DEM-6MC Din-rail Multifunction Energy Meter

User Manual

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Read me

When you use DEM-6MC Din-rail multi-function energy 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 DEM-6MC multi-function energy meter, and help to solve the various problems at the scene.

1. Before the meter turns 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 consistent with the internal system settings.

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

6. This device is not suitable for TN-C systems. Its residual current protection function is suitable for TN-C-S, TN-S, and partial TT system.

7. During installation, it is strictly prohibited to connect or mix the N (neutral) line with any PE (protective earth) line.

8. It is strictly prohibited to connect or mix the neutral conductors of different branch circuits.

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

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Directory

1.- SUMMARIZE

The DEM-6MC multi-function energy meter features high-accuracy power metering and monitoring, ideal for prepaid management systems in residential, industrial, and commercial applications. It integrates a class 0.2 precision measurement module for real-time acquisition of three-phase voltage, current, power, energy, current unbalance, and harmonic data. Measurement data is transmitted via RS485 or wireless modules (WIFI, 4G, Zigbee, LoRa, IoT) for centralized remote monitoring and management.

In prepaid mode, the device monitors power consumption based on preset energy thresholds. When the remaining credit falls below the set value or is depleted, it automatically issues a trip signal to disconnect the external breaker, ensuring safe and reliable power control. The meter also supports remote reset functions via a DI input button or management platform command. It checks the remaining balance before restoring power, then updates the system status and clears trip records, ensuring operational safety and efficient prepaid management.

It can measure all the power parameters in power grid:

Current,	Energy (Active/Reactive),	Multi-tariff record (TOU),
Voltage,	Power factor,	Demand record,
Frequency,	Voltage /current unbalance,	RTC real time clock,
Active power,	Current harmonics 2~63 times,	60 lists SOE record,
Reactive power,	Voltage harmonics 2~63 times,	Temperature monitoring
Apparent power,	Voltage and current THD%,	Residual current monitoring

FEATURES

- Class 0.2 high-accuracy energy metering;
- Real-time measurement of voltage, current, power, etc. (including unbalance,63rd harmonics);
- Prepaid control: automatic tripping when credit runs out;
- Supports power restoration via DI input or remote command;
- Supports RS485 MODBUS-RTU and wireless communication (Wi-Fi, 4G, IoT, etc.);
- Supports sound and light alarm, manual mute, and reset;

APPLICATIONS

- All power parameter measurement;
- Energy measurement and electrical fire monitor and control;
- 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	●	●	●	●
Active energy	Wh	●	●	●	●
Reactive energy	Varh	●	●	●	●
Multi- tariffs energy record	Wh	/	/	/	●
Max demand (W / var / VA)	MAX	/	/	/	●
Voltage / current unbalance	%	/	/	/	●
THD & Harmonic (2~63rd)	---	●	●	●	●

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

2.2.-Technical parameters

Working power	
Power grid mode	1P2W, 3P3W, 3P4W
Power supply	AC/DC 85-265V, 45-65Hz
Consumption	≤5VA
Data refresh frequency	1S
Voltage input	
Rate value	100V/220V/380V
Overload	1.2Un
Power consumption	<0.2VA
Impedance	0.5MΩ
Current input	
Rate value	AC 1A/5A (please specify when ordering)
Overload	Measurement: 1.2 times Instantaneous: 10 times/3s
Power consumption	<0.1VA
Impedance	<20MΩ
Accuracy	
Voltage, current	0.2
Power	0.2
Harmonics	Uh>2%: 5%Uh; Uh<=2%: 0.1%Un
Residual current	1%
Temperature	±2°C
Frequency	±0.02Hz
Active energy	0.5S
I/O capacity	
DI	2-4 channels, dry contact, Ri<500Ω turns on, Ri>100kΩ turns off
DO	2 channels, Relay contact capacity: 5A@250VAC; 5A@30VDC
Communication	RS485, Modbus-RTU or Ethernet, Modbus-TCP/IP Optional Wireless modules (WIFI, 4G, Zigbee, LoRa, IoT)

Pulse output	1 channel, pulse width 80ms, photoelectric isolation
Safety	
Pollution degree	2
Overvoltage category	CATIII@277/480VAC
Insulation capability	2kV AC RMS 1 minute, between input / output / case / power supply
EMC test	
Discharge immunity test	IEC-61000-4-2 level 4 @8kV
Fast transient burst immunity test	IEC61000-4-4 level 3 @Input 1kV; Power supply 2kV
Surge (Shock) immunity test	IEC61000-4-5 level 4 @Common mode: 4kV
Environment	
Working temperature	-10℃ ~ +55℃; RH 5% ~ 95% (non-condensation)
Storage temperature	-40℃ ~ +85℃; RH 5% ~ 95% (non-condensation)
Others	
Demand record	Maximum monthly demand in the past three months
Multi- tariffs ratio	4 sets rates, 12 segments
SOE record	60 lists, (30 lists DI/DO SOE and 30 lists Alarm SOE)
Dimension	110mm×108mmx66mm (W*H*D), 35mm Din-rail mounting

3.- INSTALLATION AND START-UP

The manual you hold contains information and warnings that -users should follow in order to guarantee 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

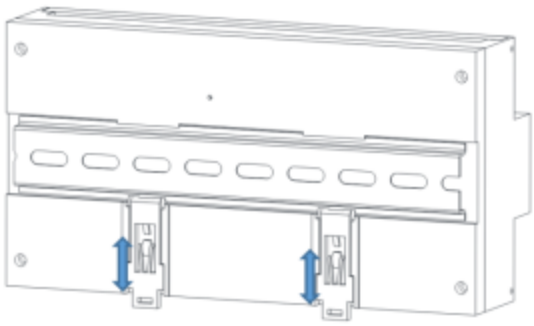
Mounting

DEM-6MC is to be mounted on 35mm Din-rail.

Step-1 Fasten a section of the 35 mm DIN rail (at least 8 inches long) to the mounting surface with appropriate hardware.

Step-2 Use the white plastic clips on the back of the DEM-6MC meter to clip the meter onto the rail.

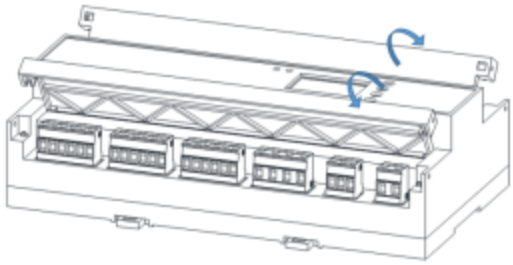
Step-3 Verify that the meter is securely fastened to the wall.



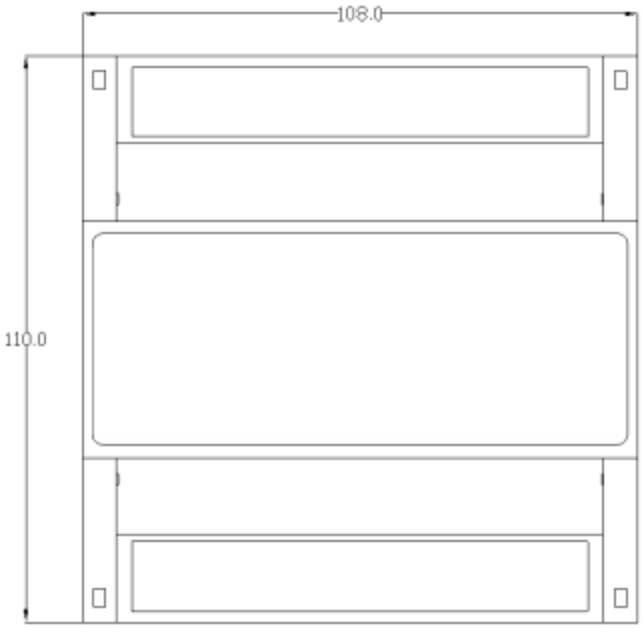
There are two flaps covers, can be sealed by lead wire to protect unauthorized access terminal block, to achieve physical anti-theft function. Also capable of completely shielding the terminal head to prevent accident electrical shock.

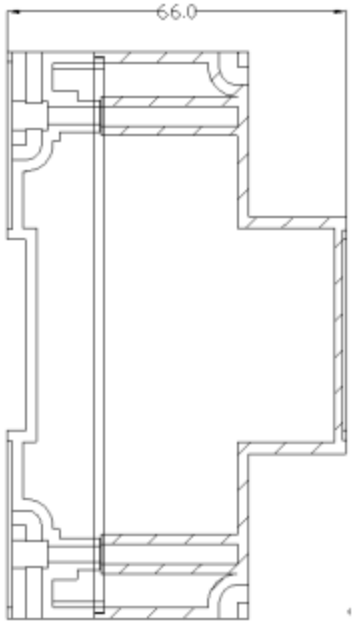
Warning that with the instrument powered on, the terminals could be dangerous to touch and cover opening actions or elements removal may allow accessing dangerous parts.
Therefore, the instrument must not be used or operation key button until this is completely

installed and close the cover.



Dimension: 108*110*66mm (W*H*D)





Notes:

Input signal: DEM-6MC 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.

Warning: 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

Warning: 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-96Y.
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

DEM-6MC 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 installing lightning surge suppressor and rapid burst suppressor to prevent lightning strikes.

3.2.- Connection Terminal

Upper terminal:

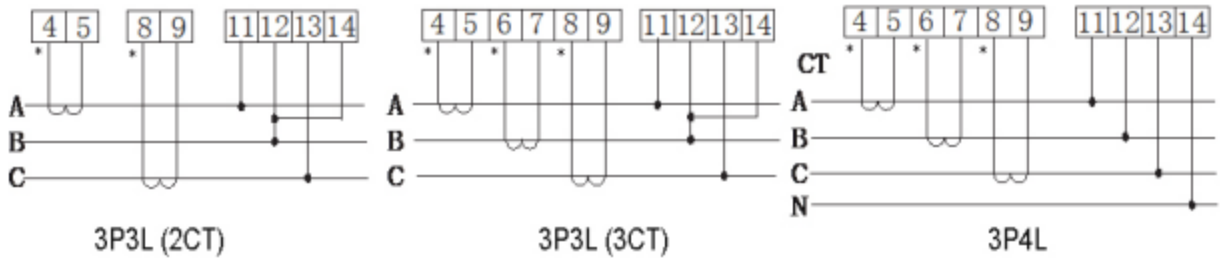
No.	Marked	Notes
19-20 21-22	**DO 1-2**	2 channels digital output
70-72	**COM** **DI 1-2**	Common terminal 2 channels digital input
23-27	/	Reserved
28-30	/	Reserved
58-59	**A, B**	RS485 communication +/-

No.	Marked	Notes
4-5 6-7 8-9	**IA, IA*** **IB, IB*** **IC, IC***	A-phase current input B-phase current input C-phase current input
14-11	**Ua, Ub, Uc, Un**	Voltage A-phase input Voltage B-phase input Voltage C-phase input Neutral Voltage input
48-47	**EP+, Ep-**	Active energy pulse output+/-
1-2	**L, N**	AUX input 85-265Vac/dc+/-

Note:

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

3.3.- Typical Wiring



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 system runs a self-test with all LEDs and the buzzer activated. If detected errors will display in screen. In normal working status, user can also press "TEST" button to manual self-test.

Button	In Monitor Screen	In Config. Menu
◀ TEST	Enter self-test	Move to the previous page or move cursor
▶ MUTE	Manually enter/ exit mute state	Move to the next page or scroll selection number 0 ~ 9
⚙ PAGE	Switch from the main measurement screen to the configuration menu	Move back to up level menu.
↵ REST	Press to call out sub-menu or Press and hold 5s for reset	Confirm the values & Entry or jump to down level menu

Note: In Config. 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.*

4.1.- Indicator Description

Indicator	Description
ALARM	Alarm occurs (Parameter threshold exceeded, DI tripped etc.)
FAULT	Fault occurs (Device itself or the sensor is abnormal (such as hardware damage, wiring error, short circuit, disconnection, etc.)
MUTE	When light on, it means that the alarm sound has been muted.
RUN	The device is operating normally

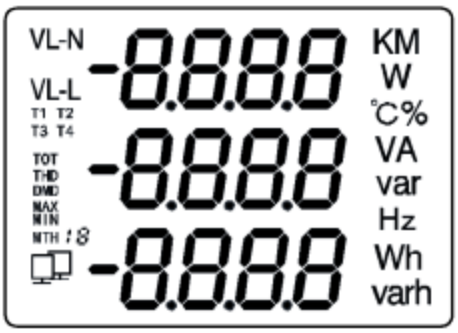
Note:

Alarm sound can be turned off by pressing the "MUTE" button, but the alarm status persists; the fault needs to be eliminated and then reset by pressing the "REST "button.

Alarm and fault events will be recorded, and the specific cause can be queried through the [Configuration menu- “SoE”/ “SoEA” (Details see **chapter 6.7**) or through RS485 Modbus protocol.

5.- SCREEN DISPLAY

5.1.- Overall screen:



VL-N: Phase to phase voltage

VL-L: Phase to line voltage

T1-T4: TOU mode1-4 of Multi tariff record function

TOT: Total value of parameter

THD: Total harmonic distortion

DMD: Maximum demand value

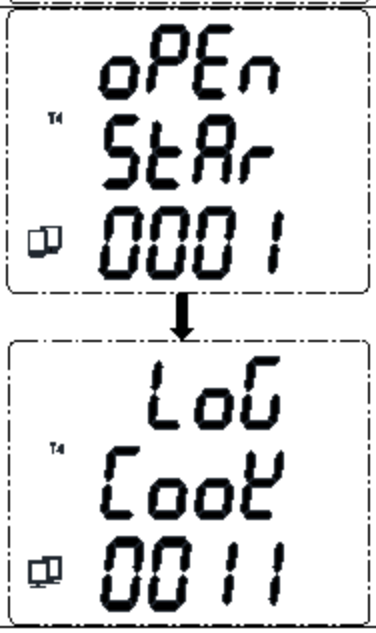
MAX/ MIN: Maximum/ Minimum Value

MTH: Month

Note:

Screen shows all the functions for reference only. If there is no relevant function, you can ignore it.

5.2.- Introduction of screen pages

Page	Screen interface	Explanation
- 1 -		**Phase to phase voltage Ua, Ub, Uc** Ua=380.1V Ub=380.0V Uc=379.9V T4 indicates the billing rate. Press " ↵ " key to switch to line voltage.
- 2 -		**Three-phase current Ia, Ib, Ic** Ia=5.000A Ib=4.998A Ic=5.001A
- 3 -		**Total active power, Total reactive power, and Total power factors**
- 4 -		**Display the 4G communication** **OPEN** means the network is not connected **STAR** means the 4G module is initialized **0001** means the execution step. If the network is successfully connected, execute step **0011** and **COOK** will be displayed.

- 5 -		**Frequency of grid** F=50.00Hz
- 6 -		**Positive active energy** Ep=1.389 kWh Note: 1 Wh = 0.001 kWh Press " ↵ " key to **negative active energy**
- 7 -		**Positive reactive energy** Eq=0.263 kvarh Press " ↵ " key to **negative reactive energy**
- 8 -		**Multi-tariff energy record (TOU)** “E0” ~ “E3” E0: Last three months total TOU record E1: Present month TOU record E2: Last month TOU record E3: Month before last month TOU record “T1” ~ “T4” for 4 types tariff energy sum record. Press " ↵ " key to **switch**
- 9 -		**Maximum demand power** Row 1: Active power Row 2: Reactive power Row 3: Apparent power **“DMD 1-3”** DMD1: Max. demand record of present month DMD2: Max. demand record of last month DMD3: Max. demand record of month before last month Press " ↵ " key to **switch**

- 10 -		**Real-time clock (RTC)** Row 1: Year Row 2: Month Row 3: Date Press " ↵ " key to shows: Hour, Minute and Second
- 11 -		Three phase voltage total harmonic distortion (THD_U%)
- 12 -		Three phase current total harmonic distortion (THD_I%)
- 13 -		**A phase harmonic components** Row 2: Voltage harmonics Row 3: Current harmonics
- 14 -		**B phase harmonic components** Row 2: Voltage harmonics Row 3: Current harmonics
- 15 -		**C phase harmonic components** Row 2: Voltage harmonics Row 3: Current harmonics

- 19 -		**DI/DO Status** Row 2: shows DI status Row 3: shows DO status "0": open, "1": closed.
- 20 -		**Alarm prompt** It means leakage alarm on channel 1, Alarm value is 0.634A

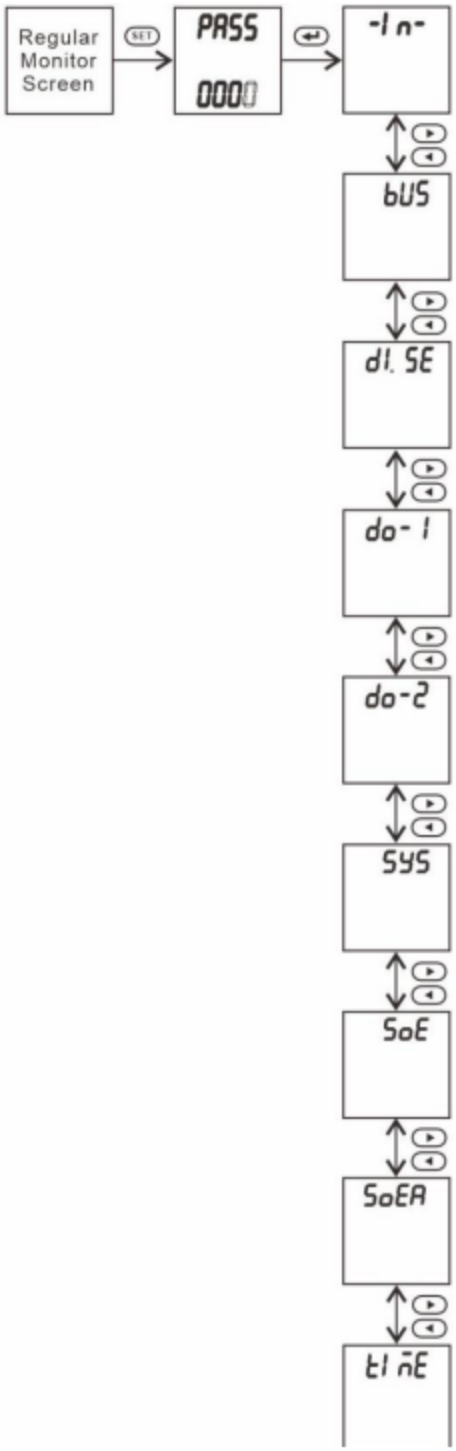
Note:

In special requirement order or firmware iteration, the screen may add or reduce the screen display pages, please ask the sales team to get the latest manual.

6.- SETUP PROCEDURE

The SETUP procedure of the DEM-6MC is performed by means of several SETUP options. There has a password to protect unexpectedly enter the Setup menu. Once into the Setup menu, use keyboard to select different options and enter required variables:

6.1.- Enter Setup Menu



Input signal setup

Refer to chapter 6.2

Communication port setup

Refer to chapter 6.3

Digital input setup

Refer to chapter 6.4

Digital output 1 and 2 setup

Refer to chapter 6.5

System parameter setup

Refer to chapter 6.6

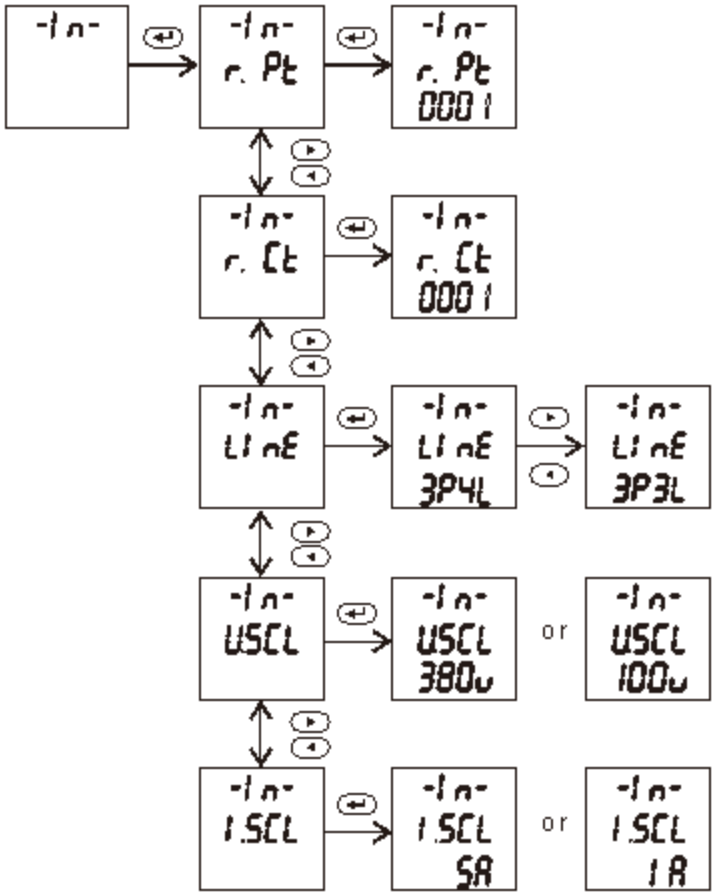
Sequence of DI/DO event records
Sequence of alarm event records

Refer to chapter 6.7

RTC and TOU Setup

Refer to chapter 6.8

6.2.- Input Signal Setup



Voltage transformer ratio(1)*

Default **0001**

Current transformer ratio(1)*

Default **0001** or based on order requirement

Power grid mode

Default **3P4L(2)***

Rated voltage scale

Default **380V(3)***

Rated current scale

Note: only related to pulse constant chapter 7

Default **5A**

Notes:

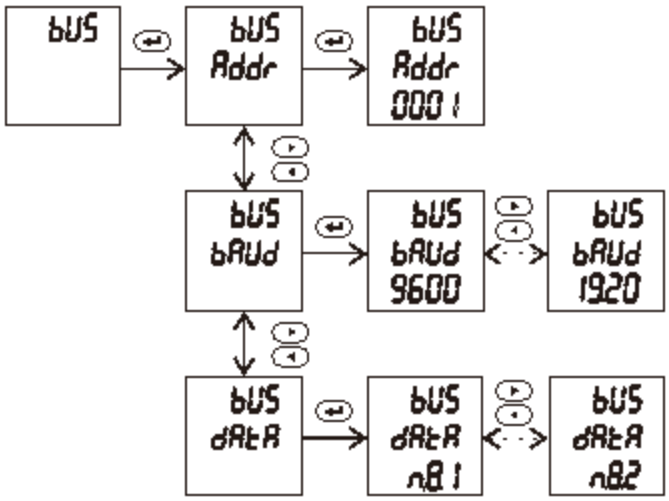
(1) In medium or high voltage system, set this value can expand measuring range, values represent the current transformer (primary side voltage) / (secondary side current). Must set **U.scl** in 100V or other specified VT secondary voltage.

(2) If in order specified power grid is 3P3L, Blue Jay will connect **Un** and **Ub** terminal internally. In screen only show phase to phase parameter.

(3) Blue Jay calibrate meter under 380V range, high-quality linearity performance ensures that the meter can accurately measure in the lower voltage range. That can 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 help.

6.3.- Communication Port Setup



Modbus address (1)*

Default **0001**

Comm port baud ratio (2)*

Default **9600** (2)*

Comm port data format

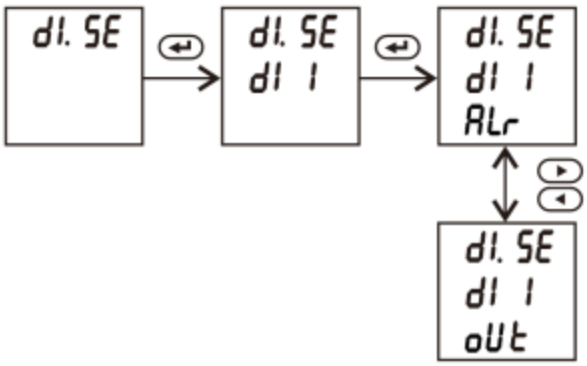
Default **n.8.1,** can select n.8.1 / E.8.1 / n.8.2

Note:

(1) Modbus address setup range 1-247.

(2) Baud ratio can select 1200 / 2400 / 4800/ 9600 / 19200, regular meter equipped communication port max baud ratio are 19200bps, if need higher speed, please contact Blue Jay sales team.

6.4.- Digital Input Setup



DI working mode

Alarm output mode

-. DI working mode: OFF/ Alarm

"OFF", means only monitoring without alarm protection action.

"ALARM" means that when the DI terminal be closed and reach the preset delay time, it will automatically display alarm screen. After the alarm occurs, manual reset is required after the fault is cleared.

-. Alarm output mode: DO1/ DO2/ OFF

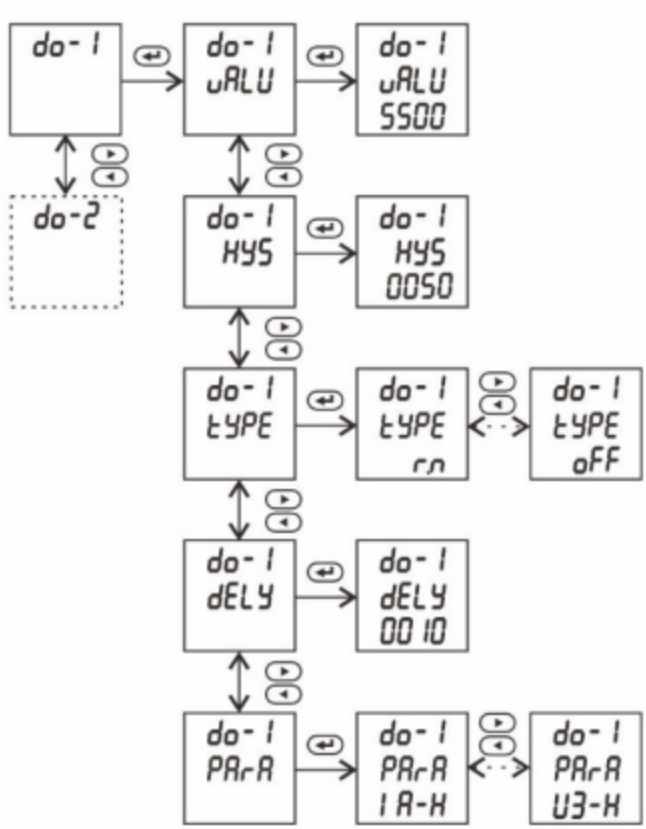
Selects the output channel as DO1 or DO2 or disables the output (OFF).

DI 2 setup is the same as DI 1

6.5.- Digital Output Setup

When the device has more than one DO port, you can set the DO-2, as same step.

The physical DO relay standard is 5A@250VAC / 5A@30VDC



Relay trip threshold, value related to secondary side

Default **5500** (1)*

Hysteresis (2)*

Default **0050**

DO working mode (3)*

Default **r.n**

r.n Remote
ALr Auto Trig
oFF Turned Off

Delay timer of the trip (4)*

Default **0010**

Parameter be tripped (5)*

Default **1A-H**

Notes:

(1) Relay trip threshold value have different units:

Voltage - 0.1V	Active power - 0.1W	Power factor - 0.001
Current - 0.001A	Reactive power - 0.1VAR	Frequency- 0.01HZ

(2) Hysteresis value is for prevent unexpected relay release, only the measurement parameter falls back lower / over a certain difference value from trip threshold, the DO can be released.

Formula: **Xm** < **X** - **Xr** (Upper edge trig) or **Xm** > **X** + **Xr** (Lower edge trig)

Xr = [VALU] **x** [HYS] / 10000

Xm is measurement rms value of electrical parameter

Example: Trig threshold value 3.700A; hysteresis value 0.03; After relay trigged, when measured value **Xm** < 3.589A (3.700-3.700*0.03), the relay will be released.

(3) DO port preset 2 types of working mode, and can be **Turned Off**

Auto Trig – When the measurement parameter over or lower the preset [VALU], the DO relay act, terminal of DO+ / DO- shorted. After the measurement parameter fall back to a certain value can be released relay coil.

Remote - DO relay act by RS-485 control command, user can use function code 05 to trig single relay, device RS-485 port follow MODBUS-RTU protocol, command as following:

Host inquiry:

Addr.	Code	No.1 Relay register	Relay value (FF00:close; 0000: open)	CRC
01	05	00 01	FF 00	DD FA

Slave response:

Addr.	Code	No.1 Relay register	Relay value (FF00:close; 0000: open)	CRC
01	05	00 01	FF 00	DD FA

(4) In **Auto trig** mode, after **Xm** > [VALU] in the specified delay time, DO relay act. Setting value from 0.000sec (no delay) to 999.9 sec, default 0010 = 1sec.

In **Remote** mode, if setup value = 0, output is **Level type**,

If set value = 0, output is **Pulse type**, value = pulse width

(5) Parameter of the DO can be set, preset 52 types parameter that can be used in auto trig mode.

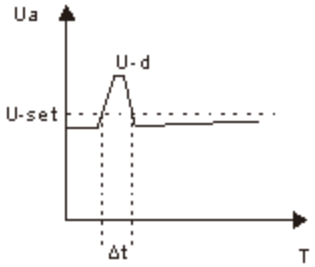
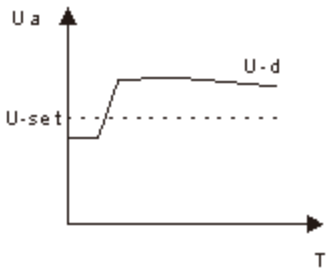
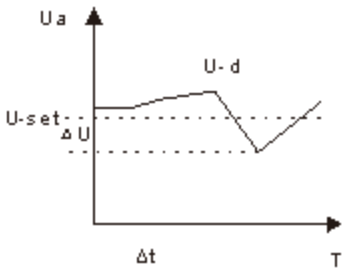
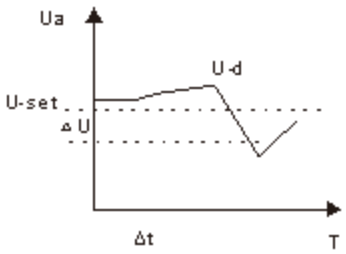
UA-H	A phase voltage upper trig	Pb-H	B phase reactive power upper trig
Ub-H	B phase voltage upper trig	PC-H	C phase reactive power upper trig
UC-H	C phase voltage upper trig	PS-H	Total reactive power upper trig
U3-H	Any one of Ua / Ub / Uc3 upper trig	SA-H	A phase apparent power upper trig
IA-H	A phase current upper trig	Sb-H	B phase apparent power upper trig
Ib-H	B phase current upper trig	SC-H	C phase apparent power upper trig
IC-H	C phase current upper trig	SS-H	Total apparent power upper trig
I3-H	Any one of Ia / Ib / Ic3 upper trig	PF-H	Total power factor upper trig
PA-H	A phase active power upper trig	Fr-H	Frequency upper trig
Pb-H	B phase active power upper trig	di 1H	DI1 closed trig
PC-H	C phase active power upper trig	di 2H	DI2 closed trig
PS-H	Total active power upper trig	di 3H	DI3 closed trig
QA-H	A phase reactive power upper trig	di 4H	DI4 closed trig

Note: If in screen show "XX -L" mean lower limit trig, for DI port mean open loop trig.

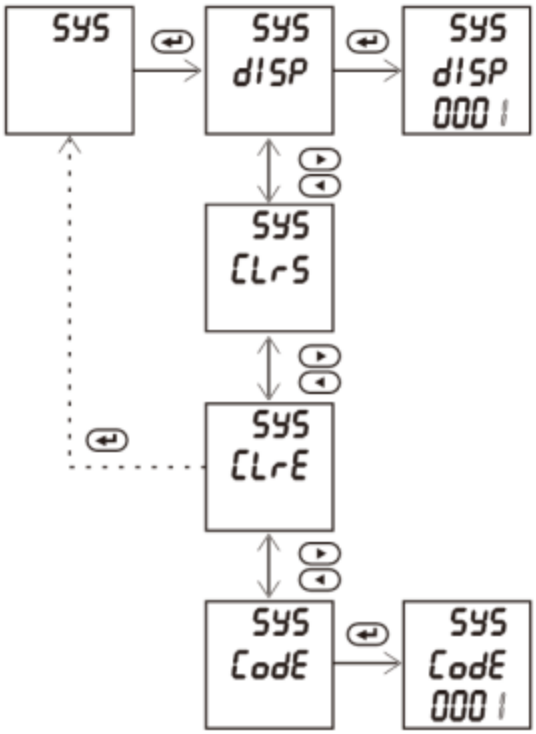
*** Delay & Hysteresis logic**

Example in upper limit alarm of A phase voltage:

U-d mean detected Ua
U-set mean Alarm value of A phase

Alarm will not trigged		If Δt < Delay setting value, The Alarm will not be trigged, that can avoid influence of the transient electrical parameters
Alarm trigged		When U-d is over U-set, and after delay setting time cool down, the value is still over U-set, the alarm will be trigged
Alarm will not released		If ΔU < Hysteresis value The Alarm will not be released, that can avoid influence of parameter unexpected fluctuations
Alarm released		When U-d is lower than (U-set -Hysteresis) The Alarm will be released

6.6.- System Setting



Screen scroll interval, unit: sec

Default **0000**(1)*

Reset SOE record (2)*

can be write by RS485 command*

Reset energy counter record (2) *

can be write by RS485 command*

Reset password (3)*

Notes:

(1) Set 0000 mean manually switch each monitor screen pages.

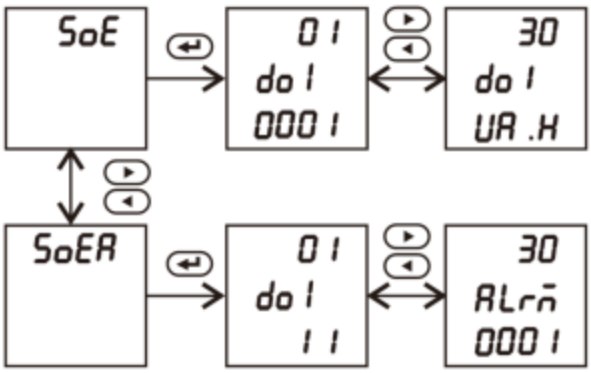
(2) Press ↵ device will roll back to **SYS** root menu, only in the exit screen press ↵ to trigger clear operation!

(3) If reset the password, please keep the password in safety, or only return to Blue Jay for reset new password!

(4) Variable step value is 2/1000. Blue Jay already do calibration before shipping, please use high precision ammeter or voltmeter as reference standard.

(5) Customers can write commands through RS485 or through the screen to clear the energy data to 0. Once the secondary side value of the internal memory reaches to 2^{32}(4294,967,296), counter automatically reset to 0.

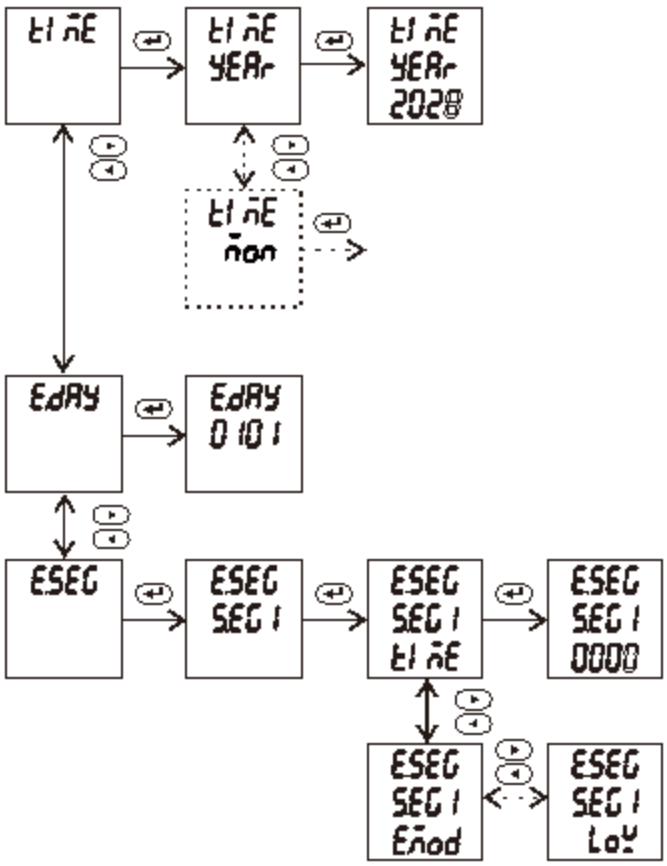
6.7.- SOE record (Read only)



Sequence of DI/DO event records, max 30 lists

Sequence of alarm event records, max 30 lists

6.8.- RTC and TOU Setup



RTC setup

YEAr	Year
non	Month
dAtE	Date
dAY	Day(1)*
HoUr	Hour
nI n	Minute
SEC	Second

TOU billing date Setup

Left 2 digital for "Date" of a month
Right 2 digital for "Hour" in the billing day

TOU segment setup(2)*

TOU tariff type setup(3)*

Notes:

(1) The weekday is independent data, only loops from 1-7, and does not linked to date information, only can be read in register map and used as data identity.

(2) DEM-6MC provides last 3 months of TOU energy record. The TOU function separate one day in to 12 segments billing interval. SEG 1 for record starting time point in one day.

(3) Device used 4 different words to indicate 4 types tariff (T1-T4) energy consumption in different time segment and record in memory. correspondence is as follows:

Tine	tI nE	T1
Peak	PEAK	T2
Flat	FLAt	T3
Valley	LoY	T4

6.9.- Menu character description

Char.	Explanation	Char.	Explanation
I.SEt	(I set) Leakage current protection setting	doSE	First-level menu relay output
uAL	(Value) Alarm value setting	oUt	Digital output setting
ALr	(Alarm) Alarm mode	oPEn	Open circuit fault
dI 1	Channel 1 Digital input setting	dI 2	Channel 1 Digital input setting
do 1	Channel 1 Digital output setting	nodE	Mode selection
PArA	Parameter selection	do2	Channel 2 Digital output setting
r.n	Remote control alarm	SHor	Short circuit fault
CLrE	Clear electric energy	SYS	System settings menu
CodE	Enter password	CLrS	Clear SOE
SAvE	Save settings prompt	dI SP	Cycle display time (seconds) 0 means no cycle display
Addr	(Address) Local communication address setting	SoE	Sequence of event record
dAtA	(Data) Communication parameter setting	bAUd	(Baud) Communication baud rate
o.8.1	(o.8.1) Indicates 8 data bits, 1 stop bit, odd parity	n.8.1	(n.8.1) Indicates 8 data bits, 1 stop bit, no parity bit
dELY	Protection action delay time	E.8.1	(e.8.1) Indicates 8 data bits, 1 stop bit, even parity

7.- PULSE OUTPUT

DEM-6MC provides 1 channel pulse output for total 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 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^2, with a maximum distance of 1,200 m between the DEM-6MC... and the master unit. This Bus may connect to a maximum of 32pcs DEM-6MC...

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 BYTES**	*Starting address, high byte* *Starting address, low byte* *Number of registers, high byte* *Number of registers, low byte*
Error Check code	**2 BYTES**	*Cyclical Redundancy Check (**CRC**)*

MODBUS FUNCTIONS:

Code	Meaning	Description
FUNCTION 01	**Read Coils**	*Reads the ON/OFF status of discrete coils in the slave.*
FUNCTION 02	**Read Discrete Inputs**	*Reads the ON/OFF status of discrete inputs in the slave.*
FUNCTION 03	**Read Holding Registers**	*Read the binary contents of holding registers in the slave.*
FUNCTION 04	**Read Input Registers**	*Read the binary contents of input registers in the slave.*
FUNCTION 05	**Write Single Coil**	*Write a single coil to either ON or OFF.*
FUNCTION 06	**Write Single Register**	*Writes a value into a single holding register.*

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

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	/	/	/	Reserved
0x203	PHAS	int	1	Voltage phase sequence status 0: normal, 1: abnormal
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	Negative sequence voltage %
0x32E	eI	float	2	Negative sequence current %
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
0x340	year	int	1	Timestamp of maximum demand in present month (Year- Month- Date- Hour- Minute)
0x341	month	int	1	
0x342	date	int	1	
0x343	hour	int	1	
0x344	minute	int	1	
0x345-0x349		int	1	Timestamp of maximum demand in last month
0x34A-0x34E		int	1	Timestamp of maximum demand in month before last month

8.3.5.- Multi-tariffs ratio data - secondary side

Register	Data	Byte mode		Instruction
0x400	E0_tol	long	2	Total cumulative energy
0x402	E0_T1	long	2	T1-T4 cumulative Energy record
0x404	E0_T2	long	2	
0x406	E0_T3	long	2	
0x408	E0_T4	long	2	
0x40a	E1_tol	long	2	Total energy of present month
0x40c	E1 _T1	long	2	T1-T4 Energy record of present month
0x40e	E1 _T2	long	2	
0x410	E1 _T3	long	2	
0x412	E1_T4	long	2	
0x414	E2_tol	long	2	Total energy of last month
0x416	E2_T1	long	2	T1-T4 Energy record of last month
0x418	E2_T2	long	2	
0x41a	E2_T3	long	2	
0x41c	E2_T4	long	2	
0x41e	E3_tol	long	2	Total energy of the month before last month
0x420	E3_T1	long	2	T1-T4 Energy record of the month before last month
0x422	E3_T2	long	2	
0x424	E3_T3	long	2	
0x426	E3_T4	long	2	

Note: In screen display the T1-T4 will display as following in screen and setup:

Tine	tInE	T1
Peak	PEAt	T2
Flat	FLAt	T3
Valley	LoU	T4

8.3.6.- THD and Individual harmonic (Max 63 times)

Register	Data	Byte mode		Instruction
0x500	THDUa	int	1	A-phase voltage THD
0x501	THDUb	int	1	B-phase voltage THD
0x502	THDUc	int	1	C-phase voltage THD
0x503	THDia	int	1	A-phase current THD
0x504	THDib	int	1	B-phase current THD
0x505	THDic	int	1	C-phase current THD
0x508-0x545	HUa	int	62	Three phase voltage individual harmonic 2-63rd Three phase current individual harmonic 2-63rd
0x548-0x585	HUb	int	62	
0x588-0x5c5	HUc	int	62	
0x5c8-0x605	HIa	int	62	
0x608-0x645	HIb	int	62	
0x648-0x685	HIc	int	62	
0x688	TOHDUa	int	1	Three phase voltage total odd harmonic distortion, unit 0.1%
0x689	TOHDUb	int	1	
0x68a	TOHDUc	int	1	
0x68b	TEHDUa	int	1	Three phase voltage total even harmonic distortion, unit 0.1%
0x68c	TEHDUb	int	1	
0x68d	TEHDUc	int	1	
0x68e	THFFUa	int	1	Three 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	A phase current total odd harmonic distortion, unit 0.1%
0x695	TOHDIb	int	1	
0x696	TOHDIc	int	1	
0x697	TEHDIa	int	1	Three 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

DI/DO SOE Record

Register	Data	Byte mode		Instruction
0x700-0x795	DI/DO event 1~30	int	1	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 2: DI2 3: DI3 4: DI4 5: DI5 6: DI6 101: DO1 102: DO2 103: DO3 104: DO4	100: Remote control action 101: UA upper alarm 102: UB upper alarm 103: UC upper alarm 104: UAB upper alarm 105: UBC upper alarm 106: UCA upper alarm 107: UA/UB/UC upper alarm 108: IA upper alarm 109: IB upper alarm 110: IC upper alarm 111: IA/IB/IC upper alarm 112: PA upper alarm 113: PB upper alarm 114: PC upper alarm 115: total active power upper alarm 116: QA upper alarm 117: QB upper alarm 118: QC upper alarm 119: total reactive power upper alarm 120: SA upper alarm 121: SB upper alarm 122: SC upper alarm 123: total apparent power upper alarm 124: total power factor upper alarm 125: frequency upper alarm 126: DI1 close alarm 127: DI2 close alarm	128: UA upper alarm 129: UB upper alarm 130: UC upper alarm ... 154: DI1 status 155: Alarm event

Alarm SOE

Register	Data	Byte mode		Instruction
0x800-0x995	Alarm event 1~30	int	1	Byte 0: Fault type Byte 1: Fault channel 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: Alarm 2: Sensor short-circuit 3: Sensor disconnected 4: DO 1 action 5: DO 2 action	1: Leakage channel 1 2: Leakage channel 2 3: Leakage channel 3 4: Leakage channel 4 5: Temperature channel 1 6: Temperature channel 2 7: Temperature channel 3 8: Temperature channel 4 9: DI 1 10: DI 2	11: Reserved 12: Communication 13: Leakage channel 5 14: Leakage channel 6 15: Leakage channel 7 16: Leakage channel 8 17: Temperature channel 5 18: Temperature channel 6 19: Temperature channel 7 20: Temperature channel 8

8.3.8 - Write operation function definition: Preset Single holding registers

Register	Data	Byte mode		Instruction
0x20A	RTC.year	int	1	Internal RTC real-time: year-month-date-hour-minute-second-day
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.day	int	1	

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 depending 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	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 DEM-6MC energy meter does not require any special maintenance. No adjustment, maintenance or repairing 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 repair 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-96Y, 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