RWH-151 General Protection Device

Operation Instruction

Rockwill Energy Technology CO., LTD.

Note: the pictures listed in the manual are all examples, please refer to the real object.

Foreword

Please read this chapter carefully before using this product!

This chapter introduces the safety precautions before using this product. Please make sure the content of this chapter is fully read and understood before installation and usage. Our company will not undertake any responsibilities for any damage or injury caused by improper operations because of ignoring relevant warning in this operation instruction.

Before operating this device, relevant professional personnel shall read this instruction carefully and well understand the content.

Operation instructions and warnings:

The following standard definitions will be adopted in this operation instruction.

Danger! Ignoring of safety precautions may cause personal death, serious personal injury or serious equipment damage.

Warning! Ignoring of safety precautions may cause personal death, serious personal injury or serious equipment damage.

Caution! Ignoring of safety precautions may cause a slight personal injury or equipment damage, especially the damage of device or the equipment protected by the device.

- **Danger!**

When the primary system is live working, secondary open circuit for the current transformer connected to the device is absolutely forbidden, and the open of this circuit may cause extremely dangerous high voltage.

- **Warning!**

Some parts of the device may have high voltage when the electrical device is running. Improper operation may cause serious personal injury or equipment damage.

Only qualified professional personnel are allowed to operate the device or work nearby the device. The operators professional shall well understand the precautions, working flows and safety regulations mentioned in this instruction.

- **Caution!**

Grounding terminals of the device shall be firmly grounded.

The device is only permitted to run in atmospheric environment that specified in the technical specifications, and abnormal vibrations shall be avoided in its running environment.

When connect the AC voltage current circuit or power circuit, please make sure they conform to the rated parameters of the device.

When the output terminals of the device are connected to external circuit, please check carefully the voltage of external power to prevent overheating of the circuit.

Carefully check the cable connected to the device, preventing applying too much external force on it.

Contents

CHAPTER 1: OVERVIEW 5

1.1 Description 5

1.2 Protection 5

1.3 Supervision 5

1.4 Control 5

1.5 Features 5

1.6 Monitoring Functions 6

1.7 Hardware 6

1.8 Data Storage and Communication 6

CHAPTER 2: TECHNICAL PERFORMANCE INDEX 7

2.1 Inputs and Outputs 7

2.2 Unit Design 8

2.3 Serial Interface 8

2.4 Data Storage 9

2.5 Mechanical Tests 9

2.6 Electrical Tests 10

2.7 Climatic Tests 11

CHAPTER 3: PROTECTION FUNCTIONALITY 12

3.1 Function Description 12

3.2 Constant Value Parameters 15

CHAPTER 4: USER INTERFACE 18

4.1 LEDs 18

4.2 Keypad 19

4.3 LCD 21

4.4 The Main Menu 21

4.5 Submenu 22

4.6 Entering the password interface 23

4.7 Relay setting 24

4.9 Parameter set 30

4.10 Calibration 32

4.11 Clear report 33

4.12 Factory setting 33

4.13 View relay and setting 33

4.14 View SOE 34

4.14 View input signal 34

CHAPTER 5: INSTALLATION AND MAINTENANCE 35

CHAPTER 6: DECOMMISSION AND TERMINAL DEFINITION DIAGRAM 36

7.1 Decommission 36

7.2 Terminal definition diagram 36

APPENDIX I: TIME-OVERCURRENT CURVE AND RECLOSE 37

Chapter 1: Overview

1.1 Description

RWK-LC overhead line protection switch intelligent controller is medium voltage overhead line grid monitoring unit, it can be equipped with RCW(RVB) type vacuum circuit breaker for achieve of automatic monitoring, fault analysis and event records.

Its given to us a safety power grid for cutting line fault and automatic recovery operation and power automation.
RWK-LC series is suitable for up to 35kV outdoor switchgear using, include: vacuum circuit breakers, oil circuit breakers and gas circuit breakers.
RWK-LC intelligent controller is gathering with line protection, control, measurement and monitoring of voltage and current signals integrated automation and control devices outdoors.

RWK is an automatic management unit for single way/multi ways/ring network/two power sourcing, provided with all voltage and current signals and all functions.
RWK-LC column switch intelligent controller supports:
Wireless (GSM/GPRS/CDMA), Ethernet mode, WIFI, optical fiber, power line carrier, RS232/485, RJ45 and other forms of communication, and can access other station premises equipment (such as TTU, FTU, DTU, etc.).

1.2 Protection

49	Thermal Overload (Over load)
50/51	Three-section of Overcurrent (Ph.OC)
50N/51N	Sensitive Earth Fault (SEF)
27/59	Under/Over Voltage (Ph.OV/Ph.UV)
51c	Cold load pickup (Cold load)

1.3 Supervision

60CTS	CT Supervision
60VTS	VT Supervision

1.4 Control

79	Auto Reclose
86	Lockout
	CB Control

1.5 Features

Password Protection – 2 levels.

50Hz/60Hz systems and two phase/three phase wiring method are available, so that the use scope of device is extended.

Protection configuration is complete, and all protection functions can be switched on and off flexibly.

4-way intellectual switching value input.

Large capacity flash memory can record at least 100 times of historical events, and no data will loss even the power is off.

Circuits operating loop can be used both the direct or alternating current, self-adaptation open/close brake function, which can co-work with various of breakers, and the operation is simple and reliable.

The device has complete self-inspection function to in-service monitor the working conditions of various parts of the device, ensuring the reliability of the device.

1.6 Monitoring Functions

Primary currents for Phases and Zero sequence current

Primary PT Voltage

Frequency

Binary Input/Output status

Trip circuit healthy/failure

Time and date

Fault records

Event records

1.7 Hardware

3CT 1 VT 4 Binary Inputs 2 Binary Outputs

1.8 Data Storage and Communication

RS485, RS232

Protocols –IEC60870-5-101, IEC60870-5-104, DNP3.0 or Modbus RTU

Event Records

Fault Records

Measurands

Commands

Time Synchronism

Viewing and Changing Settings

Chapter 2: Technical Performance Index

2.1 Inputs and Outputs

Phase Current Inputs

Quantity	3
Rated Current In	5A
Measuring Range	20 x In
Instrumentation≥ 0.1xIn	±1% In
Frequency	50Hz
Thermal Withstand: Continuous 10 Second 1 Second	 2 x In 10 x In 40 x In
Burden @ In	≤0.2VA (5A Phase element)

Sensitive Earth Current Inputs

Quantity	1
Rated Current In	5A
Measuring Range	2 x In
Instrumentation≥ 0.1xIn	±1% In
Frequency	50/60Hz
Thermal Withstand: Continuous 10 Second 1 Second	 2 x In 10 x In 40 x In
Burden @ In	≤0.02VA (1A Earth element)

Voltage Inputs

Quantity	1 PT voltage
Nominal	40…120 Vrms
Operating Range	0...200 Vrms

Instrumentation≥0.8xVn	±1% Vn
Burden @ 110V	0.06 VA
Overvoltage Withstand	240 Vrms

Auxiliary Supply

DC Voltage	220V Range 165 to 265V
AC Voltage	220 V AC 50Hz Range 165 to 350Vrms AC 50/60Hz ±5%
Power consumption	≤10W

Binary Inputs

Number	4
Operating Voltage	24V DC
Maximum dc current for operation	2mA

Binary Outputs

Number	2
Operating Voltage	220V DC
Operating Mode	User selectable - Self or Hand/Electrical Reset or pulsed
Operating Time from Energizing Binary Input	<20ms

2.2 Unit Design

Indication	16 Character 4 line Display 10 LED's
User Interface	11 Navigation Keys
Weight	18kg

2.3 Serial Interface

Communication Port	RS485, RS232
Protocols	IEC60870-5-101 IEC60870-5-104

	DNP3.0 MODBUS RTU

2.4 Data Storage

Events	100 times

2.5 Mechanical Tests

Vibration (Sinusoidal) --- IEC 60255-21-1 Class I

Type	Level	Variation
Vibration response	0.5gn	≤5%
Vibration withstand	1.0gn	≤5%

Shock and Bump --- IEC 60255-21-2 Class I

Type	Level	Variation
Shock response	0.5gn, 11ms	≤5%
Shock withstand	15gn, 11ms	≤5%
Bump test	10gn,16ms	≤5%

Shock and Bump --- IEC 60255-21- 3 Class I

Type	Level	Variation
Seismic response	X-plane-3.5mm Displacement below crossover freq (8-9Hz) 1gn and above Y-plane-1.5mm Displacement below crossover freq (8-9Hz) 0.5gn above	≤5%

Mechanical Classification

Durability	>106 operations

2.6 Electrical Tests

Insulation --- IEC 60255-5

Type	Level
Between any terminal and earth	2.0 kV AC RMS for 1 min
Between independent circuits	2.0 kV AC RMS for 1 min
Across normally open contacts	kV AC RMS for 1 min

High Frequency Disturbance --- IEC 60255-22-1 Class Ⅲ

Type	Level	Variation
Common (longitudinal) mode	2.5 kV	≤5%
Series (transverse) mode	1.0 kV	≤5%

High Frequency Disturbance --- IEC 60255-22-2 Class Ⅳ

Type	Level	Variation
Contact discharge	8.0 kV	≤5%

Fast Transients --- IEC 60255-22-4 Class A (2002)

Type	Level	Variation
5/50 ns 2.5 kHz repetitive	4 KV	≤5%

Surge Immunity --- IEC 60255-22-5

Type	Level	Variation
Analog Inputs: Line to Earth	4.0 kV	≤10%
Case, Aux Power & I/O: Line to Earth	2.0 kV	≤10%
RS485 Comms port: Line to Earth	1.0 kV	No Data Loss
Analog Inputs: Line to Line	1.0 kV	≤10%
Case, Aux Power & I/O: Line to Line	1.0 kV*	≤10%

* Note 45ms DTL pick-up delay applied to binary inputs

Conducted Radio Frequency Interference --- IEC 60255-22-6

Type	Level	Variation
0.15 to 80 MHz	10 V	≤5%

Radiated Radio Frequency --- IEC 60255-25

Type	Limits at 10 m, Quasi-peak
30 to 230 MHz	40 dB(μV)
230 to 10000 MHz	47 dB(μV)

Conducted Radio Frequency

Type	Limits	
	Quasi-peak	Average
0.15 to 0.5 MHZ	79 dB(μV)	66 dB(μV)
0.5 to 30 MHZ	73 dB(μV)	60 dB(μV)

Radiated Immunity --- IEC 60255-22-3 Class Ⅲ

Type	Level
80 MHz to 1000 MHz Sweep	10 V/m
1.4GHz to 2.7GHz Sweep	10 V/m
80,160,380,450,900,1850,2150 MHz Spot	10 V/m

2.7 Climatic Tests

Temperature --- IEC 60068-2-1/2

Operating Range	-10°C to +55°
Storage range	-25°C to +70°

Humidity --- IEC 60068-2-78

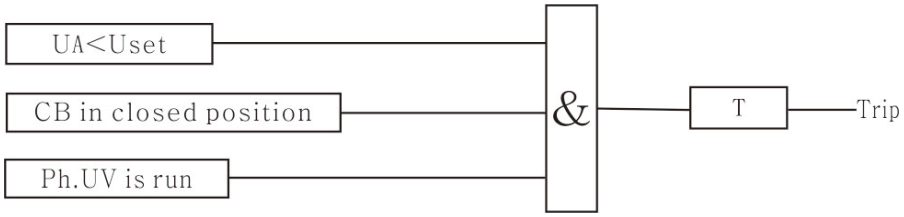
Operational test	56 days at 40°C and 93% relative humidity

Chapter 3: Protection Functionality

3.1 Function Description

Under Voltage (Ph.UV)

The device take the PT voltage as the criterion for under voltage protection.
Action Logic diagram:

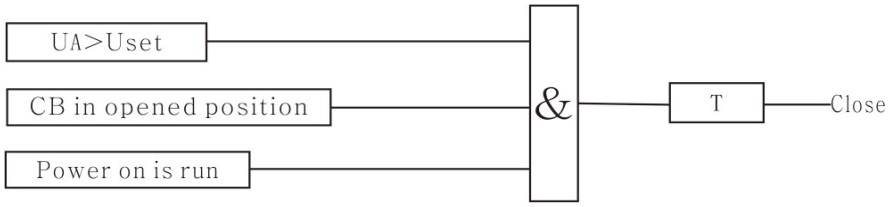


Note: Run is "√", Stop is "×".

UA—Secondary PT voltage Uset—Pickup voltage T—Delay time

Power on

The device will control the CB to close when the PT voltage greater than pickup voltage.
Action Logic diagram:

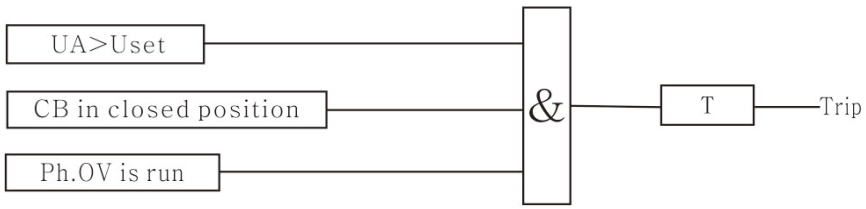


Note: Run is "√", Stop is "×".

UA—Secondary PT voltage Uset—Pickup voltage T—Delay time

Over Voltage (Ph.OV)

The device take the PT voltage as the criterion for over voltage protection.
Action Logic diagram:



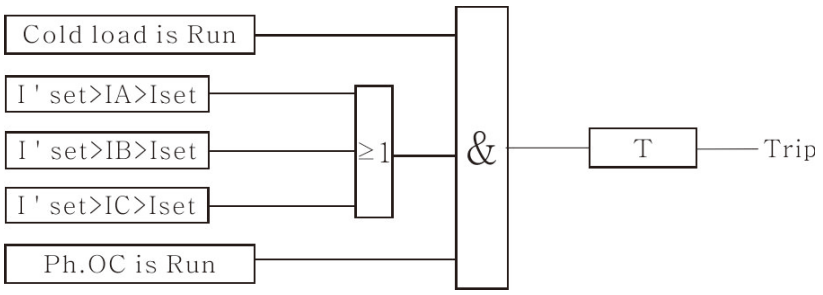
Note: Run is "√", Stop is "×".

UA—Secondary PT voltage Uset—Pickup voltage T—Delay time

51c Cold Load Pickup (Cold Load)

If a circuit breaker is closed onto a "cold" load, i.e.one that has not been powered for a prolonged period, this can impose a higher than normal load-current demand on the system which could exceed normal settings. These conditions can exist for an extended period and must not be interpreted as a fault. To allow optimum setting levels to be applied for normal operation, the cold load pickup feature will apply alternative current settings for a limited period. The feature resets when either the circuit breaker has been closed for a settable period, or if the current has reduced beneath a set level for a user set period.

Action Logic diagram:



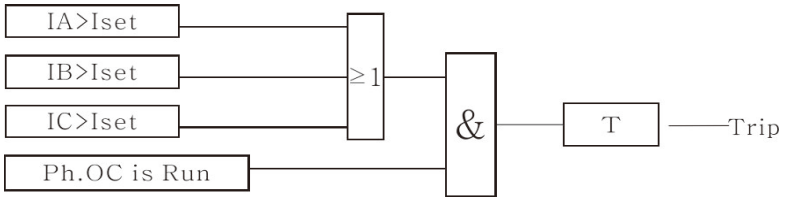
Note: Run is "√", Stop is "×".

I'set—Cold load pickup current Iset—Ph.OC pickup current T—Delay time

50/51 (Ph.OC)

Three sections phase overcurrent protection for lines include Ph.OC1 (instantaneous overcurrent protection), Ph.OC2 (definite time overcurrent protection) and Ph.OC3 (overcurrent protection). All of which are definite time actuate features.

Action Logic diagram:



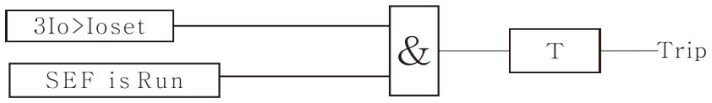
Note: Run is "√", Stop is "×".

IA IB IC—Measured current Iset—Pickup current T—Delay time(If the curve type is not set to 0, then T is determined by the curve formula)

50N/51N Sensitive Earth Fault (SEF)

The sensitive earth fault protection is definite time limit.

Action Logic diagram:



Note: Run is "√", Stop is "×".

3I0—SEF current I0set—Pickup current T—Delay time (If the curve type is not set to 0, then T is determined by the curve formula)

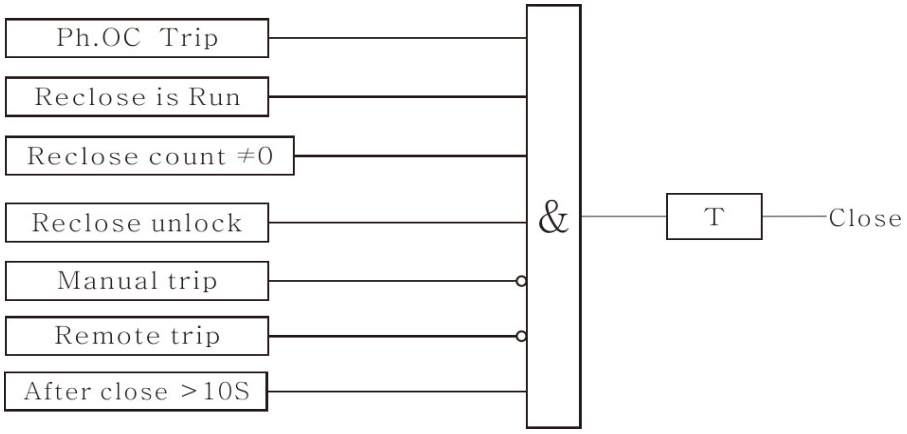
79 Auto - Reclose (Reclose)

A high proportion of faults on an overhead line network are transient and can be cleared quickly by high speed tripping followed by an automated circuit breaker reclose sequence.

The function provides phase fault and earth fault/sensitive earth fault sequences of up to 5 trip i.e.4 reclose attempts before lockout, and the charging period of the reclose is 10 seconds.

It can cooperate with the curve in P.OC to realize the process of two fast and two slow reclosing①. ①Follow Appendix I

Action Logic diagram:

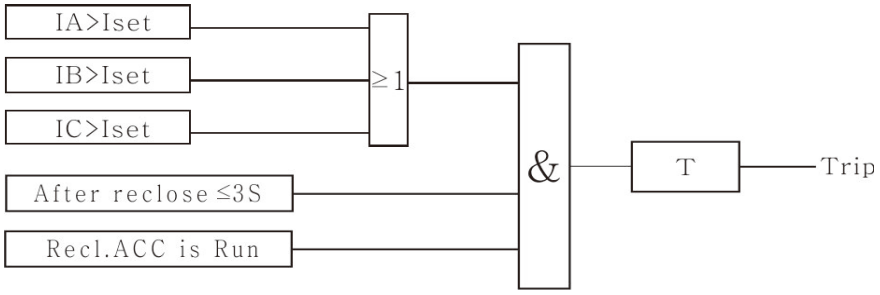


Note: Run is "√", Stop is "×".

Reclosing acceleration (Recl.ACC)

When switching on reclosing acceleration, if accidents happened in 3S after the reclose is operated, the phase over current protection will accelerate the operation.

Action Logic diagram:



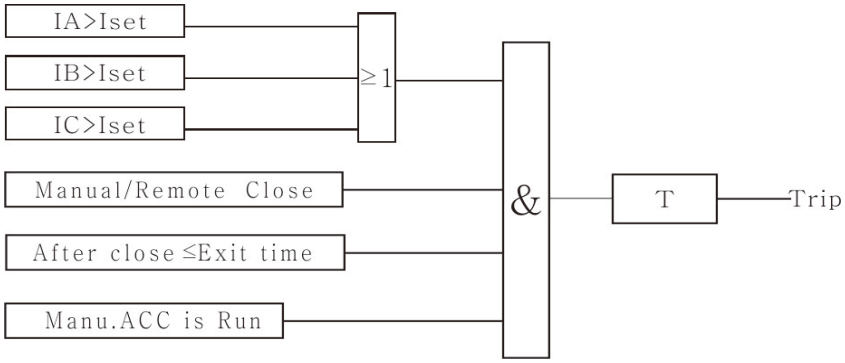
Note: Run is "√", Stop is "×".

IA IB IC—Measured current Iset—Pickup current T—Delay time

Manual closing acceleration (Manu.ACC)

When switching on manual closing acceleration, if accidents happened in the exit time after operated the close, the phase over current protection will accelerate the operation. The exit time of acceleration can be adjusted.

Action Logic diagram:



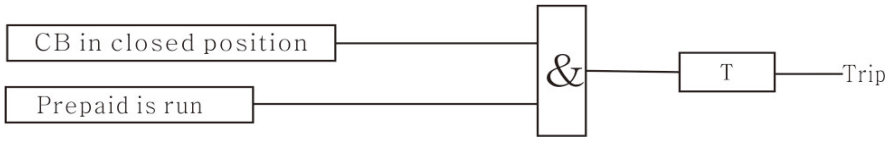
Note: Run is "√", Stop is "×".

IA IB IC—Measured current Iset—Pickup current T—Delay time

Prepaid (Optional features)

It is used to connect the dosing tank, the device will control the CB to trip when the dosing tank is in deficit.

Action Logic diagram:



Note: Run is "√", Stop is "×".

3.2 Constant Value Parameters

All values are given primary side.

Under Voltage (Ph.UV)

Description		Setting range	Step length
PH.UV	Pickup voltage	0～999.9V	0.1V
	Delay time	0～99.99S	0.01S

Power on

Description		Setting range	Step length
Power on	Pickup voltage	0~999.9V	0.1V
	Delay time	0～99.99S	0.01S

Over Voltage (Ph.OV)

Description		Setting range	Step length
PH.OV	Pickup voltage	0~999.9V	0.1V
	Delay time	0～99.99S	0.01S

51C Cold Load Pickup (Cold load)

Description		Setting range	Step length
Cold load	Pickup current	1～6000A	0.1A
	Delay time	0～99.99S	0.01S

50 Phase Fault (Ph.OC)

Description		Setting range	Step length
PH.OC1	Curve type	00 ~ 10	1
	Pickup current	00.1 ~ 6000A	0.1A
	Time dial	0.00 ~ 9.99S	0.01S
	Time adder	00.00 ~ 99.99S	0.01S
	Minimum response	00.00 ~ 99.99S	0.01S
	Enable end shot	1 ~ 5	1
PH.OC2	Curve type	00 ~ 10	1
	Pickup current	00.1 ~ 6000A	0.1A
	Time dial	0.00 ~ 9.99S	0.01S
	Time adder	00.00 ~ 99.99S	0.01S
	Minimum response	00.00 ~ 99.99S	0.01S
	Enable end shot	1 ~ 5	1
PH.OC3	Curve type	00 ~ 10	1
	Pickup current	00.1 ~ 6000A	0.1A
	Time dial	0.00 ~ 9.99S	0.01S
	Time adder	00.00 ~ 99.99S	0.01S
	Minimum response	00.00 ~ 99.99S	0.01S
	Enable end shot	1 ~ 5	1

50N Sensitive Earth Fault (EF)

Description		Setting range	Step length
EF	Operating mode	Alarm/Trip/Dir trip/Dir alarm(default trip)	
	Curve type	00 ~ 10	1
	Pickup current	00.1 ~ 999.9A	0.1A
	Time dial	000.0S ~ 600M	0.1S
	Time adder	00.00 ~ 99.99S	0.01S
	Minimum response	00.00 ~ 99.99S	0.01S
	Start angle	000° ~ 360°	1°
	End angle	000° ~ 360°	1°
Note: Start and end angle set with zero sequence directional protection			
Description		Setting range	Step length
EF2	Operating mode	Alarm/Trip/Dir trip/Dir alarm(default trip)	
	Pickup current	00.1 ~ 999.9A	0.1A
	Delay time	000.0S ~ 600M	0.1S
Note: EF2 is not support directional protection			

79 Auto - Reclose (Reclose)

Description		Setting range	Step length
Reclose	Reclose count	1:One 2:Two 3:Three 4:Four	
	Delay time	0 ~ 99.99S	0.01S
	Reset time	1.2 ~ 180S	0.1S

Reclosing acceleration (Recl.ACC)

Description		Setting range	Step length
Recl.ACC	Pickup current	0.1 ~ 6000A	0.1A
	Delay time	0 ~ 9.99S	0.01S

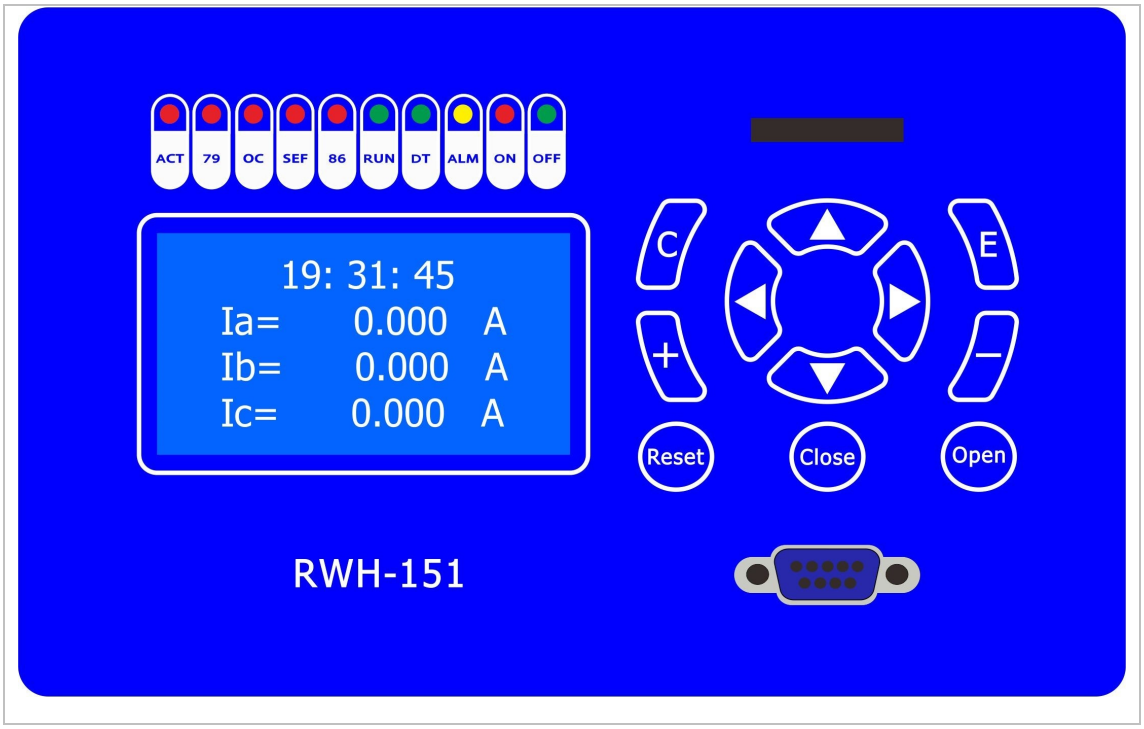
Manual closing acceleration (Manu.ACC)

Description		Setting range	Step length
Manu.ACC	Exit time	0.1 ~ 9.99S	0.01S
	Pickup current	0.1 ~ 6000A	0.1A
	Delay time	0 ~ 9.99S	0.01S

Prepaid (Optional features)

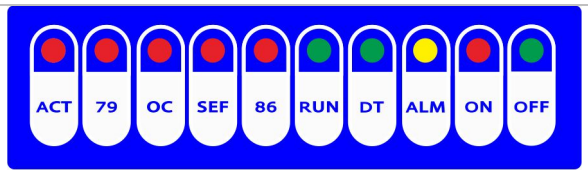
Description		Setting range	Step length
Prepaid	Delay time	0 ~ 99.99S	0.01S

Chapter 4: User Interface



The operator interface is designed to provide a user friendly method of controlling, viewing menus, entering settings and retrieving data from the relay. 11 buttons are provided for navigation around the menu structure.

4.1 LEDs



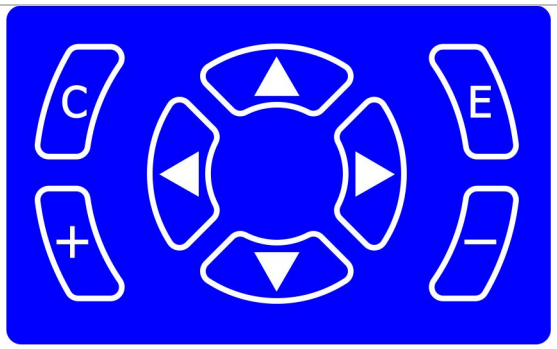
Operation Status

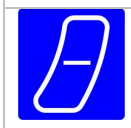
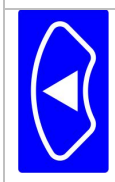
LED Categories		LED Status		
Name	Color	ON	OFF	Flashing
Run	Green	crash	crash	Working properly
DT	Green	No communication	No communication	Normal communication
ALM	Yellow	Device failure or protection alarm	Running normally	——
ON	Red	Switch is on	Switch is not on	——
OFF	Green	Switch is off	Switch is not off	——
ACT	Red	Protective action	No protective action	——
79	Red	Reclose export	Normal	——
OC	Red	Over current alarm	Normal	——
SEF	Red	Ground fault action	Normal	——
86	Red	Reclosing lockout alarm	Normal	——

4.2 Keypad

The main keys

User actions are mainly concentrated on the operation panel.



Key	Function
	Increase the number
	Reduce the number
	Move up or page up
	Move down or page down
	Move left
	Move right
	Return to the superior or Cancel the operation
	Enter the menu of confirm the operation
When you press the button，the buzzer of device will sing make a sound，so that the operation is valid; if not, please do it again.	

Operation buttons

Key	Function
	Touch reset button, you can reset protect information
	Touch closing button, close switch
	Touch tripping button, trip switch
When you press the button，the buzzer of device will make a sound，so that the operation is valid; if not, please do it again.	

Note: When you press the closing-button or tripping-button, you must make sure the device is unlock; if the lockout-light is on, please press the reset-button to reset the device, so that you can close or trip the switch.

4.3 LCD

A 4 line by 16 character liquid crystal display with power save operation indicates the relay identifier, settings, instrumentation, fault data and control commands.

4.4 The Main Menu

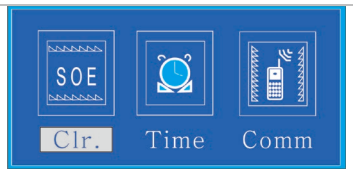
Press “Enter” when on the main screen, as shown below, including “EDIT” and “VIEW” menu item. Select the corresponding menu item with the [←] key, [→] and press "Enter" button to enter the corresponding sub-menu, press the “ESC” key to return to the previous screen.

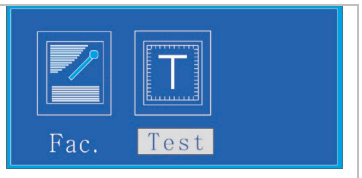
Primacy Menu

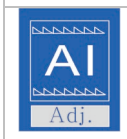
4.5 Submenu

Edit submenu

Choose the edit options, the screen will enter the submenu of the Edit menu, as shown below, the submenu includes "Relay"、"Para"、"Chnl"、"Clr"、"Time"、"Comm"、"Fac"、"Test".

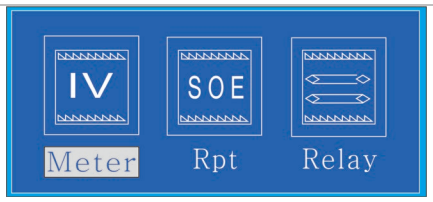


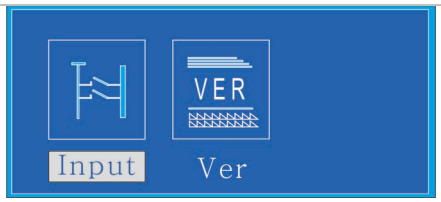


Submenu of edit	
	Enter "Relay" submenu, you can modify the protection feature.
	Enter "Para" submenu, you can modify or view other parameters. Like communication address, baud rate, password, trip and close pulse time.
	Enter "Adj." submenu, current and voltage values can be corrected, press the function key "Enter" to be modified.
	Enter "Clr." submenu, you can clear out the trip report, the alarm report, the SOE report, the count report and all report.
	Enter the "Time" submenu will modify or check the time.
	Enter "Comm" Sub-menu, choose the way to communication, it include "GSM"and "GPRS".
	Enter "Fac." Sub-menu, modify and view the factory settings.
	Enter "Test" Sub-menu, it can test the life of the switch, set the number of reclosing and the interval time of each reclosing.

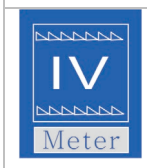
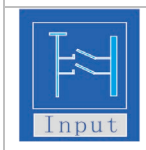
View submenu

Choose the view options, the screen will enter the submenu of the View menu, as shown below, the sub-menu includes "Meter", "RPT", "Relay", "Input", "Ver".





View submenu

	Enter "Meter" submenu, you can view the primary side measurement data include: PT voltage, phase current, zero sequence current, frequency, phase angle.
	Enter "RPT" submenu, you can view trip report, alarm report, SOE report, count report.
	Enter "Relay" submenu, you can view each protection feature is invested and set up the parameters
	Enter the "Input" submenu, you can view the input signal. The input signal includes: Breaker close, Prepaid open, Prepaid close, Spring ready.
	Enter "Ver" submenu, you can view the product model, serial number and date of manufacture.

4.6 Entering the password interface

According to the above operation, before entering each item will first enter a password input interface to prevent professional staff misuse. The device original password is "0099", as shown below, press [←] and [→] keys to switch, press the [+] and [-] keys to increase and decrease the number of line with the correct password press "Enter" button to enter.

Password interface

4.7 Relay setting

Select the "Relay" in the Edit submenu item, press the function key "Enter" to enter the password screen, enter the correct password to enter the "Relay" submenu, as Shown below, each item has a checkbox and set values.

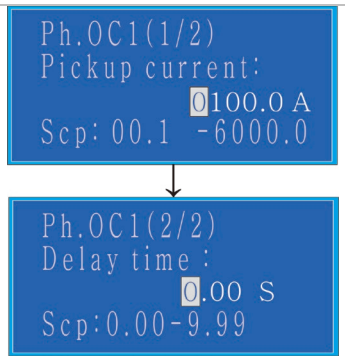
1. Ph.OC1: Instantaneous overcurrent Protection
2. Ph.OC2: Definite time overcurrent protection
3. Ph.OC3: Overcurrent protection
4. EF: Earth fault protection 1
5. EF2: Earth fault protection 2
6. Cold Load: Cold load pickup
7. Reclose: OC reclose
8. Recl.ACC: Reclosing acceleration protection
9. Manu.ACC: Manual closing acceleration protection
10. PH.OV: Overvoltage protection
12. PH.UV: Low voltage protection
12. Power on: Power on protection
13. Prepaid: Debt protection
14. Power Alm: Stored energy alarm

Due to continuous updates, please refer to the actual product for the menu! Please refer to Appendix I for other functions.

Three sections phase overcurrent

Normal overcurrent

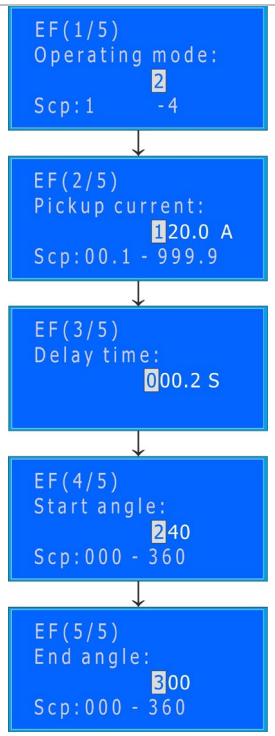
Select Ph.OC menu option press "Enter" key to enter, operational processes as shown below:

	Step 1: Setting the overcurrent protection current value, the current value can be between 0.1A ~ 6000A. Step 2: Setting the overcurrent delay time, the delay time can be between 0S ~ 9.99S. Note: Press [↓] key to switch to next screen, press the [+] and [-] keys to switch the modified current value and delayed time.
The operational processes of simple overcurrent protection setting	

Note: Here is a three-stage overcurrent protection period, the use of the other two are the same.

Earth fault

Select EF menu option press "Enter" key to enter, operational processes as shown below:

	Step 1: Choose the EF operating mode (1: Alarm 2: Trip 3: Direction alarm 4: Direction trip). Step 2: Setting the EF protection current value, the EF current value can be between 0.1A ~ 999.9A. Step 3: Setting the EF delay time, the delay time can be between 0 ~ 600.0S/M. Step 4: Setting the EF start angle, the angle can be between 0 ~ 360°. Step 5: Setting the EF end angle, the angle can be between 0 ~ 360. Note: 1.Press [↓] key to switch to next screen, press the [+] and [-] keys to switch the modified current value and delayed time. 2. Step 4 and step 5 only need to be set when zero sequence direction overcurrent is required.
EF2 protection setting is the same as step 1 to 3	

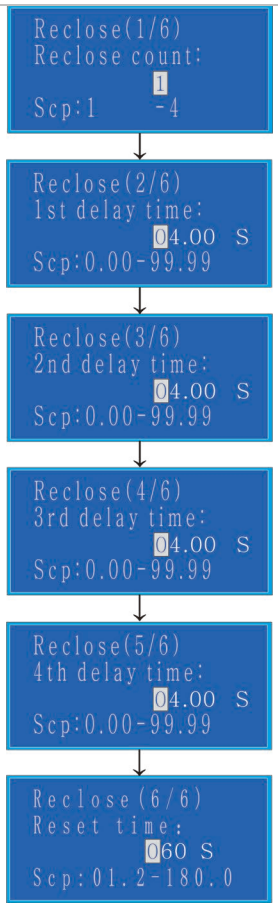
Cold Load

Select Cold Load menu option press "Enter" key to enter, operational processes as shown below:

	Step 1: Setting the cold load protection current value, the current value can be between 1A ~ 6000A. Step 2: Setting the cold load delay time, the delay time can be between 0S ~ 99.99S. Note: Press [↓] key to switch to next screen, press the [+] and [-] keys to modified current value and delayed time.
The operational processes of cold load protection setting	

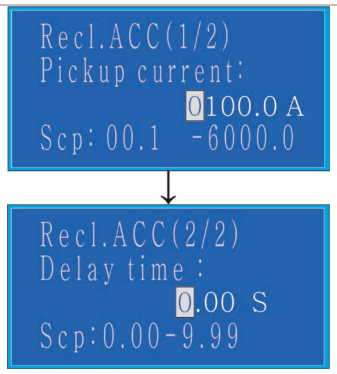
Automatic reclosing (Reclose)

Select Reclose menu option press "Enter" key to enter, operational processes as shown below:

	Step 1: Choose the reclosing times (1: One, 2: Two, 3: Three, 4: Four). Step 2: Setting the 1st delay time, the delay time can be between 0S ~ 99.99S. Step 3: Setting the 2nd delay time, the delay time can be between 0S ~ 99.99S. Step 4: Setting the 3rd delay time, the delay time can be between 0S ~ 99.99S. Step 5: Setting the 4th delay time, the delay time can be between 0S ~ 99.99S. Step 6: Setting the reclosing reset time, the reset time can be between 1.2S~ 180.0S. Note: Press [↓] key to switch to next screen, press the [+] and [-] keys to switch the mode and modified delayed time/reset time.
The operational processes of automatic reclosing setting	

Reclosing acceleration (Recl.ACC)

Select Recl.ACC menu option press "Enter" key to enter, operational processes as shown below:



Step 1: Setting the Recl.ACC protection current value, the current value can be between 0.1A ~ 6000A.

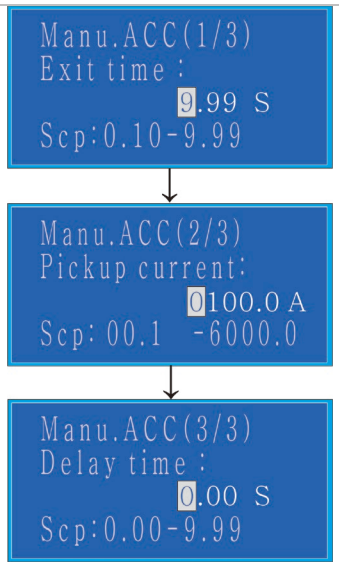
Step 2: Setting the delay time, the delay time can be between 0S ~ 9.99S.

Note: Press [↓] key to switch to next screen, press the [+] and [-] keys to switch the modified current value and delayed time.

The operational processes of reclosing acceleration protection setting

Manual closing acceleration (Manu.ACC)

Select Manu.ACC menu option press "Enter" key to enter, operational processes as shown below:



Step 1: Setting the Manu.ACC exit time, the exit time can be between 0.1S ~ 9.99S.

Step 2: Setting the Manu.ACC protection current value, the current value can be between0. 1A ~6000A.

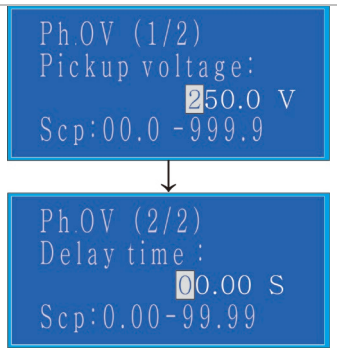
Step 3: Setting the delay time, the delay time can be between 0S ~ 9.99S.

Note: Press [↓] key to switch to next screen, press the [+] and [-] keys to switch the modified current value and delayed time.

The operational processes of manual acceleration protection setting

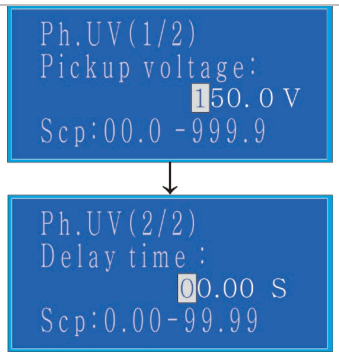
Over voltage protection (Ph.OV)

Select PH.OV menu option press "Enter" key to enter, operational processes as shown below:

	Step 1: Setting the Ph.OV protection voltage value, the voltage value can be between 0V ~ 999.9V. Step 2: Setting the delay time, the delay time can be between 0S ~ 99.99S. Note: Press [↓] key to switch to next screen, press the [+] and [-] keys to switch the modified voltage value and delayed time.
The operational processes of overvoltage protection setting	

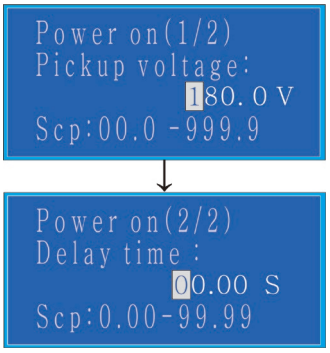
Low-voltage protection (Ph.UV)

Select PH.UV menu option press "Enter" key to enter, operational processes as shown below:

	Step 1: Setting the Ph.UV protection voltage value, the voltage value can be between 0V ~ 999.9V. Step 2: Setting the delay time, the delay time can be between 0S ~ 99.99S. Note: Press [↓] key to switch to next screen, press the [+] and [-] keys to switch the modified voltage value and delayed time.
The operational processes of low voltage protection setting	

Power on

Select Power on menu  option press "Enter" key to enter, operational processes as shown below:

	Step 1: Setting the Power on protection voltage value, the voltage value can be between 0V ~ 999.9V. Step 2: Setting the delay time, the delay time can be between 0S ~ 99.99S. Note: Press [↓] key to switch to next screen, press the [+] and [-] keys to switch the modified voltage value and delayed time.
The operational processes of Power on protection setting	

Prepaid (Optional features)

Select Prepaid menu  option press "Enter" key to enter, operational processes as shown below:

	Step 1: Setting the delay time, the delay time can be between 0S ~ 99.99S. Note: Press the [+] and [-] keys to switch the delayed time.
The operational processes of Prepaid protection setting	

4.8 Save parameter

After setting, press "ESC" key to exit, if modified below figure will show. If you need to save press "Enter" key and input password, otherwise press "ESC" key.

4.9 Parameter set

Press the EDIT → Para, enter the "parameter set".

Set the communication parameter

Name	Setting range	Step length	Description
Comm1 Status	0 ~ 1	1	0: Close this channel 1: Open this channel
Comm1 Baud	0 ~ 38400	1	Default 9600
Comm1 Protocol	1 ~ 4	1	1: IEC60870-5-101 2: IEC60870-5-104 3: DNP3.0 4: MODBUS
Comm1 Balance	0 ~ 1	1	0: Unbalanced 1: Balance
Comm1 Address	1 ~ 65535	1	Source address
Comm1 Report	0 ~ 65535	1	Destination address
Comm1 Upload	0 ~ 1	1	0: Do not upload actively 1: Active upload
Comm2 Status	0 ~ 1(not support)	1	0: Close this channel 1: Open this channel
Comm2 Baud	0 ~ 38400	1	Default 9600
Comm2 Protocol	1 ~ 4	1	1: IEC60870-5-101 2: IEC60870-5-104 3: DNP3.0 4: MODBUS
Comm2 Balance	0 ~ 1	1	0: Unbalanced 1: Balance
Comm2 Address	1 ~ 65535	1	Source address
Comm2 Report	0 ~ 65535	1	Destination address
Comm2 Upload	0 ~ 1	1	0: Do not upload actively 1: Active upload
Signal type	1 ~ 2	1	1: Single point 2: Double point
Control type	1 ~ 2	1	1: Single point 2: Double point
Meter type	1 ~ 4	1	1: Normalized telemetry 2: Normalized telemetry without quality

			3: Standardized telemetry 4: Short floating point telemetry
Address len	1 ~ 2	1	Address length 1: 1 byte 2: 2 byte
COT len	1 ~ 2	1	COT length 1: 1 byte 2: 2 byte
I factor	0.01 ~ 100	0.01	Phase current multiplier
I deadband	0.1 ~ 1000	0.1	Phase current dead zone
I0 factor	0.01 ~ 100	0.01	Zero sequence current multiplier
I0 deadband	0.1 ~ 1000	0.1	Zero sequence current dead zone
U factor	0.01 ~ 100	0.01	Line voltage multiplier
U deadband	0.1 ~ 1000	0.1	Line voltage dead zone
U0 factor	0.01 ~ 100	0.01	Zero sequence voltage multiplier
U0 deadband	0.1 ~ 1000	0.1	Zero sequence voltage dead zone
P factor	0.01 ~ 100	0.01	Power multiplier
P deadband	0.1 ~ 1000	0.1	Power dead zone
COS factor	0.01 ~ 100	0.01	COS multiplier
COS deadband	0.1 ~ 1000	0.1	COS dead zone
OTH factor	0.01 ~ 100	0.01	Other multiplier
OTH deadband	0.1 ~ 1000	0.1	Other dead zone
CLASSA	0 ~ 3	1	Class for analog event data
CLASSB	0 ~ 3	1	Class for digital event data
Select Timeout	0 ~ 30	0.1	Select/operate time-out
Confirm Link	0 ~ 1	1	Enable confirm data link
Link Retry Times	0 ~ 15	1	Data link retries times
Link Timeout	0 ~ 50	0.1	Seconds to data link time-out
Upload Confirm	0 ~ 1	1	Enable upload confirmation
Upload Timeout	0 ~ 50	0.1	Seconds to upload time-out
Upload Retry Times	2 ~ 10	1	Upload retries times
Auto Refresh	0 ~ 1	1	Enable automatic reset of events
Refresh time	0 ~ 65535	1	Seconds to automatic reset event
Check FCB	0 ~ 1	1	Check whether the FCB is overturned

Password set

	The device initial password is "0099", the password for the user to modify from the "0000" ~ "9999", when revised press "Enter" key to confirm, enter the password before the modification.

CT, CT0 rate set

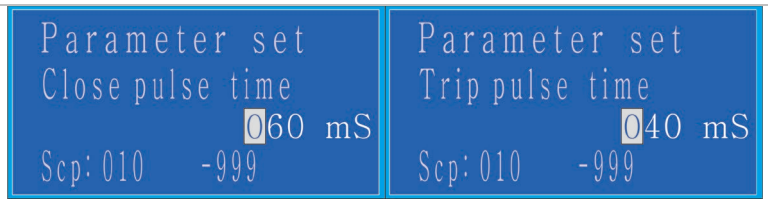
	CT rate is the three phase current rate. The value of CT ratio is equal to the primary side current value divided by the secondary side current value.
	CT0 rate is the real zero sequence current rate. The value of CT0 ratio is equal to the primary side current value divided by the secondary side current value.

Note:

1 Different current transformer, CT ratio becomes different, do not modify this parameter unless necessary(This parameter has been set before leaving the factory and cannot be modified by yourself).

2 Different current transformer, CT0 ratio becomes different, do not modify this parameter unless necessary(This parameter has been set before leaving the factory and cannot be modified by yourself).

Close and trip pulse time set



"Close pulse time" is the discharge time for close coil. "Trip pulse time" is the discharge time for trip coil.

Note: Please do not modify the trip and close pulse time.

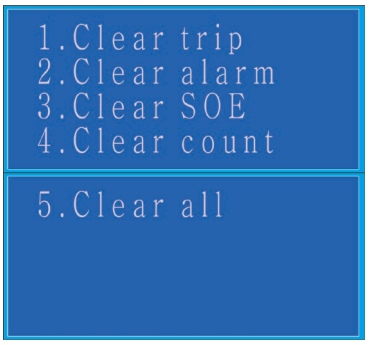
4.10 Calibration

Select the Edit submenu in "Adj.", press "Enter" key to enter into the password screen, enter the correct password to enter the "Adj." submenu, press the [+] and [-] keys to correct the value of current and voltage.

Note: All voltage and current values in the factory have been corrected before. Please do not change the parameter values.

4.11 Clear report

Select the Edit submenu in "Clr", press "Enter" key to enter, as shown below:



Select "1": Clear the trip report.

Select "2": Clear the alarm report.

Select "3": Clear the SOE report.

Select "4": Clear the count report.

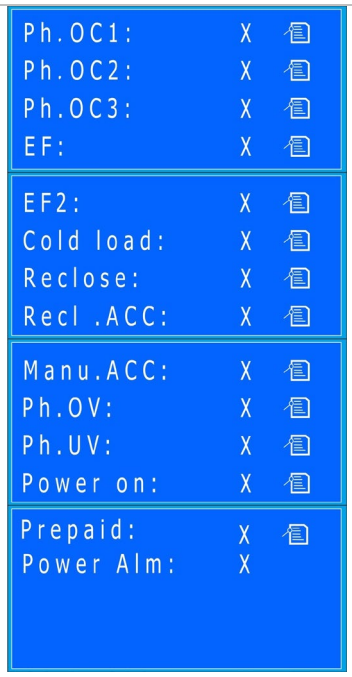
Select "5": Clear the all report (include trip record, alarm record, SOE record and count record) .

4.12 Factory setting

All the values in the factory have been corrected before. Please do not change the values.

4.13 View relay and setting

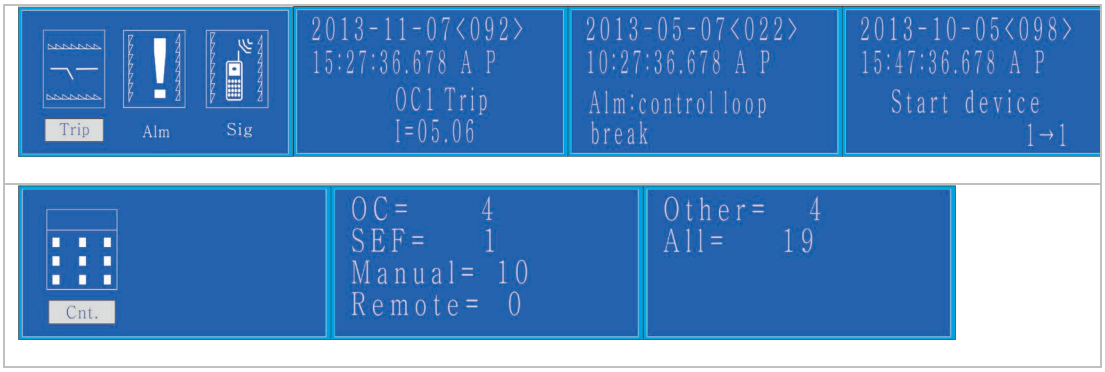
Enter the main menu select the "VIEW" option press "Enter" key to enter, and then select the "Relay" option to press "Enter" key to enter the "Relay" submenu, you can view all the protection is enabled or disabled, select the option press "Enter" key to enter the value you can view each protection, press the arrow keys to switch screens.



Due to continuous updates, please refer to the actual product for the menu! Please refer to Appendix I for other functions.

4.14 View SOE

Enter the main menu select the "VIEW" option press "Enter" key to enter, and then select "RPT" option press "Enter" key to enter the "RPT" submenu, you can view the SOE record events, recording events include: trip signal, alarm signal, telemetry signal (circuit breaker status, whether the manual or remote operation, fault trip, time and date, etc.) and count signal (the count of trip).



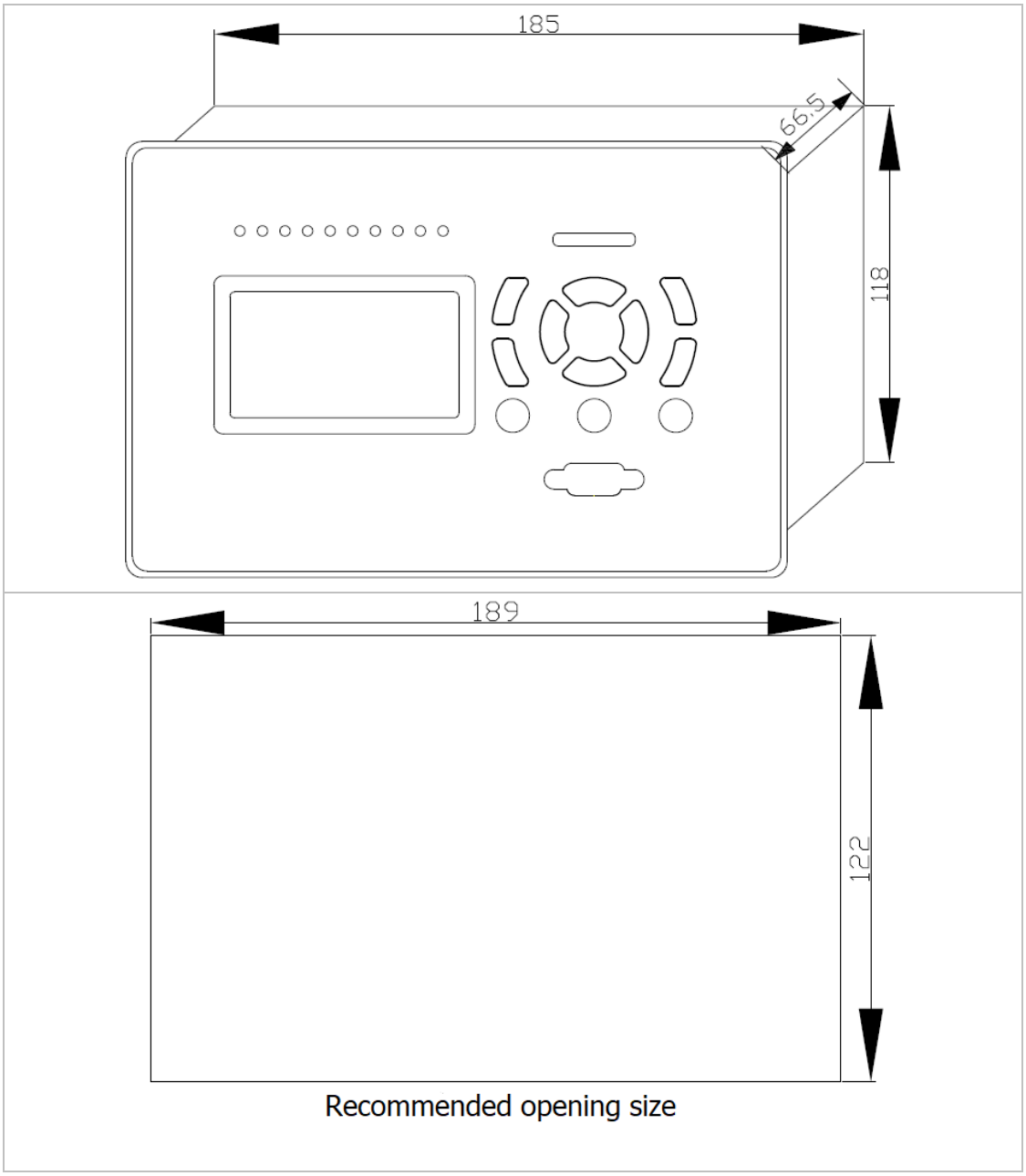
4.14 View input signal

Enter the main menu select the "VIEW" option press "Enter" key to enter, and then select the "Input" option press "Enter" key to enter the "Input" submenu, you can view the state of input signal.

Chapter 5: Installation and Maintenance

Danger: The dangerous voltage with the device maybe result in the permanent damage of equipment or personnel casualty during installing RWH-151. These voltages mainly distributes at terminal bar of device and circuits of AC current input, AC voltage input, digital input, relay output and operation power supply., etc. This device's installation, debugging and maintenance can only be operated by technical staff who has been authorized and trained strictly.

As show below, the installation mode is cabinet door imbedded. The wiring terminal wiring comes out of the backboard of the device.



Recommended opening size

Chapter 6: Decommission and Terminal definition diagram

7.1 Decommission

Shut-down Power Supply

Shut-down Device Power Supply: Turn off external power supply switch of the device.

Disconnect All Power Cables

Disconnect all power cables connected to the device.

Danger: Before disconnecting all power cables connected to the device power module, it must confirm that the external power switch is turned off to avoid danger.

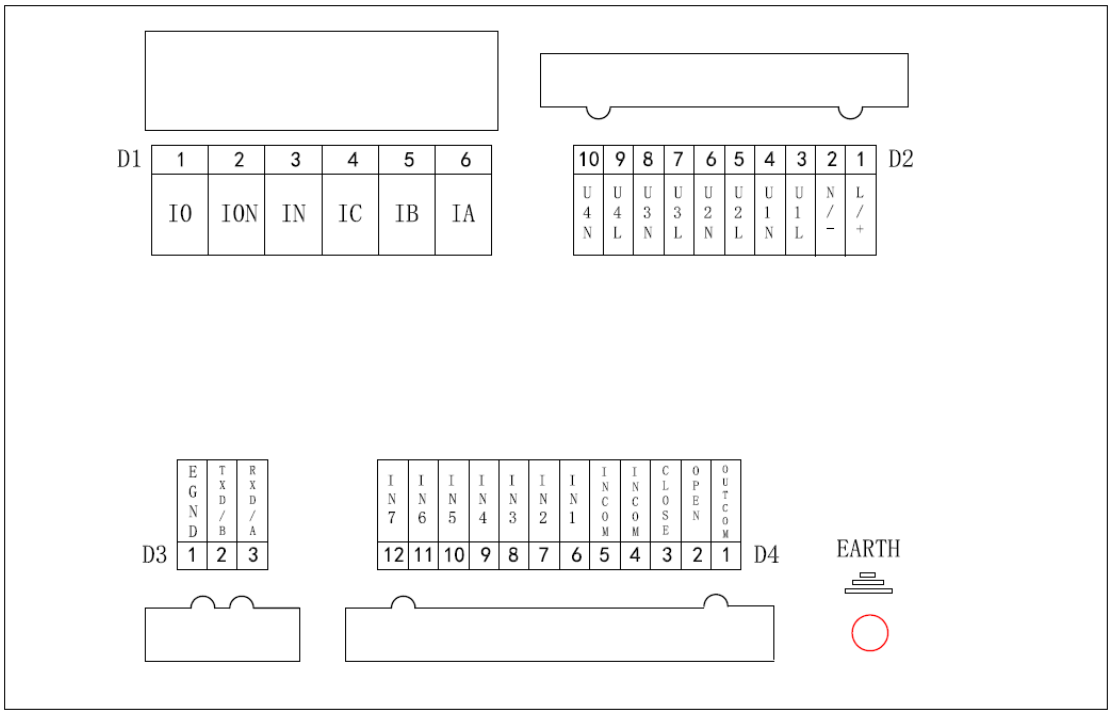
Danger: Disconnecting all power cables connected to the device alternating current module, it must confirm that the equipment corresponding to input alternating component has stopped operation to avoid danger.

Dismantle from Display Cabinet

When the above steps are completed, loosen the fix screws and dismantle the device from the display cabinet.

Danger: When neighboring equipment is in operation, it must strictly confirm the safety distance between the dismantled device and other device in operation and unskilled professional shall take particular caution.

7.2 Terminal definition diagram



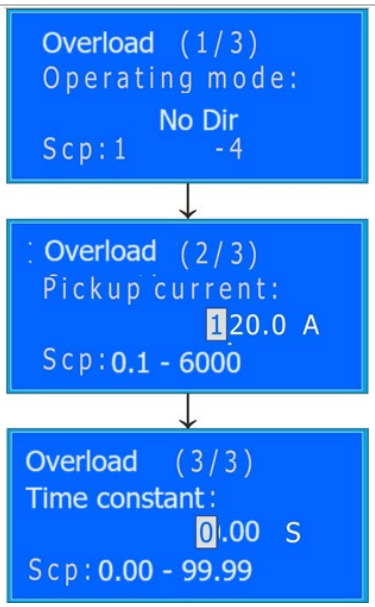
Appendix I: Time-Overcurrent curve and reclose

The following supplements are provided for additional features:

Overload

Description		Setting range	Step length
Overload	Operating mode	1.No Dir 2. Alarm	
	Pickup current	0.1～6000A	0. 1A
	Delay time	0～99.99S	0.01S

Select overload menu  option press "Enter" key to enter, operational processes as shown below:



Step 1: Choose the overload operating mode (1. Standard Inverse 2. Very Inverse 3. Extremely Inverse).
Step 2: Setting the overload protection current value, the SEF current value can be between 0.1A ~ 999.9A.

Step 3: Setting the overload delay time, the delay time can be between 0 ~ 600.0S/M.

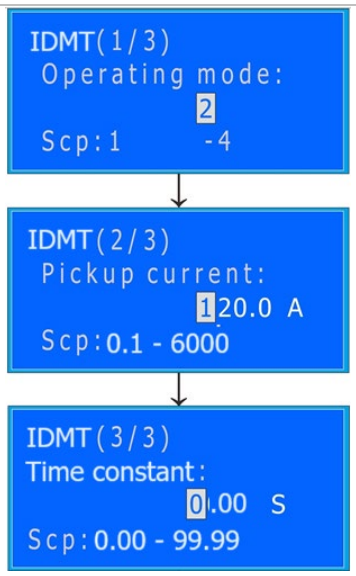
Note: 1.Press [↓] key to switch to next screen, press the [+] and [-] keys to switch the modified current value and delayed time.

The operational processes of overload protection setting

IDMT (51)

Description		Setting range	Step length
IDMT	Curve mode	1. Standard Inverse 2. Very Inverse 3. Extremely Inverse	
	Pickup current	0.1 ~ 6000A	0. 1A
	Time constant	0 ~ 99.99S	0.01S

Select IDMT menu option press "Enter" key to enter, operational processes as shown below:



Step 1: Choose the IDMT operating mode (1. Standard Inverse 2. Very Inverse 3. Extremely Inverse).
Step 2: Setting the IDMT protection current value, the SEF current value can be between 0.1A ~ 999.9A.

Step 3: Setting the IDMT delay time, the delay time can be between 0 ~ 600.0S/M.

Note: 1.Press [↓] key to switch to next screen, press the [+] and [-] keys to switch the modified current value and delayed time.

The operational processes of IDMT protection setting

51 Inverse Time Overcurrent

No	Curve Type	Operating time
1	C1 (Standard Inverse)	$T_p = TD \bullet \left(\frac{0.14}{(M^{0.02} - 1)} \right)$
2	C2 (Very Inverse)	$T_p = TD \bullet \left(\frac{13.5}{(M - 1)} \right)$
3	C3 (Extremely Inverse)	$T_p = TD \bullet \left(\frac{80}{(M^2 - 1)} \right)$

TD- Time constant M-Injuct current/Pickup current Tp-Delay time