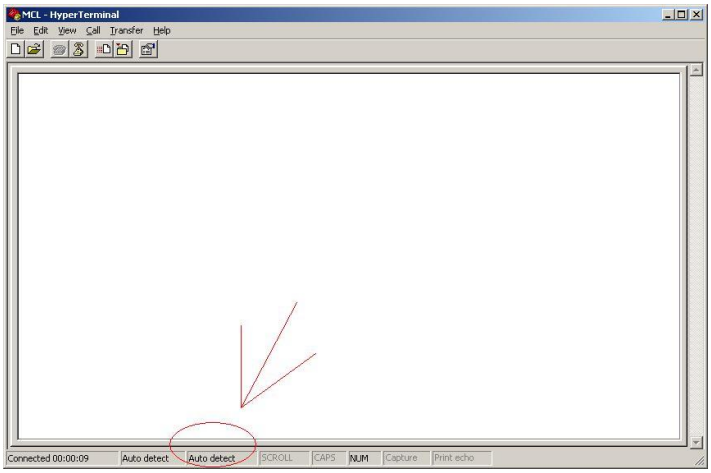


3 ex. Select interface settings

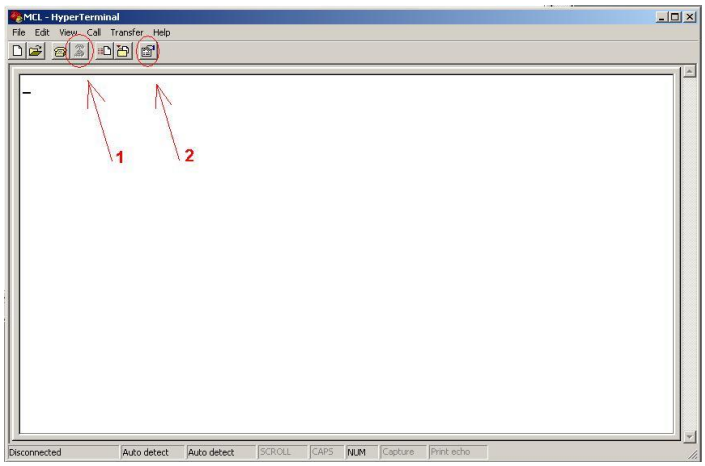
As default, after pressing the “OK” button in the dialog screen “*COM Properties”* (3 ex.), settings are set to “*Auto detect”* (4 ex.). Change them with the values:

• Press “*Disconnect”* button, as showed in ex 5;
• Press “*Properties”* button, as showed in ex. 5;
• Press “*Configure”* button, as showed in ex. 6;
• Press “*OK”* button, as showed in ex. 7;
• Make sure that other connection settings are set as they are showed in ex. 6 and 7;
• Press “*OK”* button, as showed in ex. 8;

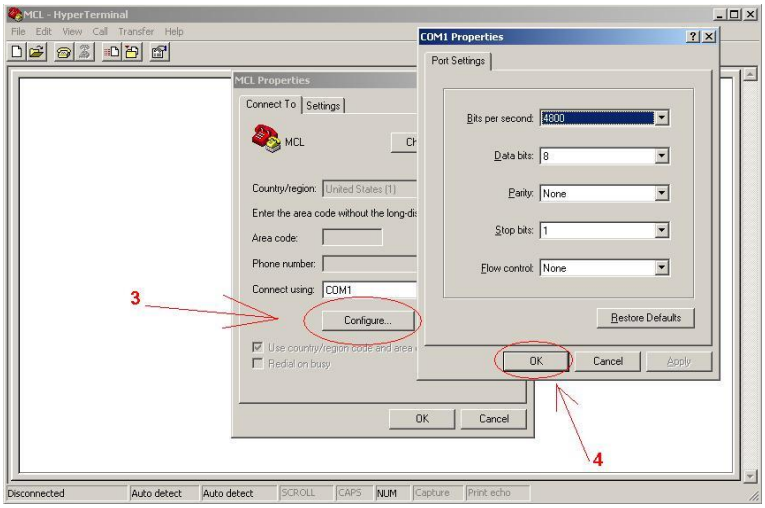
Settings should change to 4800 (9600) 8-N-1, as showed in ex. 9;



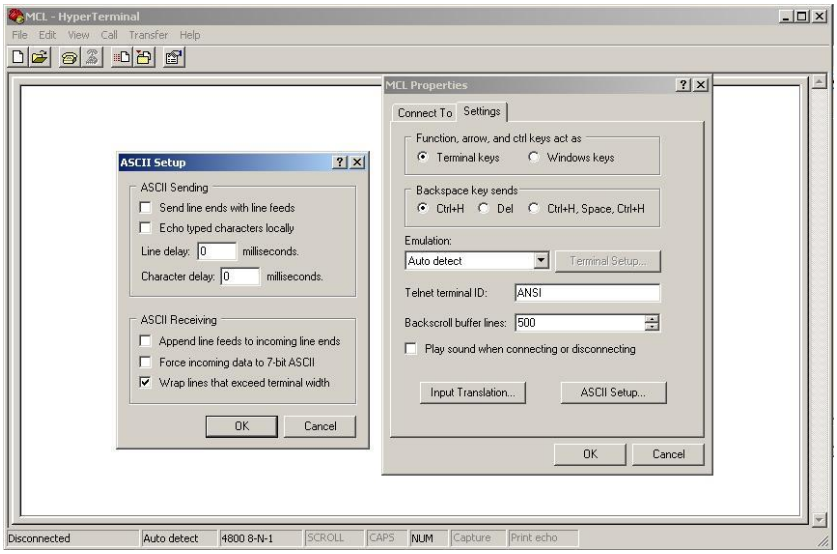
4 ex.



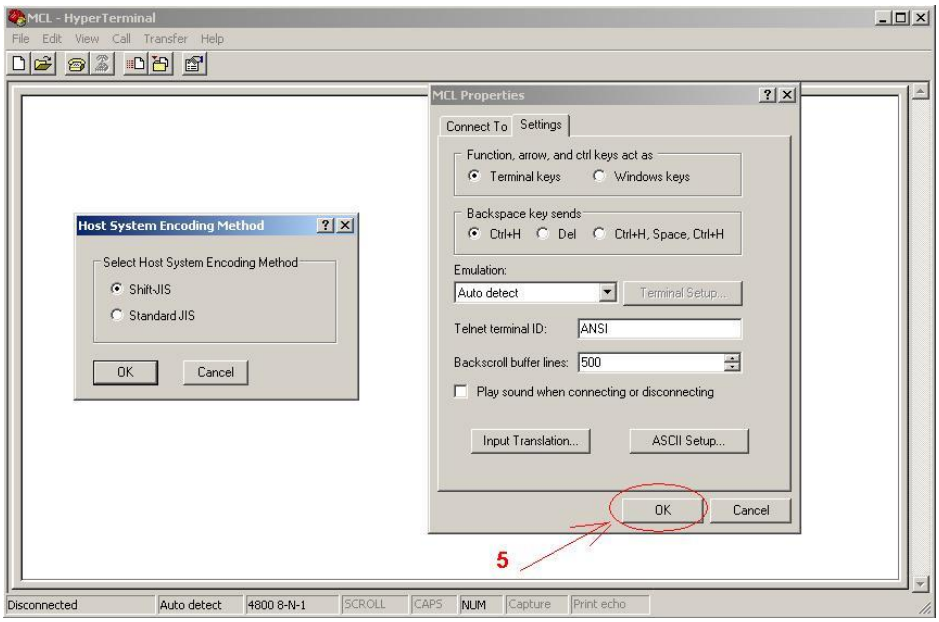
5 ex.



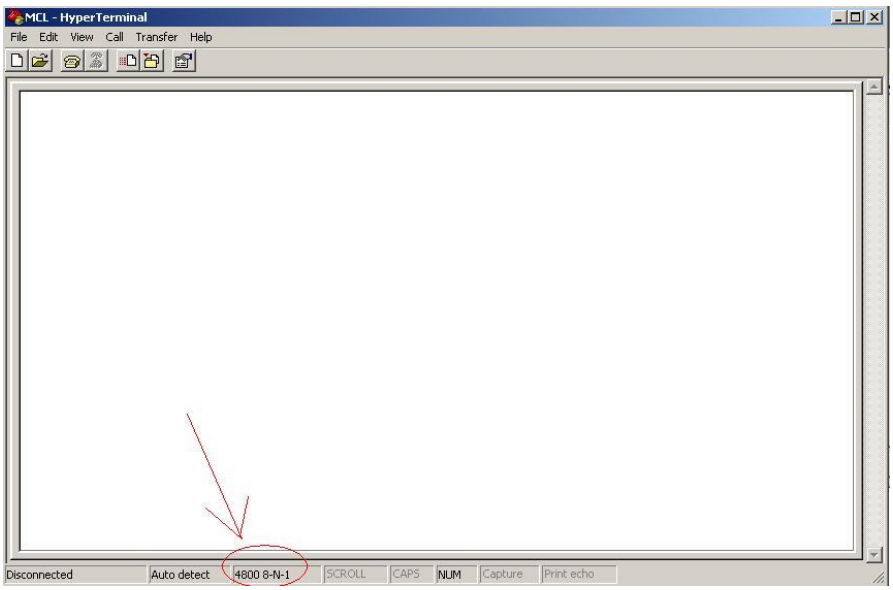
6 ex.



7 ex.



8 ex.


MCL - HyperTerminal
File Edit View Call Transfer Help
Disconnected
Auto detect
4800 8-N-1
SCROLL
CAPS
NUM
Capture
Print echo

9 ex.