MODBUS MASTER: Configuration

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Introduction

This document describes the composition for sending commands to a MODBUS master and how the MODBUS master responds. Commands are mostly used for configuration, such as sending interval, but can also be used for synchronizing of time.

A complete data packet consists of two parts: the network data and the configuration data.

The network data contains information about the sender of the packet, e.g., a gateway, and the receiver, in this case a MODBUS master. The configuration data is simply the command to the MODBUS master. The network data is described in chapter **Network data packet formats** and the configuration data is described in chapter Error! Reference s ource not found..

General knowledge

All configurations for a MODBUS master have one command for setting data and one for getting data, as the example below.

Example:

To **SET** the time, command 0x65 is used.
MODBUS master set the new time and responds with current time, and command 0x66 is used.

To **GET** the time, command 0x66 is used.
MODBUS master responds with current time, and command 0x66 is used.

Encryption

The MODBUS master is delivered without encryption enabled, i.e., no encryption key is needed for configuring/reading data from the MODBUS master.

Note: The enable/disable encryption command must always be transmitted encrypted.

It is possible to enable the embedded encryption key. If this is done, the MODBUS master will only accept encrypted set commands according to OMS mode 5 using the preprogrammed encryption key. The MODBUS master will, however, still accept non-encrypted GET commands for reading out the different settings.

The MODBUS master supports both encryption for changing configuration and encryption for changing the time using OMS time synchronization command. See the table below for more information. This byte is used when setting/getting the encryption as in chapter **Set encryption setting**.

Contact us for more details if this is something that you would like to use in your setup.

Note: All responses for configuration data from the MODBUS master will always be transmitted without encryption even if the request was done using encrypted data.

Byte value	Meaning
0x00	No encryption enabled
0x01	Encryption for changing configuration enabled
0x04	Modbus data from the device is sent encrypted

Network data packet formats

This chapter contains information of the data that is transmitted to and from the MODBUS master. The specific commands that can be used for changing configuration are transferred as M-Bus data.

Note: The actual response from a MODBUS slave has a separate message.

Configuration data TO a MODBUS master

The package format when sending from gateway to a MODBUS master.

Byte No	Field Name	Content	Info	Byte data	
1.	L-Field	Length of data			Linklayer
2.	C-Field	SND-UD2		0x43	
3.	M-Field	Meter Manufacturer code	**Example**: LAS	0x33	
4.	M-Field	Meter Manufacturer code		0x30	
5.	A-Field	Serial number, BCD coded (LSB)	Sender serial number **Example:** 11223344	0x44	
6.	A-Field	Serial number, BCD coded		0x33	
7.	A-Field	Serial number, BCD coded		0x22	
8.	A-Field	Serial number, BCD coded (MSB)		0x11	
9.	A-Field	Version		0x09	
10.	A-Field	Device type		0x31	
11.	CI-Field	Long network header		0x5B	Networklayer
12.	Ident Nr.	Serial number, BCD coded (LSB)	MODBUS serial number **Example:** 12345678	0x78	
13.	Ident Nr.	Serial number, BCD coded		0x56	
14.	Ident Nr.	Serial number, BCD coded		0x34	
15.	Ident Nr.	Serial number, BCD coded (MSB)		0x12	
16.	Manufr	Manufacturer code (LAS)	**Example:** LAS	0x33	
17.	Manufr	Manufacturer code (LAS)		0x30	
18.	Version	Version		0x14	
19.	Device type	Device type (radio converter)		0x37	
20.	Access no.	Access Number of gateway		0x75	
21.	Status	Device status (error/alarms)		0x00	
22.	Configuration	Number of encrypted blocks		0x00	
23.	Configuration	Encryption	**No encryption**: 0x00 **Encryption mode 5**: 0x05	0x00	
24.	AES-Verify	Encryption verification		0x2F	
25.	AES-Verify	Encryption verification		0x2F	
26.	The actual configuration data sent to/from the MODBUS master is sent here.				
27.					

Configuration data FROM a MODBUS master

When a MODBUS master receives a data packet, it will process the data packet and then send back a response that the configuration packet was received OK. The data format for the response is described in the tables below.

Byte No	Field Name	Content		Byte data	
1	L-Field	Length of data		0xXX	Linklayer
2	C-Field	RSP-UD		0x08	
3	M-Field	Meter Manufacturer code (LAS)	**Example:** LAS	0x33	
4	M-Field	Meter Manufacturer code (LAS)		0x30	
5	A-Field	Serial number, BCD coded (LSB)	**Example**: 12345678	0x78	
6	A-Field	Serial number, BCD coded		0x56	
7	A-Field	Serial number, BCD coded		0x34	
8	A-Field	Serial number, BCD coded (MSB)		0x12	
9	A-Field	Version		0x14	
10	A-Field	Device type (Radio converter)		0x37	
11	CI-Field	Short header		0x7A	Networklayer
12	Access No.	Access number of gateway		0x75	
13	Status	Meter state (Low battery)		0x04	
14	Configuration	Number of encrypted blocks		0x00	
15	Configuration	Encryption	**No encryption**: 0x00 **Encryption mode 5**: 0x05	0x00	
16	AES-Verify	Encryption verification		0x2F	
17	AES-Verify	Encryption verification		0x2F	
18	The actual configuration data sent to/from the MODBUS master is sent here.				
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Transparent MODBUS data from the slave

This packet contains the MODBUS slave response packet that is a response on the directly requested data from a gateway (transparent question) or requested from a saved MODBUS command in the MODBUS master (request sent to slave using index 0-63). A transparent question packet is sent typical two seconds after the request from a gateway was sent to the MODBUS master.

Note: If the MODBUS slave does not reply to the MODBUS master in time, a timeout wM-Bus packet will be sent from the MODBUS master. The data record value in DR4 will be 0x001 (marked by green) and DR5 will contain a MODBUS timeout packet (marked by yellow) as the example below.

Valid response received:
3B 44 33 30 66 00 00 00 14 37 7A D7 00 00 20 2F 2F 01 7A 01 02 FD 3A C9 00 01 FD 0B 01 02 FD 97 1D 00 00 0D FD 76 19 01 03 14 02 E7 00 80 00 00 00 00 00 00 00 00 00 00 00 02 00 00 00 14 C0 00

Packet Timeout received:
27 44 33 30 66 00 00 00 14 37 7A D3 00 00 20 2F 2F 01 7A 01 02 FD 3A C9 00 01 FD 0B 01 02 FD 97 1D 01 00 0D FD 76 05 01 83 0B 00 F7

NOTE: MODBUS CRC is only included in the packet if the MODBUS CRC was included in the request.

DR1	MODBUS slave address which the packet comes from.
DR2	The start register that was requested from the MODBUS slave. Values: 0-65535
DR3	Which index of the MODBUS master this request is from. Value 255 is a transparent question. Question index: 0-63 Transparent question: 255
DR4	Error codes. 0x0001 = Timeout, no response from slave.
DR5	The complete MODBUS packet as received from the slave. If there was no response from the slave, the MODBUS packet will instead be “0x01 0x83 0x0B”.

Byte No		Field Name	Content	Byte data	
1.	L-Field	Length of data		0xXX	**Linklayer**
2.	C-Field	SND_NR		0x44	
3.	M-Field	Meter Manufacturer code	**Example:** LAS	0x33	
4.	M-Field	Meter Manufacturer code		0x30	
5.	A-Field	Serial number, BCD coded (LSB)	**Example:** 12345678	0x78	
6.	A-Field	Serial number, BCD coded		0x56	
7.	A-Field	Serial number, BCD coded		0x34	
8.	A-Field	Serial number, BCD coded (MSB)		0x12	
9.	A-Field	Version		0x14	
10.	A-Field	Meter type (Radio converter)		0x37	

11.	CI-Field	Short header		0x7A	**Networklayer**
12.	Access no.	Transmission counter.		0x75	
13.	Status	Device status		0x00	
14.	Configuration	Number of encrypted blocks		0x00	
15.	Configuration	Encryption	**No encryption**: 0x00 **Encryption mode 5**: 0x05	0x00	
16.	AES-Verify	Encryption verification		0x2F	
17.	AES-Verify	Encryption verification		0x2F	
18.	DR1	DIF	8-bit integer	0x01	MODBUS slave address
19.	DR1	VIF	Slave address	0x7A	
20.	DR1	Value	8-bit address	0x01	
21.	DR2	DIF	16-bit integer	0x02	Requested start register from MODBUS slave.
22.	DR2	VIF	Extension table	0xFD	
23.	DR2	VIFE	Dimensionless	0x3A	
24.	DR2	Value (LSB)	**Example:** 0x065D	0x5D	
25.	DR2	Value (MSB)		0x06	
26.	DR3	DIF	8-bit integer	0x01	Which index of the MODBUS master this request is from.
27.	DR3	VIF	Extension table	0xFD	
28.	DR3	VIFE	Parameter set identification 0-63 (used index) 255 (transparent)	0x0B	
29.	DR3	Value	8-bit	0x01	
30.	DR4	DIF	16-bit integer	0x02	Error codes
31.	DR4	VIF	Extension table	0xFD	
32.	DR4	VIFE	Dimensionless	0x97	
33.	DR4	VIFE	Error flags binary, 16 bits	0x1D	
34.	DR4	Value (LSB)	0x0000 = No error 0x0001 = Timeout	0x00	
35.	DR4	Value (MSB)		0x00	
36.	DR5	DIF	Container start	0x0D	The complete MODBUS packet from slave OR as a timeout packet if slave did not respond
37.	DR5	VIF		0xFD	
38.	DR5	VIFE	Manufacture specific protocol	0x76	
39.	DR5	LVAR	Length	0x..	
40.	DR5	LVAR data (MODBUS)	MODBUS telegram as received from the slave		

Status packet sent by MODBUS master

The status packet is sent about every 5 minutes indicating that the MODBUS master is working. The status packet includes additional information about the device, such as number of transmitted packets, timeouts, used slots, and if there are devices with error (devices which didn't respond on the last request).

DR1	MODBUS slave address. **Note:** Value 255 means the packet is a status packet from the MODBUS master.
DR2	Total MODBUS packets transmitted on the bus since last power on
DR3	Total MODBUS packets received on the bus since last power on.
DR4	Number of failed index MODBUS requests to MODBUS slaves. **Note:** A value more than 0 indicates problem in communication with a device. **Note:** Value goes from 0 to 64.
DR5	Bit field (64 bits) to indicate which packet index transmitted on a bus didn't receive an answer by a MODBUS slave. Each bit represents each packet index on the MODBUS master (same information as DR4). **Example:** Index 5 and 0 failed. 0000000000000000000000000000000000000000000000000000000000010001
DR6	Bit field (64 bits) to indicate which packet index transmitted on a bus **never** has been received successfully. Each bit represents each packet index on the MODBUS master. **Example:** Index 5 and 0 failed. 0000000000000000000000000000000000000000000000000000000000010001
DR7	Used MODBUS index slots. **Note:** Value goes from 0 to 64.
DR8	Bit field (64 bits) to indicate which packet index are currently used (same information as DR7). One bit for each packet index. Value 1=*Index used*, value 0=*Index unused*. **Example:** Index 5 and 0 used. 0000000000000000000000000000000000000000000000000000000000010001
DR9	Battery level.
DR10	Software version of the device.

Byte No		Field Name	Content	Byte data	
1	L-Field	Length of data		0xXX	**Linklayer**
2	C-Field	SND_NR		0x44	
3	M-Field	Meter Manufacturer code	**Example:** LAS	0x33	
4	M-Field	Meter Manufacturer code		0x30	

5	A-Field	Serial number, BCD coded (LSB)	**Example:** 12345678	0x78	
6	A-Field	Serial number, BCD coded		0x56	
7	A-Field	Serial number, BCD coded		0x34	
8	A-Field	Serial number, BCD coded (MSB)		0x12	
9	A-Field	Version		0x14	
10	A-Field	Meter type (Radio converter)		0x37	
11	CI-Field	Short header		0x7A	**Networklayer**
12	Access no.	Transmission counter.		0x75	
13	Status	Device status		0x00	
14	Configuration	Number of encrypted blocks		0x00	
15	Configuration	Encryption	**No encryption**: 0x00 **Encryption mode 5**: 0x05	0x00	
16	AES-Verify	Encryption verification		0x2F	
17	AES-Verify	Encryption verification		0x2F	
18	DR1	DIF	8-bit integer	0x01	MODBUS slave address
19	DR1	VIF	Slave address	0x7A	
20	DR1	Value	**Example:** Status packet	0xFF	
21	DR2	DIF	32-bit integer + Extension	0x84	Total MODBUS packets transmitted on the bus since last power on
22	DR2	DIFE	Subunit 1	0x40	
23	DR2	VIF	Extension table	0xFD	
24	DR2	VIFE	Dimensionless	0x3A	
25	DR2	Value (LSB)	**Example:** 816751 (0x000C766F)	0x6F	
26	DR2	Value		0x76	
27	DR2	Value		0x0C	
28	DR2	Value (MSB)		0x00	
29	DR3	DIF	32-bit integer + Extension	0x84	Total MODBUS packets received on the bus since last power on.
30	DR3	DIFE	Subunit 2	0x80	
31	DR3	DIFE	Subunit 2	0x40	
32	DR3	VIF	Extension table	0xFD	
33	DR3	VIFE	Dimensionless	0x3A	
34	DR3	Value (LSB)	**Example:** 816751 (0x000C766F)	0x6F	
35	DR3	Value		0x76	
36	DR3	Value		0x0C	
37	DR3	Value (MSB)		0x00	
38	DR4	DIF	8-bit integer + Extension	0x81	

39	DR4	DIFE	Subunit 3	0xC0	Number of failed index MODBUS requests to MODBUS slaves.
40	DR4	DIFE	Subunit 3	0x40	
41	DR4	VIF	Extension table	0xFD	
42	DR4	VIFE	Dimensionless	0x3A	
43	DR4	Value	**Example:** 11	0x0B	
44	DR5	DIF	64-bit integer	0x87	Indicate which packet index transmitted didn't receive an answer by a MODBUS slave.
45	DR5	DIFE	Subunit 4	0x80	
46	DR5	DIFE	Subunit 4	0x80	
47	DR5	DIFE	Subunit 4	0x40	
48	DR5	VIF	Extension table	0xFD	
49	DR5	VIFE	Dimensionless	0x3A	
50	DR5	Value (LSB)	**Example:** Index 5 and 0 failed.	0x11	
51	DR5	Value		0x00	
52	DR5	Value		0x00	
53	DR5	Value		0x00	
54	DR5	Value		0x00	
55	DR5	Value		0x00	
56	DR5	Value		0x00	
57	DR5	Value (MSB)		0x00	
58	DR6	DIF	64-bit integer + extension	0x87	Indicate which packet index transmitted which **never** has been received successfully.
59	DR6	DIFE	Subunit 5	0x80	
60	DR6	DIFE	Subunit 5	0x80	
61	DR6	DIFE	Subunit 5	0x40	
62	DR6	VIF	Extension table	0xFD	
63	DR6	VIFE	Dimensionless	0x3A	
64	DR6	Value (LSB)	**Example:** Index 5 and 0 failed.	0x11	
65	DR6	Value		0x00	
66	DR6	Value		0x00	
67	DR6	Value		0x00	
68	DR6	Value		0x00	
69	DR6	Value		0x00	
70	DR6	Value		0x00	
71	DR6	Value (MSB)		0x00	
72	DR7	DIF	8-bit integer + Storage 1	0x42	Used MODBUS index slots
73	DR7	VIF	Extension table	0xFD	

74	DR7	VIFE	Dimensionless	0x97	
75	DR7	VIFE	Dimensionless	0x3A	
76	DR7	Value	**Example: 31**	0x1F	
77	DR8	DIF	64-bit integer + Storage 1 + subunit 1	0xC7	Indicate which packet index are currently used
78	DR8	DIFE	Subunit 1	0x40	
79	DR8	VIF	Extension table	0xFD	
80	DR8	VIFE	Dimensionless	0x3A	
81	DR8	Value (LSB)	**Example:** Index 5 and 0 used.	0x11	
82	DR8	Value		0x00	
83	DR8	Value		0x00	
84	DR8	Value		0x00	
85	DR8	Value		0x00	
86	DR8	Value		0x00	
87	DR8	Value		0x00	
88	DR8	Value (MSB)		0x00	
89	DR9	DIF	16-bit integer	0x02	Battery level
90	DR9	DIFE	Extension table	0xFD	
91	DR9	VIF	Voltage (mV)	0x46	
92	DR9	Value (LSB)	**Example:** 3021 mW	0xCD	
93	DR9	Value (MSB)		0x0B	
94	DR10	DIF	16-bit integer	0x02	Software version of the device
95	DR10	VIF	Extension table	0xFD	
96	DR10	VIFE	Version	0x0F	
97	DR10	Value (LSB)	**Example:** 52	0x34	
98	DR10	Value (MSB)		0x00	
99	Filler until end			0x2F	