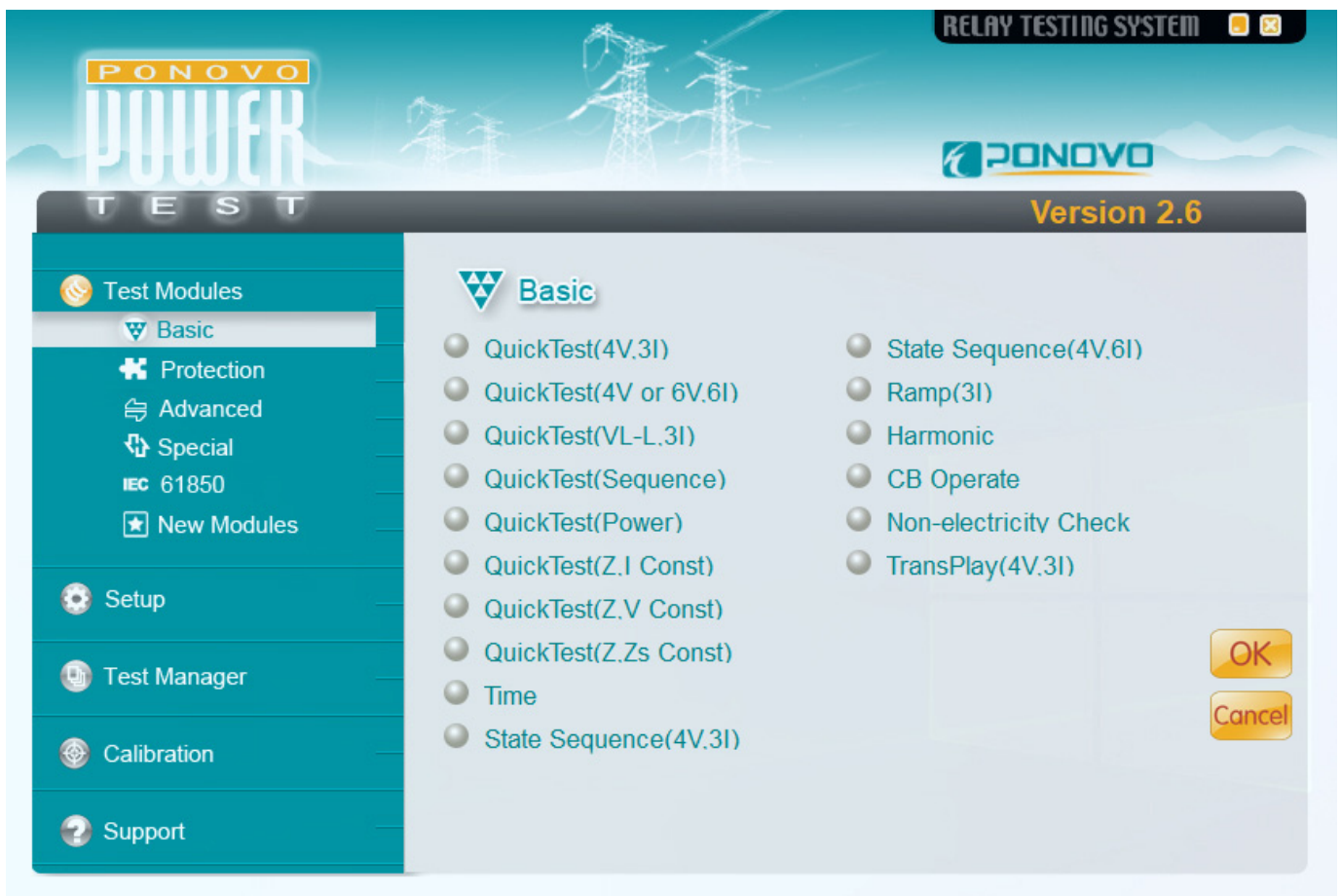




PowerTest

Protection Relay Test Software





Introduction

For all the three phase or six phase relay testers of PONOVO, one universal software can be used, the name is **PowerTest** software. PowerTest is a relay test software that includes different test packages, the **Basic** package, **Protection** package, **Advanced** package, **Special** package, **New Modules**, which packages includes different testing module, that can be used for all kinds of relay testing, and it also has the special package for more testing application, such as transducer, energy meter, etc.



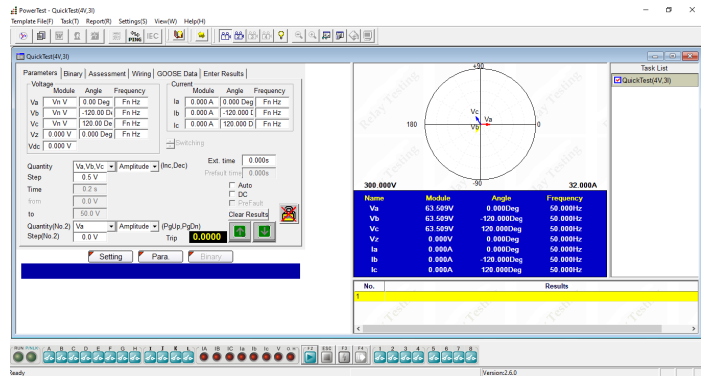
Basic Package

In the basic package, there are different Quick Test modules, Time module, State Sequence, Ramp, Harmonic, CB Operation, Non-electricity Check, and TransPlay for playing back the comtrade file.



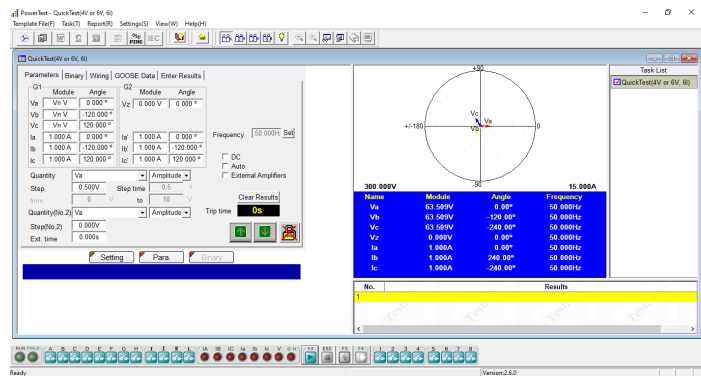
QuickTest (4V, 3I)

- ❖ 4 voltage and 3 current sources available for test relay
- ❖ Amplitude, phase angle and frequency of voltage and current sources can be controlled independently
- ❖ Test can be in manual or auto mode



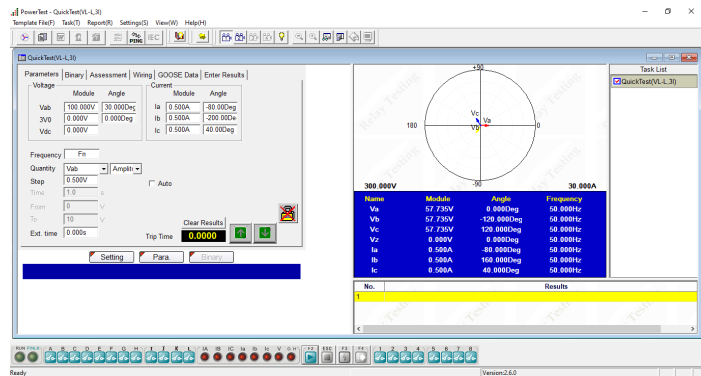
QuickTest (4V or 6V, 6I)

- ❖ 4 voltage or 6 voltage and 6 current sources available for test relay
- ❖ Amplitude, phase angle and frequency of voltage and current sources can be controlled independently
- ❖ Test can be in manual or auto mode



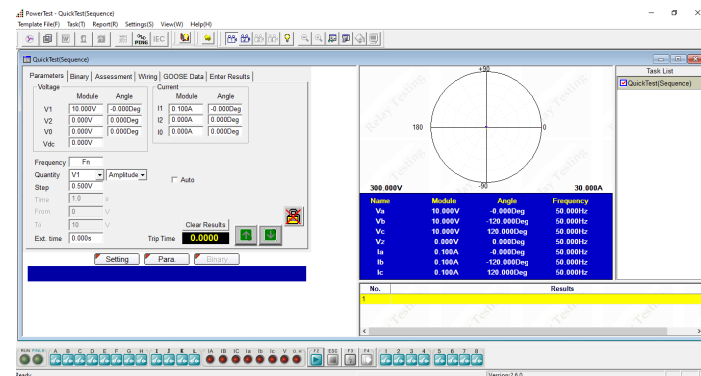
QuickTest (VL-L, 3I)

- ❖ Easy to control the phase-phase voltage, 3V0 (zero sequence voltage) and 3 currents
- ❖ Amplitude, phase angle and frequency of current sources and phase-phase voltage, zero sequence voltage can be controlled independently
- ❖ Test can be in manual or auto mode



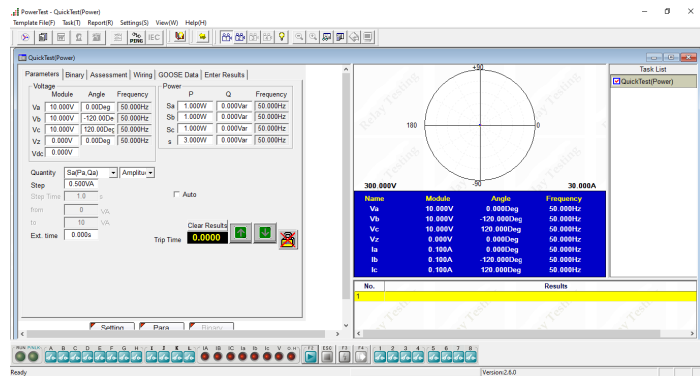
QuickTest (Sequence)

- ❖ Easy to control the sequence components (positive sequence, negative sequence and zero sequence) for voltage and current
- ❖ Amplitude and phase angle of the sequence components of voltage and current can be controlled independently
- ❖ Test can be in manual or auto mode



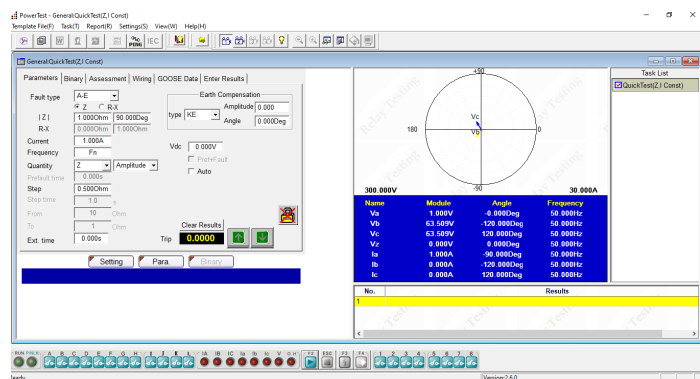
QuickTest (Power)

- ❖ Easy to control the output of power, including active power, reactive power and apparent power
- ❖ Amplitude of active power, reactive power and apparent power can be controlled independently
- ❖ Test can be in manual or auto mode



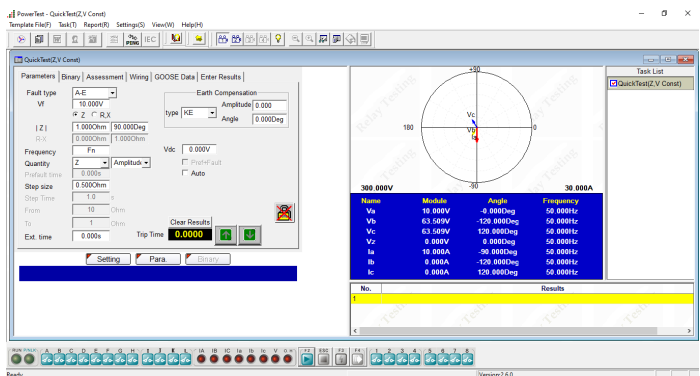
QuickTest (Z, I Const)

- ❖ Easy to test impedance relay with constant current
- ❖ Set the fault impedance and fault current, obtain the amplitude and phase angle of each phase voltage and current according to the fault type
- ❖ Can manually or automatic search the relay operation value



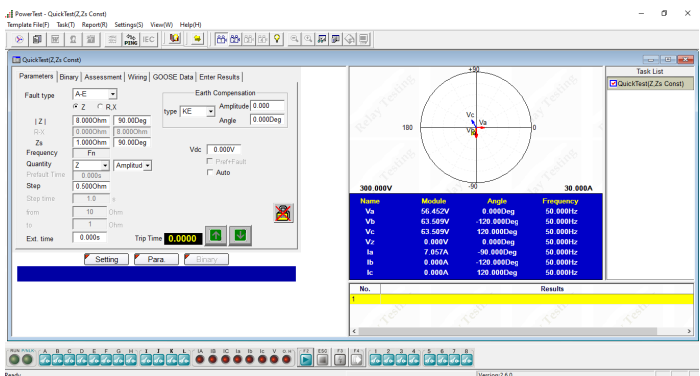
QuickTest (Z, V Const)

- ❖ Easy to test impedance relay with constant voltage
- ❖ Set the fault impedance and fault voltage, obtain the amplitude and phase angle of each phase voltage and current according to the fault type
- ❖ Can manually or automatic search the relay operation value



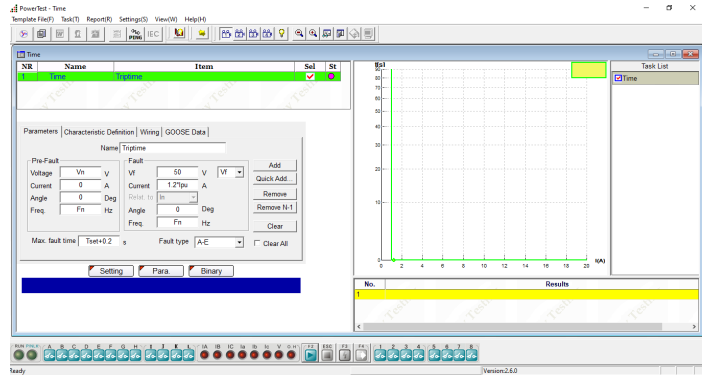
QuickTest (Z, Zs Const)

- ❖ Easy to test impedance relay with constant system impedance
- ❖ Set the fault impedance and system impedance, obtain the amplitude and phase angle of each phase voltage and current according to the fault type
- ❖ Can manually or automatic search the relay operation value



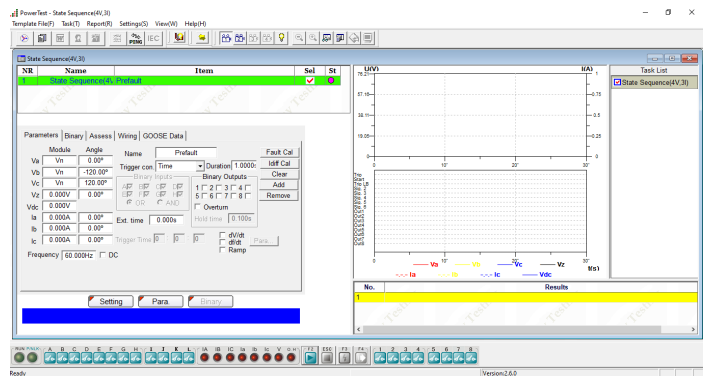
Time

- ❖ Time module is used to test trip delay time of protection relay
- ❖ Various value can be set separately, such as pick up value, delay time, pre-fault time, post-fault time, binary input/output, the voltage and current at pre-fault and fault state, characteristic definition, etc.



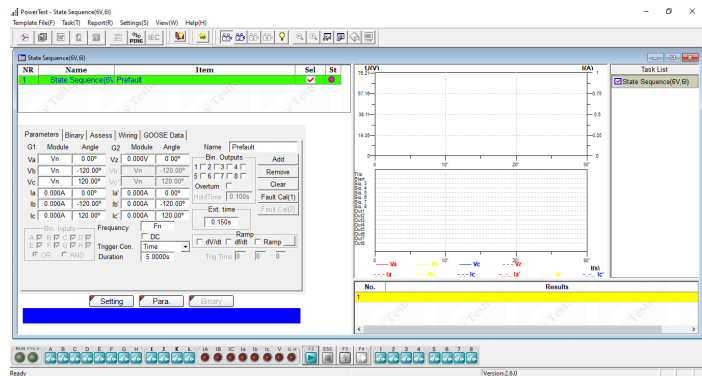
State Sequence (4V, 3I)

- ❖ Used to define multiple continues state sequences for special test applications, such as generate a series of states to test the tripping time and close time
- ❖ 4 voltage and 3 current sources available for each state
- ❖ Trigger condition of each state can be set separately



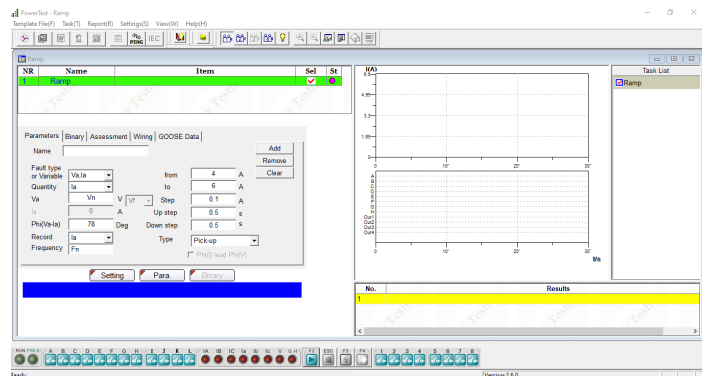
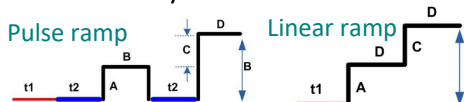
State Sequence (4V, 6I)

- ❖ Used to define multiple continues state sequences for special test applications, such as generate a series of states to test the tripping time and close time
- ❖ 4 voltage or 6 voltage and 6 current sources available for each state
- ❖ Trigger condition of each state can be set separately



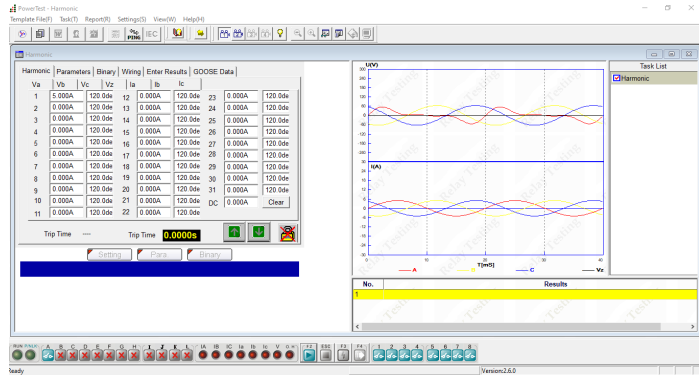
Ramp (3I)

- ❖ Specially designed to realize RAMP for different test applications, such as pick up/drop off value checking, directional relay testing, maximum torque angle checking etc.
- ❖ Both Pulse ramp and Linear ramp available
- ❖ Can search the relay operation value automatically



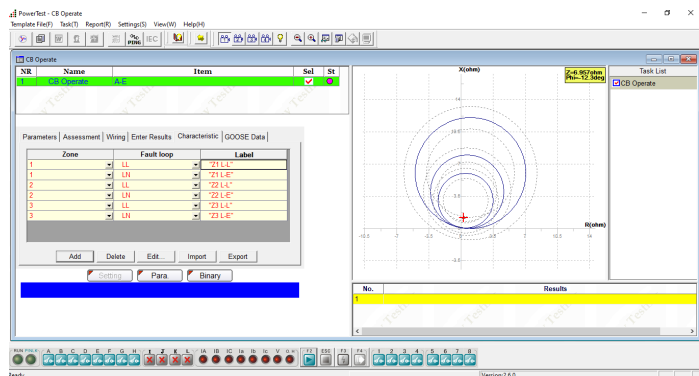
Harmonic

- ❖ Can generate harmonics for all voltage and current outputs
- ❖ Can check the 2nd /3rd / 4th /5th harmonic restraint of current differential
- ❖ Can check the harmonic measurement of the relay up to 31st harmonic
- ❖ Can set the harmonic for each channel separately



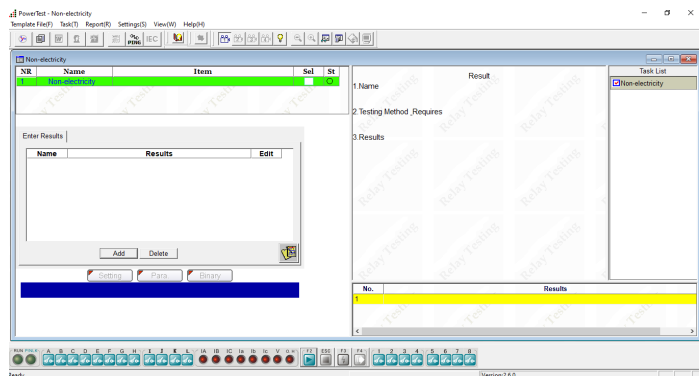
CB Operate

- ❖ Can check different types of line protection system, including over current, distance, etc.
- ❖ Can check the whole relay system, including auto-reclosing and circuit breaker simulate
- ❖ Can set different fault type
- ❖ Can do end-to-end test with GPS control mode



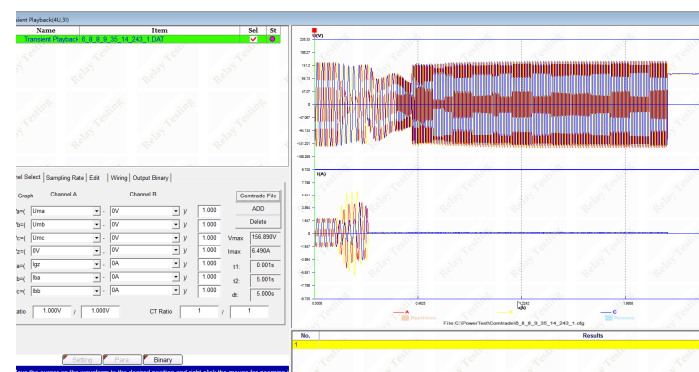
Non-electricity

- ❖ Give tips before and after testings to have test scheme prepared well and finished well
- ❖ Neither has any output value nor judge the binary input. It only generates a complete report for project check from appearance and safety.



Transient Playback (4V,3I)

- ❖ Can play back the COMTRADE format file which records 4 voltage channels and 3 current channels
- ❖ Display the waveform and data of the imported COMTRADE file





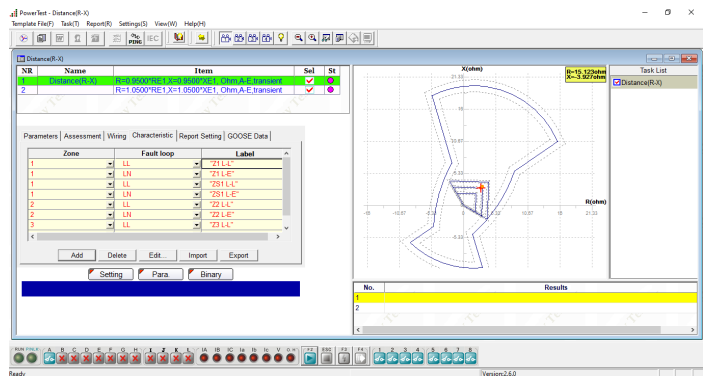
Protection Package

In protection package, there more testing modules for relay's characteristics testings, such as Distance, Differential, Directional, Time Inversed Current, Time Inversed Voltage, Frequency, Auto-Reclosing, etc.



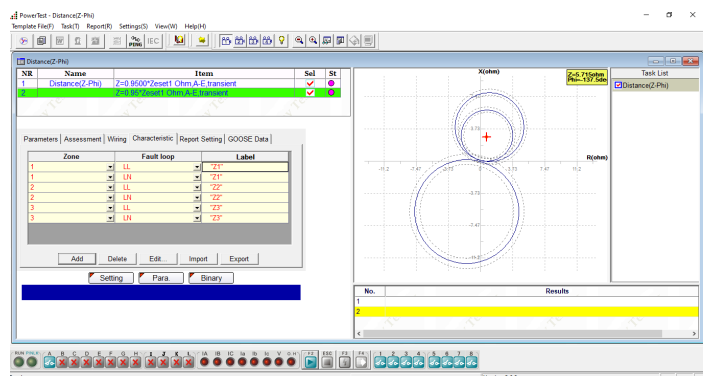
Distance (R-X)

- ❖ Can test impedance relay with R-X setting in different ways
- ❖ Input impedance characteristic to Z plain
- ❖ Associate the characteristic with relay settings
- ❖ Select test point/ items directly on Z plain or in setting box
- ❖ Zone verification
- ❖ Z-T test
- ❖ Edit new characteristic



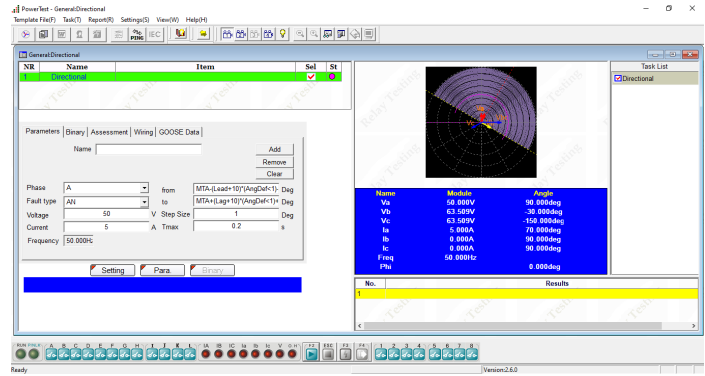
Distance (Z-Phi)

- ❖ Can test impedance relay with Z-Phi setting in different ways
- ❖ Input impedance characteristic to Z plain
- ❖ Associate the characteristic with relay settings
- ❖ Select test point/ items directly on Z plain or in setting box
- ❖ Zone verification
- ❖ Z-T test
- ❖ Edit new characteristic



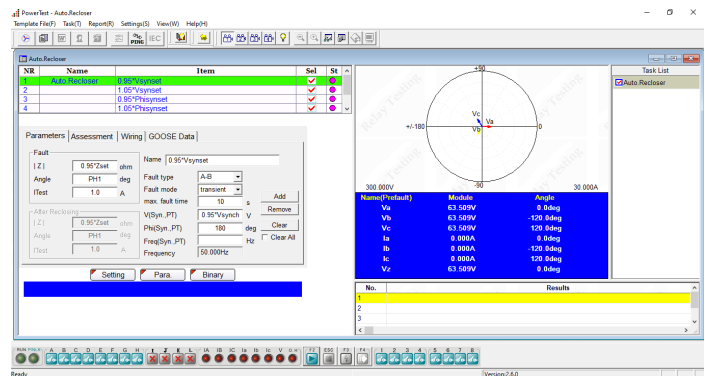
Directional

- ❖ Can search maximum torque angle and two boundary angles (Lead and lag angles)
- ❖ Can set angle define, V lead I or I lead V
- ❖ Can set fault type, single phase, phase-phase or three phase fault



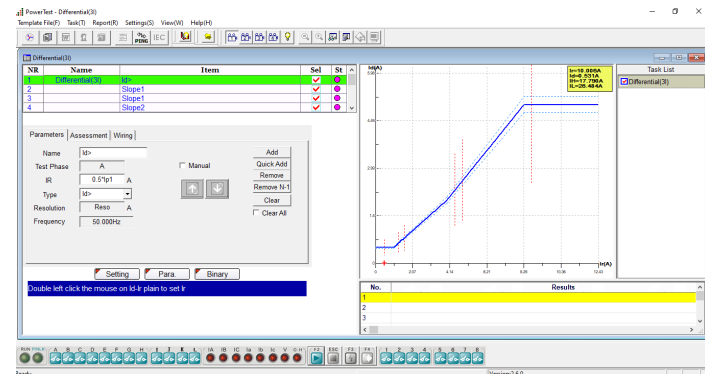
Auto-Reclosing

- ❖ Can test the reclose function
- ❖ Realize relay automatic reclosing with checking the difference between two systems, checking the synchronization setting, reclose set time checking and automatic evaluating of testing results.



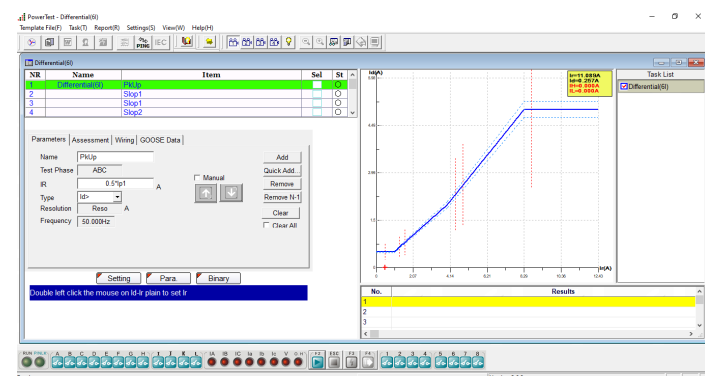
Differential (3I)

- ❖ Can search out the percentage restraint curve, harmonic restraint, trip time for single phase fault
- ❖ Can search the percentage restraint curve
- ❖ Can check 2nd harmonic restraint
- ❖ Can check 3rd harmonic restraint
- ❖ Can check 5th harmonic restraint
- ❖ Can check tripping time of set points



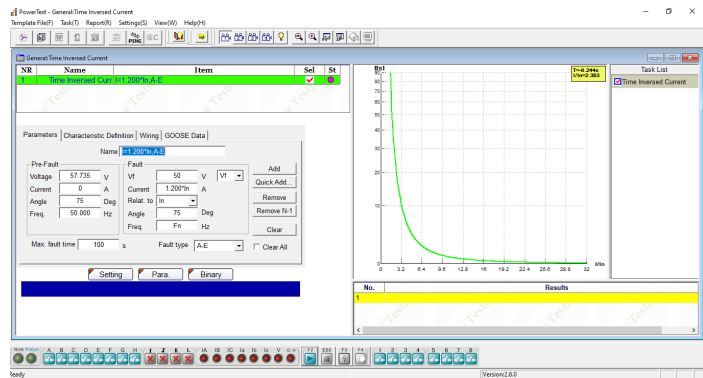
Differential (6I)

- ❖ Suitable for 6 output current channels' relay tester, such as transformer, generator and bus bar etc. differential protection equipment test
- ❖ Realizes the two sides 3 phase/phase-phase/single phase test between relay tester and relay equipment.
- ❖ Can search the percentage restraint curve, harmonic restraint, trip time



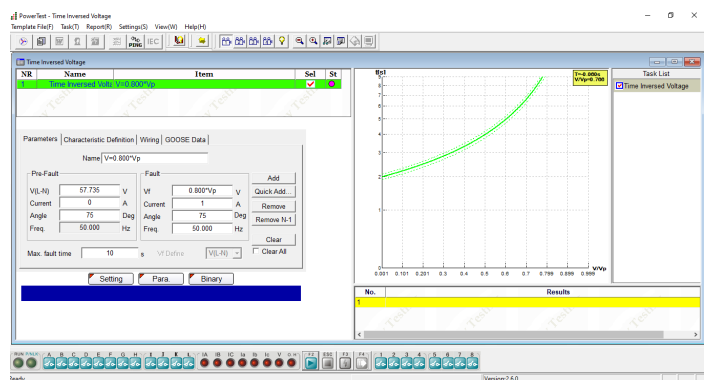
Time Inversed Current

- ❖ Realize the directional over-current test and non-directional over-current test
- ❖ Include testing positive sequence, negative sequence and zero sequence inverse-time over-current, definite-time over-current, over-heat protection.
- ❖ Can import the IEC and IEEE standard curve or user defined curve



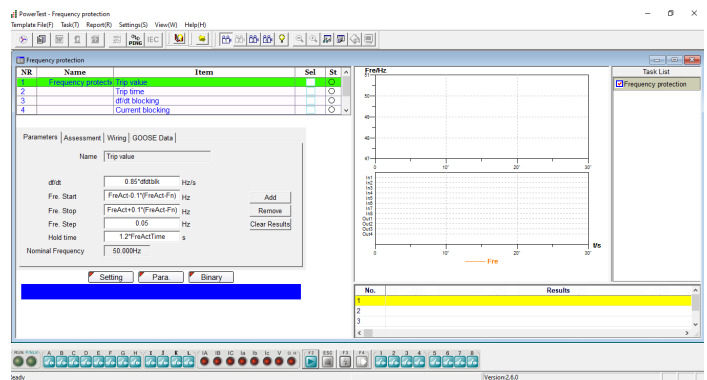
Time Inversed Voltage

- ❖ Can test time inverse over voltage and time inverse under voltage relay
- ❖ Include testing directional, time definite and with time delay voltage relay
- ❖ Can simulate three phase, phase-earth fault, and phase-phase fault



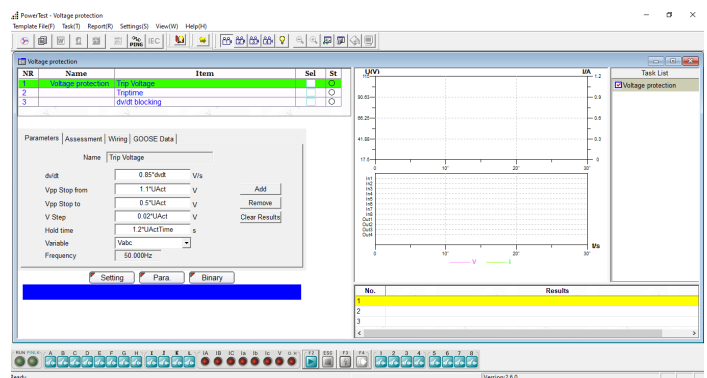
Frequency Relay

- ❖ Can test frequency protection relay, such as over frequency, under frequency, df/dt trip, df/dt blocking
- ❖ Including pick up frequency, trip time, df/dt setting value, voltage blocking value and current blocking value test



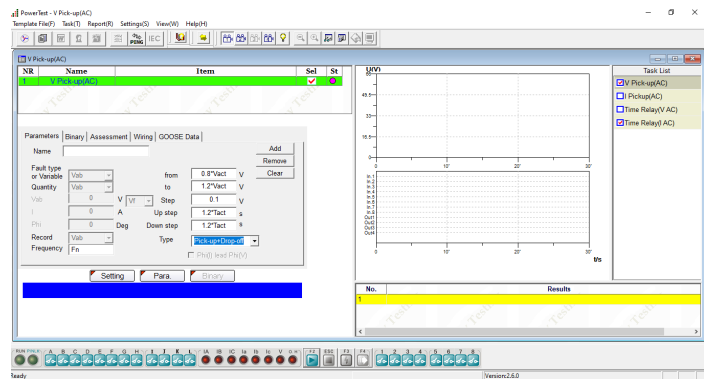
Voltage Relay

- ❖ Can test voltage protection relay including under voltage and over voltage
- ❖ Can test pick up voltage, trip time and dv/dt setting value



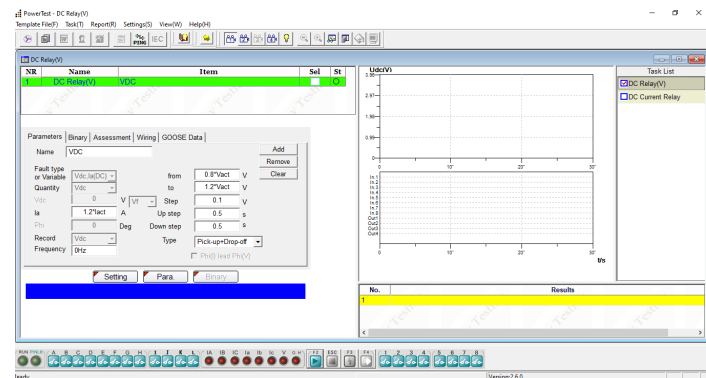
U. I. T Relay (AC)

- ❖ Can test AC type auxiliary/intermediate relay and AC type time relay
- ❖ Can test AC voltage type electromagnetic relay
- ❖ Can test AC current type electromagnetic relay
- ❖ Can test electromagnetic time relay picked-up by AC voltage
- ❖ Can test electromagnetic time relay picked-up by AC current



U. I. T Relay (DC)

- ❖ Can test DC type voltage relay. Auxiliary DC source Vdc is used for this test. Also DC current can be generated for some relays when it is required.
- ❖ Can test DC type current relay. Current source is used for this test. DC voltage can be generated for some relays when it is required.



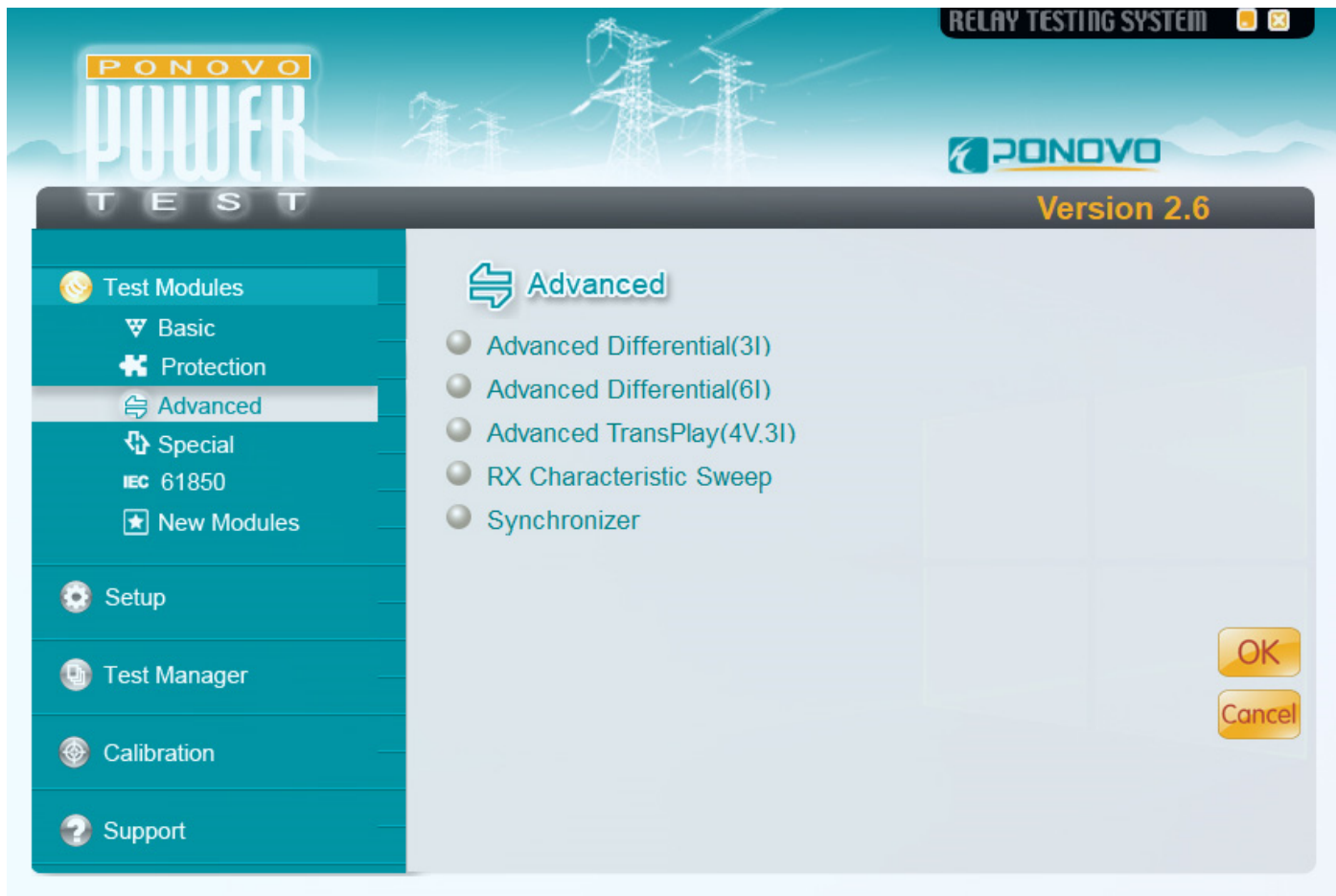
Test Examples On Site





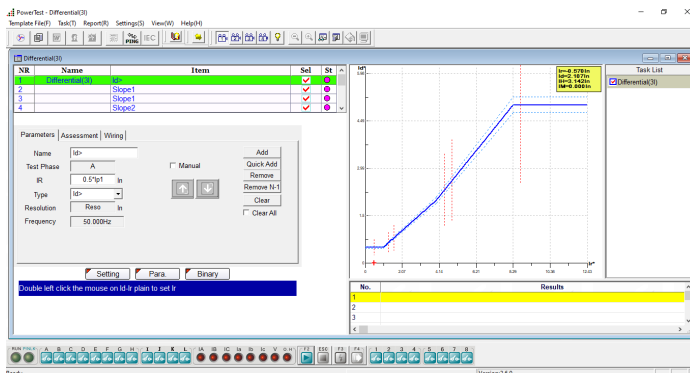
Advanced Package

In the advanced package, the centralization testing the RX Characteristic Sweep, testing for distance relay, Advanced Differential, Advanced Transplay, Synchronization, etc.



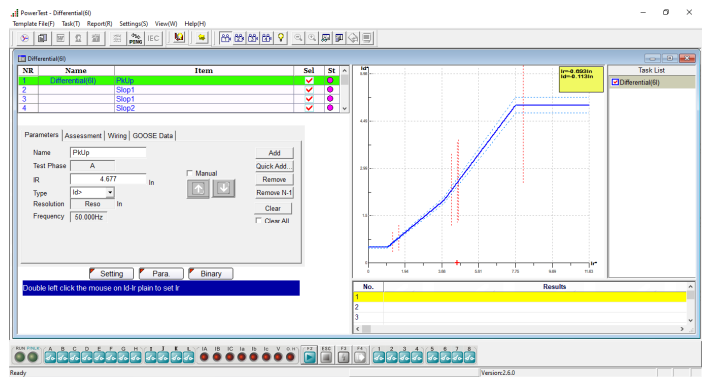
Advanced Differential (3I)

- ❖ Can search the percentage restraint curve, harmonic restraint, trip time for single phase fault
- ❖ Can automatic to calculate the matching factor via the transformer parameter and CT/PT parameter
- ❖ Only check single phase fault



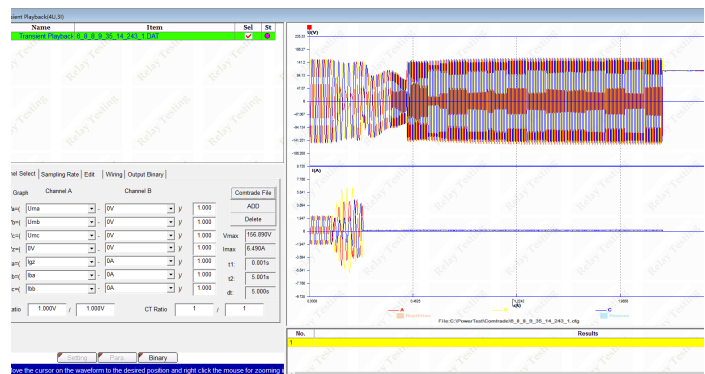
Advanced Differential (6I)

- ❖ Can search the percentage restraint curve, harmonic restraint, trip time
- ❖ Can automatic to calculate the matching factor via the transformer parameter and CT/PT parameter
- ❖ Can test single phase, phase-phase, three-phase fault



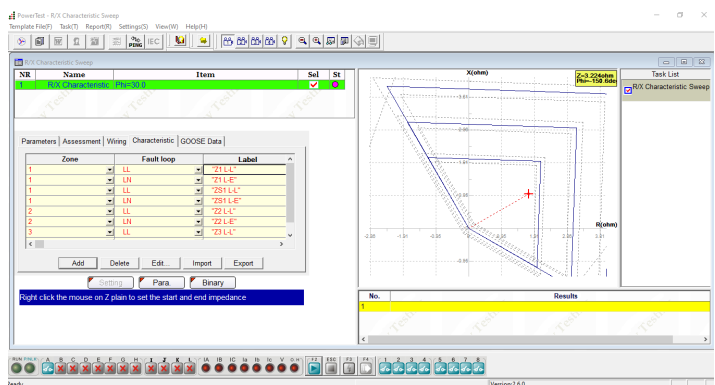
Advanced TransPlay(4V,3I)

- ❖ Can play back the COMTRADE format file, including CFG, which describe signal names, sampling frequencies, etc. and DAT which contains the sampling values for each channel.
- ❖ Can edit the COMTRADE data



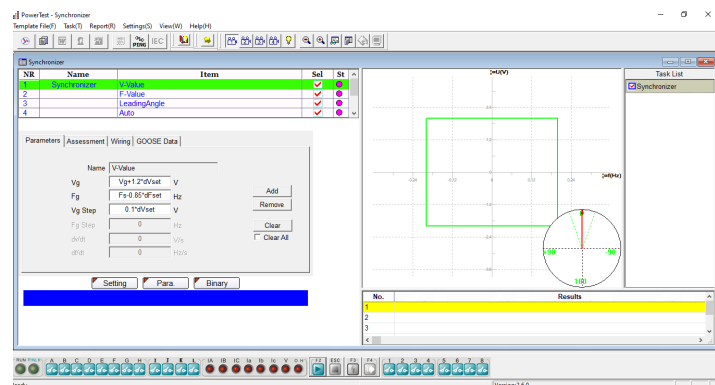
RX Characteristic Sweep

- ❖ Can search the characteristic boundary of the impedance relay
- ❖ Can find out the boundary at different angles



Synchronizer

- ❖ Can check synchronizing relay
- ❖ Can check voltage difference
- ❖ Can check frequency difference
- ❖ Can check leading time and leading angle
- ❖ Can check pulse width for frequency adjustment
- ❖ Can check pulse width for voltage adjustment
- ❖ Can check auto-adjusting function with both voltage and frequency varying





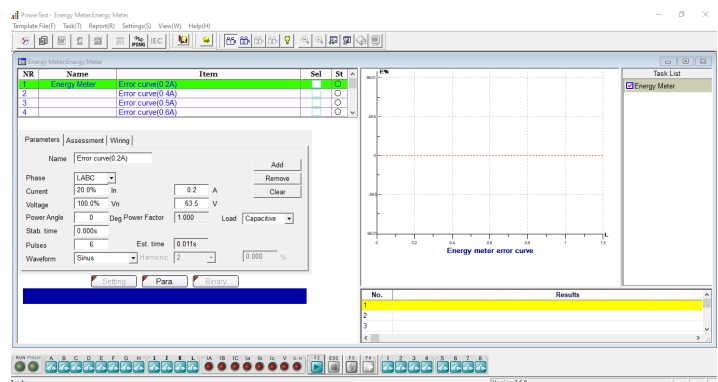
Special Package

In the special package, there are energy meter module, high burden, power swing simulation, and transducer.



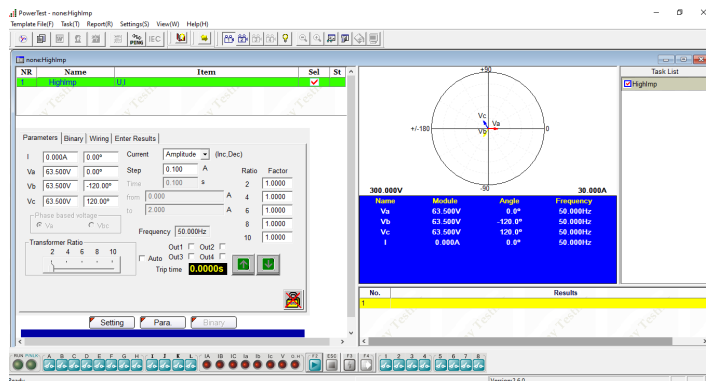
Energy Meter

- ❖ Can check the functionality and accuracy of energy meter with or without optional accessory PACB108
- ❖ 1-phase or 3-phase energy meters can be checked
- ❖ Active power meter, reactive power meter, and apparent power meter can be checked



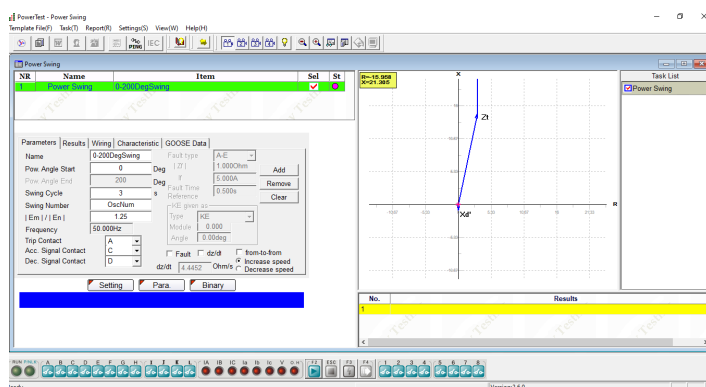
High Burden Relay (Optional)

- ❖ Can test trip current, time and direction of high burden relay, with PONOVO tester and accessory PHPC01
- ❖ Both manual and auto methods can be applied



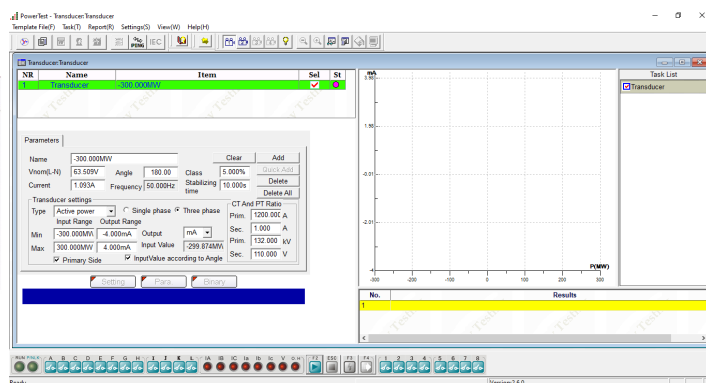
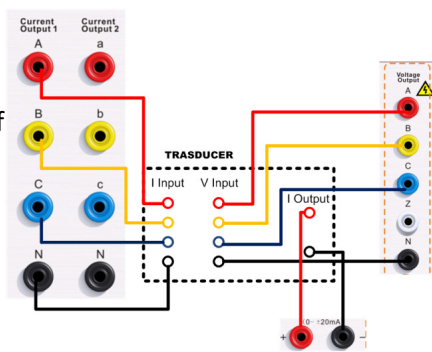
Power Swing Simulation

- ❖ Can really simulate the oscillations in power flow reference the power parameter
- ❖ Can simulate Out-Of-Step and Stable swing
- ❖ Can simulate increase and decrease swing
- ❖ Can be a tool for relay test engineer to observe the relay behavior during dynamic power swing process.



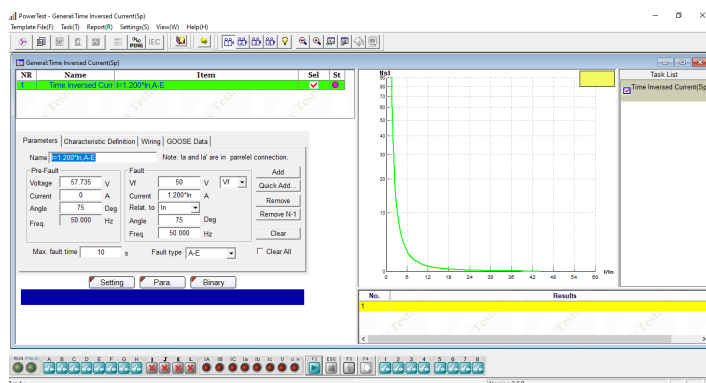
Transducer

- ❖ Can check accuracy of transducer



Time Inversed Current (Sp) (optional)

- ❖ Only valid for PONOVO relay tester PW636i
- ❖ Realize the directional over-current test and non-directional over-current test
- ❖ Include testing positive sequence, negative sequence and zero sequence inverse-time over-current, definite-time over-current, over-heat protection or the customized "Current/Time" operation characteristics





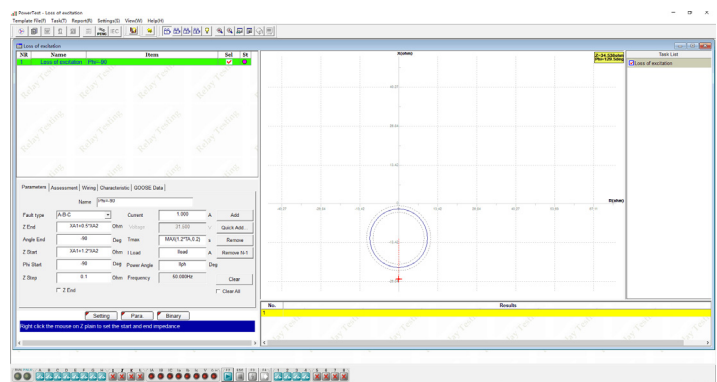
New Modules

In the New Modules package, there are loss of excitation, QuickTest(harmonic), Transplay(6V,6I), QuickTest(low level) modules.



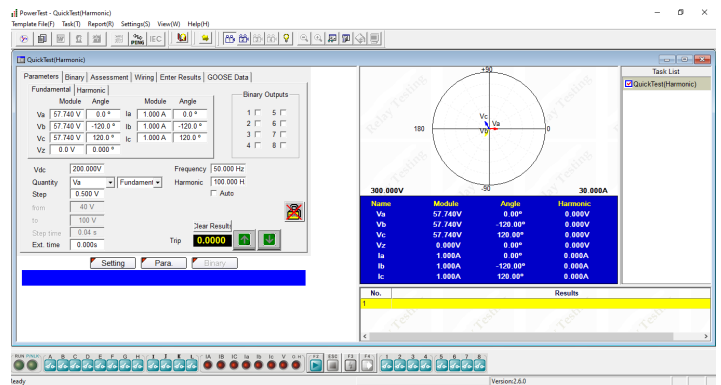
Loss of excitation

- ❖ Can search for two different excitation loss characteristics
- ❖ During the test process a series of shots will be generated to search out the boundary along this shot line. Then next shot at a different angle will be generated. In this way we can then find out the boundary at different angles.



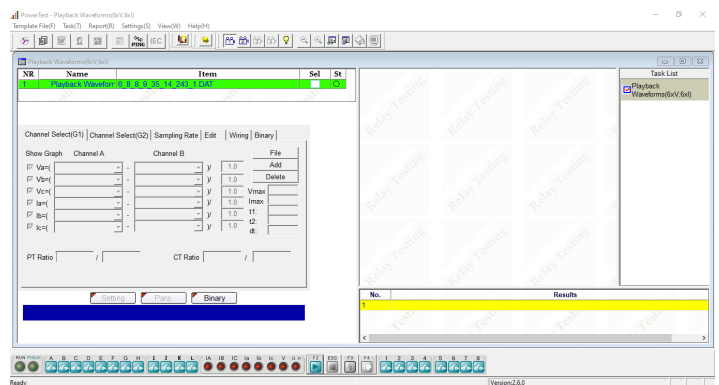
QuickTest (Harmonic)

- ❖ Can automatically and manually superposition harmonics with user-defined frequency
- ❖ The fundamental and harmonic of voltage and current sources can be controlled independently



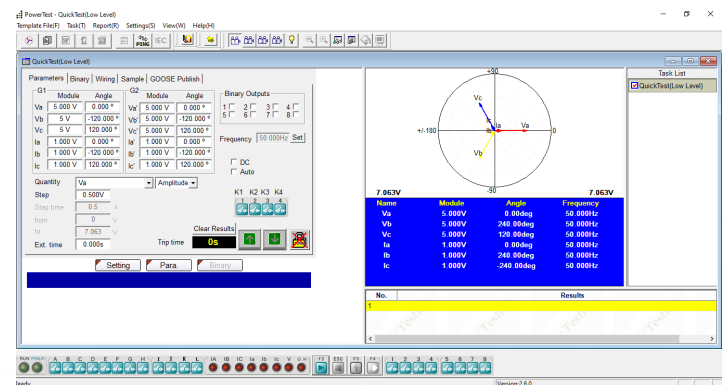
Transplay (6V, 6I)

- ❖ Can play back the COMTRADE format file which records 4 or 6 voltage channels and 6 current channels
- ❖ Display the waveform and data of the imported COMTRADE file



QuickTest (Low Level) (Optional)

- ❖ 12 low level voltage sources available for test purpose



Beside those standard test modules, the protection relay test procedure also offers the relay templates for the automatic testing. Every relay template is created based on each different relay types with same setting values and characteristics included so that the customer can use the templates to conduct automatic relay test procedures. Now on our website, there are already more than 500 different relay types, you can download it free to use for your testing.



PONOVO Template Service

PONOVO provides relay test templates based on relay model from different relay manufacturers. With the use of template, the relay test work can be simplified greatly. Each relay test template is one independent file which can be opened in PowerTest relay test software. Registered users can download Basic Template for free use. Customers can contact us to get Customized Test Templates.

The screenshot displays the PONOVO POWER TEST software interface, Version 2.6. The main window features a teal sidebar with navigation options: Test Modules (Basic, Protection, Advanced, Special, IEC 61850, New Modules), Setup, Test Manager (highlighted), Calibration, and Support. The main area shows the Test Manager interface with icons for Templates, Report, and Test Plan.

An 'Open' dialog box is overlaid on the main window, showing the file explorer for 'My Templates'. The dialog lists several template files:

Name	Date modified
1V6I	6/24/2022 3:15 PM
Differential	6/24/2022 3:15 PM
Distance	8/17/2020 4:44 PM
Distance(R-X).tpl	8/13/2020 10:43 AM
Distance(Z-Phi).tpl	8/13/2020 10:43 AM

The dialog also shows the file name field set to '.TPL' and the file type set to '*.tpl'. The 'Open' and 'Cancel' buttons are visible at the bottom right of the dialog.

Below the main interface, several smaller screenshots show the software's internal components, including parameter settings for various test modules and graphical plots of test results.

More Templates can be download from our website www.ponovo.net



- | | | | | | | | |
|----------|------------|--------|--------|--------|--------|-------------|----------|
| • CAG17 | • CTU | • P115 | • P142 | • P343 | • P438 | • P941 | • VAGM22 |
| • CTIG | • DIFB | • P120 | • P143 | • P344 | • P441 | • P942 | • VAPM |
| • CTIGM | • MFVUM | • P121 | • P144 | • P345 | • P442 | • P943 | • P632 |
| • CTMFMM | • Micromho | • P122 | • P145 | • P430 | • P443 | • PPX | • P633 |
| • CTMM | • MVAPM | • P123 | • P241 | • P433 | • P921 | • PVMM | • P634 |
| • CTNM | • MWTU | • P124 | • P242 | • P435 | • P922 | • Quadromho | • P642 |
| • CTT | • Optimho | • P127 | • P243 | • P436 | • P923 | • SKE | • P643 |
| • CTTM | • P111 | • P141 | • P342 | • P437 | • P940 | • SKD | • P645 |



- | | | | |
|----------|----------|----------|----------|
| • LZ96 | • REB670 | • REL350 | • REL531 |
| • REG100 | • REC670 | • REL352 | • REL561 |
| • REL511 | • REF542 | • REL356 | • REL650 |
| • REL531 | • REG216 | • REL511 | • REL670 |
| • MSOC | • REL300 | • REL512 | |
| • RAZFE | • REL316 | • REL521 | |



- | | | |
|----------|---------|----------|
| • 7RW600 | • 7SD5 | • 7ST6 |
| • 7SA6XX | • 7SD52 | • 7UM61 |
| • 7SA511 | • 7SD63 | • 7UM62 |
| • 7SA513 | • 7SJ61 | • 7UM512 |
| • 7SA518 | • 7SJ63 | • 7UM515 |
| • 7SA519 | • 7SJ80 | |
| • 7SA522 | • 7SS52 | |



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|-----------|-----------|
| • SEL300 | • SEL411 |
| • SEL351 | • SEL311C |
| • SEL587 | • SEL311L |
| • SEL311B | • SEL321 |
| • SEL487B | • SEL421 |
| • SEL487E | • SEL501 |
| • SEL167 | • SEL587 |



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|-----------|-------------|
| • PCS-902 | • PCS-9611 |
| • RCS-915 | • PCS-902H |
| • RCS-931 | • PCS-931D |
| • RCS-993 | • PCS-9611C |
| • RCS-902 | |



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|---------|---------|
| • SR489 | • D60 |
| • SR745 | • DLDP |
| • F650 | • G30 |
| • SR750 | • L90 |
| • GT60 | • GE345 |



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| • SEPAM 10 |
| • SEPAM 80 |
| • SEPAM 2000 |
| • SEPAM S42 |
| • T20 |



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| • MRA4 |
| • MRDT4 |
| • MRI4 |
| • MRM |
| • MRN |



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| • GRB100 |
| • GRD110 |
| • GRD140 |
| • GRD150 |
| • GRF100 |
| • GRL100 |



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| • F_PRO |
| • L_PRO |
| • T_PRO |



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| • VAMP 255 |
| • VAMP 265 |



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| • 326GD |
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| • PCT210 |
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