CPM-50(V2.31) MULTIFUNCTION POWER METER

■ DESCRIPTION

The CPM series Multifunction Power Meter provide high accuracy measurement, display and communication(Modbus RTU) of all electrical and power quality parameters, including harmonic measurement up to 31st THD(Total Harmonic distortion) or Individual harmonic. By using of large screen high density LCD with white backlight, the display can be easily read in the dim or under sunshine environment.

There are two digital input in standard and the option I/O module can be specify to provide extra 2 DIs, DI Auxiliary Power, 2 DOs and 2 Relay Outputs. Each I/O can be user programmed in functions such as remote monitoring switches status, output to represent energy, alarming and so on.

■ FEATURE

- Programmable to measure 1P2W、1P3W、3P3W、3P4W system and PT and CT ratio capability.
- True rms measurement with high accuracy for V/A: 0.2% and Power/Energy: 0.5%(4 quadrants)
- Low profile: DIN 96X96 with 63mm depth(with I/O module)
- A large high-contrast LCD display with white backlight allows the simultaneous reading of 5 parameters and their symbols with high visibility digits.

Electric Automation SCADA System

CPM can be used to replace all traditional electric meters. It also can be used as Remote Terminal Unit (RTU) for monitoring and controlling in a SCADA system. All the measured data is available via RS485 communication ports running the Mobus™ protocol.

Remote Power Control

The main function of CPM is measurement, but it has also got some flexible I/O functions. This made the meter can be used as distributed RTU(metering, monitoring, remote controlling in one unit).

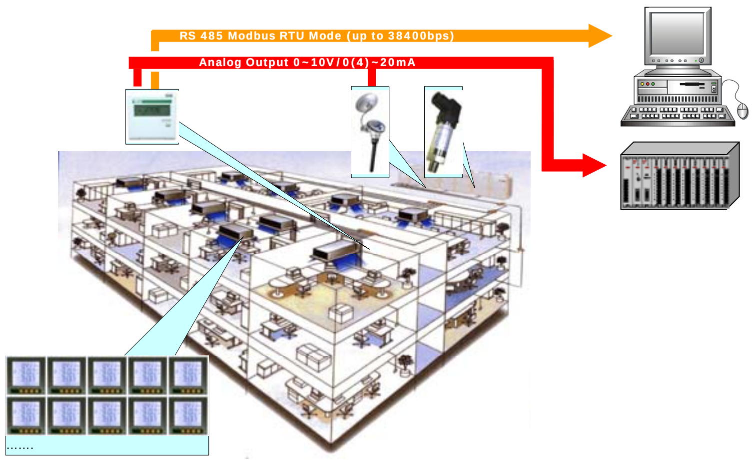
Power Quality Analysis

It can simultaneously and continuously give out the analysis results such as THD of voltage and current, harmonics up to 31st and unbalance factor of voltage and current, etc.

Energy Management

CPM can measure bi-directions four quadrants kWh and kvarh with accuracy up to 0.5%. It can provide high standard energy data and energy demand data. All these data is important for statistics for each line feeder and total.

Building automation for Mutifunction Power Meters, Temperature, Humidity and Pressure



DEFINE AND EXPLAN OF METERING OR READING

- **Voltage (U):** True RMS value of three phase voltages, three line to line voltages and their average are measured.
- **Current (I):** True RMS value of three phase currents, neutral current and their average are measured.
- **Power (P):** Three phase power and system total power are measured.
- **Reactive power (Q):** Three phase reactive power and system total reactive power are measured.
- **Apparent power (S):** Three phase apparent power and system total apparent power are measured.
- **Frequency (F):** The frequency of U1 phase voltage input is measured as system frequency.

- **Active Energy (kWh):** Active energy is time integral of active power. The unit is kWh. As power has direction, positive means consumption and negative means generating. So the energy has also the nature of consumption or generating.
  - **Import (imp):** Consumption energy
  - **Export (exp):** Generating energy
  - **Total:** Absolute sum of import and export energy.
  - **Net:** Absolute subtractions of import and export energy.
- **Reactive power:** Reactive energy is time integral of reactive power. The unit is kvarh. As reactive power has direction, positive means inductive and negative means capacitive, so the reactive energy has also got the nature of inductive and capacitive.
  - **Import (imp):** Inductive reactive energy.
  - **Export (exp):** Capacitive reactive energy.
  - **Total:** Absolute sum of import and export reactive energy.
  - **Net:** Absolute substration of import and export reactive energy. Each of the four reactive energies is measured and stored independently.
- **Demand:** Demand of active power, reactive power and apparent power. The demand statistics method in CPM-50 is sliding window. The sliding window time can be chose between 1 to 30 Minutes. The window slides one Minute each time. For example, the sliding window time is supposed to be 3 Minutes. If average power of the first Minute is 12, average power of the second Minute is 14 and average power of the third Minute is 10, then the total demand of the 3 minutes is(12+14+10)/3=12 at the end of the three Minute. If another Minute passed, the average power of the Minute is 8, then the total power demand of the last three Minutes is (14+10+8)/3=10 at the end of the fourth Minute. The function of demand only exists in CPM-52.
- **Crest factor (CF):** The crest factor is used to express the distortion of waveform. This is an important factor to scale the influence to the system insulation. The expression is as following:

$$CF = 1.414\sum_{h=1}^{50}\frac{Uh}{U1}$$

  In the expression, U1 is the RMS of fundamental and Uh is the RMS of the hth harmonic. The function of Crest factor only exists in CPM-52.
- **Total harmonic distortion:** This factor is often used to express the power quality of the electric power system. The expression is as following,

$$THD = \sqrt{\sum_{h=2}^{50}\left(\frac{Uh}{U1}\right)^2} \times 100\%$$

  In the expression, U1 is the RMS of fundamental and Uh is the RMS of the hth harmonic.
  Each harmonic rate: The percentage of each harmonic divided by fundamental.

$$HRUh = \frac{Uh}{U1} \times 100\% \qquad HRIh = \frac{Ih}{I1} \times 100\%$$

- **Total Even harmonics distortion:** Root of the sum of each even harmonics square.
- **Total Odd harmonics distortion:** Root of the sum of each odd harmonics square.
- **Telephone Interference Factor (THFF):** The interference factor to telephone communication system. The expression of the THFF is as following,

$$THFF = \sqrt{\sum_{h=1}^{100}\left(\frac{50 \times h \times Ph \times Uh}{800 \times 1000 \times U1}\right)^2} \times 100\%$$

  In the expression, the Uh is the voltage of the hth harmonic and the Ph is coefficient which is defined by CCITT committee.
  The function of the THFF exists in CPM-52.
- **K factor:** This is an important factor to scale the power quality of current.

$$K\ factor = \frac{\sum_{n=1}^{k}(n \times Fn)^2}{\sum_{n=1}^{k}(Fn)^2}$$

  In the expression, the Fn is the RMS of the nth harmonic.
- **Three phase unbalance factor:** three phase voltage unbalance factor and three phase current unbalance factor can be measured. The unbalance factor is express in percentage.

$$\text{Voltage unbalance factor} = \frac{\text{The Max different value of three voltages}}{\text{Average value of three voltages}}$$

$$\text{Current unbalance factor} = \frac{\text{The Max different value of the three currents}}{\text{Average value of three currents}}$$

- **Max/Min statistics:** The maximum and minimum value of the metering data is stored in NV-RAM and can be accessed or cleared from front panel or through communication in CPM-50. These metering data are phase voltage, line to line voltage, current, power, reactive power, apparent power, power factor, frequency, demand.
- **Real time clock:** There is a real time clock in the CPM-50. The date, month, year, hour, minute and second can be read or set from front panel or through communication.
- **Phase Angle different:** the phase angle difference gives the phase angle relationship between the voltage and current. It is from 0 to 360°. When the wiring of voltage input is set to be 2LL, it gives the phase difference U23, i1, i2

and i3relative to U12. When the wiring of voltage input is set to be 2LN and 3LN, it gives the phase difference U2, U3, i1, i2, i3 relative to U1.

- **Over limit alarming:** In CPM-50, when the metering data is over the pre-setting limit and over pre-setting time interval, the over limit alarming will be picked up. The over limit value and time will be recorded and the maximum number of records is 9. The digital output (DO) can be used as trigger to light or sound alarming. There can be maximum 9 in equations related to the over limit alarming. Any satisfaction of the in equations will trigger the over limit alarming. Any one of the 9 equations can be assigned to one of the digital output (DO). An example is given in the following to describe how the first in equation is being set and determined.

Remark: The related registers should be pre-set in order to finish the above process, and the registers are pre-set through communication.

In equation enable register: register EN_INEQU, **bit0~bit8** corresponding to 1to 9 inequation.

Bit(n)=0 forbid the nth inequation.

Bit(n)=1 enable the nth inequation.

The 9 variables (var1 to var9) can be any of the 34 parameters.

Table 3.1

Number	0	1	2	3	4	5	6	7	8
Parameter	F	V_1	V_2	V_3	V_{lnavg}	V_{12}	V_{23}	V_{31}	V_{llavg}
Number	9	10	11	12	13	14	15	16	17
Parameter	I_1	I_2	I_3	I_{avg}	I_n	P_1	P_2	P_3	P_{sum}
Number	18	19	20	21	22	23	24	25	26
Parameter	Q_1	Q_2	Q_3	Q_{sum}	S_1	S_2	S_3	S_{sum}	PF_1
Number	27	28	29	30	31	32	33	34	
Parameter	PF_2	PF_3	PF	U_{unbl}	I_{unbl}	P_d	Q_d	S_d	

Limit setting register: register Ref1 to Ref9

The setting of the Ref register should be the up limit or the low limit of the parameter. The range of the parameter limit is related to the format of the register.

Time limit setting register: register Limit_t

Limit_t is the time interval limit. It is an integer from 0 to 255. One digit is 300ms. Zero means no time limit. Trigger the record and alarming output immediately on the over limitation. All the inequations have the same time limit.

If the Limit_t=20,

the time limitation is 20x300=6000ms.

Inequation sign register: INEQU_Sign1 to INEQU_Sign9.

INEQU_Sign=0, select <, the low limit

INEQU_Sign=1, select >, the up limit

The DO select register:

Associated DO1 register bit0~bit8 correspond to the first to ninth inequation.

Bit(n)=0, DO1 do not associate with the nth inequation

Bit(n)=1, DO1 associate with the nth inequation

Associated DO2 register bit0~bit8 correspond to the first to ninth inequation.

Bit(n)=0, DO2 do not associate with the nth inequation

Bit(n)=1, DO2 associate with the nth inequation

- Example: If current I_1 goes over the high limit and time interval limit 15 Seconds, trigger the over limit alarm record and DO1 output. The CT ratio of the current I_1 is 200/5. The High limit of current I_1 is set to be 180A. The setting of the registers is as following,

Enable the inequation1: EN_INEQU register bit(0)=1

The current I_1 is number 9 in Table 3.1 The setting of the Var1 is 9.

The relation of real current and the data stored in register is,

Real current=(data in registerxCT1/5)/1000

The CT1 is 200 and high limit of current is 180A, then the data in register is 4500. The setting of the Ref1 is 4500.

Time limit is 15 Seconds and the one digit is 300ms, then the setting of Limit_t1 is 50.

As it is the high limit, the INQU_Sign1 should be 1.

Use DO1 as alarm signal output, then the bit0 of the associated DO1 should be 1.

Only recent 9 groups of the alarming record can be stored in memory of CPM-50. The format of the record is,

Address	Content	Remark
Alarming record addr.	Alarming parameter number	Refer to Table3.1
Addr +1	Alarming value	Record the value of alarming
Addr +2	Year	Alarming date
Addr +3	Month	
Addr +4	Date	
Addr +5	Hour	Alarming time
Addr +6	Minute	
Addr +7	Second	

When the alarming parameter resume normal (no longer over the limit), it is also recorded. User can get the total period of over limit time.

Remark: when the alarming parameter resume to normal, the highest bit of Varbit15 is set to be 1.

- **Energy pulse output:** The two digital outputs (DO) can be selected as energy pulse output. Any two of the 8 Active energy and Reactive energy can be assigned to be as the pulse output. The pulse width and pulse ratio can be set, while pulse width means how long the duration of the pulse is and pulse ratio means how much energy that one pulse is represented. When the energy accumulates to the setting limit, there will be a pulse output from the assigned DO port.

Pulse output assignment register: any integer from 0 to 8. The digit 0 means no assignment, while 1 to 8 corresponding to Ep_imp, Ep_exp, Eq_imp, Eq_exp, Ep_total, Ep_net, Eq_total and Eq_net respectively.
Pulse ratio register: any integer from 1 to 6000. One digit represents 0.1kwh or kvarh. This value is the minimum resolution of energy pulse output.
Pulse width setting register: any integer from 1 to 50. One digit represents 20ms.
The minimum time interval between two adjoining output pulses is 20ms. If the pulse width is 20ms, then maximum number of output pulses is 25 in one Second. If the pulse width is 80ms, then the maximum number of output pulse is 10. In practice the pulse width and the pulse ratio is selected according to system power. The relation of the two parameters should satisfied following expression,

$$\text{Pulse ratio} > \frac{(\text{pulse width} + 1) \times \text{Pmax}}{18000}$$

In the expression, the Pmax is the maximum active power or reactive power. The unit is kW or kvar. Recommend pulse ratio is 3 to 5 times the right side value of the above expression.

- **Relay output:** The two relay output (option) can be used to control electric switch or equipment. There are two output modes of the relay, latching or momentary. Momentary mode is often used to control the electric switch. The closing time interval can be selected between 50ms to 3000ms.

ORDERING INFORMATION

CPM– [Model Number] – [A Input range | V Input range] – OPTION 1 [DI | DO | RL] – OPTION 4 [AUX. POWER]

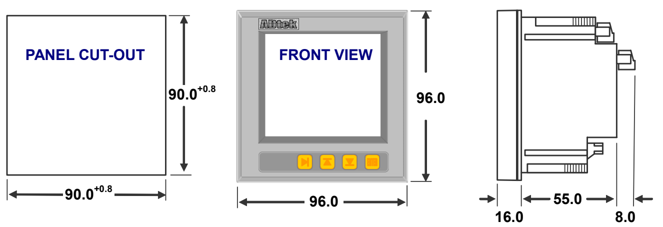
CODE	MODEL NUMBER
51	Standard
52	With individual Harmonic & Demand

CODE		INPUT RANGE
A5		0 ~ 5 A
	V5	0 ~ 500 V

CODE			DI/DO/Relay
I2	N	N	2 DI (Standard)
OPTION 1(I/O Module)			
I4	O2	R2	4 DI, 2 DO & 2R

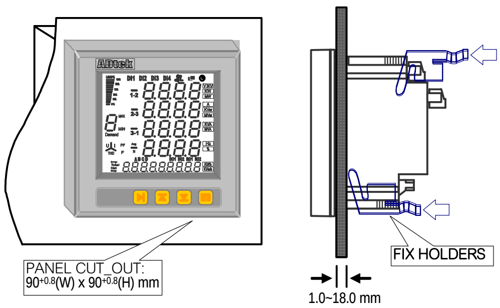
CODE	AXU. POWER
AD	AC 85~264V/ DC100~300V
OPTION 4	
D25	DC 20~56V

DIMENSIONS



Unit: mm

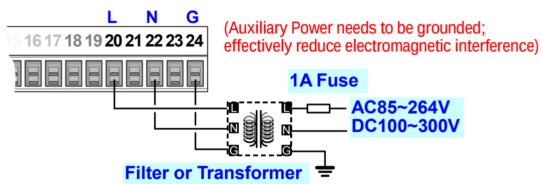
INSTALLATION



COONECTIONS

Before doing the meter wiring connection, please make sure that the power is off, and the terminals are correct for their defined. For safety of instruments and equipments, a fuse (typical 1A/250Vac) or breaker should be used in auxiliary power supply loop.

Auxiliary Power (Terminal Block 2)



Voltage & Current Input (Terminal Block 1)

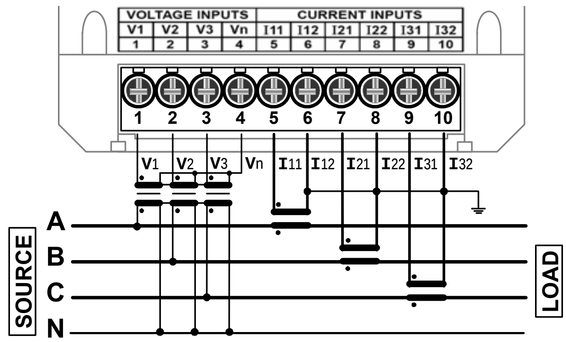
The connection has to relative the page 3 and page 4 of programming.

Voltage wiring: AWG16~12(1.3~2.0mm^2)

Current wiring: AWG15~10(1.5~2.5mm^2)

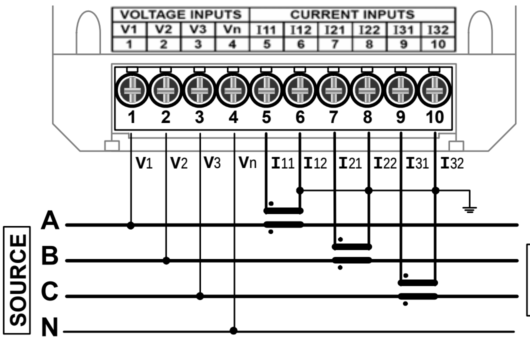
3Phase 4Wire

- 3 Phase 4 Wire with 3PT/3CT[Setting: 3LN, 3CT]



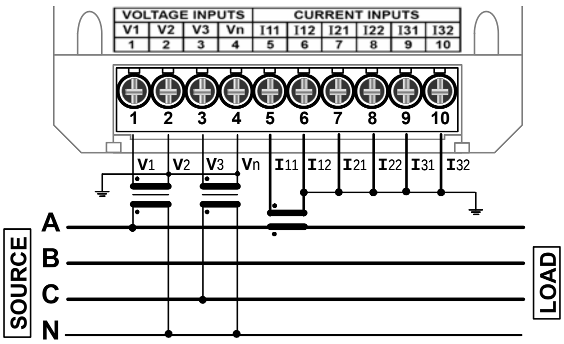
3Phase 4Wire

- 3 Phase 4 wire – direct/3CT[Setting: 3LN, 3CT]



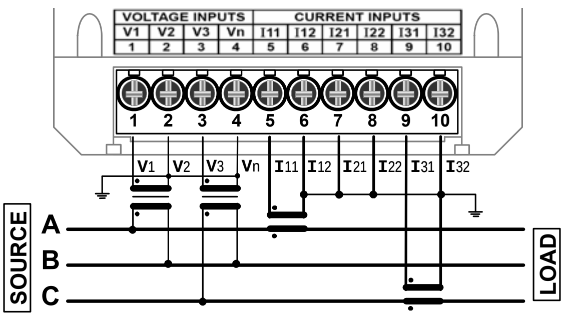
3Phase 4Wire (Balanced Load)

- 3 Phase 4 wire(Balanced) with 2PT/1CT [Setting: 2LN, 1CT]

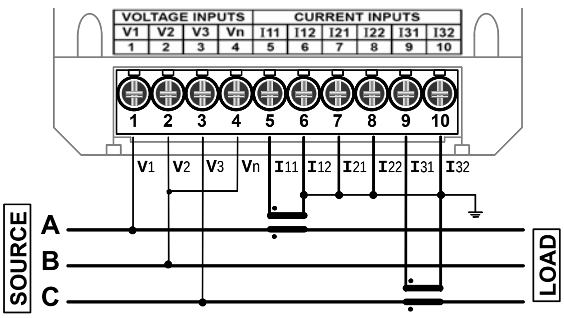


3Phase 3Wire

- 3 Phase 3 wire with 2PT/2CT[Setting: 2LL, 2CT]

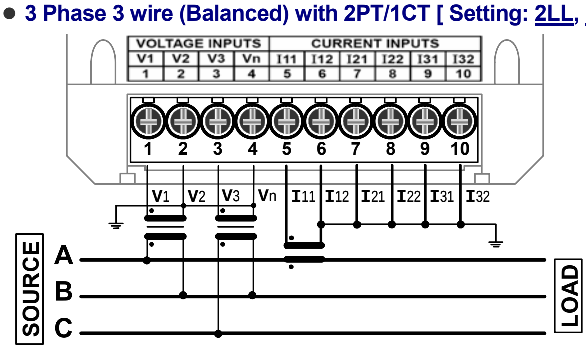


- 3 Phase 3 wire without PT /2CT[Setting: 2LL, 2CT]



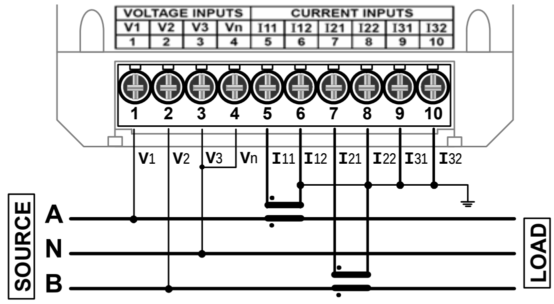
3Phase 3Wire (Balanced Load)

- 3 Phase 3 wire (Balanced) with 2PT/1CT [Setting: 2LL, 1CT]



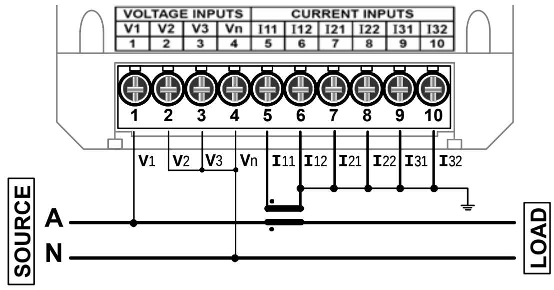
1Phase 3Wire

- 1 Phase 3 wire – [Setting 3LN, 3CT]



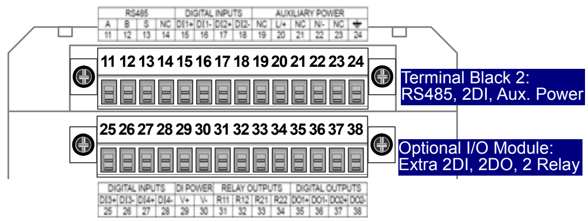
1Phase 2Wire

- 1 Phase 2 wire – [Setting 3LN, 3CT]

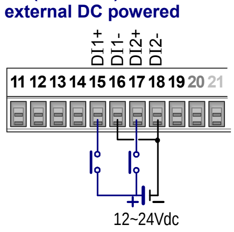


RS485 / 2DI (Terminal Block 2) and Extra 2DI / 2DO / 2Relay (Optional I/O Module)

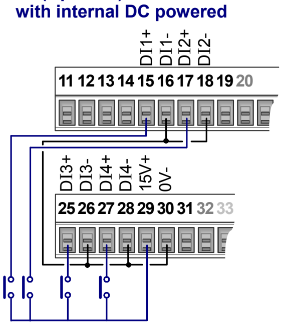
Wiring: AWG22~16(0.5~1.3mm^2)



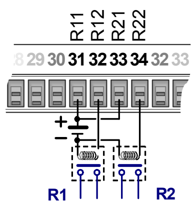
2DI(Standard) with external DC powered



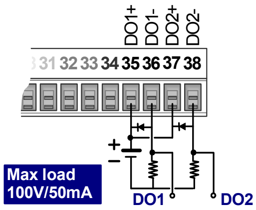
4DI(Optional) with internal DC powered



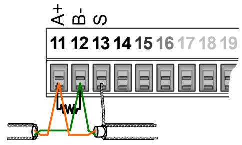
2Relay(Optional) with External Power Relay



2DO(Optional) with External Powered

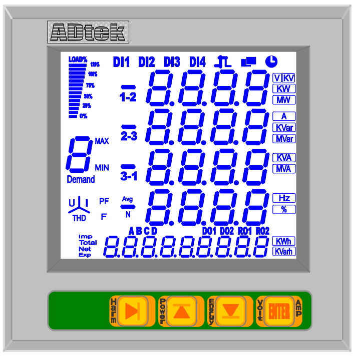


RS485 Communication Port



Max. Distance: 1200M
Terminate Resistor (at latest unit):
120~300ohm/0.25W(typical: 150ohm)

■ FRONT PANEL



CPM-50 offers a large LCD(65wX58h) with blue characters and white backlight. There are not only 5 lines for reading, but also I/O status, engineer units, description of reading indications etc. The explain are as following;

■ Metering

- 8.8.8.8 **4 lines, 4 digital:** 10.0mm high; showing Voltage, Current, Power, Power Factor, Frequency, THD, Demand, Unbalance Factor, Max, Min etc.
- 8.8.8.8.8.8.8.8.8 **1 line, 9 digital:** 6.0mm high; showing Active Energy, Re-active Energy / Import, Export, Net, Total and Real Time Clock.

■ Engineer Units

- V kV A kW MW kVar MVar kVA MVA Hz kwh kvarh %
- If the metering are over 4 digital, the relative unit will be auto-change to K(Kilo) or M(Mega).

■ I/O status indication:

- DIx **(Digital Input):** DIx will be displayed, when the DI has been input.
- ROx **(Relay Output):** ROx will be displayed, when the RO has been energized.
- ⎍ **(Pulse Output):** ⎍ will be displayed, when the DO has been set to Energy, and the Energy is accuumulating.
- ▪ **(RS 485 Communication):** There are two squares in the label. One square displayed means the CPM-50 is to be inquired from Master only and CPM-50 isn't reply. Two squares displayed mean communication was ok between CPM-50 and Master.
- DOx **(Digital Output):** DOx will be displayed, when the DO has been energized.

■ Load status

- **(The Percentage of Load) :** Showing load current to rating current percentage
- **(The Character of Load):** inductive symbol will be displayed, when the load is inductive, and capacitive symbol will be displayed, when the load is capacitive.
- **(Un-balanced):** The readings are un-balanced factor of voltage, when the symbol was displayed with U. The readings are un-balanced factor of current, when the symbol was displayed with I.

■ Symbols for metering and reading

8 **1 character:** 10.0mm high；The one 7 segments character is a description for metering of 4 lines as following;
U: Voltage； I: Current； P: Active Power；
q: Re-active Power； S: Apparent Power

- PF **(Power Factor):** The symbol is power factor to descript for metering of fourth line.
- F **(Frequency):** The symbol is Frequency of system to descript for metering of fourth line.
- 1-2 2-3 3-1 **(Line to Line):** The symbols are descriptions the metering is line to line.
- 1 2 3 **(Phase):** The symbols are descriptions the metering is Phase to Neutral.
- N **(Neutral):** The symbol with I is the Current of neutral to descript for metering of fourth line.
- Avg (Average)**:** The symbol is average to descript for meterings
- MAX MIN **(Maximum / Minimum):** The symbol is maximum or minimum to descript for meterings

■ Symbol for Power Quality

- Demand **(Demand):** The symbol is demand to descript for meterings
- THD **(Total Harmonic Distortion):** The symbol with U is Voltage Total Harmonic Distortion. The symbol with I is Current Total Harmonic Distortion.

■ OPERATION: Please refer to the define and explain for parameters before programming.

DESCRIPTION OF KEY — **Quick View Function:** There are 5 parameters showing in each page. Pressing 4 front keys to quick view parameters:

Key	Metering Page	Programming Page	REMARK
Enter key	Quick View for Voltage & Current Pages	Acknowledgment and going to the next setting page	
Down key	Quick View for Energy and Clock Pages	Decreasing the number (9, 8,..,0,9,…)	
Up key	Quick View for Power Pages	Increasing the number (0, 1,..,9,0,…)	
Shift key	Quick View for Power Quality Pages	to move cursor(the setting position)	
Up key + Enter key	Get into the Statistics pages		
Shift key + Enter key	Get into the meter parameter setting mode	Abort the setting and Exit in the page	

QUICK VIEW FOR METERING AND READING:

The pages are purpose for description only, and not real system.

USER LEVEL(Quick view parameters)

Quick View for Voltage & Current Pages, Press Enter key

In any page

Press Key ⬇ — **To show Voltage & Current Pages**

First Page: **Voltage(phase) Page**

Line 1: U_1=220.4 V

Line 2: U_2=220.8 V

Line 3: U_3=220.7 V

Line 4: U_{avg}=220.6 V

U_{lnavg}= $(U_1+U_2+U_3)/3$

Line 5: Active Energy: 141.4 kwh

Imp: Import of energy

kwh: Engineer Unit of Active energy

LOAD%: 40%, The percentage of the rated current.

When the meter is set to "2LL(3P 3W)", there is no phase voltage.

Press Key ⬇

Second Page: **Current(phase) Page**

Line 1: I_1=233.3 A

Line 2: I_2=233.3 A

Line 3: I_3=233.3 A

Line 4: I_N=698.8 A

Line 5: Active Energy: 141.7 kwh

Imp: Import of energy

kwh: Engineer unit of Active energy

LOAD%: 40%, The percentage of the rated current.

When the meter is set to "2LL(3P 3W)", there is neutral current screen.

Press Key ⬇

Third Page: **Voltage(line to line) Page**

Line 1: $U_{1\text{-}2}$=0.0 V

Line 2: $U_{2\text{-}3}$=0.0 V

Line 3: $U_{3\text{-}1}$=0.0 V

Line 4: U_{avg}=0.0 V

U_{avg}= $(U_{1\text{-}2}+U_{2\text{-}3}+U_{3\text{-}1})/3$

Press Key ⬇ — **Next Page**

Fourth Page: **Current(phase) Page**
Line 1: I_1=232.2 A
Line 2: I_2=232.3 A
Line 3: I_3=232.3 A
Line 4: I_{avg}=232.2 A
I_{avg}= (I_1+I_2+I_3)/3
Line 5: Active Energy: 142.3 kwh
Imp: Import of energy
kwh: Engineer of Active energy
LOAD%: 40%, The percentage of the rated current.
⊣⊢ : Capacitive load

Press Key ⬇ | **Go back to first page**

■ **Quick View for Energy and Clock Pages, press Down key**

In any page

Press Key ⬇ | **To show Energy Pages**

First Page: **Active Energy(Import) Page**
Line 5: Active Energy: 438.6 kwh
Imp: Import of energy
kwh: Engineer Unit of Active energy

There is not phase power to be display when the wiring of voltage setting is 2LL.

Press Key ⬇

Second Page: **Active Energy(Export) Page**
Line 5: Active Energy: 130.5 kwh
Exp: Export of energy
kwh: Engineer Unit of Active Energy

Press Key ⬇ | **Next Page**

Third Page: **Active Energy(Total of Import and Export) Page**

Line 5: Active Energy: 569.7 kwh

Total: Absolute sum of Import and Export of energy

kwh: Engineer Unit of Active Energy

Net= I Import I + I Export I

Press Key ⬇

Fourth Page: **Active Energy(Net of Import and Export) Page**

Line 5: Active Energy: 309.1 kwh

Net: Absolute subtration of Import and Export of energy

kwh: Engineer Unit of Active Energy

Net= I Import I - I Export I

Press Key ⬇

Fifth Page: **Inductive Energy(Import) Page**

Line 5: Inductive Energy: 91.5 kvarh

Imp: Inductive of reactive energy

kvarh: Engineer Unit of Inductive Energy

Press Key ⬇

Sixth Page: **Capacitive Energy(Export) Page**

Line 5: Capacitor Energy: 2.3 kvarh

Exp: Capacitive of reactive energy

kvarh: Engineer Unit of Capacitive Energy

Press Key ⬇

Next Page

	**Seventh Page:** **Reactive Energy(<u>Total of Inductive and Capacitive</u>) Page** **Line 5: Reactive Energy: 93.8 kvarh** **Total:** Absolute sum of Ind. and Cap. of reactive energy **kvarh:** Engineer Unit of Reactive Energy	**Total = I Ind. Energy I + I Cap. Energy I**
Press Key ⬇		
	**Eighth Page:** **Reactive Energy(<u>Net of Inductive and Capacitive</u>) Page** **Line 5: Reactive Energy: 89.7 kvarh** **Net:** Absolute subtration of Ind. and Cap. of reactive energy **kvarh:** Engineer Unit of Reactive Energy	**Net = I Ind. Energy I - I Cap. Energy I**
Press Key ⬇		
	**Ninth Page:** Date Page **Line 5: Date: 06(M):08(D):2007(Y)**	**The Date function is optional for CPM-52, so CPM-51 do not has this page to show.**
Press Key ⬇		
	**Tenth Page:** Clock Page **Line 5: Clock: 15(h):21(m):45(s)**	**The Clock function is optional for CPM-52, so CPM-51 do not has this page to show.**
Press Key ⬇	**Go back to first page**	

Quick View for Power Pages, press Up key

In any page		
Press Key ⬇	**To show Power Pages**	
	**First Page: Active Power Page** **Line 1: P_1=49.50 kW** **Line 2: P_2=49.65 kW** **Line 3: P_3=49.61 kW** **Line 4: P_{sum}=148.7kW** **$P_{sum} = P_1 + P_2 + P_3$** **Line 5: Active Energy: 130.5 kwh** **Exp:** Export of energy **kwh:** Engineer Unit of Active energy **LOAD%: 40%,** The percentage of the rated current. **⊣⊢ :** Capacitive load	**There is not phase power to be display when the wiring of voltage setting is 2LL.**
Press Key ⬇		
	**Second Page: Reactive Power Page** **Line 1: Q_1=0.232 kvar** **Line 2: Q_2=0.257 kvar** **Line 3: Q_3=0.265 kvar** **Line 4: Q_{sum}=0.755 kvar** **$Q_{sum} = Q_1 + Q_2 + Q_3$** **Line 5: Active Energy: 130.5 kwh** **Exp:** Export of energy **kwh:** Engineer Unit of Active energy **LOAD%: 40%,** The percentage of the rated current. **:** Inductive load	
Press Key ⬇		
	**Third Page: Apparent Power Page** **Line 1: S_1=49.01 kVA** **Line 2: S_2=49.12 kVA** **Line 3: S_3=49.11 kVA** **Line 4: S_{sum}=147.2 kVA** **$S_{sum} = S_1 + S_2 + S_3$** **Line 5: Active Energy: 130.5 kwh** **Exp:** Export of energy **kwh:** Engineer Unit of Active energy **LOAD%: 40%,** The percentage of the rated current.	
Press Key ⬇	**Next Page**	

Fourth Page: **Power Factor Page**

Line 1: PF_1=0.989

Line 2: PF_2=0.990

Line 3: PF_3=0.988

Line 4: PF=0.989

$PF = (PF_1 + PF_2 + PF_3)/3$

Line 5: Active Energy: 130.5 kwh

Exp: Export of energy

kwh: Engineer Unit of Active energy

LOAD%: 40%, The percentage of the rated current.

Press Key ⬇

Fifth Page: **Total Power & PF Page**

Line 1: P_{sum}=146.0 kW

Line 2: Q_{sum}=0.000 kvar

Line 3: S_{sum}=146.0 kVA

Line 4: PF=1.000

Line 5: Active Energy: 130.5 kwh

Exp: Export of energy

kwh: Engineer Unit of Active energy

LOAD%: 40%, The percentage of the rated current.

Press Key ⬇

Sixth Page: **Total Power & Freq. Page**

Line 1: P_{sum}=145.1 kW

Line 2: Q_{sum}=0.761 kvar

Line 3: S_{sum}=147.0 kVA

Line 4: Frequency=50.03 Hz

Line 5: Active Energy: 130.5 kwh

Exp: Export of energy

kwh: Engineer Unit of Active energy

LOAD%: 40%, The percentage of the rated current.

Press Key ⬇

Seventh Page: **Power Demand Page**

Line 1: P_{md}=145.1 kW

Line 2: Q_{md}=0.761 kvar

Line 3: S_{md}=147.0 kVA

Line 4: F=50.03 Hz

Line 5: Active Energy: 130.5 kwh

Exp: Export of energy

kwh: Engineer Unit of Active energy

LOAD%: 40%, The percentage of the rated current.

The Demand function is optional for CPM-52, so CPM-51 do not has this page to show.

Go back to first page

■ Quick View for Power Quality Pages, press Shift key

In any page

Press Key ⬇	To show Power Quality Pages	
	**First Page:** THD of Voltage Page For 3P4W Line 1: $U_1(THD_{V1})$=2.88% Line 2: $U_2(THD_{V2})$=2.92% Line 3: $U_3(THD_{V3})$=2.91% Line 4: $U_{avg}(THD_{Vavg})$=2.90% $THD_{Vavg} = (U_1(THD_{V1}) + U_2(THD_{V2}) + U_3(THD_{V3}))/3$	There is not phase THD to be show when the wiring of voltage setting is 2LL.
Press Key ⬇		
	**Second Page:** THD of Current Page For 3P4W Line 1: $I_1(THD_{I1})$=3.08% Line 2: $I_2(THD_{I2})$=3.12% Line 3: $I_3(THD_{I3})$=3.13% Line 4: $I_{avg}(THD_{Iavg})$=3.11% $THD_{Iavg} = (I_1(THD_{I1}) + I_2(THD_{I2}) + I_3(THD_{I3}))/3$	There is not phase THD to be show when the wiring of voltage setting is 2LL.
Press Key ⬇		
	**Third Page:** Un-balanced of Voltage and Current Page Un-balanced of Voltage: 0.0% Un-balanced of Current: 0.0%	
Press Key ⬇	Go back to first page	

OPTIONAL FUNCTION FOR CPM-52,
Quick View for Statistic Pages, press Up key + Enter key

In any page	
Up key + Enter key ⬇	To show Statistic Pages

First Page: Maximum of Voltage (Phase)

Line 1: $U_1(V_{1\_max})$=220.4 V

Line 2: $U_2(V_{2\_max})$=220.2 V

Line 3: $U_3(V_{3\_max})$=220.2 V

Up key ➡

Up key ⬅

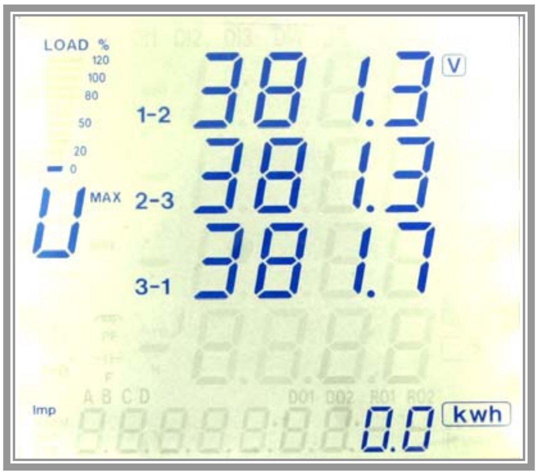
First Page: Minimum of Voltage (Phase)

Line 1: $U_1(V_{1\_min})$= 0.0 V

Line 2: $U_2(V_{2\_min})$= 0.0 V

Line 3: $U_3(V_{3\_min})$= 0.0 V

Enter key ⬇



Second Page: Maximum of Voltage(line to line)

Line 1: $U_{12}(V_{12\_max})$= 381.3 V

Line 2: $U_{23}(V_{23\_max})$= 381.3 V

Line 3: $U_{31}(V_{31\_max})$= 381.7 V

Up key ➡

Up key ⬅

Second Page: Minimum of Voltage (line to line)

Line 1: $U_{12}(V_{12\_min})$= 0.0 V

Line 2: $U_{23}(V_{23\_min})$= 0.0 V

Line 3: $U_{31}(V_{31\_min})$= 0.0 V

Enter key ⬇ | **Next Page**

Up key →

Up key ←

Third Page: **Maximum of Current (Phase)**

Line 1: $I_1(I_{1\_max})$= 5.002 A

Line 2: $I_2(I_{2\_max})$= 5.003 A

Line 3: $I_3(I_{3\_max})$= 5.003 A

Third Page: **Minimum of Current (Phase)**

Line 1: $I_1(I_{1\_min})$= 0.0 A

Line 2: $I_2(I_{2\_min})$= 0.0 A

Line 3: $I_3(I_{3\_min})$= 0.0 A

Enter key ↓

Up key →

Up key ←

Fourth Page: **Maximum of Total Power and Power Factor**

Line 1: P(P_{max})= 3.304 kW

Line 2: Q(Q_{max})= 0.017 kvar

Line 3: S(S_{max})= 3.304 kVA

Line 4: PF(PF_{max})= 1.000

Fourth Page: **Minimum of Total Power and Power Factor**

Line 1: P(P_{min})= 0.000 kW

Line 2: Q(Q_{min})= -0.001 kvar

Line 3: S(S_{min})= 0.000 kVA

Line 4: PF(PF_{min})= 0.000

Enter key ↓

Next Page

Up key →

Up key ←

Fifth Page: Maximum of Demand and Frequency

Line 1: P(P_{max_d})= 0.162 kW

Line 2: Q(Q_{max_d})= 0.000 kvar

Line 3: S(S_{max_d})= 0.162 kVA

Line 4: F(F_{max})= 60.20 Hz

Fifth Page: Minimum of Demand and Frequency

Line 1: P(P_{min_d})= 0.000 kW

Line 2: Q(Q_{min_d})= 0.000 kvar

Line 3: S(S_{min_d})= 0.000 kVA

Line 4: F(F_{min_d})= 0.00 Hz

Enter key ↓	Go back to first page

PROGRAMMING:

ENGINEER LEVEL(Programming)

In any page	Press Shift key + Enter key to get into the Engineer Level and go back Metering Page

PASS(Pass word): Pass word needed for going into the programming pages.

Range: 0000 to 9999.

Default: 0000

- After key in the right pass word, press **Enter key** to go to the first page of programming, otherwise go back to the metering display page.

Press Key ↓	Next Page

Press Key ↓

Page 01

Add(Address): Address of device number for RS485 Modbus

Range: 001 to 247

Default: 001

Operating: Shift key, Up key, Down key

- Each meter on same RS485 net should have different address according to the Modbus-RTU protocol.

Press Key ↓

Page 02

bPS(bits per second): Baud rate for RS485 Modbus

Selectable: 600, 1200, 2400, 4800, 9600, 19200, 38400

Default: 19200

Operating: Up key, Down key

- **CPM-50 series offer data format as following: 8 data bit, no parity, 1 start bit and1 stop bit.**

Press Key ↓

Page 03

WIrE-U(Wire Voltage): System wiring for voltage input

Selectable:

3Ln(1P2W, 1P3W, 3P4W) /
2LL(3P3W) /
2Ln(3P4W balanced)

Default: 3Ln

Operating: Up key, Down key

Press Key ↓

Page 04

WIrE-I(Wire Current): System wiring for Current input

Selectable:

3ct(1P2W, 1P3W, 3P4W) /
2ct(3P3W) /
1ct(3P3W balanced, 3P4W balanced)

Default: 3ct

Operating: Up key, Down key

Next Page

Press Key ↓

Page 05
Pt1: Primary of PT
Range: 100 ~ 500,000 V
Default: 400
Operating: Shift key, Up key, Down key

Press Key ↓

Page 06
Pt2: Secondary of PT
Range: 100 ~ 400 V
Default: 400
Operating: Shift key, Up key, Down key

Press Key ↓

Page 07
Ct1: Primary of CT
Range: 5 ~ 10000 A
Default: 5
Operating: Shift key, Up key, Down key

Press Key ↓

Page 08
do tYPE(DO type): The digital output mode can be set as alarm or pulse output.
Selectable: PLS(Pulse) / **AL**(Alarm)
Default: PLS
Operating: Up key, Down key

Digital outputs (DO) are optional function in I/O module. Please specify the optional code in ordering.

Next Page

Page 09

do1 PULS SLct(DO1 Pulse selection): Selection the pulse output to relative which type of energy.

Selectable: **0**(No output) /
1(Active Energy_Imp) /
2(Active Energy_Exp) /
3(Reactive Energy_Imp) /
4(Reactive Energy_Exp) /
5(Active Energy_Total) /
6(Active Energy_Net) /
7(Reactive Energy_Total) /
8(Reactive Energy_Net)

Default: 0(None)

Operating: Up key, Down key

Press Key ↓

Page 10

Do2 PULS SLct(DO2 Pulse selection): Selection the pulse output to relative which type of energy.

Selectable: **0**(No output) /
1(Active Energy_Imp) /
2(Active Energy_Exp) /
3(Reactive Energy_Imp) /
4(Reactive Energy_Exp) /
5(Active Energy_Total) /
6(Active Energy_Net) /
7(Reactive Energy_Total) /
8(Reactive Energy_Net)

Default: 0(None)

Operating: Up key, Down key

Press Key ↓

Page 11

PULS WId: Width of pulse

Range: 1 ~ 50(x 20ms)

Default: 01

- The pulse width is integer from 1 to 50. One digit is 20ms.

Operating: Shift key, Up key, Down key

Press Key ↓

Next Page

Page 12
PULS-con: Pulse Count)
Range: 1 ~ 6000 (x 0.1K)
Default: 0001

- Pulse Count means the energy value per pulse.

Operating: Shift key, Up key, Down key

Press Key ↓

Page 13
ro1 tYPE: Energized Mode of Relay1. There are two relay outputs in option.
Selectable: 0(ON) / **1**(Momentary)
Default: 1

- ON mode: the relay can be used to output two statues on or off.
- For the momentary mode, the output of the relay changes from off to on for a period of time(Ton) and than goes off. Ton can be setting from 50-300ms in next page.

Operating: Up key, Down key

Relay outputs are optional function in I/O module. Please specify the optional code in ordering.

Press Key ↓

If the ro1 tYPE set to be Momentary, this page will be appearing.

Page 14
ro1-con: Close Time Ton of Relay 1
Range: 50 ~3000ms
Default: 200
Operating: Shift key, Up key, Down key

Press Key ↓

Page 15
ro2 tYPE: Energized Mode of Relay2. There are two relay outputs in option.
Selectable: 0(ON) / **1**(Momentary)
Default: 1
Operating: Up key, Down key

Relay outputs are optional function in I/O module. Please specify the optional code in ordering.

Press Key ↓

Next Page

If the ro2 tYPE set to be Momentary, this page will be appearing.

Page 16

ro2-con: Close Time Ton of Relay 2
Range: 50 ~3000ms
Default: 200
Operating: Shift key, Up key, Down key

Press Key ↓

Page 17

bLt cont(The period of back light on): The backlight will go to “off ” for the purpose of energy saving and component duration if the key does not be touched for a period time.
Range: **0**(Always on) ~ 120 Minutes
Default: 001
Operating: Shift key, Up key, Down key

Press Key ↓

Page 18

SLId tIME(Sliding window Time of Demand): The window slid once per Minute.
Range: 1 ~ 30 Minutes
Default: 15
Operating: Shift key, Up key, Down key

The relative functions of Demand is only for model CPM-52.

Press Key ↓

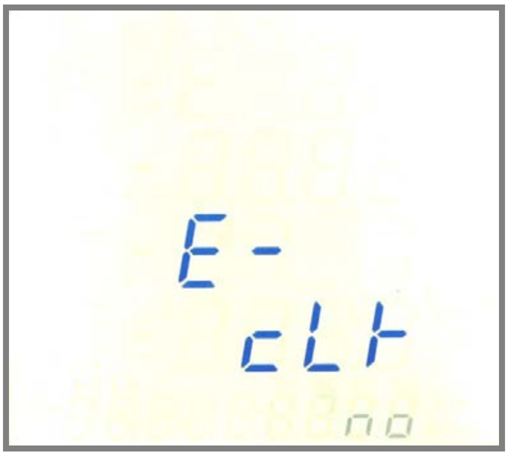
Page 19

StAt CLr(Clear the maximum and minimum storages): The Max and Min statistics value can be cleared by the front keys. Clear means to reset old value and begin records new Max and Min statistics value.
Selection: **YES** / **no**
Operating: Up key, Down key

The relative functions of Demand is only for model CPM-52.

Press Key ↓

Next Page



E- CLr(Clear energy values): Clear the Energy accumulated value
Selection: **YES** / **no**
Operating: Up key, Down key

Press Key ↓

Page 20
DAtE(Date): System date setting. Display format is MM.DD.YYYY
Range: 01.01.2000 ~ 12.31.2099
Operating: Shift key, Up key, Down key

Press Key ↓

Page 21
tIME(Time): System time setting. Display format is hh:mm:ss
Range: 00:00:00 ~ 23:59:59
Operating: Shift key, Up key, Down key

Press Key ↓

Page 22
PASS(Pass word): The Pass word can be changed in this page. It is important to remember the pass word so that getting into the engineer level in next time.
Range: 0000 ~ 9999
Default: 0000
Operating: Shift key, Up key, Down key

Press Key ↓ **Go back to first page**

RS485(ModBus RTU Mode)

■ Protocol of ModBus RTU Mode

The Modbus RTU protocol is used for communication in CPM. The data format and error check method is defined in Modbus protocol. The half duplex query and respond mode is adopted in Modbus protocol. There is only one master device in the communication net. The others are slave devices, waiting for the query of the master.

Transmission mode The mode of transmission defines the data structure within a frame and the rules used to transmit data. The mode is defined in the following which is compatible with Modbus RTU Mode*.

Start Bit: 1 bit
Data bits: 8 bits
Parity: no parity
Stop bit: 1 bit
Error checking: CRC check

Framing

Address	Function	Data	Check
8-Bits	8-Bits	N x 8-Bits	16-Bits

Address: The address field of a message frame contains eight bits. Valid slave device addresses are in the range of 1~247 decimal. A master addresses a slave by placing the slave address in the address field of the message. When the slave ends its response, it places its own address in this address field of the response to let the master know which slave is responding.

Function: The function code field of a message frame contains eight bits. Valid codes are in the range of 1~255 decimal. When a message is sent from a master to a slave device the function code field tells the slave what kind of action to perform.

Code	Meaning	Action
01	Read Relay Output Status	Obtain current status of Relay Output
02	Read Digital Input (DI) Status	Obtain current status of Digital Input
03	Read Data	Obtain current binary value in one or more registers
05	Control Relay Output	Force Relay to a state of on or off
16	Preset Multiple-Registers	Place specific binary values into a series of consecutive Multiple-Registers

Data: The data field is constructed using sets of two hexadecimal digits, in the range of 00 to FF hexadecimal. The data field of messages sent from a master to slave devices contains additional information which the slave must use to take the action defined by the function code. This can include items like discrete and register addresses, the quantity of items to be handled, and the count of actual data bytes in the field. For example, if the master requests a slave to read a group of holding registers (function code 03); the data field specifies the starting register and how many registers are to be read. If the master writes to a group of registers in the slave (function code 10 hexadecimal), the data field specifies the starting register, how many registers to write, the count of data bytes to follow in the data field, and the data to be written into the registers.

If no error occurs, the data field of a response from a slave to a master contains the data requested. If an error occurs, the field contains an exception code that the master application can use to determine the next action to be taken. The data field can be nonexistent (of zero length) in certain kinds of messages.

Error Check: Messages include an error's checking field that is based on a Cyclical Redundancy Check (CRC) method. The CRC field checks the contents of the entire message. It is applied regardless of any parity check method used for the individual characters of the message. The CRC field is two bytes, containing a 16bit binary value. The CRC value is calculated by the transmitting device, which appends the CRC to the message.

The receiving device recalculates a CRC during receipt of the message, and compares the calculated value to the actual value it received in the CRC field. If the two values are not equal, an error results. The CRC is started by first preloading a 16-bit register to all 1's. Then a process begins of applying successive 8-bit bytes of the message to the current contents of the register. Only the eight bits of data in each character are used for generating the CRC. Start and stop bits, and the parity bit, do not apply to the CRC. During generation of the CRC, each 8-bit character is exclusive ORed with the register contents. Then the result is shifted in the direction of the least significant bit (LSB), with a zero filled into the most significant bit (MSB) position. The LSB is extracted and examined. If the LSB was a1, the register is then exclusive ORed with a preset, fixed value. If the LSB was a 0, no exclusive OR takes place. This process is repeated until eight shifts have been performed. After the last (eighth) shift, the next 8-bit bytes exclusive ORed with the register current value and the process repeats for eight more shifts as described above. The final contents of the register, after all the bytes of the message have been applied, is the CRC value. When the CRC is appended to the message, the low-order byte is appended first, followed by the high-order byte.

Format of communication

Add	Fun	Data start reg hi	Data start reg lo	Data #of regs hi	Data #of regs lo	CRC16 hi	CRC16 lo
06H	03H	00H	00H	00H	21H	84H	65H

Addr: address of slave device
Fun: function code
Data start reg hi: start register address high byte
Data start reg lo: start register address low byte
Data #of reg hi: number of register high byte
Data #of reg lo: number of register low byte
CRC16 Hi: CRC high byte
CRC16 Lo: CRC low byte

1. **Read Status of Relay (Function Code 01):** This function code is used to read status of relay.
   1=On
   0=Off
   There are 2 Relays in CPM series. The Address of each Relay is
   Relay1=0000H,
   Relay2=0001H.
   The following query is to read Relay Status of the device Number 17.

   Query

Add	Fun	Relay start reg hi	Relay start reg lo	Relay #of regs hi	Relay #of regs lo	CRC16 hi	CRC16 lo
11H	01H	00H	00H	00H	02H	BFH	5BH

   Response
   The CPM response includes the CPM address, function code, quantity of data byte, the data, and error checking. An example response to read the status of Relay1 and Relay2 is shown as following.
   The status of Relay1 and Relay2 is responding to the last 2 bit of the data.
   Relay1: bit0 Relay2: bit1

Add	Fun	Byte Count	Data	CRC hi	CRC lo
11H	01H	01H	02H	D4H	89H

   The content of the data is,

7	6	5	4	3	2	1	0
0	0	0	0	0	0	1	0

   MSB **LSB**
   Relay1 = OFF (LSB), **Relay2=ON (Left to LSB)**

2. **Read the Status of DI (Function Code 02):** This function code is used to read status.
1=On
0=Off
There are 4 DIs in CPM series. The Address of each DI is
DI1=0000H,
DI2=0001H,
DI3=0002H,
DI4=0003H.
The following query is to read the 4 DI Status of the device Number 17.

Query

Add	Fun	DI start addr hi	DI start addr lo	DI num hi	DI num lo	CRC16 hi	CRC16 lo
11H	02H	00H	00H	00H	04H	7BH	59H

Response
The CPM response includes the CPM address, function code, quantity of data characters, the data characters, and error checking. An example response tread the status of 4 DIs is shown as following.
The status of each is responding to the last 4 bit of the data.
DI1: bit0 DI2: bit1 DI3: bit2 DI4: bit3

Add	Fun	Byte Count	Data	CRC 16 hi	CRC 16 lo
11H	02H	01H	03H	E5H	49H

The content of the data is,

7	6	5	4	3	2	1	0
0	0	0	0	0	0	1	1

MSB LSB
DI1=On DI2=On DI3=Off DI4=Off

3. **Read Data (Function Code 03)**

Query
This function allows the master to obtain the measurement results of CPM series.
An example as following to read the 3 measured data (F, V1 and V2) from slave device number 17, the data address of F is 0130H, V1 is 0131H and V2 is 0132H.

Add	Fun	Data start addr hi	Data start addr lo	Data #of regs hi	Data #of regs lo	CRC16 hi	CRC16 lo
11H	03H	01H	30H	00H	03H	06H	A8H

Response
The CPM response includes the CPM address, function code, quantity of data byte, data, and error checking.
An example response to read F, V1 and V2(F=1388H (50.00Hz), V1=03E7H (99.9V), V2=03E9H (100.1V) is shown as following

Add	Fun	Byte Count	Data 1 Hi	Data 1 Lo	Data 2 Hi	Data 2 Lo	Data 3 Hi	Data 3 Lo	CRC16 hi	CRC16 lo
11H	03H	06H	13H	88H	03H	E7H	03H	E9H	7FH	04H

4. **Control Relay (Function Code 05)**
Query
This message forces a single Relay either on or off. Any relay that exist switch in the CPM can be forced to be either status (on or off). The address of Relays starts at 0000H (Relay1=0000H, Relay2=0001H). The data value FF00H will set the Relay on and the value 0000H will turn it off; all other values are illegal and will not affect that relay.

The example below is a request to the device number 17 to turn on Relay1.

Add	Fun	DO addr hi	DO addr lo	Value hi	Value lo	CRC16 hi	CRC16 lo
11H	05H	00H	00H	FFH	00H	8EH	AAH

Response

The normal response to the command request is to retransmit the message as received after the Relay status has been altered.

Add	Fun	Relay addr hi	Relay addr lo	Value hi	Value lo	CRC16 hi	CRC16 lo
11H	05H	00H	00H	FFH	00H	8EH	AAH

5. Preset / Reset Multi-Register(Function Code 16)

Query

Function 16 allows the user to modify the contents of a Multi-Register. Any Register that exists within the CPM can have its contents changed by this message.

The example below is a request to a device number 17 to Preset Ep_imp(17807783.3KWH), while its Hex Value 0A9D4089H. Ep_imp data address is0156H and 0157H.

Add	Fun	Data Start addr hi	Data Start addr lo	Data regs Hi	Data regs Lo	Byte Count	Value Hi	Value Lo	Value Hi	Value lo	CRC 16 Hi	CRC 16 Lo
11H	10H	01H	56H	00H	02H	04H	0AH	9DH	40H	89H	4DH	B9H

Response

The normal response to a preset Multi-Register request includes the CPM address, function code, data start register, the number of registers, and error checking.

Add	Fun	Data Start addr hi	Data Start addr lo	Data regs Hi	Data regs Lo	CRC 16 Hi	CRC 16 Lo
11H	10H	01H	56H	00H	02H	A2H	B4H

■ CPM-50 ADDRESS TABLE **Address number are Hexadecimal

Name	Address	Range	Explain	Initial	Write/Read	Note
CPM Parameter Setting			**Function 03 Read; Function 16 Presetting**			
Pass Word	0100h	0~9999	Pass Word		R/W	
Address	0101h	1~247	Device address of RS485 Communication		R/W	
Baud Rate	0102h	600~38400	Baud Rate of RS485 Communication		R/W	
Wiring of Voltage Input	0103h	0~2	Voltage Input Wiring Mode **0:** 3LN, **1:** 2LN, **2:** 2LL		R/W	
Wiring of Current Input	0104h	0~2	Current Input Wiring Mode **0:** 3CT, **1:** 1CT, **2:** 2CT		R/W	
Primary of PT	0105h* (Hi Word)	100~500000	Primary Value of PT		R/W	
	0106h* (Lo Word)		Primary Value of PT		R/W	
Secondary of PT	0107h	100~400	Secondary Value of PT		R/W	
Primary of CT	0108h	5~10000	Primary Value of CT		R/W	
DO Mode	0109h	0~1	Digital output mode **0:** Pulse Output **1:** Alarm Output		R/W	
DO1 vs. Energy pulse o/p	010Ah	0~8	Energy Parameter Number associated with DO1. **Please refer to the page 19/40 of manual.**		R/W	
DO2 vs. Energy pulse o/p	010Bh	0~8	Energy Parameter Number associated with DO2. **Please refer to the page 19/40 of manual.**		R/W	
Pulse Width	010Ch	1~50	Pulse Width		R/W	
Pulse Rate	010Dh	1~6000	Pulse Rate		R/W	
RO1 mode selection	010Eh	0~1	Relay1 Energized Mode **0:** Latch **1:** Momentary		R/W	
	010Fh	50~3000	Relay1 Pulse Width		R/W	
RO2 mode selection	0110h	0~1	Relay2 Energized Mode **0:** Latch **1:** Momentary		R/W	

Name	Address	Range	Explain	Initial	Write/Read	Note
	0111h	50~3000	Relay2 Pulse Width		R/W	
	0112h	0~120	LCD Back light Time		R/W	
	0113h	1~30	Demand Slid Window Time.		R/W	
	0114h	0~1	Reset maximum / minimum storage **1:** Yes , **0:** No		R/W	
Status Input (DI)			**Function 02 Reading**			
	0000h		DI1 status **1:** ON , **0:** OFF		R	
	0001h		DI2 status **1:** ON , **0:** OFF		R	
	0002h		DI3 status **1:** ON , **0:** OFF		R	Option-I/O
	0003h		DI4 status **1:** ON , **0:** OFF		R	
Relay Statue and Control			**Function 01 Reading; Function 05 Controlling**			
	0000h		Relay1 status **1:** ON , **0:** OFF		R/W	Option-I/O
	0001h		Relay2 status **1:** ON , **0:** OFF		R/W	
Power Measurements			**Function 03 Read;**			
Frequency	0130h	0~7000	Frequency $F_{\_r}$(the numerical value in register) **The real physical value is** **$F= F_{\_r}/100$**		R	
V_1	0131h	0~65535	Phase Voltage V_{1_r}(the numerical value in register) **The real physical value is** **$V_1= V_{1\_r}$×(PT1/PT2)/10 (Unit: V)**		R	
V_2	0132h	0~65535	Phase Voltage V_{2_r}(the numerical value in register) **The real physical value is** **$V_2= V_{2\_r}$×(PT1/PT2)/10 (Unit: V)**		R	
V_3	0133h	0~65535	Phase Voltage V_{3_r}(the numerical value in register) **The real physical value is** **$V_3= V_{3\_r}$×(PT1/PT2)/10 (Unit: V)**		R	
V_{lnavg}	0134h	0~65535	Average Phase Voltage V_{lnavg_r}(the numerical value in register) **The real physical value is** **$V_{lnavg}= V_{lnavg\_r}$×(PT1/PT2)/10 (Unit: V)**		R	
V_{12}	0135h	0~65535	Line Voltage V_{12_r}(the numerical value in register) **The real physical value is** **$V_{12}= V_{12\_r}$×(PT1/PT2)/10 (Unit: V)**		R	
V_{23}	0136h	0~65535	Line Voltage V_{23_r}(the numerical value in register) **The real physical value is** **$V_{23}= V_{23\_r}$×(PT1/PT2)/10 (Unit: V)**		R	
V_{31}	0137h	0~65535	Line Voltage V_{31_r}(the numerical value in register) **The real physical value is** **$V_{31}= V_{31\_r}$×(PT1/PT2)/10 (Unit: V)**		R	
V_{llavg}	0138h	0~65535	Average Line Voltage V_{llavg_r}(the numerical value in register) **The real physical value is** **$V_{llavg}= V_{llavg\_r}$×(PT1/PT2)/10 (Unit: V)**		R	
I_1	0139h	0~65535	Current I_{1_r}(the numerical value in register) **The real physical value is** **$I_1= I_{1\_r}$×(CT1/5)/1000 (Unit: A)**		R	
I_2	013Ah	0~65535	Current I_{2_r}(the numerical value in register) **The real physical value is** **$I_2= I_{2\_r}$×(CT1/5)/1000 (Unit: A)**		R	

Name	Address	Range	Explain	Initial	Write/Read	Note
I_3	013Bh	0~65535	Current I_{3_r}(the numerical value in register) **The real physical value is** **$I_3 = I_{3\_r}$×(CT1/5)/1000 (Unit: A)**		R	
I_{avg}	013Ch	0~65535	Average Current I_{avg_r}(the numerical value in register) **The real physical value is** **$I_{avg} = I_{avg\_r}$×(CT1/5)/1000 (Unit: A)**		R	
I_n	013Dh	0~65535	Neutral Line Current I_{n_r}(the numerical value in register) **The real physical value is** **$I_n = I_{n\_r}$×(CT1/5)/1000 (Unit: A)**		R	
P_1	013Eh	-32768~32767	Phase Active Power P_{1_r}(the numerical value in register) **The real physical value is** **$P_1 = P_{1\_r}$×(PT1/PT2)×(CT1/ 5) (Unit: W)**		R	
P_2	013Fh	-32768~32767	Phase Active Power P_{2_r}(the numerical value in register) **The real physical value is** **$P_2 = P_{2\_r}$×(PT1/PT2)×(CT1/ 5) (Unit: W)**		R	
P_3	0140h	-32768~32767	Phase Active Power P_{3_r}(the numerical value in register) **The real physical value is** **$P_3 = P_{3\_r}$×(PT1/PT2)×(CT1/ 5) (Unit: W)**		R	
P_{sum}	0141h	-32768~32767	System Active Power P_{sum_r}(the numerical value in register) **The real physical value is** **$P_{sum} = P_{sum\_r}$×(PT1/PT2)×(CT1/ 5) (Unit: W)**		R	
Q_1	0142h	-32768~32767	Phase Reactive Power Q_{1_r}(the numerical value in register) **The real physical value is** **$Q_1 = Q_{1\_r}$×(PT1/PT2)×(CT1/ 5) (Unit: Var)**		R	
Q_2	0143h	-32768~32767	Phase Reactive Power Q_{2_r}(the numerical value in register) **The real physical value is** **$Q_2 = Q_{2\_r}$×(PT1/PT2)×(CT1/ 5) (Unit: Var)**		R	
Q_3	0144h	-32768~32767	Phase Reactive Power Q_{3_r}(the numerical value in register) **The real physical value is** **$Q_3 = Q_{3\_r}$×(PT1/PT2)×(CT1/ 5) (Unit: Var)**		R	
Q_{sum}	0145h	-32768~32767	System Reactive Power Q_{sum_r}(the numerical value in register) **The real physical value is** **$Q_{sum} = Q_{sum\_r}$×(PT1/PT2)×(CT1/ 5) (Unit: Var)**		R	
S_1	0146h	0~65535	Phase Apparent Power S_{1_r}(the numerical value in register) **The real physical value is** **$S_1 = S_{1\_r}$×(PT1/PT2)×(CT1/ 5) (Unit: VA)**		R	
S_2	0147h	0~65535	Phase Apparent Power S_{2_r}(the numerical value in register) **The real physical value is** **$S_2 = S_{2\_r}$×(PT1/PT2)×(CT1/ 5) (Unit: VA)**		R	
S_3	0148h	0~65535	Phase Apparent Power S_{3_r}(the numerical value in register) **The real physical value is** **$S_3 = S_{3\_r}$×(PT1/PT2)×(CT1/ 5) (Unit: VA)**		R	
S_{sum}	0149h	0~65535	System Apparent Power S_{sum_r}(the numerical value in register) **The real physical value is** **$S_{sum} = S_{sum\_r}$×(PT1/PT2)×(CT1/ 5) (Unit: VA)**		R	

Name	Address	Range	Explain	Initial	Write/Read	Note
PF1	014Ah	-1000~1000	Phase Power Factor PF1_r(the numerical value in register) The real physical value is PF1= PF1_r/1000		R	
PF2	014Bh	-1000~1000	Phase Power Factor PF2_r(the numerical value in register) The real physical value is PF2= PF2_r/1000		R	
PF3	014Ch	-1000~1000	Phase Power Factor PF3_r(the numerical value in register) The real physical value is PF3= PF3_r/1000		R	
PF	014Dh	-1000~1000	System Power Factor_r(the numerical value in register) The real physical value is PF= PF_r/1000		R	
Vunbl	014Eh	0~3000	Voltage Unbalance Factor Uunbl_r(the numerical value in register) Vunbl=(Uunbl_r/1000)×100%		R	
Iunbl	014Fh	0~3000	Current Unbalance Factor Iunbl_r(the numerical value in register) Iunbl=(Iunbl_r/1000)×100%		R	
Load Type	0150h	4Ch/43h/52h	Load Type (L/C/R) **4Ch:** L **43h:** C **52h:** R		R	
Pmd	0151h	-32768~32767	Power Demand Pmd_r(the numerical value in register) The real physical value is Pmd= Pmd_r×(PT1/PT2)×(CT1/ 5) (Unit: W)		R	CPM -52 only
Qmd	0152h	-32768~32767	Reactive power Demand Qmd_r(the numerical value in register) The real physical value is Qmd= Qmd_r×(PT1/PT2)×(CT1/ 5) (Unit: Var)		R	CPM -52 only
Smd	0153h	0~65535	Apparent Power Demand Smd_r(the numerical value in register) The real physical value is Smd= Smd_r×(PT1/PT2)×(CT1/ 5) (Unit: VA)		R	CPM -52 only
	0154h					
	0155h					
Energy Measurements			**Function 03 Read; Function 16 Preset**			
Imp Active Energy*	0156h* **(Hi word)**	0~99999999.9	Import Active Energy Ep_imp_r(the numerical value in register)		R/W	
	0157h* **(Lo word)**		Import Active Energy Ep_imp_r(the numerical value in register) **The real physical value is** **Ep_imp= Ep_imp_r / 10 (Unit: Kwh)**		R/W	
Exp Active Energy *	0158h* **(Hi word)**	0~99999999.9	Export Active Energy Ep_exp_r(the numerical value in register)		R/W	
	0159h* **(Lo word)**		Export Active Energy Ep_exp_r(the numerical value in register) **The real physical value is** **Ep_exp= Ep_exp_r / 10 (Unit: Kwh)**		R/W	
Imp Reactive Energy*	015Ah* **(Hi word)**	0~99999999.9	Import Reactive Energy Eq_imp_r(the numerical value in register)		R/W	
	015Bh* **(Lo word)**		Import Reactive Energy Eq_imp_r(the numerical value in register) **The real physical value is** **Eq_imp= Eq_imp_r / 10 (Unit: Kvarh)**		R/W	
Exp Reactive Energy *	015Ch* **(Hi word)**	0~99999999.9	Export Reactive Energy Eq_exp_r(the numerical value in register)		R/W	
	015Dh* **(Lo word)**		Export Reactive Energy Eq_exp_r(the numerical value in register) **The real physical value is** **Eq_imp= Eq_imp_r / 10 (Unit: Kvarh)**		R/W	

Name	Address	Range	Explain	Initial	Write/Read	Note
Total Active Energy*	015Eh* **(Hi word)**	0~99999999.9	Active Energy Ep_total_r(the numerical value in register)		R/W	
	015Fh* **(Lo word)**		Active Energy Ep_total_r(the numerical value in register) **The real physical value is** **Ep_total= Ep_total_r / 10 (Unit: Kwh)**		R/W	
Net Active Energy*	0160h* **(Hi word)**	0~99999999.9	Net Active Energy Ep_net_r(the numerical value in register)		R/W	
	0161h* **(Lo word)**		Net Active Energy Ep_net_r(the numerical value in register) **The real physical value is** **Ep_net= Ep_net_r / 10 (Unit: Kwh)**		R/W	
Total Reactive Energy*	0162h* **(Hi word)**	0~99999999.9	Reactive Energy Eq_total_r(the numerical value in register)		R/W	
	0163h* **(Lo word)**		Reactive Energy Eq_total_r(the numerical value in register) **The real physical value is** **Eq_total= Eq_total_r / 10 (Unit: Kvarh)**		R/W	
Net Reactive Energy*	0164h* **(Hi word)**	0~99999999.9	Net Reactive Energy Eq_net_r(the numerical value in register)		R/W	
	0165h* **(Lo word)**		Net Reactive Energy Eq_net_r(the numerical value in register) **The real physical value is** **Eq_net= Eq_net_r / 10 (Unit: Kwh)**		R/W	
	0166h				R/W	
	0167h				R/W	
Power Quality Measurements			**Function 03 Read;**			
THD_{V1}	0168h	0~10000	Total Harmonic Distortion of V_1 or V_{12}, THD_{V1_r}(the numerical value in register) **The real physical value is** **$THD_{V1}= THD_{V1\_r}$ / 10000×100%**		R	
THD_{V2}	0169h	0~10000	Total Harmonic Distortion of V_2 or V_{23}, THD_{V2_r}(the numerical value in register) **The real physical value is** **$THD_{V2}= THD_{V2\_r}$ / 10000×100%**		R	
THD_{V3}	016Ah	0~10000	Total Harmonic Distortion of V_3 or V_{31}, THD_{V3_r}(the numerical value in register) **The real physical value is** **$THD_{V3}= THD_{V3\_r}$ / 10000×100%**		R	
THD_{V_avg}	016Bh	0~10000	Average Total Harmonic Distortion of Voltage, $THD_{V\_avg\_r}$(the numerical value in register) **The real physical value is** **$THD_{V\_avg}= THD_{V\_avg\_r}$ / 10000×100%**		R	
THD_{I1}	016Ch	0~10000	Total Harmonic Distortion of I_1, THD_{I1_r}(the numerical value in register) **The real physical value is** **$THD_{I1}= THD_{I1\_r}$ / 10000×100%**		R	
THD_{I2}	016Dh	0~10000	Total Harmonic Distortion of I_2, THD_{I2_r}(the numerical value in register) **The real physical value is** **$THD_{I2}= THD_{I2\_r}$ / 10000×100%**		R	
THD_{I3}	016Eh	0~10000	Total Harmonic Distortion of I_3, THD_{I3_r}(the numerical value in register) **The real physical value is** **$THD_{I3}= THD_{I3\_r}$ / 10000×100%**		R	
THD_{Iavg}	016Fh	0~10000	Total Harmonic Distortion of I_{avg}, THD_{Iavg_r}(the numerical value in register) **The real physical value is** **$THD_{Iavg}= THD_{Iavg\_r}$ / 10000×100%**		R	

Name	Address	Range	Explain	Initial	Write/Read	Note
IH_{V1}	0170h ~ 018DH	0~10000	Individual Harmonic of V_1 or V_{12} (2nd to 31st), IH_{V1_r}(the numerical value in register) **The real physical value is** **$IH_{V1} = IH_{V1\_r} / 10000 \times 100\%$**		R	CPM-52 only
THD_{V1_O}	018Eh	0~10000	Total Odd Harmonic Distortion of V_{1_O} or V_{12_O}, $THD_{V1\_O\_r}$(the numerical value in register) The real physical value is $THD_{V1\_O} = THD_{V1\_O\_r} / 10000 \times 100\%$		R	CPM-52 only
THD_{V1_E}	018Fh	0~10000	Total Even Harmonic Distortion of V_{1_E} or V_{12_E}, $THD_{V1\_E\_r}$(the numerical value in register) The real physical value is $THD_{V1\_E} = THD_{V1\_E\_r} / 10000 \times 100\%$		R	CPM-52 only
CF_{V1}	0190h	0~65535	Crest factor of V_1 or V_{12}, CF_{V1_r}(the numerical value in register) The real physical value is $CF_{V1} = CF_{V1\_r} / 1000$		R	CPM-52 only
$THFF_{V1}$	0191h	0~10000	Telephone interference factor of V_1 or V_{12}, $THFF_{V1\_r}$(the numerical value in register) The real physical value is $THFF_{V1} = THFF_{V1\_r} / 10000 \times 100\%$		R	CPM-52 only
IH_{V2}	0192h ~ 01AFh	0~10000	Individual Harmonic of V_2 or V_{23} (2nd to 31st), IH_{V2_r}(the numerical value in register) The real physical value is $IH_{V2} = IH_{V2\_r} / 10000 \times 100\%$		R	CPM-52 only
THD_{V2_O}	01B0h	0~10000	Total Odd Harmonic Distortion of V_{2_O} or V_{23_O}, $THD_{V2\_O\_r}$(the numerical value in register) The real physical value is $THD_{V2\_O} = THD_{V2\_O\_r} / 10000 \times 100\%$		R	CPM-52 only
THD_{V2_E}	01B1h	0~10000	Total Even Harmonic Distortion of V_{2_E} or V_{23_E}, $THD_{V2\_E\_r}$(the numerical value in register) The real physical value is $THD_{V2\_E} = THD_{V2\_E\_r} / 10000 \times 100\%$		R	CPM-52 only
CF_{V2}	01B2h	0~65535	Crest factor of V_2 or V_{23}, CF_{V2_r}(the numerical value in register) The real physical value is $CF_{V2} = CF_{V2\_r} / 1000$		R	CPM-52 only
$THFF_{V2}$	01B3h	0~10000	Telephone interference factor of V_2 or V_{23}, $THFF_{V2\_r}$(the numerical value in register) The real physical value is $THFF_{V2} = THFF_{V2\_r} / 10000 \times 100\%$		R	CPM-52 only
IH_{V3}	01B4h ~ 01D1h	0~10000	Individual Harmonic of V_3 or V_{31} (2nd to 31st), IH_{V3_r}(the numerical value in register) The real physical value is $IH_{V3} = IH_{V3\_r} / 10000 \times 100\%$		R	CPM-52 only
THD_{V3_O}	01D2h	0~10000	Total Odd Harmonic Distortion of V_{3_O} or V_{31_O}, $THD_{V3\_O\_r}$(the numerical value in register) The real physical value is $THD_{V3\_O} = THD_{V3\_O\_r} / 10000 \times 100\%$		R	CPM-52 only
THD_{V3_E}	01D3h	0~10000	Total Even Harmonic Distortion of V_{3_E} or V_{31_E}, $THD_{V3\_E\_r}$(the numerical value in register) The real physical value is $THD_{V3\_E} = THD_{V3\_E\_r} / 10000 \times 100\%$		R	CPM-52 only
CF_{V3}	01D4h	0~65535	Crest factor of V_3 or V_{31}, CF_{V3_r}(the numerical value in register) The real physical value is $CF_{V3} = CF_{V3\_r} / 1000$		R	CPM-52 only

Name	Address	Range	Explain	Initial	Write/Read	Note
$THFF_{V3}$	01D5h	0~10000	Telephone interference factor of V_3 or V_{31}, $THFF_{V3\_r}$(the numerical value in register) The real physical value is $THFF_{V3} = THFF_{V3\_r} / 10000 \times 100\%$		R	CPM-52 only
IH_{I1}	01D6h ~ 01F3h	0~10000	Individual Harmonic of I_1 (2nd to 31st), IH_{I1_r}(the numerical value in register) The real physical value is $IH_{I1} = IH_{I1\_r} / 10000\times100\%$		R	CPM-52 only
THD_{I1_O}	01F4h	0~10000	Total Odd Harmonic Distortion of I_{1_O}, $THD_{I1\_O\_r}$(the numerical value in register) The real physical value is $THD_{I1\_O} = THD_{I1\_O\_r} / 10000\times100\%$		R	CPM-52 only
THD_{I1_E}	01F5h	0~10000	Total Even Harmonic Distortion of I_{1_E}, $THD_{I1\_E\_r}$(the numerical value in register) The real physical value is $THD_{I1\_E} = THD_{I1\_E\_r} / 10000\times100\%$		R	CPM-52 only
KF_{I1}	01F6h	0~65535	K factor of I_1, KF_{I1_r}(the numerical value in register) The real physical value is $KF_{I1} = KF_{I1\_r} / 10$		R	CPM-52 only
IH_{I2}	01F7h ~ 0214h	0~10000	Individual Harmonic of I_2 (2nd to 31st), IH_{I2_r}(the numerical value in register) The real physical value is $IH_{I2} = IH_{I2\_r} / 10000\times100\%$		R	CPM-52 only
THD_{I2_O}	0215h	0~10000	Total Odd Harmonic Distortion of I_{2_O}, $THD_{I2\_O\_r}$(the numerical value in register) The real physical value is $THD_{I2\_O} = THD_{I2\_O\_r} / 10000\times100\%$		R	CPM-52 only
THD_{I2_E}	0216h	0~10000	Total Even Harmonic Distortion of I_{2_E}, $THD_{I2\_E\_r}$(the numerical value in register) The real physical value is $THD_{I2\_E} = THD_{I2\_E\_r} / 10000\times100\%$		R	CPM-52 only
KF_{I2}	0217h	0~65535	K factor of I_2, KF_{I2_r}(the numerical value in register) The real physical value is $KF_{I2} = KF_{I2\_r} / 10$		R	CPM-52 only
IH_{I3}	0218h ~ 0235h	0~10000	Individual Harmonic of I_3 (2nd to 31st), IH_{I3_r}(the numerical value in register) The real physical value is $IH_{I3} = IH_{I3\_r} / 10000\times100\%$		R	CPM-52 only
THD_{I3_O}	0236h	0~10000	Total Odd Harmonic Distortion of I_{3_O}, $THD_{I3\_O\_r}$(the numerical value in register) The real physical value is $THD_{I3\_O} = THD_{I3\_O\_r} / 10000\times100\%$		R	CPM-52 only
THD_{I3_E}	0237h	0~10000	Total Even Harmonic Distortion of I_{3_E}, $THD_{I3\_E\_r}$(the numerical value in register) The real physical value is $THD_{I3\_E} = THD_{I3\_E\_r} / 10000\times100\%$		R	CPM-52 only
KF_{I3}	0238h	0~65535	K factor of I_3, KF_{I3_r}(the numerical value in register) The real physical value is $KF_{I3} = KF_{I3\_r} / 10$		R	CPM-52 only

Max/Min Statistics Value with Time Stamps			Function 03 Read;			
Name	**Address**	**Range**	**Explain**	**Initial**	**Write/Read**	**Note**
V_{1_max}	0239h	0~65535	V_{1_max}		R	CPM-52 only
Year	023Ah	2000~2099	Time Stamp of V_{1_max}		R	
Month	023Bh	1~12			R	
Day	023Ch	1~31			R	
Hour	023Dh	0~23			R	
Minute	023Eh	0~59			R	
Second	023Fh	0~59			R	
V_{2_max}	0240h	0~65535	V_{2_max}		R	CPM-52 only
Year	0241h	2000~2099	Time Stamp of V_{2_max}		R	
Month	0242h	1~12			R	
Day	0243h	1~31			R	
Hour	0244h	0~23			R	
Minute	0245h	0~59			R	
Second	0246h	0~59			R	
V_{3_max}	0247h	0~65535	V_{3_max}		R	CPM-52 only
Year	0248h	2000~2099	Time Stamp of V_{3_max}		R	
Month	0249h	1~12			R	
Day	024Ah	1~31			R	
Hour	024Bh	0~23			R	
Minute	024Ch	0~59			R	
Second	024Dh	0~59			R	
V_{12_max}	024Eh	0~65535	V_{12_max}		R	CPM-52 only
Year	024Fh	2000~2099	Time Stamp of V_{12_max}		R	
Month	0250h	1~12			R	
Day	0251h	1~31			R	
Hour	0252h	0~23			R	
Minute	0253h	0~59			R	
Second	0254h	0~59			R	
V_{23_max}	0255h	0~65535	V_{23_max}		R	CPM-52 only
Year	0256h	2000~2099	Time Stamp of V_{23_max}		R	
Month	0257h	1~12			R	
Day	0258h	1~31			R	
Hour	0259h	0~23			R	
Minute	025Ah	0~59			R	
Second	025Bh	0~59			R	
V_{31_max}	025Ch	0~65535	V_{31_max}		R	CPM-52 only
Year	025Dh	2000~2099	Time Stamp of V_{31_max}		R	
Month	025Eh	1~12			R	
Day	025Fh	1~31			R	
Hour	0260h	0~23			R	
Minute	0261h	0~59			R	
Second	0262h	0~59			R	
I_{1_max}	0263h	0~65535	I_{1_max}		R	CPM-52 only
Year	0264h	2000~2099	Time Stamp of I_{1_max}		R	
Month	0265h	1~12			R	
Day	0266h	1~31			R	
Hour	0267h	0~23			R	
Minute	0268h	0~59			R	
Second	0269h	0~59			R	
I_{2_max}	026Ah	0~65535	I_{2_max}		R	CPM-52 only
Year	026Bh	2000~2099	Time Stamp of I_{2_max}		R	
Month	026Ch	1~12			R	
Day	026Dh	1~31			R	
Hour	026Eh	0~23			R	
Minute	026Fh	0~59			R	
Second	0270h	0~59			R	

Name		Address	Range	Explain	Initial	Write/Read	Note
I_{3_max}		0271h	0~65535	I_{3_max}		R	CPM-52 only
	Year	0272h	2000~2099	Time Stamp of I_{3_max}		R	
	Month	0273h	1~12			R	
	Day	0274h	1~31			R	
	Hour	0275h	0~23			R	
	Minute	0276h	0~59			R	
	Second	0277h	0~59			R	
P_{max}		0278h	-32768~32767	P_{max}		R	CPM-52 only
	Year	0279h	2000~2099	Time Stamp of P_{max}		R	
	Month	027Ah	1~12			R	
	Day	027Bh	1~31			R	
	Hour	027Ch	0~23			R	
	Minute	027Dh	0~59			R	
	Second	027Eh	0~59			R	
Q_{max}		027Fh	-32768~32767	Q_{max}		R	CPM-52 only
	Year	0280h	2000~2099	Time Stamp of Q_{max}		R	
	Month	0281h	1~12			R	
	Day	0282h	1~31			R	
	Hour	0283h	0~23			R	
	Minute	0284h	0~59			R	
	Second	0285h	0~59			R	
S_{max}		0286h	0~65535	S_{max}		R	CPM-52 only
	Year	0287h	2000~2099	Time Stamp of S_{max}		R	
	Month	0288h	1~12			R	
	Day	0289h	1~31			R	
	Hour	028Ah	0~23			R	
	Minute	028Bh	0~59			R	
	Second	028Ch	0~59			R	
PF_{max}		028Dh	-1000~1000	PF_{max}		R	CPM-52 only
	Year	028Eh	2000~2099	Time Stamp of PF_{max}		R	
	Month	028Fh	1~12			R	
	Day	0290h	1~31			R	
	Hour	0291h	0~23			R	
	Minute	0292h	0~59			R	
	Second	0293h	0~59			R	
F_{max}		0294h	0~7000	F_{max}		R	CPM-52 only
	Year	0295h	2000~2099	Time Stamp of F_{max}		R	
	Month	0296h	1~12			R	
	Day	0297h	1~31			R	
	Hour	0298h	0~23			R	
	Minute	0299h	0~59			R	
	Second	029Ah	0~59			R	
P_{md_max}		029Bh	-32768~32767	P_{md_max} (Maximum Demand of Active Power)		R	CPM-52 only
	Year	029Ch	2000~2099	Time Stamp of P_{md_max}		R	
	Month	029Dh	1~12			R	
	Day	029Eh	1~31			R	
	Hour	029Fh	0~23			R	
	Minute	02A0h	0~59			R	
	Second	02A1h	0~59			R	
Q_{md_max}		02A2h	-32768~32767	Q_{md_max} (Maximum Demand of Reactive Power)		R	CPM-52 only
	Year	02A3h	2000~2099	Time Stamp of Q_{md_max}		R	
	Month	02A4h	1~12			R	
	Day	02A5h	1~31			R	
	Hour	02A6h	0~23			R	
	Minute	02A7h	0~59			R	
	Second	02A8h	0~59			R	

Name	Address	Range	Explain	Initial	Write/Read	Note
S_{md_max}	02A9h	0~65535	S_{md_max} (Maximum Demand of Apparent Power)		R	CPM-52 only
Year	02AAh	2000~2099	Time Stamp of S_{md_max}		R	
Month	02ABh	1~12			R	
Day	02ACh	1~31			R	
Hour	02ADh	0~23			R	
Minute	02AEh	0~59			R	
Second	02AFh	0~59			R	
V_{1_min}	02B0h	0~65535	V_{1_min} (Minimum value record of V_1)		R	CPM-52 only
V_{2_min}	02B1h	0~65535	V_{2_min} (Minimum value record of V_2)		R	
V_{3_min}	02B2h	0~65535	V_{3_min} (Minimum value record of V_3)		R	
V_{12_min}	02B3h	0~65535	V_{12_min} (Minimum value record of V_{12})		R	
V_{23_min}	02B4h	0~65535	V_{23_min} (Minimum value record of V_{23})		R	
V_{31_min}	02B5h	0~65535	V_{31_min} (Minimum value record of V_{31})		R	
I_{1_min}	02B6h	0~65535	I_{1_min} (Minimum value record of I_1)		R	
I_{2_min}	02B7h	0~65535	I_{2_min} (Minimum value record of I_2)		R	
I_{3_min}	02B8h	0~65535	I_{3_min} (Minimum value record of I_3)		R	
P_{min}	02B9h	-32768~32767	P_{min} (Minimum value record of total active power)		R	
Q_{min}	02BAh	-32768~32767	Q_{min} (Minimum value record of total re-active power)		R	
S_{min}	02BBh	0~65535	S_{min} (Minimum value record of total apparent power)		R	
PF_{min}	02BCh	-1000~1000	PF_{min} (Minimum value record of average power factor)		R	
F_{min}	02BDh	0~7000	F_{min} (Minimum value record of system frequency)		R	
Pmd_min	02BEh	-32768~32767	Pmd_min (Minimum Demand of Active Power)		R	
Qmd_min	02BFh	-32768~32767	Qmd_min (Minimum Demand of Reactive Power)		R	
Smd_min	02C0h	0~65535	Smd_min (Minimum Demand of Apparent Power)		R	

Power Measurements for primary — **Function 03 Read;**

Name	Address	Range	Explain	Initial	Write/Read	Note
Frequency	02D0h* (Hi word)	0~7000	Frequency		R	
	02D1h* (Lo word)					
V_1	02D2h* (Hi word)	0~429496729.6V	Phase Voltage V_1(primary)		R	
	02D3h* (Lo word)					
V_2	02D4h* (Hi word)	0~429496729.6V	Phase Voltage V_2(primary)		R	
	02D5h* (Lo word)					
V_3	02D6h* (Hi word)	0~429496729.6V	Phase Voltage V_3(primary)		R	
	02D7h* (Lo word)					
V_{lnavg}	02D8h* (Hi word)	0~429496729.6V	Average Phase Voltage V_{ln}(primary)		R	
	02D9h* (Lo word)					
V_{12}	02DAh* (Hi word)	0~429496729.6V	Line Voltage V_{12}(primary)		R	
	02DBh* (Lo word)					

Name	Address	Range	Explain	Initial	Write/Read	Note
V_{23}	02DCh* (Hi word)	0~429496729.6V	Line Voltage V_{23}(primary)		R	
	02DDh* (Lo word)					
V_{31}	02DEh* (Hi word)	0~429496729.6V	Line Voltage V_{31}(primary)		R	
	02DFh* (Lo word)					
V_{llavg}	02E0h* (Hi word)	0~429496729.6V	Average Line Voltage V_{ll}(primary)		R	
	02E1h* (Lo word)					
I_1	02E2h* (Hi word)	0~4294967.296A	Phase Current I_1(primary)		R	
	02E3h* (Lo word)					
I_2	02E4h* (Hi word)	0~4294967.296A	Phase Current I_2(primary)		R	
	02E5h* (Lo word)					
I_3	02E6h* (Hi word)	0~4294967.296A	Phase Current I_3(primary)		R	
	02E7h* (Lo word)					
I_{avg}	02E8h* (Hi word)	0~4294967.296A	Average Phase Current I_{avg}(primary)		R	
	02E9h* (Lo word)					
I_n	02EAh* (Hi word)	0~4294967.296A	Phase Current I_n(primary)		R	
	02EBh* (Lo word)					
P_1	02ECh* (Hi word)	-2147483648~ 2147483648W	Phase Active Power P_1(primary)		R	
	02EDh* (Lo word)					
P_2	02EEh* (Hi word)	-2147483648~ 2147483648W	Phase Active Power P_2(primary)		R	
	02EFh* (Lo word)					
P_3	02F0h* (Hi word)	-2147483648~ 2147483648W	Phase Active Power P_3(primary)		R	
	02F1h* (Lo word)					
P_{SUM}	02F2h* (Hi word)	-2147483648~ 2147483648W	Total Active Power P_{sum}(primary)		R	
	02F3h* (Lo word)					
Q_1	02F4h* (Hi word)	-2147483648~ 2147483648Var	Phase Re-active Power Q_1(primary)		R	
	02F5h* (Lo word)					
Q_2	02F6h* (Hi word)	-2147483648~ 2147483648Var	Phase Re-active Power Q_2(primary)		R	
	02F7h* (Lo word)					
Q_3	02F8h* (Hi word)	-2147483648~ 2147483648Var	Phase Re-active Power Q_3(primary)		R	
	02F9h* (Lo word)					

Name	Address	Range	Explain	Initial	Write/Read	Note
Q_{SUM}	02FAh* (Hi word)	-2147483648~ 2147483648Var	Total Re-active Power Q_{SUM}(primary)		R	
	02FBh* (Lo word)					
S_1	02FCh* (Hi word)	0~ 4294967296VA	Phase Apparent Power S_1(primary)		R	
	02FDh* (Lo word)					
S_2	02FEh* (Hi word)	0~ 4294967296VA	Phase Apparent Power S_2(primary)		R	
	02FFh* (Lo word)					
S_3	0300h* (Hi word)	0~ 4294967296VA	Phase Apparent Power S_3(primary)		R	
	0301h* (Lo word)					
S_{SUM}	0302h* (Hi word)	0~ 4294967296VA	Total Apparent Power S_{sum}(primary)		R	
	0303h* (Lo word)					
PF_1	0304h* (Hi word)	-1000.000~ 1000.000PF	Phase Power Factor PF_1(primary)		R	
	0305h* (Lo word)					
PF_2	0306h* (Hi word)	-1000.000~ 1000.000PF	Phase Power Factor PF_2(primary)		R	
	0307h* (Lo word)					
PF_3	0308h* (Hi word)	-1000.000~ 1000.000PF	Phase Power Factor PF_3(primary)		R	
	0309h* (Lo word)					
PF	030Ah* (Hi word)	-1000.000~ 1000.000PF	Average Power Factor PF_{avg}(primary)		R	
	030Bh* (Lo word)					
P_{md}	030Ch* (Hi word)	-2147483648~ 2147483648W	Maximum Demand of Active Power P_{md}(primary)		R	
	030Dh* (Lo word)					
Q_{md}	030Eh* (Hi word)	-2147483648~ 2147483648Var	Maximum Demand of Re-active Power Q_{md}(primary)		R	
	030Fh* (Lo word)					
S_{md}	0310h* (Hi word)	0~ 4294967296VA	Maximum Demand of Apparent Power S_{md}(primary)		R	
	0311h* (Lo word)					
Load Type	0312h* (Hi word)	76/67/82	The type of load 76: Inductive Load 67: Capative Load 82: Resistance Load		R	
	0313h* (Lo word)					
Θ_{V1-V2}	0314h* (Hi word)	0~360.0Deg	Angle of V_1 and V_2		R	
	0315h* (Lo word)					
Θ_{V1-V3}	0316h* (Hi word)	0~360.0Deg	Angle of V_1 and V_3		R	
	0317h* (Lo word)					

Name	Address	Range	Explain	Initial	Write/Read	Note
$\Theta_{V1\text{-}I1}$	0318h* (Hi word)	0~360.0Deg	Angle of V_1 and I_1		R	
	0319h* (Lo word)					
$\Theta_{V1\text{-}I2}$	031Ah* (Hi word)	0~360.0Deg	Angle of V_1 and I_2		R	
	031Bh* (Lo word)					
$\Theta_{V1\text{-}I3}$	031Ch* (Hi word)	0~360.0Deg	Angle of V_1 and I_3		R	
	031Dh* (Lo word)					
$\Theta_{V12\text{-}V23}$	031Eh* (Hi word)	0~360.0Deg	Angle of V_{12} and V_{23}		R	
	031Fh* (Lo word)					
$\Theta_{V12\text{-}I1}$	0320h* (Hi word)	0~360.0Deg	Angle of V_{12} and I_1		R	
	0321h* (Lo word)					
$\Theta_{V12\text{-}I3}$	0322h* (Hi word)	0~360.0Deg	Angle of V_{12} and I_3		R	
	0323h* (Lo word)					

Date and Time table — Function 03 Read; Function 16 Presetting

Name	Address	Range	Explain	Initial	Write/Read	Note
Year	032Ah	2000~2099			R/W	
Month	032Bh	1~12			R/W	
Day	032Ch	1~31			R/W	
Hour	032Dh	0~23			R/W	
Minute	032Eh	0~59			R/W	
Second	032Fh	0~59			R/W	

Alarm Parameter Register Setting — Function 03 Read; Function 16 Presetting

Name	Address	Range	Explain	Initial	Write/Read	Note
	0330h	0~8	9 condition inequalities enable Registers Bit0~8 corresponding to 1st~9th inequality		R/W	
	0331h	0~255	Time limit Register		R/W	
	0332h		Register associated DO1 with inequalities, Associated DO1 Bit0~8 corresponding to 1st~9th inequality **1:** Yes **0:** No		R/W	
	0333h		Register associated DO2 with inequalities, Associated DO2 Bit0~8 corresponding to 1st~9th inequality **1:** Yes **0:** No		R/W	
	0334h	0~34	Register associated 1st inequality with one of the 34 variables. Please refer to the table of Parameter		R/W	
	0335h	0~1	Relation symbol selecting register, INEQU_sign1 **0:<** Low limit **1:>** High limit		R/W	
	0336h	Related with variable	Limit value for 1st inequality, Ref1		R/W	
	0337h	0~34	Register associated 2nd inequality with one of the 34 variables. Please refer to the table of Parameter		R/W	
	0338h	0~1	Relation symbol selecting register, INEQU_sign2 **0:<** Low limit **1:>** High limit		R/W	

Name	Address	Range	Explain	Initial	Write/Read	Note
	0339h	Related with variable	Limit value for 2nd inequality, Ref2		R/W	
	033Ah	0~34	Register associated 3rd inequality with one of the 34 variables. Please refer to the table of Parameter		R/W	
	033Bh	0~1	Relation symbol selecting register, INEQU_sign3 **0:<** Low limit **1:>** High limit		R/W	
	033Ch	Related with variable	Limit value for 3rd inequality, Ref3		R/W	
	033Dh	0~34	Register associated 4th inequality with one of the 34 variables. Please refer to the table of Parameter		R/W	
	033Eh	0~1	Relation symbol selecting register, INEQU_sign4 0:< Low limit 1:> High limit		R/W	
	033Fh	Related with variable	Limit value for 4th inequality, Ref4		R/W	
	0340h	0~34	Register associated 5th inequality with one of the 34 variables. Please refer to the table of Parameter		R/W	
	0341h	0~1	Relation symbol selecting register, INEQU_sign5 0:< Low limit 1:> High limit		R/W	
	0342h	Related with variable	Limit value for 5th inequality, Ref5		R/W	
	0343h	0~34	Register associated 5th inequality with one of the 34 variables. Please refer to the table of Parameter		R/W	
	0344h	0~1	Relation symbol selecting register, INEQU_sign6 0:< Low limit 1:> High limit		R/W	
	0345h	Related with variable	Limit value for 6th inequality, Ref6		R/W	
	0346h	0~34	Register associated 7th inequality with one of the 34 variables. Please refer to the table of Parameter		R/W	
	0347h	0~1	Relation symbol selecting register, INEQU_sign7 0:< Low limit 1:> High limit		R/W	
	0348h	Related with variable	Limit value for 7th inequality, Ref7		R/W	
	0349h	0~34	Register associated 7th inequality with one of the 34 variables. Please refer to the table of Parameter		R/W	
	034Ah	0~1	Relation symbol selecting register, INEQU_sign8 0:< Low limit 1:> High limit		R/W	
	034Bh	Related with variable	Limit value for 8th inequality, Ref8		R/W	
	034Ch	0~34	Register associated 7th inequality with one of the 34 variables. Please refer to the table of Parameter		R/W	
	034Dh	0~1	Relation symbol selecting register, INEQU_sign9 0:< Low limit 1:> High limit		R/W	
	034Eh	Related with Parameter	Limit value for 9th inequality, Ref9		R/W	

Alarm Recording			Function 03 Read			
Name	Address	Range	Explain	Initial	Write/Read	Note
	0354h		Over limit Status of the 9 inequalities Bit0~8 corresponding to 1st ~9th inequality **0:** No **1:** Yes		R	
	0355h	0~34	Parameter Number of the 1st Alarm record		R	
	0356h	-32768~32767	Parameter Value of the 1st Alarm Record		R	
	0357h	2000~2099	Year of 1st Alarm Record		R	
	0358h	1~12	Month of 1st Alarm Record		R	
	0359h	1~31	date of 1st Alarm Record		R	
	035Ah	0~23	Hour of 1st Alarm Record		R	
	035Bh	0~59	Minute of 1st Alarm Record		R	
	035Ch	0~59	Second of 1st Alarm Record		R	
	035Dh	0~34	Parameter Number of the 2nd Alarm record		R	
	035Eh	-32768~32767	Parameter Value of the 2nd Alarm Record		R	
	035Fh	2000~2099	Year of 2nd Alarm Record		R	
	0360h	1~12	Month of 2nd Alarm Record		R	
	0361h	1~31	date of 2nd Alarm Record		R	
	0362h	0~23	Hour of 2nd Alarm Record		R	
	0363h	0~59	Minute of 2nd Alarm Record		R	
	0364h	0~59	Second of 2nd Alarm Record		R	
	0365h	0~34	Parameter Number of the 3rd Alarm record		R	
	0366h	-32768~32767	Parameter Value of the 3rd Alarm Record		R	
	0367h	2000~2099	Year of 3rd Alarm Record		R	
	0368h	1~12	Month of 3rd Alarm Record		R	
	0369h	1~31	date of 3rd Alarm Record		R	
	036Ah	0~23	Hour of 3rd Alarm Record		R	
	036Bh	0~59	Minute of 3rd Alarm Record		R	
	036Ch	0~59	Second of 3rd Alarm Record		R	
	036Dh	0~34	Parameter Number of the 4th Alarm record		R	
	036Eh	-32768~32767	Parameter Value of the 4th Alarm Record		R	
	036Fh	2000~2099	Year of 4th Alarm Record		R	
	0370h	1~12	Month of 4th Alarm Record		R	
	0371h	1~31	date of 4th Alarm Record		R	
	0372h	0~23	Hour of 4th Alarm Record		R	
	0373h	0~59	Minute of 4th Alarm Record		R	
	0374h	0~59	Second of 4th Alarm Record		R	
	0375h	0~34	Parameter Number of the 5th Alarm record		R	
	0376h	-32768~32767	Parameter Value of the 5th Alarm Record		R	
	0377h	2000~2099	Year of 5th Alarm Record		R	
	0378h	1~12	Month of 5th Alarm Record		R	
	0379h	1~31	date of 5th Alarm Record		R	
	037Ah	0~23	Hour of 5th Alarm Record		R	
	037Bh	0~59	Minute of 5th Alarm Record		R	
	037Ch	0~59	Second of 5th Alarm Record		R	
	037Dh	0~34	Parameter Number of the 6th Alarm record		R	
	037Eh	-32768~32767	Parameter Value of the 6th Alarm Record		R	
	037Fh	2000~2099	Year of 6th Alarm Record		R	
	0380h	1~12	Month of 6th Alarm Record		R	
	0381h	1~31	date of 6th Alarm Record		R	
	0382h	0~23	Hour of 6th Alarm Record		R	
	0383h	0~59	Minute of 6th Alarm Record		R	
	0384h	0~59	Second of 6th Alarm Record		R	
	0385h	0~34	Parameter Number of the 7th Alarm record		R	
	0386h	-32768~32767	Parameter Value of the 7th Alarm Record		R	
	0387h	2000~2099	Year of 7th Alarm Record		R	
	0388h	1~12	Month of 7th Alarm Record		R	
	0389h	1~31	date of 7th Alarm Record		R	
	038Ah	0~23	Hour of 7th Alarm Record		R	
	038Bh	0~59	Minute of 7th Alarm Record		R	
	038Ch	0~59	Second of 7th Alarm Record		R	

Name	Address	Range	Explain	Initial	Write/Read	Note
	038Dh	0~34	Parameter Number of the 8th Alarm record		R	
	038Eh	-32768~32767	Parameter Value of the 8th Alarm Record		R	
	038Fh	2000~2099	Year of 8th Alarm Record		R	
	0390h	1~12	Month of 8th Alarm Record		R	
	0391h	1~31	date of 8th Alarm Record		R	
	0392h	0~23	Hour of 8th Alarm Record		R	
	0393h	0~59	Minute of 8th Alarm Record		R	
	0394h	0~59	Second of 8th Alarm Record		R	
Name	Address	Range	Explain	Initial	Write/Read	Note
	0395h	0~34	Parameter Number of the 9th Alarm record		R	
	0396h	-32768~32767	Parameter Value of the 9th Alarm Record		R	
	0397h	2000~2099	Year of 9th Alarm Record		R	
	0398h	1~12	Month of 9th Alarm Record		R	
	0399h	1~31	date of 9th Alarm Record		R	
	039Ah	0~23	Hour of 9th Alarm Record		R	
	039Bh	0~59	Minute of 9th Alarm Record		R	
	039Ch	0~59	Second of 9th Alarm Record		R	
					R	
Phase angle recording			**Function 03 Read**			
The phase differences between voltage or Current and U_1(or U_{12})are recorded, The phase differences are used to tell the phase sequence						

Name	Address	Range	Explain	Initial	Write/Read	Note
	039Dh	0~3600	Phase difference V_1/V_2 (3P4W), Phase angle $\theta_{V1\_V2\_r}$(the numerical value in register) **The real physical value is** **Phase angle $\theta_{V1\_V2}=\theta_{V1\_V2\_r}$ / 10 (Degree)**		R	
	039Eh	0~3600	Phase difference V_1/V_3(3P4W), Phase angle $\theta_{V1\_V3\_r}$(the numerical value in register) **The real physical value is** **Phase angle $\theta_{V1\_V3}=\theta_{V1\_V3\_r}$ / 10 (Degree)**		R	
	039Fh	0~3600	Phase difference V_1/I_1 (3P4W), Phase angle $\theta_{V1\_I1\_r}$(the numerical value in register) **The real physical value is** **Phase angle $\theta_{V1\_I1}=\theta_{V1\_I1\_r}$ / 10 (Degree)**		R	
	03A0h	0~3600	Phase difference V_1/I_2(3P4W), Phase angle $\theta_{V1\_I2\_r}$(the numerical value in register) **The real physical value is** **Phase angle $\theta_{V1\_I1}=\theta_{V1\_I1\_r}$ / 10 (Degree)**		R	
	03A1h	0~3600	Phase difference V_1/I_3(3P4W), Phase angle $\theta_{V1\_I3\_r}$(the numerical value in register) **The real physical value is** **Phase angle $\theta_{V1\_I3}=\theta_{V1\_I3\_r}$ / 10 (Degree)**		R	
	03A2h	0~3600	Phase difference V_{12}/V_{23}(3P3W) , Phase angle $\theta_{V12\_V23\_r}$(the numerical value in register) **The real physical value is** **Phase angle $\theta_{V12\_V23}=\theta_{V12\_V23\_r}$ / 10 (Degree)**		R	
	03A3h	0~3600	Phase difference V_{12}/I_1 (3P3W) , Phase angle $\theta_{V12\_I1\_r}$(the numerical value in register) **The real physical value is** **Phase angle $\theta_{V12\_I1}=\theta_{V12\_I1\_r}$ / 10 (Degree)**		R	
	03A4h	0~3600	Phase difference V_{12}/I_3(3P3W) , Phase angle $\theta_{V12\_I3\_r}$(the numerical value in register) **The real physical value is** **Phase angle $\theta_{V12\_I3}=\theta_{V12\_I3\_r}$ / 10 (Degree)**		R	