

# WMP. wM-Bus Protocol Stack and Data Structures

Rev.1.3

## Revision History

Version	Date	Description
0.9	10.06.2024	Draft document revision
1.0	11.06.2024	First document revision
1.1	19.06.2024	Message example added
1.2	20.06.2024	Additional message examples added
1.3	09.09.2024	Message examples with Security Mode 0 added

## Contents

Revision History .....	1
wM-Bus Protocol Stack and References .....	3
wM-Bus Address Elements .....	3
Physical Layer .....	3
Data Link Layer (DLL) .....	4
Transport Layer (TPL).....	4
wM-Bus Data Points.....	4
Alarm structure (Error Flags) .....	4
Message examples .....	5
Example 1 .....	5
Example 2 .....	6
Example 3 .....	8
Example 4 .....	9
Example 5 .....	10
Example 6 .....	12
Example 7 .....	13
Example 8 .....	15

## wM-Bus Protocol Stack and References

wM-Bus protocol stack implemented in WMP has the following structure:

<b>Application layer</b>	EN 13757-3:2018
<b>Transport Layer</b>	EN 13757-7:2018
<b>Authentication and Fragmentation Layer</b>	EN 13757-7:2018 clause 6
<b>Data Link layer</b>	EN 13757-2:2018 EN 13757-4:2019
<b>Physical Layer</b>	EN 13757-4:2019

## wM-Bus Address Elements

As it is specified for wM-Bus, Link Layer Address (LLA) always contains the address of the sender (meter).

Extended Link Layer Address (ELLA) is not used.

Application Layer Address (ALA) is not used.

The LLA consists of four parts:

- Identification Number (Device ID)
- Manufacturer ID
- Version
- Device Type

Usage of these elements is in accordance with EN 13757-7:2018, clauses 7.5.1 to 7.5.4.

<b>Manufacturer ID (HEX)</b>	<b>Identification Nr. (BCD)</b>	<b>Version</b>	<b>Device Type</b>
04 98	14 16 44 74	00	07

- MAN ID = 0498H (ADX)
- Identification Number = e.g., 14164474 (big endian)
  - In BCD = 14164474H
- Version = 00H
- Type = 07H (Cold Water Meter)

In real wM-Bus frame each field is represented as LSB-First (little endian). Thus, for the example address shown above this would be 98 04 74 44 16 14 00 07.

## Physical Layer

Complies with OMS Gen.4 Specifications, Issue 4.3.3 / 2020-10 (<https://oms-group.org/en/open-metering-system/oms-specification-1-1#c2451>).

OMS PHY\_A mode T1 or C1.

H<sub>T</sub> = Highest transmission power (> +5 dBm).

Unidirectional synchronous transmission: transmit every 20 sec, interval of Consumption Data is 1 hour.

## Data Link Layer (DLL)

Supported C-Fields: SND-NR only.

Security mode 0 (default configuration by delivery) or 5 (may be chosen by agreement with the customer).

## Transport Layer (TPL)

Short TPL header, the meter identification is taken from the Link Layer

## wM-Bus Data Points

N	Type / Encryption	MB-Tag	Description	Data field	Tariff [T]	Function [F]	Storage [X]	Final DIFE [FD]	VIB-Type Reference	Cold Water (07h)
1	Date/Time of device	DT1!	Current date/time at time of transmission	Type F,	0	0	0	no	DT01	C
2	Meter reading	VM1!	Volume, current value, total	INT	0	0	0	no	VM01	M
3	Meter reading	VM4!	Volume, forward value	INT	0	0	0	no	VM07	O
4	Meter reading	VM5!	Volume, backward value	INT	0	0	0	no	VM09	O
5	Error (Alarm structure)	MM2!	Error flags	INT	0	0	0	no	MM02	C
6	Device information	MM8!	Remaining battery lifetime	INT	0	0	0	no	MM10	O
7	Temperature	TC1!	Flow Temperature	INT	0	0	0	no	TC01	

## Alarm structure (Error Flags)

Byte No.\Bit No.	7	6	5	4	3	2	1	0
0	WV comm. error	WV Tamper	WV Magnetic field	Reserve	Reserve	Reserve	Valve state: 0 – closed, 1 – opened 100%, 2 – opened 10% 3- opened 50%	
1	Clock invalid	Tamper	Magnetic field	Reserve	Reserve	Low bat	Firmware changed	Hardware Fault
2	Leakage	Dry	Backflow	Burst	Reserve	Low temp	Reserve	Reserve

Alarms description:

- “WV comm. error” – Water valve communication error
- “WV Tamper” – Water valve case opened
- “WV Magnetic field” – Magnetic field on water valve detected
- “Valve state” – Current water valve state
- “Clock invalid” – System time not valid
- “Tamper” – Meter case opened
- “Magnetic field” – Detect magnetic field
- “Low bat” – Critical battery level (appear before half year before 0% level)
- “Hardware fault” – Meter internal hardware fault
- “Frmw changed” – Firmware version was updated
- “Leakage” – Water flow during more than 24 hours detected
- “Dry” – Water is absent during long time
- “Backflow” – Reverse water flow more than Q1 detected
- “Burst” – Water flow  $\geq$  Q3 during long time detected
- “Low temp” – Low ambient temperature detected

## Message examples

In this section examples of some messages are presented.

### Example 1

Raw message (HEX):

```
3B 44 98 04 48 44 17 14 00 07 8C 20 7F 7A 73 00 00 20 04 6D 1B 11 01 37 04 13 03 D9 00 00
04 93 3B 9C AD 00 00 04 93 3C 67 2B 00 00 03 FD 17 01 00 00 02 FD FD 02 65 00 02 5B 19
00
```

**Table 1: SND-NR, no errors**

Byte	Field Name	Content	Plain (HEX)	Ciphered (HEX)	Layer
1	L	Length of data: 59 bytes	3B	3B	LL
2	C	SND-NR + Primary	44	44	LL
3	M	Manufacturer code: ADX	98	98	LL
4	M		04	04	LL
5	A	Address: 14174448	48	48	LL
6	A		44	44	LL
7	A		17	17	LL
8	A		14	14	LL
9	A	Version: 00	00	00	LL
10	A	Device type: Water	07	07	LL
11	CI	Extended Link Layer I	8C	8C	ELL
12	CC	Bits: -S-	20	20	ELL
13	ACC	Access: 127	7F	7F	ELL
14	CI		7A	7A	TPL
15	ACC	Access: 115	73	73	TPL
16	Status	No error --	00	00	TPL
17	Config	SecMode: 0 EncB: 0 Cont: 00b Bits: -S-	00	00	TPL
18	Config		20	20	TPL
19	DR1	DIF = 32 Bit Integer	04	04	APL
20	DR1	VIF = Date-Time "F"	6D	6D	APL
21	DR1	2024-07-01 17:27	1B	1B	APL

22	DR1		11	11	APL
23	DR1		01	01	APL
24	DR1		37	37	APL
25	DR2	DIF = 32 Bit Integer	04	04	APL
26	DR2	VIF = Volume 10 (nnn-6) m3	13	13	APL
27	DR2	55,555 m3	03	03	APL
28	DR2		D9	D9	APL
29	DR2		00	00	APL
30	DR2		00	00	APL
31	DR3	DIF = 32 Bit Integer	04	04	APL
32	DR3	VIF = Volume 10 (nnn-6) m3	93	93	APL
33	DR3	VIFE = Forward volume	3B	3B	APL
34	DR3	44,444 m3	9C	9C	APL
35	DR3		AD	AD	APL
36	DR3		00	00	APL
37	DR3		00	00	APL
38	DR4	DIF = 32 Bit Integer	04	04	APL
39	DR4	VIF = Volume 10 (nnn-6) m3	93	93	APL
40	DR4	VIFE = Reverse volume	3C	3C	APL
41	DR4	11,111 m3	67	67	APL
42	DR4		2B	2B	APL
43	DR4		00	00	APL
44	DR4		00	00	APL
45	DR5	DIF = 24 Bit Integer	03	03	APL
46	DR5	VIF	FD	FD	APL
47	DR5	VIFE = "Error flags (binary)"	17	17	APL
48	DR5	1 (WV opened 100%, no alarms)	01	01	APL
49	DR5		00	00	APL
50	DR5		00	00	APL
51	DR6	DIF = 16 Bit Integer	02	02	APL
52	DR6	VIFE1	FD	FD	APL
53	DR6	VIFE2 = month(s)	FD	FD	APL
54	DR6	101 mon	02	02	APL
55	DR6		65	65	APL
56	DR6		00	00	APL
57	DR7	DIF = 16 Bit Integer	02	02	APL
58	DR7	VIF = Temperature Flow 10 (nn-3) °C	5B	5B	APL
59	DR7	25 °C	19	19	APL
60	DR7		00	00	APL

## Example 2

Raw message (HEX):

3B 44 98 04 48 44 17 14 00 07 8C 20 8F 7A 5C 00 00 20 04 6D 1F 11 01 37 04 13 03 D9 00 00  
04 93 3B 9C AD 00 00 04 93 3C 67 2B 00 00 03 FD 17 01 00 80 02 FD FD 02 65 00 02 5B 19  
00

**Table 2: SND-NR, alarm “Leakage”**

Byte	Field Name	Content	Plain (HEX)	Ciphered (HEX)	Layer
1	L	Length of data: 59 bytes	3B	3B	LL
2	C	SND-NR + Primary	44	44	LL
3	M	Manufacturer code: ADX	98	98	LL
4	M		04	04	LL
5	A	Address: 14174448	48	48	LL

6	A		44	44	LL
7	A		17	17	LL
8	A		14	14	LL
9	A	Version: 00	00	00	LL
10	A	Device type: Water Meter	07	07	LL
11	CI	Extended Link Layer I	8C	8C	ELL
12	CC	Bits: -S-	20	20	ELL
13	ACC	Access: 143	8F	8F	ELL
14	CI		7A	7A	TPL
15	ACC	Access: 92	5C	5C	TPL
16	Status	No error --	00	00	TPL
17	Config	SecMode: 0 EncB: 0 Cont: 00b Bits: -S-	00	00	TPL
18	Config		20	20	TPL
19	DR1	DIF = 32 Bit Integer	04	04	APL
20	DR1	VIF = Date-Time "F"	6D	6D	APL
21	DR1	2024-07-01 17:31	1F	1F	APL
22	DR1		11	11	APL
23	DR1		01	01	APL
24	DR1		37	37	APL
25	DR2	DIF = 32 Bit Integer	04	04	APL
26	DR2	VIF = Volume 10 (nnn-6) m3	13	13	APL
27	DR2	55,555 m3	03	03	APL
28	DR2		D9	D9	APL
29	DR2		00	00	APL
30	DR2		00	00	APL
31	DR3	DIF = 32 Bit Integer	04	04	APL
32	DR3	VIF = Volume 10 (nnn-6) m3	93	93	APL
33	DR3	VIFE = Forward volume	3B	3B	APL
34	DR3	44,444 m3	9C	9C	APL
35	DR3		AD	AD	APL
36	DR3		00	00	APL
37	DR3		00	00	APL
38	DR4	DIF = 32 Bit Integer	04	04	APL
39	DR4	VIF = Volume 10 (nnn-6) m3	93	93	APL
40	DR4	VIFE = Reverse volume	3C	3C	APL
41	DR4	11,111 m3	67	67	APL
42	DR4		2B	2B	APL
43	DR4		00	00	APL
44	DR4		00	00	APL
45	DR5	DIF = 24 Bit Integer	03	03	APL
46	DR5	VIF	FD	FD	APL
47	DR5	VIFE = "Error flags (binary)"	17	17	APL
48	DR5	8388609 (WV opened 100%, alarm "Leakage")	01	01	APL
49	DR5		00	00	APL
50	DR5		80	80	APL
51	DR6	DIF = 16 Bit Integer	02	02	APL
52	DR6	VIF	FD	FD	APL
53	DR6	VIFE1	FD	FD	APL
54	DR6	VIFE2 = month(s)	02	02	APL
55	DR6	101 mon	65	65	APL
56	DR6		00	00	APL
57	DR7	DIF = 16 Bit Integer	02	02	APL
58	DR7	VIF = Temperature Flow 10 (nn-3) °C	5B	5B	APL
59	DR7	25 °C	19	19	APL
60	DR7		00	00	APL

### Example 3

Raw message (HEX):

3B 44 98 04 48 44 17 14 00 07 8C 20 C3 7A BD 00 00 20 04 6D 18 11 01 37 04 13 03 D9 00 00  
04 93 3B 9C AD 00 00 04 93 3C 67 2B 00 00 03 FD 17 01 00 10 02 FD FD 02 65 00 02 5B 19  
00

**Table 3: SND-NR, alarm “Burst”**

Byte	Field Name	Content	Plain (HEX)	Ciphered (HEX)	Layer
1	L	Length of data: 59 bytes	3B	3B	LL
2	C	SND-NR + Primary	44	44	LL
3	M	Manufacturer code: ADX	98	98	LL
4	M		04	04	LL
5	A	Address: 14174448	48	48	LL
6	A		44	44	LL
7	A		17	17	LL
8	A		14	14	LL
9	A	Version: 00	00	00	LL
10	A	Device type: Water Meter	07	07	LL
11	CI	Extended Link Layer I	8C	8C	ELL
12	CC	Bits: -S-	20	20	ELL
13	ACC	Access: 195	C3	C3	ELL
14	CI		7A	7A	TPL
15	ACC	Access: 189	BD	BD	TPL
16	Status	No error --	00	00	TPL
17	Config	SecMode: 0 EncB: 0 Cont: 00b Bits: -S-	00	00	TPL
18	Config		20	20	TPL
19	DR1	DIF = 32 Bit Integer	04	04	APL
20	DR1	VIF = Date-Time "F"	6D	6D	APL
21	DR1	2024-07-01 17:24	18	18	APL
22	DR1		11	11	APL
23	DR1		01	01	APL
24	DR1		37	37	APL
25	DR2	DIF = 32 Bit Integer	04	04	APL
26	DR2	VIF = Volume 10 (nnn-6) m3	13	13	APL
27	DR2	55,555 m3	03	03	APL
28	DR2		D9	D9	APL
29	DR2		00	00	APL
30	DR2		00	00	APL
31	DR3	DIF = 32 Bit Integer	04	04	APL
32	DR3	VIF = Volume 10 (nnn-6) m3	93	93	APL
33	DR3	VIFE = Forward volume	3B	3B	APL
34	DR3	44,444 m3	9C	9C	APL
35	DR3		AD	AD	APL
36	DR3		00	00	APL
37	DR3		00	00	APL
38	DR4	DIF = 32 Bit Integer	04	04	APL
39	DR4	VIF = Volume 10 (nnn-6) m3	93	93	APL
40	DR4	VIFE = Reverse volume	3C	3C	APL
41	DR4	11,111 m3	67	67	APL
42	DR4		2B	2B	APL
43	DR4		00	00	APL

44	DR4		00	00	APL
45	DR5	DIF = 24 Bit Integer	03	03	APL
46	DR5	VIF	FD	FD	APL
47	DR5	VIFE = "Error flags (binary)"	17	17	APL
48	DR5	1048577 (WV opened 100%, alarm "Burst")	01	01	APL
49	DR5		00	00	APL
50	DR5		10	10	APL
51	DR6	DIF = 16 Bit Integer	02	02	APL
52	DR6	VIF	FD	FD	APL
53	DR6	VIFE1	FD	FD	APL
54	DR6	VIFE2 = month(s)	02	02	APL
55	DR6	101 mon	65	65	APL
56	DR6		00	00	APL
57	DR7	DIF = 16 Bit Integer	02	02	APL
58	DR7	VIF = Temperature Flow 10 (nn-3) °C	5B	5B	APL
59	DR7	25 °C	19	19	APL
60	DR7		00	00	APL

#### Example 4

Raw message (HEX):

3B 44 98 04 48 44 17 14 00 07 8C 20 64 7A E7 00 00 20 04 6D 11 11 01 37 04 13 03 D9 00 00  
04 93 3B 9C AD 00 00 04 93 3C 67 2B 00 00 03 FD 17 01 40 00 02 FD FD 02 65 00 02 5B 19  
00

**Table 4: SND-NR, alarm "Meter case opened"**

Byte	Field Name	Content	Plain (HEX)	Ciphered (HEX)	Layer
1	L	Length of data: 59 bytes	3B	3B	LL
2	C	SND-NR + Primary	44	44	LL
3	M	Manufacturer code: ADX	98	98	LL
4	M		04	04	LL
5	A	Address: 14174448	48	48	LL
6	A		44	44	LL
7	A		17	17	LL
8	A		14	14	LL
9	A	Version: 00	00	00	LL
10	A	Device type: Water Meter	07	07	LL
11	CI	Extended Link Layer I	8C	8C	ELL
12	CC	Bits: -S-	20	20	ELL
13	ACC	Access: 100	64	64	ELL
14	CI		7A	7A	TPL
15	ACC	Access: 231	E7	E7	TPL
16	Status	No error --	00	00	TPL
17	Config	SecMode: 0 EncB: 0 Cont: 00b Bits: -S-	00	00	TPL
18	Config		20	20	TPL
19	DR1	DIF = 32 Bit Integer	04	04	APL
20	DR1	VIF = Date-Time "F"	6D	6D	APL
21	DR1	2024-07-01 17:17	11	11	APL
22	DR1		11	11	APL
23	DR1		01	01	APL
24	DR1		37	37	APL
25	DR2	DIF = 32 Bit Integer	04	04	APL
26	DR2	VIF = Volume 10 (nnn-6) m3	13	13	APL

27	DR2	55,555 m3	03	03	APL
28	DR2		D9	D9	APL
29	DR2		00	00	APL
30	DR2		00	00	APL
31	DR3	DIF = 32 Bit Integer	04	04	APL
32	DR3	VIF = Volume 10 (nnn-6) m3	93	93	APL
33	DR3	VIFE = Forward volume	3B	3B	APL
34	DR3	44,444 m3	9C	9C	APL
35	DR3		AD	AD	APL
36	DR3		00	00	APL
37	DR3		00	00	APL
38	DR4	DIF = 32 Bit Integer	04	04	APL
39	DR4	VIF = Volume 10 (nnn-6) m3	93	93	APL
40	DR4	VIFE = Reverse volume	3C	3C	APL
41	DR4	11,111 m3	67	67	APL
42	DR4		2B	2B	APL
43	DR4		00	00	APL
44	DR4		00	00	APL
45	DR5	DIF = 24 Bit Integer	03	03	APL
46	DR5	VIF	FD	FD	APL
47	DR5	VIFE = "Error flags (binary)"	17	17	APL
48	DR5	16385 (WV opened 100%, alarm "Meter case opened")	01	01	APL
49	DR5		40	40	APL
50	DR5		00	00	APL
51	DR6	DIF = 16 Bit Integer	02	02	APL
52	DR6	VIF	FD	FD	APL
53	DR6	VIFE1	FD	FD	APL
54	DR6	VIFE2 = month(s)	02	02	APL
55	DR6	101 mon	65	65	APL
56	DR6		00	00	APL
57	DR7	DIF = 16 Bit Integer	02	02	APL
58	DR7	VIF = Temperature Flow 10 (nn-3) °C	5B	5B	APL
59	DR7	25 °C	19	19	APL
60	DR7		00	00	APL

### Example 5

Encryption key (HEX):

2B 7E 15 16 28 AE D2 A6 AB F7 15 88 09 CF 4F 3C

Raw ciphered message (HEX):

41 44 98 04 47 44 17 14 00 07 8C 20 C3 7A 75 00 30 25 7E 73 19 2C 8F BA 7F C7 D4 75 F1  
50 88 66 47 E4 3C 91 BB 7E 0F 84 F4 04 6D 4A C8 AD 35 26 76 16 89 D8 0A E1 F1 1A 0F  
1A A1 B0 75 70 A8 E1 4A 1B

Deciphered message (HEX):

41 44 98 04 47 44 17 14 00 07 8C 20 C3 7A 75 00 30 25 2F 2F 04 6D 15 0E 13 36 04 13 03 D9  
00 00 04 93 3B 9C AD 00 00 04 93 3C 67 2B 00 00 03 FD 17 07 00 00 02 FD FD 02 65 00 02  
5B 19 00 2F 2F 2F 2F

**Table 5: SND-NR, wM-Bus Security mode 5**

Byte	Field Name	Content	Plain (HEX)	Ciphered (HEX)	Layer
1	L	Length of data = 65 bytes	41	41	LL
2	C	SND-NR + Primary	44	44	LL
3	M	Manufacturer code = ADX	98	98	LL
4	M		04	04	LL
5	A	Serial No (BCD) (= 14174447)	47	47	LL
6	A		44	44	LL
7	A		17	17	LL
8	A		14	14	LL
9	A	Version (=0)	00	00	LL
10	A	Device type (Water Meter = 7)	07	07	LL
11	CI	Extended Link Layer I	8C	8C	ELL
12	CC	Bits: -S-	20	20	ELL
13	ACC	Access	C3	C3	ELL
14	CI		7A	7A	TPL
15	ACC	Access	75	75	TPL
16	Status	No error	00	00	TPL
17	Config	SecMode: 5 EncB: 3 Cont: 00b Bits: -S-	30	30	TPL
18	Config		25	25	TPL
19	APL check	Encryption verification	2F	7E	TPL
20	APL check	Encryption verification	2F	73	TPL
21	DR1	DIF = 32 Bit Integer	04	19	APL
22	DR1	VIF = Date-Time "F"	6D	2C	APL
23	DR1	Value = 2024-06-19 14:21	15	8F	APL
24	DR1		0E	BA	APL
25	DR1		13	7F	APL
26	DR1		36	C7	APL
27	DR2	DIF = 32 Bit Integer	04	D4	APL
28	DR2	VIF = Volume 10 (nnn-6) m3	13	75	APL
29	DR2	Value = 55,555 m3	03	F1	APL
30	DR2		D9	50	APL
31	DR2		00	88	APL
32	DR2		00	66	APL
33	DR3	DIF = 32 Bit Integer	04	47	APL
34	DR3	VIF = Volume 10 (nnn-6) m3	93	E4	APL
35	DR3	VIFE = Forward volume	3B	3C	APL
36	DR3	Value = 44,444 m3	9C	91	APL
37	DR3		AD	BB	APL
38	DR3		00	7E	APL
39	DR3		00	0F	APL
40	DR4	DIF = 32 Bit Integer	04	84	APL
41	DR4	VIF = Volume 10 (nnn-6) m3	93	F4	APL
42	DR4	VIFE = Reverse volume	3C	04	APL
43	DR4	Value = 11,111 m3	67	6D	APL
44	DR4		2B	4A	APL
45	DR4		00	C8	APL
46	DR4		00	AD	APL
47	DR5	DIF = 24 Bit Integer	03	35	APL
48	DR5	VIF	FD	26	APL
49	DR5	VIFE = "Error flags (binary)"	17	76	APL
50	DR5	Value = 7 (wv opened 50%, no errors)	07	16	APL
51	DR5		00	89	APL
52	DR5		00	D8	APL
53	DR6	DIF = 16 Bit Integer	02	0A	APL
54	DR6	VIF	FD	E1	APL

55	DR6	VIFE1	FD	F1	APL
56	DR6	VIFE2 = month(s)	02	1A	APL
57	DR6	Value LSB = 101 months	65	0F	APL
58	DR6		00	1A	APL
59	DR7	DIF = 16 Bit Integer	02	A1	APL
60	DR7	VIF = Temperature Flow 10 (nn-3) °C	5B	B0	APL
61	DR7	Value LSB = 25 °C	19	75	APL
62	DR7		00	70	APL
63	APL filler		2F	A8	APL
64	APL filler		2F	E1	APL
65	APL filler		2F	4A	APL
66	APL filler		2F	1B	APL

### Example 6

Encryption key (HEX):

2B 7E 15 16 28 AE D2 A6 AB F7 15 88 09 CF 4F 3C

Raw ciphered message (HEX):

41 44 98 04 47 44 17 14 00 07 8C 20 21 7A DF 00 30 25 9E FE E5 6E DE CD 55 E5 8A 3F F1  
17 C5 77 A4 FB 02 A0 AA 8B 4D 58 7E 96 EC DD 28 6B 63 4D 56 D2 77 2C 69 C5 EF 2B B1  
B6 D7 F3 C9 99 23 9C 8B 31

Deciphered message (HEX):

41 44 98 04 47 44 17 14 00 07 8C 20 21 7A DF 00 30 25 2F 2F 04 6D A0 0E 14 36 04 13 03 D9  
00 00 04 93 3B 9C AD 00 00 04 93 3C 67 2B 00 00 03 FD 17 03 00 80 02 FD FD 02 65 00 02  
5B 19 00 2F 2F 2F 2F

**Table 6: SND-NR, wM-Bus Security mode 5, alarm “Leakage”**

Byte	Field Name	Content	Plain (HEX)	Ciphered (HEX)	Layer
1	L	Length of data = 65 bytes	41	41	LL
2	C	SND-NR + Primary	44	44	LL
3	M	Manufacturer code = ADX	98	98	LL
4	M		04	04	LL
5	A	Serial No (BCD) (= 14174447)	47	47	LL
6	A		44	44	LL
7	A		17	17	LL
8	A		14	14	LL
9	A	Version (=0)	00	00	LL
10	A	Device type (Water Meter = 7)	07	07	LL
11	CI	Extended Link Layer I	8C	8C	ELL
12	CC	Bits: -S-	20	20	ELL
13	ACC	Access	21	21	ELL
14	CI		7A	7A	TPL
15	ACC	Access	DF	DF	TPL
16	Status	No error	00	00	TPL
17	Config	SecMode: 5 EncB: 3 Cont: 00b Bits: -S-	30	30	TPL
18	Config		25	25	TPL
19	APL check	Encryption verification	2F	9E	TPL
20	APL check	Encryption verification	2F	FE	TPL

21	DR1	DIF = 32 Bit Integer	04	E5	APL
22	DR1	VIF = Date-Time "F"	6D	6E	APL
23	DR1	Value = 2024-06-20 14:32	A0	DE	APL
24	DR1		0E	CD	APL
25	DR1		14	55	APL
26	DR1		36	E5	APL
27	DR2	DIF = 32 Bit Integer	04	8A	APL
28	DR2	VIF = Volume 10 (nnn-6) m3	13	3F	APL
29	DR2	Value = 55,555 m3	03	F1	APL
30	DR2		D9	17	APL
31	DR2		00	C5	APL
32	DR2		00	77	APL
33	DR3	DIF = 32 Bit Integer	04	A4	APL
34	DR3	VIF = Volume 10 (nnn-6) m3	93	FB	APL
35	DR3	VIFE = Forward volume	3B	02	APL
36	DR3	Value = 44,444 m3	9C	A0	APL
37	DR3		AD	AA	APL
38	DR3		00	8B	APL
39	DR3		00	4D	APL
40	DR4	DIF = 32 Bit Integer	04	58	APL
41	DR4	VIF = Volume 10 (nnn-6) m3	93	7E	APL
42	DR4	VIFE = Reverse volume	3C	96	APL
43	DR4	Value = 11,111 m3	67	EC	APL
44	DR4		2B	DD	APL
45	DR4		00	28	APL
46	DR4		00	6B	APL
47	DR5	DIF = 24 Bit Integer	03	63	APL
48	DR5	VIF	FD	4D	APL
49	DR5	VIFE = "Error flags (binary)"	17	56	APL
50	DR5	Value = 8388611 (WV opened 50%, alarm "Leakage")	03	D2	APL
51	DR5		00	77	APL
52	DR5		80	2C	APL
53	DR6	DIF = 16 Bit Integer	02	69	APL
54	DR6	VIF	FD	C5	APL
55	DR6	VIFE1	FD	EF	APL
56	DR6	VIFE2 = month(s)	02	2B	APL
57	DR6	Value LSB = 101 months	65	B1	APL
58	DR6		00	B6	APL
59	DR7	DIF = 16 Bit Integer	02	D7	APL
60	DR7	VIF = Temperature Flow 10 (nn-3) °C	5B	F3	APL
61	DR7	Value LSB = 25 °C	19	C9	APL
62	DR7		00	99	APL
63	APL filler		2F	23	APL
64	APL filler		2F	9C	APL
65	APL filler		2F	8B	APL
66	APL filler		2F	31	APL

### Example 7

Encryption key (HEX):

2B 7E 15 16 28 AE D2 A6 AB F7 15 88 09 CF 4F 3C

Raw ciphered message (HEX):

41 44 98 04 47 44 17 14 00 07 8C 20 16 7A FA 00 30 25 13 6C BB EA 92 C9 A4 DE 71 FF 6E  
 61 0E 8D AE E3 05 8C 98 3C D3 5B A9 25 92 EB 42 F3 03 0C 6F 2F 5C 42 60 8C 0F 28 DA  
 40 FB F5 31 99 02 3F F8 72

Deciphered message (HEX):

41 44 98 04 47 44 17 14 00 07 8C 20 16 7A FA 00 30 25 2F 2F 04 6D BA 0E 14 36 04 13 03 D9  
 00 00 04 93 3B 9C AD 00 00 04 93 3C 67 2B 00 00 03 FD 17 01 00 10 02 FD FD 02 65 00 02  
 5B 19 00 2F 2F 2F 2F

**Table 7: SND-NR, wM-Bus Security mode 5, alarm “Burst”**

Byte	Field Name	Content	Plain (HEX)	Ciphered (HEX)	Layer
1	L	Length of data = 65 bytes	41	41	LL
2	C	SND-NR + Primary	44	44	LL
3	M	Manufacturer code = ADX	98	98	LL
4	M		04	04	LL
5	A	Serial No (BCD) (= 14174447)	47	47	LL
6	A		44	44	LL
7	A		17	17	LL
8	A		14	14	LL
9	A	Version (=0)	00	00	LL
10	A	Device type (Water Meter = 7)	07	07	LL
11	CI	Extended Link Layer I	8C	8C	ELL
12	CC	Bits: -S-	20	20	ELL
13	ACC	Access	C3	C3	ELL
14	CI		7A	7A	TPL
15	ACC	Access	75	75	TPL
16	Status	No error	00	00	TPL
17	Config	SecMode: 5 EncB: 3 Cont: 00b Bits: -S-	30	30	TPL
18	Config		25	25	TPL
19	APL check	Encryption verification	2F	13	TPL
20	APL check	Encryption verification	2F	6C	TPL
21	DR1	DIF = 32 Bit Integer	04		APL
22	DR1	VIF = Date-Time "F"	6D	BB	APL
23	DR1	Value = 2024-06-20 14:58	BA	EA	APL
24	DR1		0E	92	APL
25	DR1		14	C9	APL
26	DR1		36	A4	APL
27	DR2	DIF = 32 Bit Integer	04	DE	APL
28	DR2	VIF = Volume 10 (nnn-6) m3	13	71	APL
29	DR2	Value = 55,555 m3	03	FF	APL
30	DR2		D9	6E	APL
31	DR2		00	61	APL
32	DR2		00	0E	APL
33	DR3	DIF = 32 Bit Integer	04	8D	APL
34	DR3	VIF = Volume 10 (nnn-6) m3	93	AE	APL
35	DR3	VIFE = Forward volume	3B	E3	APL
36	DR3	Value = 44,444 m3	9C	05	APL
37	DR3		AD	8C	APL
38	DR3		00	98	APL
39	DR3		00	3C	APL
40	DR4	DIF = 32 Bit Integer	04	D3	APL
41	DR4	VIF = Volume 10 (nnn-6) m3	93	5B	APL

42	DR4	VIFE = Reverse volume	3C	A9	APL
43	DR4	Value = 11,111 m3	67	25	APL
44	DR4		2B	92	APL
45	DR4		00	EB	APL
46	DR4		00	42	APL
47	DR5	DIF = 24 Bit Integer	03	F3	APL
48	DR5	VIF	FD	03	APL
49	DR5	VIFE = "Error flags (binary)"	17	0C	APL
50	DR5	Value = 8388611 (WV opened 100%, alarm "Burst")	01	6F	APL
51	DR5		00	2F	APL
52	DR5		10	5C	APL
53	DR6	DIF = 16 Bit Integer	02	42	APL
54	DR6	VIF	FD	60	APL
55	DR6	VIFE1	FD	8C	APL
56	DR6	VIFE2 = month(s)	02	0F	APL
57	DR6	Value LSB = 101 months	65	28	APL
58	DR6		00	DA	APL
59	DR7	DIF = 16 Bit Integer	02	40	APL
60	DR7	VIF = Temperature Flow 10 (nn-3) °C	5B	FB	APL
61	DR7	Value LSB = 25 °C	19	F5	APL
62	DR7		00	31	APL
63	APL filler		2F	99	APL
64	APL filler		2F	02	APL
65	APL filler		2F	3F	APL
66	APL filler		2F	F8	APL

### Example 8

Encryption key (HEX):

2B 7E 15 16 28 AE D2 A6 AB F7 15 88 09 CF 4F 3C

Raw ciphered message (HEX):

41 44 98 04 47 44 17 14 00 07 8C 20 56 7A D9 00 30 25 4C 63 7A D2 C3 2B C3 54 BF E4 5A  
91 9A A6 E6 22 46 59 AA 8C 50 E1 EB FD D4 EE 79 77 86 0B 11 8B D6 E3 13 0E 6A E1 02  
EA 85 4A 89 F7 B2 06 B1 76

Deciphered message (HEX):

41 44 98 04 47 44 17 14 00 07 8C 20 56 7A D9 00 30 25 2F 2F 04 6D 81 0F 14 36 04 13 03 D9  
00 00 04 93 3B 9C AD 00 00 04 93 3C 67 2B 00 00 03 FD 17 01 40 00 02 FD FD 02 65 00 02  
5B 19 00 2F 2F 2F 2F

**Table 8: SND-NR, wM-Bus Security mode 5, alarm "Meter case opened"**

Byte	Field Name	Content	Plain (HEX)	Ciphered (HEX)	Layer
1	L	Length of data = 65 bytes	41	41	LL
2	C	SND-NR + Primary	44	44	LL
3	M	Manufacturer code = ADX	98	98	LL
4	M		04	04	LL
5	A	Serial No (BCD) (= 14174447)	47	47	LL
6	A		44	44	LL

7	A		17	17	LL
8	A		14	14	LL
9	A	Version (=0)	00	00	LL
10	A	Device type (Water Meter = 7)	07	07	LL
11	CI	Extended Link Layer I	8C	8C	ELL
12	CC	Bits: -S-	20	20	ELL
13	ACC	Access	C3	C3	ELL
14	CI		7A	7A	TPL
15	ACC	Access	75	75	TPL
16	Status	No error	00	00	TPL
17	Config	SecMode: 5 EncB: 3 Cont: 00b Bits: -S-	30	30	TPL
18	Config		25	25	TPL
19	APL check	Encryption verification	2F	4C	TPL
20	APL check	Encryption verification	2F	63	TPL
21	DR1	DIF = 32 Bit Integer	04	7A	APL
22	DR1	VIF = Date-Time "F"	6D	D2	APL
23	DR1	Value = 2024-06-20 15:01	81	C3	APL
24	DR1		0F	2B	APL
25	DR1		14	C3	APL
26	DR1		36	54	APL
27	DR2	DIF = 32 Bit Integer	04	BF	APL
28	DR2	VIF = Volume 10 (nnn-6) m3	13	E4	APL
29	DR2	Value = 55,555 m3	03	5A	APL
30	DR2		D9	91	APL
31	DR2		00	9A	APL
32	DR2		00	A6	APL
33	DR3	DIF = 32 Bit Integer	04	E6	APL
34	DR3	VIF = Volume 10 (nnn-6) m3	93	22	APL
35	DR3	VIFE = Forward volume	3B	46	APL
36	DR3	Value = 44,444 m3	9C	59	APL
37	DR3		AD	AA	APL
38	DR3		00	8C	APL
39	DR3		00	50	APL
40	DR4	DIF = 32 Bit Integer	04	E1	APL
41	DR4	VIF = Volume 10 (nnn-6) m3	93	EB	APL
42	DR4	VIFE = Reverse volume	3C	FD	APL
43	DR4	Value = 11,111 m3	67	D4	APL
44	DR4		2B	EE	APL
45	DR4		00	79	APL
46	DR4		00	77	APL
47	DR5	DIF = 24 Bit Integer	03	86	APL
48	DR5	VIF	FD	0B	APL
49	DR5	VIFE = "Error flags (binary)"	17	11	APL
50	DR5	Value = 8388611 (WV opened 100%, alarm "Meter case opened")	01	8B	APL
51	DR5		40	D6	APL
52	DR5		00	E3	APL
53	DR6	DIF = 16 Bit Integer	02	13	APL
54	DR6	VIF	FD	0E	APL
55	DR6	VIFE1	FD	6A	APL
56	DR6	VIFE2 = month(s)	02	E1	APL
57	DR6	Value LSB = 101 months	65	02	APL
58	DR6		00	EA	APL
59	DR7	DIF = 16 Bit Integer	02	85	APL
60	DR7	VIF = Temperature Flow 10 (nn-3) °C	5B	4A	APL
61	DR7	Value LSB = 25 °C	19	89	APL
62	DR7		00	F7	APL
63	APL filler		2F	B2	APL
64	APL filler		2F	06	APL
65	APL filler		2F	B1	APL

66	APL filler		2F	76	APL
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