

PD194Z Series Liquid Crystal

Multi-functional Network Power Instruments

User' s Manual

The manual is applied to the products of the following models

PD194Z-2SY/2SYD/2SY+

PD194Z-9SY/9SY+

JIANG SU SFERE ELECTRIC CO., LTD

Thank you for choosing PD194Z Series liquid crystal Multi-functional Network Power Instruments which have been researched and developed by Jiangsu Sfer Electric Co., Ltd. In order to ensure you to be convenient to purchase and use the meter safely, correctly and efficiently, please read this instruction carefully before using it, and make sure of paying attention to several points as follows:

CAUTION:

- ◆ **The instrument shall be installed, inspected and repaired by the professionals;**
- ◆ **Before performing external or internal operation of the instrument, make sure the input signal and power supply is switched off.**
- ◆ **The proper voltage detect device shall always be used to determine there is no voltage in every part of meter.**
- ◆ **The electrical parameter auxiliarily supplied to the meter shall be within the rated range.**

The following conditions may result in damage to the device or abnormal operation to the device

- ◆ **Whether the voltage of auxiliary power supply goes beyond the range;**
- ◆ **Whether the frequency of power distribution system goes beyond the range;**
- ◆ **Whether the input polarity of current & voltage is not correct;**
- ◆ **Whether to remove the communication plug with electricity;**
- ◆ **Whether to connect terminal wires, not according to the requirement.**



Please don't touch the terminals when the meter is in operation!

The latest edition of the manual can be downloaded from the website of company and the related test software can be downloaded as well. If you need paper manual, apply to the technical department of our company.

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1. Synopsis

1.1 Quoted Standards

Quoted National Standards

GB/T 17883-1999 Class 0.2S and Class 0.5S Static Alternating-current Active Energy Meter

GB/T 17882-1999 Class 2 and Class 3 Static Alternating-current Reactive Energy Meter

GB/T 15284-2002 Special Requirements for Multi-rate Electric Meter

DL/T 614-1997 Multifunctional Electric Energy Meter

GB/T13850-1998 Electrical Measuring Transducer for AC Electric Quantity Converting to Analog or Digital Signal

Relevant International Standards

IEC 62053-22:2003 Electricity Metering Equipment (A.C.) - Particular Requirements-Part 22: Static Meters for Active Energy (Classes 0.2 S and 0.5 S)

IEC 62053-23:2003 Electricity Metering Equipment (A.C.) - Particular Requirements -Part 23: Static Meters for Reactive Energy (Classes 2 and 3)

IEC 61010-1:2001: Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use-Part 1: General Requirements

IEC 61000-2-11 Electromagnetic Compatibility (EMC) Part 2-11

IEC 60068-2-30 Environmental testing-Part 2-30

1.2 Product Summary

PD194Z series liquid crystal multi-functional network power instruments are designed for the demands of intelligent power monitoring and electric energy metering for the power system, industrial and mining enterprises, public facilities and intelligent building. They can measure all the general power parameters in three-phase electric network with high accuracy such as three-phase voltage, three-phase current, active power, reactive power, apparent power, frequency, power factor, four-quadrant electric energy, multi-rate electric energy and UIPQ demand, monitor direct current input and switch input as well as have such functions as communication interfaces, analog

output, relay output, electric energy pulse output and event record etc.

The series of products have many optional input and output modes with many kinds of expansion functions: Two-way communication interface, four-way analog output, four-way relay output, local or long-distance switch signal monitoring and control output functions (“remote communication” and “remote control”), ten-way switch monitoring, two-way analog input measurement, two-way electric energy pulse output multi-rate energy statistics and event record function.

PD194Z Series liquid crystal Multi-functional Network Power Instruments have extremely high cost performance; can directly replace conventional power transducers, measuring indicator instruments, electric energy metering instruments and relevant auxiliary unit. As a kind of advanced intelligent digital front-end collection elements of power network, they are widely used in all different kinds of control systems, SCADA system and energy management system as well as in substation automation system, distribution network automation, power monitoring for residential quarter, industrial automation, intelligent buildings, intelligent distributor and switchboard with the characteristics of convenient installation, simple connection, easy maintenance, light workload, programmable to set and input parameters and complete the networking of communication software for different industry PLC industrial control computer.

2. Selection for Users

Products of the same series with “+” is enhanced (most complete function); the one with “D” is optional and with nothing is referential type.

Product function		Model			PD194Z-2S□		PD194Z-9S□	
		2SY	2S Y+	2SYD	9SY	9SY+		
Real-time Measurement	Three-phase Voltage	•	•	•	•	•		
	Three-phase Current	•	•	•	•	•		
	Power	•	•	•	•	•		

	Frequency					
Electric Energy Metering	Active Electric Energy	●	●	●	●	●
	Reactive Electric Energy	●	●	●	●	●
	Bi-directional Metering	●	●	●	●	●
Multi-rate	2 sets of 12 time periods and 4 kinds of rates	●	●	●	●	●
Demand	U I P Q Slip	●	●	●	●	●
Electric Energy Pulse	Passive Dry Node	2	2	2	2	2
Transmission Output	4-20mA/0-5V	2	4	4	2	2
Switch Input	Passive Dry Node	4	10		6	6
Relay Output	AC250V5A Remote/ Alarm	2	4		2	2
Communication	RS485 Interface MODBUS-RTU	1	2	1	1	2
Measurement	0-20mA		2	2		
Display Mode		192*128 Chinese and English Menu			128*128 Chinese and English Menu	

Note: 1) With ●, it embodies such function

2) With 10, it embodies such function and the channel number is 10;

The functions of products above is the ones selected and matched by the company; if customers have special requirements, they can be resolved by consultation with the Marketing Department of our company.

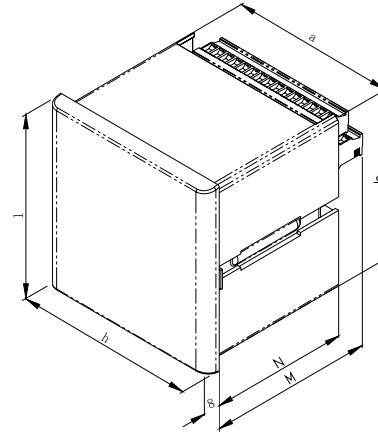
3. Technical Parameters

		Parameters	
Signal Input	Wiring		Y34 three-phase four wires/ V33 three-phase three wiresV33
	Voltage	Measuring Range	380V / 100V
		Over load	Continuous:1.2 times and instantaneous: 2 times
		Power Consumption	< 1VA
	Current	Measuring Range	5A / 1A
		Overload	Continuous:1.2 times and instantaneous: 2 times
		Power Consumption	< 1VA
	Frequency		40~65 Hz
	Power Supply		AC/DC 80~270V < 5VA
Electric Energy Pulse		Passive optical coupler collector output Fixed pulse width 80mS±20%	
Communication		RS485 communication interface, physical layer isolation Comply with MODBUS-RTU protocol Communication speed 1200~19200 Checkout mode N81, E81 and O81	
Transmission Output		0/4~20mA or 0~5/10V transmission output	

	can be programmed to set transmission item and corresponding output value
Relay Output	Can be converted into remote control/ alarm relay output Capacity 5A/250VAC 5A/30VDC Can program alarm electric quantity, switch input, analog input or remote control mode
Telemetry Switch	Measurement of telemetry switch input and passive dry contact node input Programmable correlated alarm output
DC Input Measurement	0/4~20mA direct current measurement Programmable alarm output
Measurement Grade	Electric quantity: 0.5S Frequency: ±0.1Hz Active Electric Energy: 0.5S Reactive Electric Energy: 1S Analog input: 0.5S
Display Mode	Liquid crystal display: 192*128 or 128*128 Chinese and English large-screen LCD display, LED backlight
Environment	Operating temperature: -10-55°C Storage temperature: -20-75°C
Safety	Insulation: signal, power supply, output terminal resistance to case > 5MΩ Withstand voltage: signal input, power supply and output gas > AC2KV
Outline	Dimension: 2S□:120*120*106mm 9S□:96*96*95mm Weight:2S□:0.6KG 9S□:0.5KG

4. Installation and Wiring

4.1 Dimension of Meter

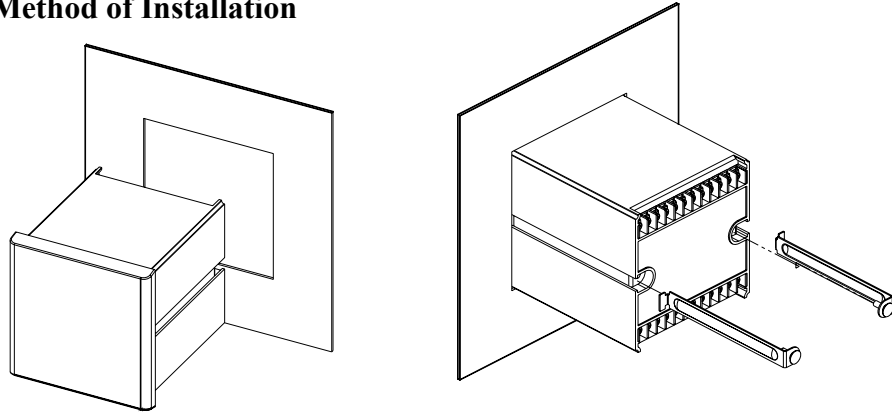


Installation Dimension: $a \times b$
Cutout Dimension: $s \times y$
Panel Dimension: $1 \times h$ (unit: mm)

Code of outline	Model of Meter	Outline Dimension Unit (mm) (1×h)	Matched Size of Screen installation (a×b) Unit (mm)	Cutout Dimension (s×y) Unit (mm)	Min Installation Distance		Total Length (M) (mm)
					Horizontal (mm)	Vertical (mm)	
42	2S□	120×120	110×110	111×111	120	120	104
96	9S□	96×96	90×90	91×91	96	96	114

eg. The outline dimension code of PD194Z-2SY+ is 2 with the outline dimension 120×120 mm

4.2 Method of Installation



Front View

Back View

- 1) On top of the fixed distribution box, open a $s \times y$ (mm) hole.
- 2) Take out the meter, screw off it and take off its fixed bracket.
- 3) Insert the meter into the installation hole at the front.
- 4) Insert the clamp, tighten the screw and fix the meter.

4.3 Description of Wiring Terminal Functions

1) Signal and Function Terminal Numbering

PD194Z series wiring terminal adopts the unified numbering, which is shown as follows:

Power supply	1, 2	AC/DC80-270V
Current signal	4, 5, 6, 7, 8, 9	4, 6, 8 is three-phase current inlet terminal
Voltage signal	11, 12, 13, 14	Three-phase voltage input
Relay Output	15—22	4-way relay output
Transmission Output	30—34	4-way 4-20mA transmission output and 30 is common end
Electric energy pulse	47, 48, 49, 50	47 and 49 is positive terminal for passive output and connected to the positive terminal of external power
RS485 The	55, 56, 57	A+ B- G

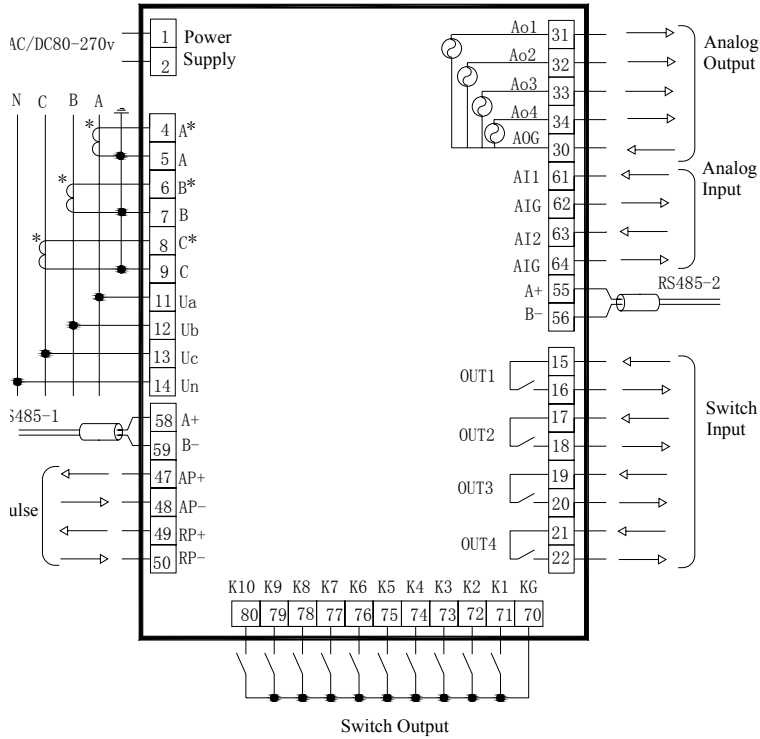
Second Channel RS485		It is respectively A+ ,B- and G
The First Channel RS485	58, 59, 60	It is respectively A+, B- and G
D.C.20mA Input	61, 62, 63, 64	61 and 63 are DC input directions, 62 and 64 are common ends
Switch Input	70—80	10-channel switch output and 70 is common end

2) Operation Instruction:

- (a) 1 and 2 are the working auxiliary power of meter; limit power voltage is AC/DC80-270V. Please make sure the power supply is applied to the series products so as to prevent the product from being damaged.
- (b) 4, 6 and 8 are the inlet terminals of current transformer; the one marked with * means inlet terminal of current.
- (c) Three-phase and three-wire connection method: B phase current doesn't need to be connected in three-phase and three-wire network. UB is connected to No.14 terminal. Please see 4.4 wiring for the detailed connection.
- (d) As for the detailed use of wiring terminal, please conduct connection according to the wiring diagram on the enclosure of the specific product.

4.4 Wiring

(1) Typical Wiring Diagram of Low Voltage Network

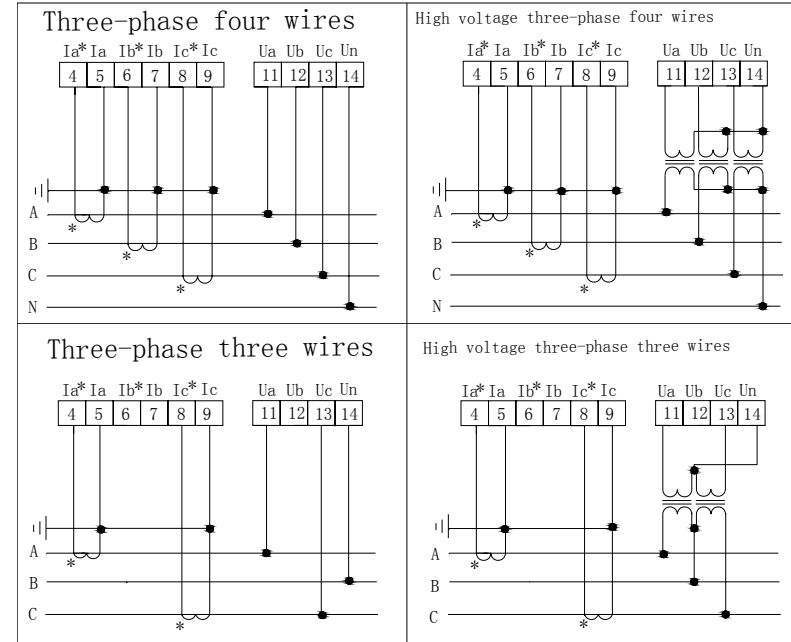


Typical Wiring Diagram of Low Voltage Network

The diagram takes PD194Z—2 SY+ for example; the wiring diagram of the other products is similar to it, but only reduces the wiring terminal and function module.

Note: The wiring terminal sequence of each product is slightly different. Please conduct connection according to the wiring diagram on the enclosure of products.

(2) Wiring Method of Input Signal



Wiring Instructions:

(a) Input Voltage: Input voltage shall not be higher than the rated voltage (100V or 400V), or PT shall be applied, and line bank is recommended to use for easy maintaining.

(b) Input Current: CT shall be applied if the input current is higher than standard rated which is 5A. The connection shall be linked in tandem type if there are other meters linked with CT, and before removing current input lines, primary circuit shall be cut off or the secondary circuit shall be short circuited. Line bank is recommended to use for easy maintenance.

(c) Make sure that input voltage corresponds with current in the same phase sequence and direction; or there will be something wrong with value and signs! (power and electric energy).

(d) Meters can work with three-phase & four-wire or three-phase & three-wire system, the user can choose relative connection according to actual

operation. Three-phase & three-wire system , which needs two CT (A & C phase) installed, is adopted if there is no center line; and three-phase & four-wire, which needs 3 CT installed (another phase current can be compounded if there are only 2 CT), is applied if there are center lines.

Note: 1. Two connection modes are available for meters, and the actual connection mode shall correspond with the setting in the meter, or the measured data is not correct.

2. Integral wiring options, pulse constant ,etc please refer to the detailed wiring diagram with products.

5. Programming

5.1 Enter & Exit Programming

(1) Enter Programming

First press “ESC”key to return to the main menu of system, select “SYSTEM” option in the main menu, and then press enter key to enter password authenticating option page. Select “user input”, press enter key to enter password authenticating page, then input correct password, press enter key again to enter programming page (the default password is 0001, use right and left key to shift optical position and amend numerical value when inputting password). **Notice: It indicates the input password is wrong or users make mistakes to choose “manufacture input” if the page reject acting by pressing enter key after inputting password.**

Take 2SY+ for example, another model: 2SY/2SYD/9SY/9SY+ similar.

INS	
ENE	PD194Z - 2SY+
MAX	ver 1.0
COIL	07-02-08 P2
HELP	14:41:53
SETS	
中文	
SFERE ELECTRIC CO. , LTD.	

↓

INS	
ENE	PD194Z - 2SY+
MAX	ver 1.0
COIL	07-02-08 P2
HELP	14:41:53
SETS	
中文	
SFERE ELECTRIC CO. , LTD.	

↓

General User	
Administrator	

↓

0001

(2) Exit Programming:

“Save all sets?” exists after pressing the key of “ESC” under the first menu of programming, and there are three selectable operations:

- (1) Save & Exit. Press the key of “Enter” to save and exit.
- (2) Remaining Programming. Pressing the key of “ESC” means remaining programming.
- (3) Exit without saving. Use up and down key to select “No”, and enter the key of “Enter” to exit without saving.

5. 2. Utilization of Keys in Programming

Keys on liquid crystal plate are composed of 6 keys. The left-right key is used for shifting the cursor when changing numerical values; the up and down keys is used for plus and minus, switching up and down menu or page turning display; “Enter” key is used for confirmation after entering menu or numerical value changing; “ESC” key is used to return the next upper menu or quitting programming operation.

Note: During programming operation, use up and down keys for choosing menu; the left and right keys is only used for shifting the position of cursor when changing numerical values.

5.3 Programming Operation

The operation of 2SY system is similar with that of 9SY series. Since the display size of 9SY is relatively smaller, there is no display for first degree menu after entering the second-degree menu, but the displayed content is the same with the relevant operation. So it takes 2SY series for example to introduce [PD194Z series](#) liquid crystal multi-functional network power instruments in this user’s manual.

1) System Setting:

SYS	CODE	0000	
SPEC	LAMP	00	
COMM	CLR	NO CLR	◀▶
COIL			
DCmA			
TIME			
AUTO			
M-Lx			

System menu can amend user’s password, adjust liquid crystal backlight brightness and clear the collected electric energy and demand record (E means clearing electric energy data; dE means clearing demand record; No means not clearing).

Note: only use up-down keys to select menu, left-right key are used to shift cursor position when amending data.

2) Signal Setting:

SYS	NET	N34	◀▶
SPEC	U	380V	
COMM	I	5A	
COIL	PT	0001	
DCmA	CT	0001	
TIME			
AUTO			
M-Lx			

Signal menu can set connection method (N34 three-phase four wires or N33 three-phase three wires), select voltage range of signal input (380V or

100V), select current range of signal input (5A or 1A); set voltage signal transformation ratio (= once scale/ twice scale) and set current signal transformation ratio (= once scale/twice scale)

3) Communication Setting

SYS	RS485-1	
SPEC	ADDR	001
COMM	BAUD	9600
COIL	DATA	N81
DCmA	RS485-2	
TIME	ADDR	002
AUTO	BAUD	9600
	DATA	N81

Signal menu can set two-way communication line, instrument address range 1~247, baud rate 200, 2400, 4800, 9600 and 19200; data format N81,E81 and O81 (they are respectively no check, even check and no check).

4) Relay Alarming Output

SYS		TYPE	VALUE
SPEC	1	COMM	0000
COMM	2	COMM	0000
COIL	3	COMM	0000
DCmA	4	COMM	0000
TIME			
AUTO			
M-Lx			

SYS		TYPE	VALUE
SPEC	1	Ua >	3800
COMM	2	COMM	0000
COIL	3	COMM	0000
DCmA	4	COMM	0000
TIME			
AUTO			
M-Lx			

1, 2, 3 and 4 means which way to output switch value. When it selects COMM type, it means turning off alarming output and changing to remote control relay output(Notice: only the type is set to be COMM , can it be remote control output). First press ENTER key to enter alarming type option (now a couple of up-down arrow mark appear), then select alarming menu through up and down keys; press enter key to quit after setting alarming type. Select magnitude option when setting magnitude, then enter magnitude option to set threshold (shift data cursor position by right-left key, realize data increasing and decreasing by up-down key) with Enter key. As the above diagram shows, when A phase voltage is over 380V, the first way switch outputs guide circuit. See 7.4 relay output list ---Alarm Item and Relevant Alarming Threshold Value Unit for details.

5) Transmission

1, 2, 3 and 4 mean which way of transmission output; for every way it can select different transmission item. As the above diagram shows, the first way is A phase voltage **0~380V**, corresponding to transmission output of **4~20mA** current signal; the second way is A phase current **0~5A**, corresponding to transmission output of **4~20mA** current signal; the third way is total active power **0~5700W** corresponding to transmission output of **4~20mA** current signal; the fourth way is total reactive power **0~5700 var** corresponding to

transmission output of 4~20mA current signal.

Note: Magnitude (full-scale value) of transmission item shall be set correctly, otherwise, the transmission will not be correct; for its data format (unit), see 7.3 Transmission Output-0/4~20 mA Transmission Output Comparison Table for details.

SYS		TYPE	VALUE
SPEC	1	Ia 0	5000
COMM	2	OFF	0000
COIL	3	OFF	0000
DCmA	4	OFF	0000
TIME			
AUTO			
M-Lx			

6) Time Setting

SYS	Real Time
SPEC	
COMM	07-08-08
COIL	15:12:31
DCmA	
TIME	
AUTO	
M-Lx	

Diagram a Selection for Time Setting

The option can set system clock, use up-down key to shift to the position of year-month-day-hour-minute-second, press enter key to confirm the amending position. Here the double arrow appears as the above Diagram a

shows, indicating the option has been in amendment state.

Press up-down key again to amend value, press enter key to confirm after amendment, which can amend other positions of year-month-day-hour-minute-second. After completing all the amendment, press ESC key to exit time setting.

7) Setting of Reading Meter

The default factory automatic meter reading time is 0 clock, 1st of every month; users can set the automatic meter reading time of every month according to their own needs (time of integral points in 1-28th of every month); its operation method and time setting method for amendment are similar.

SYS	Monthly Auto
SPEC	
COMM	01-00
COIL	
DCmA	
TIME	
AUTO	
M-Lx	

8) Select the fee statistic mode for the first/second time interval, according to the month.

SYS	Mon	Lx	Mon	Lx
SPEC	01	L1	07	L2
COMM	02	L1	08	L2
COIL	03	L1	09	L1
DCmA	04	L1	10	L1
TIME	05	L2	11	L1
AUTO	06	L2	12	L1
M-Lx				

Diagram a Selection for Charge Statistic Mode

It can select charge statistic mode of every month in monthly fee menu, as the above diagram shows, the first month adopts the first statistic mode “L1”, i.e. the statistic mode of “Fee I” and for May, June, July and August, it adopts the second statistic mode “L2”, i.e. the statistic mode of “Fee II”

L1-P	TIME	P	TIME	P
L2-P	08:00	4	00:00	1
	21:00	2	00:00	1
	00:00	1	00:00	1
	00:00	1	00:00	1
	00:00	1	00:00	1
	00:00	1	00:00	1

Diagram b Setting Time Interval Fee

Distribution of Statistic Mode

To set the statistic mode for “Fee I” or “Fee II”, it can divide a day into 12 time intervals and each time interval corresponds to “top”, “peak”, “flat” and “valley” (in 9SY system, it corresponds to “1”, “2”, “3” and “4” respectively),

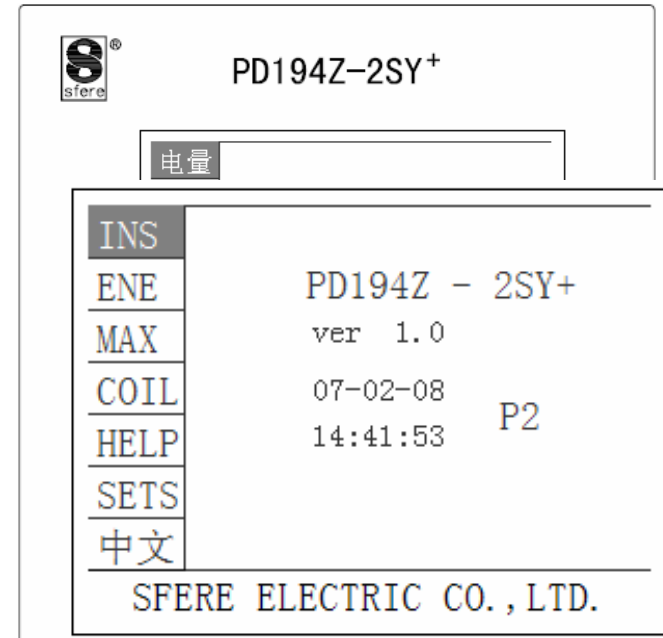
the four fee rates.

Users can adjust the time distribution of four fee rates according to the needs. As the above diagram shows, before 8 o’clock, it is the fee rate of “valley”; between 8 to 21 o’clock it is the fee rate of “peak” and from 21 o’clock to 8 o’clock of next day, it is the fee rate of “valley”. The electric energy meter can respectively statistic and display the electric energy in the four fee rates of “top”, “peak”, “flat” and “valley”(see the measurement information display of liquid crystal panel for details)

Note: When setting the time interval for statistic modes of :Fee I”(or “Fee II”), it shall set in the order from 00: 00 to 23: 59. eg. In Diagram b, the 10 time intervals after 21:00, are effective only between 21: 00 and 23: 59 (excluding 21: 00), otherwise it is considered not to use.

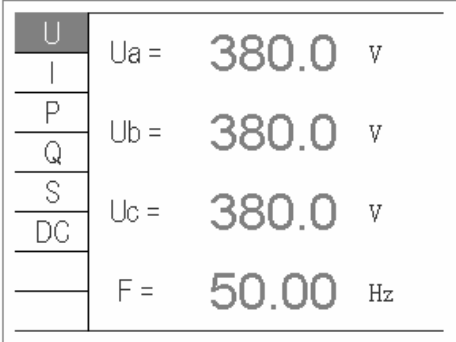
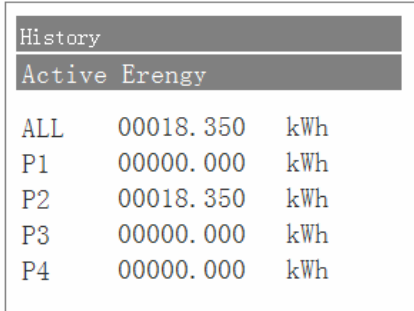
6. Panel Instruction and Measurement Information Display

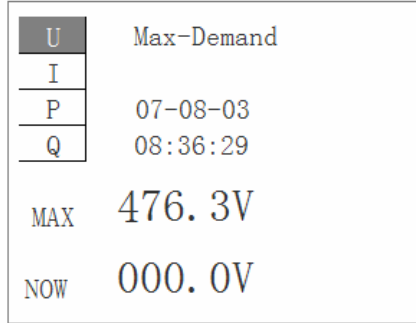
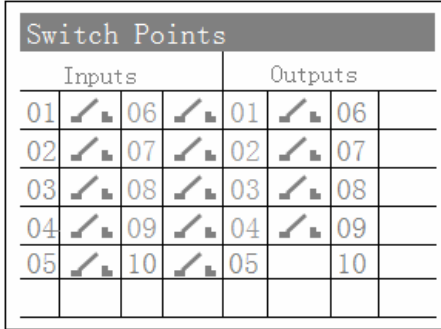
As for panel and measurement information display, it takes 2SY series liquid crystal for example; 9SY series liquid crystal display content and related operation is similar to 2SY series.

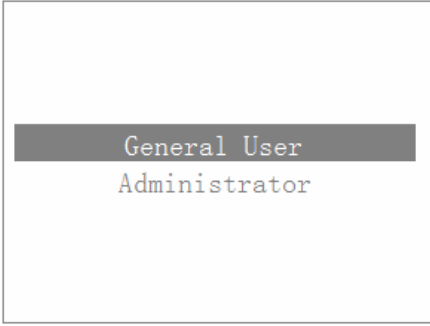

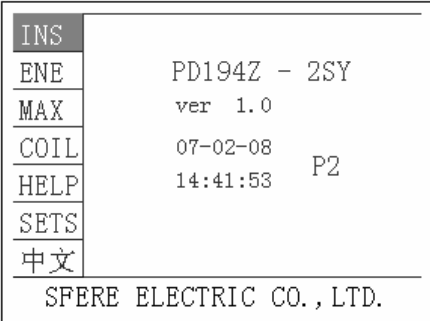


Liquid crystal interface is composed of liquid crystal display screen and six key-presses, left -right key is used for left-right shifting cursor, up-down key is used for increasing and decreasing numbers and up-down shift cursor or page turning display; **ENTER key** is used for entering menu or confirming after data amendment. **ESC key** is used for entering programming menu or returning to the next upper level menu.

Display Information of Liquid Crystal Interface

Page	Content	Specification
Electric quantity		Display voltage Ua,Ub and Uc (in three-phase and four wires) and Uab,Ubc and Uca (in three-phase and three wires) respectively, frequency, current, power factor, active and reactive power, apparent power and analog input display. Use up and down keys to display page turning.
Electric power		Display total active power, total reactive power, active power of current month , total active and reactive power of current month, active and reactive power of last month, active and reactive power of the <u>month before last month</u> as well as four-quadrant power. Use up and down keys to display page turning.

		(The statistic mode for the four fee rates of top, peak, flat and valley can be adjusted with the programming operation.
Demand		Demand records the occurrence time and concrete value of max voltage U, max current I, max active power P, and max reactive power Q. Use up-down keys to display page turning. U and I demands calculate the max value of average for the latest 15 seconds once every second; P and Q demands calculate the max value of average for the latest 15 minutes once every minute;
Switch		Respectively display switch input value and the open and closed state of switch output value. When switch turns on, its relevant switch turns off.

System		<p>Users enter system, select “user input” and press Enter key to enter user password authentication interface. Press Enter key after inputting right password then it can enter in system to do programming operation.</p> <p>(When the input password is wrong, press Enter key, the page will not act.</p>
Help		<p>It provides the customer service telephone of our company and corresponding wiring terminal instruction.</p>
Chinese and English Switch		<p>In Chinese menu, users select “EN” press Enter key, then it changes to English page; In English menu, users select “Chinese”, press Enter key, then it changes to Chinese page.</p>

7. Function Module

7.1 Communication Module

7.1.1 Physical Layer

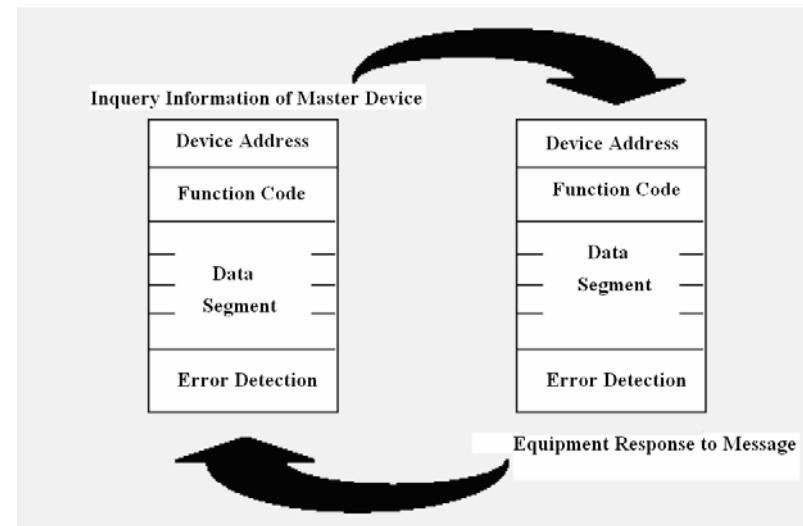
- 1) RS485 communication interface, asynchronous half-duplex mode;
- 2) Communication speed 1200~19200bps can be set; the factory default is 9600 bps;
- 3) Byte transmission format: 1 start bit, 8 data bit, 1 check bit and 2-3 stop bit (N81 E81 O81) is optional.

7.1.2 MODBUS-RTU

MODBUS protocol is that a method to connect communications uses the method of principal and subordinate response on one communication line. First, signal of main computer address to a terminal unit with the unique address (subordinate computer), then the terminal unit sends a response signal is transformed to the main computer in the opposite direction, that is: signal on one independent communication line is transformed all communication data flow along two opposite directions (semi-duplex working mode).

MODBUS protocol doesn't allow data exchange between independent terminal units but communication between main computer (PC, PLC, etc.) and terminal unit, so that al terminal units will not occupy communicate line but be limited to response to reach inquiry signal of its own computer when initialization.

Inquiry Response Periodic Chart



Host inquiry: Inquiry message frame includes equipment address code, function code, data information code and check code. The address code indicates the slave equipment needed to select; function code tells the selected slave equipment to operate what function, for example, function code 03 or 04 requires slave equipment to read register and return their contents; data information code includes additional information of function executed by slave equipment. e.g. in the reading command, the additional information of data segments includes which register is the first to read and the numbers of the register to be read; the check code is used to test the correctness of a frame information and provides a way to check whether the message contents are correct. It adopts CRC16 calibration rules.

Slave response: If the slave equipment responses normally, the address code, function code, data code and CRC16 calibration code appear in response message. The data information code includes the data collected by slave equipment such as register value or state. If there is any error, we promise no response from slave.

Means of transport refers to a series of independent data structure and limited regulation used for transporting data in a data frame, the following defines the compatible transmission mode with MODBUS protocol- RTU mode. Every byte bit: one start bit, eight data bits, (even -odd check bit), one stop bit (if even -odd check bit exists) or two stop bits (if no parity check bit).

Data frame structure: i.e. message format.

Address code	Function code	Data code	Calibration code
One BYTE	One BYTE	N BYTES	Two BYTES

Address code: It's the beginning section of frame, composed of one byte (8 bit binary code), decimal system is 0~255, but in our system 1~247 is used only with other addresses remained. These bits indicate the terminal equipment address designated by the user; the equipment will receive the host data which has been connected with it. Address of each terminal unit must be unique, and the terminal only which is addressed will respond to the inquiry to this address.

When the terminal sends back a response, the subordinate machine address data which is in response will tell the main machine which terminal is communicating with it.

Function code: shows which function the terminal which is addressed carries out. The following table lists function codes and their definitions and functions that PD194Z-2SY series meters support.

Code	Meaning
01	Read the relay output state
02	Read telemetry switch input state
03	Read data register value
05	Remote single relay operation
0F	Remote multi-relay operation

Data Code includes the required data for the terminal to carry out the specific functions or the collected data when the terminal responds to the inquiry. The contents of these data may be the value, reference address or set value. For example: the function code tells the terminal to read a register, data field need to indicate that start from which register and read how much data, while the loop back content of slave data code includes data length and corresponding data.

Calibration Code The error check field occupies two bytes, which includes a 16-bit binary value. CRC value will be calculated by the transmission equipment and then added to the data frame, besides, the receiving equipment will recalculate CRC value when receiving the data and then compare the value with the received value in CRC field; if the two values are not equal, it shows that there is error.

The process of forming a CRC:

- (1) Preset a 16-bit register as OFFFHH (full 1) and call it as CRC register.
- (2) Make the nonequivalence operation between the 8-bit of the first byte in the data frame with the low byte in CRC register, and store the results into CRC register.

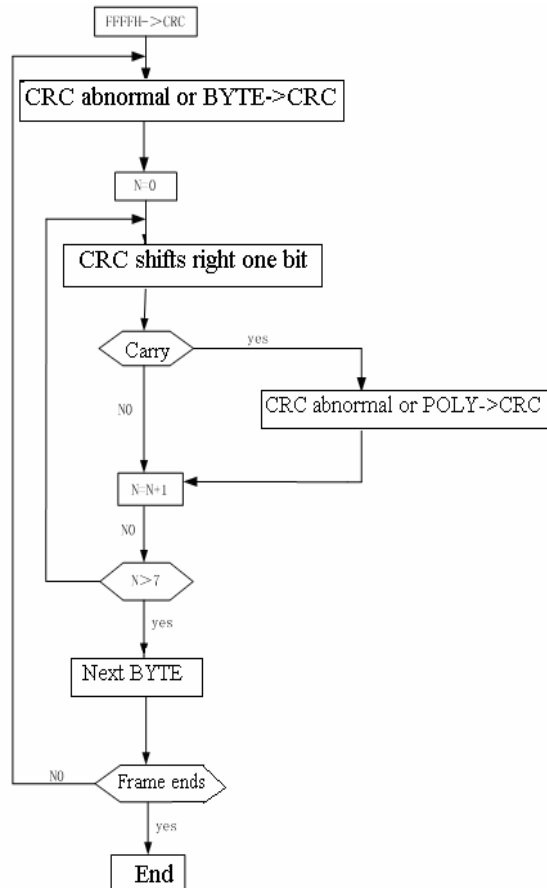
(3) Move CRC register rightward for one bit, and fill in the highest bit with 0, while the lowest bit shall be moved out and detected.

(4) If the lowest-order bit is 0: repeat the third step (the next displacement); if the lowest-order bit is 1: make the nonequivalence operation between CRC register and a preset fixed value (0A001H).

(5) Repeat the third step and the fourth step until there are eight times of displacement, thus it handles a complete eight-bit.

(6) Repeat the second step and handle the next eight-bit in the fifth step until all the treatments for bytes are completed.

(7) The CRC value is the final value of CRC register.



7.1.3 Message Command Format

Reading the command of relay output state 0x01

Host request			Slave Response		
Slave address	1Byte	1~247	Slave address	1Byte	
Function code	1Byte	0x01	Function code	1Byte	
Initial relay address	2Bytes	0x0000(fixed)	Register byte	1Byte	
Number of relay	2Bytes	0x0004(max)	Register value	N Bytes	
CRC Check code	2Bytes		CR Check code	2Bytes	

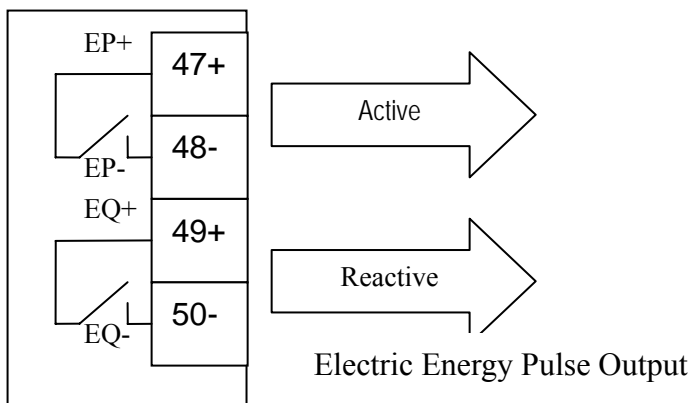
Telemetry switch input state command 0x02

Host Request Command			Slave Response		
Slave address	1Byte	1~247	Slave address	1Byte	
Function code	1Byte	0x02	Function code	1Byte	
Initial switch address	2Bytes	0x0000(fixed)	Register byte	1Byte	
Telemetry switch number	2Bytes	0x000C(max)	Register value	N Bytes	
CRC Check code	2Bytes		CRC Check code	2Bytes	

Read data register command 0x03/0x04

Host request command			Slave response		
Slave address	1Byte	1~247	Slave address	1Byte	
Function code	1Byte	0x03/0x04	Function code	1Byte	
Initial	2Bytes		Register byte	1Byte	

pulse output and the digital interface of RS485 to complete display & remote transmission of the electric energy data. Realize the active electric energy and reactive electric energy remote transmission through the electric energy pulse of the optically coupled relay of the open collector as well as adopt the remote computer terminal and the pulse sum for the collection instrument of PLC, DI switch collection module to realize the electric energy cumulative metering. Adopt the pulse output mode to inspect the precision of the electric energy (national metrological regulation: the comparative method for pulse error of the standard meter).



(a) Electrical Character: in the schematic diagram for the circuit of the pulse collection interface $VCC \leq 48V, I_z \leq 50mA$.

(b) Pulse Constant: 5000 imp/kWh (AC380V 5A range), 20000 imp/kWh (AC100V 5A or AC380V 1A measuring range) ; 80000 imp/kWh (AC100V 1A measuring range) .The meaning is: when the meter cumulates 1kWh, the number of the output pulse is N (5000,20000 and 80000) . It must be emphasized that 1kWh is the secondary measured data of electric energy.

Under the condition of PT and CT, the relevant N pulse data corresponding to primary measured electric energy is $1kWh \times \text{voltage transformation ratio PT} \times \text{current transformation ratio CT}$.

(c) Application example: the pulse counting device is used for PLC terminal. Suppose during the period with the length of t, the number of collected pulse is N; the input of meter is: 10kV/100V 400A/5A, thus the electric energy

accumulation of meter during the time period is: $N/20000 \times 100 \times 80$ degrees electric energy.

7. 3 Transmitting Output

PD194Z-2SY series liquid crystal multi-function network electrical meter has analogue data transmitting function; transmitting item and range can be set freely, refer to transmitting output check list for transmitting items in detail.

Note: The setting format of transmission range is secondary power network integral data, refer to the following table---the scale unit of 0/4~20mA in Transmission Output Comparison Table and can also refer to the secondary power network data format in Communication Address Information Table.

Electrical Parameter: Output 0/4~20mA, 0/1~5V and 0/2~10V

Accuracy Degree: 0.5 S

Overload: 120% effective output, max current 24mA, max voltage 12V.

Load: $R_{max} = 400\Omega$

Transmitting Item: phase voltage, line voltage, phase current, phase active power, total active power, phase reactive power, total reactive power, three-phase power, total apparent power, power factor, frequency, bilateral active and reactive power, etc.

The customer can give the transmitting item and range in detail while ordering, and it will be set relevant technical parameters according to the requirements before delivery; transmitting item and range can also be modified by the customer after delivery according to the actual operation, but electrical parameters can not be modified:

0/4~20mA, 0/1~5V and 0/2~10V.

0/4~20mA Comparison Table for Transmitting Output

Transformation Item Value	Transformation Item In digital display screen, Suffix H or L are used for distinguishing transmitting	Transmitting Output			
		0~ 20mA	4~ 20mA	0~ 10~	4~ 12~

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	output)			20mA	20mA
1	Ua (A Phase Voltage)	H	●		
2	Scale Value Unit 0.1V	L	●		
3	Ub (B Phase Voltage)	H	●		
4	Scale Value Unit 0.1V	L	●		
5	Uc (C Phase Voltage)	H	●		
6	Scale Value Unit 0.1V	L	●		
7	Uab (AB Line Voltage)	H	●		
8	Scale Value Unit 0.1V	L	●		
9	Ubc (BC Line Voltage)	H	●		
10	Scale Value Unit 0.1V	L	●		
11	Uca (CA Line Voltage)	H	●		
12	Scale Value Unit 0.1V	L	●		
13	Ia (A Phase Current)	H	●		
14	Scale Value Unit 0.001A	L	●		
15	Ib (B Phase Current)	H	●		
16	Scale Value Unit 0.001A	L	●		
17	Ic (C Phase Current)	H	●		
18	Scale Value Unit 0.001A	L	●		
19	Pa (A Phase Active Power)	H	●		
20	Scale Value Unit w	L	●		
21	Pb (B Phase Active Power)	H	●		
22		L	●		

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	Scale Value Unit w				
23	Pc (C Phase Active Power)	H	●		
24	Scale Value Unit w	L	●		
25	Ps (Total Active Power)	H	●		
26	Scale Value Unit w	L	●		
27	Qa (A Phase Reactive Power)	H	●		
28	Scale Value Unit var	L	●		
29	Qb (B Phase Reactive Power)	H	●		
30	Scale Value Unit var	L	●		
31	Qc (C Phase Reactive Power)	H	●		
32	Scale Value Unit var	L	●		
33	Qs (Total Reactive Power)	H	●		
34	Scale Value Unit var	L	●		
35	Sa (A Phase Apparent Power)	H	●		
36	Scale Value Unit VA	L	●		
37	Sb (B Apparent Power)	H	●		
38	Scale Value Unit VA	L	●		
39	Sc (C Phase Apparent Power)	H	●		
40	Scale Value Unit VA	L	●		
41	Ss (Total Apparent Power)	H	●		
42	Scale Value Unit VA	L	●		

43	PF(Power Factor)	H		●		
44	Scale Value Unit 0.001	L	●			
45	Fr (Frequency)	H		●		
46	Scale Value Unit 0.01Hz	L	●			
47	A1 (DC Input)	H		●		
48	Scale Value Unit 0.01mA	L	●			
49	A2 (DC Input)	H		●		
50	Scale Value Unit 0.01mA	L	●			
51	-P (Bi-directional active Power)	H				●
52	Scale Value Unit w	L			●	
53	-Q (Bi-directional Reactive Power)	H				●
54	Scale Value Unit var	L			●	
55	-F (Bi-directional Frequency)	H				●
56	Scale Value Unit 0.01Hz	L			●	
57	-PF (Bi-directional Power Factor)	H				●
58	Scale Value Unit 0.001	L			●	
59	-LC (Bi-directional Angle)	H				●
60	Full Scale Value 0 or 500	L			●	

Relevant instruction:

(a) “-F+” which is frequency bilateral transmitting, indicates transmitting frequency range is $50 \pm x$ Hz, and its corresponding transmitting output is 0~

10~20mA(or 4~12~20mA). For example, setting full-scale valve value as 6000 means transmitting frequency range is 40.00~50.00~60.00Hz) and corresponds with transmitting output 0~10~20mA(or 4~12~20mA).

(b) -P+ (-Q+) is bilateral transmitting of active (reactive) power, which is selectable from:0~10~20 mA (or 4~12~20mA) . Take meter whose input sign is 380V 5A with three-phase & four-wire for example, set the value of power full-scale as 5700w. And its transmitting correspondence is as follows: -5700W~0W~+5700W transmits into 0~10~20 mA (or 4~12~20mA)

(c) “-PF L” (or“-PF H”) is Bi-directional Power Factor transmit, Full Scale Value is 1000, its figure power factor -1~0~+1 and corresponds with transmitting output 0~10~20mA(or 4~12~20mA).

(d) “LC L” (or “LC H”) Bi-directional Angle, when Full Scale Value is 0, its figure angle -90~0~+90 and corresponds with transmitting output 0~10~20mA (or 4~12~20mA) ; when Full Scale Value is 500, its figure angle -60~0~+60 and corresponds with transmitting output 0~10~20mA (or 4~12~20mA).

(e) 0/1~5V Transmitting Output: The specific programming are the same except changing 0~20mA、4~20mA、0~10~20mA、4~10~20mA above into 0~5 V、1-5V、0~2.5~5 V、1~3~5 V.

(f) 0/2~10V Transmitting Output: The specific programming are the same except changing 0~20mA、4~20mA、0~10~20mA、4~10~20mA above into 0~10V、2-10V、0~5~10V、2~6~10V

7. 4 Relay Output

Relay Capacity: 5A 250VAC/5A 30VDC

The customer can contact with Marketing Department for customization if special specification are needed.

There are two operational modes of relay output module: electrical alarming and communication remote control, each relay can set operation mode, alarming item and alarming range freely by programming. Refer to the following tables for relay setting.

Refer to the following tables for relay output setting.

Alarm Item and Relevant Alarm Threshold Unit

Alarm Item` (Alarm item is followed with “>”, meaning high alarm output; if followed with “<”, it means low alarm output)	Relevant Alarm Threshold Unit
OFF (Close Alarm Function with Only Remote Control)	None
Ua (A Phase Voltage)	0.1 V
Ub (B Phase Voltage)	
Uc (C Phase Voltage)	
Uab (AB Wire Voltage)	
Ubc (BC Wire Voltage)	
Uca (CA Wire Voltage)	
Ia (A Phase Current)	0.001A
Ib (B Phase Current)	
Ic (C Phase Current)	
Pa (A Phase Active Power)	W
Pb (B Phase Active Power)	
Pc (C Phase Active Power)	
Ps (Total Active Power)	
Qa (A Phase Reactive Power)	Var
Qb (B Phase Reactive Power)	
Qc (C Phase Reactive Power)	
Qs (Total Reactive Power)	
Sa (A Phase Apparent Power)	VA
Sb (B Phase Apparent Power)	
Sc (C Phase Apparent Power)	
Ss (Total Apparent Power)	
Cos(Power Factor)	Fixed format 1 .000
Fr (Frequency)	0.01HZ
AI1 (1 Direct current measurement 1)	0.01mA
AI2 (2 Direct current measurement 2)	

d1-1(when Din1 openly-insert guide circuit, relay outputs guide circuit without alarm value)	Users can neglect the alarm value of the third level menu and press “enter” key directly.
d1-0(when Din1 open-inserting turns off, the relay outputs guide circuit without alarm value)	
Other opening-inserting alarm is similar	Users can neglect the alarm value of the third level menu and press “enter” key directly.

7. 5 DC Input Measurement Cautions

(a) High-low Alarm

Low alarming indicates that relay output channel turns on while it is lower than the alarming valve value of alarming item; high alarming indicates that relay output channel turns on while it is higher than that.

(b) Switching Value Monitoring Alarming

It is not necessary to set alarming valve value if switching input is adopted as alarming output, alarming item di-1 (i is the monitored switching value input channel, for example, d3-1 means the switching of the third channel turns on) indicates that there will be relay alarming output while the switching of this channel turns on; it means there will be relay output alarming while the switching of this channel turns off if di-0 is selected.

(c) Remote Control Relay

Shut down alarming when remote control relay outputs.i.e. Set relay output to be “COMM” through programming.

7. 6 Telemetry Switching Input

Switching value input module applies switching signal of dry node resistance, no external power sources is needed because of +15V working power supply equipped inside. Telemetry switching input module is applied to monitor error alarm node, off-on status, handcart position, capacitance compensation and input, which can spread to intelligent monitoring system through

communication interface, and realizes automatic off-on valve with the relay function of remote control/alarming .

The monitoring status of switching value input can be set to be the condition for relay output to realize the function of locking and interlock.(Refer to b switching monitoring alarm in 7.4 relay output instructions for realization).

PD194Z-2SY+/2SYD has 2 circuits of 0-20mA direct current input measurement function.

Direct current input measurement transfers data through communication to measure some thermal transmitting signs; direct current input measurement can be relay alarm output to realize the functions such as thermal sign alarming, distribution box automatic heating, cooling, expelling wind and removing dampness (Refer to 5 programming operation instruction of 7.4 relay output for relay output method).

7. 7 Multi-rate Electric Energy

7.7.1 Definition of Multi-rate Electric Energy

Multi-rate electric energy metering refers to many kinds of rate electric energy metering, in order to balance the contradiction between power supply and demand in different time intervals, power supply industry sets different electricity price in different time intervals to adjust electricity consumption behaviors. To achieve multi-rate electric energy metering, it needs real-time clock inside the meter to ensure the function of rate switching for time periods switching and automatic meter reading for freezing electric energy.

All the products have multi-rate electric energy metering function, they can be set 12 time periods and 4 kinds of rate prices, and also possess two sets of time period rate metering statistic ways, they can choose corresponding time interval rate statistic ways according to the month. The meter supports the function of automatic reading the meter to freeze the monthly energy, inside the meter, there is cumulative total, top, peak, flat and valley active and reactive electric energy of the current month, last month, the month before last month.

The default automatic meter reading time is 0 0'clock sharp of 1st every month, users can re-set automatic meter reading time according to their own requirements; the minimum timing unit is hour.

When setting time interval for fee rate, the minimum time interval is 15 minutes with 4 kinds of fee rates (top, peak, flat and valley).

7.7.2 Give an example to illustrate the fee rate setting of time intervals

Time	Rate	Specification
08:00	Valley	The fee rate belongs to “valley” before 08:00
21:00	Peak	The fee rate belongs to “peak” during the last time period between 08:00-21:00
00:00	Top	unused
00:00	Top	unused
00:00	Top	unused
00:00	Top	unused

The above table is the default factory setting of the first fee rate; the fee rate is valley before 08:00 and the fee rate is peak during 08:00~21:00. It allows the fee rate setting to span 0 o'clock, so the fee rate for the rest time from 21:00~08:00 of next day belongs to valley.

7.7.3 Automatic Meter Reading

The default factory automatic meter reading time is 0 o'clock of January every month. The electric energy of current month is frozen to the electric energy of last month; the electric energy of last month is frozen to the electric energy of the month before last month; The electric energy of current month is clearing and restarts to meter electric energy. Users can modify the automatic meter reading time according to the actual usage condition and it is allowed to be hourly o'clock of 1-28th every month.

It needs to be noticed that if users miss the automatic meter reading time or the system for automatic meter reading time meets with power failure during modifying the meter time, the meter will miss the automatic meter reading operation.

7. 8 Demand Record

PD194Z-2SY/2SYD/2SY+ and PD194Z-9SY/9SY+ series of products possess of demand record function, displaying previous max demand and present

demand of voltage, current, active power and reactive power as well as record the occurred time of max demand. 1 second slip is used to calculate max average voltage and current in the latest 15s, 1 minute slip is used to calculate max average active and reactive power in the latest 15 minutes.

8. Common Problem and Troubleshooting

8.1 About Telecommunication

1) The meter has not sent data back

Reply: Make sure communication setting information of the meter such as subordinate machine address, baud rate, checking mode and so on correspond with the requirements of upper motion first; check whether the communication bus on spot is connected correctly and RS485 converter is in normal operation or not if several meters have not sent data back. Related communication bus shall also be checked if only signal or a few meters communicate abnormally. Modify subordinate machine address by exchanging that of abnormal and normal meter to exclude or confirm whether there is something wrong with the software of upper motion, or exchange installation site of abnormal & normal meter to exclude or confirm whether there is something wrong with the meter.

2) The data sent back by the meter is not correct.

Reply: The data of PD194Z series liquid crystal multi-function network electric meter opening to customers are primary power grids float type and secondary power grids int/long type. Please read the illustration about data storing address & format in communication address table carefully and make sure that transformation is carried out according to relative data format. It is suggested to download MODBUS-RTU protocol testing software MODSCAN which conforms to standard MODBUS-RTU protocol from the company's homepage, and the data of the software can be display in int/long, float and hexadecimal, which can be compared with data displayed on meters directly.

8.2 Measurements about U, I and P are not correct

Reply: First make sure that the meter has been input right voltage and current, multi-meter is used for measuring voltage and clip-on ammeter for current if necessary. Then ensure signal line is connected correctly, for example, check whether the corresponding terminal (i.e. leading-in terminal) and each phase

sequence is correct. Observe power interface display for PD194Z series of liquid crystal multi-function network power meter, its power symbol is displayed positive under normal condition and negative only when it is under reverse transmission which is caused by wrong connection of inlet-outlet lines or wrong phase sequence connection. What is more, electric quantity displayed by the meter is the value of primary power grids; it may lead to wrong electric quantity display if the ratio of voltage and current transformer does not conform with that of transformer in-service. The default voltage and current range is not allowed to modify after delivery. Connection network is available to modify according to actual connection on spot, but the connection mode set in programming shall correspond with the actual, otherwise it may lead to wrong display.

8.3 Power running is not correct.

Reply: Power accumulates on the basis of power measurement; check whether power value displayed is consistent with actual loading. As PD194Z series of liquid crystal multi-function power meter supports bilateral power measurement, power will be accumulated to reverse active power instead of forward one if lines are not connected properly or total active power is negative. The most common problem on spot is inlet and outlet line of current transformer are in reverse connection. For PD194Z series of liquid crystal multi-function power meter, it is available to observe active power in split phase with symbol, it may be negative because of wrong connection, and what is more, wrong phase sequence may lead to wrong running.

8.4 Meter does not work.

Reply: Ensure proper auxiliary supply (AC/DC80-270V) is linked to the auxiliary supply terminal, as the meter may be damage by auxiliary supply voltage beyond regulation and can not recovery. Use multi-meter to measure the voltage of auxiliary supply, and non-display on the meter if it is all right, it is possible to electrify again; if the meter can not display normally, please contact with our technical service department.

8.5 The meter does not response to any operation.

Reply: If the meter gives no response after pressing the meter key, and then

electrify again after cutting off the power, please contact with our technical service department if it can not return to normal yet.

8.6 Other abnormal phenomena

Reply: Please contact with our technical service department to give a detail description of the field condition, our technician will analyze possible causes according to the description. The company will appoint technician to deal with problems on spot as soon as possible if the problem can not be settled after oral communication.

8.7 Ordering Statement and Contact Method

When signing the contract, please declare such information as product model, input signal and wiring mode, etc. All of the series products have a default factory setting, if the customer has special requirements; please clearly declare in other items as follows:

Model: PD194Z-2SY+

Signal: 10KV/100V 1000/5A

Wiring: Y34 (Three-phase four wires) or V33 (Three-phase three wires)

Others: (factory design/special requirements the customers require)

Contact Method

Sales & Marketing Department

Tel: 0510-86199087/6/5/3/2/1/0/ 8

0510-86199988

Fax: 0510-86199081

Technical Service Department

Tel: 0510-86199066/8

Fax: 0510-86199067

The latest user's manual and testing software can be downloaded from the website of company

<http://www.jcsepi.com>

Appendix 1 MODBUS-RTU Communication Address Information Table

Address	Data	Data	Data
---------	------	------	------

HE X	DE C	Content	Form at	Len gth Word	Description
Primary Power Network Data (float Type, fully compatible of PD194E-2S4)					
0x00	0	Reservation		2	
0x02	2	Reservation		2	
0x04	4	Reservation		2	
0x06	6	Ua	float	2	Three-phase Phase Voltage Data with Unit of V
0x08	8	Ub	float	2	
0x0A	10	Uc	float	2	NOTE. It is valid only in three-phase four-wire connection way, The data is invalid in three-phase three-wire connection way.
0x0C	12	Uab	float	2	Three phase line voltage data, with unit of V
0x0E	14	Ubc	float	2	
0x10	16	Uca	float	2	
0x12	18	Ia	float	2	Three- phase Current Data, with unit of A
0x14	20	Ib	float	2	
0x16	22	Ic	float	2	
0x18	24	Pa	float	2	
0x1A	26	Pb	float	2	NOTE: Active power data marked with “+” means load electric energy and “-” means load power generation. Generally, when the wiring is improper, the active power is “-”.
0x1C	28	Pc	float	2	
0x1E	30	PΣ	float	2	
0x20	32	Qa	float	2	Splitting phase and total reactive power, with unit of kvar
0x22	34	Qb	float	2	
0x24	36	Qc	float	2	

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0x26	38	$Q\Sigma$	float	2	marked with “+” means inductive load and “-” means capacitive load.
0x28	40	$S\Sigma$	float	2	Total apparent power KVA
0x2A	42	cosQ	float	2	Power factor 0~1.000
0x2C	44	FR	float	2	Voltage frequency
0x2E	46	Ep+	float	2	Positive active electric energy with unit of kWh
0x30	48	Ep-	float	2	Reverse active power (Bi-directional metering electric energy-transmitting active electric energy)
0x32	50	Eq+	float	2	Inductive reactive power, with unit of kVarh
0x34	52	Eq-	float	2	Capacitive reactive power
Secondary Power Network Data (int/long integral data)					
0x36	54	DO	int	1	Remote relay output state Bit8~11 the 1~4 channel output state
0x37	55	DI	int	1	Switch input information Bit8~15 the 1~8 channel open-inserting state Bit0~7 the 9~16 channel open-inserting state
0x38	56	Reservation			
0x39	57	An1	int	1	2-channel analog input value with unit of 0.01mA
0x3A	58	An2	int	1	
0x3B	59	Reservation			
0x3C	60	Reservation			

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C					
0x3D	61	Ua	int	1	Three-phase Phase Voltage Data, with unit of 0.1V NOTE : It is valid only in three-phase four-wire connection way, The data is invalid in three-phase three-wire connection way.
0x3E	62	Ub	int	1	
0x3F	63	Uc	int	1	
0x40	64	Uab	int	1	Three- phase line voltage data, with unit of 0.1V
0x41	65	Ubc	int	1	
0x42	66	Uca	int	1	
0x43	67	Ia	int	1	Three- phase Current data, with unit of 0.001A
0x44	68	Ib	int	1	
0x45	69	Ic	int	1	
0x46	70	Pa	int	1	Splitting phase and total active power, with unit of W NOTE: Active power data marked with “+” means load electric energy and “-” means load power generation. Generally, when the wiring is improper, the active power is “-”。
0x47	71	Pb	int	1	
0x48	72	Pc	int	1	
0x49	73	$P\Sigma$	int	1	
0x4A	74	Qa	int	1	Splitting phase and total reactive power, with unit of Var NOTE : Reactive power data marked with “+” means inductive load and “-” means capacitive load.
0x4B	75	Qb	int	1	
0x4C	76	Qc	int	1	
0x4D	77	$Q\Sigma$	int	1	
0x4E	78	Sa	int	1	Splitting phase and total apparent power, with unit of VA
0x4F	79	Sb	int	1	

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0x50	80	Sc	int	1	
0x51	81	SΣ	int	1	
0x52	82	cosQ	int	1	Power factor 0~1000, fixed format 1.000
0x53	83	FR	int	1	Frequency, with unit of 0.01Hz
0x54	84	Ep+	long	2	Positive active electric energy ,Wh
0x56	86	Ep-	long	2	Reverse active electric energy (generated energy, generally, less than or equal 0)
0x58	88	Eq+	long	2	Inductive reactive electric energy
0x5A	90	Eq-	long	2	Capacitive reactive electric energy
0x5C	92	Umax	int	1	Max. demand of voltage ,0.1V0.1V
0x5D	93	I _{max}	int	1	Max. demand of current,0.001A
0x5E	94	P _{max}	int	1	Max. demand of active power W
0x5F	95	Q _{max}	int	1	Max. demand of reactive power ,Var
0x60	96	U _{de}	int	1	Current voltage demand
0x61	97	I _{de}	int	1	Current current demand
0x62	98	P _{de}	int	1	Current active power demand
0x63	99	Q _{de}	int	1	Current reactive power demand
0x64~67	100	TIME	char	4	Internal RTC real-time time: year-month-day-hour-minute-second (integer, ends with char, unused)
0x68~72	104	Total active power	long	10	Accumulated active electric energy of total, top, peak, flat and valley
0x73~7B	114	Total reactive power	long	10	Accumulated reactive electric energy of total, top, peak, flat and valley
0x7C	124	Current month active	long	10	The active electric energy of total, top peak, flat and valley of current

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~85		power			month
0x86~91	134	Reactive electric energy of current month	long	10	The reactive electric energy of total, top peak, flat and valley of current month
0x92~99	144	Last month active power	long	10	The active electric energy of total, top peak, flat and valley of last month
0x9D~A3	154	Last month reactive power	long	10	The reactive electric energy of total, top peak, flat and valley of last month
0xA4~AD	164	Month before last month active power	long	10	The active electric energy of total, top peak, flat and valley of the month before last month Wh
0xAE~B4	174	Month before last month reactive power	long	10	The reactive electric energy of total, top peak, flat and valley of the month before last month Wh varh
0xB8	184	USOE	char	4	Max demand occurrence time of voltage :year-month-day-hour-minute-second
0xBc	188	ISOE	char	4	Max demand occurrence time of current: year-month-day-hour-minute-second
0xC0	192	PSOE	char	4	Max demand occurrence time of active power: year-month-day-hour-minute-second
0xC4	196	QSOE	char	4	Max demand occurrence time of reactive power: year-month-day-hour-minute-second



The information in this document is subject to change without notice.

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