MDM3100 Multifunction Power Meter

Operation Manual

Preface

Thank you for choosing our products.

Packing list:

1. Multifunction Power Meter	1 unit
2. Installation Component	1 pair
3. User Manual	1 copy
4. QA Certificate	1 piece
5. Software	1 copy

Please read the user manual before installing, operating and maintaining the instruments.

Declaration

This manual represents your Multifunction Power Meter as manufactured at the time of publication. It assumes standard software. Special versions of software may be fitted, in which case you will be provided with additional details.

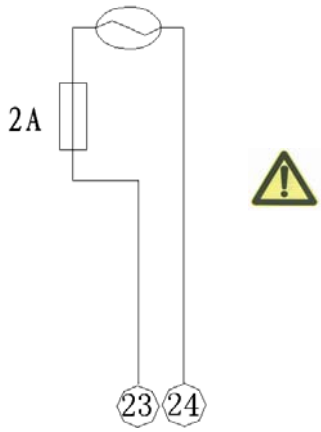
Every effort has been made to ensure that the information in this manual is complete and accurate. We updated this manual but cannot be held responsible for errors or omissions.

We reserve the right to make changes and improvements to the product without obligation to incorporate these changes and improvements into units previously shipped.

Warning Notice

Multifunction Power Meter shall function properly under the following working conditions:

1. Auxiliary power supply: 85~265VAC/DC. Multifunction Power Meter might be damaged or function improperly if the power supply is out of range.
2. For the secondary measurement, line Voltage range is 0~693V, phase Voltage range 0~400V, Current range 0~6A. Multifunction Power Meter might be damaged or function improperly if the measurement is out of above range.
3. Please wire the meter strictly following the wiring connection in the manual.
4. Operation Temperature: -20℃~60℃. Multifunction Power Meter might be damaged or function improperly if the temperature is out of range.



Multifunction Power Meter power connection diagram

Auxiliary power supply: 85~265VAC/DC

Please allow the trained expert to do the installation, operation, or maintenance work.

The sign indicates there is potential electrical power danger, which might result in the harm if not following the rule.

The safety warning sign is to remind you the potential danger.

For your safety reason, please properly use our products. It is strongly recommended that you follow the instructions:

1. Please connect to the power and load as rated in label.
2. Please confirm that the wire is connected correct, to avoid the harm resulting from the wrong connection.
3. Please turn off the power system before the maintenance of the meter.
4. Please avoid use with high Voltage and big Current.

Table of Contents

I. Product Description

1.1 Profile

Multifunction Power Meter is a meter with modular design, which can be applied for monitoring and controlling of the electrical system. It can measure and analyze real time data, such as U, I, P, Q, S, COSΦ, F, kWh, kvar, etc. Multifunction Power Meter has the following functions: RS-485 communication port, 2 Energy pulse output (include active Energy and reactive Energy), Max/min data record, and SOE event record. It can extend functions by choosing the external optional modules: harmonic analysis, 8 remote signals on/off mode, programmable 4 analog outputs (0~5V or 4~20mA optional), data storage, Profibus Com. protocol, Ethernet communication functions. The multi-tariff function allows the user to measure Energy in any interval (the min. interval is 30min.), which can read the sum, sharp, peak, valley, flat Energy data in 30 days, and measure 2^{nd} to 63^{rd} harmonics in statistics.

All our instruments fulfill all important requirements and regulations concerning electromagnetic compatibility and safety isolation (IEC61000, IEC1010 standard and EN61010 standard). The devices have been developed, manufactured and tested in accordance with Quality Assurance System ISO 9001.

1.2 Measured Scope

Multifunction Power Meter can be applied in single phase, 3P3W, 3P4W system. It can be applied vastly in the field of secondary measurement in high Voltage, low Voltage system, or transmission of measured data.

1.3. Function Description

Item			Description
Main unit	Real time measurement	Phase Voltage	Phase Voltage, average phase Voltage
		Line Voltage	Line Voltage, average line Voltage
		Current	Phase Current, average phase Current, zero sequence Current
		Active Power	Phase active Power, 3 phase total active Power
		Reactive Power	Phase reactive Power, 3 phase total reactive Power
		Apparent Power	Phase apparent Power, 3 phase total apparent Power
		Power 4 quadrant	Power 4 quadrant
		Frequency	System frequency

		Power factor	Phase Power factor, 3 phase average Power factor
	Demand statistic	Demand	3 phase active/reactive Demand
	Energy reading	Active Energy	Imported, exported and net active Energy, 1 channel active Energy pulse output
		Reactive Energy	Imported, exported and net reactive Energy, 1 channel reactive Energy pulse output
		Multi tariff billing	Multi tariff setup
	Time display	Real time display	Year/month/day/hour/minute/second
	Data communication	RS-485 communication	1 Modbus-RTU protocol
Optional module	Remote signal input module	8 channels	Status detection, SOE event record
	Relay output module	4 channels programmable overlimit/underlimit alarm	Programmable over limit value for real time measurement, Voltage unbalanced ratio, Demand value (the default setting is manual mode). The overlimit/underlimit command can be read thru com. port.
	Analog output module	4 channels programmable	4-20mA or 0-5V. Programmable output corresponding real time measurement (the default setting is Ua).
	Data storage module	Storage capacity: 2GB	Store real time measured value in cycle, Voltage/Current unbalanced ratio, Demand value, Energy, harmonics, and remote signal.
	Harmonic analysis module	Total harmonic distortion for Voltage/Current	3 phase, single phase, neutral line
		Even/odd harmonic distortion	Harmonic distortion (2nd to 63rd)
		Fundamental Voltage / Current	Magnitude, phase angle
		Fundamental active /reactive Power	
		Harmonics, individual	Magnitude, phase angle
		Current K factor	Each phase
	Profibus communication module	1channel	Profibus protocol
	Ethernet networking communication module	1 channel	10M/100M adaptable
			Based on the Ethernet Modbus RTU protocol/Modbus TCP/IP protocol

1.4 Measured Accuracy

Parameter	Display	Direction	Accuracy
Voltage	0～9999.9kV		Class 0.2; Scope: 5%~100%V
Current	0～9999.9kA		Class 0.2; Scope: 5%~100%A
			Zero sequence Current Class 0.5
Power Factor	-1～＋1	Directional	Class 1.0
Frequency	45～65Hz		±0.01Hz
Active Power	-9999～9999MW	Directional	Class 0.5
Reactive Power	-9999～9999Mvar	Directional	Class 0.5
Apparent Power	0~9999MVA		Class 0.5
Active Demand	-9999～9999MW		Class 1.0
Reactive Demand	-9999～9999Mvar		Class 1.0
Active Energy	0~9999999.99MWh	Directional	Class 1.0
Reactive Energy	0~9999999.99Mvarh	Directional	Class 2.0
Phase Angle	0.0°~359.9°	Directional	Class 2.0
Current Total Harmonic %	0~100%		Class 2.0
Voltage Total Harmonic %	0~100%		Class 2.0

1.5 Technical Specification

Input Current	
Input Current: 5A (Current value can be set up) Measurement scope: 0.5%～120% Overload capacity: 2 X rated continuously, 100A/1s non continuously Power consumption: ≤0.2VA per phase	
Voltage Input	
Input Voltage: 400VAC (L-N) , 693VAC (L-L) (Voltage value can be set up) System frequency: 45～65Hz Measurement scope: 3%～120% Overload capacity: 2 X rated continuous, 2500V/1s non continuous Power consumption: ≤0.5VA per phase	
Remote Input (Optional)	
Input channels	8 channels or customized
Input type	Dry contact
Isolated Voltage	2500VAC

Relay Output (Optional)	
Output channels	4 channels programmable or customized
Output type	Mechanic contact, constant on output
Contact capacity	5A/250VAC
Analog Output (Optional)	
No. of outputs Output signal Response time Isolated Voltage	4 channels programmable 4～20mA or 0～5V is for selected. ≤400ms 2500V AC
Pulse Output (Standard)	
No. of outputs	2 channels (active/reactive Energy each without power)
Serial Com. Port (Standard)	
NO. of outputs Communication protocol Baud rate	1 RS-485 port Modbus-RTU protocol 2400/4800/9600/19200/38400bps
Profibus Com. Module (Optional)	
No. of channels Communication protocol	1 channel Profibus-DP protocol
Ethernet Networking Module (Optional)	
No. of channels Communication protocol	1chanel Based on the Ethernet Modbus RTU protocol/Modbus TCP/IP protocol

Other Parameters	
Auxiliary Power	85～265VAC/DC (30VDC is optional. When it is DC power, Terminal 23 is positive and terminal 24 is negative.)
Display module	LCD Display
Temp. drifting factor Withstand Voltage (Input against output) Total Power consumption Operation temperature Storage temperature Operation humidity Pollution Class Material of housing Protection Class	＜100PPM/℃ 2500V/1 min ＜8VA -20℃～60℃ -40℃～85℃ 5～95％ RH Class 2 Flammability acc. to UL94V0 IP 30
Main unit with module	92x112x114mm
Main unit	92x112x74mm
Installation size	91×91mm

1.6 Parameter Setup

The programmable parameters are: com. address, PT, CT, baud rate, clock, demand cycle, user password, multi-tariff rate, etc. The user can set up relay output, analog output on PC.

The parameters setup on meter and PC: com. address, PT, CT, baud rate, time, demand statistics, No. of remote signal, user password, multi-tariff, assistant module detection, Ethernet setup.

1.7 EMC and Safety Standard

- IEC61000-4-2 (GB/T17626.2)
- IEC61000-4-8 (GB/T17626.8)
- IEC61000-4-4 (GB/T17626.4)
- IEC61010-1 (GB/T4793.1)

1.8 Terminal Chart

8	L1	INPUT VOLTAGE		PULSE OUTPUT	Ep+	11
9	L2				Ep-	12
10	L3				EQ+	13
7	N				EQ-	14
1	I1*	INPUT CURRENT		RS-485	A+	15
2	I1				B-	16
3	I2*				Earth	17
4	I2					
5	I3*					
6	I3					
22	Earth	POWER				
23	L					
24	N					

Fig. 1 Terminal description

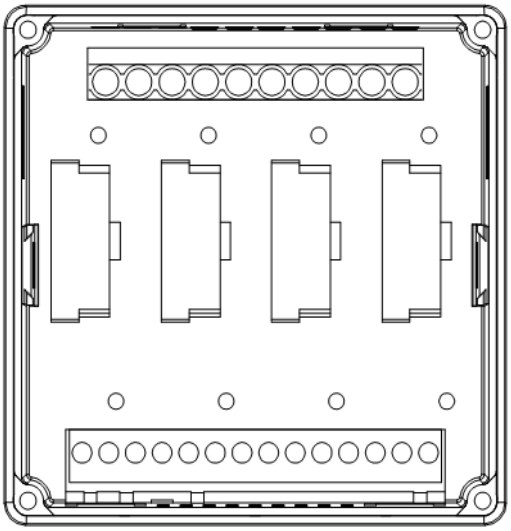


Fig. 2 Back-side diagram

Terminal Description Chart

Terminal No.	Description
No. 1～24	Terminal 1, 2, 3, 4, 5, 6 are Current In, marked as I1*, I1, I2*, I2, I3*, I3. Terminal 7, 8, 9, 10 are Voltage In, marked as N, L1, L2, L3. Terminal 11, 12 are a pair of active Energy pulse output, 11 as positive end, and 12 as negative end. Terminal 13, 14 are a pair of reactive Energy pulse output, 13 as positive end, and 14 as negative end. Terminal 15, 16, 17 are RS 485 com. 15 as A+, 16 as B-, 17 as RS-485 ground line. Terminal 18, 19, 20 are standby ends. Terminal 22, 23, 24 as auxiliary power input, 23 as L end, 24 as N end, 22 as ground line. It is recommended to connect the ground line.

1.9 Order Code

Multifunction Power Meter ----------

English code is filled above.
Up to 4 modules can be selected, nil means no optional unit is selected.

Module Code:

Module name	English code for ordering module with standard unit	Order code for ordering module alone
8 remote input signals module	A	101
4 relay output module	B	102
4 analog output module (4~20mA)	C	103
4 analog output module (0~5V)	D	104
Data storage module	E	105
Harmonic analysis module	F	106
Data storage and harmonics analysis module	G	107
Profibus communication module	H	108
Ethernet communication module	I	109

Code Description:

A means 8 remote input signals, while A# means 1-7 remote input signals, 1-7 can be selected. B means 4 relay output, while B# means 1-3 relay output, 1-3 can be selected. For example, A2 means 2 remote input signals, B2 means 2 relay output.

Note:

A max. of 4 modules can be applied to 1 main unit, and the same type of modules can't be selected together. C and D can't be selected at the same time; G, E or F can't be selected at the same time. When you purchase module with main unit, you can choose to install them together or package them separately.

1.10 Typical Wiring Diagram

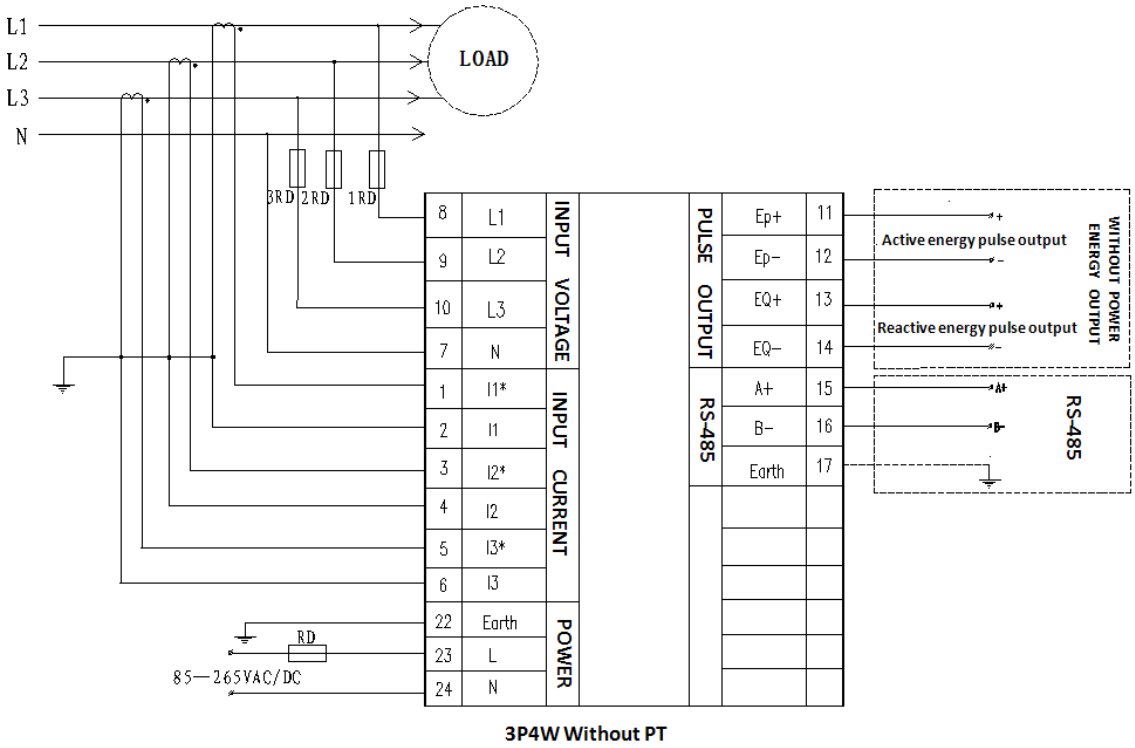


Fig. 3 3P4W without PT

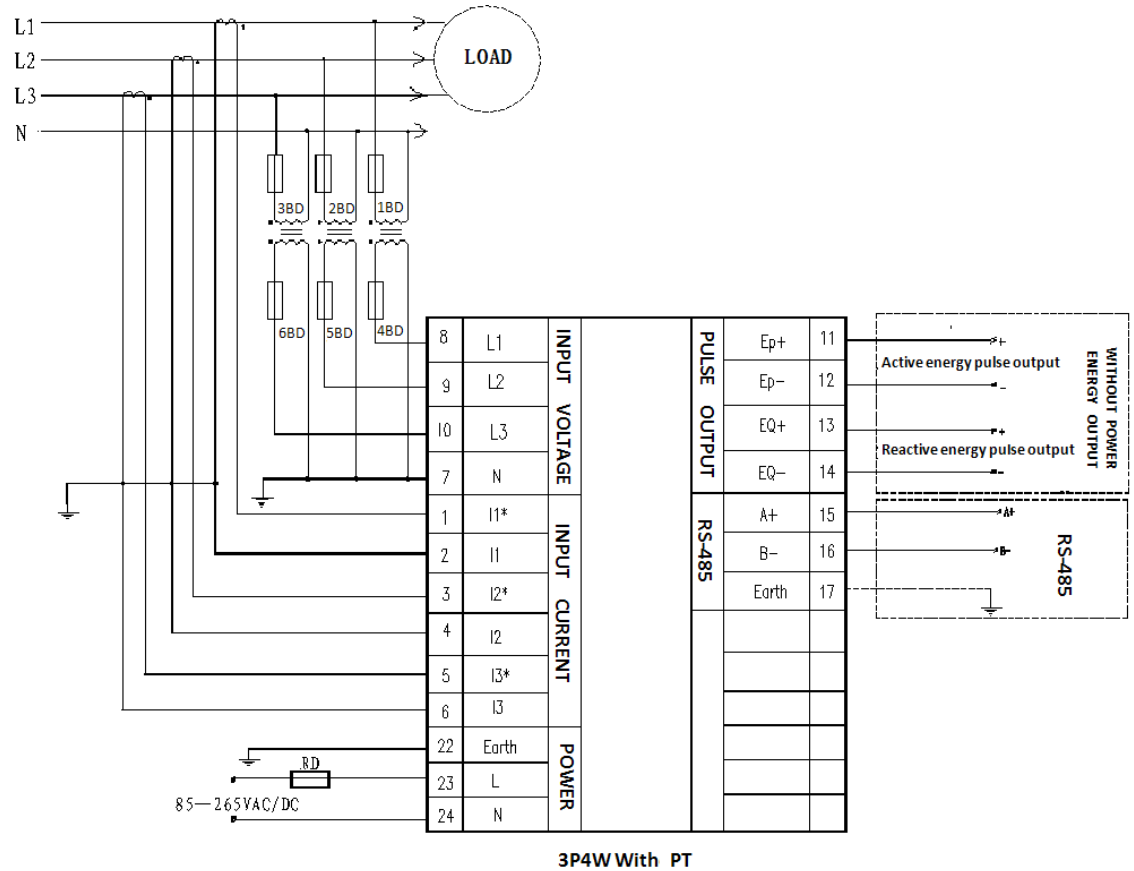


Fig. 4 3P4W with PT

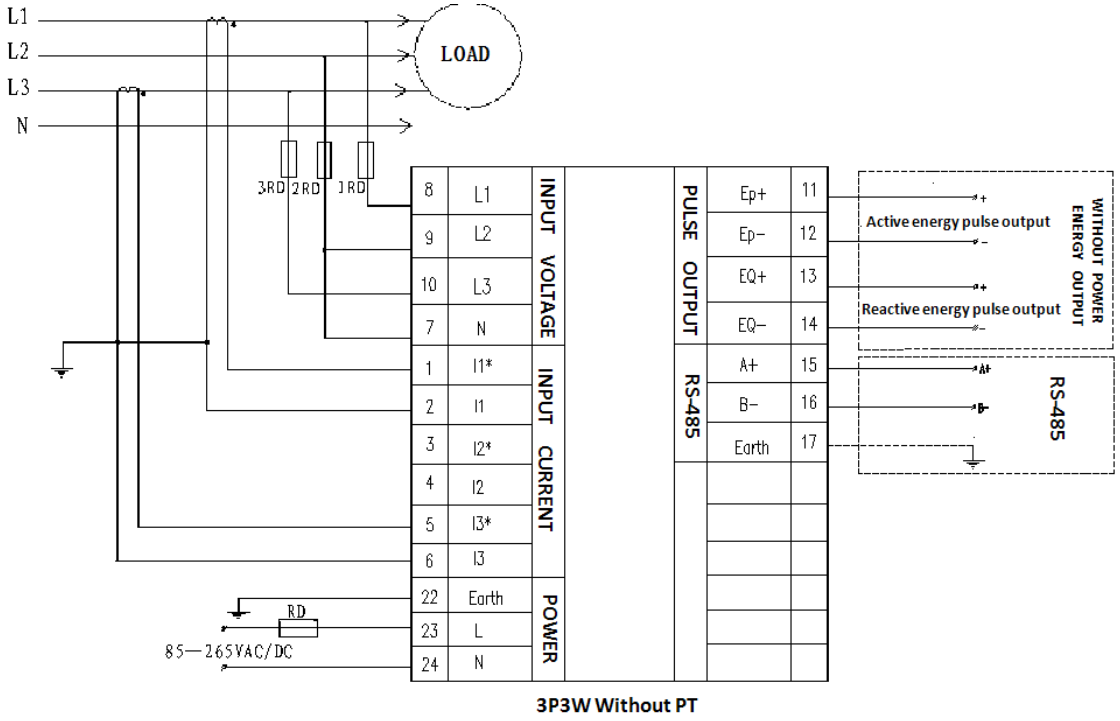


Fig. 5 3P3W without PT

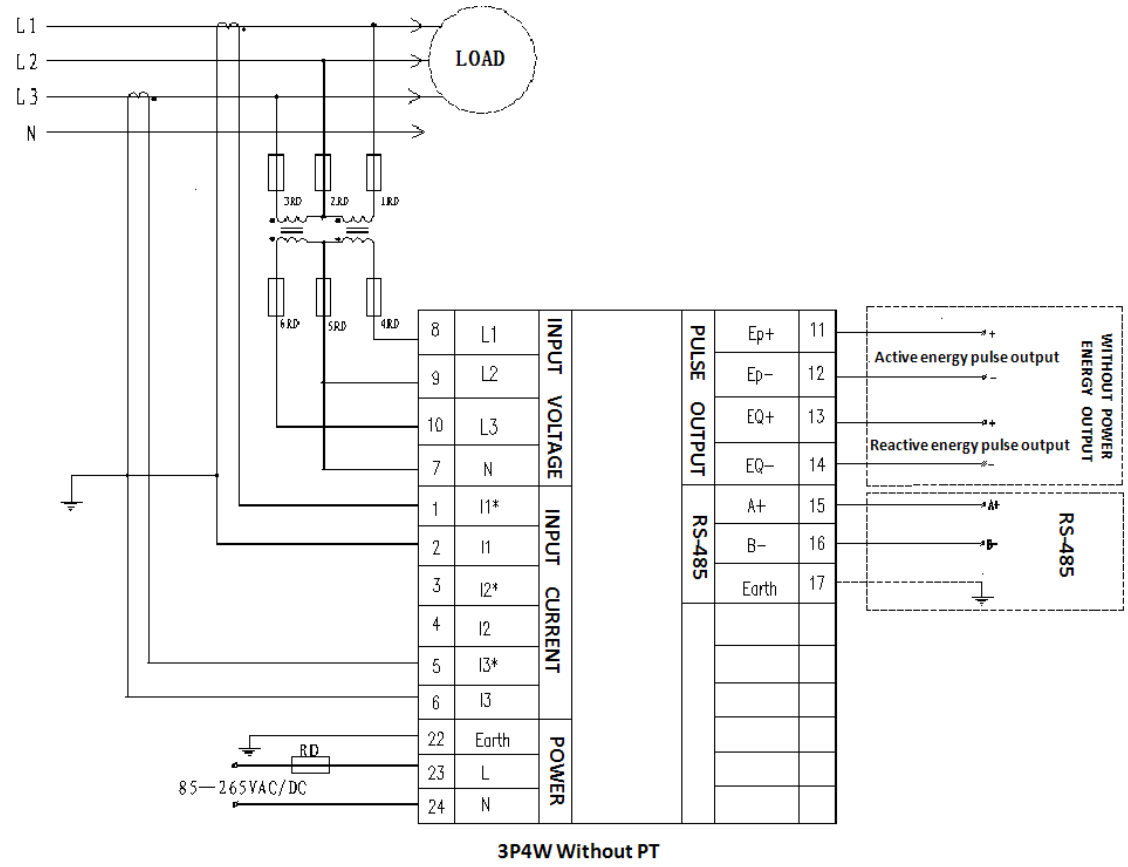


Fig. 6 3P3W with PT

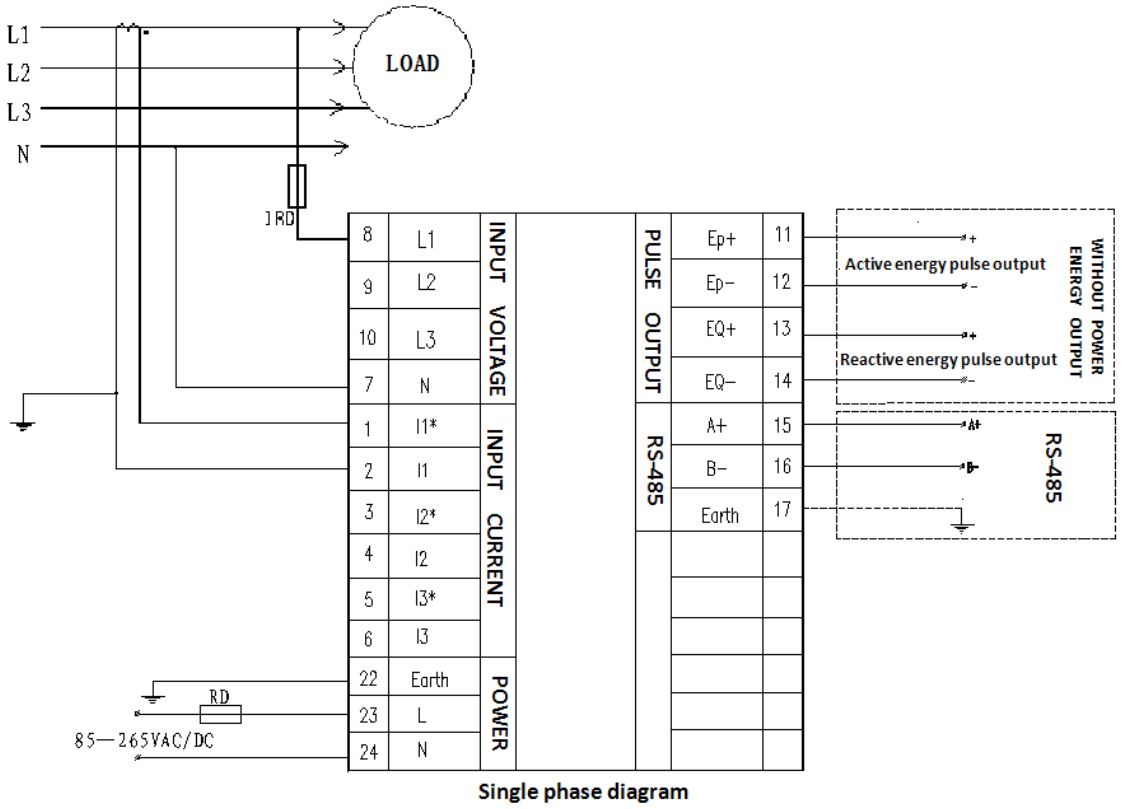


Fig. 7 Single phase diagram

Note: "*" is the Current in terminal. In single phase system, Voltage only connects to L1 and phase N. Current only connects Phase L1.

1.11 Installation

1. Exterior size: 96 mm×96 mm×72mm
2. Installation size: 91 mm×91mm

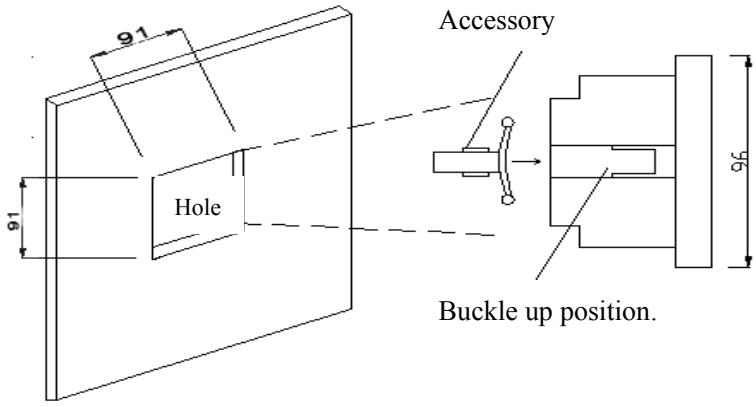


Fig. 8

During the installation, please insert the meter in the hole of the cabinet, then push and buckle up the meter with the installation accessories. It is strongly recommended there should be 20mm space around the surface of the meter for ventilation purpose.

1.12 Interface

1.12.1 Interface Description

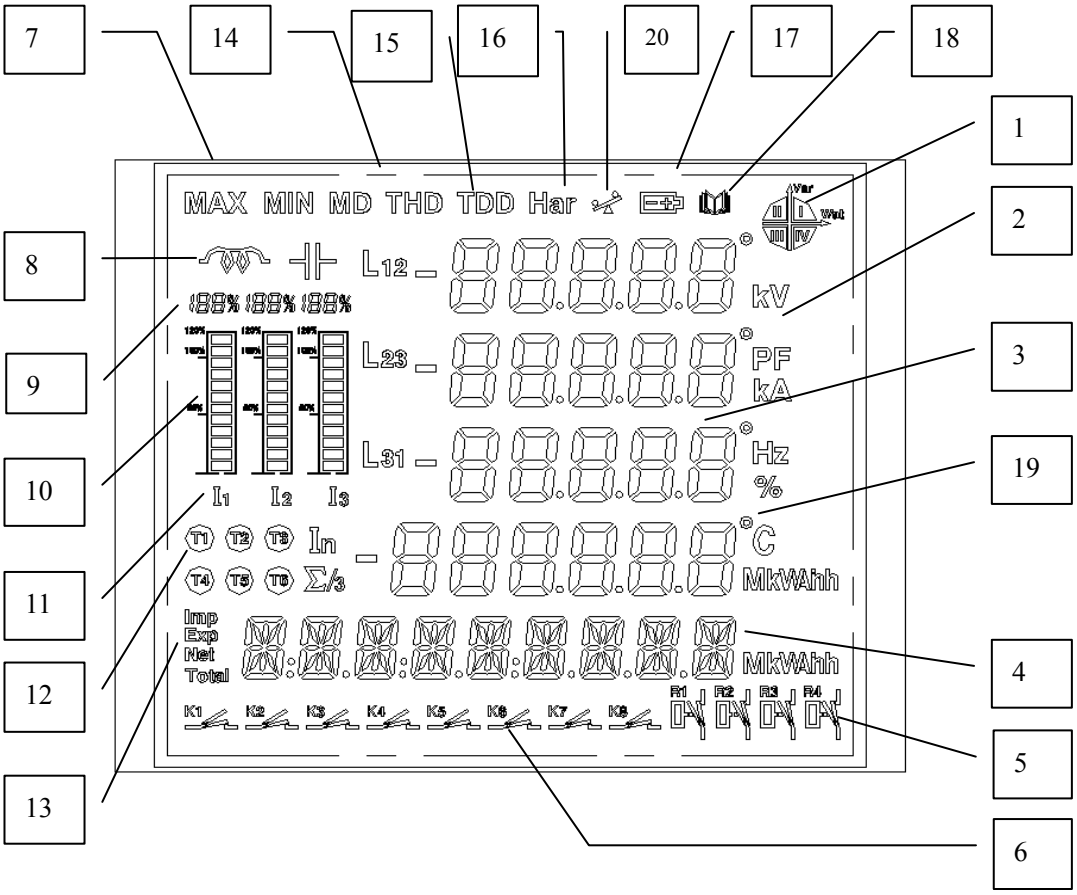


Fig. 9 Interface Description

No.	Display	Description
1	4 quadrants of Power	I, II, III, IV represents 4 quadrants. If " Ⅰ , III" are on, Power is inductive, if " II, IV" are on, Power is capacitive
2	Display unit	Displays Voltage unit V, kV; Power factor unit PF; Current unit A, kA; Frequency unit Hz; Active Energy unit kWh, MWh; Reactive Energy unit kvarh, Mvarh; Active Power unit kW, MW; Reactive Power unit kvar, Mvar.
3	4 rows of data "  " digits	Displays main measurement data: Voltage, Current, Power, Power factor, frequency, harmonic distortion rate, Demand, unbalanced ratio, max. value, min. value, parameter setup, assistant module data etc.
4	Energy or clock display row small "  ".	Displays measured Energy data: Active Energy, Reactive Energy, total Energy, and date/time display.
5	Relay status display	Displays current status of relay (with assistant module support)
6	Remote signal status	Displays current status of remote signal (with assistant module support), 1~8 channels corresponding to K1~K8 status, and on/off status can be read in the application.
7	Max. and min. display	Displays MAX, MIN symbol. The symbol is shown when the value is max. or min.
8	Load characteristic display	Displays inductive or capacitive load. Capacitive symbol displays capacitive load, and inductive symbol displays inductive load.
9	Current % display	Displays measured Current to full scale %
10	Current bar chart display	Displays real time Current
11	Current I1, I2, I3 display	Displays 3 phase L1, L2, and L3 Current symbol.
12	▫ ▫ ▫ ▫ ▫ ▫ tariff rate symbol	Tariff rate display mode interface: Displays rate (T1 (sharp) , T2 (peak) , T3 (flat) , T4 (valley), (T5, T6 remains)
13	Imp Exp Net Total symbol	Displays positive phase, negative phase, total net Energy, and total Energy symbols.
14	MD, THD	MD displays Demand, THD displays total of all phases THD.
15	TDD (Standby)	As the average sign, representing by "—"
16	Har unit	Active Power: kW MW, reactive Power: kvar, Mvar Frequency: Hz
17	Battery under-Voltage alarm display (Standby)	The light is on when the battery is under-Voltage.
18	Remote signal event record	Displays 8 channels remote signal SOE record. (Assistant module is installed)
19	Percent, angle, unbalance, reverse display symbols	" % " indicates percent. " ° " indicates angle.  indicates unbalance (Standby). "—" indicates verse direction.
20	Unbalanced ratio mode symbol	Displays Current/Voltage unbalanced ratio mode symbol.

Remark:

Fig. 9 shows all parameters when the power is on, but some parameters (Remote signals, relay and harmonics display etc.) display only when relative modules are connected.

Multifunction Power Meter has 5 menu keys: I, U, P, M, ⏎ (corresponding to the menu on the meter.)

The backlight shall be off if no action is taken for 60 seconds. Press any key to start the backlight.

No.	Menu Key	Display Mode	Parameter Setup Mode
1	**I**	Current display page	Add 1 to the current value in the parameter setup mode.
2	**U**	Voltage display page	Minus 1 to the current value in the parameter setup mode.
3	**P**	Power display page	Change the current position in the parameter setup mode.
4	**M**	Displays max. and min. value.	Skip the current setup in the parameter setup mode.
5	⏎	To the next page.	Save the current setup and enter the next parameter setup page.
6	**I + P**	Enter setup page	Enter or exit the setup mode page.
7	**I + M**	Enter harmonic display mode	Enter or exit the harmonic display mode.
8	**U + P**	Module status check	Check module status and type, checking if SD card functions correctly, or exit check module status.

1.12.2 Parameter Data Display Mode

Press key ⏎ to display the page as following chart.

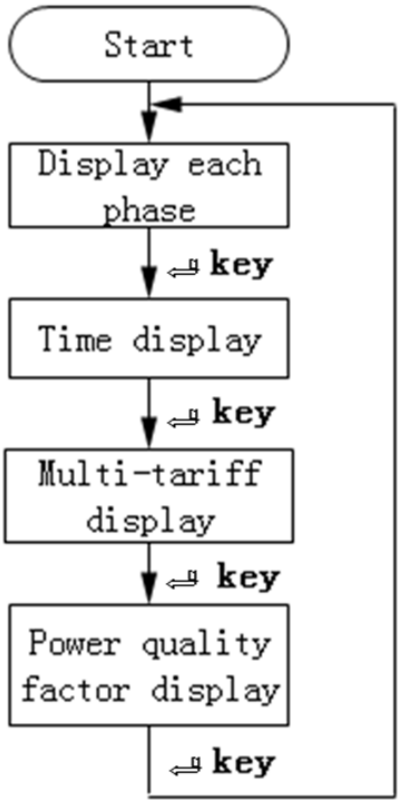


Fig. 10 Display flow chart

Under each menu display page in the above chart, press M key to enter the submenu page. There is no submenu under time display page.

1.12.2.1 Submenu under 3 phase data display menu

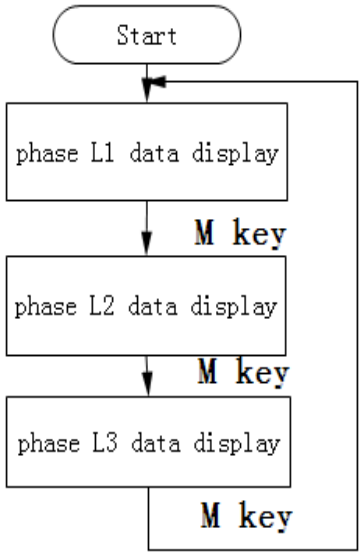


Fig. 11

(1) Phase L1 parameter display page

The Power quadrant is display in the right upper corner. The inductive or capacitive character is displayed in the upper right corner.

The ratios of 3 phase Current load to the rated Current are displayed on the left.

The 1st row displays Phase L1 Voltage.

The 2nd row displays Phase L1 Current.

The 3rd row displays system Frequency.

The 4th row displays Phase L1 Power.

The 5th row displays total active Energy.

As shown in Fig. 12, Phase L1 Voltage is 220.1V, Current is 5.000A, Power is 1.110kW, system Frequency is 50.00Hz, and total active Energy is 628.86kWh.

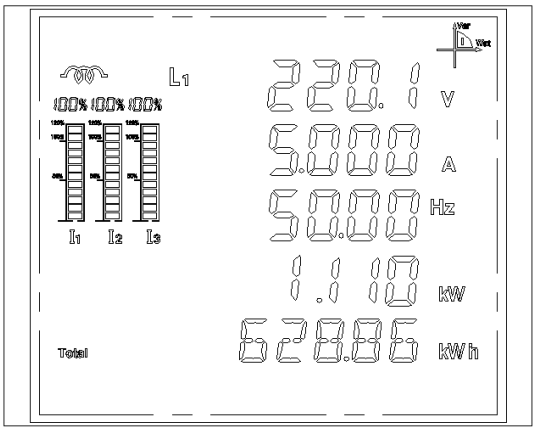


Fig. 12

(2) Phase L2 parameter display page

The Power quadrant is display in the right upper corner. The inductive or capacitive is displayed in the upper right corner.

The ratios of 3 phase Current load to the rated Current are displayed on the left.

The 1st row displays Phase L2 Voltage.

The 2nd row displays Phase L2 Current.

The 3rd row displays system frequency.

The 4th row displays Phase L2 Power.

The 5th row displays total reactive Energy.

As shown in Fig. 13, Phase L2 Voltage is 220V, Current is 5.000A, Power is 1.110kW, system frequency is 50.00Hz, and total reactive Energy is 608.86kvarh.

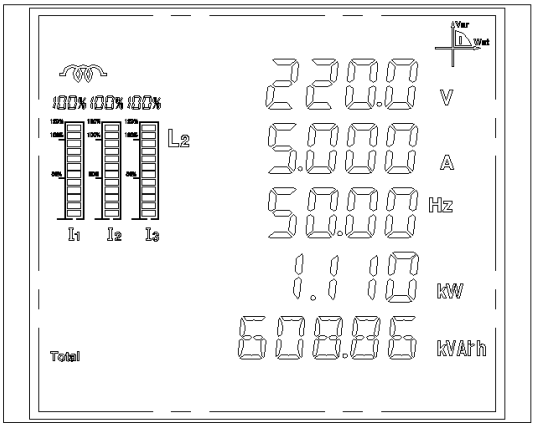


Fig. 13

(3) Phase L3 parameter display page

The Power quadrant is display in the right upper corner. The inductive or capacitive is displayed in the upper right corner.

The ratios of 3 phase Current load to the rated Current are displayed on the left.

The 1st row displays Phase L3 Voltage.

The 2nd row displays Phase L3 Current.

The 3rd row displays system frequency.

The 4th row displays Phase L3 Power.

The 5th row displays time (hour, minute, second.).

As shown in Fig. 14, Phase L3 Voltage is 220.0V, Current is 5.000A, Power is 1.110kW, system frequency is 50.00Hz, and time display is 13:28:28.

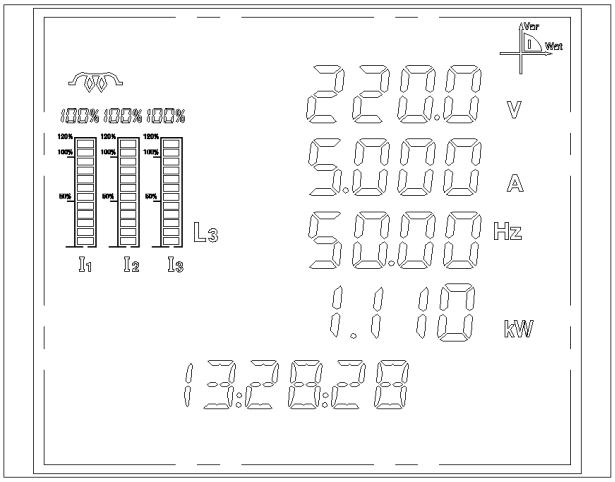


Fig. 14

1.12.2.2 Time display

The 3rd row displays year.

The 4th row displays month and date.

The 5th row displays hour, minute and second.

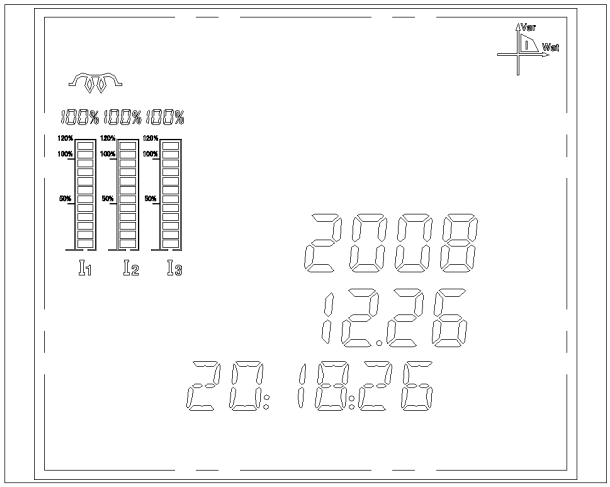


Fig. 15

1.12.2.3 Multi-tariff display mode

In the multi-tariff display mode, press **U** key repeatedly to display the last 4 months' tariff. 00, 01, 02, 03 shows tariff of the current month, last month, the month before the last, and 2 months before the last by sequence. Press **I** key repeatedly to display Total, T1, T2, T3, T4 by sequence, which shows current month's total Energy, peak total Energy, sharp total Energy, flat total Energy, and valley total Energy (The electric Energy recode of the current month could be change with PT/CT change) .

Press ⏎ key to exit the multi-tariff mode, and enter next menu page.

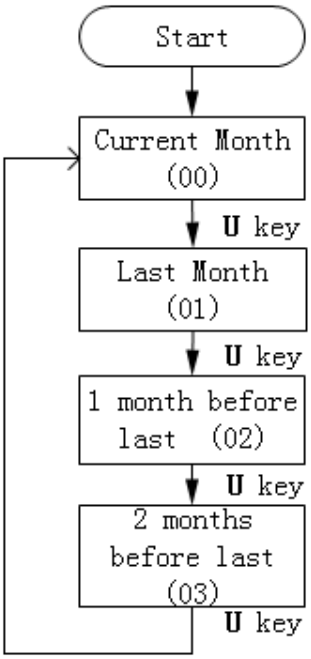


Fig. 16 Month selection flow chart

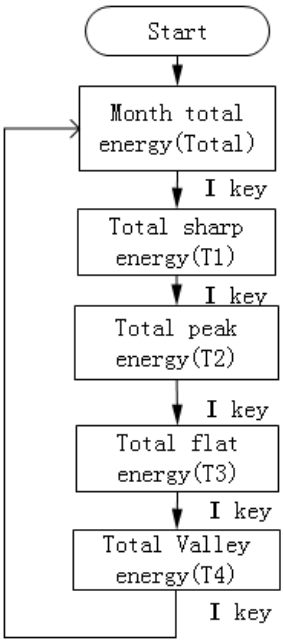


Fig. 17 Multi-tariff selection flowchart

The symbol in the right middle part displays multi-tariff Total (total Energy), T1 (peak Energy), T2 (sharp Energy), T3 (flat Energy), T4 (valley Energy).

The 3rd row displays month selected. (00 (current month), 01 (the last month), 02 (the month before last), 03 (the month before the last 2)

The 5th row displays the current Energy with the selected multi-tariff.

As shown in the Fig. 18, current months' total Energy is 3068206.36kWh.

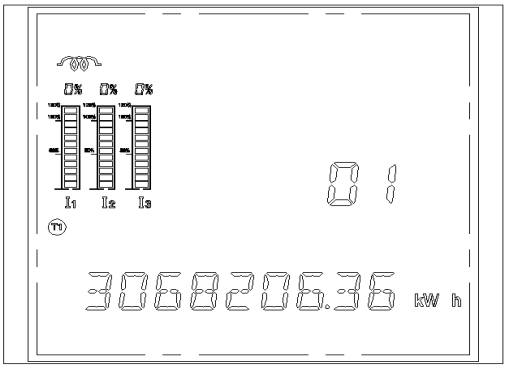


Fig. 18

1.12.2.4 Power quality factor display mode

Note: When the harmonic module is included, the measurement data can displays. Otherwise, only 0 displays.

Power quality displays mode and Power quality factor. Press key ⏎ to exit the mode, and enter the next display mode.

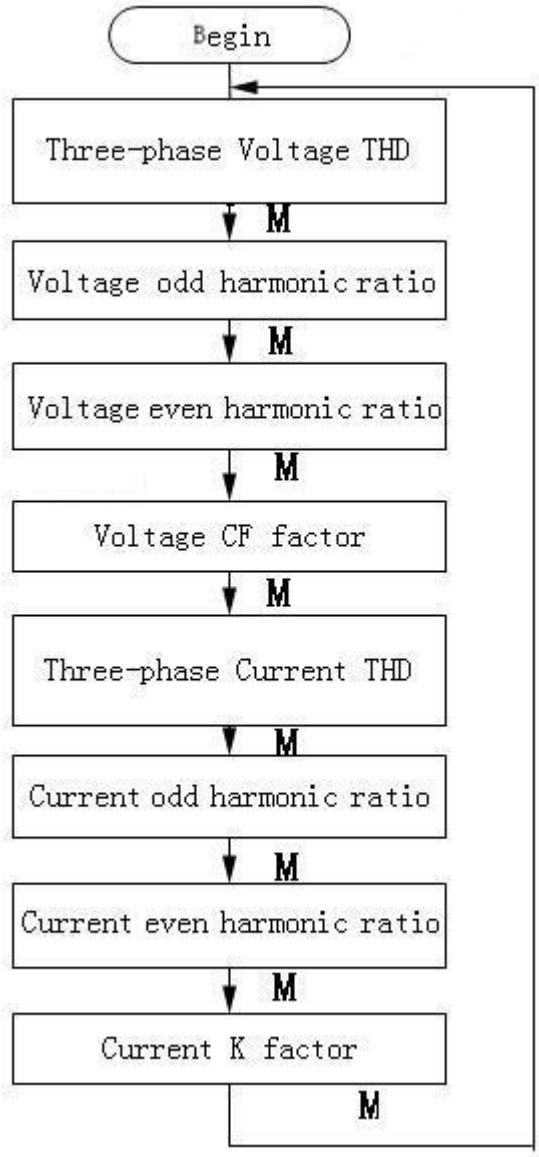


Fig. 19 Harmonic submenu display flow chart

(1) 3 phase Voltage display page

The 1st row displays Phase L1 Voltage THD %.

The 2nd row displays Phase L2 Voltage THD%.

The 3rd row displays Phase L3 Voltage THD%.

The 5th row displays symbol "U" as Voltage harmonics.

As shown in Fig. 20, Phase L1, L2, and L3 Voltage harmonics THDs % are 0.86%, 2.38%, and 0.68% separately.

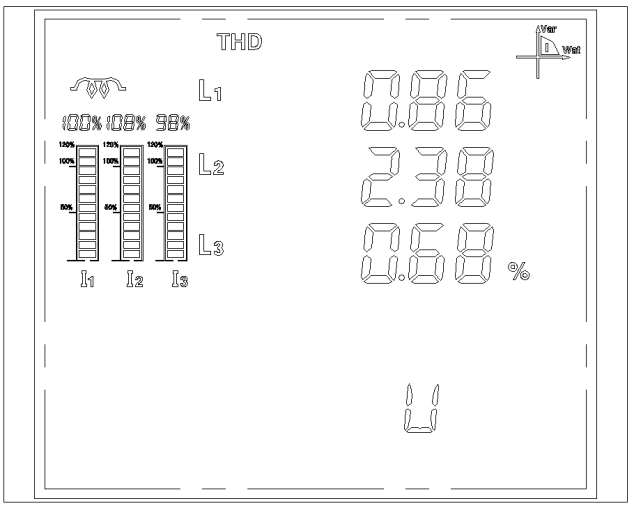


Fig. 20

(2) Voltage odd harmonic distortion % display page

The 1st row displays L1 odd total harmonic distortion %

The 2nd row displays L2 odd total harmonic distortion %

The 3rd row displays L3 odd total harmonic distortion %

The 5th row "U ODD" is the symbol for odd Voltage.

As shown in Fig. 21, Phase L1, L2, L3 Voltage odd harmonic distortions % are 0.36%, 1.06%, and 2.15% separately.

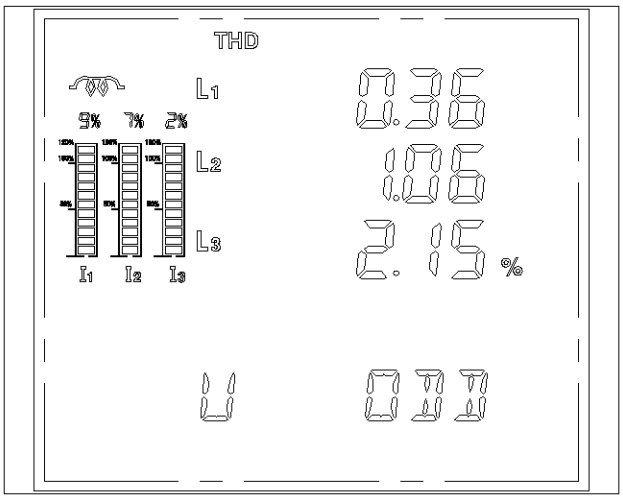


Fig. 21

(3) Voltage even harmonic distortion % display page

The 1st row displays L1 even total harmonic distortion %.

The 2nd row displays L2 even total harmonic distortion %.

The 3rd row displays L3 even total harmonic distortion %.

The 5th row "U EVEN" is the symbol for even Voltage.

As shown in Fig. 22, Phase L1, L2, L3 Voltage even total harmonic distortions % are 1.81%, 2.03%, and 1.66% separately.

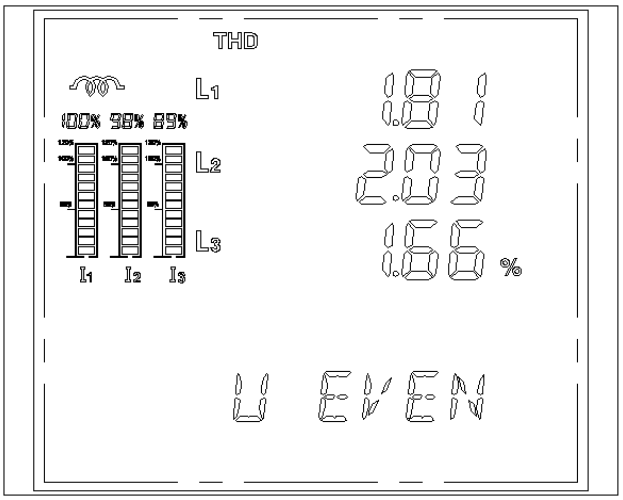


Fig. 22

(4) Voltage peak factor mode display page

The 1st row displays L1 Voltage peak factor.

The 2nd row displays L2 Voltage peak factor.

The 3rd row displays L3 Voltage peak factor.

The 5th row displays "CF" as peak factor.

As shown in Fig. 23, Phase L1, L2, L3 Voltage peak factors are 0.8, 0.3, and 0.6 separately.

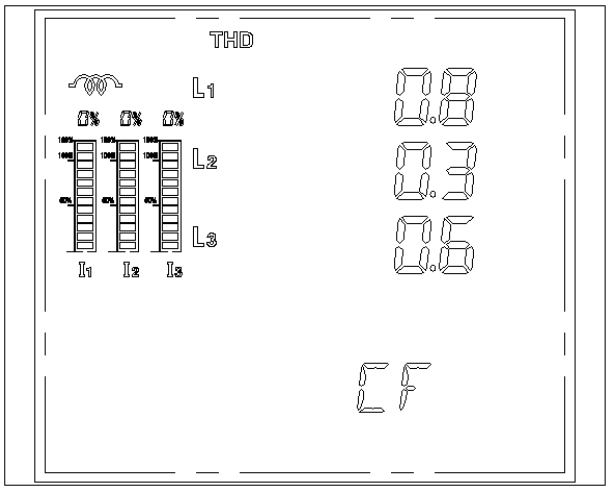


Fig. 23

(5) Phase Current distortion display page

The 1st row displays Phase L1 Current THD%

The 2nd row displays Phase L2 Current THD%

The 3rd row displays Phase L3 Current THD%

The 5th row "I" symbol represents Current harmonic distortion.

As shown in Fig. 24, Phase L1, L2, L3 Current harmonic distortions are 0.86%, 2.38%, and 0.68% separately, and the avg. Current harmonic distortion is 1.08%.

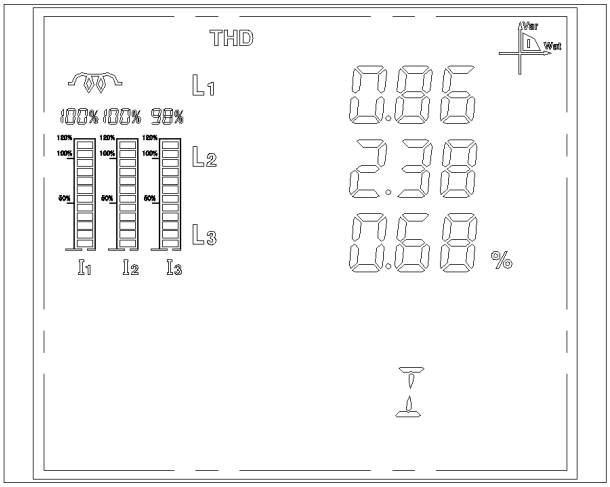


Fig. 24

(6) Current odd total harmonic distortion % display page

The 1st row displays Phase L1 odd total harmonic distortion %.

The 2nd row displays Phase L2 odd total harmonic distortion %.

The 3rd row displays Phase L3 odd total harmonic distortion %.

The 5th row "I ODD" symbol represents Current odd total harmonic distortion %.

As shown in Fig. 25, Phase L1, L2, L3 Current odd total harmonic distortions % are 0.36%, 1.06%, and 2.15% separately.

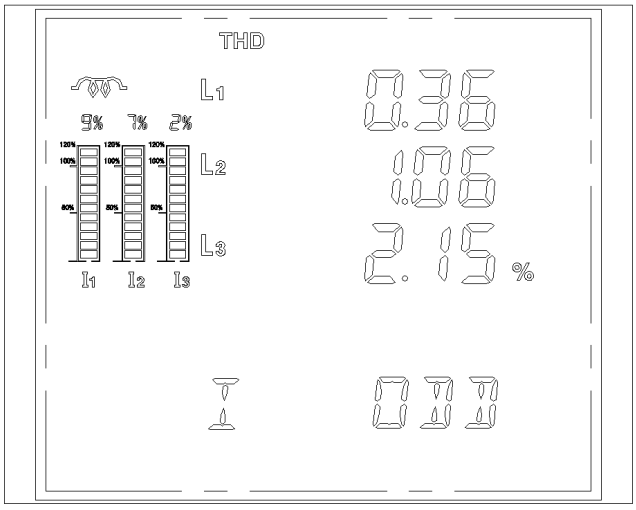


Fig. 25

(7) Current even total harmonic distortion % display page

The 1st row displays Phase L1 even total harmonic distortion %.

The 2nd row displays Phase L2 even total harmonic distortion %.

The 3rd row displays Phase L3 even total harmonic distortion %.

The 5th row "I EVEN" symbol represents Current even total harmonic distortion %

As shown in Fig. 26, Phase L1, L2, L3 Current even total harmonic distortions % are 1.81%, 2.09%, and 1.68% separately.

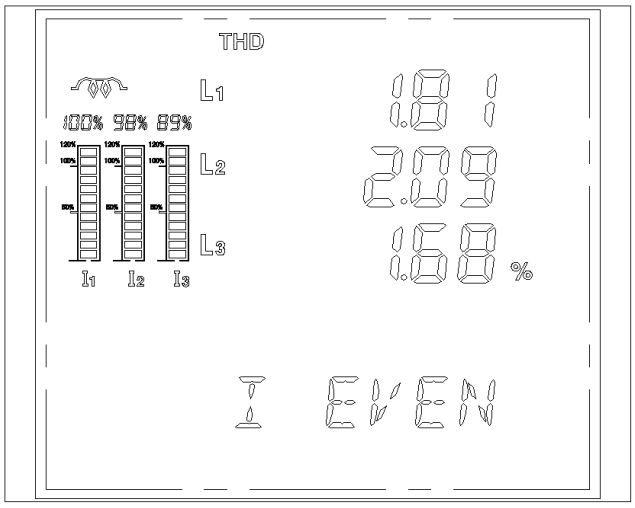


Fig. 26

(8) Current K factor mode display page

The 1st row displays Phase L1 Current peak factor.

The 2nd row displays Phase L2 Current peak factor.

The 3rd row displays Phase L3 Current peak factor.

The 5th row "K F" symbol is as the K factor.

As shown in Fig. 27, K factors in Phase L1, L2 and L3 are 0.6, 0.3, and 0.6 separately.

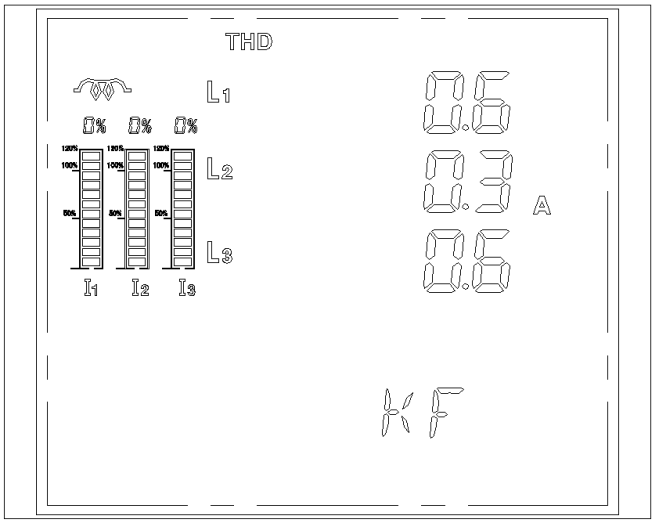


Fig. 27

1.12.2.5 Current (I) display page

When pressing key **I** in the parameter display page, Current display page displays. Press key ⏎ to exit the mode.

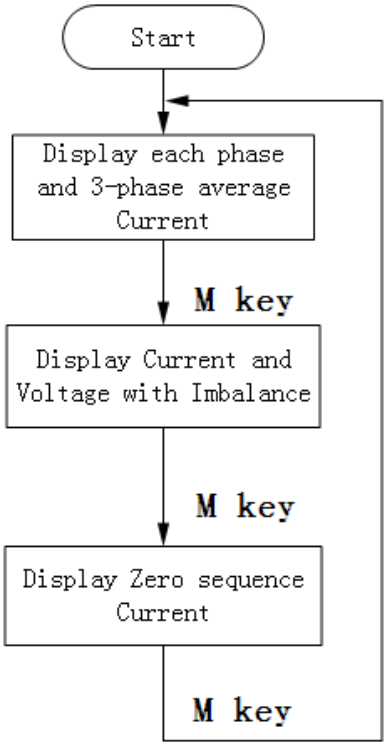


Fig. 28 Current display flow chart

Zero sequence Current can be displayed in 3P4W system. When the user presses **M** key in the Current mode, the max. and min. value in each mode can be displayed.

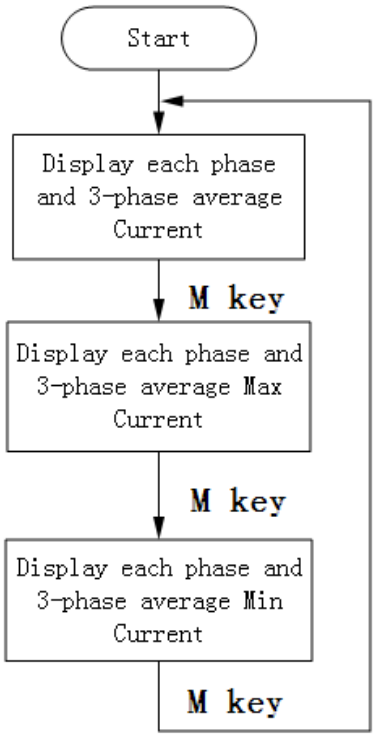


Fig. 29 3 phase max/min Current value

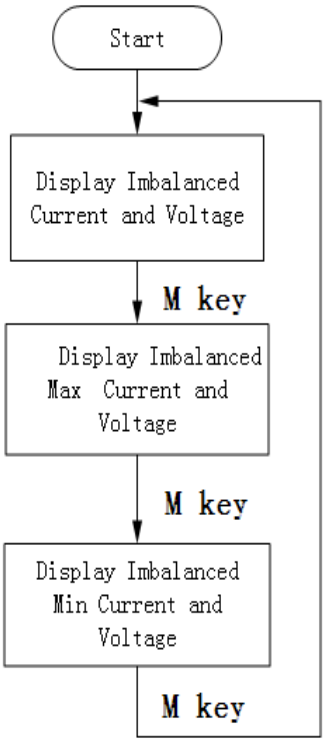


Fig. 30 Unbalanced max/min value

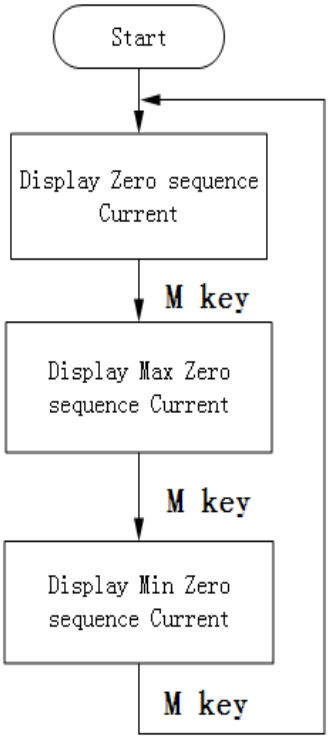


Fig. 31 Zero sequence max/min value

(1) 3 Phase Current and average Current display

The 1st row displays Phase L1 Current.

The 2nd row displays Phase L2 Current.

The 3rd row displays Phase L3 Current.

The 4th row displays average 3 phase Current.

In the max. and min. value page, the upper left corner displays symbol "max" or "min".

As shown in Fig. 32, Phase L1, L2, L3 and average Currents are 5.002A, 5.001A, 5.002A, 5.001A.

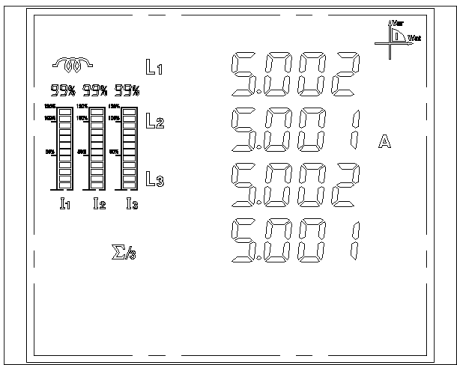


Fig. 32

(2) Current/Voltage unbalanced ratio mode display page

The 1st row displays Voltage unbalanced ratio.

The 2nd row displays Current unbalanced ratio.

The 5th row displays "U AND I", representing Voltage and Current.

As shown in Fig. 33, the unbalanced ratio of Voltage and Current are 99.6%, 93.3% separately.

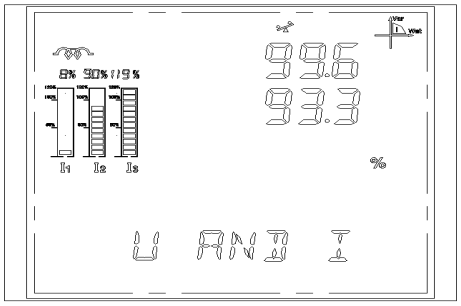


Fig. 33

(3) Zero sequence Current mode display page

As shown in Fig. 34, the zero sequence Current is 5.002A.

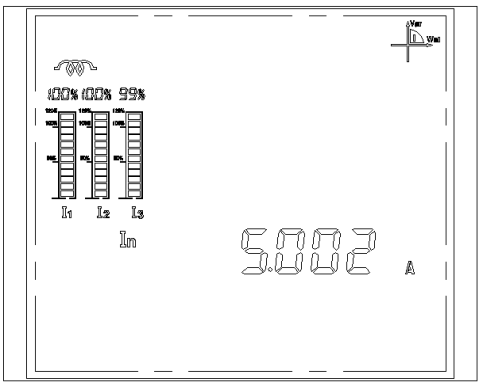


Fig. 34

1.12.2.6 Voltage (U) display mode

Press **U** key under parameter display mode to enter Voltage display mode. Press ⏎ key to exit the display.

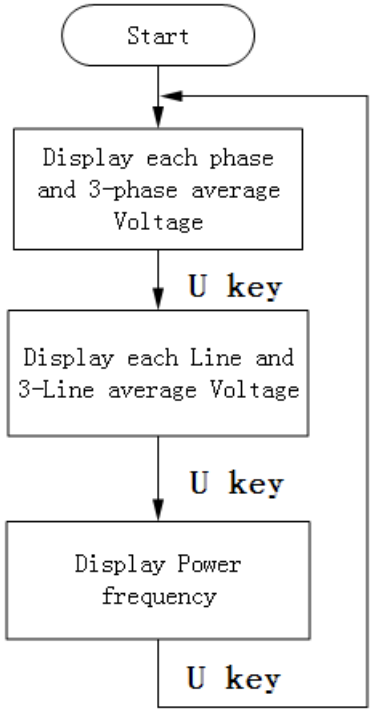


Fig. 35 Voltage display flow chart

Line Voltage shall be displayed in 3P4W system. When the user presses M key in Voltage display page, the max. and min. value page is displayed.

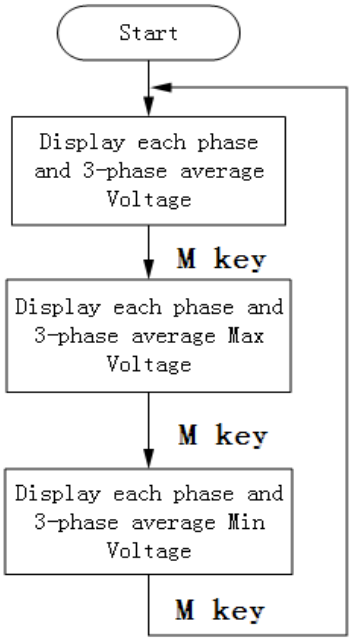


Fig. 36 Phase Voltage max/min value

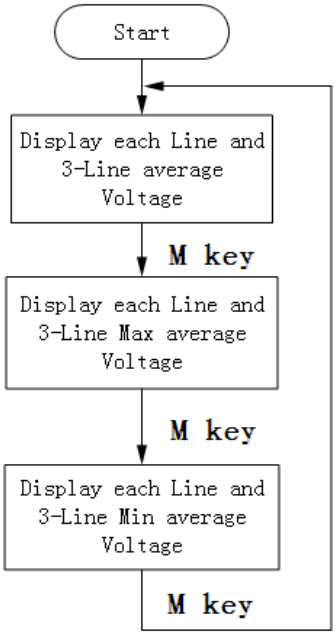


Fig. 37 Line Voltage max/min value

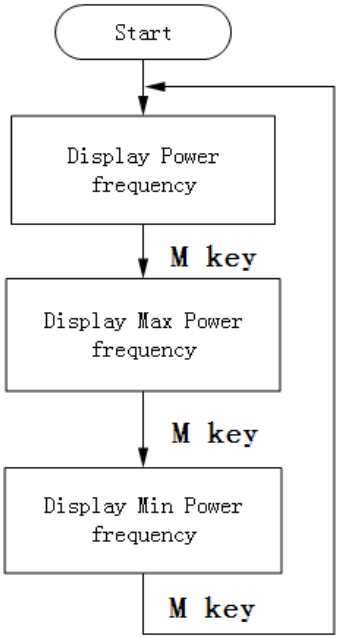


Fig. 38 Frequency max/min value

(1) Phase Voltage and average Voltage display page

The 1st row displays L1 phase Voltage.

The 2nd row displays L2 phase Voltage.

The 3rd row displays L3 phase Voltage.

The 4th row displays 3 phase average Phase Voltage.

When max. and min. page are displayed, the upper left corners shows max and min symbol.

As shown in Fig. 39, Phase L1, L2, L3 and average phase Voltages are 220.2V, 220.0V, 220.0V, 220.0V.

As shown in Fig. 40, Phase L1, L2, L3 and average max. phase Voltages are 230.0V, 210.6V, 230.6V, 230.6V.

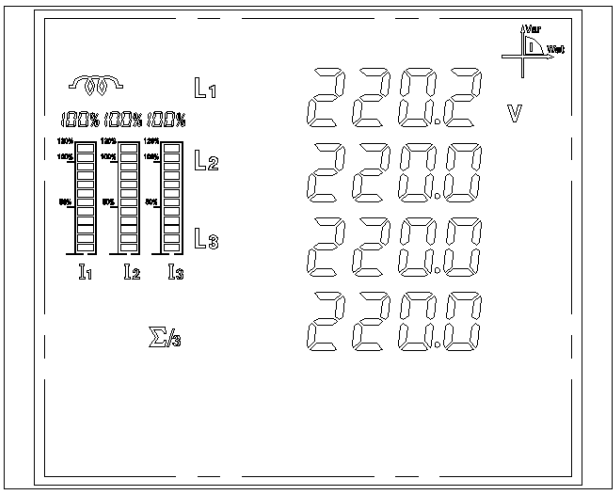


Fig. 39 Displays 3 Phase Voltage and average phase Voltage page

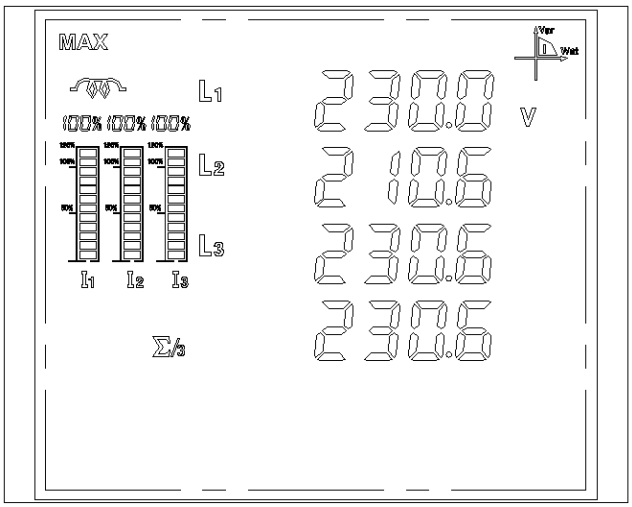


Fig. 40 Displays 3 phase max. Voltage and average max. Voltage

(2) Line Voltage and average line Voltage display page

The 1st row displays Phase L1 line Voltage.

The 2nd row displays Phase L2 line Voltage.

The 3rd row displays Phase L3 line Voltage.

The 4th row displays average line Voltage.

As shown in Fig. 41, Line 12, Line23, Line31 and average line Voltages are 230.0V, 210.8V, 238.6V, 230.6V.

As shown in Fig. 42, Line 12, Line 23, Line 31 and average max. line Voltages are 230.0V, 210.8V, 238.6V, 230.6V.

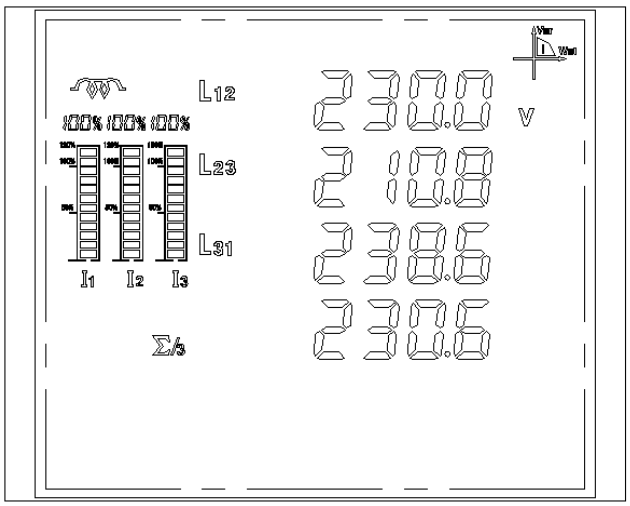


Fig. 41

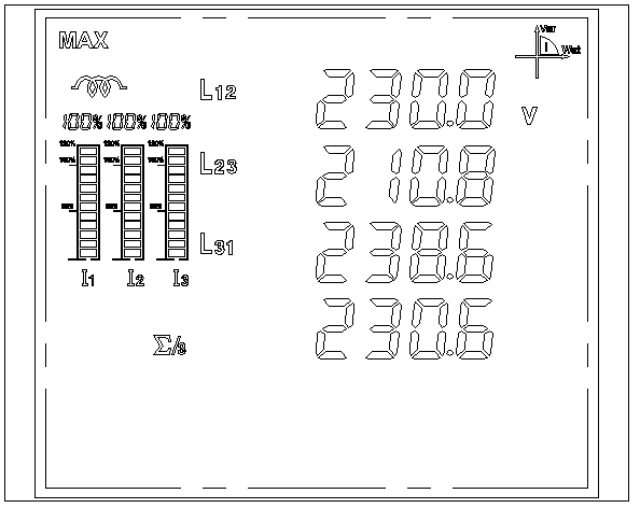


Fig. 42

(3) System Frequency display page

As shown in Fig. 43, the system Frequency is 50.00Hz.

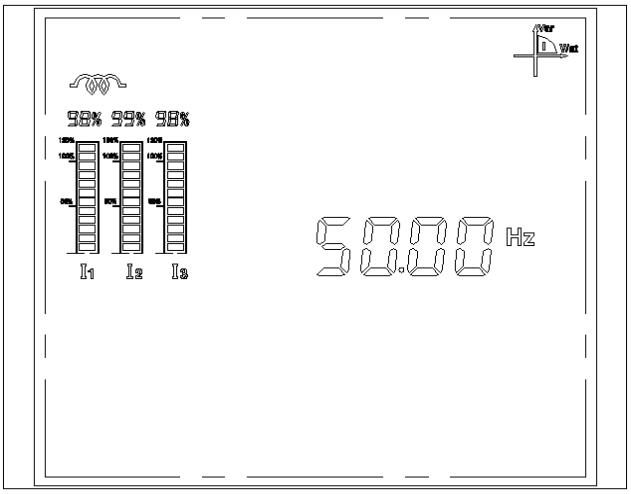


Fig. 43

1.12.2.7 Power display mode

Press **P** key under the parameter display mode, to enter the Power display page. Press ⏎ key to exit the Power display mode.

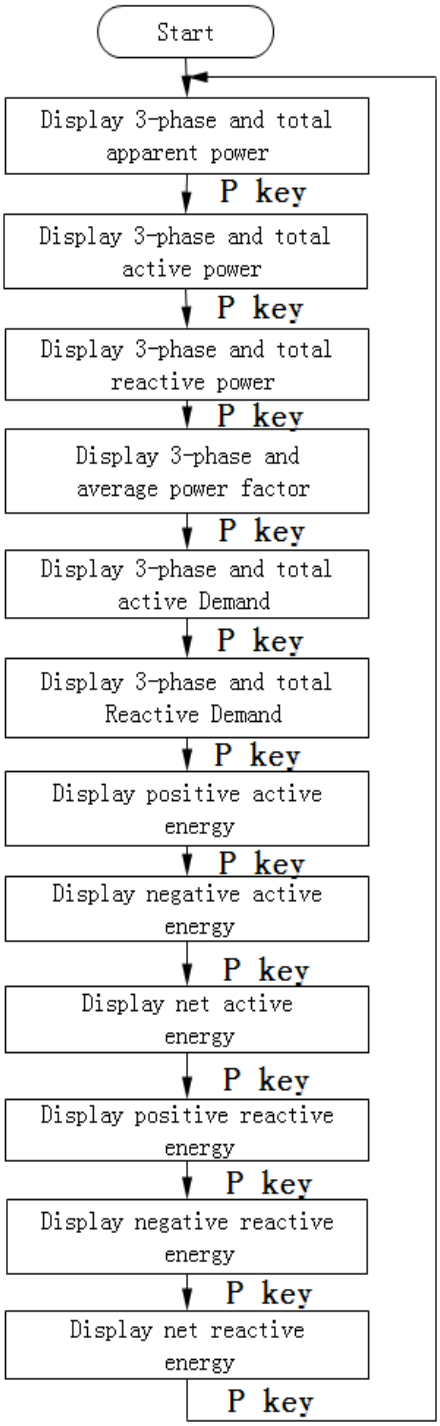


Fig. 44 Power display flow chart

Press **M** key under Power display mode, to enter max. and min. value pages. Energy has no max. and min. value.

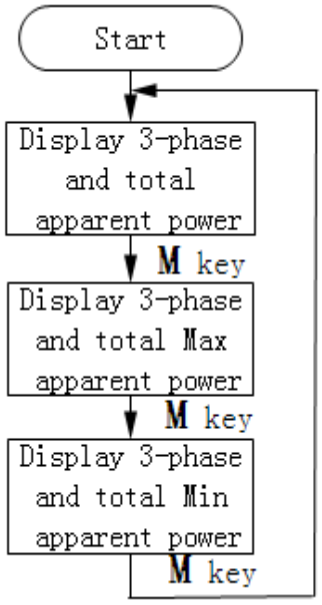


Fig. 45 Apparent Power display display

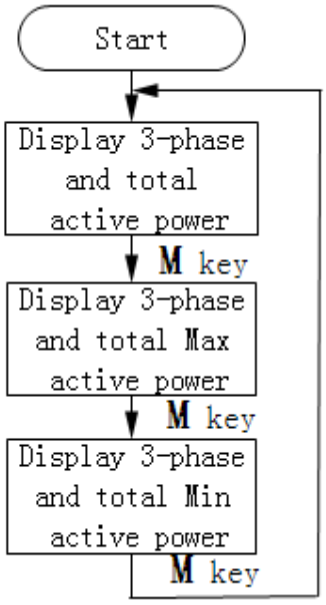


Fig. 46 max/min active Power display

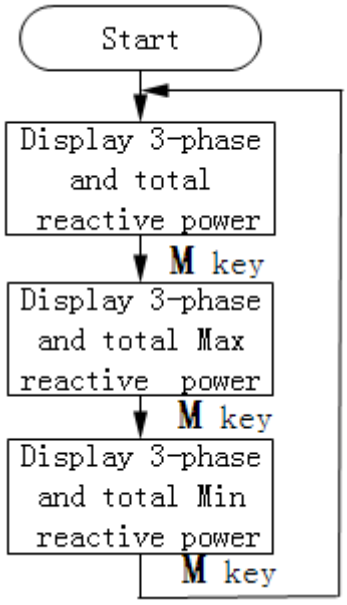


Fig. 47 Max/min reactive Power

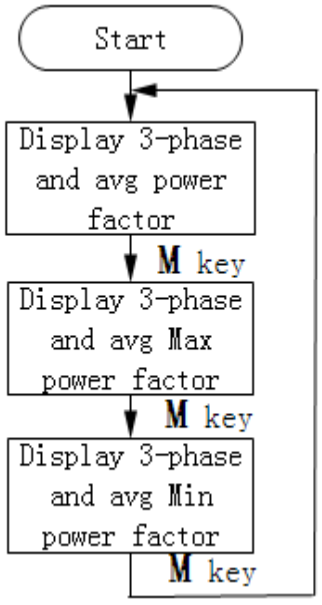


Fig. 48 Max/min PF display

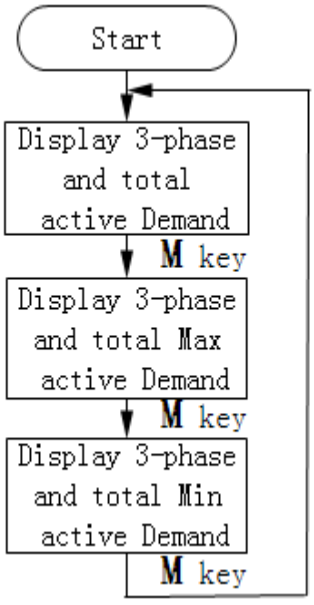


Fig. 49 Max/min active Demand display

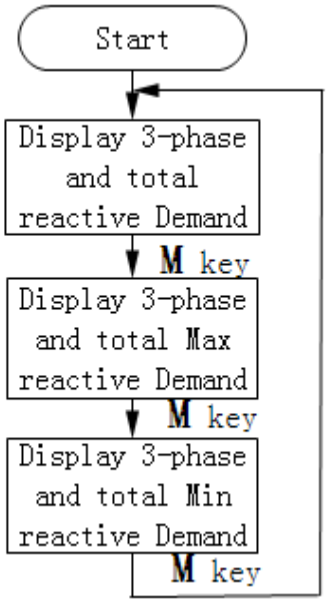


Fig. 50 Max/min reactive Demand display

(1) 3 phase and total apparent Power display page

The 1st row displays L1 apparent Power.

The 2nd row displays L2 apparent Power.

The 3rd row displays L3 apparent Power.

The 4th row displays 3 phase total apparent Power.

As shown in Fig. 51, Phase L1, L2, L3 and 3 phase total apparent Powers are 1.101kVA, 1.103kVA, 1.102kVA, 3.306kVA.

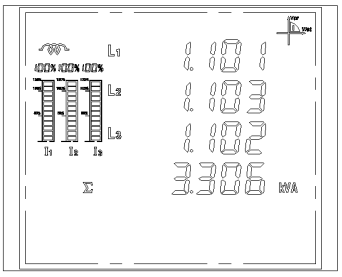


Fig. 51

(2) 3 phase and total active Power display page

The 1st row displays L1 active Power.

The 2nd row displays L2 active Power.

The 3rd row displays L3 active Power.

The 4th row displays 3 phase total active Power.

As shown in Fig. 52, Phase L1, L2 L3 and 3 phase total active Powers are 1.100kW, 1.100kW, 1.101kW, 3.301kW.

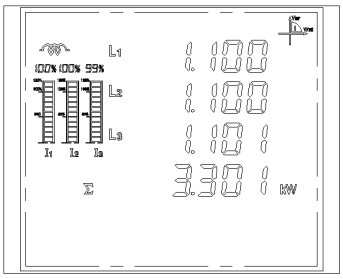


Fig. 52

(3) 3 phase and total reactive Power display page

The 1st row displays L1 reactive Power.

The 2nd row displays L2 reactive Power.

The 3rd row displays L3 reactive Power.

The 4th row displays 3 phase total active Power.

As shown in Fig. 53, Phase L1, L2 and L3 and 3 phase total reactive Powers are 1.101kvar, 1.101kvar, 1.101kvar, 3.303kvar.

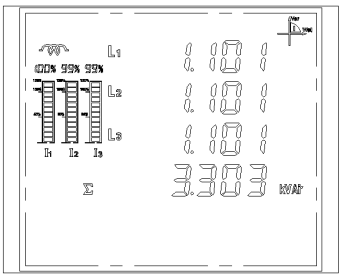


Fig. 53

(4) 3 Phase and average Power factor display page

The 1st row displays L1 Power factor.

The 2nd row displays L2 Power factor.

The 3rd row displays L3 Power factor.

The 4th row displays 3 phase total Power factor.

As shown in Fig. 54, Phase L1, L2 and L3 and 3 phase total Power factors are 1.000, 1.000, 1.000, 1.000.

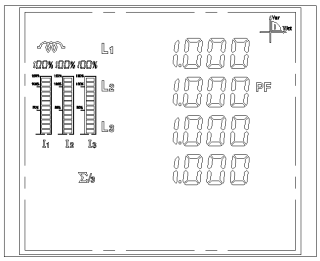


Fig. 54

(5) 3 Phase and total active Demand display page

The 1st row displays L1 active Demand.

The 2nd row displays L2 active Demand.

The 3rd row displays L3 active Demand.

The 4th row displays 3 phase total active Demand.

The symbol "MD" displayed in the upper row as the Demand sign.

As shown in Fig. 55, Phase L1, L2 and L3 and 3 phase total active Demands are 1.000kW, 1.000kW, 1.000kW, 3.000kW.

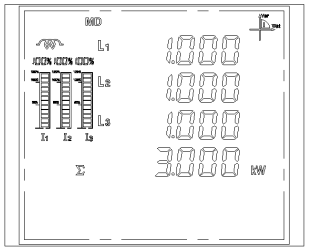


Fig. 55

(6) 3 Phase and total reactive Demand display page

The 1st row displays L1 reactive Demand.

The 2nd row displays L2 reactive Demand.

The 3rd row displays L3 reactive Demand.

The 4th row displays 3 phase total reactive Demand.

The symbol "MD" displayed in the upper row is the Demand sign.

As shown in Fig. 56, Phase L1, L2 and L3 and 3 phase total reactive Demands are 1.000kvar, 1.000kvar, 1.000kvar, 3.000kvar.

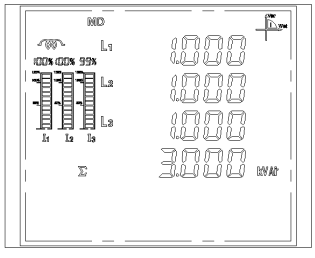


Fig. 56

(7) Importing active Energy display page

The symbol "Imp" indicates importing direction.

As shown in Fig. 57, the importing active Energy is 623.28kWh.

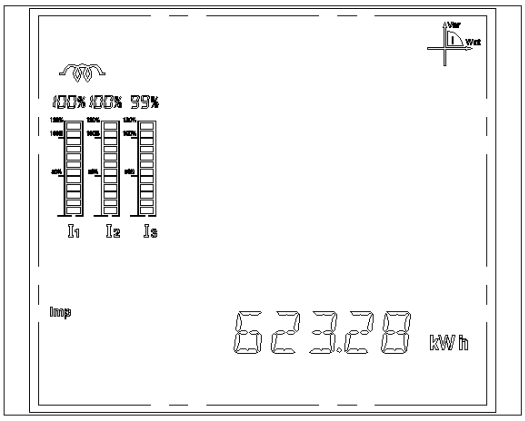


Fig. 57

(8) Exporting active Energy display page

The symbol "exp" indicates exporting direction.

As shown in Fig. 58, the exporting active Energy is 621.27kWh.

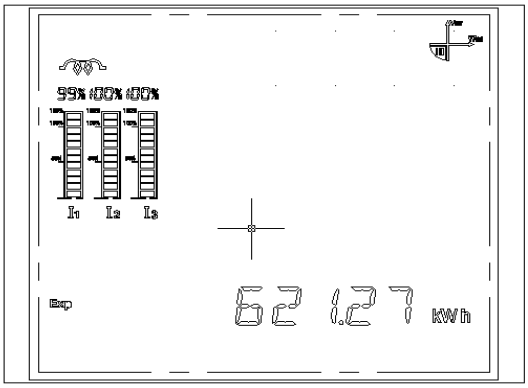


Fig. 58

(9) Net active Energy display page

The symbol "Net" indicates net Energy.

As shown in Fig. 59, the net active Energy is 623.28kWh.

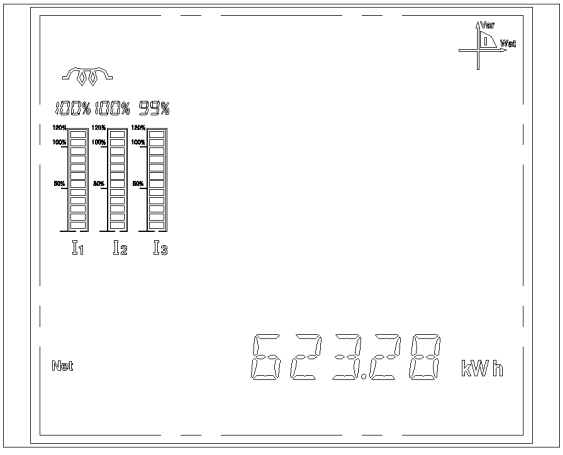


Fig. 59

(10) Importing reactive Energy display page

The symbol "Imp" indicates importing direction.

As shown in Fig. 60, the importing active Energy is 126.36kvarh.

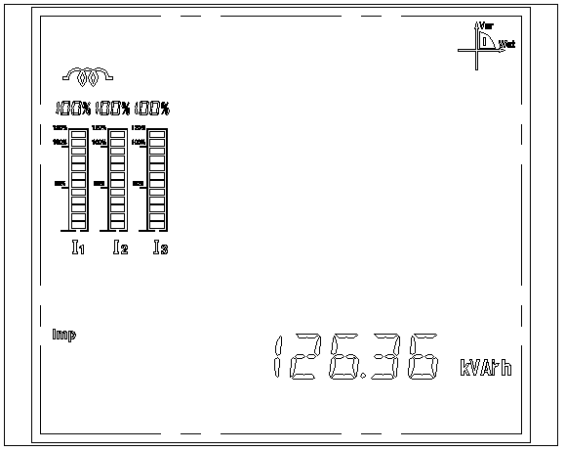


Fig. 60

(11) Exporting reactive Energy display page

The symbol "exp" indicates exporting direction.

As shown in Fig. 61, the exporting reactive Energy is 125.76kvarh.

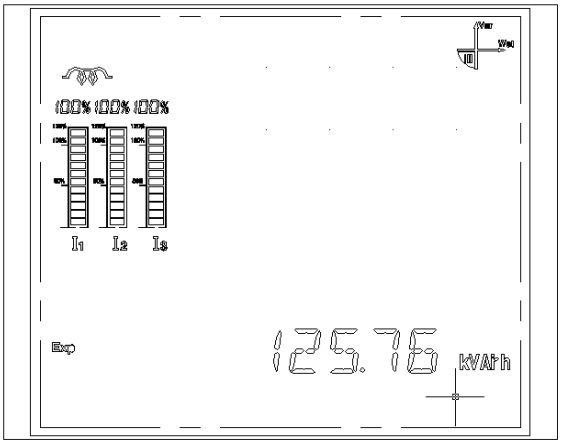


Fig. 61

(12) Net reactive Energy display page

The symbol "Net" indicates net reactive Energy.

As shown in Fig. 62, the net reactive Energy is 125.76kvarh.

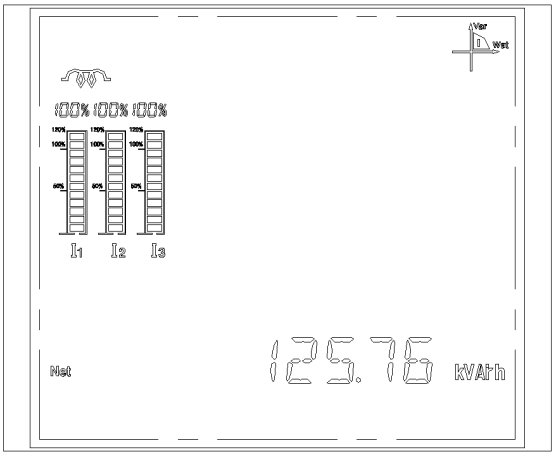


Fig. 62

1.12.3 Module Display Mode

Note: Modules can be displayed only when the optional modules are installed.

1.12.3.1 Harmonic data display mode

In the parameter data display mode, press **I** + **M** to enter harmonic display mode. Under this mode, press ⏎ key to switch to the fundamental harmonic Voltage page, Current harmonic % page and phase angle page. Press **M** key to switch to the following submenu pages: the fundamental harmonic Voltage, Fundamental Voltage phase angle, fundamental Current, fundamental Current phase angle, fundamental apparent Power, fundamental active Power, fundamental reactive Power. In the harmonic data, the 5th row shows "XX X XX": The first 2 "XX" represents % or angle, HR as the %, PA as the angle. The third "X" represents Voltage or Current, I as Current, U as Voltage. The last 2 "XX" represents degrees of harmonics. For an example: The fifth row "RT I 02" represents Current 2nd harmonic%.

The meter can show the harmonic from 2nd to 63rd in the corresponding main harmonic interface. To display degree of harmonic data, Press **I** key to add 1 to tens digit, press **U** key to minus 1 to tens digit, Press **P** key to add 1, press **M** key to minus 1. When the desired harmonic degree is reached, the corresponding data can be shown.

The flow charts are shown below:

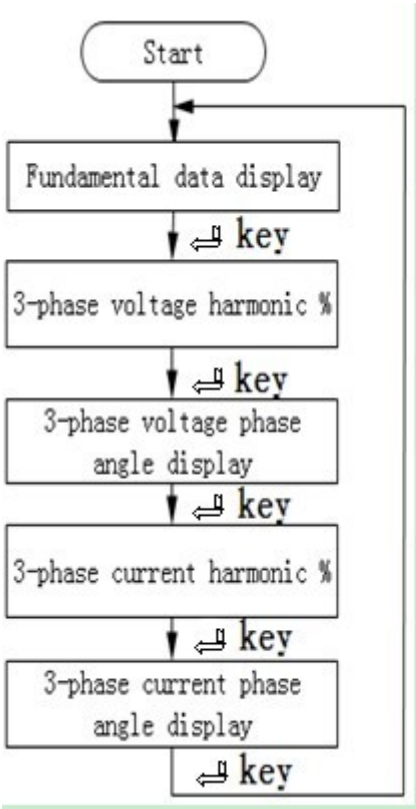


Fig. 63 Harmonic data main flow chart

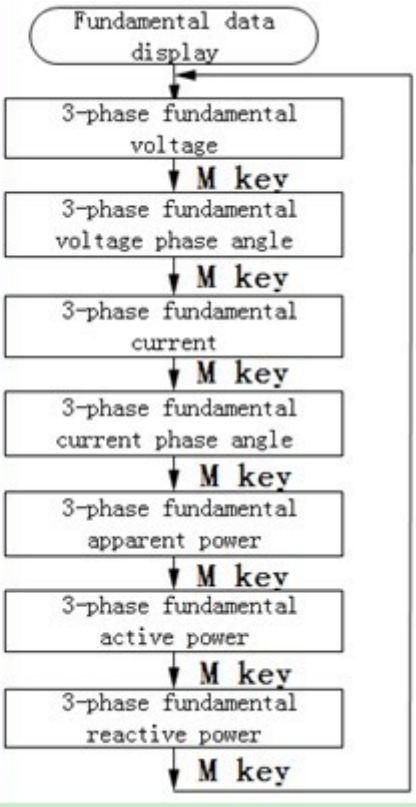


Fig. 64 Fundamental data display mode

Press **I** + **M** key to exit harmonic display mode, and enter the main menu.

(1) 3 phase fundamental Voltage display mode page

The 1st row displays Phase L1 fundamental Voltage.

The 2nd row displays Phase L2 fundamental Voltage.

The 3rd row displays Phase L3 fundamental Voltage.

The symbol "U" represents fundamental Voltage.

As shown in Fig. 65, Phase L1, L2, L3 fundamental Voltages are 232.4V, 263.3V, 208.6V.

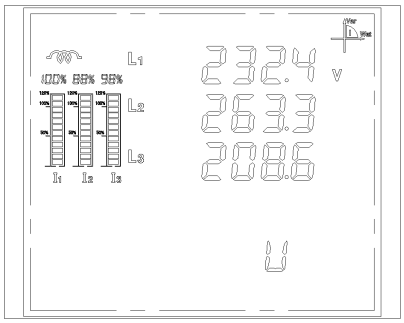


Fig. 65

(2) 3 phase fundamental Voltage phase angle display page

The 1st row displays Phase L1 fundamental harmonic phase angle.

The 2nd row displays Phase L2 fundamental harmonic phase angle.

The 3rd row displays Phase L3 fundamental harmonic phase angle.

The symbol "PA U" represents fundamental Voltage phase angle.

As shown in Fig. 66, Phase L1, L2 and L3 fundamental phase angles are 32.4°, 63.3°, 76.6°.

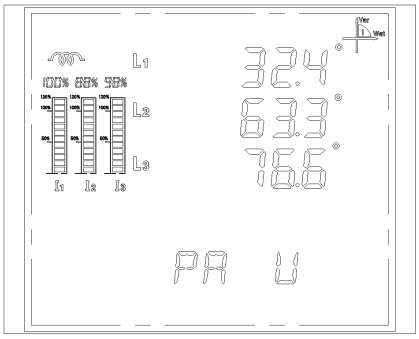


Fig. 66

(3) 3 phase fundamental Current display page

1st row displays L1 fundamental Current.

2nd row displays L2 fundamental Current.

3rd row displays L3 fundamental Current.

The symbol "I" represents L1, L2, L3 fundamental Current.

As shown in Fig. 67, Phase L1, L2, L3 fundamental Currents are 2.324A, 2.633A, 2.086A.

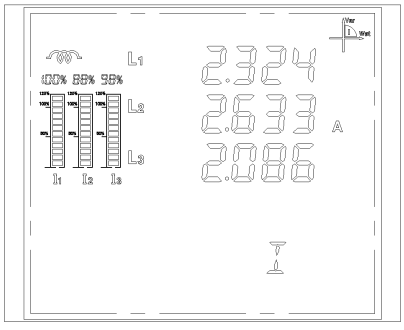


Fig. 67

(4) 3 phase fundamental Current phase angle display page

The 1st row displays Phase L1 fundamental Current phase angle.

The 2nd row displays Phase L2 fundamental Current phase angle.

The 3rd row displays Phase L3 fundamental Current phase angle.

The symbol "PAI" represents the fundamental Current phase angle.

As shown in Fig. 68, Phase L1, L2, L3 fundamental Current phase angles are 12.4°, 67.7°, 76.6°.

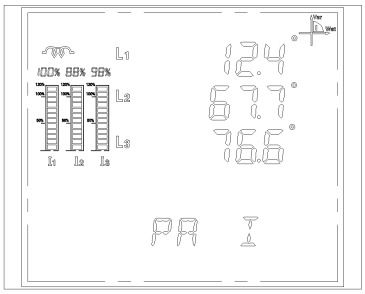


Fig. 68

(5) 3 phase fundamental apparent Power display page

The 1st row displays Phase L1 fundamental apparent Power.

The 2nd row displays Phase L2 fundamental apparent Power.

The 3rd row displays Phase L3fundermental apparent Power.

The symbol "S" represents L1, L2, and L3 fundamental apparent Power.

As shown in Fig. 69, Phase L1, L2, L3 fundamental apparent Powers are 2.724kVA, 2.837kVA, 2.006kVA.

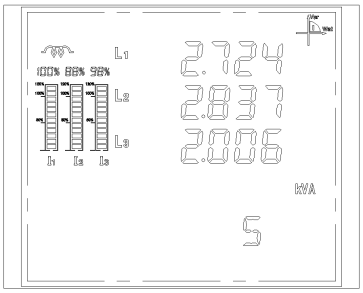


Fig. 69

(6) 3 phase fundamental active Power display page

The 1st row displays Phase L1 fundamental active Power.

The 2nd row displays Phase L2 fundamental active Power.

The 3rd row displays Phase L3 fundamental active Power.

The symbol "P" represents fundamental active Power.

As shown in Fig. 70, Phase L1, L2, L3 fundamental active Powers are 2.721kW, 2.871kW, 2.006kW.

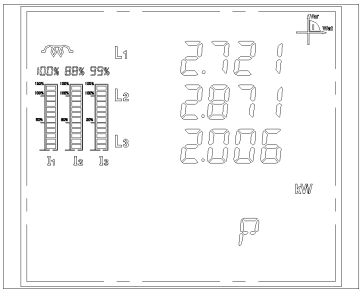


Fig. 70

(7) 3 phase fundamental reactive Power display page

The 1st row displays Phase L1 fundamental reactive Power.

The 2nd row displays Phase L2 fundamental reactive Power.

The 3rd row displays Phase L2 fundamental reactive Power.

The symbol "q" represents fundamental reactive Power.

As shown in Fig. 71, Phase L1, L2, L3 fundamental reactive Powers are 2.721 kvar, 2.871 kvar, 2.006 kvar.

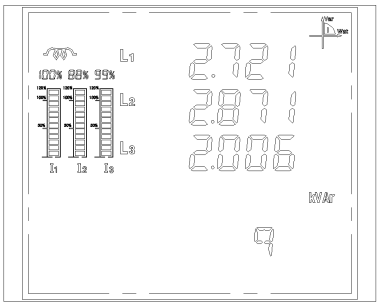


Fig. 71

(8) Voltage harmonics % display page

The 1st row displays Phase L1 Voltage harmonic%.

The 2nd row displays Phase L2 Voltage harmonic%.

The 3rd row displays Phase L3Voltage harmonic%.

The symbol "HR U XX" (XX as degree of Voltage harmonic %)

As shown in Fig. 72, L1, L2, L3 Voltage 2nd harmonics % are 3.86%, 9.88%, 28.86%.

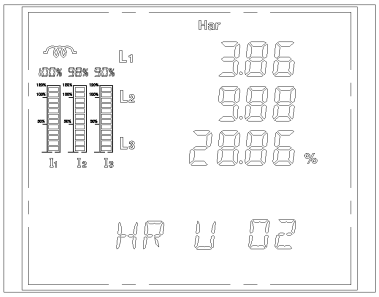


Fig. 72

(9) Voltage harmonic phase angle display page

The 1st row displays Phase L1 Voltage harmonic phase angle.

The 2nd row displays Phase L2 Voltage harmonic phase angle.

The 3rd row displays Phase L3 Voltage harmonic phase angle.

The symbol "PA U XX" (XX as the degree of Voltage harmonic phase angle)

As shown in Fig. 73, Phase L1, L2, L3 2nd harmonic phase angles are 38.6°, 350.0°, 288.6°.

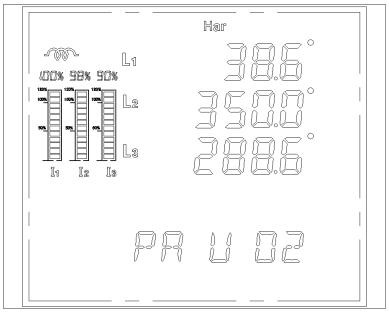


Fig. 73

(10) Current harmonic % display page

The 1st row displays Phase L1 Current harmonic %.

The 2nd row displays Phase L2 Current harmonic %.

The 3rd row displays Phase L3 Current harmonic %.

The 5th row "HR I XX" (XX as the no. of harmonic)

As shown in Fig. 74, Phase L1, L2, L3 2nd harmonic Currents % are 3.86%, 9.88%, 28.86%.

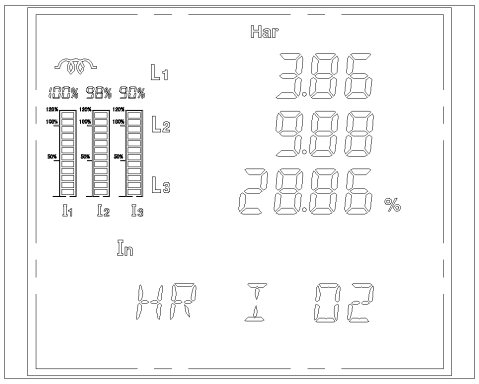


Fig. 74

(11) Current harmonic phase angle display page

The 1st row displays Phase L1 Current harmonic phase angle.

The 2nd row displays Phase L2 Current harmonic phase angle.

The 3rd row displays Phase L3 Current harmonic phase angle.

The 5th row "PA I XX" (XX as the no. of harmonic)

As shown in Fig. 75, L1, L2, L3 Current 2nd harmonic phase angles are 3.86°, 9.88°28.86°.

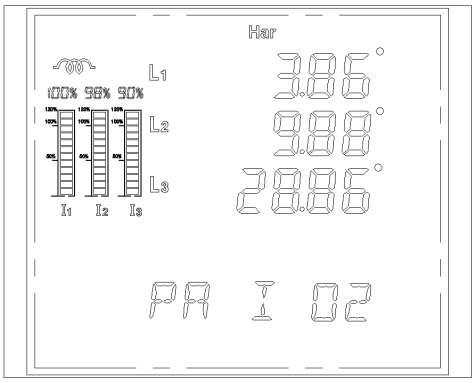


Fig. 75

1.12.3.2 Other modules display mode

In parameter display page, press **U+ P key** to display the installed modules. Under this mode, press **I** key to display Software version number. Press **U+ P key** to exit SD card display mode.

(1) Detecting module status display page

The 1st row to the 4th row display the corresponding modules that are detected, represented by the order code of the optional modules.

The 5th row displays no. of modules that are detected, max. of 4.

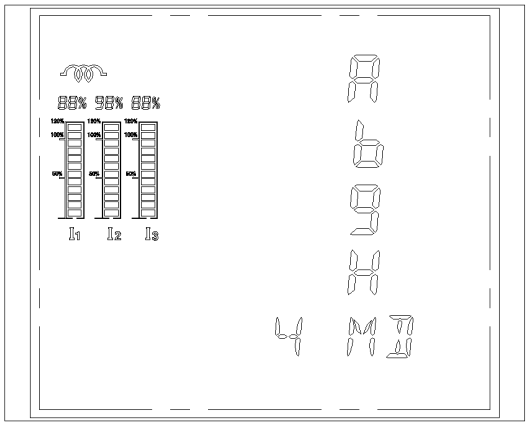


Fig. 76

(2) Detecting no module display page

When no assistant module is detected, the page is shown as Fig. 77.

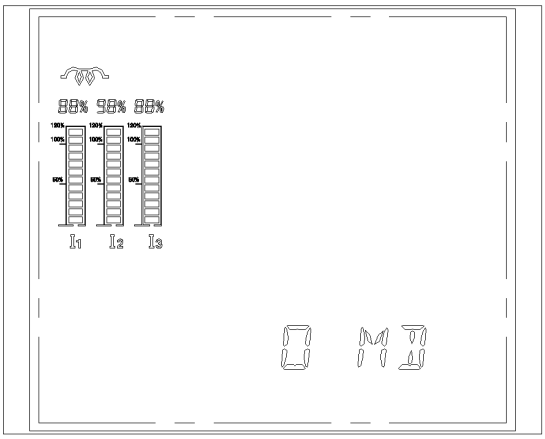


Fig. 77

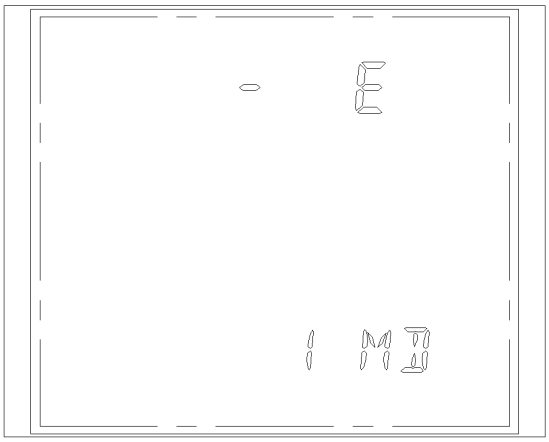


Fig. 78

Note:

If "NO SD" is displayed when the power is on or "-E" or "-g" is displayed on SD card status checking mode after SD card is plugged in, please check SD card connection again and turn the power off. The assistant module H, I can't display in the mode.

Then turn on the power to see if SD card functions well. If no sign is shown when power is on or "E" or "g' is shown in the corresponding page, which indicates that the data storage module is installed properly and functioning well, as shown in Fig. 78.

1.12.4 Parameter Setup Mode

There are 3 modes: system setup mode, multi-tariff setup mode, and Ethernet setup mode. In the parameter display and module data display mode, press **I+P** key to enter the setup mode, and press **I+P** key to exit the setup mode in the setup page. See the following flow chart.

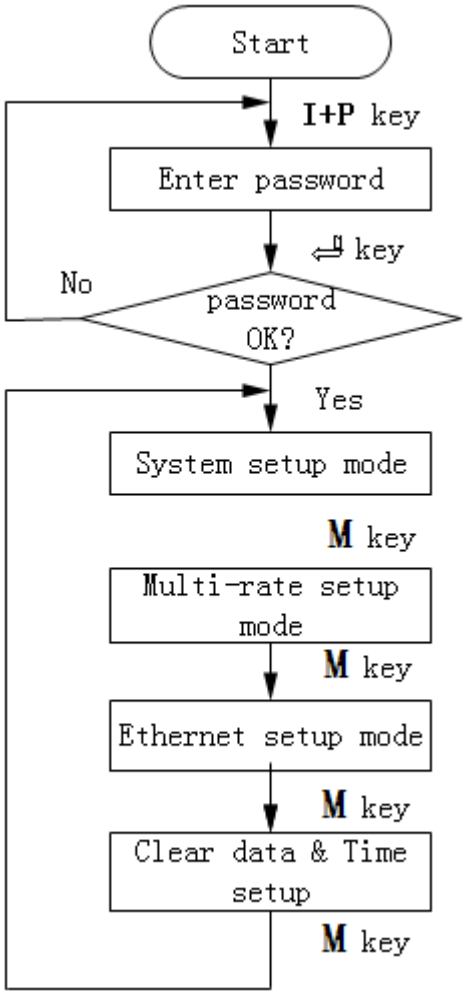


Fig. 79 Set up mode main menu flow chart

General Instruction

In the setup mode page, the current digit shimmers. Press **P** key to move to the next cursor. Press **I** key to add 1 to the current digit, press **U** key to minus 1 to the current digit. Press ↵ key to save the current setting and enter the next page. Press **I+P** key to exit the setup mode without saving the modification, and enter the data display page.

The user must click ↵ key to enter the next page, as long as the parameter is modified.

1.12.4.1 Setup mode main page

(1) Password input page

The 1st row displays "0000", the first left 0 shimmers.

The 2nd row displays "PASSWORD", indicating the password input page.

As shown in Fig. 80, the password is 0000 (factory default password.)

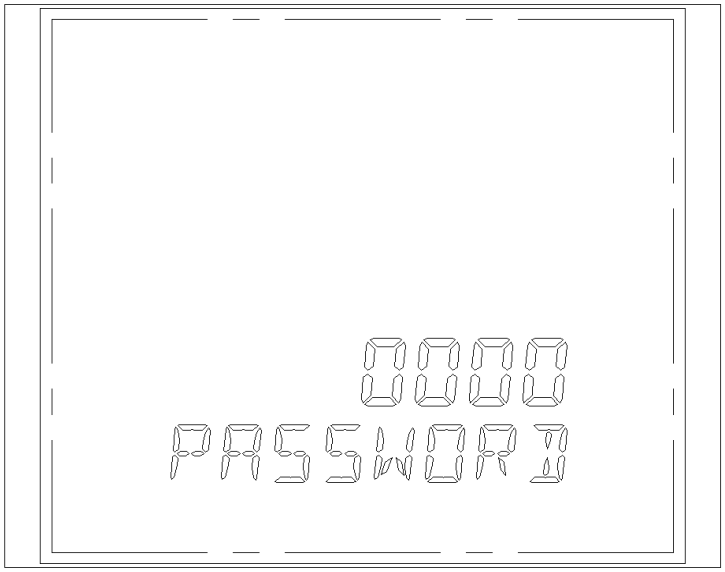


Fig. 80 Password input page

(2) System setup mode page

As shown in Fig. 81, the symbol "SYS SET" symbol indicates that the system setup mode is selected.

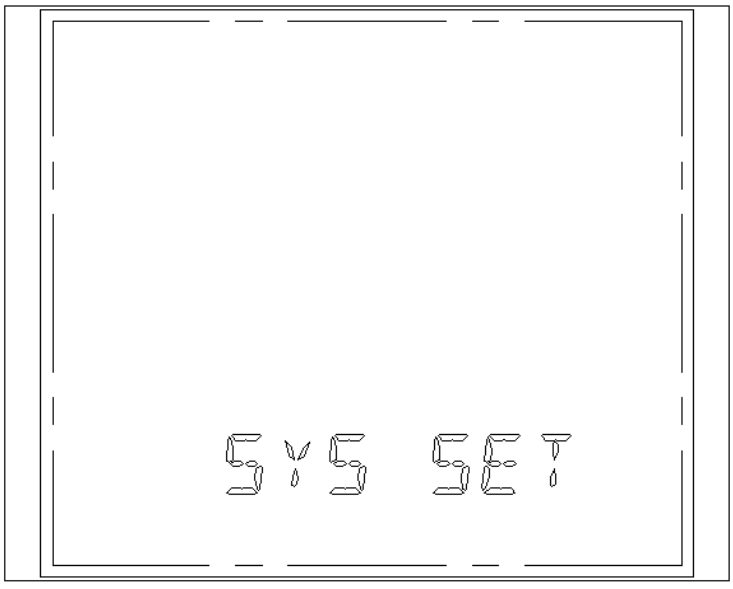


Fig. 81

(3) Multi-tariff setup mode

As shown in Fig. 82, the symbol "DUP SET" represents that the multi-tariff setup mode is selected.

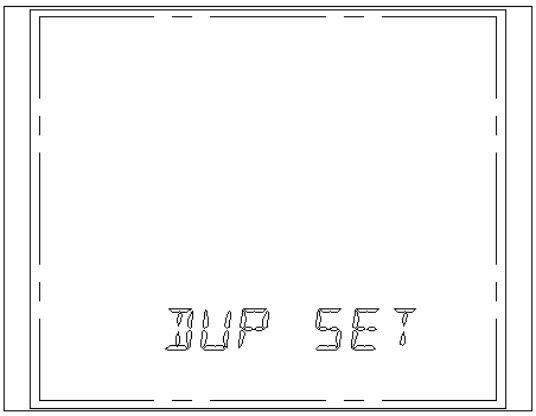


Fig. 82

(4) Ethernet setup display mode (not available now)

As shown in Fig. 83, the symbol "NET SET" indicates that the Ethernet setup mode is selected.

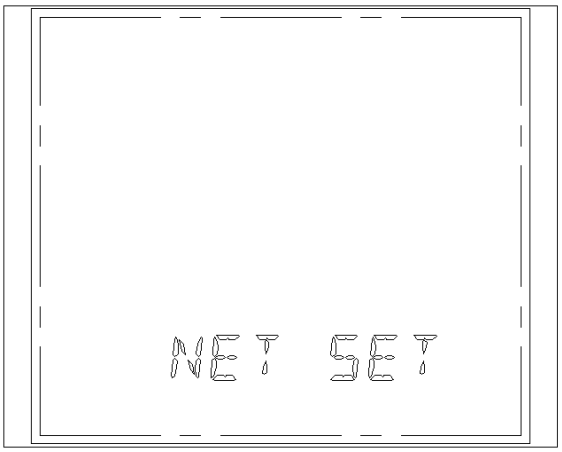


Fig. 83

(5) Clearing the data and clock mode setup mode

As shown in Fig. 84, "CLR SET" indicates that clearing data and clock setup mode is selected.

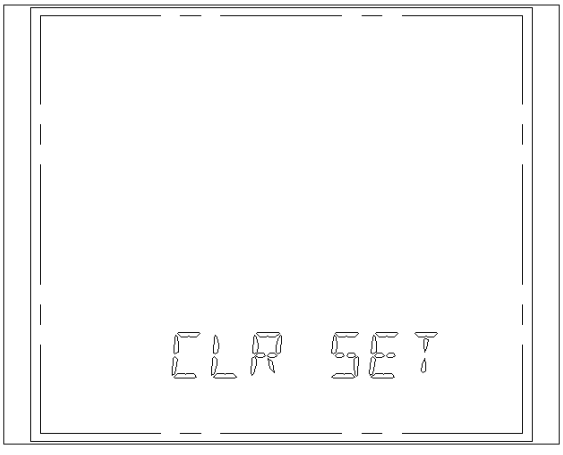


Fig. 84

Press ⏎ in the corresponding mode page to enter the parameter setup for the next step.

1.12.4.2 System setup flow chart

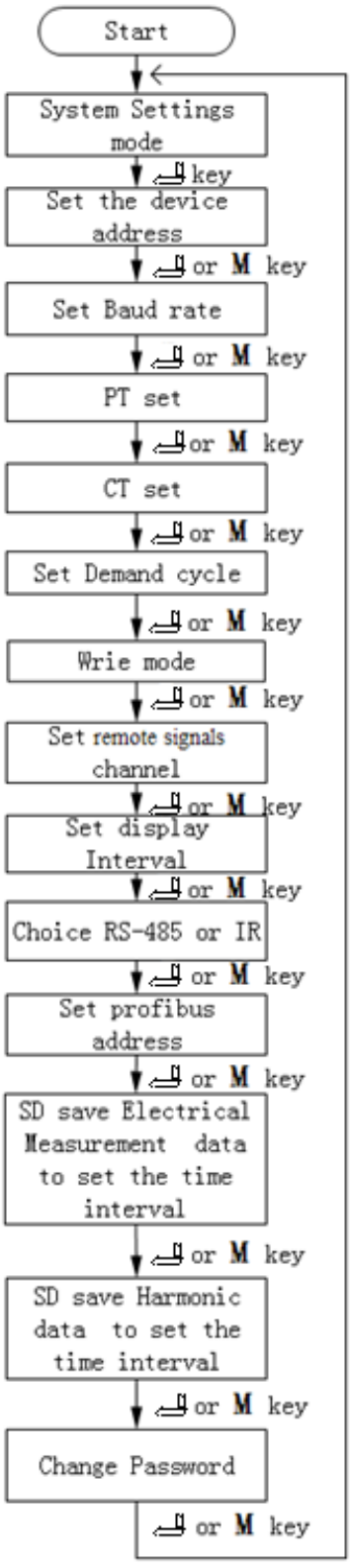


Fig. 85

Press ⏎ key to save the current settings and enter the next page. Press **M** key to enter the next page without saving.

(1) Setup meter address page

The upper row displays the current meter address. As shown in Fig. 86, the meter address is 001.

The lower row displays "ADDR SET", which indicates the meter address setup page.

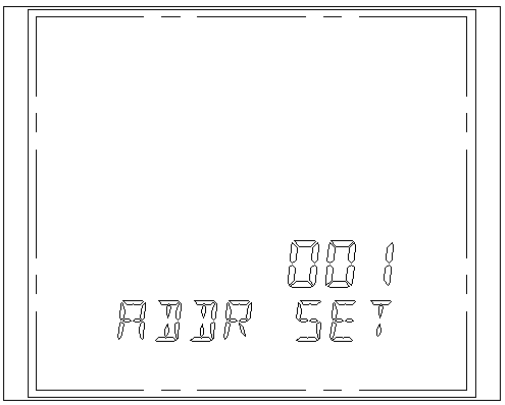


Fig. 86

(2) Setup baud rate page

The upper row displays the baud rate data. As shown in Fig. 87, the baud rate is 9600.

The lower row "BAUD SET" indicates the baud rate setup page.

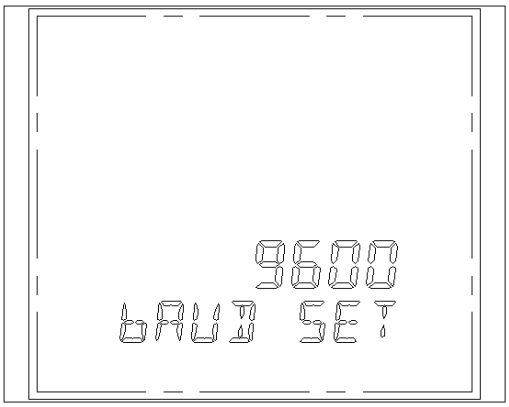


Fig. 87

(3) Setup PT page

The upper row displays PT data. The upper left 0 is shimmering. As shown in Fig. 88, PT is set as 1.0.

The lower row displays "PT SET", as the PT setup page.

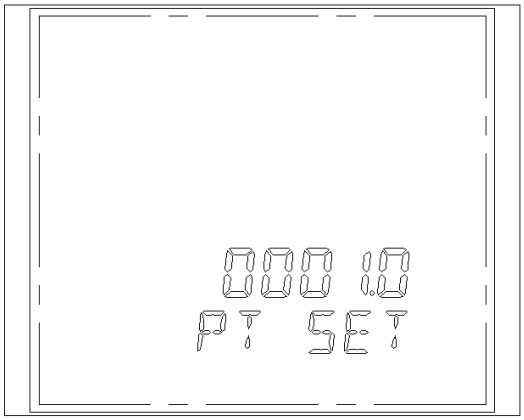


Fig. 88

(4) Setup CT display page

The upper row displays CT data. The upper left 0 is shimmering. As shown in Fig. 89, CT is set as 1.0.

The lower row displays "CT SET", as the CT setup page.

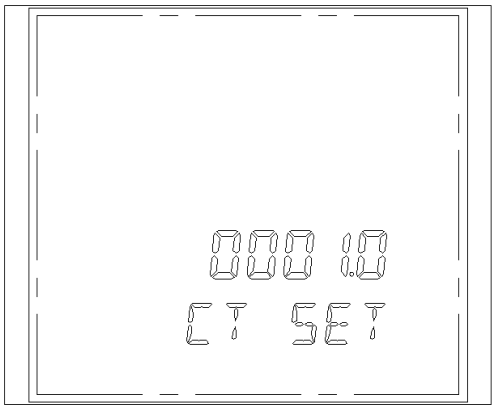


Fig. 89

(5) Setup demand cycle page.

Demand cycle indicates the interval of measuring average Power. It can be set from 1 to 15 minutes.

The upper row shows the Demand cycle. As shown in Fig. 90, the Demand cycle is 15 minutes.

The lower row shows "DEMD SET", to indicate the Demand cycle page.

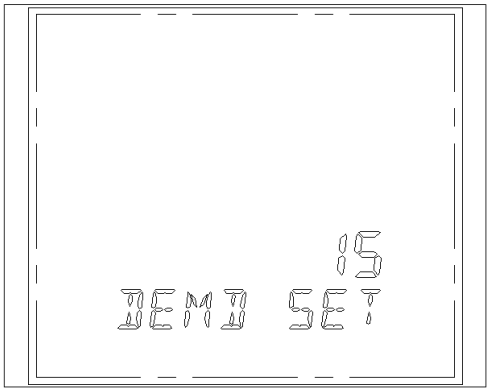


Fig. 90

(6) Setup connection mode page

The upper row shows the connection mode. As shown in Fig. 91, the current connection is 3P4W. (0 is for 3P3W and 1 for 3P4W)

The lower row shows "WIRE SET", indicating connection setup page.

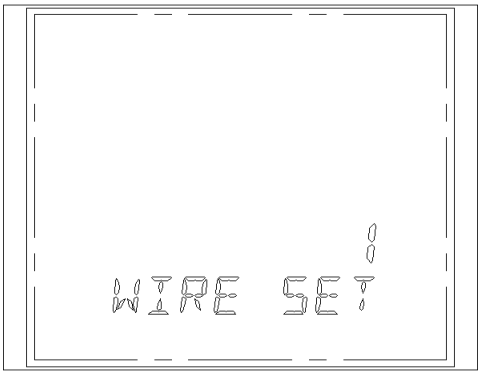


Fig. 91

(7) Setup remote signal channels page

The upper row displays no. of channels is set. As shown in Fig. 92, 8 represent 8 channels remote signals.

The lower row shows "CHANSET", indicating remote signal channel no. setup page.

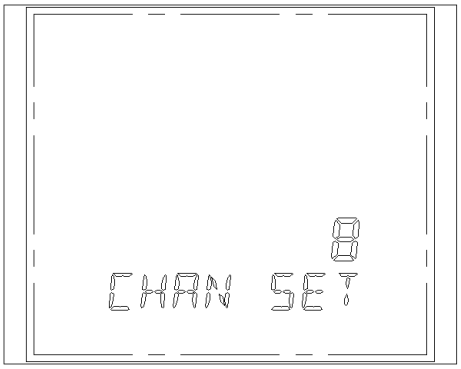


Fig. 92

(8) Setup the display interval page.

The upper row displays the interval for the next page. As shown in Fig. 93, the interval for next page is 10 seconds.

The lower row displays "INTV SET", indicating the interval for changing to the next display page.

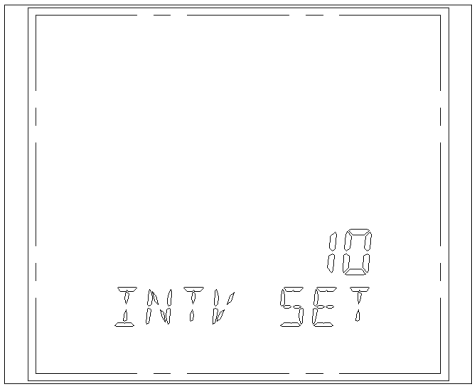


Fig. 93

(9) Setup RS485 or infrared selection display page

The upper row shows the selected format (0 as infrared, 1 as RS485). As shown in Fig. 94, RS485 as the com. mode. The infrared function is not available in the current stage.

The lower row shows"485 OR IR", indicating the com. selection page.

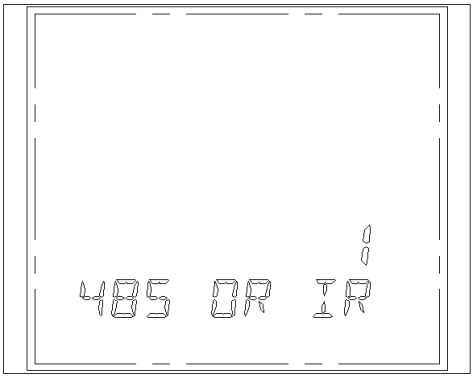


Fig. 94

(10) Setup Profibus address page

The upper row displays the meter address.

The lower row "PROFIBUS" symbol indicates Profibus address page.

As shown in Fig. 95, the address for Profibus is 0.

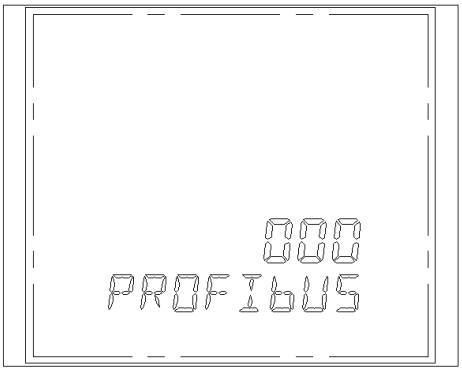


Fig. 95

(11) Data storage interval in SD card page

The upper row displays the interval in seconds (60~3600secs, the time is fixed, but it isn't differ from the set value when the SD card is operated. e.g. reading the SD card)

The lower row "ELEC KEEP" symbol indicates SD card storage interval.

As shown in Fig. 96, the interval for saving the data in SD card is 2601 seconds.

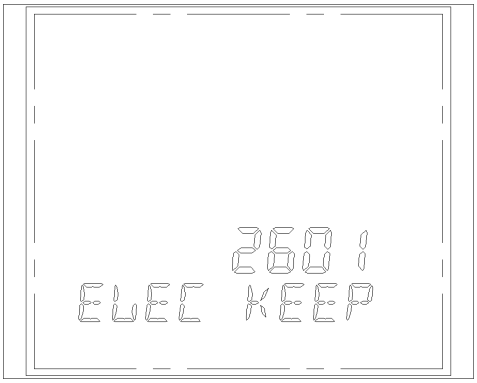


Fig. 96

(12) Password modification page

The upper row displays the new password.

The lower row "CHN PASS" symbol indicates the password modification page.

As shown in Fig. 97, the new password is 0000

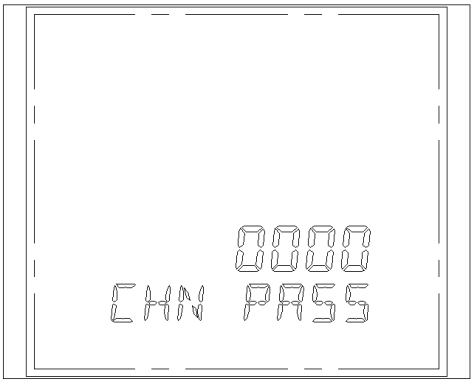


Fig. 97

(13) Example

Suppose the order code of the meter is Multifunction Power Meter -ABCG, representing 8 channels remote signal input module, 4 relay outputs, 4 analog outputs (4~20mA), data storage and harmonic module. The input signal is 10kV, 50A, 50Hz. The PT ratio is 10kV/100V, and CT ratio is 50A/5A. The corresponding analog outputs are Voltage, Current, active Power, frequency. 4 relay output can connect to the alarm outputs. PT ratio is 100, and CT ratio is 10 (As default, PT=1, CT=1, and the values of PT*U and CT*I can not exceed the measurement scope of Power)

Example:

4 analog outputs module (4~20mA)		4 relay outputs	
Analog output 1	L1 phase Voltage 100V 0V:4.000mA, 100V:20.000mA,	Relay output 1	L1 Voltage Upper limit: 130V, Lower limit: 30V
Analog output 2	L1phase Current 5A 0A: 4.000mA, 5A: 20.000mA,	Relay output 2	L1 phase Current Upper limit: 6A, Lower limit: 1A
Analog output 3	Active Power:1.5kW 0kW:4.000mA, 1.5kW: 20.000mA	Relay output 3	Frequency Upper limit: 55Hz, Lower limit: 45Hz
Analog output 4	Frequency: 45~55Hz 45Hz: 4.000mA, 55Hz: 20.000mA	Relay output 4	Zero sequence Current Upper limit: 6A, Lower limit: 1A

Relay Control Mode		
0	Manual (Remote) control mode	Write output control register can control the relay, 0 as off/1as pulse output.
1	L1 phase Voltage	1. In the overlimit control mode, output control register can respond to the on/off status of the relay. 0 as off/1 as on. 2. In the overlimit control mode, the meter executes according to the upper and the lower limits parameters, set by software.
2	L2 phase Voltage	
3	L3 phase Voltage	
4	I1 phase Current	
5	I2 phase Current	
6	I3 phase Current	
7	Sequence Current	
8	3 phase active Demand	
9	3 phase reactive Demand	
A	Power factor	
B	Frequency	
C	Reactive Power neg. direction	
D	Active Power	
E	Unbalanced Voltage	
F		

Analog Output Selection					
D7~D4	Select phase		0-L1, 1-L2, 2-L3, 3-3 phase F- constant output 4mA E- constant output 20mA		
D3~D0	Output parameters		4mA/0V	12mA/ 2.5V	20mA/5V
	0	Frequency	45 (55) Hz	50 (60) Hz	55 (65) Hz
	1	Voltage	0V	1/2Vn	Vn
	2	Current	0A	1/2In	In
	3	Apparent Power	0kVA	1/2 Sn	Sn
	4	Active Power abs. value	0kW	1/2 Pn	Pn
	5	Reactive Power abs. value	0kVAr	1/2 Qn	Qn
	6	Power factor abs. value	0	0.5	1.00
	7	Active Power	-Pn	0	Pn
	8	Reactive Power	-Qn	0	Qn
	9	Power factor	-1.00	0	1.00

* Vn, In is the Max. output parameters, Sn=Vn*In, Pn= Sn*cosΦ, Qn=Sn*sinΦ

1. Set up PT, CT ratio (scope: 1~6500)

(1). Press [I+P] for 3 seconds to enter the programming state, the 1st left digit shimmers, and the password is requested to enter. (The default password is "0000").

(2). Press I key to add 1 to the current digit, and press U key to minus 1 to the current digit. When "0000" is displayed, press " ⏎ "to enter setup.

(3). Press ⏎ key 3 times till "PT SET" appears. Press I and U key to get the desired value. In this example, When 100 appears, save the value by pressing ⏎ , and CT SET page appears. When CT ratio is set as 10, press ⏎ to save the value and enter the next page.

2. When the remote signal module A is installed, 8 channels remote signal status is shown on the meter as in Fig. 98.

3. When the relay output module B is installed, the meter is displayed as shown in Fig. 98.

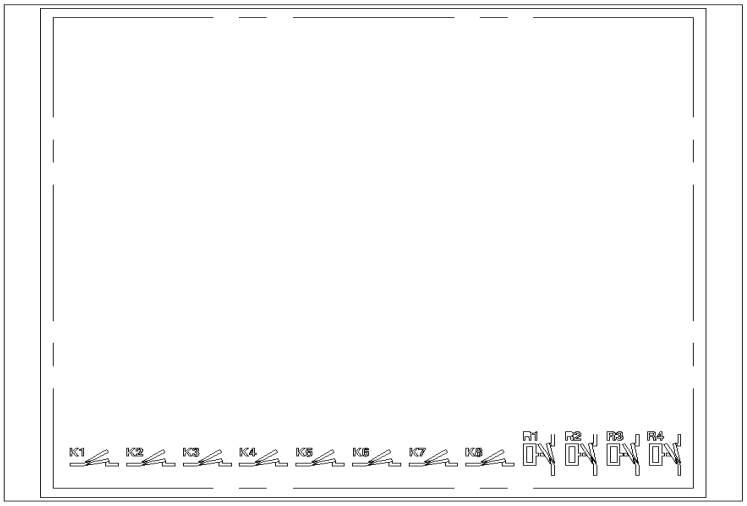


Fig. 98

4. Relay alarm value setup

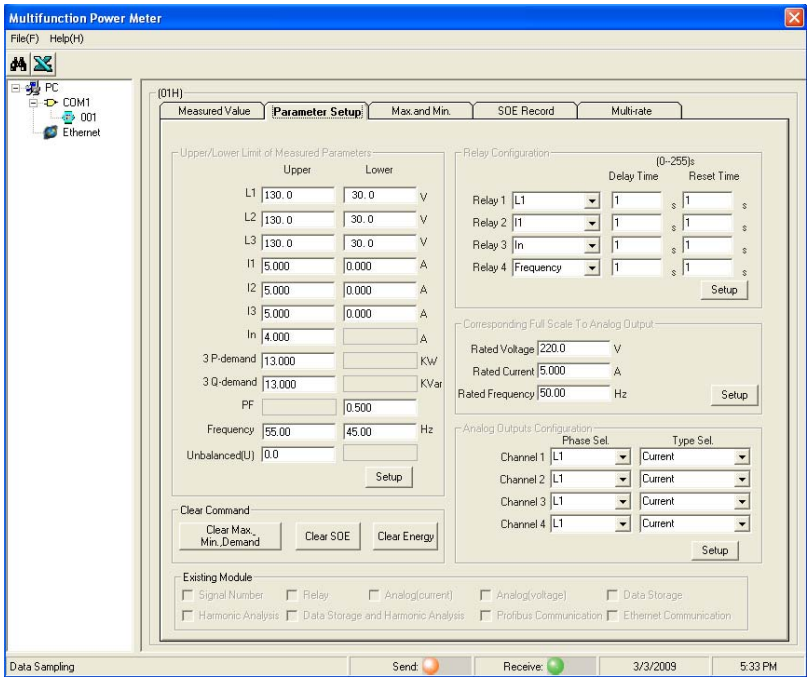


Fig. 99

In the "Parameter Setup" page shown in Fig. 99, set up the corresponding value as shown in the table, and save it. When the value is over the upper limit, or less than the lower limit, the corresponding relay alarm is on.

5. When the 4 analog outputs module C is installed, set up the value in the "Parameter Setup" page as shown in Fig. 100.

(1). In the "Corresponding Full Scale to Analog Output" column, input the full scale value. In this example, the signal input: 10kV, 50A, 50Hz, PT ratio 100, CT ratio 10, then the corresponding rated Voltage is 100, the rated Current is 5, and the rated frequency is 50.

(2). In the "Analog Outputs Configuration" column, select the corresponding parameter in each channel as in the table.

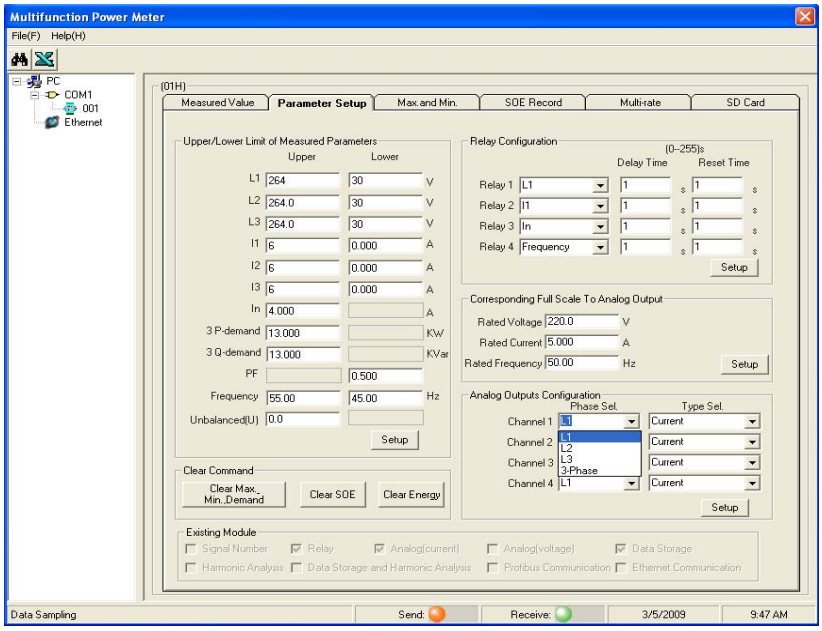


Fig. 100

6. When data storage and harmonic analysis module G is installed, the meter has the corresponding function.

1.12.4.3 Multi-tariff setup mode

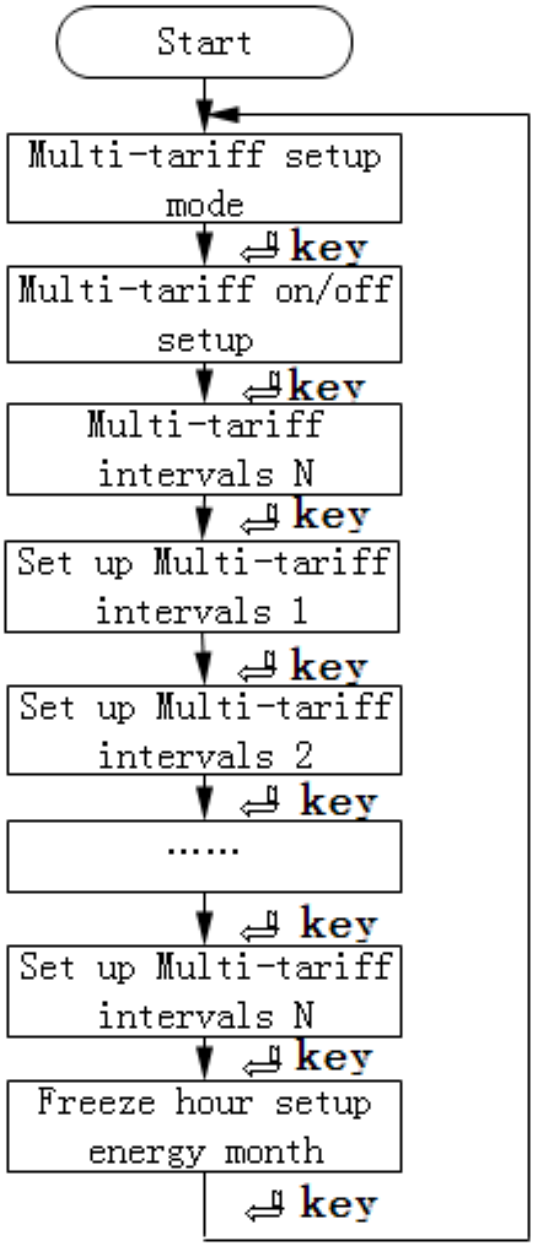


Fig. 101 Multi-tariff setup flow chart

(1) Setup multi-tariff on/off page

The upper row shows the multi-tariff function on/off status (0 as off, 1 as on). As shown in Fig. 102, the multi-tariff function is off.

The lower row shows "ON OFF", indicating the multi-tariff on/off page.

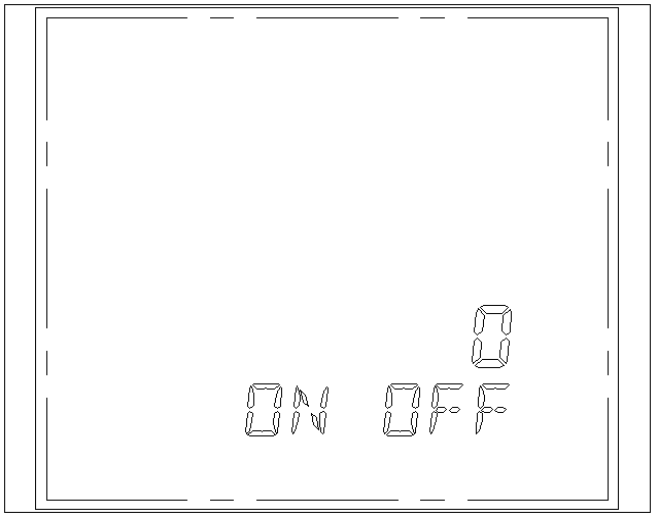


Fig. 102

(2) Setup No. of interval for multi-tariff page

The upper row displays no. of interval. As shown in Fig. 103, there shall be 2 tariffs.

The lower row shows "DP NUMB", indicating the interval setup page.

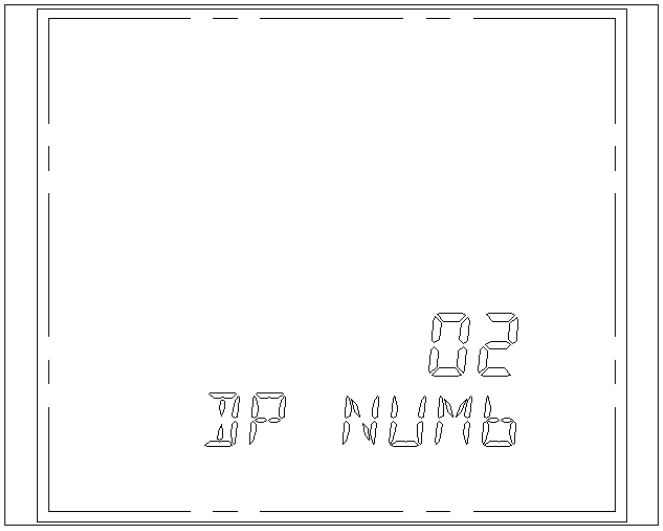


Fig. 103

(3) Multi-tariff interval N setup page

The 1st row displays current interval.

The 2nd row displays the different rate (0 as sharp rate, 1 as peak rate, 2 as flat rate, and 3 as valley rate.).

The 3rd row shows the set intervals.

The 5th row "DP TIME" is the indicator.

Note: The min. interval is 30 minutes. The starting time of N+1 interval should be consistent to the ending time of n interval. The 1st interval can't cross 0:00. The ending interval can cross 0:00.

No. of Intervals: 5

Duration: 1 day

Interval: 02: 00——08: 00 (valley)
08: 00——12: 00 (peak)
12: 00——17: 00 (flat)
17: 00——21: 00 (sharp)
21: 00——02: 00 (valley)

As shown in Fig. 104, the 1st interval multi-tariff type is sharp, and the starting time is 21: 00.

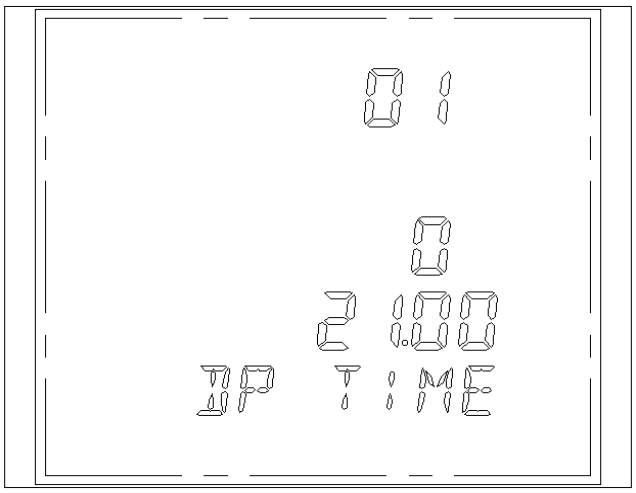


Fig. 104

(4) Frozen time every month setup page

The 1st row displays the date.

The 2nd row displays hour.

The 3rd row displays minute.

The 4th row displays second.

The 5th row "FR TIME" indicates the frozen time every month setup page.

As shown in Fig. 105, the frozen time every month is 16th, 08:18:30.

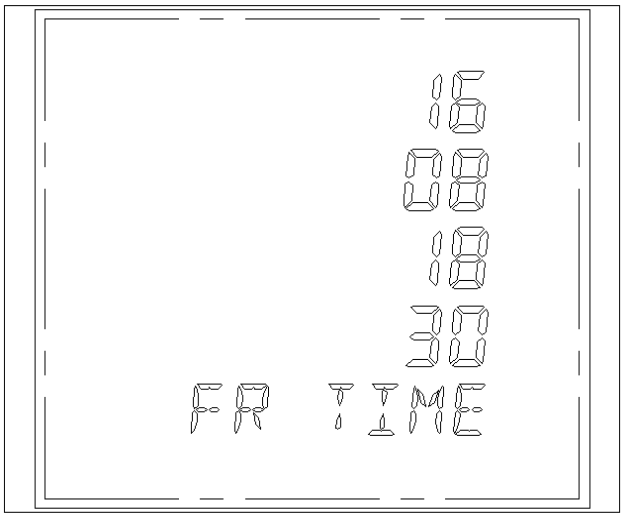


Fig. 105

1.12.4.4 Setup Ethernet module

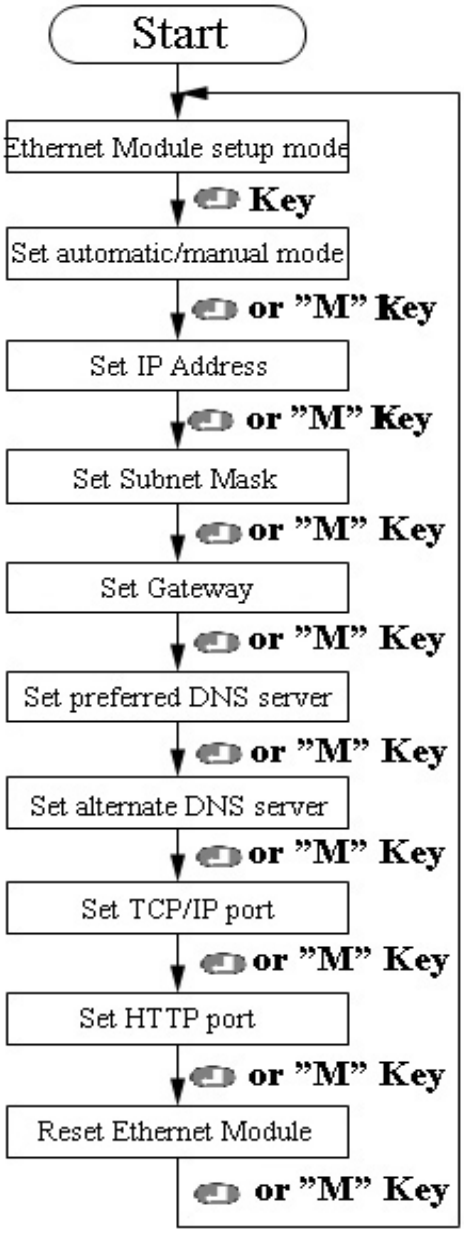


Fig. 106 Ethernet module setup flow chart

Press key to save the current settings and enter the next page. Press "M" key to enter the next page without saving. The user must reset Ethernet module after modifying the parameters. There are 2 kinds of reset methods, power reset and manual reset.

(1) Ethernet setting manual

When “NET SET” displays, please press to check the connection of Ethernet module. If the connection is OK, it will turn to Automatic/manual mode setup page after 2 seconds, otherwise there will be error hint. “NET F 0” means no Ethernet module. When it shows, please check if the module is installed well. “NET F 1” means the module is installed, but can

not work well. Usually the reason is that the user does not set up network correctly, such as setting DHCP as automatic mode when there is no DHCP service.

(2) Automatic/manual mode setup page

The upper row displays setting data (0 is for automatic, 1 is for manual mode).
The lower row "DHCP SET" indicates automatic/manual mode setup page. Please make sure there is DHCP service before setting it as automatic mode.

As shown in Fig. 107, it indicates automatic mode.

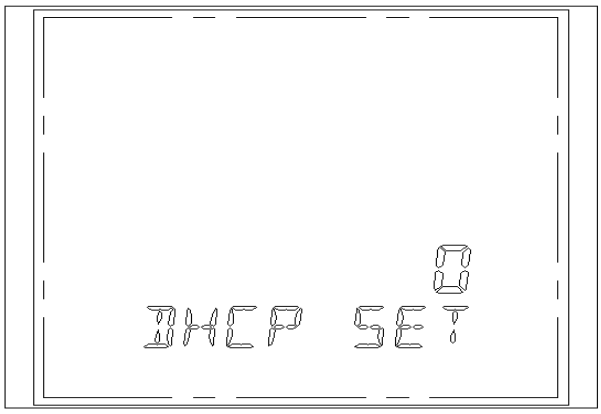


Fig. 107

(3) IP Address mode setup page

The first row displays the first data of IP Address, as 192 shown in Fig. 108.
The second row displays the second data of IP Address, as 168 shown in Fig. 108.
The third row displays the third data of IP Address, as 0 shown in Fig. 108.
The fourth row displays the fourth data of IP Address, as 188 shown in Fig. 108.
The fifth row "IP" indicates IP setup page.

As shown in Fig. 108, IP Address is 192.168.0.188

IP Address should be legal addresses as in A, B, C classes. i.e. 0.0.0.0 and 255.255.255.255 can not be set. 192.168.0.0, and 192.168.0.255 can not be set either.

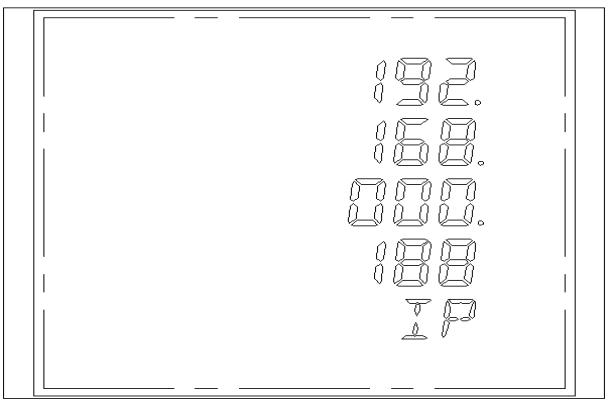


Fig. 108

(4) Subnet mask mode setup page

The first row displays the first data of Subnet mask, as 255 shown in Fig. 109.
The second row displays the second data of Subnet mask, as 255 shown in Fig. 109.
The third row displays the third data of Subnet mask, as 255 shown in Fig. 109.
The fourth row displays the fourth data of Subnet mask, as 0 shown in Fig. 109.
The fifth row "SUB" indicates Subnet mask setup page.

As shown in Fig. 109, Subnet mask is 255.255.255.0.

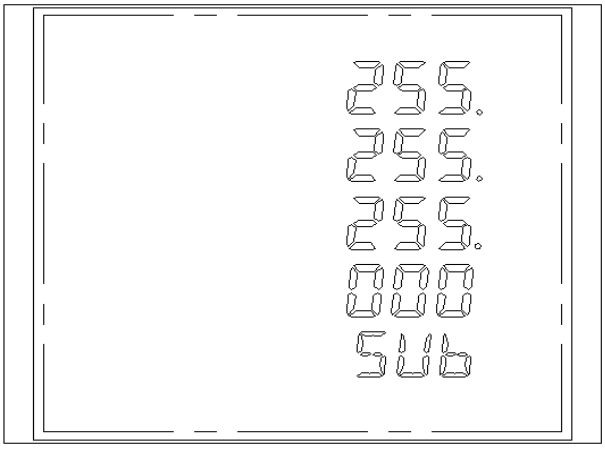


Fig. 109

(5) Gateway mode setup page

The first row displays the first data of Gateway, as 192 shown in Fig. 110.
The second row displays the second data of Gateway, as 168 shown in Fig. 110.
The third row displays the third data of Gateway, as 0 shown in Fig. 110.
The fourth row displays the fourth data of Gateway, as 1 shown in Fig. 110.
The fifth row "DT" indicates gateway mode setup page.

As shown in Fig. 110, Gateway is 192.168.0.1.

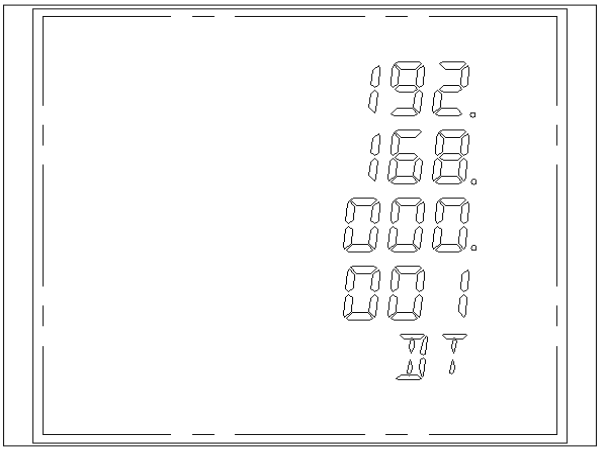


Fig. 110

(6) Preferred DNS server setup page

The first row displays the first data of preferred DNS server, as 202 shown in Fig. 111.
The second row displays the second data of preferred DNS server, as 96 shown in Fig. 111.
The third row displays the third data of preferred DNS server, as 134 shown in Fig. 111.
The fourth row displays the fourth data of preferred DNS server, as 133 shown in Fig. 111.
The fifth row "DNS1" indicates preferred DNS server setup page.

As shown in Fig. 111, preferred DNS server is 202.96.134.133.

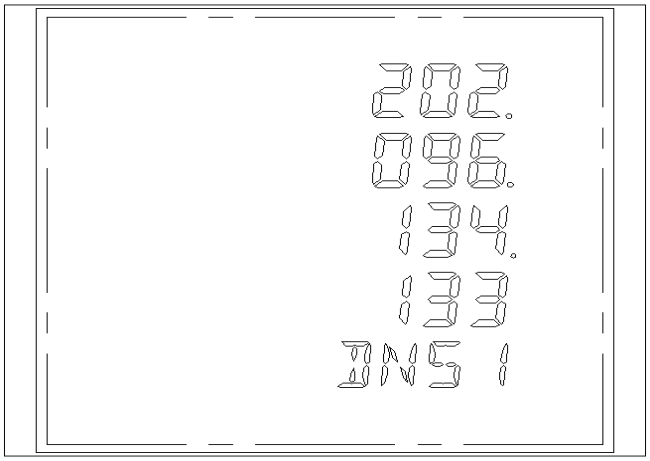


Fig. 111

(7) Alternate DNS server address setup page

The first row displays the first data of alternate DNS server, as 202 shown in Fig. 112.
The second row displays the second data of alternate DNS server, as 96 shown in Fig. 112.
The third row displays the third data of alternate DNS server, as 128 shown in Fig. 112.
The fourth row displays the fourth data of alternate DNS server, as 166 shown in Fig. 112.
The fifth row "DNS2" indicates alternate DNS server setup page.

As shown in Fig. 112, alternate DNS server is 202.96.128.166.

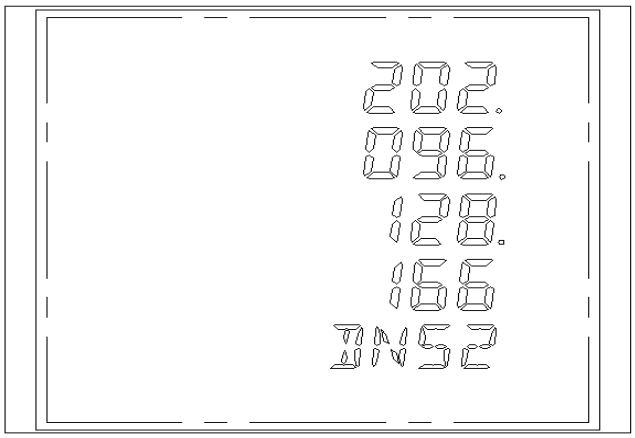


Fig. 112

(8) TCP/IP port mode setup page

The upper row displays TCP/IP port setting data, as 502 shown in Fig. 113.

The lower row "TCP IP" indicates TCP/IP port setup page.

As shown in Fig. 113, TCP/IP port is 502

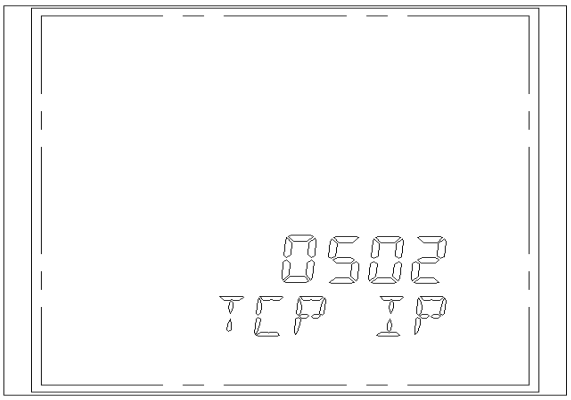


Fig. 113

(9) HTTP port mode setup page

The upper row displays HTTP port setup data, as 80 shown in Fig. 114.

The lower row "HTTP" indicates HTTP port setup page.

As shown in Fig. 114, HTTP port is 80.

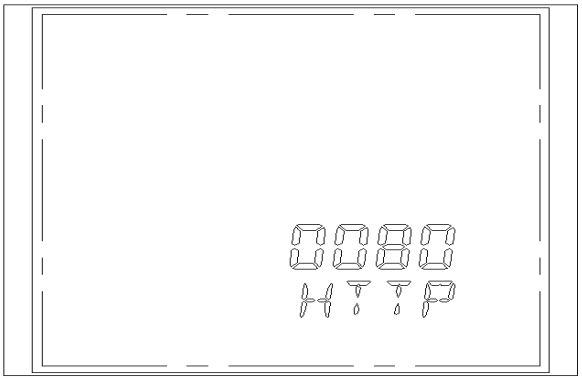


Fig. 114

(10) Reset Ethernet module mode setup page

The upper row displays setting data (0 is for reset later, 1 is for reset now).

The lower row "E RESET" indicates reset Ethernet Module setup page.

As shown in Fig. 115, it indicates reset Ethernet Module later.

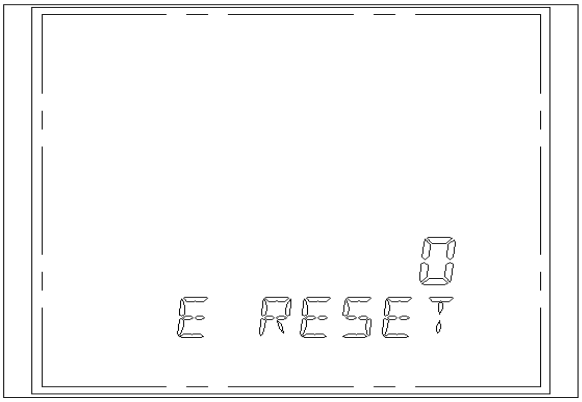


Fig. 115

1.12.4.5 Clear and time setup mode

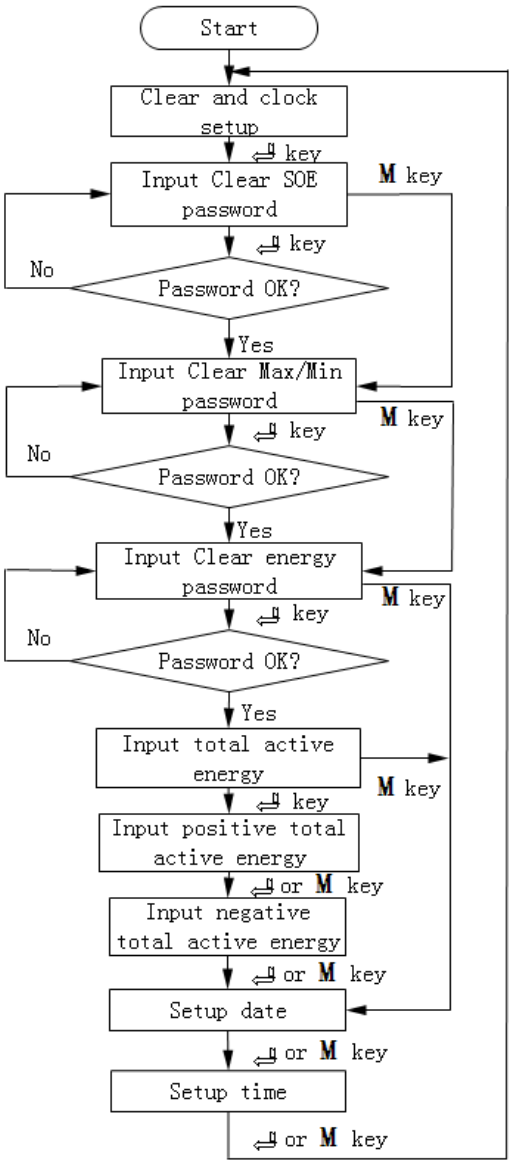


Fig. 116

Note: The data can be cleared only when the password is correct.

After inputting the password, the user press ↵ key to clear the data. If the password is not correct, the meter returns to the password mode. After the data is input, press ↵ key to save current saving and go to the next page. Press **M** key to enter the next page without saving.

(1) Clear SOE record page

The upper row displays the password.

The lower row displays "CLR SOE", indicating clear SOE record page.

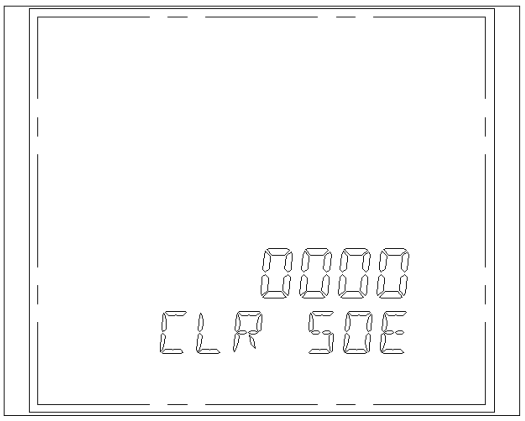


Fig. 117

(2) Clear max/min value page

The upper row shows the password.

The lower row "MAXMIN" indicates the clearing max/min value page.

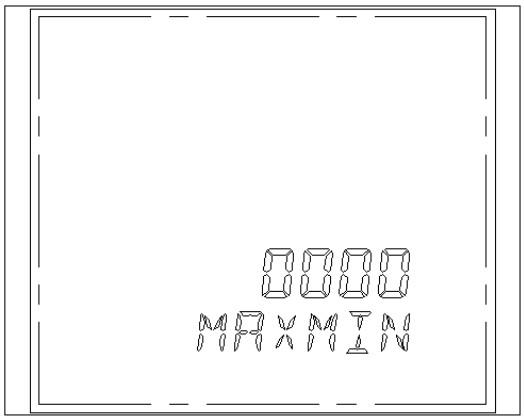


Fig. 118

(3) Clear Energy page

The upper row shows the password.

The lower row "CLR ENER" shows the clear Energy page.

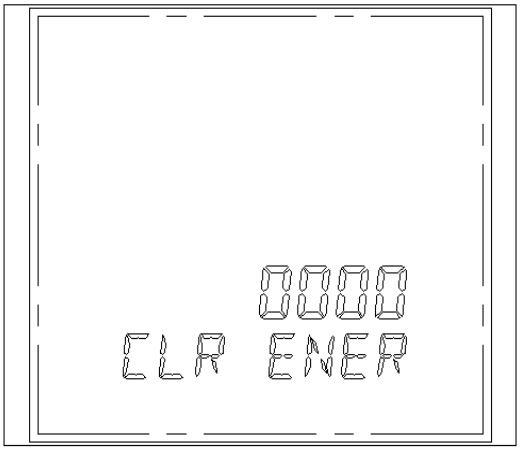


Fig. 119

(4) Total Energy display page

"Total" symbol is shown in the left lower row. As shown in Fig. 120, the total active Energy is 626.68kWh.

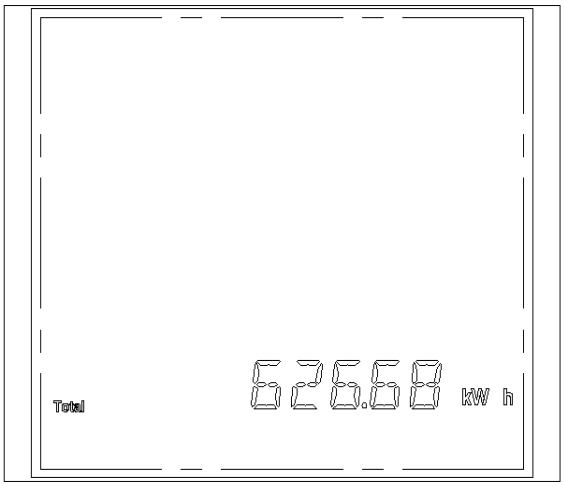


Fig. 120

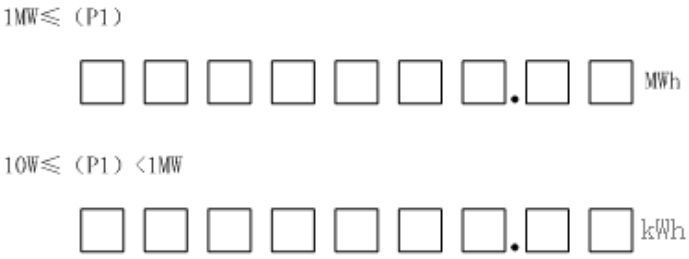


Fig. 121

Note: After the Energy accumulates to 9999999.99MWh, it shall be reset to 0 when Energy is accumulated 0.01MWh. After the Energy accumulates to 9999999.99Kwh, it shall be reset to 0 when Energy is accumulated 0.01Kwh. Meanwhile, the register for recording no. of active Energy overlimit adds 1, as shown in Fig. 121.

(5) Importing total Energy page

"Imp" symbol is shown in the left lower corner. As shown in Fig. 122, the importing total active Energy is 6832100.86kWh.

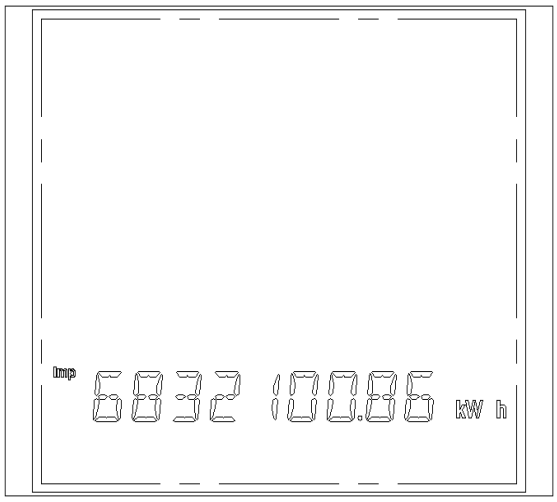


Fig. 122

(6) Exporting total Energy page

"Exp" symbol is shown in the left lower corner. As shown in Fig. 123, the exporting total active Energy is 6312100.26kWh.

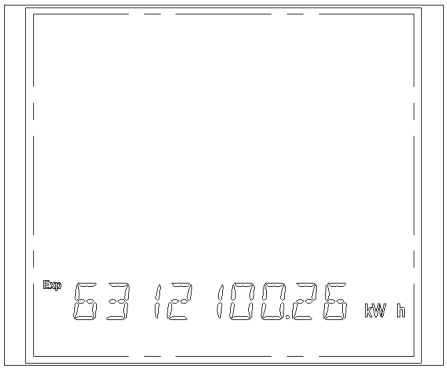


Fig. 123

(7) Setup date page

The 2nd row is year 20XX data.

The 3rd row is XX month data.

The 4th row is XX date data.

The 5th row "DATE SET" indicates the date setup page.

As shown in Fig. 124, the date is June 25th, 2008.

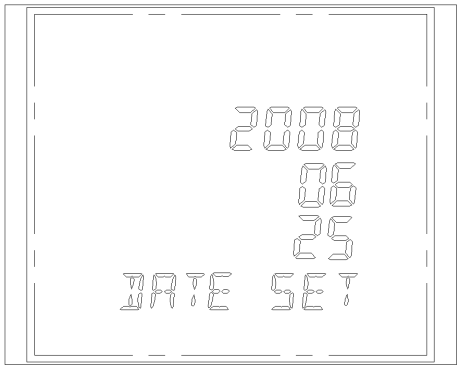


Fig. 124

(8) Setup clock page

The 2nd row displays XX hour.

The 3rd row displays XX minute.

The 4th row displays XX second.

The 5th row "TIME SET" indicates time setup page.

As shown in Fig. 125, the time is 0:31:40.

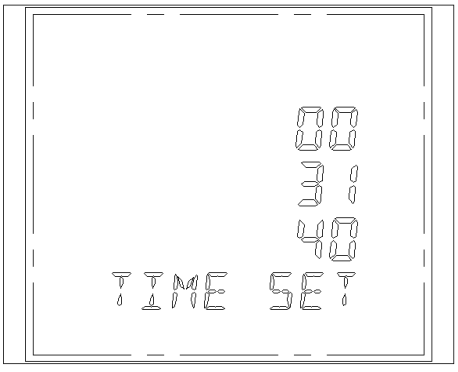


Fig. 125

II. Software Description

2.1. Function Description

Multifunction Power Meter can read sampling data, real time monitoring the data, and can remote set up sampling data, which includes clearing max. and min. values, relay overlimit parameter setup, relay action delay setup, relay current status setup, analog parameter programming, remote signal alarm and record check-up, SD data storage setup, harmonic data statistics, multi-tariff data. The harmonic measurement function can analyze the harmonics with graphs and tables. The user must add 120Ω resistance on the terminal to communicate through RS485.

2.2. Installing the Software

(1) Software environment: Win9x, WinMe, Win2000/XP.
(2) Installation: Click setup.exe, and follow the instruction step by step to install the software. Click English for the next step.

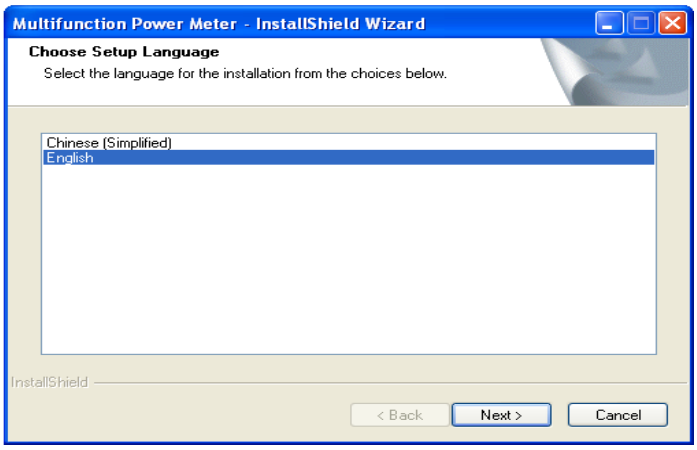


Fig. 126

(3) When the next page is shown, the installation in progress.

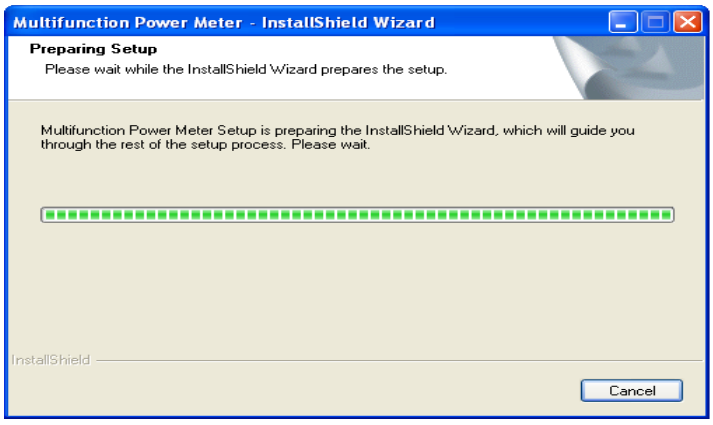


Fig. 127

(4) When the page in Fig. 128 is shown, click "next", the Fig. 129 is shown.

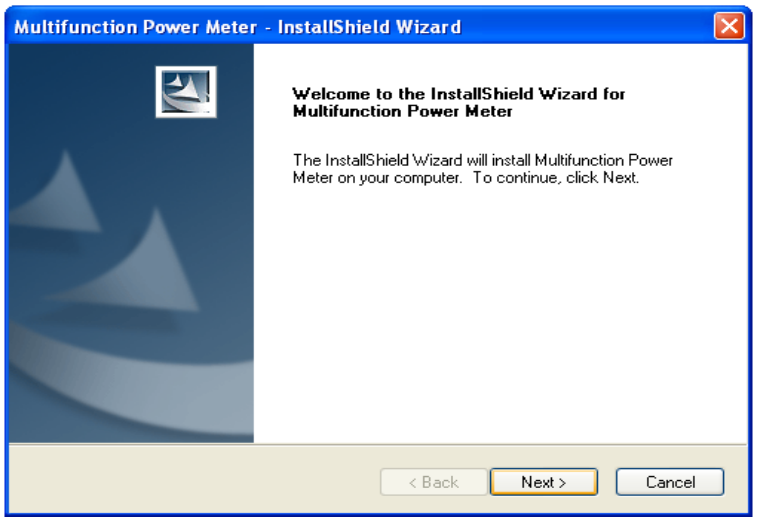


Fig. 128

(5) If the user wants to change the destination file, click "change" to change it. Click "next" to continue installing software.

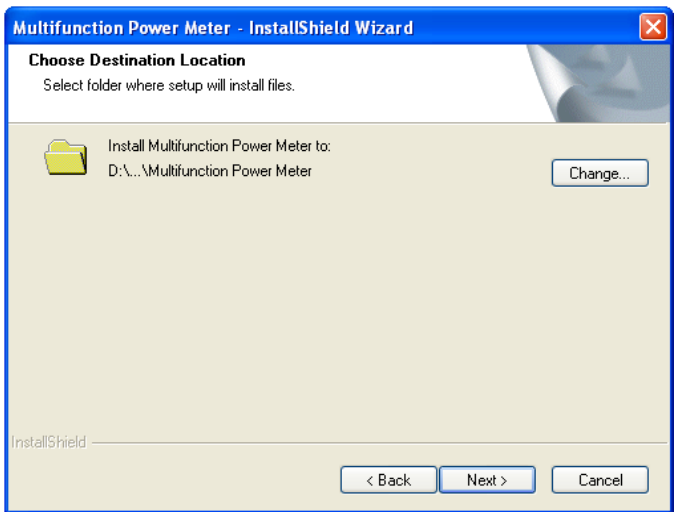


Fig. 129

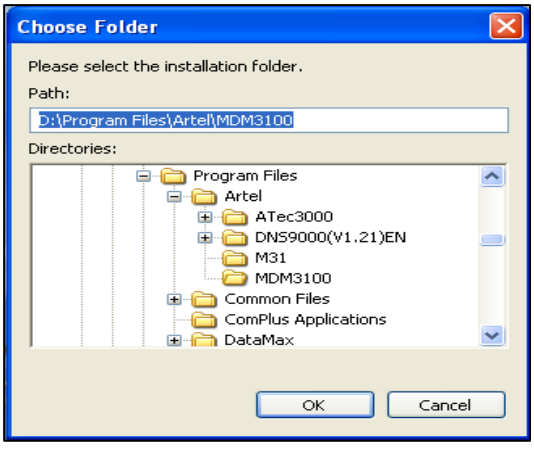


Fig. 130

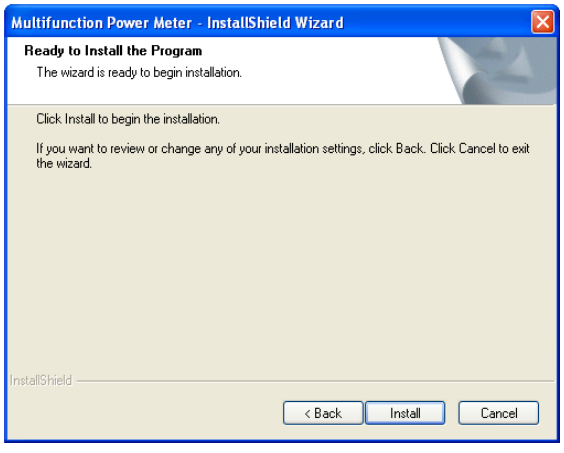


Fig. 131

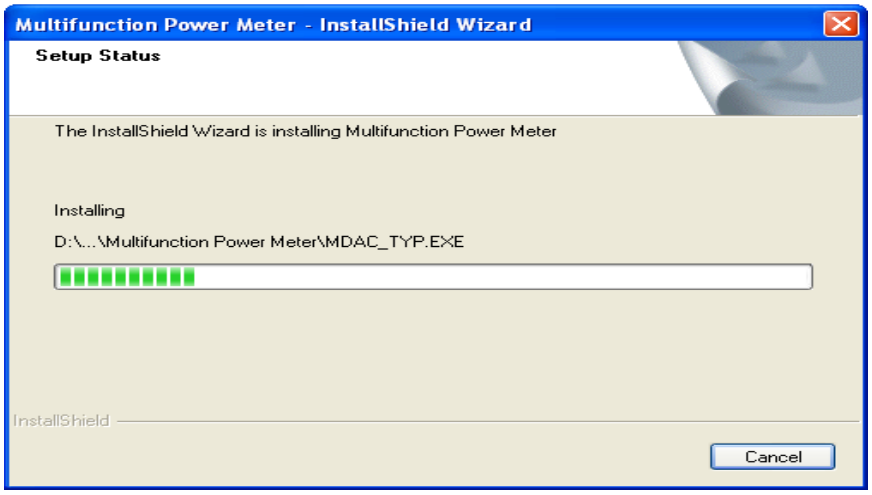


Fig. 132

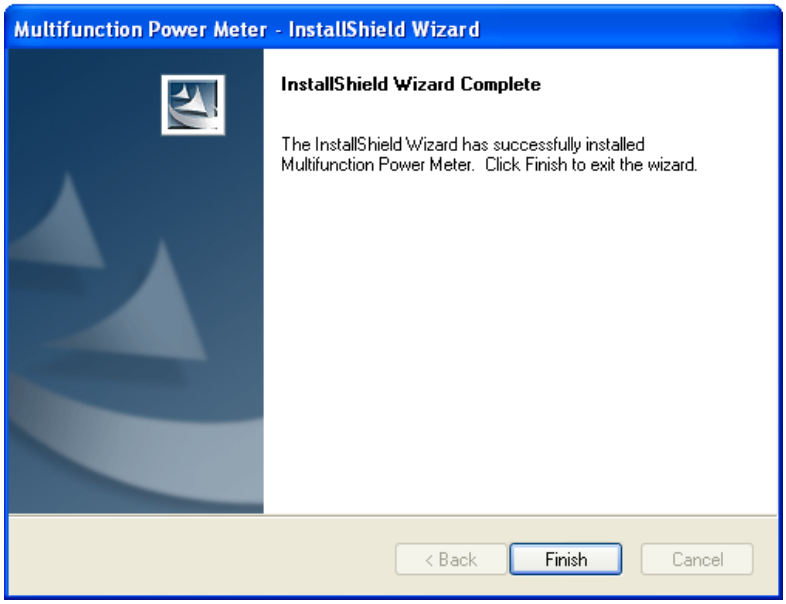


Fig. 133

Click "Finish" icon, the "Multifunction Power Meter" icon shall appear on the desktop.

Fig. 134

2.3 Operation Page Setup

After the software is installed, double click the 

icon to enter the following page as shown in Fig. 135 on PC. Choose the corresponding com. port (choose com1), click search button on the "search online" page that shows up. The user can type the corresponding address as the setup on the meter (the default setting is 1).

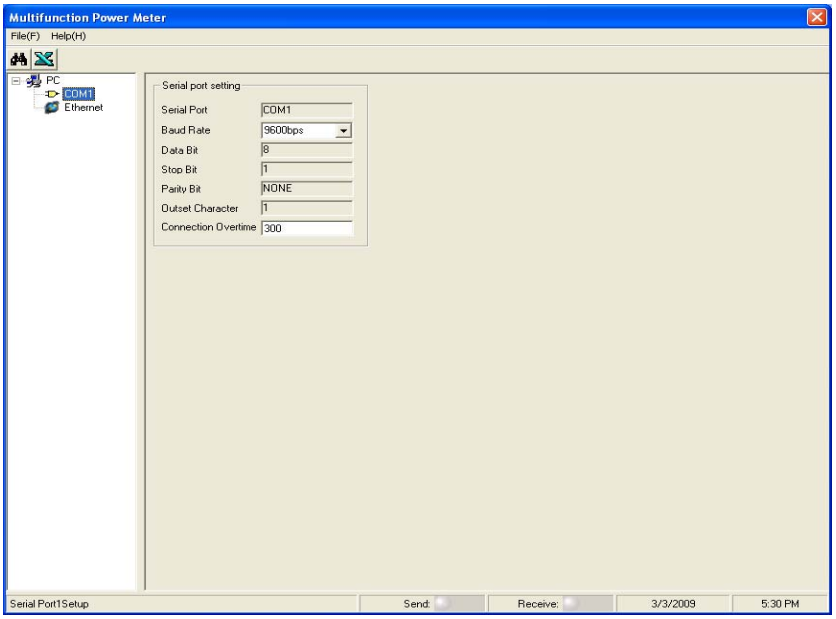


Fig. 135

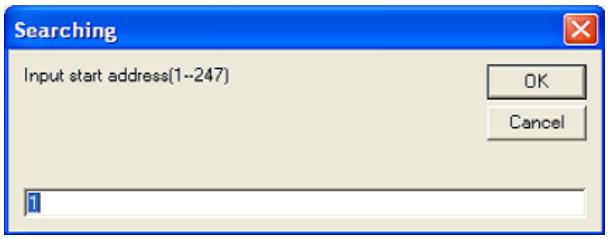


Fig. 136

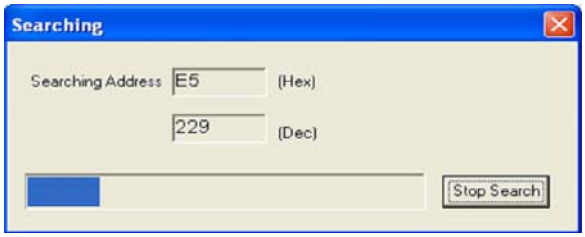


Fig. 137

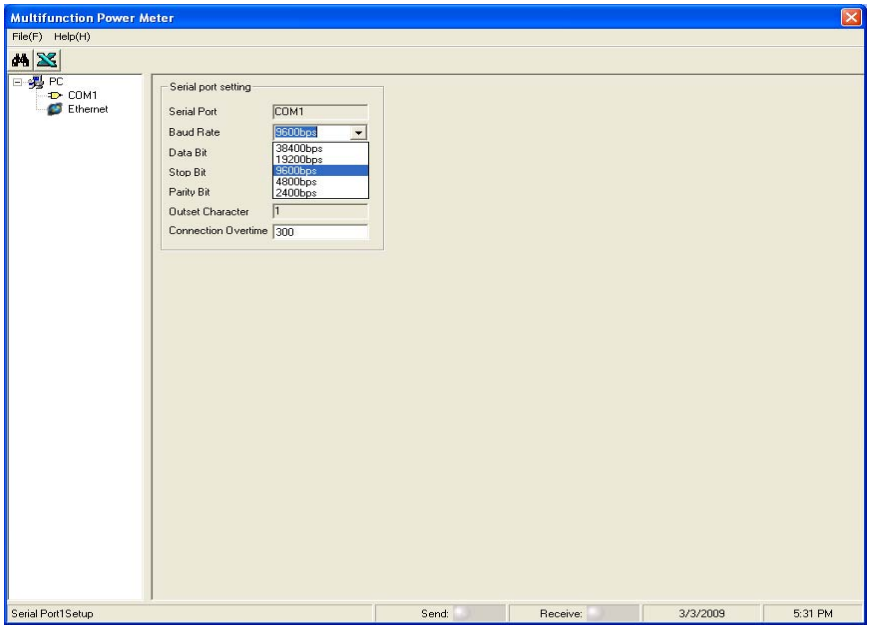


Fig. 138

After the meter is searched, click "stop" button. Meanwhile click the  icon in the page to reach the page shown as Fig. 139.

2.4 Interface Page Description

As Fig. 139 shows, the measured data in 3P4W system are displayed. Parameters include address, PT, CT, baud rate, Demand statistics, clock, no. of remote signals, pulse width, meter constant value (The pulse constant for meter could be set a little bigger when the signal is small, like 9600; it could be set a little smaller when the signal is big, like 1600), display interval, storage interval in memory, output selections, etc. Relay output, relay status, and remote signal input status can be programmed as well. As shown in Fig. 139, the user can view parameters measured, including run time (accumulation every 200 seconds). The user can also read and modify Current/Voltage measurement range, and wiring.

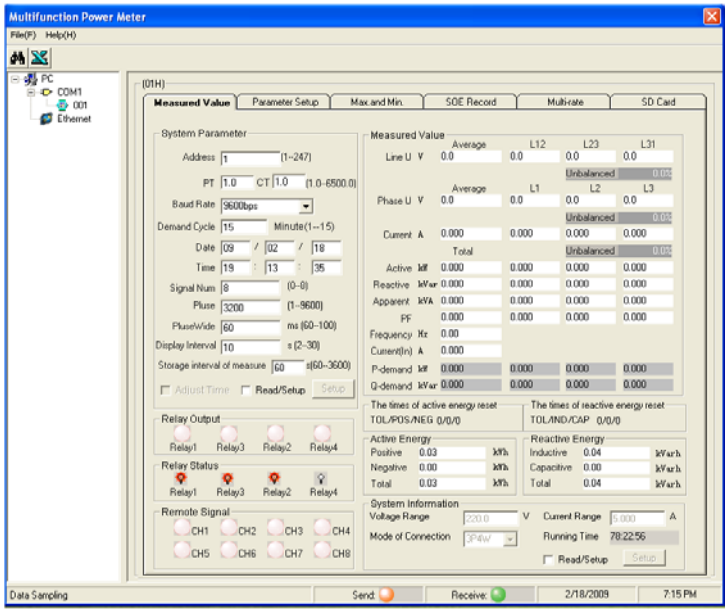


Fig. 139 Measurement page in 3P4W system

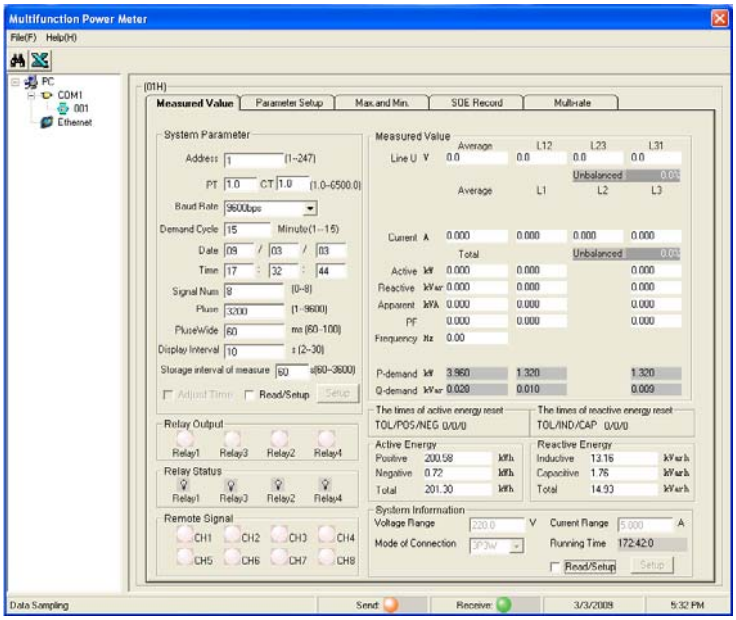


Fig. 140 Measurement page in 3P3W system

Click “Parameter Setup”, Fig. 141 will show. In the page, the user can set upper/lower limit, relay configuration, and analog output configuration, through PC. If the input is wrong, the input words will be red. After setting parameters, click “Setup” (3P3W has no zero Current upper limit.) As shown in Fig. 142 and Fig. 143, the user can choose corresponding functions according to requirements (Default: Relay is in manual mode. Analog output full scale is in calibration mode, 220V, 5A, 50Hz, and Frequency 50Hz correspond the middle value 12mA or 2.5V).

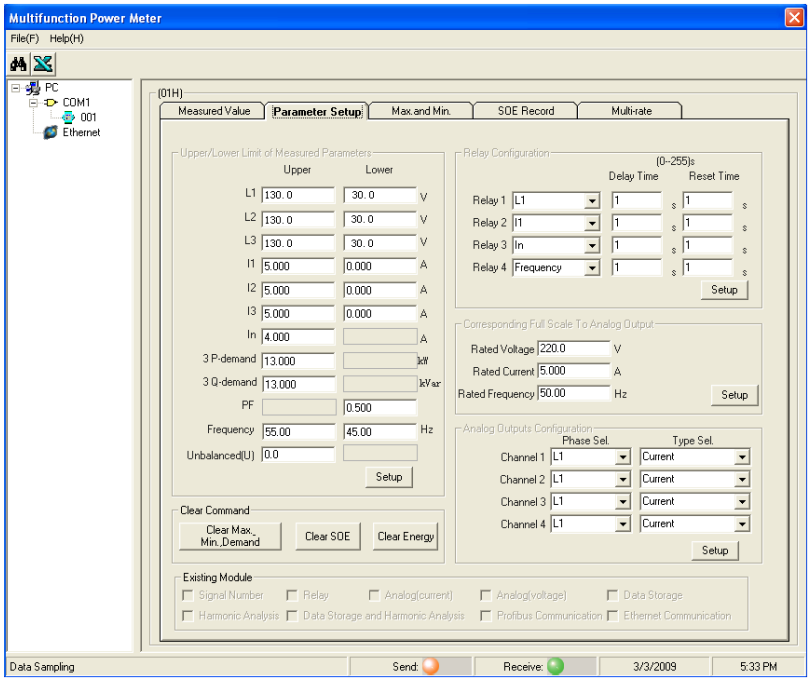


Fig.141

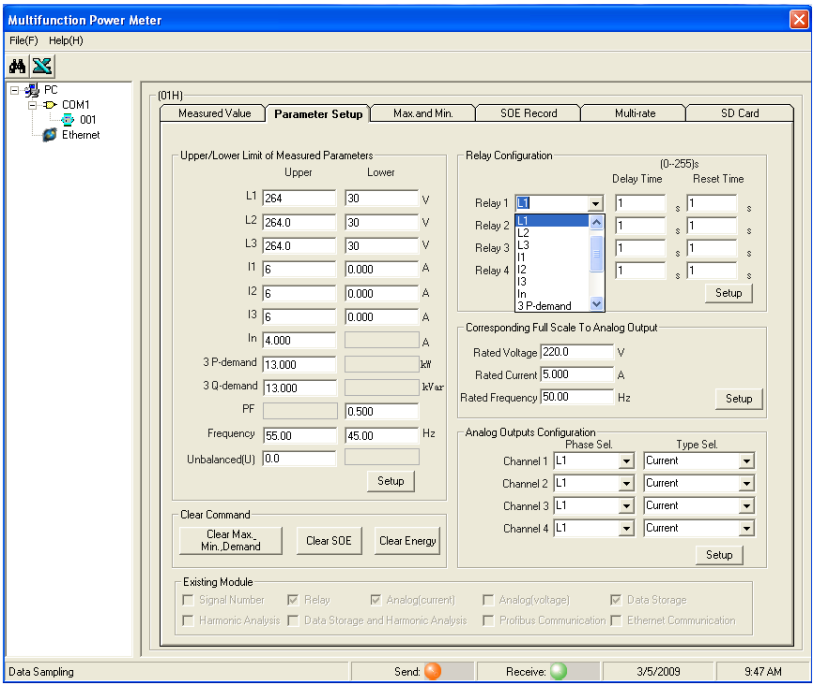


Fig. 142

Notice: Frequency 50Hz correspond the middle value 12mA or 2.5V

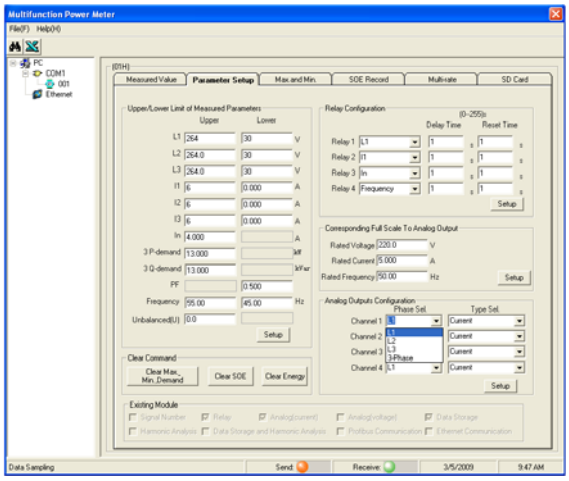


Fig.143

In Fig. 143, current module detected assistant module. If assistant modules are detected, the corresponding item shall be checked.

In max/min value display page, click the corresponding menu bar to read the value.

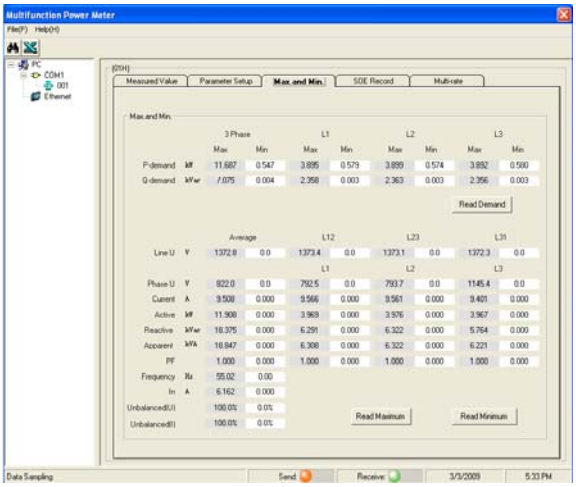


Fig. 144 Max/min value display page (3P4W)

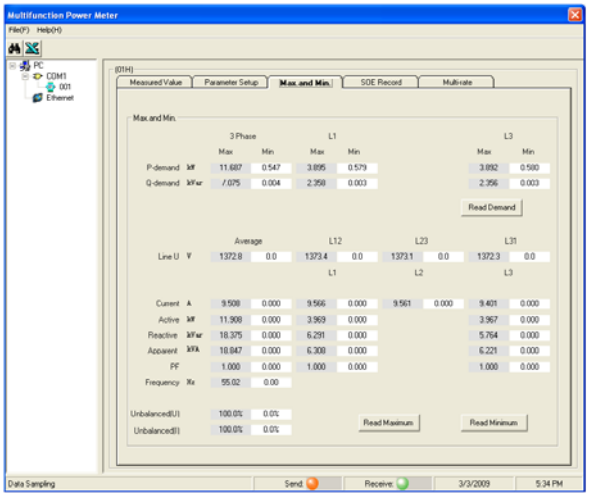


Fig. 145 Max/min value display page (3P3W)

In SOE record Fig. 139, click the “SOE record” menu bar, the actions, and the record of date and time are displayed. (SOE record is available when 8 channels remote signal input module is selected.)

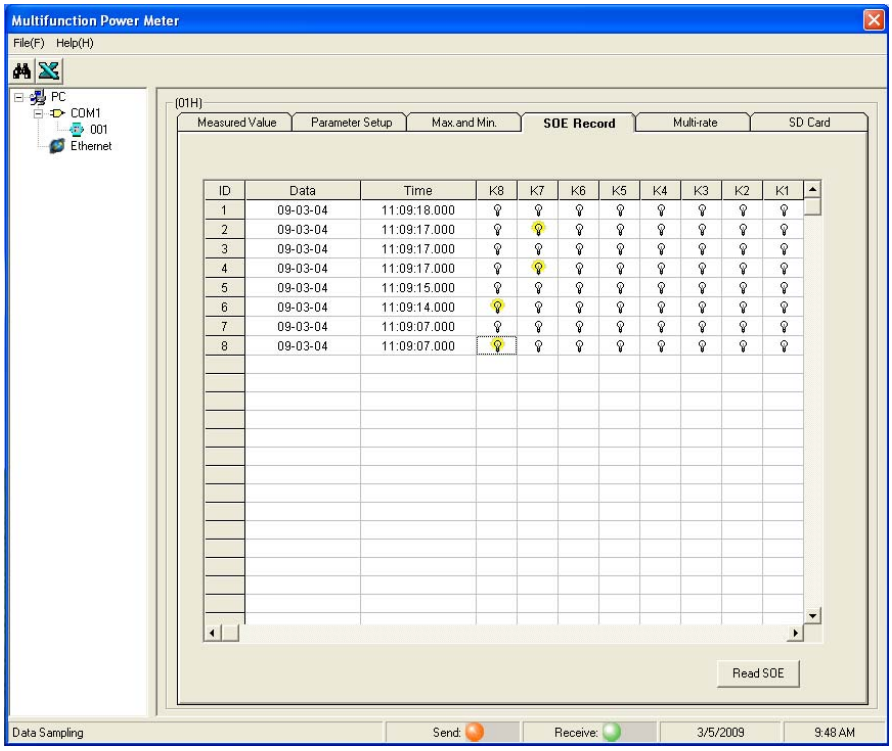


Fig. 146 SOE record display

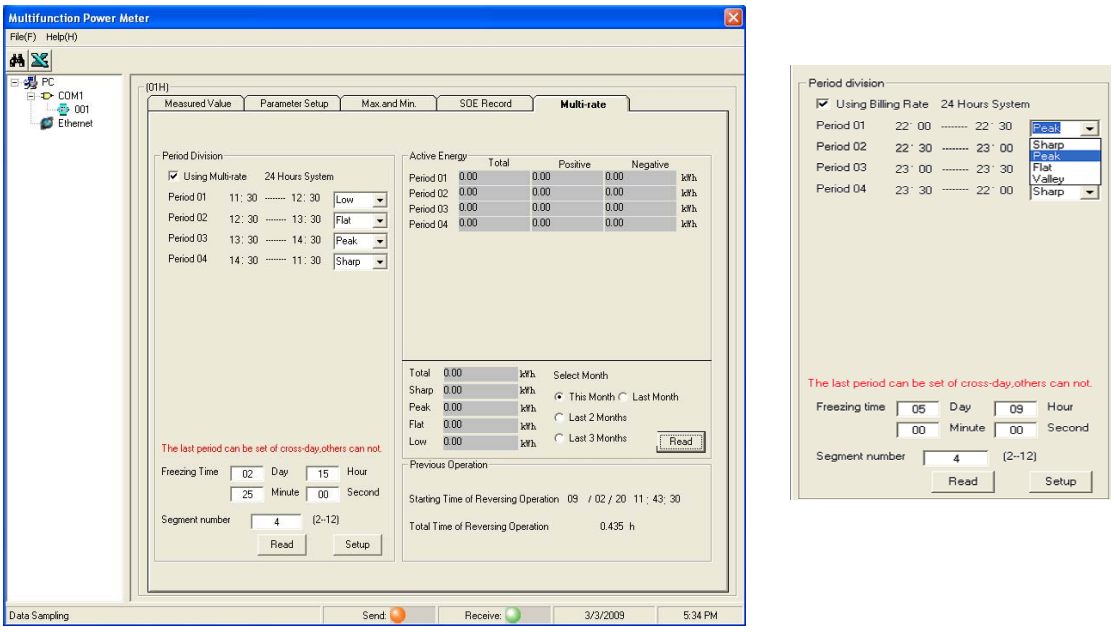


Fig. 147 Multi-tariff page display

Click “read” menu bar to read the active total Energy in the set interval. The factory default is the multi-tariff function turned off. The user can turn on the multi-tariff function by setting up in Fig. 147. When the setting date or time is greater than the freezing time, the Energy value will be frozen and saved. If the Energy value has not been frozen before the freezing time, it will be frozen and saved automatically when the power is on. Please do not modify the date casually, otherwise there will be exceptions.

“Starting Time of Reversing Operation” means the time of one reversing operation, while “Total Time of Reversing Operation” means the accumulated value of reversing operation.

Click “Harmonic” in Fig. 139 to enter harmonic measurement page shown in Fig. 148 and Fig. 149.

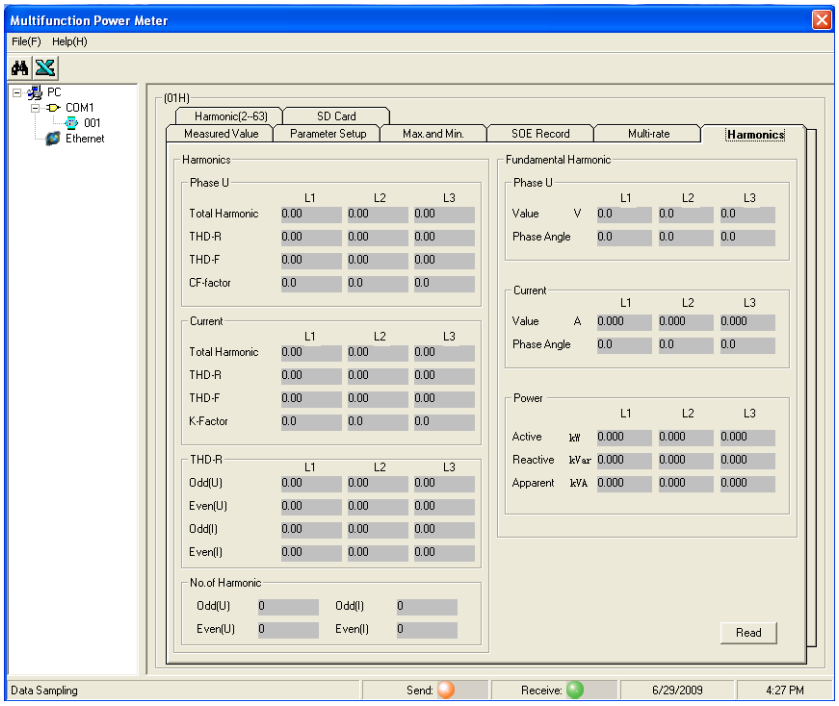


Fig. 148

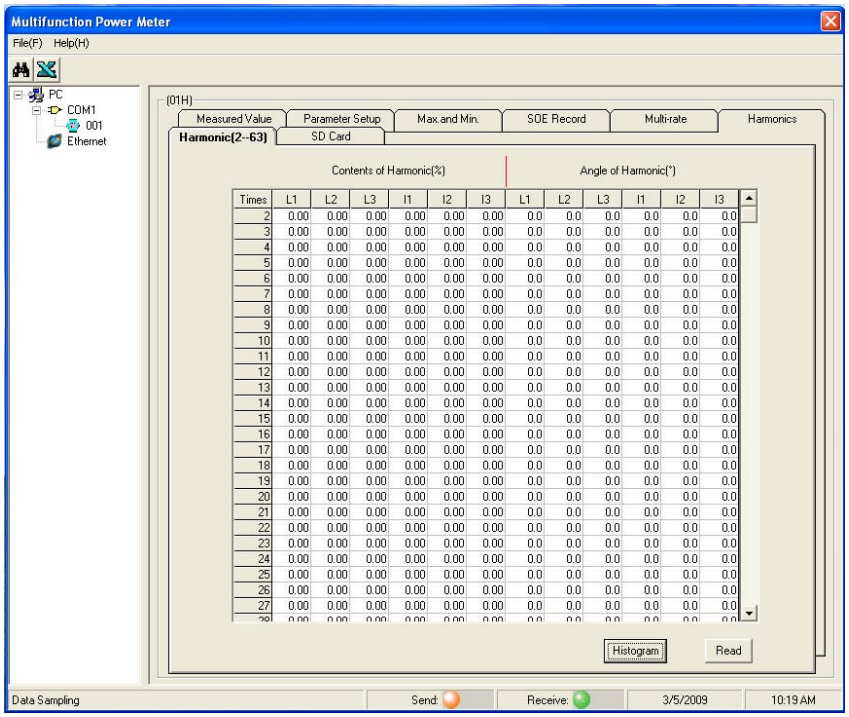


Fig. 149

2.5 SD Card Instruction

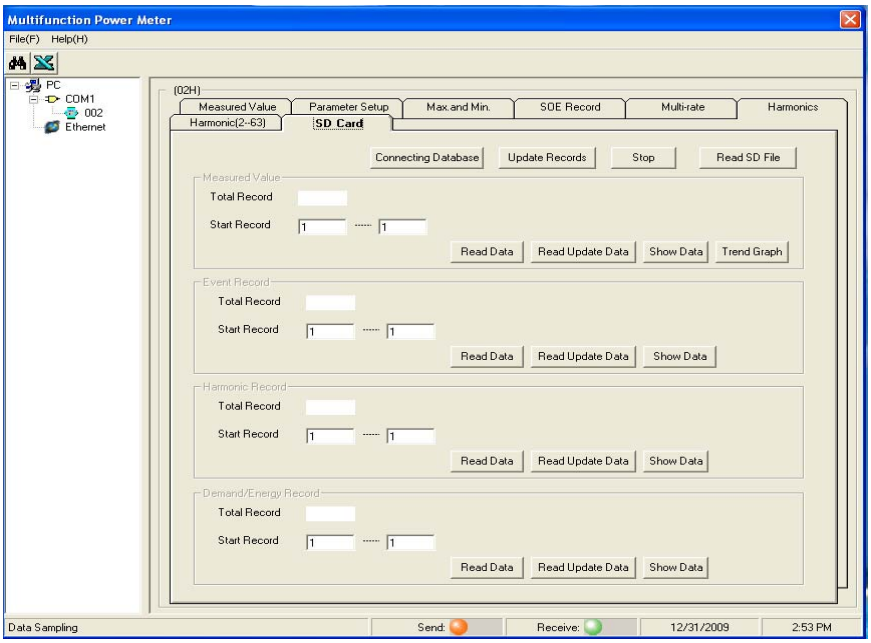


Fig. 150

1. Click “connecting database” bar as shown in Fig. 150. The user can click “update record” after the connection is done successfully. Input the records that you want to read, and click “read data”. After the data is retrieved, the user can click “show data” or “trend graph” to get the data desired.

2. The user can read desired data or graph of event record or harmonic record by clicking the corresponding bar.

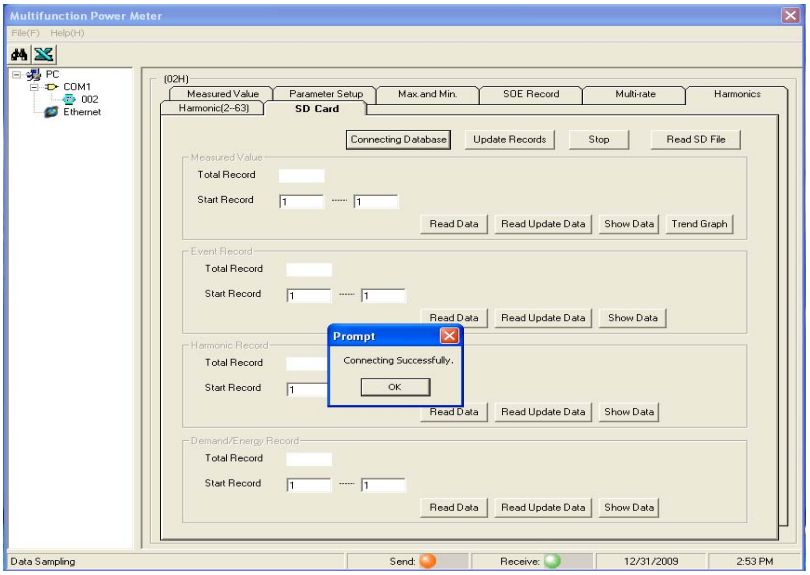


Fig. 151

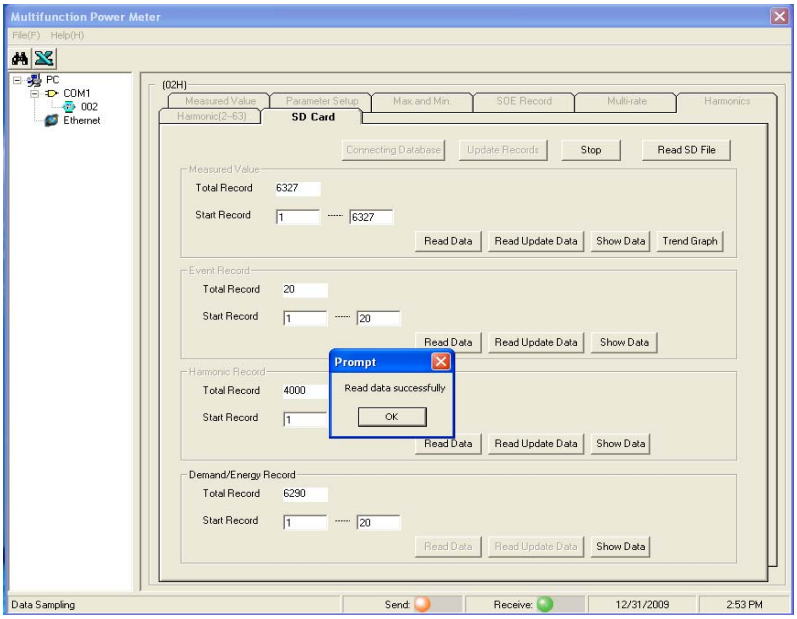


Fig. 152

As shown in Fig. 152, the data is read successfully.

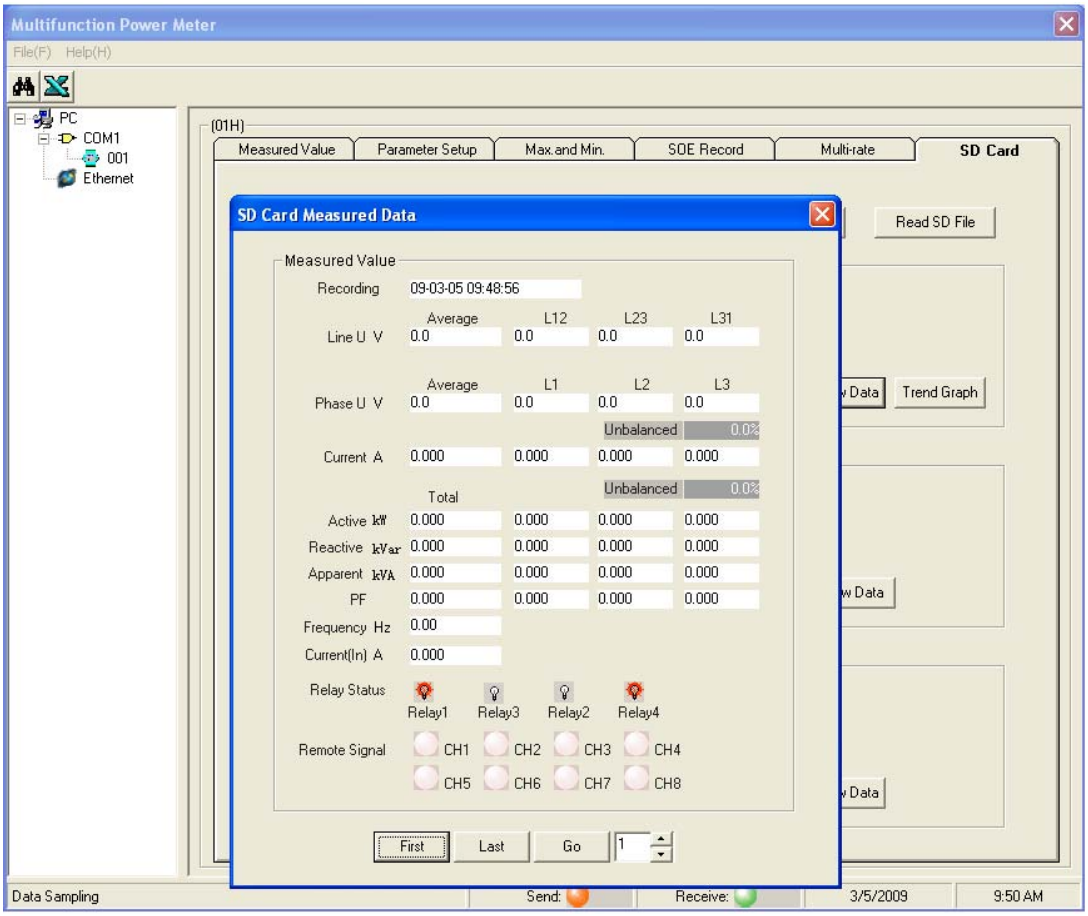


Fig. 153

Click “show data”, Fig. 153 page will show.

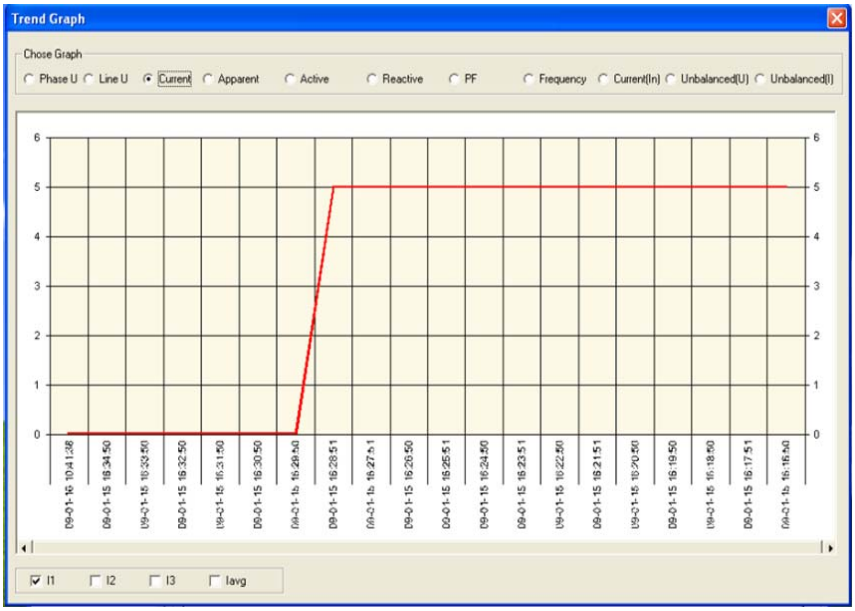


Fig. 154

As shown in Fig. 154, click “Trend graph”, the corresponding wave graph will appear.

In event record area, click “Show data” and corresponding measurement data will appear, as shown in Fig. 155.

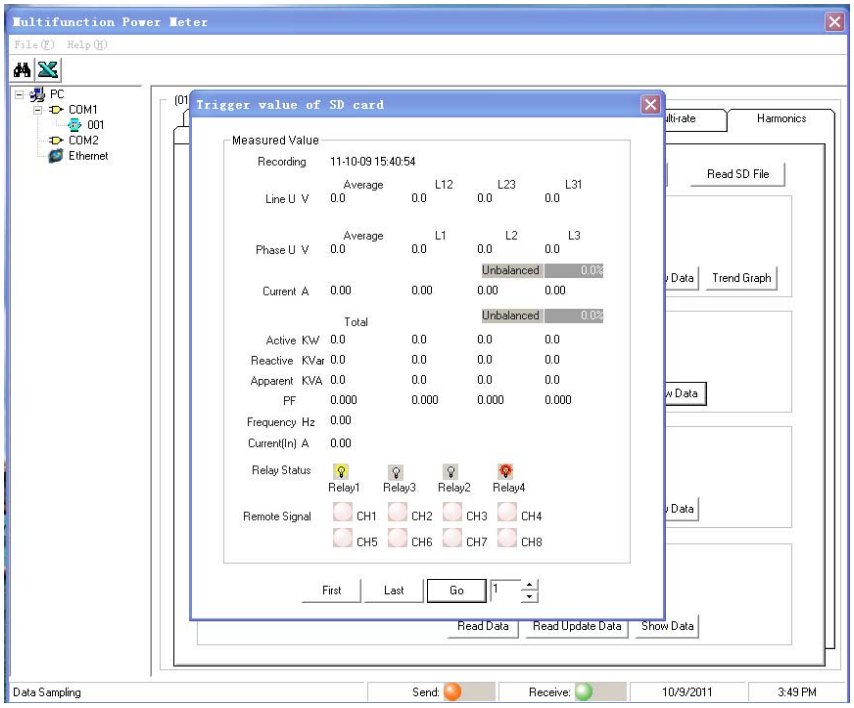


Fig. 155

In the harmonic record area, click “show data”, the corresponding data shall appear as in Fig. 156.

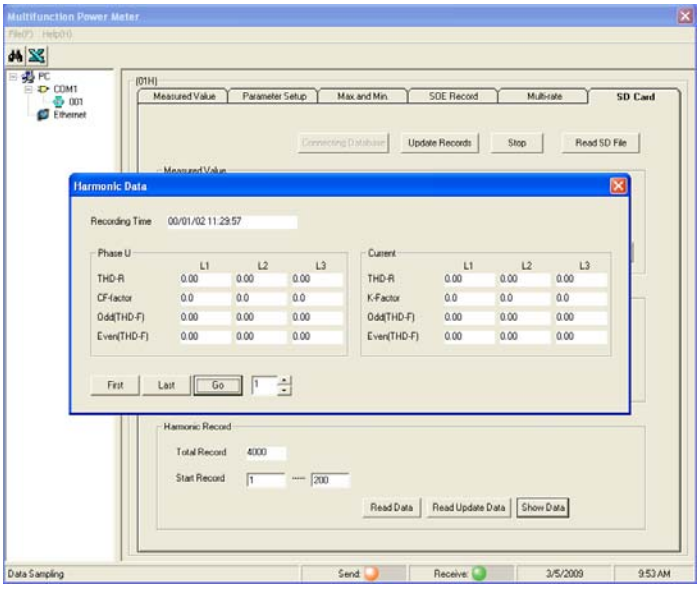


Fig. 156

In the Energy record area, click “show data”, the corresponding data shall appear as in Fig. 157.

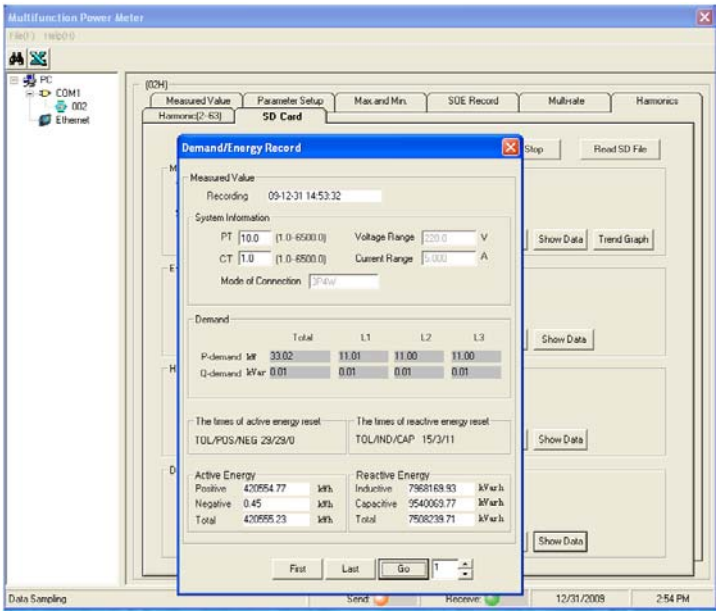


Fig. 157

The steps of reading the data from SD card alone:

The user is required to install the Microsoft Excel in the PC first.

First, the user takes out SD card from the module when the power is off, and insert the SD card in the card reader, then connect the card reader to the PC via USB. Now the data can be read as in Fig. 158.

Fig. 158

The user can copy all the data from the SD card to the folder in the PC. The folder is created in PC by the user. For an example, D:\SDADTA,SADATA is the created by the user.

Then open the software, and click  , Fig. 159 will show (Please alter the date discretionarily when Multifunction Power Meter is operating, or else all the data can't be exported.)

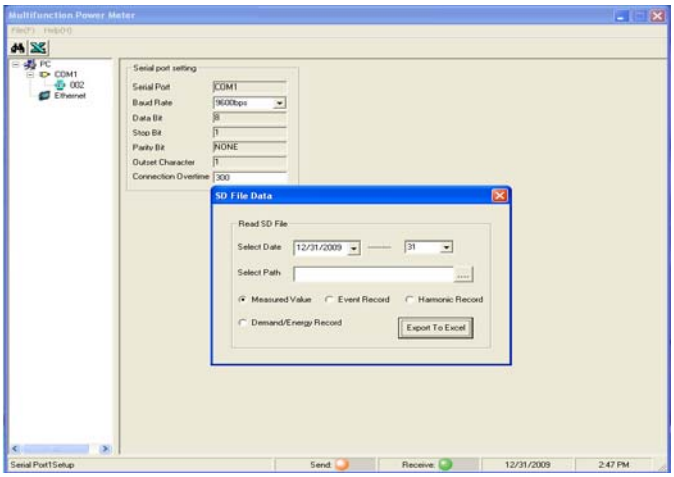


Fig. 159

Select the date, the path and the record, as shown in the Fig. 160.

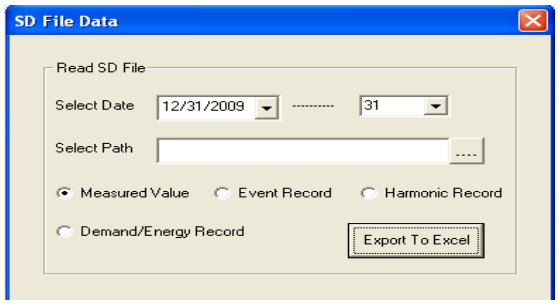


Fig. 160

Clicking 

, the user will either see the “File Export” interface as in Fig. 161, or the error massage when the error occurs.

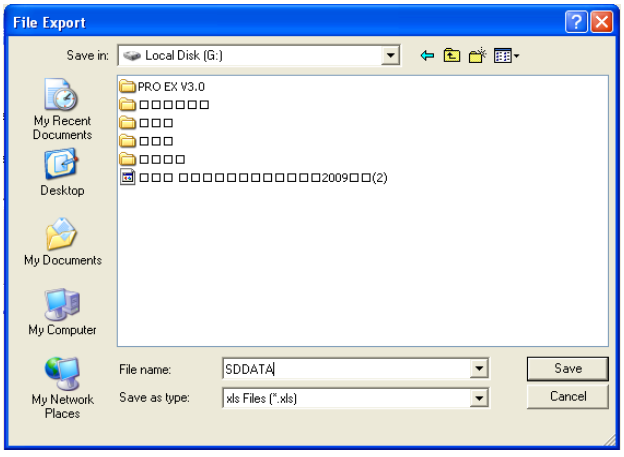


Fig. 161

The user can select the file name and the path, and save the file. Then the data can be read by Microsoft excel.

III. Communication

3.1 Communication Protocol

MODBUS RTU protocol, the data format as: **1 start bit ＋ 8 bit ＋ 1 stop bit**

3.2 RTU Command Format and Example

Command:

03H — read single and consecutive registers.

	BYTE	EXAMPLE
Meter address	1	01H
Function No.	2	03H
Address (High Byte)	3	01H
Address (Low Byte)	4	02H
No. of bytes (N) (High Byte)	5	00H
No. of bytes (N) (Low Byte)	6	02H
CRC (High Byte)	7	CRC (H)
CRC (Low Byte)	8	CRC (L)

Note: Multifunction Power Meter with address 01H send 2 consecutive WORDS from the starting address 0102H.

Receive:

	BYTE	EXAMPLE
Meter address	1	01H
Function number	2	03H
No. of bytes (2N)	3	04H
Data1 (High)	4	00H
Data1 (Low)	5	01H
Data2 (High)	6	00H
Data2 (Low)	7	01H
CRC (High Byte)	8	CRC (H)
CRC (Low Byte)	9	CRC (L)

Note: Multifunction Power Meter with address 01H receive 2 consecutive WORDS from the starting address 0102H.

06H ——Write single register

Send command:

	BYTE	EXAMPLE
Meter address	1	01H
Function No.	2	06H
Address (High Byte)	3	01H
Address (Low Byte)	4	02H
Data (High Byte)	5	00H

Data (Low Byte)	6	01H
CRC (High Byte)	7	CRC (H)
CRC (Low Byte)	8	CRC (L)

Note: Write 1 WORD data in the starting address 0102H register of the address 01H.

Receive:

	BYTE	EXAMPLE
Meter address	1	01H
Function No.	2	06H
Address (High Byte)	3	01H
Address (Low Byte)	4	02H
Data (High Byte)	5	00H
Data (Low Byte)	6	01H
CRC (High Byte)	7	CRC (H)
CRC (Low Byte)	8	CRC (L)

Note: Send and receive the same content.

10H ——Write consecutive registers.

Send command:

	BYTE	EXAMPLE
Meter address	1	01H
Function No.	2	10H
Address (High Byte)	3	01H
Address (Low Byte)	4	02H
Number of bytes (N) (High Byte)	5	00H
Number of bytes (N) (Low Byte)	6	02H
No. of byte (2N)	7	04H
Data 1 (High Byte)	8	00H
Data 1 (Low Byte)	9	01H
Data 2 (High Byte)	10	00H
Data 2 (Low Byte)	11	01H
CRC (High Byte)	12	CRC (H)
CRC (Low Byte)	13	CRC (L)

Note: Write 2 WORD data in 2 registers with starting address 0102H of the address 01H

Receive:

	BYTE	EXAMPLE
Meter address	1	01H
Function No.	2	10H
Address (High Byte)	3	01H
Address (Low Byte)	4	01H
Data (High Byte)	5	00H
Data (Low Byte)	6	02H
CRC (High Byte)	7	CRC (H)
CRC (Low Byte)	8	CRC (L)

Note: MODBUS RTU protocol also can be based on the Ethenet transmission.

3.3 TCP/IP Protocol description

1. The Modbus protocol terminal number in TCP is 502, the equipment operating in TCP –Server mode.
2. Data frame description
   The differences between Modbus protocol on the Ethernet data frame format and serial line data frame format are:

① Device address is replaced by MBAP header;

② The Modbus data frame in the Ethernet has no CRC check code;

Shown as below:

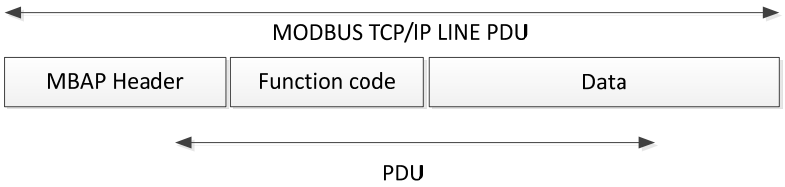


Fig 1 Modbus frame format in Ethernet

MBAP header is a data domain with 7 bytes, the constructions are as follows:

Byte domain meaning	Length	Description
Transation identifer	2 bytes	Modbus request/responds ID
Protocol identifer	2 bytes	0=modbus protocol
Length	2 bytes	The following bytes number
Unit identifer	1 byte	The remote device ID which connected to the serial line or other bus

3.4 Data Format

Primary Energy uses four registers:

Real value = (integer part high byte *65536 + integer part low byte) ＋ (decimal part high byte *65536 + decimal part low byte) / 100000000

For example: Integer part high byte = 0000H = 0,
Integer part low byte = 0001H = 1,
Decimal part high byte = 0165H = 357,
Decimal part low byte = EC15H= 60437

After calculate, the real value= (0*65536 +1) ＋ (357*65536 + 60437) / 100000000
= 1.23456789MWh = 1234.56789kWh

The multi-rate Energy use three registers:

Real value= (kWh Hi*65536*65536+kWh Mi*65536＋kWh Lo)/ 10000 kWh

For example: kWh HI= 0001H=1,

kWh Mi = 0165H=357,

kWh Lo = EC15H= 60437,

(Hex need change to decimal system)

After calculate; the real value = (1*65536*65536＋357*65536 + 60437)/ 10000

= 431842.4085kWh

Energy calculation: (**[**register value**]** convert to decimal system) to the actual value, then calculate the Energy using the above formula.

Energy Data Format

No.	Parameter	Data Format (Decimal System)	Direction	Unit	Description
1	Voltage	999.9		V	＜1000V
2	Current	19.999		A	＜20A
3	Power Factor	±1.000	directional		-1.000~1.000
4	Frequency	64.99		Hz	45.00~65.00
5	Active Power	±999999	directional	MW	
6	Reactive Power	±999999	directional	MVAr	
7	Apparent Power	±999999		MVA	
8	Active Demand	±999999		MW	
9	Reactive Demand	±999999		MVAr	
10	Active Energy	999999999	directional	MWh	
11	Reactive Energy	999999999	directional	Mvarh	
12	Phase Angle	0.0°~359.9°	directional		
13	Current Harmonic%	0~100%			
14	Voltage Harmonic%	0~100%			
15					

MODBUS Command	Function	Description
0x03	Read multiple registers	Read/write 40 registers.
0x10	Write multiple registers	
0x06	Write single register	

Calibration Parameter Register (Current 0~12A, Voltage 20~690V)			
Register No.	**Type**	**Description**	**Remark**
0000	RO	Hardware edition	
0001	RW	Connection method	0-3P3W, others-3P4W,

0002	RO	Operation time H	
0003	RO	Operation time L	
0004	RW	U scope	U scope as 0~690, 1 decimal is kept, Register value= U scope *10, U scope = register value /10
0005	RW	I scope	I scope 0~5, 3 decimals are kept, register value ad I scope *1000, I scope= register value /1000.
Control Parameters Register			
Register No.	**Type**	**Description**	**Explanation**
0100	RW	Address	1~247
0101	RW	PT	6500.0
0102	RW	CT	6500.0
0103	RW	Baud rate	2-38400, 3-19200, 4-9600, 5-4800, 6-2400
0104	RW	Demand cycle	1~15 minute
0105	RW	clock (year month)	Hi—year , Lo—month
0106	RW	clock (day hour)	Hi—day, Lo—hour
0107	RW	clock (minute second)	Hi—minute, Lo—second
0108	RW	L1 phase Voltage upper limit	Phase Voltage
0109	RW	L1 phase Voltage lower limit	
010A	RW	L2 phase Voltage upper limit	
010B	RW	L2 phase Voltage lower limit	
010C	RW	L3 phase Voltage upper limit	
010D	RW	L3 phase Voltage lower limit	
010E	RW	I1 Current upper limit	
010F	RW	I1 Current lower limit	
0110	RW	I2 Current upper limit	
0111	RW	I2 Current lower limit	
0112	RW	I3 Current upper limit	
0113	RW	I3 Current lower limit	
0114	RW	Zero sequence Current upper limit	
0115	RW	3 phase total active Demand upper limit	
0116	RW	3 phase total reactive Demand upper limit	

0117	RW	Power factor lower limit	
0118	RW	System frequency upper limit	
0119	RW	System frequency lower limit	
011A	RW	Unbalanced Voltage upper limit	
011B	RW	Relay 1 automatic control mode delay and reset time	Hi BYTE delay time Lo BYTE reset time 1~255, unit: secs
011C	RW	Relay 2 automatic control mode delay and reset time	
011D	RW	Relay 3 automatic control mode delay and reset time	
011E	RW	Relay 4 automatic control mode delay and reset time	
011F	RW	Relay 1 control mode	
0120	RW	Relay 2 control mode	
0121	RW	Relay 3 control mode	
0122	RW	Relay 4 control mode	
0123	RW	Relay output control	D0-realy1, D1-relay2...0 off/1 on
0124	RW	Analog output channel 1 selection	
0125	RW	Analog output channel 2 selection	
0126	RW	Analog output channel 3 selection	
0127	RW	Analog output channel 4 selection	
0128	RW	Analog output rated Voltage Vn	999.9V
0129	RW	Analog output rated Current In	19.999A
012A	RW	Analog output system frequency Fn	50.00/60.00Hz
012B	RW	Remote signals channels	0~8
012C	RW	Password	User can't operate
012D	RW	Meter constant	1~9600
012E	RW	Pulse width	80±20ms

012F	RW	Display interval	2～30s, default10s
0130	RO	Software edition	
0131	RW	Infrared/485 (standby)	0:infrared, 1: 485
0132	RW	Data storage interval	60~3600S
0133	RW	(standby)	
0134	RW	Profibus ID	3~123
0135	RO	No. of times Active Total Energy out of scope	0~65535
0136	RO	No. of times Importing Active Energy out of scope	0~65535
0137	RO	No. of times Exporting Active Energy out of scope	0~65535
0138	RO	No. of times Reactive Total Energy out of scope	0~65535
0139	RO	No. of times Inductive reactive Energy out of scope	0~65535
013A	RO	No. of times Capacitive active Energy out of scope	0~65535
Control Parameter Register (Multi-tariff ;TCP/IP)			
Register No.	**Type**	**Description**	**Explanation**
0200	RW	Start multi-tariff	0-off 1-on
0201	**RW**	**(Default multi-tariff)** (standby)	**(Change default tariff)**
0202	RW	No. of intervals	2 ~ 12
0203	RW	Interval 01	00:00 (0000~2400)
0204	RW	Interval 02	00:00
0205	RW	Interval 03	00:00
0206	RW	Interval 04	00:00
0207	RW	Interval 05	00:00
0208	RW	Interval 06	00:00
0209	RW	Interval 07	00:00
020A	RW	Interval 08	00:00
020B	RW	Interval 09	00:00
020C	RW	Interval 10	00:00
020D	RW	Interval 11	00:00
020E	RW	Interval 12	00:00

020F	RW	Interval 01 tariff type	0- sharp / 1-peak / 2-flat / 3-valley
0210	RW	Interval 02 tariff type	0- sharp / 1-peak / 2-flat / 3-valley
0211	RW	Interval 03 tariff type	0- sharp / 1-peak / 2-flat / 3-valley
0212	RW	Interval 04 tariff type	0- sharp / 1-peak / 2-flat / 3-valley
0213	RW	Interval 05 tariff type	0- sharp / 1-peak / 2-flat / 3-valley
0214	RW	Interval 06 tariff type	0- sharp / 1-peak / 2-flat / 3-valley
0215	RW	Interval 07 tariff type	0- sharp / 1-peak / 2-flat / 3-valley
0216	RW	Interval 08 tariff type	0- sharp / 1-peak / 2-flat / 3-valley
0217	RW	Interval 09 tariff type	0- sharp / 1-peak / 2-flat / 3-valley
0218	RW	Interval 10 tariff type	0- sharp / 1-peak / 2-flat / 3-valley
0219	RW	Interval 11 tariff type	0- sharp / 1-peak / 2-flat / 3-valley
021A	RW	Interval 12 tariff type	0- sharp / 1-peak / 2-flat / 3-valley
021B	RW	Frozen time every month (day hour)	Hi—day, Lo—hour
021C	RW	Frozen time every month (minute second)	Hi—minute, Lo—second
021D	RW	IP address H	255．255．255．255
021E	RW	IP address L	
021F	RW	Subnet mask H	255．255．255．255
0220	RW	Subnet mask L	
0221	RW	Gateway H	255．255．255．255
0222	RW	Gateway L	
0223	RW	1 DNS H	255．255．255．255
0224	RW	1 DNS L	
0225	RW	2 DNS H	255．255．255．255
0226	RW	2 DNS L	
0227	RW	TCP/IP terminal	0~9999 (default:502)
0228	RW	Http terminal	0~9999 (default:80)

Program Automatic Record

Register No.	Type	Description	Explanation
0230	RO	No. of SOE record and index	Hi-no. of records, Lo- index
0331	RO	The last calibration clock time (year month) (standby)	Hi—year, Lo—month
0232	RO	The last calibration clock time (day hour) (standby)	Hi—day, Lo—hour
0233	RO	The last calibration	Hi—minute, Lo—second

		clock time (minute second) (standby)	
0234	RO	No. of calibration (standby)	
0235	RO	The last programming time (year month) (standby)	Hi—year, Lo—month
0236	RO	The last programming time (day hour) (standby)	Hi—day, Lo—hour
0237	RO	The last programming time (minute second) (standby)	Hi—minute, Lo—second
0238	RO	No. of programming (standby)	
0239	RO	The latest Energy Reverse running start time (year month)	Hi—year, Lo—month
023A	RO	The latest Energy Reverse running start time (day hour)	Hi—day, Lo—hour
023B	RO	The latest Energy Reverse running start time (minute second)	Hi—minute, Lo—seconds
023C	RO	Total Reverse running times Hi	999999.999 (hour)
023D	RO	Total Reverse running times Lo	
023E	RO	multi-tariff month Records of the number and indicators	

Register:023E

Hi- multi-tariff month Records of the number, Lo- indicators

1、Multi-tariff (Secondary Data)

0518……	[0]
056A……	[1]
05BC……	[2]
060E……	[3]

For example:

If indicators =0

0518……	[0]	Current month
056A……	[1]	2 month before last
05BC……	[2]	1 month before last
060E……	[3]	Last month

If indicators =1

0518……	[0]	Last month
056A……	[1]	Current month
05BC……	[2]	2 month before last
060E……	[3]	1 month before last

If indicators =2

0518……	[0]	1 month before last
056A……	[1]	Last month
05BC……	[2]	Current month
060E……	[3]	2 month before last

If indicators =3

0518……	[0]	2 month before last
056A……	[1]	1 month before last
05BC……	[2]	Last month
060E……	[3]	Current month

2、Multi-tariff (Primary data)

1A18……	[0]
1A93……	[1]
1B0E……	[2]
1B89……	[3]

For example:

If indicators =0

1A18……	[0]	Current month
1A93……	[1]	2 month before last
1B0E……	[2]	1 month before last
1B89……	[3]	Last month

If indicators =1

1A18……	[0]	Last month
1A93……	[1]	Current month
1B0E……	[2]	2 month before last
1B89……	[3]	1 month before last

If indicators =2

1A18……	[0]	1 month before last
1A93……	[1]	Last month
1B0E……	[2]	Current month
1B89……	[3]	2 month before last

If indicators =3

1A18……	[0]	2 month before last
1A93……	[1]	1 month before last
1B0E……	[2]	Last month
1B89……	[3]	Current month

Demand Statistic Register

Register No.	Type	Description	Explanation
0268	RO	L1 active Demand	
0269	RO	L2 active Demand	
026A	RO	L3 active Demand	
026B	RO	3 phase total active Demand	
026C	RO	L1 reactive Demand	
026D	RO	L2 reactive Demand	
026E	RO	L3 reactive Demand	
026F	RO	3 phase total reactive Demand	
0270	RO	L1 max. active Demand	
0271	RO	L2 max. active Demand	
0272	RO	L3 max. active Demand	
0273	RO	3 phase max. total active Demand	
0274	RO	L1 max. reactive Demand	
0275	RO	L2 max. reactive Demand	
0276	RO	L3 max. reactive Demand	
0277	RO	3 phase max. total reactive Demand	
0278	RO	L1 min. active Demand	
0279	RO	L2 min. active Demand	
027A	RO	L3 min. active Demand	
027B	RO	3 phase min. total active Demand	

027C	RO	L1 min. reactive Demand	
027D	RO	L2 min. reactive Demand	
027E	RO	L3 min. reactive Demand	
027F	RO	3 phase min. total reactive Demand	
Instant Value Register (Real value = register value / xxx, xxx is the multiple, Voltage 10, Current 1000, Power 1000, Power factor 1000, unbalanced radio 1000, PT/CT 10)			
Register No.	**Type**	**Description**	**Explanation**
0300	RO	L1 phase Voltage	
0301	RO	L2 phase Voltage	
0302	RO	L3 phase Voltage	
0303	RO	Avg. phase Voltage	
0304	RO	L12 line Voltage	
0305	RO	L23 line Voltage	
0306	RO	L31line Voltage	
0307	RO	Avg. line Voltage	
0308	RO	I1 Current	
0309	RO	I2 Current	
030A	RO	I3 Current	
030B	RO	Average Current	
030C	RO	L1 apparent Power	
030D	RO	L2 apparent Power	
030E	RO	L3 apparent Power	
030F	RO	3 phase total apparent Power	
0310	RO	L1 phase active Power	
0311	RO	L2 phase active Power	
0312	RO	L3 phase active Power	
0313	RO	3 phase total active Power	
0314	RO	L1 phase reactive Power	
0315	RO	L2 phase reactive Power	
0316	RO	L3 phase reactive Power	
0317	RO	3 phase total reactive Power	
0318	RO	L1 Power factor	
0319	RO	L2 Power factor	
031A	RO	L3 Power factor	
031B	RO	3 phase Power factor	
031C	RO	System frequency	
031D	RO	Zero sequence Current	
031E	RO	Voltage unbalanced ratio	In 3P4W system as phase Voltage, in 3P3W system as line Voltage

031F	RO	Current unbalanced ratio	
0320	RO	(standby)	
0321	RO	Relay alarm status	D0-relay 1 alarm, D8-0over upper limit/1under lower limit, relay 2 corresponding to D1 and D9... 1 is for close, while 0 for open
0322	RO	Remote signal input status	D0-remote signal 1, D1-remote signal 2...
0323	RO	Current module	(User can't operate)
Instant Max/Min Value Register			
Register No.	**Type**	**Description**	**Explanation**
0400	RO	L1 max. phase Voltage	
0401	RO	L2 max. phase Voltage	
0402	RO	L3 max. phase Voltage	
0403	RO	Average max. phase Voltage	
0404	RO	L12 max. line Voltage	
0405	RO	L23 max. line Voltage	
0406	RO	L31 max. line Voltage	
0407	RO	Average max. line Voltage	
0408	RO	I1 max. Current	
0409	RO	I2 max. Current	
040A	RO	I3 max. Current	
040B	RO	Average max. Current	
040C	RO	L1 max. apparent Power	
040D	RO	L2 max. apparent Power	
040E	RO	L3 max. apparent Power	
040F	RO	3 phase max. total apparent Power	
0410	RO	L1 max. active Power	
0411	RO	L2 max. active Power	
0412	RO	L3 max. active Power	
0413	RO	3 phase max. total active Power	
0414	RO	L1 max. reactive Power	
0415	RO	L2 max. reactive Power	
0416	RO	L3 max. reactive Power	
0417	RO	3 phase max. total reactive Power	
0418	RO	L1 max. Power factor	
0419	RO	L2 max. Power factor	
041A	RO	L3 max. Power factor	
041B	RO	3 phase max. Power factor	
041C	RO	Max. system frequency	

041D	RO	Max. zero sequence Current	
041E	RO	Max. unbalanced Voltage ratio	
041F	RO	Max. unbalanced Current ratio	
0420	RO	L1 min. phase Voltage	
0421	RO	L2 min. phase Voltage	
0422	RO	L3 min. phase Voltage	
0423	RO	Average min. phase Voltage	
0424	RO	L12 min. line Voltage	
0425	RO	L23 min. line Voltage	
0426	RO	L31 min. line Voltage	
0427	RO	Average min. line Voltage	
0428	RO	I1 min. Current	
0429	RO	I2 min. Current	
042A	RO	I3 min. Current	
042B	RO	Average min. Current	
042C	RO	L1 min. apparent Power	
042D	RO	L2 min. apparent Power	
042E	RO	L3 min. apparent Power	
042F	RO	3 phase min. total apparent Power	
0430	RO	L1 min. active Power	
0431	RO	L2 min. active Power	
0432	RO	L3 min. active Power	
0433	RO	3 phase min. total active Power	
0434	RO	L1 min. reactive Power	
0435	RO	L2 min. reactive Power	
0436	RO	L3 min. reactive Power	
0437	RO	3 phase min. total reactive Power	
0438	RO	L1 min. Power factor	
0439	RO	L2 min. Power factor	
043A	RO	L3 min. Power factor	
043B	RO	3 phase min. Power factor	
043C	RO	Min. system frequency	
043D	RO	Min. zero sequence Current	
043E	RO	Min. unbalanced Voltage ratio	
043F	RO	Min. unbalanced Current ratio	

Energy Register

Register No.	Type	Description	Explanation
0500	RO	Active total Energy Hi	999999999 MWh/Mvarh
0501	RO	Active total Energy Lo	
0502	RO	Importing active Power Hi	
0503	RO	Importing active Power Lo	

0504	RO	Exporting active Power Hi	
0505	RO	Exporting active Power Lo	
0506	RO	Reactive total Energy Hi	
0507	RO	Reactive total Energy Lo	
0508	RO	Inductive reactive Energy Hi	
0509	RO	Inductive reactive Energy Lo	
050A	RO	Capacitive active Energy Hi	
050B	RO	Capacitive active Energy Lo	
050C	RO	Total active Energy decimal Hi	＜1MWh or 1Mvarh 0.00000001*100000000
050D	RO	Total active Energy decimal Lo	
050E	RO	Importing active Energy decimal Hi	
050F	RO	Importing active Energy decimal Lo	
0510	RO	Exporting active Energy decimal Hi	
0511	RO	Exporting active Energy decimal Lo	
0512	RO	Total reactive Energy decimal Hi	
0513	RO	Total reactive Energy decimal Lo	
0514	RO	Inductive reactive Energy decimal Hi	
0515	RO	Inductive reactive Energy decimal Lo	
0516	RO	capacitive reactive Energy decimal Hi	
0517	RO	capacitive reactive Energy decimal Lo	
0518	RO	Current month sum Energy Hi	19999.99999kWh
0519	RO	Current month sum Energy Lo	
051A	RO	Current month sharp Energy Hi	
051B	RO	Current month sharp Energy Lo	
051C	RO	Current month peak Energy Hi	
051D	RO	Current month peak Energy Lo	
051E	RO	Current month flat Energy Hi	
051F	RO	Current month flat Energy Lo	
0520	RO	Current month valley Energy Hi	
0521	RO	Current month valley Energy Lo	
0522	RO	Current month total Energy in 01 interval Hi	
0523	RO	Current month total Energy in 01 interval Lo	
0524	RO	Current month importing Energy in 01 interval Hi	
0525	RO	Current month importing Energy in 01 interval Lo	
0526	RO	Current month exporting Energy in 01 interval Hi	
0527	RO	Current month exporting Energy in 01 interval Lo	
…..		2~11	
0564	RO	Current month total Energy in 12	

		interval Hi	
0565	RO	Current month total Energy in 12 interval Lo	
0566	RO	Current month importing Energy in 12 interval Hi	
0567	RO	Current month importing Energy in 12 interval Lo	
0568	RO	Current month exporting Energy in 12 interval Hi	
0569	RO	Current month exporting Energy in 12 interval Lo	
056A	RO	Last month sum Energy Hi	
056B	RO	Last month sum Energy Lo	
056C	RO	Last month sharp Energy Hi	
056D	RO	Last month sharp Energy Lo	
056E	RO	Last month peak Energy Hi	
056F	RO	Last month peak Energy Lo	
0570	RO	Last month flat Energy Hi	
0571	RO	Last month flat Energy Lo	
0572	RO	Last month valley Energy Hi	
0573	RO	Last month valley Energy Lo	
0574	RO	Last month total Energy in 01 interval Hi	
0575	RO	Last month total Energy in 01 interval Lo	
0576	RO	Last month importing Energy in 01 interval Hi	
0577	RO	Last month importing Energy in 01 interval Lo	
0578	RO	Last month exporting Energy in 01 interval Hi	
0579	RO	Last month exporting Energy in 01 interval Lo	
…..		2~11	
05B6	RO	Last month total Energy in 12 interval Hi	
05B7	RO	Last month total Energy in 12 interval Lo	
05B8	RO	Last month importing Energy in 12 interval Hi	
05B9	RO	Last month importing Energy in 12 interval Lo	
05BA	RO	Last month exporting Energy in 12	

		interval Hi	
05BB	RO	Last month exporting Energy in 12 interval Lo	
05BC	RO	1 month before last total Energy Hi	
05BD	RO	1 month before last total Energy Lo	
05BE	RO	1 month before last sharp Energy Hi	
05BF	RO	1 month before last sharp Energy Lo	
05C0	RO	1 month before last peak Energy Hi	
05C1	RO	1 month before last peak Energy Lo	
05C2	RO	1 month before last flat Energy Hi	
05C3	RO	1 month before last flat Energy Lo	
05C4	RO	1 month before last valley Energy Hi	
05C5	RO	1 month before last valley Energy Lo	
05C6	RO	1 month before last 01 interval total Energy Hi	
05C7	RO	1 month before last 01 interval total Energy Lo	
05C8	RO	1 month before last 01 Interval imp Energy Hi	
05C9	RO	1 month before last 01 Interval imp Energy Lo	
05C8	RO	1 month before last 01 Interval exp Energy Hi	
05C9	RO	1 month before last 01 Interval exp Energy Lo	
…..		2~11 Interval	
0606	RO	1 month before last 12 Interval total Energy Hi	
0607	RO	1 month before last 12 Interval total Energy Lo	
0608	RO	1 month before last 12 Interval imp Energy Hi	
0609	RO	1 month before last 12 Interval imp Energy Lo	
060A	RO	1 month before last 12 Interval exp Energy Hi	
060B	RO	1 month before last 12 Interval exp Energy Lo	
060E	RO	2 month before last total Energy Hi	
060F	RO	2 month before last total Energy Lo	
0610	RO	2 month before last sharp Energy Hi	
0611	RO	2 month before last sharp Energy Lo	

0612	RO	2 month before last peak Energy Hi			
0613	RO	2 month before last peak Energy Lo			
0614	RO	2 month before last flat Energy Hi			
0615	RO	2 month before last flat Energy Lo			
0616	RO	2 month before last valley Energy Hi			
0617	RO	2 month before last valley Energy Lo			
0618	RO	2 month before last 01 Interval total Energy Hi			
0619	RO	2 month before last 01 Interval total Energy Lo			
061A	RO	2 month before last 01 Interval imp Energy Hi			
061B	RO	2 month before last 01 Interval imp Energy Lo			
061C	RO	2 month before last 01 Interval exp Energy Hi			
061D	RO	2 month before last 01 Interval exp Energy Lo			
…..		2~11 Interval			
065A	RO	2 month before last 12 Interval total Energy Hi			
065B	RO	2 month before last 12 Interval total Energy Lo			
065C	RO	2 month before last 12 Interval imp Energy Hi			
065D	RO	2 month before last 12 Interval imp Energy Lo			
065E	RO	2 month before last 12 Interval exp Energy Hi			
065F	RO	2 month before last 12 Interval exp Energy Lo			
Harmonic Register (Real value = register value / xxx, xxx is the multiple, Voltage 10, Voltage THD 10000, Current 1000, Current THD 10000, CF 10000, K 10000, phase angle 10, harmonic 10000)					
Register No.	**Type**	**Description**	**Explanation**		
0660	RO	L1 Voltage total harmonic	0.01%	0~65535	
0661	RO	L2 Voltage total harmonic	0.01%	0~65535	
0662	RO	L3 Voltage total harmonic	0.01%	0~65535	
0663	RO	L1 Voltage (THD—R)	0.01%	0~65535	
0664	RO	L2 Voltage (THD—R)			

0665	RO	L3 Voltage (THD—R)			
0666	RO	L1 Voltage (THD—F)	0.01%	0~65535	
0667	RO	L2 Voltage (THD—F)			
0668	RO	L3 Voltage (THD—F)			
0669	RO	L1 Voltage (CF)	0.1	0~65535	
066A	RO	L2 Voltage (CF)			
066B	RO	L3 Voltage (CF)			
066C	RO	I1 Current total harmonic	0.01%	0~65535	
066D	RO	I2 Current total harmonic			
066E	RO	I3 Current total harmonic			
066F	RO	Neutral phase Current total harmonic			
0670	RO	I1 Current (THD—R)	0.01%	0~65535	
0671	RO	I2 Current (THD—R)			
0672	RO	I3 Current (THD—R)			
0673	RO	Neutral Current (THD—R)			
0674	RO	I1 Current (THD—F)	0.01%	0~65535	
0675	RO	I2 Current (THD—F)			
0676	RO	I3 Current (THD—F)			
0677	RO	Neutral Current (THD—F)			
0678	RO	I1 (K— factor)	0.1	0~65535	
0679	RO	I2 (K— factor)			
067A	RO	I3 (K— factor)			
067B	RO	Neutral Current (K— factor)			
067C	RO	Voltage total odd harmonic	1	0~65535	
067D	RO	Voltage total even harmonic	1	0~65535	
067E	RO	Current total odd harmonic	1	0~65535	
067F	RO	Current total even harmonic	1	0~65535	
0680	RO	L1 Voltage odd (THD—R)	0.01%	0~65535	
0681	RO	L2 Voltage odd (THD—R)			
0682	RO	L3 Voltage odd (THD—R)			
0683	RO	L1 Voltage even (THD—R)			
0684	RO	L2 Voltage even (THD—R)			
0685	RO	L3 Voltage even (THD—R)			
0686	RO	I1 Current odd (THD—R)			
0687	RO	I2 Current odd (THD—R)			
0688	RO	I3 Current odd (THD—R)			
0689	RO	Neutral phase Current odd (THD—R)			
068A	RO	I1 Current even (THD—R)			
068B	RO	I2 Current even (THD—R)			
068C	RO	I3 Current even (THD—R)			
068D	RO	Neutral phase Current even (THD—R)			

Base Wave					
068E	RO	L1 Voltage	0.1V	0~65535	
068F	RO	L2 Voltage			
0690	RO	L3 Voltage			
0691	RO	Voltage L1 phase angle	0.1	0~359.9	
0692	RO	Voltage L2 phase angle			
0693	RO	Voltage L3 phase angle			
0694	RO	I1 Current	0.001 A	0~65535	
0695	RO	I2 Current			
0696	RO	I3 Current			
0697	RO	Neutral phase Current			
0698	RO	Current I1 phase angle	0.1	0~359.9	
0699	RO	Current I2 phase angle			
069A	RO	Current I3 phase angle			
069B	RO	Current neutral line phase angle			
069C	RO	L1 active Power	0.001k W	-32767～32767	
069D	RO	L2 active Power			
069E	RO	L3 active Power			
069F	RO	L1 reactive Power	0.001k VAr	-32767～32767	
06A0	RO	L2 reactive Power			
06A1	RO	L3 reactive Power			
06A2	RO	L1 apparent Power	0.001k VA	0～65535	
06A3	RO	L2 apparent Power			
06A4	RO	L3 apparent Power			
Register No.	**Type**	**Description**	**Explanation**		
1001	RO	Voltage L1 1st harmonic %	0.01% (L1)		
1002	RO	Voltage L1 2nd harmonic %			
1003	RO	Voltage L1 3rd harmonic %			
.....					
103F	RO	Voltage L1 63rd harmonic %			
1041	RO	Voltage L2 1st harmonic %	0.01% (L2)		
1042	RO	Voltage L2 2nd harmonic %			
.....					
107F	RO	Voltage L2 63rd harmonic %			
1081	RO	Voltage L3 1st harmonic %	0.01% (L3)		
1082	RO	Voltage L3 2nd harmonic %			

.....			
10BF	RO	Voltage L3 63rd harmonic %	
10C1	RO	I1 Current 1st harmonic %	0.01% (I1)
10C2	RO	I1 Current 2nd harmonic %	
.....			
10FF	RO	I1 Current 63rd harmonic %	
1101	RO	I2 Current 1st harmonic %	0.01% (I2)
1102	RO	I2 Current 2nd harmonic %	
.....			
113F	RO	I2 Current 63rd harmonic %	
1141	RO	I3 Current 1st harmonic %	
1142	RO	I3 Current 2nd harmonic %	
.....			
117F	RO	I3 Current 63rd harmonic %	
1181	RO	Current neutral 1st harmonic %	0.01% (IZ)
1182	RO	Current neutral 2nd harmonic %	
.....			
11BF	RO	Current neutral 63rd harmonic %	
Harmonic Phase Angle Register			
Register No.	**Type**	**Description**	**Explanation**
			359.9° (L1)
1201	RO	Voltage L1 1st phase angle	
1202	RO	Voltage L1 2nd phase angle	
1203	RO	Voltage L1 3rd phase angle	
.....			
123F	RO	Voltage L1 63rd phase angle	
			359.9° (L2)
1241	RO	Voltage L2 1st phase angle	
1242	RO	Voltage L2 2nd phase angle	
.....			
127F	RO	Voltage L2 63rd phase angle	
			359.9° (L3)
1282	RO	Voltage L3 1st phase angle	
1283	RO	Voltage L3 2nd phase angle	
.....			
12BF	RO	Voltage L3 63rd phase angle	
			359.9° (I1)
12C1	RO	Current I1 1st phase angle	
12C2	RO	Current I1 2nd phase angle	

.....			
12FF	RO	Current I1 63rd phase angle	
			359.9° (I2)
1301	RO	Current I2 1st phase angle	
1302	RO	Current I2 2nd phase angle	
.....			
133F	RO	Current I2 63rd phase angle	
			359.9° (I3)
1341	RO	Current I3 1st phase angle	
1342	RO	Current I3 2nd phase angle	
.....			
137F	RO	Current I3 63rd phase angle	
			359.9° (IZ)
1381	RO	Current neutral line 1st phase angle	
1382	RO	Current neutral line 2nd phase angle	
.....			
13BF	RO	Current neutral line 63rd phase angle	
SOE Record Register			
Register No.	**Type**	**Description**	**Explanation**
0C00	RO	Record 1 (year month)	Hi—year, Lo—month
0C01	RO	Record 1 (day hour)	Hi—day, Lo—hour
0C02	RO	Record 1 (minute sec.)	Hi—minute, Lo—second
0C03	RO	Record 1 (event)	Hi—1/16s, Lo—DI
...			
0C7C	RO	Record 32 (year month)	Hi—year, Lo—month
0C7D	RO	Record 32 (day hour)	Hi—day, Lo—hour
0C7E	RO	Record 32 (minute sec.)	Hi—minute, Lo—second
0C7F	RO	Record 32 (event)	Hi—1/16s, Lo—DI
0E00	RO	Record 33 (year month)	Hi—year, Lo—month
0E01	RO	Record 33 (day hour)	Hi—day, Lo—hour
0E02	RO	Record 33 (minute sec.)	Hi—minute, Lo—second
0E03	RO	Record 33 (event)	Hi—1/16s, Lo—DI
...			
0E7C	RO	Record 64 (year month)	Hi—year, Lo—month
0E7D	RO	Record 64 (day hour)	Hi—day, Lo—hour
0E7E	RO	Record 64 (minute sec.)	Hi—minute, Lo—second
0E7F	RO	Record 64 (event)	Hi—1/16s, Lo—DI
Demand Statistic Register (Primary Data)			
Register No.	**Type**	**Description**	**Explanation**
1800	RO	L1 active Demand Hi	*1000
1801		L1 active Demand Mi	

1802		L1 active Demand Lo	
1803	RO	L2 active Demand Hi	as same on
1804	RO	L2 active Demand Mi	
1805	RO	L2 active Demand Lo	
1806	RO	L3 active Demand Hi	
1807	RO	L3 active Demand Mi	
1808	RO	L3 active Demand Lo	
1809	RO	3 phase total reactive Demand Hi	
180A	RO	3 phase total reactive Demand Mi	
180B	RO	3 phase total reactive Demand Lo	
180C	RO	L1 reactive Demand Hi	
180D	RO	L1 reactive Demand Mi	
180E	RO	L1 reactive Demand Lo	
180F	RO	L2 reactive Demand Hi	
1810	RO	L2 reactive Demand Mi	
1811	RO	L2 reactive Demand Lo	
1812	RO	L3 reactive Demand Hi	
1813	RO	L3 reactive Demand Mi	
1814	RO	L3 reactive Demand Lo	
1815	RO	3 phase total reactive Demand Hi	as same on
1816	RO	3 phase total reactive Demand Mi	
1817	RO	3 phase total reactive Demand Lo	
1818	RO	L1 max. active Demand Hi	
1819	RO	L1 max. active Demand Mi	
181A	RO	L1 max. active Demand Lo	
181B	RO	L2 max. active Demand Hi	
181C	RO	L2 max. active Demand Mi	
181D	RO	L2 max. active Demand Lo	
181E	RO	L3 max. active Demand Hi	
181F	RO	L3 max. active Demand Mi	
1820	RO	L3 max. active Demand Lo	
1821	RO	3 phase max. total active Demand Hi	
1822	RO	3 phase max. total active Demand Mi	
1823	RO	3 phase max. total active Demand Lo	
1824	RO	L1 max. reactive Demand Hi	
1825	RO	L1 max. reactive Demand Mi	
1826	RO	L1 max. reactive Demand Lo	
1827	RO	L2 max. reactive Demand Hi	
1828	RO	L2 max. reactive Demand Mi	
1829	RO	L2 max. reactive Demand Lo	
182A	RO	L3 max. reactive Demand Hi	
182B	RO	L3 max. reactive Demand Mi	
182C	RO	L3 max. reactive Demand Lo	

182D	RO	3 phase max. total reactive Demand Hi	
182E	RO	3 phase max. total reactive Demand Mi	
182F	RO	3 phase max. total reactive Demand Lo	
1830	RO	L1 min. active Demand Hi	
1831	RO	L1 min. active Demand Mi	
1832	RO	L1 min. active Demand Lo	
1833	RO	L2 min. active Demand Hi	
1834	RO	L2 min. active Demand Mi	
1835	RO	L2 min. active Demand Lo	
1836	RO	L3 min. active Demand Hi	
1837	RO	L3 min. active Demand Mi	
1838	RO	L3 min. active Demand Lo	
1839	RO	3 phase min. total active Demand Hi	
183A	RO	3 phase min. total active Demand Mi	
183B	RO	3 phase min. total active Demand Lo	
183C	RO	L1 min. reactive Demand Hi	
183D	RO	L1 min. reactive Demand Mi	
183E	RO	L1 min. reactive Demand Lo	
183F	RO	L2 min. reactive Demand Hi	as same on
1840	RO	L2 min. reactive Demand Mi	
1841	RO	L2 min. reactive Demand Lo	
1842	RO	L3 min. reactive Demand Hi	
1843	RO	L3 min. reactive Demand Mi	
1844	RO	L3 min. reactive Demand Lo	
1845	RO	3 phase min. total reactive Demand Hi	
1846	RO	3 phase min. total reactive Demand Mi	
1847	RO	3 phase min. total reactive Demand Lo	
Instant Value Register			
Register No.	**Type**	**Description**	**Explanation**
1848	RO	L1 phase Voltage Hi	*10
1849	RO	L1 phase Voltage Lo	as same on
184A	RO	L2 phase Voltage Hi	
184B	RO	L2 phase Voltage Lo	
184C	RO	L3 phase Voltage Hi	
184D	RO	L3 phase Voltage Lo	
184E	RO	Avg. phase Voltage Hi	
184F	RO	Avg. phase Voltage Lo	
1850	RO	L12 line Voltage Hi	
1851	RO	L12 line Voltage Lo	
1852	RO	L31 line Voltage Hi	
1853	RO	L31 line Voltage Lo	
1854	RO	L23 line Voltage Hi	

1855	RO	L23 line Voltage Lo	
1856	RO	Avg. line Voltage Hi	
1857	RO	Avg. line Voltage Lo	
1858	RO	I1 phase Current Hi	*1000
1859	RO	I1 phase Current Lo	
185A	RO	I2 phase Current Hi	
185B	RO	I2 phase Current Lo	
185C	RO	I3 phase Current Hi	
185D	RO	I3 phase Current Lo	
185E	RO	Average phase Current Hi	
185F	RO	Average phase Current Lo	
1860	RO	L1 apparent Power Hi	*1000
1861	RO	L1 apparent Power Mi	
1862	RO	L1 apparent Power Lo	
1863	RO	L2 apparent Power Hi	
1864	RO	L2 apparent Power Mi	
1865	RO	L2 apparent Power Lo	
1866	RO	L3 apparent Power Hi	
1867	RO	L3 apparent Power Mi	
1868	RO	L3 apparent Power Lo	
1869	RO	3 phase total apparent Power Hi	
186A	RO	3 phase total apparent Power Mi	
186B	RO	3 phase total apparent Power Lo	
186C	RO	L1 phase active Power Hi	
186D	RO	L1 phase active Power Mi	
186E	RO	L1 phase active Power Lo	
186F	RO	L2 phase active Power Hi	
1870	RO	L2 phase active Power Mi	
1871	RO	L2 phase active Power Lo	
1872	RO	L3 phase active Power Hi	as same on
1873	RO	L3 phase active Power Mi	
1874	RO	L3 phase active Power Lo	
1875	RO	3 phase total active Power Hi	
1876	RO	3 phase total active Power Mi	
1877	RO	3 phase total active Power Lo	
1878	RO	L1 phase reactive Power Hi	
1879	RO	L1 phase reactive Power Mi	
187A	RO	L1 phase reactive Power Lo	
187B	RO	L2 phase reactive Power Hi	
187C	RO	L2 phase reactive Power Mi	
187D	RO	L2 phase reactive Power Lo	
187E	RO	L3 phase reactive Power Hi	
187F	RO	L3 phase reactive Power Mi	

1880	RO	L3 phase reactive Power Lo	
1881	RO	3 phase total reactive Power Hi	
1882	RO	3 phase total reactive Power Mi	
1883	RO	3 phase total reactive Power Lo	
1884	RO	L1 Power factor	*1000
1885	RO	L2 Power factor	*1000
1886	RO	L3 Power factor	*1000
1887	RO	3 phase Power factor	*1000
1888	RO	System frequency	*100
1889	RO	Zero sequence Current Hi	*1000
188A	RO	Zero sequence Current Lo	
188B	RO	Voltage unbalanced ratio	*1000
188C	RO	Current unbalanced ratio	*1000
(Primary Data)			
Register No.	**Type**	**Description**	**Explanation**
188D	RO	L1 max. phase Voltage Hi	*10
188E	RO	L1 max. phase Voltage Lo	
188F	RO	L2 max. phase Voltage Hi	
1890	RO	L2 max. phase Voltage Lo	
1891	RO	L3 max. phase Voltage Hi	
1892	RO	L3 max. phase Voltage Lo	
1893	RO	Average max. phase Voltage Hi	
1894	RO	Average max. phase Voltage Lo	
1895	RO	L12 max. line Voltage Hi	
1896	RO	L12 max. line Voltage Lo	
1897	RO	L31 max. line Voltage Hi	
1898	RO	L31 max. line Voltage Lo	
1899	RO	L23max. line Voltage Hi	
189A	RO	L23 max. line Voltage Lo	
189B	RO	Average max. line Voltage Hi	
189C	RO	Average max. line Voltage Lo	
189D	RO	I1 max. Current Hi	*1000
189E	RO	I1 max. Current Lo	
189F	RO	I2 max. Current Hi	
18A0	RO	I2 max. Current Lo	
18A1	RO	I3 max. Current Hi	
18A2	RO	I3 max. Current Lo	
18A3	RO	Average max. Current Hi	
18A4	RO	Average max. Current Lo	
18A5	RO	L1 max. apparent Power Hi	*1000
18A6	RO	L1 max. apparent Power Mi	
18A7	RO	L1 max. apparent Power Lo	

18A8	RO	L2 max. apparent Power Hi	
18A9	RO	L2 max. apparent Power Mi	
18AA	RO	L2 max. apparent Power Lo	
18AB	RO	L3 max. apparent Power Hi	
18AC	RO	L3 max. apparent Power Mi	
18AD	RO	L3 max. apparent Power Lo	
18AE	RO	3 phase max. total apparent Power Hi	
18AF	RO	3 phase max. total apparent Power Mi	
18B0	RO	3 phase max. total apparent Power Lo	
18B1	RO	L1 max. active Power Hi	
18B2	RO	L1 max. active Power Mi	
18B3	RO	L1 max. active Power Lo	
18B4	RO	L2 max. active Power Hi	
18B5	RO	L2 max. active Power Mi	
18B6	RO	L2 max. active Power Lo	
18B7	RO	L3 max. active Power Hi	
18B8	RO	L3 max. active Power Mi	
18B9	RO	L3 max. active Power Lo	
18BA	RO	3 phase max. total active Power Hi	
18BB	RO	3 phase max. total active Power Mi	
18BC	RO	3 phase max. total active Power Lo	
18BD	RO	L1 max. reactive Power Hi	
18BE	RO	L1 max. reactive Power Mi	
18BF	RO	L1 max. reactive Power Lo	
18C0	RO	L2 max. reactive Power Hi	
18C1	RO	L2 max. reactive Power Mi	
18C2	RO	L2 max. reactive Power Lo	
18C3	RO	L3 max. reactive Power Hi	
18C4	RO	L3 max. reactive Power Mi	
18C5	RO	L3 max. reactive Power Lo	
18C6	RO	3 phase max. total reactive Power Hi	
18C7	RO	3 phase max. total reactive Power Mi	
18C8	RO	3 phase max. total reactive Power Lo	
18C9	RO	L1 max. Power factor	*1000
18CA	RO	L2 max. Power factor	*1000
18CB	RO	L3 max. Power factor	*1000
18CC	RO	3 phase max. Power factor	*1000
18CD	RO	Max. system frequency	*100
18CE	RO	Max. zero sequence Current Hi	*1000
18CF	RO	Max. zero sequence Current Lo	
18D0	RO	Max. unbalanced Voltage ratio	*1000
18D1	RO	Max. unbalanced Current ratio	*1000
18D2	RO	L1 min. phase Voltage Hi	*10

18D3	RO	L1 min. phase Voltage Lo	
18D4	RO	L2 min. phase Voltage Hi	
18D5	RO	L2 min. phase Voltage Lo	
18D6	RO	L3 min. phase Voltage Hi	
18D7	RO	L3 min. phase Voltage Lo	
18D8	RO	Average min. line Voltage Hi	
18D9	RO	Average min. line Voltage Lo	
18DA	RO	L12 min. line Voltage Hi	
18DB	RO	L12 min. line Voltage Lo	
18DC	RO	L31 min. line Voltage Hi	
18DD	RO	L31 min. line Voltage Lo	
18DE	RO	L23 min. line Voltage Hi	
18DF	RO	L23 min. line Voltage Lo	
18E0	RO	Average min. line Voltage Hi	
18E1	RO	Average min. line Voltage Lo	
18E2	RO	I1 min. phase Current Hi	*1000
18E3	RO	I1 min. phase Current Lo	
18E4	RO	I2 min. phase Current Hi	
18E5	RO	I2 min. phase Current Lo	
18E6	RO	I3 min. phase Current Hi	
18E7	RO	I3 min. phase Current Lo	
18E8	RO	Average min. phase Current Hi	
18E9	RO	Average min. phase Current Lo	
18EA	RO	L1 min. apparent Power Hi	*1000
18EB	RO	L1 min. apparent Power Mi	
18EC	RO	L1 min. apparent Power Lo	
18ED	RO	L2 min. apparent Power Hi	
18EE	RO	L2 min. apparent Power Mi	
18EF	RO	L2 min. apparent Power Lo	
18F0	RO	L3 min. apparent Power Hi	
18F1	RO	L3 min. apparent Power Mi	
18F2	RO	L3 min. apparent Power Lo	
18F3	RO	3 phase min. total apparent Power Hi	
18F4	RO	3 phase min. total apparent Power Mi	
18F5	RO	3 phase min. total apparent Power Lo	
18F6	RO	L1 min. active Power Hi	
18F7	RO	L1 min. active Power Mi	
18F8	RO	L1 min. active Power Lo	
18F9	RO	L2 min. active Power Hi	
18FA	RO	L2 min. active Power Mi	
18FB	RO	L2 min. active Power Lo	
18FC	RO	L3 min. active Power Hi	
18FD	RO	L3 min. active Power Mi	

18FE	RO	L3 min. active Power Lo	
18FF	RO	3 phase min. total active Power Hi	
1900	RO	3 phase min. total active Power Mi	
1901	RO	3 phase min. total active Power Lo	
1902	RO	L1 min. reactive Power Hi	
1903	RO	L1 min. reactive Power Mi	
1904	RO	L1 min. reactive Power Lo	
1905	RO	L2 min. reactive Power Hi	
1906	RO	L2 min. reactive Power Mi	
1907	RO	L2 min. reactive Power Lo	
1908	RO	L3 min. reactive Power Hi	
1909	RO	L3 min. reactive Power Mi	
190A	RO	L3 min. reactive Power Lo	
190B	RO	3 phase min. total reactive Power Hi	
190C	RO	3 phase min. total reactive Power Mi	
190D	RO	3 phase min. total reactive Power Lo	
190E	RO	L1 min. Power factor	*1000
190F	RO	L2 min.. Power factor	*1000
1910	RO	L3 min. Power factor	*1000
1911	RO	3 phase min. Power factor	*1000
1912	RO	Min. system frequency	*100
1913	RO	Min. zero sequence Current Hi	*1000
1914	RO	Min. zero sequence Current Lo	
1915	RO	Min. unbalanced Voltage ratio	*1000
1916	RO	Min. unbalanced Current ratio	*1000
Energy Register (Primary Data)			
Register No.	**Type**	**Description**	**Explanation**
1A00	RO	Total active total Energy Hi	999999999 MWh/Mvarh
1A01	RO	Total active total Energy Lo	
1A02	RO	Importing active Power Hi	
1A03	RO	Importing active Power Lo	
1A04	RO	Exporting active Power Hi	
1A05	RO	Exporting active Power Lo	
1A06	RO	Total reactive total Energy Hi	
1A07	RO	Total reactive total Energy Lo	
1A08	RO	Inductive reactive Energy Hi	
1A09	RO	Inductive reactive Energy Lo	
1A0A	RO	Capacitive active Energy Hi	
1A0B	RO	Capacitive active Energy Lo	
1A0C	RO	Active Energy decimal Hi	＜1MWh or1Mvarh 0.00000001*100000000
1A0D	RO	Active Energy decimal Lo	
1A0E	RO	Importing active Energy decimal Hi	

1A0F	RO	Importing active Energy decimal Lo	
1A10	RO	Exporting active Energy decimal Hi	
1A11	RO	Exporting active Energy decimal Lo	
1A12	RO	Reactive Energy decimal Hi	
1A13	RO	Reactive Energy decimal Lo	
1A14	RO	Inductive reactive Energy decimal Hi	
1A15	RO	Inductive reactive Energy decimal Lo	
1A16	RO	Capacitive reactive Energy decimal Hi	
1A17	RO	Capacitive reactive Energy decimal Lo	
1A18	RO	Current month sum Energy Hi	199 999 999 99.9 999kWh
1A19	RO	Current month sum Energy Mi	
1A1A	RO	Current month sum Energy Lo	
1A1B	RO	Current month sharp Energy Hi	
1A1C	RO	Current month sharp Energy Mi	
1A1D	RO	Current month sharp Energy Lo	
1A1E	RO	Current month peak Energy Hi	
1A1F	RO	Current month peak Energy Mi	
1A20	RO	Current month peak Energy Lo	
1A21	RO	Current month flat Energy Hi	
1A22	RO	Current month flat Energy Mi	
1A23	RO	Current month flat Energy Lo	
1A24	RO	Current month valley Energy Hi	
1A25	RO	Current month valley Energy Mi	
1A26	RO	Current month valley Energy Lo	
1A27	RO	Current month total Energy in 01 interval Hi	
1A28	RO	Current month total Energy in 01 interval Mi	
1A29	RO	Current month total Energy in 01 interval Lo	
1A2A	RO	Current month importing Energy in 01 interval Hi	
1A2B	RO	Current month importing Energy in 01 interval Mi	
1A2C	RO	Current month importing Energy in 01 interval Lo	
1A2D	RO	Current month exporting Energy in 01 interval Hi	
1A2E	RO	Current month exporting Energy in 01 interval Mi	
1A2F	RO	Current month exporting Energy in 01 interval Lo	
……		2~11 Interval	
1A8A	RO	Current month total Energy in 12	

		interval Hi	
1A8B	RO	Current month total Energy in 12 interval Mi	
1A8C	RO	Current month total Energy in 12 interval Lo	
1A8D	RO	Current month importing Energy in 12 interval Hi	
1A8E	RO	Current month importing Energy in 12 interval Mi	
1A8F	RO	Current month importing Energy in 12 interval Lo	
1A90	RO	Current month exporting Energy in 12 interval Hi	
1A91	RO	Current month exporting Energy in 12 interval Mi	
1A92	RO	Current month exporting Energy in 12 interval Lo	
1A93	RO	Last month sum Energy Hi	
1A94	RO	Last month sum Energy Mi	
1A95	RO	Last month sum Energy Lo	
1A96	RO	Last month sharp Energy Hi	
1A97	RO	Last month sharp Energy Mi	
1A98	RO	Last month sharp Energy Lo	
1A99	RO	Last month peak Energy Hi	
1A9A	RO	Last month peak Energy Mi	
1A9B	RO	Last month peak Energy Lo	
1A9C	RO	Last month flat Energy Hi	
1A9D	RO	Last month flat Energy Mi	
1A9E	RO	Last month flat Energy Lo	
1A9F	RO	Last month valley Energy Hi	
1AA0	RO	Last month valley Energy Mi	
1AA1	RO	Last month valley Energy Lo	
1AA2	RO	Last month total Energy in 01 interval Hi	
1AA3	RO	Last month total Energy in 01 interval Mi	
1AA4	RO	Last month total Energy in 01 interval Lo	
1AA5	RO	Last month importing Energy in 01 interval Hi	
1AA6	RO	Last month importing Energy in 01 interval Mi	
1AA7	RO	Last month importing Energy in 01	

		interval Lo	
1AA8	RO	Last month exporting Energy in 01 interval Hi	
1AA9	RO	Last month exporting Energy in 01 interval Mi	
1AAA	RO	Last month exporting Energy in 01 interval Lo	
		2~11 Interval	
1B05	RO	Last month total Energy in 12 interval Hi	
1B06	RO	Last month total Energy in 12 interval Mi	
1B07	RO	Last month total Energy in 12 interval Lo	
1B08	RO	Last month importing Energy in 12 interval Hi	
1B09	RO	Last month importing Energy in 12 interval Mi	
1B0A	RO	Last month importing Energy in 12 interval Lo	
1B0B	RO	Last month exporting Energy in 12 interval Hi	
1B0C	RO	Last month exporting Energy in 12 interval Mi	
1B0D	RO	Last month exporting Energy in 12 interval Lo	
1B0E	RO	1 month before last total Energy Hi	
1B0F	RO	1 month before last total Energy Mi	
1B10	RO	1 month before last total Energy Lo	
1B11	RO	1 month before last sharp Energy Hi	
1B12	RO	1 month before last sharp Energy Mi	
1B13	RO	1 month before last sharp Energy Lo	
1B14	RO	1 month before last peak Energy Hi	
1B15	RO	1 month before last peak Energy Mi	
1B16	RO	1 month before last peak Energy Lo	
1B17	RO	1 month before last flat Energy Hi	
1B18	RO	1 month before last flat Energy Mi	
1B19	RO	1 month before last flat Energy Lo	
1B1A	RO	1 month before last valley Energy Hi	
1B1B	RO	1 month before last valley Energy Mi	
1B1C	RO	1 month before last valley Energy Lo	
1B1D	RO	1 month before last 01 interval total Energy Hi	

1B1E	RO	1 month before last 01 interval total Energy Mi	
1B1F	RO	1 month before last 01 interval total Energy Lo	
1B20	RO	1 month before last 01 Interval imp Energy Hi	
1B21	RO	1 month before last 01 Interval imp Energy Mi	
1B22	RO	1 month before last 01 Interval imp Energy Lo	
1B23	RO	1 month before last 01 Interval exp Energy Hi	
1B24	RO	1 month before last 01 Interval exp Energy Mi	
1B25	RO	1 month before last 01 Interval exp Energy Lo	
		2~11 Interval	
1B80	RO	1 month before last 12 Interval total Energy Hi	
1B81	RO	1 month before last 12 Interval total Energy Mi	
1B82	RO	1 month before last 12 Interval total Energy Lo	
1B83	RO	1 month before last 12 Interval imp Energy Hi	
1B84	RO	1 month before last 12 Interval imp Energy Mi	
1B85	RO	1 month before last 12 Interval imp Energy Lo	
1B86	RO	1 month before last 12 Interval exp Energy Hi	
1B87	RO	1 month before last 12 Interval exp Energy Mi	
1B88	RO	1 month before last 12 Interval exp Energy Lo	
1B89	RO	2 month before last total Energy Hi	
1B8A	RO	2 month before last total Energy Mi	
1B8B	RO	2 month before last total Energy Lo	
1B8C	RO	2 month before last sharp Energy Hi	
1B8D	RO	2 month before last sharp Energy Mi	
1B8E	RO	2 month before last sharp Energy Lo	
1B8F	RO	2 month before last peak Energy Hi	
1B90	RO	2 month before last peak Energy Mi	

1B91	RO	2 month before last peak Energy Lo	
1B92	RO	2 month before last flat Energy Hi	
1B93	RO	2 month before last flat Energy Mi	
1B94	RO	2 month before last flat Energy Lo	
1B95	RO	2 month before last valley Energy Hi	
1B96	RO	2 month before last valley Energy Mi	
1B97	RO	2 month before last valley Energy Lo	
1B98	RO	2 month before last 01 Interval total Energy Hi	
1B99	RO	2 month before last 01 Interval total Energy Mi	
1B9A	RO	2 month before last 01 Interval total Energy Lo	
1B9B	RO	2 month before last 01 Interval imp Energy Hi	
1B9C	RO	2 month before last 01 Interval imp Energy Mi	
1B9D	RO	2 month before last 01 Interval imp Energy Lo	
1B9E	RO	2 month before last 01 Interval exp Energy Hi	
1B9F	RO	2 month before last 01 Interval exp Energy Mi	
1BA0	RO	2 month before last 01 Interval exp Energy Lo	
		2~11 Interval	
1BFB	RO	2 month before last 12 Interval total Energy Hi	
1BFC	RO	2 month before last 12 Interval total Energy Mi	
1BFD	RO	2 month before last 12 Interval total Energy Lo	
1BFE	RO	2 month before last 12 Interval imp Energy Hi	
1BFF	RO	2 month before last 12 Interval imp Energy Mi	
1C00	RO	2 month before last 12 Interval imp Energy Lo	
1C01	RO	2 month before last 12 Interval exp Energy Hi	
1C02	RO	2 month before last 12 Interval exp Energy Mi	
1C03	RO	2 month before last 12 Interval exp Energy Lo	

IV. Module Usage

4.1 Profile of Modules

4.1.1 Function and Advantage

Multifunction Power Meter can extend functions by choosing the external optional modules, including 8 remote signals module, programmable 4 analog outputs (0~5V or 4~20mA) module, 4 relay outputs module, data storage & harmonic analysis module, Profibus module and Ethernet module.

With extension capability, variety, dependability, and flexibility, Multifunction Power Meter can realize different functions by connecting different modules. It can suit different customers' needs flexibly.

4.1.2 Table of Module Function

Assistant Modules Type		Assistant Modules Function
A	8 remote signal module	Detect the on/off status exterior device. (Dry contact must). It can record the no. of on/off states and SOE event record.
B	4 programmable relay output module	Programmable 4 channels relay output, remote control or auto alarm outputs to be chosen.
C	4 programmable analog outputs module	Programmable 4 independent analog outputs can correspond to several measured parameters. (Outputs: 4~20mA)
D		Programmable 4 independent analog outputs can correspond to several measured parameters. (Outputs: 0~5V).
E	Data storage module	Store harmonic and real time measured data.
F	Harmonic analysis module	Analyze（2^{nd} ~63^{rd} ）harmonic data.
G	Data storage and harmonic analysis module	Above 2 functions.
H	Profibus communication module	Communicate with Profibus-DP protocol
I	Ethernet communication module	Communicate with Ethernet

4.2 Module Installation

4.2.1 Exterior Size

Exterior size: 52 mm×37 mm×20.67mm
Installation size: 21.7 mm×9.3mm×7mm.
As shown in Fig. 162 and Fig. 163.

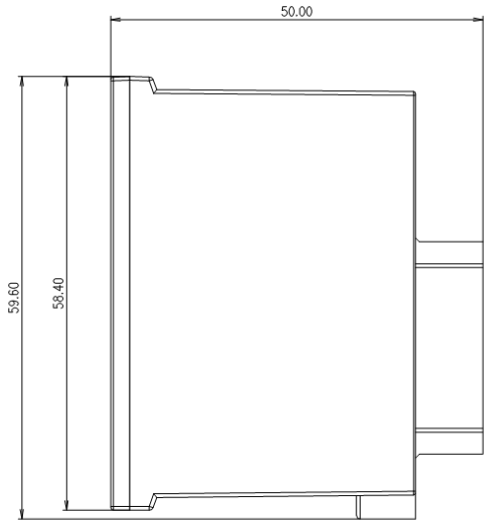


Fig. 162 Side view

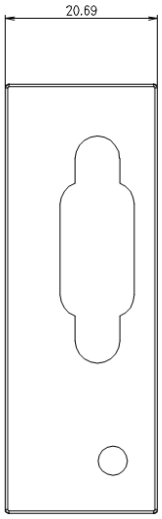


Fig. 163 Back view

4.2.2 Installation Condition

Assistant Module can be easily installed, but several conditions have to be matched:
(1) Temperature
Working Temperature: -20~60℃.
Storage Temperature: -40~85℃
(2) Humidity:
5~95%（non-condensing）
(3) Installed Environment
Meter and Assistant modules should be installed in a dry, non-dust environment, avoiding heat, strong-disturbance source nearby.

4.2.3 Installation Method

Modules and main unit are connected by pins. The back side of meter has pin holes, and modules have pins. As shown in Fig. 164.

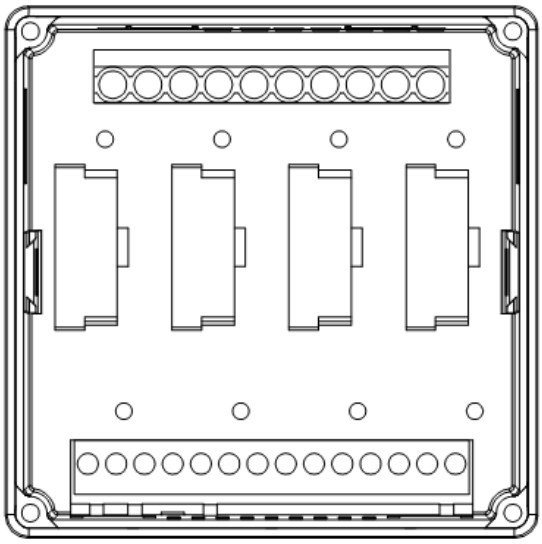


Fig. 164 Back-side diagram

Fig. 165 Side diagram

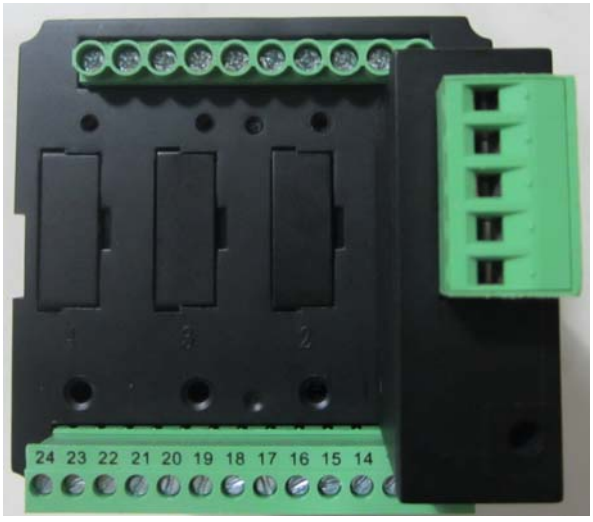


Fig. 166 Back-side diagram (one module)

First, you should make sure the inserted pin of the assistant module not to fold or distort (see Fig. 165), take the extended back cover of the main assistant module off, and then plug the module in

parallelly according to the direction of the main unit rabbet & the assistant module cover (see Fig. 166). When you operate it, please use the proper strength. Don't insert it deflectively or forcibly. At the same time, you should make the fixed pole aim at the fixed hole. If you can't put the fixed pole into the hole, you can check whether the pin can work or not, and then plug the module in (see Fig. 166). After finish that, the cover of the module should be stick on the back cover of the main unit properly. Last, we should make the screw tightly, which is used to fix the module into the mainboard (see Fig. 167).

Fig. 167 Back-side diagram (4 modules)

Up to 4 modules can be connected with Meter. The module C & D can't be selected at the same time, one time for one module. Module C & D must be inserted into the first pin holes. Besides, the module G, E & F can't be selected at the same time too. The module H & I can only be inserted to the second, third and fourth hole, but they can't be plugged into the first hole. However, the module A, B, G, E & F can be inserted to any hole optionally.

Notice: We should make sure the power is off when we plug the module in or plug it off. In order to make ourselves in safe condition, please don't operate when the power is on.

4.2.4 Module Connection

Module A: 8 channels remote signal module wiring diagram

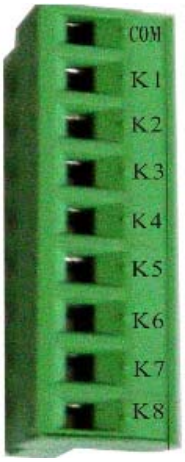
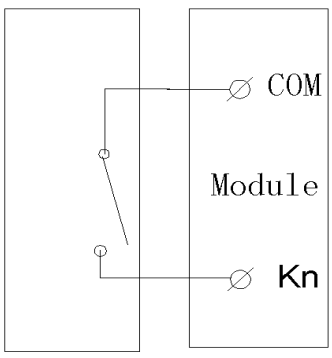


Fig. 168 Terminal Chart



n=1, 2, 3, 4, 5, 6, 7, 8

Fig. 169 External Connection

Please install the module in corresponding module positions in backside of the meter. Please be ware of the direction. Com as the pubic terminal, and K1 as channel 1 input, K2 as channel 2 input, and so on, K8 as channel 8 input. If it is customized for 2 channels, K1 as channel 1 input and K2 as channel 2 input, for 4 channels, K1 as channel 1 input, K2 as channel 2 input, and so on, K4 as channel 4 input.

Module B: 4 Programmable relay output module wiring diagram

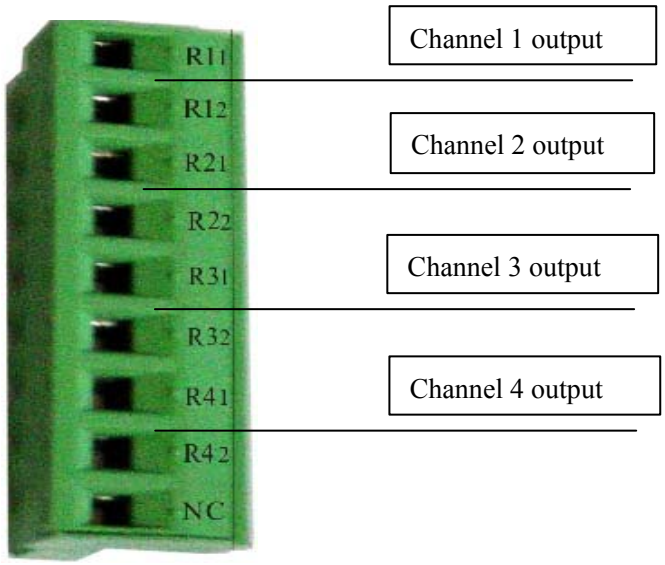


Fig. 170 Terminal chart

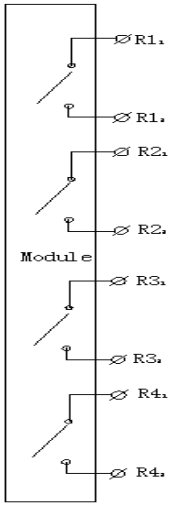
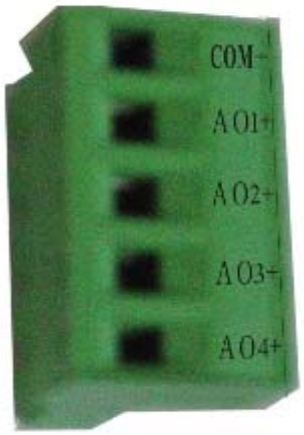


Fig. 171 Logic symbol

Please install the module in any of the module positions in backside of the meter. Please be ware of the direction. R11and R12 as channel 1 output, R21and R22 as channel 2 output, R31and R32 as channel 3 output, R41and R42 as channel 4 output and NC as no connection.

Module C/D: 4 programmable analog outputs module wiring diagram



4 analog public terminals
Channel 1 output
Channel 2 output
Channel 3 output
Channel 4 output

Fig. 172 Terminal Chart

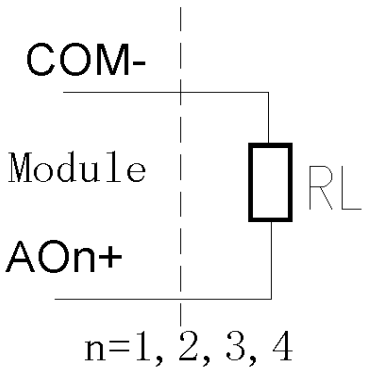


Fig. 173 External Connection

Please insert the module carefully in the back side of meter. Be aware of direction, as shown in Fig.172. Com- as the pubic terminal, AO1+ as channel 1 analog output, AO2+ as channel analog output , AO3+ as channel 3 analog output, AO4+ as channel 4 analog output.

Notice: Analog output modules can only be inserted in No.1 module position, as shown in Fig. 9. (The rightmost terminal when you hold the meter backside.)

Module H: Profibus module wiring diagram

(1) As shown in Fig. 174, the user can connect Multifunction Power Meter with Profibus module.

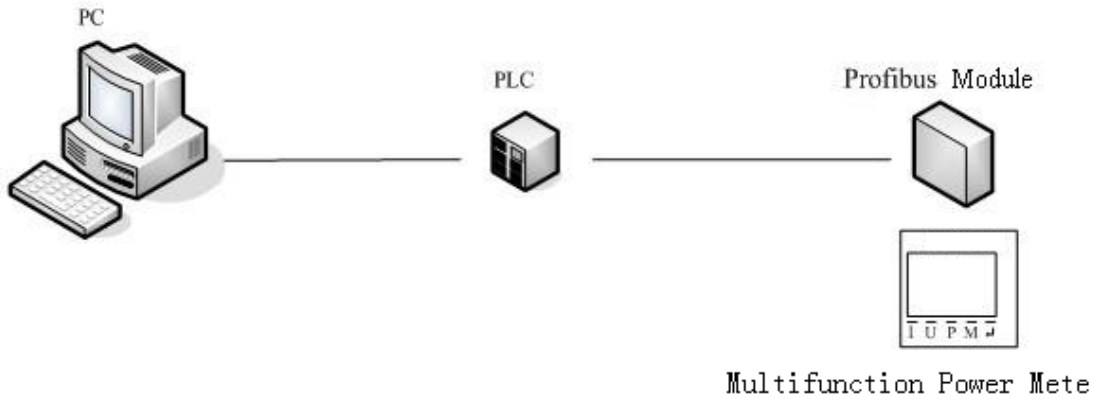


Fig. 174

Fig. 175 Terminal port

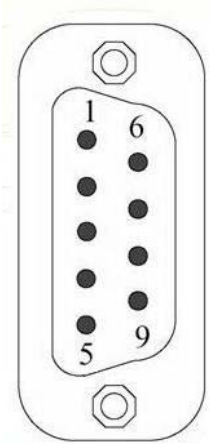


Fig. 176 DB9 port sequence

(2) DP Port Definition

Pin No.	RS-485	Signal Term	Description	Availability
1	——	Shield	Shield, protect ground	No
2	——	N24V	-24V output Voltage	No
3	B	RXD/TXD-P	Data P (Receive/Send)	Yes
4	——	CNTR-P	Control P	Yes
5	C	DGND	DGND	Yes
6	——	Vp	Positive Voltage	Yes
7	——	P24V	+24V output Voltage	No
8	A	RXD/TXD-P	Data N	Yes

			(Receive/Send)	
9	——	CNTR-N	Control N	No

(3) Cable

Usually the user is required to use STP (Shielded Twisted Pair) cable, as the standard EIA RS-485. In addition, the user can use unshielded twisted pair cable if there is no much disturbance.

(4) Bus Terminal

According to DP standard, the user can add bus terminals (resistances) at the start and the end of PROFIBUS-DP, as shown in Fig. 177.

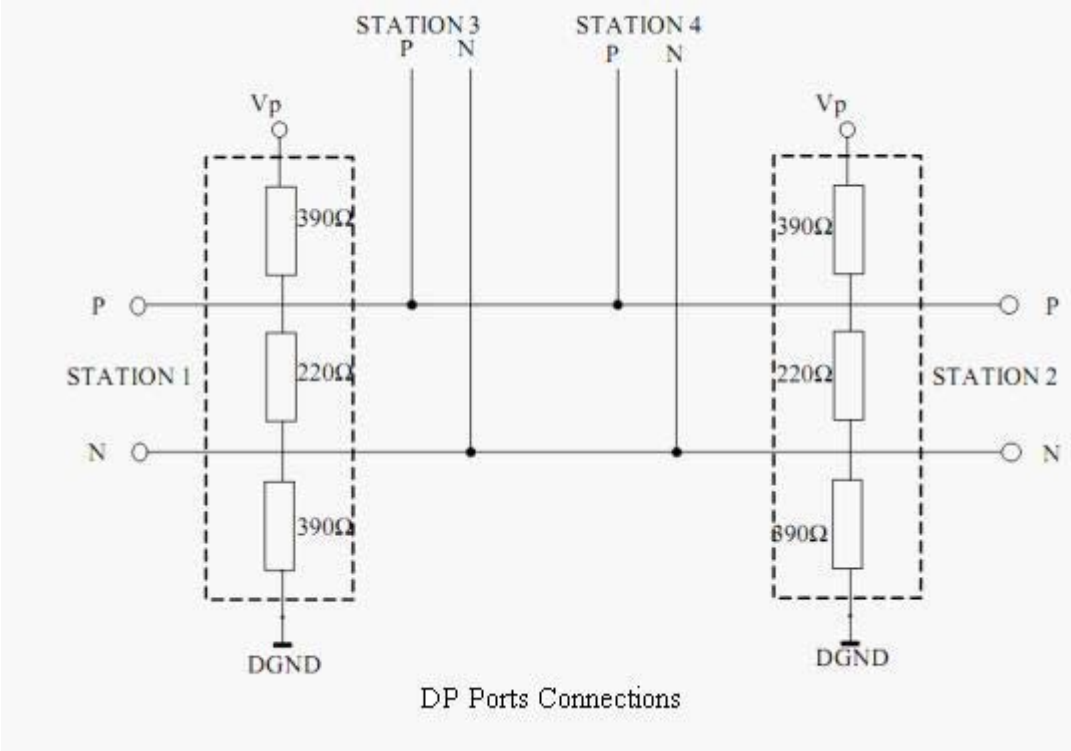


Fig. 177

Bus terminal consists of 3 resistors (values as shown in Fig. 177) and connecting wires. Vp stands for positive end of power. DGND stands for Digital Ground. As shown in Fig. 177, level of Data P is higher than Data N, and bus free signal is 1.

Module I: Ethernet module wiring diagram

The terminal can communicate with PC by Ethernet Module. (For set details, please refer to the first part of user manual).

The connect diagrams is as shown in Fig. 178 and Fig. 179.

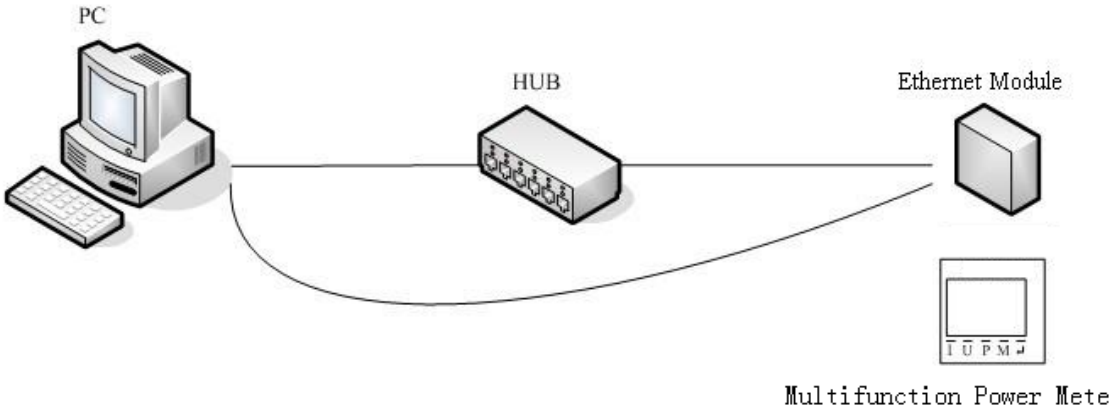


Fig. 178

Fig. 179 Front view of module

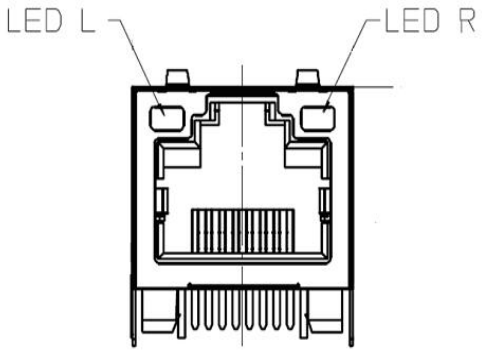


Fig. 180 Front view of RJ-45

LED_L (Yellow) indicates speed characteristics. Constant on of LED represents 100Mbps, while Constant off of LED represents 10Mbps.

LED_R (Green) indicates characteristics of connection and data exchange. Constant on of LED represents connection, while flickering of LED represents s data output.

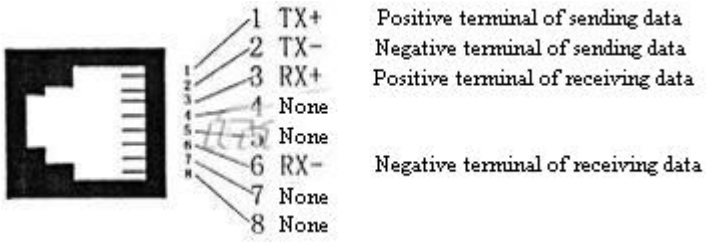


Fig. 181 RJ-45 Ports No.

4.3 Module Function

4.3.1 Remote Signal Input Function

Meter can display on/off status of 8 remote signal inputs. Also the user can remote monitor on/off status of 8 remote signals and SOE records, as shown in Fig.182 and Fig. 183.（See the meter operation manual）

SOE Record Register			
Register No.	**Type**	**Description**	**Explanation**
0C00	RO	Record 1（year month）	Hi—year, Lo—month
0C01	RO	Record 1（day hour）	Hi—day, Lo—hour
0C02	RO	Record 1（minute sec.）	Hi—minute, Lo—second
0C03	RO	Record 1（event）	Hi—1/16s, Lo—DI
...			
0C7C	RO	Record 32（year month）	Hi—year, Lo—month
0C7D	RO	Record 32（day hour）	Hi—day, Lo—hour
0C7E	RO	Record 32（minute sec.）	Hi—minute, Lo—second
0C7F	RO	Record 32（event）	Hi—1/16s, Lo—DI
0E00	RO	Record 33（year month）	Hi—year, Lo—month
0E01	RO	Record 33（day hour）	Hi—day, Lo—hour
0E02	RO	Record 33（minute sec.）	Hi—minute, Lo—second
0E03	RO	Record 33（event）	Hi—1/16s, Lo—DI
...			
0E7C	RO	Record 64（year month）	Hi—year, Lo—month
0E7D	RO	Record 64（day hour）	Hi—day, Lo—hour
0E7E	RO	Record 64（minute sec.）	Hi—minute, Lo—second
0E7F	RO	Record 64（event）	Hi—1/16s，Lo—DI DI: low 8 bit D0- remote signal 1 D1- remote signal 2 D2- remote signal 3 D3- remote signal 4 D4- remote signal 5 D5- remote signal 6 D6- remote signal 7 D7- remote signal 8 Bit status ‘0’- off ‘1’- on

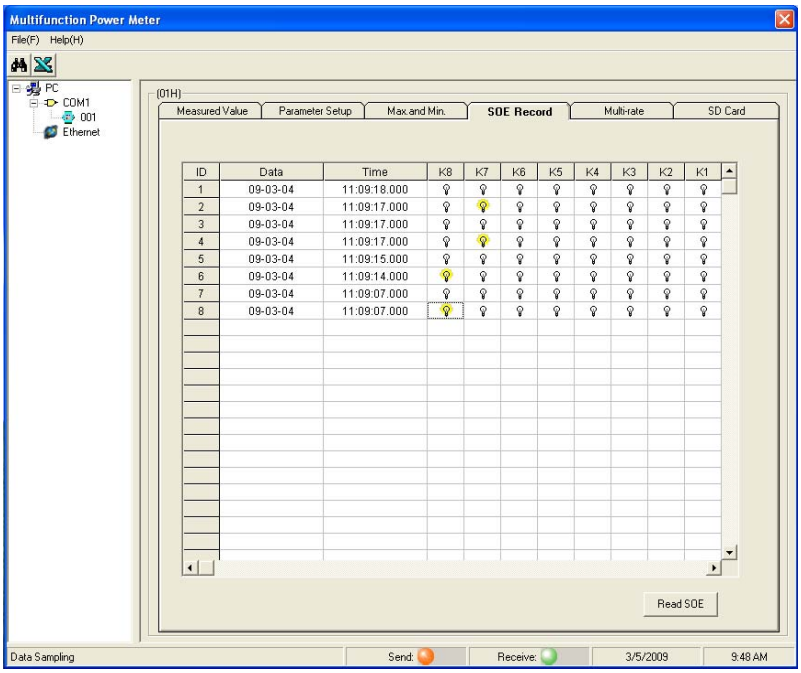


Fig.182

Register No.	Type	Description	Explanation
0322	RO	Remote signal input status	Low 8 bit: D0- remote signal 1 D1- remote signal 2 D2- remote signal 3 D3- remote signal 4 D4- remote signal 5 D5- remote signal 6 D6- remote signal 7 D7- remote signal 8 Bit status ‘0’- off ‘1’- on

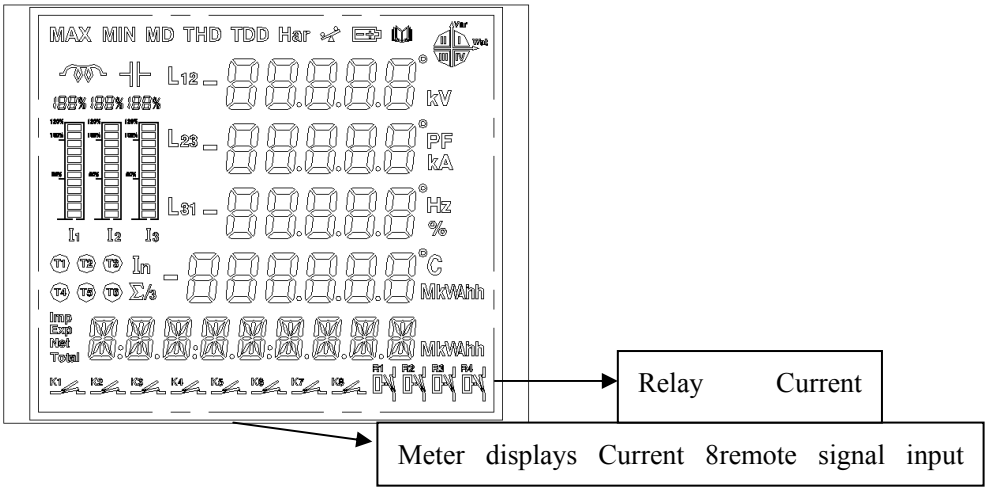


Fig.183

4.3.2 Relay Output Module Function

4 channels programmable relay output can export on/off command during constant on or constant off state of relays, connecting with exterior equipment.

Auto alarm output: First choose items of parameters in “Relay Configuration”: Voltage, Current, 3 phase active Demand, 3 phase reactive Demand, Power factor, frequency, active negative direction, reactive negative direction, unbalanced Voltage. The delay time, reset time unit is second. Press “setup” to save the current setting. The measured value is over upper limit or under lower value. The relay alarm is on after “delay time”. The relay status is changed. When the measured value reaches the value in between lower and upper value, the alarm is off after “reset time”, and the relay retrieves the original status. As shown in Fig. 185.

Constant on status: when alarm is on the relay is closed; relay is disconnected in no alarm state.

Manual control output: Click the button in PC to control on/off state of relays.

Relay control mode (0x011F—0x0122)		
0	Manual (Remote) control mode	Write output control register can control the relay, 0 as off/1 pulse output.
1	L1 phase Voltage	1. In the overlimit control mode, output control register can response to the on/off status of the relay. 0 as off/1 as on. 2. In the overlimit control mode, the meter executes according to the upper and the lower limits parameters, set by software.
2	L2 phase Voltage	
3	L3 phase Voltage	
4	I1 phase Current	
5	I2 phase Current	
6	I3 phase Current	
7	Sequence Current	
8	3 phase active Demand	
9	3 phase reactive Demand	
A	Power factor	
B	Frequency	
C	Reactive Power neg. direction	
D	Active Power	
E	Unbalanced Voltage	

Register No.	Type	Description	Explanation
011B	RW	Relay 1 automatic control mode delay and reset time	Hi BYTE delay time, Lo BYTE reset time 1~255, unit: secs
011C	RW	Relay 2 automatic control mode delay and reset time	
011D	RW	Relay 3 automatic control mode delay and reset time	
011E	RW	Relay 4 automatic control	

		mode delay and reset time	
011F	RW	Relay 1 control mode	
0120	RW	Relay 2 control mode	
0121	RW	Relay 3 control mode	
0122	RW	Relay 4 control mode	
0123	RW	Relay output control	Low 4 bit D0- Relay 1, D1- Relay 2, D2- Relay 3, D3- Relay 4 Bit status '0'- off, '1'- on
0321	RO	Relay alarm status	D0=0-Realy1 no alarm D0=1- Realy1 alarm D8=0 Realy1 over upper limit D8=1 Realy1 under lower limit D1=0-Realy2 no alarm D1=1- Realy2 alarm D9=0 Realy2 over upper limit D9=1 Realy2 under lower limit D2=0-Realy3 no alarm D2=1- Realy3 alarm D10=0 Realy3 over upper limit D10=1 Realy3 under lower limit D3=0-Realy4 no alarm D3=1- Realy4 alarm D11=0 Realy4 over upper limit D11=1 Realy4 under lower limit

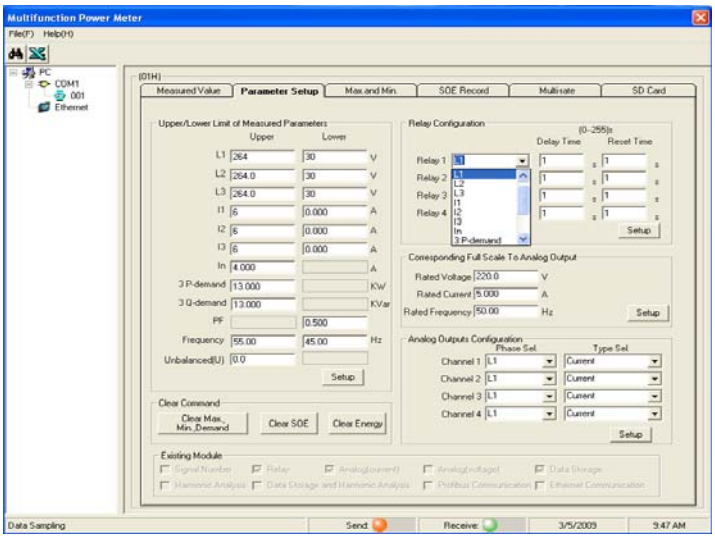


Fig.185

4.3.3 Analog Output Module Function

4 programmable analog output module can output Voltage(0~5V),or Current(4~20mA） signal. The user can program the corresponding Current, Voltage, apparent Power, active Power, reactive Power, system frequency and Power factor(See the meter operation manual), as shown in Fig. 186.

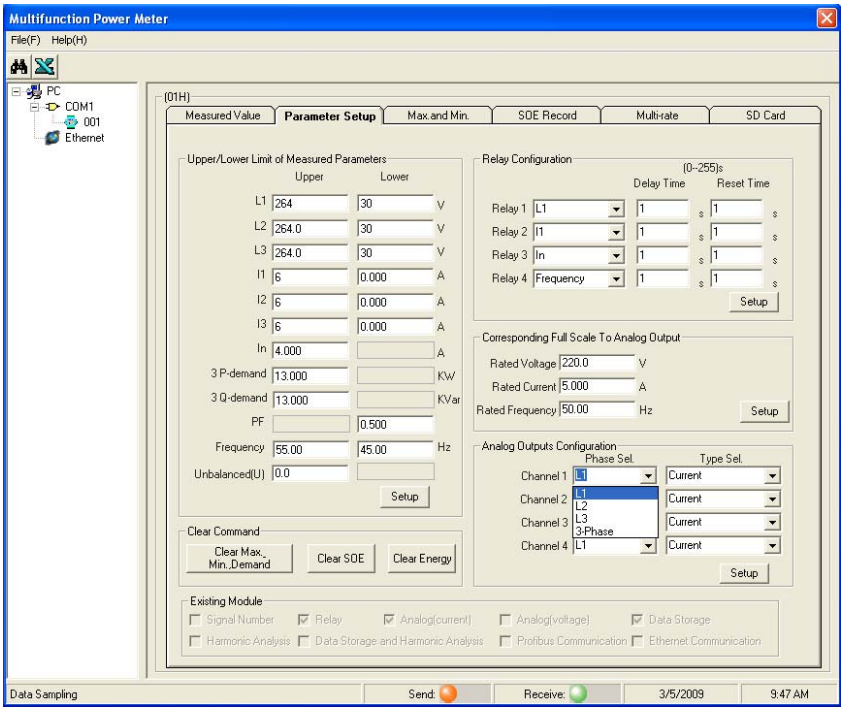


Fig.186

4.3.4 Data Storage Module Function

Data storage module can store measurement values and harmonics values. SD card is 2GB (Other requirements should indicate when you place the order). Please set relative parameters through software.

As shown in Fig. 187, the page indicates that there is no SD card or SD card can't be initialized. Please check SD card. If necessary, please change a new one.

Do not plug out or plug in SD card when the power is on.

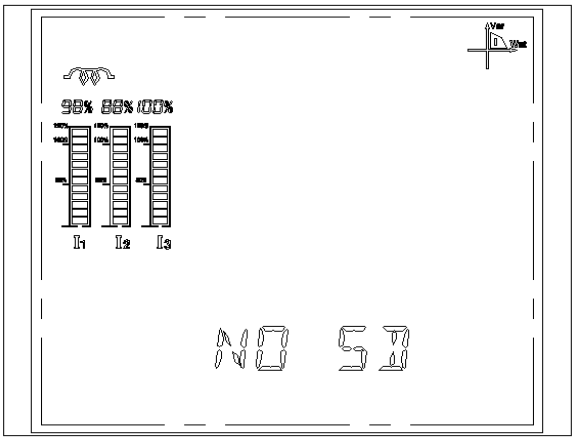


Fig. 187

4.3.4.1 Data storage format

(1) Data storage instruction

The system will indicate to delete the oldest files when SD card is almost full. According to Microsoft EFI FAT32 File System Specification, the file name can not exceed 8 characters. Otherwise, the file will be destroyed.

(2) Measured data

When SD card is connected, the measured data shall be stored according to the interval set.

The measured data has 2 layer's folders. The first folder "ELEXXXX", XXXX as the year and month the folder was created. "ELE0801"represents that the folder was created in Jan., 2008. The second folder is "ELEXXDAY", XX represents day, "ELE23DAY"represents the folder was created on 23rd. The TXT file in the folder is "ELXXXXXX.TXT", XXXXXX as the hour, minute, seconds that the file was created. "EL053640.TXT"representsthe file was created on 5:36:40.

The stored data are hexadecimal system data, the 1st byte is the time for writing the data, and the time data is BCD code. One record has 74 bytes. The data are stored in the following sequence.

Byte	Stored Accuracy	Description
1 (BCD code)		Year
1 (BCD code)		Month
1 (BCD code)		Day
1 (BCD code)		Hour
1 (BCD code)		Minute
1 (BCD code)		Second
2	0.1V	L1 phase Voltage
2	0.1V	L2 phase Voltage
2	0.1V	L3 phase Voltage
2	0.1V	Average Phase Voltage
2	0.1V	L12 line Voltage
2	0.1V	L23 line Voltage
2	0.1V	L31line Voltage
2	0.1V	Avg. line Voltage
2	0.001A	I1 Current
2	0.001A	I2 Current
2	0.001A	I3 Current
2	0.001A	Avg. phase Current
2	1W	L1 apparent Power
2	1W	L2 apparent Power
2	1W	L3 apparent Power
2	1W	3 phase total apparent Power
2	1W	L1 active Power
2	1W	L2 active Power
2	1W	L3 active Power
2	1W	3 phase total active Power
2	1W	L1 reactive Power

2	1W	L2 reactive Power
2	1W	L3 reactive Power
2	1W	3 phase total reactive Power
2	0.1%	L1 Power factor
2	0.1%	L2 Power factor
2	0.1%	L3 Power factor
2	0.1%	3 phase Power factor
2	0.01Hz	System frequency
2	0.001A	Zero sequence Current
2	0.1%	Unbalanced Voltage ratio
2	0.1%	Unbalanced Current ratio
2		Relay alarm status
2		Remote signal status

(3) Event record data

When event occurs, enquiry of records of new Event data

The event data are recorded as 2 classified folders. The first folder is "EVEXXXX", XXXX represents the year and the month when the folder is created. "EVE0709"represents that the folder is created in September, 2007. The second folder is "EVEXXDAY", XX represents date, "HAR13DAY"represents that the folder is created on 13th, the TXT file under the folder is "EVXXXXXX.TXT", XXXXXX as the seconds and minutes when the file is created. "EV134425.TXT" represents that the file is created on 13:44:25.

Event data record, 1 record is 74 bytes. The lasted 4000 records can be read and stored by the following sequence.

(4) Harmonic record data

When harmonic module is connected, and the harmonic record function is turned on in SD card, the harmonic data are stored in the SD according to the set interval.

The harmonic data are recorded as 2 classified folders. The first folder is "HARXXXX", XXXX represents the year and the month when the folder is created. "HAR0709"represents that the folder is created in September, 2007. The second folder is "HARXXDAY", XX represents date. "HAR12DAY"represents that the folder is created on 12th. The TXT file under the folder is "HARXXXX.TXT", XXXX as the seconds and minutes when the file is created. "HAR5336.TXT" represents that the file is created in 53 min. 36 sacs.

Harmonic data record, 1 record is 62 bytes (6 byte time data; Power quality data 56 bytes). The lasted 4000 records can be read and stored by the following sequence.

Power Quality				
Record time	BCD	Year	1 byte	00~99
		Month	1 byte	1~12
		day	1 byte	1~31
		hour	1 byte	0~23
		minute	1 byte	0~59
		second	1 byte	0~59

Voltage total harmonic distortion	THD	L1 (THD—R)	0.01%	0~65535
		L2 (THD—R)		
		L3 (THD—R)		
Peak factor		L1 peak factor	0.1	0~65535
		L2 peak factor		
		L3 peak factor		
Voltage odd harmonic distortion%		L1 Voltage odd harmonic distortion %	0.01%	0~65535
		L2 Voltage odd harmonic distortion %		
		L3 Voltage odd harmonic distortion %		
Voltage even harmonic distortion %		L1 Voltage even harmonic distortion %	0.01%	0~65535
		L2 Voltage even harmonic distortion %		
		L3 Voltage even harmonic distortion %		
Current total harmonic distortion %	THD	I1 (THD—R)	0.01%	0~65535
		I2 (THD—R)		
		I3 (THD—R)		
		N Current distortion %		
K factor		I1 K factor	0.1	0~65535
		I2 K factor		
		I3 K factor		
		N phase K factor		
Current odd harmonic distortion %		I1 Current odd harmonic distortion %	0.01%	0~65535
		I2 Current odd harmonic distortion %		
		I3 Current odd harmonic distortion %		
		N Current odd harmonic distortion %		
Current even harmonic distortion %		I1 Current even harmonic distortion %	0.01%	0~65535
		I2 Current even harmonic distortion %		
		I3 Current even harmonic distortion %		
		N Current even harmonic distortion %		

(5) Energy record data

When SD card is connected, and the Energy record function is turned on in SD card, the Energy data are stored in the SD according to the set interval.

The Energy data are recorded as 2 classified folders. The first folder is "ENGXXXX", XXXX represents the year and the month when the folder is created. "ENG0709"represents that the folder is created in September, 2007. The second folder is "ENGXXDAY", XX represents date. "ENG12DAY"represents that the folder is created on 12th. The TXT file under the folder is "ENGXXXX.TXT", XXXX as the seconds and minutes when the file is created. "ENG5336.TXT" represents that the file is created in 53 min. 36 sacs.

Energy data record, 1 record is 92 bytes. The lasted 8000 records can be read and stored by the following sequence.

Byte	Stored Accuracy	Description
1 (BCD code)		Year
1 (BCD code)		Month
1 (BCD code)		Day
1 (BCD code)		Hour
1 (BCD code)		Minute
1 (BCD code)		Second
2	1W	L1 active Demand
2	1W	L2 active Demand
2	1W	L3 l active Demand
2	1W	3 Phase and total active Demand
2	1W	L1 reactive Demand
2	1W	L2 reactive Demand
2	1W	L3 reactive Demand
2	1W	3 Phase and total reactive Demand
2	999999999	Total active Energy Hi
2	MWh/Mvarh	Total active Energy Lo
2		Importing Active Energy Hi
2		Importing Active Energy Lo
2		Exporting Active Energy Hi
2		Exporting Active Energy Lo
2		Total reactive Energy Hi
2		Total reactive Energy Lo
2		Inductive reactive Energy Hi
2		Inductive reactive Energy Lo
2		Capacitive active Energy Hi
2		Capacitive active Energy Lo
2	<1MWh/Mvarh	Total active Energy decimal Hi
2	0.00000001*100000000	Total active Energy decimal Lo
2		Importing Active Energy decimal Hi
2		Importing Active Energy decimal Lo
2		Exporting Active Energy decimal Hi
2		Exporting Active Energy decimal Lo

2		Total reactive Energy decimal Hi
2		Total reactive Energy ecimal Lo
2		nductive reactive Energy decimal Hi
2		nductive reactive Energy decimal Lo
2		Capacitive active Energy decimal Hi
2		Capacitive active Energy decimal Lo
2	1.0~6500.0	PT
2	1.0~6500.0	CT
1	0: (3P3L); 1: (3P4L)	Connection method
1		(standby)
2	0.1~693.0	U scope
2	0.001~5.000	I scope
2	0~65535	No. of times Active Total Energy out of scope
2	0~65535	No. of times Importing active total Energy out of scope
2	0~65535	No. of times Exporting active total Energy out of scope
2	0~65535	No. of times reactive Energy out of scope
2	0~65535	No. of times inductive reactive Energy out of scope
2	0~65535	No. of times capacitive reactive Energy out of scope

4.3.4.2 Com. format

MODBUS RTU Protocol : **1 start byte + 8 byte data + 1 stop byte**

Modbus com. function code**:**
03H —— Read single or multiple registers.
RTU command example
03H ——Read single or multiple registers

Send:

	BYTE	**EXAMPLE**
Meter address	1	01H
Function no.	2	03H
Address (High Byte)	3	2FH
Address (Low Byte)	4	FFH
Byte (N) (High Byte)	5	00H
Byte (N) (Low Byte)	6	01H
CRC (High Byte)	7	CRC (H)
CRC (Low Byte)	8	CRC (L)

Note: No. of records received from meter 01H

Receive:

	BYTE	EXAMPLE
Meter address	1	01H
Function no.	2	03H
Bytes (2N)	3	02H
Data (High)	4	03H
Data (Low)	5	5DH
CRC (High Byte)	6	CRC (H)
CRC (Low Byte)	7	CRC (L)

Note: The no. of records retrieved from meter 01H-861 pieces.

(1) Read measurement data (Receive data, 74 byte)

ID 03 2F FE 00 01 CRC16 (enquiry of records of new measured data)

ID 03 2F FF 00 01 CRC16 (enquiry of records of measured data)

1st record

ID 03 30 00 00 25 CRC16

2nd record

ID 03 30 01 00 25 CRC16

.....

.....

The 8000th record

ID 03 4F 3F 00 25 CRC16

(2) Read harmonic data (Receive data, 62 byte)

ID 03 4F FE 00 01 CRC16 (enquiry of records of new Harmonic data)

ID 03 4F FF 00 01 CRC16 (enquiry of records of Harmonic data)

1st record

ID 03 50 00 00 1F CRC16

2nd record

ID 03 50 01 00 1F CRC16

.....

.....

The 4000th record

ID 03 5F 9F 00 1F CRC16

(3) Read event record data (Receive data, 74 byte)

ID 03 5F FE 00 01 CRC16 (enquiry of records of new Event data)

ID 03 5F FF 00 01 CRC16 (enquiry of records of Event data)

1st record

ID 03 60 00 00 25 CRC16

2nd record

ID 03 60 01 00 25 CRC16

.....

.....

The 4000th record

ID 03 6F 9F 00 25 CRC16

(4) Read Energy record data (Receive data, 92 byte)

ID 03 6F FE 00 01 CRC16 (enquiry of records of new Energy data)

ID 03 6F FF 00 01 CRC16 (enquiry of records of Energy data)

1st record

ID 03 70 00 00 2E CRC16

2nd record

ID 03 70 01 00 2E CRC16

…….

…….

The 8000th record

ID 03 8F 3F 00 2E CRC16

4.3.5 Harmonic Analysis Module Function

The user is required to set up parameters on PC when this module is installed. It can display 2nd to 63rd harmonic real time measured data, also harmonic%, phase angle data. (See meter user manual) As shown in Fig.188 and Fig. 189.

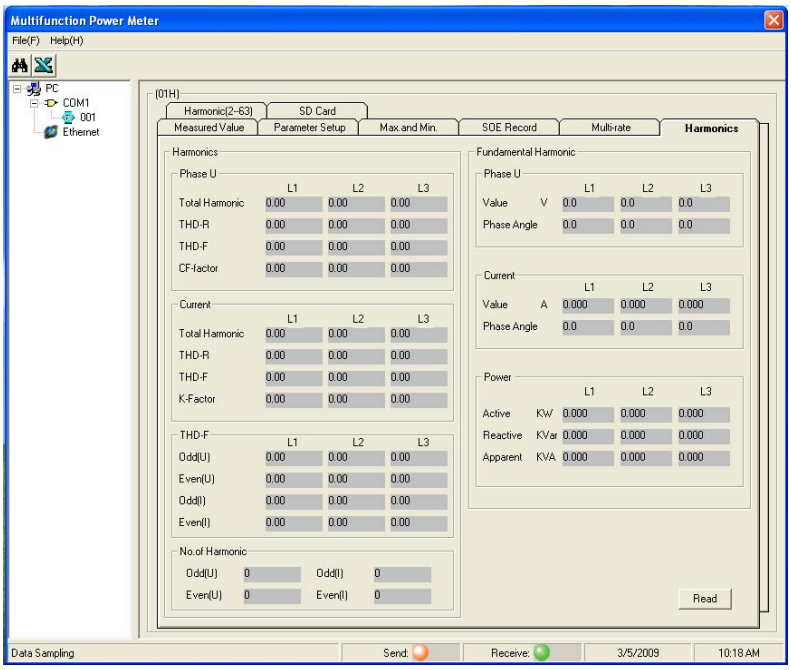


Fig. 188

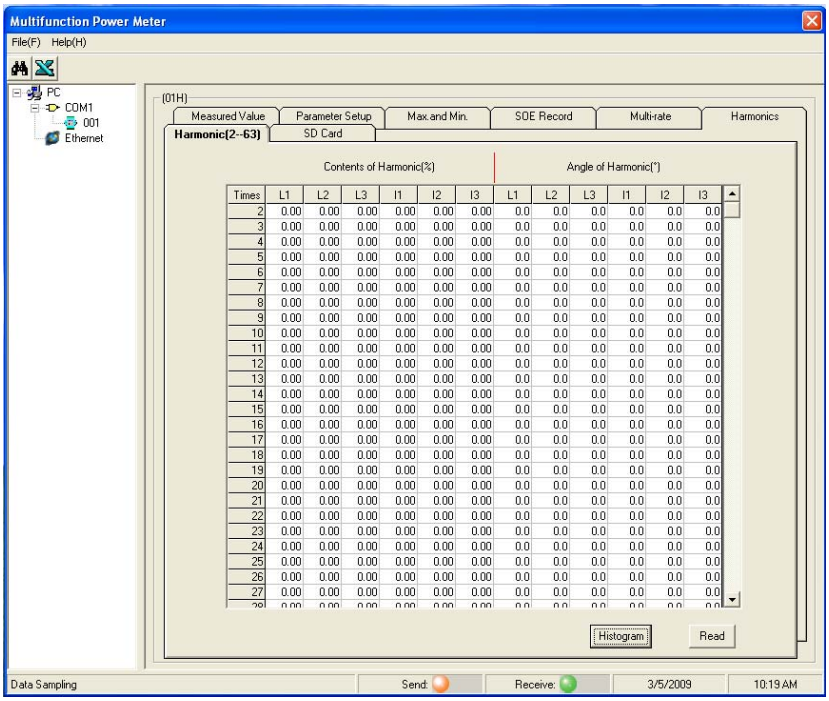


Fig. 189

4.3.6 Data Storage and Harmonic Analysis Module Function

This module combines both data storage function and harmonic analysis function. It can store the real time data and display 2nd to 63rd harmonic real time measured data, also harmonic%, Phase angle data. (See meter user manual)

4.3.7 Profibus Module Function

(1) Profibus fieldbus profile

PROFIBUS (Process Fieldbus) is an international standard of fieldbus that is applied in industrial automation and process automation. It is also a digital communication system that can be applied to fast time constrain, and high reliability communication task.

(2) Address setting

PROFIBUS can only be used as slave station. Station address can be set from 3 to 123. The user can modify the address by pressing button (In system setup mode).

(3) Baud rate

Baud rate of PROFIBUS is self-adaptive. It is not necessary to set it. Baud rate can be set from 9.6Kbps to 12Mbps.

(4) Profile

The detailed instructions of product application and brief instructions of product physical layer are described below. Please refer to relevant standards for link layer protocol.

Physical Layer:
Physical layer of Profibus-DP protocol adopts SPC3, supporting network chip of Profibus-DP, so the physical layer is compatible with link layer well.
Com. Baud Rate is self-adaptive. The scope is 9.6Kbps-12Mbps.
Com. Address: 3-126 (126 is default)
Data Com. Length (Unit: Byte): Receive: 30-98, Send: 30-98
Three modes can be selected:

Modle0: Receive: 30 Send: 50
Modle1: Receive: 30 Send: 30
Modle2: Receive: 98 Send: 98

GSD document (Device description document) includes information of model, manufacturer etc., defines com. support baud rate, the com. length of send and receive message etc.

(5) Details of application layer

1. Message Format

The application layer of Profibus-DP is similar to that of Modbus.
Variable: Each variable corresponds to one variable address. The message format of receive data is the same as send data.
Message format:

Function code	Start variable address high byte	Start variable address low byte	No. of variable	Variable value
1 byte	1 byte	1 byte	1 byte	N*2 bytes

2. Message Characteristic

Function Code
The following chart includes all function codes and their meanings and functions.

Code	Description	Function
03H	Read data register	Read one or more continuous variable value
10H	Write multiple registers	Set one or more continuous variable value

Variable Address
Address field consists of 2 characteristics (16 bit binary code), 0~65535 as decimal system, which indicates the start address of variable. For more details, the user can refer to variable address chart.

No. of variable
No. of variable indicates the quantity of variable, message read and modified from the beginning of address field. The unit of variable is character. In another word, one variable (2 bytes) corresponds to one address. The matching of address and variable no. should be in the scope of variable address. Otherwise, the user will retrieve the invalid data.

Variable
The number and meaning of no cyclical variable field are decided by message characteristic. The user can decide the data length according to his needs

3. Example

In the example, the length of receive is 30 bytes and send is 30 bytes too.

Read 03 Function code

Read 3 variables with 2 bytes, Ua, Ub, Uc. The address of Ua is 0300H, Ub 0301H, Uc 0302H.

Receive Message

Function code	Variable address high byte	Variable address low byte	No. of variable	Data1	Data2	……
03H	03H	00H	03H			

The data after Data1 is meaningless.

Send Message

Function code	Variable address high byte	Variable address low byte	No. of variable	Variable1 high byte	Variable1 low byte	Variable2 high byte
03H	03H	00H	03H	08H	98H	08H
Variable2 low byte	Variable3 high byte	Variable3 low byte				
99H	08H	97H				

The data validation from the user are decided by the no. of receive message required. i.e., there are 3 variable required to read. The send message returns as usual, but only the first 6 bytes are valid.

Preset Several Registers

The address of PT is 0101H, CT 0102H. If the user wants to modify PT to 10.0, CT to 100.0, PT will be input 0064H, CT will be input 03E8H.

Receive Message

Function code	Variable address high byte	Variable address low byte	No. of variable	Variable1 high byte	Variable1 low byte	Variable2 high byte	Variable2 low byte
10H	01H	01H	02H	00H	64H	03H	E8H

Send Message

Function code	Variable address high byte	Variable address low byte	No. of variable	Variable1 high byte	Variable1 low byte	Variable2 high byte	Variable2 low byte
10H	01H	01H	02H	00H	64H	03H	E8H

4.3.8 Ethernet Module Function

Ethernet module connects Ethernet through RJ45. You can read measurement data through remote access. The module is 10M/100M adaptable. (Default address is 192.168.0.250 and Local port 27011)

(1) As shown in Fig. 190, search the port and then choose module with 192.168.0.250.

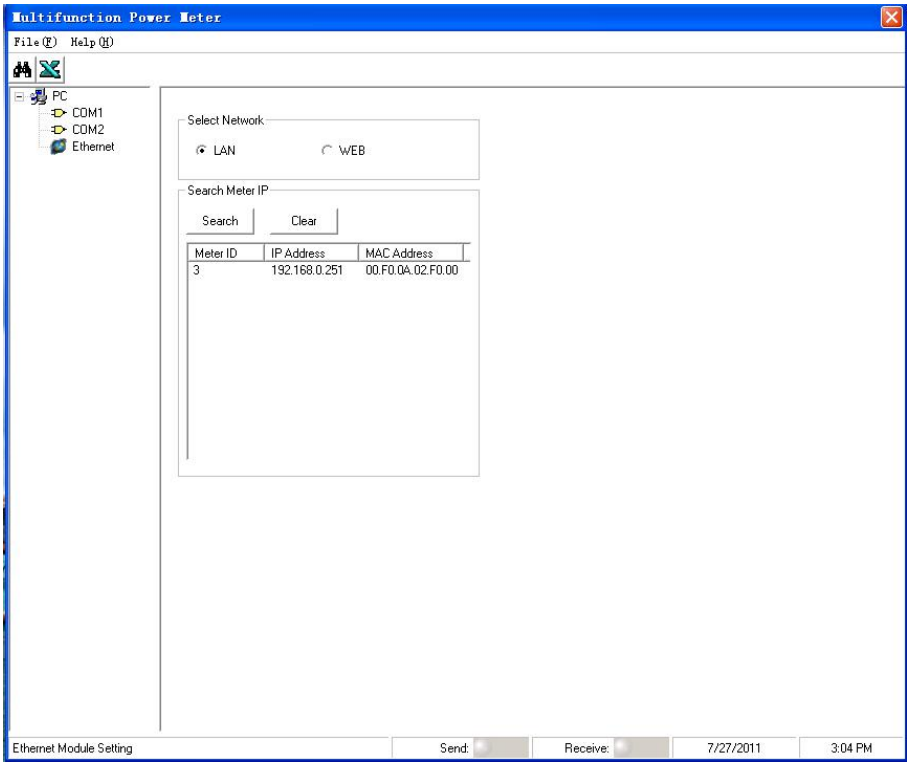


Fig. 190

(2) As shown in Fig. 191, click meter1. Modify meter address, IP address, no. of port, subnet mask and gateway etc., then click set. After the module restarts, the modification is finished.

Remark: IP Address should be legal addresses as in A, B, C classes. i.e. 0.0.0.0 and 255.255.255.255 can not be set. 192.168.0.0 and 192.168.0.255 can not be set either.

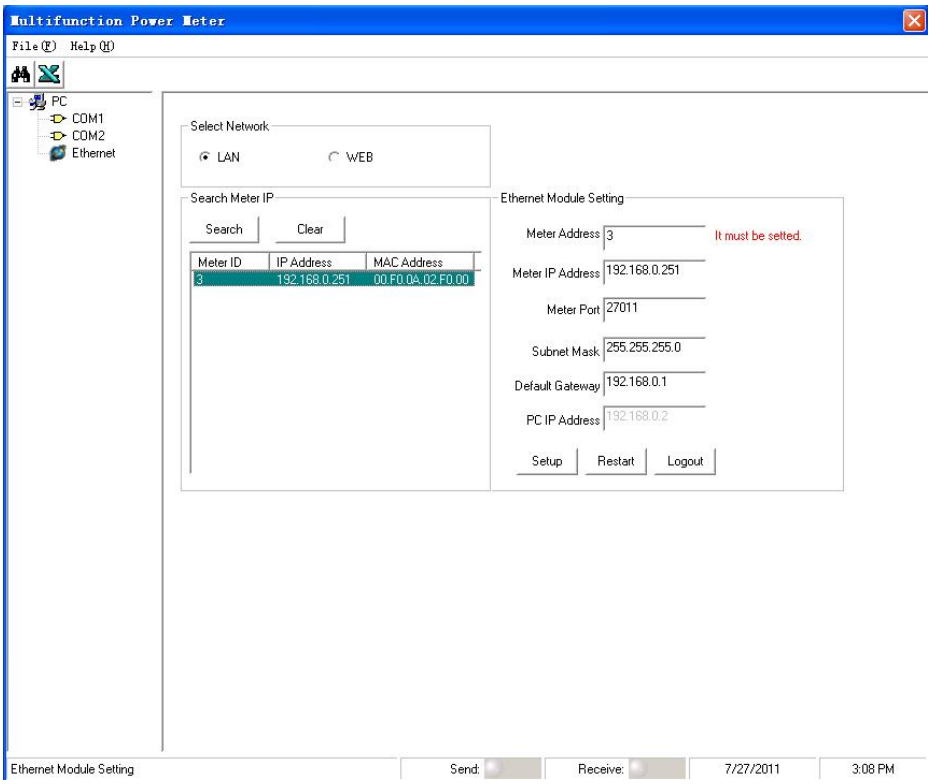


Fig. 191

(3) As shown in Fig. 192, click "File" then click "search meter address".

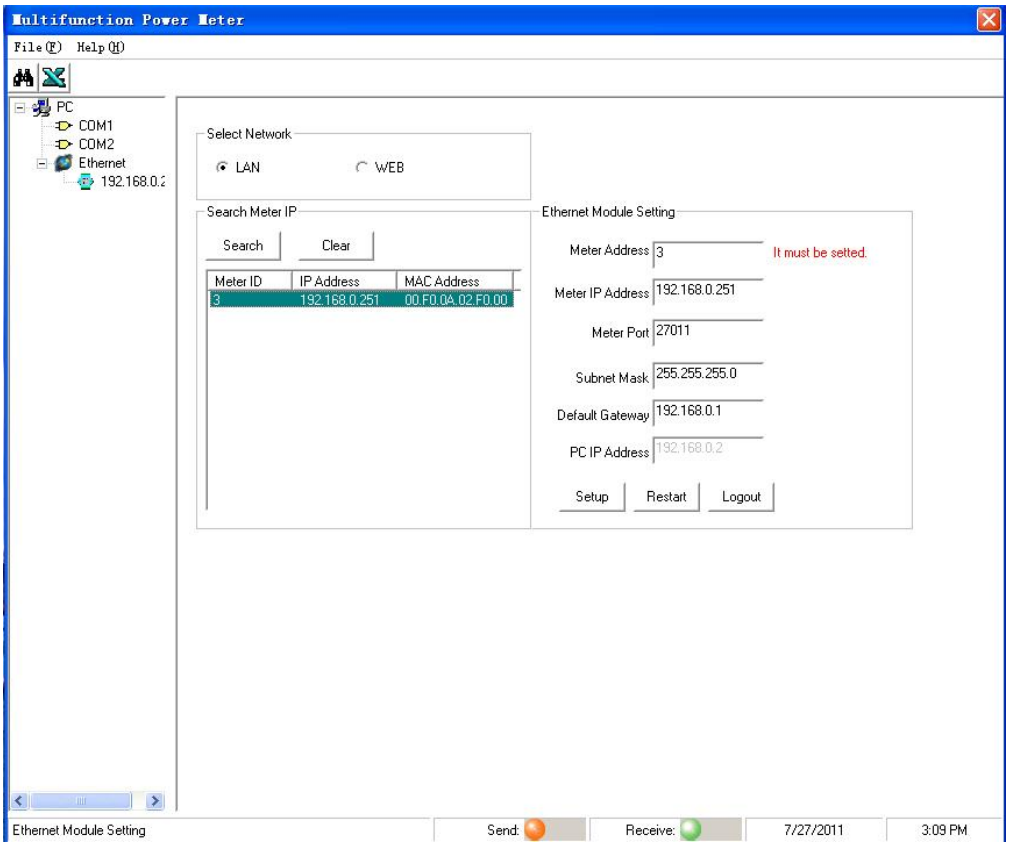


Fig. 192

(4) As shown in Fig. 193, click meter1 then go to current parameters page.

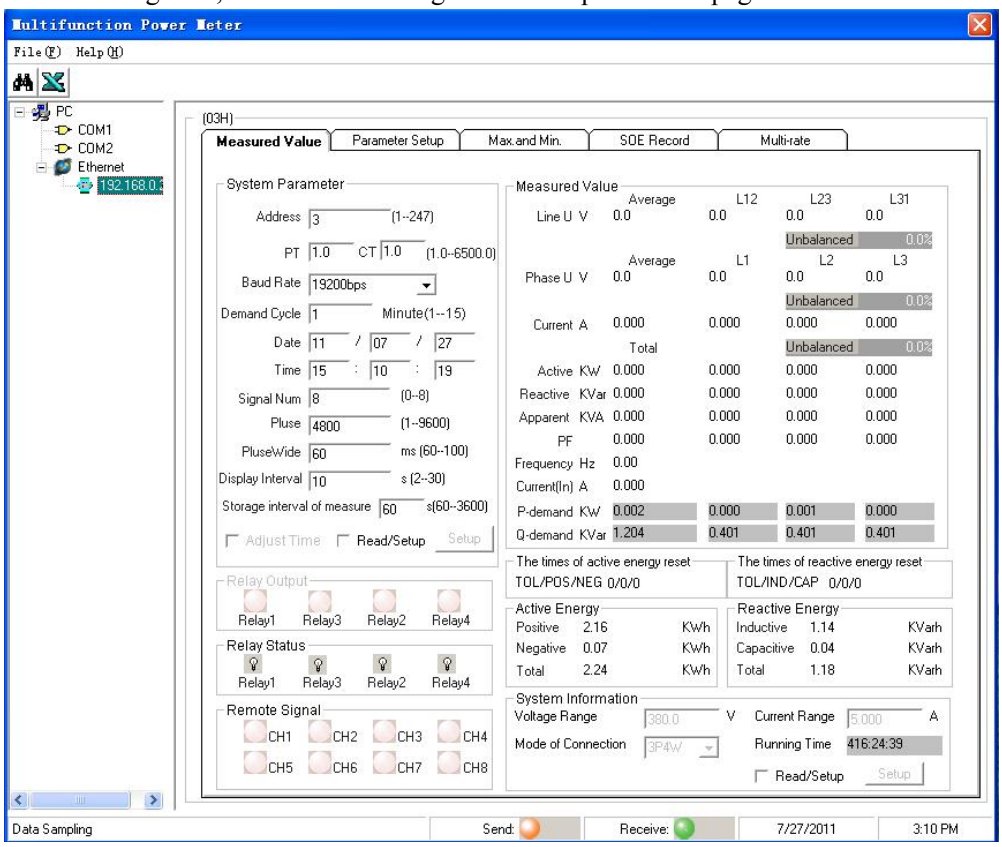


Fig. 193

4.3.9 Function of GPRS Communication Module

The user can read and setup parameters of the meter through GPRS. With GPRS communication module, some related settings of meter are required.

4.3.9.1 Operation interface

Following is the network setting

①IP Address: the address of network service;

②Network Port;

③Automatic Open Time: The open time after connecting, can be set from 1 to 255;

④Connecting interval: Can be set several slots, 12 slots Max.;

⑤APN: The name of network connector;

⑥Interval: The time of communication.

As shown in Fig. 194, the time is 9:51, 2012/04/27, setting time 9:52. After setting above parameters, choose “Read/Set” and click “Set” to save the parameters.

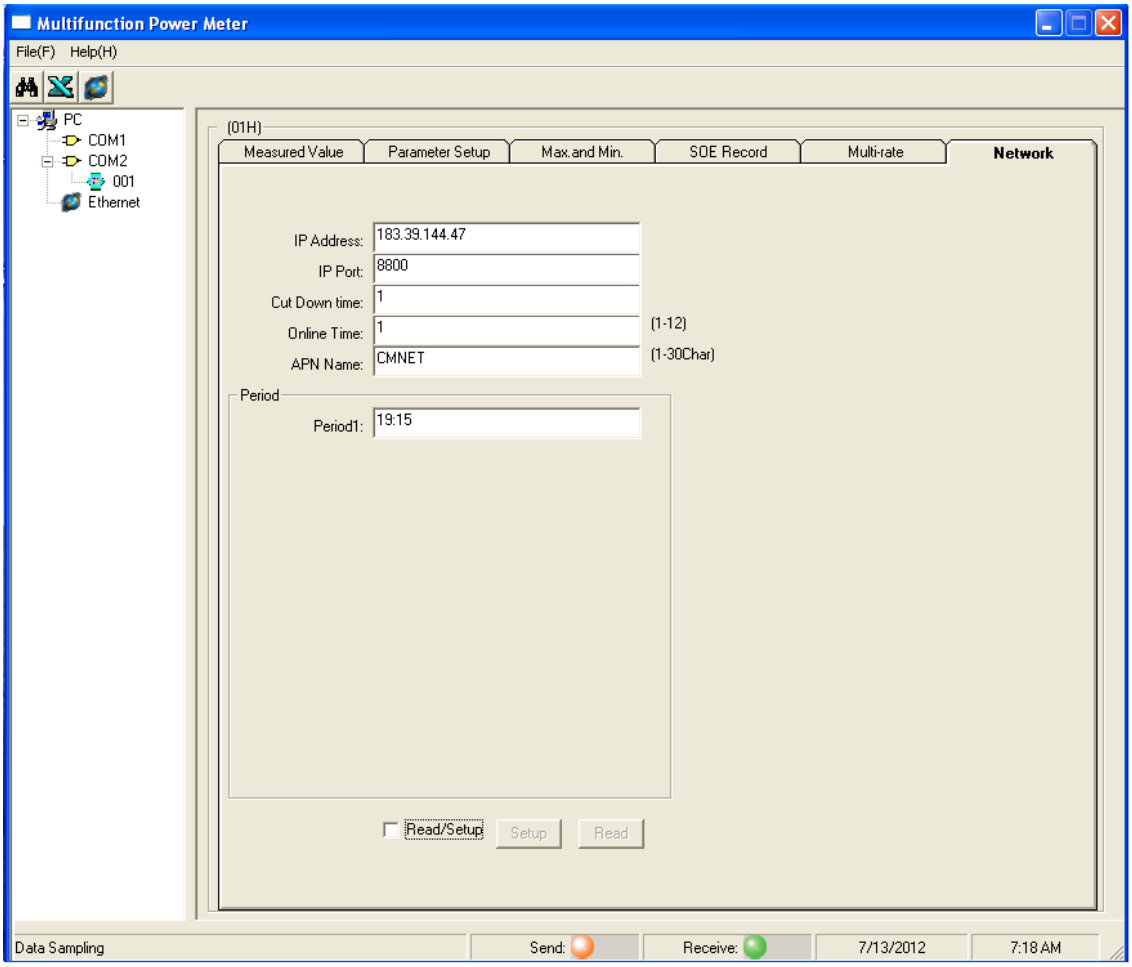


Fig. 194

Click network connecting button and click “Monitor” to connect meter and service through PC.

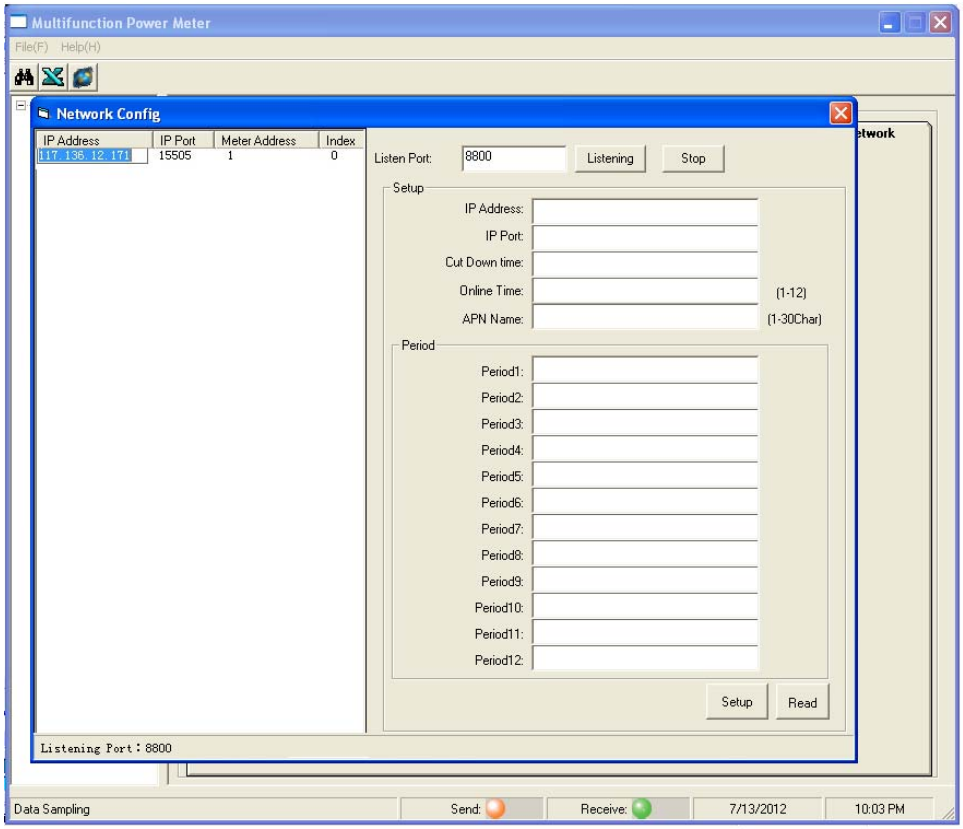


Fig. 195

When meter connects with server, select IP address, referring to Fig. 195, and click “Read” to read and set network parameters, as shown in Fig. 196.

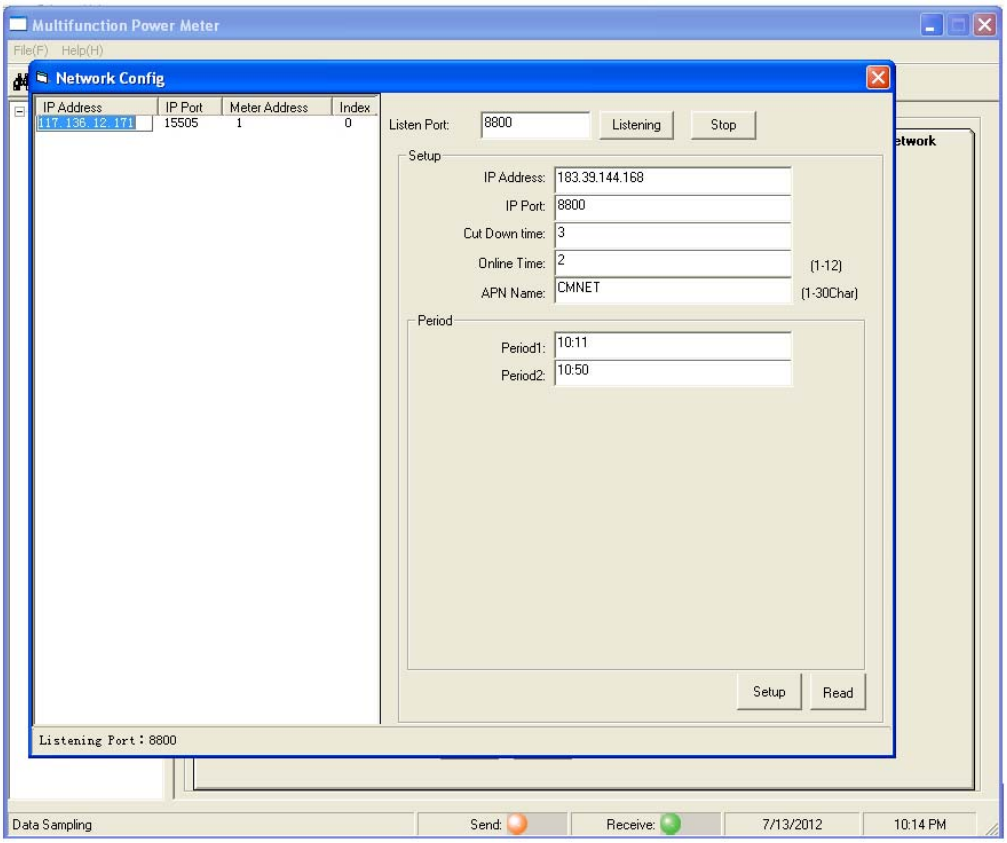


Fig. 196

4.3.9.2 Register setting

GPRS Register			
Register No.	**Type**	**Description**	**Explanation**
1D00	RW	Server IP address	Field 1 and 2 of IP address
1D01	RW	Server IP address	Field 3 and 4 of IP address
1D02	RW	Server port	0-65535
1D03	RW	Off time and connecting interval	High byte: Auto off time without connecting, 1-255 minute. Low byte: No. of TCP/IP connecting interval, 0-12. If it is set as 2, when time is the same as interval 1 and interval 2, the meter and module connect automatically.
1D04	RW	Connecting interval 1	High byte: Hour (BCD code) Low byte: Minute (BCD code)
1D05	RW	Connecting interval 2	As above
1D06	RW	Connecting interval 3	As above
1D07	RW	Connecting interval 4	As above
1D08	RW	Connecting interval 5	As above
1D09	RW	Connecting interval 6	As above
1D0A	RW	Connecting interval 7	As above
1D0B	RW	Connecting interval 8	As above
1D0C	RW	Connecting interval 9	As above
1D0D	RW	Connecting interval 10	As above
1D0E	RW	Connecting interval 11	As above
1D0F	RW	Connecting interval 12	As above