

ASJ series Residual Current Operated Relay

Installation and Operation Manual V2.0

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Modified Records

No.	Time	Versions	Reasons for revision
1	2016.09	V1.3	Add ASJ10L
2	2017.09	V1.4	delete break line alarm
3	2018.12	V1.5	Add chapter 4.2.2
4	2019.12	V1.6	Delete ASJ10L
5	2020.12	V1.7	Add ASJ10L, modify address, contact
6	2021.04	V1.8	Modify AC type output as open, Modify some mistake, add transformer
7	2021.07	V1.9	Update power supply voltage input
8	2023.07	V2.0	Adjust the format, update the annotation, update the transformer reference current, and add the default value to the address table
Notes: V1.3 before is demo version			

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ASJ series residual current operated relay

1 Introduction

ASJ series residual current operated relay can be combined with low voltage circuit breaker or low voltage contactor to form a residual current protection device, which is mainly used for the TT and TN system distribution lines with AC 50Hz and rated voltage of 400V and below. It is used to protect the electrical circuit form ground faults, prevent equipment damage caused by earth fault current and electrical fire accidents, and can also be used to provide indirect contact protection against personal electric shock hazard.

Products meet the requirements of GB/T 22387 *residual current operated relay*.

2 Type Specification

Type	Function	Installation	Appearance
ASJ10-LD1C	AC-type residual current measurement; Alarm prompt of current crossing line; Rated residual operating current can be measured; Limit non-driving time can be set; Two sets of relay output; With local and remote "test" and "reset" functions.	Guide (DIN35mm)	
ASJ10-LD1A	A-type residual current measurement; Current percentage light column display; Rated residual operating current can be measured; Limit non-driving time can be set; Two sets of relay output (settable) ^[1] ; With local and remote "test" and "reset" functions.		
ASJ10L-LD1A ^[2]	A-type residual current measurement; Rated residual operating current can be measured; Limit non-driving time can be set; Two sets of relay output (settable); Transformer breakage alarm can be set; Pre-alarm value can be set; Return value can be set. With local and remote "test" and "reset" functions. LCD display, 25 event records.		
ASJ20-LD1C	AC-type residual current measurement; Alarm prompt of current crossing line; Rated residual operating current can be measured; Limit non-driving time can be set; Two sets of relay output; With local and remote "test" and "reset" functions.	Panel (48*48)	

ASJ20-LD1A	A-type residual current measurement; Current percentage light column display; Rated residual operating current can be measured; Limit non-driving time can be set; Two sets of relay output (settable)note 1; With local and remote "test" and "reset" functions.		
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Notes: 1. The function of setting for relay means that you can set the initialization and the output state of relay by yourself through the code dialing on the panel; the specific setting guide can be found from the chapter 5.2.

2. Optional function of meter, RS485 interface, Modbus-RTU Communication, type is ASJ10L-LD1A/C

3 Technical Parameters

Item		Technical Parameters	
		AC type	A type
Power supply	Voltage range	AC110V; AC220V ($\pm 10\%$)	AC/DC85~265V
	Power dissipation	$\leq 5W$	
Input	Rated residual operating current $I_{\Delta n}$	0.03, 0.1, 0.3, 0.5 (A)	0.03, 0.05, 0.1, 0.3, 0.5, 1, 3, 5, 10, 30 (A) ^[3]
	Limit non-driving time Δt	0.1, 0.5 (s)	0, 0.06, 0.1, 0.2, 0.3, 0.5, 0.8, 1, 4, 10 (s) ^[4]
	Rated residual non-operating current $I_{\Delta no}$	$50\%I_{\Delta n}$	$50\%I_{\Delta n}$
	Performance characteristics	Sinusoidal AC	Sinusoidal AC And pulsating DC
	Frequency	$50Hz \pm 5Hz$	$50Hz \pm 5Hz$
	Operating range	$-20\% \sim -10\%I_{\Delta n}$	$-20\% \sim -10\%I_{\Delta n}$
Output	Output mode	One is normally open and another is for transformation	One is normally closed or open, and another is for transformation
	Contact capacity	5A 250VAC 5A 30VDC	AL1:8A 250VAC; 5A 30VDC AL2:6A 250VAC; 5A 30VDC
	Reset mode	Local reset or remote reset	Local reset, remote reset, or automatic reset
Installation and use environment	Temperature	Run temperature: $-20^{\circ}C \sim +55^{\circ}C$, Storage temperature: $-30^{\circ}C \sim +70^{\circ}C$	
	Humidity	$\leq 95\%RH$, no condensation, and no corrosive gas places	
	Elevation	$\leq 2000m$	
	Class of pollution	Grade three	
	Installation category	Type III	

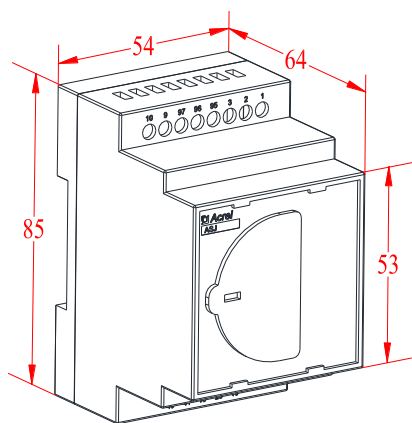
Notes: 3. ASJ10L-LD1A rated residual operating current $I_{\Delta n}$ is 10mA~30A continuously adjustable;

4. ASJ10L-LD1A limit non-driving time Δt is 0~10S continuously adjustable.

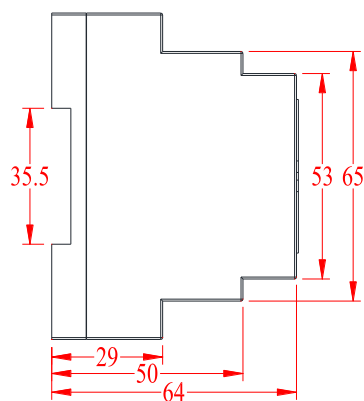
4 Installation Guide

4.1 Overall Dimensions and Hole Size

The outline of ASJ10 series and the dimensions of mounting holes are shown below. (Unit: mm)

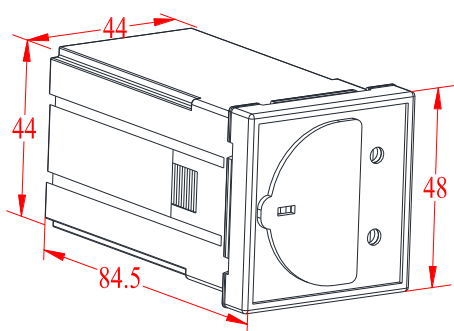


ASJ10 Overall Dimensions

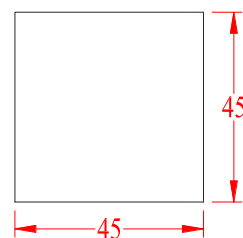


ASJ10 installation size

The outline of ASJ20 series and the dimensions of mounting holes are shown below. (Unit: mm)



ASJ20 Overall Dimensions



ASJ20 hole size

The specific size of the meter is shown in the table below.

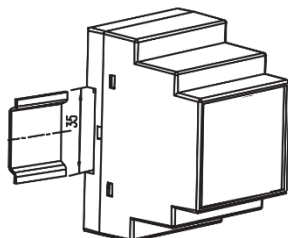
type	Panel size (mm)	Shell size (mm)	Hole size (mm)
ASJ10	----	85*54*64 (L*W*H)	----
ASJ20	48*48	44*44*84.5 (L*W*H) ^[5]	45*45

Note: 5. ASJ20 housing with terminal, panel to terminal depth is 106mm.

4.2 Installation Instructions

4.2.1 Installation Steps

The ASJ10 series instrument is mounted on a guide rail, using a standard 35mm guide rail, as shown in the following figure.

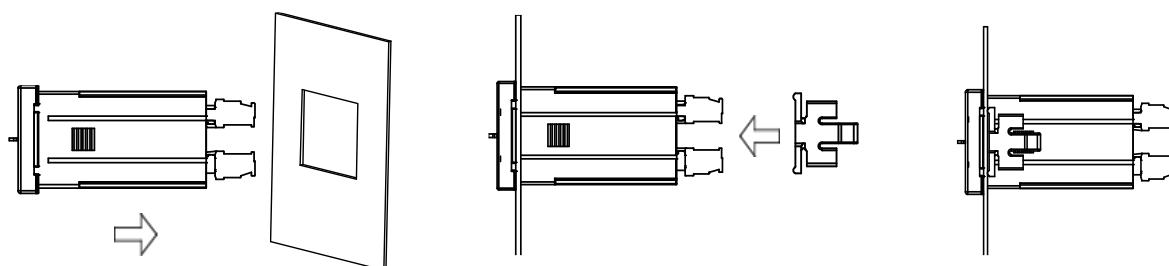


ASJ20 series instrument installation method is panel installation, both sides of the buckle extrusion fixed, the specific operation is as follows:

- 1) On the switchboard, choose the appropriate place to cut the 45*45mm² mounting hole;
- 2) Take out the remaining current relay and remove the fixed buckle;

3) Install the instrument into the distribution board, and then install it with a buckle.

The specific operation is shown in the figure below.



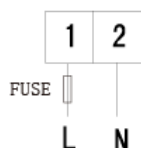
4.2.2 Installation of Accessories

Accessories include residual current transformers and magnetic rings. The remaining current transformer passes through all the phase lines and neutral lines, and is installed in the cabinet with a firm fixation. The secondary side wiring is connected to terminals 40 and 41 of the instrument through a magnetic ring. The installation method of the magnetic ring is shown in the figure below. It is installed near the end of the instrument wiring and the wiring bypasses the magnetic ring for two laps.

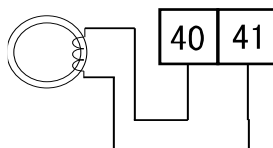


4.3 Terminals and Wiring

4.3.1 Auxiliary power supply and signal input terminal

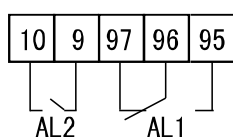


Auxiliary power supply



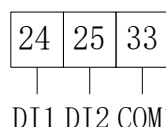
Signal input

4.3.2 Switching quantity input/output terminal



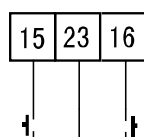
Relay output terminal
(no auxiliary power supply)

AL1: Alarm relay
AL2: Warning relay

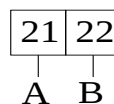


Switching input terminal
(Only ASJ10L-LD1A)

4.3.3 Additional functional terminals



Remote test remote reset



RS485 interface
(Only ASJ10L-LD1A)

4.4 Matters Needing Attention

- 1) The grounding wire (PE) shall not penetrate the remaining current transformer.
- 2) For single-phase power grid, only phase lines and neutral lines need to penetrate the residual current transformer.
- 3) ASJ10L-LD1A/C provides RS485 interface and adopts Modbus-RTU protocol. Bus connections do not exceed 128 meters.

5 Operating Guide

5.1 Description of AC Type Panel

No.	Name	Function	
1	Power light	Always lights when the power supply is normal	
2	Reset button	To reset the system	
3	Alarm light	Lights when the operating current $I_{\Delta n}$ is exceeded	
4	Test button	Self-check, for indicator light and the relay	
5	residual current set switch	Providing four settings of residual operating current	
6	Limit non-driving time set switch	Providing two settings of limit non-driving time	

5.2 Description of A-Type Panel

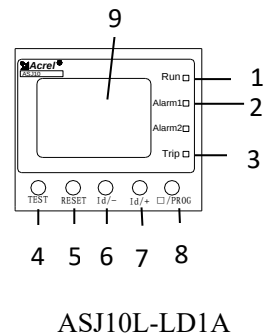
No.	Name	Function							
1	Power light	Always lights when the power supply is normal							
2	Reset button	To reset the system							
3	Alarm light	Lights when the operating current $I_{\Delta n}$ is exceeded							
4	Test button	Self-check, for indicator light and the relay							
5	Residual current set switch	Providing four settings of residual operating current							
6	limit non-driving time set switch	Providing two settings of limit non-driving time							
7	Dial switch	Dial switch		Relay AL2 warning		Relay AL1 alarm			State
		A	B	10	9	97	96	95	
		0	0						
		0	1						
		1	0						
		1	1						
		C		0: manual reset, 1: automatic reset					
		D		reserved					
8	Indicator light with streamer	Three green LEDs are combined to show the current percentage, which will flash when the current reaches more than 50%, indicating early warning.							

ASJ10-LD1A

ASJ20-LD1A

5.3 Description of LCD Type Panel

No.	Name	Function
1	Run light	Work often light, communication light flashing
2	Alarm light	Red indicator light, it lights when the leakage current reaches the alarm value
3	Disconnected alarm light	Red indicator light, it lights when the external transformer is disconnected ^[6]
4	Test key	In normal operation, press key for 2s, relay will operate, backlight will turn red, and alarms will be output. used to check the light and relay
5	Reset key	In operation mode, used to relieve relay operation; In programming mode, used to return to previous menu or mode
6	Td/- key	In SOE page of operation mode, it is used to view the fault records; In programming mode, it is used to enter next menu or subtract 1 from the value
7	Td/+ key	In SOE page of operation mode, it is used to view the fault records; In programming mode, it is used to back last menu or add 1 from the value. Long press the Td/- and Td/+ at the same time, system will start a self-check and reset
8	PROG key	In operation mode, press the key to check SOE; In programming mode, it is used to select, return, confirm and save menu item
9	LCD	LCD displays real-time residual current size, residual current alarm set value, limit no drive time set value ^[7] and communication status. Normal backlight is green, alarm backlight is red, early warning backlight is yellow



Note: 6. When the transformer broken line alarm indicates, the "TEST" key is locked in the invalid state.

7. When the rated remaining operating current is set to 30mA, the action delay time is invalid, and the default action is immediate.

5.4 Description of Selection

1) The device is mainly used in system protection, as the protection of direct electric shock, indirect electric shock, electrical fire, and hierarchical protection. For directing shock protection only as supplementary protection, the rated residual operating current currently does not exceed 30mA.

2) Protective devices must be installed in the following equipment and places: mobile electrical equipment and hand-held power tools, electrical equipment used in production, electrical and mechanical equipment in construction sites, electrical equipment installed outdoors, etc. (See GB13955 for details).

3) The rated remaining operating current shall fully consider the normal leakage current value of the system. Generally, not less than 2~4 times of the maximum measured residual current: 4 times of the

branch line; 2.5 times of branch line; 2 times main line 2 times. According to the empirical formula:

Single-phase circuit: $I_{\Delta n} \geq I_n / 2000$ (lighting)

Three-phase loop: $I_{\Delta n} \geq I_n / 1000$ (power or power lighting hybrid)

I_n is the maximum current.

4) In order to ensure the selectivity of hierarchical protection action, the current and time coordination between the upper and lower levels shall conform to the following provisions:

$I_{\Delta n1} \text{ (upper)} \geq I_{\Delta n2} \text{ (lower)}$

tF_1 (upper ASJ return time) $> tF_2$ (low ASJ break time), the time difference is not less than 0.2s.

General branch line and end: 30~100mA, $\leq 0.1s$; Branch line: 300~500mA, 0.2~0.8S;

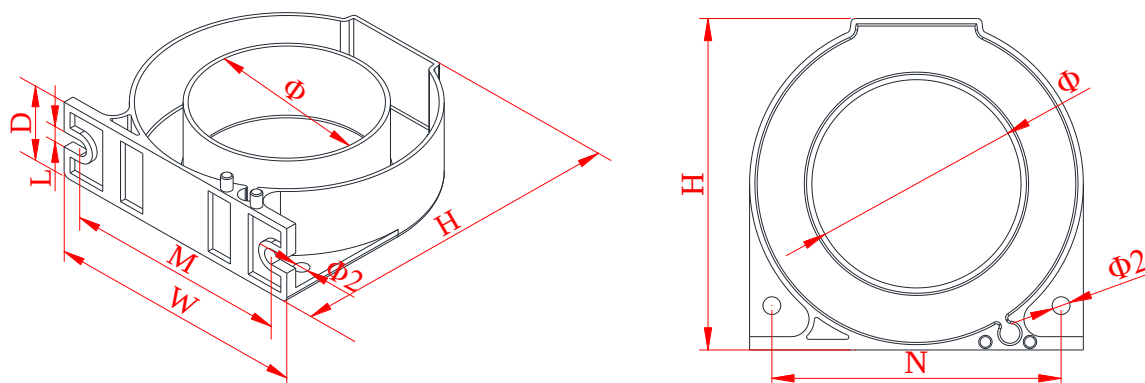
Main line: 500~1000mA, $\leq 2s$.

5) System Selection Instructions

Type of system	Wiring of system	Description
TT system		ASJ is recommended. When a single-phase grounding fault occurs, the fault current is small and difficult to estimate, switch cannot tripping, and the dangerous voltage will appear in the housing.
TN-S system		ASJ is available. When a single-phase grounding fault occurs, the fault is cut off more quickly and sensitively, improving safety and reliability. The ground cable (PE) must not pass through the transformer. The N cable must pass through the transformer and must not be grounded repeatedly.
TN-C system		The ASJ cannot be adopted. If the PEN line is not grounded repeatedly, when the shell is charged, the incoming and outgoing current of the transformer is equal, and the ASJ is not activated. If the PEN line is repeatedly grounded, part of the single-phase current will flow into the repeated grounding. When the current reaches a certain value, the ASJ starts incorrectly.
TN-C-S system		Before point F, the system is TN-C, and ASJ cannot be used. After point F, the TN-S system can be used, and the PE line must not pass through the transformer.
IT system		ASJ as required. First, an insulation monitor should be used to monitor the first ground fault. As a secondary fault backup protection, the ASJ adopts the protection measures similar to the TT or TN system depending on the cable type.

5.5 Instructions for Transformer

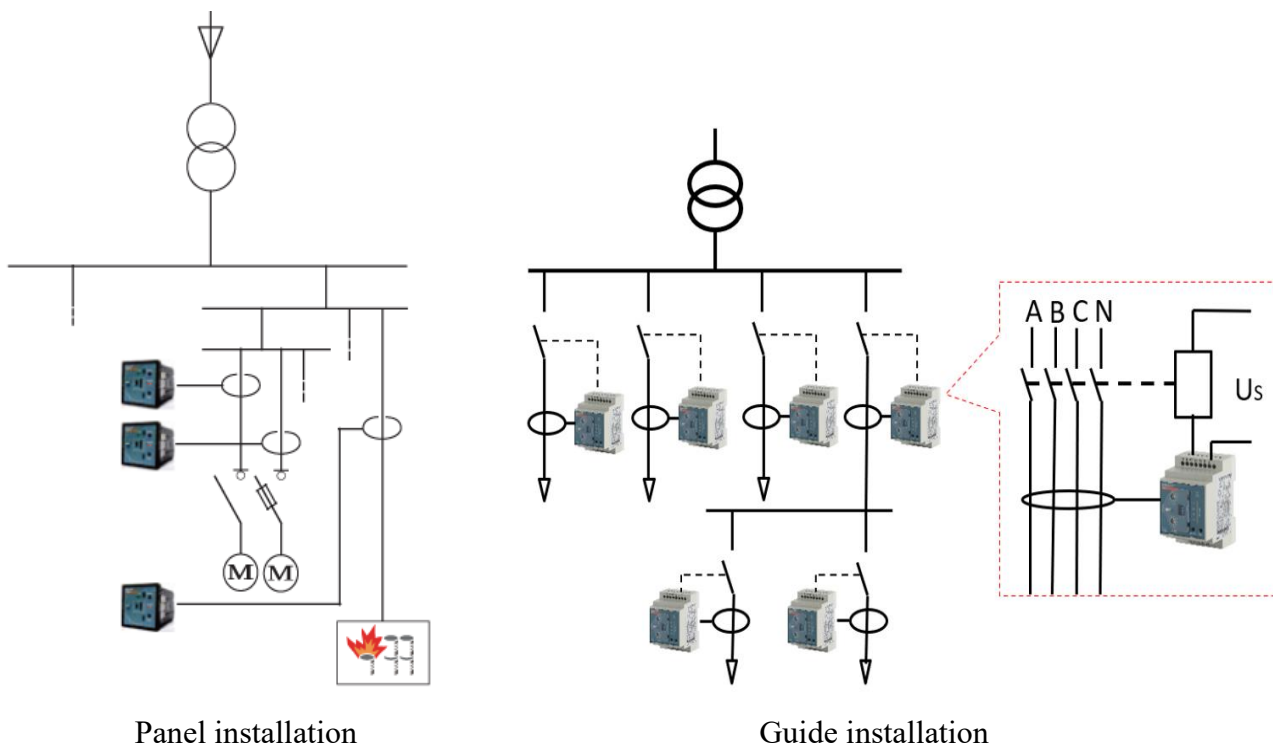
AKH-0.666L-XX series residual current transformer. The dimensions are shown in the following figure. (Unit: mm)



Product model	Rated current (A)	Overall dimensions (mm)			Hole size (mm)	Installation dimensions (mm)				Product weight (g)
		W	H	D		M	N	L	Φ2	
L-45	16~100	75	75	22	46	65	65	4.3	4	200±10
L-80	100~250	120	120	23	81	105	105	4.4	4	380±20
L-100	250~400	140	140	23	100	124	124	4.6	4	460±30
L-150	400~800	196	205	24	150	175	180	4.6	6	850±50
L-200	800~1500	240	247	28	200	214	212	5	6	1200±50

Explain: The current transformer with corresponding specifications should be selected according to the rated current of the circuit and the thickness of the wire. (If you have special requirements on the shape and range of the transformer, contact us)

6 Typical Applications



7 Programming Menu

Chapters 7 and 8 apply only to ASJ10L-LD1A.

First Menu	Second Menu	Third Menu	Descriptions
Addr	1~247	none	Address setting
bAUd	1200, 2400, 4800, 9600, 19200, 38400	none	Communication Baud rate setting
AL	Select a modified bit	modified bit	Rated residual operating current setting
AL.Pr	Select a modified bit	modified bit	Warning operating current setting
rSt.P	Select a modified bit	modified bit	Alarm, warning operating current return value ^[8]
Td	Select a modified bit	modified bit	Limit non-driving time setting
Mod	000,001,010,011,10 0,101, 110, 111	none	For details see attached table "Mod Menu Description"
Brk	on/oFF	none	Disconnection alarm setting: on/off
LCd	0~9999	none	Backlight setting, 0: backlight is always bright; 1~9999 settable. Unit: second
PASS	1~9999	none	Password setting
Time	Year, month, day, hour, minute	Modify time	Time setting
Clr	yes/no	none	Yes: clear the event log

Mod menu description:

bit2	0	Manual reset
	1	Automatic reset
bit1	0	Relay AL1 terminals 97,96 are normally closed by default, 96,95 are normally open by default
	1	Relay AL1 terminals 97,96 are normally open by default, 96,95 are normally closed by default
bit0	0	Relay AL2 terminals 10 and 9 are normally open by default
	1	Relay AL2 terminals 10 and 9 are normally closed by default

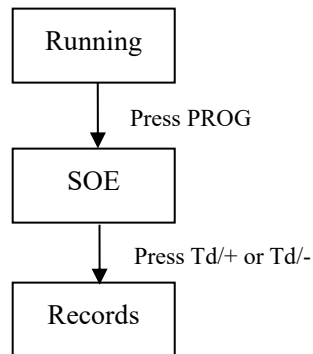
After entering the first level menu, short press PROG key to enter the second level menu, Td/+ key and Td/- key are used to switch channels between the second level menu, then press PROG key, use Td/+ key and Td/- key to modify the specific value. When you're done, press PROG or RESET to return. After the modification is completed, press RESET key to exit. Before exiting, you should choose whether to save or not. Press the RESET key again to avoid saving and press PRGO key to save (when setting the real-time time, it will be saved after modified).

Note: 8. The default percentage of return value of alarm and early warning action current is 85%. When the leakage current is less than 85% of the rated remaining action current, the alarm relay AL1 will reset; when the leakage current is less than 85% of the rated remaining action current, the early warning relay AL2 will reset (the instrument needs to be set to automatic reset mode).

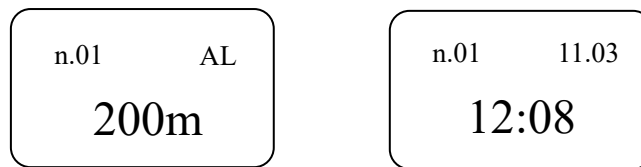
7.1 Programming Example

The following is a few programming diagrams, users can refer to these examples to program menu items of the same level.

1) View SOE records in running mode



Each SOE consists of two pages, and the SOE format is as follows:

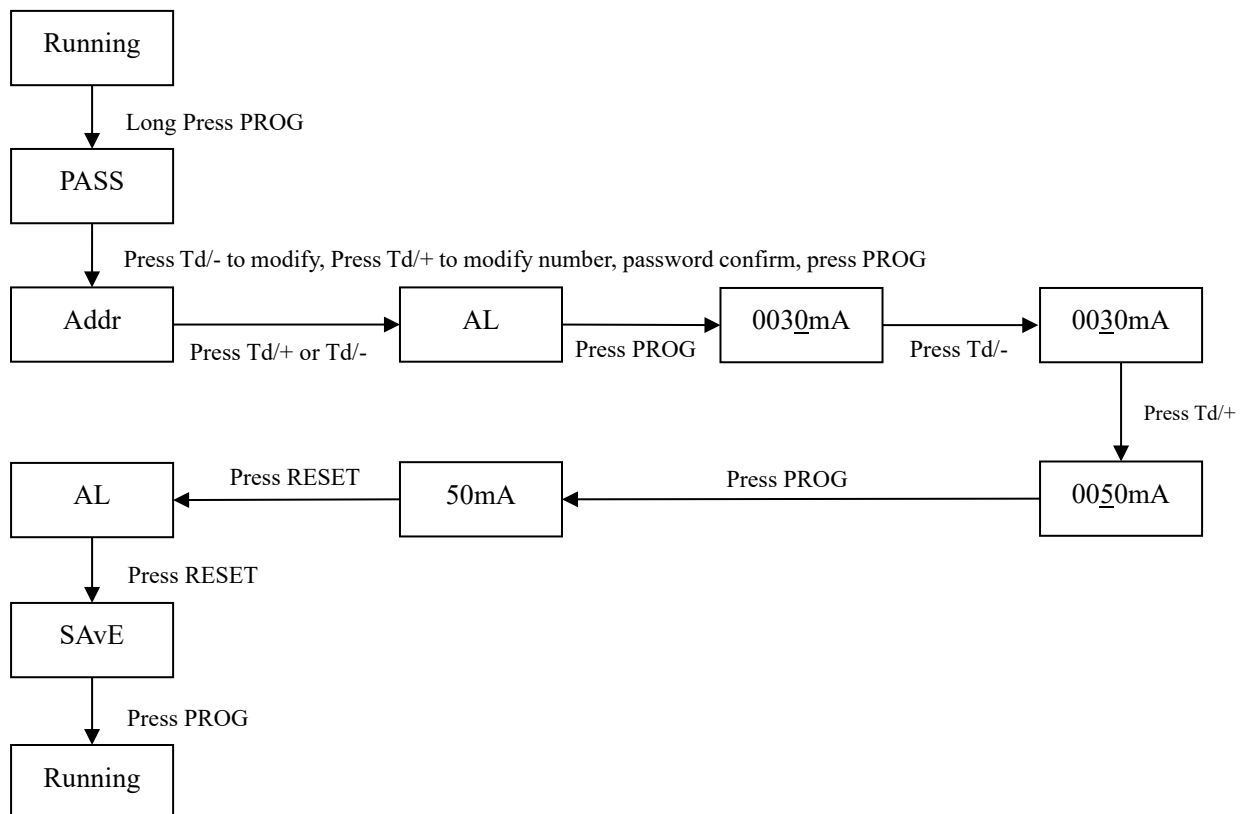


The "n.01" indicates the latest event record, and so on. A maximum of 25 event records can be stored.

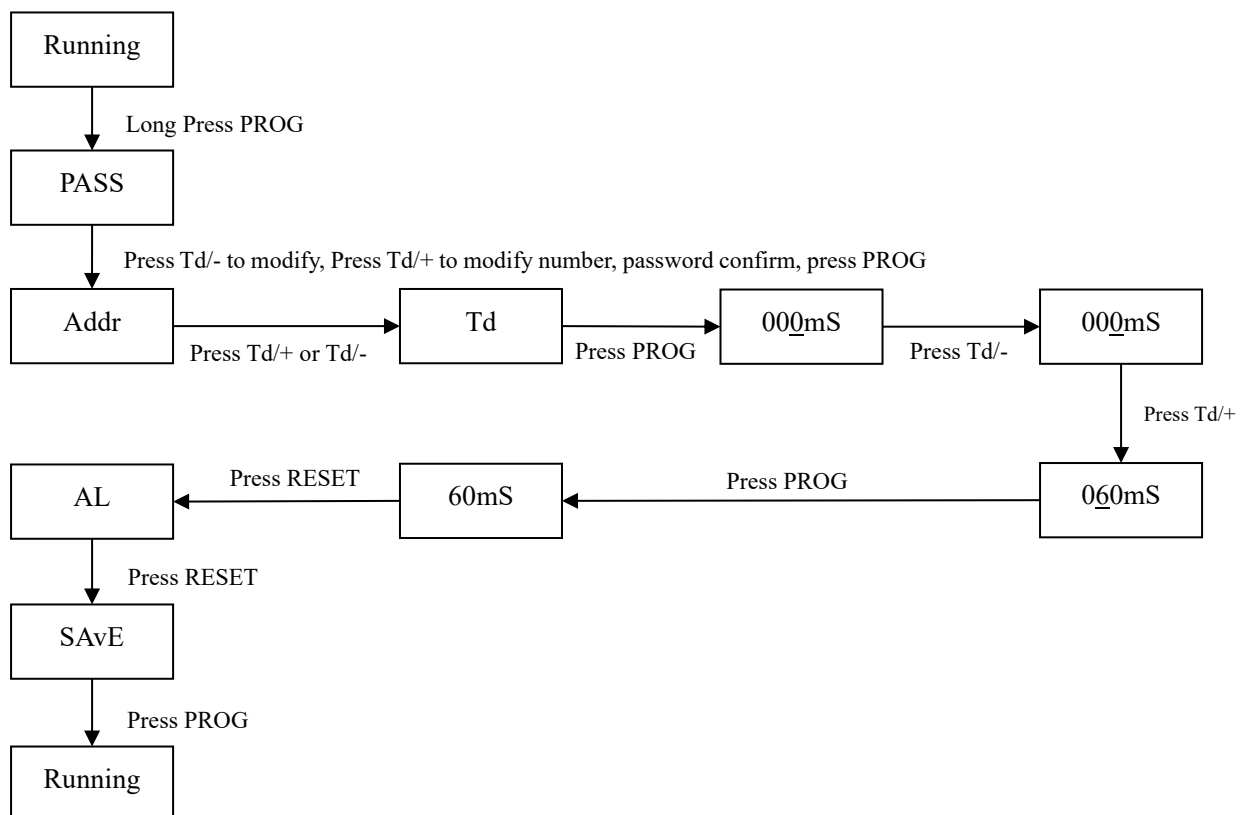
AL indicates that the record is generated by the residual current alarm action, and AL.pr indicates that it is generated by the early warning action.

The figure above shows that the first event record is generated by the residual current alarm action, the alarm value is 200mA, and the time is 12:08 on November 3rd.

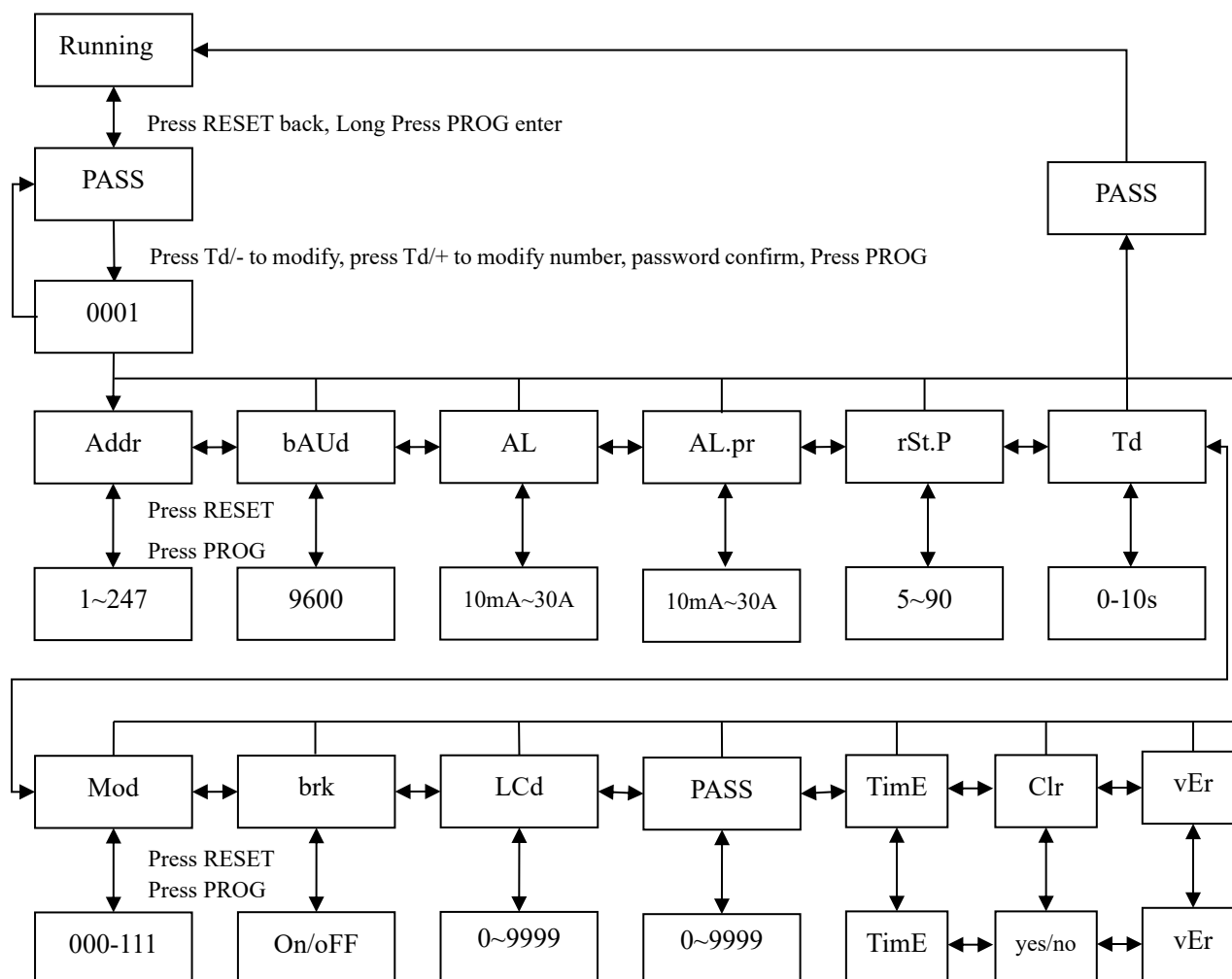
2) Set the remaining current action value to 50mA, where _ indicates the modified position.



3) Set the limit non-driving time to 60ms.



7.2 Programming Example



8 Communication Guide

8.1 Communication Protocol

Meter RS485 interface adopts Modbus-RTU communication protocol, which defines the address, function code, data, check code in detail. It is the necessary content to complete the data exchange between the host and slave machine.

8.2 Introduction to Function Code

8.2.1 Function code 03H or 04H: Read the registers

This function allows the user to acquire the data collected and recorded by equipment and the system parameters. The number of data requested by hosts has no limit, but cannot exceed the defined address range.

The following example shows how to read a measured insulation resistance value from No.01 slave computer, with the address of the value of 0008H.

The host computer sends		Send message
Address code		01H
Function code		03H
Start address	High byte	00H

The slave computer returns		Return message
Address code		01H
Function code		03H
Bytes		02H

	Low byte	08H
Number of registers	High byte	00H
	Low byte	01H
CRC check code	Low byte	05H
	High byte	C8H

Register data	High byte	00H
	Low byte	50H
CRC check code	Low byte	B8H
	High byte	78H

8.2.2 Function code 10H: Write the registers

The function code 10H allows the user to change the contents of multiple registers, which can write the time and date in this meter. The host can write up to 16 (32 bytes) data at a time.

The following example shows a preset address of 01 with an installation date and time of 12:00, Friday, December 1, 2009.

The host computer sends		Send message
Address code		01H
Function code		10H
Start address	High byte	00H
	Low byte	04H
Number of registers	High byte	00H
	Low byte	03H
Number of registers		06H
0004H data	High byte	09H
	Low byte	0CH
0005H data	High byte	01H
	Low byte	05H
0006H data	High byte	0CH
	Low byte	00H
CRC check code	Low byte	A3H
	High byte	30H

The slave computer returns		Return message
Address code		01H
Function code		10H
Start address	High byte	00H
	Low byte	04H
Number of registers	High byte	00H
	Low byte	03H
CRC check code	Low byte	C1H
	High byte	C9H

8.3 ASJ10L-LD1A Address Table

No.	Address	Parameter	Read-Write	Value Range	Data Type
0	00H	Residual current value	R	0~30000mA	UINT16
1~7	01H~07H	Reserved	R/W		UINT16*7
8	08H	Alarm current setting	R/W	10~30000mA (default 30000)	UINT16
9	09H	Warning current setting	R/W	10~30000mA (default 30000)	UINT16
10~15	0AH~0FH	Reserved	R/W		UINT16*6

16	10H	Limit non-driving time value		R/W	0~10000ms (default 0)	UINT16
17~23	11H~17H	Reserved		R/W		UINT16*7
24	18H	Address		R/W	1~247 (default 1)	UINT16
25	19H	Baud rate		R/W	0, 1, 2, 3, 4, 5 correspond to 38400, 19200, 9600, 4800, 2400, 1200 (default 2)	UINT16
26	1AH	ZCT disconnect alarm setting		R/W	bit15~bit3: Reserved bit2~ bit0: disconnect alarm set 000: close 001: open (default 0)	UINT16
27	1BH	Alarm status		R	bit15~bit3: Reserved bit2~bit0: Alarm status 000: normal 001: Warning 010: Alarm 100: disconnect	UINT16
28	1CH	Mode setting		R/W	See 8.4 for details	UINT16
29	1DH	Protection password		R/W	0000~9999（default 0001）	UINT16
30	1EH	DI status		R	bit15~bit3: Reserved bit1~bit0: DI status 00: open all 01: ch1 close 10: ch2 close 11: all close	UINT16
31	1FH	Backlight delay		R/W	0~9999; 0: Always light; 1~9999 settable (default 60s)	UINT16
32~35	20H~23H	Reserved		R/W		UINT16*4
36	24H high	Year		R/W	00~99 stand for 2000~2099	UINT16
	24H low	Month		R/W	1~12	
37	25H high	Day		R/W	1~31	UINT16
	25H low	Hour		R/W	0~23	
38	26H high	Minutes		R/W	0~59	UINT16
	25H low	Second		R/W	0~59	
39~44	21H~2CH	Reserved		R/W		UINT16*6
45	2DH	first SOE	SOE type	R	0: alarm, 1: warning	UINT16
46	2EH		Alarm value	R	0~30000mA	UINT16
47	2FH		Alarm	R	10-30000mA	UINT16
48	30H		Year	R	alarm time - year	UINT16
			Month	R	alarm time - month	
49	31H		Day	R	alarm time - day	UINT16
			Hour	R	alarm time – hour	

50	32H		Minutes	R	alarm time – minute	UINT16
			Second	R	alarm time – seconds	
51~194	33H~C2H	Other 24 SOE		R	For details, see the first event record	UINT16*144

8.4 1CH Data Explain

The parameter of address 1CH represents the current setting value, as shown in the table below.

High 8	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
Low 8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0



valid bit

bit2	0	Manual reset
	1	Automatic reset
bit1	0	The terminals 97 and 96 of relay are normally closed by default and 96 and 95 are normally open by default
	1	The terminals 97 and 96 of relay are normally open by default and 96 and 95 are normally closed by default
bit0	0	Relay AL2 terminals 10 and 9 are normally open by default
	1	Relay AL12 terminals 10 and 9 are normally closed by default

9 Ordering example

Example:

Auxiliary power supply: AC 220V/50Hz

Rated current In: 80A

Guide rail installation, other no special requirements

Model selection

Residual current operated relay: ASJ10-LD1C;

Residual current transformer: AKH-0.66L-L45

Manufacturer: Jiangsu Acrel Electrical Manufacturing Co., LTD.

Address: No.5 Dongmeng Road, Dongmeng industrial Park, Nanzha Street, Jiangyin City, Jiangsu Province, China

TEL: 0086-15161626103

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