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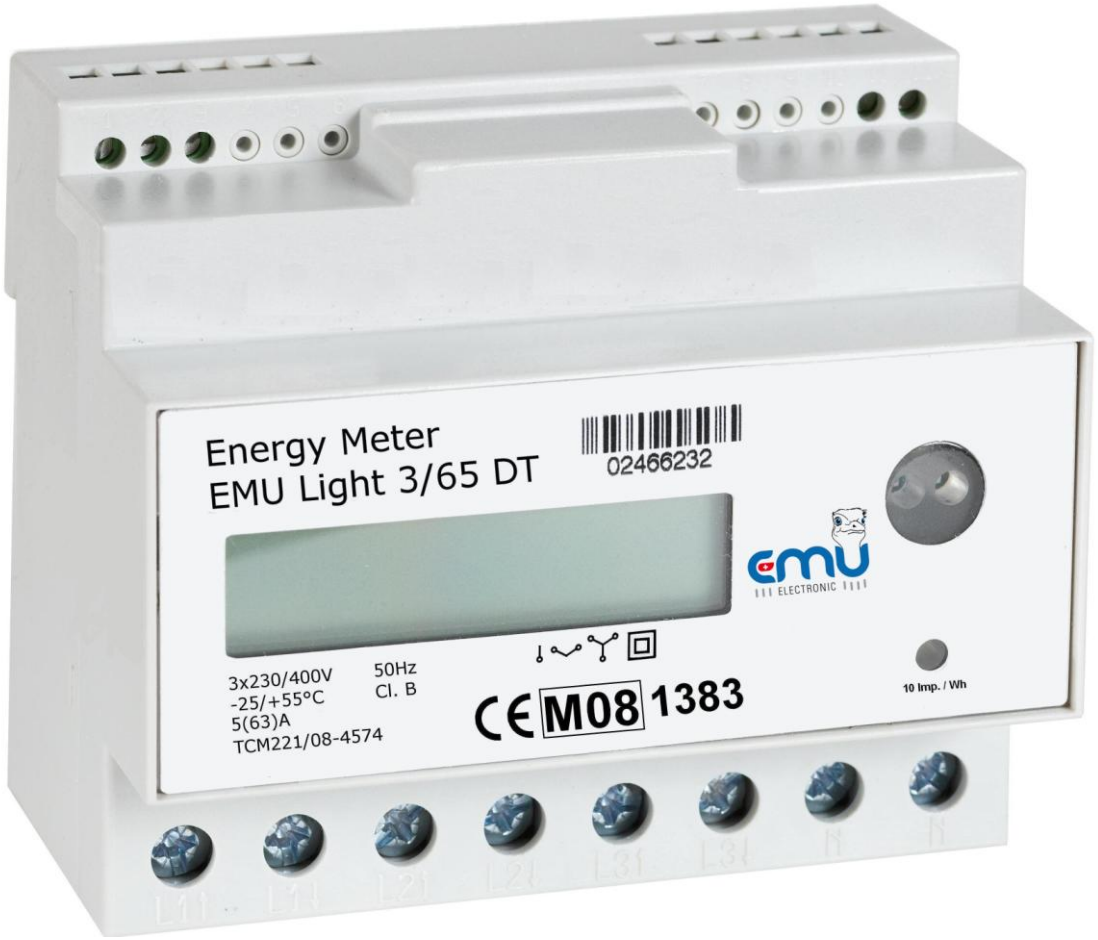
Energy Meter EMU Light



M-BUS Telegrams

Remark: ELM stands for Electricity Meter

1 Telegrams Overview

The M-Bus ELM fully complies with M-BUS standard (www.m-bus.com/files/w4b21021.pdf). The entire communication is ensured with 8 Data Bits, Even Parity, 1 Stop Bit and a Baud Rate from 300 to 9600 Bauds.

1.1 Command Telegrams

Initialize M-BUS ELM	(SND_NKE)	Short Telegram
Select M-BUS ELM by Secondary Address	(SND_UD)	Long Telegram
Transmit Read-out Data via Primary / Secondary Address	(REQ_UD2)	Short Telegram

1.2 Response and Data Transmission Telegrams

Response Sign when Telegram Received is O.K.	(ACK: E5H)	Single Character
Data Telegram containing Read-out Data	(RSP_UD)	Long Telegram

1.3 Parameterization Telegrams

Set Baud Rate	(SND_UD)	LONG TELEGRAM
Set Primary Address	(SND_UD)	Long Telegram
Set Secondary Address	(SND_UD)	Long Telegram
Set Secondary Address	(SND_UD)	Long Telegram
Set Secondary Address and Manufacturer's Mark	(SND_UD)	Long Telegram
Reset M-BUS ELM	(SND_NKE)	Long Telegram

2 Telegram Format

2.1 Telegram Structure

2.1.1 Structure of the Three Telegram Formats

Byte	Single Character	Short Telegram	Long Telegram
1	Starting Character (E5)	Starting Character (10)	Starting Character (68)
2		C Field	L Field
3		A Field	L Field (Repetition)
4		CS (Check Sum)	Starting Character (68)
5		Stop Character (16)	C Field
6			A Field
7			Cl Field
x			Active Data (0 – 246 Bytes)
8 + x			CS (Check Sum)
9 + x			Stop Character (16)

2.1.2 Single Character

This Telegram Format consists of a Single Character (ACK: E5) and is used to acknowledge the telegram received.

2.1.3 Short Telegram

The Short Telegram is identified by the Starting Character (10) and always has a length of five Bytes (C and A Fields, Check Sum (CS) and Stop Character). This telegram is used (amongst others) by the Master to command the transmission of data from the M-BUS ELM.

2.1.4 Long Telegram

The Long Telegram is identified by the Starting Character (68) and can have a variable number of bytes. After the Starting Character the L Field is transmitted twice. Then, after a further Starting Character (68) the C, A and CI Fields are following. The Active Data are transmitted to the CI Field, followed by the Check Sum (CS) and the Stop Character (16). This Telegram is above all used to transmit Data read-out from the M-BUS ELM to the It is further employed by the Master to transmit commands to the M-BUS ELM.

2.1.5 Telegram Fields (A, C, CI Fields)

The Telegram Fields (A, C, CI Fields) have a fixed length of one Byte (8 Bits) and serve pre-determined effects in the M-BUS Communication.

2.1.6 L Field

The L Field (Length Field) defines the number of Bytes of the Active Data making up the telegram, plus 3 Bytes for the C, A and CI Fields. The L Field is always transmitted twice in Long Telegrams.

2.1.7 C Field

The C Field (Control Field) contains information on the direction of the exchange of communication, the success of the actual operation of communication and the proper function of the telegram.

2.1.7.1 Control Fields (C Field) Used by M-BUS ELM

C Field (Binary)	C Field (Hex)	Telegram Name	Telegram Format	Function
0100 0000	40	SND_NKE	Short	Initialize M-BUS ELM
01x1 0011	53 / 73	SND_UD	Long	Transmit Data to M-BUS ELM
01x1 1011	5B / 7B	REQ_UD2	Short	Transmit Read-out Data from M-BUS ELM
0000 1000	08	RSP_UD	Long	Transmit Read-out Data from M-BUS ELM on Request

2.1.8 A Field = Primary Address

The A Field (Address- Field) comprises the M-BUS ELM Primary Address and is used to identify the receiver in calling direction and the sender in response direction. The A Field can take values from 0 to 255.

2.1.8.1 Address Fields (A Fields) Used by M-BUS ELM

A Field (Binary)	A Field (Hex)	Primary Address	Remarks
0000 0000	00	0	Setting of M-BUS ELM upon leaving factory. (Factory Setting)
0000 0001 – 1111 1010	01 - FA	1 - 250	Primary Addresses settable
1111 1011 + 1111 1100	FB, FC	251, 252	Reserved for future use
1111 1101	FD	253	Used for Secondary Address Procedures
1111 1110	FE	254	Used to transmit information to All Participants in the M-BUS System (Broadcast- Telegram). All participants respond by acknowledging (ACK) or by their Primary Address.
1111 1111	FF	255	Used to transmit information to All Participants in the M-BUS System (Broadcast- Telegram). Telegrams so addressed are not acknowledged.

The A Field (Address- Field) contains the M-BUS ELM Primary Address and is used to identify the M-BUS ELM. The A Field can assume values from 0 – 255.

2.1.9 CI Field

The CI- Field (Control Information Field) contains information for the Receiver of the telegram as to Active Data which are to be transmitted in Long Telegrams. The CI Field can further contain Commands and Parameter Information for the M-BUS ELM sent by the Master.

2.1.9.1 Control Information Fields (CI Fields) Used by M-BUS ELM

CI Field (Binary)	CI Field (Hex)	Meaning / Function
0101 0000	50	Reset M-BUS ELM
0101 0001	51	The Telegram contains Data for the M-BUS ELM (Slave)
0101 0010	52	Selection of M-BUS ELM
0111 0010	72	The Telegram contains the Data called from the Slave
1011 1000	B8	Set Baud Rate to 300 bps
1011 1001	B9	Set Baud Rate to 600 bps
1011 1010	BA	Set Baud Rate to 1200 bps
1011 1011	BB	Set Baud Rate to 2400 bps
1011 1100	BC	Set Baud Rate to 4800 bps
1011 1101	BD	Set Baud Rate to 9600 bps

2.2 Active Data

The Active Data (0 – 246 Bytes) in Long Telegrams comprise the Data to be read from the M-BUS ELM (Read-out Data), or Command Information transmitted by the Master to the M-BUS ELM.

2.2.1 Coding of Active Data Transmitted from M-BUS ELM to Master

Fixed Data Record Header	Data Set
12 Byte	A Variable Number of Bytes

For communication with the M-BUS ELM the Byte of lowest value out of the Multi-Byte Active Data starts transmission.

2.3 Fixed Data Record Header

Each block of Active Data transmitted by the M-BUS ELM starts with a Fixed Data Record Header (FDH = Fixed Data Header). The Fixed Data Record Header comprises a number of general information relating to the M-BUS ELM.

2.3.1 Coding of Fixed Data Record Header

Byte	Name	Length	Contents / Meaning
1 - 4	Ident - Number	4 Byte	8-digit Serial Number of M-BUS ELM (Secondary Address)
5 - 6	Manufacturer	2 Byte	Company Code (e.g. ZPA = “01 6A”, EMU = “B5 15”)
7	Version	1 Byte	Specifies the Version Number of M-BUS ELM Software
8	Medium	1 Byte	Specifies the Medium Electricity; 02 M-BUS ELM
9	Meters called upon	1 Byte	Not Used in M-BUS ELM (Value = „00“)
10	Status	1 Byte	Not Used in M-BUS ELM (Value = „00“)
11-12	Signature	2 Byte	Not Used in M-BUS ELM (Value = „0000“)

2.4 Data Records

The Data to be read out from the M-BUS ELM and the Information sent by the Master are transmitted in one Data Record within the Active Data Block. Every Data Record contains Coding data, its length and kind, in addition to the Active Data desired. The maximum length of a Data Record is 234 Bytes.
All Data Records consist of a Data Record Header (DRH = Data Record Header) and the actual data. The Data Record Header on its part consists of the Data Information Block (DIB = Data Information Block) and the Value Information Block (VIB = Value Information Block). The DIB refers to Length, Type and Coding of the Data. The VIB contains the Unit reference and the Multiplicator of the Data measured.
Transmission of the Data Record is carried out from left to right.

2.4.1 Structure of the Data Record Header (DRH)

Data Information Block (DIB)		Value Information Block (VIB)		
DIF	DIFE	VIF	VIFE	Data
1 Byte	0 – 10 Byte(s)	1 Byte	0 – 10 Byte(s)	0 – n Bytes

2.5 Data Information Block (DIB)

The Data Information Block (DIB) contains as a minimum one Data Information Field Byte (DIF = Data Information Field). This Byte can be extended by a further 10 Data Information Field Extension Bytes (DIFE = Data Information Field Extension).

2.5.1 Coding of Data Information Field (DIF)

Bit	Name	Contents / Meaning
7	Extension Bit	Specifies if DIFE- Byte to follow. (1 = yes; 0 = no)
6	LSB of Storage Number	On M-BUS ELM Always at 0
5 - 4	Functions Field	00: An Instantaneous Value is Transmitted 01: A Maximum Demand Value is Transmitted
3 - 0	Data Field	Length and Coding of Data: 0000 (0H): No Data 0001 (1H): 8 Bit Integer, 1 Byte 0010 (2H): 16 Bit Integer, 2 Byte 0011 (3H): 24 Bit Integer, 3 Byte 0100 (4H): 32 Bit Integer, 4 Byte 0110 (6H): 48 Bit Integer, 6 Byte 1100 (CH): 8 figures BCD, 4 Byte

- The Extension Bit is set if the next Byte is a Data Information Field Extension Byte (DIFE).
- The Functions Field on the M-BUS ELM is set to „00“or „01“.

01: Total Maximum Demand Active Power
Maximum Demand Active Power Tariff 1
Maximum Demand Active Power Tariff 2

00: All other Values are instantaneous values.

2.5.2 Coding of Data Information Field Extension Byte (DIFE)

Bit	Name	Contents / Meaning
7	Extension Bit	Specifies if a DIFE Byte follows. (1 = yes; 0 = no)
6	Unit	Is used for Energy and Power measurements in order to specify the Data Value: 0: Import Energy or Power Values 1: Export Energy or Power Values
5 - 4	Tariff	Specifies with which Tariff the Energy or Maximum Demand Power Values are related: 00: Total Value 01: Tariff 1 10: Tariff 2
3 - 0	Storage Number	For M-BUS ELM always on „0000“

- The Extension Bit is set if the next Byte is a Data Information Field Extension Byte (DIFE).
- The Unit is set for Energy and Power Values to identify if an Active or Reactive Value is present.
- The Tariff Bits specify with which Tariff the Energy or Maximum Demand Power Values are related.

2.6 Value Information Block (VIB)

The Value Information Block (VIB = Value Information Block) follows a DIF or a VIFE without an Extension Bit being set. It contains as a minimum the Value Information Field (VIF). It may however comprise up to 10 additional VIF Bytes which contain so-called Value Information Field Extension

Bytes (VIFE = Value Information Field Extension). VIFE is available in two formats: Standard and specific.

2.6.1 Coding of Value Information Field (VIF)

Bit	Name	Contents / Meaning
7	Extension Bit	Specifies if a VIFE Byte Follows. (1 = yes; 0 = no)
6 - 0	Value Information	Contains Information on the single Values such as Unit, Multiplicator, etc.

2.6.2 Value Information Fields (VIF) Used by M-BUS ELM

VIF (Binary)	VIF (Hex)	Meaning	Unit
x000 0011	03 / 83	Import or Export Energy	Wh
0010 1011	2B	Total Instantaneous Power	W
1010 1011	AB	Instantaneous Power Phases L1 – L3 A further VIFE is following.	W
1111 1101	FD	A further Standard VIFE is following	-
1111 1111	FF	A further Specific VIFE is following	-

- If Bit x (Bit No. 7) in the Value Information Field (VIF) is set to „1“, a VIFE is following directly. This VIFE may be, amongst others, the Status VIFE- Byte. If Bit x is set to „0“ the first Data Byte is following straight away.
- If the Value Information Field (VIF) exhibits the Value FD, the next VIFE is a Standard VIFE.
- If the Value Information Field (VIF) exhibits the Value FF, the next VIFE is a Specific VIFE.

2.6.3 Standard Value Information Field Extension Bytes(VIFE) Used by M-BUS ELM

The Standard VIFE has a structure identical to the VIF.

VIFE (Binary)	VIFE (Hex)	Meaning	Unit
x101 1001	59 / D9	Total instantaneous Current	mA
x110 0000	60 / E0	Number of Voltage Outages on M-BUS ELM	-
1100 1001	C9	Instantaneous Voltage Phases L1 – L3 A further VIFE is following.	V
1101 1001	D9	Instantaneous Current Phases L1 – L3 A further VIFE is following	mA
1111 1111	FF	A further Specific VIFE is following	-

If Bit x (Bit No. 7) in the Standard Value Information Field (VIFE) is set to „1“ a VIFE is following directly. The VIFE may be, amongst others, the Status VIFE Byte. If Bit x in the VIFE is set to „0“ it is directly followed by the first Data Byte.

2.6.4 Specific Value Information Field Extension Bytes (VIFE) Used by M-Bus ELM

The Specific VIFE has the same structure as the VIF.

VIFE (Binary)	VIFE (Hex)	Meaning	Unit
x000 0001	01 / 81	Phase L1 (Import and Export Power, Voltage, Current and Power Factor)	W, V, mA, Fo x 0.01
x000 0010	02 / 82	Phase L2 (Import and Export Power, Voltage, Current and Power Factor)	W, V, mA, Fo x 0.01
x000 0011	03 / 83	Phase L3 (Import and Export Power, Voltage, Current and Power Factor)	W, V, mA, Fo x 0.01
x001 0001	11 / 91	Constant S0 (imp/kWh)	-
x001 0010	12 / 92	Current Transformer Factor	-
1110 0001	E1	Power Factor (Cos Phi) A further VIFE is following	Fo x 0.01
1111 1111	FF	A further Specific VIFE is following	-

- If Bit x (Bit No. 7) in the Specific Value Information Field Extension (VIFE) is set to „1“, the Status VIFE Byte follows straight away and thereafter the first Data Byte. If Bit x is set to „0“ in VIFE, the first Data Byte follows next.

2.6.5 Status VIFE Byte

The option exists for the M-BUS ELM to send a Status VIFE Byte in the Telegram Structure ahead of each measured Value to be transmitted. The Status VIFE Byte contains information regarding the validity of the measured values following. Since all M-BUS ELM use the same Data Transmission Telegram, but do not always transmit the same Data. This Byte is first to be decoded in order to assure whether the value measured now following is actually valid.

The Parameterization to ensure whether or not the Status VIFE Byte is to be sent by the M-BUS ELM is taking place upon Setting of the Parameters for the Read-out Data which are possible.

2.6.6 Status VIFE Bytes (VIFE) Used by M-BUS ELM

Status VIFE (Binary)	Status VIFE (Hex)	Meaning
0000 0000	00	All o.k.. The Data are valid.
0001 1000	18	The M-BUS ELM Data are faulty. The Data are not valid. The M-BUS ELM has so far Never Been Able to actualize the Data.

2.7 Data

The Values measured, the Error Data, or the Status Information of M-BUS ELM follow after the last VIF or VIFE Byte without an Extension Byte having been set.

2.7.1 Check Sum (CS)

The Check Sum (CS = Check Sum) is used to recognize Transmission Errors during the Telegram Exchange.
The Check Sum is formed by arithmetically summing up all Bytes, starting from the Control Field (C Field) and ending at the last Active Data Byte. Overflow Bits (Carry Bits) are hereby not counted.

2.8 Secondary Address (UD)

If „FD“ is set in the A Field the identification of the M-BUS ELM is accomplished via Secondary Address (UD).

2.8.1 Structure of the Secondary Address (UD):

Identification Number	Manufacturer	Version	Medium
xxxxxxxx	01 6A	xx	02

- Identification Number : 8-digit Serial Number of M-BUS ELM (Sec. Adr.)
  00000000 – 99999999

- Manufacturer's Code : 2 Byte Company Constant (EMU = “B5 15”, ZPA = “01 6A”)
  01 – FF, 01 – FF

- Version Number : 1 Byte
  01 – FF

- Medium : 1 Byte Constant Electricity
  02

2.8.2 Wild Cards

The M-BUS ELM only reacts to Commands if the constant Parameter (Manufacturer, Version, and Medium) and the Identification Number correspond with Parameters transmitted.
In all these 4 Command Parameters „Wild Cards“(Space Keepers for any desired Signs) are permitted. The „Wild Card“ Sign is the Character „F“.
For the constant Parameters no single „Wild Cards“ may be used.

Example:
M-BUS ELM: Identification Number = 12345678, Manufacturer = ZPA, Version = 01, Medium = 02

Sec. Adr. (UD): 12345678, 01 6A, 01, 02 => M-BUS ELM reacts
Sec. Adr. (UD): FFF45678, 01 6A, 01, 02 => M-BUS ELM reacts
Sec. Adr. (UD): 123FFF78, 01 6A, FF, 02 => M-BUS ELM reacts
Sec. Adr. (UD): 12345FFF, FF FF, 01, 02 => M-BUS ELM reacts
Sec. Adr. (UD): 12345678, 01 6A, 01, FF => M-BUS ELM reacts
Sec. Adr. (UD): FFFFFFF8, FF FF, FF, FF => M-BUS ELM reacts
Sec. Adr. (UD): FFFFFFFF, FF FF, FF, FF => All M-BUS ELM Mtrs in System react (Bus-Config.)
Sec. Adr. (UD): FFFFFFF7, FF FF, FF, FF => M-BUS ELM does not react (Id. No. invalid)
Sec. Adr. (UD): 02FFFFFF, 01 6A, 01, 02 => M-BUS ELM does not react (Id. No. invalid)
Sec. Adr. (UD): 12345678, FF 6A, 01, 02 => M-BUS ELM does not react (Manuf. Invalid)
Sec. Adr. (UD): 12345678, 01 6F, 01, 02 => M-BUS ELM does not react (Manuf. Invalid)
Sec. Adr. (UD): 12345678, 01 6A, 0F, 02 => M-BUS ELM does not react (Version invalid)
Sec. Adr. (UD): 12345678, 01 6A, 01, F2 => M-BUS ELM does not react (Medium invalid)

3 Telegram Communication

3.1 Procedures of Telegram Communication via the M-BUS

The Telegram Communication via the M-BUS (Data Link Layer) works under two procedures.

- Send / Confirm (SND / CON = Send / Confirm)
- Request / Respond (REQ / RSP = Request / Respond)

After receipt of a valid telegram the M-BUS ELM wait between 35 and 75 ms before responding.
A telegram received is considered valid if it complies with the following criteria:

- Start, Parity and Stop Bits per Communication Byte.
- Start Character, Check Sum and Stop Character per Telegram.
- The entire Telegram Length for Long Telegrams is equal to the L Field + 6 Bytes.
- The Telegram received contains a Pilot Command known to the M-BUS ELM.

If these Test Criteria are not complied with the M-BUS ELM will not respond.

3.2 Send / Confirm / Request / Response

3.2.1 Initializing Telegram SND_NKE

This Short Telegram initializes the M-BUS ELM. The M-BUS ELM confirms correct receipt by Single Character Acknowledgement (ACK = E5). If the telegram was not correctly received the M-BUS ELM will not send an acknowledgement.

3.2.2 Long Telegram SND_UD

This Telegram is used to transmit Pilot and Parameterization Data from the Master to the M-BUS. The M-BUS ELM confirms correct receipt by a Single Character Acknowledgement (ACK = E5). Should the telegram not have been received correctly, no acknowledgement will be sent by the M-BUS ELM.

3.2.3 Long Telegram REQ_UD2 and RSP_UD

The Master commands Data from the M-BUS ELM by sending a REQ_UD2 Telegram. The M-BUS either transmits its Data by a RSP_UD Telegram or remains without any reaction if the Command was not properly received or if the information in the telegram does Not Require a Response.
Upon first receipt of the Command Telegram REQ_UD2 with FCB (set to „1“) and FCV Bit („1“)
The M-BUS Meter will transmit the Data Telegram containing the Read-out Data.

4 Telegrams Detailed

4.1 Command Telegrams

4.1.1 Initialize M-Bus ELM (SNK_NKE)

This Short Telegram initializes the M-BUS ELM. The M-BUS ELM confirms correct receipt by Single Character Acknowledgement (ACK = E5). If the telegram was not correctly received the M-BUS ELM will not send an acknowledgement.

Byte Nr.	Size (Byte)	Value (Hex)	Meaning
1	1	10	Start Character Short Telegram
2	1	40	C- Field, REQ_UD2
3	1	xx	A Field, Primary Address 00 – FA : Valid Primary Address FB, FC : Reserved for future use FD : is set if Transmission is by Secondary Address FE : All M-BUS Elms in the System send the Read-out Data FF : No action by M-BUS ELM
4	1	xx	CS Check Sum, summed up from C Field and A Field
5	1	16	Stop Character

- In order to parameterize simultaneously all M-BUS Elms in the System to a new Baud Rate, the Primary Address 255 (HEX FF) is to be used in the A Field (Broadcast). The M-BUS Elms in the M-BUS System will however not send an Acknowledgement.

4.1.2 Select M-BUS ELM Using Secondary Address (SND_UD)

This Telegram enables to select M-BUS ELM.

The M-BUS ELM confirms the correct receipt by Single Character Acknowledgement (ACK = E5). If the telegram has not been correctly received the M-BUS ELM will not send an Acknowledgement. After issue of the Single Character Acknowledgement the M-BUS ELM is ready to transmit the entire Read-out Data within 3 seconds from receiving the Telegram „Transmit Read-out Data“. (Short Telegram REQ_UD2 with A Field on FD).

At the end of 3 seconds the M-BUS ELM will switch back to normal mode.

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start Character Long Telegram
2	1	0B	L Field
3	1	0B	L Field Repetition
4	1	68	Start Character
5	1	73	C Field, SND_DU
6	1	FD	A Field, Primary Address on FD = Secondary Address
7	1	52	CI Field, Selection of M-BUS ELM
8 - 15	8	„UD“	Secondary Address UD (Please see: „Secondary Address DU“)
16	1	xx	CS Check Sum, summed up from C Field to Sec. Address inclusive
17	1	16	Stop Character

4.1.3 Transmit Read-out Data via Primary / Sencondary Address (REQ_UD2)

This Short Telegram enables to select the M-BUS ELM and to command it to transmit the Read-out Data parameterized.

The M-BUS ELM confirms correct receipt by transmitting of the Read-out Data. If the Short Telegram has not been received correctly; no Data will be transmitted by the M-BUS ELM. The Read-out Data are sent within 35 – 75 ms from receipt of the Short Telegram by the M-BUS Meter.

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	10	Start Character Short Telegram
2	1	7B	C Field, Transmit Read-out Data
3	1	xx	A Field, Primary Address 00 – FA : Valid Primary Address FB, FC : Reserved for future use FD : Is set if transmission is by Secondary Address FE : All M-BUS ELM in the System transmit the Read-out Data FF : No action by M-BUS ELM
4	1	xx	CS Check Sum, summed up by C Field and A Field
5	1	16	Stop Character

4.2 Response and Data Transmission Telegrams

4.2.1 Response Sign when Telegram Received is O.K.

This response is E5H.

4.2.2 Data Telegram containing Read-out Data (RSP_UD)

The Read-out Data are transmitted by the M-BUS ELM within 35 – 75 ms from receipt of the Short Telegram „Transmit Read-out Data.

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start Character Long Telegram
2	1	xx	L Field, corresponding to number of Read-out Data parameterized
3	1	xx	L Field Repetition
4	1	68	Start Character
5	1	08	C Field, Transmit Data of M-BUS ELM
6	1	xx	A Field, Primary Address (00 – FA = 0 – 250)
7	1	72	CI Field, Read-out Data of M-BUS ELM
8 - 11	4	xxxxxxxx	8-digit Serial Number of M-BUS ELM (Sec. Address)
12 - 13	2	01 6A	Manufacturer's Mark of ZPA = 01 6A = „ZPA“
14	1	xx	Version Number of M-BUS ELM Software (00 – FF)
15	1	02	Medium Electricity
16	1	xx	Meter called upon, not used in M-BUS ELM (Value = „00“)
17	1	xx	Shows the Meter Status
18 - 19	2	00 00	Signature. For M-BUS ELM always on „0000“
20 - YY	0 - EA	xx.....xx	Read-out Data.
YY + 1	1	xx	CS Check Sum, summed up from C Field to End of „Read-out Data parameterized“
YY + 2	1	16	Stop Character

4.2.2.1 Active Energy Import in Tariff 1 (kWh) = ST or DT (OBIS 1.8.1)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	86	DIF: 48 Bit Integer, 6 Byte, followed by a DIFE
YY+1	1	10	DIFE: Tariff 1
YY+2	1	83	VIF: Active Energy Import followed by the status VIFE Byte
YY+3	1	xx	Status VIFE Byte: 00 = OK, 18 = ERROR.

<YY+4,YY+9>	6	xx xx xx xx xx xx	Value: Range from 0.000 to 999,999,999.999 kWh

4.2.2.2 Active Energy Import in Tariff 2 (kWh) = DT only (OBIS 1.8.2)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	86	DIF: 48 Bit Integer, 6 Byte, followed by a DIFE
YY+1	1	20	DIFE: Tariff 2
YY+2	1	83	VIF: Active Energy Import followed by the status VIFE Byte
YY+3	1	xx	Status VIFE Byte: 00 = OK, 18 = ERROR.
<YY+4,YY+9>	6	xx xx xx xx xx xx	Value: Range from 0.000 to 999,999,999.999 kWh

4.2.2.3 Active Energy Export in Tariff 1 (kWh) = ST or DT (OBIS 2.8.1)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	86	DIF: 48 Bit Integer, 6 Byte, followed by a DIFE
YY+1	1	90	DIFE: Tariff 1; followed by a DIFE
YY+2	1	40	DIFE: Active Energy Export
YY+3	1	83	VIF: Export followed by the status VIFE Byte
YY+4	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+5,YY+10>	6	xx xx xx xx xx xx	Value: Range from 0.000 to 999,999,999.999 kWh

4.2.2.4 Active Energy Export in Tariff 2 (kWh) = DT only (OBIS 2.8.2)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	86	DIF: 48 Bit Integer, 6 Byte, followed by a DIFE
YY+1	1	A0	DIFE: Tariff 2; followed by a DIFE
YY+2	1	40	DIFE: Active Energy Export
YY+3	1	83	VIF: Export followed by the status VIFE Byte
YY+4	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+5,YY+10>	6	xx xx xx xx xx xx	Value: Range from 0.000 to 999,999,999.999 kWh

4.2.2.5 Number of Power Supply Failures (OBIS C.7.0)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	02	DIF: 16 Bit Integer, 2 Byte

YY+1	1	FD	VIF: followed by a Standard VIFE
YY+2	1	E0	Standard VIFE: Number of Power Supply Failures followed by the status VIFE Byte
YY+3	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+4,YY+5>	2	xx xx	Value: Number of Power Supply Failures

4.2.2.6 Instant Voltage in Phase 1 (V) (OBIS 32.7)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	02	DIF: 16 Bit Integer, 2 Byte
YY+1	1	FD	VIF: followed by a Standard VIFE
YY+2	1	C9	Standard VIFE: Instant Voltage (V) followed by a further VIFE Byte
YY+3	1	FF	VIFE: followed by a Specific VIFE
YY+4	1	81	VIFE: Phase L1 followed by the status VIFE Byte
YY+5	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+6,YY+7>	2	xx xx	Value: Instant Voltage in Phase 1 (V)

4.2.2.7 Instant Voltage in Phase 2 (V) (OBIS 52.7)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	02	DIF: 16 Bit Integer, 2 Byte
YY+1	1	FD	VIF: followed by a Standard VIFE
YY+2	1	C9	Standard VIFE: Instant Voltage (V) followed by a further VIFE Byte
YY+3	1	FF	VIFE: followed by a Specific VIFE
YY+4	1	82	VIFE: Phase L2 followed by the status VIFE Byte
YY+5	1	Xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+6,YY+7>	2	xx xx	Value: Instant Voltage in Phase 2 (V)

4.2.2.8 Instant Voltage in Phase 3 (V) (OBIS 72.7)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	02	DIF: 16 Bit Integer, 2 Byte
YY+1	1	FD	VIF: followed by a Standard VIFE
YY+2	1	C9	Standard VIFE: Instant Voltage (V) followed by a further VIFE Byte
YY+3	1	FF	VIFE: followed by a Specific VIFE
YY+4	1	83	VIFE: Phase L3 followed by the status VIFE Byte
YY+5	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+6,YY+7>	2	xx xx	Value: Instant Voltage in Phase 3 (V)

4.2.2.9 Instant Current in Phase 1 (A) (OBIS 31.7)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	03	DIF: 24 Bit Integer, 3 Byte
YY+1	1	FD	VIF: followed by a Standard VIFE
YY+2	1	D9	Standard VIFE: Instant Current (A) followed by a further VIFE Byte
YY+3	1	FF	VIFE: followed by a Specific VIFE
YY+4	1	81	VIFE: Phase L1 followed by the status VIFE Byte
YY+5	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+6,YY+8>	3	xx xx xx	Value: Instant Current in Phase 1 (A)

4.2.2.10 Instant Current in Phase 2 (A) (OBIS 51.7)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	03	DIF: 24 Bit Integer, 3 Byte
YY+1	1	FD	VIF: followed by a Standard VIFE
YY+2	1	D9	Standard VIFE: Instant Current (A) followed by a further VIFE Byte
YY+3	1	FF	VIFE: followed by a Specific VIFE
YY+4	1	82	VIFE: Phase L2 followed by the status VIFE Byte
YY+5	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+6,YY+8>	3	xx xx xx	Value: Instant Current in Phase 2 (A)

4.2.2.11 Instant Current in Phase 3 (A) (OBIS 71.7)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	03	DIF: 24 Bit Integer, 3 Byte
YY+1	1	FD	VIF: followed by a Standard VIFE
YY+2	1	D9	Standard VIFE: Instant Current (A) followed by a further VIFE Byte
YY+3	1	FF	VIFE: followed by a Specific VIFE
YY+4	1	83	VIFE: Phase L3 followed by the status VIFE Byte
YY+5	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+6,YY+8>	3	xx xx xx	Value: Instant Current in Phase 3 (A)

4.2.2.12 Instant Current Total (A) (OBIS 91.7)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	03	DIF: 24 Bit Integer, 3 Byte
YY+1	1	FD	VIF: followed by a Standard VIFE
YY+2	1	D9	Standard VIFE: Instant Current (A) Total followed by the status VIFE Byte
YY+3	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+4,YY+6>	3	xx xx xx	Value: Instant Current Total (A)

4.2.2.13 Instant Active Power in Phase 1 (W) (OBIS 1.6.1)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	04	DIF: 32 Bit Integer, 4 Byte
YY+1	1	AB	VIF: Instant Active Power (W) followed by a further VIFE Byte
YY+2	1	FF	VIFE: followed by a Specific VIFE
YY+3	1	81	VIFE: Phase L1 followed by the status VIFE Byte
YY+4	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+5,YY+8>	4	xx xx xx xx	Value: Instant Active Power in Phase 1 (W)

4.2.2.14 Instant Active Power in Phase 2 (W) (OBIS 1.6.2)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	04	DIF: 32 Bit Integer, 4 Byte
YY+1	1	AB	VIF: Instant Active Power (W) followed by a further VIFE Byte
YY+2	1	FF	VIFE: followed by a Specific VIFE
YY+3	1	82	VIFE: Phase L2 followed by the status VIFE Byte
YY+4	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+5,YY+8>	4	xx xx xx xx	Value: Instant Active Power in Phase 2 (W)

4.2.2.15 Instant Active Power in Phase 3 (W) (OBIS 1.6.3)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	04	DIF: 32 Bit Integer, 4 Byte
YY+1	1	AB	VIF: Instant Active Power (W) followed by a further VIFE Byte
YY+2	1	FF	VIFE: followed by a Specific VIFE
YY+3	1	83	VIFE: Phase L3 followed by the status VIFE Byte
YY+4	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+5,YY+8>	4	xx xx xx xx	Value: Instant Active Power in Phase 3 (W)

4.2.2.16 Instant Active Power Total (W) (OBIS 1.7.0)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	04	DIF: 32 Bit Integer, 4 Byte
YY+1	1	AB	VIF: Instant Active Power (W) Total followed by the status VIFE Byte
YY+2	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+3,YY+6>	4	xx xx xx xx	Value: Instant Active Power Total (W)

4.2.2.17 Instant Power Factor for Phase 1 (Cos Phi) (OBIS 33.7)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	01	DIF: 8 Bit Integer, 1 Byte
YY+1	1	FF	VIF: followed by a Specific VIFE
YY+2	1	E1	VIFE: Instant Power Factor (Cos Phi) followed by a further VIFE Byte
YY+3	1	FF	VIFE: followed by a Specific VIFE
YY+4	1	81	VIFE: Phase L1 followed by the status VIFE Byte
YY+5	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
YY+6	1	xx	Value: Instant Power Factor for Phase 1 (Cos Phi)

4.2.2.18 Instant Power Factor for Phase 2 (Cos Phi) (OBIS 53.7)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	01	DIF: 8 Bit Integer, 1 Byte
YY+1	1	FF	VIF: followed by a Specific VIFE
YY+2	1	E1	VIFE: Instant Power Factor (Cos Phi) followed by a further VIFE Byte
YY+3	1	FF	VIFE: followed by a Specific VIFE
YY+4	1	82	VIFE: Phase L2 followed by the status VIFE Byte
YY+5	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
YY+6	1	xx	Value: Instant Power Factor for Phase 2 (Cos Phi)

4.2.2.19 Instant Power Factor for Phase 3 (Cos Phi) (OBIS 73.7)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	01	DIF: 8 Bit Integer, 1 Byte
YY+1	1	FF	VIF: followed by a Specific VIFE
YY+2	1	E1	VIFE: Instant Power Factor (Cos Phi) followed by a further VIFE Byte
YY+3	1	FF	VIFE: followed by a Specific VIFE
YY+4	1	83	VIFE: Phase L3 followed by the status VIFE Byte
YY+5	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
YY+6	1	xx	Value: Instant Power Factor for Phase 3 (Cos Phi)

4.2.2.20 Maximum Current in Phase 1 (A) (OBIS 31.6.0)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	13	DIF: 24 Bit Integer, 3 Byte
YY+1	1	FD	VIF: followed by a Standard VIFE
YY+2	1	D9	Standard VIFE: Maximum Current (A) followed by a further VIFE Byte
YY+3	1	FF	VIFE: followed by a Specific VIFE
YY+4	1	81	VIFE: Phase L1 followed by the status VIFE Byte
YY+5	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+6,YY+8>	3	xx xx xx	Value: Maximum Current in Phase 1 (A)

4.2.2.21 Maximum Current in Phase 2 (A) (OBIS 51.6.0)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	13	DIF: 24 Bit Integer, 3 Byte
YY+1	1	FD	VIF: followed by a Standard VIFE
YY+2	1	D9	Standard VIFE: Maximum Current (A) followed by a further VIFE Byte
YY+3	1	FF	VIFE: followed by a Specific VIFE
YY+4	1	82	VIFE: Phase L2 followed by the status VIFE Byte
YY+5	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+6,YY+8>	3	xx xx xx	Value: Maximum Current in Phase 2 (A)

4.2.2.22 Maximum Current in Phase 3 (A) (OBIS 71.6.0)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	13	DIF: 24 Bit Integer, 3 Byte
YY+1	1	FD	VIF: followed by a Standard VIFE
YY+2	1	D9	Standard VIFE: Maximum Current (A) followed by a further VIFE Byte
YY+3	1	FF	VIFE: followed by a Specific VIFE
YY+4	1	83	VIFE: Phase L3 followed by the status VIFE Byte
YY+5	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+6,YY+8>	3	xx xx xx	Value: Maximum Current in Phase 3 (A)

4.2.2.23 Maximum Power in Phase 1 (W) (OBIS 21.6.0)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	14	DIF: 32 Bit Integer, 4 Byte
YY+1	1	AB	VIF: Maximum Power (W) followed by a further VIFE Byte
YY+2	1	FF	VIFE: followed by a Specific VIFE
YY+3	1	81	VIFE: Phase L1 followed by the status VIFE Byte
YY+4	1	Xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+5,YY+8>	4	xx xx xx xx	Value: Maximum Power in Phase 1 (W)

4.2.2.24 Maximum Power in Phase 2 (W) (OBIS 41.6.0)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	14	DIF: 32 Bit Integer, 4 Byte
YY+1	1	AB	VIF: Maximum Power (W) followed by a further VIFE Byte
YY+2	1	FF	VIFE: followed by a Specific VIFE
YY+3	1	82	VIFE: Phase L2 followed by the status VIFE Byte
YY+4	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+5,YY+8>	4	xx xx xx xx	Value: Maximum Power in Phase 2 (W)

4.2.2.25 Maximum Power in Phase 3 (W) (OBIS 61.6.0)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	14	DIF: 32 Bit Integer, 4 Byte
YY+1	1	AB	VIF: Maximum Power (W) followed by a further VIFE Byte
YY+2	1	FF	VIFE: followed by a Specific VIFE
YY+3	1	83	VIFE: Phase L3 followed by the status VIFE Byte
YY+4	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+5,YY+8>	4	xx xx xx xx	Value: Maximum Power in Phase 3 (W)

4.2.2.26 Constant S0 (imp/kWh) (OBIS 0.3.3)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	03	DIF: 24 Bit Integer, 3 Byte
YY+1	1	FF	VIF: followed by a Specific VIFE
YY+2	1	91	VIFE: Constant S0 (imp/kWh) followed by the status VIFE Byte
YY+3	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+4,YY+6>	3	xx xx xx	Value: Constant S0 (imp/kWh)

4.2.2.27 CT Factor (OBIS 0.4.2)

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	02	DIF: 16 Bit Integer, 2 Byte
YY+1	1	FF	VIF: followed by a Specific VIFE
YY+2	1	92	VIFE: CT Factor followed by the status VIFE Byte
YY+3	1	xx	Status VIFE Byte: 00 = OK, 18=ERROR.
<YY+4,YY+5>	2	xx xx	Value: CT Factor

4.3 Parameterization Telegrams

4.3.1 Set Baud Rate on M-BUS ELM (SND_UD)

This telegram enables to set the desired Baud Rate to the M-BUS ELM.
The M-BUS ELM confirms the correct receipt by Single Character Acknowledgement (ACK = E5). If the telegram was not received correctly the M-BUS ELM does not send an Acknowledgement. The Single Character Acknowledgement (ACK) is sent by the M-BUS ELM in the Old Baud Rate. As soon as ACK is transmitted the M-BUS Meter switches to the baud rate newly parameterized. If the ELM now does not receive a new Telegram under the new baud rate within a period of 30 – 40 seconds, it automatically switches back to the old baud rate. This is apt to prevent that a faulty setting of the baud rate may interrupt communication.

4.3.1.1 Set Baud Rate via Primary Address

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start Character Long Telegram
2	1	03	L Field
3	1	03	L Field Repetition
4	1	68	Start Character
5	1	73	C Field, SND_UD
6	1	xx	A Field, Primary Address (00 – FF = 0 – 255)
7	1	xx	CI Field, Set new Baud Rate B8 : Set Baud Rate to 300 Bauds B9 : Set Baud Rate to 600 Bauds BA : Set Baud Rate to 1200 Bauds BB : Set Baud Rate to 2400 Bauds BC : Set Baud Rate to 4800 Bauds BD : Set Baud Rate to 9600 Bauds
8	1	xx	CS Check Sum summed up by C Field, A Field and CI Field
9	1	16	Stop Character

- In order to parameterize simultaneously all M-BUS Elms in the System to a new Baud Rate, the Primary Address 255 (HEX FF) is to be used in the A Field (Broadcast). The M-BUS Elms in the M-BUS System will however not send an Acknowledgement.

4.3.1.2 Set Baud Rate via Secondary Address

Byte Nr.	Size(Byte)	Value (Hex)	Description
1	1	68	Start- Character Long Telegram
2	1	0B	L Field
3	1	0B	L Field Repetition
4	1	68	Start Character
5	1	73	C Field, SND_UD
6	1	FD	A Field, Primary Address on FD = Secondary Address
7	1	xx	CI Field, Set new Baud Rate B8 : Set Baud Rate to 300 Bauds B9 : Set Baud Rate to 600 Bauds BA : Set Baud Rate to 1200 Bauds BB : Set Baud Rate to 2400 Bauds BC : Set Baud Rate to 4800 Bauds BD : Set Baud Rate to 9600 Bauds
8 - 15	8	„UD“	Secondary Address UD (Please see: „Secondary Address UD“)
16	1	xx	CS Check Sum, summed up by C Field, A Field, CI Field and UD.
17	1	16	Stop Character

4.3.2 Set Primary Address (SND_UD)

This Telegram enables to set a new Primary Address in the M-BUS ELM.
The M-BUS ELM confirms the correct receipt by Single Character Acknowledgement (ACK = E5). If the telegram has not been correctly received the M-BUS ELM will not send an Acknowledgement.

4.3.2.1 Set Primary Address Using Primary Addressing

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start Character Long Telegram
2	1	06	L Field
3	1	06	L Field Repetition
4	1	68	Start Character
5	1	73	C Field, SND_UD
6	1	xx	A Field, Primary Address (00 – FF = 0 – 255)
7	1	51	CI Field, New Data for M-BUS ELM
8	1	01	DIF Field, 8 Bit Integer Data (1 Byte)
9	1	7A	VIF Field, Set Primary Address
10	1	xx	New Primary Address: Range: 00 – FA (0 – 250), Invalid: FB – FF (no action in meter)
11	1	xx	CS Check Sum, summed up from C Field to Primary Address incl.
12	1	16	Stop Character

- In order to set the new Primary Address simultaneously to all M-BUS Elms in the System please uses the Primary Address 255 (HEX FF) in the A Field (Broadcast). The M-BUS Elms in the M-BUS System will not send an Acknowledgement.

4.3.2.2 Set Primary Address Using Secondary Addressing

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start Character Long Telegram
2	1	0E	L Field
3	1	0E	L Field Repetition
4	1	68	Start Character
5	1	73	C Field, SND_UD
6	1	FD	A Field, Primary Address on FD = Secondary Address
7	1	51	CI Field, New Data for M-BUS ELM
8 - 15	8	„UD“	Secondary Address UD (Please see:: „Secondary Address UD“)
16	1	01	DIF Field, 8 Bit Integer Data (1 Byte)
17	1	7A	VIF Field, Set Primary Address
18	1	xx	New Primary Address, Range :00 – FA (0 – 250), Invalid: FB – FF (no action in meter)
19	1	xx	CS Check Sum, summed up from C Field up to New Primary Address incl.
20	1	16	Stop Character

4.3.3 Set Secondary Address (SND_UD)

This Telegram enables to set a new Secondary Address in the M-BUS ELM.
The M-BUS ELM confirms the correct receipt by Single Character Acknowledgement (ACK = E5). If the telegram has not been correctly received the M-BUS ELM will not send an Acknowledgement.

4.3.3.1 Set Secondary Address Using Primary Addressing

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start Character Long Telegram
2	1	09	L Field
3	1	09	L Field Repetition
4	1	68	Start Character
5	1	73	C Field, SND_UD
6	1	xx	A Field, Primary Address (00 – FF = 0 – 255)
7	1	51	CI Field, New Address for M-BUS ELM
8	1	0C	DIF Field, 8 digits BCD, 4 Byte
9	1	79	VIF Field, Set Secondary Address
10	1	xx	New Secondary Address digits 7 and 8, Range: 00 – 99 Example: Sec.Address = 01234567 => Byte Value = 67
11	1	xx	New Secondary Address digits 5 and 6, Range: 00 – 99 Example: Sec.Address = 01234567 => Byte- Value = 45
12	1	xx	New Secondary Address digits 3 and 4, Range: 00 – 99 Example: Sec.Address = 01234567 => Byte- Value = 23
13	1	xx	New Secondary Address digits 1 and 2, Range: 00 – 99 Example: Sec.Address = 01234567 => Byte- Value = 01
14	1	xx	CS Check Sum, summed up from C Field up to Sec.Address incl.
15	1	16	Stop Character

- In order to set the new Secondary Address simultaneously to all M-BUS Elms in the System please uses the Primary Address 255 (HEX FF) in the A Field (Broadcast). The M-BUS Elms in the M-BUS System will not send an Acknowledgement.

4.3.3.2 Set Secondary Address Using Secondary Addressing

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start Character Long Telegram
2	1	11	L Field
3	1	11	L Field Repetition
4	1	68	Start Character
5	1	73	C Field, SND_UD
6	1	FD	A Field, Primary Address on FD = Secondary Address
7	1	51	CI Field, New Data for M-BUS ELM
8 - 15	8	„UD“	Secondary Address UD (Please see: „Secondary Address UD“)
16	1	0C	DIF Field, 8 digits BCD, 4 Byte
17	1	79	VIF Field, Set Secondary Address
18	1	xx	New Secondary Address figures 7 and 8, Range: 00 – 99 Example: Sec. Address = 01234567 => Byte Value = 67
19	1	xx	New Secondary Address figures 5 and 6, Range: 00 – 99 Example: Sec. Address = 01234567 => Byte Value = 45
20	1	xx	New Secondary Address figures 3 and 4, Range: 00 – 99 Example: Sec. Address = 01234567 => Byte Value = 23
21	1	xx	New Secondary Address figures 1 and 2, Range: 00 – 99 Example: Sec. Address = 01234567 => Byte Value = 01
22	1	xx	CS Check Sum, summed up from C Field to Sec.Address inclusive
23	1	16	Stop Character

4.3.4 Reset / Restart M-BUS ELM (SND_UD)

This Telegram reset / restart M-BUS ELM.
The M-BUS ELM confirms correct receipt by Single Character Acknowledgement (ACK = E5). If the telegram was not correctly received the M-BUS ELM will not send an acknowledgement.

4.3.4.1 Reset / Restart M-BUS ELM via Primary Address

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start Character Long Telegram
2	1	03	L Field
3	1	03	L Field Repetition
4	1	68	Start Character
5	1	73	C Field, SND_UD
6	1	xx	A Field, Primary Address (00 – FF = 0 – 255)
7	1	50	CI Field, Initialize M-BUS ELM (Set Meter called to „0“)
8	1	xx	CS Check Sum, summed up by C Field, A Field and CI Field
9	1	16	Stop Character

- In order to initialize simultaneously all M-BUS Elms in a System, the Primary Address 255 (HEX FF) is to be used in the A Field (Broadcast). The M-BUS Elms in the M-BUS System will however not send any Acknowledgement.

4.3.4.2 Reset / Restart M-BUS ELM via Secondary Address

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start Character Long Telegram
2	1	0B	L Field
3	1	0B	L Field Repetition
4	1	68	Start Character
5	1	73	C Field, SND_UD
6	1	FD	A Field, Primary Address on FD = Secondary Address
7	1	50	CI Field, Initialize M-BUS ELM (Set meter called to „0“)
8 - 15	8	„UD“	Secondary Address UD (Please see: „Secondary Address UD“)
16	1	xx	CS Check Sum, summed up by C Field, A Field, CI Field and UD
17	1	16	Stop Character

5 Telegram Examples

5.1 Read-out via Primary Address

10 40 01 41 16	Initialise M-BUS ELM (Primary Address = 01)
E5	ACK
10 7B 01 7C 16	REQUEST
68 E6 E6 68 08 01 72	Number of Bytes = E6 = 230; Primary Address = 01 = 01
93 57 46 02	Secondary Address = 02465793
01 6A	Manufacturer = “ZPA”
01 02	Version = 01; Medium = 02 = Electricity
00	Meter called upon = 00 = 00
00 00 00	Status = 00; Signature = 00 00
86 10 83 00 **F8 11 00 00 00 00**	1.8.1 - Active Energy Import (kWh) in Tariff 1 (ST) = 11F8h = 4600 Wh
86 20 83 00 **E8 03 00 00 00 00**	1.8.2 - Active Energy Import (kWh) in Tariff 2 (DT) = 03E8h = 1000 Wh
86 90 40 83 **00 C8 00 00 00 00 00**	2.8.1 – Active Energy Export (kWh) in Tariff 1 (ST) = C8h = 200 Wh
86 A0 40 83 **00 00 00 00 00 00 00**	2.8.2 – Active Energy Export (kWh) in Tariff 2 (DT) = 00h = 00 Wh
02 FD E0 00 **4C 00**	C.7.0 - Number of Power Supply Failures = 4Ch = 76
02 FD C9 FF 81 00 **F2 00**	32.7 - Instant Voltage (V) in Phase 1 = F2h = 242 V
02 FD C9 FF 82 00 **00 00**	52.7 - Instant Voltage (V) in Phase 2 = 00h = 0 V
02 FD C9 FF 83 00 **00 00**	72.7 - Instant Voltage (V) in Phase 3 = 00h = 0 V
03 FD D9 FF 81 00 **00 00 00**	31.7 - Instant Current (A) in Phase 1 = 00h = 0 A
03 FD D9 FF 82 00 **00 00 00**	51.7 - Instant Current (A) in Phase 2 = 00h = 0 A
03 FD D9 FF 83 00 **00 00 00**	71.7 - Instant Current (A) in Phase 3 = 00h = 0 A
03 FD D9 00 **00 00 00**	91.7 - Instant Current (A) Total = 00h = 0 A
04 AB FF 81 00 **00 00 00 00**	1.6.1 – Instant Active Power (W) in Phase 1 = 00h = 0 W
04 AB FF 82 00 **00 00 00 00**	1.6.2 – Instant Active Power (W) in Phase 2 = 00h = 0 W
04 AB FF 83 00 **00 00 00 00**	1.6.3 – Instant Active Power (W) in Phase 3 = 00h = 0 W
04 AB 00 **00 00 00 00**	1.7.0 – Instant Active Power (W) Total = 00h = 0 W
01 FF E1 FF 81 00 **00**	33.7 – Instant Power Factor (Cos Phi) for Phase 1 = 00h = 0
01 FF E1 FF 82 00 **00**	53.7 – Instant Power Factor (Cos Phi) for Phase 2 = 00h = 0
01 FF E1 FF 83 00 **00**	73.7 – Instant Power Factor (Cos Phi) for Phase 3 = 00h = 0
13 FD D9 FF 81 00 **20 5B 00**	31.6.0 - Maximum Current (A) in Phase 1 = 5B20h = 23 328 mA
13 FD D9 FF 82 00 **64 5A 00**	51.6.0 - Maximum Current (A) in Phase 2 = 5A64h = 23 140 mA
13 FD D9 FF 83 00 **D3 5B 00**	71.6.0 - Maximum Current (A) in Phase 3 = 5BD3h = 23 507 mA
14 AB FF 81 00 **BE 12 00 00**	21.6.0 - Maximum Power (W) in Phase 1 = 12BEh = 4 798 W
14 AB FF 82 00 **8E 12 00 00**	41.6.0 - Maximum Power (W) in Phase 2 = 12E8h = 4 840 W
14 AB FF 83 00 **D2 12 00 00**	61.6.0 - Maximum Power (W) in Phase 3 = 12D2h = 4 818 W
03 FF 91 00 **FA 00 00**	0.3.3 - Constant S0 (imp/kWh) = FAh = 250 imp/kWh
02 FF 92 00 **00 00**	0.4.2 **-** CT Factor = 00h = 0
CS	Check Sum
16	Stop Character

Timing: The M-BUS ELM transmits the Response at 35 – 70 ms from valid receipt of Request (Command).

The interval between 2 Bytes is 0 – 70 ms.

5.2 Read-out via Secondary Address

10 40 FF 3F 16	Initialise M-BUS ELM (ff - NO ACK)
68 0B 0B 68 73 FD 52 93 57 46 02 FF FF FF FF F0 16	Selection of M-BUS ELM by Sec. Address
E5	ACK
10 5B FD 58 16	REQUEST
68 E6 E6 68 08 01 72	Number of Bytes = E6 = 230; Primary Address = 01 = 01
93 57 46 02	Secondary Address = 02465793
01 6A	Manufacturer = “ZPA”
01 02	Version = 01; Medium = 02 = Electricity
00	Meter called upon = 00 = 00
00 00 00	Status = 00; Signature = 00 00
86 10 83 00 **F8 11 00 00 00 00**	1.8.1 - Active Energy Import (kWh) in Tariff 1 (ST) = 11F8h = 4600 Wh
86 20 83 00 **E8 03 00 00 00 00**	1.8.2 - Active Energy Import (kWh) in Tariff 2 (DT) = 03E8h = 1000 Wh
86 90 40 83 **00 C8 00 00 00 00 00**	2.8.1 – Active Energy Export (kWh) in Tariff 1 (ST) = C8h = 200 Wh
86 A0 40 83 **00 00 00 00 00 00 00**	2.8.2 – Active Energy Export (kWh) in Tariff 2 (DT) = 00h = 00 Wh
02 FD E0 00 **4C 00**	C.7.0 - Number of Power Supply Failures = 4Ch = 76
02 FD C9 FF 81 00 **F2 00**	32.7 - Instant Voltage (V) in Phase 1 = F2h = 242 V
02 FD C9 FF 82 00 **00 00**	52.7 - Instant Voltage (V) in Phase 2 = 00h = 0 V
02 FD C9 FF 83 00 **00 00**	72.7 - Instant Voltage (V) in Phase 3 = 00h = 0 V
03 FD D9 FF 81 00 **00 00 00**	31.7 - Instant Current (A) in Phase 1 = 00h = 0 A
03 FD D9 FF 82 00 **00 00 00**	51.7 - Instant Current (A) in Phase 2 = 00h = 0 A
03 FD D9 FF 83 00 **00 00 00**	71.7 - Instant Current (A) in Phase 3 = 00h = 0 A
03 FD D9 00 **00 00 00**	91.7 - Instant Current (A) in Total = 00h = 0 A
04 AB FF 81 00 **00 00 00 00**	1.6.1 – Instant Active Power (W) in Phase 1 = 00h = 0 W
04 AB FF 82 00 **00 00 00 00**	1.6.2 – Instant Active Power (W) in Phase 2 = 00h = 0 W
04 AB FF 83 00 **00 00 00 00**	1.6.3 – Instant Active Power (W) in Phase 3 = 00h = 0 W
04 AB 00 **00 00 00 00**	1.7.0 – Instant Active Power (W) Total = 00h = 0 W
01 FF E1 FF 81 00 **00**	33.7 – Instant Power Factor (Cos Phi) for Phase 1 = 00h = 0
01 FF E1 FF 82 00 **00**	53.7 – Instant Power Factor (Cos Phi) for Phase 2 = 00h = 0
01 FF E1 FF 83 00 **00**	73.7 – Instant Power Factor (Cos Phi) for Phase 3 = 00h = 0
13 FD D9 FF 81 00 **20 5B 00**	31.6.0 - Maximum Current (A) in Phase 1 = 5B20h = 23 328 mA
13 FD D9 FF 82 00 **64 5A 00**	51.6.0 - Maximum Current (A) in Phase 2 = 5A64h = 23 140 mA
13 FD D9 FF 83 00 **D3 5B 00**	71.6.0 - Maximum Current (A) in Phase 3 = 5BD3h = 23 507 mA
14 AB FF 81 00 **BE 12 00 00**	21.6.0 - Maximum Power (W) in Phase 1 = 12BEh = 4 798 W
14 AB FF 82 00 **8E 12 00 00**	41.6.0 - Maximum Power (W) in Phase 2 = 12E8h = 4 840 W
14 AB FF 83 00 **D2 12 00 00**	61.6.0 - Maximum Power (W) in Phase 3 = 12D2h = 4 818 W
03 FF 91 00 **FA 00 00**	0.3.3 - Constant S0 (imp/kWh) = FAh = 250 imp/kWh
02 FF 92 00 **00 00**	0.4.2 - CT Factor = 00h = 0
CS	Check Sum
16	Stop Character

Timing: The M-BUS ELM transmits the Response at 35 – 70 ms from valid receipt of Request (Command).

The interval between 2 Bytes is 0 – 70 ms.

5.3 Set Primary Address via Secondary Address

68 0B 0B 68 73 FD 52 93 57 46 02 FF FF FF FF F0 16	Selection of M-BUS ELM by Sec. Address
E5	ACK
68 06 06 68 53 FD 51 01 7A **02** 1E 16	Set Primary Address to 02
E5	ACK

5.4 Set Baud Rate

68 03 03 68 73 01 BB 2F 16	Set Baud Rate to BB = 2400 baud
E5	ACK
10 40 **01** 41 16	To 30 sec. send init telegram under new Baud Rate (2400)
E5	ACK

5.5 Reset / Restart

68 03 03 68 73 **01** 50 C4 16	Reset
E5	ACK