ABB

COMMUNICATION PROTOCOL

MODBUS MANUAL
D1M Power Meters

Table of Contents

1. Applicable Products

The following table lists the types of products to which this document applies:

D1M 15	D1M 15 Modbus
D1M 20	D1M 20 Modbus, D1M 20 Ethernet

Please carefully distinguish that the different types of products support different Modbus functions.

2. General

D1M products offer include versions with both Modbus-RTU and Modbus-TCP/IP protocols. The Modbus protocol is specified in its entirety in Modbus Application protocol Specification available at https://modbus.org/specs.php. If you want to know the Modbus protocols of other ABB series of meters, please refer to the relevant documents.

2.1. Modbus-RTU

2.1.1. Overview

D1M Modbus RTU communication protocol is done on master-slave reply to connection (half duplex), 3-wire (A, B, and Common) polarity dependent bus according to the RS-485 standard. Modbus is a master-slave communication protocol that can support up to 247 slaves (which is the same as the individual device address range in Modbus RTU) organized as a multidrop bus. The communication is half duplex. Services on Modbus are specified by function codes.

2.1.2. Topology

The RS-485 bus uses line topology, see figure below. Stubs at the meter connections are allowed but should be kept as short as possible and no longer than 1 m. Bus termination in both ends of the line should be used. The resistors should have the same values as the characteristic impedance of the cable which normally is 120 Ohm.
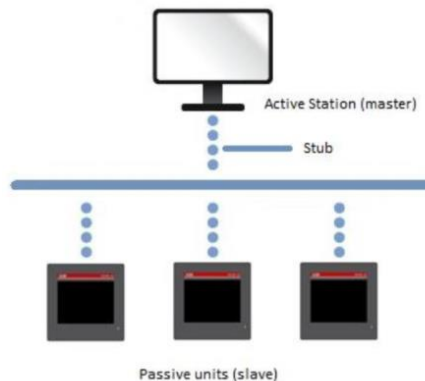
2.1.3. RS-485 wiring on D1M

Each D1M provided with Modbus RTU communication is equipped with RS-485 port. The RS485 terminal is a 3-pole plug contact. A and B are mandatory for the correct communication of the device. C can be connected to the data common ground, if available and needed. RS485 is a differential signal so no common ground is required.
Given the differential nature of the RS485 signal, the signal can be recovered without any reference to a ground as such - the signal is the difference between the A and B voltages, not the different between one voltage and ground. The third wire C (Common) helps to ensure that the common mode requirements (-7 V to +12 V) of the transceivers are maintained.

RS-485
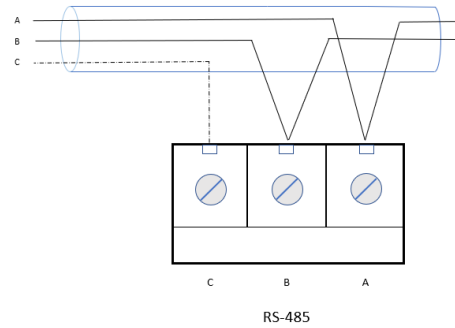
2.1.4. Cable

Cable used is non-shielded or shielded twisted pair cable with wire area of 0.35-1.52mm^2 Maximum length of the bus is 700 m.

The cable recommended in this type of connection has 2 twisted pairs. A pair will be used for "A" and "B", one of the wires of the second pair will be used as common wire and the fourth wire will be not used.

See image below:
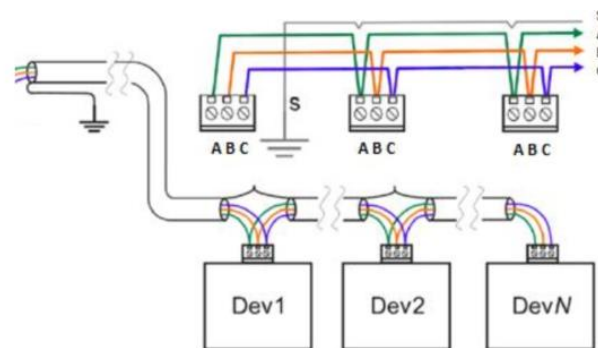
Recommended practice：
- Good quality shielded twisted pair cable should be used.
- If shielded cable is used the shield should be connected to ground in one end.
- Do not put communications cables and power cables in the same raceways.
- Route communications cables to avoid potential noise sources such as high-power equipment.
- Ferrite should be used especially when long cables are used.

2.2. Modbus-TCP/IP

2.2.1. Overview

Modbus TCP/IP is a Modbus variant used for communications over TCP/IP networks, typically connecting over port 502 (default value).

2.2.2. Topology

Hereafter an example of Modbus TCP/IP topology. Please note that D1M Ethernet allows to daisy-chain the Modbus TCP/IP communication through 2 RJ45 ports on the devices.
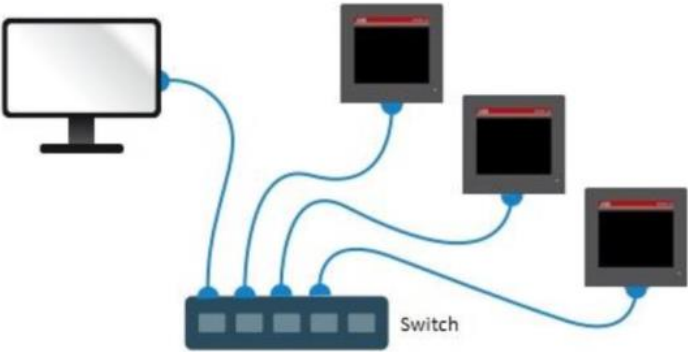
2.2.3. Cable

Suitable cables for Modbus TCP/IP connection:

CATEGORY	SHIELDING
Category 5	Unshielded
Category 5e	Unshielded
Category 6	Shielded or Unshielded
Category 6a	Shielded
Category 7	Shielded

Recommended practice
- If shielded cable is used the shield should be connected to ground in one end.
- Do not put communications cables and power cables in the same raceways.
- Route communications cables to avoid potential noise sources such as high-power equipment.
- Ferrite should be used especially when long cables are used.

3. Modbus transport format

3.1. Byte format

The byte format includes data bits, parity bits 6 and stop bits.
Masters and slaves on the same bus must use the same byte format to ensure normal transmission of communication.

3.2. Frame format

3.2.1. Modbus-RTU data frame

A Modbus request frame generally has the following structure:

Slave Address	Function Code	Data	Error Check
1 byte	1 byte	N byte	2 bytes

Slave Address：
Slave address code is the first byte of each frame and occupies one byte, ranging from 0~247, and the address 0 is the broadcast address.
Each slave must have a unique address code, and only the matched slave address can respond and send back information. The address code sent indicates the address of the slave to be sent, and the address code returned by the slave indicates the address of the slave to be sent back. The corresponding address code can indicate which slave machine the information came from.
The network messages can be query-response or broadcast type. The query-response command sends a query from the master to an individual slave and is generally followed by a response. The broadcast command sends a message to all slaves and is never followed by a response.

Function Code：
Function code decides the service to be performed.
The function codes in D1M (H stands for hex)

Function code	Application	Description
03H	Read holding registers	Used to read measurement values or other information from the electricity meter. Single or registers can be read in one request.
10H	Write multiple registers	Used to config meter with single or multiple Modbus registers.

Data：
The data are used to exchange between the host and the slave in the way of reading and writing registers, and the data length is varying.
Modbus uses a **'big-Endian'** representation for addresses and data items. This means that when a numerical quantity larger than a single byte is transmitted, the most significant byte is sent first. For example

Register size   Value
16 - bits   0x1234   the first byte sent is 0x12 then 0x34

If the data corresponding to the register is 0xFFFF when using 03H, the current device cannot measure or calculate the register data.
For example, when the D1M device is set to "3 3T", that means the 3-phase 3-wire system, the phase voltage cannot be measured. When reading the phase voltage data, the meter responds to the phase voltage data as 0xFFFF.

Error Check：

Modbus adopts CRC16 verification mode and 'small-Endian' byte order transmission, that is, low bytes are transmitted before high bytes are transmitted.

All communication examples in the following section are described according to Modbus-RTU unless otherwise specified.

3.2.2. Modbus-TCP/IP data frame

The Modbus-TCP/IP data frame format is basically the same as the Modbus-RTU data frame format, only with an extra 6-byte header and no check:

Frame header	Slave address	Function code	Data
6 bytes	1 byte	1 byte	N bytes

More details can see [Modbus-TCP/IP（https://modbus.org/specs.php）](https://modbus.org/specs.php).

3.3. Frame format of Function Code 3

Function code 3 is used to read measurement values or other information from the electricity meter.

Request frame

Slave Address	Function Code	Data		Error Check
1~247	0x03	Address	No. of Register	CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Response frame

Slave Address	Function Code	Data		Error Check
1~247	0x03	Byte count	Data	CRC16
1 byte	1 byte	1 byte	No. of Register *2 bytes	2 bytes

The value range of "No. of Register" is 1-125, and the "Byte count" equal to 2 times of "No. of Register".
Please refer to chapter 3 for the specific example.

3.4. Frame format of Function Code 16

Function code 16 is used to modify settings in the meter.

Request frame

Slave Address	Function Code	Data				Error Check
1~247	0x10	Start Address	No. of Register	No. of Data	Register Values	CRC16
1byte	1byte	2 bytes	2 bytes	1 byte	No. of Register *2 byte	2 bytes

Response frame

Slave Address	Function Code	Data		Error Check
1~247	0x10	Start Address	No. of Register	CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Please refer to chapter 3 for the specific example.

3.5. Exception Responses

If an error should occur while processing a request, the power meter gives an exception response that contains an exception code.
An exception frame has the following structure:

Slave Address	Function Code	Exception Code	Error Check
1 byte	1 byte	1 byte	CRC16

In the exception response the function code is set to the function code of the request plus 0x80.
The exception codes that are used are listed in the following table:

Exception Code	Exception	Definition
01	Illegal Function	A function code that is not supported has been used.
02	Illegal data address	The requested register is outside the allowed range.
03	Illegal data value	The structure of a received message is incorrect.
04	Slave device failure	Processing the request fail due to an internal error in the meter.

4. D1M Mapping Tables

4.1. Features

The purpose of this section is to explain the relation between register number and metering data. Please visit the ABB Library https://library.abb.com/d/9AKK107991A8720 to get the full Modbus table file. The following table describes the meanings of each register in the source file:

Quantity/Functionality	Name of the meter quantity
Explanation	other information available in the meter (if applicable).
Unit	Unit of data(if applicable).
Resolution	Resolution of the value for this Quantity (if applicable). A resolution of 0.01 means that the received data needs to be divided by 100 and then taken to two decimal places.
Data Type	Data types Unsigned is an unsigned integer, signed is a signed integer, ASCII is a character type, and float 32bits is a 32-bit floating point type.
Access	Read / Write access. Read means read-only, write means write-only, read/write means registers can read and write.
Register(Hex)	Hexadecimal start registers address [a].
Register(Dec)	Decimal start registers address.
Nr of registers	Number of registers. The number of registers used for this meter quantity. A register is 2 bytes, and if the number of registers for a function is 4, the number of data for that function is 8 bytes.
Product type	Meter type Note the corresponding model number after each register address. For example, the "Average current L1" register is only applicable to D1M 20 , but not to D1M 15.
Functional block	Number of Modbus registers for the meter quantities.

[a]: D1M supports two register groups in different data formats, namely, floating-point register groups in the range 0x3000 to 0x3145 and integer register groups in the range 0x5000 to 0xCCB3. The command formats for reading data are the same. The following describes the read and write register groups in integer format only.

Before setting parameters through communication, enable the communication setting function via HMI, otherwise you cannot set parameters, for details, see the user manual.

4.2. Energy

Follows are energy registers.

Register (Hex)	Quantity/Functionality	Unit	Data Type	Resolution	No. of registers	Product Type
5000	Total Active energy - import	kWh	Unsigned	0.01	4	D1M 15/20
5004	Total Active energy - export	kWh	Unsigned	0.01	4	D1M 15/20
5008	Total Active energy - net	kWh	signed	0.01	4	D1M 15/20
500C	Total Reactive energy - import	kvarh	Unsigned	0.01	4	D1M 15/20
5010	Total Reactive energy - export	kvarh	Unsigned	0.01	4	D1M 15/20
5014	Total Reactive energy - net	kvarh	signed	0.01	4	D1M 15/20
5018	Total Apparent energy - import	kVA	Unsigned	0.01	4	D1M 15/20
501C	Total Apparent energy - export	kVA	Unsigned	0.01	4	D1M 15/20
5020	Total Apparent energy - net	kVA	Signed	0.01	4	D1M 15/20
5024	Total Active energy CO_2 - import	kg	Unsigned	0.001	4	D1M 20
5034	Total Active energy Currency - import	Currency	Unsigned	0.001	4	D1M 20
5170	Total Active energy - import - T 1	kWh	Unsigned	0.01	4	D1M 20
5174	Total Active energy - import - T 2	kWh	Unsigned	0.01	4	D1M 20
5178	Total Active energy - import - T 3	kWh	Unsigned	0.01	4	D1M 20
517C	Total Active energy - import - T 4	kWh	Unsigned	0.01	4	D1M 20
5190	Total Active energy - export - T 1	kWh	Unsigned	0.01	4	D1M 20
5194	Total Active energy - export - T 2	kWh	Unsigned	0.01	4	D1M 20
5198	Total Active energy - export - T 3	kWh	Unsigned	0.01	4	D1M 20
519C	Total Active energy - export - T 4	kWh	Unsigned	0.01	4	D1M 20
51B0	Total Reactive energy - import - T 1	kvarh	Unsigned	0.01	4	D1M 20
51B4	Total Reactive energy - import - T 2	kvarh	Unsigned	0.01	4	D1M 20
51B8	Total Reactive energy - import - T 3	kvarh	Unsigned	0.01	4	D1M 20
51BC	Total Reactive energy - import - T 4	kvarh	Unsigned	0.01	4	D1M 20
51D0	Total Reactive energy - export - T 1	kvarh	Unsigned	0.01	4	D1M 20
51D4	Total Reactive energy - export - T 2	kvarh	Unsigned	0.01	4	D1M 20

51D8	Total Reactive energy - export - T 3	kvarh	Unsigned	0.01	4	D1M 20
51DC	Total Reactive energy - export - T 4	kvarh	Unsigned	0.01	4	D1M 20

Example

request (read Total Active energy – import).

Slave address	0x01
Function code	0x03
Start address, high byte	0x50
Start address, low byte	0x00
No. of registers, high byte	0x00
No. of registers, low byte	0x04
Error check (CRC), high byte	0x55
Error check (CRC), low byte	0x09

Response frame:

Slave address	0x01
Function code	0x03
Byte count	0x08
Value of registers	0x00 00 00 00 00 0F 42 43
Error check (CRC), high byte	0x95
Error check (CRC), low byte	0xD7

The result of response means the value of registers is 0x0F4243, the decimal conversion is 1000003, the resolution is 0.01, so the total import active energy is 1000003/100=10000.03kWh.

4.3. Real Time Data

Follows are real time data registers.

Register (Hex)	Quantity/Functionality	Unit	Data Type	Resolution	No. of registers	Product Type
5B00	Three phase system voltage	V	Unsigned	0.1	2	D1M 15/20
5B02	Phase voltage L1	V	Unsigned	0.1	2	D1M 15/20
5B04	Phase voltage L2	V	Unsigned	0.1	2	D1M 15/20
5B06	Phase voltage L3	V	Unsigned	0.1	2	D1M 15/20
5B08	Line voltage L1-L2	V	Unsigned	0.1	2	D1M 15/20
5B0A	Line voltage L3-L2	V	Unsigned	0.1	2	D1M 15/20
5B0C	Line voltage L1-L3	V	Unsigned	0.1	2	D1M 15/20
5B0E	Three phase system current	A	Unsigned	0.01	2	D1M 15/20
5B10	Current L1	A	Unsigned	0.01	2	D1M 15/20
5B12	Current L2	A	Unsigned	0.01	2	D1M 15/20
5B14	Current L3	A	Unsigned	0.01	2	D1M 15/20
5B16	Current N	A	Unsigned	0.01	2	D1M 20
5B1A	Active Power total	W	Signed	0.01	2	D1M 15/20
5B1C	Active Power L1	W	Signed	0.01	2	D1M 15/20
5B1E	Active Power L2	W	Signed	0.01	2	D1M 15/20
5B20	Active power L3	W	Signed	0.01	2	D1M 15/20
5B22	Reactive Power total	VAR	Signed	0.01	2	D1M 15/20
5B24	Reactive Power L1	VAR	Signed	0.01	2	D1M 15/20
5B26	Reactive Power L2	VAR	Signed	0.01	2	D1M 15/20
5B28	Reactive Power L3	VAR	Signed	0.01	2	D1M 15/20
5B2A	Apparent Power total	VAR	Signed	0.01	2	D1M 15/20
5B2C	Apparent Power L1	VA	Signed	0.01	2	D1M 15/20
5B2E	Apparent Power L2	VA	Signed	0.01	2	D1M 15/20
5B30	Apparent power L3	VA	Signed	0.01	2	D1M 15/20
5B32	Frequency	Hz	Unsigned	0.01	1	D1M 15/20
5B33	Power Total Angle	°	Signed	0.1	1	D1M 15/20
5B34	Power Angle L1	°	Signed	0.1	1	D1M 15/20
5B35	Power Angle L2	°	Signed	0.1	1	D1M 15/20
5B36	Power Angle L3	°	Signed	0.1	1	D1M 15/20
5B37	Voltage Angle L1	°	Signed	0.1	1	D1M 15/20
5B38	Voltage Angle L2	°	Signed	0.1	1	D1M 15/20
5B39	Voltage Angle L3	°	Signed	0.1	1	D1M 15/20
5B3D	Current Angle L1	°	Signed	0.1	1	D1M 15/20
5B3E	Current Angle L2	°	Signed	0.1	1	D1M 15/20
5B3F	Current Angle L3	°	Signed	0.1	1	D1M 15/20
5B40	Power factor total		Signed	0.001	1	D1M 15/20
5B41	Power factor L1		Signed	0.001	1	D1M 15/20
5B42	Power factor L2		Signed	0.001	1	D1M 15/20
5B43	Power factor L3		Signed	0.001	1	D1M 15/20
5B48	Cosphi (displacement factor total)		Signed	0.001	1	D1M 20
5B49	Cosphi (displacement factor L1)		Signed	0.001	1	D1M 20

5B4A	Cosphi (displacement factor L2)		Signed	0.001	1	D1M 20
5B4B	Cosphi (displacement factor L3)		Signed	0.001	1	D1M 20

Example

Request (read Phase voltage L1~L3)

Slave address	0x01
Function code	0x03
Start address, high byte	0x5B
Start address, low byte	0x02
No. of registers, high byte	0x00
No. of registers, low byte	0x06
Error check (CRC), high byte	0x77
Error check (CRC), low byte	0x2C

Response frame

Slave address	0x01
Function code	0x03
Byte count	0x0C
Value of registers	0x00 00 08 CA 00 00 08 CB 00 00 08 CC
Error check (CRC), high byte	0x9F
Error check (CRC), low byte	0x32

The result of response means the L1 to L3 phase voltages in the meter are 0x08CA, 0x08CB and 0x08CC respectively, which are converted to base decimal and multiplied by the resolution, the phase voltages are 2250/10=225.0V, 2251/10=225.1V and 2252/10=225.2V respectively.

4.4. Average, maximum, and minimum values

Follows are average, maximum, and minimum values.

Register (Hex)	Quantity/Functionality	Unit	Data Type	Resolution	No. of registers	Product Type
5BD4	Average current L1	A	Unsigned	0.01	2	D1M 20
5BD6	Average current L2	A	Unsigned	0.01	2	D1M 20
5BD8	Average current L3	A	Unsigned	0.01	2	D1M 20
5BDA	Average current neutral	A	Unsigned	0.01	2	D1M 20
5BDC	Average voltage L1	V	Unsigned	0.1	2	D1M 20
5BDE	Average voltage L2	V	Unsigned	0.1	2	D1M 20
5BE0	Average voltage L3	V	Unsigned	0.1	2	D1M 20
5BE2	Average voltage L1-L2	V	Unsigned	0.1	2	D1M 20
5BE4	Average voltage L2-L3	V	Unsigned	0.1	2	D1M 20
5BE6	Average voltage L1-L3	V	Unsigned	0.1	2	D1M 20
5BE8	Average active power total	W	Signed	0.01	2	D1M 20
5BEA	Average active power L1	W	Signed	0.01	2	D1M 20
5BEC	Average active power L2	W	Signed	0.01	2	D1M 20
5BEE	Average active power L3	W	Signed	0.01	2	D1M 20
5BF0	Average reactive power total	VAR	Signed	0.01	2	D1M 20
5BF2	Average reactive power L1	VAR	Signed	0.01	2	D1M 20
5BF4	Average reactive power L2	VAR	Signed	0.01	2	D1M 20
5BF6	Average reactive power L3	VAR	Signed	0.01	2	D1M 20
5BF8	Average apparent power total	VA	Signed	0.01	2	D1M 20
5BFA	Average apparent power L1	VA	Signed	0.01	2	D1M 20
5BFC	Average apparent power L2	VA	Signed	0.01	2	D1M 20
5BFE	Average apparent power L3	VA	Signed	0.01	2	D1M 20
5C10	Maximum current L1	A	Unsigned	0.01	2	D1M 20
5C12	Maximum current L2	A	Unsigned	0.01	2	D1M 20
5C14	Maximum current L3	A	Unsigned	0.01	2	D1M 20
5C16	Maximum current neutral	A	Unsigned	0.01	2	D1M 20
5C18	Maximum voltage L1	V	Unsigned	0.1	2	D1M 20
5C1A	Maximum voltage L2	V	Unsigned	0.1	2	D1M 20
5C1C	Maximum voltage L3	V	Unsigned	0.1	2	D1M 20
5C1E	Maximum voltage L1-L2	V	Unsigned	0.1	2	D1M 20
5C20	Maximum voltage L2-L3	V	Unsigned	0.1	2	D1M 20
5C22	Maximum voltage L1-L3	V	Unsigned	0.1	2	D1M 20
5C24	Maximum active power total	W	Signed	0.01	2	D1M 20
5C26	Maximum active power L1	W	Signed	0.01	2	D1M 20
5C28	Maximum active power L2	W	Signed	0.01	2	D1M 20
5C2A	Maximum active power L3	W	Signed	0.01	2	D1M 20
5C2C	Maximum reactive power total	VAR	Signed	0.01	2	D1M 20
5C2E	Maximum reactive power L1	VAR	Signed	0.01	2	D1M 20
5C30	Maximum reactive power L2	VAR	Signed	0.01	2	D1M 20
5C32	Maximum reactive power L3	VAR	Signed	0.01	2	D1M 20
5C34	Maximum apparent power total	VA	Signed	0.01	2	D1M 20
5C36	Maximum apparent power L1	VA	Signed	0.01	2	D1M 20
5C38	Maximum apparent power L2	VA	Signed	0.01	2	D1M 20
5C3A	Maximum apparent power L3	VA	Signed	0.01	2	D1M 20
5C4C	Maximum current L1 timestamp		Unsigned		2	D1M 20

5C4E	Maximum current L2 timestamp		Unsigned		2	D1M 20
5C50	Maximum current L3 timestamp		Unsigned		2	D1M 20
5C52	Maximum current neutral timestamp		Unsigned		2	D1M 20
5C54	Maximum voltage L1 timestamp		Unsigned		2	D1M 20
5C56	Maximum voltage L2 timestamp		Unsigned		2	D1M 20
5C58	Maximum voltage L3 timestamp		Unsigned		2	D1M 20
5C5A	Maximum voltage L1-L2 timestamp		Unsigned		2	D1M 20
5C5C	Maximum voltage L2-L3 timestamp		Unsigned		2	D1M 20
5C5E	Maximum voltage L1-L3 timestamp		Unsigned		2	D1M 20
5C60	Maximum active power total timestamp		Unsigned		2	D1M 20
5C62	Maximum active power L1 timestamp		Unsigned		2	D1M 20
5C64	Maximum active power L2 timestamp		Unsigned		2	D1M 20
5C66	Maximum active power L3 timestamp		Unsigned		2	D1M 20
5C68	Maximum reactive power total timestamp		Unsigned		2	D1M 20
5C6A	Maximum reactive power L1 timestamp		Unsigned		2	D1M 20
5C6C	Maximum reactive power L2 timestamp		Unsigned		2	D1M 20
5C6E	Maximum reactive power L3 timestamp		Unsigned		2	D1M 20
5C70	Maximum apparent power total timestamp		Unsigned		2	D1M 20
5C72	Maximum apparent power L1 timestamp		Unsigned		2	D1M 20
5C74	Maximum apparent power L2 timestamp		Unsigned		2	D1M 20
5C76	Maximum apparent power L3 timestamp		Unsigned		2	D1M 20
5C88	Minimum current L1	A	Unsigned	0.01	2	D1M 20
5C8A	Minimum current L2	A	Unsigned	0.01	2	D1M 20
5C8C	Minimum current L3	A	Unsigned	0.01	2	D1M 20
5C8E	Minimum current neutral	A	Unsigned	0.01	2	D1M 20
5C90	Minimum voltage L1	V	Unsigned	0.1	2	D1M 20
5C92	Minimum voltage L2	V	Unsigned	0.1	2	D1M 20
5C94	Minimum voltage L3	V	Unsigned	0.1	2	D1M 20
5C96	Minimum voltage L1-L2	V	Unsigned	0.1	2	D1M 20
5C98	Minimum voltage L2-L3	V	Unsigned	0.1	2	D1M 20
5C9A	Minimum voltage L1-L3	V	Unsigned	0.1	2	D1M 20
5C9C	Minimum active power total	W	Signed	0.01	2	D1M 20
5C9E	Minimum active power L1	W	Signed	0.01	2	D1M 20
5CA0	Minimum active power L2	W	Signed	0.01	2	D1M 20

5CA2	Minimum active power L3	W	Signed	0.01	2	D1M 20
5CA4	Minimum reactive power total	VAR	Signed	0.01	2	D1M 20
5CA6	Minimum reactive power L1	VAR	Signed	0.01	2	D1M 20
5CA8	Minimum reactive power L2	VAR	Signed	0.01	2	D1M 20
5CAA	Minimum reactive power L3	VAR	Signed	0.01	2	D1M 20
5CAC	Minimum apparent power total	VA	Signed	0.01	2	D1M 20
5CAE	Minimum apparent power L1	VA	Signed	0.01	2	D1M 20
5CB0	Minimum apparent power L2	VA	Signed	0.01	2	D1M 20
5CB2	Minimum apparent power L3	VA	Signed	0.01	2	D1M 20
5CC4	Minimum current L1 timestamp		Unsigned	1	2	D1M 20
5CC6	Minimum current L2 timestamp		Unsigned	1	2	D1M 20
5CC8	Minimum current L3 timestamp		Unsigned	1	2	D1M 20
5CCA	Minimum current neutral timestamp		Unsigned	1	2	D1M 20
5CCC	Minimum voltage L1 timestamp		Unsigned	1	2	D1M 20
5CCE	Minimum voltage L2 timestamp		Unsigned	1	2	D1M 20
5CD0	Minimum voltage L3 timestamp		Unsigned	1	2	D1M 20
5CD2	Minimum voltage L1-L2 timestamp		Unsigned	1	2	D1M 20
5CD4	Minimum voltage L2-L3 timestamp		Unsigned	1	2	D1M 20
5CD6	Minimum voltage L1-L3 timestamp		Unsigned	1	2	D1M 20
5CD8	Minimum active power total timestamp		Unsigned	1	2	D1M 20
5CDA	Minimum active power L1 timestamp		Unsigned	1	2	D1M 20
5CDC	Minimum active power L2 timestamp		Unsigned	1	2	D1M 20
5CDE	Minimum active power L3 timestamp		Unsigned	1	2	D1M 20
5CE0	Minimum reactive power total timestamp		Unsigned	1	2	D1M 20
5CE2	Minimum reactive power L1 timestamp		Unsigned	1	2	D1M 20
5CE4	Minimum reactive power L2 timestamp		Unsigned	1	2	D1M 20
5CE6	Minimum reactive power L3 timestamp		Unsigned	1	2	D1M 20
5CE8	Minimum apparent power total timestamp		Unsigned	1	2	D1M 20
5CEA	Minimum apparent power L1 timestamp		Unsigned	1	2	D1M 20
5CEC	Minimum apparent power L2 timestamp		Unsigned	1	2	D1M 20
5CEE	Minimum apparent power L3 timestamp		Unsigned	1	2	D1M 20

8F60	Average time interval	minute	Unsigned		1	D1M 20

The timestamp format is the total number of seconds from January 1, 2010 to the time the data was stored.

Example

Request frame of reading Maximum active power total.

Slave address	0x01
Function code	0x03
Start address, high byte	0x5C
Start address, low byte	0x24
No. of registers, high byte	0x00
No. of registers, low byte	0x02
Error check (CRC), high byte	0x96
Error check (CRC), low byte	0x50

Response frame

Slave address	0x01
Function code	0x03
Byte count	0x04
Value of registers	0x00 12 34 56
Error check (CRC), high byte	0xCC
Error check (CRC), low byte	0xC8

The result means the current total maximum active power in the meter is 0x123456, which is converted to base decimal and multiplied by the resolution, that is 1193046/100=11930.46W.

4.5. Power Quantity

Follows are power quantity registers.

Register (Hex)	Quantity/Functionality		Unit	Data Type	Resolution	No. of registers	Product Type
5D00	Phase Voltage harmonics	L1 (THD)	%	Unsigned	0.1	1	D1M 20
5D01		L1 (2nd,3rd…40th)	%	Unsigned	0.1	39	D1M 20
5D80		L2 (THD)	%	Unsigned	0.1	1	D1M 20
5D81		L2 (2nd,3rd…40th)	%	Unsigned	0.1	39	D1M 20
5E00		L3 (THD)	%	Unsigned	0.1	1	D1M 20
5E01		L3 (2nd,3rd…40th)	%	Unsigned	0.1	39	D1M 20
5E80	Line Voltage harmonics	L1-L2 (THD)	%	Unsigned	0.1	1	D1M 20
5E81		L1-L2 (2nd,3rd…40th)	%	Unsigned	0.1	39	D1M 20
5F00		L2-L3 (THD)	%	Unsigned	0.1	1	D1M 20
5F01		L2-L3 (2nd,3rd…40th)	%	Unsigned	0.1	39	D1M 20
5F80		L3-L1 (THD)	%	Unsigned	0.1	1	D1M 20
5F81		L3-L1 (2nd,3rd…40th)	%	Unsigned	0.1	39	D1M 20
6000	Current harmonics	L1 (THD)	%	Unsigned	0.1	1	D1M 20
6001		L1 (2nd,3rd…40th)	%	Unsigned	0.1	39	D1M 20
6080		L2 (THD)	%	Unsigned	0.1	1	D1M 20
6081		L2 (2nd,3rd…40th)	%	Unsigned	0.1	39	D1M 20
6100		L3 (THD)	%	Unsigned	0.1	1	D1M 20
6101		L3 (2nd,3rd…40th)	%	Unsigned	0.1	39	D1M 20
6200	Unbalances	Phase voltage	%	Unsigned	0.1	2	D1M 20
6202		Line voltage	%	Unsigned	0.1	2	D1M 20
6204		Current	%	Unsigned	0.1	2	D1M 20

Example

Request (read phase voltage, line voltage and current unbalance)

Slave address	0x01
Function code	0x03
Start address, high byte	0x62
Start address, low byte	0x00
No. of registers, high byte	0x00
No. of registers, low byte	0x06
Error check (CRC), high byte	0xDA
Error check (CRC), low byte	0x70

Response frame

Slave address	0x01
Function code	0x03
Byte count	0x0C
Value of registers	0x00 00 00 32 00 00 00 3C 00 00 00 46
Error check (CRC), high byte	0x0F
Error check (CRC), low byte	0xE6

The result of response means the unbalance degree of phase voltage, line voltage and current in the meter is 0x32、0x3C、0x46，which are converted to base decimal and multiplied by the resolution, these are 50/10=5.0%、60/10=6.0%、70/10=7.0%.

4.6. IO

Follows are IO registers.

Register (Hex)	Quantity/Functionality	Unit	Data Type	Resolution	No. of registers	Product Type
6300	Digital Output 1		Unsigned		1	D1M 15/20
6301	Digital Output 2		Unsigned		1	D1M 15/20
6308	Digital Input 1		Unsigned		1	D1M 20
6309	Digital Input 2		Unsigned		1	D1M 20
6318	Digital Input 1 pulse counter		Unsigned	1	4	D1M 20
631C	Digital Input 2 pulse counter		Unsigned	1	4	D1M 20
6400	Digital Input 1 energy	kWh, kvarh, kVA	Unsigned	0.01	4	D1M 20
6404	Digital Input 2 energy	kWh, kvarh, kVA	Unsigned	0.01	4	D1M 20
8C0C	DO1 function configuration		Unsigned		1	D1M 15/20
8C0D	DO2 function configuration		Unsigned		1	D1M 15/20
8C0E	DI1 function configuration		Unsigned		1	D1M 20
8C0F	DI2 function configuration		Unsigned		1	D1M 20
8C10	I/O Port Pulse configuration -Port number		Unsigned		1	D1M 15/20
8C11	I/O Port Pulse configuration- Type of Energy		Unsigned		1	D1M 15/20
8C12	I/O Port Pulse configuration- Pulse frequency	Output: imp/MWh, imp/Mvarh Input: Wh/imp, varh/imp	Unsigned		2	D1M 15/20
8C14	I/O Port Pulse configuration- Pulse width	ms	Unsigned		2	D1M 15/20

Example

Example of reading led pulse configuration.

First, sending a request frame to set the I/O port selection to the LED.

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0x10
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x80 00
Error check (CRC), high byte	0x5E
Error check (CRC), low byte	0x0D

Then, the device returns the response frame, it sends a request frame to read the power type of the LED.

Slave address	0x01
Function code	0x03
Start address, high byte	0x8C
Start address, low byte	0x11
No. of registers, high byte	0x00
No. of registers, low byte	0x05
Error check (CRC), high byte	0x0A
Error check (CRC), low byte	0x4D

Finally, receiving the response frame from device.

Slave address	0x01
Function code	0x03
Byte count	0x0A
Value of registers	0x00 00 FF FF FF FF FF FF FF FF
Error check (CRC), high byte	0x0F
Error check (CRC), low byte	0xE6

The register data returned by the response frame of the device is 0, which means that the LED has not been set to pulse output and has been disabled.

Example

Example of setting DI1 and DI2 function configurations.

Request frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0x0E
No. of registers, high byte	0x00
No. of registers, low byte	0x02
Byte count	0x04
Value of registers	0x00 05 00 00
Error check (CRC), high byte	0x5B
Error check (CRC), low byte	0x8D

Response frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0x0E
No. of registers, high byte	0x00
No. of registers, low byte	0x02
Error check (CRC), high byte	0x0F
Error check (CRC), low byte	0xE6

The result means that DI1 is pulse input, DI2 is disable.

4.7. Device information

Follows are device information registers, and **only the product tag name can be modified**.

Register (Hex)	Quantity/Functionality	Unit	Data Type	Resolution	No. of registers	Product Type
8900	Serial number(s)		ASCII		5	D1M 15/20
8908	Meter firmware version		ASCII		8	D1M 15/20
8910	Product type number ID		Unsigned		1	D1M 15/20
8911	Linear Slave ID		Unsigned		1	D1M 15/20
8919	Product tag name		ASCII		5	D1M 15/20
8960	Type designation		ASCII		6	D1M 15/20
8966	Product Name		ASCII		8	D1M 15/20

Example of reading serial number

Request frame

Slave address	0x01
Function code	0x03
Start address, high byte	0x89
Start address, low byte	0x00
No. of registers, high byte	0x00
No. of registers, low byte	0x05
Error check (CRC), high byte	0xAF
Error check (CRC), low byte	0x95

Response frame

Slave address	0x01
Function code	0x03
Byte count	0x0A
Value of registers	0x4E 32 35 37 41 42 31 32 33 34
Error check (CRC), high byte	0x42
Error check (CRC), low byte	0x14

The result means the meter's SN is 0x4E323537414231323334. the hexadecimal code is converted to ASCII "N257AB1234".

Example of reading Product Name

Request frame:

Slave address	0x01
Function code	0x03
Start address, high byte	0x89
Start address, low byte	0x66
No. of registers, high byte	0x00
No. of registers, low byte	0x08
Error check (CRC), high byte	0xA3
Error check (CRC), low byte	0x78

Response frame:

Slave address	0x01
Function code	0x03
Byte count	0x10
Value of registers	0x44 31 4D 20 32 30 20 4D 4F 44 42 55 53 00 00 00
Error check (CRC), high byte	0x8E
Error check (CRC), low byte	0x4F

The result means that the meter's name is 0x44314D203230204D4F44425553. the hexadecimal code is converted to ASCII "D1M 20 MODBUS".

4.8. Time and Date

Only D1M20 can set this function, **when setting DST (daylight saving time), all relevant registers must be set at the same time**. The YYMMDDHHMMSS means year, month, date, hour minute, second, the YYMMDDHH means year, month, date, hour.
When setting the DST, the start year and end year must be same.

Register (Hex)	Quantity/Functionality	Unit	Data Type	Resolution	No. of registers	Product Type
8A00	Date Time (0xYYMMDDHHMMSS)		Unsigned		3	D1M 20
8A03	Day of week (1~7, Monday=1, Sunday=7)		Unsigned		1	D1M 20
8CE6	DST Start Date time, 0xYYMMDDHH		Unsigned		2	D1M 20
8CE8	DST End Date time, 0xYYMMDDHH		Unsigned		2	D1M 20
8CEA	DST Enable, 0=Disable, 1=Enable		Unsigned		1	D1M 20

Example
Read frame

Slave address	0x01
Function code	0x03
Start address, high byte	0x8A
Start address, low byte	0x00
No. of registers, high byte	0x00
No. of registers, low byte	0x03
Error check (CRC), high byte	0x2F
Error check (CRC), low byte	0xD3

Response frame

Slave address	0x01
Function code	0x03
Byte count	0x06
Value of registers	0x16 02 02 0E 00 00
Error check (CRC), high byte	0x3A
Error check (CRC), low byte	0x38

The result of response means the current date of the meter is 0x1602020E0000，year is 0x16, month is 2，date is 2, hour is 0xE, minute is 0, second is 0, which are converted to base decimal, that is 2022/2/2 14:00:00.

Example

Example of setting DST to start at 00:00 on March 31,2024, end at 00:00 on October 27, 2024.

Request frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xE6
No. of registers, high byte	0x00
No. of registers, low byte	0x04
Byte count	0x08
Value of registers	0x18 03 1F 00 18 0A 1B 00
Error check (CRC), high byte	0xCF
Error check (CRC), low byte	0x16

Response frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xE6
No. of registers, high byte	0x00
No. of registers, low byte	0x04
Error check (CRC), high byte	0x0A
Error check (CRC), low byte	0xAD

The response frame means the setting is successful.

4.9. Transformer ratios

When setting the ratio between the current and the voltage transformer, you must set all the registers of the current and voltage transformer. You cannot set only the current transformer or only the voltage transformer.
Follows are transformer ratios registers.

Register (Hex)	Quantity/Functionality	Unit	Data Type	Resolution	No. of registers	Product Type
8C00	CT primary		Unsigned	1	2	D1M 15/20
8C02	CT secondary		Unsigned	1	2	D1M 15/20
8C04	VT primary		Unsigned	1	2	D1M 15/20
8C06	VT secondary		Unsigned	1	2	D1M 15/20
8CE5	Wires		Unsigned		1	D1M 15/20

Example

Setting the primary/secondary of CT transformer to 5A/5A and the primary /secondary of the voltage transformer to 230V/230V.
Request frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0x00
No. of registers, high byte	0x00
No. of registers, low byte	0x08
Byte count	0x10
Value of registers	0x00 00 00 05 00 00 00 05 00 00 00 E6 00 00 00 E6
Error check (CRC), high byte	0xF1
Error check (CRC), low byte	0xC0

Response frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0x00
No. of registers, high byte	0x00
No. of registers, low byte	0x08
Error check (CRC), high byte	0xEB
Error check (CRC), low byte	0x5F

The response frame means the setting is successful.

4.10. Communication

4.10.1. Modbus-RTU

When setting Modbus-RTU communication parameters, all registers must be set at the same time, and only some parameters cannot be set.
Follows are Modbus-RTU registers.

Register (Hex)	Quantity/Functionality	Unit	Data Type	Resolution	No. of registers	Product Type
8CEB	Address, 1~247		Unsigned		1	D1M 15/20
8CEC	Baudrate,9600~115200		Unsigned		2	D1M 15/20
8CEE	Parity, 0-none，1-even，2-odd		Unsigned		1	D1M 15/20

The range of device address bits: 1~247.
The range of baudrat:9600,19200,38400,57600,115200.

Example
Reading the Modbus-RTU communication parameters refers to the other examples above.
Setting the Modbus-RTU communication parameters to address 1, baud rate 19200, and byte format 8E1.
Request frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xEB
No. of registers, high byte	0x00
No. of registers, low byte	0x04
Byte count	0x08
Value of registers	0x00 01 00 00 4B 00 00 01
Error check (CRC), high byte	0x40
Error check (CRC), low byte	0x63

Response frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xEB
No. of registers, high byte	0x00
No. of registers, low byte	0x04
Error check (CRC), high byte	0x9B
Error check (CRC), low byte	0x6E

The response frame means the setting is successful.

4.10.2. Modbus-TCP/IP

Modbus-TCP/IP communication is only used in D1M20 Ethernet products and must follow the Modbus-TCP/IP instructions.
When setting the Modbus-TCP/IP communication parameters, you must set all registers at the same time. You cannot set only some parameters.

Follows are Modbus-TCP/IP registers.

Register (Hex)	Quantity/Functionality	Unit	Data Type	Resolution	No. of registers	Product Type
8CEF	DHCP, 0=disable, 1=enable		Unsigned		1	D1M 20
8CF0	IP, A.B.C.D=0xAABBCCDD		Unsigned		2	D1M 20
8CF2	Mask, A.B.C.D=0xAABBCCDD		Unsigned		2	D1M 20
8CF4	Gateway, A.B.C.D=0xAABBCCDD		Unsigned		2	D1M 20
8CF6	TCP Port, fixed 502		Unsigned		1	D1M 20

Example

Reading the Modbus-TCP/IP communication parameters refers to the other examples above.

Setting the Modbus-TCP/IP communication parameters to DHCP disable, IP address to 192.168.1.12, mask to 255.255.255.0, and gateway address to 192.168.1.1.

The TCP packet header is for reference only. The actual packet shall prevail.

Request frame

TCP header	0x00 00 00 00 00 15
Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xEF
No. of registers, high byte	0x00
No. of registers, low byte	0x07
Byte count	0x0E
Value of registers	0x00 00 C0 A8 01 0C FF FF FF 00 C0 A8 01 01

Response frame

TCP header	0x00 00 00 00 00 06
Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xEF
No. of registers, high byte	0x00
No. of registers, low byte	0x07

The response frame means the setting is successful.

4.11. Power without decimal point

Follows are registers.

Register (Hex)	Quantity/Functionality	Unit	Data Type	Resolution	No. of registers	Product Type
CB1A	Average Active power total Scaler 1	W	Signed	1	2	D1M 15/20
CB1C	Average Active power L1 Scaler 1	W	Signed	1	2	D1M 15/20
CB1E	Average Active power L2 Scaler 1	W	Signed	1	2	D1M 15/20
CB20	Average Active power L3 Scaler 1	W	Signed	1	2	D1M 15/20
CB22	Average Reactive power total Scaler 1	VAR	Signed	1	2	D1M 15/20
CB24	Average Reactive power L1 Scaler 1	VAR	Signed	1	2	D1M 15/20
CB26	Average Reactive power L2 Scaler 1	VAR	Signed	1	2	D1M 15/20
CB28	Average Reactive power L3 Scaler 1	VAR	Signed	1	2	D1M 15/20
CB2A	Average Apparent power total Scaler 1	VA	Signed	1	2	D1M 15/20
CB2C	Average Apparent power L1 Scaler 1	VA	Signed	1	2	D1M 15/20
CB2E	Average Apparent power L2 Scaler 1	VA	Signed	1	2	D1M 15/20
CB30	Average Apparent power L3 Scaler 1	VA	Signed	1	2	D1M 15/20
CBE8	Max Active power total Scaler 1	W	Signed	1	2	D1M 20
CBEA	Max Active power L1 Scaler 1	W	Signed	1	2	D1M 20
CBEC	Max Active power L2 Scaler 1	W	Signed	1	2	D1M 20
CBEE	Max Active power L3 Scaler 1	W	Signed	1	2	D1M 20
CBF0	Max Reactive power total Scaler 1	VAR	Signed	1	2	D1M 20
CBF2	Max Reactive power L1 Scaler 1	VAR	Signed	1	2	D1M 20
CBF4	Max Reactive power L2 Scaler 1	VAR	Signed	1	2	D1M 20
CBF6	Max Reactive power L3 Scaler 1	VAR	Signed	1	2	D1M 20
CBF8	Max Apparent power total Scaler 1	VA	Signed	1	2	D1M 20
CBFA	Max Apparent power L1 Scaler 1	VA	Signed	1	2	D1M 20
CBFC	Max Apparent power L2 Scaler 1	VA	Signed	1	2	D1M 20
CBFE	Max Apparent power L3 Scaler 1	VA	Signed	1	2	D1M 20
CC24	Min Active power total Scaler 1	W	Signed	1	2	D1M 20
CC26	Min Active power L1 Scaler 1	W	Signed	1	2	D1M 20
CC28	Min Active power L2 Scaler 1	W	Signed	1	2	D1M 20
CC2A	Min Active power L3 Scaler 1	W	Signed	1	2	D1M 20
CC2C	Min Reactive power total Scaler 1	VAR	Signed	1	2	D1M 20
CC2E	Min Reactive power L1 Scaler 1	VAR	Signed	1	2	D1M 20
CC30	Min Reactive power L2 Scaler 1	VAR	Signed	1	2	D1M 20
CC32	Min Reactive power L3 Scaler 1	VAR	Signed	1	2	D1M 20
CC34	Min Apparent power total Scaler 1	VA	Signed	1	2	D1M 20
CC36	Min Apparent power L1 Scaler 1	VA	Signed	1	2	D1M 20
CC38	Min Apparent power L2 Scaler 1	VA	Signed	1	2	D1M 20
CC3A	Min Apparent power L3 Scaler 1	VA	Signed	1	2	D1M 20
CC9C	Average Active power total Scaler 1	W	Signed	1	2	D1M 20

CC9E	Average Active power L1 Scaler 1	W	Signed	1	2	D1M 20
CCA0	Average Active power L2 Scaler 1	W	Signed	1	2	D1M 20
CCA2	Average Active power L3 Scaler 1	W	Signed	1	2	D1M 20
CCA4	Average Reactive power total Scaler 1	VAR	Signed	1	2	D1M 20
CCA6	Average Reactive power L1 Scaler 1	VAR	Signed	1	2	D1M 20
CCA8	Average Reactive power L2 Scaler 1	VAR	Signed	1	2	D1M 20
CCAA	Average Reactive power L3 Scaler 1	VAR	Signed	1	2	D1M 20
CCAC	Average Apparent power total Scaler 1	VA	Signed	1	2	D1M 20
CCAE	Average Apparent power L1 Scaler 1	VA	Signed	1	2	D1M 20
CCB0	Average Apparent power L2 Scaler 1	VA	Signed	1	2	D1M 20
CCB2	Average Apparent power L3 Scaler 1	VA	Signed	1	2	D1M 20

Example

Reading the power data without decimal points is the same as reading the real-time data above, except that the obtained power data are all integers.

4.12. Notification

4.12.1. Register Address

Notifications include error logs, alarm logs, warning logs, audit logs, and power outage logs. Each notification type has a header and a block of data. The register addresses are shown in the following table. In addition, error signs, warning signs, alarm signs are also included in the notification function.

Register (Hex)	Quantity/Functionality		Unit	Data Type	Resolution	No. of registers	Product Type
6500	Errors Log	Header - Get next entry, 1=read the next entry	--	Unsigned	--	1	D1M 15/20
6501		Header - Entry Number	--	Unsigned	--	1	D1M 15/20
6507		Header - Direction, 0=read the entry from the most newest 1=read the entry from most oldest	--	Unsigned	--	1	D1M 15/20
6508		Header - Total Entry Number	--	Unsigned	--	1	D1M 15/20
6510		Data block 1 - Timestamp, 0xYYMMDDHHMMSS	--	Unsigned	--	3	D1M 15/20
6513		Data block 1 - Category, 2=Error	--	Unsigned	--	1	D1M 15/20
6514		Data block 1 - Error ID, see the sheet "Event ID"	--	Unsigned	--	1	D1M 15/20
6515		Data block 1 - Duration, total second of this error	s	Unsigned	--	2	D1M 15/20
6517		…...	--	Unsigned	--	3	D1M 15/20
6572		Data block 15 - Timestamp, 0xYYMMDDHHMMSS	--	Unsigned	--	3	D1M 15/20
6575		Data block 15 - Category, 2=Error	--	Unsigned	--	1	D1M 15/20
6576		Data block 15 - Error ID, see the sheet "Event ID"	--	Unsigned	--	1	D1M 15/20
6577		Data block 15 - Duration, total second of this error	s	Unsigned	--	2	D1M 15/20
65B0	Alarms log	Header - Get next entry, 1=read the next entry	--	Unsigned	--	1	D1M 15/20
65B1		Header - Entry Number	--	Unsigned	--	1	D1M 15/20
65B7		Header - Direction, 0=read the entry from most newest 1=read the entry from most oldest	--	Unsigned	--	1	D1M 15/20
65B8		Header - Total Entry Number	--	Unsigned	--	1	D1M 15/20
65C0		Data block 1 - Timestamp, 0xYYMMDDHHMMSS	--	Unsigned	--	3	D1M 15/20
65C3		Data block 1 - Category, 8=Alarm	--	Unsigned	--	1	D1M 15/20

65C4		Data block 1 - Alarm ID, see the sheet "Event ID"	--	Unsigned	--	1	D1M 15/20
65C5		Data block 1 - Duration, total second of this alarm	s	Unsigned	--	2	D1M 15/20
65C7		…...	--	Unsigned	--	3	D1M 15/20
6622		Data block 15 - Timestamp, 0xYYMMDDHHMMSS	--	Unsigned	--	3	D1M 15/20
6625		Data block 15 - Category, 8=Alarm	--	Unsigned	--	1	D1M 15/20
6626		Data block 15 - Alarm ID, see the sheet "Event ID"	--	Unsigned	--	1	D1M 15/20
6627		Data block 15 - Duration, total second of this alarm	s	Unsigned	--	2	D1M 15/20
6660		Header - Get next entry, 1=read the next entry	--	Unsigned	--	1	D1M 15/20
6661		Header - Entry Number	--	Unsigned	--	1	D1M 15/20
6667		Header - Direction, 0=read the entry from newest 1=read the entry from most oldest	--	Unsigned	--	1	D1M 15/20
6668		Header - Total Entry Number	--	Unsigned	--	1	
6670		Data block - Entry Number	--	Unsigned	--	2	D1M 15/20
6672		Data block - Timestamp (seconds from 2010-01-01)	--	Unsigned	--	2	D1M 15/20
6674		Data block - Upgrade Counter	--	Unsigned	--	1	D1M 15/20
6675	Audit Log	Data block - Firmware Version	--	ASCII	--	6	D1M 15/20
667B		Data block - VT Primary	--	Unsigned	--	2	D1M 15/20
667D		Data block - VT Secondary	--	Unsigned	--	2	D1M 15/20
667F		Data block - CT Primary	--	Unsigned	--	2	D1M 15/20
6681		Data block - CT Secondary	--	Unsigned	--	2	D1M 15/20
6687		Data block - Type of Network	--	Unsigned	--	1	D1M 15/20
6688		Data block - Active energy import Total	kWh	Unsigned	0.01	4	D1M 15/20
6698		Data block - Active energy Tariff 1	kWh	Unsigned	0.01	4	D1M 15/20
669C		Data block - Active energy Tariff 2	kWh	Unsigned	0.01	4	D1M 15/20
66A0		Data block - Active energy Tariff 3	kWh	Unsigned	0.01	4	D1M 15/20
66A4		Data block - Active energy Tariff 4	kWh	Unsigned	0.01	4	D1M 15/20

66B0		Data block - Active energy export Total	kWh	Unsigned	0.01	4	D1M 15/20
6710		Header - Get next entry, 1=read the next entry	--	Unsigned	--	1	D1M 15/20
6711		Header - Entry Number	--	Unsigned	--	1	D1M 15/20
6717		Header - Direction, 0=read the entry from newest 1=read the entry from most oldest	--	Unsigned	--	1	D1M 15/20
6718		Header - Total Entry Number	--	Unsigned	--	1	D1M 15/20
6720		Data block 1 - Timestamp, 0xYYMMDDHHMMSS	--	Unsigned	--	3	D1M 15/20
6723		Data block 1 - Category, 4=Warning	--	Unsigned	--	1	D1M 15/20
6724	Warni ngs log	Data block 1 - Warning ID, see the sheet "Event ID"	--	Unsigned	--	1	D1M 15/20
6725		Data block 1 - Duration, total second of this warning	--	Unsigned	--	2	D1M 15/20
6727		….....	--	Unsigned	--	3	D1M 15/20
6782		Data block 15 - Timestamp, 0xYYMMDDHHMMSS	--	Unsigned	--	3	D1M 15/20
6785		Data block 15 - Category, 4=Warning	--	Unsigned	--	1	D1M 15/20
6786		Data block 15 - Warning ID, see the sheet "Event ID"	--	Unsigned	--	1	D1M 15/20
6787		Data block 15 - Duration, total second of this warning	--	Unsigned	--	2	D1M 15/20
67C0		Header - Get next entry, 1=read the next entry	--	Unsigned	--	1	D1M 15/20
67C1		Header - Entry Number	--	Unsigned	--	1	D1M 15/20
67C7	Power outag e	Header - Direction, 0=read the entry from newest 1=read the entry from most oldest	--	Unsigned	--	1	D1M 15/20
67C8		Header - Total Entry Number	--	Unsigned	--	1	D1M 15/20
67D0		Data block 1 - Timestamp, 0xYYMMDDHHMMSS	--	Unsigned	--	3	D1M 15/20
67D3		….....	--	Unsigned	--	3	D1M 15/20
67FA		Data block 15 - Timestamp, 0xYYMMDDHHMMSS	--	Unsigned	--	3	D1M 15/20

8A13		Bit0 - Error ID 1 status, 1=Error active, 0=Error unactive		Unsigned		4	D1M 15/20
8A1F	Flags	Bit0 - Warning ID 1 status, 1=Warning active, 0=Warning unactive		Unsigned		4	D1M 15/20
8A25		Bit0 - Alarm ID 1 status, 1=Alarm active, 0-Alarm unactive		Unsigned		4	D1M 15/20

4.12.2. Header

The header is used to control the readout and filling of data blocks.

Content	No. of registers	Description	Data Type
Get next entry	1	1=read the next entry	Unsigned
Entry Number	1	Write the entry number that will be read	Unsigned
Direction	1	0=read the entry from newest 1=read the entry from oldest	Unsigned
Total Entry Number	1	Read total entry number, up to 999 entries	Unsigned

4.12.3. Data block

The data block contains the actual data, 15 records in total. The data format of the error log, alarm log, and warning log is the same.
However, the data format of audit log and power outage log is different from the above. The data block of audit log contains the configuration information of electricity meter and power information. The data block of the power outage log contains only the timestamp.

Content	No. of registers	Description	Data Type
Timestamp	3	0xYYMMDDHHMMSS	Unsigned
Category	1	2-error, 4- warning ,8-alarm	Unsigned
Event ID	1	More details see the event ID table	Unsigned
Duration	2	total second of this event	Unsigned

4.12.4. Event ID

Error ID	Description
40	Audit log error, space full
42	Persistent storage error, EEPROM chip
43	RAM Memory CRC error, Flash chip
44	Firmware upgrade invalid image
46	Firmware upgrade error
53	RTC circuit error
60	Product was not approved
Warning ID	Description
1000	U1 missing
1001	U2 missing (and it is not single-phase system)
1002	U3 missing (and it is not single-phase system)
1003	Not Locked device, not set password
1008	Frequency out of the metering limit

1010	Date not set
1011	Time not set
1012	U2 connected for single phase wires setup
1013	U3 connected for single phase wires setup
1014	I1 missing
1015	I2 missing (and it is not single-phase system)
1016	I3 missing (and it is not single-phase system)
1017	I2 connected for single phase wires setup
1018	I3 connected for single phase wires setup
1030	Power Fail
1040	U1, U2 and U3 are inverse in 3 phases system
1041	I1 wrong direction
1042	I2 wrong direction (and it is not single-phase system)
1043	I3 wrong direction (and it is not single-phase system)
1044	I1 and I2 are inverse (and it is not single-phase system)
1045	I2 and I3 are inverse (and it is not single-phase system)
1046	I3 and I1 are inverse (and it is not single-phase system)
Alarm ID	Description
2013	alarm 1
2014	alarm 2
2015	alarm 3
2016	alarm 4
2017	alarm 5
2018	alarm 6
2019	alarm 7
2020	alarm 8
2021	alarm 9
2022	alarm 10
2023	alarm 11
2024	alarm 12
2025	alarm 13
2026	alarm 14
2027	alarm 15

4.12.5. The Errors flag, Warnings flag, Alarms flag

The registers of error flags, warning flags, and alarm flags are used to obtain which are activated errors and which are activated warning and alarm information. Each bit in the register represents an error, a warning, or an alarm. Here's an example of a warning flag.

Bit	Bit 63	Bit 62	······	Bit 25	······	Bit 0
value	1	0	......	1	......	0
description	Warning 63 enable	Warning 62 disable	......	Warning 25 enable	......	Warning 0 disable

To read the notification, you first write the header of the associated log type and then read the data in the data block, as shown in the following table:

step	operation
1	Write "N" in Header - Entry Number
2	Write 0 or 1 in Header - Direction
3	Write 1 in Header - Get next entry, start to read
4	Read data block, can read from N to (N+14) entries
5	Repeat 3-4, can read from (N+15) to (N+29) entries
6	......[a,b]
a: Repeat 3-4 to read the saved multiple notifications. The number read in each time is 15 after or forward of the last number read in the previous time, and the forward and backward are related to the data written by direction. b: If you do not follow the correct steps, you may read an error log.	

Example of reading warning log in D1M20

Request frame of Entry Number

Slave address	0x01
Function code	0x10
Start address, high byte	0x67
Start address, low byte	0x11
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 01
Error check (CRC), high byte	0x72
Error check (CRC), low byte	0x17

Response frame of Entry Number

Slave address	0x01
Function code	0x10
Start address, high byte	0x67
Start address, low byte	0x11
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0x4E
Error check (CRC), low byte	0xB8

The response frame means the setting is successful. Reading warning log from entry 1.

Request frame of direction

Slave address	0x01
Function code	0x10
Start address, high byte	0x67
Start address, low byte	0x17
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 01
Error check (CRC), high byte	0x72
Error check (CRC), low byte	0x71

Response frame of direction

Slave address	0x01
Function code	0x10
Start address, high byte	0x67
Start address, low byte	0x17
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0xAE
Error check (CRC), low byte	0xB9

The response frame means the setting is successful. Reading warning log from entry 1, and the first log occurs later than the second.

Request frame of get next entry.

Slave address	0x01
Function code	0x10
Start address, high byte	0x67
Start address, low byte	0x10
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 01
Error check (CRC), high byte	0x73
Error check (CRC), low byte	0xC6

Response frame of get next entry.

Slave address	0x01
Function code	0x10
Start address, high byte	0x67
Start address, low byte	0x10
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0x1F
Error check (CRC), low byte	0x78

The response frame means the setting is successful. Upload the contents of the data block to be read to the read address.

Request frame of data blocks

Slave address	0x01
Function code	0x03
Start address, high byte	0x67
Start address, low byte	0x20
No. of registers, high byte	0x00
No. of registers, low byte	0x69
Error check (CRC), high byte	0x9B
Error check (CRC), low byte	0x5A

Response frame of data block

Slave address	0x01
Function code	0x03
Byte count	0xD2
Value of registers	0x17 02 15 17 00 17 00 04 03 F8 00 00 22 EC 17 02 15 17 00 17 00 04 03 F7 00 00 22 EC 17 02 15 17 00 17 00 04 03 F6 00 00 22 EC 17 02 15 17 00 17 00 04 03 EA 00 00 22 EC 17 02 15 17 00 17 00 04 03 E9 00 00 22 EC 17 02 15 17 00 17 00 04 03 E8 00 00 22 EC 17 02 06 17 00 17 00 04 03 F8 00 00 28 8C 17 02 06 17 00 17 00 04 03 F7 00 00 28 8C 17 02 06 17 00 17 00 04 03 F6 00 00 28 8C 17 02 06 17 00 17 00 04 03 EA 00 00 28 8C 17 02 06 17 00 17 00 04 03 E9 00 00 28 8C 17 02 06 17 00 17 00 04 03 E8 00 00 28 8C 17 02 06 16 00 16 00 04 03 F8 00 01 56 E5 17 02 06 16 00 16 00 04 03 F7 00 01 56 E5 17 02 06 16 00 16 00 04 03 F6 00 01 56 E5
Error check (CRC), high byte	0x75
Error check (CRC), low byte	0x19

The response frame means the reading is successful. 15 logs were read. Example: The first log is "17 02 15 17 00 17 00 04 03 F8 00 00 22 EC", where the first six bytes represent the time: February 21, 2020 23:0:23 seconds; "00 04" indicates that the event type is a warning; "03 F8" is "1016", indicating that the event is I3 missing; "00 00 22 EC" and "8940" means that the duration of the event is 8940 seconds.

Example of reading warning log in D1M15

Request frame of Entry Number

Slave address	0x01
Function code	0x10
Start address, high byte	0x67
Start address, low byte	0x11
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 01
Error check (CRC), high byte	0x72
Error check (CRC), low byte	0x17

Response frame of Entry Number

Slave address	0x01
Function code	0x10
Start address, high byte	0x67
Start address, low byte	0x11
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0x4E
Error check (CRC), low byte	0xB8

The response frame means the setting is successful. The warning log starting from record 1 will be read.

Request frame of direction

Slave address	0x01

Function code	0x10
Start address, high byte	0x67
Start address, low byte	0x17
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 01
Error check (CRC), high byte	0x72
Error check (CRC), low byte	0x71

Response frame of direction

Slave address	0x01
Function code	0x10
Start address, high byte	0x67
Start address, low byte	0x17
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0xAE
Error check (CRC), low byte	0xB9

The response frame means the setting is successful. You will read the warning log starting at record 1 and going backward, meaning that the first record is later than the second.

Request frame of get next entry.

Slave address	0x01
Function code	0x10
Start address, high byte	0x67
Start address, low byte	0x10
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 01
Error check (CRC), high byte	0x73
Error check (CRC), low byte	0xC6

Response frame of get next entry.

Slave address	0x01
Function code	0x10
Start address, high byte	0x67
Start address, low byte	0x10
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0x1F
Error check (CRC), low byte	0x78

The response frame means the setting is successful. Upload the contents of the data block to the read address.

Request frame of total entry number

Slave address	0x01
Function code	0x03
Start address, high byte	0x67
Start address, low byte	0x18

No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0x1B
Error check (CRC), low byte	0x79

Response frame of total entry number

Slave address	0x01
Function code	0x03
Byte count	0x02
Value of registers	0x00 06
Error check (CRC), high byte	0x38
Error check (CRC), low byte	0x46

The response frame means the reading is successful. The total entries are 6.

Request frame of data block, since one alarm log is 7 bytes long, the total size of six alarm logs is 6*7=42 bytes, or 0x2A.

Slave address	0x01
Function code	0x03
Start address, high byte	0x67
Start address, low byte	0x20
No. of registers, high byte	0x00
No. of registers, low byte	0x2A
Error check (CRC), high byte	0xDA
Error check (CRC), low byte	0xAB

Response frame

Slave address	0x01
Function code	0x03
Byte count	0x54
Value of registers	0xFF FF FF FF FF FF 00 04 03 E8 FF FF FF FF FF FF FF FF FF FF 00 04 03 E9 FF FF FF FF FF FF FF FF FF FF 00 04 03 EA FF FF FF FF FF FF FF FF FF 00 04 03 F6 FF FF FF FF FF FF FF FF FF 00 04 03 F7 FF FF FF FF FF FF FF FF FF 00 04 03 F8 FF FF FF FF
Error check (CRC), high byte	0x2C
Error check (CRC), low byte	0x85

The response frame means the setting is successful, you can read six records. the first record data is "FF FF FF FF FF FF 00 04 03 E8 FF FF FF FF", the first 6 bytes represent the time, which is the full FF, "00 04" indicates that the event type is a warning, "03 E8" is "1000", indicating that the event is U1 missing, The rest of the bytes are FF, see FF for [details](#).

Example of reading audit log in D1M20

Request frame of Entry Number

Slave address	0x01
Function code	0x10
Start address, high byte	0x66
Start address, low byte	0x61
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 01
Error check (CRC), high byte	0x69
Error check (CRC), low byte	0xE7

Response frame of Entry Number

Slave address	0x01
Function code	0x10
Start address, high byte	0x66
Start address, low byte	0x61
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0x4E
Error check (CRC), low byte	0x9F

The response frame means the setting is successful. The audit log starting from record 1 will be read.
Request frame of direction

Slave address	0x01
Function code	0x10
Start address, high byte	0x66
Start address, low byte	0x67
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 01
Error check (CRC), high byte	0x69
Error check (CRC), low byte	0x81

Response frame of direction

Slave address	0x01
Function code	0x10
Start address, high byte	0x66
Start address, low byte	0x67
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0xAE
Error check (CRC), low byte	0x9E

The response frame means the setting is successful. you will read the audit log from record 1 backward, meaning that the record 1 is occur later than the second.
Request frame of get next entry.

Slave address	0x01
Function code	0x10
Start address, high byte	0x66
Start address, low byte	0x60
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 01
Error check (CRC), high byte	0x68
Error check (CRC), low byte	0x36

Response frame of get next entry.

Slave address	0x01
Function code	0x10
Start address, high byte	0x66
Start address, low byte	0x60

No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0x1F
Error check (CRC), low byte	0x5F

The response frame means the setting is successful. Upload the contents of the data block to the read address.

Request frame of total entry number

Slave address	0x01
Function code	0x03
Start address, high byte	0x66
Start address, low byte	0x68
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0x1B
Error check (CRC), low byte	0x5E

Response frame of total entry number

Slave address	0x01
Function code	0x03
Byte count	0x02
Value of registers	0x00 18
Error check (CRC), high byte	0xB8
Error check (CRC), low byte	0x4E

The response frame indicates that a total of 24 pieces of data are stored in the register.

Request frame of data blocks

Slave address	0x01
Function code	0x03
Start address, high byte	0x66
Start address, low byte	0x70
No. of registers, high byte	0x00
No. of registers, low byte	0x2C
Error check (CRC), high byte	0x5B
Error check (CRC), low byte	0x44

Response frame of data blocks

Slave address	0x01
Function code	0x03
Byte count	0x58

Value of registers	0x00 00 00 18 00 2D 0A 66 00 03 30 2E 31 2E 30 32 31 2E 30 2E 30 30 00 00 00 E6 00 00 00 E6 00 00 00 05 00 00 00 05 00 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Error check (CRC), high byte	0xE2
Error check (CRC), low byte	0x93

The response frame means reading the 24th record is successful. The first four bytes represent the time in seconds, "00 2D 0A 66" is the time from 00:00:00 on 01/01/2010 to the 2,951,782 second. "0003" means the time of upgrades is 3; "30 2E 31 2E 30 32 31 2E 30 2E 30 30" means that the firmware version is "0.1.021.0.00", "00 00 00 E6" means that the VT primary is 230V ; "00 00 00 E6" means VT secondary is 230V, "00 00 00 05" means CT primary is 5A, "00 00 00 05" means CT secondary test is 5V, "00 01" means connection type is 3P3E, "00 00 00 00 00 00 00" means that the total input active power is 0, "00 00 00 00 00 00 00 00 00 00 00" means that the active power of T1 is 0, "00 00 00 00 00 00 00 00 00 00" means that the active power of T2 is 0, "00 00 00 00 00 00 00" means that the active power of T3 is 0, "00 00 00 00 00 00 00 00 00 00" means that the active power of T4 is 0, and "00 00 00 00 00 00 00 00 00 00" means that the total output active power is 0.

Example of reading audit log in D1M15

Request frame of Entry Number

Slave address	0x01
Function code	0x10
Start address, high byte	0x66
Start address, low byte	0x61
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 01
Error check (CRC), high byte	0x69
Error check (CRC), low byte	0xE7

Response frame of Entry Number

Slave address	0x01
Function code	0x10
Start address, high byte	0x66
Start address, low byte	0x61
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0x4E
Error check (CRC), low byte	0x9F

The response frame means the setting is successful. The audit log starting from record 1 will be read.

Request frame of direction

Slave address	0x01
Function code	0x10
Start address, high byte	0x66
Start address, low byte	0x67
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 01
Error check (CRC), high byte	0x69
Error check (CRC), low byte	0x81

Response frame of direction

Slave address	0x01
Function code	0x10
Start address, high byte	0x66
Start address, low byte	0x67
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0xAE
Error check (CRC), low byte	0x9E

The response frame means the setting is successful. You will read audit log from record 1 and backward, meaning that the record 1 is occur later than the second.

Request frame of get next entry.

Slave address	0x01
Function code	0x10
Start address, high byte	0x66
Start address, low byte	0x60
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 01
Error check (CRC), high byte	0x68
Error check (CRC), low byte	0x36

Response frame of get next entry.

Slave address	0x01

Function code	0x10
Start address, high byte	0x66
Start address, low byte	0x60
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0x1F
Error check (CRC), low byte	0x5F

The response frame means the setting is successful. Upload the contents of the data block to the read address.

Request frame of total entry number

Slave address	0x01
Function code	0x03
Start address, high byte	0x66
Start address, low byte	0x68
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0x1B
Error check (CRC), low byte	0x5E

Response frame of total entry number

Slave address	0x01
Function code	0x03
Byte count	0x02
Value of registers	0x00 11
Error check (CRC), high byte	0x78
Error check (CRC), low byte	0x48

The response frame indicates that a total of 17 records are stored in the register.

Request frame of data blocks

Slave address	0x01
Function code	0x03
Start address, high byte	0x66
Start address, low byte	0x70
No. of registers, high byte	0x00
No. of registers, low byte	0x2C
Error check (CRC), high byte	0x5B
Error check (CRC), low byte	0x44

Response frame of data blocks

Slave address	0x01
Function code	0x03
Byte count	0x58
Value of registers	0x00 00 00 11 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
Error check (CRC), high byte	0xE5
Error check (CRC), low byte	0x46

The response frame means that reading the content of record 17 successfully. Only the first 4 bytes of D1M 15 are valid values, and the rest are FF. The specific meaning of FF is shown in the detail. This reply frame records the current 17th log.

4.13. Alarm Setting

The module defines the threshold and hysteresis values, delay, type, and action to be performed for each alarm. Each alarm can be configured separately, and when the specified conditions are met, the corresponding alarm is generated, and the content of the related alarm is recorded.
When setting alarm registers, **all registers must be set at the same time**, not just some registers.
The registers that configure the alarm parameters are shown in the following table.

Register (Hex)	Quantity/Functionality	Unit	Data Type	Resolution	No. of registers	Product Type
8C60	Alarm number, 1 ~ 15	--	Unsigned	--	1	D1M 15/20
8C61	Quantity, see the sheet "OBIS Code"	--	Unsigned	--	3	D1M 15/20
8C64	Threshold of Alarm	x	Unsigned	1	4	D1M 15/20
8C68	Hysteresis	%	Unsigned	1	1	D1M 15/20
8C69	Delays of Alarm	s	Unsigned	1	2	D1M 15/20
8C6B	Type of alarm	--	Unsigned	--	1	D1M 15/20
8C6C	Action of enable	--	Unsigned	--	1	D1M 15/20
8C6D	Link to which DO, 0=None, 1=DO1, 2=DO2	--	Unsigned	--	1	D1M 15/20

Threshold of Alarm

The register is used to configure the threshold for alarm triggering, and the alarm is triggered when the value of the alarm quantity exceeds the threshold.

Hysteresis of Alarm

The register is used to calculate the alarm shutdown threshold. turn off threshold=threshold – (threshold * hysteresis).

Delays of Alarm

The register is used to delay response alarm triggering and shutdown.

Type of alarm

The register means that 1=Cross up, 2=Cross down.

Action of enable

The register is used to configure the action when an alarm is triggered, 0=unlog in flash, 1=log in flash, can send 0 for D1M15 and 1 for D1M20.

Example of reading alarm 1

Request frame of setting the alarm number

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0x60
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 01
Error check (CRC), high byte	0x9F
Error check (CRC), low byte	0x02

After the response frame successfully, then setting the alarm 1 parameters.

The relevant configuration of alarm 1 is set as follows.

Number	Quantity	Threshold	Hysteresis	Delay	Type	Action	Link
01	1.0.32.7.0.255 Voltage L1	Min：0000000 Max：9999000	50%	10s	Cross up	Save log, bit=1	DO2

Example of alarm setting

Request frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0x60
No. of registers, high byte	0x00
No. of registers, low byte	0x0E
Byte count	0x1C
Value of registers	0x00 01 01 00 20 07 00 FF 00 00 00 00 00 00 00 98 92 98 00 32 00 0A 00 01 01 11 00 02
Error check (CRC), high byte	0x23
Error check (CRC), low byte	0xB5

Response frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0x60
No. of registers, high byte	0x00
No. of registers, low byte	0x0E
Error check (CRC), high byte	0x6B
Error check (CRC), low byte	0x43

The response frame means the setting is successful.

4.14. Tariffs Setting

Only D1M20 support this function. All related registers need to be configured together and cannot be configured individually. **Start times for weekdays, weekends, and special days also need to be configured together**. Follows are tariffs settings.

Register (Hex)	Quantity/Functionality	Unit	Data Type	Resolution	No. of registers	Product Type
8A07	Current active tariff (None, 1~4)		Unsigned		1	D1M 20
8C90	Tariffs source, 0=RTC, 1=Communication, 2=DI, 0xFF=Disable.		Unsigned		1	D1M 20
8C91	Input configuration, fixed 0x04E4, see the sheet "Details"		Unsigned		1	D1M 20
8C92	Weekday type - Monday, 0=weekday, 1=weekend		Unsigned		1	D1M 20
8C93	Weekday type - Tuesday, 0=weekday, 1=weekend		Unsigned		1	D1M 20
8C94	Weekday type - Wednesday, 0=weekday, 1=weekend		Unsigned		1	D1M 20
8C95	Weekday type - Thursday, 0=weekday, 1=weekend		Unsigned		1	D1M 20
8C96	Weekday type - Friday, 0=weekday, 1=weekend		Unsigned		1	D1M 20
8C97	Weekday type - Saturday, 0=weekday, 1=weekend		Unsigned		1	D1M 20
8C98	Weekday type - Sunday, 0=weekday, 1=weekend		Unsigned		1	D1M 20
8C99	Weekday Start time - T1, 0xHHMM, 0xFFFF: Disable		Unsigned		1	D1M 20
8C9A	Weekday Start time - T2, 0xHHMM		Unsigned		1	D1M 20
8C9B	Weekday Start time - T3, 0xHHMM		Unsigned		1	D1M 20
8C9C	Weekday Start time - T4, 0xHHMM		Unsigned		1	D1M 20
8CA1	Weekend Start time - T1, 0xHHMM, 0xFFFF: Disable		Unsigned		1	D1M 20
8CA2	Weekend Start time - T2, 0xHHMM		Unsigned		1	D1M 20
8CA3	Weekend Start time - T3, 0xHHMM		Unsigned		1	D1M 20
8CA4	Weekend Start time - T4, 0xHHMM		Unsigned		1	D1M 20
8CA9	Special day Start time - T1, 0xHHMM, 0xFFFF: Disable		Unsigned		1	D1M 20
8CAA	Special day Start time - T2, 0xHHMM		Unsigned		1	D1M 20
8CAB	Special day Start time - T3, 0xHHMM		Unsigned		1	D1M 20

8CAC	Special day Start time - T4, 0xHHMM		Unsigned		1	D1M 20
8CD3	Special day - Total number, 1~50		Unsigned		1	D1M 20
8CD4	Special day - Current special day number, 1~Total number		Unsigned		1	D1M 20
8CD5	Special day - Entry Date, 0xYYMMDDxx (xx fixed FF)		Unsigned		2	D1M 20
8CD7	Special day - Entry ID, 1~Total number		Unsigned		1	D1M 20

Reading tariffs settings refer to the other examples above.

Example of setting tariffs

Setting tariffs in RTC approach, Monday through Friday is a working day and Saturday through Sunday is a weekend.

Request frame.

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0x92
No. of registers, high byte	0x00
No. of registers, low byte	0x07
Byte count	0x0E
Value of registers	0x00 00 00 00 00 00 00 00 00 00 00 01 00 01
Error check (CRC), high byte	0x23
Error check (CRC), low byte	0x75

Response frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0x92
No. of registers, high byte	0x00
No. of registers, low byte	0x07
Error check (CRC), high byte	0x0A
Error check (CRC), low byte	0xB6

The response frame means the setting is successful.

Example of setting special day

Setting special day first needs to configure its total.

Enable T1 Special day Start time at 00:19

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xA9
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 0C
Error check (CRC), high byte	0xFB
Error check (CRC), low byte	0x79

Response frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xA9
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0xFB
Error check (CRC), low byte	0x79

Setting Special day's total number is 32

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xD3
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 20
Error check (CRC), high byte	0xF9
Error check (CRC), low byte	0xE3

Response frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xD3
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0xDA
Error check (CRC), low byte	0xA0

Configuring the 16th Special day

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xD4
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 10
Error check (CRC), high byte	0xF8
Error check (CRC), low byte	0x40

Response frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xD4
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0x6B
Error check (CRC), low byte	0x61

Configure the 16th special date as January 9th, 2024. **Note that the ID and date must be set simultaneously**.

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xD5
No. of registers, high byte	0x00
No. of registers, low byte	0x03
Byte count	0x06
Value of registers	0x18 01 09 FF 00 10
Error check (CRC), high byte	0x68
Error check (CRC), low byte	0xD3

Response frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xD5
No. of registers, high byte	0x00
No. of registers, low byte	0x03
Error check (CRC), high byte	0xBB
Error check (CRC), low byte	0x60

The response frame means the setting is successful.

4.15. Timer Setting

Follows are timer setting registers.

Register (Hex)	Quantity/Functionality	Unit	Data Type	Resolution	No. of registers	Product Type
8CF7	Timer Up Counter		Unsigned		2	D1M 20
8CF9	Timer Down Counter		Unsigned		2	D1M 20
8CFB	Timer Down Counter Reset Value		Unsigned		2	D1M 20

Reading timer setting refers to the other examples above.

Example of setting timer to count down to 10 hours.
Request frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xFB
No. of registers, high byte	0x00
No. of registers, low byte	0x02
Byte count	0x04
Value of registers	0x00 00 00 64
Error check (CRC), high byte	0x09
Error check (CRC), low byte	0x94

Response frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8C
Start address, low byte	0xFB
No. of registers, high byte	0x00
No. of registers, low byte	0x02
Error check (CRC), high byte	0x1A
Error check (CRC), low byte	0xA9

The response frame means the setting is successful.

4.16. Display Setting

The home page selection and auto scroll page two registers cannot be configured separately, they need to be configured together.
Follows are setting display registers.

Register (Hex)	Quantity/Functionality	Unit	Data Type	Resolution	No. of registers	Product Type
8CFD	Brightness, 10-100	%	Unsigned		1	D1M 20
8D00	Inactivity time, 1-60	minute	Unsigned		1	D1M 15/20
8D01	Auto scroll time, 5-60	second	Unsigned		1	D1M 15/20
8D02	Home page: 0-Summary page 1-Phase voltage page 2-Line voltage page 3-Current page		Unsigned		1	D1M 15/20
8D03	Auto scroll page: 0-none 1-All real-time measurement pages 2-phasetotal of home page except for Summary		Unsigned		1	D1M 15/20

Reading frame of display can refer to other examples above.

Example of setting display
Setting the display function that returning the home page without operation is 1 minute, and the page switching time is 5 seconds, the main page is the summary page, and the automatic scroll page is all real-time measurement pages.
Request frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8D
Start address, low byte	0x00
No. of registers, high byte	0x00
No. of registers, low byte	0x04
Byte count	0x08
Value of registers	0x00 01 00 05 00 00 00 01
Error check (CRC), high byte	0x47
Error check (CRC), low byte	0xF6

Response frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8D
Start address, low byte	0x00
No. of registers, high byte	0x00
No. of registers, low byte	0x04
Error check (CRC), high byte	0xEA
Error check (CRC), low byte	0xA6

The response frame means the setting is successful.

4.17. Reset

Follows are reset registers.

Register (Hex)	Quantity/Functionality	Unit	Data Type	Resolution	No. of registers	Product Type
8F57	Reset Notification		Unsigned		1	D1M 15/20
8F59	Reset Timer		Unsigned		1	D1M 20
8F5A	Reset Energy		Unsigned		1	D1M 15/20
8F5B	Reset Factory		Unsigned		1	D1M 15/20
8F5C	Reset Max/Min/Average		Unsigned		1	D1M 20
8F5D	Reset Global		Unsigned		1	D1M 15/20

The register only support write operation, write 1 is valid, other values are invalid, please see the more details in D1M user manual.

Example

Request frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8F
Start address, low byte	0x57
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Byte count	0x02
Value of registers	0x00 01
Error check (CRC), high byte	0x14
Error check (CRC), low byte	0xBF

Response frame

Slave address	0x01
Function code	0x10
Start address, high byte	0x8F
Start address, low byte	0x57
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0x9A
Error check (CRC), low byte	0xCD

The response frame means the setting is successful.

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