CHINT DDSU666

USER MANUAL

DDSU666 Single-phase electronic type guide
rail mounting electric energy meter

LANDPORT
ENERGY
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Contents

1. Summary

1.1 The main purpose and the suitable occasions

The DDSU666 Single-phase electronic guide rail-mounted electric energy meter, hereinafter referred to as "the instrument", is specifically designed to meet the power monitoring and energy metering needs of the electric power system, communication industry, and construction industry.

This innovative device represents a new generation of intelligent instruments, seamlessly integrating communication and measurement functionalities. Its primary functions include measuring and displaying key electrical parameters such as voltage, current, power, frequency, power factor, and active power within an electrical circuit.

The instrument facilitates external device data networking through RS485 communication, employing a standardized DIN35mm rail mounting structure and a modular design. Its notable advantages include its compact size, straightforward installation process, and ease of networking. The DDSU666 is widely applied in energy monitoring and assessment across diverse sectors, including industrial and mining enterprises, hotels, schools, and large public buildings.

1.2 Product features

1. The DDSU666 electric energy meter measures both positive and negative electric energy. Importantly, it combines negative electric energy with positive energy, but this summation is for reference purposes and is not used as the basis for billing.
2. The DDSU666 electric energy meter utilizes a wide-temperature LCD, ensuring reliable performance across a range of temperature conditions.
3. The DDSU666 electric energy meter is designed with a standard DIN35mm rail mounting structure and a modular design. This configuration offers several advantages, including a compact size, effortless installation, and seamless networking capabilities, making it an ideal choice for various applications.

1.3 Model composition and significance

D	Electric Energy Meter
D	Single-Phase
S	Electronic
U	Guide rail
666	Design Serial Number

1.4 Environmental conditions

Rated temperature: -25°C~55°C
Limit temperature : -40°C~70°C
Relative humidity (average annual): ≤75%
Atmosphere: 86kP~106kPa

2. Overall principle block-diagram

The following Figure 1 is the overall block diagram of the instrument.

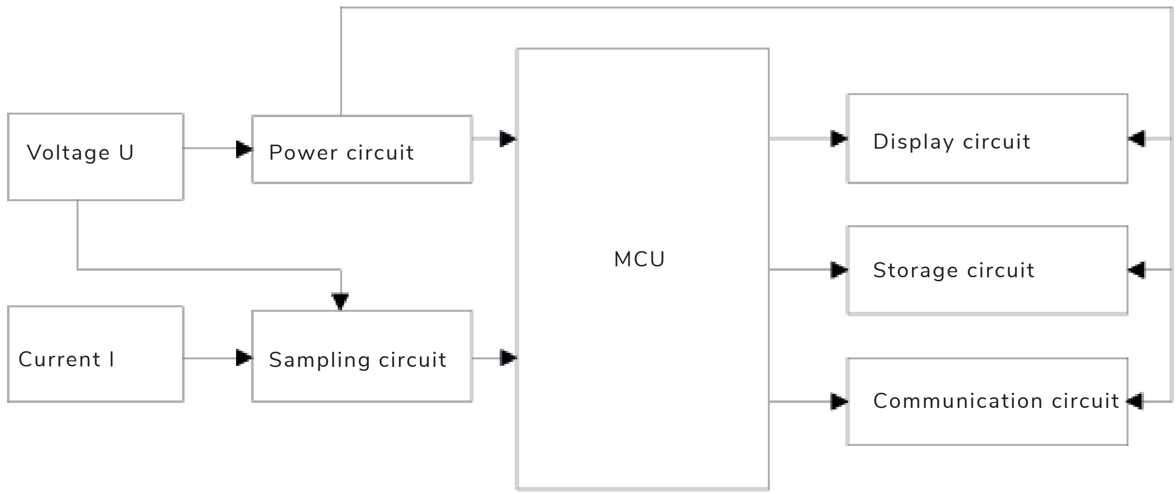


Figure 1 Overall principle block-diagram

3. Main specifications and parameters

3.1 Types and specifications

Model numbers	**Accuracy grade**	**Frequency**	**Reference voltage**	**Current rating**	**Constant**	**Type**
DDSU666	Active power 1	50Hz/60Hz	230 V	5(60)A	800imp/kWh	Direct access meter
DDSU666	Active power 1	50Hz/60Hz	230 V	*/100mA	800imp/kWh	Mutual inductance access

*Note: In order to match the product

3.2 Percentage error

The percentage error of a single-phase electric meter shall not exceed the following limit values:

Current value		Power factor	Percent error limit of each level meter	
Direct access meter	Connected with electronic transformers		1	2
0.05 I b ≤ I < 0.1 I b	0.02 I n ≤ I < 0.05 I n	1	±1.5	±2.5
0.1 I b ≤ I ≤ I max	0.05 I n ≤ I ≤ I max	1	±1.0	±2.0
0.1 | b ≤| < 0.2 I b	0.05 I n ≤I < 0.1 I n	0.5L	±1.5	±2.5
		0.8C	±1.5	--
0.2 | b ≤ I ≤ I max	0.1 I n ≤ I ≤ I max	0.5L	±1.0	±2.0
		0.8C	±1.0	--
The user's special requirements		0.25L	±3.5	--
0.2 | b ≤ I ≤ I max	0.1 I n ≤ I ≤ I max	0.5C	±2.5	--

3.3 Start

Under the conditions of reference voltage and Table 4, the electric meter can start and continuously measure the electric energy.

Instrument	Grade of electric meter		Power factor
	1 grade	2 grade	
Direct access meter	$0.004I_b$	$0.005I_b$	1
Connected with electronic transformers	$0.002I_n$	$0.003I_n$	

3.4 Creeping

The meter should have robust anti-creeping logic. When the voltage loop is subjected to 1.15 times the reference voltage and the current circuit is open, the meter should not generate more than 1 pulse.

3.5 Electrical parameters

Specified operating voltage range	0.9Un ~ 1.1Un
Extended operating voltage range	0.7Un ~ 1.2Un
Limiting operating voltage rang	0 Un ~ 1.9Un
Voltage line power consumption	≤2W/10VA
Current line power consumption	≤2.5VA

3.6 Other technical parameters

Range of measurement	0~999999.99 kWh (Only shows 6 bits, decimal shift automatically)
Display mode	LCD
Communication protocol	DL/T 645-2007 (default) Modbus-RTU

3.7 Key parts and components

Metering chip: HT5019
Pressure sensitive resistance: 14K681
Crystal oscillator: 32.768KHz
Power transformer: ZTY6.170.234
Printed circuit board: ZTY8.067.1930, ZTY8.067.1931, ZTY8.067.1932, ZTY8.067.1933

4. Main Functions

4.1 Metering

(Not used as the basis for billing, for reference only)

It measures both positive and negative electric energy, with negative electric energy being added to the positive.

The stored data will not be lost after a power outage.

4.2 Display

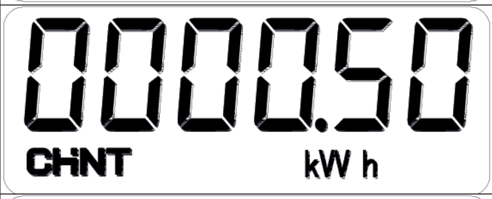
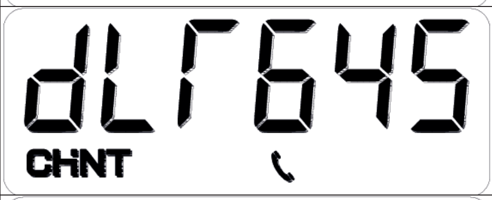
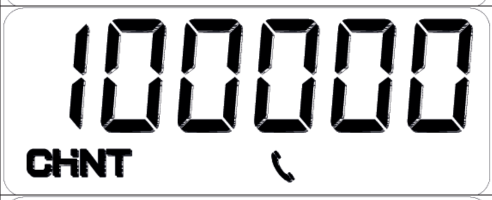
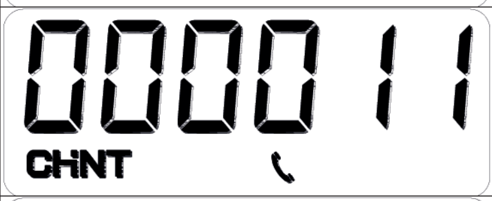
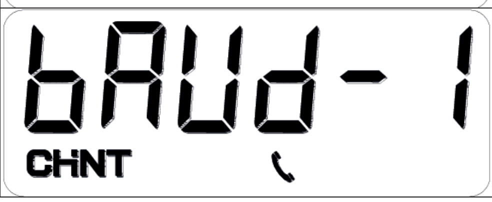
Under normal operating conditions (load conditions), the positive pulse indicator light should be flashing. If it remains steady or doesn't light up for an extended period, please check the wiring.

Meaning of liquid crystal identification

Notations	Meaning
V	Voltage data
A	Current data
W	Power data
var	Reactive power data
Hz	Frequency data
kWh	Active electric energy data
kvarh	Reactive power data

The measurement data pages are displayed every 5 seconds, and the pages are as follows (if the instrument panel is not the same, it depends on the actual model).

Display instructions

Pages	Content	Instruction
1		Voltage, the unit is 'V'. The picture left shows: U=220.0V.
2		Current, the unit is 'A'. The picture left shows: I=5.000V.
3		Active power, the unit is 'W'. The picture left shows : P=0.0 W.
4		Active energy, the unit is 'A'. The picture left shows : Imp=0000.50kWh
5		645 communication protocol
6		Current 645 address is 100000000011
7		
8		Baud rate is 2400

4.3 Communication

The instrument uses the RS485 communication mode, and the baud rate can be set to 1200, 2400 bps, 4800 bps, or 9600 bps.

You can connect up to 32 meters on the same communication line, and each meter can have its address configured. For communication connections, use copper mesh shielded twisted pair with a minimum diameter of 0.5mm². Ensure that the communication line is wired at a distance from the power cable or other strong electric fields. The maximum transmission distance is 1200 meters. The typical network connection is shown in the following figure, and users can choose other suitable connections based on specific conditions.

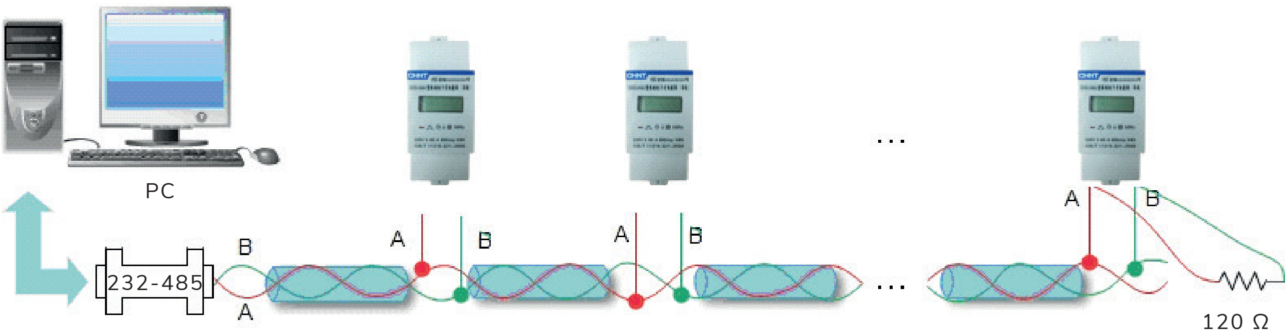


Figure 2 A typical network connection

When the instrument is set to the DL/T 645-2007 transmission mode, it must adhere to the relevant specifications outlined in DL/T 645-2007.

Be attentive to the data it reads:

- Electric energy data should support total power consumption.
- Variable data should support voltage, current, instantaneous active and reactive power, and power factor.
- Address settings are supported, and the detailed protocols are defined in DL/T 645-2007.

If the DL/T 645-2007 protocol is changed to the ModBus-RTU protocol, the data frame is as follows:
FE FE FE FE 68 xx xx xx xx xx xx 68 14 0E 33 33 35 3D 35 33 33 33 33 33 33 33 33 33 CS 16

When the instrument is configured for the ModBus-RTU transmission mode, it utilizes a master-slave communication protocol over a communication line. Initially, the host computer sends a signal addressed to a single terminal device (slave), and then the response signal from the terminal device is transmitted back to the host in the opposite direction, essentially operating in a half-duplex mode.

This protocol restricts communication to occur only between the host (PC, PLC) and the terminal equipment; it does not permit independent data exchange. The design ensures that terminal equipment does not occupy the communication line during their initialization, but rather only queries the device for response signals.

The instrument supports the ModBus-RTU communication protocol, which is detailed in Appendix A. This communication protocol enables the reading and modification of parameter information, as indicated in the following table.

Table 3 Communication parameter information

Parameter address	Parameter code	Instruction of the parameters	Type of data	Length of data word	Read&write attributes
0000H	UCode	Programming password code	16-bit with symbols	1	R/W
0001H	REV.	Reserved, actual read is the version number	16-bit with symbols	1	R
0002H	Clr.E	Electric energy zero clearing CLr.E (1:zero clearing)	16-bit with symbols	1	R/W
0003H	RESERVED	RESERVED	16-bit with symbols	1	
0004H	RESERVED	RESERVED	16-bit with symbols	1	
0005H	Change Protocol	Protocol changing-over	16-bit with symbols	1	R/W
0006H	Addr	Communication address Addr	16-bit with symbols	1	R/W
0007H	RESERVED	RESERVED	16-bit with symbols	1	
0008H	RESERVED	RESERVED	16-bit with symbols	1	
0009H	RESERVED	RESERVED	16-bit with symbols	1	
000AH	RESERVED	RESERVED	16-bit with symbols	1	
000BH	Meter type	Meter type	16-bit with symbols	1	R
000CH	BAud	Communication baud rate BAud	16-bit with symbols	1	R/W
000DH	RESERVED	RESERVED	16-bit with symbols	1	
000EH	RESERVED	RESERVED	16-bit with symbols	1	
000FH	RESERVED	RESERVED	16-bit with symbols	1	
0010H	RESERVED	RESERVED	16-bit with symbols	1	
Electric quantity of the secondary side					
2000H	U	Voltage	Single precision Floating decimal	2	R
2002H	I	Current	Single precision Floating decimal	2	R
2004H	P	Conjunction active power, the unit is KW	Single precision Floating decimal	2	R
2006H	Q	Conjunction reactive power, the unit is Kvar	Single precision Floating decimal	2	R
2008	RESERVED	RESERVED	Single precision Floating decimal	2	R
200AH	PF	Conjunction power factor	Single precision Floating decimal	2	R
200CH	RESERVED	RESERVED	Single precision Floating decimal	2	R
200EH	Freq	Frequency	Single precision Floating decimal	2	R
2010H	RESERVED	RESERVED	Single precision Floating decimal	2	R
Electrical data of the secondary side					
4000H	Ep	Active in electricity	Single precision Floating decimal	2	R
400AH	-Ep	Reverse in electricity	Single precision Floating decimal	2	R

Note: XX XX XX XX XX is the table communication address; CS is the check code.

Protocol Change:
When the data is set to 2, the protocol is Modbus-RTU protocol, and when the data is set to 1, the protocol is DL/T 645-2007 protocol.

CLr.E:
Electric energy clear. When set to 1, it will clear the total electric energy.

BAud:
- 0: 1200 bps
- 1: 2400 bps
- 2: 4800 bps
- 3: 9600 bps

4.4 Output

The electric energy pulse output interface of the meter is a passive photoelectric isolated output, and the output pulse waveform is an 80 + 16ms square wave. The meter's pulse indication utilizes a long-life LED display.

5. External and Installation Dimensions

External dimensions: 36mm x 89mm x 74mm
Installation dimensions: 35mm

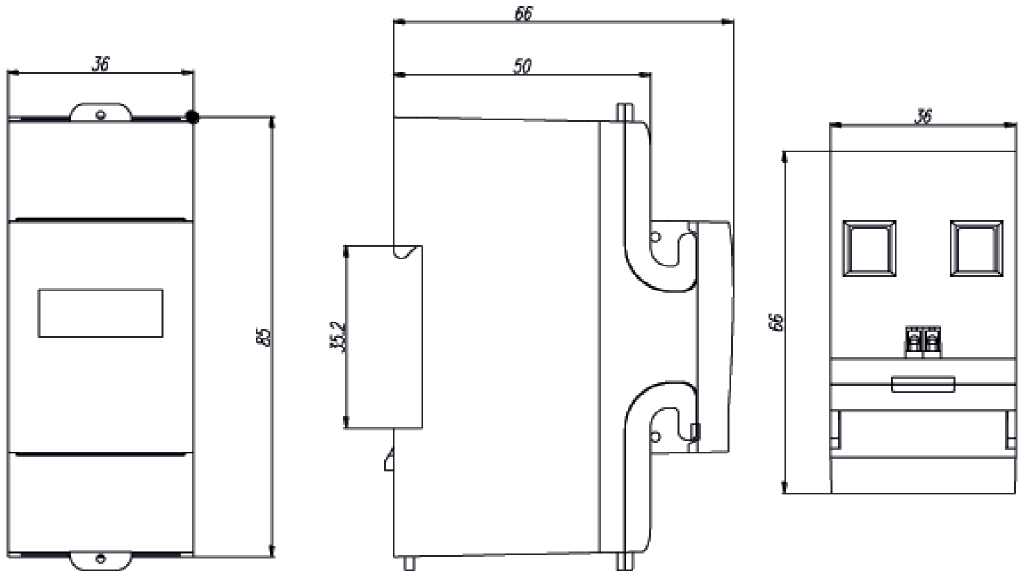


Figure 3 Outline and installation dimensions

6. Installation and Usage Instructions

6.1 Check

1. Before installation, please verify if the model and specifications of the products on the box match the materials. If not, please contact the supplier.
2. Inspect the product's packaging for any signs of damage. If you find any damage, please contact the supplier.

6.2 Installation

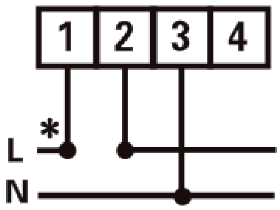
Attach the instrument directly to the guide rail and then install both the instrument and the rail into the distribution box.

1. Once installed, insert the end of the card slot into the guide rail.
2. When uninstalling, use a screwdriver to push the card to release and remove the instrument.

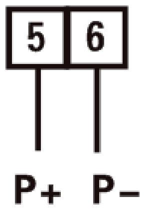
6.3 Connection

6.3.1 Terminals

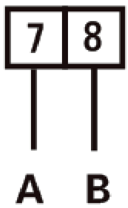
Before powering up, ensure that the wiring is correct. The wiring diagram is as follows:



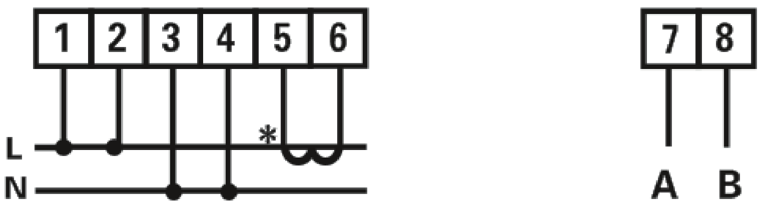
Single phase input



Impulse input



485 communication



Mutual inductance access to the instrument

Figure 4 Wiring diagram

7. Diagnosis, Analysis and Troubleshooting

7.1 Display faults

1. Check: Verify whether the actual wiring complies with the wiring requirements, especially the position of 'N.'
2. Measure: If the connections are fine, use a multimeter to check the external lines for proper conductivity. Please note that when inspecting current and voltage lines, ensure that the signal current and voltage are in the open state to ensure personal safety.

7.2 Communication failure

1. Check: Verify that the communication settings match those on the PC, including the address, baud rate, and parity.
2. If the issues persist despite the above checks, please contact the supplier.

8. Packaging, Transportation and Storage

The packaging of the meter should be made from materials that meet environmental requirements. The storage environment should have a temperature range of -40°C~70°C, and the relative humidity should not exceed 75%. The packaging should adhere to the standards outlined in GB/T 13384-2008. Conventional storage and transportation environments should meet the criteria specified in GB/T 25480-2010.

A complete set of packaging products should include the following:

1. Chint Electric Energy Meter
2. User manual
3. Packet of desiccant
4. Certificate

9. Maintenance and Repair

If users encounter any quality problems within 18 months from the date of dispatch, our company is responsible for free repair or replacement, provided that users operate in accordance with the manual's instructions and the factory seal remains intact.

When our products reach the end of their usable life, we kindly request your assistance in recycling the products or their component materials to protect the environment. Please also dispose of materials that cannot be recycled properly.

Appendix A MODBUS-RTU Communication protocol

A.1 Communication format

Information transmission is carried out using an asynchronous mode with bytes as the unit. The communication data exchanged between the host and the slave computer is in an 11-bit format, comprising 1 start bit (0), 8 data bits, and 2 stop bits (1).

Format of information frame:

Start	Address code	Function code	Data field	CRC check code	End
Pause time for more than 3.5 characters	1 byte	1 byte	N bytes	2 bytes	Pause time for more than 3.5 characters

Table A.1

A.2 Communication information transmission procedure

When a communication command is sent from the host computer to the slave device, the slave device matching the address code sent by the host computer receives the communication command. If the CRC check passes without any errors, the corresponding operation is executed, and the result (data) is returned to the host computer. The returned information includes the address code, function code, execution date, and CRC check code. In case of a CRC verification code error, no information will be returned.

A.2.1 Address code

The address code is the first byte of each communication frame and falls within the range of 1 to 247. Every slave device on the bus must possess a unique address code. Only the slave device matching the address code sent by the host computer can respond with returned information. When the slave device sends back information, all returned data begins with the respective address code. The address code transmitted from the host computer signifies the slave address, while the returned address code from the slave computer indicates its address. This corresponding address code identifies the source of the information.

A.2.2 Function code

It's the second byte of each communication frame. It is sent by the host to instruct the slave computer on the actions to be performed. When the slave responds, it indicates that the slave has acknowledged the host's command and is carrying out the corresponding operations. The function code returned by the slave matches the function code sent by the host.

The meter supports the following two function codes:

Function code	Definition	Operation
033H	Read register	Read the data of one or several registers
10H	Write multi-port register	Write n 16-digit binary data into n continuous registers

Table A.2

A.2.3 Data field

The data field varies with different function codes and can include numerical values, reference addresses, and other data types. Each slave device has unique address and data information, which should be documented in a communication information table.

The host uses communication commands (function codes 03H and 10H) to read and modify the slave's data registers. However, the data length read or written at one time should remain within the valid range of the data register's address.

A.3 Function code

A.3.1 Function code 03H: Read register

For instance, if the host wishes to read data from a slave with address 01H, specifically two registers starting from address 0CH, the host will send:

Host to send		Sent data
Address code		01H
Function code		03H
Start register address	High byte	00H
	Low byte	0CH
The number of registers	High byte	00H
	Low byte	02H
CRC check code	Low byte	04H
	High byte	08H

Table A.3

If the data of the slave register 0CH, 0DH is 0000H, 1388H, the slave will return:

Slave to return		Returned information
Address code		01H
Function code		03H
The number of bytes		04H
Data of register 0CH	High byte	00H
	Low byte	00H
Data of register 0DH	High byte	13H
	Low byte	88H
CRC check code	Low byte	F7H
	High byte	65H

Table A.4

A.3.2 Function code 10H: Write multi-port register

For example, if the host wants to store the values 0002H, 1388H, and 000AH into slave address 01H across 3 registers starting from address 00H, the host will send:

Host to send		Sent information
Address code		01H
Function code		03H
Start register address	High byte	00H
	Low byte	00H
The number of registers	High byte	00H
	Low byte	03H
Number of written bytes		06H
Data of 00H to be written	High byte	00H
	Low byte	02H
Data of 01H to be written	High byte	13H
	Low byte	88H
Data of 02H to be written	High byte	00H
	Low byte	0AH
CRC check code	Low byte	9BH
	High byte	E9H

The slave will return:

Slave to return		Returned information
Address code		01H
Function code		10H
Start register address	High byte	00H
	Low byte	00H
The number of registers	High byte	00H
	Low byte	03H
CRC check code	Low byte	80H
	High byte	08H

Table A.5

A.4 16-digit CRC check code

The host and slave use a check code to verify the accuracy of received information, as electronic noise or other factors can introduce errors during transmission. This check code ensures the correctness of the communication information for both the host and slave.

The check code is a 16-digit CRC (Cyclic Redundancy Check) code, calculated by the host and placed at the end of the transmitted information frame. The slave independently recalculates the CRC based on the received information and compares it to the calculated CRC. If they do not match, an error is detected.

It's important to note that only the 8 data bits are involved in the CRC calculation; the start and stop bits are not considered.

CRC Calculation Method:

1. Begin with a 16-digit register initialized to hexadecimal FFFF (i.e. fully 1), referred to as the CRC register.
2. Perform an XOR calculation between the lower 8 digits of the CRC register and the first 8 binary digits of the communication information frame (the first byte). Place the result back into the CRC register.
3. Shift the contents of the CRC register one digit to the right, filling the leftmost digit with 0. Check the value of the shifted-out digit.
4. If the shifted-out digit is 0, repeat step 3 (shift right one more time).
   If the shifted-out digit is 1, perform an XOR calculation between the CRC register and a fixed polynomial A001 (1010 0000 0000 0001).
5. Repeat steps 3 and 4 for a total of 8 shifts, processing all 8 digits.
6. Repeat step 2) and 5), processing the next byte of the communication information frame.
7. After completing the calculation for all bytes in the communication information frame (excluding the CRC check code itself), the content of the CRC register represents the 16-digit CRC check code.

A.5 Error handling

When the meter detects errors other than the CRC check code error, it sends information back to the host. The highest digit of the function code is set to 1, meaning the function code returned to the host is obtained by adding 128 to the function code sent by the host. The error returned from the slave is as follows:

Address code	Function code (the highest digit is 1)	Error code	Low byte of CRC check code	High byte of CRC check code
1 byte	1 byte	1 byte	1 byte	1 byte

Table A.7

Error codes as follows:

01H	Illegal function code	The meter does not support the received function code
02H	Illegal register address	The received register address exceeds the register address range of the meter
03H	Illegal data value	The received data exceeds the data range of the corresponding address

Table A.8

10. Notes

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