MPR-6M
Multifunction Protection Relay

User Manual

Version: 1.10

Revision: 2025.09

Tel: +0086-023-67628702
www.cqbluejay.com
Add: 1802,Building 2,No.88,Jianxin East Road,Chongqing,400020,China
Email:tech@cqbluejay.com

Read me

When you use MPR-6M multifunction protection relay, 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 MPR-6M multifunction protection relay, 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**

Tel: +0086-023-67628702
Email:tech@cqbluejay.com
www.cqbluejay.com
Add: 1802,Building 2,No.88,Jianxin East Road,Chongqing,400020,China

Directory

1.- SUMMARIZE ..... - 1 -

2.-TECHNICAL PARAMETERS ..... - 3 -

3.- INSTALLATION AND START-UP ..... - 5 -

3.1.- INSTALLATION ..... - 5 -
3.2.- CONNECTION TERMINAL ..... - 9 -
3.3.- TYPICAL WIRING ..... - 10 -

4.- OPERATION MODE ..... - 11 -

4.1.- INDICATOR DESCRIPTION ..... - 12 -

5.- SCREEN DISPLAY ..... - 13 -

5.1.- OVERALL SCREEN: ..... - 13 -
5.2.- INTRODUCTION OF SCREEN PAGES ..... - 14 -

6.- SETUP PROCEDURE ..... - 17 -

6.1.- ENTER SETUP MENU ..... - 17 -
6.2.- INPUT SIGNAL SETUP ..... - 19 -
6.3.- COMMUNICATION PORT SETUP ..... - 20 -
6.4.- RESIDUAL CURRENT SETUP ..... - 21 -
6.5.- TEMPERATURE SETUP ..... - 22 -
6.6.- DIGITAL INPUT SETUP ..... - 23 -
6.7.- DIGITAL OUTPUT SETUP ..... - 24 -
6.8.- SYSTEM SETTING ..... - 28 -
6.9.- SOE RECORD (READ ONLY) ..... - 29 -
6.10.- RTC SETUP ..... - 30 -
6.11.- MENU CHARACTER DESCRIPTION ..... - 31 -

7.- PULSE OUTPUT ..... - 32 -

8.- COMMUNICATION INTERFACE ..... - 33 -

8.1.- CONNECTION FOR THE RS485 BUS ..... - 33 -
8.2.- MODBUS © PROTOCOL ..... - 33 -
8.3.- REGISTER MAP ..... - 34 -

9.- SAFETY CONSIDERATIONS ..... - 46 -

10.- MAINTENANCE ..... - 46 -

11.- TECHNICAL SERVICE ..... - 47 -

1.- SUMMARIZE

The MPR-6M Multifunction Protection Relay is suitable for circuit protection and monitoring of electrical lines and distribution cabinets. It can monitor various parameters in real time, such as current, voltage, power, and electric energy. It is particularly ideal for safety protection of critical power supply lines, fire power distribution, industrial power cabinets, computer rooms, and intelligent building power distribution systems.

The device has a built-in Class 0.2 high-precision measurement unit, with standard 2-way DO output, 2-way DI input, 4-way temperature sensors, and 2-way residual current monitoring. It supports multiple protection action modes including overcurrent, overvoltage, and undervoltage. Via RS485 communication, it can upload data to SCADA, EMS, and smart operation and maintenance platforms. It also features functions like sound and light alarm, remote control, and automatic tripping.

It can monitor and detect all protection-related parameters in electrical system:

Protection function	Real-time monitor parameter
Overvoltage	Three-phase current
Undervoltage	Current unbalance
Overcurrent stall	Heat capacity
Undercurrent	Ground residential current
Overload	Three-phase line voltage
Underload	Frequency
Phase failure (Phase loss)	Power factor
Current unbalance	Active power
Under power	Reactive power
Ground fault	Apparent power
Short circuit	Electrical energy
External failure	
Overtemperature	
Module failure	
Abnormal frequency	
Abnormal power factor	

FEATURES

- Class 0.2, real-time measurement of key electrical parameters;
- Protection for overcurrent, over/undervoltage, etc. (including residual current);
- 2 channels relay outputs (custom logic);
- 2 channels passive digital inputs;
- 4 channel temperature monitoring (equipment/cabinet protection);
- 2 channels residual current detection (electrical fire detection);
- Supports RS485 Modbus RTU communication;
- Built-in sound-light alarm; manual mute/reset/self-test;

APPLICATIONS

- Feeder protection/monitoring in low-medium voltage systems;
- Industrial cabinet: electrical fire prevention & fault isolation;
- Protection for transformers, generators, motors;
- Data acquisition for SCADA, EMS, power management platforms;
- Safety monitoring: smart buildings, industrial plants, etc;

2.- Technical parameters

Working power	
Power grid mode	1P2W, 3P3W, 3P4W
Power supply	85-265VAC/DC, 45-65Hz
Consumption	≤5VA
Data refresh frequency	1S
Voltage input	
Rated value	100V/220V/380V
Overload	1.2Un
Power consumption	<0.2VA
Impedance	0.5MΩ
Current input	
Rated value	AC 100mA, 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
Residual current	1%
Temperature	±2℃
Frequency	±0.02Hz
Active energy	0.5S
I/O capacity	
DI	2 channels, dry contact, Ri<500Ω turns on, Ri>100kΩ turns off
DO	2 channels, contact capacity: 5A@250VAC; 5A@30VDC, isolation voltage: 2500VAC
Communication	RS485, Modbus-RTU, baud rate 1200-19200bps

Pulse output	1 channel, pulse width 80ms, photoelectric isolation
Safety	
Pollution degree	2
Overvoltage category	CAT III@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°C ~ +55°C; RH 5% ~ 95% (non-condensation)
Storage temperature	-40°C ~ +85°C; RH 5% ~ 95% (non-condensation)
Others	
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.

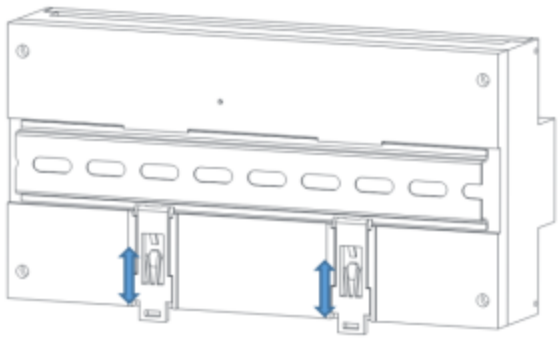
3.1.- Installation

Mounting: MPR-6M 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.

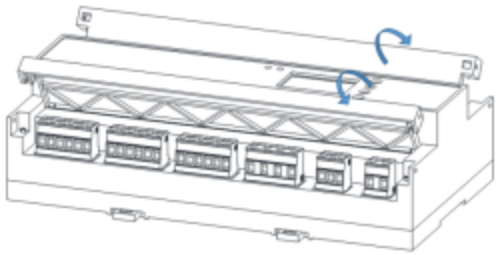
Step-2 Use the white plastic clips on the back of the MPR-6M meter to clip the meter onto the rail.

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

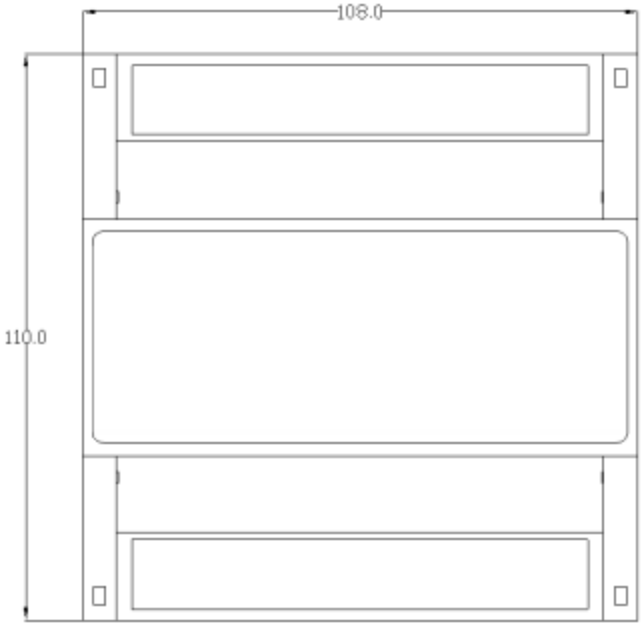


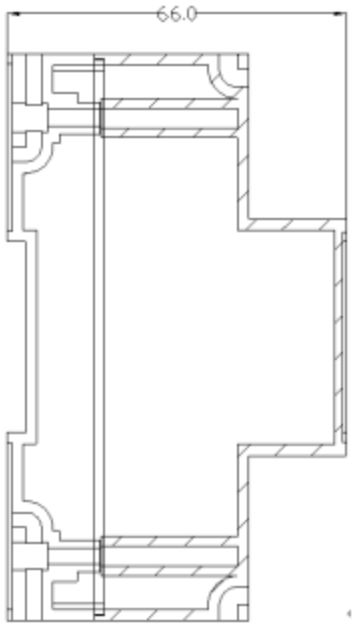
There are two flaps covers, can be sealed by lead wire to protect unauthorized access terminal block, to achieve physical anti-theft function. Also capable of completely shielding the terminal head to prevent accident electrical shock.

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: MPR-6M 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 MPR-6M.
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.

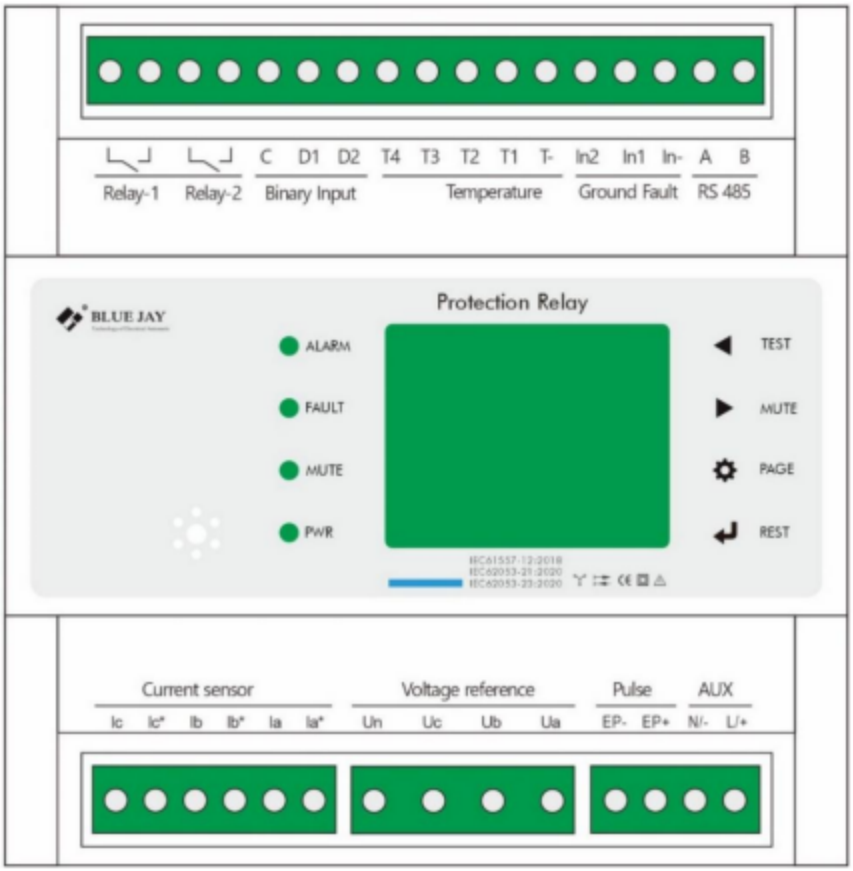
D. Auxiliary power

MPR-6M 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:

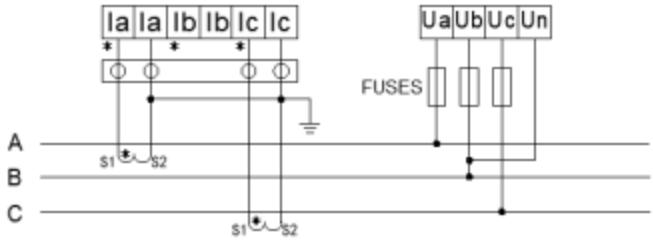
Marked	Notes
Relay 1-2	2 channels digital output
C, D1-2	Common terminal, 2 channels digital input
T-, T1-T4	Temp sensor negative pole, 4 channels temperature sensor input
In-, In1- In2	Leakage current CT negative pole, 2 channels leakage current CT input
A, B	RS485 communication

Lower terminal:

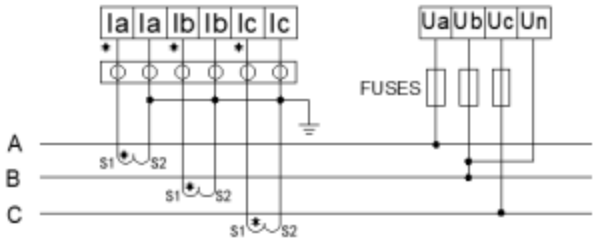
Marked	Notes
Ia*, Ia - Ic*, Ic	A B C phase current sensor input +/-
Ua, Ub, Uc, Un	A B C phase voltage input Neutral Voltage input
EP+, Ep-	Active energy pulse output+/-
L, N	AUX input 85-265Vac/dc+/-

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

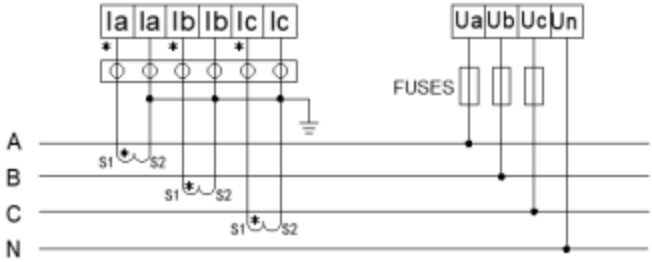
3.3.- Typical Wiring



3P3W(2CT)



3P3W(3CT)



3P4W(3CT)

Note:

- The current direction is defined as flowing from terminal Ia* (positive pole) to Ia (negative pole).
- 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 "◀" button to manual self-test.

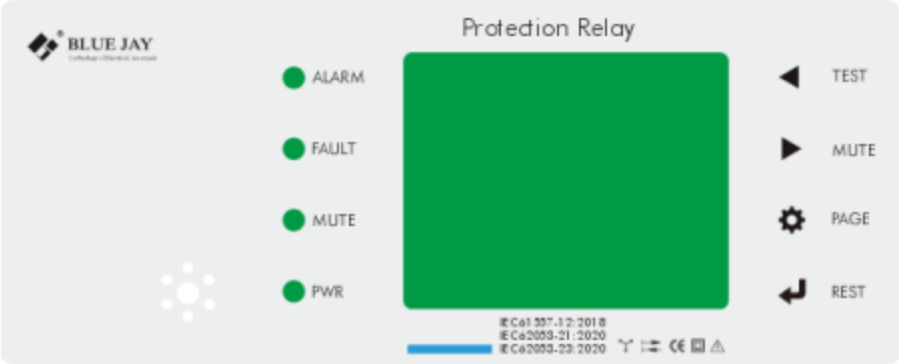
Button	In Monitor Screen	In Config. Menu
◀ TEST	Enter self-test	Move to the previous page or move cursor
▶ MUTE	Manually enter/ exit mute state	Move to the next page or scroll selection number 0 ~ 9
⚙ PAGE	Switch from the main measurement screen to the configuration menu	Move back to up level menu.
↵ 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.
PWR	Power indicator for showing the meter is powered on and operating normally.

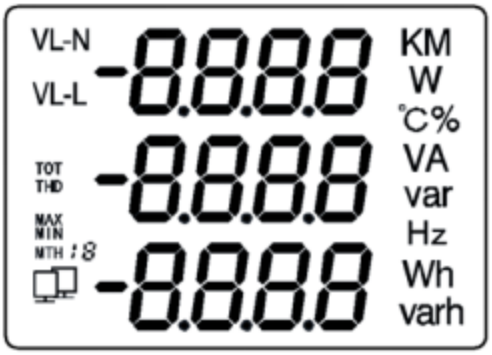
Note:

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 6.9**) or through RS485 Modbus protocol.

5.- SCREEN DISPLAY

5.1.- Overall screen:



VL-N: Phase to phase voltage

VL-L: Phase to line voltage

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**
- 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 -		**Real-time clock (RTC)** Row 1: Year Row 2: Month Row 3: Date Press " ↵ " key to shows: Hour, Minute and Second
- 9 -		**Leakage current** "I1-2" indicates the residual current of the 1st and 2nd channels Row 2: the 1st channel residual current is 0.046A Row 3: the 2nd channel residual current is 0.057A
- 10 -		**Temperature of channel 1-2** t1 = 24.6°C t2 = 24.3°C
- 11 -		**Temperature of channel 3-4** t1 = 24.5°C t2 = 24.4°C
- 12 -		**DI/DO Status** Row 2: shows DI status Row 3: shows DO status "0": open, "1": closed.

- 13 -		Alarm prompt It means leakage alarm on channel 1, Alarm value is 0.634A

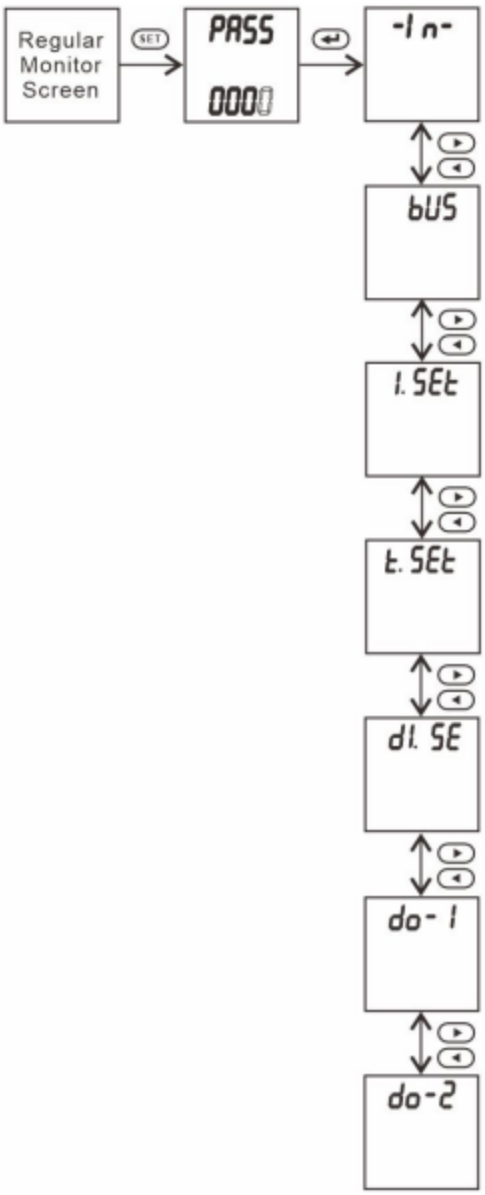
Note:

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 MPR-6M 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

Residual current setup

Refer to chapter 6.4

Temperature setup

Refer to chapter 6.5

Digital input setup

Refer to chapter 6.6

Digital output 1 and 2 setup

Refer to chapter 6.7

System parameter setup

Refer to chapter 6.8

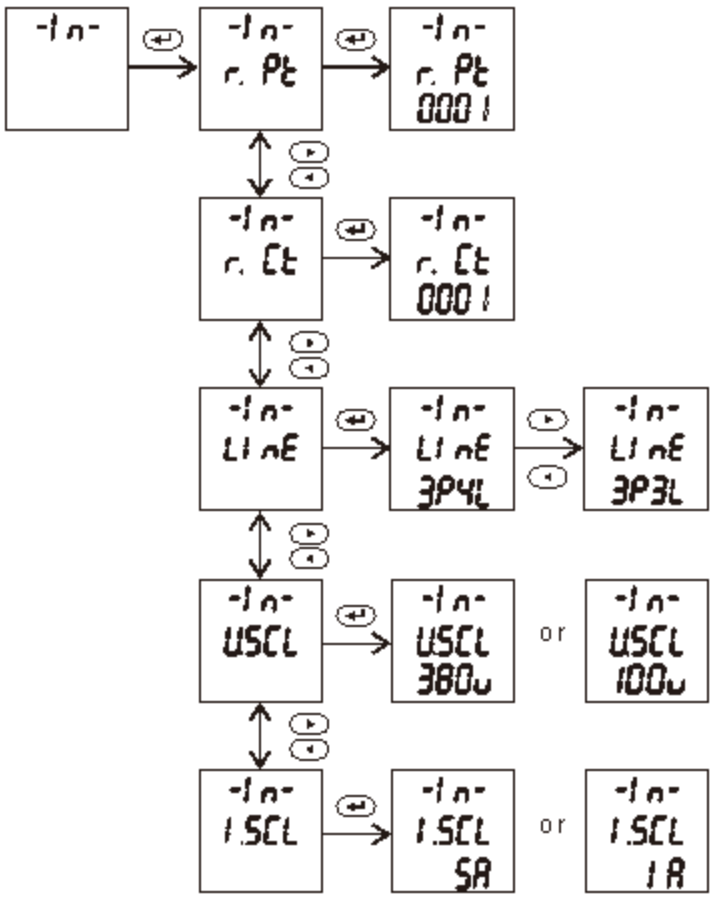
Sequence of DI/DO event records
Sequence of alarm event records

Refer to chapter 6.9

RTC setup

Refer to chapter 6.10

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

Notes:

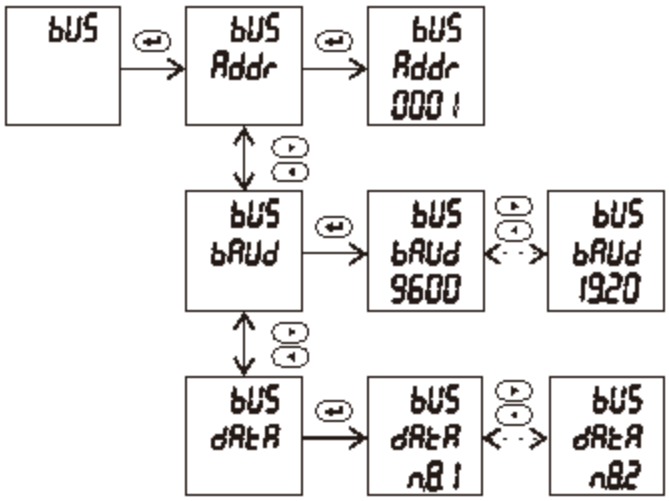
(1) In medium or high voltage system, set this value can expand measuring range, values represent the current transformer (primary side voltage) / (secondary side current). Must set **U.scl** in 100V or other specified VT secondary voltage.

(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

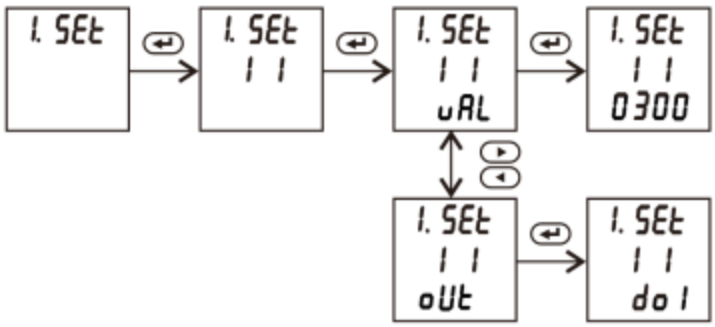
Default **n.8.1,** can select n.8.1 / E.8.1 / n.8.2

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.- Residual current setup



Alarm value

Range: 20~3000 mA,
Default 300mA, Step 1mA

Alarm output mode

OFF/ DO1/ DO2

The alarm threshold should be set at least twice the normal leakage current of the protected circuit, and not exceed 3000mA. In multi-level protection systems, upstream settings must be greater than or equal to downstream settings.

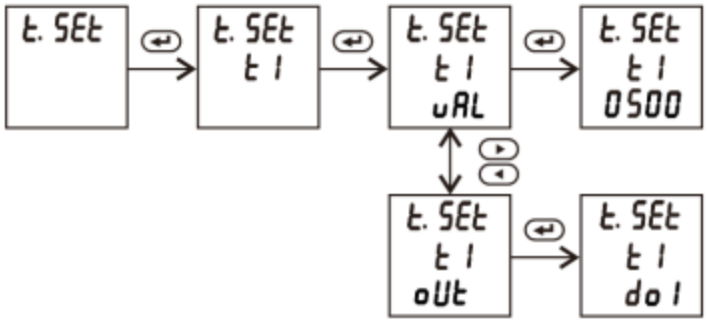
Modes:

"OFF": Only monitors real time residual current value, no alarm or action is taken.

"DO1/ DO2": When residual current value exceeds the preset value and delay time will trip alarm screen and relay output DO1/ DO2 ,manual reset is required after the fault is cleared.

I 2 setup is the same as I 1.

6.5.- Temperature setup



Alarm value

Range: 40 ~ 140°C,
Default 50°C, Step 0.1°C

Alarm output mode

OFF/ DO1/ DO2

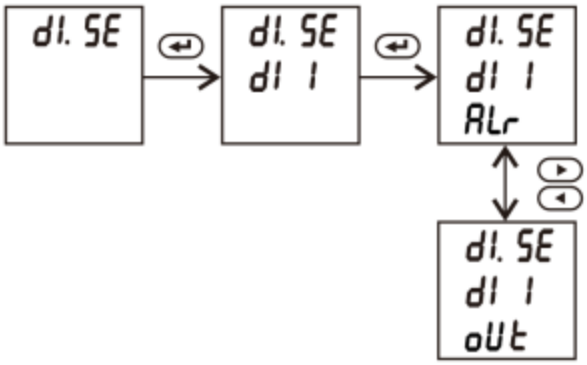
Modes:

"OFF": Only monitors real time temperature value, no alarm or action is taken.

"DO1/ DO2": When temperature value exceeds the preset value and delay time will trip alarm screen and relay output DO1/ DO2 ,manual reset is required after the fault is cleared.

T2, T3, T4 setup is the same as T1.

6.6.- 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

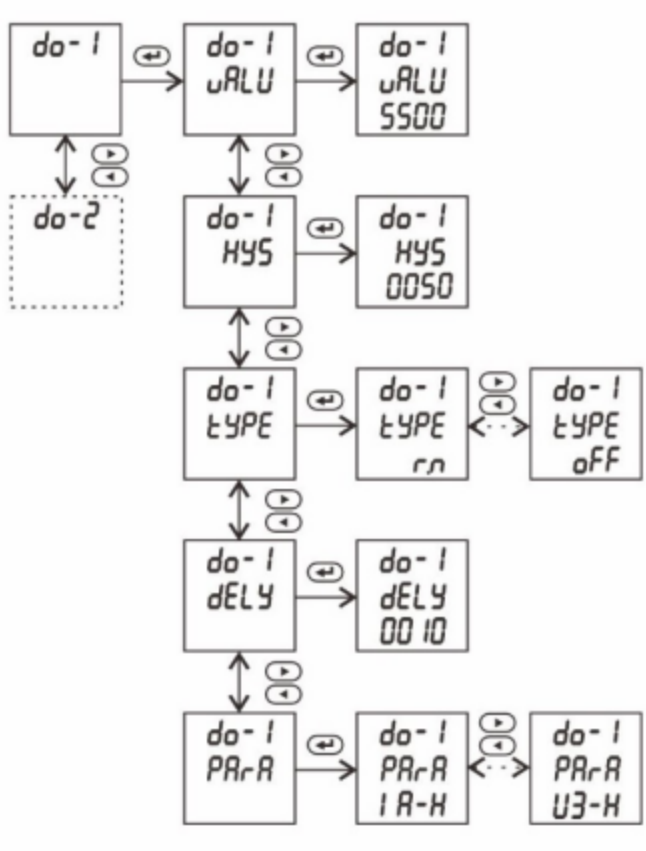
Selects the output channel as DO1 or DO2 or disables the output (OFF).

DI 2 setup is the same as DI 1

6.7.- Digital Output Setup

When 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)*

rn Remote
ALr Auto Trig
oFF Turned Off

Default **r.n**

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.

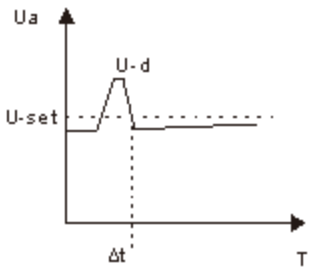
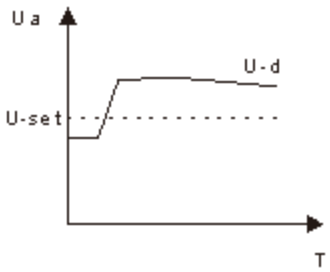
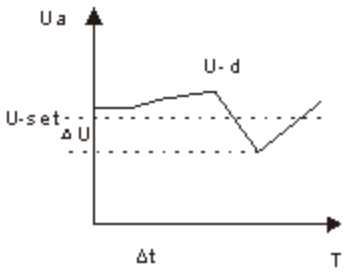
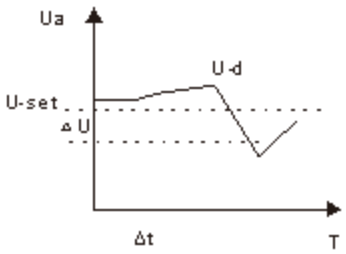
UA-H	A phase voltage upper trig	Pb-H	B phase reactive power upper trig
Ub-H	B phase voltage upper trig	PC-H	C phase reactive power upper trig
UC-H	C phase voltage upper trig	PS-H	Total reactive power upper trig
U3-H	Any one of Ua / Ub / Uc3 upper trig	SA-H	A phase apparent power upper trig
IA-H	A phase 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.

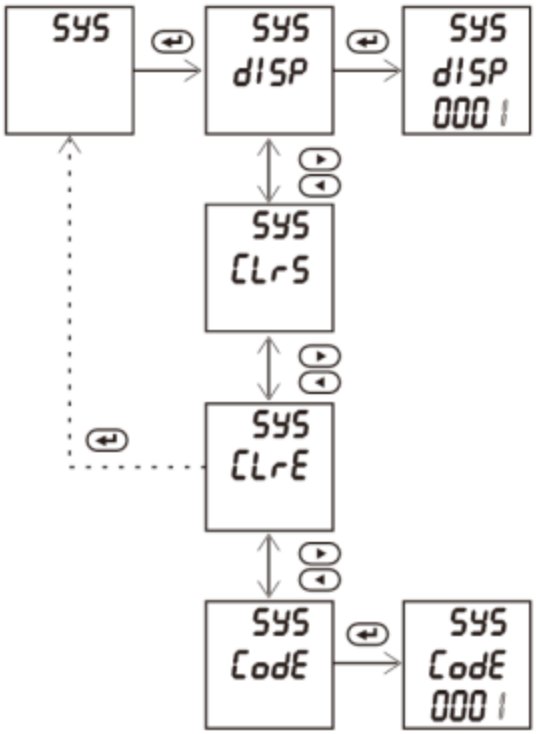
*** Delay & Hysteresis logic**

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

6.8.- 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.

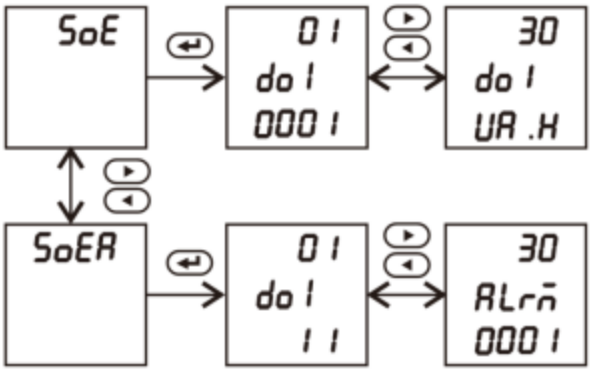
(2) Press ↵ device will roll back to **SYS** root menu, only in the exit screen press ↵ to trigger clear operation!

(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.

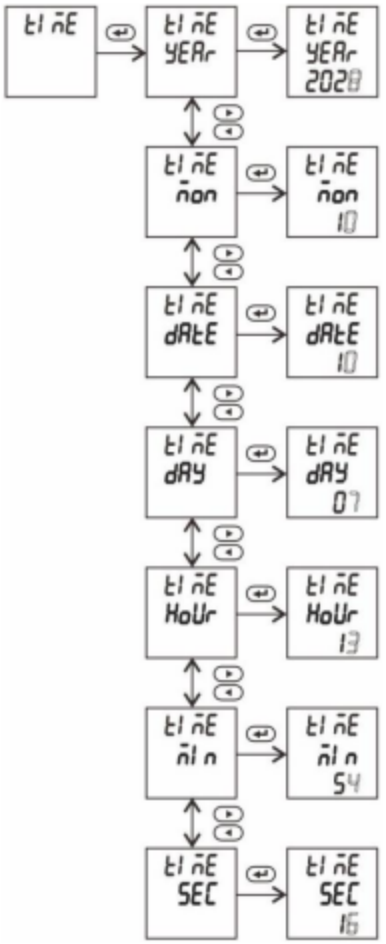
6.9.- SOE record (Read only)



Sequence of DI/DO event records, max 30 lists

Sequence of alarm event records, max 30 lists

6.10.- RTC Setup



Year

Month

Date

Day

Hour

Minute

Second

Notes:

(1) The day 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.

6.11.- Main 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	t.SEt	(T set) Temperature protection setting
I 1	(I 1) The first channel residual current	oUt	Digital output setting
ALr	(Alarm) Alarm mode	t 1	(T1) The first channel temperature
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
oPEn	Open circuit fault	dELu	Delay setting
ClrE	Clear electric energy	SYS	System settings menu
CodE	Enter password	ClrS	Clear SOE
SAuE	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

MPR-6M 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 MPR-6M... and the master unit. This Bus may connect to a maximum of 32pcs MPR-6M...

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- read only

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- read only

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.- Device status data- read only

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

Read and write

Register	Data	Byte mode		Instruction
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- read only

Register	Data	Byte mode		Instruction
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

8.3.5.- Leakage current, temperature, DI/DO status, RTC, -read only

Reg.	Data	Byte mode		Instruction
0x1000	Channel 1 residual current RMS value	int	1	The lowest bit represents 0.1mA. For example, the read value is 235, means the actual value is 23.5mA.
0x1001	Channel 2 residual current RMS value	int	1	
0x1002	Channel 3 residual current RMS value	int	1	
0x1003	Channel 4 residual current RMS value	int	1	
0x1004	Channel 1 residual current senser present status	int	1	0: Normally 1: Alarm status 2: Sensor short circuit 3: Sensor disconnection
0x1005	Channel 2 residual current senser present status	int	1	
0x1006	Channel 3 residual current senser present status	int	1	
0x1007	Channel 4 residual current senser present status	int	1	
0x1008	Channel 5 residual current RMS value	int	1	Same as above
0x1009	Channel 6 residual current RMS value	int	1	
0x100A	Channel 7 residual current RMS value	int	1	
0x100B	Channel 8 residual current RMS value	int	1	
0x100C	Channel 5 residual current senser present status	int	1	Same as above
0x100D	Channel 6 residual current senser present status	int	1	
0x100E	Channel 7 residual current senser present status	int	1	
0x100F	Channel 8 residual current senser present status	int	1	
0x1010	Channel 1 temperature value	int	1	The lowest bit represents 0.1°C. For example, the read value is 173, means the actual value is 17.3°C.
0x1011	Channel 2 temperature value	int	1	
0x1012	Channel 3 temperature value	int	1	
0x1013	Channel 4 temperature value	int	1	
0x1014	Channel 1 temperature senser present status	int	1	0: Normal 1: Alarm status 2: Sensor short circuit 3: Sensor disconnection
0x1015	Channel 2 temperature senser present status	int	1	
0x1016	Channel 3 temperature senser present status	int	1	
0x1017	Channel 4 temperature senser present status	int	1	
0x1018	Channel 5 temperature value	int	1	Same as above
0x1019	Channel 6 temperature value	int	1	
0x101A	Channel 7 temperature value	int	1	
0x101B	Channel 8 temperature value	int	1	
0x101C	Channel 5 temperature senser present status	int	1	Same as above
0x101D	Channel 6 temperature senser present status	int	1	

0x101E	Channel 7 temperature senser present status	int	1	
0x101F	Channel 8 temperature senser present status	int	1	
0x1020	Digital input value	int	1	0: open; 1: closed Bit0~2: Channel 1-2 DI status
0x1021	Channel 1 DI present status	int	1	0: Normal; 1: Alarm status (Note: When alarm function turned off, will not enter alarm status)
0x1022	Channel 2 DI present status	int	1	
0x1030	Digital output value	int	1	0: open; 1: closed Bit0~2: Channel 1-2 DO status
0x1040	Year	int	1	Internal RTC real-time: year-month-date-hour-minute-second-day
0x1041	Month	int	1	
0x1042	Date	int	1	
0x1043	Hour	int	1	
0x1044	Minute	int	1	
0x1045	Second	int	1	
0x1046	Day	int	1	0: Sunday 1: Monday 2: Tuesday…

8.3.6.- Leakage current, temperature, DI/DO status, RTC- read and write

Reg.	Data	Byte mode		Instruction
0x1100	Channel 1 residual current alarm value	int	1	Range: 20-3000, unit: mA
0x1101	Channel 2 residual current alarm value	int	1	
0x1102	Channel 3 residual current alarm value	int	1	
0x1103	Channel 4 residual current alarm value	int	1	
0x1104	Channel 1 residual current alarm action	int	1	After alarms, the output action: 0: No action; 1: DO1 action; 2: DO2 action
0x1105	Channel 2 residual current alarm action	int	1	
0x1106	Channel 3 residual current alarm action	int	1	
0x1107	Channel 4 residual current alarm action	int	1	
0x1108	Channel 5 residual current alarm value	int	1	Same as above
0x1109	Channel 6 residual current alarm value	int	1	
0x110A	Channel 7 residual current alarm value	int	1	
0x110B	Channel 8 residual current alarm value	int	1	
0x110C	Channel 5 residual current alarm action	int	1	Same as above
0x110D	Channel 6 residual current alarm action	int	1	
0x110E	Channel 7 residual current alarm action	int	1	
0x110F	Channel 8 residual current alarm action	int	1	
0x1110	Channel 1 temperature alarm value	int	1	Range: 400-1400, unit: °C
0x1111	Channel 2 temperature alarm value	int	1	
0x1112	Channel 3 temperature alarm value	int	1	
0x1113	Channel 4 temperature alarm value	int	1	
0x1114	Channel 1 temperature alarm action	int	1	After alarms, the output action: 0: No action; 1: DO1 action; 2: DO2 action
0x1115	Channel 2 temperature alarm action	int	1	
0x1116	Channel 3 temperature alarm action	int	1	
0x1117	Channel 4 temperature alarm action	int	1	
0x1118	Channel 5 temperature alarm value	int	1	Same as above
0x1119	Channel 6 temperature alarm value	int	1	

0x111A	Channel 7 temperature alarm value	int	1	
0x111B	Channel 8 temperature alarm value	int	1	
0x111C	Channel 5 temperature alarm action	int	1	Same as above
0x111D	Channel 6 temperature alarm action	int	1	
0x111E	Channel 7 temperature alarm action	int	1	
0x111F	Channel 8 temperature alarm action	int	1	
0x1120	DI 1 Alarm ON/OFF	int	1	After the corresponding DI channel is closed, whether to enter the alarm mode 0: No alarm 1: Alarm
0x1121	DI 2 Alarm ON/OFF	int	1	
0x1123	DI 1 Alarm action	int	1	After alarms, the output action: 0: No action; 1: DO1 action; 2: DO2 action
0x1124	DI 2 Alarm action	int	1	
0x1130	DO 1 trip mode	int	1	0: Remote (by RS485 command) 1: Auto trip 2: Turn off
0x1131	DO 2 trip mode	int	1	
0x1132	DO 1 trip delay time	int	1	Range: 1-9999, unit 0.1s
0x1133	DO 2 trip delay time	int	1	
0x1134	DO 1 trip parameters	int	1	See the note table below
0x1135	DO 2 trip parameters	int	1	
0x1136	DO 1 trip threshold value	int	1	Range: 0-9999
0x1137	DO 2 trip threshold value	int	1	
0x1138	DO 1 trip hysteresis value	int	1	Range: 0-9999
0x1139	DO 2 trip hysteresis value	int	1	

Note:

0: UA upper alarm	15: QA upper alarm	
1: UB upper alarm	16: QB upper alarm	27: UA upper alarm
2: UC upper alarm	17: QC upper alarm	28: UB upper alarm
3: UAB upper alarm	18: Total reactive power upper alarm	29: UC upper alarm
4: UBC upper alarm	19: SA upper alarm	...
5: UCA upper alarm	20: SB upper alarm	52: DI1 close alarm
6: UA/UB/UC upper alarm	21: SC upper alarm	53: DI2 close alarm
7: IA upper alarm		54: Corresponding alarm code
8: IB upper alarm	22: Total apparent power upper alarm	
9: IC upper alarm	23: Total power factor upper alarm	
10: IA/IB/IC upper alarm	24: Frequency upper alarm	
11: PA upper alarm	25: DI1 close alarm	
12: PB upper alarm	26: DI2 close alarm	
13: PC upper alarm		
14: Total active power upper alarm		

8.3.7.- SOE record- read only

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	100: Remote control action	128: UA upper alarm
3: DI3	101: UA upper alarm	129: UB upper alarm
4: DI4	102: UB upper alarm	130: UC upper alarm
5: DI5	103: UC upper alarm	...
6: DI6	104: UAB upper alarm	154: DI1 status
	105: UBC upper alarm	155: Alarm event
	106: UCA upper alarm	
101: DO1	107: UA/UB/UC upper alarm	
102: DO2	108: IA upper alarm	
103: DO3	109: IB upper alarm	
104: DO4	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	

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**

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 MPR-6M 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 MPR-6M, 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