

**ЭНЕРГОМЕТРИКА**  
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## **Multi-channel DC Energy Meter**

### **User Manual**

**Version: 2.2**

## Read me

**When you use Multi-channel DC Energy Meter, be sure to carefully read this user manual, and be able to fully understand the implications, the correct guidance of operations in accordance with user manual, which will help you make better use this DC Energy Meter, and help to solve the various problems at the scene.**

1. Before the meter turning on the power supply, be sure that the power supply within the provisions of the instrument;
2. When installation, the current input terminal must non-open, voltage input terminals must Non-short circuit;
3. Be sure the instrument wiring consistent with the internal system settings;
4. When communicating with the PC, instrument communication parameters must be consistent with the PC



- **Please read this user manual carefully**
- **Please save this document**

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## 1. - SUMMARIZE

Meter is an advanced solution for multi-channel energy metering in DC system. It can visually display voltage, current, power data and energy cumulative data. With a panel keypad, it can set voltage display parameters and the hall CT parameters.

With RS485 communication interface, can be connected to the monitoring center. It is a high-performance automatic meter suitable for industrial and mining enterprises, civil construction, building automation.

These series can measure the power parameters in power grid:

<b>Current</b>	<b>0.000 ~ 500A (Depends on the Hall CT)</b>
<b>Voltage</b>	<b>0.0 ~ 1000V</b>
<b>Active power</b>	<b>0.000 ~ 9999KW</b>
<b>Energy</b>	<b>0.00Wh ~ 999999999Wh</b>

## 2. - SPECIFICATIONS

### 1. - Reference standard:

Basic electricity: IEC 61557-12:2007

Active energy: IEC 62053-21:2003

### 2- Accuracy standards

Parameter	Accuracy
Current	0.5%fs
Voltage	0.5%fs
Active power	1%fs
Energy	1%fs

### 3. - Input

Current: Hall Effective CT, aux +/-15VDC, 4V signal input

### 4. - Load

Current: <0.5VA / phase (rated 5A)

### 5. - Overload

Current: 1.2 times rated continuous; 1 seconds for 10 times the rated

Voltage: 1.2 times rated continuous; 10 seconds for 2 times the rated

### 6. - Dielectric strength

IEC/EN 61010-1:2010

2kV AC RMS 1 minute, between input / output / case / power supply

### 7. - Work environment

Temperature: -20°C~ +60°C

Humidity: RH 20%~95% (No condensation)

### 8. - Protection

Panel: IP40

### 9. - Storage Conditions

Temperature: -25°C~+70°C

Humidity: RH 20%~95%

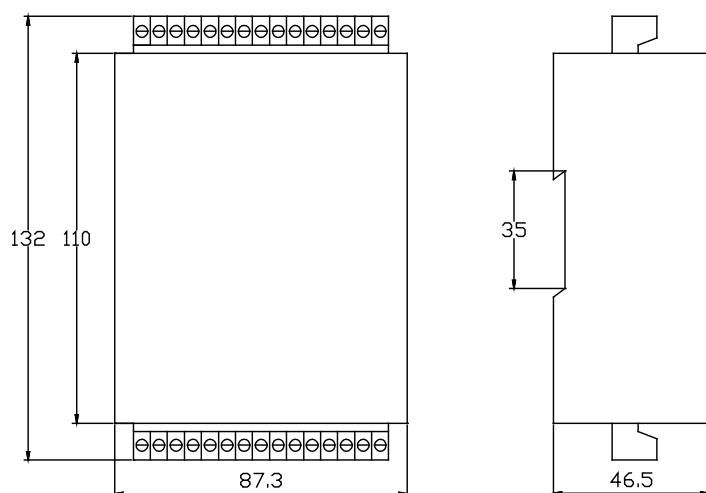
### 10. - Power Supply

DC 24V / DC48V / AC/DC85~265V

Maximum power consumption 4VA

### 11. - Dimensions

L × H × D =87.3X132X46.5mm (with wiring terminal)



### 3.- INSTALLATION AND START-UP



The manual you hold in your hands contains information and warnings that the user should respect in order to guarantee a proper operation of all the instrument functions and keep its safety conditions. The instrument must not be powered and used until its definitive assembly is on the cabinet's door.

**Whether the instrument is not used as manufacturer's specifications, the protection of the instrument can be damaged.**

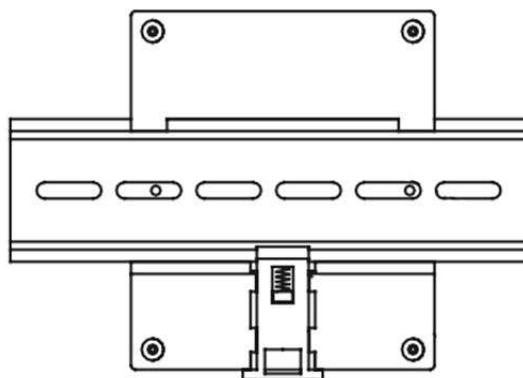
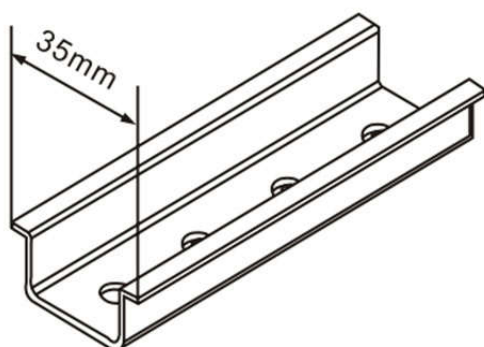
When any protection failure is suspected to exist (for example, it presents external visible damages), the instrument must be immediately powered off. In this case contact a qualified service representative.

#### 3.1.- Installation

##### Mounting

Instrument is to be mounted on 35mm Din-rail. Keep all connections inside the cabinet.

Note that with the instrument powered on, the terminals could be dangerous to touch and cover opening actions or elements removal may allow accessing dangerous parts. Therefore, the instrument must not be used until this is completely installed.

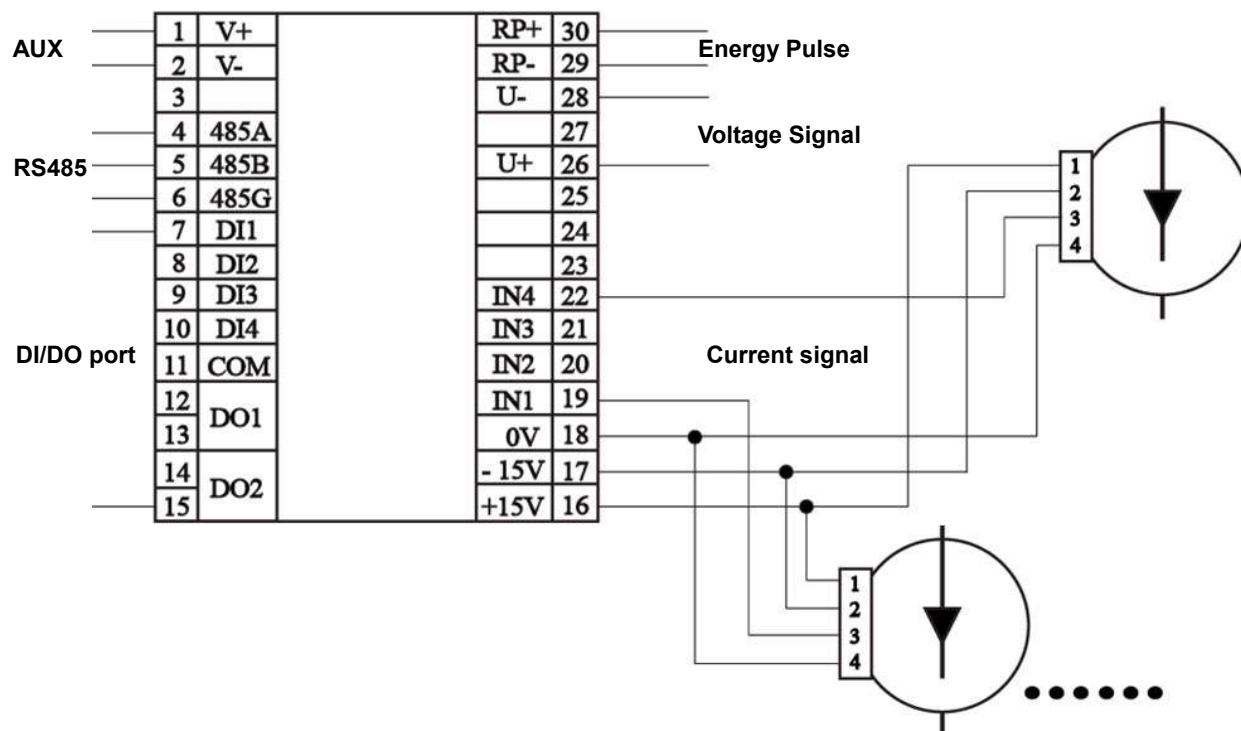


##### Notes:

##### Auxiliary power:

Meter with AUX power input, if not for a special statement, we provide the 85-265VAC/DC power interface for standard products. Please ensure that the auxiliary power match meter access to prevent damage to the product.

### 3.2. - Connection terminal and drawing for BJ-DCEM



#### Notes:

The current input pin need to access the Hall CT, and output signal of CT is 0-4VDC, Hall CT need +/-15V AUX power, on the meter pin 16, 17 provide the AUX.

Wiring diagram may be changed due to the special requirements of customers order, please refer the label on the rear part.

## 4. - SETUP PROCEDURE

### 4.1. - Key operation

“←” or “→” for screen switch or value increase/decrease

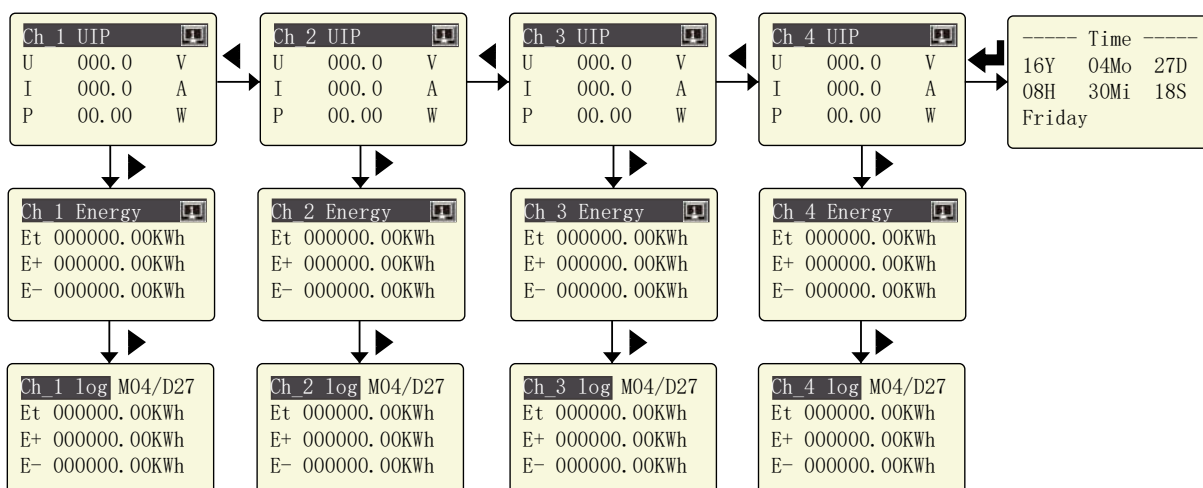
“SET” for menu enters or exit

“↵” for enter next menu or confirm the change



### 4.2. - Show electric parameters

When the in monitor screen, user can use keypad switch shows the electrical parameters, when press “←” or “→” to switch another screen, screen roller logic as following:

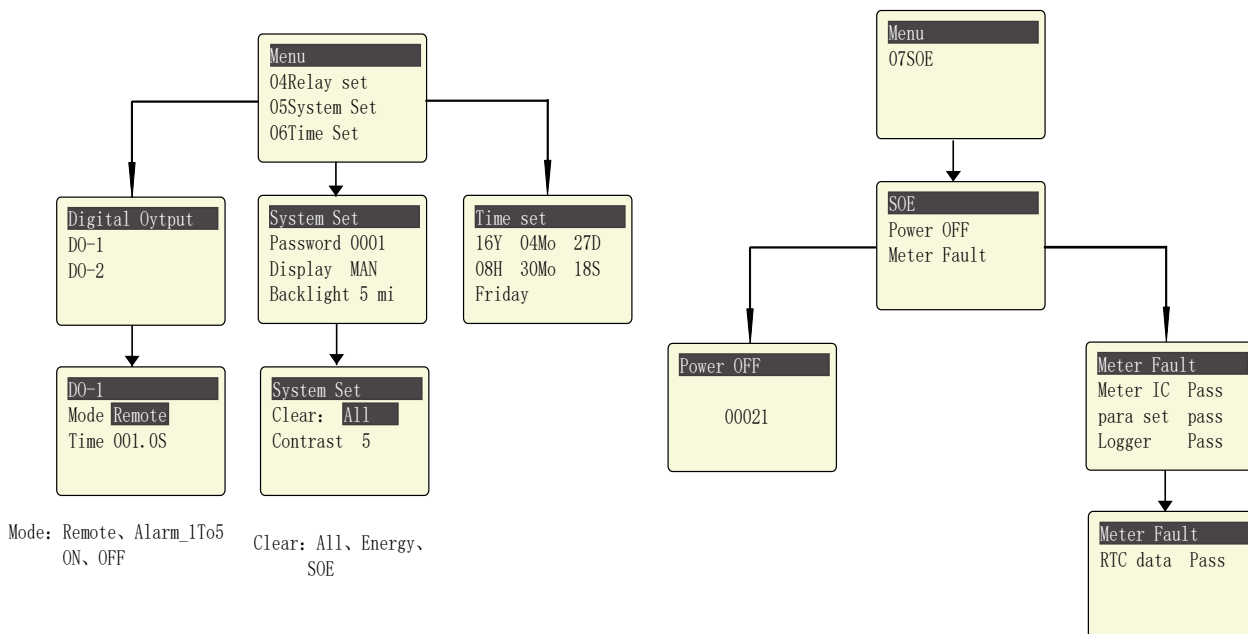
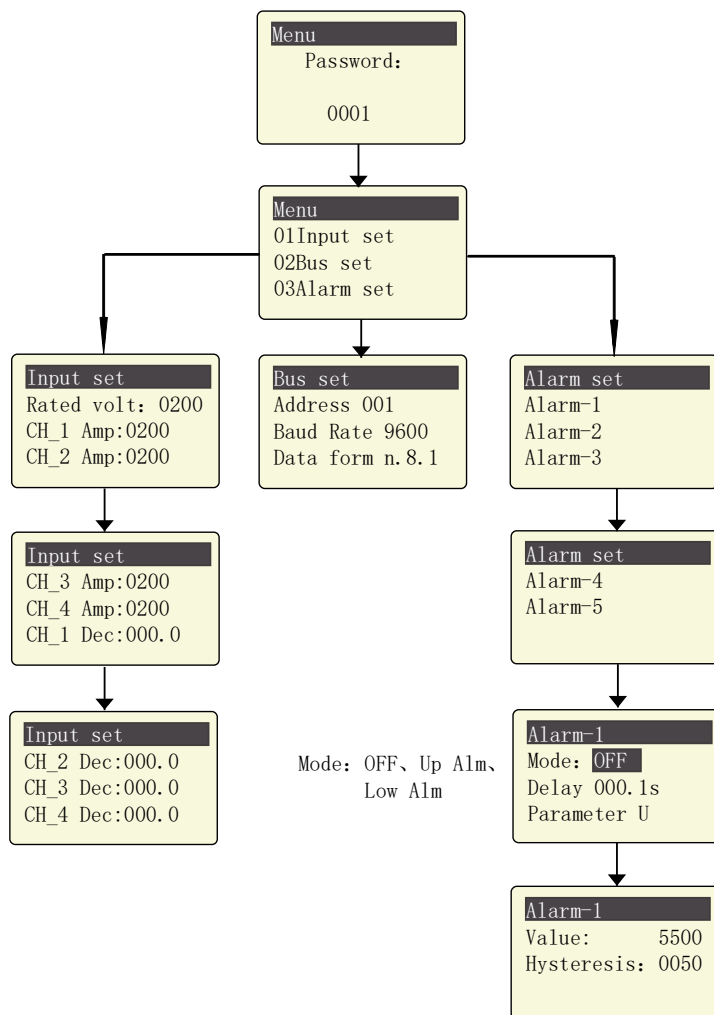


### 4.3- Parameters Setting

The SETUP procedure of the is performed by means of several SETUP options. When into the SETUP, use the keyboard to select different options and enter required variables: Press the key **SET** can enter the parameter setting. the screen ask access password (Default is 0001), then press ↵ can enter the menu.

The operation menu logic as following:





## 4.4. - Menu Structure

level 1	Level 2	Level 3	Level 4	Description
Input Setting	Rated volt	48	/	Voltage metering range
	CH_1~4 Amp	100	/	Current metering range
	CH_1~4 Dec	/	/	Decimal point position
Comm Setting	Address	1~247	/	Default 0001
	Baud Rate	2400 / 4800 / 9600	/	Default is 9600
	Check format	n.8.1 / o.8.1 / e.8.1	/	Factory default ( <b>n.8.1</b> )
Alarm Setting	Alarm_1~5	Mode	OFF / Upper Limit / Lower Limit	Total three mode
		Delay	/	Alarm triggered time delay, Default 001.0s
		Parameter	U / I / P / ...	Alarm triggered parameters
		Value	0~9999	Default is 5500
		hysteresis	0~9999	Default is 0050
Digital Output	DO_1~2	Mode	Remote Alarm_1~5 ON / OFF	Total 8 mode
		Time	0~999.9	Alarm triggered time delay. In remote mode is pulse width. Default 000.1s.
System Settings	Password	0~9999	/	Reset user password
	Display	MAN Number 1~9	/	Manual switching, or automatic switching in 1~9sec
	Backlight	1~5	/	LCD backlight duration, unit is min, default is 5
	Clear	All / Energy / SOE	/	Clear the record in meter
	Contrast	1~9	/	LCD display contrast, default is 5
Time setting	Year	00-99	/	Clock setting
	Month	1~12	/	
	Date	1~31	/	
	Hour	00~23	/	
	Minute	00~59	/	
	Second	00~59	/	
	Week day	1~7	/	
SOE	Power OFF	0-99999	/	Record the meter power off times
	Meter fault	/	/	See screen description

## 5. - PULSE OUTPUT

provides 1 channel pulse output for the total active energy and total reactive energy.

The host/PLC/DI module can cumulative the data of both the active and reactive power energy sent by the pulse from optocoupler relay.

1). Electrical specification: voltage  $VCC \leq 48V$ ,  $I_z \leq 50mA$ .

2). Pulse: example in 5000 imp / kWh, pulse upto 80ms.

This means: When the meter detect 1 kWh, the meter output 5000 pulse

**Note:** 1 kWh energy is for secondary side energy data, if there have PT and CT accessed; primary side energy data is "1 kWh  $\times$  PT ratio  $\times$  CT ratio".

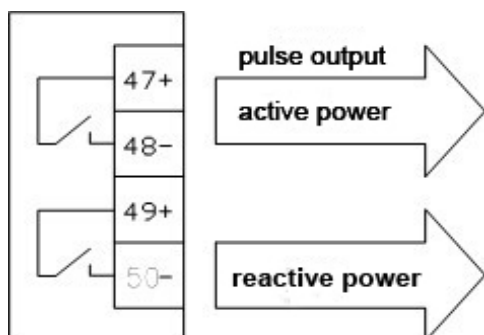
**For example:** In measure time "T", the received total pulse is "N",

Primary side input of voltage is 10Kv

Primary side input of current is 400A.

Secondary side measurement range is 100V and 5A.

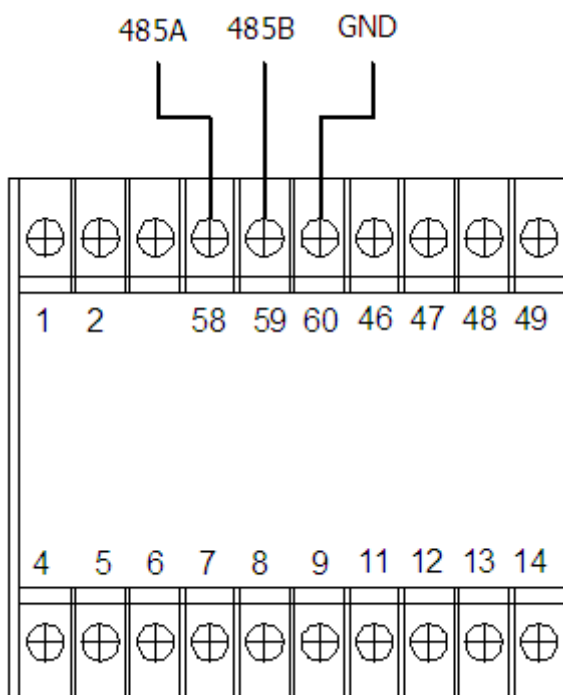
In the time "T", energy accumulated is :  $N/5000 \times 100 \times 80$



## 6. - COMMUNICATION PROTOCOL

### 6.1. - Connection for the RS485 BUS

The composition of the RS-485 cabling must be carried out with a meshed screen cable (minimum 3 wire), diameter of not less than 0.5mm<sup>2</sup>, with a maximum distance of 1,200 m between the BJ194... and the master unit. This Bus may connect a maximum of 32 BJ194...



**Note:**

1. For communication with the master unit, customers can choose the RS-232 to RS-485 converter to use
2. Full range of BJ-194... meter RS485 PIN number is 58,59,60
3. Due to product modifications or custom requirements, the interface pin place may be changed. For details, please refer to product label on the rear board

## 6.2. - MODBUS © protocol

### Modbus RTU Frame Format:

<b>Address code</b>	<b>1 BYTE</b>	<i>Slave device address 1-247</i>
<b>Function code</b>	<b>1 BYTE</b>	<i>Indicates the function codes like read coils / inputs</i>
<b>Data code</b>	<b>4 BYTE</b>	<i>Starting address, high byte Starting address, low byte Number of registers, high byte Number of registers, low byte</i>
<b>Error Check code</b>	<b>2 BYTE</b>	<i>Cyclical Redundancy Check (CRC)</i>
	:	

### MODBUS FUNCTIONS

<b>Code:</b>	<b>Meaning:</b>	<b>Description:</b>
<b>FUNCTION 03/04</b>	Reading of n Words	<i>This function permits to read all the electrical parameters of the BJ194...series.</i>
<b>FUNCTION 08</b>	Clear energy counters	<i>Cleared energy data by the PC (*User also can clear energy counter on meter operation, refer the <b>User Manual</b> related section)</i>
<b>FUNCTION 16</b>	Preset Multiple Registers	<i>Write value in to the relevant register</i>

### 6.3. - Register Address Table

#### 6.3.1- Basic Power Data—Primary Side

Address	Data	Byte mode		Instruction
0x00	U	float	2	System Voltage, Unit: V
0x02	I1	float	2	Current of Channel_1, Unit: A
0x04	P1	float	2	Power of Channel_1, Unit: W
0x06	Epz1	float	2	Total Energy of Channel_1, Unit: KWh
0x08	EP1+	float	2	Total Positive Energy of Channel_1, Unit: KWh
0x0a	EP1-	float	2	Total Negative Energy of Channel_1, Unit: KWh
0x0c	I2	float	2	Current of Channel_2, Unit: A
0x0e	P2	float	2	Power of Channel_2, Unit: W
0x10	Epz2	float	2	Total Energy of Channel_2, Unit: KWh
0x12	EP2+	float	2	Total Positive Energy of Channel_2, Unit: KWh
0x14	EP2-	float	2	Total Negative Energy of Channel_2, Unit: KWh
0x16	I3	float	2	Current of Channel_3, Unit: A
0x18	P3	float	2	Power of Channel_3, Unit: W
0x1a	Epz3	float	2	Total Energy of Channel_3, Unit: KWh
0x1c	EP3+	float	2	Total Positive Energy of Channel_3, Unit: KWh
0x1e	EP3-	float	2	Total Negative Energy of Channel_3, Unit: KWh
0x20	I4	float	2	Current of Channel_4, Unit: A
0x22	P4	float	2	Power of Channel_4, Unit: W
0x24	Epz4	float	2	Total Energy of Channel_4, Unit: KWh
0x26	EP4+	float	2	Total Positive Energy of Channel_4, Unit: KWh
0x28	EP4-	float	2	Total Negative Energy of Channel_4, Unit: KWh

Float data follow IEEE754, float low bit first, high bit next. (CD AB)

#### 6.3.2- Meter status data

Address	Data	Byte mode		Instruction
0x200	DO	int	1	Digital output: Bit 0~1 show channel 1 and channel 2 status 0 for open, 1 for closed
0x201	DI	int	1	Digital input: Bit 0~3 show channel 1 to channel 4 status 0 for open, 1 for closed
0x203	DZ	int	1	Alarm condition Bit 0~4 show channel 1 to channel 5 status
0x20A	TIME.year	int	1	Internal RTC clock: year-month-day-hour-minutes-second-week (Integer, the last char unused)
0x20B	TIME.month	int	1	
0x20C	TIME.date	int	1	
0x20D	TIME.hour	int	1	
0x20E	TIME.minute	int	1	

0x20F	TIME.secon d	int	1	
0x210	TIME.day	int	1	

### 6.3.3 - Energy record Data (max 31 days)

Address	Data	Byte mode		Instruction
0x3000	MMDD/1	int	1	Record Date(1), BCD code, unit: Month/Day
0x3001	Epz1/1	long	2	Total energy record for Channel_1 in Date(1) unit 0.01KWh
0x3003	EP1+/1	long	2	Positive energy record for Channel_1 in Date(1) unit 0.01KWh
0x3005	EP1-/1	long	2	Negative energy record for Channel_1 in Date(1) unit 0.01KWh
0x3007	Epz2/1	long	2	Total energy record for Channel_2 in Date(1) unit 0.01KWh
0x3009	EP2+/1	long	2	Positive energy record for Channel_2 in Date(1) unit 0.01KWh
0x300B	EP2-/1	long	2	Negative energy record for Channel_2 in Date(1) unit 0.01KWh
0x300D	Epz3/1	long	2	Total energy record for Channel_3 in Date(1) unit 0.01KWh
0x300F	EP3+/1	long	2	Positive energy record for Channel_3 in Date(1) unit 0.01KWh
0x3011	EP3-/1	long	2	Negative energy record for Channel_3 in Date(1) unit 0.01KWh
0x3013	Epz4/1	long	2	Total energy record for Channel_4 in Date(1) unit 0.01KWh
0x3015	EP4+/1	long	2	Positive energy record for Channel_4 in Date(1) unit 0.01KWh
0x3017	EP4-/1	long	2	Negative energy record for Channel_4 in Date(1) unit 0.01KWh
0x3019	MMDD/2	int	1	Record Date(2), BCD code, unit: Month/Day
0x301A	Epz1/2	long	2	Total energy record for Channel_1 in Date(2) unit 0.01KWh
0x301C	EP1+/2	long	2	Positive energy record for Channel_1 in Date(2) unit 0.01KWh
0x301E	EP1-/2	long	2	Negative energy record for Channel_1 in Date(2) unit 0.01KWh
0x3020	Epz2/2	long	2	Total energy record for Channel_2 in Date(2) unit 0.01KWh
0x3022	EP2+/2	long	2	Positive energy record for Channel_2 in Date(2) unit 0.01KWh
0x3024	EP2-/2	long	2	Negative energy record for Channel_2 in Date(2) unit 0.01KWh
0x3026	Epz3/2	long	2	Total energy record for Channel_3 in Date(2) unit 0.01KWh
0x3028	EP3+/2	long	2	Positive energy record for Channel_3 in Date(2) unit 0.01KWh
0x302A	EP3-/2	long	2	Negative energy record for Channel_3 in Date(2) unit 0.01KWh
0x302C	Epz4/2	long	2	Total energy record for Channel_4 in Date(2) unit 0.01KWh

0x302E	EP4+/2	long	2	Positive energy record for Channel_4 in Date(2) unit 0.01KWh
0x3030	EP4-/2	long	2	Negative energy record for Channel_4 in Date(2) unit 0.01KWh
0x3032-0x304A	Date(3) data block, format same as above			
0x304B-0x3063	Date(4) data block, format same as above			
0x3064-0x307D	Date(5) data block, format same as above			
.....	.....			
.....	.....			
.....	.....			
0x32EE-0x3306	Date(31) data block, format same as above			

**Notes:** Date (1) mean the last day before current time, Date(31) for the oldest record time point, will automatic cycle record the data, mean the oldest data will loss one by one.

#### 6.3.4 - Energy record Data max 31 days

Address	Data	Byte mode	Instruction	
0x5000		int	1	Total power off number of times
0x5001		int	1	Meter fault alarm

**Notes:** in address 0x5001, following chart show the related alarm condition

Bit	Meter Fault	Abnormal	Normal
D0	Metering IC error	1	0
D1	reversed		
D2	reversed		
D3	reversed		
D4	Setting config. area error	1	0
D5	Logger record area error	1	0
D6	Real-time data area error	1	0
D7	reversed		
D8	reversed		
D9	reversed		
D10	reversed		
D11	reversed		
D12	reversed		
D13	reversed		
D14	reversed		
D15	reversed		



## 7. - SAFETY CONSIDERATIONS



All installation specification described at the previous chapters named: **INSTALLATION AND STARTUP, INSTALLATION MODES and SPECIFICATIONS.**

Note that with the instrument powered on, the terminals could be dangerous to touching and cover opening actions or elements removal may allow accessing dangerous parts. This instrument is factory-shipped at proper operation condition.

## 8. - MAINTENANCE

The does not require any special maintenance. No adjustment, maintenance or repairing action should be done when the instrument open and powered on, should those actions are essential, high-qualified operators must perform them.

Before any adjustment, replacement, maintenance or repairing operation is carried out; the instrument must be disconnected from any power supply source.

When any protection failure is suspected to exist, the instrument must be immediately put out of service. The instrument's design allows a quick replacement in case of any failure.