APM-96J
Multi-Function Power Meter

User Manual



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Read me

When you use APM-96J 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-96J 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**

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1.- SUMMARIZE

APM-96J 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 0.2 level, which can be achieved On-site display and remote RS-485/ Modbus-RTU communication and optional Profibus-DP protocol or optional Ethernet interface/ Modbus-TCP & Modbus-RTU protocol.

It can measure all power parameters in the power grid:

Current, Voltage, Frequency, Active power, Reactive power, Voltage/ current unbalance	Apparent power, Energy (Active/Reactive), Power factor, Voltage/ current angle, Current harmonics 2~63 times, Voltage harmonics 2~63 times, Voltage/ frequency deviation,	Voltage and current THD%, Harmonics factor, Voltage crest factor, Current K-factor, Multi- tariffs ratio, Demand record, SOE record,

APM-96J offers optional expansions modules including 2-8 channel digital input (DI), 2-6 channel digital output (DO), and 1-4 channel analog output (AO).

APPLICATIONS

-. Measure all power parameters;

-. Monitor and control, energy measurement and electrical fire;

-. Replace the three-phase power meter, three phase electricity transmitter;

-. Transformers, generators, capacitors and electric motors distributed detection;

-. Medium and low voltage systems;

-. SCADA, EMS, DCS integrators.

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	●	●	●	●
Voltage/ current unbalance	%	●	●	●	●
THD & Harmonic (2~63rd)	THD	●	●	●	●

●: Display and communications
o: Optional functions
/ : No such function

Note:

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

APM-96J delivers the visualization of parameters listed above by means of monochrome dot matrix LCD 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

-. Low-size (96 x 96 mm), panel mounting meter.
-. True R.M.S. measuring system.
-. 0.2% High-precision measurement
-. Instantaneous, maximum and minimum values of each measured parameter.
-. 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 61557-12:2016
Active energy	IEC 62053-21:2018
Reactive energy	IEC 62053-24:2018

- Input

Voltage	AC100V, 220V, 380V (please specify when ordering)
Current	AC1A/5A (please specify when ordering)
Frequency	40~65Hz
Current overload	Measurement: 1.2 times Instantaneous: 10 times/1s
Voltage overload	Measurement: 1.2 times Instantaneous: 2 times/10s

- Output

Digital interface	RS-485, MODBUS-RTU or DLT645-2007
Pulse output	Optional 1-2 channel
SOE record	50 lists, (10 lists DI/DO SOE; 40 lists Alarm SOE)
Alarm threshold	Default 5 channels
DI (optional)	1-6 channels, Dry contact, Ri<500Ω turns on, Ri>100kΩ turns off
DO (optional)	1-4 channels, Relay capacity: 5A@250V AC; 5A@30VDC
AO (optional)	Current 4~20mA, load <390Ω Voltage 0~10V, load >100kΩ

- Load

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

- Safety

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

- Accuracy

Parameter	Accuracy	A phase	B phase	C phase	All
Voltage	0.2	V1	V2	V3	
Current	0.2	A1	A2	A3	
Active power	0.5s	W1	W2	W3	W
Reactive power	0.5s	var1	var2	var3	var
Apparent power	0.5s	VA1	VA2	VA3	VA
Power factor	0.5s	PF1	PF2	PF3	PF
Active energy	0.5s				Wh
Reactive energy	1.0				varh
Frequency	0.02				Hz

Others

Deviation	Voltage: 0.2%; Frequency: 0.02%
Unbalance	Voltage: 0.2%; Current: 0.2%
Harmonic content	When Uh>2%: 5%Uh; when Uh<=2%: 0.1%UN
Demand record	Maximum monthly demand in the past three months
Multi- tariffs ratio	4 sets rates, 12 segments

- Environment

Working temperature: -10°C ~ +55°C; 93%RH (Non-condensation)
Storage temperature: -30°C ~ +70°C; 93%RH (Non-condensation)

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.

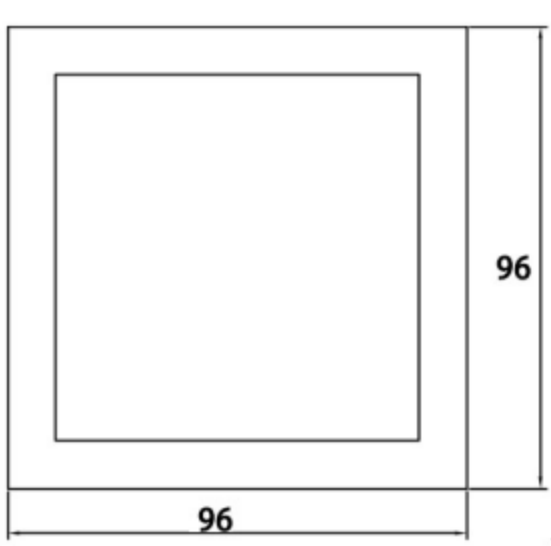
3.1. - Installation

Mounting

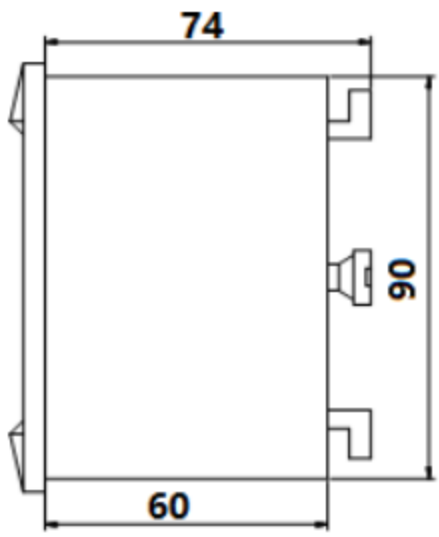
Instrument is to be mounted on panel (cut-out *91 x 91mm*). Keep all connections into the cabinet.

Please note that as the instrument be 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: **Unit: mm**



Front view



Side view

Notes:

Input signal: APM-96J 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-96J.
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.

D. Auxiliary power

APM-96J 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.

3.2.- Connection Terminal

Upper-15pin: (Power supply and function output)

No.	Marked	Notes
1	**L**	AUX input 85-265Vac/dc
2	**N**	
58	**RS485**	RS485+
59		RS485-
47	**Pulse output**	Pulse output+
48		Pulse output-
70 71 72 73 74	**4 DI**	4 channel digital input
19 20 21 22	**2 DO**	2 channels digital output

Upper-11pin: (Power supply and optional AO)

No.	Marked	Notes
1	**L**	AUX input 85-265Vac/dc
2	**N**	
58	**RS485**	RS485+
59		RS485-
47	**Pulse output**	Pulse output+
48		Pulse output-
/	/	/
15 16 15 17	**3 AO**	3 channels Analog output

Upper-15pin: (Power supply, 2* communications and optional AO)

No.	Marked	Notes
1	**L**	AUX input 85-265Vac/dc
2	**N**	
47	**EP+/ Ep-**	Active energy pulse output+
48		Active energy pulse output-
49	**EQ+/ EQ-**	Reactive energy pulse output+
50		Reactive energy pulse output-
58	**RS485-1**	Channel 1 RS485+
59		Channel 1 RS485-
61	**RS485-2**	Channel 2 RS485+
62		Channel 2 RS485-
15-18	**AO 1-3**	3 channels analog output

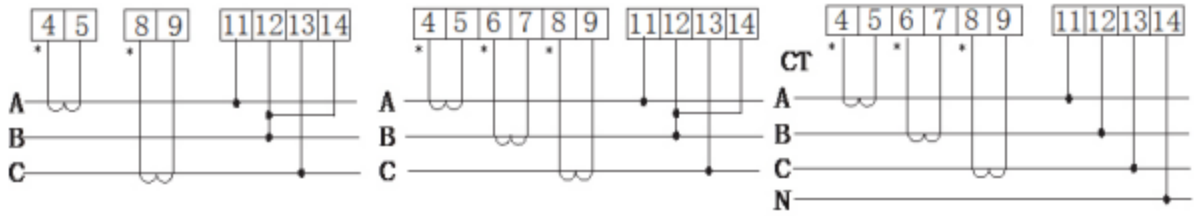
Lower-10pin: Signal

No.	Marked	Notes
11 12 13 14	**Ua** **Ub** **Uc** **Un**	Voltage A-phase input Voltage B-phase input Voltage C-phase input Neutral Voltage input
8 9	**C-phase Current**	Current C-phase - S1 input
		Current C-phase - S2 input
6 7	**B-phase Current**	Current B-phase - S1 input
		Current B-phase - S2 input
4 5	**A-phase Current**	Current A-phase - S1 input
		Current A-phase - S2 input

Note:

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

3.3.- Typical Wiring



3P3L (2CT) 3P3L (3CT) 3P4L

Note:

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
	Call out password screen	Exit & roll back to up level menu.	
	Call out sub-screen or version screen	Confirm the values & Entry or jump to down level menu	

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

Then press  *exit without saving;*

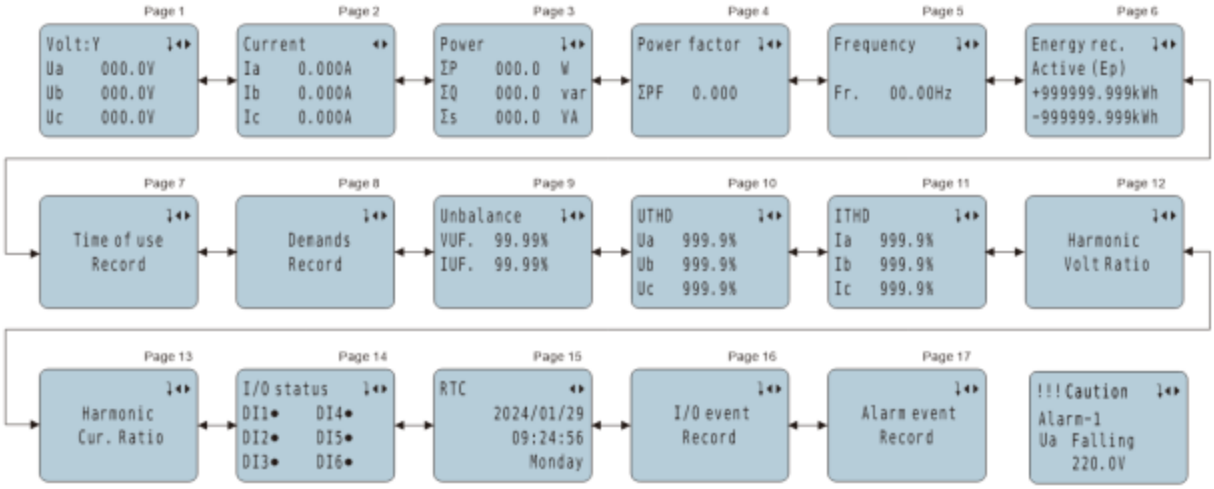
press  *save and exit.*

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:



Notes:

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

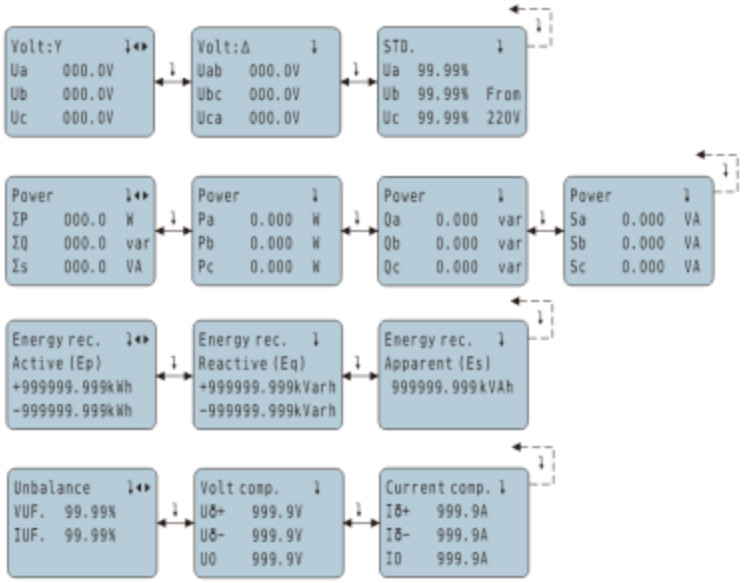
The above picture displays all function information. If this meter does not have a certain function, it can be ignored.

5.1.1.- Screen detailed instructions

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

5.2.- Detail parameter screen:

5.2.1.- The Detail Information of Basic Electrical Parameters



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

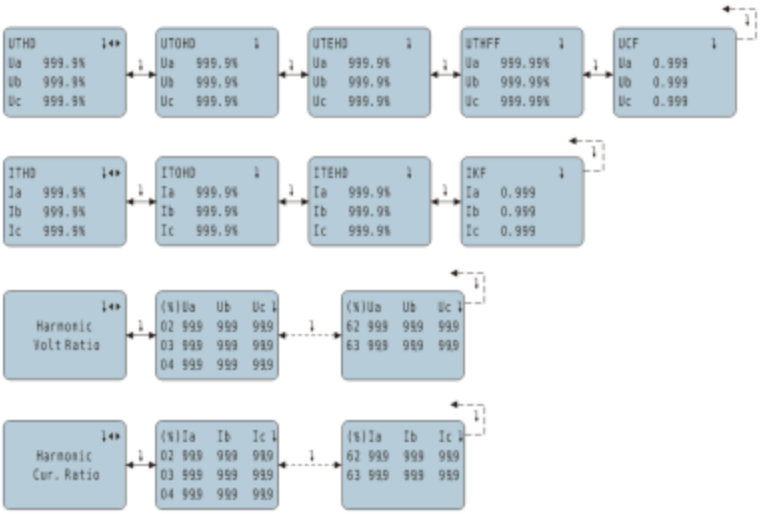
Energy record

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



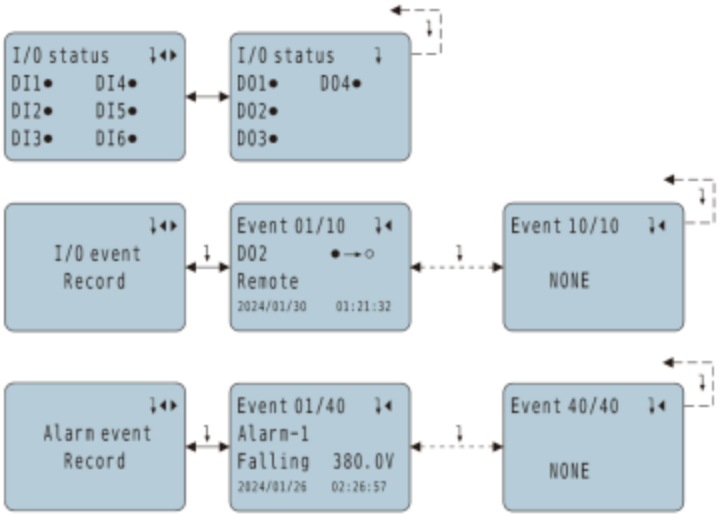
Voltage total harmonic distortion
Total odd harmonic distortion
Total even harmonic distortion
Telephone harmonic
Crest factor

Current total harmonic distortion
Total odd harmonic distortion
Total even harmonic distortion
Telephone harmonic
K factor

Harmonic voltage ratio: 2-63rd

Harmonic current ratio: 2-63rd

5.2.3.- The Detail Information of DI/DO Status

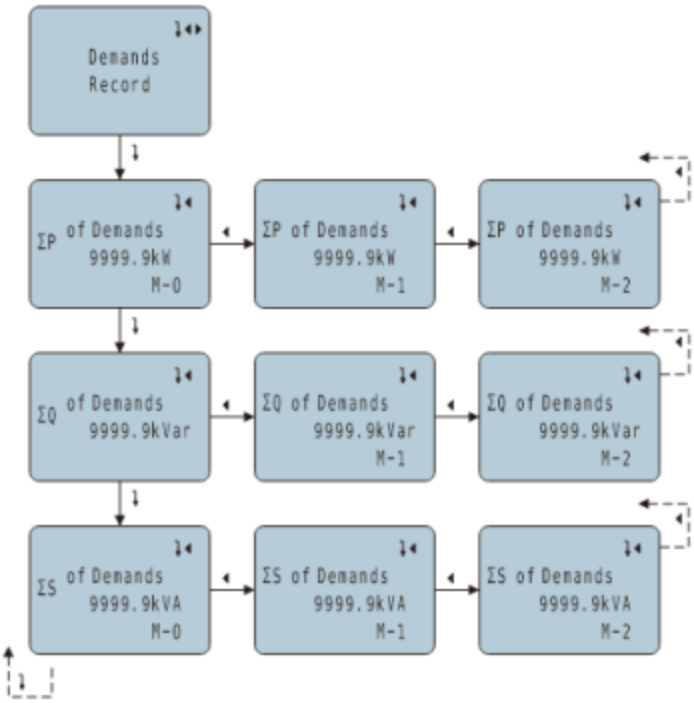


DI1-DI6 Status
DO1-DO4 Status

DI/DO events record:1-10

Alarm events record:1-40

5.2.4.- The Detail Information of Max Demands



Total active power demands

M0: Present month
M1: Last month
M2: Month before last month

Total reactive power demands

M0: Present month
M1: Last month
M2: Month before last month

Total apparent power demands

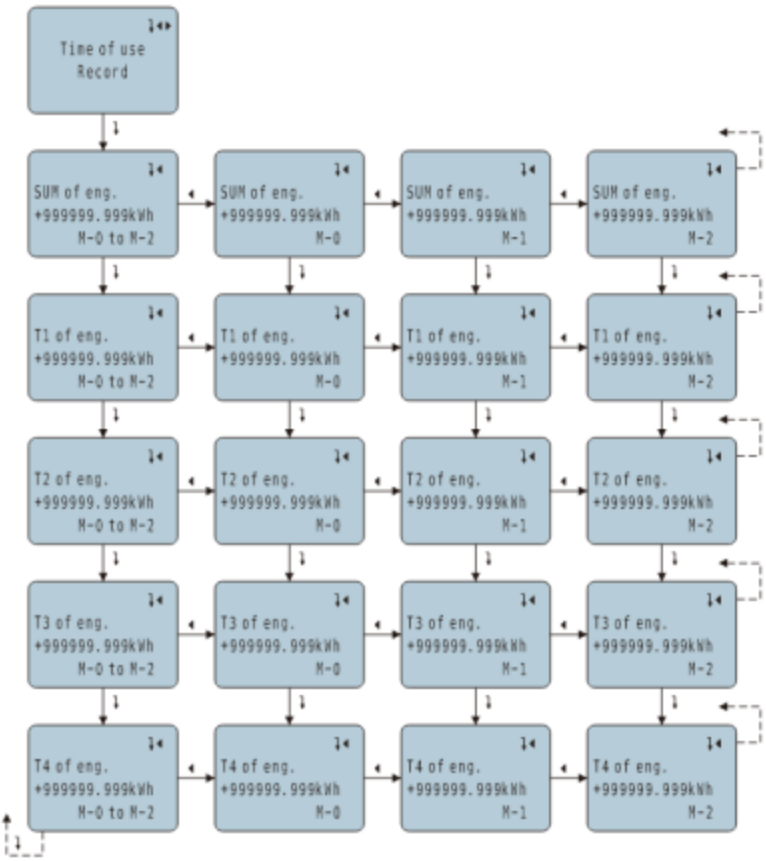
M0: Present month
M1: Last month
M2: Month before last month

Note:

To further clarify, take an example:

Assuming this month is March 2025,
M0 (this month): refers to March 2025;
M1 (last month): refers to February 2025;
M2 (the month before last month): refers to data from January 2025.

5.2.5.- The Detail Information of Time of Use (Multi-tariff)



Total cumulative energy

T1 cumulative energy record

T2 cumulative energy record

T3 cumulative energy record

T4 cumulative energy record

6.- SETUP PROCEDURE

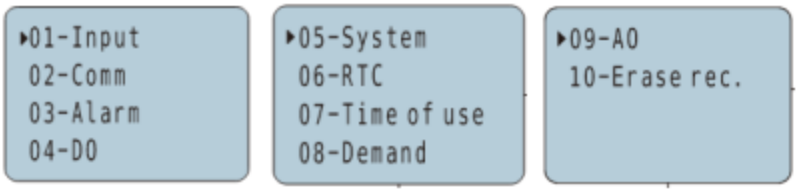
The SETUP procedure of the APM-96J is performed by means of several SETUP options. There is a password to protect unexpectedly to enter the setup menu. Once in the setup menu, use the keyboard to select different options and enter required variables:

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.



There are 10 sub-menus for meter configuration:

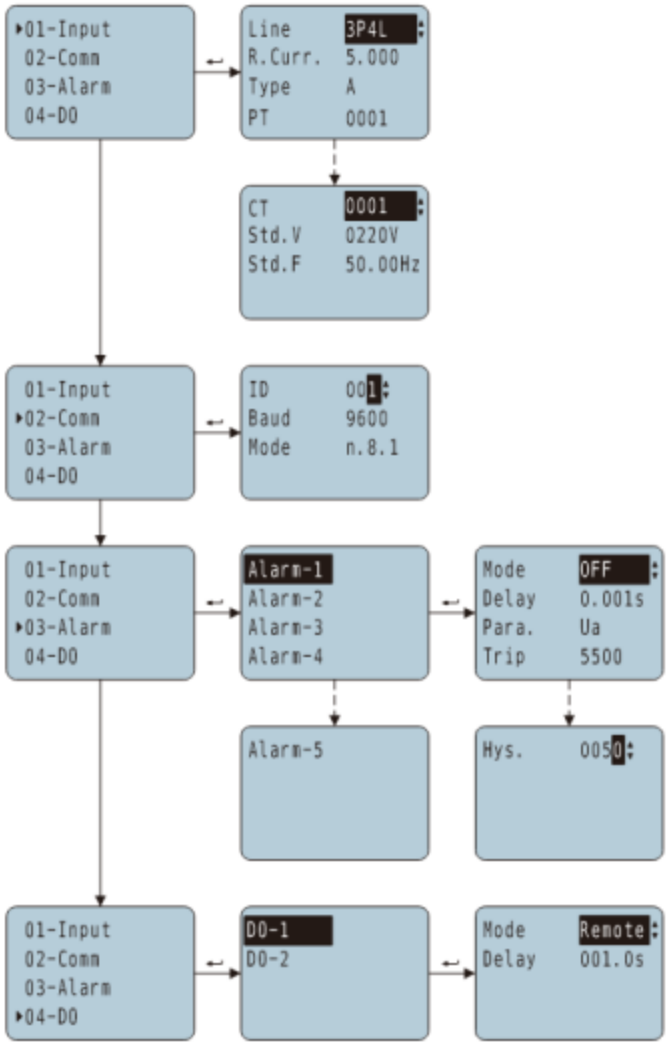


Input	Basic settings of signal access	**RTC**	Real-time clock setting
Comm	Communication port setting	**TOU**	Time of use record setting
Alarm	Alarm trig threshold setting	**Demand**	Demands record setting
DO	Digital relay output port setting	**AO**	Analog output port setting
System	System settings	**Erase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



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

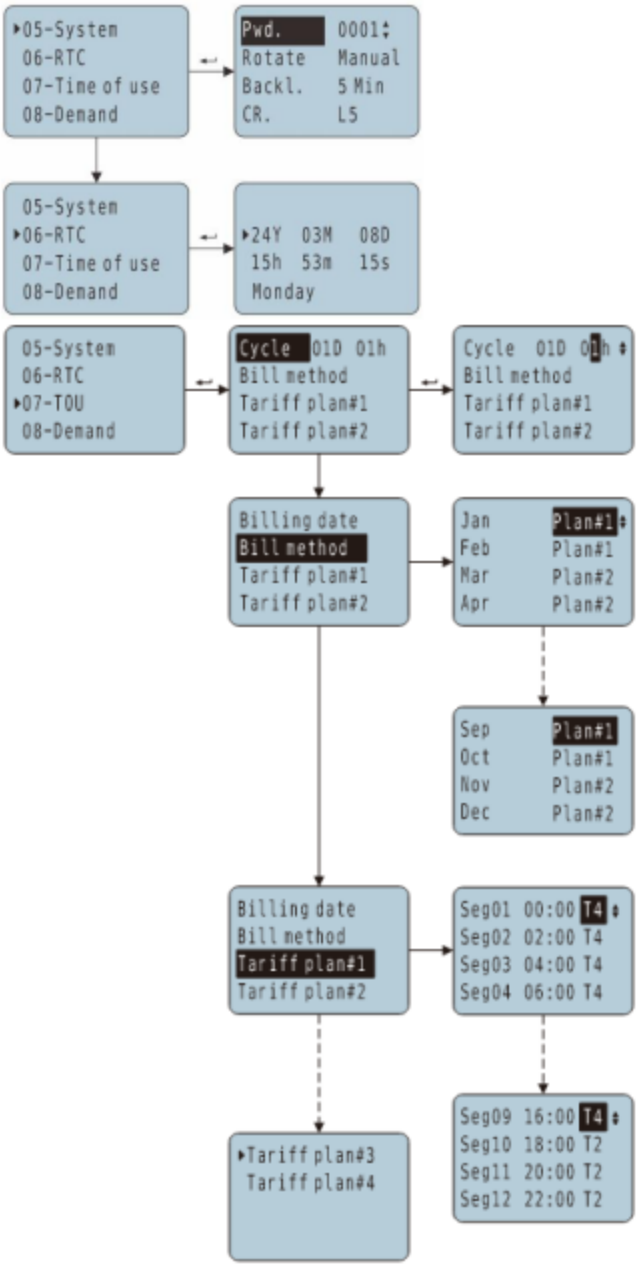
Notes:

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.



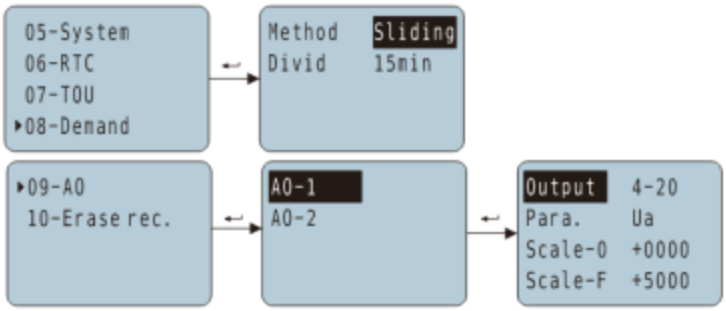
System parameter setup

Password
Page scroll method
Duration of LCD backlight
Color contrast

Real-time clock set up

TOU billing mode settings

4 sets rates, 12 segments

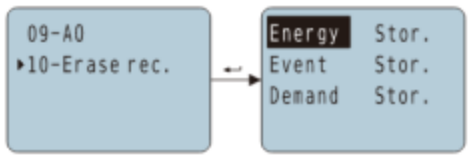


Demands record setting

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

Analog output setup

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



Erase record setting

Erase energy records
Erase event records
Erase demand records

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

6.3.- Flowchart Explanation

Layer 1	Layer 2	Layer 3	Layer 4	Description	
-SYS.-	CodE	Default **0001**		Set password	
	DISP	0		Select manual switching	
		Display of non-zero values: 1,2....99.....		Switching time, unit is seconds. For example, displaying '1' means that the switching time between screens is 1 second.	
	LCd,t	Default **0005**		LCD backlight time settings	
	AO-1	4MA	(Default **0290**)	Analog zero span calibration	
		20MA	(Default **0850**)	Analog full span calibration	
	AO-2	4MA	(Default **0290**)	Analog zero span calibration	
		20MA	(Default **0850**)	Analog full span calibration	
	U.SIG	Default **0020**		Voltage small signal shielding value	
	I.SIG	Default **0010**		Current small signal shielding value	
	CLRE			Energy reset	
	CLRS			SOE reset	
	CLRD			Demand reset	
-IN.-	Lin.e	3P4L,3P3L2CT, 3P3L3CT		Wiring method	
	U.SCL	100V,380V		Range of input voltage signal	
	I.SCL	5A,1A		Range of input current signal	
	r.Pt	Default **0001**	Range 1~9999	Set voltage signal ratio	
	r.Ct	Default **0001**	Range 1~9999	Set current signal transformation ratio	
-BUS-	ADDR	Default **0001**	Range 1~247	Set meter communication address	
	BAUD	1200,2400,4800 ,9600 (Default **9600**)		Set communication speed (baud rate)	
	DATA	n.8.1, o.8.1, e.8.1 (Default **n.8.1**)		Set communication data format	
-ALARM-	Alarm-1 Alarm-2 Alarm-3 Alarm-4 Alarm-5	TYPE	**r.n, Alr, OFF** (Default **r.n**)	DO working mode:	Remote Auto Trig Turned Off
		DELY	Default **0010**	The setting value of 0000 indicates level mode, and when it is not zero, it indicates pulse mode. The value inside is the pulse width.	
		PArA	**I3-H, PS-H...U3-H**	Details see chapter 6.4	
		VALU	Default **5500**	Set the corresponding alarm value. The alarm value is set according to the secondary value and has nothing to do with the transformation ratio.	
		HYS	Default **0050**	Set the corresponding hysteresis	
-DO-	DO-1 DO-2	TYPE	Remote control Alarm-1 Alarm-2 Alarm-3 Alarm-4	8 type action modes	

			Alarm-5 Manually close DO Manually open DO	
		Time	Default **001.0 sec**	After meeting the action condition, the action delay time acts as pulse time under remote control mode.
-AO-	TYPE	12.20, 4-20, 0-20 (Default 4-20)		Select the output method
	PArA	UA, UB, UC...FR (Default UA)		Select the corresponding parameters
	LdlS	Default **0000**		Analog output zero span calibration
	HdlS	Default **5000**		Analog output full span calibration
-TIME-	YEAR	Range: 00-99		Set year
	MON	Range: 1-12		Set mon
	DAY	Range: 1-7		Set the day of the week
	DATE	Range: 1-31		Set date
	HOUR	Range: 00-23		Set hour
	MIN	Range: 00-59		Set min
	SEC	Range: 00-59		Set sec
-E.dAy-	Default **0101**			Set the meter reading time. 01 on the left represents the 1st of each month and the 01 on the right represents 1 o'clock.
-E.Mon-	Mon.1	E.SE1, E.SE2、E.SE3, E.SE4		Corresponding to 1-4 sets of rates
	...	...		...
	Mo.12	E.SE1, E.SE2、E.SE3, E.SE4		Corresponding to 1-4 sets of rates
-E.SE1-	SEG.1	TIME	Default **0000**	Set the meter reading time for segment 1
		E.Mod	TInE, PEAK, FLAt, LOW	Setting billing rates
	...	...	...	...
	SEG.C	TIME	Default **0000**	Set the meter reading time for segment 12
		E.Mod	TInE, PEAK, FLAt, LOW	Setting billing rates
...	...	...	...	...
-E.SE4-	...	...	...	...
-SOE-	I/O event			Record 10 lists DI/DO action record
	Alarm event			Record 40 lists alarm threshold events

Notes:

Not all APM series multi-function meters have complete menu settings; please confirm your purchased Multi-function Meter has the corresponding extension module. Without the module, the corresponding part of the menu is not valid.

7.- PULSE OUTPUT

APM-96J provides 2* pulse output for the total active energy & 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 opt coupler relay.

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

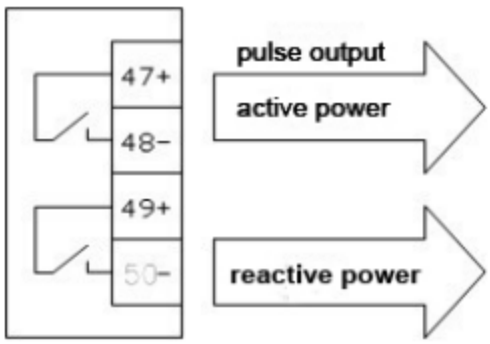
2). Pulse: 5000 imp / kWh, pulse up to 80ms.
This means: When the device detects 1 kWh, the port will generate 5000 pulse.

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.

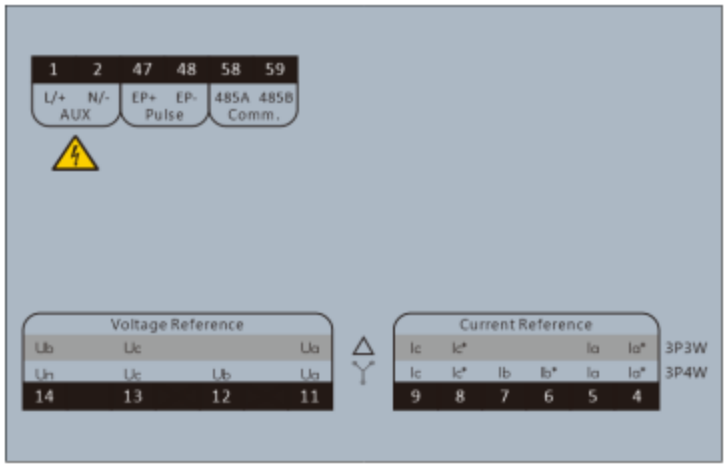
In the time "T", energy accumulated is: N / 20000 × 100 × 80



8.- COMMUNICATION INTERFACE

8.1.- Connection for RS485 BUS

The composition of the RS-485 cabling must be carried out with a meshed screen cable (minimum 3 wire), diameter of not less than 0.5mm^2, with a maximum distance of 1,200 m between the APM-96J and the master unit. This Bus may connect a maximum of 32pcs APM-96J…



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 series meter RS485 PIN number is 58,59.

-. 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		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	Total and split phase active power, Unit: kW
0x14	Pb	float	2	
0x16	Pc	float	2	
0x18	P∑	float	2	
0x1a	Qa	float	2	Total and split phase reactive power, Unit: kVar
0x1c	Qb	float	2	
0x1e	Qc	float	2	
0x20	Q∑	float	2	
0x22	Sa	float	2	Total and split apparent power, Unit: kVA
0x24	Sb	float	2	
0x26	Sc	float	2	
0x28	S∑	float	2	
0x2a	PFa	float	2	Total and split power factor, 0~1.000
0x2c	PFb	float	2	
0x2e	PFc	float	2	
0x30	PF∑	float	2	
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
0x3c	ES	float	2	Total apparent energy, unit: VAh
0x3e	EpA+	float	2	A phase positive active energy, unit: kWh
0x40	EpA-	float	2	A phase negative active energy
0x42	EqA+	float	2	A phase inductive reactive energy, unit: kVarh
0x44	EqA-	float	2	A phase capacitive reactive energy

0x46	ESA	float	2	A phase apparent energy, unit VAh
0x48	EpB+	float	2	B phase positive active energy, unit: kWh
0x4A	EpB-	float	2	B phase negative active energy
0x4C	EqB+	float	2	B phase inductive reactive energy, unit: kVarh
0x4E	EqB-	float	2	B phase capacitive reactive energy
0x50	ESB	float	2	B phase apparent energy, unit: VAh
0x52	EpC+	float	2	C phase positive active energy, unit: kWh
0x54	EpC-	float	2	C phase negative active energy
0x56	EqC+	float	2	C phase inductive reactive energy, unit: kVarh
0x58	EqC-	float	2	C phase capacitive reactive energy
0x5A	ESC	float	2	C phase apparent energy, unit: VAh
0x5C	Io	float	2	Real-time measurement zero-sequence current data, unit: A (Reserved function)

8.3.2.- Basic power data-secondary side

Register	Data	Byte		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	Total and split phase active power, Unit: kW
0x10a	Pb	int	1	
0x10b	Pc	int	1	
0x10c	P∑	int	1	
0x10d	Qa	int	1	Total and split phase reactive power, Unit: kVar
0x10e	Qb	int	1	
0x10f	Qc	int	1	
0x110	Q∑	int	1	
0x111	Sa	int	1	Total and split apparent power, Unit: kVA
0x112	Sb	int	1	
0x113	Sc	int	1	
0x114	S∑	int	1	
0x115	PFa	int	1	Total and split power factor, 0~1.000
0x116	PFb	int	1	
0x117	PFc	int	1	
0x118	PF∑	int	1	
0x119	FR	int	1	Frequency, Unit:0.01Hz
0x11a	Ep+	Int 32	2	Positive active energy, Unit: Wh
0x11c	Ep-	Int 32	2	Negative active energy, Unit: Wh
0x11e	Eq+	Int 32	2	Inductive reactive power, Unit:Varh
0x120	Eq-	Int 32	2	Capacitive reactive power
0x122	ES	int	2	Total apparent energy, unit: VAh
0x124	EpA+	int	2	A phase positive active energy, unit: kWh
0x126	EpA-	int	2	A phase negative active energy
0x128	EqA+	int	2	A phase inductive reactive energy, unit: kVarh
0x12A	EqA-	int	2	A phase capacitive reactive energy
0x12C	ESA	int	2	A phase total apparent energy, unit VAh

0x12E	EpB+	int	2	B phase positive active energy, unit: kWh
0x130	EpB-	int	2	B phase negative active energy
0x132	EqB+	int	2	B phase inductive reactive energy, unit: kVarh
0x134	EqB-	int	2	B phase capacitive reactive energy
0x136	ESB	int	2	B phase total apparent energy, unit: VAh
0x138	EpC+	int	2	C phase positive active energy, unit: kWh
0x13A	EpC-	int	2	C phase negative active energy
0x13C	EqC+	int	2	C phase inductive reactive energy, unit: kVarh
0x13E	EqC-	int	2	C phase capacitive reactive energy
0x140	ESC	int	2	C phase total apparent energy, unit: VAh
0x142	Io	int	1	Real-time measurement zero-sequence current data, unit: 0.001A (Reserved function)
0x143	Ang_Ua	int	1	A phase voltage angle, unit: 0.1 degree
0x144	Ang_Ub	int	1	B phase voltage angle
0x145	Ang_Uc	int	1	C phase voltage angle
0x146	Ang_Ia	int	1	A phase current angle
0x147	Ang_Ib	int	1	B phase current angle
0x148	Ang_Ic	int	1	C phase current angle

8.3.3.- Meter status data

Register	Data	Byte mode		Instruction
0x200	DO	int	1	Digital output: Bit 0~1 show channel 1and 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
0x202	DZ	int	1	Alarm status Bit 0~4 show channel 1- channel 5 alarm status
0x20A	RTC. year	int	1	Internal RTC real time clock: Year - Month - Date - Hour - Minutes - Second-Week
0x20B	RTC. month	int	1	
0x20C	RTC. date	int	1	
0x20D	RTC. hour	int	1	
0x20E	RTC. minute	int	1	
0x20F	RTC. second	int	1	
0x210	RTC. week	int	1	

8.3.4.- Advanced electrical parameter - primary side

Register	Data	Byte mode		Instruction
0x300	Pde	float	2	Present active power demand, Unit: W
0x302	Qde	float	2	Present reactive power demand, Unit: var
0x304	Sde	float	2	Present apparent power demand, Unit: VA
0x306	Pd_M0	float	2	Maximum active power demand in present month
0x308	Qd_M0	float	2	Maximum reactive power demand in present month
0x30a	Sd_M0	float	2	Maximum apparent power demand in present month
0x30c	Pd_M1	float	2	Maximum active power demand in last month
0x30e	Qd_M1	float	2	Maximum reactive power demand in last month
0x310	Sd_M1	float	2	Maximum apparent power demand in last month
0x312	Pd_M2	float	2	Maximum active power demand in month before last month
0x314	Qd_M2	float	2	Maximum reactive power demand in month before last month
0x316	Sd_M2	float	2	Maximum apparent power demand in month before last month
0x318-0x31F	/	float	2	Reserved
0x320	V_{δ}+	float	2	Positive sequence voltage in primary side
0x322	V_{δ}-	float	2	Negative sequence voltage in primary side
0x324	V_0	float	2	Zero sequence voltage in primary side
0x326	I_{δ}+	float	2	Positive sequence current in primary side
0x328	I_{δ}-	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_{δ}- / V_{δ}+)%
0x32E	eI	float	2	Current unbalance, eI = (I_{δ}- / I_{δ}+)%
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

8.3.5.- Tou/ Multi- tariffs ratio data

Register	Data	Byte mode		Instruction
0x400	Sum	long	2	Total cumulative energy of M0+M1+M2
0x402	Sum _T1	long	2	T1-T4 cumulative Energy record
0x404	Sum _T2	long	2	
0x406	Sum _T3	long	2	
0x408	Sum _T4	long	2	
0x40a	M0_Sum	long	2	Total energy of this month
0x40c	M0_T1	long	2	T1-T4 Energy record of present month
0x40e	M0_T2	long	2	
0x410	M0_T3	long	2	
0x412	M0_T4	long	2	
0x414	M1_Sum	long	2	Total energy of last month
0x416	M1_T1	long	2	T1-T4 Energy record of last month
0x418	M1_T2	long	2	
0x41a	M1_T3	long	2	
0x41c	M1_T4	long	2	
0x41e	M2_Sum	long	2	Total energy of the month before last month
0x420	M2_T1	long	2	T1-T4 Energy record of the month before last month
0x422	M2_T2	long	2	
0x424	M2_T3	long	2	
0x426	M2_T4	long	2	

8.3.6.- THD and individual harmonic (Max 63 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	62	Each phase voltage individual harmonic 2~63rd, unit 0.1%
0x548-0x586	HUb	int	62	
0x588-0x5C5	HUc	int	62	
0x5C8-0x605	HIa	int	62	Each phase current individual harmonic 2~63rd, unit 0.1%
0x608-0x645	HIb	int	62	
0x648-0x685	HIc	int	62	
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	

8.3.7.- SOE record

Register	Data	Byte mode		Instruction
0x700-0x7F9	I/O event 10 list Alarm event 50list	int	5	Byte 0: Fault type Byte 1: Fault event Byte 2,3: Fault value Byte 4: Fault time: Year Byte 5: Fault time: Month Byte 6: Fault Time: Day Byte 7: Fault time: Time Byte 8: Fault time: Minute Byte 9: Fault time: Seconds

Byte 0	Byte 1	
1:DI1 Closed	0: Remote control	
2:DI2 Closed	1: DZ Alarm_1	
3:DI3 Closed	2: DZ Alarm_2	
4:DI4 Closed	3: DZ Alarm_3	
	4: DZ Alarm_4	
21:DI1 Opened	5: DZ Alarm_5	
22:DI2 Opened	6: Manually close DO	
23:DI3 Opened	7: Manually open DO	
24:DI4 Opened	100: Manually turn off DZ when tripped	
	101:UA upper alarm	132:UA lower alarm
51: Alarm_1 tripped	102:UB upper alarm	133:UB lower alarm
52: Alarm_2 tripped	103:UC upper alarm	134:UC lower alarm
53: Alarm_3 tripped	104:UAB upper alarm	135:UAB lower alarm
54: Alarm_4 tripped	105:UBC upper alarm	136:UBC lower alarm
55: Alarm_5 tripped	106:UCA upper alarm	137:UCA lower alarm
	107:UA/UB/UC upper alarm	138:UA/UB/UC lower alarm
61: Alarm_1 released	108:IA upper alarm	139:IA lower alarm
62: Alarm_2 released	109:IB upper alarm	140:IB lower alarm
63: Alarm_3 released	110:IC upper alarm	141:IC lower alarm
64: Alarm_4 released	111:IA/IB/IC3 upper alarm	142:IA/IB/IC3 lower alarm
65: Alarm_5 released	112:PA upper alarm	143:PA lower alarm
	113:PB upper alarm	144:PB lower alarm
	114:PC upper alarm	145:PC lower alarm
101:DO1 Closed	115:total active power upper alarm	146:total active power lower alarm
102:DO2 Closed	116:QA upper alarm	147:QA lower alarm
	117:QB upper alarm	148:QB lower alarm
121:DO1 Opened	118:QC upper alarm	149:QC lower alarm
122:DO2 Opened	119:total reactive power upper alarm	150:total reactive power lower alarm
	120:SA upper alarm	151:SA lower alarm
	121:SB upper alarm	152:SB lower alarm
	122:SC upper alarm	153:SC lower alarm
	123:total apparent power upper alarm	154:total apparent power lower alarm
	124:total power factor upper alarm	
	125:frequency upper alarm	155:total power factor lower alarm
	126:DI1 close alarm	156:frequency lower alarm
	127:DI2 close alarm	157:DI1 open alarm
	128:DI3 close alarm	158:DI2 open alarm
	129:DI4 close alarm	159:DI3 open alarm
	130:DI5 close alarm	160:DI4 open alarm
	131:DI6 close alarm	161:DI5 open alarm
		162:DI6 open alarm

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**

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	CRC	CRC

PC user ask upload Ua, Ub, Uc, Uab, Ubc, Uca

Slave device answer

Addr.	Func.	Byte count	Data1-6				CRC16 (low)	CRC16 (high)
0CH	03H	18H	19H	9AH	43H	5CH	CRC	CRC
			33H	33H	43H	5CH		
			E6H	66H	43H	5BH		
			EFH	9EH	40H	9FH		
			00H	00H	40H	A0H		
			10H	62H	40H	A0H		

Show the data:

Float data follow the IEEE754 format, with the low word first and high word second (CD AB).

UA = 199A435C → 435C199A →220.1V.
UB= 3333435C→ 435C3333 →220.2V.
UC= E666435B→ 435BE666 →219.9V.
... ...

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-96J 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**).

Calculation formula of electrical parameter

Formula	Parameter
$U = \sqrt{\frac{1}{N}\sum_{n=0}^{N} u_n^2} \quad n = 0,1,2.....N$	Voltage RMS value
$I = \sqrt{\frac{1}{N}\sum_{n=0}^{N} i_n^2} \quad n = 0,1,2.....N$	Current RMS value
$P = \frac{1}{N}\sum_{n=1}^{N} (i_{an}u_{an} + i_{bn}u_{bn} + i_{cn}u_{cn})$	Total active power cycle average
$P_s = UI$	Single-phase apparent power cycle average
$\cos\theta = \frac{P_p}{P_S}$	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 90°)
$W = \int P * dt$	Electric energy

Note: In above formula, N for sampling points in one AC wave, In standard APM-96J, 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

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