

# **BJ-RCM-IV**

## **Multi-channel Residual Current Monitor**

### **User Manual**

**Version : 3.5**

**Revision 2022-08**

## Read me

**When you use BJ-RCM... series multi-channel monitor, 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-RCM... series multi-channel monitor, 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

RCM-IV residual current monitor is designed for measuring residual and operating temperature in TT and TN-S systems. It can inject multiple sensor signal, which are able to detect and evaluate fault, residual and operating currents in earthed power supplies.

When the residual current in the protected line or the temperature exceeds preset alarm value, RCM-IV will generate audible & visual alarm signal, front screen shows details value. RS485 port can transfer data to remote host, data will record internally for post-event failure analysis.

RCM-IV provide max 8 channels of residual current and 8 channels of temperature signal access, please confirmed your purchase product PN code and refer to related chapter of wiring. Product must be adapted to local equipment and operating conditions by making individual parameter settings, in order to meet the requirements of applicable standards and to attain the protection goals.

### Features:

- Residual current alarm setting range 300 ~ 1000mA, minimal adjustment step 1mA;
- The temperature alarm setting range 50.0 ~ 100.0°C, minimal adjustment step is 0.1°C;
- With 2 relay outputs, free to configuration various protection methods;
- Building in buzzer to provide sound alarm, automatically jump to the alarm interface when protection occurs, key buttons can manual silencing and reset;
- Circular record 100 sequence of events, non-volatile memory saves more than 10 years;
- Standard RS485 communication port, MODBUS-RTU protocol;
- Support manual self-check;
- Optional 2-way passive open input.

### Applications:

- Temperature monitoring of critical parts of cables or electrical boxes.
- Residual current monitoring of stationary electrical equipment and systems.
- Personnel protection and protection against fire by rapid disconnection.
- Monitoring of digital inputs.

## 2. - SPECIFICATIONS

### - Reference standard:

EMC: IEC 61000-4  
 Insulation: IEC 60664-1  
 Rated residual: IEC 62020

### - Residential Current Transformer Input

Primary side current  $I_n$ : 1A(rms);  
 Secondary side current  $I_o$ : 0.5mA (rms);  
 Load resistor  $R_L$ :  $\leq 620\Omega$ ;  
 Secondary side impedance  $R$ :  $100\pm 20 \Omega$

**Notes:** Blue Jay provide CTZ series transformer work with RMS series, if purchase from other brand, please refer this basic specification.

### - Temperature Sensor

Temperature detect range: 0 ~120C;  
 Accuracy 2%;

**Notes:** Blue Jay provide temperature probe in package, but not all sub-mode have temperature detect function, please refer to PN code in order.

### - Current relay

AC 250V/5A or DC 30V/5A  
 2500V optocoupler isolation

### - Dielectric strength

IEC / EN 61010-1:2010  
 2kV AC RMS 1 minute, between input / output / case / power supply

### - 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

**- Work environment**

Temperature: -20°C ~ +60°C

Humidity: RH 20% ~ 95% (No condensation)

**- Protection**

Panel: IP54

Case: IP20

**- Storage Conditions**

Temperature: -25°C ~ +70°C

Humidity: RH 20% ~ 95%

**- Working Power**

AC/DC 90-240V, 45-65Hz

DC 20-60V (Optional)

Maximum power consumption 6W

**- Dimensions**

L × W × H =96mm×96mm×75mm

**- Installation hole size**

L × W = (91+0.8mm) × (91+0.8mm)

### 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.**

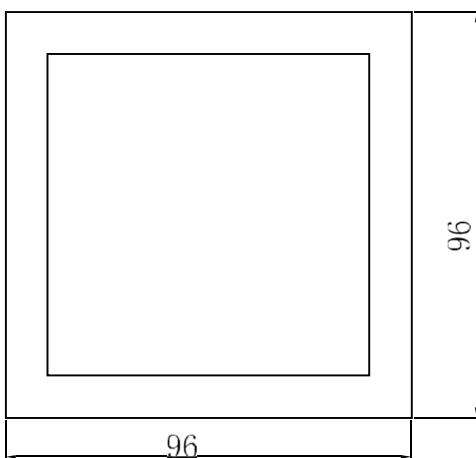
When any protection failure is suspected to exist (for example, it presents external visible damages), the instrument must be immediately powered off. In this case contact a qualified service representative.

#### 3.1.- Installation

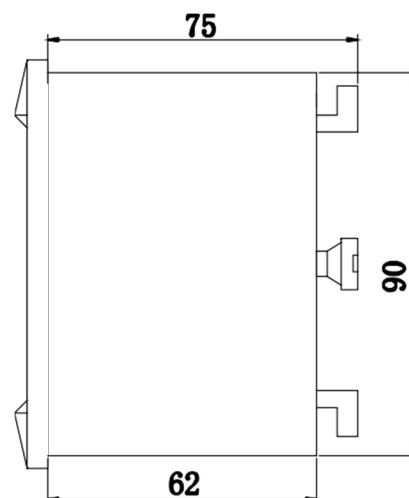
##### Mounting

Instrument is to be mounted on panel (cut-out  $91+0.8 \times 91+0.8 \text{ mm}$ ). 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

**Notes:**

Input signal: BJ-RCM... 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.

**Auxiliary power:**

BJ-RCM... 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-RCM... 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.



### 3.2. - Connection Terminal and Wiring of RCM-16IN

#### Upper connection terminal

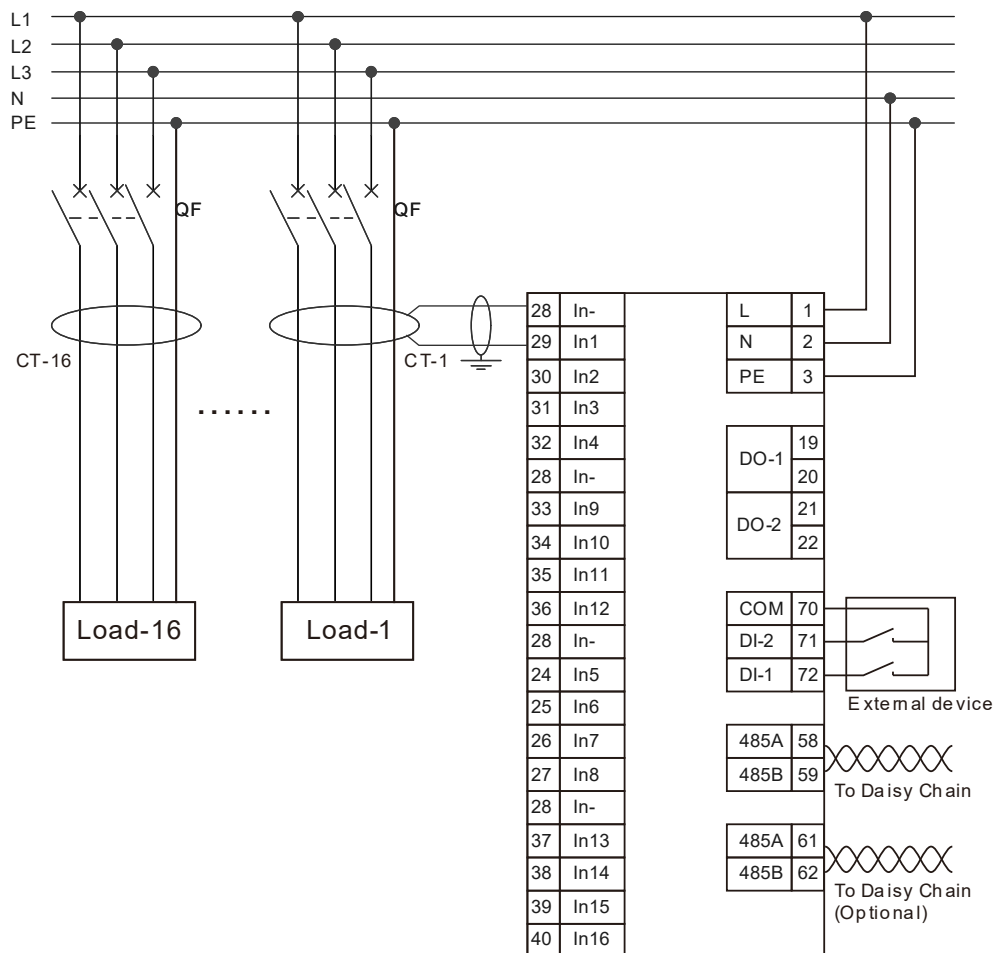
59	58	22	21	20	19		3	2	1
485B1	485A1	DO2-	DO2+	DO1-	DO1+		PE	N	L

#### Middle connection terminal

62	61		28	33	34	35	36	28	37	38	39	40
485B2	485A2		In-	In9	In10	In11	In12	In-	In13	In14	In15	In16

#### Lower connection terminal

28	29	30	31	32	28	24	25	26	27	72	71	70
In-	In1	In2	In3	In4	In-	In5	In6	In7	In8	DI1	DI2	COM



### 3.3.- Connection Terminal and Wiring of RCM-8IN8T

#### Upper connection terminal

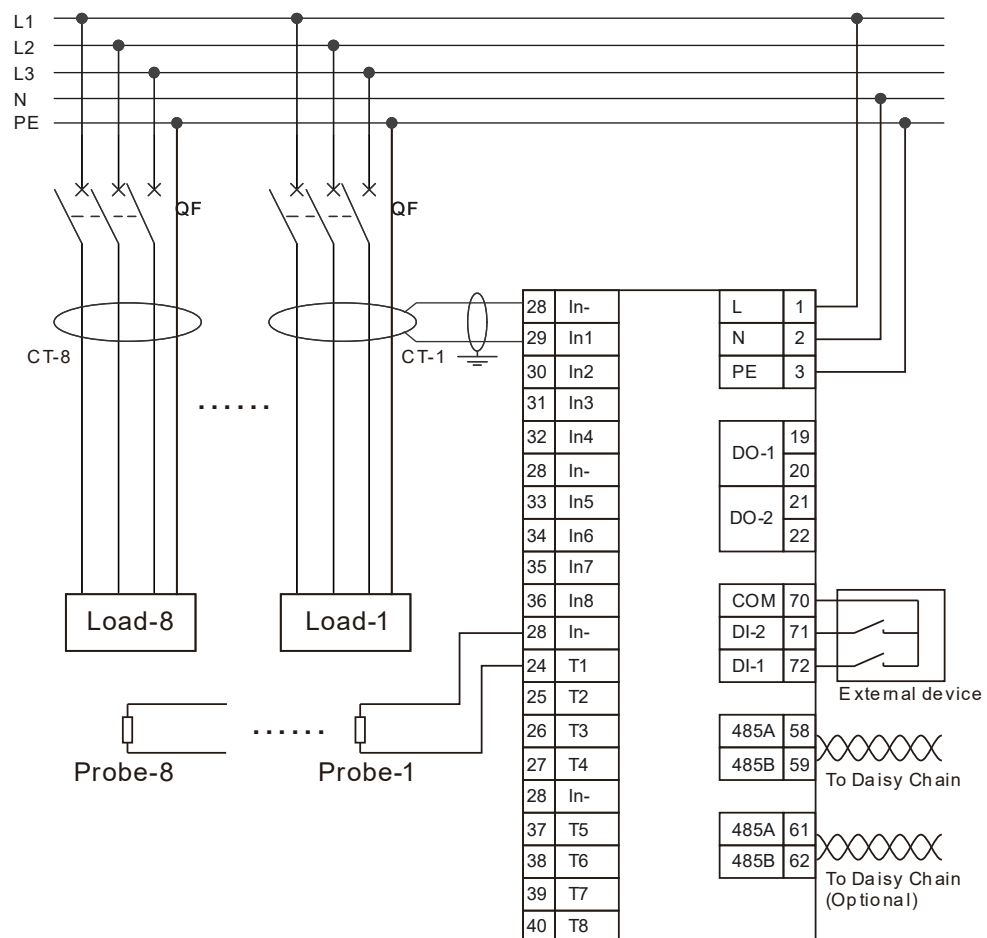
59	58	22	21	20	19		3	2	1
485B1	485A1	DO2-	DO2+	DO1-	DO1+		PE	N	L

#### Middle connection terminal

62	61		28	33	34	35	36	28	37	38	39	40
485B2	485A2		In-	In5	In6	In7	In8	In-	T5	T6	T7	T8

#### Lower connection terminal

28	29	30	31	32	28	24	25	26	27	72	71	70
In-	In1	In2	In3	In4	In-	T1	T2	T3	T4	DI1	DI2	COM



**Notes:** For RCM-8IN, the temperature probe terminal is invalid.

### 3.5.- Connection Terminal and Wiring of RCM-4IN4T

#### Upper connection terminal

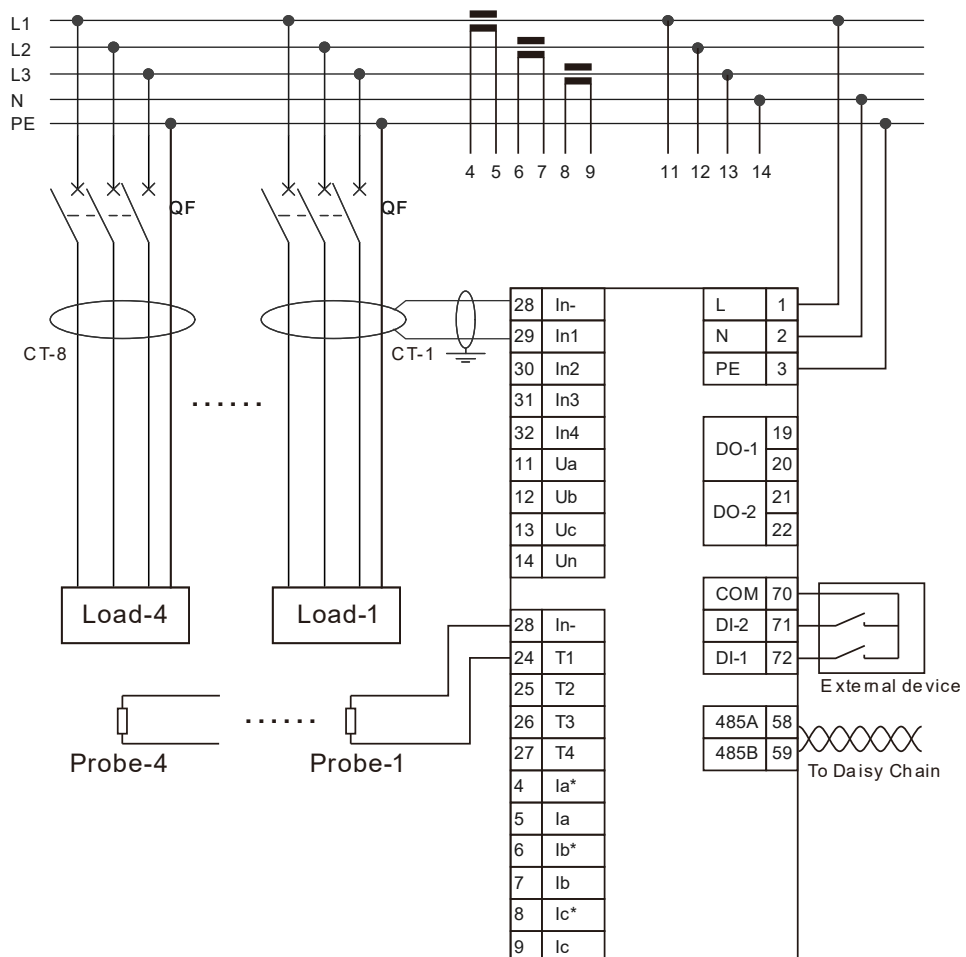
59	58	22	21	20	19		3	2	1
485B1	485A1	DO2-	DO2+	DO1-	DO1+		PE	N	L

#### Middle connection terminal

14	13	12	11	9	8	7	6	5	4
UN	UC	UB	UA	IC	IC*	IB	IB*	IA	IA*

#### Lower connection terminal

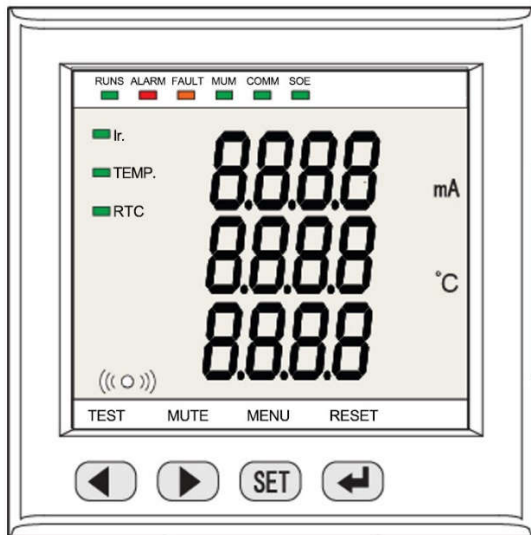
28	29	30	31	32	28	24	25	26	27	72	71	70
In-	In1	In2	In3	In4	In-	T1	T2	T3	T4	DI1	DI2	COM



**Notes:** The voltage/current measurement function is optional, please refer to the PN code of purchase products





## 4. SCREEN DISPLAY

### 4.1.- Full Symbol in Display Screen





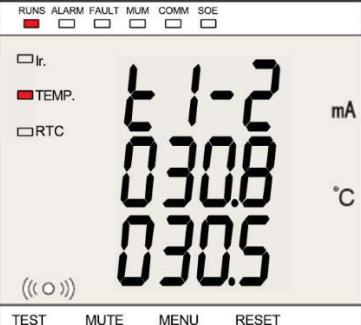

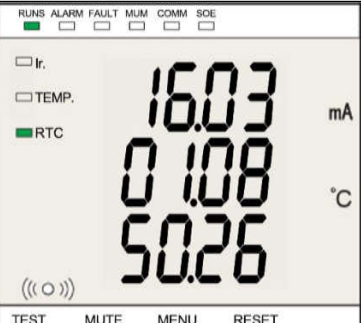
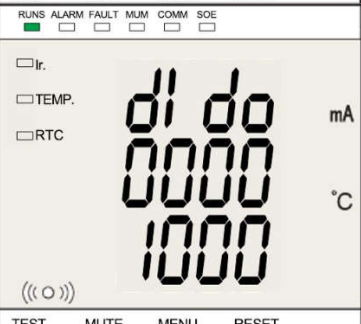
<b>RUNS</b>	System regular status, no alarm or fault
<b>ALARM</b>	There have alarm triggered
<b>FAULT</b>	There have failure triggered
<b>MUM</b>	Buzzer stopped
<b>COMM</b>	Device in TX/RX
<b>SOE</b>	Screen show event record
<b>Io</b>	Leakage current
<b>TEMP.</b>	Temperature value
<b>RTC</b>	Real Time Clock

### 4.2.- Operation Button Description

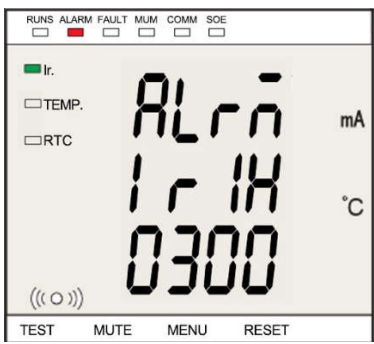


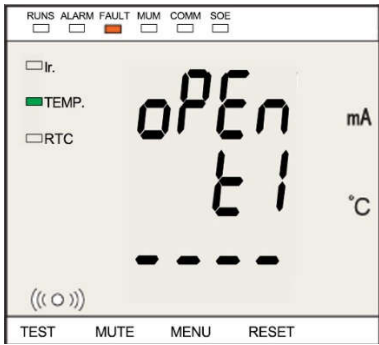


Button	Measurement Interface	Alarm/Fault Interface	Configuration Interface
	<b>Click:</b> Switch to the previous page <b>Long press 3S:</b> Self-test	<b>Click:</b> Switch to next "Alarm" info page <b>Long press 3S:</b> Self-test	Move cursor or Modify number
	<b>Click:</b> Switch to the next page <b>Long press 3S:</b> ON/OFF buzzer	<b>Click:</b> Switch to next "Fault" info page <b>Long press 3S:</b> ON/OFF buzzer	Move cursor or Modify number
	<b>Click:</b> Enter configuration menu	<b>Click:</b> Enter configuration menu	Exit or Return to upper menu level
	<b>Click:</b> Refresh sensor to measurement	<b>Click<sup>1</sup>:</b> Refresh sensor to clear alarm status	Confirm or Enter next menu level

**Notes<sup>1</sup>:** If there have fault event, after fault be resolution, device will automatic reset "FAULT" status, "ALARM" status must manually press button to reset.

### 4.3.- Measurement Interface

Screen	Description	
	Line-1	“I” for residential current “1-2” for mean this page for channel-1 and channel-2
	Line-2	Channel-1 current, screen show 100mA
	Line-3	Channel-2 current, screen show 200mA
	Press button  can switch to show page 2-8 (Ir3-Ir16)	
	Line-1	“t” for temperature “1-2” for mean this page for channel-1 and channel-2
	Line-2	Channel-1 temperature, screen show 30.8°C
	Line-3	Channel-2 temperature, screen show 30.5°C
	Press button  can switch to show page 2-4 (t3-t8)	
	Line-1	“Year”. “Month”
	Line-2	“Date”. “Hour”
	Line-3	“Minute”. “Second”
	Demo RTC is 2016-03-01 08:50:26	
	Line-1	This page show DI and DO status
	Line-2	DI status, LED tube show “DI-1, DI-2, / , /”
	Line-3	DO status, LED tube show “DO-1, DO-2, / , /”
	<b>Notes:</b> 0 for opened, 1 for closed	

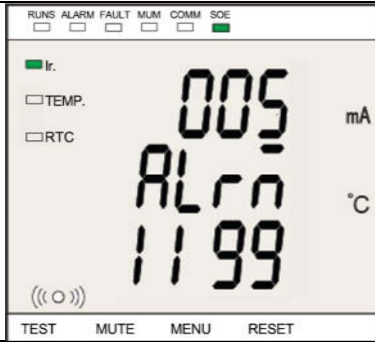
### 4.4.- Alarm/Fault Interface

Screen	Description	
	Line-1	Show this screen is alarm info, “ALARM” light will ON
	Line-2	“Ir” mean residential current alarm info “1H” mean channel-1 over upper limit
	Line-3	Alarm trip value is 300mA
	Press and hold  3set can Self-test, device will check whether have other channels in alarm status. “MUM” light ON mean buzzer in silence, press and hold  can switch ON/OFF the buzzer sound.	
	Line-1	Show this screen is probe open loop fault, “FAULT” light will ON
	Line-2	“t1” mean problem is in channel-1 temperature
	Line-3	No info in this line
	Press and hold  3set can Self-test, device will check whether have other channels in fault status. “MUM” light ON mean buzzer in silence, press and hold  can switch ON/OFF the buzzer sound.	

#### Notes:

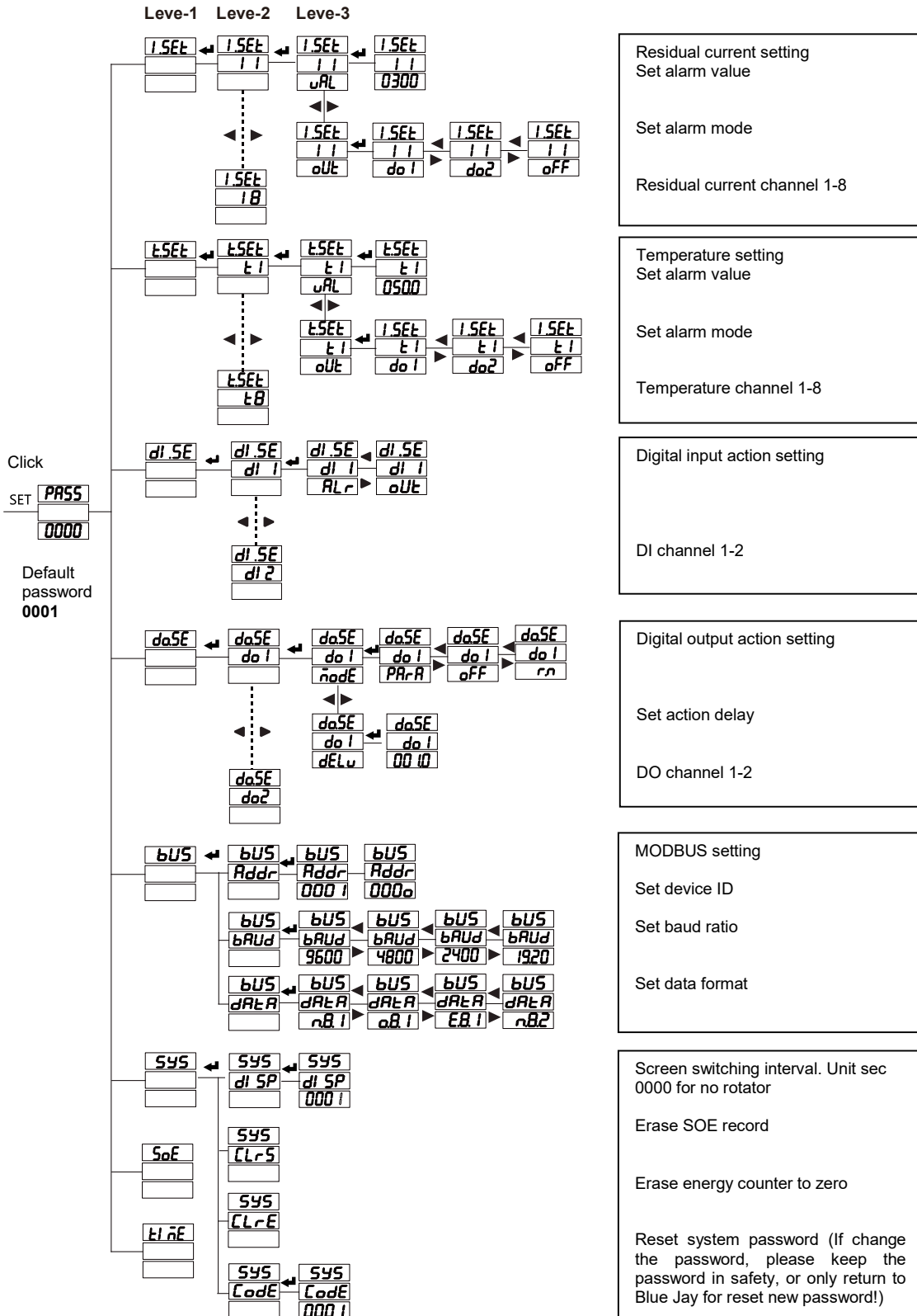
1. If any channel trigs the alarm, will automatic switch to alarm/fault interface
2. If “ALARM” / “FAULT” light ON, mean troubles are not resolved, please do “Self-test” and “Reset” to troubleshooting and until indicator OFF.

### 4.5.- Event record

	Line-1	Event number
	Line-2	Event type
	Line-3	Event value <b>Notes:</b> Event channel and Event value will automatic switch to display one by one.

## 6. - SETUP PROCEDURE

The SETUP procedure of the RCM-IV is performed by means of several configurations. There has a password to protect unexpectedly enter the configuration interface menu. Once into the configuration interface, use the keyboard to select different options and enter required variables:



SOE record are folded under configuration interface, in this sub-screen user can review the all the 100 log event record.

**Notes:** This menu page is read only.

<p>SoE</p>	<p>00 I do 1- 000 I</p>	<p>00 I do 2- dI I</p>	<p>DO event, screen show DO-1 triggered or DO2 triggered by DI1 closed.</p>
	<p>00 I ALr n̄ 000 I</p>	<p>00 I ALr n̄ dI I</p>	<p>Alarm event, screen show Alarm triggered by DI1 closed.</p>
	<p>00 I SHor 0000</p>	<p>00 I SHor t I</p>	<p>Short circuit, 000.0 is meaningless, t1 mean channel-1 temperature 1 probe shorted loop.</p>
	<p>00 I oPE n̄ 0000</p>	<p>00 I oPE n̄ I I</p>	<p>Open circuit, 000.0 is meaningless, I1 mean channel-1 residual current CT opened loop.</p>

RTC configuration:

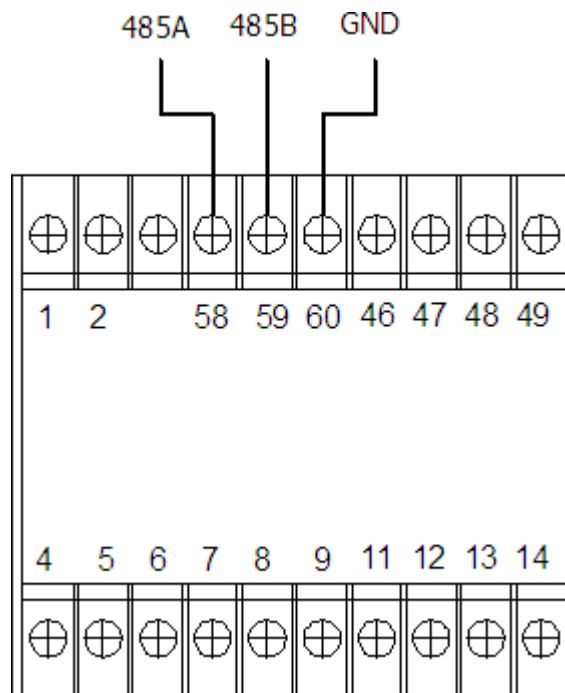
<p>ti n̄E</p>	<p>ti n̄E ← ti n̄E YEAR ← YEAR 0000</p>	<p>Set Year</p>
	<p>ti n̄E ← ti n̄E mon ← mon 0000</p>	<p>Set Month</p>
	<p>ti n̄E ← ti n̄E DAY ← DAY 0000</p>	<p>Set Day</p>
	<p>ti n̄E ← ti n̄E DATE ← DATE 0000</p>	<p>Set Date</p>
	<p>ti n̄E ← ti n̄E Hour ← Hour 0000</p>	<p>Set Hour</p>
	<p>ti n̄E ← ti n̄E min ← min 0000</p>	<p>Set Minute</p>
	<p>ti n̄E ← ti n̄E SEC ← SEC 0000</p>	<p>Set Second</p>



## 8.- COMMUNICATION INTERFACE

### 8.1.- 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<sup>2</sup>, with a maximum distance of 1,200 m between the BJ-RCM... and the master unit. This Bus may connect a maximum of 32pcs BJ-RCM...



#### 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-RCM... 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

## 8.2.- MODBUS © protocol

### Modbus RTU Frame Format:

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

### MODBUS FUNCTIONS:

<b>Code</b>	<b>Meaning</b>	<b>Description</b>
<b>FUNCTION 01</b>	Read Coil Status	<i>Only valid when equipped DO port</i>
<b>FUNCTION 02</b>	Read Input Status	<i>Only valid when equipped DI port</i>
<b>FUNCTION 03</b>	Reading of n Words	<i>This function permits to read all the electrical parameters of the BJRCM...series.</i>
<b>FUNCTION 05</b>	Force Single coil	<i>Details see chart 6.4 When DO in remote control mode can work</i>
<b>FUNCTION 06</b>	Preset Single register	<b><i>Disable in default</i></b>  <i>If need valid this code, please contact Blue Jay Sales Team before your order!</i>

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

### 8.3. - Register map

#### 8.3.1- Measurement data, Read Only

Address	Item.	Description
0x00	Channel -1 residual current (rms)	Real value = [Read value] / 10mA Example: Polling data 235, Real value = 23.5mA
0x01	Channel -2 residual current (rms)	
0x02	Channel -3 residual current (rms)	
0x03	Channel -4 residual current (rms)	
0x04	Channel -1 residual current status	0: Normal status 1: Alarm trig 2: Sensor in short circuit 3: Sensor disconnection
0x05	Channel -2 residual current status	
0x06	Channel -3 residual current status	
0x07	Channel -4 residual current status	
0x08	Channel -5 residual current (rms)	Real value = [Read value] / 10mA Example: Polling data 235, Real value = 23.5mA
0x09	Channel -6 residual current (rms)	
0x0A	Channel -7 residual current (rms)	
0x0B	Channel -8 residual current (rms)	
0x0C	Channel -5 residual current status	0: Normal status 1: Alarm trig 2: Sensor in short circuit 3: Sensor disconnection
0x0D	Channel -6 residual current status	
0x0E	Channel -7 residual current status	
0x0F	Channel -8 residual current status	
0x10	Channel -1 temperature detect	Real value = [Read value] / 10°C Example: Polling data 173, Real value = 17.3mA
0x11	Channel -2 temperature detect	
0x12	Channel -3 temperature detect	
0x13	Channel -4 temperature detect	
0x14	Channel -1 temperature sensor status	0: Normal status 1: Alarm trig 2: Sensor in short circuit 3: Sensor disconnection
0x15	Channel -2 temperature sensor status	
0x16	Channel -3 temperature sensor status	
0x17	Channel -4 temperature sensor status	
0x18	Channel -5 temperature detect	Real value = [Read value] / 10°C Example: Polling data 173, Real value = 17.3mA
0x19	Channel -6 temperature detect	
0x1A	Channel -7 temperature detect	
0x1B	Channel -8 temperature detect	
0x1C	Channel -5 temperature sensor status	0: Normal status 1: Alarm trig 2: Sensor in short circuit 3: Sensor disconnection
0x1D	Channel -6 temperature sensor status	
0x1E	Channel -7 temperature sensor status	
0x1F	Channel -8 temperature sensor status	

### 8.3.2 - Device status, Read Only

Address	Item.	Description
0x20	Digital Input	Bit 0 for DI-1 Bit 1 for DI-2 0: Opened 1: Closed
0x21	DI-1 channel status	0: Normal status 1: Alarm trig Note: In configuration screen if disable alarm function, this register is invalid.
0x22	DI-2 channel status	
0x30	Digital Output	Bit 0 for relay DO-1 Bit 1 for relay DO-2 0: Opened 1: Closed
0x40	Year	RTC information
0x41	Month	
0x42	Date	
0x43	Hour	
0x44	Minute	
0x45	Second	
0x46	Week	

### 8.3.3- Meter status data, Read and Write

Address	Item.	Description
0x100	CH -1 residual current alarm threshold	Range 20~1000 (For 20~1000mA)
0x101	CH -2 residual current alarm threshold	
0x102	CH -3 residual current alarm threshold	
0x103	CH -4 residual current alarm threshold	
0x104	CH -1 residual current alarm action	0: No action 1: DO-1 trig 2: DO-2 trig
0x105	CH -2 residual current alarm action	
0x106	CH -3 residual current alarm action	
0x107	CH -4 residual current alarm action	
0x108	CH -5 residual current alarm threshold	Range 20~1000 (For 20~1000mA)
0x109	CH -6 residual current alarm threshold	
0x10A	CH -7 residual current alarm threshold	
0x10B	CH -8 residual current alarm threshold	
0x10C	CH -5 residual current alarm action	0: No action 1: DO-1 trig 2: DO-2 trig
0x10D	CH -6 residual current alarm action	
0x10E	CH -7 residual current alarm action	
0x10F	CH -8 residual current alarm action	
0x110	CH -1 temperature alarm threshold	Range 450 ~ 1400 (For 45.0°C ~ 140.0°C)
0x111	CH -2 temperature alarm threshold	
0x112	CH -3 temperature alarm threshold	
0x113	CH -4 temperature alarm threshold	
0x114	CH -1 temperature alarm action	0: No action 1: DO-1 trig 2: DO-2 trig
0x115	CH -2 temperature alarm action	
0x116	CH -3 temperature alarm action	
0x117	CH -4 temperature alarm action	
0x118	CH -5 temperature alarm threshold	Range 450 ~ 1400 (For 45.0°C ~ 140.0°C)
0x119	CH -6 temperature alarm threshold	
0x11A	CH -7 temperature alarm threshold	
0x11B	CH -8 temperature alarm threshold	
0x11C	CH -5 temperature alarm action	0: No action 1: DO-1 trig 2: DO-2 trig
0x11D	CH -6 temperature alarm action	
0x11E	CH -7 temperature alarm action	
0x11F	CH -8 temperature alarm action	
0x120	DI-1 alarm enable	When DI loop closed, alarm or not: 0: No action
0x121	DI-2 alarm enable	1: Alarm trig
0x123	DI-1 alarm action	0: No action
0x124	DI-2 alarm action	1: DO-1 trig 2: DO-2 trig
0x130	DO-1 action method	0: Comm port
0x131	DO2 action method	1: Local buzzer 2: No action
0x132	DO-1 trig delay timer	Range 0 ~ 9999
0x133	DO-2 trig delay timer	(For 0 ~ 999.9sec)

### 8.3.4- Sequence of Event, Read Only

Address	Contents	Description
0x200-0x204	SOE_001	SOE_001 is latest record Details see Notes
0x205-0x209	SOE_002	
0x20A-0x20E	SOE_003	
0x20F-0x213	SOE_004	
0x214-0x218	SOE_005	
0x219-0x21D	SOE_006	
...	...	
0x3D9-0x3DD	SOE_100	

**Notes:** Each event is represented by 10 bytes.

BYTE 0	Event type: 01: Alarm,	02: Sensor short circuit, 03: sensor disconnection,	04: DO1 action event, 05: DO2 action event
BYTE 1	Event channel: 01: CH-1 residual current 02: CH-2 residual current 03: CH-3 residual current 04: CH-4 residual current 05: CH-1 temperature 06: CH-2 temperature	07: CH-3 temperature 08: CH-4 temperature 09: DI-1 10: DI-2 11: Reserved 12: Comm port 13: CH-5 residual current	14: CH-6 residual current 15: CH-7 residual current 16: CH-8 residual current 17: CH-5 temperature 18: CH-6 temperature 19: CH-7 temperature 20: CH-8 temperature
BYTE 2-3	Failure value		
BYTE 4-9	Failure event timestamp		
BYTE 4	Year		
BYTE 5	Month		
BYTE 6	Date		
BYTE 7	Hour		
BYTE 8	Minute		
BYTE 9	Second		

**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-channel monitor 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](mailto:tech@cqbluejay.com)

## 9. - 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;

## 10. - MAINTENANCE

The BJ-RCM... 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.