LANSEN

Integration Manual

Wireless M-BUS Gateway 5 LTE-M1 or CAT1/4G

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Table of Contents

Introduction

This Integration manual explains how to integrate the Wireless M-Bus Gateway 5 with *Head-End Systems* (*HES*). It covers *MQTT message structures* and data format, which follows the *EN 13757-4 standard*. The Gateway 5 does not decrypt or parse the data. It forwards the data packets as received and prepends metadata such as *RSSI*, *timestamp*, and *gateway ID*. This ensures data integrity is preserved.

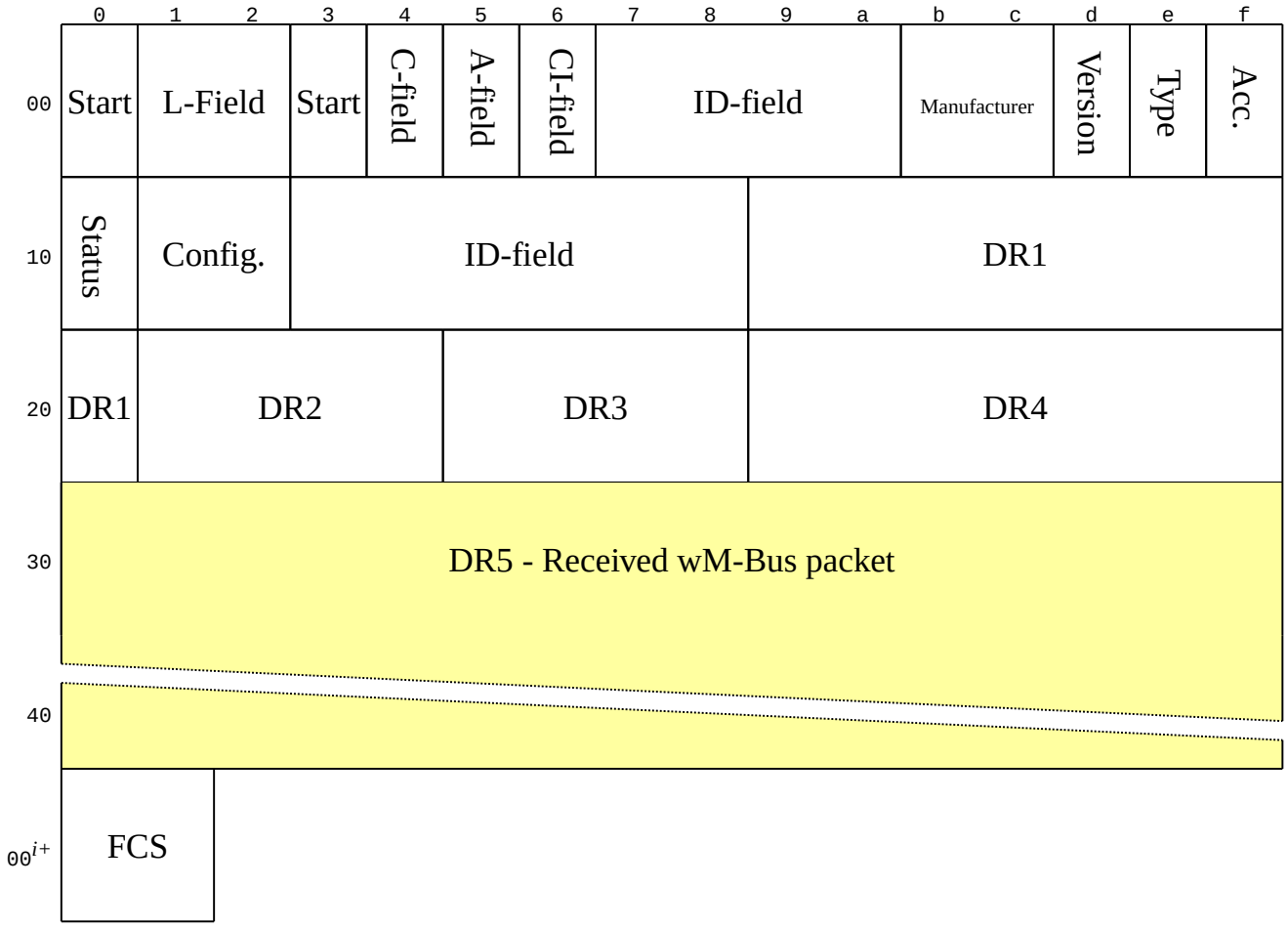


Figure 1. MQTT header structure.

Verify correct device and version

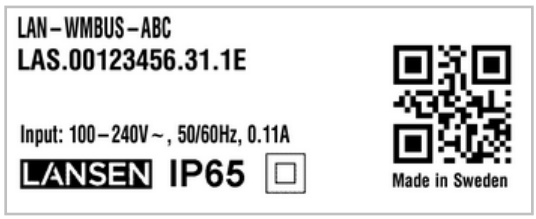
This document applies to Gateway 5 devices with *protocol version 30 (1E)*. Find the protocol version by looking at the label on the device or by inspecting the data packets sent by the device.

Protocol version in data packets

The *protocol version* is included in the data field *A-Field Protocol version*. For more information, see Status packet.

Protocol version in device label

Find the unique device identifier on the device label.



Example 1. The protocol version is the last segment of the unique identifier.

LAN.00123456.31.**1E**

MQTT Traffic

This chapter describes how to interpret data packets from a Gateway 5.

The number `01234567` below is an example of a device serial number.

The topics for the gateway are:

Data posted from the gateway	`LAS/W/D/01234567`
Configuration to the gateway	`LAS/W/C/01234567`
Response of configuration from the gateway	`LAS/W/R/01234567`
Gateway ready to accept configuration data	`LAS/W/I/01234567`

Packets are sent with Quality of Service (QoS) set to 0. The MQTT server does not need to reply to the message. TCP/IP handles the transmission, ACK, and QoS automatically.

If the connection is lost, the gateway stores data in its flash memory. This applies to battery-powered devices also.

If a transmission is lost, the gateway will resend the undelivered telegram to the server when the connection is active again.

Example 2. A packet sent from the gateway. The MQTT header is in red, the received wM-Bus packet is in yellow and the wM-Bus data is in green.

30 A0 01 00 10 4C 41 53 2F 57 2F 44 2F 30 30 30 34 36 31 35 33 68 88 88 68 08 FD 72 97 42 04 00 33 30 0B 32 58 00 00 00 0C 78 53 61 04 00 06 6D 58 84 95 DE 26 5B 01 FD 71 A3 8C 40 78 97 42 04 00 81 40 FD F1 94 74 00 0D FD 3B 55 54 44 33 30 97 42 04 00 0B 32 7A C4 00 00 40 2F 2F 04 FD 3A D3 C4 00 00 82 40 FD 3A 1E 01 02 FD 0F 95 00 81 80 40 FD 3A 00 84 C0 40 FD 3A A6 99 00 00 42 FD 3A 19 00 82 01 FD 3A 87 05 C1 01 FD 3A 7F 82 02 FD 3A E0 01 06 6D 1A 04 95 DE 26 00 02 FD 46 0B 0D B2 16

Packet sent by gateway with wM-Bus container

The data is packed into a wM-Bus container data record. See Table 1.

Table 1. Data records of an MQTT packet

Data Record	Description
DR1	Time the packet was received
DR2	Signal strength of the received packet Note: Interpret the value using two's complement.
DR3	If packet received from a repeater: Repeater serial number. Otherwise value is 0xFFFFFFFF
DR4	RSSI value that the repeater received the packet. RSSI 0-100, 0 is the best and 100 is the worst. 0xFF means the value is not used
DR5	Wireless M-Bus data received.

Example 3. A complete MQTT packet

Data Link layer

Byte No.	Field Name	Content	Info	Byte data (example)
1	Start	Start-byte		0x68
2	L-Field	Telegram length	If packet is longer than 255 then both L-fields should be added, otherwise the L-fields are the same.	0x45
3	L-field	Telegram length		0x45
4	Start	Start-byte		0x68
5	C-Field	ACC-DMD		0x08
6	A-Field	Primary addressing	0xFD = Use secondary addressing	0xFD

Transport layer

Byte No.	Field Name	Content	Info	Byte data (example)
7	CI-Field	Long header (0x72)		0x72
8	ID-Field	Identification number (LSB)	**Example:** 33221100	0x00
9	ID-Field	Identification number		0x11
10	ID-Field	Identification number		0x22
11	ID-Field	Identification number (MSB)		0x33
12	Manufacturer	Manufacturer code (LSB)	LAS	0x33
13	Manufacturer	Manufacturer code (MSB)		0x30
14	Version	Version		0x07
15	Type	Device type		0x1B
16	Acc.	Access number		0x01
17	Status	Errors and alerts		0x00
18	Config.	Configuration field	**Example:** Encryption off	0x00
19	Config.	Configuration field		0x00

Application layer

Byte No.	Field Name	Content	Info	Byte data (example)
20	ID-Field	DIF	8-digit BCD	0x0C
21	ID-Field	VIF	Fabrication number	0x78
22	ID-Field	Gateway serial number (LSB)	**Example:** 00000008	0x08
23	ID-Field	Gateway serial number		0x00
24	ID-Field	Gateway serial number		0x00
25	ID-Field	Gateway serial number (MSB)		0x00

Data record 1: Time the packet was received

Byte No.	Field Name	Content	Info	
26	DR1	DIF	48-bit integer	0x06
27	DR1	VIF	Time Type I format	0x6D
28	DR1	Received time (LSB)	**Example:** 2000-01-01 00:01:02	0x02
29	DR1	Received time		0x01
30	DR1	Received time		0xC0
31	DR1	Received time		0x01
32	DR1	Received time		0x01
33	DR1	Received time (MSB)		0x00

Data record 2: Signal strength of the received packet

Byte No.	Field Name	Content	Info	
34	DR2	DIF	8-bit integer	0x01
35	DR2	VIF	Extension	0xFD
36	DR2	VIF	RSSI	0x71
37	DR2	Value	**Example:** 118	0x76

Data record 3: If packet received from a repeater: Repeater serial number. Otherwise value is 0xFFFFFFFF

Byte No.	Field Name	Content	Info	
38	DR3	DIF	8 digit BCD	0x8C
39	DR3	DIFE	Subunit 1	0x40
40	DR3	VIF	Fabrication number	0x78
41	DR3	Repeater serial number (LSB)	**Example:** 00000009	0x09
42	DR3	Repeater serial number		0x00
43	DR3	Repeater serial number		0x00
44	DR3	Repeater serial number (MSB)		0x00

Data record 4: RSSI value that the repeater received the packet.

Byte No.	Field Name	Content	Info	
45	DR4	DIF	8-bit integer	0x81
46	DR4	DIFE	Subunit 1	0x40
47	DR4	VIF	Extension	0xFD
48	DR4	VIFE	RSSI	0xF1
49	DR4	VIFE	Relative deviation	0x94
50	DR4	VIFE	Multiplier (0.01)	0x74
51	DR4	Value	RSSI of repeater (0-100%) **Note:** 0xFF = Not used **Example:** 70	0x46

Data record 5: Wireless M-Bus data received.

Byte No.	Field Name	Content	Info	
52	DR5	DIF	Variable length	0x0D
53	DR5	VIF	Extension	0xFD
54	DR5	VIFE	Data container for wireless M-Bus protocol	0x3B
55	DR5	LVAR	**Example:** 50	0x32
56	DR5	Telegram content starting with the L-field in the contained wireless MBUS packet		0x8C
57	...		...	
58	DR5	Last byte of the telegram		0x06

Data Link layer frame check sequence

Byte No.	Field Name	Content	Info	Byte data (example)
59	Checksum			0x
60	Stop-byte			0x16

The response from the Gateway 5

The packet is always sent to the topic `LAS/W/R/12345678`, where `12345678` is the serial number of the gateway.

After the header, the configuration data is added – The configuration data is also referred to as ENAPI Data. A Non-Disclosure Agreement (NDA) is required to receive the ENAPI commands and structure from Lansen.

Example 4. Response packet

Data Link layer

Byte No	Field Name	Content	Info	Byte data
1	L-Field	Length of data		0x
2	C-Field	RSP-UD		0x08
3	M-Field	Meter Manufacturer code (LAS)		0x33
4	M-Field	Meter Manufacturer code (LAS)		0x30
5	A-Field	Serial NO LSB (BCD)		0x78
6	A-Field	Serial NO (BCD)		0x56
7	A-Field	Serial NO (BCD)		0x34
8	A-Field	Serial NO MSB (BCD) of GW		0x12
9	A-Field	Version		0x0A
10	A-Field	Device type		0x31

Transport layer

Byte No	Field Name	Content	Info	Byte data
11	CI-Field	Short transport header		0x7A
12	Access No.	Access number of gateway		0x75
13	Status	Meter state (Low battery)	**Example**: Low battery	0x04
14	Config Field			0x00
15	Config Field			0x00
16	AES-Verify	Encryption verification		0x2F
17	AES-Verify	Encryption verification		0x2F

Short Status packet

The packet is always sent to the topic `LAS/W/S/12345678` where `12345678` is the serial number of the gateway.

A short status packet contains information and settings about the gateway.

A short status packet is sent:

- Every 12 h over the MQTT interface.
- On every new connection to the MQTT server.

Table 2. Data records of the Short Status packet.

Data Record	Description
DR1	Software version of gateway
DR2	Revision of the gateway modem
DR3	Hardware model
DR4	Hardware version
DR5	Current battery level. Battery level is always 3600 for battery version and 5000 for mains version
DR6	Number of seconds the modem has been active

Data Record	Description
DR7	Timestamp for last change done on the gateway configuration
DR8	Timestamp for last change done on the gateway meter list
DR9	Extension card type
DR10	Extension card software version
DR11	Network interface type
DR12	Network interface used
DR13	Network interface card software version

Example 5. A short status packet

Data Link layer

Byte No.	Field Name	Content	Info	Byte data (example)
1	Start	Start-byte		0x68
2	L-Field	Telegram length	If packet is longer than 255 then both L-fields should be added, otherwise the L-fields are the same.	0x45
3	L-field	Telegram length		0x45
4	Start	Start-byte		0x68
5	C-Field	SND_NR		0x44
6	A-Field	Primary addressing	0xFD = Use secondary addressing	0xFD

Transport layer

Byte No.	Field Name	Content	Info	Byte data (example)
7	CI-Field	Long header (0x72)		0x72
8	ID-Field	Identification number (LSB)	**Example:** 33221100	0x00
9	ID-Field	Identification number		0x11
10	ID-Field	Identification number		0x22
11	ID-Field	Identification number (MSB)		0x33
12	Manufacturer	Manufacturer code (LSB)	LAS	0x33
13	Manufacturer	Manufacturer code (MSB)		0x30
14	Version	Version		0x07
15	Type	Device type		0x1B
16	Acc.	Access number		0x01
17	Status	Errors and alerts	**Example:** Low battery	0x04
18	Config.	Configuration field	**Example:** Encryption off	0x00
19	Config.	Configuration field		0x00

Data record 1: Version of the gateway

Byte No.	Field Name	Content	Info	Byte data (example)
20	DR1	DIF	16-bit integer	0x02
21	DR1	VIF	Extension table	0xFD
22	DR1	VIFE	Version	0x0F
23	DR1	Value (LSB)	**Example:** 120 (0x0078)	0x78
24	DR1	Value (MSB)		0x00

Data record 2: Revision of the modem

Byte No.	Field Name	Content	Info	Byte data (example)
25	DR2	DIF	Variable Length	0xCD
26	DR2	DIFE	Storage 11	0x05
27	DR2	VIF	Extension table	0xFD
28	DR2	VIFE	Dimensionless	0x3A
29	DR2	LVAR	Modem revision string length (10-35 bytes)	0x11
30	DR2	Revision Ascii string (LSB)		0x32
31	DR2	Revision Ascii string		0x33
32	DR2	Revision Ascii string		0x37
33	DR2	Revision Ascii string		0x34
34	DR2	Revision Ascii string		0x42
35	DR2	Revision Ascii string		0x30
36	DR2	Revision Ascii string		0x31
37	DR2	Revision Ascii string		0x53
38	DR2	Revision Ascii string	**Example:** 2374B01SIM767XM5A	0x49
39	DR2	Revision Ascii string		0x4D
40	DR2	Revision Ascii string		0x37
41	DR2	Revision Ascii string		0x36
42	DR2	Revision Ascii string		0x37
43	DR2	Revision Ascii string		0x58
44	DR2	Revision Ascii string		0x4D
45	DR2	Revision Ascii string		0x35
46	DR2	Revision Ascii string MSB		0x41

Data record 3: Hardware model

Byte No.	Field Name	Content	Info	Byte data (example)
47	DR3	DIF	8-bit integer	0x01
48	DR3	VIF	Extension table	0xFD
49	DR3	VIFE	Model version	0x0C
50	DR3	Value	**Example:** 0x01	0x01

Data record 4: Hardware version

Byte No.	Field Name	Content	Info	Byte data (example)
51	DR4	DIF	8-bit integer	0x01
52	DR4	VIF	Extension table	0xFD
53	DR4	VIFE	Hardware version	0x0D
54	DR4	Value	**Example:** 0x01	0x01

Data record 5: Current battery level

Byte No.	Field Name	Content	Info	Byte data (example)
55	DR5	DIF	16-bit integer	0x02
56	DR5	DIFE	Extension table	0xFD
57	DR5	VIF	Voltage (mV)	0x46
58	DR5	Value (LSB)	**Example:** 3600 (0x0E10)	0x10
59	DR5	Value (MSB)		0x0E

Data record 6: Number of seconds the modem has been active

Byte No.	Field Name	Content	Info	Byte data (example)
60	DR6	DIF	32-bit integer	0x04
61	DR6	VIF	Operating time s	0x24
62	DR6	Value (LSB)	**Example:** 9173511 s	0x07
63	DR6	Value		0xFA
64	DR6	Value		0x8B
65	DR6	Value (MSB)		0x00

Data record 7: Timestamp for configuration

Byte No.	Field Name	Content	Info	Byte data (example)
66	DR7	DIF	32-bit integer	
67	DR7	VIF	Timestamps in s for last change of the configuration	
68	DR7	Value (LSB)	**Example:** 1737368574 s	
69	DR7	Value		
70	DR7	Value		
70	DR7	Value (MSB)		

Data record 8: Timestamp for last change done on the gateway meter list

Byte No.	Field Name	Content	Info	Byte data
71	DR8	DIF	32-bit integer	
72	DR8	VIF	Timestamps in s for last change of the meter list	

Byte No.	Field Name	Content	Info	Byte data
73	DR8	Value (LSB)	**Example:** 1737368575 s	
74	DR8	Value		
75	DR8	Value		
76	DR8	Value (MSB)		

Data record 9: Extension card type

Byte No.	Field Name	Content	Info	Byte data
77	DR9	DIF	8-bit integer	0x01
78	DR9	VIF	Extension table	0xFD
79	DR9	VIFE	Dimensionless	0x3A
80	DR9	Value	**Example:** Pulse	0x01

Data record 10: Extension card software version

Byte No.	Field Name	Content	Info	Byte data
81	DR10	DIF	16-bit integer	0x02
82	DR10	VIF	Extension card version	0xFD
83	DR10	ViFE	Dimensionless	0x3A
84	DR10	Value (LSB)	**Example:** 1.0	0x01
85	DR10	Value (MSB)		0x00

Data record 11: Network interface type

Byte No.	Field Name	Content	Info	Byte data
86	DR11	DIF	8-bit integer	0x01
87	DR11	VIF	Extension table	0xFD
88	DR11	VIFE	Network interface type	0x3A
89	DR11	Value	**Example:** ETH	0x01

Data record 12: Network interface used

Byte No.	Field Name	Content	Info	Byte data
90	DR12	DIF	8-bit integer	0x01
91	DR12	VIF	Extension table	0xFD
92	DR12	VIFE	Dimensionless	0x3A
93	DR12	Value	**Example:** ETH	0x01

Data record 13: Network interface card software version

Byte No.	Field Name	Content	Info	Byte data
94	DR13	DIF	16-bit integer	0x02
95	DR13	VIF	Extension table	0xFD
96	DR13	VIFE	Dimensionless	0xFD

Byte No.	Field Name	Content	Info	Byte data
97	DR13	Value (LSB)	**Example:** v1.0	0x01
98	DR13	Value (MSB)		0x00

Status packet

A status packet contains information and settings about the gateway.

A status packet is sent:

- Every 12 h over the MQTT interface.
- On every new connection to the MQTT server.
- Every minute over the wM-Bus interface (default in C mode, frame format A).

Table 3. Data records of a Status packet.

Data Record	Description
DR1	Total number of packets transmitted over MQTT since power up
DR2	Used routing slots (maximum 2000) used (whitelist devices).
DR3	Software version of gateway
DR4	Is the bridge listening now? (1=Yes, 0=NO)
DR5	Seconds to mode change (Listen→Sleep or Sleep→Listen). Maximum 32767 s
DR6	Value on parameter **Listen timer**
DR7	Value on parameter **Pause timer** (0=The gateway will always listen)
DR8	Weekday(s) the gateway is listening. See Table 5 for more information
DR9	Value on parameter **Start time**, shown as minutes after midnight (-1=Not used)
DR10	Current time
DR11	Current battery level. Battery level is always 3600 for battery version and 5000 for mains version
DR12	IMEI number
DR13	ICCID number of SIM-card number
DR14	RSSI in the LTE M1 network (connection between the gateway and the base station)
DR15	Hardware model
DR16	Hardware version
DR17	On time (days) since powerup
DR18	Number of seconds the modem has been active
DR19	Number of seconds the wM-Bus radio has been in listen mode
DR20	Weekday(s) the gateway will upload data. See Table 5 for more information **Note:** Has no function if parameter **MQTT Always Online** is enabled.
DR21	The time the modem will upload stored data, shown as minutes after midnight (-1=Not used) **Note:** Has no function if parameter **MQTT Always Online** is enabled.
DR22	The interval the modem uploads data. Maximum 1440 min (24 h). Can be combined with days to upload data (see DR20).
DR23	Number of NTP server connection retries since last successful NTP connection.

Data Record	Description
DR24	Month/day(s) the gateway will upload data. **Note:** Has no function if parameter **MQTT Always Online** is enabled.
DR25	Weeks the gateway uploads data. 1 = Every week, 2 = Every other week, 3 = Every third week etc. **Note:** Has no function if parameter **MQTT Always Online** is enabled.
DR26	Month/days(s) the gateway is listening.
DR27	Weekdays the gateway is listening
DR28	Extension card type
DR29	Extension card software version
DR30	Network interface type
DR31	Network interface card software version

Example 6. A status packet.

Data Link layer

Byte No.	Field Name	Content	Info	Byte data (example)
1	Start	Start-byte		0x68
2	L-Field	Telegram length	If packet is longer than 255 then both L-fields should be added, otherwise the L-fields are the same.	0x45
3	L-field	Telegram length		0x45
4	Start	Start-byte		0x68
5	C-Field	SND_NR		0x44
6	A-Field	Primary addressing	0xFD = Use secondary addressing	0xFD

Transport Layer

Byte No.	Field Name	Content	Info	Byte data (example)
7	CI-Field	Long header (0x72)		0x72
8	ID-Field	Identification number (LSB)	**Example:** 33221100	0x00
9	ID-Field	Identification number		0x11
10	ID-Field	Identification number		0x22
11	ID-Field	Identification number (MSB)		0x33
12	Manufacturer	Manufacturer code (LSB)	LAS	0x33
13	Manufacturer	Manufacturer code (MSB)		0x30
14	Version	Version		0x07
15	Type	Device type		0x1B
16	Acc.	Access number		0x01
17	Status	Errors and alerts	**Example**: Low battery	0x04
18	Config.	Configuration field	**Example:** Encryption off	0x00
19	Config.	Configuration field		0x00

Application Layer

Byte No.	Field Name	Content	Info	Byte data (example)
20	ID-Field	DIF	8-digit BCD	0x0C
21	ID-Field	VIF	Fabrication number	0x78
22	ID-Field	Gateway serial number (LSB)	**Example:** 00000008	0x08
23	ID-Field	Gateway serial number		0x00
24	ID-Field	Gateway serial number		0x00
25	ID-Field	Gateway serial number (MSB)		0x00

Data record 1: Number of total packets transmitted over MQTT since power up

Byte No.	Field Name	Content	Info	Byte data (example)
26	DR1	DIF	32-bit integer	0x04
27	DR1	VIF	Extension table	0xFD
28	DR1	VIFE	Dimensionless	0x3A
29	DR1	Value (LSB)	**Example:** 65793 (0x010101)	0x01
30	DR1	Value		0x01
31	DR1	Value		0x01
32	DR1	Value (MSB)		0x00

Data record 2: Used routing slots

Byte No.	Field Name	Content	Info	Byte data (example)
33	DR2	DIF	16-bit integer + Extension	0x82
34	DR2	DIFE	Subunit 1	0x40
35	DR2	VIF	Extension table	0xFD
36	DR2	VIFE	Dimensionless	0x3A
37	DR2	Value (LSB)	**Example:** 521 (0x0209)	0x09
38	DR2	Value (MSB)		0x02

Data record 3: Software version of gateway

Byte No.	Field Name	Content	Info	Byte data (example)
39	DR3	DIF	16-bit integer	0x02
40	DR3	VIF	Extension table	0xFD
41	DR3	VIFE	Version	0x0F
42	DR3	Value (LSB)	**Example:** 120 (0x0078)	0x78
43	DR3	Value (MSB)		0x00

Data record 4: Is the bridge listening now? (1=Yes, 0=NO)

Byte No.	Field Name	Content	Info	Byte data (example)
44	DR4	DIF	8-bit integer + Extension	0x81
45	DR4	DIFE	Subunit 2	0x80
46	DR4	DIFE	Subunit 2	0x40
47	DR4	VIF	Extension table	0xFD
48	DR4	VIFE	Dimensionless	0x3A
49	DR4	Value	**Example:** Yes (0x01)	0x01

Data record 5: Seconds to mode change

Byte No.	Field Name	Content	Info	Byte data (example)
50	DR5	DIF	32-bit integer + Extension	0x84
51	DR5	DIFE	Subunit 3	0xC0
52	DR5	DIFE	Subunit 3	0x40
53	DR5	VIF	Extension table	0xFD
54	DR5	VIFE	Dimensionless	0x3A
55	DR5	Value (LSB)	**Example:** 5803 (0x000016AB)	0xAB
56	DR5	Value		0x16
57	DR5	Value		0x00
58	DR5	Value (MSB)		0x00

Data record 6: Value on parameter **Listen timer**

Byte No.	Field Name	Content	Info	Byte data (example)
59	DR6	DIF	16-bit integer + Storage 1	0x42
60	DR6	VIF	Extension table	0xFD
61	DR6	VIFE	Dimensionless	0x3A
62	DR6	Value (LSB)	**Example:** 20 (0x0014)	0x14
63	DR6	Value (MSB)		0x00

Data record 7: Value on parameter **Pause timer**

Byte No.	Field Name	Content	Info	Byte data (example)
64	DR7	DIF	16-bit integer + Extension	0x82
65	DR7	DIFE	Storage 2	0x01
66	DR7	VIF	Extension table	0xFD
67	DR7	VIFE	Dimensionless	0x3A
68	DR7	Value (LSB)	**Example:** 1420 (0x058C)	0x8C
69	DR7	Value (MSB)		0x05

Data record 8: Weekdays the gateway is listening

Byte No.	Field Name	Content	Info	Byte data (example)
70	DR8	DIF	8-bit integer + Storage + Extension	0xC1
71	DR8	DIFE	Storage 3	0x01
72	DR8	VIF	Extension table	0xFD
73	DR8	VIFE	Dimensionless	0x3A
74	DR8	Value	**Example:** Mondays **Note:** See Table 5 for more info.	0x02

Data record 9: Value on parameter **Start time**, *shown as minutes after midnight*

Byte No.	Field Name	Content	Info	Byte data (example)
75	DR9	DIF	16-bit integer + Extension	0x82
76	DR9	DIFE	Storage 4	0x02
77	DR9	VIF	Extension table	0xFD
78	DR9	VIFE	Dimensionless	0x3A
79	DR9	Value (LSB)	**Example:** 10:01 (0x0259)	0x59
80	DR9	Value (MSB)		0x02

Data record 10: Current time

Byte No.	Field Name	Content	Info	Byte data (example)
81	DR10	DIF	48-bit integer	0x06
82	DR10	VIF	Time Type I format	0x6D
83	DR10	Current Time	**Example**: 2001-0101 00:01:02	0x02
84	DR10	Current Time		0x01
85	DR10	Current Time		0xC0
86	DR10	Current Time		0x01
87	DR10	Current Time		0x01
88	DR10	Current Time		0x00

Data record 11: Current battery level

Byte No.	Field Name	Content	Info	Byte data (example)
89	DR11	DIF	16-bit integer	0x02
90	DR11	DIFE	Extension table	0xFD
91	DR11	VIF	Voltage (mV)	0x46
92	DR11	Value (LSB)	**Example:** 3600 (0x0E10)	0x10
93	DR11	Value (MSB)		0x0E

Data record 12: IMEI number

Byte No.	Field Name	Content	Info	Byte data (example)
94	DR12	DIF	Variable Length	0xCD
95	DR12	DIFE	Storage 5	0x02
96	DR12	VIFE	Extension table	0xFD
97	DR12	VIF	Dimensionless	0x3A
98	DR12	LVAR	EMEI string length (15 bytes)	0x0F
99	DR12	EMEI Ascii string (LSB)	**Example:** 012345678901234	0x34
100	DR12	EMEI Ascii string		0x33
101	DR12	EMEI Ascii string		0x32
102	DR12	EMEI Ascii string		0x31
103	DR12	EMEI Ascii string		0x30
104	DR12	EMEI Ascii string		0x39
105	DR12	EMEI Ascii string		0x38
106	DR12	EMEI Ascii string		0x37
107	DR12	EMEI Ascii string		0x36
108	DR12	EMEI Ascii string		0x35
109	DR12	EMEI Ascii string		0x34
110	DR12	EMEI Ascii string		0x33
111	DR12	EMEI Ascii string		0x32
112	DR12	EMEI Ascii string		0x31
113	DR12	EMEI Ascii string (MSB)		0x30

Data record 13: ICCID number of SIM-card number

Byte No.	Field Name	Content	Info	Byte data (example)
114	DR13	DIF	Variable Length	0x8D
115	DR13	DIFE	Storage 6	0x03
116	DR13	VIF	Extension table	0xFD
117	DR13	VIFE	Dimensionless	0x3A
118	DR13	LVAR	ICCID string length (19-20 bytes)	0x14

Byte No.	Field Name	Content	Info	Byte data (example)
119	DR13	ICCID Ascii string (LSB)	**Example:** 01234567890123456789	0x39
120	DR13	ICCID Ascii string		0x38
121	DR13	ICCID Ascii string		0x37
122	DR13	ICCID Ascii string		0x36
123	DR13	ICCID Ascii string		0x35
124	DR13	ICCID Ascii string		0x34
125	DR13	ICCID Ascii string		0x33
126	DR13	ICCID Ascii string		0x32
127	DR13	ICCID Ascii string		0x31
128	DR13	ICCID Ascii string		0x30
129	DR13	ICCID Ascii string		0x39
130	DR13	ICCID Ascii string		0x38
131	DR13	ICCID Ascii string		0x37
132	DR13	ICCID Ascii string		0x36
133	DR13	ICCID Ascii string		0x35
134	DR13	ICCID Ascii string		0x34
135	DR13	ICCID Ascii string		0x33
136	DR13	ICCID Ascii string		0x32
137	DR13	ICCID Ascii string		0x31
138	DR13	ICCID Ascii string (MSB)		0x30

Data record 14: RSSI in the LTE M1 network

Byte No.	Field Name	Content	Info	Byte data (example)
139	DR14	DIF	8-bit integer	0x01
140	DR14	VIF	Extension table	0xFD
141	DR14	VIFE	RSSI	0x71
142	DR14	Value	**Example:** -71 **Note:** Calculate this value as two's (2's) complement	0xB9

Data record 15: Hardware model

Byte No.	Field Name	Content	Info	Byte data (example)
143	DR15	DIF	8-bit integer	0x01
144	DR15	VIF	Extension table	0xFD
145	DR15	VIFE	Model version	0x0C
146	DR15	Value	**Example:** 0x01	0x01

Data record 16: Hardware version

Byte No.	Field Name	Content	Info	Byte data (example)
147	DR16	DIF	8-bit integer	0x01
148	DR16	VIF	Extension table	0xFD
149	DR16	VIFE	Hardware version	0x0D
150	DR16	Value	**Example:** 0x01	0x01

Data record 17: On time (days) since powerup

Byte No.	Field Name	Content	Info	Byte data (example)
151	DR17	DIF	16-bit integer	0x02
152	DR17	VIF	On time days	0x23
153	DR17	Value (LSB)	**Example:** 2051	0x03
154	DR17	Value (MSB)		0x08

Data record 18: Number of seconds the modem has been active

Byte No.	Field Name	Content	Info	Byte data (example)
155	DR18	DIF	32-bit integer	0x04
156	DR18	VIF	Operating time seconds	0x24
157	DR18	Value (LSB)	**Example:** 9173511 s (0x008BFA07)	0x07
158	DR18	Value		0xFA
159	DR18	Value		0x8B
160	DR18	Value (MSB)		0x00

Data record 19: Number of seconds the wM-Bus radio has been in listen mode

Byte No.	Field Name	Content	Info	Byte data (example)
161	DR19	DIF	32-bit integer + Extension	0x84
162	DR19	DIFE	Subunit 1	0x40
163	DR19	VIF	Operating time seconds	0x24
164	DR19	Value (LSB)	**Example:** 9173511 s (0x008BFA07)	0x07
165	DR19	Value		0xFA
166	DR19	Value		0x8B
167	DR19	Value (MSB)		0x00

Data record 20: Weekday(s) gateway uploads data

Byte No.	Field Name	Content	Info	Byte data (example)
168	DR20	DIF	8-bit integer + Storage + Extension	0xC1
169	DR20	DIFE	Storage 7	0x03

Byte No.	Field Name	Content	Info	Byte data (example)
170	DR20	VIF	Extension table	0xFD
171	DR20	VIFE	Dimensionless	0x3A
172	DR20	Value	**Example:** Monday + Wednesday **Note:** Refer to Table 5.	0x0A

Data record 21: The time the modem uploads stored data, shown as minutes from midnight

Byte No.	Field Name	Content	Info	Byte data (example)
173	DR21	DIF	16-bit integer + Extension	0x82
174	DR21	DIFE	Storage 8	0x04
175	DR21	VIFE	Dimensionless	0x3A
176	DR21	VIF	Extension table	0xFD
177	DR21	Value (LSB)	**Example**: 00:30	0x1E
178	DR21	Value (MSB)		0x00

Data record 22: The interval for modem data uploads

Byte No.	Field Name	Content	Info	Byte data (example)
179	DR22	DIF	16-bit integer + Extension + storage	0xC2
180	DR22	DIFE	Storage 9	0x04
181	DR22	VIF	Extension table	0xFD
182	DR22	VIFE	Dimensionless	0x3A
183	DR22	Value (LSB)	**Example:** 30 min	0x1E
184	DR22	Value (MSB)		0x00

Data record 23: Number of NTP server connection retries since last successful NTP connection

Byte No.	Field Name	Content	Info	Byte data (example)
185	DR23	DIF	16-bit integer + Extension	0x82
186	DR23	DIFE	Storage 10	0x05
187	DR23	VIF	Extension table	0xFD
188	DR23	VIFE	Dimensionless	0x3A
189	DR23	Value (LSB)	**Example:** 5	0x05
190	DR23	Value (MSB)		0x00

Data record 24: Day(s) of the month gateway uploads data

Byte No.	Field Name	Content	Info	Byte data (example)
191	DR24	DIF	32-bit integer + Extension	0xC4
192	DR24	DIFE	Storage 11	0x05

Byte No.	Field Name	Content	Info	Byte data (example)
193	DR24	VIF	Extension table	0xFD
194	DR24	VIFE	Dimensionless	0x3A
195	DR24	Value (LSB)	**Example:** First day of the month	0x01
196	DR24	Value		0x00
197	DR24	Value		0x00
198	DR24	Value (MSB)		0x00

Data record 25: Weeks gateway uploads data

Byte No.	Field Name	Content	Info	Byte data (example)
199	DR25	DIF	8-bit integer + Storage + Extension	0x81
200	DR25	DIFE	Storage 12	0x06
201	DR25	VIF	Extension table	0xFD
202	DR25	VIFE	Dimensionless	0x3A
203	DR25	Value	**Example:** Every week	0x01

Data record 26: Days of the month the gateway is listening

Byte No.	Field Name	Content	Info	Byte data (example)
204	DR26	DIF	32-bit integer + Extension	0x84
205	DR26	DIFE	Storage 13	0x06
206	DR26	VIF	Extension table	0xFD
207	DR26	VIFE	Dimensionless	0x3A
208	DR26	Value (LSB)	**Example:** First day of the month	0x01
209	DR26	Value		0x00
210	DR26	Value		0x00
211	DR26	Value (MSB)		0x00

Data record 27: Weekday(s) the gateway is listening

Byte No.	Field Name	Content	Info	Byte data (example)
212	DR27	DIF	8-bit integer	0x84
213	DR27	DIFE	Storage 14	0x07
214	DR27	VIF	Extension table	0xFD
215	DR27	VIFE	Dimensionless	0x3A
216	DR27	Value	**Example:** Weekday(s) the gateway is listening	0x01

Data record 28: Extension card type

Byte No.	Field Name	Content	Info	Byte data (example)
217	DR28	DIF	8-bit integer + Extension	0xC1
218	DR28	DIFE	Storage 15	0x07
219	DR28	VIF	Extension table	0xFD
220	DR28	VIFE	Dimensionless	0x3A
221	DR28	Value	**Example:** Pulse	0x01

Data record 29: Extension card version

Byte No.	Field Name	Content	Info	Byte data (example)
222	DR29	DIF	16-bit integer + Extension	0xC1
223	DR29	DIFE	Storage 16	0x08
224	DR29	VIF	Extension table	0xFD
225	DR29	VIFE	Dimensionless	0x3A
226	DR29	Value (LSB)	**Example:** v.1	0x01
227	DR29	Value (MSB)		0x00

Data record 30: Network interface type

Byte No.	Field Name	Content	Info	Byte data (example)
228	DR30	DIF	8-bit integer + Extension	0xC1
229	DR30	DIFE	Storage 17	0x08
230	DR30	VIF	Extension table	0xFD
231	DR30	VIFE	Dimensionless	0x3A
232	DR30	Value	**Example:** ETH	0x01

Table 4. Data record 31: Network interface card software version

Byte No.	Field Name	Content	Info	Byte data (example)
233	DR31	DIF	16-bit integer + Extension	0x82
234	DR31	DIFE	Storage 18	0x09
235	DR31	VIF	Extension table	0xFD
236	DR31	VIFE	Dimensionless	0x3A
237	DR31	Value (LSB)	**Example:** v.1	0x01
238	DR31	Value (MSB)		0x00

Table 5. Bit representation for days when gateway is listening

Bit	Info
1 (0x01)	Sunday
2 (0x02)	Monday
3 (0x04)	Tuesday

Bit	Info
4 (0x08)	Wednesday
5 (0x10)	Thursday
6 (0x20)	Friday
7 (0x40)	Saturday
8 (0x80)	NOT USED

Ready-for-conf packet

The *Ready-for-conf* packet is sent from the Gateway 5 every time upload of data to MQTT from the gateway is finished. This indicates that the gateway is ready for configuration via MQTT.

The packet is always sent to the topic `LAS/W/I/12345678` where `12345678` is the serial number of the gateway.

Example 7. Ready-for-conf packet

Data Link layer

Byte No.	Field Name	Content	Info	Byte data (example)
1	Start	Start-byte		0x68
2	L-Field	Telegram length	If packet is longer than 255 then both L-fields should be added, otherwise the L-fields are the same.	0x45
3	L-field	Telegram length		0x45
4	Start	Start-byte		0x68
5	C-Field	SND_NR		0x44
6	A-Field	Primary addressing	0xFD = Use secondary addressing	0xFD

Transport layer

7	CI-Field	Long header (0x72)		0x72
8	ID-Field	Identification number (LSB)	**Example:** 33221100	0x00
9	ID-Field	Identification number		0x11
10	ID-Field	Identification number		0x22
11	ID-Field	Identification number (MSB)		0x33
12	Manufacturer	Manufacturer code (LSB)	LAS	0x33
13	Manufacturer	Manufacturer code (MSB)		0x30
14	Version	Version		0x07
15	Type	Device type		0x1B
16	Acc.	Access number		0x01
17	Status	Errors and alerts	**Example**: Low battery	0x04
18	Config.	Configuration field	**Example:** Encryption off	0x00
19	Config.	Configuration field		0x00

MQTT connection sequences

Battery operation

This sequence describes how a battery-operated Gateway 5 uploads data to an MQTT server.

To conserve battery, always make sure the **MQTT always online** setting is disabled on a battery-operated device.

1. The device starts the modem. It immediately searches for an LTE M1 or CAT1/4G network. The flashing IP-COM LED indicates this search.
2. When the modem finds an LTE-M1 or CAT1/4G network, it retrieves the APN server from the network. It stores the APN server in a temporary memory.
3. The modem connects to the NTP server as specified by the customer. The default NTP server is `pool.ntp.org` unless it has been changed.
4. The modem tries to connect to the MQTT server.
5. If the connection succeeds, the red IP-COM LED turns on fully. The NET LED blinks every 0.3 seconds. The device starts uploading all meter data from its internal flash memory to the MQTT server.
6. When the upload is complete, the device registers itself to receive configuration data from the MQTT server. It uses the address `LAN/W/C/01234567`, where `01234567` is the *device ID number*.
7. The device listens for incoming MQTT configuration data. It listens for 30 seconds by default.
8. Once the configuration time is complete, the device turns off the modem. It waits until the next scheduled data upload time.

Mains operation

This sequence describes how a mains-operated Gateway 5 uploads data to an MQTT server. In this example, the **MQTT always online** setting is enabled.

1. The device starts the modem. It immediately searches for an LTE M1 or CAT1/4G network. The flashing IP-COM LED indicates this search.
2. When the modem finds an LTE-M1 or CAT1/4G network, it retrieves the APN server from the network. It stores the APN server in a temporary memory.
3. The modem connects to the NTP server specified by the customer. The default NTP server is `pool.ntp.org` unless changed.
4. The modem tries to connect to the MQTT server.
5. If the connection succeeds, the red IP-COM LED turns on fully. The NET LED blinks every 0.3 seconds. The device starts uploading all meter data from its internal flash memory to the MQTT server.
6. When the upload is complete, the device registers itself to receive configuration data from the MQTT server. It uses the address `LAN/W/C/01234567`, where `01234567` is the *device ID number*.
7. Because the **MQTT always online** setting is active, the device keeps the connection to the *MQTT server* open. The device immediately transmits data as it detects it on the *wM-Bus interface*. The configuration interface is also always active, which allows you to configure the Gateway 5 through the *MQTT interface*.

Sending Configuration Packets to the Gateway 5

Configuration packets are always sent to the topic `LAS/W/C/12345678` where `12345678` is the serial number of the device to be configured. There are two types of M-Bus headers for configuration.

Option 1: M-BUS header for encrypted and non-encrypted configuration packets

Option 1 must be used if Gateway 5 has been set to only accept encrypted configuration packets. This is the default setting.

Use this header for for sending both *AES128 encrypted* and *non-encrypted* configuration data.

The serial number in bytes 12-15 must be the serial number of the device being configured (i.e., the same serial number found in the MQTT configuration header).

For best security, you should increment the access number (byte 20) by 1 for each packet sent to the device. However, configuration will still function even if you always use the same access number.

Example 8. M-Bus header - Encrypted and non-encrypted data

Data Link layer

Byte No.	Field Name	Content	Info	Byte data
20	L-Field	Length of data		0x43
21	C-Field	SND-UD2		0x43
22	M-Field	Meter Manufacturer Code	LAS	0x33
23	M-Field	Meter Manufacturer Code		0x68
24	A-Field	Serial number BCD (LSB)	**Example:** 0A0A0A0A	0x0A
25	A-Field	Serial number BCD		0x0A
26	A-Field	Serial number BCD		0x0A
27	A-Field	Serial number BCD (MSB)		0x0A
28	A-Field	Version	**Example:** 00	0x00
29	A-Field	Device type	**Example**: 00	0x00

Transport layer

Byte No.	Field Name	Content	Info	Byte data
30	CI-Field	Long network header		0x5B
31	Ident Nr.	Gateway serial number BCD (LSB)	**Example:** 12345678	0x78
32	Ident Nr.	Gateway serial number BCD		0x56
33	Ident Nr.	Gateway serial number BCD		0x34
34	Ident Nr.	Gateway serial number BCD (MSB)		0x12
35	Manufacturer	Manufacturer code (LSB)	LAS	0x33
36	Manufacturer	Manufacturer code (MSB)		0x30

Byte No.	Field Name	Content	Info	Byte data
37	Version	Version (Ignored by gateway)	This can be set to any value	0xFF
38	Device type	Device type (Ignored by gateway)	This can be set to any value	0xFF
39	Access number.	Access Number to gateway		0x75
40	Status	Errors and alerts		0x00
41	Config.	Configuration field	**Example:** Encryption off	0x00
42	Config.	Configuration field		0x00
43	AES-verify	Encryption verification		0x2F
44	AES-verify	Encryption verification		0x2F

Option 2: M-BUS header for only non-encrypted configuration packets

This format is simpler than option 1, but it supports only *non-encrypted* configuration data.

For best security, you should increment the access number (byte 12) by 1 for each packet sent to the device. However, configuration will still function even if you always use the same access number.

Example 9. M-Bus header - Non-encrypted data only

Data Link layer

Byte No	Field Name	Content	Info	Byte data (example)
1	L-Field	Length of data		
2	C-Field	SND-NR		0x44
3	M-Field	Meter Manufacturer Code	LAS	0x33
4	M-Field	Meter Manufacturer Code		0x30
5	A-Field	Serial number BCD (LSB)	**Example:** 0A0A0A0A	0x0A
6	A-Field	Serial number BCD		0x0A
7	A-Field	Serial number BCD		0x0A
8	A-Field	Serial number BCD (MSB)		0x0A
9	A-Field	Version		0x00
10	A-Field	Device type		0x00

Transport layer

Byte No.	Field Name	Content	Info	Byte data
11	CI-Field	Short network header		0x7A
12	Access no.	Access Number		0xA1
13	Status	Errors and alerts		0x00
14	Configuration		**Example:** Encryption off	0x00

Byte No.	Field Name	Content	Info	Byte data
15	Configuration			0x00
16	AES-verify	Encryption verification		0x2F
17	AES-verify	Encryption verification		0x2F

The configuration data is added after the header. This configuration data is also referred to as *ENAPI Data*.

Configuration data is sent the same way on the MQTT interface as with the dongle. A *Non-Disclosure Agreement (NDA)* is required to receive the commands and the structure.

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