BJ-194Q

Multi-Function Power Analyzer

User Manual

Version：4.4

Read me

When you use BJ-194… series multi-function meter, be sure to read this user manual carefully, and be able to fully understand the implications, the correct guidance of operations in accordance with user manual, which will help you make better use of BJ-194… series multi-function meter, and help to solve the various problems at the scene.

1. Before the meter turning on the power supply, be sure that the power supply within the provisions of the instrument;

2. When installation, the current input terminal must non-open, voltage input terminals must Non-short circuit;

3. Communication terminal (RS232/RS485 or Ethernet) is strictly prohibited to impose on high pressure;

4. Be sure the instrument wiring consistent with the internal system settings;

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

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

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1. - SUMMARIZE

BJ-194Q-9SY Multi-Function Power Analyzer is a high-end multifunction power meter. It is the ideal choice for monitoring and measuring of power systems. Using dot matrix LCD screen, can more easily display more electrical parameters on the same screen.

It can measure all of the power parameters in power grid:

Current,	Energy (Active/Reactive),	Max demand,
Voltage,	Power factor	Harmonics factor,
Frequency,	Multi- tariffs ratio	Voltage crest factor,
Active power,	Current harmonics 2~63 times,	Current K-factor,
Reactive power,	Voltage harmonics 2~63 times,	Voltage drop,
Apparent power,	Voltage and current THD%,	Voltage flicker.

With optional expansion modules, it can also transmit the parameter into 2*Relay output (2DO) and 6*Switch input (6DI), 3*Analog output (3AO). For transformers, generators, capacitor banks and motors of the distributed detection, automatic control system, on-line monitoring display. BJ-194Q provide max 100 lists event logging, real-time saving DI/DO acted events, also can optional logging function for event tracing.

It can replace the traditional analog or many digital measurement instruments (such as ammeter, voltmeter, power meter, power factor meter, frequency meter, etc.) The integrated advanced electrical parameter and logging function can replace the general power recorder to perform real-time online monitoring, with the advantages of improving system reliability, making the on-site wiring convenient and reduce system cost.

With serial port, BJ-194Q can connect with PC; and use Modbus to set programming and read the data. Based on this power meters, you can simply set up a monitoring system with the IPC and central software.

APPLICATIONS

-. All power parameter measurement;

-. Energy Measurement and electrical fire monitor and control;

-. Replacing the three-phase power meter, three phase electricity transmitter;

-. Transformers, generators, capacitors and electric motors distributed detection;

-. Medium and low pressure systems;

-. SCADA, EMS, DCS integrators.

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2. - FEATURES

2.1. - Electricity Metering

By means of an internal microprocessor it simultaneously measures:

Parameter	Symbol	A-phase	B-phase	C-phase	Total
Single phase voltage	V	x	x	x	/
*Phase-phase voltage	V	x	x	x	/
Current	A	x	x	x	/
Frequency	Hz	/	/	/	x
Power factor	COSΦ	x	x	x	x
Apparent power	VA	x	x	x	x
Active power	W	x	x	x	x
Reactive power	Var	x	x	x	x
Apparent power	VA	x	x	x	x
Active energy	Wh	x	x	x	x
Reactive energy	Varh	x	x	x	x
Multi- tariffs energy record	Wh	/	/	/	x
Max demand (W / var / VA)	MAX	/	/	/	x
Voltage / frequency deviation	---	x	x	x	/
Voltage / current unbalance	---	/	/	/	x
THD & Harmonic (2~63th)	---	x	x	x	x

Note: Phase-phase voltage is Uab, Ubc, Uca, voltage data determined by the different wiring
Available: **x:** Display and communications.

The BJ-194Q delivers the visualization of parameters listed above by means of 3.0'' dot matrix LCD screen. It shown multiple electrical parameters in total 18 main screens, folded some parameter in sub-screen. Also can display the phase angle and harmonic histogram to facilitate the on-site personnel to intuitively understand the electric-grid status.

OTHER FEATURES

- Low-size (96 x 96 mm), panel-mounting meter.
- True R.M.S. measuring system.
- Instantaneous, maximum and minimum values of each measured parameter.
- Energy measurement (indication through a lighting led)
- With positive/negative energy measurement
- RS-485 or Ethernet (optional) type communication to a PC.

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2.2. - Specifications

Specification			Parameter
Input	Network		1P2W / 3P3W / 3P4W
	Voltage	Rating	AC100V, 220V, 380V (Confirmed before order)
		Overload	Continues: 1.2times, Instantaneous: 2times/10s
		Burned	<0.1VA (per-phase)
		Impedance	>1MΩ
		Precision	0.5S, RMS
	Current	Rating	AC../1A or ../5A (Confirmed before order)
		Overload	Continues: 1.2times; Instantaneous: 10times /1s
		Burned	<0.4VA (per-phase)
		Impedance	<10mΩ
		Precision	0.2S, RMS
	Frequency		40~65Hz, ±0.02Hz
	Power		0.2S
	Energy		Active energy (0.2S), Reactive energy (1.0)
	Deviation		Voltage deviation: 0.2%; Frequency deviation: 0.02%
	Unbalance		Voltage: 0.2% Current: 0.2%
	Individual Harmonic		Uh>2%: 5%Uh, Uh<=2%: 0.1%UN
	Screen		3.0 inch Dot matrix LCD (Resolution 192x160)
	SOE		Cyclic storage 20 lists I/O event and 80 lists alarm record
AUX	Working range		90V~240V AC/DC
	Burned		≤4VA
Output	Digital interface		RS-485, MODBUS-RTU
	Pulse output		2 channels energy pulse
	Alarm record		5 different alarm record
	Digital input (optional)		4*DI (Max 6*DI), dry contact
			Ri<500Ω trig, Ri>100kΩ disconnect
	Digital output (optional)		2* relay outputs (Max 4*DO)
			Relay capacity: 5A/250V AC & 5A/30V DC
	Analog output (optional)		Current 4~20mA，load<390Ω
			Voltage 0~10V，load>100kΩ
Environment	Working		-10~55℃ altitude≤2000m, 93%RH，No condensation, no corrosive gas
	Storage		-30~70℃
Safety	Insulation		Input to power >2kV; Input to output>2kV; AUX to output>2kV
	Resistance		Input, output, power supply to Shell >5MΩ

3. - INSTALLATION AND START-UP

The manual you hold in your hand contains information and warnings that the user should respect in order to guarantee a proper operation of all the instrument functions and keep it in safety conditions. The instrument must not be powered on and used until its definitive assembly is on the cabinet's door.

If the instrument is not used as manufacturer's specifications, the protection of the instrument will be damaged.

When any protection failure is suspected to exist (for example, it presents external visible damages), the instrument must be immediately powered off. In this case contact a qualified service representative.

3.1. - Installation

Mounting

Instrument is to be mounted on panel (cut-out *91+0.8 x 91+0.8 mm*). Keep all connections into the cabinet.

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

Front view

Side view

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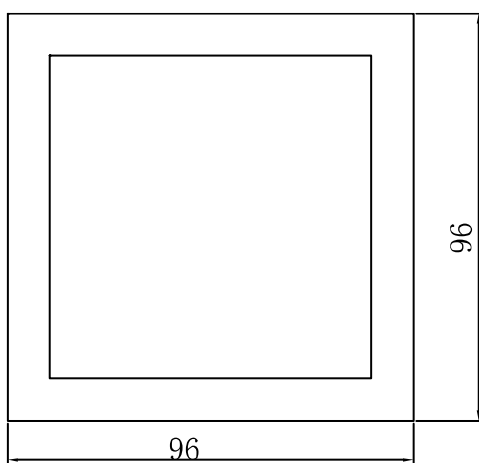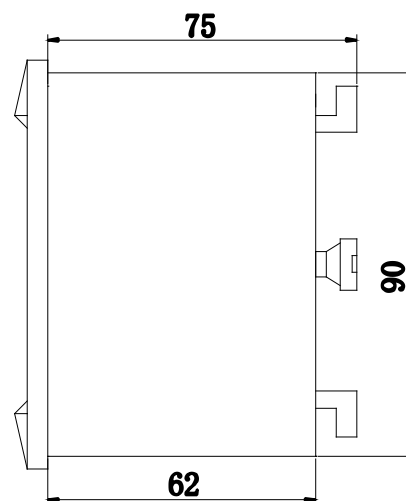
Notes:

Input signal: BJ-194… series using a separate acquisition calculate for each measurement channel, to ensure consistent in use, for different load forms, it's a variety of connection mode. Access wire shall be met: the current 2.5 square mm, voltage of 1.5 square millimeters.

Voltage input:

Input voltage should not exceed the rated input voltage products (120Vac or 450Vac),
Otherwise, you should use external CT. Suggest 1A fuse be installed in the voltage input side.

Current Input:

Standard input current is 5A, if greater than 5A should use external CT.
When the CT is connected with other instruments, make sure wiring methods be used in series.

Before remove the current input connection, must be sure to disconnect the primary circuit or shorted secondary circuit of CT. In order to facilitate disassembly, please do not connect to CT directly, and the terminal block is suggested.

Sequence of wire:

Please make sure that the input voltage and current corresponding to the same phase sequence, and the same direction; Otherwise, the Values and symbols will be wrong!! (Power and Energy)

The input network configuration of instrument depends on the CT number of the system:
in the condition of 2 CT, select the three-phase, three-lines two components;
in the condition of 3 CT, select the three-phase, four-lines three component mode.

Instrument connection mode, set of the instrument (programming input network NET) should be the same load wiring as measured wiring. Otherwise, the measurement instrument will lead to incorrect voltage or power.

In three-phase three-wire mode, the measurement and shows the line voltage;
In three-phase four-wire mode, the measurement and shows the phase voltage.

Auxiliary power:

BJ-194… series with universal (AC / DC) power input, if not for a special statement, we provide the 220VAC/DC or 110VAC/DC power interface for standard products. Instruments limit work power supply: AC / DC: 90-240V, please ensure that the auxiliary power can match with BJ-194… series meter to prevent damage to the product.

A. Suggest install 1A fuse in the fire line side.
B. For the areas with poor power quality, suggest install lightning surge suppressor and rapid burst suppressor to prevent lightning strikes.

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3.2. - Connection Terminal

Upper connection terminal

15	16	50	49	48	47	60	59	58	1	2
AO-	AO+	RP-	RP+	AP-	AP+	GUD	RS485B	RS485A	Power supply	

16. Analog output (+)
15. Analog output (–)
47. Active energy pulse output (+)
48. Active energy pulse output (-)
49. Reactive energy pulse output (+)
50. Reactive energy pulse output (-)

1. *Supply voltage input: 0 V
2. *Supply voltage input: 220 Va.c.
58. RS-485 (+)
59. RS-485 (-)
60. RS-485 (GND)

Middle connection terminal

70	71	72	73	74	75	76		19	20	21	22	23	24
COM	DI1+	DI2+	DI3+	DI4+	DI5+	DI6+		DO1		DO2		DO3	

70. Digital input COM pin
71. Route 1 digital input (+)
72. Route 2 digital input (+)
73. Route 3 digital input (+)
74. Route 4 digital input (+)
75. Route 5 digital input (+)
76. Route 6 digital input (+)

20. Route 1 digital output (+)
19. Route 1 digital output (-)
22. Route 2 digital output (+)
21. Route 2 digital output (-)
24. Route 3 digital output (+)
23. Route 3 digital output (-)

Lower connection terminal

14	13	12	11	9	8	7	6	5	4
Un	Uc	Ub	Ua	C-phase Current		B-phase Current		A-phase Current	

11. Voltage A-phase input
12. Voltage B-phase input
13. Voltage C-phase input
14. Neutral Voltage input

4. Current A-phase - S1 input
5. Current A-phase - S2 input
6. Current B-phase - S1 input
7. Current B-phase - S2 input
8. Current C-phase - S1 input
9. Current C-phase - S2 input

Note:

The terminal pin will change depends on special order requirement; please refer to the sticker on the meter!

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3.3. – Typical Connection Drawing
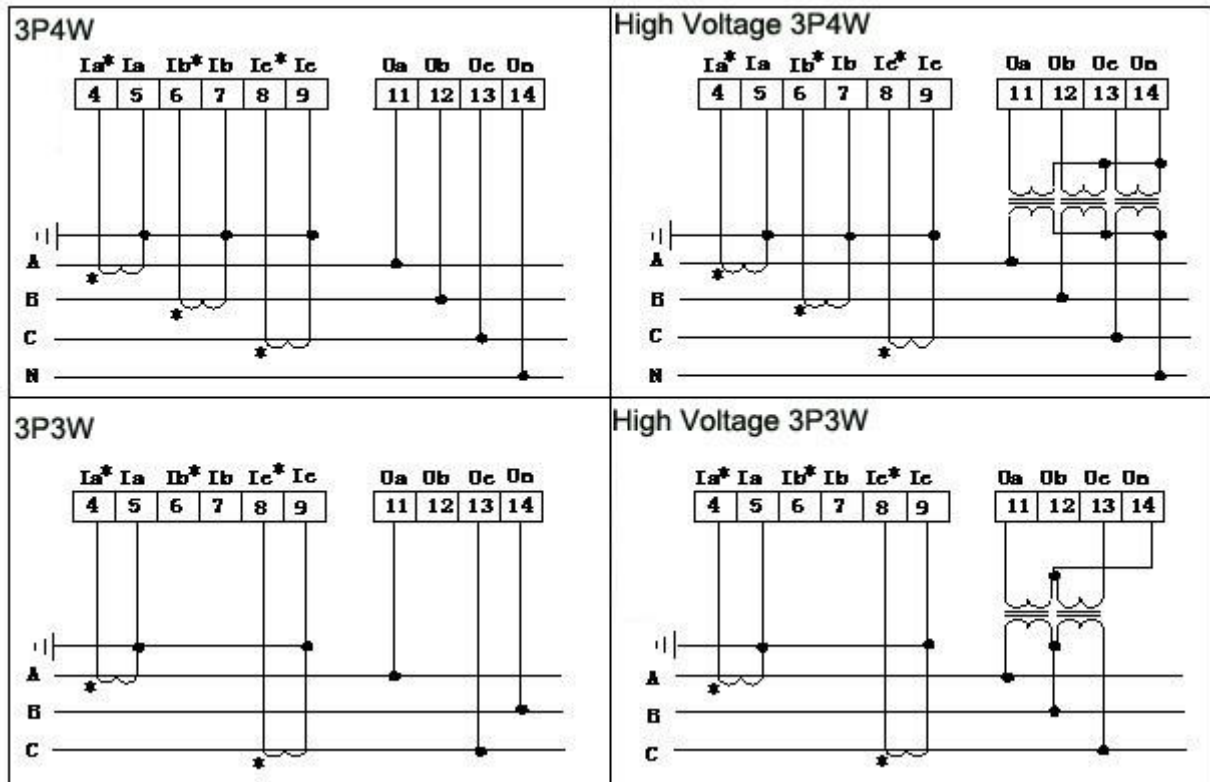
IMPORTANT REMARK!

If power = -0.01 is shown for any of the phases and voltage and current are not zero for this phase, check out following points:
- Assure that A, B and C phases coincide in voltage and current.
- Correct polarity? Reverse the current transformer placed at this phase.

Note:

This connection drawing is for reference only; the actual connecting terminal please refer to the label on the rear part.

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4. - OPERATION MODE

When the device is powered up, the entire symbol will be on, and the meter starts to self- test. After few seconds, the meter is ready for operation and shows firmware, then automatic jump to The first screen.

| ◄ |　| ► |
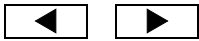
In Monitor screen & Setup sub-menu　　press key | ◄ | or | ► | , screen will move to previous or next page.

In Setup variables　　press | ◄ | can move the setting cursor to left;
configuration menu　　press | ► | can scroll selection the number 0 ~ 9.

| SET |

Press this key in monitor screen can call out the password screen;
In other screen used as Exit & roll back to up layer menu.

| ↵ |

Press this key in monitor screen can call out the firmware screen;
In Setup menu used as confirm the value entry or jump to down layer menu

In Setup menu, if changed the setting value, press | SET | for exit menu, device will call out confirm screen ask "SAVE"

Then press | SET | *exit without saving*
　　　press | ↵ | *save and exit.*

Note: In some screen the button has different operation logic, in display screen have symbol to illustrate.

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Overall of the Screen pages

P-P Voltage 01/19		
Ua	233.85	V
Ub	232.41	V
Uc	232.67	V
F	49.972	Hz
← → MENU NEXT		

P-P Current 02/19		
Ia	2.2034	A
Ib	5.6251	A
Ic	4.2897	A
F	49.972	Hz
← → MENU RTC		

Total Power 03/19		
Ps	2820.7	W
Qs	1074.7	var
Ss	3018.8	VA
PF	0.9343	
← → MENU RTC		

Split-P Power 04/19		
Pa	515.27	W
Pb	1307.3	W
Pc	998.08	W
Ps	2820.7	W
← → MENU RTC		

Split-Q Power 05/19		
Qa	213.02	var
Qb	485.23	var
Qc	377.43	var
Qs	1075.7	var
← → MENU RTC		

Split-S Power 06/19		
Sa	557.56	VA
Sb	1394.5	VA
Sc	1067.1	VA
Ss	3018.8	VA
← → MENU RTC		

Split-PF 07/19	
Pfa	0.9241
Pfb	0.9375
Pfc	0.9353
Pf	0.9343
← → MENU RTC	

Ep-Eq 08/19		
Ep+	00345.324	kWh
Ep-	00039.078	kWh
Eq+	00282.863	kvarh
Eq-	00005.411	kvarh
← → MENU RTC		

Waveform U&I 09/19 — V Pk=327, 220, Ua, -220, scale 10 20 30 ms — ← → MENU RTC

Phase Angle 10/19	
U-Angle	$\theta a:60.23$ $\theta b:281.2$ $\theta c:160.7$
I-Angle	$\theta a:000.0$ $\theta b:000.0$ $\theta c:000.0$
← → MENU RTC	

TOU Ep 11/19		
Total Ep		
E0-Z:	03518.212	kWh
E1-Z:	03027.655	kWh
E2-Z:	02290.996	kWh
E3-Z:	01673.792	kWh
← → MENU NEXT		

Max Demand 12/19		
Dynamic demand		
Ps	3012.2	W
Qs	1088.4	var
Ss	3407.8	VA
← → MENU NEXT		

U&F Deviation 13/19		
δUa	05.91	%
δUb	06.22	%
δUc	05.64	%
δF	00.47	%
← → MENU RTC		

U-Unbalance 14/19		
Uδ+	067.5	V
Uδ-	032.7	V
U₀	024.5	V
eU	04.84	%
← → MENU RTC		

I-Unbalance 15/19		
Iδ+	067.5	A
Iδ-	032.7	A
I₀	024.5	A
eI	05.52	%
← → MENU RTC		

Harmonic 16/19		
UTHD	A 001.3 % B 003.7 % C 002.5 %	
ITHD	A 001.3 % B 003.7 % C 002.5 %	
← → MENU NEXT		

Harmonic-U&I 17/19					
(%)	02	03	04	05	06
Ua	00.0	00.0	00.0	00.0	00.0
Ub	00.0	00.0	00.0	00.0	00.0
Uc	00.0	00.0	00.0	00.0	00.0
Ia	00.0	00.0	00.0	00.0	00.0
Ib	00.0	00.0	00.0	00.0	00.0
Ic	00.0	00.0	00.0	00.0	00.0
← → MENU NEXT					

Harmonic Bar 18/19 — HUa bar chart, axis 01 03 05 07 09 11 13 15 17 19 21 — ← → MENU RTC

DIDO Status 19/19	
DI1: ⎍	DO1: ⎍
DI2: ⎍	DO2: ⎍
DI3: ⎍	
DI4: ⎍	
← → MENU RTC	

Notes:

-. In screen 01, 11, 12, 16, 17 can press button ↵ to enter sub-screen to read more info of this screen page.

-. Other screen press button ↵ to check Real time clock.

-. If do not choose DI/DO function module, there only 18 pages screen.

5. - SETUP PROCEDURE

The SETUP procedure of the BJ-194Q is performed by means of several SETUP options. There has a password to protect unexpectedly enter the Setup menu. Once into the Setup menu, use the keyboard to select different options and enter required variables:

5.1.- Main Configuration Menu

Press **SET** button in any of the monitor screen page can call out the password screen

```
Configuration Menu

      Password:

       0000

 ←    +   EXIT  ENTER
```
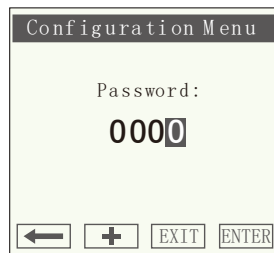
Enter the default password 0001 can entry the configuration menu

Note: If changed the password, please keep the password in safety, or only need to ready password from RS485 port

```
Configuration Menu

 Input      RTC
 Comm       TOU
 Alarm      LOG
 Relay
 AO
 System
 ↑    ↓   EXIT  ENTER
```
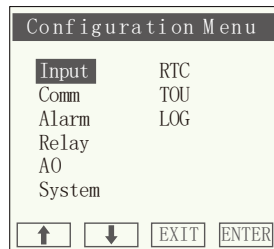
There have 8 sub-menus for meter configuration:

Input	Basic settings of signal access	**AO**	Analog output port setting
Comm	Communication port setting	**System**	System settings & clear memory logging info
Alarm	Alarm trig threshold setting	**RTC**	Real-time clock setting
Relay	Digital relay output port setting	**TOU**	Time of use record setting

Note: "LOG" menu is for read logging data that record in meter memory.

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5.2.- Input Setting

Power grid mode [1]

Default **3P4W**,

Can select 3P3W3CT and 3P3W2CT

Sampling voltage signal

Default **380Vac**

Can select 100Vac for external voltage transformer connect

Sampling current signal [2]

Default **5A**,

Can select 1A.

Voltage transformer ratio [3]

Default **1**

Can select 0-9999

Current transformer ratio

Default **1** or based on order requirement

Can select 0-9999

Notes:

(1) In 3P3W mode need short Ub and Un external

(2) If need other range of CT connect, please contact our sales team before order

(3) In 380V range please set PT ratio to 1, in 100V range can set PT ratio to expand measurement range

5.3.- Communication Port Setting

Comm port-1 address

Default **001**

Can select 1-247

Comm port-1 baud ratio

Default **9600**

Can select 1200 / 2400 / 4800/ 9600 / 19200

Comm port data format

Default **n.8.1,**

Can select n.8.1 / E.8.1 / n.8.2

Note: 194Q optional dual communication port, Comm-2 can be used for external HMI or other special operation, default only Comm-1 valid

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5.4.- Alarm Setting

BJ-194Q provide 5* [**Virtual Alarm**] for remote communication, defined in "Alarm-1", "Alarm-2" … "Alarm-5". When meter detect the parameter raise to or drop to pre-setting limit, it will be shown in register and SOE. If meter equipped physical DO port, the relay can be triggered by the linkage configuration.

Alarm-1 operation mode

Default **OFF**

Can select "Upper"(upper limit),

"Lower" (lower limit)

Operation trig delay timer

Default **0.1sec**

Alarm-1 trig parameter

Default **Ua**

Trig parameter threshould

Default **2000**

Trig status relase Hysteresis

Default **0050**

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5.4.1.- Alarm setting detail illustrate

Sub-setting	Settings value	Definition
Mode	OFF / Upper Limit / Lower Limit	**Default OFF**
Delay*	0.1~999.9s	After the preset parameter over the setting value in the specified delay, Virtual Alarm will trig **Default 0.1s**
Parameter	U_a / U_b / U_c / U_{ab} / U_{bc} / U_{ac} / U_{abc} I_a / I_b / I_c / I_{abc} P_a / P_b / P_c / Ps Q_a / Q_b/ Q_c / Qs S_a / S_b/ S_c / Ss PF / Fr DI_1 / DI_2 / DI_3 / DI_4 / DI_5 / DI_6	Parameter be trigged **Notes**: -. U_{abc}, I_{abc} mean any value in phase -. P_s, Q_s, S_s mean total value in three phase -. Not all value above in setting screen, depends on sub-mode of BJ-194Q
Value	0~9999	Trig threshold, Value related to secondary side, units: Voltage - 0.1V Current - 0.001A Active power - 0.1W Reactive power - 0.1VAR Power factor - 0.001 Frequency- 0.01HZ **Default is 5500**
Hysteresis*	0~9999	When the measurement parameter falls back lower / over this exceed value, the alarm will be released **Default is 0050**

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5.4.2.- Delay & Hysteresis operation logic

Example in upper limit alarm of A phase voltage:

U-d mean detected Ua

U-set mean Alarm value of A phase

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

5.5.- Relay setting (Optional DO port)

BJ-194Q optional physical DO port, if do not choose this external port, this chapter are invalid. When device has more than one DO port, you can set the DO-2, DO-3…as same step.

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

Relay working mode

Default **Remote**

Multipurpose timer

Default **0.1sec**

Note: If do not select DO output module, this menu cannot be accessed.

5.5.1.- Relay setting detail illustrate

Sub-setting	Settings value	Definition
Mode	Remote* / [Alarm-X] / [NC] / [NO]	Remote - DO act by RS-485 control command [Alarm-X] - DO act when Alarm-X be trigged [NC] – DO always closed, cannot control [NO] – DO always opened, cannot control **Default Remote**

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Time	0.0~999.9s	000.0 - Level type signal, contact coil will close when trigged 000.1~ 999.9 - Pulse type signal, value for width. Contact coil will close in the pulse width time, then release **Note**: In [Alarm-X] the value setting is valid **Default 0.1s**

5.5.2.- Remote mode operation

In "Remote" mode, user can use function code 05 to trig single relay, device RS-485 port follow MODBUS-RTU protocol, command as following:

Host inquiry:

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

Slave answer:

01	05	00 01	FF 00	DD FA

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5.6.- Analog Output Setting (Optional AO port)

BJ-194Q optional max 3* Analog output port, can generate analog signal to downstream equipment

Basic specification

AO output type	Output 4 ~ 20mA / 0~20mA or 1 ~ 5V
Accuracy class	0.5S
Overload	120% effective output, the maximum current of 24mA, voltage 15V
Load	$R_{max} = 420Ω$
Isolation	1KV to other terminal (Between AO-AO port non-isolation)

Output current signal range

Default **4-20mA**

Transducer parameter

Default **Ua**

Zero scale value

Default **0000**

Full scale value

Default **5000**
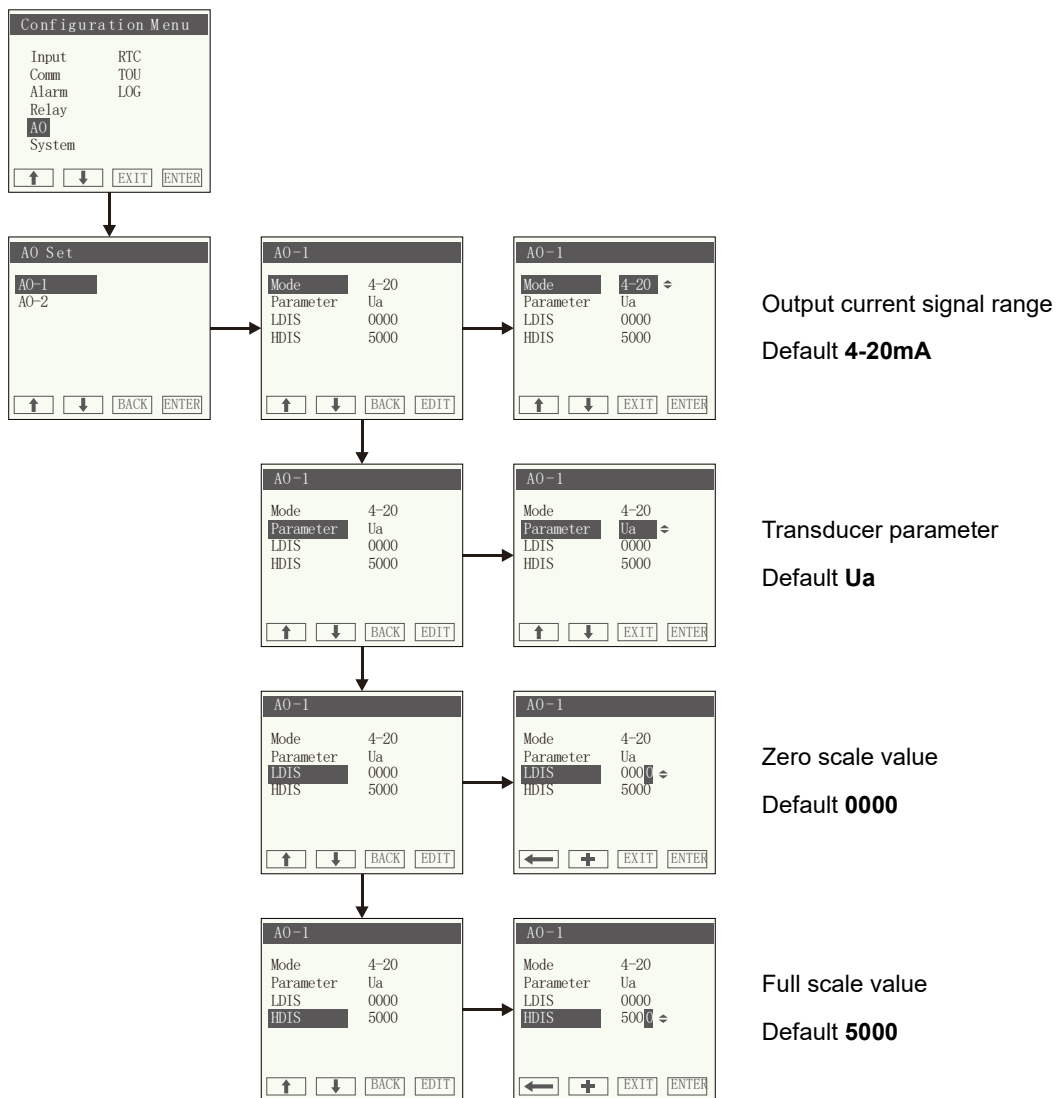
Note: If do not select AO output module, this menu cannot be accessed

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5.6.1.- Analog output setting detail illustrate

Sub-setting	Settings value	Definition
Mode	4-20 / 12-20 / 0-20 0-5 / 0-10	Output current signal range, unit mA **Default 4-20**
Parameter	U_a / U_b / U_c / U_{ab} / U_{bc} / U_{ac} I_a / I_b / I_c / PF / Fr P_a / P_b / P_c Q_a / Q_b/ Q_c S_a / S_b/ S_c	Parameter that can be set
LDIS	0~9999	Zero scale value for transmission output, units: Voltage - 0.1V Current - 0.001A Active power - 0.1W Reactive power - 0.1VAR Power factor - 0.001 Frequency- 0.01HZ **Default is 0000**
HDIS	0~9999	Full scale value for transmission output, units are same with LDIS **Default is 5000**

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5.7.- System Setting

Menu Screen	Screen	Screen	Description

Change password

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

Screen scroll interval, unit: **sec**

Default **Manually switch**

Can select 0-9sec

Duration of LCD backlight, unit: **Min**

Default **5Min**

Can select 0-9min, or always "Bright"

Data log interval **(1)**

Default **1min**

Can select 1-9min

Clear register memory **(2)**

Can select Energy, SOE, Demand, Log or clear all
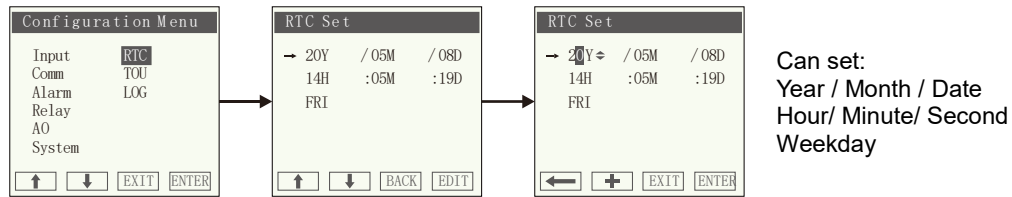
Display contrast setting

Default **5**

Can select 1-9

Notes:

(1) The data log is optional function, in meter screen cannot view data, only read by MODBUS polling command, details please refer chapter 7.1.

(2) The clear memory function can separate reset memory or register to 0, if no such function, this sub-menu is invalid.

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5.8.- RTC setting (Real time clock)

Can set:
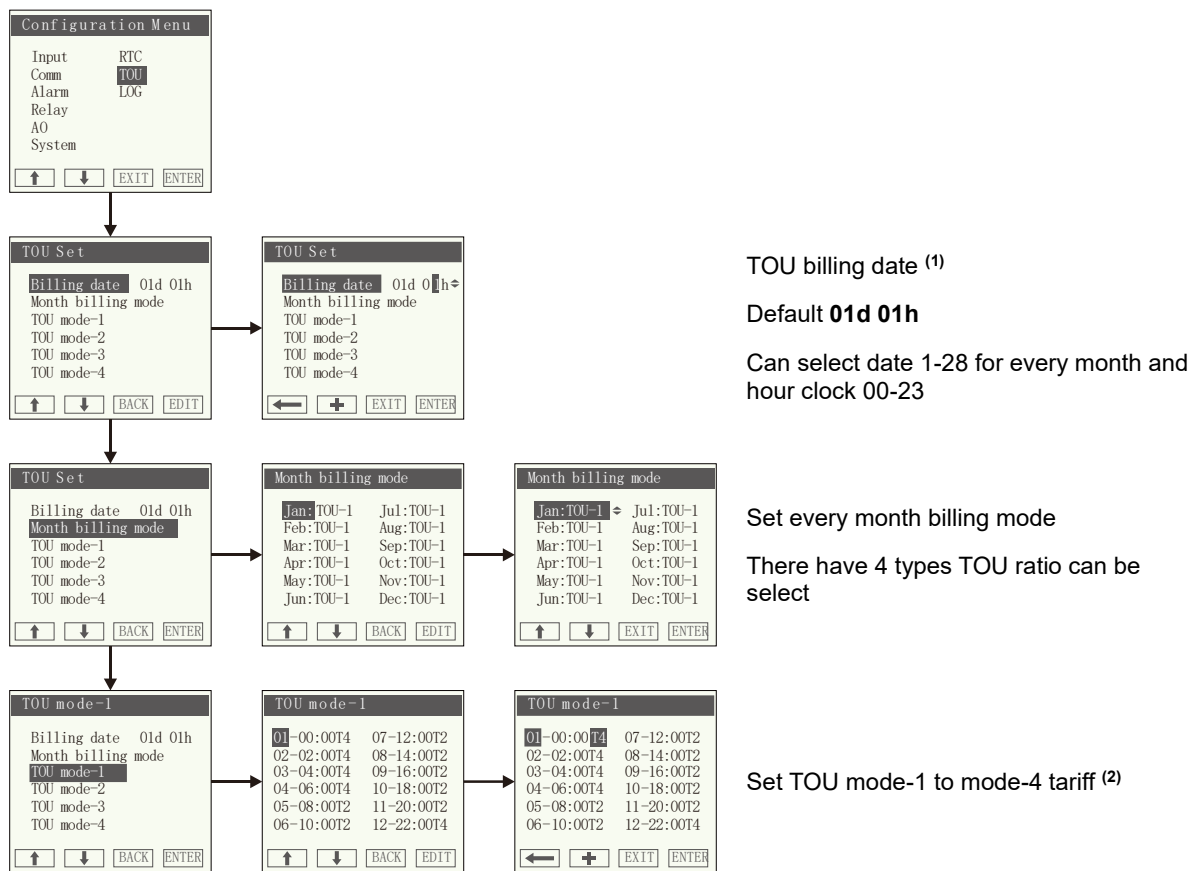Year / Month / Date
Hour/ Minute/ Second
Weekday

Note: 194Q inside with 1* CR2032 battery for keep RTC chip always run, without AUX power the battery life can support 5~6 years working. When AUX power accessed, meter will automatic transfer to use aux power line, and battery power loops will disconnect.

Before shipping Blue Jay will set RTC to local time zone, if need other time zone presetting, please contact our sales team or reset the RTC in meter setup.

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5.9.- TOU Setting (Time of Use / Multi tariff record)

BJ-194Q provides last 3 months of TOU energy record. The TOU function separate one day in to 12 segments billing interval, use T1-T4 tariff (or marked "Sharp" "Peak" "Flat" "Valley") to indicate energy consumption in different time segment and record in memory. There have 4 different TOU billing mode can be select for different month in one year.

Users can get monthly energy data from panel display screen or RS485 (RS485 data refer to **Communication protocol**), and calculate their energy cost in different tariff period.

TOU billing date [1]

Default **01d 01h**

Can select date 1-28 for every month and hour clock 00-23

Set every month billing mode

There have 4 types TOU ratio can be select

Set TOU mode-1 to mode-4 tariff [2]

Notes:

(1) Meter default automatic billing time meter reading time at 0:00 on the 1st of each month, electrical energy of this month will be freeze to last month value, the electrical energy of last month will freeze to the month before last month. Electrical data of this month will clear and re-start record.

-. If re-set billing time miss the last billing time, meter will immediately record billing;

-. If power off during the billing time, meter will immediately record billing after power recover.

(2) Billing period is designed for automatic closed loop, when Segment-X time-point equal segment-1 time-point, the remained segment setting will be ignoring by meter.

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5.10.- Other port

5.10.1.- Pulse output port

BJ-194Q provides 2* pulse output for the total active energy & total reactive energy.

The host / PLC / DI module can cumulative the data of both the active and reactive power energy sent by the pulse from opt coupler relay.

1). Electrical specification: voltage VCC ≤ 48V, Iz ≤ 50mA.

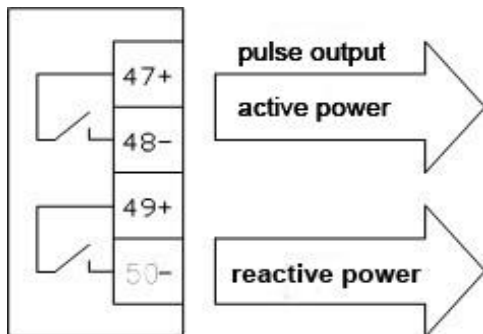2). Pulse: 5000 imp / kWh, pulse up to 80ms.
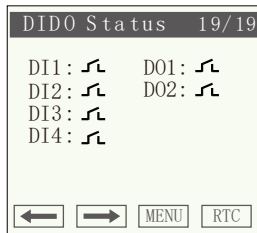   This means: When the device detects 1 kWh, the port will generate 5000 pulse

   Note: 1 kWh energy is for _secondary side energy data_, if there have PT and CT accessed; primary side energy data is "1 kWh ×PT ratio× CT ratio".

Voltage (V)	Current (A)	Pulse constant (imp / kWh)
380 or 220	5	5000
	1	20000
100	5	20000
	1	80000

Example: In measure time "T", the received total pulse is "N",
Primary side input of voltage is 10Kv
Primary side input of current is 400A.
Secondary side measurement range is 100V and 5A.

In the time "T", energy accumulated is: N / 20000 × 100 × 80

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5.10.2.- Digital input port (Optional DI port)

```
DIDO Status   19/19

DI1:    DO1:
DI2:    DO2:
DI3:
DI4:


 ←    →    MENU   RTC
```

BJ-194Q can optional max 6*DI port, uses dry contact resistance switching (passive node), with +15V meter internal power supply, for detecting variety of outside coil status.

Display the coil status in monitor screen and record in register(SOE). It also can work with remote control / alarm relay for device automatic control.

Note: The DI port operation will record in register; and can check the event record in System screen, details please refer to chapter 7.

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6. - Data log function

194Q provide data logging function, include DI/DO port SOE, Alarm SOE, Waveform capture. User can check log record info in configuration menu. **LOG** sub-menu. The real-time data logger is optional function, only ready from MODBUS-RTU polling command, please refer to chapter 7.1
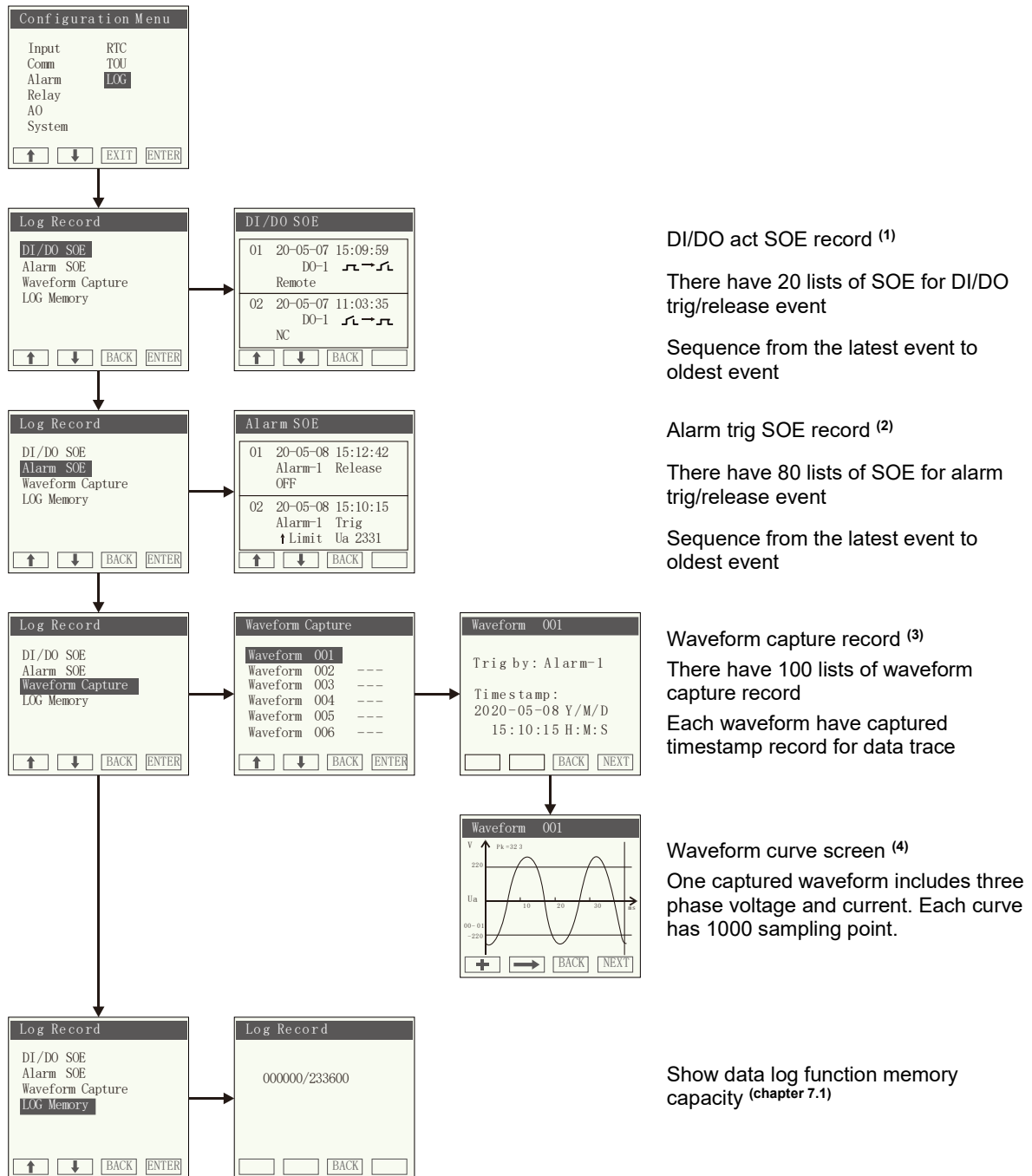
DI/DO act SOE record [1]

There have 20 lists of SOE for DI/DO trig/release event

Sequence from the latest event to oldest event

Alarm trig SOE record [2]

There have 80 lists of SOE for alarm trig/release event

Sequence from the latest event to oldest event

Waveform capture record [3]
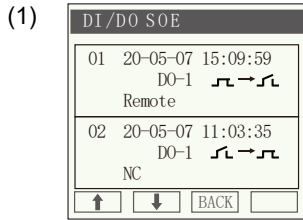
There have 100 lists of waveform capture record

Each waveform have captured timestamp record for data trace

Waveform curve screen [4]

One captured waveform includes three phase voltage and current. Each curve has 1000 sampling point.
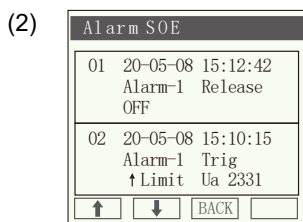
Show data log function memory capacity [chapter 7.1]

Notes:

(1)

```
DI/DO SOE
01  20-05-07 15:09:59
        DO-1  ⌐_→_⌐
    Remote
02  20-05-07 11:03:35
        DO-1  _⌐→_⌐
    NC
  [↑]  [↓]  [BACK]  [ ]
```
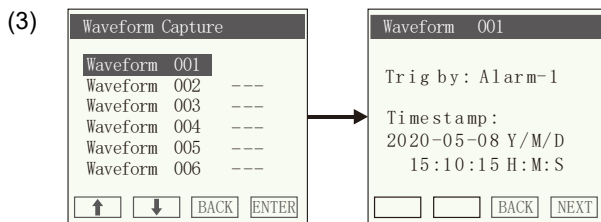
Each SOE include:

Timestamp

Trig port number, trig event

Trig mode

Demo of the event 01:
Event time 2020-7-07, 15:09:59
Trig by DO-1 port, port status from closed change to opened
Trig in Remote control mode

(2)

```
Alarm SOE
01  20-05-08 15:12:42
    Alarm-1  Release
    OFF
02  20-05-08 15:10:15
    Alarm-1  Trig
    ↑Limit  Ua  2331
  [↑]  [↓]  [BACK]  [ ]
```

Each SOE include:

Timestamp

Virtual alarm channel, trig event

Trig operation and trip threshold

Demo of the event 02:
Event time 2020-5-08, 15:10:15
Alarm-1 trig
Trig by over upper limit threshold 233.1V

(3)

```
Waveform Capture
Waveform  001
Waveform  002   ---
Waveform  003   ---
Waveform  004   ---
Waveform  005   ---
Waveform  006   ---
 [↑] [↓] [BACK] [ENTER]
```

```
Waveform   001
Trig by: Alarm-1

Timestamp:
2020-05-08 Y/M/D
  15:10:15 H:M:S
 [ ] [ ] [BACK] [NEXT]
```

If the waveform record is empty, will show "----"

Press [↵] can move to details page, there have timestamp show basic info.

(4)

```
Waveform   001
V   Pk=323
220
Ua        10  20  30   ms
00-01
 -220
 [+] [→] [BACK] [NEXT]
```
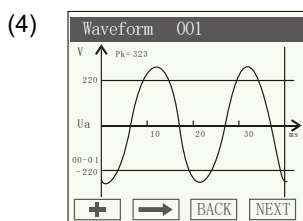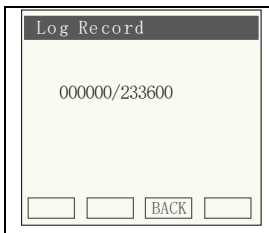
Press [+] can switch measurement range from 100-600V or 1-7A

Press [→] can move to next wave (in 50Hz system there have 50 waveform)

Press [Next] can switch to show Ua / Ub / Uc / Ia / Ib / Ic waveform

Capture operation trigged by Alarm setting logic, the captured waveform described 1sec data when event trig time point. Waveform graphics be displayed in screen that can help engineer for event tracing.

Note: When using this function, we recommended to set the "Delay" of [Alarm-X] to 0, please refer to chapter "Alarm setting"

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6.1.- Date Logger (Optional)

Log Record 000000/233600 □ □ BACK □	BJ-194Q optional equipped 128M large-capacity memory for storing electrical parameter. Logging secondary side voltage, current, active, reactive power, power factor, frequency value. Total record 233,600* logging data. *In 1min log interval can record 160days data.

Logging data only can be read through the COMM port, use MODBUS protocol to polling. Each data package length 22 words, one polling can read max 5 Record point data

Polling operation:

Step1-Use function code (0x10) to write [No.X] of data package to Reg [0x2710], ask device prepare the 5 newer data package.

Step2-Use MODBUS polling command to read the logging info in Reg[0x2710-0x277d] to get 5 lists record.

Note: The latest logging data are defined No.1 log group

Example:

Slave address 01, read data package [No.X] = No.60 (No.56~No.60)

Step1- Send command: 01 10 27 10 00 02 04 00 00 00 3C 41 02
        Slave response: 01 10 27 10 00 02 4A B9

Step2- Send command: 01 03 27 10 00 6E CF 57
   **Slave response:** 01 03 DC……

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Register map of Log record

Register	Data	Byte mode		Instruction
0x2710	Ua	int	1	Phase to Line Voltage, Unit: 0.1V
0x2711	Ub	int	1	
0x2712	Uc	int	1	
0x2713	Ia	int	1	Three phase Current, Unit: 0.001A
0x2714	Ib	int	1	
0x2715	Ic	int	1	
0x2716	Pa	int	1	Individual phase active power, Unit: W
0x2717	Pb	int	1	
0x2718	Pc	int	1	
0x2719	P∑	int	1	Total active power, Unit: W
0x271a	Qa	int	1	Individual phase reactive power, Unit: Var
0x271b	Qb	int	1	
0x271c	Qc	int	1	
0x271d	Q∑	int	1	Total reactive power, Unit: Var
0x271e	PFa	int	1	Individual phase power factor, 0~1.000
0x271f	PFb	int	1	
0x2720	PFc	int	1	
0x2721	PF∑	int	1	Total apparent power, Unit: VA
0x2722	FR	int	1	Frequency, Unit:0.01Hz
0x2723-0x2725	/	Char	3	First 5 bytes are time stamp Year-Month-Date-Hour-Minutes Last 1 byte are sum check of all data in package
0x2726-0x273b	/	/	22	Logging data NO.X-3
0x273c-0x2751	/	/	22	Logging data NO.X-2
0x2752-0x2767	/	/	22	Logging data NO.X-1
0x2768-0x277d	/	/	22	Logging data NO.X

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7.- COMMUNICATION INTERFACE

7.1.- Connection for RS485 BUS

The composition of the RS-485 cabling must be carried out with a meshed screen cable (minimum 3 wire), diameter of not less than 0.5mm^2, with a maximum distance of 1,200 m between the BJ-194… and the master unit. This Bus may connect a maximum of 32pcs BJ-194…
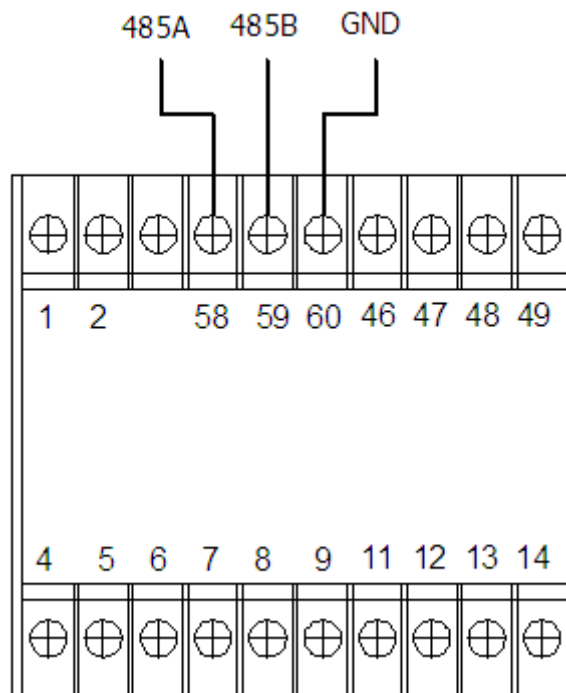
Notes:

-. For communication with the master unit, user can choose RS-485 to RS-232 converter or RS485 to USB adapter to use.

-. For expand the number of devices in the communication network, a signal repeater can be used.

-. Full range of BJ-194… meter RS485 PIN number is 58,59,60

-. Due to product modifications or special requirements, the interface pin place may be change. For details, please refer to product label on the rear side

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7.2.- MODBUS © Protocol

Modbus RTU Frame Format:

Address code	1 BYTE	*Slave device address **1-247***
Function code	1 BYTE	*Indicates the function codes like read coils / inputs*
Data code	4 BYTE	*Starting Register, high byte* *Starting Register, low byte* *Number of registers, high byte* *Number of registers, low byte*
Error Check code	2 BYTE	*Cyclical Redundancy Check (**CRC**)*

MODBUS FUNCTIONS:

Code	Meaning	Description
FUNCTION 01	Read Coil Status	*Only valid when equipped DO port*
FUNCTION 02	Read Input Status	*Only valid when equipped DI port*
FUNCTION 03	Reading of n Words	*This function permits to read all the electrical parameters of the BJ194…series.*
FUNCTION 05	Force Single coil	*Details see chart 7.4.1* *When DO in remote control mode can work*
FUNCTION 06	Preset Single register	***Disable in default*** *If need valid this code, please contact Blue Jay Sales Team before your order!*

Note: Float data follow **IEEE754**, float low bit first, high bit next. (**CD AB**)

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7.3. - Register Map

7.3.1- Basic power data—Primary Side

Register	Data	Byte mode		Instruction
0x00	Ua	float	2	Phase to Line Voltage, Unit: V
0x02	Ub	float	2	
0x04	Uc	float	2	
0x06	Uab	float	2	Phase to Phase Voltage, Unit: V
0x08	Ubc	float	2	
0x0a	Uca	float	2	
0x0c	Ia	float	2	Three phase Current, Unit: A
0x0e	Ib	float	2	
0x10	Ic	float	2	
0x12	Pa	float	2	Individual phase active power, Unit: kW
0x14	Pb	float	2	
0x16	Pc	float	2	
0x18	P∑	float	2	Total active power, Unit: kW
0x1a	Qa	float	2	Individual phase reactive power, Unit: kVar
0x1c	Qb	float	2	
0x1e	Qc	float	2	
0x20	Q∑	float	2	Total reactive power, Unit: kVar
0x22	Sa	float	2	Individual phase apparent power, Unit: kVA
0x24	Sb	float	2	
0x26	Sc	float	2	
0x28	S∑	float	2	Total apparent power, Unit: kVA
0x2a	PF_a	float	2	Individual three phase power factor
0x2c	PF_b	float	2	
0x2e	PF_c	float	2	
0x30	cosQ	float	2	Total power factor, 0~1.000
0x32	FR	float	2	Frequency, Unit:0.01Hz
0x34	Ep+	float	2	Positive active energy, Unit: kWh
0x36	Ep-	float	2	Negative active energy, Unit: kWh
0x38	Eq+	float	2	Inductive reactive power, Unit: kVarh
0x3a	Eq-	float	2	Capacitive reactive power

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7.3.2 - Basic power data—Secondary Side

Register	Data	Byte mode		Instruction
0x100	Ua	int	1	
0x101	Ub	int	1	Phase to Line Voltage, Unit: 0.1V
0x102	Uc	int	1	
0x103	Uab	int	1	
0x104	Ubc	int	1	Phase to Phase Voltage, Unit: 0.1V
0x105	Uca	int	1	
0x106	Ia	int	1	
0x107	Ib	int	1	Three phase Current, Unit: 0.001A
0x108	Ic	int	1	
0x109	Pa	int	1	
0x10a	Pb	int	1	Individual phase active power, Unit: W
0x10b	Pc	int	1	
0x10c	P∑	int	1	Total active power, Unit: W
0x10d	Qa	int	1	
0x10e	Qb	int	1	Individual phase reactive power, Unit: Var
0x10f	Qc	int	1	
0x110	Q∑	int	1	Total reactive power, Unit: Var
0x111	Sa	int	1	
0x112	Sb	int	1	Individual phase apparent power, Unit: VA
0x113	Sc	int	1	
0x114	S∑	int	1	Total apparent power, Unit: VA
0x115	PFa	int	1	
0x116	PFb	int	1	Individual power factor, 0~1.000
0x117	PFc	int	1	
0x118	cosQ	int	1	Total power factor, 0~1.000
0x119	FR	int	1	Frequency, Unit:0.01Hz
0x11a	Ep+	int	2	Positive active energy, Unit: Wh
0x11c	Ep-	int	2	Negative active energy, Unit: Wh
0x11e	Eq+	int	2	Inductive reactive power, Unit:Varh
0x120	Eq-	int	2	Capacitive reactive power
0x122	Ang_Ua	int	1	Phase A voltage angle, unit 0.1 degree
0x123	Ang_Ub	int	1	Phase B voltage angle, unit 0.1 degree
0x124	Ang_Uc	int	1	Phase C voltage angle, unit 0.1 degree
0x125	Ang_Ia	int	1	Phase A current angle, unit 0.1 degree
0x126	Ang_Ib	int	1	Phase B current angle, unit 0.1 degree
0x127	Ang_Ic	int	1	Phase C current angle, unit 0.1 degree

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7.3.3- Meter status data

Register	Data	Byte mode		Instruction
0x200	DO	int	1	Digital output: Bit 0~1 show channel 1and channel 2 status 0 for open, 1 for closed
0x201	DI	int	1	Digital input: Bit 0~3 show channel 1 to channel 4 status 0 for open, 1 for closed
0x20A	TIME.year	int	1	Internal RTC real time clock: Year - Month - Day - Time - minutes - seconds
0x20B	TIME.month	int	1	
0x20C	TIME.date	int	1	
0x20D	TIME.hour	int	1	
0x20E	TIME.minute	int	1	
0x20F	TIME.second	int	1	
0x210	TIME.day	int	1	

7.3.4- Advanced electrical parameter

Register	Data	Byte mode		Instruction
0x300	Pde	float	2	Present active power demand, Unit: W
0x302	Qde	float	2	Present reactive power demand, Unit: var
0x304	Sde	float	2	Present apparent power demand, Unit: VA
0x306	Pd_Mi	float	2	Active power demand in present month
0x308	Qd_Mi	float	2	Reactive power demand in present month
0x30a	Sd_Mi	float	2	Apparent power demand in present month
0x30c	Pd_Mii	float	2	Active power demand in last month
0x30e	Qd_Mii	float	2	Reactive power demand in last month
0x310	Sd_Mii	float	2	Apparent power demand in last month
0x312	Pd_Miii	float	2	Active power demand in month before last month
0x314	Qd_Miii	float	2	Reactive power demand in month before last month
0x316	Sd_Miii	float	2	Apparent power demand in month before last month
0x318-0x31F	/	float	2	Reversed
0x320	$V_\delta+$	float	2	Positive sequence voltage in primary side
0x322	$V_\delta-$	float	2	Negative sequence voltage in primary side
0x324	V_0	float	2	Zero sequence voltage in primary side
0x326	$I_\delta+$	float	2	Positive sequence current in primary side
0x328	$I_\delta-$	float	2	Negative sequence current in primary side
0x32A	I_0	float	2	Zero sequence current in primary side
0x32C	eU	float	2	Voltage unbalance, eU = $(V_\delta- / V_\delta+)\%$
0x32E	eI	float	2	Current unbalance, eI = $(I_\delta- / I_\delta+)\%$
0x330	Va_d	float	2	A phase voltage deviation

0x332	Vb_d	float	2	B phase voltage deviation
0x334	Vc_d	float	2	C phase voltage deviation
0x336	F_d	float	2	Frequency deviation
0x338	Pst-Ua	float	2	Three phase Short Term Flicker Perceptibility (Pst) in past 10min
0x33A	Pst-Ub	float	2	
0x33C	Pst-Uc	float	2	**Refer IEC61000-4-15**
0x33E	Plt-Ua	float	2	Three phase Long Term Flicker Perceptibility (Plt) in past 120min
0x340	Plt-Ub	float	2	
0x342	Plt-Uc	float	2	**Refer IEC61000-4-15**
0x344	Pst-$_{Ua\_Pk}$	float	2	Pst peak value of flicker in A phase
0x346	Pst-$_{Ub\_Pk}$	float	2	Pst peak value of flicker in B phase
0x348	Pst-$_{Uc\_Pk}$	float	2	Pst peak value of flicker in C phase
0x34A	/	int	1	Pst record time stamp - Year
0x34B	/	int	1	Pst record time stamp - Month
0x34C	/	int	1	Pst record time stamp - Date
0x34D	/	int	1	Pst record time stamp - Hour
0x34E	/	int	1	Pst record time stamp - Minute
0x34F	/	int	1	Pst record time stamp - Second
0x350	V$_{drop\_A}$	float	2	Three phase latest Voltage drop, unit V
0x352	V$_{drop\_B}$	float	2	**Default rated value 220V, lower than 90% of Rated and last 0.5 wave will trig**
0x354	V$_{drop\_C}$	float	2	
0x356	V$_{drop\_Ta}$	float	2	Duration of the V$_{drop}$ during time, unit ms
0x358	V$_{drop\_Tb}$	float	2	
0x35A	V$_{drop\_Tc}$	float	2	
0x35C	/	int	1	V$_{drop\_A}$ recover timestamp - Year
0x35D	/	int	1	V$_{drop\_A}$ recover timestamp - Month
0x35E	/	int	1	V$_{drop\_A}$ recover timestamp - Date
0x35F	/	int	1	V$_{drop\_A}$ recover timestamp - Hour
0x360	/	int	1	V$_{drop\_A}$ recover timestamp - Minute
0x361	/	int	1	V$_{drop\_A}$ recover timestamp - Second
0x362-0x367	/	int	6	V$_{drop\_B}$ recover timestamp
0x368-0x36d	/	int	6	V$_{drop\_C}$ recover timestamp

7.3.5- Multi- tariffs ratio data

Register	Data	Byte mode		Instruction
0x400	Cumulative_tol (Total)	long	2	The total energy
0x402	Cumulative_T1(Sharp)	long	2	T1-T4 cumulative Energy record
0x404	Cumulative_T2 (Peak)	long	2	
0x406	Cumulative_T3 (Flat)	long	2	
0x408	Cumulative_T4 (Vally)	long	2	

0x40a	Present_tol (Total)	long	2	Total energy of this month
0x40c	Present_T1 (Sharp)	long	2	T1-T4 Energy record of present month
0x40e	Present_T2 (Peak)	long	2	
0x410	Present_T3 (Flat)	long	2	
0x412	Present_T4 (Vally)	long	2	
0x414	Last_tol (Total)	long	2	Total energy of last month
0x416	Last_T1 (Sharp)	long	2	T1-T4 Energy record of last month
0x418	Last_T2 (Peak)	long	2	
0x41a	Last_T3 (Flat)	long	2	
0x41c	Last_T4 (Vally)	long	2	
0x41e	Prior_tol (Total)	long	2	Total energy of the month before last month
0x420	Prior_T1 (Sharp)	long	2	T1-T4 Energy record of the month before last month
0x422	Prior_T2 (Peak)	long	2	
0x424	Prior_T3 (Flat)	long	2	
0x426	Prior_T4 (Vally)	long	2	

7.3.6- THD and individual harmonic (Max 62 times)

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

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Register	Data	Byte mode		Instruction
0x68f	THFFUb	int	1	unit 0.1%
0x690	THFFUc	int	1	
0x691	CFUa	int	1	Three phase voltage crest factor, unit 0.001
0x692	CFUb	int	1	
0x693	CFUc	int	1	
0x694	TOHDIa	int	1	A phase current total odd harmonic distortion, unit 0.1%
0x695	TOHDIb	int	1	
0x696	TOHDIc	int	1	
0x697	TEHDIa	int	1	Three phase current total even harmonic distortion, unit 0.1%
0x698	TEHDIb	int	1	
0x699	TEHDIc	int	1	
0x69a	KFIa	int	1	Three phase current K factor, unit 0.01
0x69b	KFIb	int	1	
0x69c	KFIc	int	1	

7.3.7- SOE record (20lists record for I/O port trig, 80 lists record for Alarm-X trig)

Register	Data	Byte mode		Instruction
0x700-0x763	I/O Event 1~20	int	5	Byte 0: Fault channel Byte 1: Fault event Byte 2,3: Fault value Byte 4: Fault time: Year Byte 5: Fault time: Month Byte 6: Fault Time: Day Byte 7: Fault time: Time Byte 8: Fault time: Minute Byte 9: Fault time: Seconds
0x764-0x8F3	Alarm record 1~80	int	5	

Byte 0	Byte 1	
1:DI1 Closed	0: Remote control	
2:DI2 Closed	1: DZ Alarm_1	
3:DI3 Closed	2: DZ Alarm_2	
4:DI4 Closed	3: DZ Alarm_3	
	4: DZ Alarm_4	
21:DI1 Opened	5: DZ Alarm_5	
22:DI2 Opened	6: Manually close DO	
23:DI3 Opened	7: Manually open DO	
24:DI4 Opened	100: Manually turn off DZ when trigged	
	101:UA upper alarm	132:UA lower alarm
51: Alarm_1 trigged	102:UB upper alarm	133:UB lower alarm
52: Alarm_2 trigged	103:UC upper alarm	134:UC lower alarm
53: Alarm_3 trigged	104:UAB upper alarm	135:UAB lower alarm
54: Alarm_4 trigged	105:UBC upper alarm	136:UBC lower alarm
55: Alarm_5 trigged	106:UCA upper alarm	137:UCA lower alarm
	107:UA/UB/UC upper alarm	138:UA/UB/UC lower alarm
61: Alarm_1 released	108:IA upper alarm	139:IA lower alarm
62: Alarm_2 released	109:IB upper alarm	140:IB lower alarm
63: Alarm_3 released	110:IC upper alarm	141:IC lower alarm
64: Alarm_4 released	111:IA/IB/IC3 upper alarm	142:IA/IB/IC3 lower alarm
65: Alarm_5 released	112:PA upper alarm	143:PA lower alarm
	113:PB upper alarm	144:PB lower alarm

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	114:PC upper alarm	145:PC lower alarm
101:DO1 Closed	115:total active power upper alarm	146:total active power lower alarm
102:DO2 Closed	116:QA upper alarm	147:QA lower alarm
	117:QB upper alarm	148:QB lower alarm
121:DO1 Opened	118:QC upper alarm	149:QC lower alarm
122:DO2 Opened	119:total reactive power upper alarm	150:total reactive power lower alarm
	120:SA upper alarm	151:SA lower alarm
	121:SB upper alarm	152:SB lower alarm
	122:SC upper alarm	153:SC lower alarm
	123:total apparent power upper alarm	154:total apparent power lower alarm
	124:total power factor upper alarm	155:total power factor lower alarm
	125:frequency upper alarm	156:frequency lower alarm
	126:DI1 close alarm	157:DI1 open alarm
	127:DI2 close alarm	158:DI2 open alarm
	128:DI3 close alarm	159:DI3 open alarm
	129:DI4 close alarm	160:DI4 open alarm
	130:DI5 close alarm	161:DI5 open alarm
	131:DI6 close alarm	162:DI6 open alarm

Notes:

1. Not all of the data above can be read by RS485, the reading address will be unsuccessful

2. The data can be read out depends on your multi-function meter model, please refer to the corresponding product manual before build your software.

3. Some software has different definitions of the start bit of register address, there will be offset, please add 1 for the right address. To get more info, please contact technical support **tech@cqbluejay.com**

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7.4.- Example

Host inquiry slave device

Addr	Fun	Data Address (high)	Data Address (low)	Data Number (high)	Data number (low)	CRC16 (low)	CRC16 (high)
0CH	03H	00H	00H	00H	06H	C4H	D5H

PC user ask upload UA, UB, UC, IA, IB, IC

Slave device answer

Addr	Fun	Byte count	Data1 high	Data1 low	Data2 high	Data2 low	Data3 high	Data3 low
0CH	03H	0CH	03H	E8H	03H	E9H	03H	E8H

Data4 high	Data4 low	Data5 high	Data5 low	Data6 high	Data6 low	CRC16 low	CRC16 high	
13H	84H	13H	88H	13H	8AH	A6H	D6H	

Show the data:

UA=3E8H (100.0)
UB=3E9H (100.1)
UC=3E7H (99.9)
IA=1384H (4.996)
IB=1388H (5.000)
IC=138AH (5.002)

Notes:

1. Blue Jay disable the 06 function in default setting, if Activated the write command, please check the host device program to avoid the meaningless write operation, that may reduce the reduce the register working life.

2. When the write is unsuccessful, no return data from the slave device. In this addition, please re-send write inquiry again

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8. - SAFETY CONSIDERATIONS

All installation specification described at the previous chapters named:
INSTALLATION AND STARTUP, INSTALLATION MODES and SPECIFICATIONS.

Please note that with the instrument powered on, the terminals could be dangerous to touching and cover opening actions or elements removal may allow accessing dangerous parts. This instrument is factory-shipped at proper operation condition.

◆ The device must have a professional installation and maintenance
◆ Any operation of the device, you must cut off the input signal and power;

9. - MAINTENANCE

The BJ194… series meter does not require any special maintenance. No adjustment, maintenance or repairing action should be done when the instrument is open and powered on, should those actions are essential, high-qualified operators must perform them.

Before any adjustment, replacement, maintenance or repairing operation is carried out, the instrument must be disconnected from any power supply source.

When any protection failure is suspected to exist, the instrument must be immediately put out of service. The instrument's design allows a quick replacement in case of any failure.

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10. - TECHNICAL SERVICE

FAQ's

1.- Once cabled and connected is seen to give a correct voltage and current reading, but shows negative values for active power (generation).

This is an error with the cabling for the current transformer secondary; the direction of the transformer current has to be respected as shown in the connection diagram. The current transformers have a two face primary; the current must pass from P1 to P2 giving the result in secondary (S1 and S2) of 5 amps.

The error stems from:

a). The current transformers have been incorrectly installed. As a result, it gives the direction of the current as passing from P2 to P1; to resolve this problem, the current transformer does not have to be dismantled and installed again, but the transformer secondary (S1 and S2) just has to be inverted.

b). The connection of the current secondary in the current transformers have been incorrectly connected; to resolve this problem just connect the S1 transformer secondary to the S1 on the meter and the S2 on the current transformer to the S2 on the meter

2.- Once cabled and connected, is seen to give an incoherent Power factor and CosΦ reading (-0.01 or similar).

This is again a current transformer and voltage phase connection error phase A, must correspond to the current transformer installed in phase A; phase B, must correspond to the current transformer installed in phase B; and phase C, must correspond to the current transformer installed in phase C.

This connection terminal is clearly shown on the area side of the device.

3.- The measuring voltage and is displaying the secondary voltage (for example 110 volts). Ensure that the voltage Transformer ratio has been correctly set (Please refer to voltage PT ratio setting section in chapter **SETUP PROCEDUCE**).

4.- Device does not correctly display the current reading. It shows values varying between 0 to 5 amps of current.
Ensure that the Current Transformer ratio has been correctly set; (Please refer to current CT ratio setting section in chapter **SETUP PROCEDUCE**).

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Calculation formula of Electrical parameter

Formula	Parameter
$U = \sqrt{\dfrac{1}{N}\sum_{n=0}^{N} u_n^2} \quad n = 0,1,2\ldots\ldots N$	Voltage RMS value
$I = \sqrt{\dfrac{1}{N}\sum_{n=0}^{N} i_n^2} \quad n = 0,1,2\ldots\ldots N$	Current RMS value
$P = \dfrac{1}{N}\sum_{n=1}^{N}(i_{an}u_{an} + i_{bn}u_{bn} + i_{cn}u_{cn})$	Total active power cycle average
$P_s = UI$	Single-phase apparent power cycle average
$\cos\theta = \dfrac{P_p}{P_S}$	Power factor
$P_q = \sqrt{P_S^2 - P_P^2}$	Reactive power (Pq is positive and the direction cannot be determined; P algorithm can be used to shift the voltage component by 90o)
$W = \int P * dt$	Electric energy

Note: In above formula, N for sampling points in one AC wave, In standard BJ-194Q, the N=128

For any inquiry about the device performance or any failure,
contact to Blue Jay's technical service.

Blue Jay - After-sales service

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