statement

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This manual is only used as a guide for the use of the product, and all statements and information do not constitute any form of warranty.

Service commitment

Thank you for using our products.Before you use the instrument for the first time, in order to use the instrument correctly, please read this manual carefully, give full play to its function, and ensure the safety of the instrument and personnel.

We firmly believe that high-quality, systematic, comprehensive and efficient service is the foundation of career development.After years of continuous exploration and progress, we have formed a "quality, customer oriented" service concept.With better product quality and more perfect after-sales service, we will try our best to build a brand enterprise of electric power test products with leading technology, quality and service.To provide customers with satisfactory pre-sale, sale and after-sales service!

safety requirements

To avoid possible hazards, please read the following safety precautions.

Please use our standard accessories for this product.

To prevent fire or electric shock hazard and ensure life safety.Before using this product for test, please read the product manual carefully and carry out the test according to the specified test environment and parameter standard.

Use the fuse of the product.Only use fuses of the type and rating specified in this product.The input and output terminals, test columns, etc. of the product may have voltage. During the test,

when plugging in and out the test line and power socket, electric sparks will be generated. Please pay attention to personal safety!Do not operate the instrument without front (rear) cover.
Before the test, in order to prevent electric shock, the grounding conductor must be connected with the real grounding wire to ensure the correct grounding of the product.During the test, when the test lead is connected with the live terminal, do not connect or disconnect the test lead at will.After the test, shut down the instrument according to the operating instructions, disconnect the power supply, and properly manage the instrument according to the requirements.
If the product is damaged or faulty, do not continue to operate, please disconnect the power supply and properly save the instrument, and contact our after-sales service department, our professional and technical personnel are happy to serve you.

Please use this product in strict accordance with the instructions and standard test operation procedures.

Do not use the instrument in humid environment.

Do not use the instrument in explosive environment (except explosion-proof products).

Please keep the product surface clean and dry.

The product is a precision instrument. Please keep it up and handle it with care.

Catalog

Chapter I Characteristics and technical parameters of the device

Section 1 Main features

1. Meet all on-site testing requirements. This instrument has standard six phase voltage and six phase current output, which can be used to test various traditional relays and protection devices, as well as various modern microcomputer protections, especially for transformer differential power protection and backup automatic switching devices, making testing more convenient and complete.

2. Meet the standards of GB/T 7261-2016 "Basic Test Methods for Relay Protection and Safety Automatic Devices" and DL/T 624-2010 "Technical Conditions for Microcomputer based Test Devices for Relay Protection".

3. Classic Windows XP operating interface, user-friendly human-machine interface, easy and fast operation; A high-performance embedded industrial control computer and a 10.4-inch resolution 800 × 600 LED true color display screen can provide rich and intuitive information, including the current working status of the device and various help information.

4. The Windows XP system comes with a built-in recovery function to prevent system crashes caused by illegal shutdowns or misoperations.

5. The device panel is equipped with ultra-thin multifunctional quick connect buttons and an optical mouse, which can complete various operations through the keyboard or mouse just like operating a regular PC.

6. The main control board adopts a DSP+FPGA structure and a 16 bit DAC output which can generate a high-density sine wave of 2000 points per week for the base wave, greatly improving the quality of the waveform and enhancing the accuracy of the tester.

7. The power amplifier adopts high fidelity linear power amplifier, which ensures the accuracy of small current and the stability of large current.

8. It uses a USB interface to communicate directly with the PC without any adapter

cables, making it convenient to use.

9. Can be connected to a laptop (optional) for operation. Laptops and industrial computers use the same software, so there is no need to relearn the operating methods.

10. Equipped with an independent dedicated DC auxiliary voltage source output, with output voltages of 110V (1A) and 220V (0.6A) respectively. To be used for relays or protective devices that require DC working power supply.

11. It has software self calibration function, which avoids the need to open the chassis and adjust the potentiometer to calibrate accuracy, greatly improving the stability of accuracy.

Section 2 Technical parameters

1.AC current source (6 * 30A)

Single phase current output (RMS)	0 - 30A / phase, accuracy: 0.2% ± 5mA
Six phase parallel output (RMS)	0-180A/six parallel outputs with the same phase
Allowable working value of phase current for a long time (effective value)	9.9A
Maximum output power per phase	320VA
Maximum output power of six phase parallel current	1800VA
Maximum output allowable working time of six-phase parallel current	5s
frequency range	0 - 1000Hz, accuracy 0.001Hz
Harmonic number	2-20th
phase	0-360° The accuracy is 0.1°

2. DC current source

DC current output	0-± 10A / phase, accuracy: 0.5% ± 5mA

3. AC voltage source

Single phase voltage output (RMS)	0 - 120V / phase, accuracy: 0.5% ± 5mv
Line voltage output (RMS)	0-240V
Phase voltage / line voltage output power	75VA/100VA
Frequency range	0 - 1000Hz, accuracy: 0.001Hz
Harmonic number	2-20th
Phase	0-360° The accuracy is 0.1°

4. DC voltage source

Single phase voltage output amplitude	0-± 160V, accuracy: 0.5% ± 5mv
Output amplitude of line voltage	0-±320V
Phase voltage / line voltage output power	90VA/180VA

5. Switching value terminal

Switch input terminal	8 pairs
Idle contact	1 - 20 mA, 24 V, internal active output of the device
Potential reversal	Passive contact: low resistance short circuit signal Active contact: 0-250V DC
Switch output terminal	4 pairs, empty contacts, interruption capacity: DC: 0-30V/5A, AC:0-250V/5A

6. Others

Time frame	1ms - 9999s, measuring accuracy: 1ms
Volume and weight of single machine	Volume 418x 363 x 208mm3, about 17.8kg
Power Supply	AC220V±10%，50/60Hz，10A

7．Working time of AC current

Working current < 10A	working hours≤60minute
20A > Working current≥10A	working hours≤70S
30A > Working current≥20A	working hours≤15S
Working current：30A	working hours≤5S

Chapter 2 Hardware structure of the device

Section 1 Hardware composition of the device

1. Built in high-performance industrial control computer

This device uses a high-performance industrial computer as the control computer, equipped with a self restoration system and a 10.4-inch "800 × 600 resolution LED true color LED display screen. This machine comes with high-performance dedicated multifunctional quick connect buttons and mouse, which can be used directly without the need for additional peripherals. The software runs under the Windows XP operating system and is easy to operate. The device panel is equipped with two USB interfaces for convenient data access, communication, and software upgrades. (Multi functional interface upgradable)

2. DSP digital signal processing system

The 6000 series DSP controller is used as the core, and FPGA programmable logic devices output waveforms. Due to the use of DDS hardware output waveform technology, the waveform frequency and phase accuracy are quite high. At the same time, the system communicates directly with the industrial computer using USB2.0 interface, making data communication stable and reliable.

3. D/A and A/D conversion

By using a high-precision D/A converter and an active low-pass filter, the output waveform is smoothed and the amplitude frequency characteristics are excellent. At the same time, the control system also retains 12 channels of 12 bit A/D conversion circuits, which can real-time

collect the output waveforms of 12 analog signals and display the actual output waveforms, amplitudes, and phases on the screen through software.

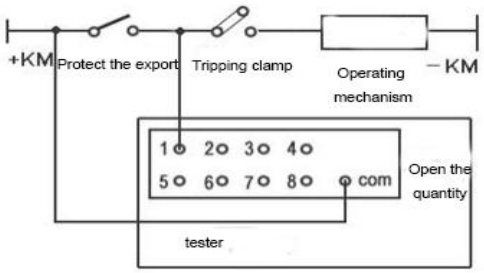
4. High precision linear voltage and current power amplifier

The current and voltage are directly coupled and output using high-performance linear amplifiers, allowing the current and voltage sources to directly output AC and DC waveforms. Various combinations of waveforms such as square waves, harmonics, and transient fault waveforms can be calculated and output through software, which can effectively simulate the current and voltage characteristics during various short-circuit faults. The power amplifier circuit adopts imported high-power high fidelity modular power devices as the power output stage, combined with carefully designed heat dissipation structure, with sufficient power redundancy and thermal capacity. The power amplifier circuit has complete overheating, overcurrent, overvoltage and short-circuit protection, and the current circuit allows open circuit without damaging the device. The panel has a current open circuit indicator light to facilitate users in checking whether the wiring is correct. At the same time, the panel also has a voltage overload or short circuit indicator light. When a short circuit occurs in the voltage circuit (with output), the indicator light will light up and give an alarm. The high current time limit adopts unique hardware and time limit circuit, which overcomes the shortcomings of traditional software time limit and makes high current use safer and more reliable.

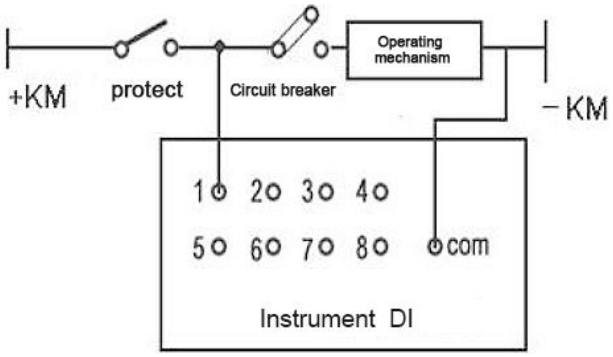
5. Switching input and switching output

The device has 8 pairs of switch input terminals and 4 pairs of switch output terminals. The input and output quantities are both composed of optoelectronic isolators and 24V DC relays, and their working power supply is an independent 24V working power supply, so there is a 24V DC voltage between the COM terminal and the input quantity. Here are several common wiring diagrams for input quantities:

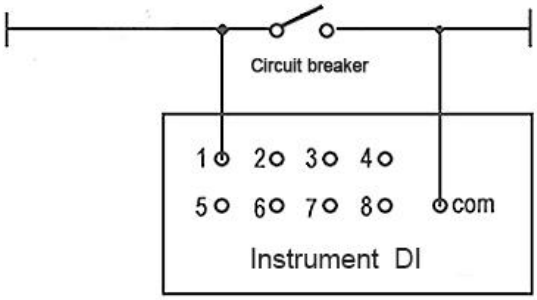
Empty contact with potential:



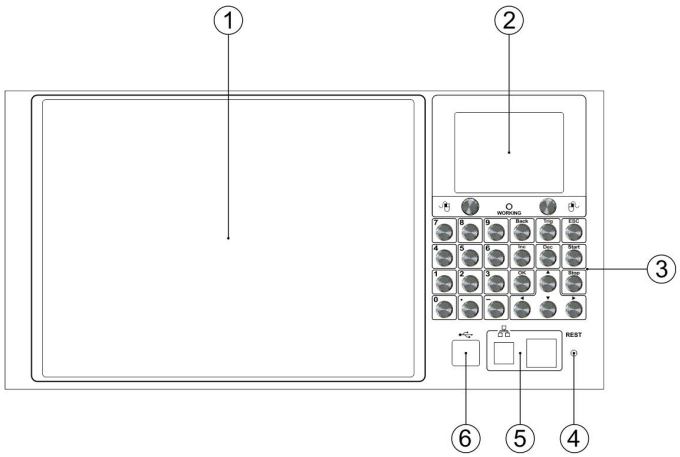
Potential reversal:



Idle contact:



Section 2　Device panel side plate description



Display screen: 8.4 inch TFT LCD screen.

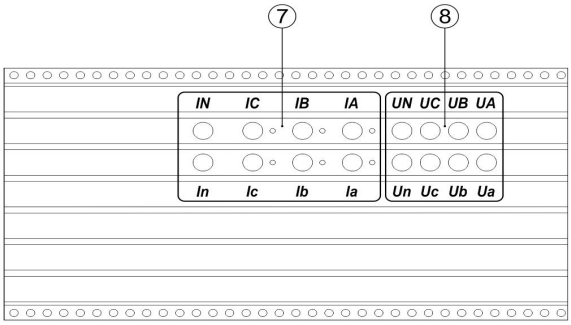
2.Touch pad: similar to the touch pad of notebook computer, it can be controlled by omni-directional touch.Left and right keys: the left key is the confirmation key, and the right key can view the file properties.

3.Keyboard: used to input fixed value data, including start, end, exit shortcut keys, up, down, left and right direction keys

4.Rst: reset button of DSP control board. When the software shows that data transmission fails or no device is connected, press this button to reset the DSP board, and the mark of USB device can appear at the bottom right of the screen.

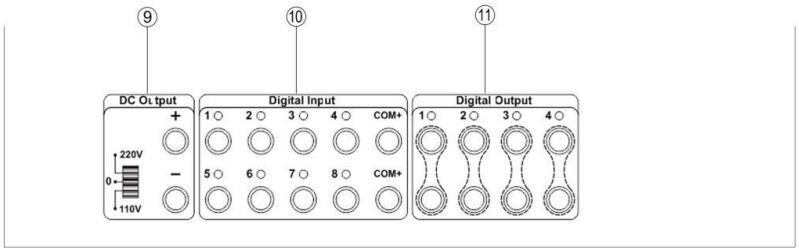
5. Communication port: USB communication can be connected to an external laptop to control the operation of the instrument;Network port communication (optional), which can realize multi machine control function, or single machine network port communication to control and operate the instrument.

6. USB expansion interface: there are two USB interfaces, which can be connected to USB devices such as mouse, keyboard, U disk and so on.



7. The first group of current output terminals: IA, IB, IC,and the second group of current output terminals: IA, IB, IC,In,IN is the common terminal.

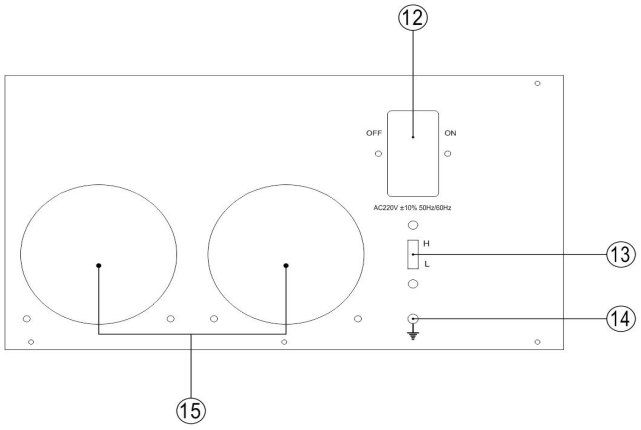
8. The first group of voltage output terminals: UA, UB, UC and the second group of voltage output terminals: Ua, Ub, Uc ,UN .Un,are the common terminals.



9.Auxiliary power supply of the device: can output DC 0;110V； The 220V power supply can be switched through the dial switch, and the maximum current output is 2a, which can supply power to the protection device.

10.Switching value input: used to collect the output switching value signal of the protection device and measure the time or detection signal.It can identify the active contact and passive contact. The maximum DC voltage of the active contact is dc220v. When connecting the active contact, note that + com is the positive pole of the power supply.

11. Switching value output: used to control other equipment, passive nodes, with maximum capacity of AC220V / 1a.



12. Power interface: AC220V AC voltage is connected through supporting connecting line, and internal insurance specification: 10a, 5mm * 10mm;On: power on, off: power off.

13. Switch between heavy load and light load, "H" when heavy load, "L" when light load. Switch to "L" when long time current output

14.Grounding: it can be safely grounded through supporting grounding wire.

15. Fan exhaust hole: heat dissipation and exhaust.(do not block when using)

Chapter 3 Quick start

Section 1 Test precautions

1. The tester has built-in industrial computer and windows operating system. Please do not switch on and off the host power too frequently.

2. The device panel is equipped with a USB port, which allows hot dialing and plugging of USB port devices (such as U disk, etc.), but it should be noted that the dialing and plugging must be carried out after the end of data transmission.

3. The device is equipped with a dedicated self restoring CF card to avoid operating system damage caused by illegal shutdown, deletion or modification of files on the hard disk and icons on the desktop.If you really need to store data in this machine, please store the data in disk D.When using USB disk to copy data, please make sure that the USB disk is clean and virus-free, and do not use the USB disk to install other software programs in the system.

4. When connecting the keyboard or mouse, do not insert the wrong port, otherwise the windows operating system will not start normally.

5. Do not turn off the power supply directly in the output state, so as to avoid the protection misoperation due to the output error.

6. The input is compatible with empty contact and potential (0-250vdc). When using live contact, the high end of contact potential (positive) shall be connected to the com terminal of common terminal.

7. When using this instrument, do not block or close the air vent of the machine body. Generally, place the instrument standing or open the support foot and place it slightly inclined.

8. It is forbidden to introduce the external AC and DC power supply into the voltage and current output jack of the tester.Otherwise, the tester will be damaged.

9. If the field interference is strong or the safety requirements are high, before the test, the grounding terminal of the power line (3-core) shall be reliably grounded or the grounding hole of the device shall be grounded.

10. If the interface data is wrong or the device cannot be connected in the process of using, it can be solved as follows: press the reset button down to reset the DSP; or exit the running

program to return to the main menu and re run the program, then all the interface data will return to the default value.

Section 2 On / off procedure

1. Startup steps

1. Firstly, plug the power cord of the tester into the AC220V power socket, turn on the power of the host computer, and the IPC starts the Windows XP operating system. After the startup, the host computer automatically enters into the main interface of the tester software.

2. Connect the current and voltage circuits, and then turn on the power switch of the power amplifier. It is necessary to connect the input and select the corresponding software module for the test.

2.Matters needing attention:

① When the current circuit is connected, the phenomenon of sparking may occur, which is normal and need not be worried.The current circuit has about 20V AC voltage.When the circuit is short circuited, the voltage will disappear automatically.If you want to avoid sparking, you can turn off the power switch of the power amplifier, connect the wire of the current circuit, and then turn on the power switch of the power amplifier after connecting, so as to avoid sparking.

② Check whether the wiring is correct.When the current open circuit indicator lights up red, it indicates that the phase current circuit wiring is wrong; when the voltage short circuit indicator lights up red, it indicates that the phase voltage circuit wiring is wrong.The voltage short circuit indicator can not return to normal by itself.When the voltage circuit is out of trouble, turn off the power supply of the power amplifier, and turn on the power supply of the power amplifier after 20 seconds of pause. At this time, if the short voltage street lamp does not light up, it means that the wiring is correct.

3. Shutdown steps

1. First, turn off the power switch.

2. Then close the test software menu.In the [start] column, click [shut down]. When the windows operating system prompts [it's safe to shut down], turn off the host power, unplug the relevant test cable, and finally load the instrument into the packing box.

Section 3 Index of relay protection test items

1. Relay test

Type of relay	Test items	Recommended test module	Remarks
Signal relay Time relay Intermediate relay Reclosing relay	Corresponding test items	DC test Intermediate relay DC test	If the intermediate relay requires AC and DC mixed input, please test it in the "AC / DC test" module. If the rated current of the signal relay is too small, it can be tested by the voltage circuit output of the tester.
Current relay Over (under) voltage relay Sequence component relay Synchronous check (or phase comparison) relay Inverse time current relay	Corresponding test items	AC test Current voltage Inverse time current relay DC test	The sequence component relay can be tested in the special sequence component module of "AC test". The inverse time relay can also be tested in "inverse time overcurrent".
Differential relay	DC magnetization characteristics	Differential relay Differential test Harmonic test	During the test, please refer to the wiring mode of "differential test" in the manual for correct wiring.
	Harmonic braking characteristics		
	Proportional braking	Differential test Differential relay	

	characteristics	AC test	
Power (direction) relay Impedance relay	Corresponding test items	Power direction AC test	Before testing the power (direction) relay, the wiring type and the general action boundary of the protection should be determined in advance.
Synchronizing relay	Corresponding test items	Simultaneous test AC test	The UA and UB of the tester are used as the voltage output of the system side and the side to be paralleled respectively in the "synchronization test" module, which can measure the action frequency, action voltage and phase, and carry out automatic quasi synchronization test.
Frequency relay	Corresponding test items	Frequency test	It can test the action frequency and slip lock value.

2. Microcomputer protection device test

Relay protection type		Test items	Recommended test module	remarks
Line road protect	Multi stage overcurrent Over (under) voltage Sequence component voltage and current	Corresponding test items	AC test Frequency test Power direction	As long as the method is proper and the "AC test" module can be used to test most relays and microprocessor-based protections, we should focus on this module.

	Frequency device			
	Power direction protection			
	Reclosing and Switching fault	Corresponding test items	Whole set test State Series	It is required to test the synchronization and no voltage, and use UX as the output voltage of the side to be paralleled.
	Distance and zero sequence	Distance and zero sequence fixed value verification	Impedance ladder Zero sequence protection	Both "impedance ladder" and "zero sequence protection" can automatically test multiple sections, various fault types, various phase distances and zero sequence setting values at one time.
		Impedance characteristics	Impedance phase characteristics	
	Power frequency variation distance	Constant value verification	Power frequency variation distance	The fault current should be large enough, such as 10 ~ 15A (when 5A system CT).
	Composite voltage blocking Over current	Over current, low voltage, negative sequence voltage blocking over	AC test	The "low voltage" and "negative sequence voltage" of some protections are input by different terminals, and the wiring needs to be replaced during the test.

		current, etc		
	Low cycle, low pressure Load shedding device	Corresponding test items	Low cycle in the same period Frequency test AC test	If other conditions are met, but the device cannot operate, please confirm whether the device needs to input current and switch contact at the same time.
Generator transformer group protect	Differential protection	Proportional braking characteristics	Differential relay differential protection AC test	When the generator differential protection is tested with "differential protection", it can be regarded as a transformer protection with Y / Y connection and 1 balance coefficient at both high and low voltage sides. "Differential test" focuses on curve characteristic search, sub proportional braking boundary search, proportional braking fixed-point test, harmonic braking boundary search, harmonic braking fixed-point test, which can comprehensively test differential protection.
		Harmonic braking characteristics	Differential test differential protection Harmonic test	
	Loss of excitation protection	Corresponding test items	AC test	The angle between the output voltage and current should be

	Excitation protection			paid attention to during the test.
	Composite voltage blocking (direction) overcurrent (backup)	Corresponding test items	AC test	
Other protect	Automatic quasi synchronization device	Corresponding test items	Simultaneous test	When doing the automatic adjustment test, the input of each switch must be tested, and the wiring must be in accordance with the requirements of the manual.
	Standby automatic switching device	Action logic and action time of each switch	State Series	The key to the success of the test is to foresee the test process before the test and to connect the wires correctly.
	Bus differential protection Optical fiber line differential protection	Corresponding test items	AC test	Please refer to the description of BP-2B and RCS-915 in "Nari partial protection" in Appendix 6 Before the test, determine whether the device forms "self loop". If so, the action value of the protection should be equal to half of its setting value.

Chapter 4 Software operation method

Section 1 Software introduction

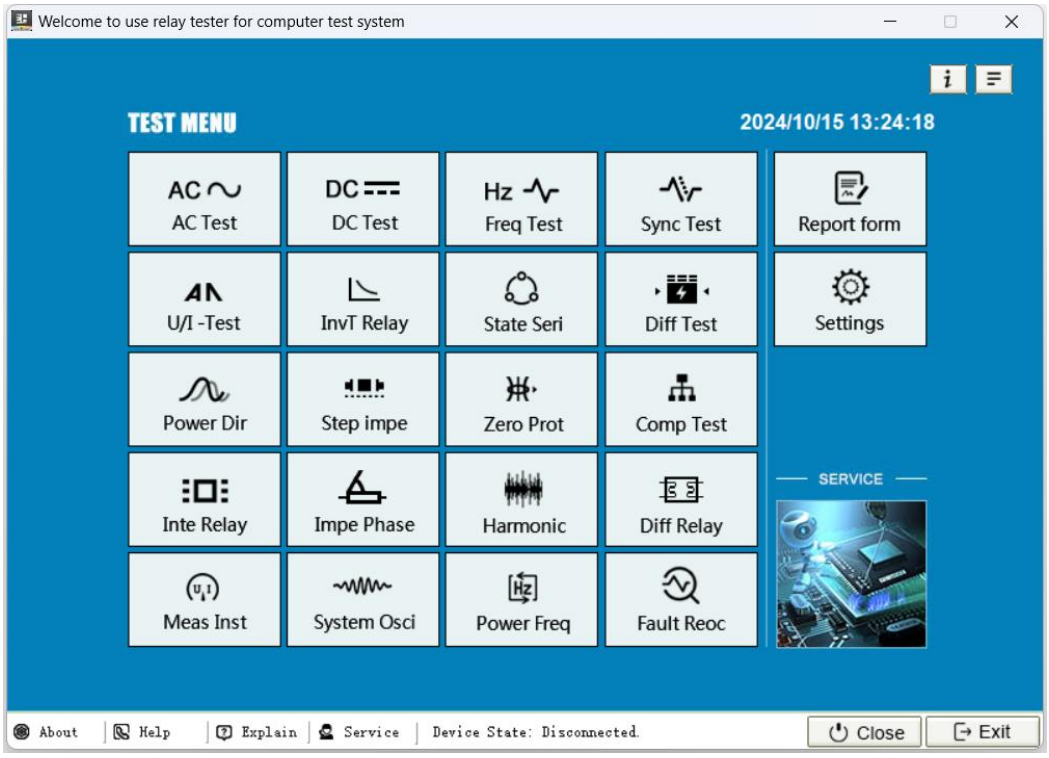
1. Software installation

The industrial computer is pre installed with application software and USB drivers before leaving the factory. If the user wants to reinstall it, they can double-click the SETUP. EXE file and follow the prompts to complete the installation automatically.

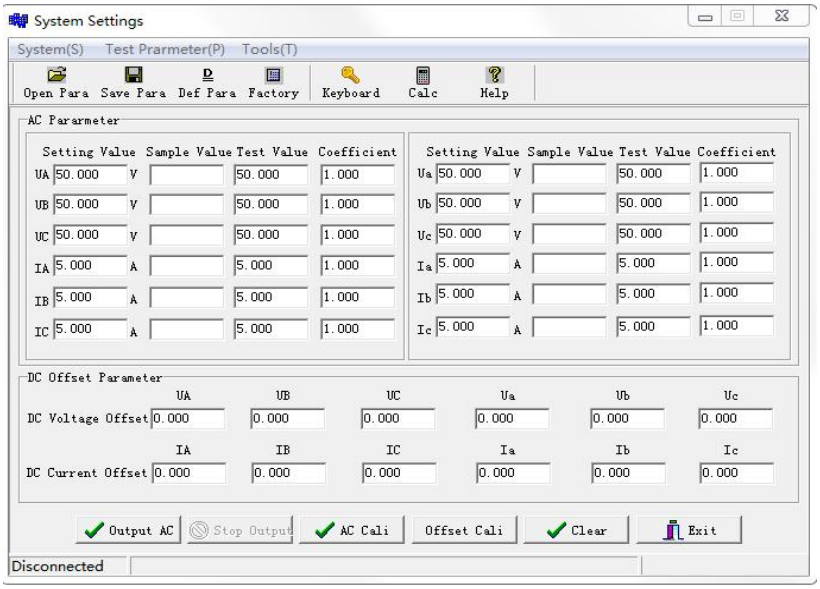
2. Driver installation

Insert the USB cable, and the computer will automatically detect a new USB device. Select the specified directory for installation, enter browsing, find the location of the driver program, click OK to perform automatic installation. After installation, a label similar to a USB flash drive will pop up in the lower right corner of the screen. Move the mouse to this location to view detailed information. The screen will display the words USB FOR DSP, indicating that the driver installation is successful and can be used now. If the industrial computer needs to reinstall the program, you can copy the files on the CD to a USB drive, insert the USB drive into the panel USB port, and perform the above installation operation on the USB drive. (For detailed operation, please refer to the appendix)

3.Main menu



4. System settings



This module is used to calibrate the accuracy and DC offset of the device.The accuracy and DC offset of the instrument are calibrated automatically by software instead of traditional potentiometer adjustment mode. The advantage of software calibration is high accuracy and easy to use.The usage is as follows:

AC calibration

Click [output AC], and the device outputs voltage of each phase: 50V and current of each phase: 5A according to the setting value.Use a high-precision meter to measure the actual output value of voltage and current of each phase, input all the actual measured values into the corresponding column of [measured value], and then click [stop output] to stop the voltage and current output of the device, and then click [AC calibration] to input the specified password.

DC offset calibration

When the device has no output, it is necessary to turn on the power switch of the power amplifier, measure the DC components of the voltage and current channels of each phase with DC voltmeter and DC ammeter, input the measured DC components of each phase into the corresponding column of [DC offset] (unit: MV, Ma), and then click [offset calibration], and input the specified password.

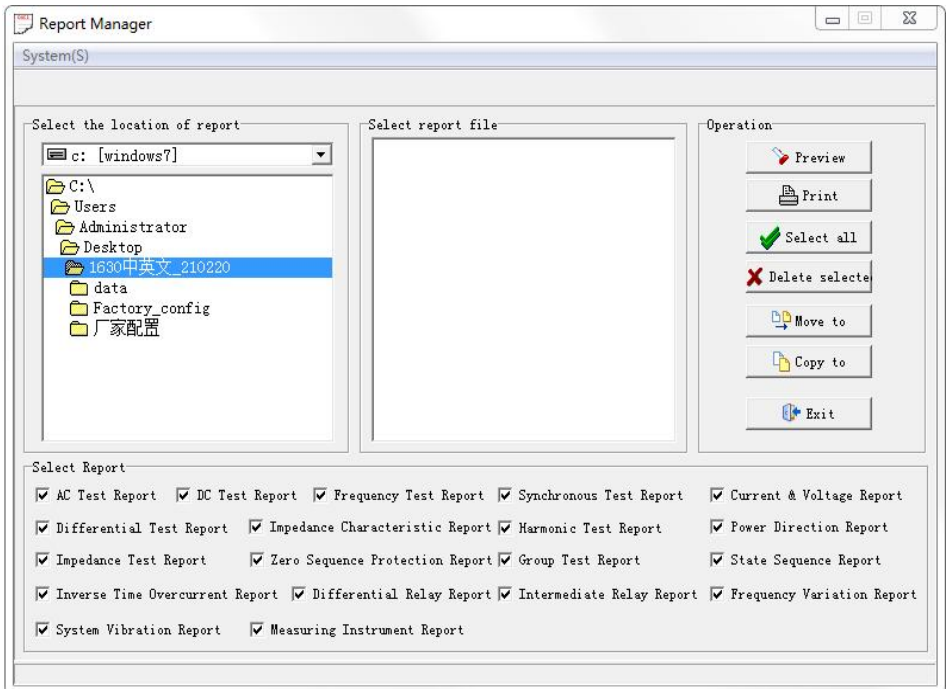
Specified password

Enter the year, month and date of the day. For example:June 8, 2021.

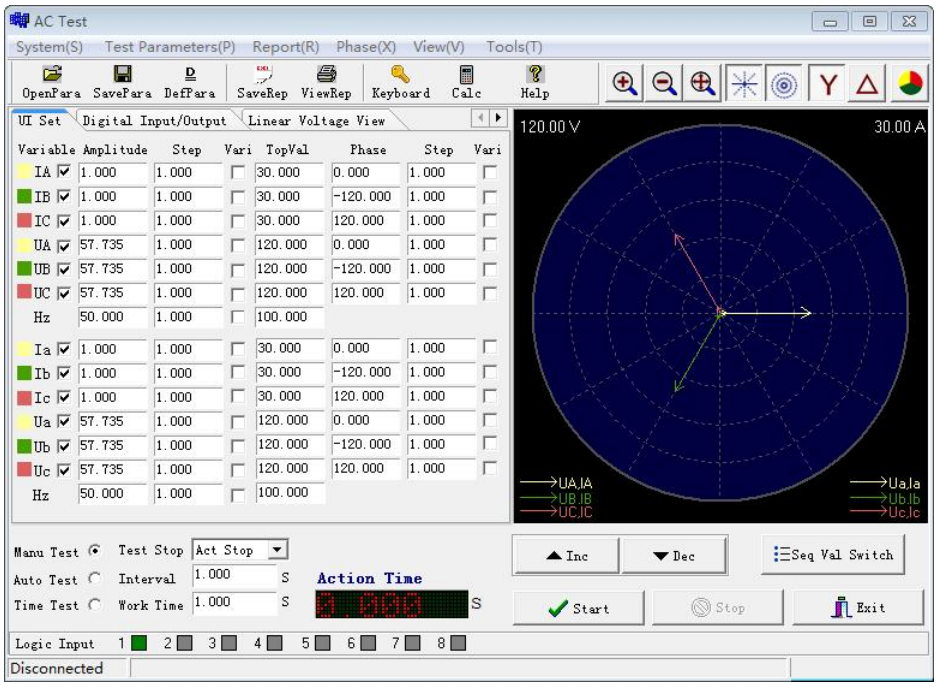
Be careful

The precision of the device has been calibrated before leaving the factory. The user should not adjust it without a standard meter, so as not to affect the calibrated parameters of the device.

3. Report management



Section 2 AC test



1. Interface description

[AC test] module is a general and comprehensive test module, which is composed of independent 6-phase current and 6-phase voltage. By setting the corresponding voltage or current as the variable, giving the variable a certain change step, and selecting the appropriate test methods (such as manual, automatic, action stop, action return), it is convenient to test the action value, return value and action time of various voltage and current protections, and automatically calculate the return coefficient.

1.1 Variable selection

User can select a single variable or multiple variables that can be changed at the same time. Just tick "√" in the [variable] column.

1.2 Step size of variable

The step size can be selected according to the requirements of test accuracy.Such as: voltage step, current step, etc.

1.3 [Time of each step]

In automatic test, the interval time of each step change.This column does not need to be set in manual test.

1.4 [Automatic test (action stop)]

When the program is outputted, the quantity involved in the change will automatically change according to the set step size and interval time, and other quantities will remain unchanged.Until the relay acts, record the action value and time.Stop output, the program automatically returns.

1.5 [Automatic test (action return)]

When the program is outputted, the quantity involved in the change will automatically change according to the set step size and interval time, and other quantities will remain unchanged.Until the relay acts, record the action value and action time. At this time, the device still maintains the output state, and then changes in the opposite direction according to the set step size and interval time until the relay contact returns, the device stops the output, records the return value, and the program automatically returns.

1.6 [Manual test (action stop)]

The program continuously outputs the current value. When you click the [}] button, the variable quantity increases by one step. When you click the [}] button, the variable quantity decreases by one step.If the relay acts, the action value and time can be recorded. At this time, the tester will terminate the output and the program will return automatically.

1.7 [Manual test (action return)]

The program continuously outputs the current value. When you click the [}] button, the variable quantity increases by one step. When you click the [}] button, the variable quantity decreases by one step.If the relay acts, the action value and action time can be recorded. At this time, the tester still maintains the output state. The user can manually change the step size in the opposite direction until the relay contact returns. Then the tester will terminate the output, record the return value, and the program will return automatically.

1.8 [Open parameters]

Select the appropriate folder to open the previously saved parameters.

1.9 [Save parameters]

Save the current parameters to the folder specified by the user.

1.10 [Default parameter]

To restore the interface to the default parameters, the initial voltage is 57.73v, the current is 1a, the phase difference is 120 °, the frequency is 50 Hz and the positive sequence.

1.11 [Save report]

Save the test result file to the specified folder, default: disk D.

1.12 [View report]

Call out a file in disk D for browsing or printing.

1.13 [Virtual keyboard]

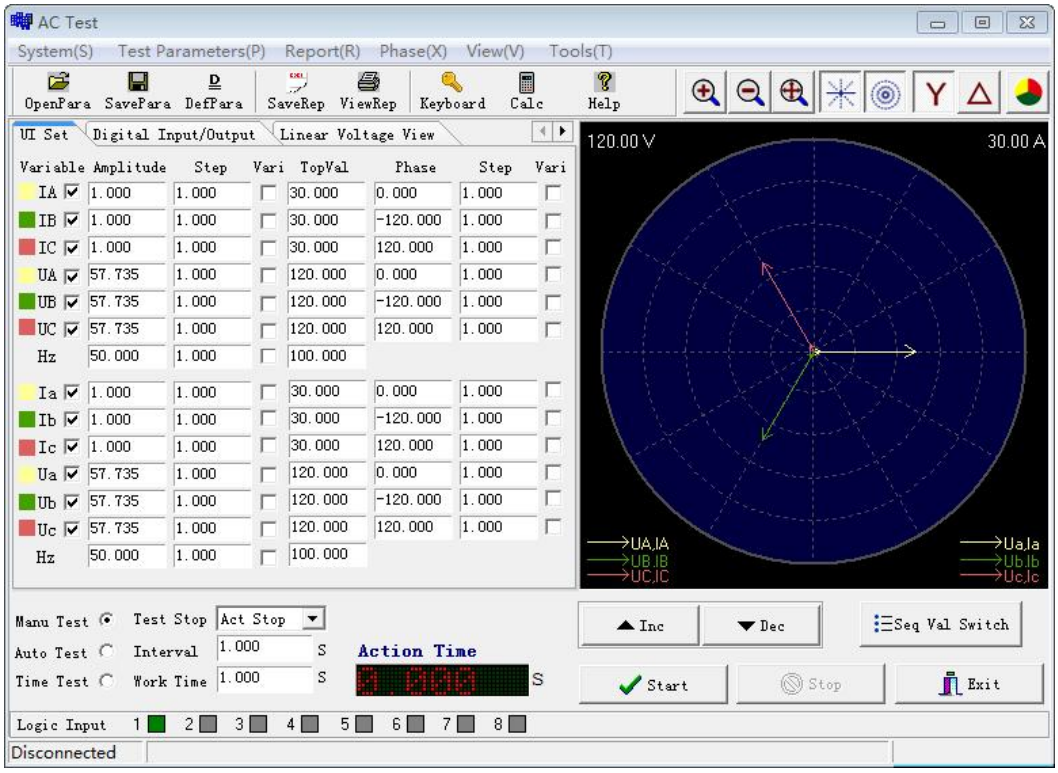
If you don’t want to use the panel keyboard, you can use the virtual keyboard to input Chinese or numbers.

1.14 [Positive sequence] and [negative sequence] switching

The program can exchange the phases of B and C automatically.

1.15 [Sequence component switching]

The program automatically converts the parameters into sequence component mode, which are u +, u -, U0, I +, I - and I0.Voltage and current are represented by positive sequence, negative sequence and zero sequence. At this time, three-phase current and three-phase voltage must be connected, which can be directly changed according to the sequence component, so as to facilitate the sequence component relay.



1.16 [Movement input]

Input: 1-8, choose one.Connect to the normally open contact or normally closed contact of the relay.

1.17 [Action output]

When the contact of the relay acts, the output of one circuit is given at the same time, usually from open to close, and the maintenance time is 1 second.Used to start recorder or millisecond meter.

1.18 Record variables

Some tests are relatively simple, and the required variables are not many. Users can select the required variables to record the test results, which can make the test report concise and clear.

1.19 Contact [jitter delay]

Some relays, such as electromagnetic relay and fast saturation converter, will vibrate when the electrical parameters are close to the action setting value, which may lead to misjudgment of the tester. Therefore, it is necessary to set a time in the program. When the contact of the relay is flipped for a certain period of time, the program will determine that the relay is reliable. In this way, the jitter of the relay can be avoided.The current action value is not accurate.The delay time of general microprocessor-based protection is 10-20ms. The delay time of electromagnetic relay and fast saturation converter can be extended appropriately.

2. Introduction of test function

2.1 Voltage and current test

Select a phase voltage or a phase current as the variable, select automatic or manual test mode change, until the relay acts.When the voltage is greater than 125V and the current is greater than 40a, the line voltage output can be used, such as UAB, UBC and UCA.The current can be output in two-phase parallel or three-phase parallel mode. Note that the current phase should be in the same phase.The high current output time should be as short as possible, and the initial value can be set as 90% of the setting value to shorten the test time.When doing multi-stage over-current protection, it can directly output 1.2 times of current setting value, so that the measured action time is accurate.

2.2 Frequency test

The default value of the initial frequency is 50 Hz, which can be modified by the user.Select variable frequency, input appropriate frequency step, and click start test. All current and voltage frequencies change.

2.3 Power direction test

The protection device generally adopts 90 degree wiring mode, and the low voltage setting is 60V. During the test, UA = 60V and phase is 0 degree; UB = 0V and phase is 0 degree; in

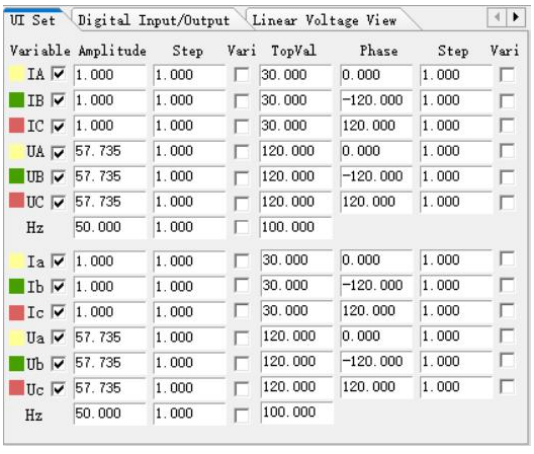
this way, the line voltage UAB = 60V and phase is 0 degree, and then the voltage is fixed.The amplitude of IC is fixed (generally 5a), and the phase of IC is changed to measure the two action boundary angles.The 90 degree wiring mode is output in the way of "UAB, IC", "UBC, IA" and "UCA, IB".0 degree wiring is output in the way of "UAB, IA", "UBC, IB" and "UCA, IC".Sensitivity angle = (boundary angle 1 + boundary angle 2)/2.

2.4 Transformer composite voltage blocking (direction) over-current protection

Composite voltage blocking (directional) over-current protection is generally used for transformer backup protection, which can be simulated by [AC test] module, and the operation is as follows:

2.4.1 Low voltage blocking (directional) over current protection

Assumption: low voltage closed lock value is 60V (refers to line voltage), over-current setting value is 5A.Connect the UA, UB, UC, UN; IA, IB, IC and in of the tester to the AC input of the transformer backup protection, and connect the protection outlet trip contact to the switch input 1 of the tester. Set ia = 6a, IB = ic = 0, UA = UB = UC = 57V, and the phase difference is 120 degrees.Select UA, Ub and UC to be variable at the same time, 60 / 1.732 = 34.64, decrease three-phase voltage at the same time by [manual test], when UA = UB = UC = 34.64v, the protection will act.



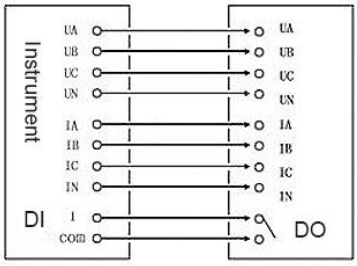
2.4.2 Negative sequence voltage blocking over current protection

Assumption: the negative sequence voltage is 7 V (phase voltage) and the over-current setting is 5 a.Connect the UA, UB, UC, UN; IA, IB, IC and in of the tester to the AC input of the transformer backup protection, connect the protection outlet trip contact to the input 1 of

the tester, set ia = 6a, IB = ic = 0, UA = UB = UC = 0V, and the phase is 0120240 degrees (actual negative sequence).When UA = UB = UC = 7V, the protection will act.

Variable	Amplitude	Step	Vari	TopVal	Phase	Step	Vari
IA	0.000	1.000		30.000	0.000	1.000	
IB	0.000	1.000		30.000	120.000	1.000	
IC	0.000	1.000		30.000	240.000	1.000	
UA	0.000	1.000		120.000	0.000	1.000	
UB	0.000	1.000		120.000	120.000	1.000	
UC	0.000	1.000		120.000	240.000	1.000	
Hz	50.000	1.000		100.000			
Ia	1.000	1.000		30.000	0.000	1.000	
Ib	1.000	1.000		30.000	120.000	1.000	
Ic	1.000	1.000		30.000	240.000	1.000	
Ua	57.735	1.000		120.000	0.000	1.000	
Ub	57.735	1.000		120.000	120.000	1.000	
Uc	57.735	1.000		120.000	240.000	1.000	
Hz	50.000	1.000		100.000			

2.4.3 Wiring mode as shown in the figure:



Section 3 DC test

This test module provides special DC voltage and DC current output, mainly to meet the test requirements of DC voltage relay, time relay and intermediate relay.The main interface is shown in the figure, and its operation method is basically the same as that of AC test.

1. Introduction of test function

1.1Time relay

1.1.1 Action time test

Apply the rated DC voltage (generally 220 V) to the voltage coil of the relay, connect the delay action contact of the relay to the input of the tester, set UA = 110 V, UB = - 110 V, connect the UAB line voltage to the voltage coil of the relay, and output it in the mode of [manual test (action stop)] to measure the action time of the time relay.

1.1.2 Test of action voltage and return voltage

The test can be completed by using single-phase voltage.Set UA = 50V, select UA variable, voltage step is 1V, connect the instantaneous action contact of relay to the input of tester, use [automatic test (action return)] mode for test, the program automatically tests the action voltage and return voltage, and calculates the return coefficient.Generally, the action voltage is about 110V and the return voltage is about 30V.

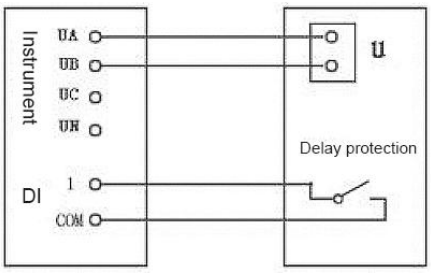
1.2 Intermediate relay

According to different types, a certain phase voltage or a certain phase current can be selected as the variable, and the test can be carried out manually or automatically.This instrument has a special test procedure for the intermediate relay, which can be referred to the introduction of the [intermediate relay] module.

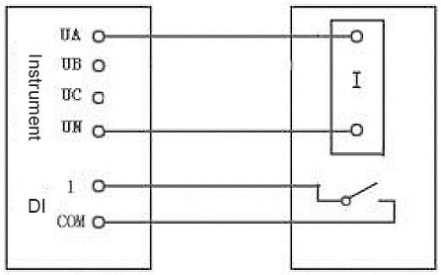
1.3Signal relay

Because the action current of the signal relay is very small, only tens of Ma, the inherent DC offset of the tester may make the relay act, so the action current of the relay cannot be measured.Usually, we use the method of applying DC voltage to divide the measured voltage value by the DC resistance value of the relay coil, which is the action current of the relay.For example: take the voltage UA, start from 0V, and increase it by 0.2V step by step manually, until 4V, the relay acts. Set the DC resistance value of the relay coil as 150 ohm (which can be read from the relay coil or measured with a multimeter), then the relay action current = 4/150 = 26.67mA.

1.4 Wiring mode as shown in the figure:



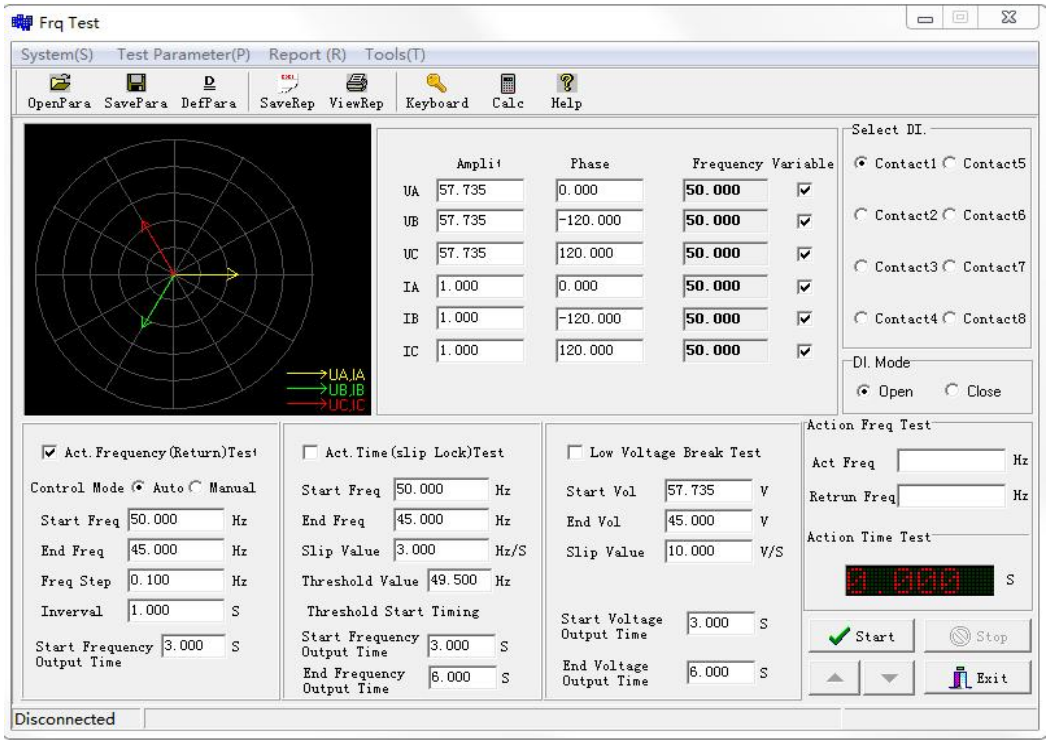
Signal relay wiring



time relay wiring

Section 4 Frequency test

The module is mainly used to test the functions of low cycle load shedding and high cycle tripping protection.



1. [Action frequency (return frequency) test]

When the start frequency is greater than the end frequency, it is to do low frequency test; when the start frequency is less than the end frequency, it is to do high cycle test, and the program automatically judges the change direction of frequency.The test can be carried out automatically or manually, and the action frequency and return frequency of the test results

are automatically recorded by the program.The duration of starting frequency output is generally 3-5 seconds to make the protection enter the normal operation state.

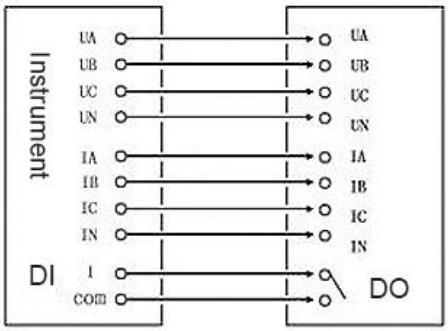
2. [Action time (slip locking) test]

Different from the action frequency (return frequency) test, it changes the frequency according to the speed and can only be tested by trial method.For example, given that the slip locking value of a certain protection is 3.00hz/s, we first set [slip setting value] to 3.10hz/s for test. If the protection does not act, we then set [slip setting value] to 2.90hz/s for test. If the protection acts, it means that the slip locking setting value of 3.00hz/s is correct.In a word, in principle, when the set slip value is greater than the slip closing lock value, the protection should not act; when it is less than the slip closing lock value, the protection should act reliably.

3. Precautions

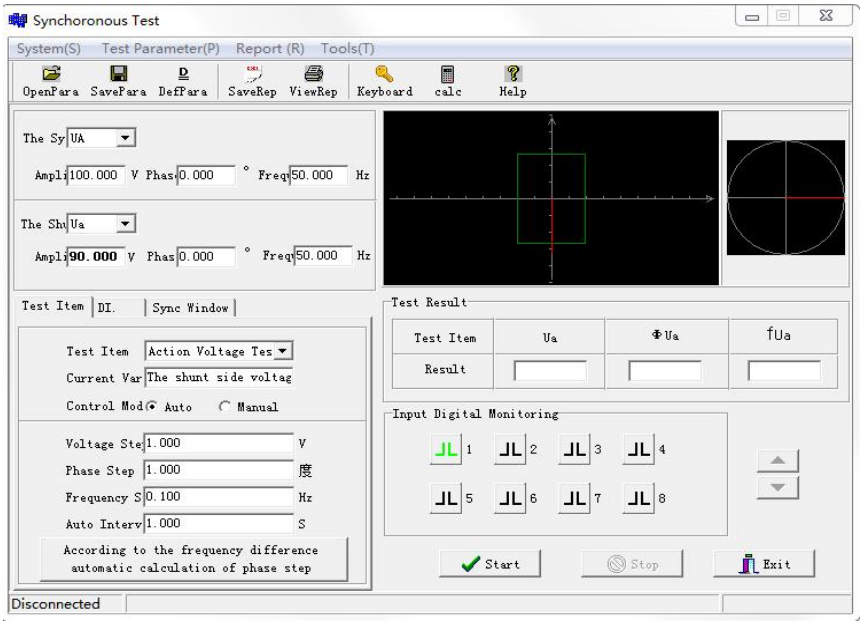
Some protections can be tested only by adding three-phase voltage, but some protections have current blocking function. Because there is no load current, the protection thinks that there is no need for low cycle load rejection.So we need to add three-phase current.The voltage is 58V and the current is about 1A.

4. Wiring mode as shown in the figure



Section 5 Synchronous test

This module is used to test the action voltage, action frequency, action angle of the synchronization device and to carry out the automatic synchronization adjustment test.



1. Interface description

1.1 Using this program, the tester only outputs voltage value, not current value

Generally, UA is selected for the system side, UB is selected for the parallel side, and any one of the input terminals 1-8 is selected.Either manual test or automatic test can be selected.Automatic quasi synchronous adjustment only has the mode of automatic test.

1.2 Basic conditions of synchronous device operation

When the frequency, voltage amplitude and angle difference between the parallel side and the system side are basically the same, and the three conditions are met at the same time, the synchronization device will send the closing signal immediately.

1.3 Test items

1.3.1 Test action voltage

System side voltage UA = 100V, phase 0° and frequency 50Hz.The system side parameters are constant.Let the voltage UB of the side to be paralleled be 90V, the phase 0 ° and the frequency 50 Hz. It can be seen that only the amplitude is different, and the other two items meet the conditions. The amplitude of Ub phase is increased manually or automatically.

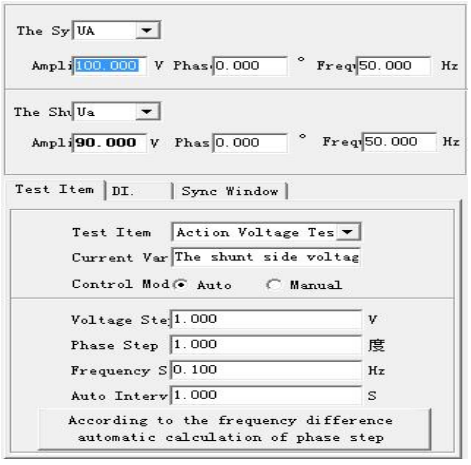
When it is close to the amplitude of UA phase, the synchronizing device acts, and the program records that the UB amplitude at this time is the action voltage value.

1.3.2 Test action frequency

System side voltage UA = 100V, phase 0° and frequency 50Hz.The system side parameters are constant.Let UB = 100V, phase 0° and frequency 49Hz. It can be seen that only the frequency is different, and the other two items meet the conditions. The frequency of Ub phase is increased by using the [manual test] or [automatic test]. When it is close to the frequency of UA phase, the synchronization device acts, and the program records the frequency value of UB as the action frequency value.

1.3.3 Test action phase

System side voltage UA = 100V, phase 0° and frequency 50Hz.The system side parameters are constant.Let the voltage UB of the side to be paralleled be 100 V, the phase 340° and the frequency 50Hz. It can be seen that only the phases are not equal, and the other two meet the conditions. The phase of Ub is increased manually or automatically. When it is close to the phase value of UA, the synchronization device acts, and the program records the phase value of Ub as the action phase value.

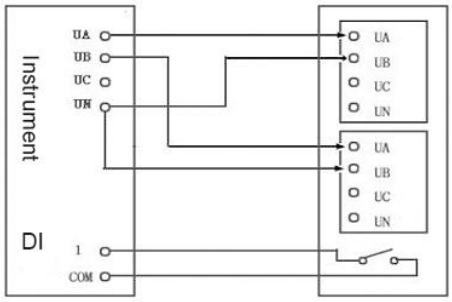


1.3.4 Automatic quasi synchronization adjustment

As shown in the figure above, only the phases on both sides are equal, and other conditions do not meet the synchronization conditions. The difference is that the command of changing frequency and amplitude is not controlled by the program, but by the output of the

synchronization device.By connecting it to the input of the tester, the command to change the frequency and amplitude is given.The program defines the input terminal 5 of the tester as increasing frequency, input terminal 6 as decreasing frequency, input terminal 7 as increasing pressure and input terminal 8 as decreasing pressure.The action contact can be selected from any one of the input terminals 1-4. When the synchronization conditions are met, the tester records the action frequency and action voltage.

2. Wiring mode as shown in the figure:



3. Precautions

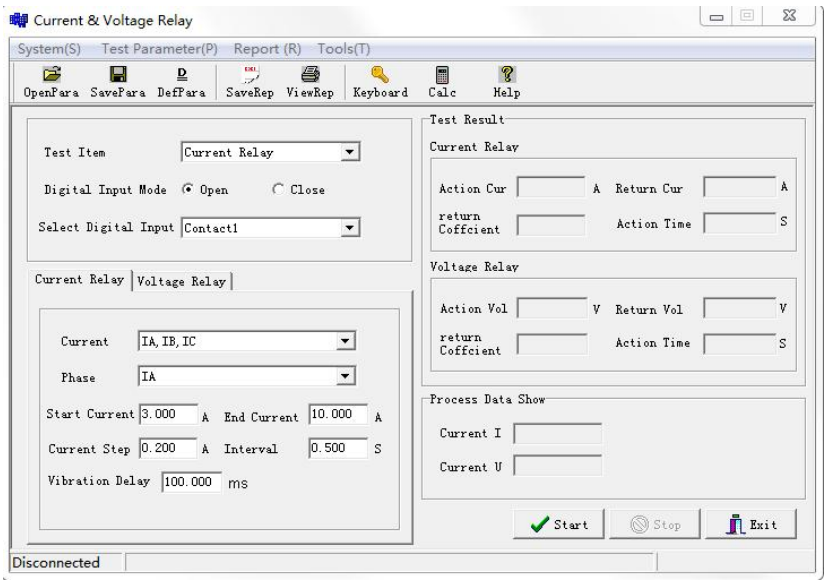
During the synchronization test, the start button of the synchronization device should be pressed at the beginning, and the synchronization device can enter the waiting synchronization state.Before the test, please find the input terminal of synchronous start signal on the device, lead out two wires, and short them first to start the synchronous device, and then start the test.

In addition, some synchronization devices can set the synchronization time. During the test, if the synchronization process exceeds the time, the device will block the synchronization closing and send out the alarm signal.If you want to continue the test, you should press the synchronization start button again, or short the above two wires to start the synchronization device again.

Section 6 Current / voltage test

This test module is specially used to test current relay and voltage relay.Given the parameters of starting and ending values of current and voltage, the program will automatically test the action value and return value of relay, and calculate the return

coefficient automatically.The current output mode can select single-phase, two-phase parallel or three-phase parallel output; the voltage output mode can select single-phase or line voltage output.For electromagnetic relay, appropriate contact jitter delay time should be set to improve the accuracy of test.



1. Test guidance

1.1 Current relay

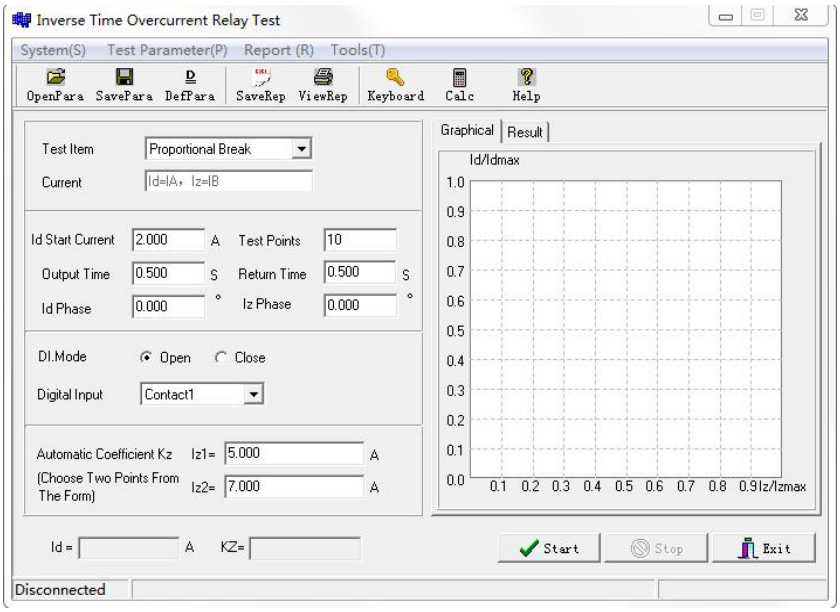
The output current of the tester is connected to the current coil of the relay, and the input terminal 1 is connected to the action contact of the relay. When the starting current is less than the ending current, the program will automatically test according to the current increasing mode; when the starting current is greater than the ending current, the program will automatically test according to the current decreasin mode, and automatically test the return current, and calculate the current return coefficient.

1.2 Voltage relay

The output voltage of the tester is connected to the voltage coil of the relay, and the input terminal 1 is connected to the action contact of the relay. When the starting voltage is less than the ending voltage, the program will automatically test according to the voltage increasing mode; when the starting voltage is greater than the ending voltage, the program will automatically test according to the voltage decreasing mode, and automatically test the return voltage, and calculate the voltage return coefficient.

Section 7 Differential relay

The test module can be used for BCH type differential relay proportional braking test and DCD type differential relay DC auxiliary magnetic test.The program uses dichotomy to find the action boundary automatically.



Interface description

1. [Test item selection]

Choose one from the two items of proportional braking and DC magnetic assistance.

2. Test current] selection

IA is action current (ID).

IB is the braking current or auxiliary magnetic direct current (iz).

3. [Starting current]

Minimum operating current without braking.

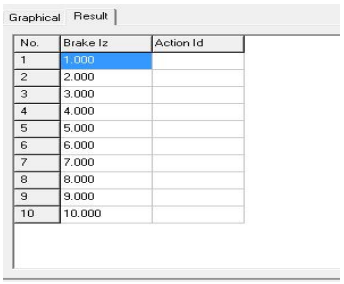
4. [Measurement points] are generally fixed to 10 points.

5. [Delivery time] is the maintenance time with current output

6. [Reset time] is the time without current output.

7. Input selection: 1-8 channels, choose any one.

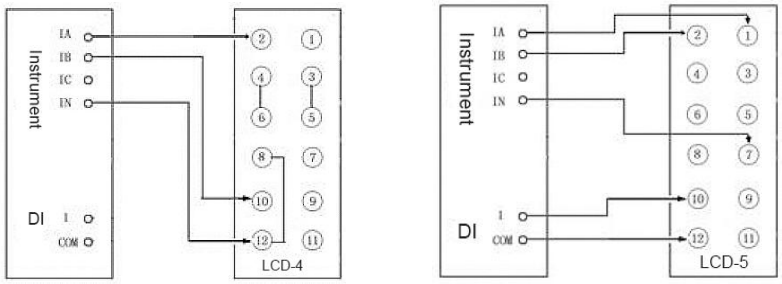
8. Selection and modification of braking current.As shown in the figure above, there is a set of brake current data in the test result column, which can be modified directly by user.



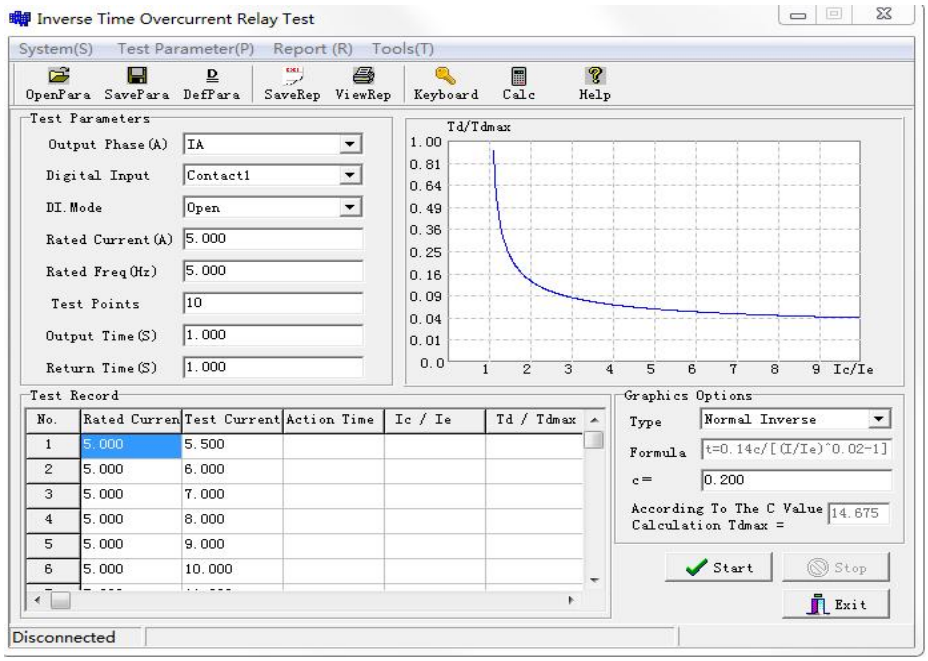
1. Test principle

The program automatically tests the corresponding action current under each braking current, measures a group of corresponding action current, and describes the action curve in the coordinate system.The calculation of braking coefficient is based on the user's selection of two points in the braking current.

2. Test wiring as shown in the figure:



Section 8 Inverse time over current relay



Set a group of current, the program automatically tests the relay action time under each current, and draws the relationship curve between action current and action time in the coordinate system.It can be used for single-phase inverse time limit test and three-phase inverse time limit test.

1.Interface description

1. [Current phase]

Generally single-phase current, when the current is relatively large, two-phase parallel or three-phase parallel output can be selected.When multi-phase parallel connection is selected, the current phase is automatically set to the same phase in the program, and the current is evenly distributed to each phase current output at the same time, so the user does not have to recalculate.When making three-phase reverse time limit, the three-phase current is output according to the debugging current at the same time, and the phase difference is 120°.

2. [Measurement points] are 10 points

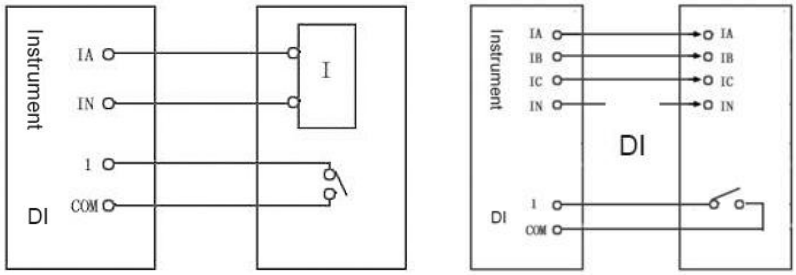
3. [Delivery time] the time with current output must be greater than the action time of rated current.

4. [Reset time] the time without current output, generally 1-2 seconds.

5. Test current (debug current)

For a given set of current data, the user can modify, fixed to 10 points.

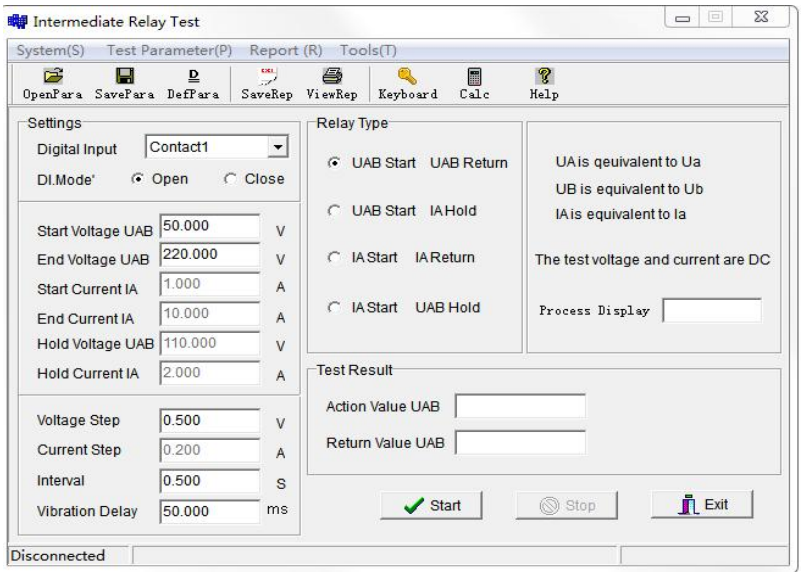
Wiring mode as shown in the figure



Single phase inverse time connection three phase inverse time connection

Section 9 Intermediate relay

This procedure is specially used for the test of intermediate relay.



1.Classification of intermediate relay

1. Voltage action and voltage return
2. Voltage action and current holding
3. Current action and voltage holding
4. Current action, current return

Current and voltage output

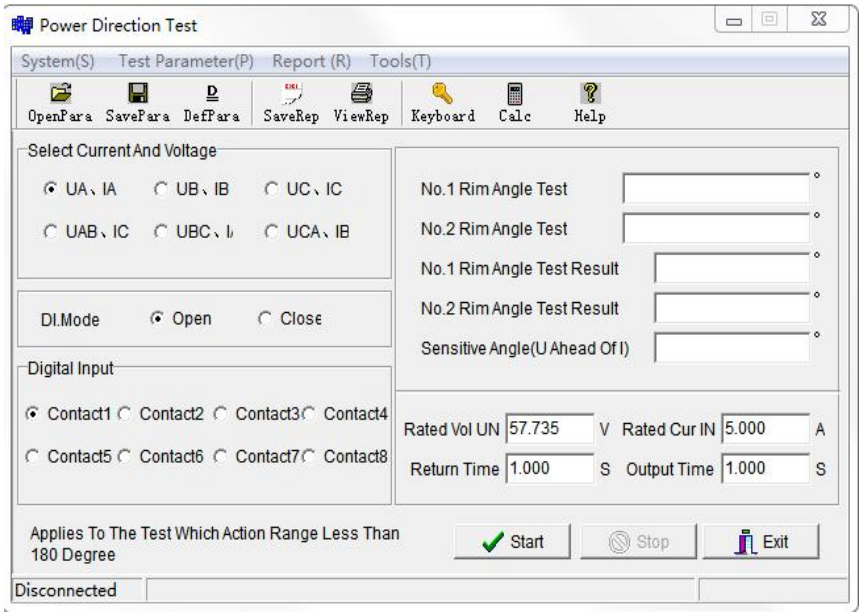
The output voltage and current of this program are DC, the voltage output is UAB line voltage, and the current output is IA.

Parameter selection

1. The starting voltage is 50.00v and the ending voltage is 220.00V.
2. The starting current is 1.00a and the ending current is 10.00A.
3. [Holding voltage] is generally 110V or 220V.
4. [Holding current] is generally 2.00A.
5. [Voltage step] is generally 0.5V or 1.00V.
6. [Current step] is generally 0.2A or 0.1A.
7. The time of each step was 0.5 seconds.
8. Jitter delay is usually 50 ms.

Section 10 Power direction

This module is specially used for power direction relay test. According to the wiring mode of power direction relay, it can be divided into two kinds of test, one is 0° wiring mode, the other is 90° wiring mode.The user can choose any way of wiring, and the program will automatically test the boundary angle according to the dichotomy method, and automatically calculate the sensitivity angle of the power direction relay.



1. Selection of current and voltage

For 0° wiring, select [UA, IA], [UB, IB] or [UC, IC].

For 90° wiring, select UAB, IC, UBC, IA or UCA, IB.

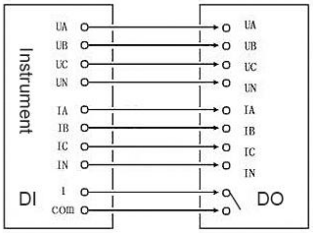
2. The rated voltage is 57.735V and the rated current is 5.000A.

3. [Reset time]: the time of no voltage and no current output, usually one second.

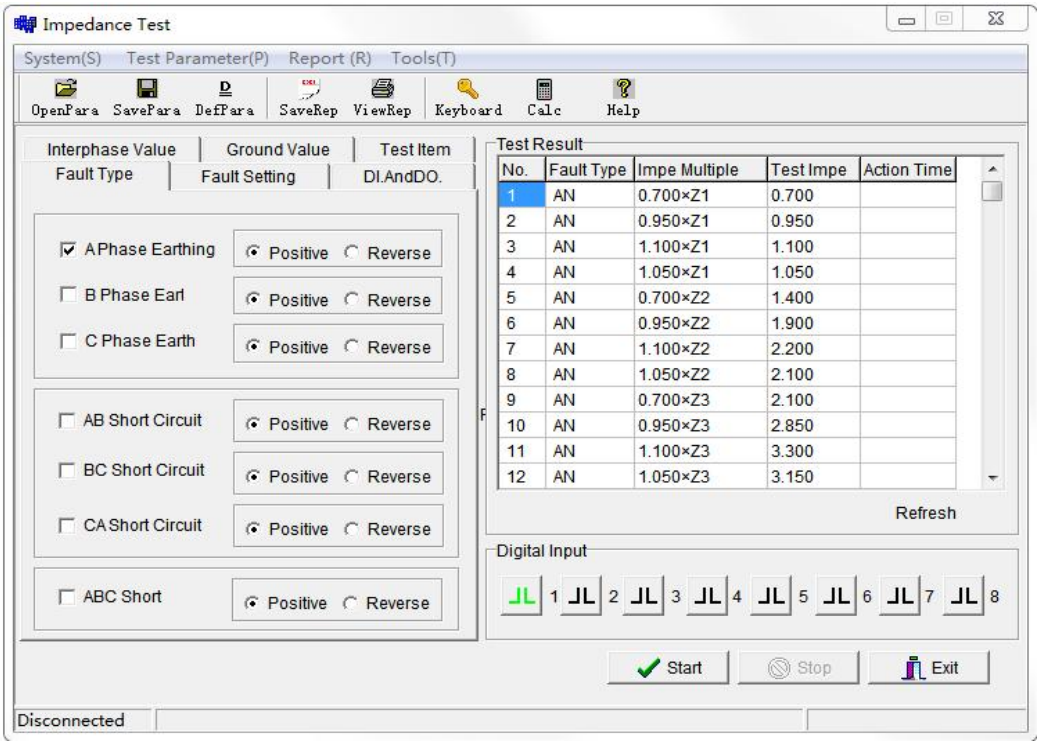
4. [Delivery time]: the time with voltage and current output, usually one second.

5. Sensitivity angle: the angle of voltage leading current.(boundary angle 1 + boundary angle 2) / 2.

6. Wiring mode as shown in the figure below:



Section 11 Impedance ladder



This program is used to verify the impedance setting of three or four section distance protection.Generally, the distance protection device is equipped for the line protection in the substation with voltage level above 110kV.

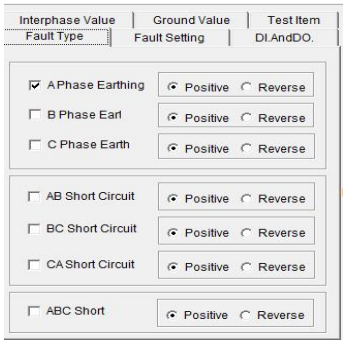
1. [Interphase setting]

The program has four sections, namely Z1, Z2, Z3 and Z4.It can be input in Z / φ mode, or R, X mode. The protection setting value is generally expressed by pure reactance, and the resistance component is ignored. Therefore, the impedance angle or sensitivity angle is generally 90 degrees or 80 degrees.Choose one of the two ways, and the program will convert automatically.The general protection is only provided with three sections. During the test, the setting value of the three sections can be input into the setting value column.If there is no fixed value of the fourth paragraph, it is not necessary to set the fixed value, and at the same time, it is not necessary to select the fourth test in the [test items] column.

2. [Grounding setting value]

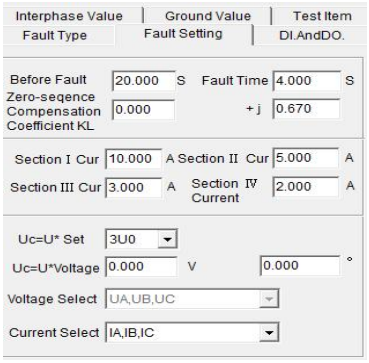
Single phase short-circuit impedance setting, the program has four sections, namely Z1, Z2, Z3 and Z4.It can be input in Z / φ mode, or R, X mode. The protection setting value is generally expressed by pure reactance, and the resistance component is ignored. Therefore,

the impedance angle or sensitivity angle is generally 90° or 80°. Choose one of the two ways, and the program will convert automatically.The general protection is only provided with three sections. During the test, the setting value of the three sections can be input into the setting value column.If there is no fixed value of the fourth paragraph, it is not necessary to set the fixed value, and at the same time, it is not necessary to select the fourth test in the [test items] column.



3. [Fault type]

Fault types can be divided into an, BN, CN, AB, BC, Ca and ABC.The user can select one or more or all. If he only wants to test one of the faults, he can select one of them.If you want to test all the items at one time, you can select all the fault types, and the input value should be the three trip contact of the protection.



4. [Fault setting]

[Time before failure]: it shall be greater than the reset time of the whole set of protection devices, generally 20 seconds.

[Fault state time]: it shall be greater than the action time of the fourth impedance of the protection device, generally 4-5 seconds.

[Zero sequence compensation coefficient]: for single-phase grounding, only input imaginary part, generally 0.67.

[Section I short circuit current]: the impedance of section I is generally small. In order to raise the short circuit voltage, the short circuit current should be set larger, generally 10A.

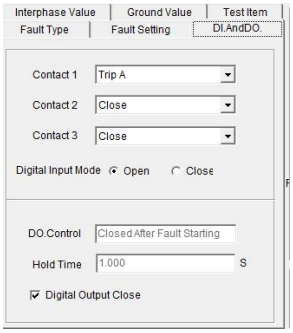
[Section II short circuit current]: the impedance of section II is moderate, so the short circuit current can be set to medium equivalent, generally 5A.

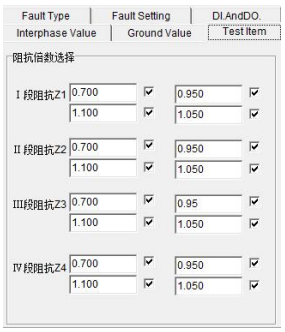
[Section III short circuit current] and [Section IV short circuit current]: because the impedance of section III and Section IV is generally large, in order to reduce the short circuit voltage, the short circuit current should be set smaller, generally 2A or 3A.

For the distance protection of 500kV voltage level, the secondary rated current of current transformer is 1A, so the short-circuit current is generally set smaller, which can be selected according to the specific situation.

5. [Test items]

This test item includes four kinds of multiples: 0.7 times, 0.95 times, 1.05 times and 1.1 times of the constant value of 1-4 sections of impedance. Generally, it is enough to take 0.7 times, 0.95 times and 1.05 times of the constant value for test.You can also do it in sections, and you don't need to select the sections you don't want to do.According to the protection regulations, 0.95 times of this section must act reliably, 1.05 times of this section must act as the next section impedance, 1 section impedance is instantaneous action, 2 and 3 sections impedance are action with delay, and the action time is determined by the protection setting sheet.Generally, the larger the impedance is, the longer the action time is. Therefore, the action time rises in a ladder shape with the increase of impedance, so it is also called impedance ladder test.





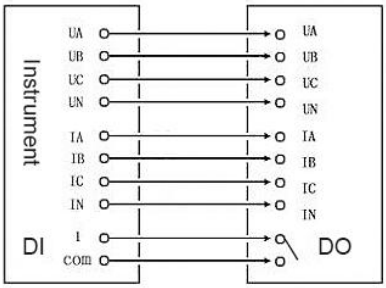
6. [Switching value]

Protect the three jump out contact and connect to one channel of the input terminal contact of the tester.

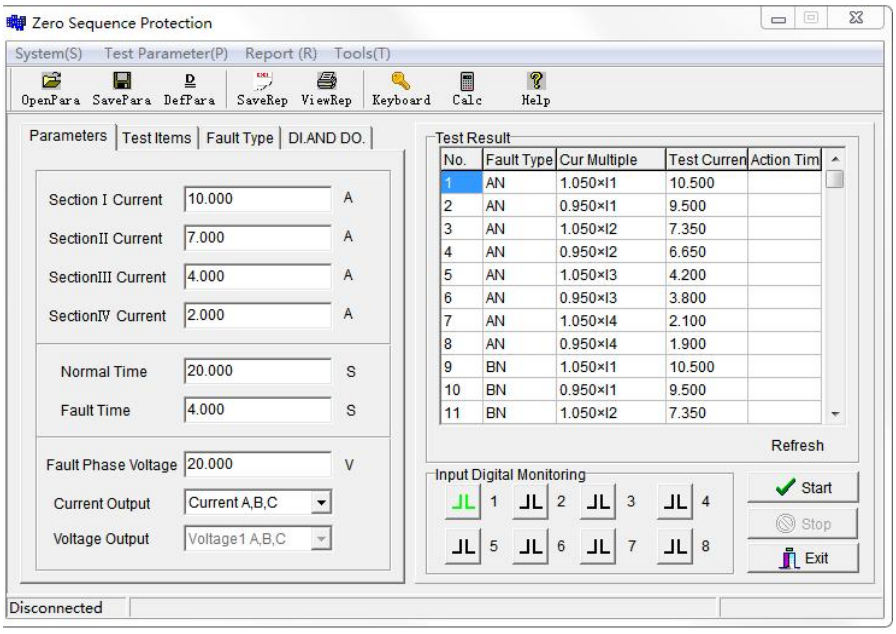
7. Protection on / off

Only the distance protection platen is put into operation, and the main protection and zero sequence protection platens exit.

8. Wiring mode as shown in the figure below



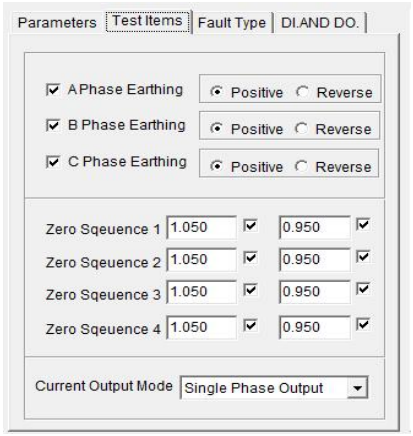
Section 12 Zero sequence protection



It is used to test the zero sequence over-current of distance protection. The zero sequence over-current is generally divided into four sections. The first section of current is generally the quick break outlet, and the second, third and fourth sections of current are generally the delayed outlet. The action time is inversely proportional to the current.

1. [Parameter setting]

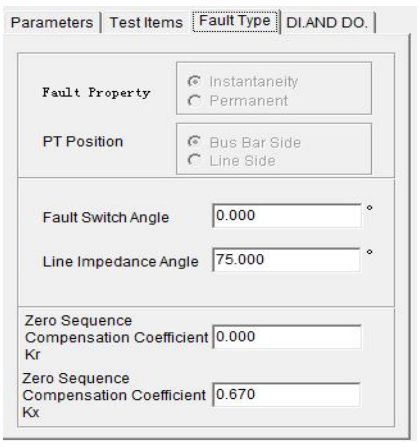
According to the protection setting sheet, input the current setting values of zero sequence section 1, Section 2, section 3 and section 4 respectively.The normal state time shall be greater than the reset time of the whole protection group, generally 20 seconds; the fault state time shall be greater than the action time of zero sequence four sections, generally 4 seconds.The fault phase voltage should be lower than 58V, generally 20V.

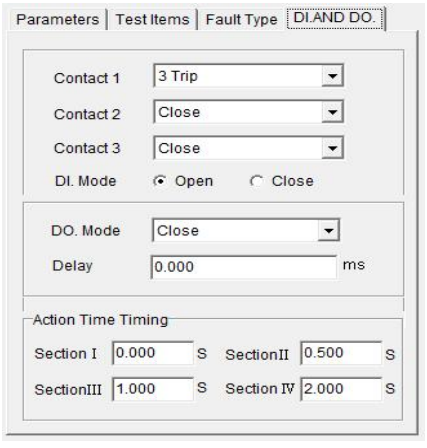


2. [Test items]

Fault types: an, BN and CN.You can choose one or more.[forward] means that the fault voltage is 75 degrees ahead of the fault current, and [reverse] means that the fault voltage is 255 degrees ahead of the fault current.

Each zero sequence current takes two values for test, which are 1.05 times and 0.95 times of the fixed value respectively. The regulation stipulates that this section will act when it is 1.05 times, and the next section will act when it is 0.95 times.When the current is greater than 30a, two-phase parallel output can be used.At this time, the fault type must be a single choice, such as an or BN.





3. [Fault type]

[Closing angle]: 0 degrees; [line impedance angle]: 75 degrees; [zero sequence compensation coefficient KX]: 0.67.

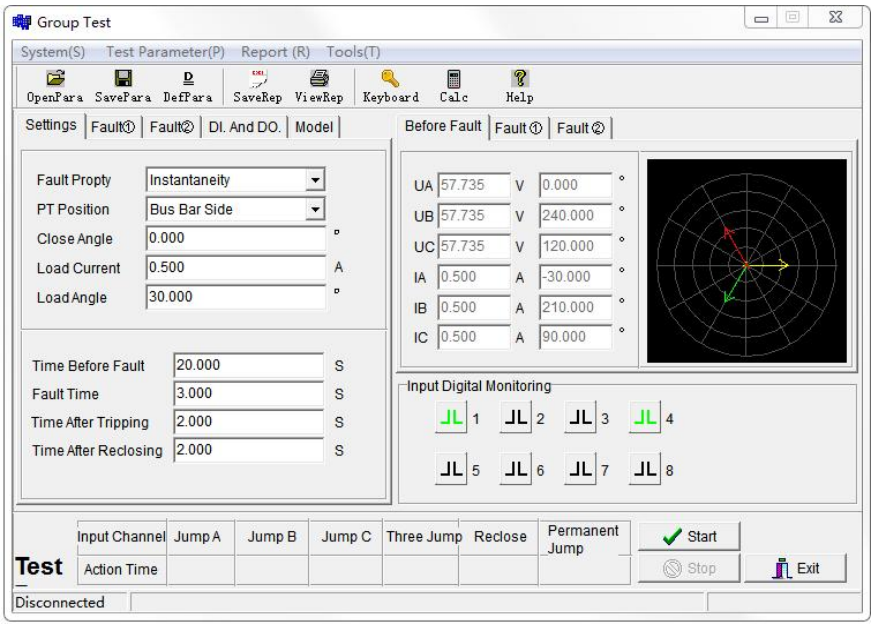
4. [Switching value]

Three trips are selected for contact 1 and others are closed.

5. Platen on / off

Only zero sequence pressing plate is put into operation, and other pressing plates exit.

Section 13 Group test



This program can simulate transient, permanent and switching faults, and can be used to test reclosing test, post acceleration of line protection and whole set transmission test with switch.

1. [Parameter setting]

[Fault nature]: choose one from three types of transient fault, permanent fault and switching fault.

[PT installation position]: bus side or line side.When the bus side is selected, when the switch is tripped, the voltage circuit returns to the normal state voltage and the current is 0A.When selecting the line side, when the switch is off, the voltage is 0V and the current is 0A.

[Closing angle]: the initial phase of phase a voltage at the beginning of fault.The phase of UA is used as the reference phase.

[Load current]: the amplitude of three-phase current in normal state, generally 0.5A, or 0A.

[Load power angle]: the angle between current and voltage of each phase in normal state.It's usually 30 degrees.

[Normal state time]: generally 20s to avoid the whole group reset time and reclosing charging time.

[Fault state time]: greater than the action time of protection, generally 3-4s.

[State time after tripping]: it shall be greater than the action time of protection reclosing, generally 1-2s.

[State time after reclosing]: it is generally normal state after reclosing, generally taking 2S.

2. [Fault 1]

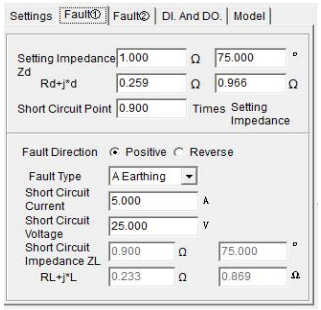
For the first fault, the fault setting is in the form of impedance of distance protection.When the protection is 110kV below the line protection, only over-current can be needed, the voltage can not be connected to the protection.Just set the short-circuit current higher than the over-current setting.

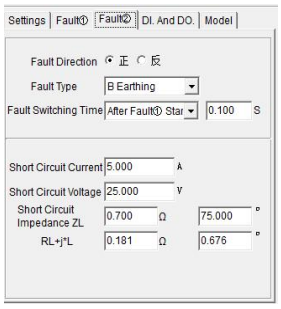
Impedance setting value: input the impedance setting value of a certain section, the sensitivity angle is generally 75 degrees, and the short-circuit point is set as 0.9 times of the setting impedance, so as to make the protection operate reliably.

[Fault types]: an, BN, CN; AB, BC, CA; ABN, BCN, can and ABC.

[Short circuit current]: the current value of the fault phase shall be greater than the action current of the protection, generally 5A.(the fault model is valid when the current is constant).

[Short circuit voltage]: the voltage value of the fault phase shall be 57V lower than the normal voltage, generally 25V.(the fault model is valid when the voltage is constant).





3. [Fault 2]

The second fault is generally conversion fault, which is divided into conversion before reclosing and conversion after reclosing.The conversion before reclosing is generally defined as the conversion from fault 1 to fault 2 0.1 second after the start of fault 1, and the conversion after reclosing is generally defined as the conversion from reclosing to fault 2 immediately after reclosing.

Impedance setting value: input the impedance setting value of a certain section, the sensitivity angle is generally 75 degrees, and the short circuit point is set to be less than the setting impedance, so that the protection can operate reliably.

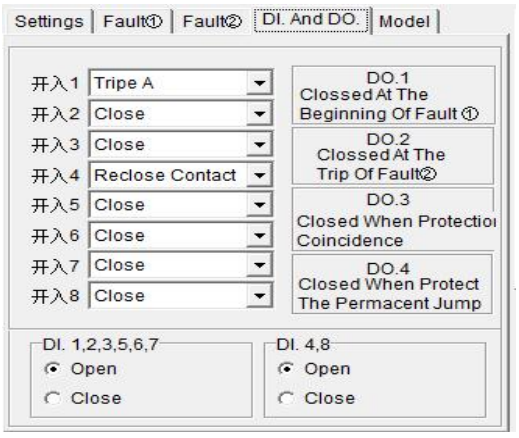
Fault types: an, BN, CN; AB, BC, CA; ABN, BCN, can and ABC.Generally, short circuit type different from fault 1 is selected.

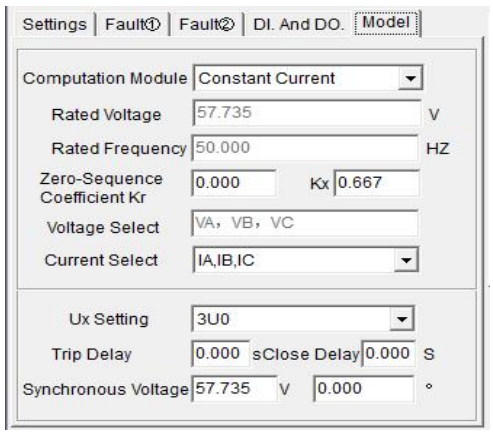
Short circuit current]: the current value of the fault phase shall be greater than the action current of the protection, generally 5A.(the fault model is valid when the current is constant).

[Short circuit voltage]: the voltage value of the fault phase shall be 57V lower than the normal voltage, generally 25V.(the fault model is valid when the voltage is constant).

4. [Switching value]

Input terminals 1, 2, 3, 5, 6 and 7 can be connected to the three trip contact or split phase trip contact of the protection, while input terminals 4 and 8 are defined as reclosing action contact, which can be connected to the reclosing action contact of the protection.The switch can be either normally open or normally closed.When fault 1 starts, output 1 is closed.When fault 2 trips, output 2 is closed.When the reclosing action of the protection, output 3 is closed.When the protection trips permanently (the second trip), the output 4 is closed.





5. [Calculation model]

5.1.Constant current: short circuit voltage is calculated by short circuit current, which can be observed by the amplitude, phase and vector diagram of current and voltage in each state on the right side of the interface.

5.2.Constant voltage: short circuit current is calculated by short circuit voltage, which can be observed by current, voltage amplitude, phase and vector diagram of each state on the right side of the interface.

Zero sequence coefficient: input according to protection setting value.KX value is generally 0.67.

UX can be defined as 3U0 or synchronous voltage.

Some reclosing protections need to check the synchronous voltage before reclosing can act. At this time, UX can be used as the synchronous voltage input to the protection device.The amplitude and phase of synchronous voltage can be input according to the protection setting value, generally 57.73V or 100V.

6. [Test results]

Automatically record the action time of protection device and reclosing.

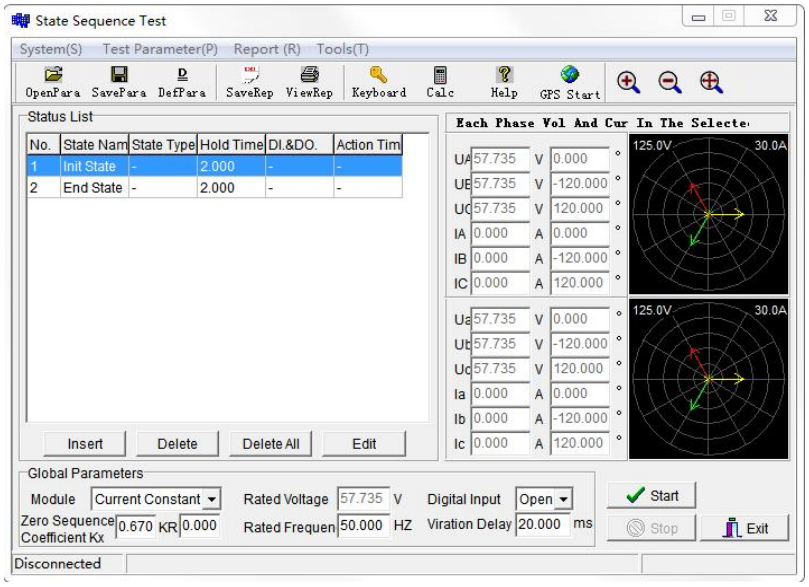
7. Contact control / time control

In this test, the principle of time control and contact priority is adopted. When the field contact cannot be found, each state can be output according to time control.

Note: the fault state time should be set slightly greater than the protection action time, and the state time after tripping should be set slightly greater than the protection reclosing action time.The output process of each state is as follows:

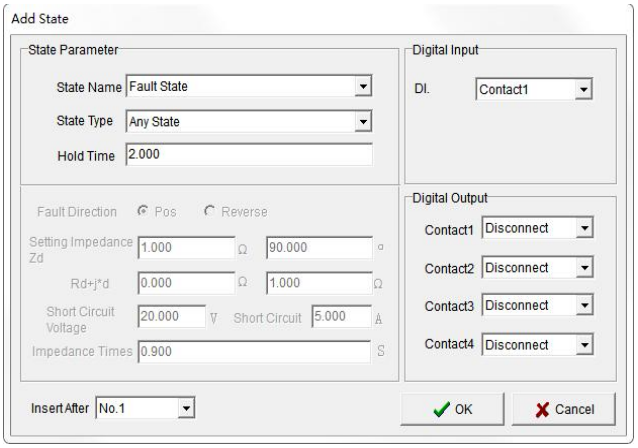
Normal state → fault state → state after tripping → state after reclosing → permanent tripping

Section 14 State Series



This program for multiple states, according to the given time continuous output, from the start state to the end state, up to 20 states can be output.State types can be divided into: no-load, arbitrary; an, BN, CN; AB, BC, CA; ABN, BCN, can and ABC.The start state and end state are fixed as no-load state or any state. When any state is selected, the current value, voltage value and phase of each phase can be set in the right status bar.

1. [Status insertion]



The default state of the program has only two states: the start state and the end state.All kinds of fault states can be inserted in the middle. It is better to insert a no-load state between two fault states as a transition state. The time of this state should be more than 10 seconds, so that the whole set of protection can be reset or reclosing charging is completed.The parameters such as fault type, fault impedance, short-circuit current, holding

time and switching value of each fault state can be selected by oneself. The input channels of two adjacent states cannot be the same and must be staggered so that the program can accurately record the action time.

2. Status editing

You can delete a state or all inserted States, and re edit the inserted states.

3. [Calculation model]

Constant current or constant voltage, usually in constant current mode.

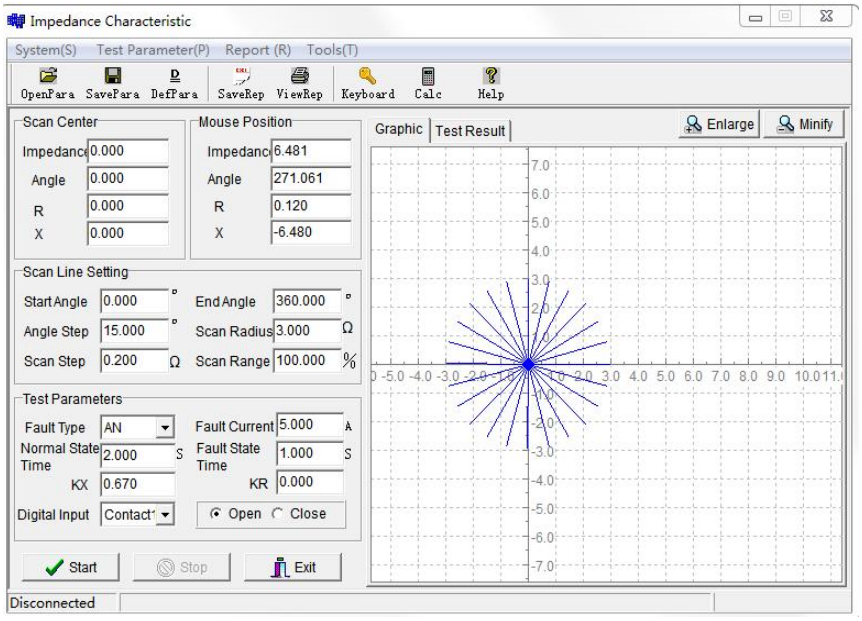
4[Zero sequence coefficient]: generally KX = 0.67

5. Contact [jitter delay]: generally 10-20ms.

6. View status parameters

The right column of the interface shows the current and voltage parameters in the selected state.In any state, the user can modify all the parameters, while in other states, the parameters are automatically calculated by the program and cannot be modified by the user.

Section 15 Impedance phase characteristics



This program is used to test the phase characteristics of impedance relay.It is suitable for the impedance boundary search test of impedance relay with the characteristics of circle, polygon, up throw circle and down throw circle.

1. [Scanning center]

Move the mouse in the coordinate system and click the left button to change the scanning center. The user can estimate the position of the scanning center according to the impedance characteristics.

2. [Scanning radius]

The scanning radius should be larger than the impedance setting value.

3. [Scanning step length]

It is represented by impedance, which represents the step approaching from the top of the scanning radius to the scanning center.

4. [Scanning range]

100% means to scan from the top of the scanning radius to the scanning center, 50% means to scan from the top of the scanning radius to the half of the radius without scanning to the scanning center, which can reduce the test time.

5. [Fault type] AN, BN, CN; AB, BC and CA choose one out of six.

6. [Short circuit current] is generally 5A.

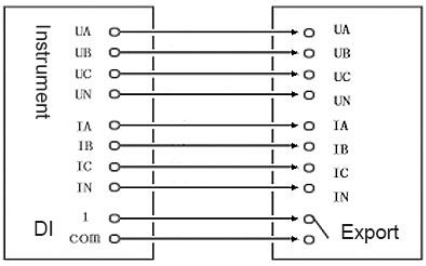
7. [Normal state time]: 2 seconds.

8. [Fault state time]: 1 second.

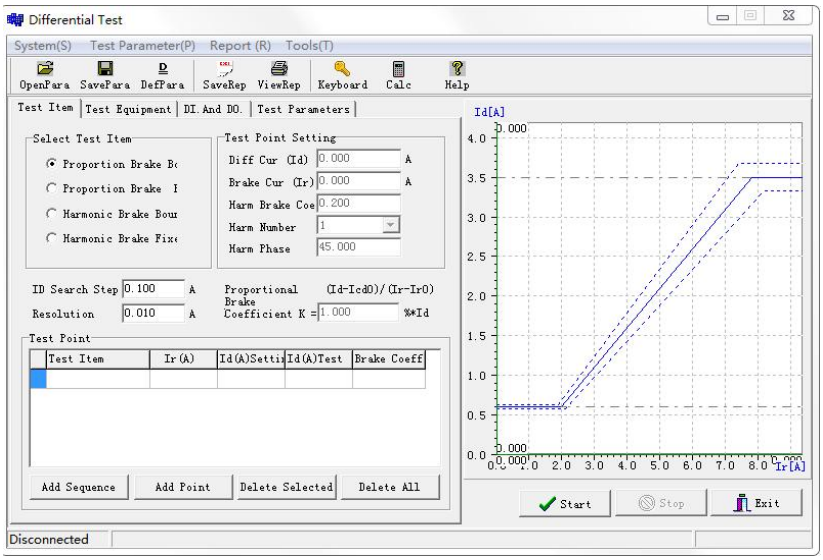
9. [Zero sequence coefficient]: 0.67.

10. [Switching value]: contact 1, normally open.

11. The wiring mode is shown in the figure.



Section 16 Differential Test



This program is used to test the proportional braking characteristic and harmonic braking characteristic of microcomputer differential protection device.This instrument is a three-phase current differential test.

1.Three phase differential (six phase differential) test

1. Current definition

IA is the current input at the high voltage side and IB is the current input at the low voltage side. IC can choose to be equal to IA or IB to apply compensation current. As for which side to add compensation, it depends on the connection mode of the transformer. The later connection mode will explain this problem.The phase difference between IA and IB is generally 0 degrees or 180 degrees.The six phase differential adopts IA, IB, IC and in to connect to a, B, C and n phases of high voltage side, and connects IA, IB, IC and in to a, B, C and n phases of low (medium) voltage side.

2. [Test parameters]

2.1 [Threshold value of differential current]: input according to protection setting value, generally 1A-2A.

2.2 [Differential current quick break value]: input according to protection setting value, generally 8A-10A.

2.3 [Proportional braking coefficient]: input according to the protection setting value, generally 0.2-0.9.

2.4 [Harmonic braking coefficient]: input according to the protection setting value, generally 0.1-0.9.

2.5 [Inflection point setting value]: input according to protection setting value, generally 2A-6A.

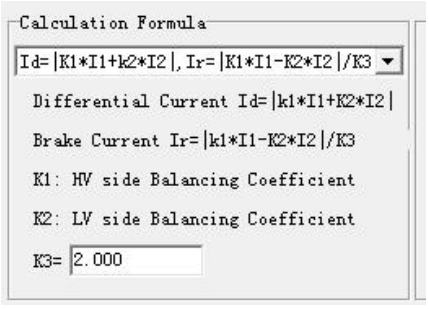
2.6 Slope: proportional braking coefficient.Input according to the protection setting value.

2.7 [Maximum output time]: the time with current output.Generally 0.5-1 second.

2.8 [Output interruption time]: the time of no current output.Generally 0.5-1 second.Because the microcomputer protection adopts the principle of sudden change starting, the current output adopts the intermittent output mode.

2.9 [Calculation formula]

According to the calculation formula provided by the protection manufacturer, I1 (IA) is the high voltage side current, I2 (IB) is the low (medium) voltage side current, K1 is the high voltage side balance coefficient, K2 is the low (medium) voltage side balance coefficient.K3 is a constant.



3. [Test equipment]

3.1 Transformer turns: two or three windings.

3.2 Wiring method:

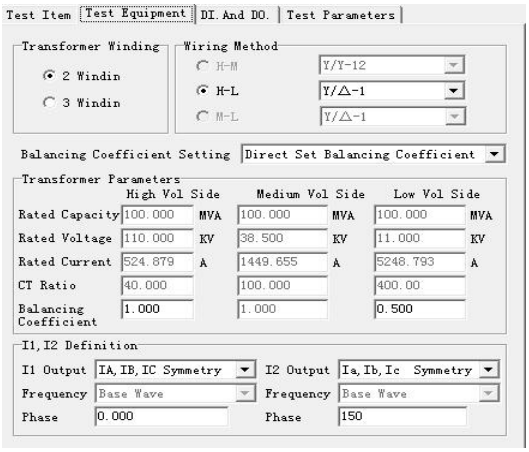
[y / Y-12]: the program automatically sets the phase difference between I1 and I2 to 180 degrees.

[y / Δ - 1]: the program automatically sets the phase difference between I1 and I2 to 150 degrees.

[y / Δ - 11]: the program automatically sets the phase difference between I1 and I2 to 210 degrees.

For the relay protection tester of this instrument, the phase difference between I1 and I2 must be manually changed to 0 degree or 180 degree.Otherwise, the experimental results will be wrong.

3.3 [Balance coefficient setting]



There are three settings:

(1) Set the balance coefficient directly: set the balance coefficient directly according to the protection setting value.

(2) Calculated by rated voltage and CT transformation ratio:

Taking Y / Y / Δ - 11 wiring as an example, the calculation method of balance coefficient on each side (represented by K1, K2 and K3) is as follows:

K1=1/1.732=0.577

K2=U2n*CT2/(1.732*U1n*CT1)

K3=U3n*CT3/(U1n*CT1)

If the balance coefficient of the high pressure side is set to 1, the calculation method is as follows:

K1=1

K2=U2n*CT2/(*U1n*CT1)

K3=1.732*U3n*CT3/(U1n*CT1)

(3) Calculate the balance coefficient by rated current:

K1=1

K2=Ie1/Ie2

K3=Ie1/Ie3

Among them: K1, K2, K3 --- balance coefficient of transformer side 1, 2, 3.

IE1, IE2, ie3 --- secondary rated current of transformer side 1, 2, 3.

U1n, u2n, u3n --- primary rated voltage of transformer side 1, 2 and 3.

CT1, CT2, CT3 --- ratio of CT transformer at 1, 2 and 3 sides of transformer.

The calculation of balance coefficient of differential protection is different. Please refer to the operation manual of each manufacturer during the test.

3.4.Two side current phase

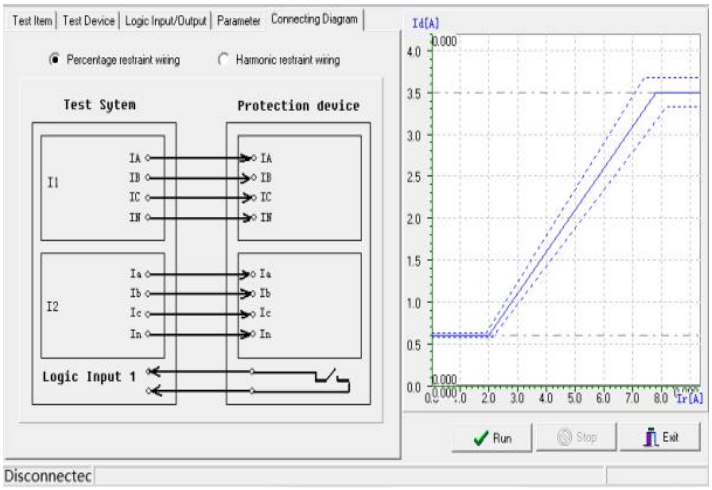
Transformer wiring	I1 phase	I2 phase
Y/Y-12	0°	180° or 0°
Y/Δ-11	0°	180° or 0°
Y/Δ-1	0°	180° or 0°

4. [Switching value]

Connect the protection outlet contact to the input channel 1 of the tester.Normally open contact.

The contact jitter delay is 10ms.

5. Connection mode



(1) Six phase proportional braking wiring:

Connect the first group of three-phase current to the high voltage side,

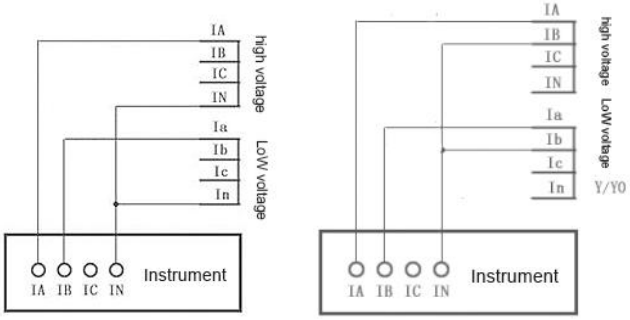
Connect the second group of three-phase current to the low-voltage side

The six phase differential connection is relatively simple.

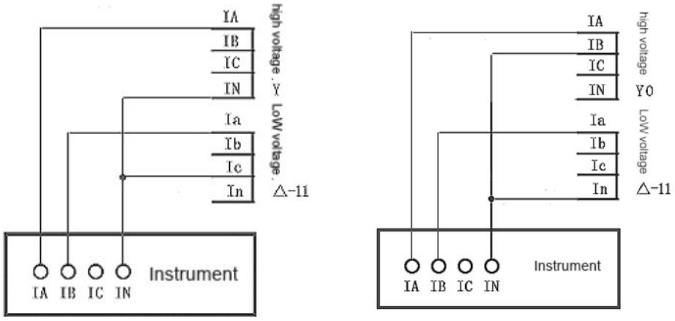
(2) Three phase proportional braking wiring:

According to different wiring, there are six wiring modes, including current compensation.

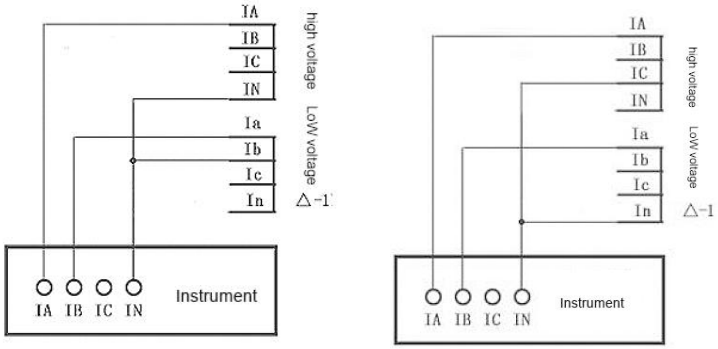
1. y (Y0) / Y (Y0) wiring



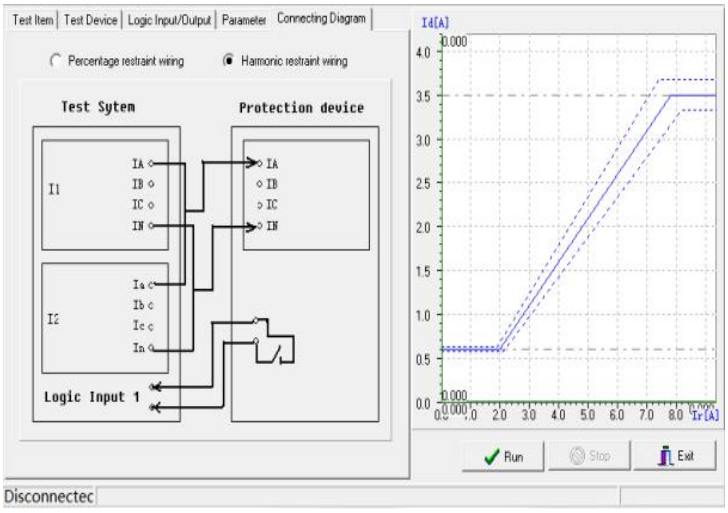
2. y (Y0) / △ - 11 wiring



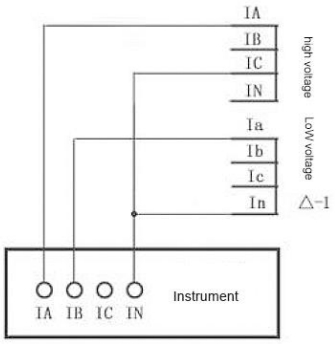
3. y (Y0) / △ - 1 wiring



(3) Harmonic braking connection six phase current connection



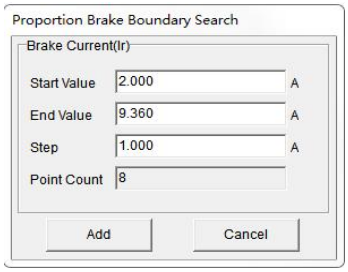
Harmonic braking connection -- three phase current connection



6. Test items

When all the parameters are set, we can carry out various tests.

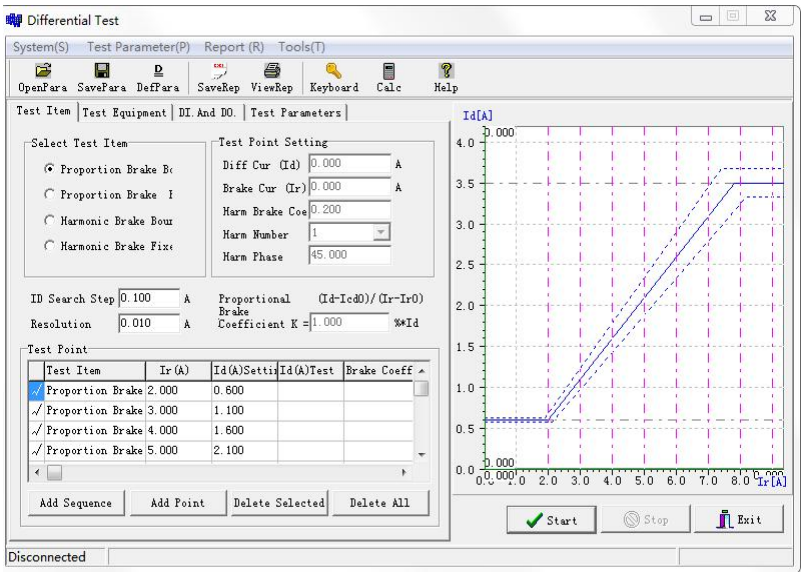
6.1[proportional braking boundary search]



Click the [add sequence] button to open the dialog box:

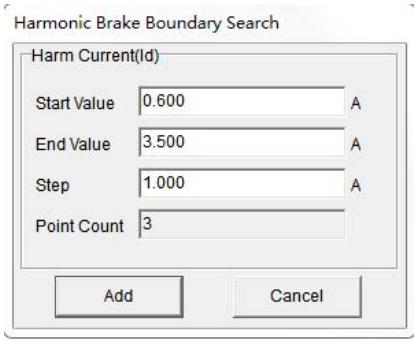
This dialog box is used to select a group of braking current, including [Start value] and [End value]. The step size determines the number of measurement points. Generally, the step size is 2.00A. After setting the parameters, click Add to add the data to the test table, and then click start to test.

6.2 Proportional braking fixed point test

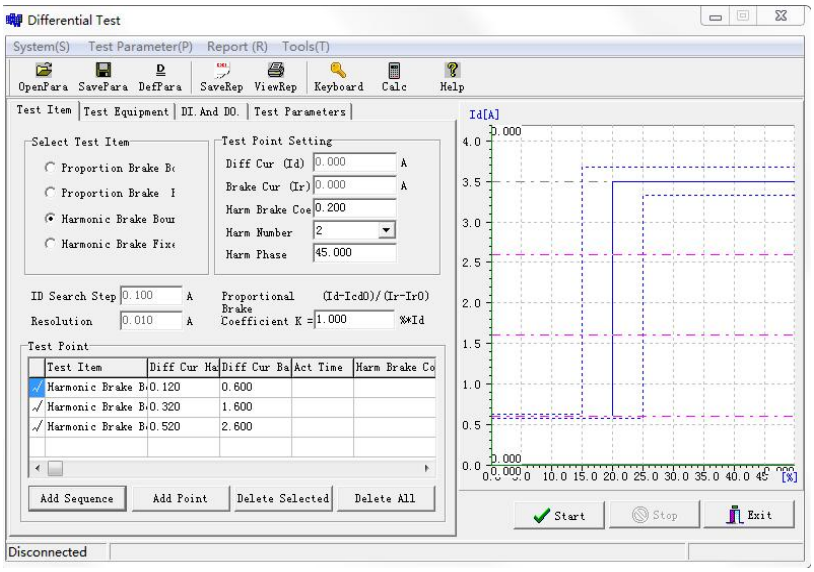


Move the mouse to the coordinate system of the characteristic curve, click the left mouse button, and then click the [Add point] button to add this point to the test table. Repeat this for many times to add multiple test points, as shown in the figure. The test point should be selected between the action area and the non action area to verify the correctness of the curve. Click [start test] to start the test.

6.3 [Harmonic braking boundary search]

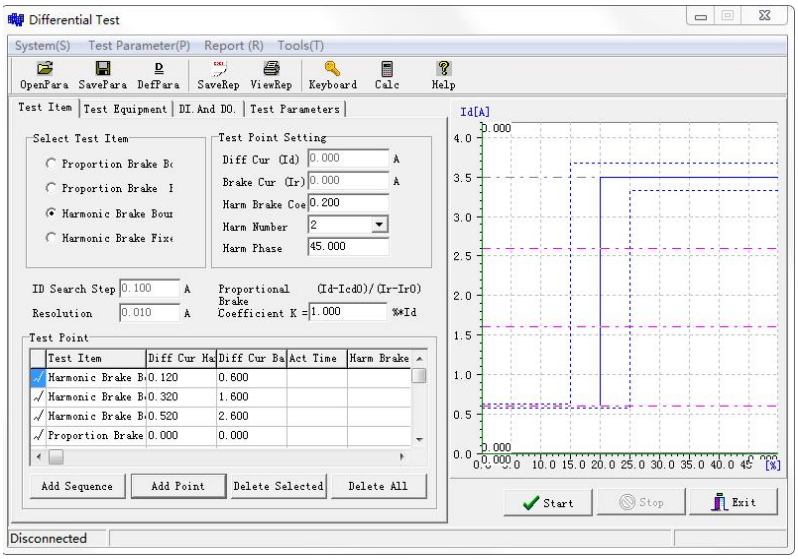


Click the "Add sequence" button, and a dialog box will pop up: this dialog box is used to select a group of differential current, with start value and end value, [Start value] as differential threshold value and [End value] as differential quick break value.The step size determines the number of measurement points. [Step size] is generally 1.00A. After setting parameters, click Add to add the data to the test table, and then click start test.



6.4 Harmonic braking fixed point test

Move the mouse to the coordinate system of the characteristic curve, click the left mouse button, and then click the [add point] button to add this point to the test table. Repeat this for many times to add multiple test points, as shown in the figure.The test point should be selected between the action area and the non action area to verify the correctness of the curve.Click [start test] to start the test.



2. Common formulas and calculation of balance coefficient

Beijing Sifang: CST-141B, - 200B series (high voltage side phase adjustment)

Calculation formula of proportional braking

Double winding, Y / △ 11: id = ｜ K1 * I1 + K2 * I2 ｜, IR = ｜ K1 * i1-k2 * I2 ｜ / 2

Equilibrium coefficient: K1 = 1, K2 = KPL

Three winding, Y / Y / △ 11: id = ｜ K1 * I1 + K2 * I2 + K3 * I3 ｜

Ir=MAX（｜K1*I1｜, ｜K2*I2｜, ｜K3*I3｜）

Balance coefficient: K1 = 1, K2 = KPM, K3 = KPL (set balance coefficient directly)

KPM and KPL are the constant values of balance coefficient of medium pressure side and low pressure side respectively.

2. Guodian Nanzi: PST-641 (double winding, Y / △ - 11, high voltage side phase adjustment)

Calculation formula of proportional braking

Id=｜K1*I1+K2*I2｜,Ir=｜K1*I1-K2*I2｜/2

Equilibrium coefficient: K1 = 1.732, K2 = IE1 / IE2

IE1, IE2 --- secondary rated current setting values of high voltage side and low voltage side respectively

3. Guodian Nanzi: PST-621 / 622 (three winding, Y / Y / △ - 11-12, high voltage side phase adjustment)

Calculation formula of proportional braking

Id=｜K1*I1+K2*I2+K3*I3｜

Ir=MAX（｜K1*I1｜, ｜K2*I2｜, ｜K3*I3｜）

Balance coefficient:

K1=1.732

K2=1.732*U2n*CT2/（U1n*CT1）

K3=U3n*CT3/（U1n*CT1）

4. Guodian Nanzi: PST-1200 (three winding, Y / Y / △ - 11-12, high voltage side phase adjustment)

Calculation formula of proportional braking

Id=｜K1*I1+K2*I2+K3*I3｜

Ir=MAX（｜K1*I1｜, ｜K2*I2｜, ｜K3*I3｜）

Balance coefficient: K1 = 1

K2=U2n*CT2/（U1n*CT1）, K3=U3n*CT3/（U1n*CT1）

5. Shenzhen Nari ISA series: (three winding, Y / Y / △ - 11-12, high voltage side phase adjustment)

Calculation formula of proportional braking

Id=｜K1*I1+K2*I2+K3*I3｜

Ir=｜Id -｜K1*I1｜-｜K2*I2｜-｜K3*I3｜ ｜

Equilibrium coefficient: K1 = 1.732, K2 = 1.732 * D35, K3 = D36

6. NARI-RCS-9671: (double winding, Y / △ - 11, high voltage side phase adjustment)

Calculation formula of proportional braking

Id=｜K1*I1+K2*I2｜

Ir=｜K1*I1-K2*I2｜/2

Balance coefficient:

K1=1,K2=U2n*CT2/（U1n*CT1）

7. NARUI RCS-978,985 series: (double winding, Y / △ - 11, low voltage side phase adjustment, high voltage side zero sequence correction)

Calculation formula of proportional braking

Id=｜K1*I1+K2*I2｜

Ir= MAX（｜K1*I1｜, ｜K2*I2｜）

Balance coefficient:

K1=1,K2=U2n*CT2/（U1n*CT1）= Ie1/Ie2

Explanation of balance coefficient:

Because the tester has only six phase current output at most, the differential test can only be done through both sides. There are only two balance coefficients in the calculation formula given on the program interface, which are K1 and K2 respectively. When the high to low test is selected, K2 = K3; when the medium to low test is selected, K1 = K2, K2 = K3.During the test, the balance coefficient of the three sides can be input at the same time, and the program will calculate automatically according to the type of test.

3. Precautions for differential test

Setting of balance coefficient: if the balance coefficient is not set correctly, there will be

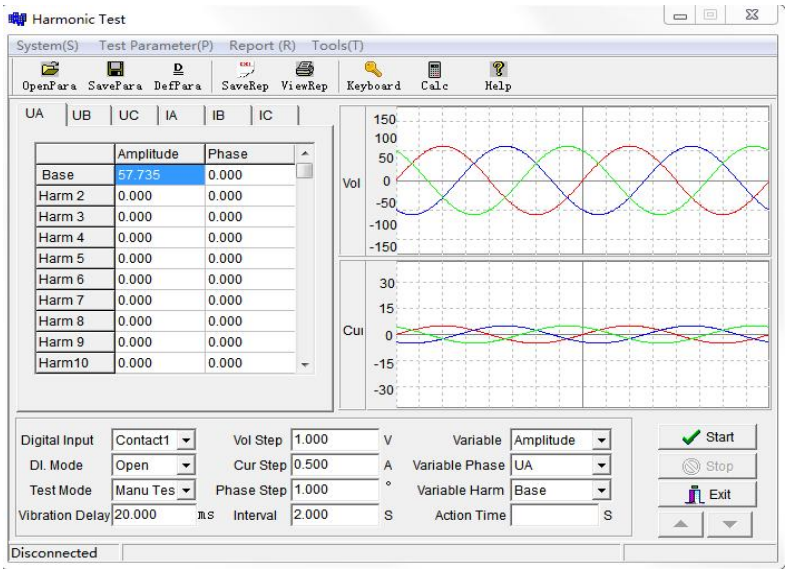
a big deviation between the test curve and the setting curve.The balance coefficient should be selected correctly according to the protection setting value.

Selection of calculation formula: if the formula of differential current and braking current is not selected correctly, the test result will deviate from the setting value, or even be completely wrong.It should be selected correctly according to the formula provided by the protection manufacturer.

Selection of current phase on both sides: if the current phase on both sides is not selected correctly, the test result will be completely wrong.If the difference current is equal to the sum of the currents on both sides, the phase difference of the currents on both sides is 180 degrees; if the difference current is equal to the difference of the currents on both sides, the phase difference of the currents on both sides is 0°.

When using three-phase current for differential test. If no compensation current is added, the test result will be incorrect.Because the three-phase current can only do the differential test by phase, and because of the different connection mode of the transformer, the two sides of the current will produce a certain phase difference, so the protection device must carry out phase compensation on the software. In this way, when we do a phase difference test, the differential of other phases will act first, and a compensation current must be added to the rushing phase, so that the phase difference can not work in this way, the test results can be correct.

Section 17 Harmonic test



This program outputs three-phase current and three-phase voltage. Each phase current and voltage can add 2-20 harmonics on the fundamental wave. The amplitude and phase of each harmonic can be changed arbitrarily. It can be used to test various devices reflecting harmonic components.

1. [Switch selection]

1- 8 input terminals, choose any one.Input mode: normally open or normally closed.

2. [Test mode]: manual or automatic.

3. Jitter delay: 10-20ms.

4. Voltage step: generally 1.00V.

5. Current step: generally 0.50A.

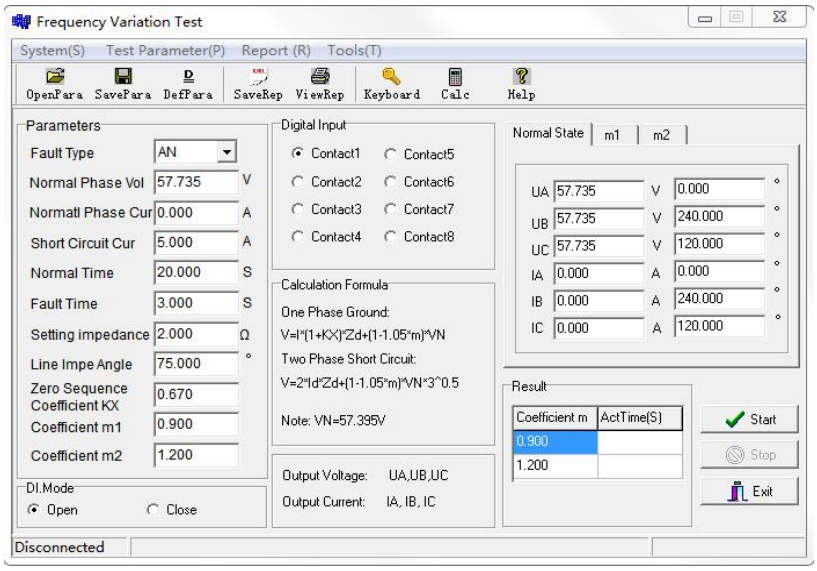
6. [Time of each step]: generally 2.00s.

7. Variable parameter: amplitude or phase.

8. [change phase]: UA, UB, UC; IA, IB, IC.

9. Variable harmonic: fundamental wave or 2-20th harmonic.

Section 18 Power frequency variation



This program simulates U-phase, V-phase, w-phase single-phase grounding transient fault and UV, VW, Wu phase transient fault respectively.The simulated fault current is a fixed current, the voltage before the simulated fault is 57.73v, the simulated fault time is generally 100-150ms, and the short-circuit voltage V = (1 + k) I × ZD + (1-1.05m) × UN in case of

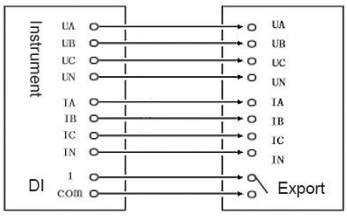
single-phase ground fault.In case of phase to phase short circuit, the fault voltage U = 2 × I × ZD + (1-1.05m) × UN, where m is the coefficient, and its values are 0.9 and 1.2 respectively. For microprocessor-based protection, when m = 0.9, D + + outlet (directional element outlet), when m = 1.2, DZ and D + + shall be outlet, DZ is the sudden variable distance outlet, DZ acts first, main protection and zero sequence protection can be put into operation, and other protections shall be withdrawn.

It is suitable for the protection devices produced by the main domestic manufacturers: Guodian Nanzi, Guodian Nari, Xuji Electric and Beijing Sifang.

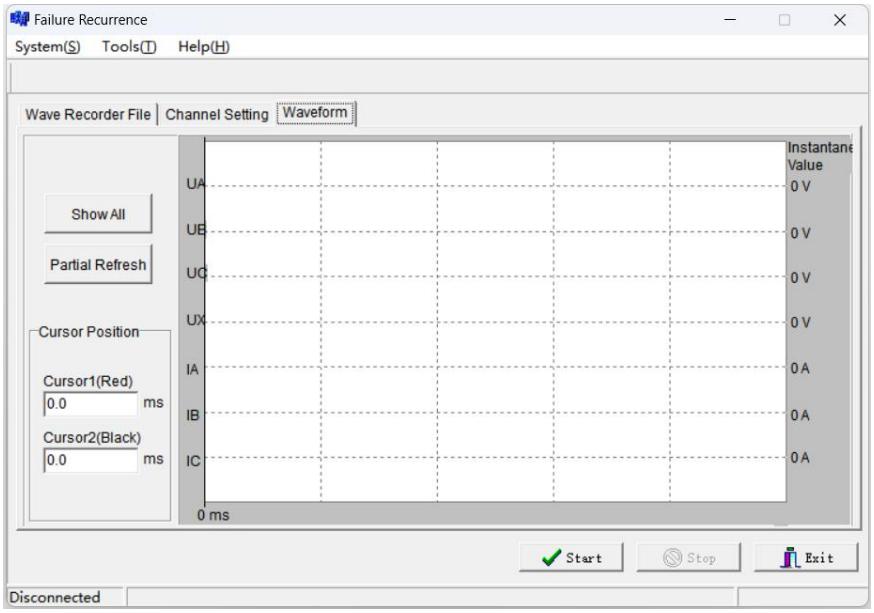
1. ZD -- setting value of power frequency variation distance protection

When the power frequency variation distance protection is 1.2 times, it should operate reliably.However, when m = 0.9 times, the protection device should be reliable and not operate.

2. Wiring mode: as shown in the figure below:



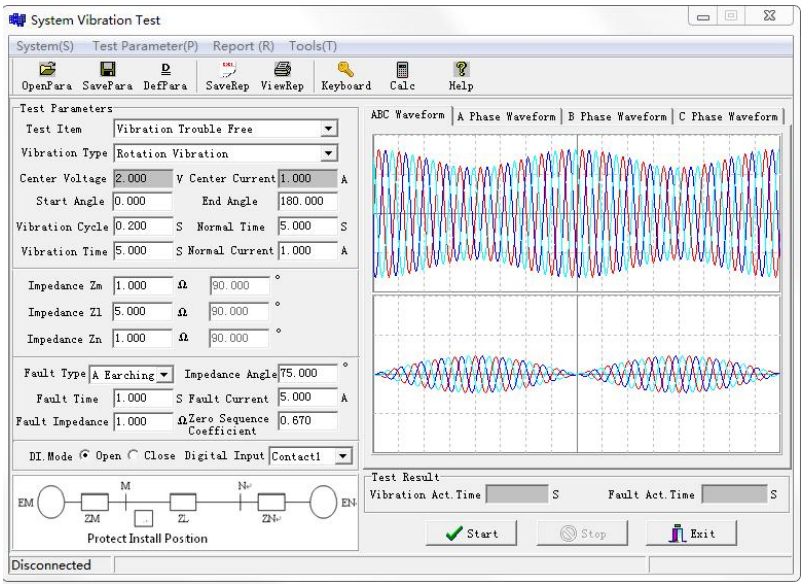
Section 19 Fault recurrence



This program is to read out the wave recording file in COMTRADE format, and display the substation name, the number of analog channels, the number of switching channels, the sampling frequency of each section of data, the number of sampling points and the total number of sampling points on the interface.The user can define the voltage channel and current channel of the tester corresponding to the corresponding channel in the recording file, then calculate the waveform and display it on the screen, and click the [output] button to output the displayed waveform.

The voltage and current outputs of this program are UA UB、UC；IA、IB、IC。

Section 20 System oscillation



This program can simulate the oscillation process of single machine infinite bus system, and add faults in the oscillation to test whether the protection device can operate correctly.The user input [oscillation period] is generally 0.2S, the [oscillation duration] is 3 seconds, and the output voltage and current are in the first channel: UA, UB, UC; IA, IB and IC.

1. Oscillation and no fault

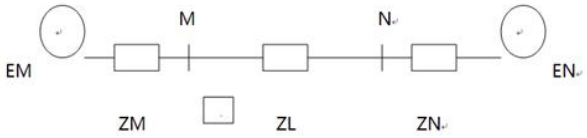
The test process is: normal state → oscillation state → return

2. In case of oscillation or failure

The test process is: normal state → oscillation state → fault state → return.

The test results can be used to test the operation time in oscillation state and protection operation time in fault state.

3. Oscillation model



Protection installation

EM=57.735∠0º EN=57.735∠δ

Oscillation start angle = δ 1 = θ 1 * π / 180 oscillation end angle = δ 2 = θ 2 * π / 180

Z11=ZM+ZL+ZN ZM=|ZM|∠90º ZL=|ZL|∠90º ZN=|ZN|∠90º

Iz=2*57.735/Z11 K=ZM/Z11 f1=50.000Hz f2=1/Tz

ϕ1=240º=240*π/180=4*π/3 ϕ2=120º=120*π/180=2*π/3

(1) Rotary oscillation (waveform calculated by DSP)

Oscillation period (s) = Tz, F1 = 50.000hz, F2 = 1 / Tz

$UA=57.735*\sqrt{2}*\sin(2*\pi*f1*t)*\sqrt{1-4*K*(1-K)*\sin^2(\pi*f2*t+\delta1/2)}$

$UB=57.735*\sqrt{2}*\sin(2*\pi*f1*t+\phi1)*\sqrt{1-4*K*(1-K)*\sin^2(\pi*f2*t+\delta1/2)}$

$UC=57.735*\sqrt{2}*\sin(2*\pi*f1*t+\phi2)*\sqrt{1-4*K*(1-K)*\sin^2(\pi*f2*t+\delta1/2)}$

$IA=Iz*\sqrt{2}*\sin(\pi*f2*t+\delta1/2)*\sin(2*\pi*f1*t+0)$

$IB=Iz*\sqrt{2}*\sin(\pi*f2*t+\delta1/2)*\sin(2*\pi*f1*t+\phi1)$

$IC=Iz*\sqrt{2}*\sin(\pi*f2*t+\delta1/2)*\sin(2*\pi*f1*t+\phi2)$

(2)Swing oscillation (waveform calculated by DSP)

$UA=57.735*\sqrt{2}*\sin(2*\pi*f1*t)$

$*\sqrt{1-4*K*(1-K)*\sin^2((\delta2-\delta1)/2*|\sin(\pi*f2*t)|+\delta1/2)}$

$UB=57.735*\sqrt{2}*\sin(2*\pi*f1*t+\phi1)$

$*\sqrt{1-4*K*(1-K)*\sin^2((\delta2-\delta1)/2*|\sin(\pi*f2*t)|+\delta1/2}$

$UC=57.735*\sqrt{2}*\sin(2*\pi*f1*t+\phi2)$

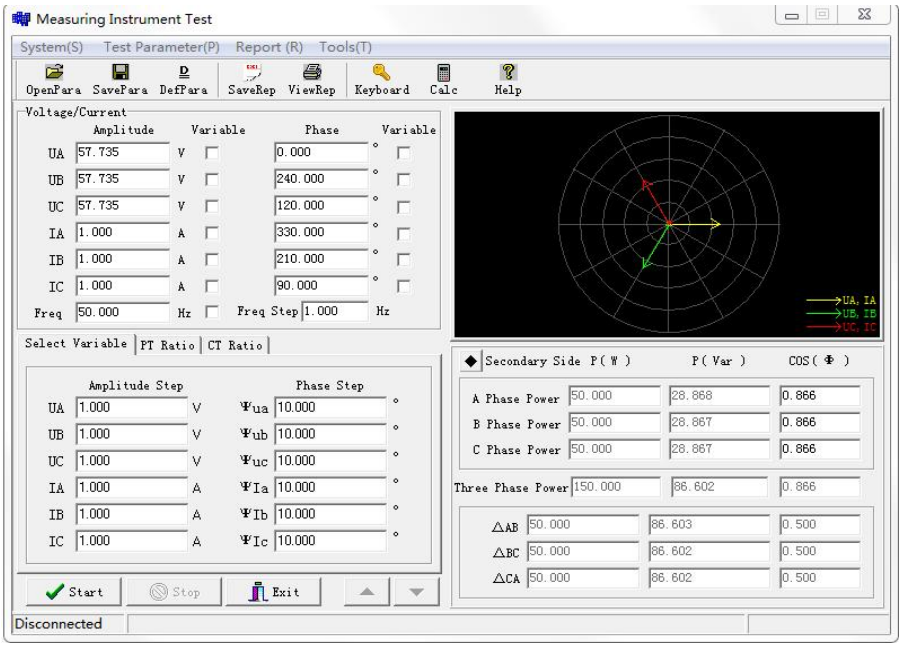
$*\sqrt{1-4*K*(1-K)*\sin^2((\delta2-\delta1)/2*|\sin(\pi*f2*t)|+\delta1/2)}$

$IA=Iz*\sqrt{2}*\sin((\delta2-\delta1)/2*|\sin(\pi*f2*t)|+\delta1/2)*\sin(2*\pi*f1*t+0)$

$IB=Iz*\sqrt{2}*\sin((\delta2-\delta1)/2*|\sin(\pi*f2*t)|+\delta1/2)*\sin(2*\pi*f1*t+\phi1)$

$IC=Iz*\sqrt{2}*\sin((\delta2-\delta1)/2*|\sin(\pi*f2*t)|+\delta1/2)*\sin(2*\pi*f1*t+\phi2)$

Section 21 Measuring instruments



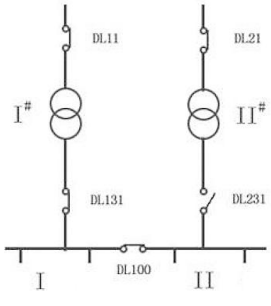
This program is used to detect the active power, reactive power and power factor of single-phase or three-phase watt hour meter.Add the current parameters and voltage parameters to the corresponding columns in the table, and then click [start test] to compare the readings of the meter with the data displayed on the interface to test whether they are consistent.

Section 22 Standby automatic switching test

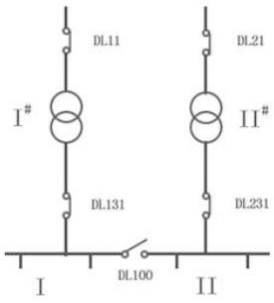
The [State sequence] program is used to carry out the automatic switching test. The starting state is with voltage and current, and the fault state is without current and voltage.

Connection type and standby mode of standby automatic switching

1. Wiring type 1

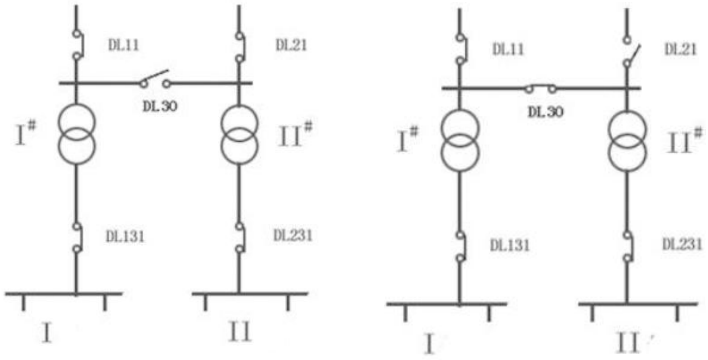


Open standby



Dark standby

2. Wiring type 2



Open standby Dark standby

Fault type

1. Power loss of line 1
2. Power loss of line 2
3. DL11 switch jumps stealthily
4. DL21 switch jumps stealthily
5. DL131 switch jumps stealthily
6. DL231 switch jumps stealthily
7. 1# main transformer fault
8. 2# main transformer fault
9. Manual tripping of DL11 switch
10. DL21 switch manual trip
11. Manual tripping of DL131 switch
12. Manual tripping of DL231 switch

Explain:

1. In the case of main transformer fault, sometimes it is not allowed to operate the standby automatic switch, otherwise it may cause an accident. At this time, an output can be output by the tester and connected to the standby automatic switch as the locking signal of the standby automatic switch.

2. Sometimes, during maintenance and test, the power supply is cut off by jumping the switch manually. At this time, the standby automatic switch is not allowed to operate. At this

time, an output can be output by the tester and connected to the standby automatic switch as the locking signal of the standby automatic switch.

Connection of current and voltage

The wiring of automatic switch on test is complex. Different wiring types, standby modes and accident causes may cause different wiring.The methods described below are for reference only, and users can flexibly apply them according to the site conditions.

1. Current connection (add one current to each low voltage side of two main transformers)

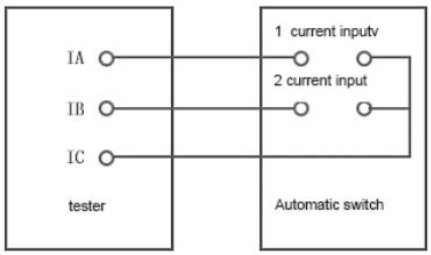
Function of current connection:

(1) Before switching on, it is necessary to judge that there is no current in the branch of the transformer on the side to be switched off before switching on the standby switch.

(2) In the dark standby mode, after the standby switch is closed, because the load exceeds the maximum allowable load of the transformer, load rejection is required. Generally, whether the transformer is overloaded is determined by judging whether the current after automatic switching exceeds the set overcurrent action value.

(3) When the switch is closed on the fault bus, the current after automatic switching is very large to simulate the post acceleration action.

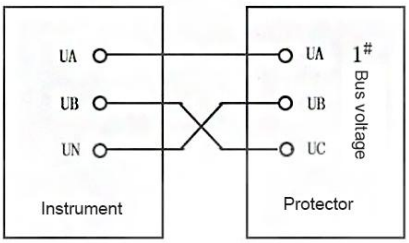
The wiring of current is relatively simple, as shown in the figure



2. Voltage connection

The voltage connection of standby automatic switch is complex, and up to 8 voltages must be connected. Some voltages can be connected by line voltage, which can reduce the number of voltage channels of the tester.The number of voltage channels of the tester is generally 4-6.

The wiring is shown in the figure



The output voltage of the tester is set as follows: UA = 100V, 0 degree; UB = 100V, 60 degree, then UAB = 100V, - 60 degree.Since the output voltage UA and UB of the tester are respectively applied to the UA and UC of the standby automatic switch, the voltage of the standby automatic switch side is:

UAB=100V，0°

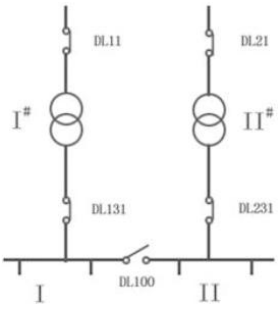
UBC=-UB=100V，-120°，

UCA=-UAB=100V，120°。

Similarly, UC, UX and UN can be connected to another group of bus voltage respectively.

Parameter setting

1. Main wiring 1



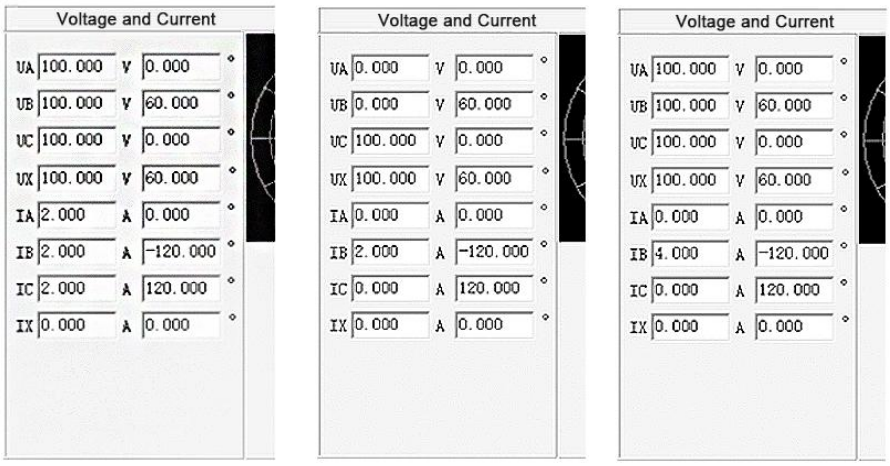
(1) Working principle:

Before fault: there is current and voltage in I# bus and II# bus.

Fault status: DL11 jumps off, I# bus has no current and no voltage, II# bus has current and voltage.

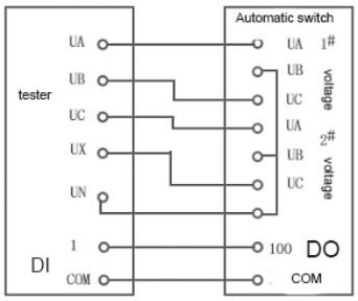
Standby automatic switching action: when the standby automatic switching judgment I# bus has no current or voltage, the standby automatic switching action, DL131 is disconnected and DL100 is closed.

After standby automatic switching action: I# bus has voltage, I# main transformer has no current, II# bus has voltage, II# main transformer current increases.The current and voltage settings of each state are as follows:



Before fault during fault after automatic switching

(2) Test wiring - as shown in the figure:



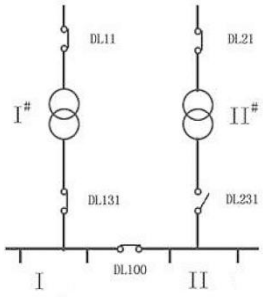
2. Main wiring 2

(1) Working principle:

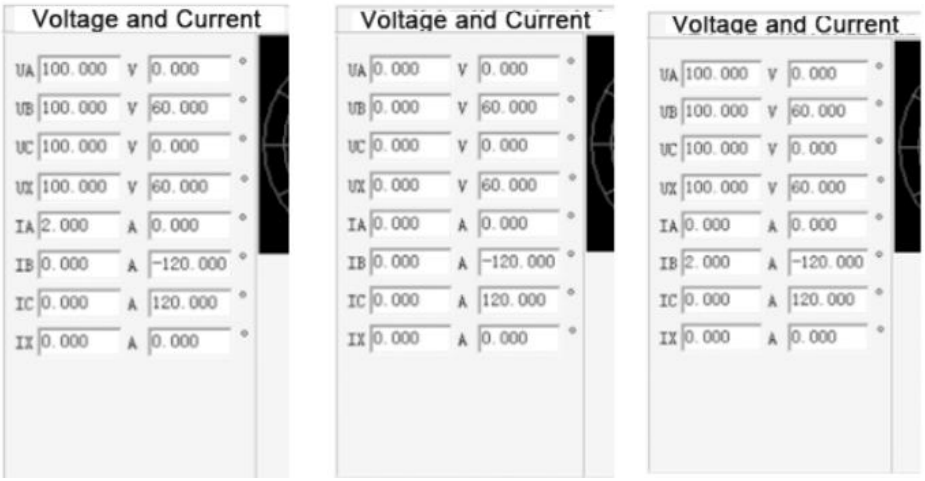
Before fault: I# bus has current and voltage, II# bus has voltage and II# main transformer has no current.

Fault state: DL11 jumps off, I# bus and II# bus have no voltage, I# main transformer and II# main transformer have no current.

Standby automatic switching action: when the standby automatic switching judgment I# Bus has no current or voltage, the standby automatic switching action, DL131 is disconnected and DL231 is closed.

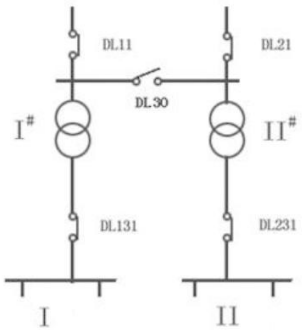


After standby automatic switching action: I# bus has voltage, I# main transformer has no current, II# bus has voltage, II# main transformer has current.The current and voltage settings of each state are as follows:



Before fault During fault After automatic switching

(2) Test wiring: same as before



3. Main wiring 3

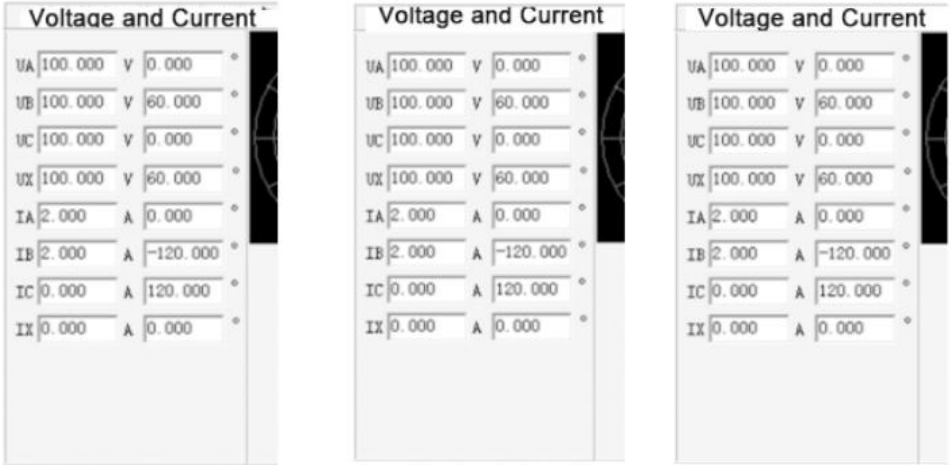
(1) Working principle:

Before fault: I# bus and II# bus have voltage, I# main transformer has current and II# main transformer has current.

Fault status: DL11 jumps off, I# bus has no voltage, I# main transformer has no current, 2II# main transformer has current, II# bus has voltage.

Standby automatic switching action: when the standby automatic switching judgment I# bus has no current or voltage, the standby automatic switching action and DL30 close.

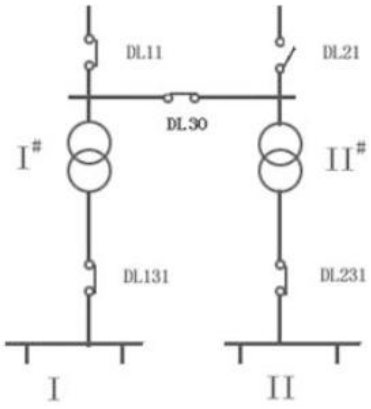
After the standby automatic switching action: it returns to the state before the fault.The current and voltage settings of each state are as follows:



Before fault During fault After automatic switching

(2) Test wiring: same as before

4. Main wiring 4



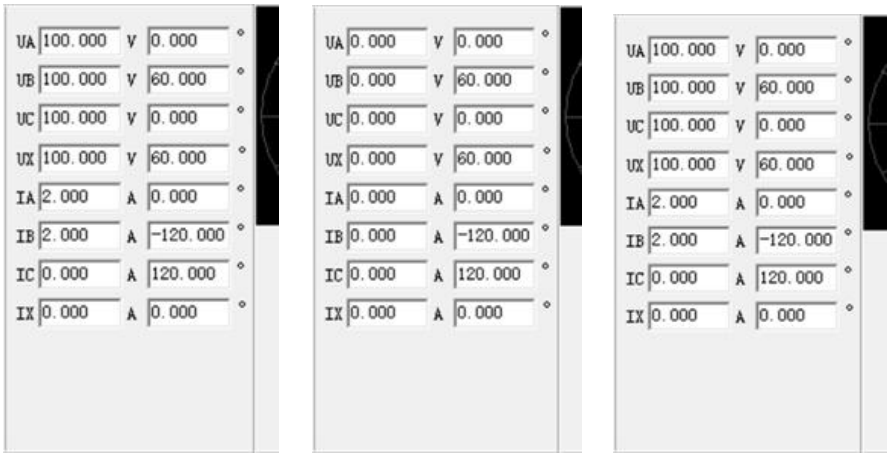
(1) Working principle:

Before fault: I# bus and II# bus have voltage, I # main transformer has current and II# main transformer has current.

Fault state: DL11 jumps off, I# bus and II# bus have no voltage, I# main transformer and 2II# main transformer have no current.

Standby automatic switching action: when the standby automatic switching judgment I# bus has no current and no voltage, the standby automatic switching action, DL21 close.

After the standby automatic switching action: it returns to the state before the fault.



Before fault During fault After automatic switching

(2) Test wiring: same as before

5.Test summary

1.Confirm the main wiring mode of the system according to the drawings and site conditions.

2.According to the main wiring mode and the operating instructions of the standby automatic switching device, understand the action logic relationship of the standby automatic switching device, so as to set the state parameters.

3. Set the current and voltage parameters of each state, and select the corresponding input and output.According to the action time of automatic switching device, the maintenance time of each state is set.

4. If the standby automatic switching device has been put into operation and all switches have been put into operation, the output of the tester may not be connected.If the standby automatic switching device is not put into operation, and each switch is not put into operation, the output of the tester shall be connected to the corresponding input of the standby automatic switching device, or some input of the standby automatic switching device shall be short circuited artificially, so as to master the opening and closing conditions of each switch of the standby automatic switching device, so that the device can issue the automatic switching command.

Beginner's Guide

Appendix A driver installation instructions

Plug in the hardware, the system will automatically pop up the installation wizard, select no, not yet, and click next.

Select Install from list or specified location and click next.

Select [include this location in search], and in [browse], select the [.. \ driver] directory on the CD.Click next.

In the pop-up dialog box, select continue.

The installation completes automatically.

Note: after the driver is installed, a USB logo will appear in the lower right corner of the screen.Click the USB logo to display the menu of "safely remove USB drvier for you like".In general, do not delete the device, otherwise, the tester cannot communicate with the host computer.If there is no USB mark, it is necessary to plug in the USB again (pull down the USB switch in the IPC, and then pull it on again) or restart the microcomputer relay protection tester.

Appendix B troubleshooting of USB communication

This machine uses high-speed USB2.0 protocol for test communication. Before the test, it must be confirmed that the USB connection is normal.If the status bar of the test software interface always shows [equipment not connected], the following steps

can be taken to remove the fault:

1. Confirm whether the USB control switch on the instrument panel is selected correctly.

The selection of USB control switch is based on different test methods. If the test is to connect the built-in industrial control computer for test, the USB control switch is selected to the industrial control computer; if the test is to connect the external computer for test, please select the PC.

When connecting the external computer, please confirm whether the IPC driver is installed. See Appendix A for details.

Check the status bar of the test software interface again, if it still shows [equipment not connected], then go to the next step.

2. Try to press the reset button on the instrument interface.

Wait for 5 seconds, check the status bar of the test software interface, if it still displays [device not connected], then enter the next step.

3. Turn off the system normally, turn off the power and wait for a few minutes before starting up.

If the above methods can not solve the problem, please contact our after-sales service department, our technical personnel will guide you to carry out detailed operation.Thank you for your support!