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S40A

Three-Phase Relay Tester Manual

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Content

Chapter I General System

1.1 General System

S40A is a type of relay tester controlled by SCM. It is portable, and easy to use. This tester can apply to the tests not only on operating value and operating time of AC/DC relays, but also on complex voltage blocking directional overcurrent, zero sequence overcurrent, low-frequency load shedding and other protection functions of low voltage line micro-processor based protection and whole group transmission of high voltage line micro-processor based protection, and on starting value, quick-break value, harmonic blocking value and manual synchronization of micro-processor based transformer differential protection.

1.2 Test Functions

1.2.1 Manual test: This unit can output 3 AC voltages and 3 AC currents or 1 DC voltage and 1 DC current. It can manually control amplitude, phase and frequency of AC values and amplitude of DC values by step size.
1.2.2 Time: This unit provides two status, when it enters into the second status, then starts timing, it can make the test of AC and DC protection operating time.
1.2.3 Remp test: This unit can output 1 voltage Uab, with DC or AC, or 3 AC currents or 1 DC current, implement the automatic change of amplitude of AC, DC value by step size, automatically record operating value, return value and calculate return coefficient.
1.2.4 Distance: This unit can make the test of setting value verification, logic verification and switching transmission of line protection. It provides three modes of zero-sequence compensating coefficient, KL, Kr and Kx, Z0/Z1.
1.2.5 F relays: This unit can make the fixed point test for operating value, operating time, slip deviation blocking value, voltage blocking value and current blocking value of low-frequency load shedding.

1.3 Introduction of Front Panel

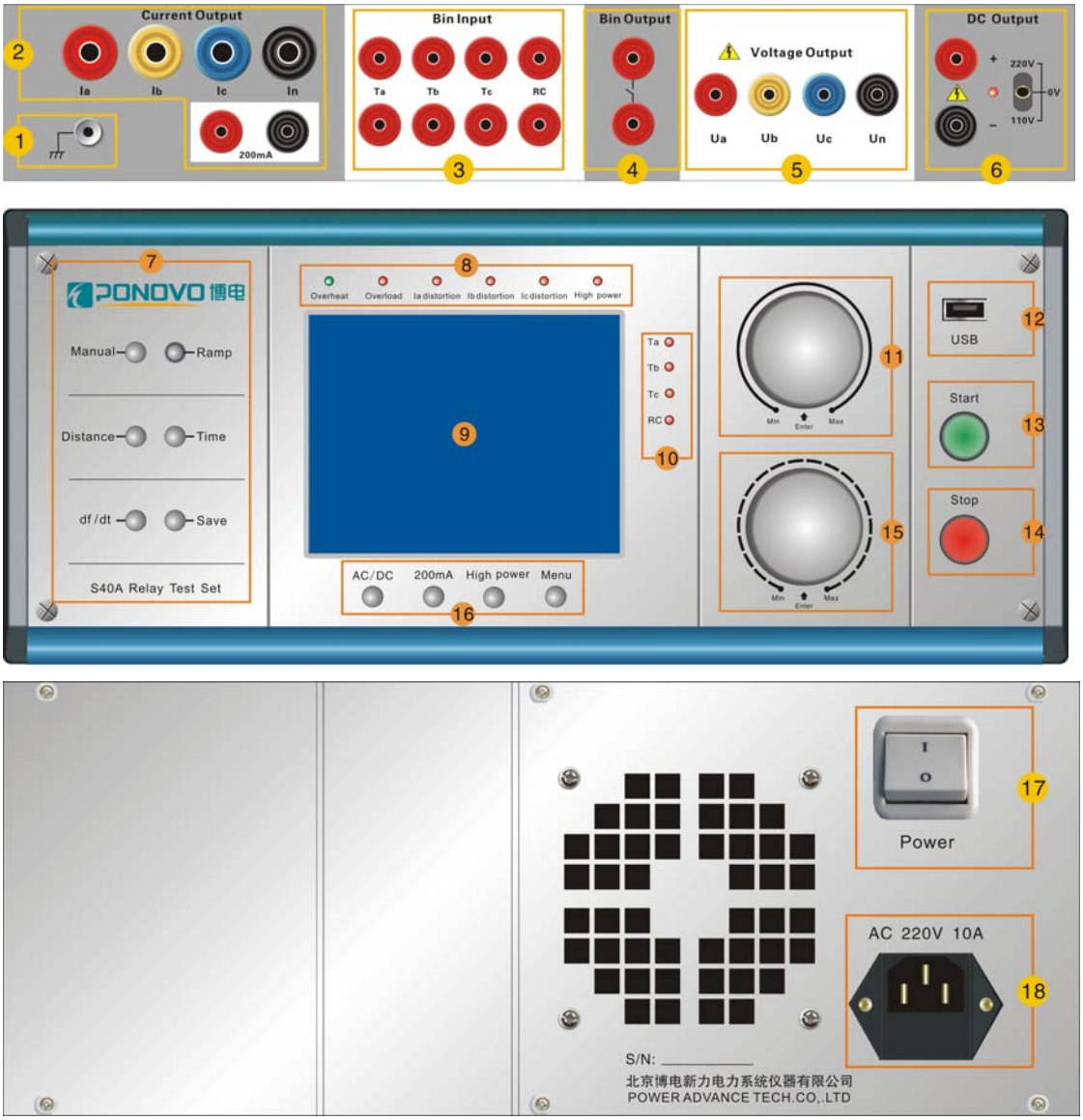


Figure 1.1

1 Device earthing terminal

2 Current output terminals：Ia, Ib, Ic, In, 0mA～200mA（low grade）

3 Bin input terminals：Ta, Tb, Tc, RC

4 Bin output terminals

5 Voltage output terminals：Ua, Ub, Uc, Un

6 DC power supply output terminals:：220V, 0V, 110V switchover

7 Test items selection key: Manual, Ramp, Distance, Time, df/dt, Save

8 Overheat LED
Overload LED
Ia distortion LED
Ib distortion LED
Ic distortion LED
High power LED

9 LCD

10 Ta, Tb, Tc,RC LED

11 Coarse regulation button：also it can be used as **Enter** key

12 USB port

13 Start button

14. Stop button: at any time, to end test and stop outputs
15. Fine regulation button：also it can be used as **Enter** key
16. Function keys：**AC/DC, 200mA, High Power**（available in AC operating value unit, to be light when switchover to high power）, **Menu**
17. Power supply switch button
18. Power supply plug: there is power supply fuse inside, can replace

1.4 Technical Data

Frequency range:	DC 40 to 100Hz
Frequency resolution:	2mHz
Frequency accuracy:	0.001 %
Phase angle:	0º...360º
Phase resolution:	0.1º
Phase accuracy:	0.2º
Voltage amplifiers	
Amplitude range:	3x 150V (1 x 300V LL) DC 300V
Power :	3 x 60VA, 1 x 120VA, DC 150W
Resolution:	10mV AC (20mV DC)
Accuracy:	0.2% (10% to 100%)
Distortion:	0.1 % (150V)
Current amplifier	
Amplitude range:	3 x 0 to 40A, 1 x DC 0 to 10A (10A@100W) **Low grade:** 1 x0 to 200mA（200mA @3VA） 1 x DC 0 to 200mA（200mA @4W）
Power:	5A @ 75VA, 30A @ 360VA, 40A @ 400VA
Accuracy:	0.2% (10% to 100%)
Distortion:	0.1% (10A)
Auxiliary output:	0, 110V & 220VDC 220V@ 110W
Binary inputs:	4 Dry / Wet (5 to 250VDC), 0 - 999,999.999s, accuracy

	1ms±0.1%, resolution 1ms
Binary outputs:	1, rated 250V 0.5A
Resolution:	100μs
PC interface	USB(Only for saving the test report)
Power Supply	220V±15% 40 to 60Hz
Temperature:	-10º to + 45º
Dimensions:	364 mm×155.5 mm×376mm（W×H×D）
Weight:	19.7kg

Bin. inputs：4 pairs of independent input terminals (Ta, Tb, Tc, RC), with the function of measuring connecting or disconnecting, dead contacts compatible with 15V～250V potentials, automatic pole identification

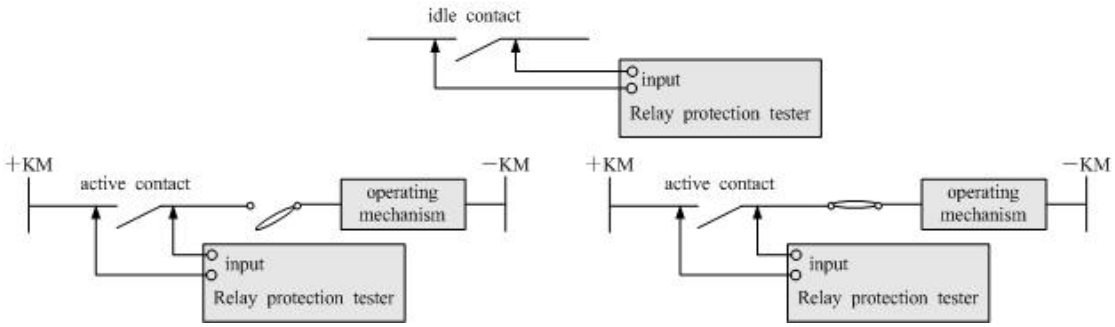


Figure 1.2

1.5 Operation Instruction

1.5.1 How to select test item

Two approaches to test unit：main menu and test item selection key

Main menu：it automatically enters into main menu when starting up, during test process, it can enter into main menu by the **MENU** key in the bottom right-hand corner of LCD, to turn coarse regulation/fine regulation knob to select test unit, press **Enter** key to enter into test unit.

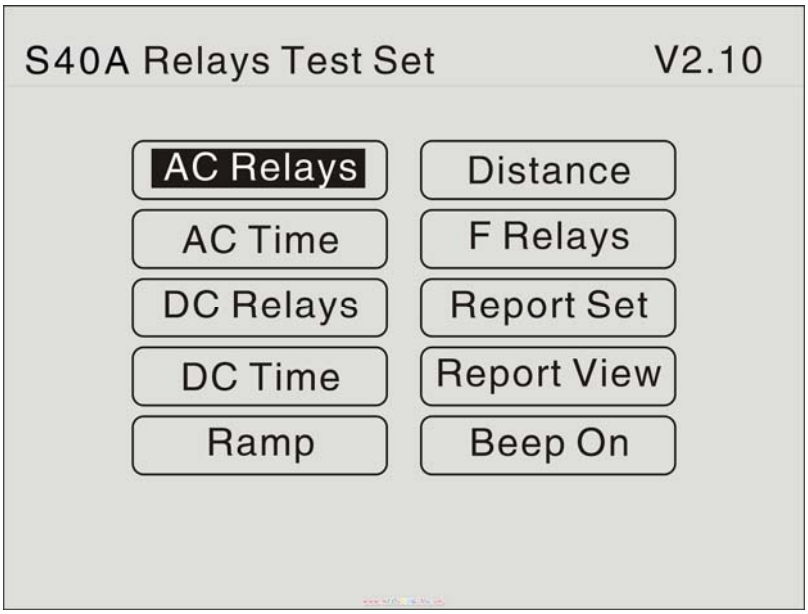


Figure 1.3

Test item selection key: The left of LCD is test item selection section, there are 5 shortcut keys directly entering into the corresponding unit: Manual, Ramp, Distance, Time, df/dt. In three units, Manual, Ramp, Time, it can make the AC, DC unit switchover by **AC/DC** key.

1.5.2 How to set parameters

At any test interface, turn coarse regulation/fine regulation knob to move cursor to select variable, press **Enter** key to set the value of variable. Coarse regulation knob can set three digits ahead of radix point. Fine regulation knob can set two digits after radix point. For three units, AC operating value, DC operating value and synchronization test, by selecting variables can set corresponding parameters before or after starting test; for other test units, by turning coarse regulation/fine regulation knob can change output of variables before starting test, the parameter setting can not be changed after starting test.

Min. adjustable step size of variables:

	coarse regulation	fine regulation
Voltage amplitude	1V	0.01V
Current (0A～0.2A grade) amplitude	10mA	1mA
Current (0A～40A grade)amplitude	1A	0.01A
phase	5°	0.1°
frequency	1Hz	0.01 Hz

1.5.3 How to save a report

Insert the flash dish which has the "S40A. txt" file into the USB port.

when experiment is finished,it will have "the Press Save Key to save" hint in the right corner of screen. press 

key and the report will saved automaticly in the S40A file.

The report setting: choose the **report set** in main procedure menu, it could establish a report name.

look into the report :choose **Report View** in the main menu

Chapter II Operating Value Test

2.1 General

This unit can output 3 AC voltages and 3 AC current or 1 DC voltage and 1 DC current. It can manually control amplitude, phase and frequency of AC values and amplitude of DC values by step size.

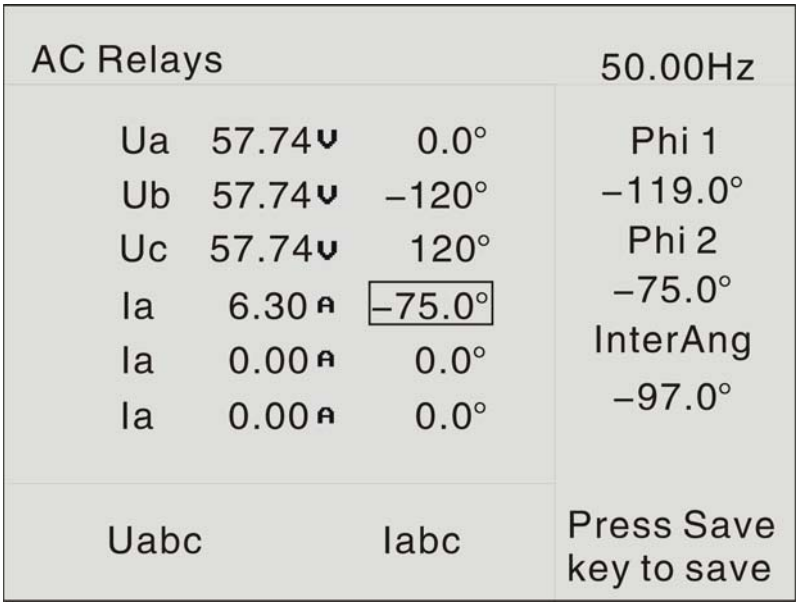


Figure 2.1

Figure 2.2

2.2 Operation Instruction

2.2.1 Select test item

- Press 

key to enter into AC, DC operating value test unit, or select AC operating value or DC operating value on main menu, press **Enter** key to enter；
- Press **AC/DC** key can make switchover of AC operating value test unit and DC operating value test unit.

2.2.2 Set voltage and current value

- Turn coarse regulation / fine regulation knob to select the variable need to set;
- Press **Enter** key to select the value need to change;
- Under AC status, it can select a certain phase voltage or current as variable, also can select ***Uabc*** or ***Iabc*** to change three-phase voltage or current at the same time；
- Turn coarse regulation / fine regulation knob to set the value of variable.

For example: to set I=5.20A

Turn coarse regulation / fine regulation knob to move cursor to the position of Ia amplitude→press **Enter** key→turn coarse regulation knob to set 5→turn fine regulation knob to set 0.20

2.2.3 Description of test process

Press **START** button→tester start outputs according to setting values→turn coarse regulation / fine regulation knob to control the output of selected variable→bin inputs of tester receive protection operating signal and record operating value→change variable to make protection to return and record return value, at the same time, automatically calculate return coefficient and end test (when the variable is phase, it can record

operating boundary I, boundary II and max. sensitive angle)

Note: Bin outputs change from disconnection to closing when the test starts.

2.3 Test Example:

Test Items: current operating value of low voltage blocking directional overcurrent stage II, low voltage blocking value, operating zone of power direction, sensitive angle.

2.3.1 Protection setting value:

Overcurrent setting value 4A; overcurrent time delay 0.5s; low voltage blocking value 60V (line voltage); direction setting value - 90°～30°（90°connection）; Most sensitive angle - 30°.
90°connection setting value is the phase which Ubc ahead of Ia, converted to the phase which Ia ahead of Ua：-120°～0°, most sensitive angle-60°.

2.3.2 Test connection

Correctly connect three phase voltages, and connect phase A current to protection. To connect the operating contact to tripping bin input of tester. Quit overcurrent stage I and stage III, to avoid the influence to stage II in test.

2.3.3 Test process

2.3.3.1 Current operating value

Figure 2.3

To set parameters as above figure

turn coarse regulation / fine regulation knob to move cursor to the position of Ia phase→press **Enter** key：select Ia phase as variable, set initial phase of Ia as -60°;

turn coarse regulation / fine regulation knob to move cursor to the position of Ia amplitude→press **Enter** key：select Ia amplitude as variable, set initial value of Ia as 3.5A（less than operating value）;

Press **Start** button, tester starts to outputs according to setting values;

turn coarse regulation, fine regulation knobs to increase current till protection operating contact overturn , tester records operating value.

Note: When it turns coarse regulation, fine regulation knobs to change current to be close to operating value, each step size must keep a certain of time more than output time delay.

3.3.3.2 Voltage blocking value

turn coarse regulation / fine regulation knob to move cursor to the position of *Uabc* →press **Enter** key：select three-phase voltage amplitude as variable；

turn coarse regulation / fine regulation knobs to decrease three-phase voltage till protection blocking contact return, at this time the return value recorded by tester is voltage blocking value.

3.3.3.3 Operating zone

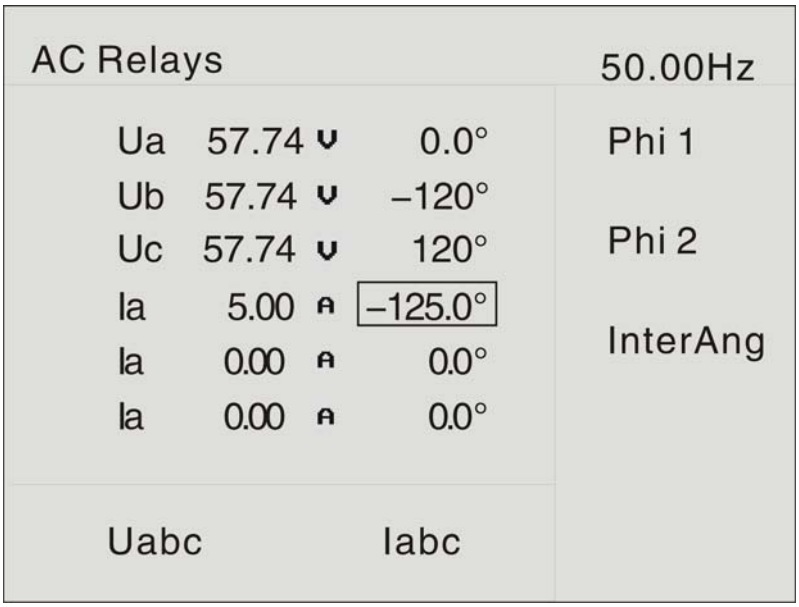


Figure 2.4

To set parameters as above figure

turn coarse regulation / fine regulation knob to move cursor to the position of Ia phase→press **Enter** key：to select Ia phase as variable, set initial phase φ（I）=-125.0°in non-operating zone;

Press **START** button, tester starts to output according to setting values, protection does not operate;

Turn coarse regulation / fine regulation knobs to increase φ（I）to change to operating zone, till protection operation find boundary I, tester records boundary I;

Continue to increase φ（I）till protection contact return to find boundary II, tester ends test and records boundary II, and automatically calculate the biggest sensitive angle.

Chapter III Time Test

3.1 General

This unit provides two status, when it enters into the second status, then starts timing, it can make the test of AC and DC protection operating time.

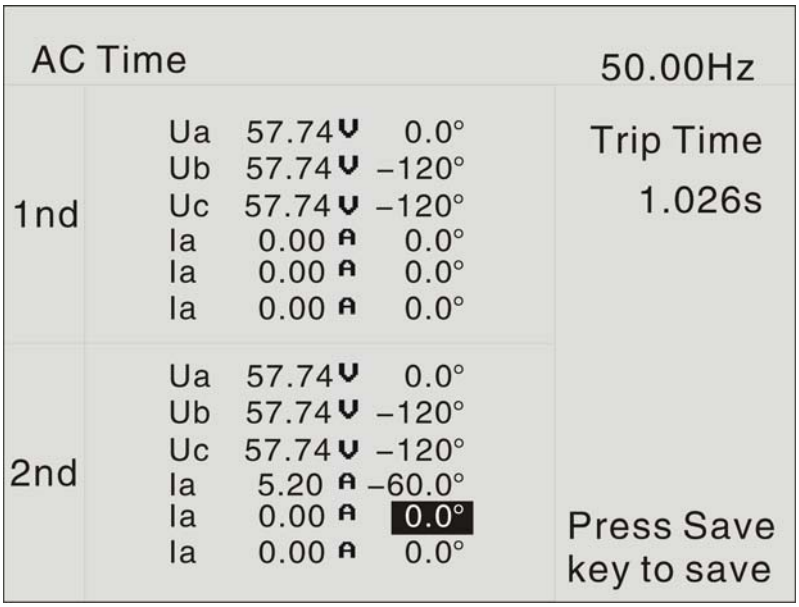


Figure 3.1


DC Time
1nd
Uab 220.00 V
Ia 0.00 A
Trip Time
2nd
Uab 220.00 V
Ia 9.00 A

Figure 3.2

3.2 Operation Instruction

3.2.1 To select test item

- Press 

key, to enter into AC, DC operating time test unit, or select AC operating time test unit or DC operating time test unit via main menu, press **Enter** key to enter;
- Press **AC**/**DC** key can separately enter into AC operating time test unit and DC operating time test unit.

3.2.2 To set voltage and current value

- set variable of "1st status" as value of non-operating;
- set variable of "2nd status" as value of reliable operating of tested protection;

3.2.3 Description of test process

Press **START** button, tester starts to output according to the setting of "1st status", press **Enter** to enter into "2nd status", at the same time, starts timing, when the bin input receives protection operating signal, and records operating time.

Note：When it enters into "2nd status", at the same time, the bin output will be changed from disconnection to closing.

Chapter IV Ramp Test

4.1 General

This unit can output 1 voltage Uab, with DC or AC, or 3 AC currents or 1 DC current, implement the automatic change of amplitude of AC, DC value by step size, automatically record operating value, return value and calculate return coefficient.

Figure 4.1

4.2 Operation Instruction

4.2.1 Select test item

Under any status：

- Press 

key to directly enter into automatic test unit, or select automatic test via main menu, press **Enter** key to enter；
- Press **AC**/**DC** key to make switchover of AC automatic test and DC automatic test.

4.2.2 To select parameter

- Output phase can select AC Ia, Ib, Ic,Iabc（three phase currents parallel connection output）, Uab or DC Ia, Uab；
- Turn coarse regulation / fine regulation knobs to set parameter value, the biggest time of each step can be 10s；
- Changing initial value and final value should include operating value and return value, time setting of each step should be bigger than protection operating time.

4.2.3 Test process description

press **START** button→tester outputs current according to setting initial value→automatically change from initial value to final value by step size→bin input of tester receive protection operating signal, then record operating value, at the same time change to initial value→receive protection return signal and record return value, at the same time automatically calculate return coefficient and end test

If tester does not receive protection operating signal during the process of changing from initial value to final value, then test will end at final value; if tester does not receive return signal during the process changing to initial value after bin input receives protection

operating signal, then test will end at initial value.

Note：Bin output changes from disconnection to closing when it starts test.

4.3 Test Example：

Test item：Operating value and return value of AC current relay.

4.3.1 Relay setting value

Operating value4.5A, return coefficient 0.8.\

4.3.2 Test connection

Connect Ia, In to relay current terminals, to connect operating contact of current relay to tripping bin input of tester Ta.

4.3.3 Test process

Figure 4.2

To set parameters as above figure

turn coarse regulation, fine regulation knobs：make switchover of setting of output phase, changing initial value, changing final value, each step size and time.

press **Enter** to select values need to set：set output phase Ia, changing initial value 3.2A（less than return value）, changing final value 5.5A（more than operating value）, step size 0.1A, time 0.1s（relay transiently operates）;

press **START** button, tester starts to output according to setting Ia initial value 3.2A, keep 0.1s, then increase one step size 0.1A, increase voltage until relay operating contact turnover, tester record operating value, then decrease by step size until relay return, then record return value and automatically calculate return coefficient.

Chapter V Distance

5.1 General

This unit can make the test of setting value verification, logic verification and switching transmission of line protection.

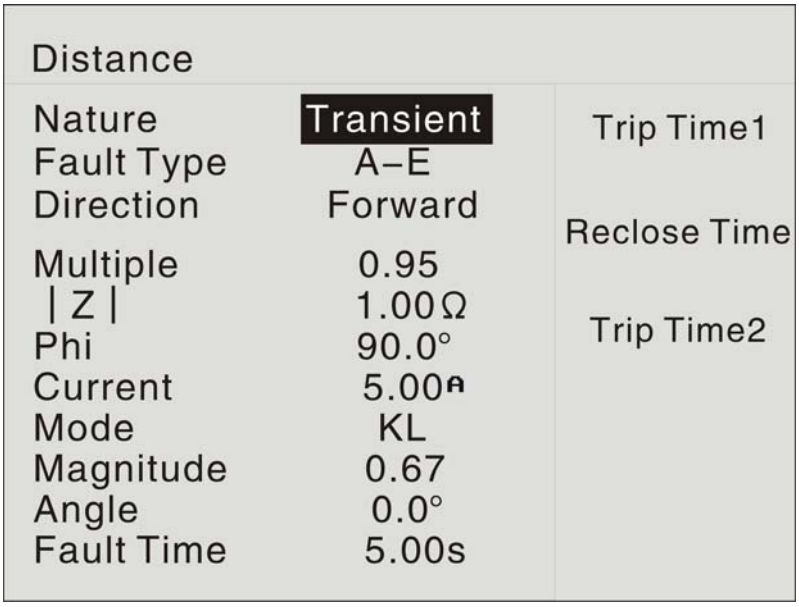


Figure 5.1

Nature：It can set transient fault and permanent fault. For transient fault, test will end after receiving signal of tripping and reclosing operation. For permanent fault, test will end after receiving signal of tripping, reclosing and post-acceleration operation. If the corresponding bin input has no operating overturn, then test will end after biggest fault time.

Fault type：including phase A earthing, phase B earthing, phase C earthing, AB short-circuit, BC short-circuit, CA short-circuit, three-phase short-circuit。

Direction：Including forward direction and reverse direction.

multiple：actual fault impedance＝short-circuit impedance×short-circuit impedance

multiple.

|Z|：It can be combined with short-circuit impedance multiple to verify setting value of distance protection.

Phi：Generally it is set as sensitive angle of protection operation, the setting of reverse phase may cause non-operation of protection.

current：Under default calculation model with constant current, to calculate output short-circuit voltage according to the setting short-circuit current and actual impedance, if short-circuit voltage is too large, it can decrease short-circuit current or short-circuit impedance.

Mode：provide three types of compensating coefficient, KL, Kr and Kx, Z0/Z1. Earthing distance protection made by NARI uses Kl compensating coefficient, in this case, it sets amplitude and phase of KL；Earthing distance protection made by SIFANG and NAEF uses Kr and Kx compensating coefficient, in this case, it sets amplitude of Kr and Kx；Z0/Z1 is mainly used by imported protection; in this case, it sets amplitude and phase of Z0/Z1.

Fault time：the time from starting fault to ending test. Tester records operating status of bin input from starting fault to ending test, does not record operating status after test ends. When it is not convenient to lead into bin input, this time can be used to control output fault time.

Display of test outcome：

- operating time：The time from fault starting to tester‘s receiving protection tripping signal.
- reclosing time：The time from tester‘s receiving protection tripping signal to receiving protection reclosing signal.
- post-acceleration time：The time from tester’s receiving protection reclosing signal to receiving protection permanent signal.

5.2 Operation Instruction

5.2.1 Test control

- Press **START** button, tester outputs rated voltage and current, with zero.
- Press **Enter** key, to output fault.
- Press **END TEST** button, to end test at any time.
- Bin output simulates NC contacts of TWJ, closing at tripping status, disconnection at closing status.
- Parameters can not be changed during test process, parameter setting only can be made at the status of stopping test..

5.2.2 Voltage, current and output time under normal ante-fault status

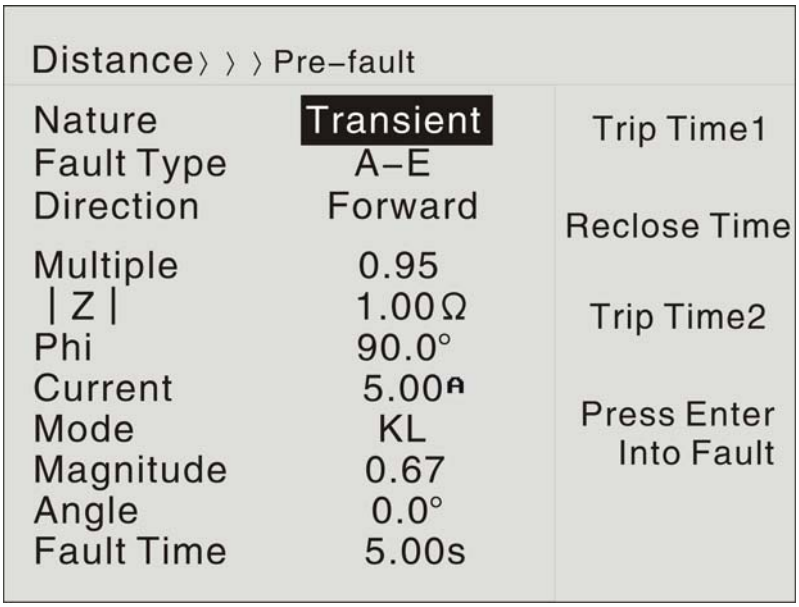


Figure 5.2

5.2.2.1 output of voltage and current：press **START** button, tester outputs rated voltage and rated current, with zero.
5.2.2.2 output time：Press **Enter** key to end the outputs under normal status before fault, to enter into fault status.
5.2.2.3 bin output：Disconnection status

5.2.3 Voltage, current and output time under fault status

5.2.3.1 output of voltage and current：Press **Enter** to output fault.
5.2.3.2 output time：After receive protection tripping signal, to end output of fault status, enter into post-tripping status.
5.2.3.3 bin output：Disconnection status

5.2.4 Voltage, current and output time under post-tripping status

5.2.4.1 output of voltage and current：fix to output rated voltage and rated current as zero, awaiting reclosing.
5.2.4.2 output time：End output of post-tripping status after receive protection reclosing signal.
5.2.4.3 bin output：It is turnover from disconnection to closing after receiving protection tripping signal.

5.2.5 Voltage, current and output time under post-reclosing status

There are two cases after ending output of post-tripping status：if it is transient fault, then end test；if it is permanent fault, then enter into post-reclosing status.

5.2.5.1 output of voltage and current：the same with fault status.

5.2.5.2 output time：End test after receive protection post-acceleration signal.

5.2.5.3 bin output：It is changed from closing to disconnection after receiving protection reclosing signal.

5.3 Test Example

Test protection：SIFANG digital line protection device CSL－101BE

test item：earthing permanent fault operating status of earthing distance Ⅱ stage phase B protection setting value：earthing distance Ⅱ stage setting value 3Ω, operating time 0.5s, reclosing time 0.5s, zero-sequence compensating coefficient Kr＝0.67, Kx＝0.67

5.3.1 Setting of fault status parameter

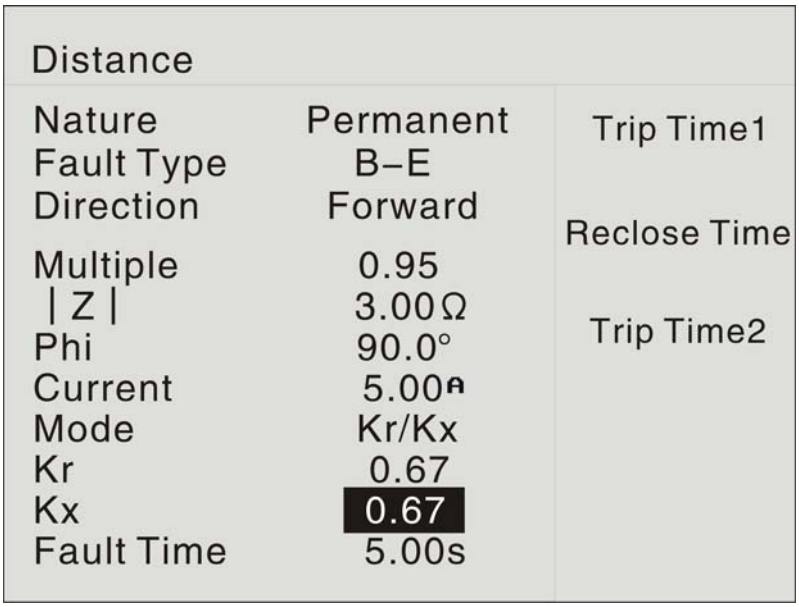


Figure 5.3

Parameters are set as Figure 5.3.

5.3.2 Description of test process

press **START** button→tester output rated voltage and rated current as 0→按 **Enter** key→output fault status→output post-tripping status after receiving tripping signal→output post-reclosing status after receiving reclosing signal→end test after receiving post-acceleration signal

Note: If protection tripping and closing contacts do not operate or if bin inputs of tester are not connected into protection tripping and closing contacts, then end test 5s (biggest fault time) after press **Enter** key to output fault status. When short-circuit impedance multiple is changed to 1.05, it should be earthing III stage operation.

Chapter VI F Relays

6.1 General

This unit can make the fixed point test for operating value, operating time, slip deviation blocking value, voltage blocking value and current blocking value of low-frequency load shedding.

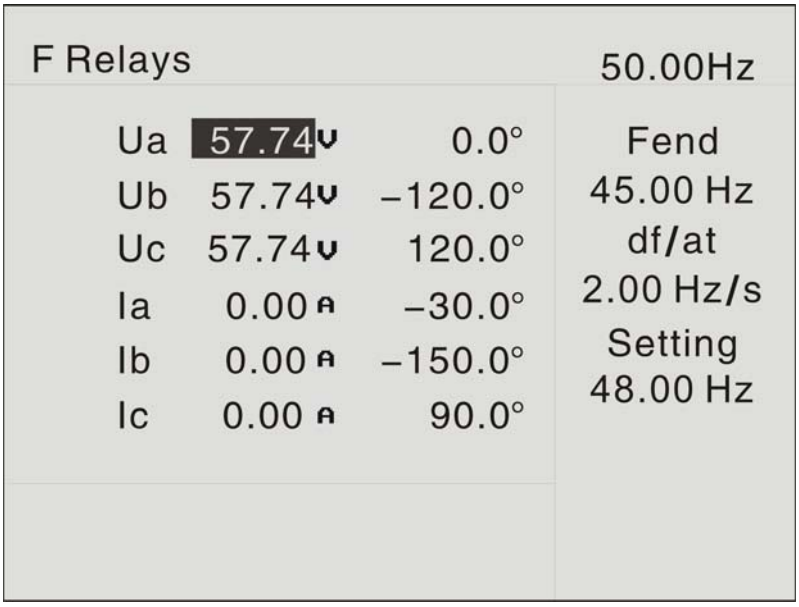


Figure 6.1

6.2 Operation Instruction

6.2.1 Set parameter

- Voltage amplitude：unless test voltage blocking value of protection, it should be more than voltage blocking value of protection；
- Current amplitude：unless test current blocking value of protection, it should be more than current blocking value of protection；
- Ending frequency：it should be more than low-frequency blocking value of protection, suggest not less than 45Hz；
- Frequency slip deviation：unless test frequency slip deviation of protection, it should be less than frequency slip deviation of protection；
- Timing frequency：it can be setting low-frequency operating value or actual measuring operating frequency.

6.2.2 Description of test process

- Press **START** button, tester outputs the setting voltage and current values, with 50Hz frequency and 5s fixed time;
- When 5stime out, voltage frequency and current frequency decrease from 50Hz to ending frequency by setting slip deviation of frequency, at the same time, when frequency decrease to setting timing frequency, tester will start timing;
- If protection operates (operating contact connected to tripping bin input), then tester will stopwatch and display operating time;
- If protection does not operate, then it will decrease to ending frequency and end test after keeping for 20s.

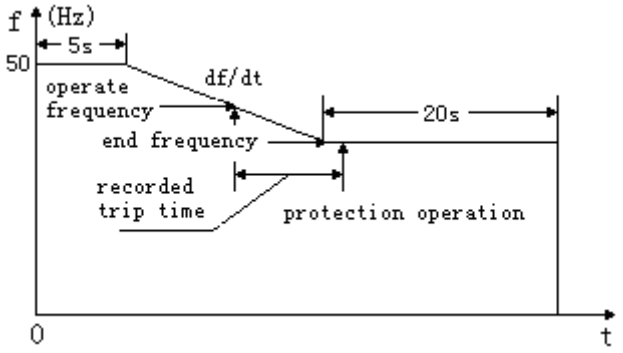


Figure 6.2

6.3 Test Example

Test item：Frequency operating value, operating time, slip deviation blocking value, voltage blocking value of low-frequency load shedding.

6.3.1 Protection setting value

Operating value：49 Hz , operating time setting value：2s, slip deviation blocking setting value：2 Hz/s , voltage blocking value：60V, current blocking value：1A

6.3.2 Test low-frequency operating value

6.3.2.1 Fixed point test：f=48.99Hz，low-frequency load shedding operates or not
set ending frequency48.99Hz：less than low-frequency setting value to make it reliably operate;
set frequency slip deviation 1Hz/s：less than slip deviation blocking setting value to open the output of low-frequency load shedding;
set timing frequency 49Hz：the frequency with which tester starts timing, set as the setting low-frequency value;
set voltage value 57.74V：more than low voltage blocking setting value to open the output of low-frequency load shedding;
set current value（if put in current blocking）1.2A：more than low current blocking setting value to open the output of low-frequency load shedding.

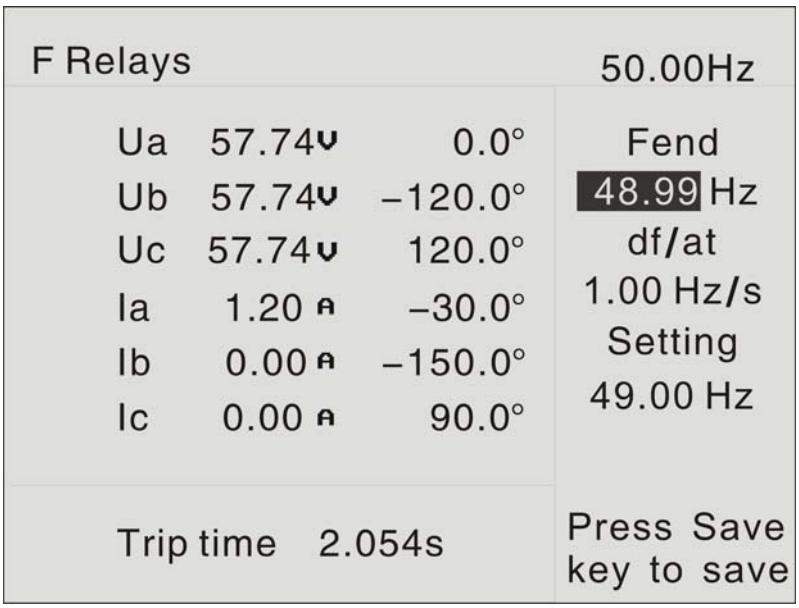


Figure 6.3

Test outcome：Low-frequency load shedding operates

6.3.2.2 Fixed point test：f=49.01Hz，low-frequency load shedding operates or not

set ending frequency 49.01Hz：More than low-frequency setting value to make it not operates;

set frequency slip deviation 1Hz/s：Less than slip deviation blocking setting value to open the output of low-frequency load shedding;

set timing frequency 49 Hz：The frequency with which tester starts timing, set as the setting low-frequency value;

set voltage value 57.74V：More than low voltage blocking setting value to open the output of low-frequency load shedding;

set current value（if put in current blocking）1.2A: more than low current blocking setting value to open the output of low-frequency load shedding.

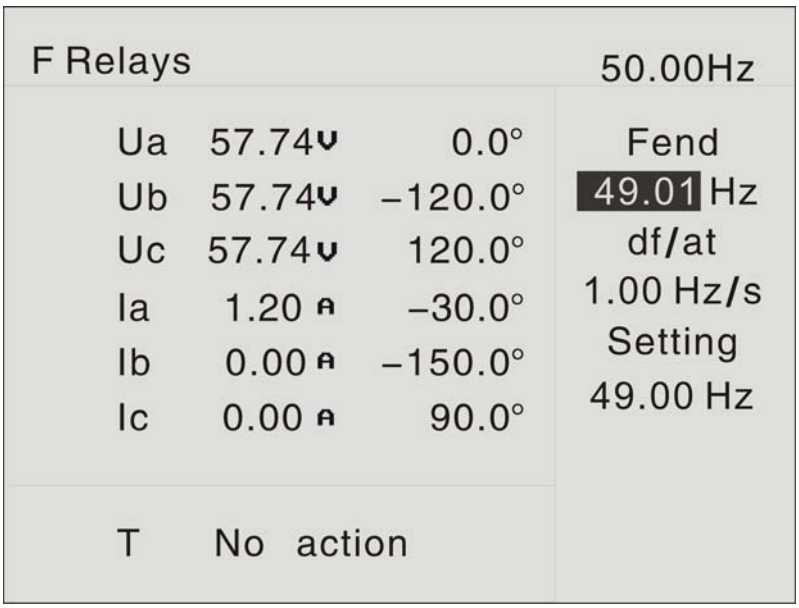


Figure 6.4

Test outcome：Low-frequency load shedding not operates

- Conclusion of fixed point test：under the conditions that slip deviation blocking value, voltage blocking value and current blocking value all open output, when ending frequency is 48.99Hz, low-frequency load shedding operates, when ending frequency is 49.01Hz, low-frequency load shedding not operates. It means that the operating value of low-frequency load shedding is between 48.99Hz and 49.01Hz.

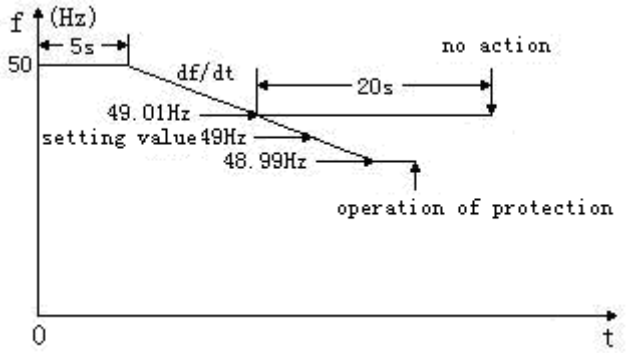


Figure 6.5

6.3.3 Test low-frequency operating time

Set ending frequency 47Hz: Less than low-frequency setting value to make it reliably operates;

Set frequency slip deviation 1Hz/s: Less than slip deviation blocking setting value to open the output of low-frequency load shedding;

Set timing frequency 49Hz: the frequency with which tester starts timing, set as the setting low-frequency value;

Set voltage value 57.74V: more than low voltage blocking setting value to open the output of low-frequency load shedding;

Set current value（if put in current blocking）1.2A: more than low current blocking setting value to open the output of low-frequency load shedding.

Figure 6.6

Test process：press **START** button, after tester outputs rated voltage, Ia＝1.2A and 50Hz frequency, the frequency of voltage and current decreases from 50Hz to 47Hz by the step of 1Hz/s, when the frequency is 49Hz, tester starts timing, when tripping bin input of tester receives protection operating signal, then it stops timing and display operating time.

6.3.4 Fixed point test of slip deviation blocking value

6.3.4.1 Fixed point test：df/dt=1.9Hz/s, low-frequency load shedding operates or not

Set frequency slip deviation 1.9Hz/s: less than slip deviation blocking setting value to open the output of low-frequency load shedding;

Set ending frequency 47Hz: less than low-frequency setting value to make it reliably operates;

Set timing frequency 49Hz: the frequency with which tester starts timing, set as the setting low-frequency value;

Set voltage value 57.74V: more than low voltage blocking setting value to open the output of low-frequency load shedding;

Set current value（if put in current blocking）1.2A: more than low current blocking setting value to open the output of low-frequency load shedding.

Figure 6.7

Test outcome：Low-frequency load shedding operates

6.3.4.2 Fixed point test: df/dt=2.1Hz/s, low-frequency load shedding operates or not

Set frequency slip deviation 2.1Hz/s: more than slip deviation blocking setting value to block the output of low-frequency load shedding;

Set ending frequency 47Hz：Less than low-frequency setting value to make it operates;

Set timing frequency 49 Hz: The frequency with which tester starts timing, set as the setting low-frequency value;

Set voltage value 57.74V：More than low voltage blocking setting value to open the output of low-frequency load shedding;

Set current value（if put in current blocking）1.2A: More than low current blocking setting value to open the output of low-frequency load shedding.

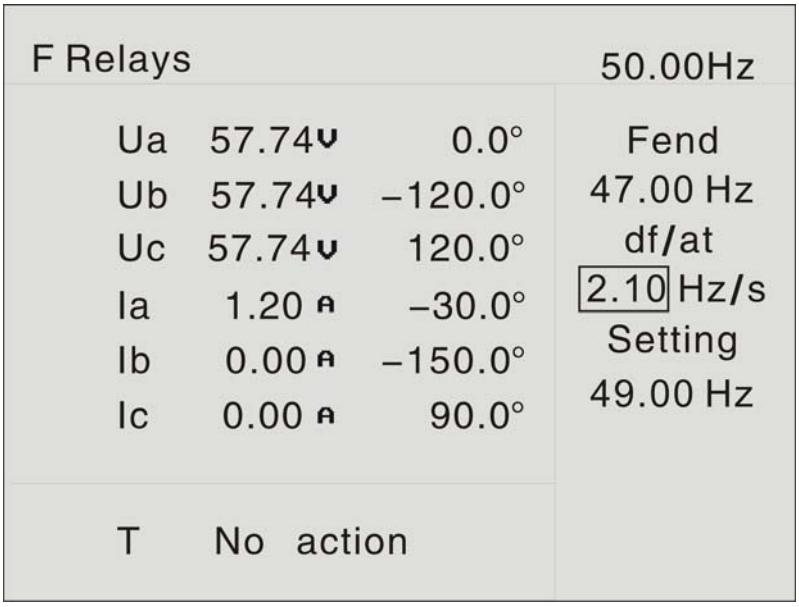


Figure 6.8

Test outcome：Low-frequency load shedding not operates

- Conclusion of fixed point test：when low-frequency meet the output condition and under the conditions that voltage blocking value and current blocking value all open output, when df/dt is 1.9Hz/s, low-frequency load shedding operates, when df/dt is 2.1Hz/s, low-frequency load shedding not operates. It means that the slip deviation blocking value is between 1.9Hz/s and 2.1Hz/s.

6.3.5 Fixed point test of voltage blocking value

6.3.5.1 Fixed point test：Three-phase line voltage=62V, low-frequency load shedding operates or not

Set ending frequency 47Hz：Less than low-frequency setting value to make it reliably operates;

Set frequency slip deviation 1Hz/s：Less than slip deviation blocking setting value to open the output of low-frequency load shedding;

Set timing frequency 49Hz：The frequency with which tester starts timing, set as the setting low-frequency value;

Set phase value 35.8 V (line voltage=62V)：more than low voltage blocking setting value to open the output of low-frequency load shedding;

Set current value（if put in current blocking）1.2A：more than low current blocking setting value to open the output of low-frequency load shedding.

Figure 6.9

Test outcome：Low-frequency load shedding operates

6.3.5.2 Fixed point test: Three-phase line voltage=58V, low-frequency load shedding operates or not

Set ending frequency 47Hz: Less than low-frequency setting value to make it reliably operates;

Set frequency slip deviation 1Hz/s: less than slip deviation blocking setting value to open the output of low-frequency load shedding;

Set timing frequency 49Hz: the frequency with which tester starts timing, set as the setting low-frequency value;

Set phase value 33.5V (line voltage=58V): less than low voltage blocking setting value to block the output of low-frequency load shedding;

Set current value（if put in current blocking）1.2A: more than low current blocking setting value to open the output of low-frequency load shedding.

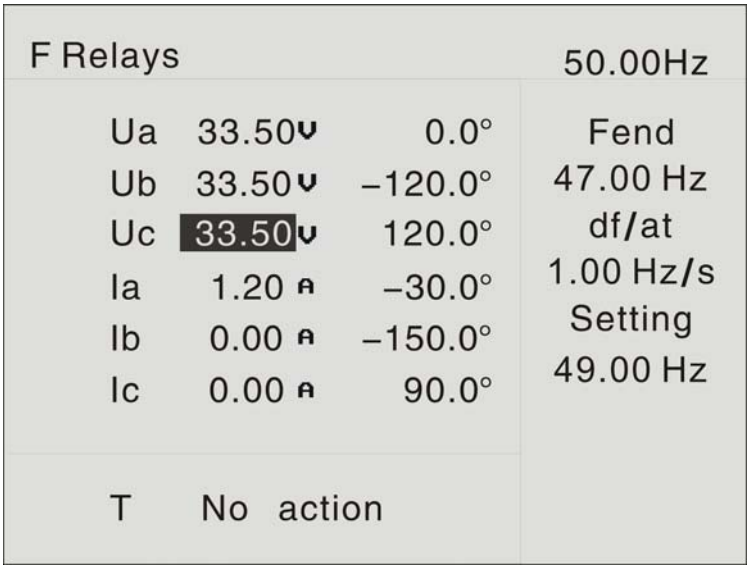


Figure 6.10

Test outcome：Low-frequency load shedding not operates

- Conclusion of fixed point test：when low-frequency meet the output condition and under the conditions that slip deviation blocking value and current blocking value all open output, when line voltage is 62V, low-frequency load shedding operates, when line voltage is 58V, low-frequency load shedding not operates. It means that the voltage blocking value is between 62V and 58V.

Chapter VII Report Set and Report View

7.1 General

The test provides an USB port to connect with PC. Users can get and view testing report conveniently from relay test; customer also can set the name of report in the relay test.

7.2 Operation Instruction

7.2.1 Save report

- When any test finishes, there will be “Others key for save ” on the lower right of LCD.
- Press **Others** key to save reports in relay test.
- Relay test support saving 21 reports at best.

7.2.2 View report

- Press **Menu** key and then use **Enter** key into “**Report View**” unite to view reports.
- Use **Enter** key to collect report users want to view. Results and names of test items will display on the lower of LCD.
- **AC/DC** key and **200mA** key can be used to delete reports.

7.2.3 Set report

- Press **Menu** key and then use **Enter** key into “**Report Set**” unite to view reports.
- Press **AC/DC** key to move cursor.
- Use **Enter** key to change the name of report.
- Press **200mA** key to save report name.

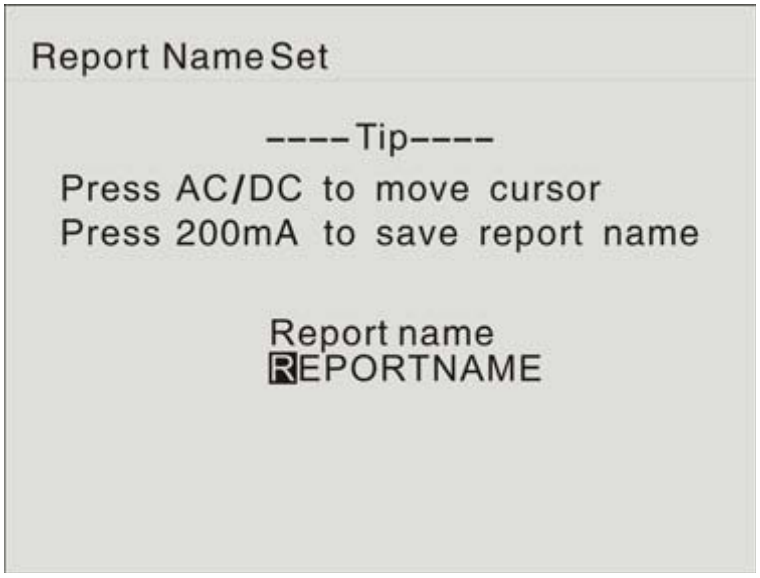
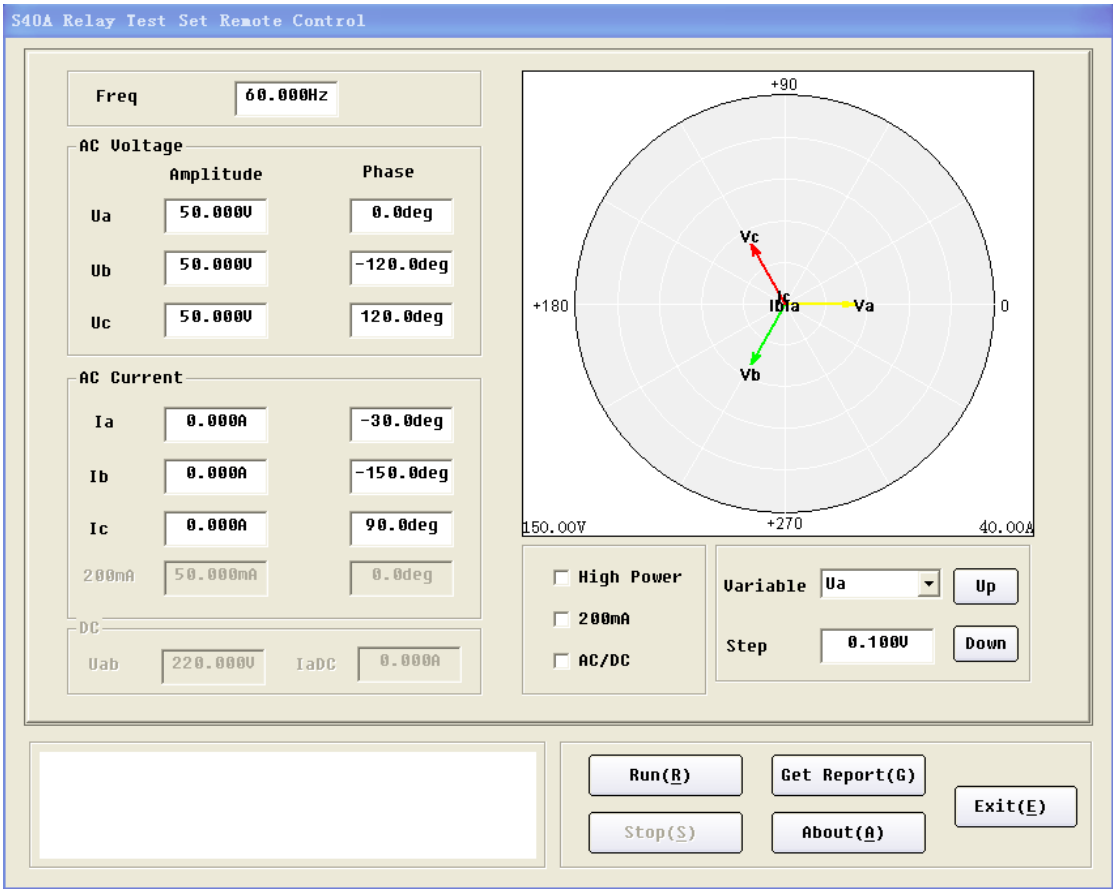


Figure 7.2

Note: S40A also allows PC to get reports from relay test. Please read ***S40A Relay Test Set Report Control User Manual***

Appendix：S40A Relay Test Set Remote Control User Manual

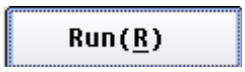
Chapter 1 Interface of Software



The S40A Relay Test Set Remote Control software is designed to control the S40A Relay Test Set with PC. The “AC Relays” and “DC Relays” test unit are both supported in this software until now, but the report can’t be generated in remote control mode.

S40A Three-Phase Relay Tester

The functions of keys as follows:



Connect the S40A Relay Test Set and begin to test.

Stop test

Read reports from relay test.

Information of the software.

Exit process.

Chapter 2 Format of S40A Report

S40A relay test can save 21 test reports at best. S40A Report Picker support reading test reports from relay test and displaying reports on PC by form of WORD or TXT. Example format of WORD as follows:

S40A Report

Test Name	Station Name	Value1	Value2	Value3
Ramp	LIGGREPORT	0.800A	0.700A	0.875
Transient	LIGGREPORT	0.803s		
Ramp	LIGGREPORT	0.400V	0.300V	0.750
F Relays	LIGGREPORT	0.769s		
AC Relay	LIGGREPORT	49.940V	49.870V	0.999
Time	LIGGREPORT	0.502s		
Ramp	LIGGREPORT	0.400A	0.300A	0.750
Ramp	LIGGREPORT	1.900A	1.800A	0.947
Ramp	LIGGREPORT	1.500A	1.400A	0.933
Ramp	LIGGREPORT	1.500A	1.400A	0.933

“TestName”,“Station Name”,“Value1”,“Value2”,“Value3”.ect of test item can be found in the WORD report.

“TestName”is the name of test item, and “AC Relays”, “DC Relays”, “Ramp” “Permanent”、“Transient”, “Time” are test items.

“Station Name” is the name of transformer substation, which can support 10 bytes.“Station Name” can be set by users in order to remember expediently.

“Value1”, “Value2”, “Value3”are the results of test, which means distinctness in different

test items. Embody as follows:

	Value1	Value2	Value3
AC Relay Pick	up Drop	off Factor	AC Relay Pick
DC Relay Pick	up Drop	off Factor	DC Relay Pick
Ramp	Pick-up	Drop-off	Factor
Permanent	Trip	Time1	Reclose
Transient	Trip Time1	Reclose Time	
Time	Trip Time		

Example format of TXT as follows:

```
----------------------S40A Relay Test Set Report------------
------------------------------------------------------------
Ramp    LIGGREPORT    0.800A    0.700A    0.875
Transient    LIGGREPORT    0.803s
Ramp    LIGGREPORT    0.400V    0.300V    0.750
F Relays    LIGGREPORT    0.769s
DC Relay    KIGGREPORT    220.000V    220.000V    1.000
Time    LIGGREPORT    0.502s
Ramp    LIGGREPORT    0.400A    0.300A    0.750
Ramp    LIGGREPORT    1.900A    1.800A    0.947
Ramp    LIGGREPORT    1.500A    1.400A    0.933
Ramp    LIGGREPORT    1.500A    1.400A    0.933
AC Relay    LIGGREPORT    54.000V    54.000V    1.000
AC Relay    LIGGREPORT    52.000V    52.000V    1.000
Time    LIGGREPORT    0.381s
AC Relay    LIGGREPORT    50.000V
Ramp    LIGGREPORT    1.600A    1.500A    0.938
AC Relay    LIGGREPORT    50.000V    50.000V    1.000
AC Relay    LIGGREPORT    50.000V    50.000V    1.000
Time    LIGGREPORT    0.410s
Time    LIGGREPORT    0.591s
AC Relay    LIGGREPORT    50.000V    50.000V    1.000
AC Relay    LIGGREPORT    50.000V    50.000V    1.000
------------------------------------------------------------
```

Chapter 3 Steps of Remote Control Test

Steps of remote control test as follows:

1. First, use the USB lines to connect PC and relay test.
2. Turn on the power,
3. Run the process of S40A Relay Test Set Report Control.
4. Select the style of parameter. (“200mA”and“AC/DC”can be selected together)
5. Set the value of voltage and current.
6. Press the “Run” button and chose the variable .And you can increase the output by press  or decrease it by press  .
7. Press the “Stop” button to stop test.

If “Can’t Open USB**”** or “Device can’t be find “display” on PC when you begin to test, there will be several reasons as follows:

- S40A USB port drivers have not been installed. Please click Start –> S40A Relay Test Set Report Control**->**usbdriver.exe and install drivers following instructions.
- Power of relay test is cut.
- USB lines are not connected correctly

Warning: Once you have controlled the S40A by using this software, if you want to operate S40A without PC, the S40A must be power off and then power on, or else the S40A may not run correctly.

Chapter 4 Steps of Getting Reports

Steps of getting reports from relay test as follows:

1. First, use the USB lines to connect PC and relay test set.
2. Run the program of S40A Relay Test Set Report Control.
3. Execute correlative test function on offline control mode. When a test duty is completed, press down the “other” button on the front panel of the test set S40A to store the report to test set hardware
4. Clicking **“Get Report (G)**”, PC will read reports from test set for 2 seconds and build reports by format of WORD and TXT in documents:C:\S40A\report. After that, the WORD format report will show on the current interface automatically
5. Open the report file under the stored path “C:\S40A\report”, then you also can browse and/or print the report based on the corresponding file format opened—WORD or TXT format.

Note: Detail information on report name setting or other correlative operation; please refer to Chapter VII, ***Report Set and Report View***

Chapter 5 Change the system frequency

1. Enter the test module “Distance”.
2. Press “AC/DC” + “High Power” buttons together.
3. The kit will display debug mode.
4. Find out the system frequency parameter at the screen.
5. Move the cursor to the parameter of system frequency.
6. Change it from 50.00 to 60.00 Hz. (Don’t Change Other Parameters.)
7. Press “200mA” button to save it in flash.
8. After saved, restart the kit, and test the system frequency

Chapter 6 S40A-Related Products and Accessories

This chapter describes the optional equipments and accessories for the*S40A* test set. Please visit the PONOVO Web site **www.ponovo.com.cn** for up-to-date information.

Optional accessories

Item	Part No.
PSS01 circuit breaker simulator	SAB0101

Standard accessories

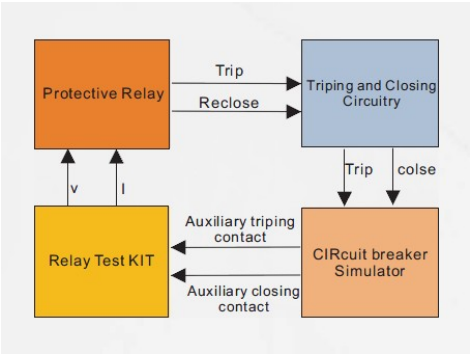
Item	Part No.
Color coded voltage cables	SAW0202
Signal cables	SAW0204/0205
Flexible terminal adapter	SAW0206
Flexible jumpers	SAW0207
Crocodile clips	SAW0208
U clamps 1#	SAW0209
U clamps 2#	SAW0210
Pin clamps	SAW0211
Power cord	SAW0009
Earthing lead	SAW0018
Data cable (USB)	SAW0011
Transportation case	SAC0105

6.1 PSS01 Circuit Breaker Simulator

It can simulate circuit breaker behaviors in three pole or 1 pole tripping of 6-500KV voltage grade, being available for power system, etc.
It provides 12 circuit breaker auxiliary contacts for complex test applications.

SAB0101 PSS01

This is one of the application examples:



6.2 Standard Accessories

6.2.1 Soft Bag for Test Leads

The S40A Wiring Accessory Package contains the following articles:

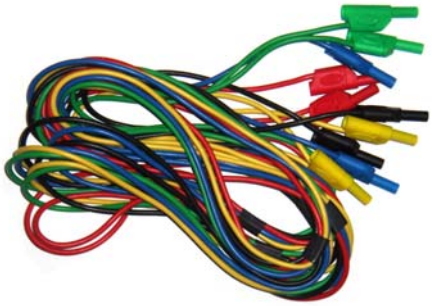
1. Colour coded current cables

SAW0201/ 0203 colour coded current cable

Amount: 2xred, 2xblack, 2xyellow, 2xblue 1xred, 1xblack, 1xyellow, 1xblue

The current cables to connect the S40A output to other safety sockets of, generally the current parts, voltage and signal tripping.

2. Color coded voltage cables



SAW0202 Colour coded voltage cable

Amount: 5xblack

The voltage cables to connect the S40A output to other safety sockets of, generally the voltage parts, current and signal tripping.

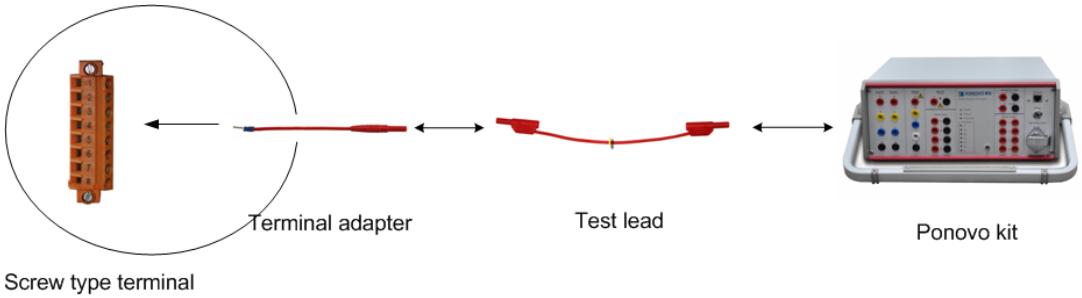
3. Signal Cable

SAW0204/0205 Signal cables

Amount: 2xred, 2x black 2xred, 2xblack

It connects the S40A with other different sockets, generally with signal tripping and current/voltage testing.

4. Flexible Terminal Adapter



SAW0206 Flexible terminal adapter

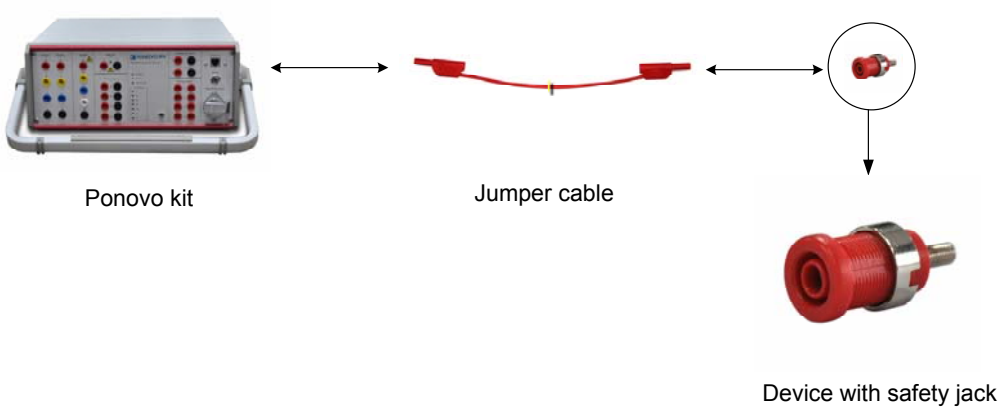
Amount: 10xred, 10xblack

Flexible terminal adapter connect to screw-clip terminals.

Notes: One end of the adapters have no insulator, users should make sure there is no output during connecting the adapters. Users insert the non-safety into the terminals and screw it firmly, then connect the test lead with the other end.

---

5. Jumper Cable

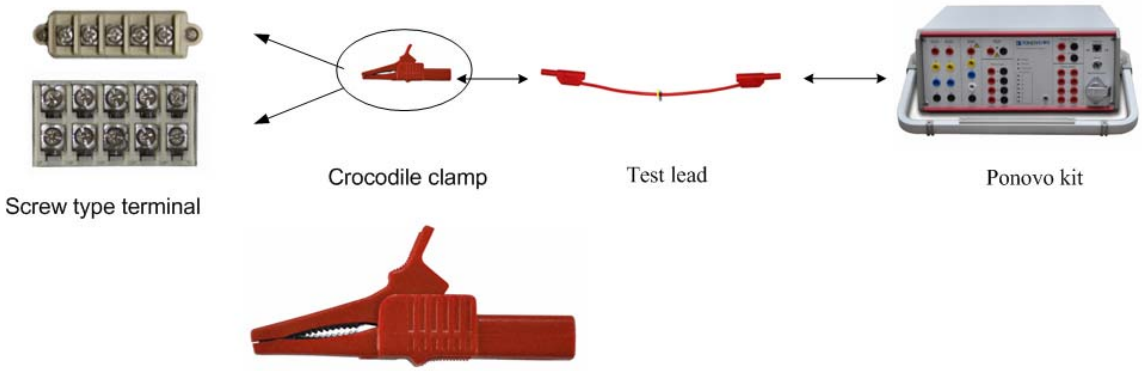


SAW0207 Flexible jumpers

Amount: 4xblack

Flexible jumper connects current outputs in parallel.

6. Crocodile Clips



SAW0208 Crocodile clips

Amount: 2xred, 2xblack, 2xyellow, 2xblue

Crocodile clips for secondary side to connect to pins or screw types.

7. U Clamps

SAW0209 U clamps 1#

Amount: 10xred, 10xblack

SAW0210 U clamps 2#

5xred, 5xblack

Screw type terminal

U clamp

Test lead

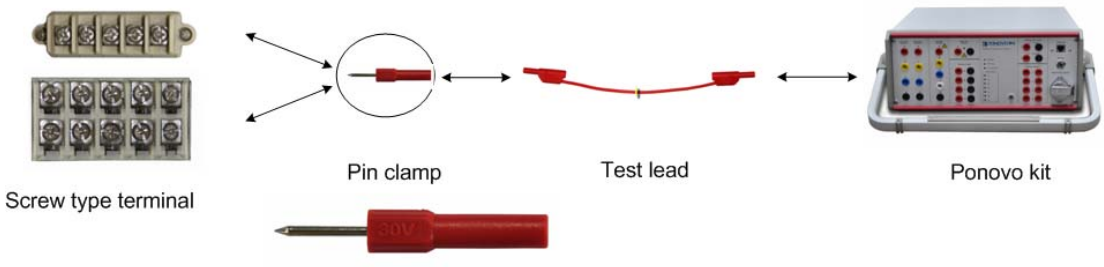
Ponovo kit

U clamps for screws to connect regular test leads to screw-clamp terminals relays.

Notes: One end of the adapters have no insulator, users should make sure there is no output during connecting the adapters. Users insert the non-safety into the terminals and screw it firmly, then connect the test lead with the other end.

---

8. Pin clamps



SAW0211 Pin clamps

Amount: 4xred, 4xblack

Pin clamps for screws to connect regular test leads to screw-clamp terminals relays.

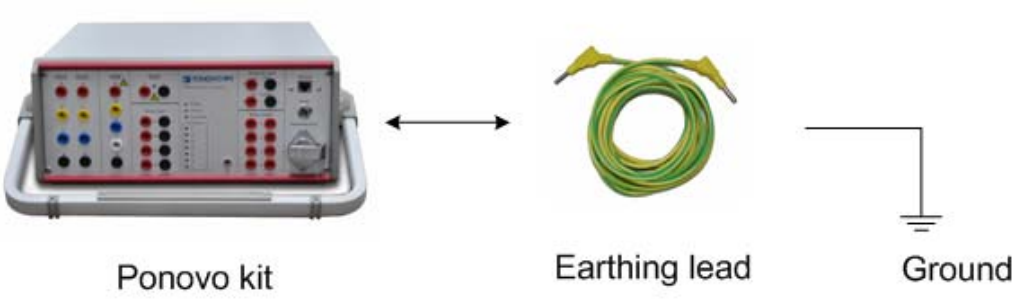
9. Power Cord

SAW0009 Power code

Amount: 1 piece

Power cord connects the S40A with power supply socket.

10. Earthing Lead



SAW0018 Earthing lead

Specification: 2.5mm²×4m

Amount: 1 piece

Earthing lead connects the S40A with ground to ensure kit safety.

Notes: In order to avoid static induction, users should connect the S40A with ground reliably before testing.

---

11. Data cable (USB)

SAW0011 Data cable Amount: 1 piece

It helps transfer data between PC and S40A. PONOVO will provide relevant plug socket according to different countries. For the plug socket information, please check the Chapter 6. Appendix.

6.2.2 Transportation Case

The large-size case with wheels is designed for heavy transport stress with folding hand it is made of fireproof materials and smooth rolling rubber tires.

SAC0105 Transportation case

Dimension: 465x250x525mm (WxHxD)
Weight: 10Kg

Chapter 7 Appendix

In order to assure PONOVO sockets are used smoothly in foreign countries, PONOVO provides the plug sockets to our customers in different countries.

The followings are the sockets used in different countries.

1. Plug Type B

Type B adapter is mainly used in America, Canada and Taiwan etc.

2. Plug Type I Adapter

The UK type plug is mainly used in United Kingdom, India, Pakistan, Thailand, Malaysia, Singapore, New Zealand and Hong Kong etc.

3. Plug Type L Adapter

Type L Adapter is mainly used in South Africa and British Standard 15A.

4. Plug Type N Adapter

This adapter is mainly used in Italy.

5. Type G Adapter

Type G Adapter is mainly used in German, Finland, France, Norway, Sweden, Poland, South Korean, Austria, Spain, Hungary, Czech, Ukraine, Turkey, Brazil and Russia etc.

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