

Multifunctional Panel Meters & Power Quality Analyzers
Protocol description for M-Bus protocol

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For device firmware version 2.0.x

PRELIMINARY TEXT

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1 Communication Options

M-Bus configuration and behavior is similar to that of RS-485. The only differences are physical layer, which corresponds to M-Bus standard, and ability to process commands *Readout Data*, *Set Baud Rate*, *Set Primary Address*, *Set Date and Time* and *Wakeup Message* according to EN1434-3 standard for slaves. Device is still able to respond even to KMB or Modbus messages on M-Bus interface. This means that user can use M-Bus master node for remote configuration, firmware upgrade and access to any KMB systems device on M-Bus network using supplied configuration software. Protocol is recognised automatically between proprietary KMB messages, Modbus or M-Bus commands.

In communication configuration device address, baud rate and parity bit must be specified (see user manual for details). Baud rate can be changed using *Set Baud Rate* M-Bus command. A gap between bytes corresponding to maximum 1.5 characters (bytes) is allowed while receiving a command or transmitting a reply. The instrument sends back a reply within 200 ms time frame after receiving each command. Between each master and the instrument the communication must follow the single request-reply. Master should wait for each reply before submitting new request.

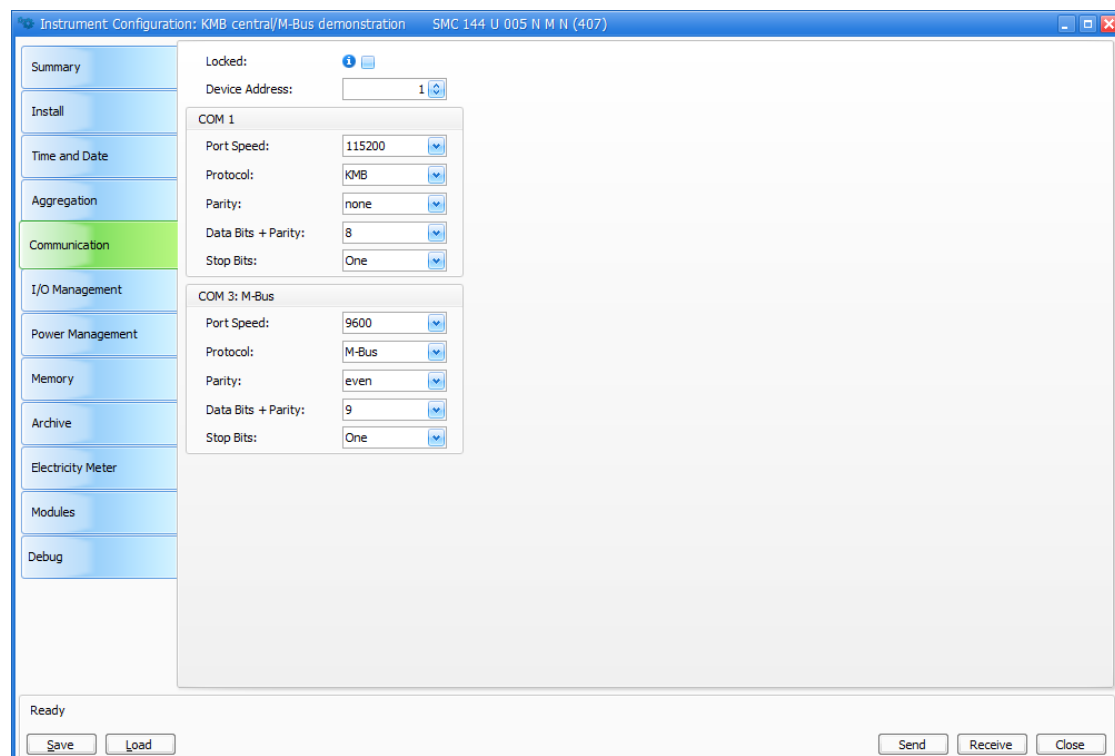
2 Description of M-Bus Implementation

2.1 Physical Layer Configuration Options

Following table summarises parameters of M-Bus serial port settings in KMB systems device.

Parameter	Default	Range
Device address	1	1 ÷ 250
Baud rate	2400	1200 ÷ 9600
Parity	Even	None, Even, Odd
Data bits + parity	9	8, 9
Stop bits	1	1, 2

In case there is need for different than default settings, software ENVIS.Daq can be used (over alternate communication interface or even over M-Bus, but with KMB protocol). If a device is equipped with more serial interfaces (RS-485 + M-Bus), there will be more than one settings available. COM port used for M-Bus interface is indicated as *COM X: M-Bus*. In case of SML, SMY and SMZ devices COM1 is used for the M-Bus interface. In case of PA, SMC and ARTIQ devices the highest COM number corresponds to the M-Bus interface as illustrated on the following screenshot (COM 3).



2.2 Supported Functions

2.2.1 SND_NKE

Wakeup message after interruption or beginning of communication. Secondary mode is deselected if slave was selected for secondary addressing.

Byte number	Size (Bytes)	Value	Description
1	1	0x10	Start character (short telegram)
2	1	0x40	C field
3	1	xx	A field - primary address 0x00 – 0xFA
4	1	xx	CS - checksum
5	1	0x16	Stop character

Slave response: 0xE5

2.2.2 SND_UD

Procedure for sending user data to the M-Bus slave.

Select a Slave (using Secondary Address)

Byte number	Size (Bytes)	Value	Description
1	1	0x68	Start character (long query)
2	1	0x0B	L field
3	1	0x0B	L field repeated
4	1	0x68	Start character (long query) repeated
5	1	0x53/0x73	C field SND_UD
6	1	0xFD	A field
7	1	0x52	CI field
8 – 15	8	xx xx xx xx xx xx xx xx	Secondary address
16	1	xx	CS checksum
17	1	0x16	Stop character

Slave response: 0xE5

Set Baud Rate (using primary address)

Byte number	Size (Bytes)	Value	Description
1	1	0x68	Start character (long query)
2	1	0x03	L field
3	1	0x03	L field repeated
4	1	0x68	Start character (long query) repeated
5	1	0x53/0x73	C field SND_UD
6	1	0xFD	A field - primary address 0x00 – 0xFF
7	1	xx	CI field – Baud Rate (see table below)
8	1	xx	CS checksum
9	1	0x16	Stop character

CI field Baud Rate encoding								
CI field	0xB8	0xB9	0xBA	0xBB	0xBC	0xBD	0xBE	0xBF
Baud Rate (bps)	300	600	1200	2400	4800	9600	19200	38400

Slave response: 0xE5

Set Baud Rate (using secondary address)

Byte number	Size (Bytes)	Value	Description
1	1	0x68	Start character (long query)
2	1	0x0B	L field
3	1	0x0B	L field repeated
4	1	0x68	Start character (long query) repeated
5	1	0x53/0x73	C field SND_UD
6	1	0xFD	A field
7	1	xx	CI field – Baud Rate (see table below)
8 – 15	8	xx xx xx xx xx xx xx xx	Secondary address
16	1	xx	CS checksum
17	1	0x16	Stop character

CI field Baud Rate encoding								
CI field	0xB8	0xB9	0xBA	0xBB	0xBC	0xBD	0xBE	0xBF
Baud Rate (bps)	300	600	1200	2400	4800	9600	19200	38400

Slave response: 0xE5

Set Primary Address (using primary address)

Byte number	Size (Bytes)	Value	Description
1	1	0x68	Start character (long query)
2	1	0x06	L field
3	1	0x06	L field repeated
4	1	0x68	Start character (long query) repeated
5	1	0x53/0x73	C field SND_UD
6	1	xx	A field - primary address 0x00 – 0xFF
7	1	0x51	CI field – Baud Rate (see table below)
8	1	0x01	DIF
9	1	0x7A	VIF
10	1	xx	New primary address 0x00 – 0xFA
11	1	xx	CS checksum
12	1	0x16	Stop character

Slave response: 0xE5

Set Primary Address (using secondary address)

Byte number	Size (Bytes)	Value	Description
1	1	0x68	Start character (long query)
2	1	0x0E	L field
3	1	0x0E	L field repeated
4	1	0x68	Start character (long query) repeated
5	1	0x53/0x73	C field SND_UD
6	1	0xFD	A field
7	1	0x51	CI field – Baud Rate (see table below)
8 – 15	8	xx xx xx xx xx xx xx xx	Secondary address
16	1	0x01	DIF
17	1	0x7A	VIF
18	1	xx	New primary address 0x00 – 0xFA
19	1	xx	CS checksum
20	1	0x16	Stop character

Slave response: 0xE5

Set Date and Time (using primary address)

Byte number	Size (Bytes)	Value	Description
1	1	0x68	Start character (long query)
2	1	0x09	L field
3	1	0x09	L field repeated
4	1	0x68	Start character (long query) repeated
5	1	0x53/0x73	C field SND_UD
6	1	xx	A field
7	1	0x51	CI field – Baud Rate (see table below)
8	1	0x04	DIF field
9	1	0x6D	VIF field
10 – 13	1	mm hh YD YM	Date and Time
14	1	xx	CS checksum
15	1	0x16	Stop character

Slave response: 0xE5

Set Date and Time (using secondary address)

Byte number	Size (Bytes)	Value	Description
1	1	0x68	Start character (long query)
2	1	0x11	L field
3	1	0x11	L field repeated
4	1	0x68	Start character (long query) repeated
5	1	0x53/0x73	C field SND_UD
6	1	0xFD	A field
7	1	0x51	CI field – Baud Rate (see table below)
8 – 15	8	xx xx xx xx xx xx xx xx	UD field Secondary address
16	1	0x04	DIF
17	1	0x6D	VIF
18 – 21	1	mm hh YD YM	Date and Time
22	1	xx	CS checksum
23	1	0x16	Stop character

Slave response: 0xE5

2.2.3 REQ_UD2

Procedure for requesting data from M-Bus slave.

Request Readout Data

Byte number	Size (Bytes)	Value	Description
1	1	0x10	Start character (short telegram)
2	1	0x7B/0x5B	C field
3	1	xx	A field
4	1	xx	CS checksum
5	1	0x16	Stop character

Slave response: RSP_UD

2.2.4 RSP_UD

Procedure used by M-Bus slave to send the requested data to the M-Bus master.

Readout Data Reply

Byte number	Size (Bytes)	Value	Description
1	1	0x68	Start character (long telegram)
2	1	xx	L field
3	1	xx	L field repeated
4	1	0x68	Start character (long telegram) repeated
5	1	0x08/0x18	C field RSP_UD
6	1	xx	A field
7	1	0x72	CI field – Baud Rate (see table below)
8 – 11	4	xx xx xx xx	M-Bus interface identification number
12 – 13	2	xx xx	Manufacturer's mark
14	1	xx	Firmware version number (always 0x00)
15	1	0x02	Medium: Electricity
16	1	xx	Access number
17	1	xx	M-Bus interface status
18 – 19	2	0x00 0x00	Signature (always 0x0000)
20 – N	0 – 234	xx ... xx	Readout data
N + 1	1	xx	CS checksum
N + 2	1	0x16	Stop character

2.3 Readout Meter Implementation

Request Readout Data REQ_UD2 (in hexadecimal)

10 7B 01 7C 16

10 Read

7B Read registers

01 Device address

7C Checksum

16 Stop sign

Readout Data Reply RSP_UD (in hexadecimal)

68 F1 F1 68 08 01 72 C6 02 00 00 A2 2D 00 02 00 00 00 00 02 FD C8 FF 01 00 00 02 FD C8 FF
 02 00 00 02 FD C8 FF 03 00 00 02 FD C8 FF 04 00 00 02 FD DA FF 01 00 00 02 FD DA FF
 02 00 00 02 FD DA FF 03 00 00 02 FD DA FF 04 00 00 02 AB FF 01 00 00 02 AB FF 02 00 00
 02 AB FF 03 00 00 02 AB FF 04 00 00 02 AB FF 00 00 00 82 40 AB FF 01 00 00 82 40 AB FF
 02 00 00 82 40 AB FF 03 00 00 82 40 AB FF 04 00 00 82 40 AB FF 00 00 00 07 83 FF 01 00 00
 00 00 00 00 00 07 83 FF 02 00 00 00 00 00 00 00 07 83 FF 03 00 00 00 00 00 00 00 07
 83 FF 04 00 00 00 00 00 00 00 07 83 FF 00 00 00 00 00 00 00 00 84 40 83 FF 01 00 00 00
 00 84 40 83 FF 02 00 00 00 00 84 40 83 FF 03 00 00 00 00 84 40 83 FF 04 00 00 00 00 84 40 83
 FF 00 00 00 00 00 4B 16

Readout Data Reply data structure description

M-Bus „register” name	Quantity	Unit	Description
Primary Address			Device Address
Secondary Address			Not implemented
Manufacturer			„KMB”
Version			Not implemented (0)
Medium			Electricity
Access counter			Not implemented (0)
Status			Not implemented (0)
Power phase L1	U_1	V	Voltages
Power phase L2	U_2	V	
Power phase L3	U_3	V	

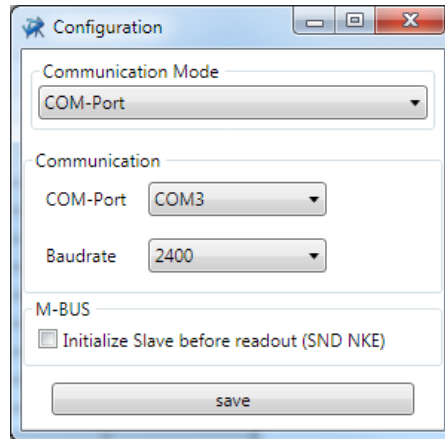
M-Bus „register” name	Quantity	Unit	Description
Power Manufacturer specific	U_4	V	
Current phase L1	I_1	A	Currents
Current phase L2	I_2	A	
Current phase L3	I_3	A	
Current Manufacturer specific	I_4	A	
Active power phase L1	P_1	W	Active power
Active power phase L2	P_2	W	
Active power phase L3	P_3	W	
Active power Manufacturer specific	P_4	W	
Active power Manufacturer specific	$3P$	W	
Active power phase L1	Q_1	var	Reactive power
Active power phase L2	Q_2	var	
Active power phase L3	Q_3	var	
Active power Manufacturer specific	Q_4	var	
Active power Manufacturer specific	$3Q$	var	
Active energy phase L1	$EP1+$	Wh	Active energy import
Active energy phase L2	$EP2+$	Wh	
Active energy phase L3	$EP3+$	Wh	
Active energy Manufacturer specific	$EP4+$	Wh	
Active energy Manufacturer specific	$3EP+$	Wh	
Active energy phase L1	$EQL1$	varh	Reactive inductive energy
Active energy phase L2	$EQL2$	varh	
Active energy phase L3	$EQL3$	varh	
Active energy Manufacturer specific	$EQL4$	varh	
Active energy Manufacturer specific	$3EQL$	varh	

2.4 M-Bus evaluation

EMU MB-Connect is a tool available free of charge for download at <http://www.emuag.ch/wp-content/uploads/M-Bus-Auslesesoftware-Read-out-software-EMU-MB-Connect.zip>. We promote this 3rd-party tool for reference testing of our M-Bus implementation.

COM port configuration

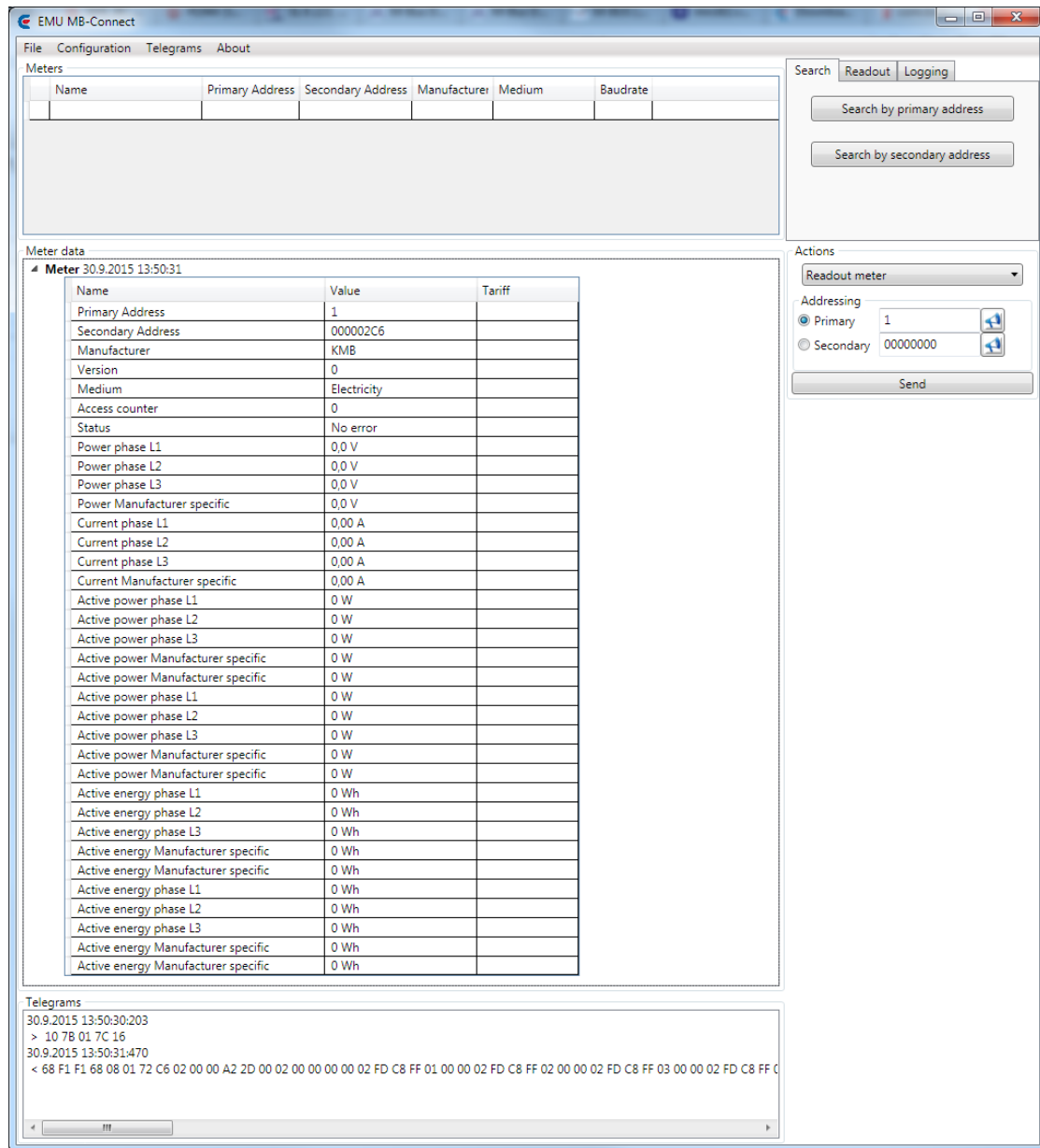
Configuration menu opens dialog, where it is possible to choose *COM-Port*, where M-Bus master driver/node/converter is connected. Also, it is possible to select *Baudrate* from 300¹, 1200, 2400, 4800 or 9600 options.



Redout meter

In *Actions* panel select *Readout meter*, switch addressing mode to *Primary*, set device address and click on the button *Send*. New row should appear in *Meter data* panel. Details of received data can be seen after expanding the row by clicking on a triangle next to the *Meter DATE TIME* caption. It is possible to observe communication in detail in *Telegram* frame.

¹Baudrate 300 bps is not supported by KMB systems devices.



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