BLUE JAY®
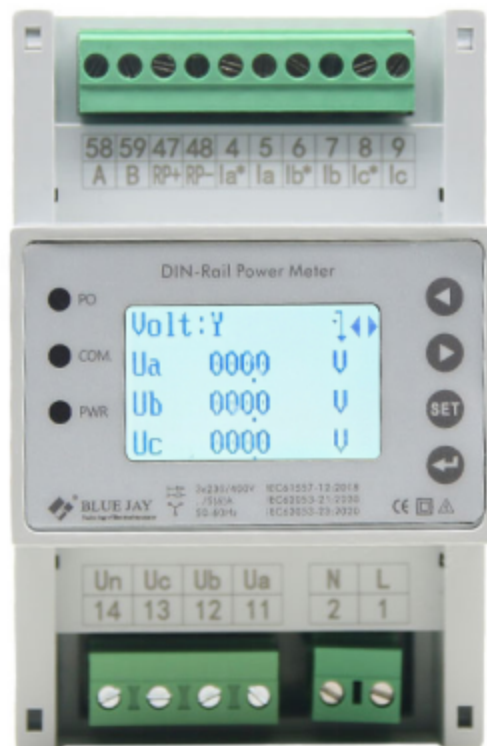Technology of Electrical Automatic

APM-4MJ
Din Rail Power Meter

User Manual

Version: 1.11

Revision: 2024-7

Read me

When you use APM-4MJ multi-function meter, be sure to read this user manual carefully, 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 of APM-4MJ multi-function meter, and help to solve various problems at the scene.

1. Before the meter turn on the power supply, be sure that the power supply within the provisions of the instrument;

2. When installation, the current input terminal must be non-open, voltage input terminals must be Non-short circuit;

3. Communication terminal (RS232/RS485) is strictly prohibited to impose on high pressure;

4. Be sure the instrument wiring is consistent with the internal system settings;

5. When communicating with the PC, instrument communication parameters must be consistent with the PC.

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

Directory

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1. - SUMMARIZE

APM-4MJ Din rail multi-function power meter has functions such as programmable measurement, display, transmission output, digital communication and power pulse output. It can complete power measurement, power metering, data display, collection and transmission.

The measurement accuracy is 0.5S level, which can be achieved On-site display and remote RS-485/MODBUS-RTU communication.

It can measure all power parameters in power grid:

Current,	Apparent power,	Harmonics factor,
Voltage,	Energy (Active/reactive),	Voltage crest factor,
Frequency,	Power factor,	Current K-factor,
Active power,	Current harmonics 2~31 times,	Multi- tariffs ratio.
Reactive power,	Voltage harmonics 2~31 times,	Demand record,
Voltage /current unbalance*	Voltage and current THD%,	Voltage/frequency deviation*

Note :* represent optional functions.

APM-4MJ supports RS485 / MODBUS-RTU communication and optional Profibus-DP protocol.

APPLICATIONS

-. Measure all power parameters;
-. Renewable energy systems;
-. Medium and low voltage systems;
-. SCADA, EMS, DCS integrators;
-. Remote meter reading, load management and demand response for smart grids;
-. Transformers, generators, capacitors and electric motors distributed detection.

2. - FEATURES

2.1. - Electricity Metering

By means of an internal microprocessor it simultaneously measures:

Parameter	Symbol	A-phase	B-phase	C-phase	Total
Phase-line voltage	V	●	●	●	/
Phase-phase voltage	V	●	●	●	/
Current	A	●	●	●	/
Frequency	Hz	●	●	●	●
Power factor	Cos Φ	●	●	●	●
Active power	W	●	●	●	●
Reactive power	Var	●	●	●	●
Apparent power	VA	●	●	●	●
Active energy	Wh	●	●	●	●
Reactive energy	Varh	●	●	●	●
Multi-tariffs energy record	Wh	/	/	/	/
Max demand (W / var / VA)	MAX	/	/	/	/
Voltage / frequency deviation	V	o	o	o	o
Voltage / current unbalance	%	o	o	o	o
THD & Harmonic (2~31th)	THD	●	●	●	●

●: Display and communications

o: Optional functions

/ : No such function

Note:

Phase-phase voltage is Uab, Ubc, Uca, voltage data determined by the different wiring.

APM-4MJ delivers the visualization of parameters listed above by means of LCD type displays. In the main display area show 3 power parameters, with other display area show the various parameters and state of meter on each page jump. For more details of measurement parameters please refer to the subsequent for displays introduction and RS485 communication instructions.

OTHER FEATURES

-. Din-rail mounting meter;

-. True R.M.S. measuring system;

-. Instantaneous, maximum and minimum values of each measured parameter;

-. Energy measurement (indication through a lighting led);

-. RS-485 communication to a PC.

2.2. - Technical parameters

-. Working Power

AC/DC 85-265V, (DC 48V or AC 380V customized)
45-65Hz
Consumption ≤4VA

-. Reference Standard

Basic electricity	IEC 61557-12:2018
Active energy	IEC 62053-21:2020
Reactive energy	IEC 62053-24:2020

-. Input

Voltage	AC100V, 220V, 380V
Current	AC1A/5A (please specify when ordering)
Frequency	40~65Hz
Current overload	Measurement: 1.2 times Instantaneous: 2 times/10s
Voltage overload	Measurement: 1.2 times Instantaneous: 2 times/10s

-. Output

Digital interface	RS-485, MODBUS-RTU or DLT645-2007
Pulse output	1 Channel

-. Load

Voltage: <0.1VA / phase (rated 220V)
Current: <0.4VA / phase (rated 5A)

-. Accuracy

Parameter	Accuracy	A phase	B phase	C phase	All
Voltage	0.5s	V1	V2	V3	
Current	0.5s	A1	A2	A3	
Active Power	0.5s	W1	W2	W3	W
Reactive Power	1	var1	var2	var3	var
Apparent Power	0.5s	VA1	VA2	VA3	VA
Power Factor	0.5s	PF1	PF2	PF3	PF
Active Energy	0.5				Wh
Reactive Energy	1.0				varh
Frequency	0.02				Hz

-. Environment

Working temperature: -10°C ~ +55°C; RH 20% ~ 95% (Non-condensation)
Storage temperature: -30°C ~ +70°C; RH 20% ~ 95% (Non-condensation)

-. Safety

2kV AC RMS 1 minute, between input / output / case / power supply
Input, output and power supply to the chassis ≥100MΩ

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3. - INSTALLATION AND START-UP

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

If the instrument is not used as manufacturer's specifications, the protection of the instrument will 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

The instrument is to be mounted on the 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.
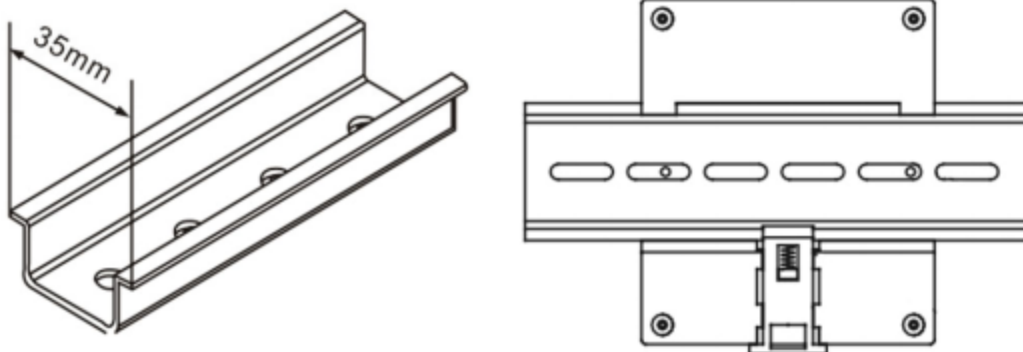
Dimension

W*H*D: 72*110*66 mm
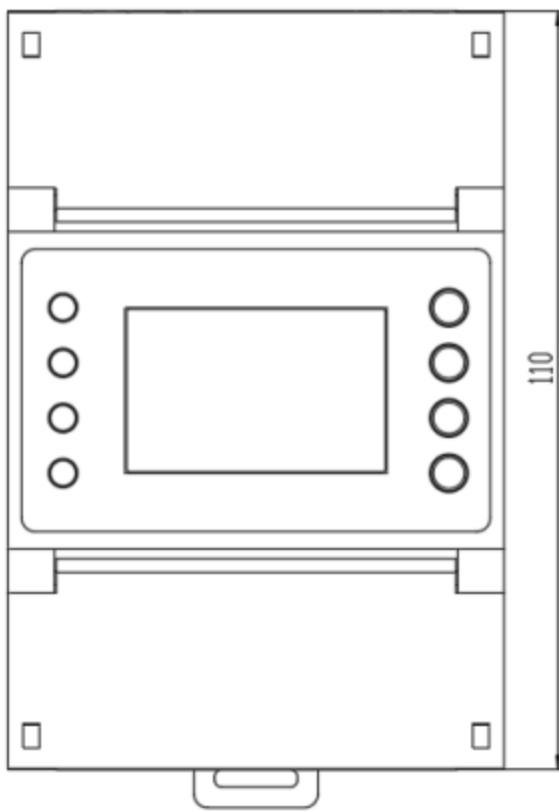
Front view

Side view

66

110

Upper view

72

66
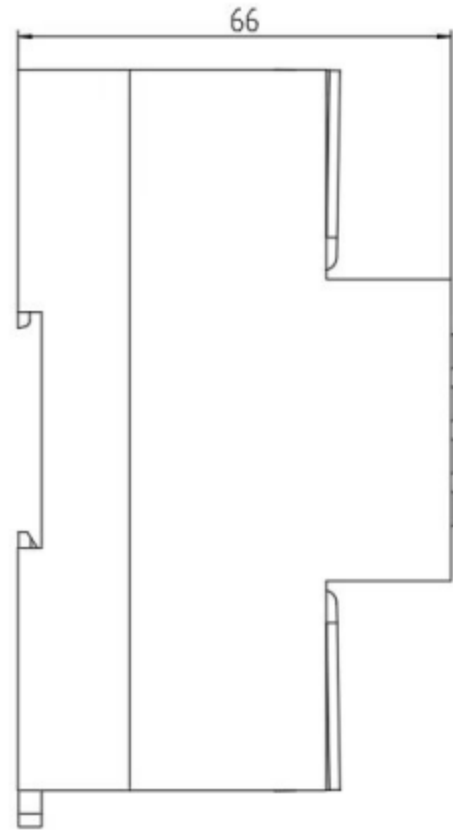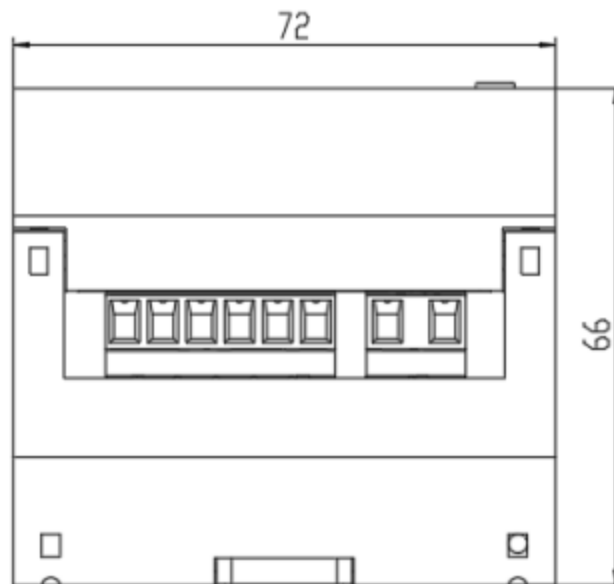
Notes:

Input signal: APM-4MJ using a separate acquisition calculate for each measurement channel, to ensure consistent in use, for different load forms, it's a variety of connection mode. Access wire shall be met 2.5 square mm.

A. Voltage input

Input voltage should not exceed the rated input voltage products 450V.
Otherwise, you should use external VT. Suggest 1A fuse be installed in the voltage input side.

B. Current Input

Standard input current is 5A or 1A, if greater than 5A/1A should use external CT.
When the CT is connected with other meters, make sure wiring methods be used in series.

**Warming: Forbid to install a CT on the live feeder wire with open secondary leads. This can be extremely dangerous!**

Before remove the current input connection, must be sure to disconnect the primary circuit or shorted secondary circuit of CT.

C. Sequence of wire

Warming: Please make sure that the input voltage and current corresponding to the same phase, sequence, and the same direction; Otherwise, the Values and symbols will be wrong! (Power and Energy)

Always observe the physical orientation of CT (P1 - P2) when installing on the feeder wire.
Always pay attention to wiring polarity and phasing when terminating the CT leads to the APM-4MJ.
S1 connect to Ix*, S2 connect to Ix.

The input network configuration of instrument depends on the CT number of the system:
in the condition of 2 CT, select the three-phase, three-lines two components;
in the condition of 3 CT, select the three-phase, four-lines three component mode.

Instrument connection mode, set of the instrument (programming input network NET) should be the same load wiring as measured wiring. Otherwise, the measurement instrument will lead to incorrect voltage or power.

In three-phase 3 wire mode, measurement and shows the line voltage;
In three-phase 4 wire mode, measurement and shows the phase voltage and line voltage both.

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D. Auxiliary power

APM-4MJ with universal (AC / DC) power input, if not for a special statement, we provide the 90-240AC/DC power interface for standard products, please ensure that the auxiliary power can match with meter to prevent unexpected damage.

A. Suggest install 1A fuse in the fire line side.

B. For the areas with poor power quality, suggest install lightning surge suppressor and rapid burst suppressor to prevent lightning strikes.

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3.2. - Connection Terminal

Upper terminal

No.	Marked	Notes
58	**RS485**	RS485+
59		RS485-
47	**RP+**	Active energy pulse output +
48	**RP-**	Active energy pulse output -
4	**Ia***	Current A-phase - S1 input
5	**Ia**	Current A-phase - S2 input
6	**Ib***	Current B-phase - S1 input
7	**Ib**	Current B-phase - S2 input
8	**Ic***	Current C-phase - S1 input
9	**Ic**	Current C-phase - S2 input

Lower terminal

No.	Marked	Notes
14	**Un**	Neutral voltage input
13	**Uc**	Voltage C-phase input
12	**Ub**	Voltage B-phase input
11	**Ua**	Voltage A-phase input
1	**L**	AUX input 85-265Vac/dc
2	**N**	Connect extra 1A , 250V fuse @ L line

Note:

The terminal pin definition may change depends on customer order; please refer to the label on the meter!

3.3. - Typical Wiring
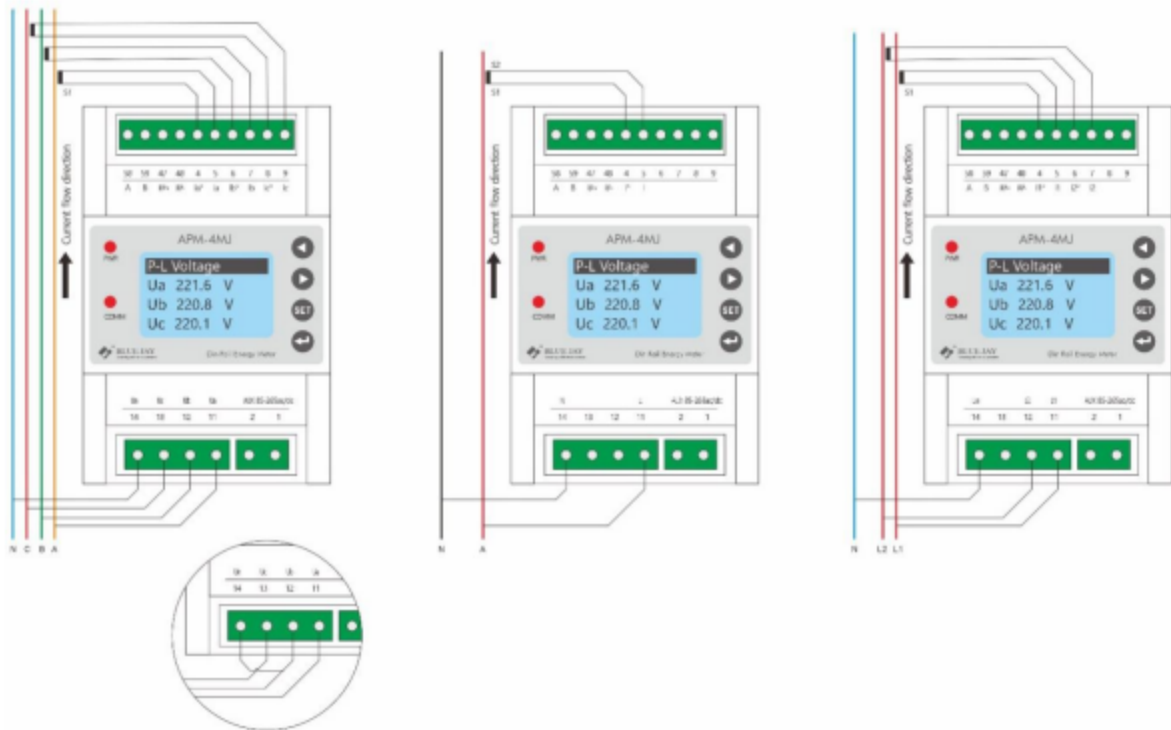
Notes:

This connection drawing is for reference only; the actual connecting terminal, please refer to the label on the rear part.

WARNINGS!

If power = -0.01 is shown for any of the phases and voltage and current are not zero for this phase, check out following points:

- Assure that A, B and C phases coincide in voltage and current.
- Correct polarity? Reverse the current transformer placed at this phase.

4. - OPERATION MODE

When the device is powered on, the entire symbol will be on, and the meter starts to self- test. After few seconds, the meter is ready for operation and shows firmware, then automatic jump to The first screen.

Button	In Monitor Screen	In Config Sub-menu	In Parameter Setup
◀	Screen will move to previous or next page	Move cursor up and down to select function	Move setting cursor to left
▶			Scroll selection number 0 ~ 9
SET	Call out password screen	Exit & roll back to up level menu.	
↵	Call out Sub-screen	Confirm the values & Entry or jump to down level menu	

Note: In Setup menu, if change the setting value, press (SET) for exit menu, device will call out confirm screen ask "SAVE".

Then press (SET) *exit without saving.*

press (↵)*save and exit.*

5. - SCREEN DISPLAY

5.1.- Overall screen:

Press the ▶ on any display interface, the corresponding data will be displayed in the measurement data display area.

Each time you press the ▶ it will flip one screen. When you reach the last screen, press the right button to return to the first screen. As shown below:
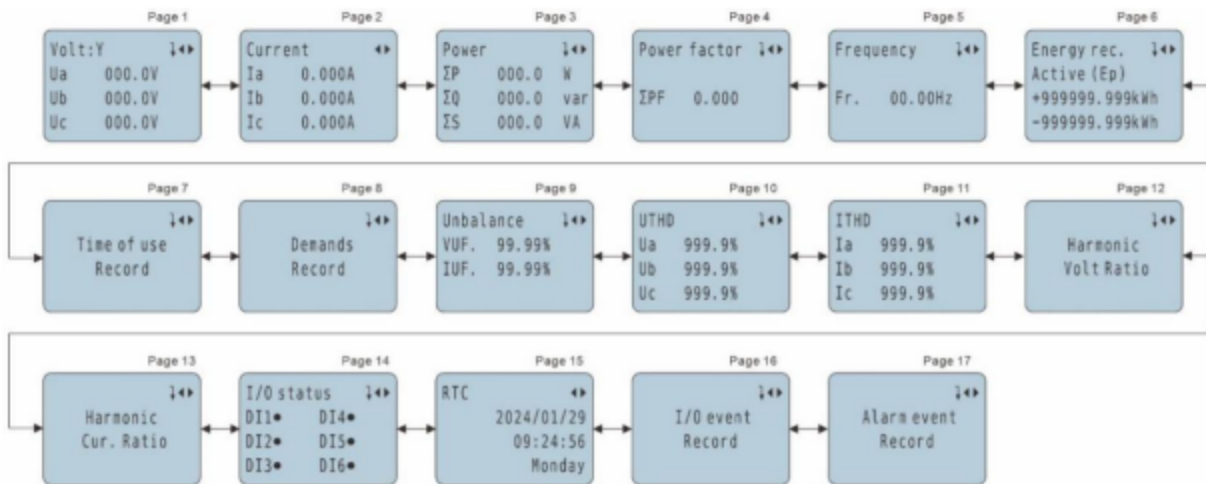
Note:

Pages marked with ↓ indicate that this page has a sub-menu.

5.1.1. - Screen detailed instructions

Page No.	Description	Page No.	Description
Page 1	System voltage	Page 10	Voltage total harmonic distortion
Page 2	Primary current	Page 11	Current total harmonic distortion
Page 3	Power information	Page 12	Harmonic voltage ratio
Page 4	Power factor	Page 13	Harmonic current ratio
Page 5	System frequency	Page 14	DI/DO status
Page 6	Energy record	Page 15	Real time clock
Page 7	Time of use (Multi-tariff) record	Page 16	DI/DO event record
Page 8	Demands record	Page 17	Alarm event record
Page 9	Current and voltage unbalance		

5.2.- Detail parameter screen:

5.2.1.- The detail information of basic electrical parameters

Volt:Y   ↓↔
Ua   000.0V
Ub   000.0V
Uc   000.0V

Volt:Δ   ↓
Uab   000.0V
Ubc   000.0V
Uca   000.0V

STD.   ↓
Ua 99.99%
Ub 99.99% From
Uc 99.99% 220V

Power   ↓↔
ΣP 000.0 W
ΣQ 000.0 var
Σs 000.0 VA

Power   ↓
Pa   0.000 W
Pb   0.000 W
Pc   0.000 W

Power   ↓
Qa   0.000 var
Qb   0.000 var
Qc   0.000 var

Power   ↓
Sa   0.000 VA
Sb   0.000 VA
Sc   0.000 VA

Energy rec.   ↓↔
Active (Ep)
+999999.999kWh
-999999.999kWh

Energy rec.   ↓
Reactive (Eq)
+999999.999kVarh
-999999.999kVarh

Energy rec.   ↓
Apparent (Es)
999999.999kVAh

Unbalance   ↓↔
VUF. 99.99%
IUF. 99.99%

Volt comp.   ↓
Uδ+   999.9V
Uδ-   999.9V
U0   999.9V

Current comp. ↓
Iδ+   999.9A
Iδ-   999.9A
I0   999.9A

System voltage

Phase to line voltage

Phase to phase voltage

Voltage standard deviation

Power information

Total active/ reactive /apparent power

Individual active/ reactive /apparent power

Energy record

Positive/ Negative active energy

Positive/ Negative reactive energy

Apparent energy

Unbalance

Voltage/current unbalance factor

Positive/negative/zero sequence voltage in primary side

Positive/negative/zero sequence current in primary side

5.2.2.- The detail information of THD and individual harmonic

UTHD   ↓↔
Ua 999.9%
Ub 999.9%
Uc 999.9%

UTOHD   ↓
Ua 999.9%
Ub 999.9%
Uc 999.9%

UTEHD   ↓
Ua 999.9%
Ub 999.9%
Uc 999.9%

UTHFF   ↓
Ua 999.99%
Ub 999.99%
Uc 999.99%

UCF   ↓
Ua 0.999
Ub 0.999
Uc 0.999

ITHD   ↓↔
Ia 999.9%
Ib 999.9%
Ic 999.9%

ITOHD   ↓
Ia 999.9%
Ib 999.9%
Ic 999.9%

ITEHD   ↓
Ia 999.9%
Ib 999.9%
Ic 999.9%

IKF   ↓
Ia 0.999
Ib 0.999
Ic 0.999

↓↔
Harmonic
Volt Ratio

(%)Ua Ub Uc ↓
02 999 999 999
03 999 999 999
04 999 999 999

(%)Ua Ub Uc ↓
62 999 999 999
63 999 999 999

↓↔
Harmonic
Cur. Ratio

(%)Ia Ib Ic ↓
02 999 999 999
03 999 999 999
04 999 999 999

(%)Ia Ib Ic ↓
62 999 999 999
63 999 999 999

Voltage total harmonic distortion

Total odd harmonic distortion

Total even harmonic distortion

Telephone harmonic

Crest factor

Current total harmonic distortion

Total odd harmonic distortion

Total even harmonic distortion

Telephone harmonic

K factor

Harmonic voltage ratio: 2-63th

Harmonic current ratio: 2-63th

5.2.3.- The detail information of max demands

```
         ↕◄►
  Demands
  Record
```
↓

```
              ↕◄              ↕◄              ↕◄
ΣP of Demands      ΣP of Demands      ΣP of Demands
   9999.9kW           9999.9kW           9999.9kW
         M-0               M-1               M-2
```

Total active power demands

M0: Present month

M1: Last month

M2: Month before last month

```
              ↕◄              ↕◄              ↕◄
ΣQ of Demands      ΣQ of Demands      ΣQ of Demands
   9999.9kVar        9999.9kVar        9999.9kVar
                         M-1               M-2
```

Total reactive power demands

M0: Present month

M1: Last month

M2: Month before last month

```
              ↕◄              ↕◄              ↕◄
ΣS of Demands      ΣS of Demands      ΣS of Demands
   9999.9kVA         9999.9kVA         9999.9kVA
         M-0               M-1               M-2
```

Total apparent power demands

M0: Present month

M1: Last month

M2: Month before last month

5.2.4.- The detail information of time of use (Multi-tariff)

Time of use Record				
SUM of eng. +999999.999kWh M-0 to M-2	SUM of eng. +999999.999kWh M-0	SUM of eng. +999999.999kWh M-1	SUM of eng. +999999.999kWh M-2	Total cumulative energy
T1 of eng. +999999.999kWh M-0 to M-2	T1 of eng. +999999.999kWh M-0	T1 of eng. +999999.999kWh M-1	T1 of eng. +999999.999kWh M-2	T1 cumulative energy record
T2 of eng. +999999.999kWh M-0 to M-2	T2 of eng. +999999.999kWh M-0	T2 of eng. +999999.999kWh M-1	T2 of eng. +999999.999kWh M-2	T2 cumulative energy record
T3 of eng. +999999.999kWh M-0 to M-2	T3 of eng. +999999.999kWh M-0	T3 of eng. +999999.999kWh M-1	T3 of eng. +999999.999kWh M-2	T3 cumulative energy record
T4 of eng. +999999.999kWh M-0 to M-2	T4 of eng. +999999.999kWh M-0	T4 of eng. +999999.999kWh M-1	T4 of eng. +999999.999kWh M-2	T4 cumulative energy record

Note:

All above pictures display all function information. If this meter does not have the certain function, it can be ignored.
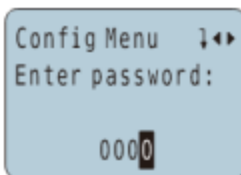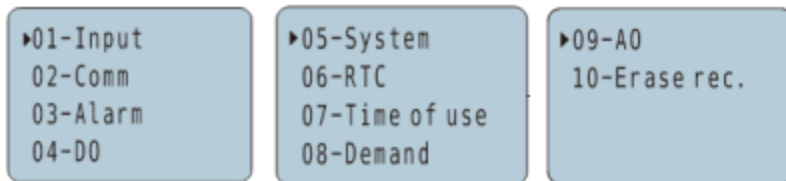
6. - SETUP PROCEDURE

The SETUP procedure of the APM-4MJ is performed by means of several SETUP options. There is a password to protect unexpectedly to enter the setup menu. Once into the setup menu, use the keyboard to select different options and enter required variables:

6.1. - Enter setup menu

Press (SET) button in any of the monitor screen can call out the password page. Enter the default password 0001 can enter the configuration menu.

```
Config Menu   ↕◄►
Enter password:

      0000
```

There are 10 sub-menus for meter configuration:

```
▶01-Input
 02-Comm
 03-Alarm
 04-DO
```
```
▶05-System
 06-RTC
 07-Time of use
 08-Demand
```
```
▶09-AO
 10-Erase rec.
```

Input	Basic settings of signal access	RTC	Real-time clock setting
Comm	Communication port setting	TOU	Time of use record setting
Alarm	Alarm trig threshold setting	Demand	Demands record setting
DO	Digital relay output port setting	AO	Analog output port setting
System	System settings	Erase rec.	Erase record setting

Note：

If the meter does not have the certain function, it can be ignored.

6.2. - The detail of meter configuration

►01-Input 02-Comm 03-Alarm 04-DO	Line **3P4L** R.Curr. 5.000 Type A PT 0001
	CT **0001** Std.V 0220V Std.F 50.00Hz
01-Input ►02-Comm 03-Alarm 04-DO	ID 00**1** Baud 9600 Mode n.8.1
01-Input 02-Comm ►03-Alarm 04-DO	**Alarm-1** Alarm-2 Alarm-3 Alarm-4
	Alarm-5
	Mode **OFF** Delay 0.001s Para. Ua Trip 5500
	Hys. 005**0**
01-Input 02-Comm 03-Alarm ►04-DO	**DO-1** DO-2
	Mode **Remote** Delay 001.0s
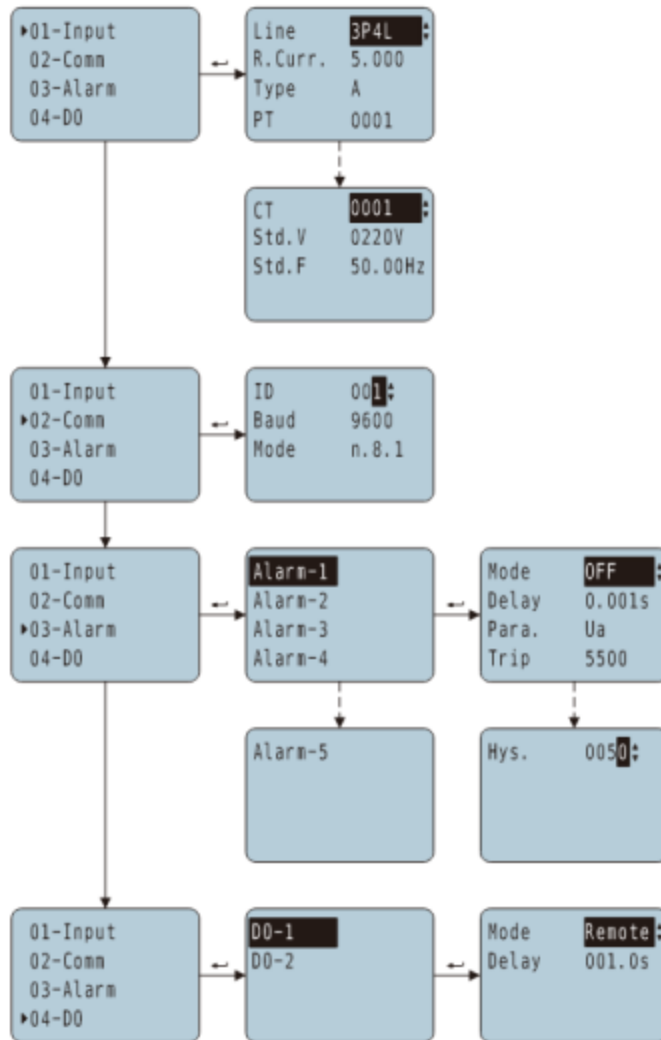
Input signal setup

Power grid mode: default **3P4L** [1] *
Secondary current
Current Type: **A/ mV**
Voltage transformer ratio
Current transformer ratio [2] *
Voltage standard deviation
Frequency standard deviation
Communication setup

Modbus address: **1-247**
Comm. baud ratio
Comm. data format
Alarm trig threshold setting

Alarm mode
Delay timer of the trig
Parameter be trigged
Trip value
Hysteresis value: default 0050
Digital output setup

DO working mode: remote, auto trig, turned off
Delay timer of the trig

Notes:

1. Wiring method default: 3P4L, optional: 2P3L, 3P3L3CT, 3P3L2CT, 1P2L1CT, and **1P2L3CT** will be specially specified when ordering, and this setting is invalid when the hardware does not support it. Three-channels single-phase meter may use 5A, 100mA, 333mV signal.

2. When the current signal is lower than 333mV, the CT value defaults to the primary side parameter.
The pulse output value defaults to 5000/kWh.

3. Blue Jay calibrates meter under 380V range, and high-quality linearity performance ensures that the meter can accurately measure in the lower voltage range. That can be compatible with 120V, 220V, 230V, 240V, 277V system.

If need to use in different voltage scale or different types CT, please contact our sales team for

more details.

System parameter setup

```
▸05-System        Pwd.   0001↕
 06-RTC           Rotate Manual
 07-Time of use   Backl. 5 Min
 08-Demand        CR.    L5
```
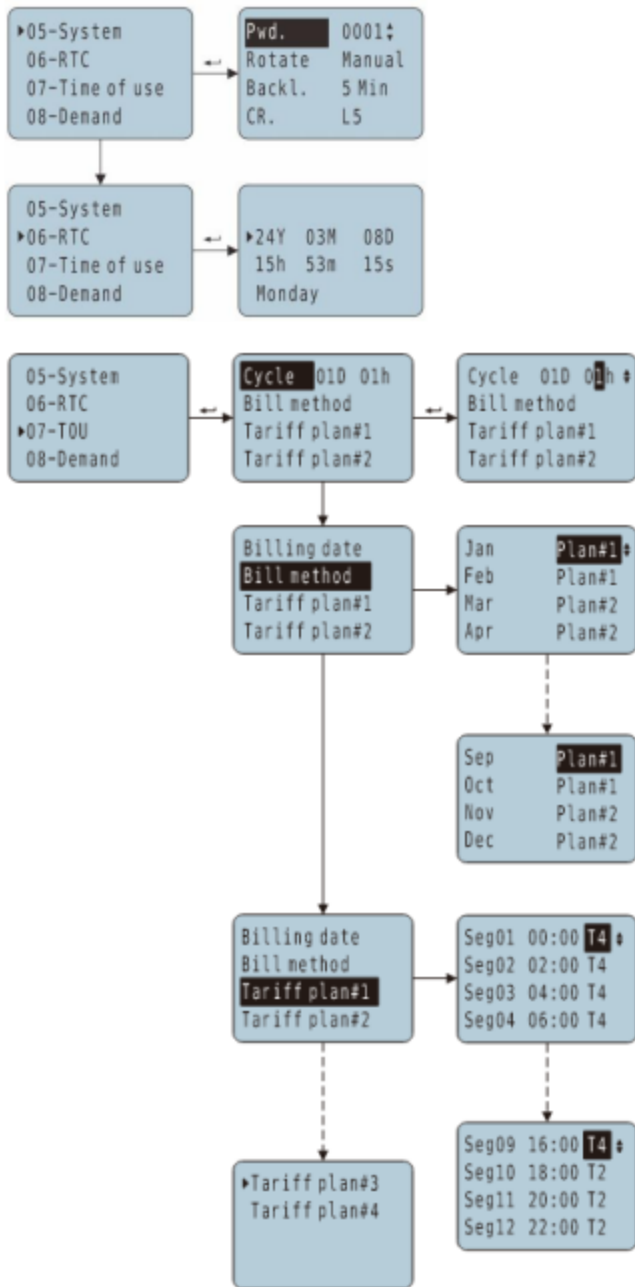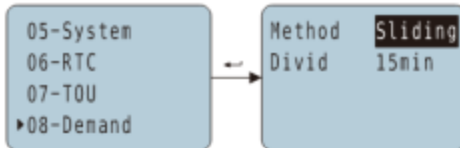
Password
Page scroll method
Duration of LCD backlight
Color contrast

```
 05-System       ▸24Y  03M   08D
▸06-RTC           15h  53m   15s
 07-Time of use   Monday
 08-Demand
```

Real-time clock set up

```
 05-System        Cycle 01D 01h     Cycle  01D 01h↕
 06-RTC           Bill method       Bill method
▸07-TOU           Tariff plan#1     Tariff plan#1
 08-Demand        Tariff plan#2     Tariff plan#2
```

TOU billing mode settings

4 Tariff plans, 12 segments

```
 Billing date     Jan    Plan#1↕
 Bill method      Feb    Plan#1
 Tariff plan#1    Mar    Plan#2
 Tariff plan#2    Apr    Plan#2
```

```
                  Sep    Plan#1
                  Oct    Plan#1
                  Nov    Plan#2
                  Dec    Plan#2
```

```
 Billing date     Seg01 00:00 T4↕
 Bill method      Seg02 02:00 T4
 Tariff plan#1    Seg03 04:00 T4
 Tariff plan#2    Seg04 06:00 T4
```

```
▸Tariff plan#3    Seg09 16:00 T4↕
 Tariff plan#4    Seg10 18:00 T2
                  Seg11 20:00 T2
                  Seg12 22:00 T2
```

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```
05-System     Method  Sliding
06-RTC        Divid   15min
07-TOU    ↵
▸08-Demand
```

Demands record setting

Calculate method: sliding window/ block
Divide time: 15 minutes

```
▸09-AO        AO-1          Output  4-20
 10-Erase rec.↵ AO-2    ↵   Para.   Ua
                            Scale-0 +0000
                            Scale-F +5000
```
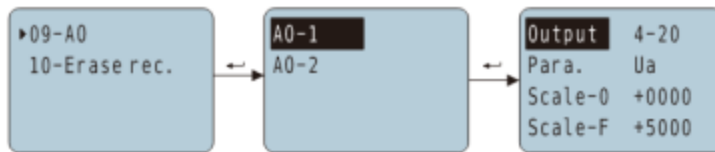
Analog output setup

Analog output signal range
Analog output signal parameter
Zero-scale value
Full-scale value

```
 09-AO         Energy  Stor.
▸10-Erase rec.↵ Event   Stor.
                Demand  Stor.
```
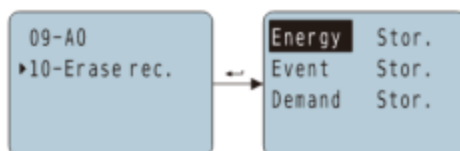
Erase record setting

Erase energy records
Erase event records
Erase demand records

(Note: optional storage or erase, need to save after setting.)

7. - PULSE OUTPUT

APM-4MJ provides 1* pulse output for the positive active energy.

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

1). Electrical specification: voltage VCC ≤ 48V, Iz ≤ 50mA.

2). Pulse: 5000 imp / kWh, pulse up to 80ms.
   This means: When the device detects 1 kWh, the port will generate 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 ×PT ratio× CT ratio".

| Voltage (V)	Current (A)	Pulse constant (imp / kWh)
380 or 220	5	5000
	1	20000
100	5	20000
	1	80000

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 / 20000 × 100 × 80

8. - COMMUNICATION INTERFACE

8.1. - Connection for RS485 BUS

The composition of the RS-485 cabling must be carried out with a meshed Page cable (minimum 3 wire), diameter of not less than 0.5mm^2, with a maximum distance of 1,200 m between the APM-4MJ and the master unit. This Bus may connect a maximum of 32pcs APM-4MJ...
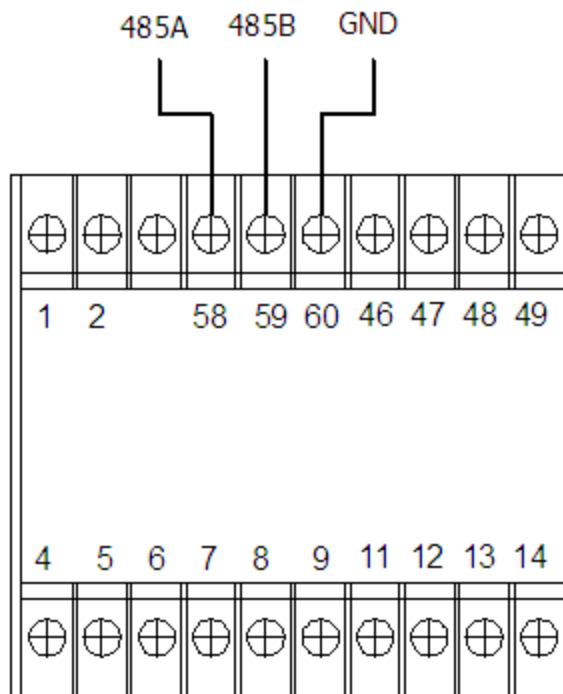
Notes:

-. For communication with the master unit, user can choose RS-485 to RS-232 converter or RS485 to USB adapter to use.

-. For expand the number of devices in the communication network, a signal repeater can be used.

-. Full range of APM-4MJ... meter RS485 PIN number is 58,59,60.

-. Due to product modifications or special requirements, the interface pin place may be change. For details, please refer to product label on the rear side.

8.2. - MODBUS © protocol

Modbus RTU Frame Format:

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

MODBUS FUNCTIONS:

Code	Meaning	Description
FUNCTION 01	Read Coil Status	*Only valid when equipped DO port*
FUNCTION 02	Read Input Status	*Only valid when equipped DI port*
FUNCTION 03	Reading of n Words	*This function permits to read all the electrical parameters of the device.*
FUNCTION 05	Force Single coil	*When DO in remote control mode can work*
FUNCTION 06	Preset Single holding register	*There is an upper limit for writing, please be sure to check the upper limit of the host computer to avoid exhausting the life of the storage machine.*

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

8.3. - Register map

8.3.1 - Basic power data-primary side

Register	Data	Byte mode		Instruction
0x00	Ua	float	2	Phase to line voltage, Unit: V
0x02	Ub	float	2	
0x04	Uc	float	2	
0x06	Uab	float	2	Phase to phase voltage, Unit: V
0x08	Ubc	float	2	
0x0a	Uca	float	2	
0x0c	Ia	float	2	Three phase current, Unit: A
0x0e	Ib	float	2	
0x10	Ic	float	2	
0x12	Pa	float	2	Individual phase active power, Unit: kW
0x14	Pb	float	2	
0x16	Pc	float	2	
0x18	P∑	float	2	Total active power, Unit: kW
0x1a	Qa	float	2	Individual phase reactive power, Unit: kVar
0x1c	Qb	float	2	
0x1e	Qc	float	2	
0x20	Q∑	float	2	Total reactive power, Unit: kVar
0x22	Sa	float	2	Individual phase apparent power, Unit: kVA
0x24	Sb	float	2	
0x26	Sc	float	2	
0x28	S∑	float	2	Total apparent power, Unit: kVA
0x2a	PFa	float	2	Individual phase power factor, 0~1.000
0x2c	PFb	float	2	
0x2e	PFc	float	2	
0x30	PF∑	float	2	Total power factor, 0~1.000
0x32	FR	float	2	Frequency, Unit:0.01Hz
0x34	Ep+	float	2	Positive active energy, Unit: kWh
0x36	Ep-	float	2	Negative active energy, Unit: kWh
0x38	Eq+	float	2	Inductive reactive power, Unit: kVarh
0x3a	Eq-	float	2	Capacitive reactive power

8.3.2 - Basic power data-secondary side

Register	Data	Byte mode		Instruction
0x100	Ua	int	1	Phase to line voltage, Unit: 0.1V
0x101	Ub	int	1	
0x102	Uc	int	1	
0x103	Uab	int	1	Phase to phase voltage, Unit: 0.1V
0x104	Ubc	int	1	
0x105	Uca	int	1	
0x106	Ia	int	1	Three phase current, Unit: 0.001A
0x107	Ib	int	1	
0x108	Ic	int	1	
0x109	Pa	int	1	Individual phase active power, Unit: W
0x10a	Pb	int	1	
0x10b	Pc	int	1	
0x10c	P∑	int	1	Total active power, Unit: W
0x10d	Qa	int	1	Individual phase reactive power, Unit: Var
0x10e	Qb	int	1	
0x10f	Qc	int	1	
0x110	Q∑	int	1	Total reactive power, Unit: Var
0x111	Sa	int	1	Individual phase apparent power, Unit: kVA
0x112	Sb	int	1	
0x113	Sc	int	1	
0x114	S∑	int	1	Total apparent power, Unit: VA
0x115	PFa	int	1	Individual phase power factor, 0~1.000
0x116	PFb	int	1	
0x117	PFc	int	1	
0x118	PF∑	int	1	Total power factor, 0~1.000
0x119	FR	int	1	Frequency, Unit:0.01Hz
0x11a	Ep+	int	2	Positive active energy, Unit: Wh
0x11c	Ep-	int	2	Negative active energy, Unit: Wh
0x11e	Eq+	int	2	Inductive reactive power, Unit: Varh
0x120	Eq-	int	2	Capacitive reactive power
0x200	DO	int	1	Bit 0~1 show channel 1and channel 2 status 0 for open, 1 for closed
0x201	DI	int	1	Bit 0~3 show channel 1 to channel 4 status 0 for open, 1 for closed

8.3.3 - Advanced electrical parameter - primary side

Register	Data	Byte mode		Instruction
0x320	$V_\delta+$	float	2	Positive sequence voltage in primary side
0x322	$V_\delta-$	float	2	Negative sequence voltage in primary side
0x324	V_0	float	2	Zero sequence voltage in primary side
0x326	$I_\delta+$	float	2	Positive sequence current in primary side
0x328	$I_\delta-$	float	2	Negative sequence current in primary side
0x32A	I_0	float	2	Zero sequence current in primary side
0x32C	eU	float	2	Voltage unbalance, eU = $(V_\delta- / V_\delta+)$%
0x32E	eI	float	2	Current unbalance, eI = $(I_\delta- / I_\delta+)$%
0x330	Va_d	float	2	A phase voltage deviation
0x332	Vb_d	float	2	B phase voltage deviation
0x334	Vc_d	float	2	C phase voltage deviation
0x336	F_d	float	2	Frequency deviation

8.3.4- THD and individual harmonic (Max 31 times)

Register	Data	Byte mode		Instruction
0x500	THDUa	int	1	A-phase voltage THD, unit 0.1%
0x501	THDUb	int	1	B-phase voltage THD
0x502	THDUc	int	1	C-phase voltage THD
0x503	THDia	int	1	A-phase current THD, unit 0.1%
0x504	THDib	int	1	B-phase current THD
0x505	THDic	int	1	C-phase current THD
0x508-0x545	HUa	int	32	Each phase voltage individual harmonic 2~31th, unit 0.1%
0x548-0x586	HUb	int	32	
0x588-0x5C5	HUc	int	32	
0x5C8-0x605	HIa	int	32	Each phase current individual harmonic 2~31th, unit 0.1%
0x608-0x645	HIb	int	32	
0x648-0x685	HIc	int	32	
0x688	TOHDUa	int	1	Each phase voltage total odd harmonic distortion, Unit 0.1%
0x689	TOHDUb	int	1	
0x68a	TOHDUc	int	1	
0x68b	TEHDUa	int	1	Each phase voltage total even harmonic distortion, unit 0.1%
0x68c	TEHDUb	int	1	
0x68d	TEHDUc	int	1	
0x68e	THFFUa	int	1	Each phase voltage telephone harmonic form factor, unit 0.1%
0x68f	THFFUb	int	1	
0x690	THFFUc	int	1	
0x691	CFUa	int	1	Three phase voltage crest factor, unit 0.001
0x692	CFUb	int	1	
0x693	CFUc	int	1	
0x694	TOHDIa	int	1	Each phase current total odd harmonic distortion, unit 0.1%
0x695	TOHDIb	int	1	
0x696	TOHDIc	int	1	
0x697	TEHDIa	int	1	Each phase current total even harmonic distortion, unit 0.1%
0x698	TEHDIb	int	1	
0x699	TEHDIc	int	1	
0x69a	KFIa	int	1	Three phase current k factor, unit 0.01
0x69b	KFIb	int	1	
0x69c	KFIc	int	1	

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8.3.4 - Write operation function definition: Preset single holding register

Register	Data	Byte mode		Instruction
0x900	Line	int	1	Wiring method: 0: 3-phase 4-wire 1: 3-phase 3-wire 2CT 2: 3-phase 3-wire 3CT
0x901	U.SCL	int	1	Voltage range 0:100V 1:380V
0x902	I.SCL	int	1	Current range 0:1A 1:5A
0x903	PT	int	1	Voltage ratio
0x904	CT	int	1	Current ratio
0x905	Communication address	int	1	Range: 1-247
0x906	Communication baud rate	int	1	0:1200 1:2400 2:4800 3:9600 4:19200
0x907	Communication data format	int	1	0:n.8.1 1:o.8.1 2:e.8.1 3:n.8.2

Notes:

1. Not all of the data above can be read by RS485, the reading address will be unsuccessful.

2. The data can be read out depends on your multi-function meter model, please refer to the corresponding product manual before build your software.

3. Some software has different definitions of the start bit of register address, there will be offset, please add 1 for the right address. To get more info, please contact technical support **tech@cqbluejay.com**

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8.4. - Example

Host inquiry slave device

Addr.	Func.	Data Address (high)	Data Address (low)	Data Number (high)	Data number (low)	CRC16 (low)	CRC16 (high)
0CH	03H	00H	00H	00H	06H	C4H	D5H

PC user ask upload UA, UB, UC, IA, IB, IC

Slave device answer

Addr.	Func.	Byte count	Data1 high	Data1 low	Data2 high	Data2 low	Data3 high	Data3 low
0CH	03H	0CH	03H	E8H	03H	E9H	03H	E8H

Data4 high	Data4 low	Data5 high	Data5 low	Data6 high	Data6 low	CRC16 low	CRC16 high	
13H	84H	13H	88H	13H	8AH	A6H	D6H	

Show the data:

UA=3E8H (100.0)
UB=3E9H (100.1)
UC=3E7H (99.9)
IA=1384H (4.996)
IB=1388H (5.000)
IC=138AH (5.002)

Notes:

1. Blue Jay disable the 06 function in default setting, if Activated the write command, please check the host device program to avoid the meaningless write operation, that may reduce the reduce the register working life.

2. When the write is unsuccessful, no return data from the slave device. In this addition, please re-send write inquiry again.

9. - SAFETY CONSIDERATIONS

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

Please 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.

◆ The device must have a professional installation and maintenance.
◆ Any operation of the device, you must cut off the input signal and power.

10. - MAINTENANCE

The APM-4MJ meter does not require any special maintenance. No adjustment, maintenance or repairing action should be done when the instrument is 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.

11. - TECHNICAL SERVICE

FAQ's

1.- Once cabled and connected is seen to give a correct voltage and current reading, but shows negative values for active power (generation).

This is an error with the cabling for the current transformer secondary; the direction of the transformer current has to be respected as shown in the connection diagram. The current transformers have a two face primary; the current must pass from P1 to P2 giving the result in secondary (S1 and S2) of 5 amps.

The error stems from:

a). The current transformers have been incorrectly installed. As a result, it gives the direction of the current as passing from P2 to P1; to resolve this problem, the current transformer does not have to be dismantled and installed again, but the transformer secondary (S1 and S2) just has to be inverted.

b). The connection of the current secondary in the current transformers have been incorrectly connected; to resolve this problem just connect the S1 transformer secondary to the S1 on the meter and the S2 on the current transformer to the S2 on the meter.

2.- Once cabled and connected, is seen to give an incoherent Power factor and CosΦ reading (-0.01 or similar).

This is again a current transformer and voltage phase connection error phase A, must correspond to the current transformer installed in phase A; phase B, must correspond to the current transformer installed in phase B; and phase C, must correspond to the current transformer installed in phase C.

This connection terminal is clearly shown on the area side of the device.

3.- The measuring voltage and is displaying the secondary voltage (for example 110 volts).
Ensure that the voltage Transformer ratio has been correctly set (Please refer to voltage PT ratio setting section in chapter **SETUP PROCEDUCE**).

4.- Device does not correctly display the current reading. It shows values varying between 0 to 5 amps of current.
Ensure that the Current Transformer ratio has been correctly set; (Please refer to current CT ratio setting section in chapter **SETUP PROCEDUCE**).

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Calculation formula of electrical parameter

Formula	Parameter
$U = \sqrt{\dfrac{1}{N}\sum_{n=0}^{N} u_n^2}$ $\quad n = 0,1,2\ldots\ldots N$	Voltage RMS value
$I = \sqrt{\dfrac{1}{N}\sum_{n=0}^{N} i_n^2}$ $\quad n = 0,1,2\ldots\ldots N$	Current RMS value
$P = \dfrac{1}{N}\sum_{n=1}^{N}(i_{an}u_{an} + i_{bn}u_{bn} + i_{cn}u_{cn})$	Total active power cycle average
$P_s = UI$	Single-phase apparent power cycle average
$\cos\theta = \dfrac{P_p}{P_s}$	Power factor
$P_q = \sqrt{P_s^2 - P_p^2}$	Reactive power (Pq is positive and the direction cannot be determined; P algorithm can be used to shift the voltage component by 90º)
$W = \int P * dt$	Electric energy

Note: In above formula, N for sampling points in one AC wave, In standard APM-4MJ, the N=128

For any inquiry about the instrument performance or any failure, contact to Blue Jay's technical service.

Blue Jay - After-sales service

E-mail: tech@cqbluejay.com