DCM3366D-J2(-G)-2R DC Energy Meter Communication Protocol (ModBus) V1.04

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Document History

Document Version	Revision No.	Change Date	Changed By	Change Description
V1.00	1	2020/06/29	Zhang Mei	Initial creation
V1.01	2	2023/11/24	Zhang Mei	1. Added pulse constant setting 2. Added the 2nd set of time-of-use tariff data 3. Added Chinese/English display switching mode word 4. Added reading of 3-decimal energy (fixed-point data)
V1.02	3	2025/03/13	Zhang Mei	Removed floating-point energy reading area (starting from 0x9a00)
V1.03	4	2025/03/26	Zhang Mei	Baud rate extended to 115200
V1.04	5	2025/11/13	Zhang Mei	1. Added information area (customer-specific) 2. Added total circuit data (current, power, energy)

Instructions for Use of Communication Protocol

The energy meter supports the MODBUS-RTU protocol, which is based on the basic

standard MODBUS protocol. For details, refer to relevant standards. The specific content of the protocol is described below.

The DCM3366D-J2(-G)-2R type energy meter is a 2-circuit DC energy meter, equivalent to integrating 2 DC energy meters. Each circuit corresponds to a device address. If the device address of the first circuit of the energy meter is 01, the address of the second circuit is incremented by 1 to 02 in sequence. Each circuit complies with the communication functions of the MODBUS-RTU protocol. The default address is the device address of the first circuit of the energy meter.

1. Communication Protocol

1.1 Introduction

This communication protocol for DCM3366D-J2(-G)-2R type details the read/write command formats and definitions of internal information data for serial port communication of the device, facilitating third-party development and use.

1.1.1 PLC ModBus Compatibility

The ModBus communication protocol allows the DCM3366D-J2(-G)-2R type energy meter to effectively transmit information and data with programmable logic controllers (PLCs), RTUs, SCADA systems, DCS systems of multiple internationally renowned brands such as Schneider, Siemens, AB, GE, Modicon, or third-party monitoring systems compatible with ModBus. With the DCM3366D-J2(-G)-2R type energy meter, a monitoring system can be established by simply adding a set of central communication master control and display software (such as KingView, Intouch, FIX, Synall, etc.) based on a PC (or industrial computer).

1.1.2 Wide Communication Integration

The DCM3366D-J2(-G)-2R type energy meter provides a ModBus communication protocol compatible with Modicon systems, which is widely used as a standard for system integration. The ModBus communication protocol for programmable logic controllers compatible with RS-485/232C interfaces allows effective transmission of information and data between the DCM3366D-J2(-G)-2R type energy meter and Modicon programmable logic controllers (PLCs), RTUs, SCADA systems, DCS systems, and other systems compatible with the ModBus communication protocol.

1.2 Basic Rules of ModBus

1. All RS485 communication loops shall follow the master/slave mode. In this mode, data can be transmitted between one master station (e.g., PC) and 32 slave stations.
2. The master station initializes and controls all information transmitted on the RS485 communication loop.
3. No communication can be initiated from the slave station.

4. All communications on the RS485 loop are transmitted in the form of "information frames".

5. If the master station or slave station receives an information frame containing an unknown command, it will not respond.

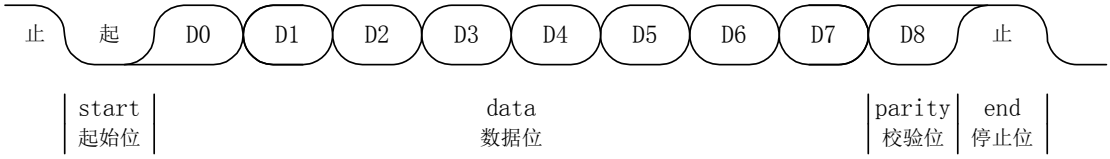
An "information frame" is a string (up to 255 bytes) composed of data frames (each byte is a data frame). It is standard asynchronous serial data consisting of a header and encoded data to be sent. This communication method is also compatible with the RTU communication protocol.

1.3 Data Frame Format

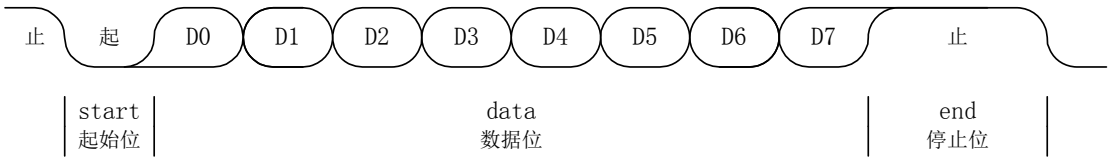
Communication transmission is asynchronous and takes bytes (data frames) as the unit. Each data frame transmitted between the master station and the slave station is an 11-bit serial data stream.

Start Bit	1 bit
Data Bits	8 bits (LSB first, MSB last)
Parity Bit	1 bit: with parity bit; None: without parity bit
Stop Bit	1 bit: with parity bit; 2 bits: without parity bit

Timing diagram with parity bit:



Timing diagram without parity bit:



1.4 Communication Protocol for DCM3366D-J2(-G)-2R Type Energy Meter

When a communication command is sent to the instrument, the device with the corresponding address code receives the communication command, removes the address code, reads the information, and executes the corresponding task if there is no error. Then, it sends the execution result back to the sender. The returned information includes the address code, the function code of the executed action, the

data after the execution of the action, and the cyclic redundancy check (CRC) code. If an error occurs, no information is sent.

2 Information Frame Format

START	ADD	CS	DATA	CRC	END
Initial Structure	Address Code	Function Code	Data Area	Error Check	End Structure
Delay (equivalent to the time of 4 bytes)	1 byte 8 bits	1 byte 8 bits	N bytes N×8 bits	2 bytes 16 bits	Delay (equivalent to the time of 4 bytes)

2.1 Address Code (ADD)

The address code is the first data frame (8 bits) of the information frame transmitted in each communication, ranging from 1 to 255. This byte indicates that the slave device with the address code set by the user will receive the information sent by the master station. Each slave device has a unique address code, and both responses and feedback start with their respective address codes. The address code sent by the master station indicates the address of the slave station to which the information will be sent, while the address code sent by the slave station indicates the address of the slave station sending the feedback.

2.2 Function Code (CS)

The function code is the second data frame of the information frame transmitted in each communication. The ModBus communication protocol defines function codes from 1 to 127 (01H to 7FH). The DCM3366D-J2(-G)-2R type energy meter uses a part of these function codes. As a master station request, the function code tells the slave station what action to execute. As a slave station response, the function code sent by the slave station is the same as that sent by the master station, indicating that the slave station has responded to the master station's operation. If the highest bit of the function code sent by the slave station is 1 (function code > 127), it indicates that the slave station has not responded or an error has occurred.

The following table lists the specific meanings and operations of the function codes.

Function Code	Definition	Operation
03H	Read Registers	Read data from one or more registers
06H	Write Single Register	Write a 16-bit binary number into a single register

1. 03: Read Registers

The DCM3366D-J2(-G)-2R type energy meter adopts the ModBus communication protocol. Communication commands can be used to read points (holding registers or return value input registers). The holding and input register values in the data area mapped by function code 03H are both 16 bits (2 bytes). Thus, the read register values are all 2 bytes. The maximum number of registers that can be read at one time is 100. Since some programmable logic controllers do not use function code 03, function code 03 is used for reading points and return values.

The command format of the slave station response includes the slave station address, function code, data area, and CRC code. The data in the data area are 2-byte numbers in groups of 2 bytes, with the high byte first.

2. 06: Write Single Register

The master station uses this command to save single-point data to the memory of the DCM3366D-J2(-G)-2R type energy meter. The slave station also uses this function code to send information back to the master station.

3. 10: Write Multiple Continuous Registers

The master station uses this command to save multi-point data to the memory of the DCM3366D-J2(-G)-2R type energy meter. A register in the ModBus communication protocol refers to 16 bits (i.e., 2 bytes), with the high byte first. Thus, the points of the DCM3366D-J2(-G)-2R type energy meter are all 2 bytes. The maximum number of points that can be saved with one command depends on the slave station. The DCM3366D-J2(-G)-2R type energy meter allows a maximum of 100 registers to be saved at one time. The command format of the DCM3366D-J2(-G)-2R type energy meter includes the slave station address, function code, data area, and CRC code.

3 Data Area (DATA)

The data area varies with the function code. The data area of the read command (03H) information frame sent by the master station is different from that of the slave station response information frame. The data area of the write command (06H, 10H) information frame sent by the master station is exactly the same as that of the slave station response information frame. The data area contains the information that the slave station needs to execute or the information collected by the slave station that needs to be sent back. This information can be values, reference addresses, etc. For example, if the function code tells the slave station to read the value of a register, the data area must contain the starting address of the register to be read and the reading length (number of registers).

1. Data Area Format Corresponding to Function Code 03

- Master Station Transmission

Data Sequence	1	2

Data Meaning	Starting Address	Number of Registers to Read
Number of Bytes	2	2

- Slave Station Response

Data Sequence	1	2
Data Meaning	Number of Returned Bytes	Data of N Registers
Number of Bytes	1	2×N

2. Data Area Format Corresponding to Function Code 06

Data Sequence	1	2
Data Meaning	Starting Address	Data to Be Written to the Register
Number of Bytes	2	2

3. Data Area Format Corresponding to Function Code 10

Data Sequence	1	2	…	N
Data Meaning	Starting Address	Written Data 1	…	Written Data N
Number of Bytes	2	2	…	2

3.1 Cyclic Redundancy Check (CRC) Code

The master station or slave station can use the check code to determine whether the received information is erroneous. Sometimes, due to electronic noise or other interference, information may undergo slight changes during transmission. The error check code ensures that the master station or slave station does not act on the erroneous information during transmission, thereby improving system safety and efficiency. The error check code adopts the CRC-16 check method.

The 2-byte error check code is in the order of low byte first and high byte last.

Note: The format of the information frame is the same: address code, function code, data area, and error check code.

3.2 Error Checking

The cyclic redundancy check (CRC) code consists of 2 bytes, i.e., 16-bit binary. The CRC code is calculated by the transmitting end and placed at the end of the transmitted information. The receiving device recalculates the CRC code of the received information and compares it with the received one. If they do not match, it indicates an error.

The calculation method of the CRC code is as follows: first, preset the 16-bit register to all 1s. Then, process each 8-bit data information gradually. When calculating the CRC code, only the 8-bit data bits are used. The start bit, stop bit, and parity bit (if any) are not involved in the CRC code calculation.

During the calculation of the CRC code, the 8-bit data is XORed with the data of the register, and the result is shifted one bit to the low position, filling the high position with 0. Then, check the low bit. If the low bit is 1, XOR the content of the register with the polynomial A001 (1010 0000 0000 0001); if the low bit is 0, no XOR operation is performed.

This process is repeated 8 times. After the 8th shift, the next 8 bits are XORed with the current content of the register, and the same process is repeated 8 times. After all data information is processed, the final content of the register is the CRC code value.

3.3 Calculation Steps of CRC-16 Code

1. Set the 16-bit register to hexadecimal FFFF (i.e., all 1s). This register is called the CRC register.
2. XOR an 8-bit data with the low byte of the 16-bit CRC register and store the result in the CRC register.
3. Shift the content of the register one bit to the right (towards the low bit), fill the high bit with 0, and check the low bit (shifted-out bit).
4. If the low bit is 0: repeat step 3 (shift again).

If the low bit is 1: XOR the CRC register with the polynomial A001 (1010 0000 0000 0001).

5. Repeat steps 3 and 4 until shifting 8 times, so that the entire 8-bit data is processed.
6. Repeat steps 2 to 5 to process the next 8 bits.
7. The final CRC register is the CRC code, with the low byte first and the high byte last.

4 Examples of Information Frame Formats (The addresses in the following examples are not related to this meter and are only used to illustrate the usage of each function code)

4.1 Function Code 03

Slave station address is 01, reading 3 registers starting from address 2000.

The register data addresses in this example are:

Address	Data (Hexadecimal)
0000	EA60
0001	C350
0002	DB6C

Master Station Transmission	Number of Bytes	Example (Hexadecimal)	Description
Slave Station Address	1	01	Sent to slave station 01
Function Code	1	03	Read registers
Starting Address	2	00 00	Starting address is 0000
Number of Registers to Read	2	00 03	Read 3 registers (6 bytes in total)
CRC Code	2	05 CB	CRC code calculated by the master station

Slave Station Response	Number of Bytes	Example (Hexadecimal)	Description
Slave Station Address	1	01	From slave station 01
Function Code	1	03	Read registers
Number of Returned Bytes	1	06	3 registers (6 bytes in total)
Register Data 1	2	EA 60	Content at address 0000
Register Data 2	2	C3 50	Content at address 0001

Slave Station Response	Number of Bytes	Example (Hexadecimal)	Description
Register Data 3	2	DB 6C	Content at address 0002
CRC Code	2	D1 3F	CRC code calculated by the slave station

4.2 Function Code 06

Slave station address is 01, saving 2 values starting from address A001. In this example, after the data is saved, the content at address A001 in the slave station is 0002.

Master Station Transmission	Number of Bytes	Example (Hexadecimal)	Description
Slave Station Address	1	01	Sent to slave station 01
Function Code	1	06	Single data (2 bytes) saving
Starting Address	2	A0 01	Starting address is A001
Data to Be Saved	2	00 02	Data to be saved is 0002
CRC Code	2	7B CB	CRC code calculated by the master station

Slave Station Response	Number of Bytes	Example (Hexadecimal)	Description
Slave Station Address	1	01	From slave station 01
Function Code	1	06	Single-point saving
Starting Address	2	A0 01	Starting address is A001
Saved Data	2	00 02	Saved data is 0002
CRC Code	2	7B CB	CRC code calculated by the

Slave Station Response	Number of Bytes	Example (Hexadecimal)	Description
			slave station

4.3 Function Code 10

Slave station address is 01, saving 0002 to address A001 and 0003 to A002. In this example, after the data is saved, the information saved in the energy meter with address 01 is:

Address	Data (Hexadecimal)
A001	0002
A002	0003

Master Station Transmission	Number of Bytes	Example (Hexadecimal)	Description
Slave Station Address	1	01	Sent to slave station 01
Function Code	1	10	Multi-point saving
Starting Address	2	A0 01	Starting address is A001
Number of Data to Be Saved	2	00 02	Save 2 points (4 bytes in total)
Number of Bytes	1	04	
Saved Data 1	2	00 02	Data address is A001
Saved Data 2	2	00 03	Data address is A002
CRC Code	2	2B A5	CRC code calculated by the master station

Slave Station Response	Number of Bytes	Example (Hexadecimal)	Description

Slave Station Response	Number of Bytes	Example (Hexadecimal)	Description
Slave Station Address	1	01	From slave station 01
Function Code	1	10	Multi-point saving
Starting Address	2	A0 01	Starting address is A001
Number of Saved Data	2	00 02	Save 2 points (4 bytes in total)
CRC Code	2	32 08	CRC code calculated by the slave station

4.4 Function Code 53

Slave station address is 01, reading 1 register starting from address 0000.

The register data address in this example is:

Address	Data (Hexadecimal)
0000	3E8

Master Station Transmission	Number of Bytes	Example (Hexadecimal)	Description
Slave Station Address	1	01	Sent to slave station 01
Function Code	1	53	Read registers
Starting Address	2	00 00	Starting address is 0000
Number of Registers to Read	1	00 01	Read 1 register (2 bytes in total)
CRC Code	2	44 06	CRC code calculated by the master station

Slave Station Response	Number of Bytes	Example (Hexadecimal)	Description

Slave Station Response	Number of Bytes	Example (Hexadecimal)	Description
Slave Station Address	1	01	From slave station 01
Function Code	1	53	Read registers
Number of Returned Bytes	1	02	1 register (2 bytes in total)
Register Data 1	2	03 E8	Content at address 0000
CRC Code	2	A9 FA	CRC code calculated by the slave station

4.5 Function Code 0x54 (Write DL/T 645 Protocol Communication Address)

Slave station address is 01, 3 registers starting from address 0021H. The DL/T 645 protocol communication address is 123456789011.

Master Station Transmission	Number of Bytes	Example (Hexadecimal)	Description
Slave Station Address	1	01	Sent to slave station 01
Function Code	1	54	Multi-point saving
Starting Address	2	00 21	Starting address is 0021
Number of Data to Be Saved	2	00 03	Write 3 registers (6 bytes in total)
Number of Bytes	1	06	
DL/T 645 Protocol Communication Address	6	12 34 56 78 90 11	BCD code
CRC Code	2	A5 8A	CRC code calculated by the master station

Slave Station Response	Number of Bytes	Example (Hexadecimal)	Description

Slave Station Response	Number of Bytes	Example (Hexadecimal)	Description
Slave Station Address	1	01	From slave station 01
Function Code	1	54	Multi-point saving
Starting Address	2	00 21	Starting address is 0021
Number of Saved Data	2	00 03	Save 3 points (6 bytes in total)
CRC Code	2	20 0D	CRC code calculated by the slave station

4.6 Error Handling

When the data format received by the DCM3366D-J2(-G)-2R type energy meter is incorrect, no response is returned.

4.7 Terminology

Name	Description
Master Node	In master-slave communication, the party that takes the initiative to initiate communication is called the master node
Slave Node	In master-slave communication, the party that passively responds to commands is called the slave node
Register Address	A register address corresponds to a 2-byte information
Forwarding	Forward (transparent transmission) data to another processing unit
U16	Unsigned 16-bit integer
U32	Unsigned 32-bit integer
I16	Signed 16-bit integer
I32	Signed 32-bit integer

Name	Description
STR	String
float	Floating-point number, IEEE754 format
MLD	Multi-byte
N/A	Not applicable
RO	Read-only data
RW	Readable and writable data
WO	Write-only data

4.8 Explanation of Energy Data

Communication/Display		Energy Type	Symbol	Maximum Value	Operation After Exceeding
Communication report with 3 decimal places(Hexadecimal)		Combined Energy	Signed	2147483.647	Clear
		Forward Energy	Unsigned	2147483.647	Clear
		Reverse Energy	Unsigned	2147483.647	Clear
Communication report with 2 decimal places(BCD code)		Combined Energy	Signed	799999.99	Clear
		Forward Energy	Unsigned	999999.99	Clear
		Reverse Energy	Unsigned	999999.99	Clear
Communication report with 3 decimal places(BCD code)		Combined Energy	Signed	79999.999	Clear
		Forward Energy	Unsigned	99999.999	Clear
		Reverse Energy	Unsigned	99999.999	Clear
Display only one screen	Display with 2 decimal places	Combined Energy	Signed	799999.99	When exceeding, the high bit is not displayed; when the value exceeds 2147483.647, it resets to zero
		Forward Energy	Unsigned	999999.99	
		Reverse Energy	Unsigned	999999.99	
	Display with 3 decimal	Combined Energy	Signed	99999.999	

	places	Forward Energy	Unsigned	99999.999	
		Reverse Energy	Unsigned	99999.999	
Display two screens		Combined Energy	Signed	2147483.647	When the value exceeds 8 digits, it automatically displays in two screens, first the high bit, then the low bit; when the value exceeds 2147483.647, it resets to zero
		Forward Energy	Unsigned	2147483.647	
		Reverse Energy	Unsigned	2147483.647	
The maximum energy value at the bottom layer of the protocol is 2147483.647					

5. Data and Addresses

For the data items defined in the following tables, if the variable names are the same, they refer to the same data. They only have different register addresses to be compatible with some protocols. The value range of energy is 0~7FFFFFFF (2147483.647kWh).

5.1 Read-Only Data Area (Function Code 03H): (One circuit data is read with one device address)

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0x0000	Forward Active Total Energy	0.01kWh	RO	U32	2	
0x0002	Forward Active Peak 1 Energy	0.01kWh	RO	U32	2	
0x0004	Forward Active Peak 2 Energy	0.01kWh	RO	U32	2	
0x0006	Forward Active Flat Energy	0.01kWh	RO	U32	2	
0x0008	Forward Active Valley Energy	0.01kWh	RO	U32	2	
0x000A	Reverse Active Total Energy	0.01kWh	RO	U32	2	

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0x000C	Reverse Active Peak 1 Energy	0.01kWh	RO	U32	2	
0x000E	Reverse Active Peak 2 Energy	0.01kWh	RO	U32	2	
0x0010	Reverse Active Flat Energy	0.01kWh	RO	U32	2	
0x0012	Reverse Active Valley Energy	0.01kWh	RO	U32	2	
0x0014	Power	0.0001kW	RO	I32	2	
0x0016	Current	0.0001A	RO	I32	2	
0x0018	Voltage	0.0001V	RO	I32	2	
0x001A	Calibrated Voltage	0.01V	RO	U32	2	
0x001C	Calibrated Current	0.01A	RO	U32	2	
0x001E	Combined Active Total Energy	0.01kWh	RO	I32	2	
0x0020	Combined Active Peak 1 Energy	0.01kWh	RO	I32	2	
0x0022	Combined Active Peak 2 Energy	0.01kWh	RO	I32	2	
0x0024	Combined Active Flat Energy	0.01kWh	RO	I32	2	
0x0026	Combined Active Valley Energy	0.01kWh	RO	I32	2	
0x0028	Combined Active Total Energy	0.001kWh	RO	I32	2	

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0x002A	Combined Active Peak 1 Energy	0.001kWh	RO	I32	2	
0x002C	Combined Active Peak 2 Energy	0.001kWh	RO	I32	2	
0x002E	Combined Active Flat Energy	0.001kWh	RO	I32	2	
0x0030	Combined Active Valley Energy	0.001kWh	RO	I32	2	
0x0032	Forward Active Total Energy	0.001kWh	RO	U32	2	
0x0034	Forward Active Peak 1 Energy	0.001kWh	RO	U32	2	
0x0036	Forward Active Peak 2 Energy	0.001kWh	RO	U32	2	
0x0038	Forward Active Flat Energy	0.001kWh	RO	U32	2	
0x003A	Forward Active Valley Energy	0.001kWh	RO	U32	2	
0x003C	Reverse Active Total Energy	0.001kWh	RO	U32	2	
0x003E	Reverse Active Peak 1 Energy	0.001kWh	RO	U32	2	
0x0040	Reverse Active Peak 2 Energy	0.001kWh	RO	U32	2	
0x0042	Reverse Active Flat Energy	0.001kWh	RO	U32	2	
0x0044	Reverse Active	0.001kWh	RO	U32	2	

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
	Valley Energy					

5.2 Read-Only Data Area (Function Code 03H)

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0x2000	Circuit 1 Combined Active Total Energy	0.01kWh	RO	I32	2	
0x2002	Circuit 2 Combined Active Total Energy	0.01kWh	RO	I32	2	
0x2004	Circuit 1 Combined Active Peak 1 Energy	0.01kWh	RO	I32	2	
0x2006	Circuit 2 Combined Active Peak 1 Energy	0.01kWh	RO	I32	2	
0x2008	Circuit 1 Combined Active Peak 2 Energy	0.01kWh	RO	I32	2	
0x200A	Circuit 2 Combined Active Peak 2 Energy	0.01kWh	RO	I32	2	
0x200C	Circuit 1 Combined Active Flat Energy	0.01kWh	RO	I32	2	
0x200E	Circuit 2 Combined Active Flat Energy	0.01kWh	RO	I32	2	
0x2010	Circuit 1 Combined Active Valley Energy	0.01kWh	RO	I32	2	
0x2012	Circuit 2 Combined Active Valley Energy	0.01kWh	RO	I32	2	

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0x2014	Circuit 1 Forward Active Total Energy	0.01kWh	RO	U32	2	
0x2016	Circuit 2 Forward Active Total Energy	0.01kWh	RO	U32	2	
0x2018	Circuit 1 Forward Active Peak 1 Energy	0.01kWh	RO	U32	2	
0x201A	Circuit 2 Forward Active Peak 1 Energy	0.01kWh	RO	U32	2	
0x201C	Circuit 1 Forward Active Peak 2 Energy	0.01kWh	RO	U32	2	
0x201E	Circuit 2 Forward Active Peak 2 Energy	0.01kWh	RO	U32	2	
0x2020	Circuit 1 Forward Active Flat Energy	0.01kWh	RO	U32	2	
0x2022	Circuit 2 Forward Active Flat Energy	0.01kWh	RO	U32	2	
0x2024	Circuit 1 Forward Active Valley Energy	0.01kWh	RO	U32	2	
0x2026	Circuit 2 Forward Active Valley Energy	0.01kWh	RO	U32	2	
0x2028	Circuit 1 Reverse Active Total Energy	0.01kWh	RO	U32	2	
0x202A	Circuit 2 Reverse Active Total Energy	0.01kWh	RO	U32	2	

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0x202C	Circuit 1 Reverse Active Peak 1 Energy	0.01kWh	RO	U32	2	
0x202E	Circuit 2 Reverse Active Peak 1 Energy	0.01kWh	RO	U32	2	
0x2030	Circuit 1 Reverse Active Peak 2 Energy	0.01kWh	RO	U32	2	
0x2032	Circuit 2 Reverse Active Peak 2 Energy	0.01kWh	RO	U32	2	
0x2034	Circuit 1 Reverse Active Flat Energy	0.01kWh	RO	U32	2	
0x2036	Circuit 2 Reverse Active Flat Energy	0.01kWh	RO	U32	2	
0x2038	Circuit 1 Reverse Active Valley Energy	0.01kWh	RO	U32	2	
0x203A	Circuit 2 Reverse Active Valley Energy	0.01kWh	RO	U32	2	
0x203C	Circuit 1 Voltage	0.0001V	RO	I32	2	
0x203E	Circuit 2 Voltage	0.0001V	RO	I32	2	
0x2040	Circuit 1 Current	0.0001A	RO	I32	2	
0x2042	Circuit 2 Current	0.0001A	RO	I32	2	
0x2044	Circuit 1 Power	0.0001kW	RO	I32	2	
0x2046	Circuit 2 Power	0.0001kW	RO	I32	2	

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0x2048	Circuit 1 Calibrated Voltage	0.01V	RO	U32	2	
0x204A	Circuit 2 Calibrated Voltage	0.01V	RO	U32	2	
0x204C	Circuit 1 Calibrated Current	0.01A	RO	U32	2	
0x204E	Circuit 2 Calibrated Current	0.01A	RO	U32	2	
0x2050	Circuit 1 Combined Active Total Energy	0.001kWh	RO	I32	2	
0x2052	Circuit 2 Combined Active Total Energy	0.001kWh	RO	I32	2	
0x2054	Circuit 1 Combined Active Peak 1 Energy	0.001kWh	RO	I32	2	
0x2056	Circuit 2 Combined Active Peak 1 Energy	0.001kWh	RO	I32	2	
0x2058	Circuit 1 Combined Active Peak 2 Energy	0.001kWh	RO	I32	2	
0x205A	Circuit 2 Combined Active Peak 2 Energy	0.001kWh	RO	I32	2	
0x205C	Circuit 1 Combined Active Flat Energy	0.001kWh	RO	I32	2	
0x205E	Circuit 2 Combined Active Flat Energy	0.001kWh	RO	I32	2	

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0x2060	Circuit 1 Combined Active Valley Energy	0.001kWh	RO	I32	2	
0x2062	Circuit 2 Combined Active Valley Energy	0.001kWh	RO	I32	2	
0x2064	Circuit 1 Forward Active Total Energy	0.001kWh	RO	U32	2	
0x2066	Circuit 2 Forward Active Total Energy	0.001kWh	RO	U32	2	
0x2068	Circuit 1 Forward Active Peak 1 Energy	0.001kWh	RO	U32	2	
0x206A	Circuit 2 Forward Active Peak 1 Energy	0.001kWh	RO	U32	2	
0x206C	Circuit 1 Forward Active Peak 2 Energy	0.001kWh	RO	U32	2	
0x206E	Circuit 2 Forward Active Peak 2 Energy	0.001kWh	RO	U32	2	
0x2070	Circuit 1 Forward Active Flat Energy	0.001kWh	RO	U32	2	
0x2072	Circuit 2 Forward Active Flat Energy	0.001kWh	RO	U32	2	
0x2074	Circuit 1 Forward Active Valley Energy	0.001kWh	RO	U32	2	
0x2076	Circuit 2 Forward Active Valley Energy	0.001kWh	RO	U32	2	

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0x2078	Circuit 1 Reverse Active Total Energy	0.001kWh	RO	U32	2	
0x207A	Circuit 2 Reverse Active Total Energy	0.001kWh	RO	U32	2	
0x207C	Circuit 1 Reverse Active Peak 1 Energy	0.001kWh	RO	U32	2	
0x207E	Circuit 2 Reverse Active Peak 1 Energy	0.001kWh	RO	U32	2	
0x2080	Circuit 1 Reverse Active Peak 2 Energy	0.001kWh	RO	U32	2	
0x2082	Circuit 2 Reverse Active Peak 2 Energy	0.001kWh	RO	U32	2	
0x2084	Circuit 1 Reverse Active Flat Energy	0.001kWh	RO	U32	2	
0x2086	Circuit 2 Reverse Active Flat Energy	0.001kWh	RO	U32	2	
0x2088	Circuit 1 Reverse Active Valley Energy	0.001kWh	RO	U32	2	
0x208A	Circuit 2 Reverse Active Valley Energy	0.001kWh	RO	U32	2	

5.3 Readable and Writable Data Area (Function Code 03H, 06H, 10H)

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0xA000	Write Programming Enable		RW	U16	1	Write 0X5AA5 to enable; automatically reset to zero after 30S
0xA001	Local Address		RW	U16	1	1～254
0xA002	Baud Rate (Network A)		RW	U16	1	0:1200, 1:2400, 2:4800, 3:9600, 4:19200, 5:38400, 6:115200 (default: 9600)
0xA003	Parity Bit (Network A)		RW	U16	1	0: No parity, 1: Odd parity, 2: Even parity (default: Even parity)
0xA004	Baud Rate (Network B)		RW	U16	1	0:1200, 1:2400, 2:4800, 3:9600, 4:19200, 5:38400, 6:115200 (default: 9600)
0xA005	Parity Bit (Network B)		RW	U16	1	0: No parity, 1: Odd parity, 2: Even parity (default: Even parity)
0xA007	Circuit 1 Maximum Current	0.01A	RW	U32	2	1～480000
0xA009	Circuit 2 Maximum Current	0.01A	RW	U32	2	1～480000
0xA00B	Effective Value Sign Selection Status Word		RW	U16	1	Bit0: Voltage signed flag Bit1: Current signed flag (0: Signed, 1: Unsigned)
0xA00D	Voltage Zero Point Shielding Rate	0.1‰	RW	U16	1	Default: 10.0‰
0xA00E	Current Zero Point Shielding Rate	0.1‰	RW	U16	1	Default: 0.8‰

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0xA011	Display Energy Decimal Places		RW	U16	1	0, 2, 3
0xA012	Number of Time Periods		RW	U16	1	1～14
0xA013	1st Set Day Time Period Table Data: 1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number (1～4)
…	…	…	…	…	…	…
0xA02D	1st Set Day Time Period Table Data: 14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number (1～4)
0xB000	Energy Clear		WO	U16	1	Write 0X5A01 to clear
0xB001	Time		RW	MLD	4	Year/Month/Day/Hour/Minute/Second/Week (BCD)
0xB006	Chinese/English Display Switching Mode Word		RW	U16	1	0: Chinese, 1: English
0xB008	Circuit 1 Energy Meter Pulse Constant	imp/kWh	RW	U32	2	
0xB00A	Circuit 2 Energy Meter Pulse Constant	imp/kWh	RW	U32	2	

Note: When setting the day time period table, it must be set, read, and written as a complete table, that is, the number of registers to be read and written must be a multiple of 28, and the time must be arranged in ascending order.

5.4 Tariff Time Period Data (Function Code 03H, 06H, 10H)

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0xA900	Switching Time of Two Sets of Time Zone Tables		RW	MLD	3	Year/Month/Day/Hour/Minute/Second (BCD)
0xA903	Switching Time of Two Sets of Day Time Period Tables		RW	MLD	3	Year/Month/Day/Hour/Minute/Second (BCD)
0xA906	Number of Annual Time Zones		RW	U16	1	≤14; 0: Not used
0xA907	Number of Day Time Period Tables		RW	U16	1	≤8; 0: Not used
0xA908	Number of Day Time Periods		RW	U16	1	≤14; 0: Not used
0xA909	Number of Tariffs		RW	U16	1	≤4; 0: Not used
0xA90A	Reserved		RW	U16	1	≤14; 0: Not used
0xA90B	Reserved		RW	U16	1	
0xA90C	Reserved		RW	U16	1	
0xA90D	1st Set Time Zone Table Data:1st Time Zone Start Date and Day Time Period Table Number		RW	MLD	2	Month and day (BCD) Day time period table number

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
…	…	…	…	…	…	…
0xA927	1st Set Time Zone Table Data:14th Time Zone Start Date and Day Time Period Table Number		RW	MLD	2	Month and day (BCD) Day time period table number
0xA929	1st Set 1st Day Time Period Table Data:1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
…	…	…	…	…	…	…
0xA943	1st Set 1st Day Time Period Table Data:14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
0xA945	1st Set 2nd Day Time Period Table Data:1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
…	…	…	…	…	…	…
0xA95F	1st Set 2nd Day Time Period Table Data:14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
0xA961	1st Set 3rd Day Time Period Table Data:1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
…	…	…	…	…	…	…

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0xA97B	1st Set 3rd Day Time Period Table Data: 14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
0xA97D	1st Set 4th Day Time Period Table Data: 1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
…	…	…	…	…	…	…
0xA997	1st Set 4th Day Time Period Table Data: 14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
0xA999	1st Set 5th Day Time Period Table Data: 1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
…	…	…	…	…	…	…
0xA9B3	1st Set 5th Day Time Period Table Data: 14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
0xA9B5	1st Set 6th Day Time Period Table Data: 1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
…	…	…	…	…	…	…
0xA9CF	1st Set 6th Day Time Period Table Data: 14th Day Time Period Start		RW	MLD	2	Hour and minute (BCD) Tariff number

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
	Time and Tariff Number					
0xA9D1	1st Set 7th Day Time Period Table Data: 1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
…	…	…	…	…	…	…
0xA9EB	1st Set 7th Day Time Period Table Data: 14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
0xA9ED	1st Set 8th Day Time Period Table Data: 1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
…	…	…	…	…	…	…
0xAA07	1st Set 8th Day Time Period Table Data: 14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
0xAA09	2nd Set Time Zone Table Data: 1st Time Zone Start Date and Day Time Period Table Number		RW	MLD	2	Month and day (BCD) Day time period table number
…	…	…	…	…	…	…
0xAA23	2nd Set Time Zone Table Data: 14th Time Zone Start Date and Day Time Period Table Number		RW	MLD	2	Month and day (BCD) Day time period table number

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0xAA25	2nd Set 1st Day Time Period Table Data: 1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
…	…	…	…	…	…	…
0xAA3F	2nd Set 1st Day Time Period Table Data: 14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
0xAA41	2nd Set 2nd Day Time Period Table Data: 1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
…	…	…	…	…	…	…
0xAA5B	2nd Set 2nd Day Time Period Table Data: 14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
0xAA5D	2nd Set 3rd Day Time Period Table Data: 1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
…	…	…	…	…	…	…
0xAA77	2nd Set 3rd Day Time Period Table Data: 14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
0xAA79	2nd Set 4th Day Time Period Table Data: 1st Day Time Period Start		RW	MLD	2	Hour and minute (BCD) Tariff number

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
	Time and Tariff Number					
…	…	…	…	…	…	…
0xAA93	2nd Set 4th Day Time Period Table Data: 14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
0xAA95	2nd Set 5th Day Time Period Table Data: 1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
…	…	…	…	…	…	…
0xAAAF	2nd Set 5th Day Time Period Table Data: 14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
0xAAB1	2nd Set 6th Day Time Period Table Data: 1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
…	…	…	…	…	…	…
0xAACB	2nd Set 6th Day Time Period Table Data: 14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
0xAACD	2nd Set 7th Day Time Period Table Data: 1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
…	…	…	…	…	…	…

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0xAAE7	2nd Set 7th Day Time Period Table Data: 14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
0xAAE9	2nd Set 8th Day Time Period Table Data: 1st Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number
…	…	…	…	…	…	…
0xAB03	2nd Set 8th Day Time Period Table Data: 14th Day Time Period Start Time and Tariff Number		RW	MLD	2	Hour and minute (BCD) Tariff number

Note: When setting the time zone table or day time period table, it must be set, read, and written as a complete table, that is, the number of registers to be read and written must be a multiple of 28, and the time must be arranged in ascending order.

5.5 Read Version and Energy Meter Model (Function Code: 53H)

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0x0000	Read Version		RO	U16	1	
0x0001	Read Energy Meter Model		RO	STR	32	ASCII code
0x0021	Read DL/T 645 Protocol Communication Address		RO	MLD	3	BCD code

5.6 Write DL/T 645 Protocol Communication Address

(Function Code: 54H)

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0x0021	Write DL/T 645 Protocol Communication Address		WO	MLD	3	BCD code

5.7 Energy Meter Information (Function Code: 03H)

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0xAB80	Energy Meter Model		RO	STR	16	ASCII
0xAB90	Software Version		RO	STR	8	ASCII
0xAB98	Hardware Version		RO	STR	8	ASCII
0xABA0	Compilation Time		RO	STR	8	ASCII
0xABA8	Protocol Version		RO	STR	8	ASCII
0xABB0	Serial Number		RW	STR	8	ASCII code Customer-specific
0xABB8	Manufacturer		RW	STR	8	
0xABC0	Model		RW	STR	8	
0xABC8	Software Version Number		RW	STR	8	

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0xABD0	Production Date		RW	STR	8	

5.8 Used Circuit Data Area (Function Code: 03H)

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0x500	Circuit 1 Voltage	0.0001V	RO	I32	2	
0x502	Circuit 2 Voltage	0.0001V	RO	I32	2	
0x504	Total Circuit Current	0.0001A	RO	U32	2	
0x506	Circuit 1 Current	0.0001A	RO	I32	2	
0x508	Circuit 2 Current	0.0001A	RO	I32	2	
0x50A	Total Circuit Power	0.0001kW	RO	U32	2	
0x50C	Circuit 1 Power	0.0001kW	RO	I32	2	
0x50E	Circuit 2 Power	0.0001kW	RO	I32	2	
0x510	Total Circuit Combined Active Total Energy	0.001kWh	RO	I32	2	
0x512	Total Circuit Combined Active Peak 1 Energy	0.001kWh	RO	I32	2	
0x514	Total Circuit Combined Active Peak 2 Energy	0.001kWh	RO	I32	2	
0x516	Total Circuit Combined Active Flat Energy	0.001kWh	RO	I32	2	
0x518	Total Circuit Combined Active Valley Energy	0.001kWh	RO	I32	2	
0x51A	Total Circuit Forward Active Total Energy	0.001kWh	RO	I32	2	

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0x51C	Total Circuit Forward Active Peak 1 Energy	0.001kWh	RO	I32	2	
0x51E	Total Circuit Forward Active Peak 2 Energy	0.001kWh	RO	I32	2	
0x520	Total Circuit Forward Active Flat Energy	0.001kWh	RO	I32	2	
0x522	Total Circuit Forward Active Valley Energy	0.001kWh	RO	I32	2	
0x524	Total Circuit Reverse Active Total Energy	0.001kWh	RO	I32	2	
0x526	Total Circuit Reverse Active Peak 1 Energy	0.001kWh	RO	I32	2	
0x528	Total Circuit Reverse Active Peak 2 Energy	0.001kWh	RO	I32	2	
0x52A	Total Circuit Reverse Active Flat Energy	0.001kWh	RO	I32	2	
0x52C	Total Circuit Reverse Active Valley Energy	0.001kWh	RO	I32	2	
0x52E	Circuit 1 Combined Active Total Energy	0.001kWh	RO	I32	2	
0x530	Circuit 1 Combined	0.001kWh	RO	I32	2	

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
	Active Peak 1 Energy					
0x532	Circuit 1 Combined Active Peak 2 Energy	0.001kWh	RO	I32	2	
0x534	Circuit 1 Combined Active Flat Energy	0.001kWh	RO	I32	2	
0x536	Circuit 1 Combined Active Valley Energy	0.001kWh	RO	I32	2	
0x538	Circuit 1 Forward Active Total Energy	0.001kWh	RO	I32	2	
0x53A	Circuit 1 Forward Active Peak 1 Energy	0.001kWh	RO	I32	2	
0x53C	Circuit 1 Forward Active Peak 2 Energy	0.001kWh	RO	I32	2	
0x053E	Circuit 1 Forward Active Flat Energy	0.001kWh	RO	I32	2	
0x540	Circuit 1 Forward Active Valley Energy	0.001kWh	RO	I32	2	
0x542	Circuit 1 Reverse Active Total Energy	0.001kWh	RO	I32	2	
0x544	Circuit 1 Reverse Active Peak 1 Energy	0.001kWh	RO	I32	2	
0x546	Circuit 1 Reverse Active Peak 2 Energy	0.001kWh	RO	I32	2	

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0x548	Circuit 1 Reverse Active Flat Energy	0.001kWh	RO	I32	2	
0x54A	Circuit 1 Reverse Active Valley Energy	0.001kWh	RO	I32	2	
0x54C	Circuit 2 Combined Active Total Energy	0.001kWh	RO	I32	2	
0x54E	Circuit 2 Combined Active Peak 1 Energy	0.001kWh	RO	I32	2	
0x550	Circuit 2 Combined Active Peak 2 Energy	0.001kWh	RO	I32	2	
0x552	Circuit 2 Combined Active Flat Energy	0.001kWh	RO	I32	2	
0x554	Circuit 2 Combined Active Valley Energy	0.001kWh	RO	I32	2	
0x556	Circuit 2 Forward Active Total Energy	0.001kWh	RO	I32	2	
0x558	Circuit 2 Forward Active Peak 1 Energy	0.001kWh	RO	I32	2	
0x55A	Circuit 2 Forward Active Peak 2 Energy	0.001kWh	RO	I32	2	
0x55C	Circuit 2 Forward Active Flat Energy	0.001kWh	RO	I32	2	
0x055E	Circuit 2 Forward Active Valley Energy	0.001kWh	RO	I32	2	

Register (Hexadecimal)	Variable Name	Unit	Read/Write	Data Type	Quantity	Remarks
0x560	Circuit 2 Reverse Active Total Energy	0.001kWh	RO	I32	2	
0x562	Circuit 2 Reverse Active Peak 1 Energy	0.001kWh	RO	I32	2	
0x564	Circuit 2 Reverse Active Peak 2 Energy	0.001kWh	RO	I32	2	
0x566	Circuit 2 Reverse Active Flat Energy	0.001kWh	RO	I32	2	
0x568	Circuit 2 Reverse Active Valley Energy	0.001kWh	RO	I32	2	