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OMS Vol.2 Primary 2.0.0 Elster Implementation

AE.02:02.01:01.01

Specification

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Revision history

Date:	Version:	Author:	Description:
02.11.2009	1.0	Th. Peters	Initial version
04.11.2009	1.1	Th. Peters	Update the contents
20.11.2009	1.2	Th. Peters	Update the contents
22.02.2010	1.3	Többen	Chapter 4.1.3.1: Error Status bit 4 (temporary error) is set by the WAVE RECEIVER if the actuality duration time is unknown (e.g. due to power loss).
23.03.2010	1.4	Többen	Chapter 4.2.4: Corrected the description of the Actuality Duration time. Chapter 4.3.5: Added a note that the Actuality Duration is only used by the wave system. Corrected some links, removed encryption related notes and comments.
18.06.2010	1.5	Gerdes	Chapter 4.2.1: New data point (ownership number) implemented. Annex B9: Frame example for the new data point “ownership number” implemented.

Contents

1 Introduction

The document describes the implementation of the M-Bus protocol for Elster devices as specified in OMS Issue 2.0.0 /2009-07-20. It specifies the primary communication protocol for wired M-Bus connections and for dongle based connections.
The wireless M-Bus connection is out of scope of this document.

2 Physical Layer

Baud rate	2400/300
Parity	Even
Data Bits	8
Stop Bit	1
Max. number of M-Bus slaves	4
Max. current per M-Bus slave	6 mA (4*1,5 mA)

Table 1 M-Bus Interface Configuration

3 Data Link Layer

The usage of the frame count bit (FCB) of the C-Field is specified in [2]. The assumption is that ignoring the FCB in the particular case of P2 communication has no harming side-effect, since communication is carried out with single, independent, packets. However, it will be a proprietary implementation; and any compliancy or compatibility issue will be the responsibility of the vendor.

3.1 Supported C-Fields

Name	Hex
SND_NKE	40
REQ_UD1	5A
REQ_UD2	5B
SND_UD	53
RSP_UD	08

Table 2: C-Fields Overview

3.1.1 SND_NKE

	Field	Hex	Remark
0	Start Character	10	Sort frame
1	C-Field	40	SND_NKE
2	A	A-0	Primary Address
3	*Checksum*		
4	Stop Character	16	

Table 3:SND_NKE

3.1.2 REQ_UD1

	Field	Hex	Remark
0	Start Character	10	Start byte sort telegram
1	C	5A	Request User Data (counter sending) FCB=0
2	A	A-0	Primary Address
3	*Checksum*		
4	Stop Character	16	Always 16

Table 4:REQ_UD1

3.1.3 REQ_UD2

	Field	Hex	Remark
0	Start Character	10	Start byte sort telegram
1	C	5B	Request User Data (counter sending) FCB=0
2	A	A-0	Primary Address
3	*Checksum*		
4	Stop Character	16	Always 16

Table 5:REQ_UD2

3.1.4 SND_UD

	Field	Hex	Remark
0	Start Character	68	Start byte long telegram
1	L	L-0	Length
2	L	L-0	Length
3	Start Character	68	Start byte long telegram
4	C	53	SND_UD (FCB=0)
5	A	A-0	Primary Address
6	*CI-Field Data Block*		
7	*Checksum*		
8	Stop Character	16	Always 16

Table 6: SND_UD

3.1.5 RSP_UD

	Field	Hex	Remark
0	Start Character	68	Start byte long telegram
1	L	L-0	Length
2	L	L-0	Length
3	Start Character	68	Start byte long telegram
4	C	08	(FCB=0)
5	A	A-0	Primary Address
6	*CI-Field Data Block*		
7	*Checksum*		
8	Stop Character	16	Always 16

Table 7: RSP_UD

4 Application Layer

4.1 Supported CI Fields

Control Information	Hex	Header
Application Reset	50	None
Command to device	51	None
Selection of device	52	None
Command to device	5A	Short Data Header
Command to device	5B	Long Data Header
Response error from device	70	None
Response from device	72	Fixed Data Header
Set Baud Rate	B8/BB	None

4.1.1 Short Data Header

	Field		Hex	Remark
0	*SND_UD Frame*			
1		CI	5A	Data send (master to slave)
2	4 byte data header	Access No	AC-0	Access Number
3		Status	S-0	Status
4		Signature	X0	Number of bytes encrypted, must be multiple of 16
5			EC-0	Encryption Method Code; for Absolute Encoder AE2 always zero
6	*Variable Data Blocks*			

Table 8: Short Data Header (CI=5Ah)

4.1.2 Long Data Header

	Field			Hex	Remark
0	*SND_UD Frame*				
1			CI	5B	Data send (master to slave)
2	Long Header	Short ID	Identification Number	ID-0	Identification Number
3				ID-1	
4				ID-2	
5				ID-3	
6			Manufacturer Identification	MI-0	Manufacturer ID
7				MI-1	
8			Version	V-0	Generation
9			Medium	M-0	Medium
10		Short Header	Access No	AC-0	Access Number
11			Status	ST-0	Error Status Code
12			Signature	X0	Number of bytes encrypted, must be multiple of 16
13				EC-0	Encryption Method Code; for Absolute AE2 always zero
14	*Variable Data Blocks*				

Table 9: Long Data Header

4.1.3 Fixed Data Header

	Field			Hex	Remark
15	*RSP_UD Frame*				
16			CI	72	Data send (slave to master)
17	Long Header	Short ID	Identification Number	ID-0	Identification Number
18				ID-1	
19				ID-2	
20				ID-3	
21			Manufacturer Identification	MI-0	Manufacturer ID
22				MI-1	
23			Version	V-0	Generation
24			Medium	M-0	Medium
25		Short Header	Access No	AC-0	Access Number
26			Status	ST-0	Error Status Code
27			Signature	00	Number of bytes encrypted, must be multiple of 16
28				EC-0	No encryption method use
29	*Variable Data Blocks*				

Table 10: Fixed Data Header

Note 1: The combination of Identification Number (4 octets), Manufacturer identification (2 octets), Version identification (1 octet) and Device Type identification (Medium field, 1 octet) is defined as the Short ID.

Note 2: The Short ID shall be unique within the network of the grid operator. The manufacturer guarantees uniqueness with a Version field that is fixed over the lifetime of the individual M-Bus device. Hence firmware upgrades are not possible without changing the Version number.

4.1.3.1 Error Status Codes

The following table shows the M-Bus status byte according to the [1]
$b_7\, b_6\, b_5\, b_4\, b_3\, b_2\, b_1\, b_0$

	Bit	Meaning	Set Conditions	Reset Conditions
0	b_0	Application Busy	Absolute Encoder was not able to read the Index	After the next successful readout.
1	b_1			
2	b_2	Low power	Battery is low	Change the WAVESYSTEM
3	b_3			
4	b_4	Temporary Error	The actuality duration time is unknown in the WAVE RECEIVER.	When the WAVE RECEIVER receives a new RSP_UD frame.
5	b_5	-	-	-
6	b_6	-	-	-
7	b_7	-	-	-

Table 11 OMS M-Bus Status Byte

4.1.4 Version

The Version field is implemented as a bit mask:

b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0
Protocol Type		Protocol Version					

Table 12: Version Field

Protocol Type

Code	Meaning
00	Elster wired M-Bus
01	Elster P2 V2.2
10	Elster OMS V2.0.0
11	Reserved for future use

Table 13: Protocol Type Definitions

The Protocol Version represents the version of the Protocol, e.g. OMS Vol. 2 Primary 2.0.0.

Protocol Version for Protocol Type = 'Elster OMS'

Code	Meaning
000000	OMS Vol.2 Primary 2.0.0 Elster Implementation (this document)
any other value	Reserved for future OMS Implementations

Table 14: Protocol Version Definition

4.2 Variable Data Blocks

4.2.1 Data Points Overview

ID	Name	Data Record Header				
		DIF	DIFE	VIF	VIFE	LVAR
D001	Ownership number	0D		FD	11	00…BF
D002	Volume, converted	0C	-	13…14	-	-
D003	Volume, unconverted	0C	-	93…94	3A	-
D004	Actuality Duration	02		74		

Table 15: Data Points

4.2.2 Ownership number

	Field	Hex	Remark
0	DIF	0D	Variable length
1	VIF	FD	Ownership number
2	VIFE	11	Ownership number
3	LVAR	00…BF	Ownership number length
4	Ownership number	ON-0	4 characters, ASCII coded LSB (i.e. last character) first.
5		ON-1	
6		ON-2	
7		ON-3	

Data Point D002: Ownership number

4.2.3 Volume, converted

	Field	Hex	Remark
8	DIF	0C	Data format 8 Digit BCD, Storage Number Bit = 0 / 1
9	VIF	13…14	Multiplier 0,001 m³ ...0,01 m³
10	Volume	V-0	Temperature Converted Value, where V-0 is the LSB of the value
11		V-1	
12		V-2	
13		V-3	

Data Point D002: Volume, converted

4.2.4 Volume, unconverted

	Field	Hex	Remark
0	DIF	0C	Data format 8 Digit BCD, Storage Bit = 0 / 1
1	VIF	93…94	Multiplier 0,001 m³ ... 0,01 m³
2	VIFE	3A	VIF contains unconverted units.
3	Volume	V-0	Unconverted volume where V-0 is the LSB of the value
4		V-1	
5		V-2	
6		V-3	

Data Point D003: Volume, unconverted

4.2.5 Actuality Duration

	Field	Hex	Remark
0	DIF	02	16 Bit Integer/Binary
1	VIF	74	Actuality duration
2	Time	T-0	Actuality duration in seconds, where T-0 is the LSB of the value.
3		T-1	

Data Point D004: Actuality Duration

4.3 Procedures

4.3.1 Overview

ID	Telegram Name	CI-Field
P001	SND_UD Set Baud Rate	B8/BB
P002	SND_UD Application Reset	50
P003	SND_UD Slave Select	52
P004	RSP_UD Standard Data Record	72

4.3.2 SND_UD Set Baud Rate

	Field
0	*SND_UD Frame*
1	*Control Information:* *B8 set baud rate to 300 baud* *BB set baud rate to 2400 baud*

Procedure P001: SND_UD Set Baud Rate

Note 3: Supported baud rates are depending on communication modules.

4.3.3 SND_UD Application Reset

	Field
2	*SND_UD Frame*
3	*Control Information: 50 Application Reset*

Procedure P002: SND_UD Application Reset

4.3.4 SND_UD Slave Select

	Field
0	*SND_UD Frame*
1	*Control Information: 52 Slave Select*
2	*Short ID*

Procedure P003: SND_UD Slave Select

4.3.5 RSP_UD Standard Data Record

	Field
0	*RSP_UD Frame*
1	*Control Information: 72 slave to master*
2	*Fixed Data Header*
3	*Data Point D001 Ownership number*
4	*Data Point D002 Volume, converted* *or* *Data Point D003Volume, unconverted*
5	*[Data Point D004 Actuality Duration]*

Procedure P004: RSP_UD Standard Data Record

Note 1: Data Point D004 Actuality Duration is used by the ACM WAVE SYSTEM only.

Note 2: Data Point D001 Ownership number is only send if the Ownership number is activated (depending on parameterization).

5 Abbreviation list

n.a. not applicable

6 References

[1] EN 13757-3:2004
Communication Systems for and remote reading of meters –
Part 3: Dedicated application layer

[2] EN 60870-5-2:1993
Telecontrol equipment and systems –
Part 5: Transmission Protocols
Section 2: Link Transmission Procedures

[3] OMS Open Metering System Specification
Volume 2
Primary Communication
Issue 2.0.0 / 2009-07-20

Appendix

Annex A Protocol Implementation Conformance Statement

A.1 Supported C-Fields

C-Field Name	AE2	ACM WAVE TRANSMITTER	ACM WAVE RECEIVER
SND_NKE	Yes	Yes	Yes
REQ_UD1	Yes	Yes	Yes
REQ_UD2	Yes	Yes	Yes
SND_UD	Yes	Yes	Yes
RSP_UD	Yes	Yes	Yes

Table 16: Supported C-Fields

A.2 Supported CI-Fields

Control Information	AE2	ACM WAVE TRANSMITTER	ACM WAVE RECEIVER
Application Reset	Yes	Yes	Yes
Command to device	Yes	Yes	Yes
Selection of device	Yes	Yes	Yes
Command to device, Short Data Header	Yes	Yes	Yes
Command to device, Long Data Header	Yes	Yes	Yes
Response from device, Fixed Data Header	Yes	Yes	Yes

Table 17: Supported CI-Fields

A.3 Supported Data Points

Data Point Name	AE2	ACM WAVE TRANSMITTER	ACM WAVE RECEIVER
D001: Ownership number	C1	Yes	Yes
D002: Volume, converted	C1	Yes	Yes
D003: Volume, unconverted	C1	Yes	Yes

Table 18: Supported Data Points

Condition C1: Depending on parameterization

A.4 Supported Procedures

ID	Telegram Name	AE2	ACM WAVE TRANSMITTER	ACM WAVE RECEIVER
P001: SND_UD Set Baud Rate		Yes	Yes	Yes
P002: SND_UD Application Reset		Yes	Yes	Yes
P003: SND_UD Slave Select		Yes	Yes	Yes
P004: RSP_UD Standard Data Record		Yes	Yes	Yes

Table 19: Supported Procedures

Annex B Absolute Encoder 2 Examples

B.1 SND_NKE

	Field	Hex	Remark
5	Start Character	10	Sort frame
6	C-Field	40	SND_NKE
7	Primary Address	01	e.g. 01
8	Checksum	41	
9	Stop Character	16	

Example 1: SND_NKE

B.2 REQ_UD1

	Field	Hex	Remark
5	Start Character	10	Start byte sort telegram
6	C	5A	Request User Data (counter sending) FCB=0
7	A	01	Primary Address
8	CS	5B	Checksum
9	Stop Character	16	Always 16

Example 2: REQ_UD1

B.3 REQ_UD2

	Field	Hex	Remark
5	Start Character	10	Start byte sort telegram
6	C	5B	Request User Data (counter sending) FCB=0
7	A	01	Primary Address
8	CS	5C	Checksum
9	Stop Character	16	Always 16

Example 3: REQ_UD2

B.4 SND_UD Set Baud Rate

	Field	Hex		Remark
		clear	encrypted	
0	Start Character	68		Start byte long telegram
1	L	03		Length
2	L	03		Length
3	Start Character	68		Start byte long telegram
4	C	53		FCB=0
5	A	01		Primary Address
6	CI	BB		Set Baud Rate to 2400 baud
7	CS	0F		Checksum
8	Stop Character	16		Always 16

Example 4: Set Baud Rate to 2400

B.5 SND_UD Set Baud Rate

	Field	Hex		Remark
		clear	encrypted	
9	Start Character	68		Start byte long telegram
10	L	03		Length
11	L	03		Length
12	Start Character	68		Start byte long telegram
13	C	53		FCB=0
14	A	01		Primary Address
15	CI	B8		Set Baud Rate to 300 baud
16	CS	0C		Checksum
17	Stop Character	16		Always 16

Example 5: Set Baud Rate to 300

B.6 SND_UD Application Reset

	Field	Hex		Remark
		clear	encrypted	
0	Start Character	68		Start byte long telegram
1	L	03		Length
2	L	03		Length
3	Start Character	68		Start byte long telegram
4	C	53		FCB=0
5	A	01		Primary Address
6	CI	50		Application Reset
7	CS	A4		Checksum
8	Stop Character	16		Always 16

Example 6: Application Reset

B.7 SND_UD Slave Select

	Field	Hex		Remark
		clear	encrypted	
0	Start Character	68		Start byte long telegram
1	L	0B		Length
2	L	0B		Length
3	Start Character	68		Start byte long telegram
4	C	53		FCB=0
5	A	FD		Secondary Addressing
6	CI	52		Slave Select
7	Identification Number	78		Identification Number, e.g. 12345678
8		56		
9		34		
10		12		
11	Manufacturer ID	93		Manufacturer ID e.g. “ELS”
12		15		
13	Version	33		
14	Medium	03		
15	CS	94		Checksum
16	Stop Character	16		Always 16

Example 7: Slave Select

B.8 Standard Data Record with ACM M-BUS WIRE

Example 8 shows a RSP_UD telegram of a meter comprising of the following properties:

- temperature converted volume
- meter type G4 => volume multiplier = 0,001m³

	Field	Hex clear	Remark
0	Start Character	68	Start byte long telegram
1	L	15	Length
2	L	15	Length
3	Start Character	68	Start byte long telegram
4	C	08	(FCB=0)
5	A	01	Primary Address
6	CI	72	Data send (master to slave)
7	Identification Number	78	Identification Number, e.g. 12345678
8		56	
9		34	
10		12	
11	Manufacturer ID	93	Manufacturer ID, e.g. “ELS”
12		15	
13	Generation	33	Version = 51
14	Medium	03	Medium = gas
15	Access No	01	Access Number = 01
16	Status	00	Error Status:
17	Signature	00	No encryption
18		00	
19	DIF	0C	Temperature Converted Volume Multiplier = 0,001 m³ Value = 1,230 m³
20	VIF	13	
21	Data	30	
22		12	
23		00	
24		00	
25	CS	CF	Checksum
26	Stop Character	16	16

Example 8: RSP_UD telegram of an Elster Gas Meter with wired M-Bus

B.9 Standard Data Record with wired ACM M-BUS WIRE

Example 8 shows a RSP_UD telegram of a meter comprising of the following properties:

- Ownership number
- temperature converted volume
- meter type G4 => volume multiplier = 0,001m³

	Field	Hex clear	Remark
27	Start Character	68	Start byte long telegram
28	L	1E	Length
29	L	1E	Length
30	Start Character	68	Start byte long telegram
31	C	08	(FCB=0)
32	A	01	Primary Address
33	CI	72	Data send (master to slave)
34	Identification Number	78	Identification Number, e.g. 12345678
35		56	
36		34	
37		12	
38	Manufacturer ID	93	Manufacturer ID, e.g. “ELS”
39		15	
40	Generation	33	Version = 51
41	Medium	03	Medium = gas
42	Access No	01	Access Number = 01
43	Status	00	Error Status:
44	Signature	00	No encryption
45		00	
46	DIF	0D	Ownership Number, ASCII coded
47	VIF	FD	
48	VIFE	11	e.g. 123AB (variable length)
49	LVAR	05	
50		42	
51		41	
52		33	
53		32	
54		31	
55	DIF	0C	Temperature Converted Volume Multiplier = 0,001 m³ Value = 1,230 m³
56	VIF	13	
57	Data	30	
58		12	
59		00	
60		00	

	Field	Hex clear	Remark
61	CS	08	Checksum
62	Stop Character	16	16

Example 9: RSP_UD telegram of an Elster Gas Meter with wired M-Bus

B.10 Standard Data Record with ACM WAVE SYSTEM RF

Example 10 shows a RSP_UD telegram of a meter comprising of the following properties:

- unconverted volume
- meter family G10 => volume multiplier = 0,01m³

	Field	Hex clear	Remark
0	Start Character	68	Start byte long telegram
1	L	1A	Length
2	L	1A	Length
3	Start Character	68	Start byte long telegram
4	C	08	(FCB=0)
5	A	01	Primary Address
6	CI	72	Data send (master to slave)
7	Identification Number	78	Identification Number, e.g. 12345678
8		56	
9		34	
10		12	
11	Manufacturer ID	93	Manufacturer ID, e.g. “ELS”
12		15	
13	Generation	33	Version = 51
14	Medium	03	Medium = gas
15	Access No	01	Access Number = 01
16	Status	04	Error Status: - Low Power
17	Signature	00	No encryption
18		00	
19	DIF	0C	Temperature Unconverted Volume Multiplier = 0,01 m³ Value = 12,30 m³
20	VIF	94	
21	DIF	3A	
22	Data	30	
23		12	
24		00	
25		00	
26	Duration between measuring and transmission	02	Value in Seconds 0D98h = 3480 sec = 58 min.
27		74	
28		98	
29		0D	
30	Checksum	A9	Checksum
31	Stop Character	16	

Example 10: RSP_UD telegram of an Elster Gas Meter with ACM WAVE SYSTEM