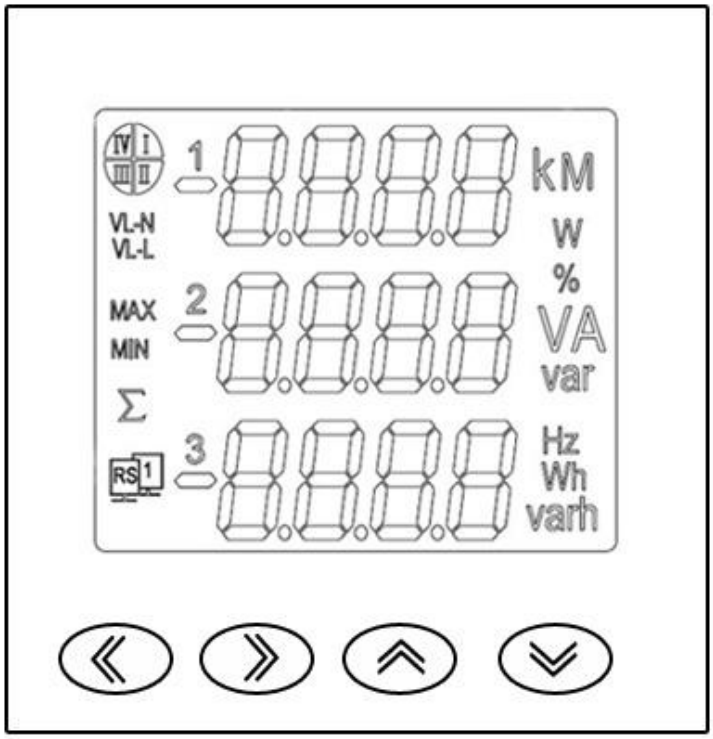
BJ194L-ASY Mini Multi-function Meter

User Manual

Version：3.3



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Read me

When you use BJ194L-ASY series mini 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 BJ194L-ASY series mini 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

BJ194L-ASY series mini multi-function meter is a efficient and economy multifunction power meter. It is the ideal choice for monitoring and measuring of power systems.

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

Current,
Voltage,
Frequency,
Active power,
Reactive power,
Energy,
Power factor,

It can replace the traditional analog or many digital measurement instruments (such as ammeter, voltmeter, power meter, power factor meter, frequency meter, etc.) with the advantages of improving system reliability, making the on-site wiring convenient and reduce system cost.

Optional digital I/O port, and with serial port, BJ194L-ASY mini multi-function meter 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.

2. - APPLICATIONS

- ◆ All power parameter measurement;
- ◆ Power factor measurement and control;
- ◆ Energy Measurement;
- ◆ 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.

3. - FEATURES

3.1. - 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	Cos Φ	/	/	/	**x**
Active power	W	/	/	/	**x**
Reactive power	Var	/	/	/	**x**
Active energy	Wh	/	/	/	**x**
Reactive energy	Varh	/	/	/	**x**

Notes: Phase-phase voltage is Uab, Ubc, Uca, voltage data determined by the different wiring
Available: **x:** Display and communications.
xx: Only can read in RS485 communication

The 194L-ASY delivers the visualization of parameters listed above by means of LCD type displays. In the main display area shows 3 power parameters, with other display area show the various parameters and state of meter on each page jump.

OTHER FEATURES

- Low-size (72 x 72 mm), panel-mounting meter.
- True R.M.S. measuring system.
- Instantaneous, maximum and minimum values of each measured parameter.
- Energy measurement
- RS-485 or Ethernet (optional) type communication to a PC.

3.2. – Specifications

1. - Reference standard:

Basic electricity: IEC 61557-12:2007

Active energy: IEC 62053-21:2003

Reactive energy: IEC 62053-23:2003

2- Accuracy standards

Parameter	Accuracy	A phase	B phase	C phase	All
Voltage	0.5%fs	V1	V2	V3	
Current	0.5%fs	A1	A2	A3	
Active Power	0.5%fs				W
Reactive Power	0.5%fs				var
Power Factor	0.5%fs				PF
Active Energy	1%rd				Wh
Reactive Energy	2%rd				varh
Frequency	0.05%rd				Hz

3. - Input

Voltage: Rated 400V (optional 100V)

Current: Rated 5A (optional 1A)

Frequency: 45-65Hz

4. - Load

Voltage: <0.5VA / phase (rated 220V)

Current: <0.5VA / phase (rated 5A)

5. - Overload

Current: 1.2 times rated continuous; 10 seconds for 10 times the rated

Voltage: 1.2 times the rated continuous; 10 seconds for 800V

6. - Dielectric strength

IEC/EN 61010-1:2010

2kV AC RMS 1 minute, between input / output / case / power supply

7. - EMC Test

	standard	Test voltage
Electrostatic discharge immunity test:	IEC-61000-4-2 level 4	8Kv
Electrical fast transient burst immunity test	IEC61000-4-4 level 3	Input 1kV; Power supply 2kV
Surge (Shock) immunity test	IEC61000-4-5 level 4	common mode test voltage 4kV

8. - Work environment

Temperature: -20℃~ +60℃

Humidity: RH 20%～95%（No condensation）

9. - Protection

Panel: IP54

Case: IP20

10. - Storage Conditions

Temperature: -25℃～+70℃

Humidity: RH 20%～95%

11. - Working Power

AC 80-265V, 45-65Hz, DC 80-380V

DC 20-60V (Optional)

Maximum power consumption 6W

12. - Dimensions

L × W × H =72mm×72mm×71mm

13. - Installation hole size

L × W = (66+0.8mm) × (66+0.8mm)

4.- 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.

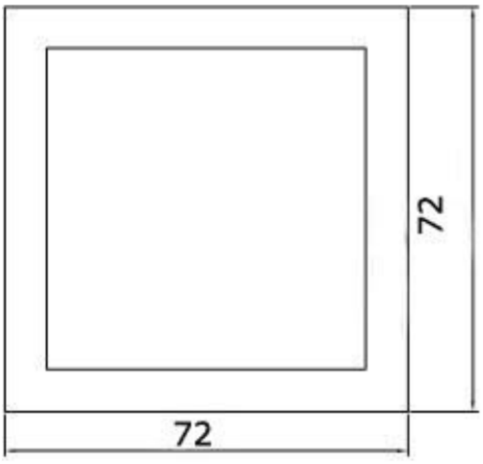
When any protection failure is suspected to exist (for example, it presents external visible damages),the instrument must be immediately powered off. In this case contact a qualified service representative.

4.1.- Installation

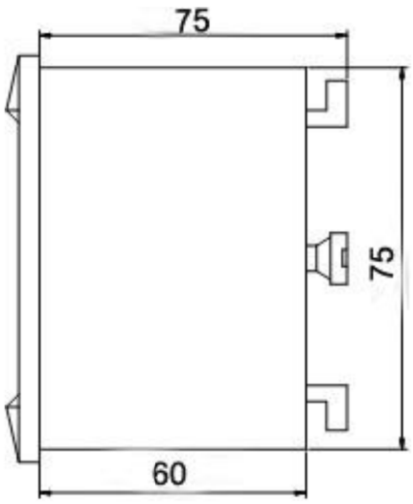
Mounting

Instrument is to be mounted on panel (cut-out *66+0.8 x 66+0.8 mm*). Keep all connections into the cabinet.

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

Notes:

Input signal: BJ194L using a separate acquisition calculate for each measurement channel, to ensure consistent in use, for different load forms, its a variety of connection mode. Access wire shall be met: the current 2.5 square mm, voltage of 1.5 square millimeters.

A. Voltage input:

Input voltage should not exceed the rated input voltage products (100V or 400V),
Otherwise, you should use external CT. Suggest 1A fuse be installed in the voltage input side.

B. 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.

C. 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:

BJ194L series mini multi-function meter 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: 80-270V, please ensure that the auxiliary power can match with BJ194Z 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.

4.2. - Connection Terminal

Upper connection terminal

						60	59	58			1	2
						GUD	RS485B	RS485A			Power supply	

*1. *Supply voltage input: 0 V*

*2. *Supply voltage input: 220 Va.c.*

58. RS-485 (+)

59. RS-485 (-)

60. RS-485 (GND)

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	

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

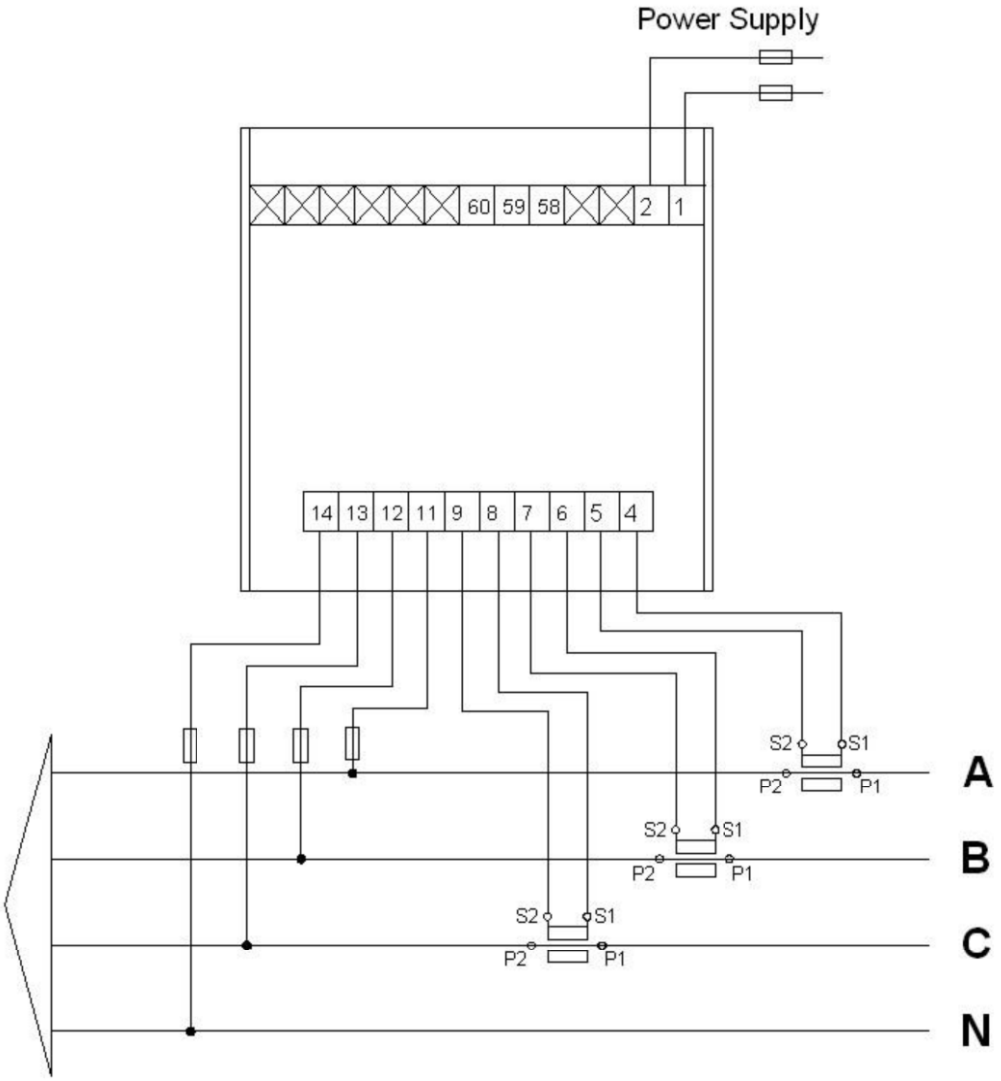
11. Voltage A-phase input

12. Voltage B-phase input

13. Voltage C-phase input

14. Neutral Voltage input

4.3. - Connection Drawing



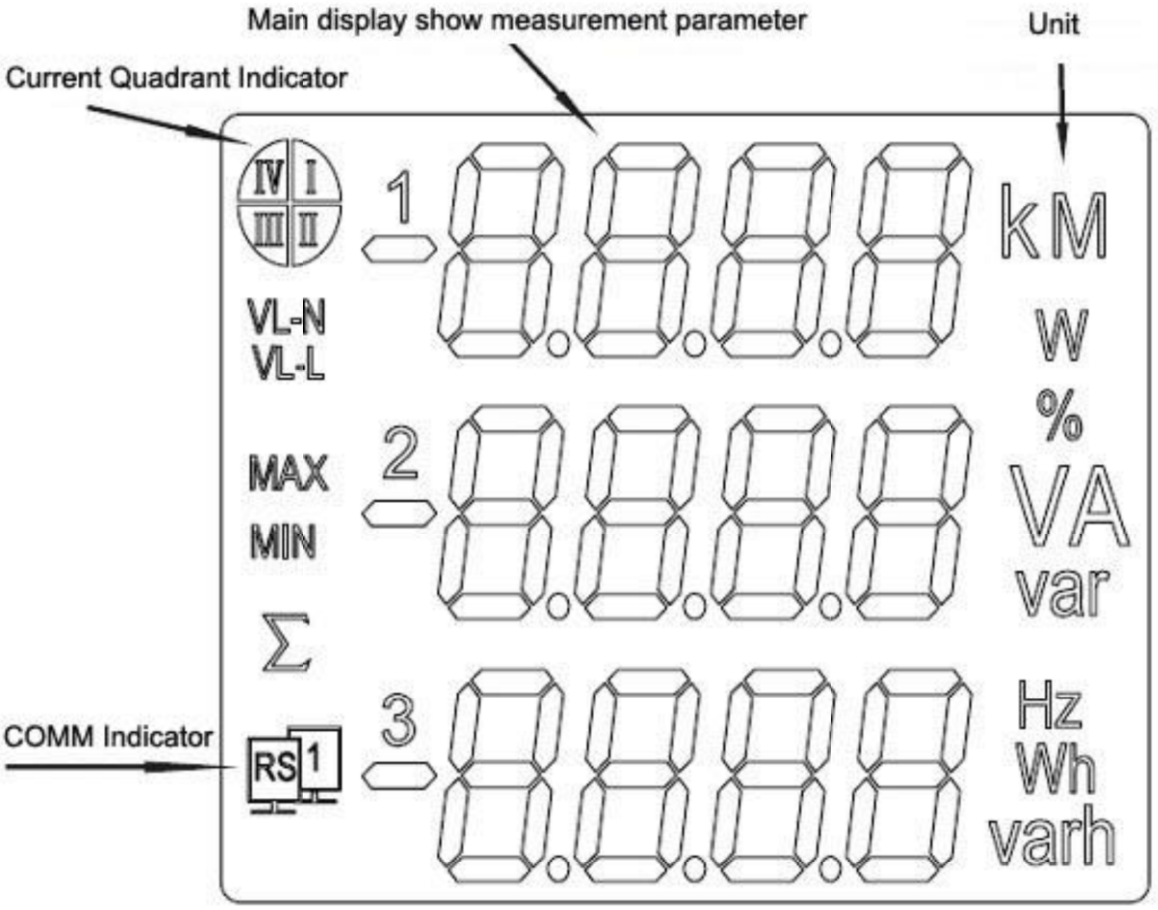
IMPORTANT REMARK!

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.

5. SCREEN DISPLAY



Note: Please see detail instructions of "*" items at "**OPERATION MODE".**

6. - OPERATION MODE

When the 194L-ASY is powered up, the entire symbol will be on, and the meter starts to self-test. After some seconds, the meter is ready for operation and shows one of the available screens.

Parameters on display can be switched by pressing key  or  LCD shown on screen at any moment

When the key  is pressed, the screen CURRENT values of each phase are now showing.

Pressing again the key  , the screen will show the following parameters successively.

In setting menu, pressing  can move the setting cursor to left;
Pressing  can enter the number 0 ~ 9.

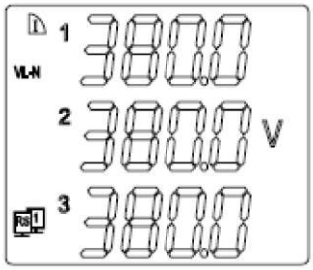
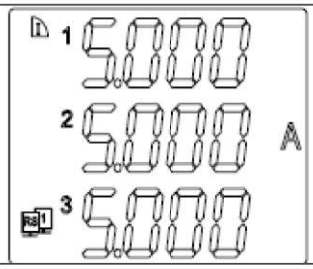
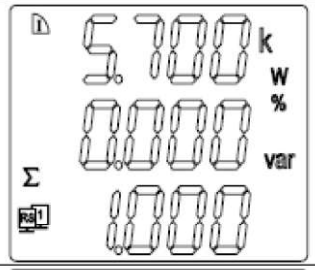
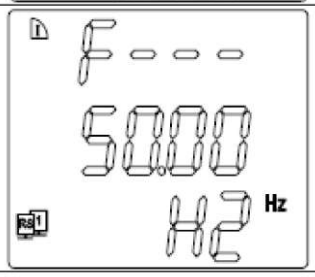
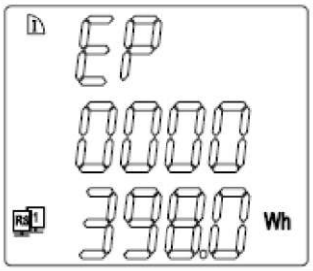
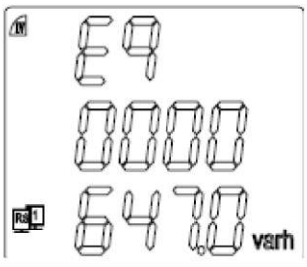
This key named "SET" key, pressing it can open the programming menu and return to previous menu.

This key named “Enter” key, pressing this key you can exit it with saving any modification that you might have done, in menu operation press “Enter” key, and user can go to the next menu.

Note:

Press key  or  in normal standby status, and the meter will show different data in main screen:

In the menu set mode, when changes the parameter and exit setting, the meter will ask to "SAVE", press  *exit without saving*
press  *save and exit.*

Screen	Shown	Explain
1		Show the phase voltage Ua, Ub, Uc (three-phase four-wire) or line voltage Uab, Ubc, Uca (three-phase three-wire) In the three phase4-wire connection, press ⌄⌄ can switch show the phase voltage and line voltage. Screenshots show: Ua = 380.0V, Ub = 380.0V, Uc = 380.0V
2		Shows three-phase current Ia, Ib, Ic units A, Screenshots show: Ia = 5.000A, Ib = 5.000A, Ic = 5.000A The symbol in upper left corner of the screen mean the meter show the first quadrant data
3		Shows the total active power P, total reactive power Q, total power factor PF. Screenshots show: P = 5.700kW, Q = 0kvar, PF = 1.000
4		Show grid frequency, Screenshots show: F = 50.00Hz,
5		Show positive active energy: Second line show 4 high bit value, and the third line show 4 low bit value. 8 digital combined show the energy value. Screenshots show: EP = 398.0Wh. Press the key ⌄⌄ to switch show negative active energy values.
6		Show positive reactive energy: Second line show 4 high bit value, and the third line show 4 low bit value. 8 digital combined show the energy value. Screenshots show: EP = 647.0varh. Press the key ⌄⌄ to switch show negative reactive energy values.

7. - SETUP PROCEDURE

The SETUP procedure of the BJ194L-ASY is performed by means of several SETUP options. Once into the SETUP, use the keyboard to select different options and enter required variables:

7.1.- Input Password

A 4-figure password is required to be entered (in case that in case that the meter will work without permission.)

At normal display mode, press  to enter the programming mode, meter display

Meter display “  ”,

Ask for the password. Press  to input the password number, from “0~9”. Press  to move the cursor . After password switch press  to confirm the input.

If password is correct, meter can enter next setting.

Notes: the default password is 0001.

7.2. - Input Signal Selection

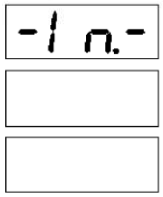
Press  , return to level 1 menu.

In this section, user will set:.

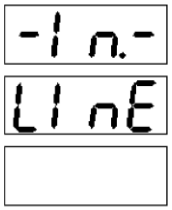
1. Input net mode;
2. Voltage measure range;
3. Current measure range;
4. Voltage transformation ratio;
5. Current transformation ratio.

7.2.1.- Choice the input net mode

In level 1 menu, use ≪ and ≫ to choose item “-IN-”, and the meter shows like this:

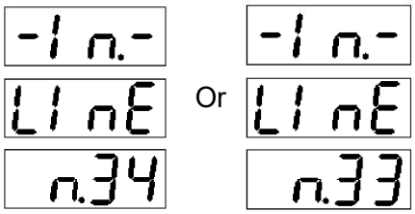


then press ⌄ , enter the level 2 menu, choose “LINE”, meter shows:



Then press ⌄ again, enter the level 3 menu.

Use ≪ and ≫ to select the right wiring mode, meter shows like this:



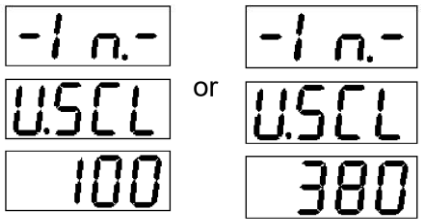
Note: Selecting the wiring mode must match with actual wiring, or the reading data will go wrong.

7.2.2.- Voltage measure range

In level 1 menu of “-IN-”

Choose item “U.SCL”, and the meter shows like this:

then press , enter the level 3 menu, user can see the voltage range:

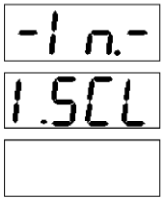


100V: Maximum measured value is 100V
380V: Maximum measured value is 380V

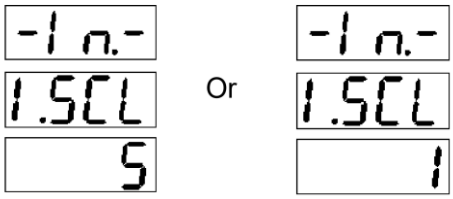
Note: A different range will affect the accuracy of measurements. If the accuracy is 0.5.
Select 100V range, means the minimum scale value is 0.5V (100 x 0.5%);
Select 380V range, means the minimum scale value is 1.9V (380 x 0.5%).

7.2.3.- Current measure range

In level 1 menu of "-IN-".
Choose "I.SCL", meter shows like this:



then press , enter the level 3 menu, user can see the current range:



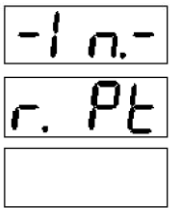
5A: Maximum measured value is 5A.
1A: Maximum measured value is 1A.

Note: Select a different range will affect the accuracy of measurements, if the accuracy is 0.5.
Select 1A range, means the minimum scale value is 0.005A (1 x 0.5%);
Select 5A range, means the minimum scale value is 0.025A (5 x 0.5%).

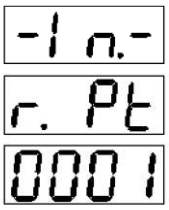
7.2.4- Voltage transformation ratio

In level 1 menu of "-IN-".

Choose item “r.PT” , meter shows like this:



then press , enter the level 3 menu, allowing us to set the current transformer.

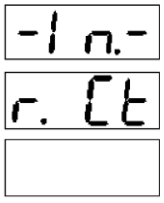


Press to input the number, from “0~9”. Press to move the cursor. After password switch press to confirm the input, value is 1~9999.

Note: The input values represent the voltage transformer (primary side voltage) / (secondary side voltage).
Secondary side voltage is 100V or 380V; user set it at section **7.2.2**

7.2.5. - Current transformation ratio

In level 1 menu of “-IN-”.
Choose the item “r.CT”, meter shows like this:



then press , enter the level 3 menu, allowing us to set the current transformer.

Press to input the number, from “0~9”. Press to move the cursor. After password switch press to confirm the input, value is 1~9999.

Note: The input values represent the current transformer (primary side voltage) / (secondary side current) .
Secondary side current is 1A or 5A, user set it at section **7.2.3**

7.3. - Communication Preferences

Press , return to level 1 menu.

In this section, user will set:

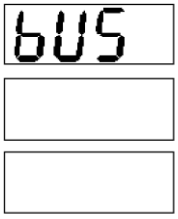
1. Meter communication address;
2. Baud rate;
3. Communication format.

Note: Not all the meter have communication function, please make sure your purchase meter first, if no communication mode, you can skip this section.

7.3.1. - Meter communication address setting

One or some BJ194…meter can be connected to a P.C. With this system we can get all the parameters in one central point of reading. The BJ194..., has a serial RS-485 or RS-232 type output (according to the model). If we connect more than one device to the same communication line (RS-485), we have to assign to each of them a different code or direction (from 1 to 247), since the P.C. needs the identification of every measuring point.

In level 1 menu, choose the item “bus”, the meter shows like this:



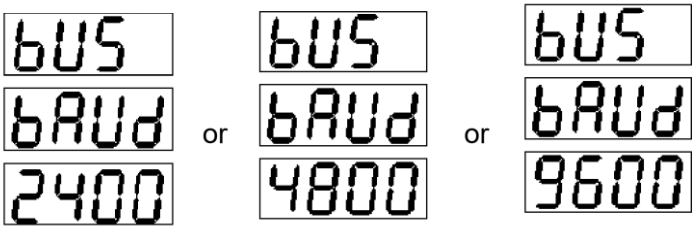
Then press , enter the level 2 menu, choose the item “Addr”, the meter shows like this:

Press to input the number, from “0~9”. Press to move the cursor. After password, press to confirm the input, value is 1~9999.

7.3.2.- Communication Baud rate setting

In level 1 menu of “bus”.
Choose item “BAUD”, and the meter shows like this:

Then press , enter the level 3 menu, allowing us to set the Baud rate 2400, 4800 or 9600.



7.3.3.- Choose communication format

In level 1 menu of “bus”.
Choose item “data”, and the meter shows like this:

Then press , enter the level 3 menu, allowing us to set the communication data format. **(Factory setting n.8.1)**

7.4. - Digital Output Setting

Press , return to level 1 menu.

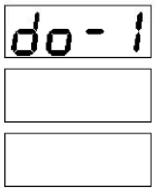
In this section, user will set:

1. Digital output type;
2. Output delay;
3. Choose the electrical parameter;
4. Set the alarm value
5. Set the hysteresis value

Note: If the meter have more than one channel digital output, you can set the DO-2,DO-3…as the following step, please select the appropriate output settings in the level 1 menu,.

7.4.1. - Output type

In level 1 menu, use and to choose item “DO-1”, and the meter shows like this:



then press , enter the level 2 menu, choose “TYPE”. The meter shows:

then press again, enter the level 3 menu.

Use and to select the output type, meter shows like this:

r.n: Mean remote control mode, there have pulse and level output mode, more detail refer chapter **7.4.2**.

Host inquiry:

01	05	00 01	FF 00	DD FA
Address	Code	Relay address	Relay value (FF00:close; 0000: open)	CRC

Slave answer

01	05	00 01	FF 00	DD FA
Address	Code	Relay address	Relay value (FF00:close; 0000: open)	CRC

RS485 communication please refer to chapter **9.1**

ALr: Mean directly alarm mode
OFF: Mean the relay will not work

7.4.2. - Set output delay

In level 1 menu of "DO-1".

Choose item "DELY", and the meter shows like this:

Then press , enter the level 3 menu, user can set the delay value:

Press to input the number, from "0~9". Press to move the cursor. After password switch press to confirm the input, value is 1~9999. **(Default 0010)**

Note: The setting of relay value is indicating the width pulse output; value "0000" is for level output. The setting value resolution is 100ms, which means "0001" is 100ms, "9999" means 999.9s. **0 for level output, 1~9999 for pulse output**

7.4.3. - Choose the electrical parameter

In level 1 menu of “DO-1”.

Choose item “PArA”, meter shows like this:

then press , enter the level 3 menu, user can choose the output parameter:

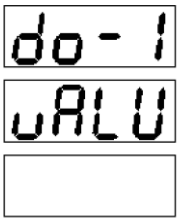
Note: There are two alarm mode, indicate with “**XX-H**” and “**XX-L**”,
“**XX-H**” mean the rising edge alarm;
“**XX-L**” mean the falling edge alarm;

Example: “IA-H” mean when the A-phase current is rising to a certain value then output alarm.
“I3-H” mean when one phase of A, B, C phase current is rising to a certain value then output alarm.
“PS-L” mean when Three-phase total power is falling to a certain value then output alarm.

7.4.4. - Set the alarm value

In level 1 menu of “DO-1”.

Choose item “VALU”; meter shows like this:



then press , enter the level 3 menu, user can set the alarm value:

Press  to input the number, from “0~9”. Press  to move the cursor. After password switch press  to confirm the input, value is 1~9999. **(Default 5500)**

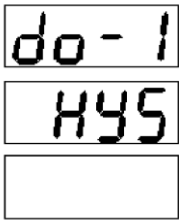
Note: Alarm value is about the secondary side value (such as AC100V, AC5A).

Voltage unit is 0.1V;	Reactive power unit is 0.1VAR;
Current unit is 0.001A;	Power factor Is 0.001;
Active power unit is 0.1W;	Frequency 0.01HZ;

7.4.5. - Set the hysteresis value

In level 1 menu of “DO-1”.

Choose item “HYS”, meter shows like this:



then press  , enter the level 3 menu, and user can set the alarm value:

Press  to input the number, from “0~9”. Press  to move the cursor. After password switch press  to confirm the input, value is 1~9999. **(Default 5500)**

Note: hysteresis value is for preventing the relay repeated action.

Example: Alarm value 3.700A; hysteresis value 0.030A; Rising edge alarm

Measured value is 3.700A then relay action, output alarm;
When measured value is bellow 3.670A, the relay will be closed.

7.5. - System Setting

Press , return to level 1 menu.

In this section, user will set:

1. Backlight time of the LCD;
2. Clear energy counters;
3. Set display mode;
4. Change the password

7.5.1. - Set the LCD backlight time

In level 1 menu, use and to choose item “SYS”, meter shows like this:

then press , enter the level 2 menu, choose “LCd.t”, meter show:

then press again, enter the level 3 menu, Use and to select the value

Note: Minimum step is 1 minute, 0005 for 5 minutes, which means if not any operation in 5 minutes, the backlight will turn off

Set value > 1000, the backlight always on;
Set value = 0000, the backlight always off.

7.5.2. - Clear energy counters

In level 1 menu of “SYS”.

Choose item “CLr.E”, meter shows like this:

then press ⟱ again to confirm clear all the energy data, meter display:

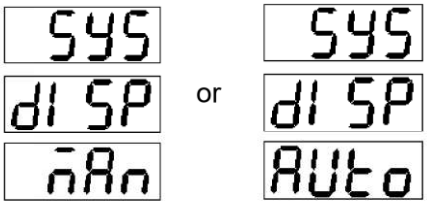
And then press ⟱ again, to save the operation and exit.
Press ⟰ without save and exit.

7.5.3. - Set display mode

In level 1 menu of “SYS”.

Choose item “dISP”, meter shows like this:

then press ⟱ , enter the level 3 menu, user can choose the display mode:

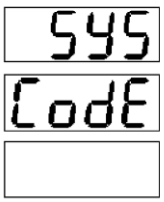


Note: Man means the screen display will change by press ⟪ and ⟫
Auto means the screen display will change in every 10 sec.

7.5.4. - Change the password

In level 1 menu of “SYS”.

Choose item “CodE”, meter shows like this:



then press  again, enter the level 3 menu.
Use  and  to input the new password:

Note: *Please do not change the password, If necessary, please contact Blue Jay technical !!*

7.6. – Menu Structure

level 1	Level 2	Level 3	Description
(System setting) **SYS**	(LCD backlight time) **LCd.t**	0000~1000	Factory default is 0005
	(Clear energy counters) **CLr.E**		Unrecoverable for Clear data
	(Display mode) **dISP**	Manual or Automatic	Factory default is manual
	(Change the password) **CodE**	0000~9999	Default is 0001
(Signal input) **-IN-**	(Net) **Lin.e**	N.3.4, N.3.3, N.1	Select the input signal network measurement
	(Voltage Range) **U.SCL**	100V, 220V, 380V	Select the range of measured voltage signal
	(Current Range) **I.SCL**	5A and 1A	Select the range of measured current signal
	(Voltage transformation ratio) **R.PT**	1-9999	Setting voltage signal transformation ratio = 1 / 2 scale
	(Current transformation ratio) **R.CT**	1-9999	Setting current signal transformation ratio = 1 / 2 scale
(Communication Parameters) **bUS**	(Address) **ADDR**	1-247	Instrument address range 1-247
	(Communication speed) **BAUD**	4800~9600	Default is 4800
	Protocol **DATA**	o.8.1; e.8.1; n.8.1	Factory default communication mode for the word (**n.8.1**)
(Digital output setting) **DO-1**	(Output type) **TYPE**	**r.n, Alr, OFF**	Default is **Alr**
	(Set output delay) **DELY**	0000~9999	Default is 0010
	Choose the electrical parameter **PArA**	**I3-H, PS-H...U3-H**	Default is I3-H
	(Set the alarm value) **VALU**	0000~9999	Default is 0050
	hysteresis value **HYS**	4800~9600	Default is 4800

Note: Not all 194L series mini multi-function meter have the complete menu settings, Please confirm your purchased Mini Multi-function Meter has the corresponding extension module. Without the module, the corresponding part of the menu is not valid.

7.7.- Display Character instructions

PASS	User passwords	U.SCL	Input voltage range selection
Erro	Input error	I.SCL	Input current range selection
-In.-	User settings menu	r. Ct	Set CT ratio
bUS	Communication settings menu	r. Pt	Set PT ratio
SCAL	Shows scal input value	LInE	Select phase
Polt	Set the decimal point	do-1	Route 1 switch output settings
dAtA	Communication parameter setting	do-2	Route 2 switch output settings
Addr	Metter address setting	SYS	System parameter settings
bAUd	Baud rate	tYPE	Choose Setted parameter
o.8.1	8 data bits, 1 stop bit, even parity	PArA	The corresponding parameters
E.8.1	8 data bits, 1 stop bit, odd parity	uALU	Set the alarm value
n.8.1	8 data bits, 1 stop bit, no parity	LdI S	Show Low alarm setting
SUrE	Confirm the change	HdI S	Show High alarm setting
		CodE	System password

8.- PULSE OUTPUT

BJ-194L mini multi-function meter provides 2 routes pulse output for the total active energy and 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 optocoupler relay.

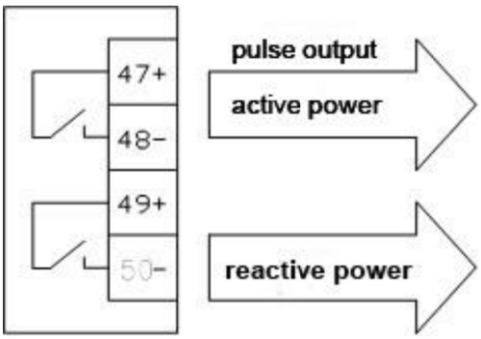
1). Electrical specification: voltage VCC ≤ 48V, Iz ≤ 50mA.

2). Pulse: 5000 imp / kWh, pulse upto 80ms.
This means: When the meter detect 1 kWh, the meter output 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".

For 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/5000 × 100 × 80

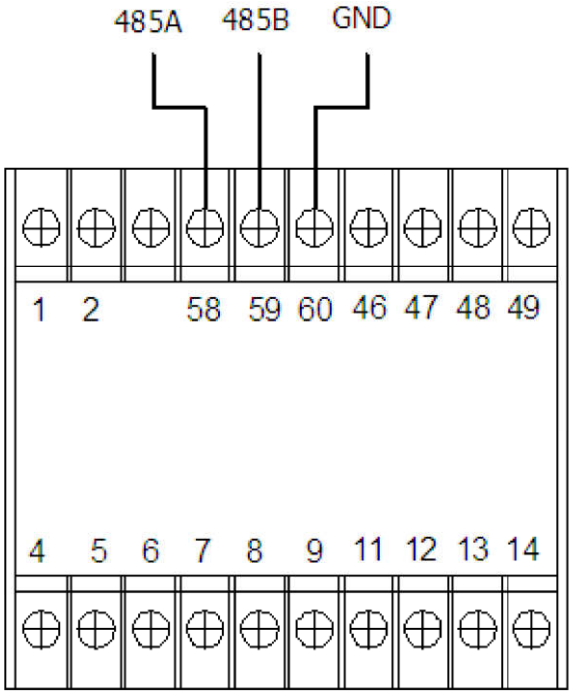


Notes: *Due to size restrictions, 194L can only alternative one in pulse output or RS485 communication port, can not optional both module in one meter. Please contact Blue Jay's sales team to confirm before order!*

9. - COMMUNICATION PROTOCOL

9.1. - Connection for the RS485 BUS

The composition of the RS-485 cabling must be carried out with a meshed screen cable (minimum 3 wire), diameter of not less than 0.5mm^2, with a maximum distance of 1,200 m between the BJ194… and the master unit. This Bus may connect a maximum of 32 BJ194…



Note:

1. For communication with the master unit, customers can choose the RS-232 to RS-485 converter to use

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

3. Due to product modifications or custom requirements, the interface pin place may be changed. For details, please refer to product label on the rear board

4. If have error in communication, default is that slave do not response. Master device should resend inquiry.

9.2. - 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	**N BYTE**	*Starting address, high byte* *Starting address, 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 03/04	Reading of n Words	*This function permits to read all the electrical parameters of the BJ194…series.*
FUNCTION 08	Clear energy counters	*Cleared energy data by the PC (*User also can clear energy counter on meter operation, refer the **User Manual** related section)*
FUNCTION 16	Preset Multiple Registers	*Write value in to the relevant register*

9.3. - Register Address Table

9.3.1- Primary Side Power Data

Address	Data	Instruction	Byte mode	Note

0	U_A	A-phase Voltage	0,1	***Data Format Description:***
				
				Power with 2-byte register (0-9999) and 1-byte decimal register (0-15) describe the electric data. Power register show the BCD part, decimal point registers show the exponent of electric data.
				
				For example:
				
				A phase voltage representation:
				The register UA = 0DACH (3500);
				register DPT = 5;
				UA = 0.3500 × 10 ^ 5 = 35.00kV.
				
				A phase current representation:
				The register IA = 0FA0H (4000);
				register DCT=3;
				IA = 0.4000 × 10 ^ 3 = 400.0A.
				
				Note: Frequency and power factor use fixed exponent to calculation.
				XXHz (DHZ = 2); 0.XXX (DPF = 0)

1	U_B	B-phase Voltage	2,3	
2	U_C	C-phase Voltage	4,5	
3	I_A	A-phase Current	6,7	
4	I_B	B-phase Current	8,9	
5	I_C	C-phase Current	10,11	
6	P_S	Total Active Power	12,13	
7	Q_S	Total Reactive Power	14,15	
8	PF_S	Power Factor	16,17	
9	FR	Frequency	18,19	

Note:

1. Not all of the data 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 have different definitions of the start bit of register address, there will be offset, please add 1 for the right address. To get more info, please contact technical support **tech@cqbluejay.com**

9.3.2 - Auxiliary Information

Address	Data	Instruction	Byte mode	Note
10	DPT	Voltage data decimal position	20	Decimal point registers show the exponent of current and voltage data
	DCT	Current data decimal position	21	
11	DPQ	Power data decimal position	22	Decimal point registers show the exponent of power data
	SIGN	Sign bit of power data	23	SIGN “0 to 7”, means the data: Bit 1 show reactive data symbol Bit 4 show active data symbol Symbols, 0: mean positive (**+**); 1: mean negative (**-**).

9.3.3- Energy Data

Address	Data	Instruction	Byte mode	Note
12,13	WPP	Positive active energy	24 25 26 27	**Secondary side** energy data. High byte first, low byte follow, use 4-byte integer, unit 0.1Wh. Show the cumulative value of the input signal: as in AC100V/5A = 0.866kW run 1 hour for the 0.866kWh.
14,15	WPN	Negative active energy	28 29 30 31	
16,17	WQP	Positive reactive energy	32 33 34 35	
18,19	WQN	Negative reactive energy	36 37 38 39	
20,21	EPP	Positive active energy	40 41 42 43	**Primary side** energy data. Use IEEE754 floating-point data show the results. Unit 0.1Wh. For as in AC100V5A = 0.866kW input signal, when the meter turns ratio PT = 10kV/100V = 100, CT = 200A/5A, the meter work 1 hour 0.866kWh × 100 × 40 = 3464kWh. **Note:** meter LCD display show the primary side data can be directly copied without conversion.
22,23	EPN	Negative active energy	44 45 46 47	
24,25	EQP	Positive reactive energy	48 49 50 51	
26,27	EQN	Negative reactive energy	52 53 54 55	

Note:

1. Not all of the data 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 have different definitions of the start bit of register address, there will be offset, please add 1 for the right address. To get more info, please contact technical support **tech@cqbluejay.com**

9.3.4- Other data

Address	Data	Instruction	Byte mode	Note
28	DI	Digital input	56	Low four effective, 0 for open, 1 for closed
	DO	Digital output	57	Low two effective, 0 for open, 1 for closed
33	UAB	AB-line Voltage	66 67	Same as primary side power data
34	UBC	BC-line Voltage	68 69	
35	UCA	CA-line Voltage	70 71	
48	R_U	PT ratio	96 97	
49	R_I	CT ratio	98 99	
50	USE_U	Voltage input range	100 101	
51	USE_I	Current input range	102 103	

9.4. - Example

Host to Slave inquiry

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 to Host 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**	**CRC1 6 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)

10. - SAFETY CONSIDERATIONS

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

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.

11. - MAINTENANCE

The 194L 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.

12. - TECHNICAL SERVICE

FAQ's

1. The BJ-194L mini multi-function meter, 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. The BJ-194L, 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 is clearly shown on the back of the analyzer.

3. The BJ-194L is measuring in average voltage and is displaying the secondary voltage (for example 110 volts).
   Ensure that the voltage Transformer ratio has been correctly set (see section on **chapter7**).

4. The BJ-194L does not correctly display the current reading. It shows values varying between 0 to 5 amps of current.
   Ensure that the Transformer ratio has been correctly set; once correctly set the current measurement shall be shown correctly (see section on **chapter7**).

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

Blue Jay - After-sales service

E-mail : tech@cqbluejay.com