



PW866i

Protection Relay Tester

PONOVO POWER CO., LTD.
www.ponovo.net





PW866i Protection Relay Tester



PW866i (6×32A, 4×300V) Protection Relay Tester could be used for testing different kinds of relay, also supports testing IEC61850 combined relays. The test function and features are similar with PW636i. The main difference between PW866i and PW636i is that PW866i has the local control system, with 10.4inch touch screen based on Windows system, a mouse and digital input keys, an Ethernet port used for connect with PC and 2 USB ports to facilitate data transmission. It can be used in power plants, substations, and relay manufactures, etc.

Product Features

- ❖ Current output 6x32A/450VA, 3x64A, 1x180A
- ❖ Voltage output 4x300V/75VA, 1x600V
- ❖ Aux DC (0-300V)
- ❖ 12 binary inputs, 8 binary outputs
- ❖ Support both local control with 10.4inch touch screen and PC control with PowerTest software
- ❖ Support the test of IEC61850 complied relay
- ❖ In-built monitoring and recording
- ❖ More than 500 relay templates offered freely for different relay templates to do automatic testings
- ❖ Support importing setting value of relays via CSV, XPIO/RIO PONOVO's Powertest default set files automatically into relay templates



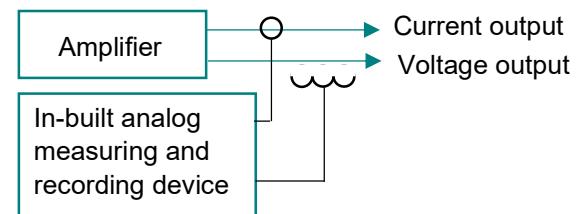
Local control with touch screen for relay testing



PC control for relay testing

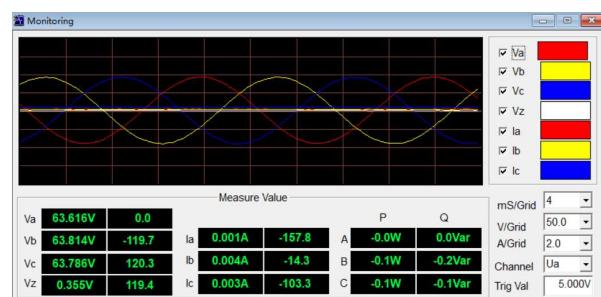
➤ In-built analog monitoring & recording unit

- In-built analog monitoring and recording unit samples the actual current/voltage outputs and real-time output waveform can be displayed in the software.
- Makes it easy to check the correctness of wiring before the test and observe the output during the test process.



➤ Real-time outputs display

- Real-time output waveform display helps the fast troubleshooting of wiring and test circuitry before test actual started.
- User can also use this provision to analyze the external signals, such as phase angle, power, harmonic, etc.



➤ IEC 61850 function

- PW866i provides analog voltage/current signal to relay and the GOOSE message from relay is received and analyzed by relay test set.



Application

▪ Relay test

- Distance protection
- Differential protection
- Directional relay
- Time-inversed current relay
- Auto-reclosing, etc.

▪ Measuring and control device

- Synchronizer
- Transducer
- Energy meter
- df/dt, etc.

▪ System simulation

- Transient, steady-state fault simulation
- Playback of COMTRADE format file

▪ Calibration

- 0.5 Class energy meter
- Disturbance recorder
- Indicating meters, etc.

Test functions according to IEEE relay code

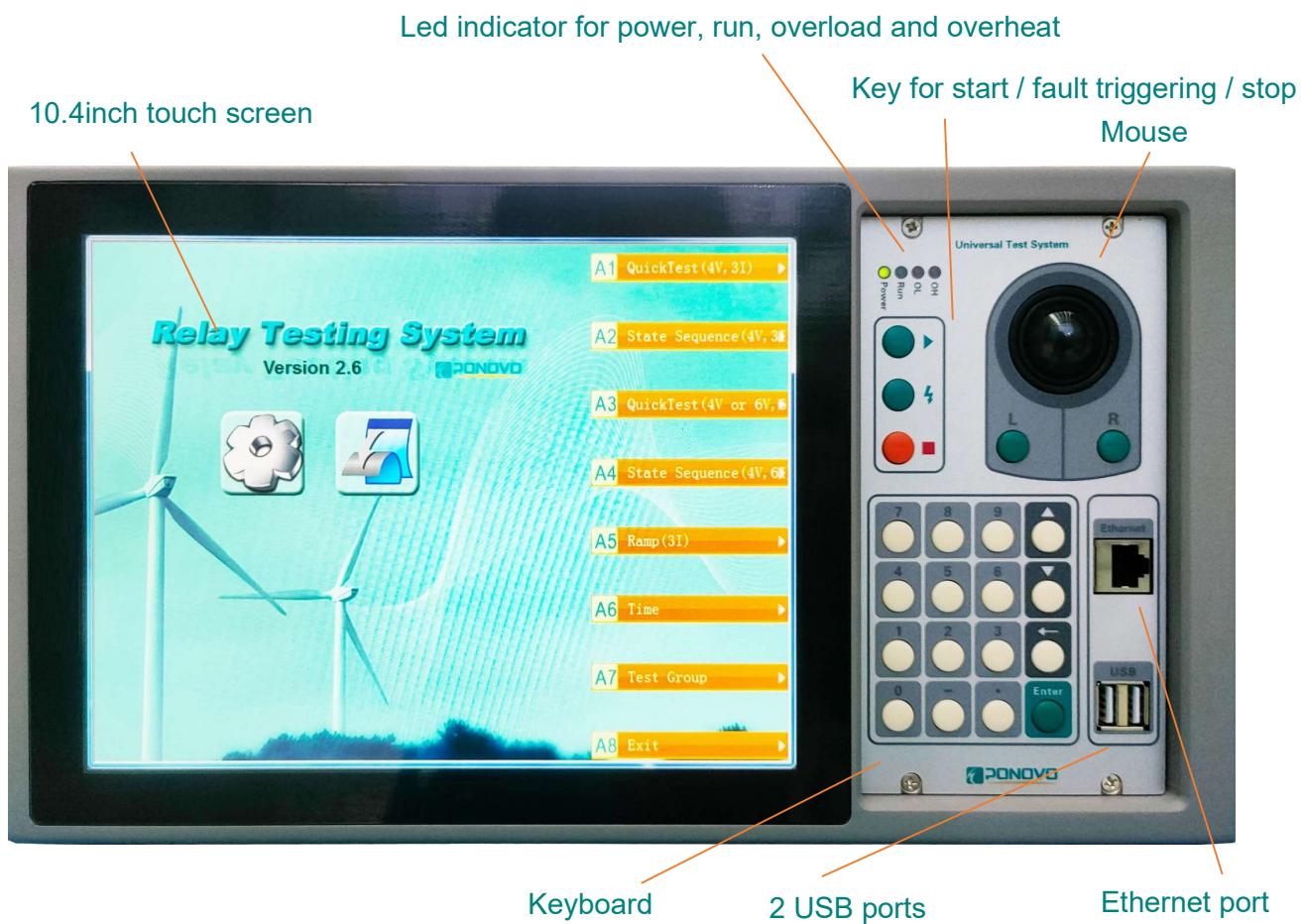
| IEEE.NO. | Device | IEEE. NO. | Device |
|----------|---|----------------------------|--------------------------------------|
| 2 | time delay starting or closing relay | 61 | density switch or sensor |
| 21 | distance relay | 62 | time-delay stopping or opening relay |
| 24 | volts per hertz relay | 64 | ground detector relay |
| 25 | synchronizing or synchronism-check device | 67/67N | AC directional overcurrent relay |
| 27/27N | undervoltage relay | 68 | blocking or "out of step" relay |
| 30 | annunciator relay | 74 | alarm relay |
| 32 | directional power relay | 76 | DC overcurrent relay |
| 36 | polarity or polarizing voltage devices | 78 | phase-angle measuring relay |
| 37 | undercurrent or underpower relay | 79 | AC-reclosing relay |
| 40 | field (over/under excitation) relay | 81/81U/O/R | frequency relay |
| 46 | reverse phase or phase-balance current relay | 82 | DC load-measuring reclosing relay |
| 47 | phase-sequence or phase-balance voltage relay | 85 | carrier or pilot-receiver relay |
| 50/50N | instantaneous overcurrent relay | 86 | lock-out relay |
| 51/51N | AC time overcurrent relay | 87 | differential protective relay |
| 52 | AC circuit breaker | 91 | voltage directional relay |
| 53 | field excitation relay | 92 | voltage and power directional relay |
| 55 | power factor relay | 94 | trip relay |
| 56 | field application relay | Other functions (optional) | IEC61850 |
| 58 | rectification failure relay | | Lower level outputs |
| 59/59N | overvoltage relay | | Transducer |
| 60 | voltage or current balance relay | | Energy meter |

PW866i Protection Relay Tester

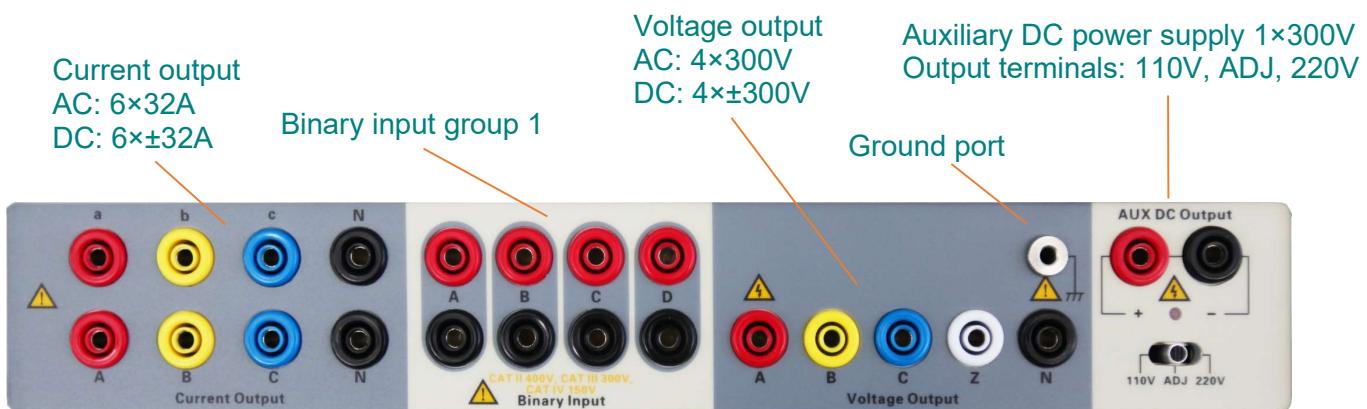
PW866i Panels

PW866i is designed with fuse on the mains supply and electronic protection for overload on the current (open circuit) or voltage outputs (short circuit), with immediate isolation of the output and alarm indication. Also diagnostic message for the setting of wrong data, mistakes on the input etc. There's also electronic protection in case of counter-feed of voltage output, if any incorrectness happens, the alarm light shall flash. And Overheat LED indicator shall flash for protection against over-temperature on all outputs.

▪ Front Panel

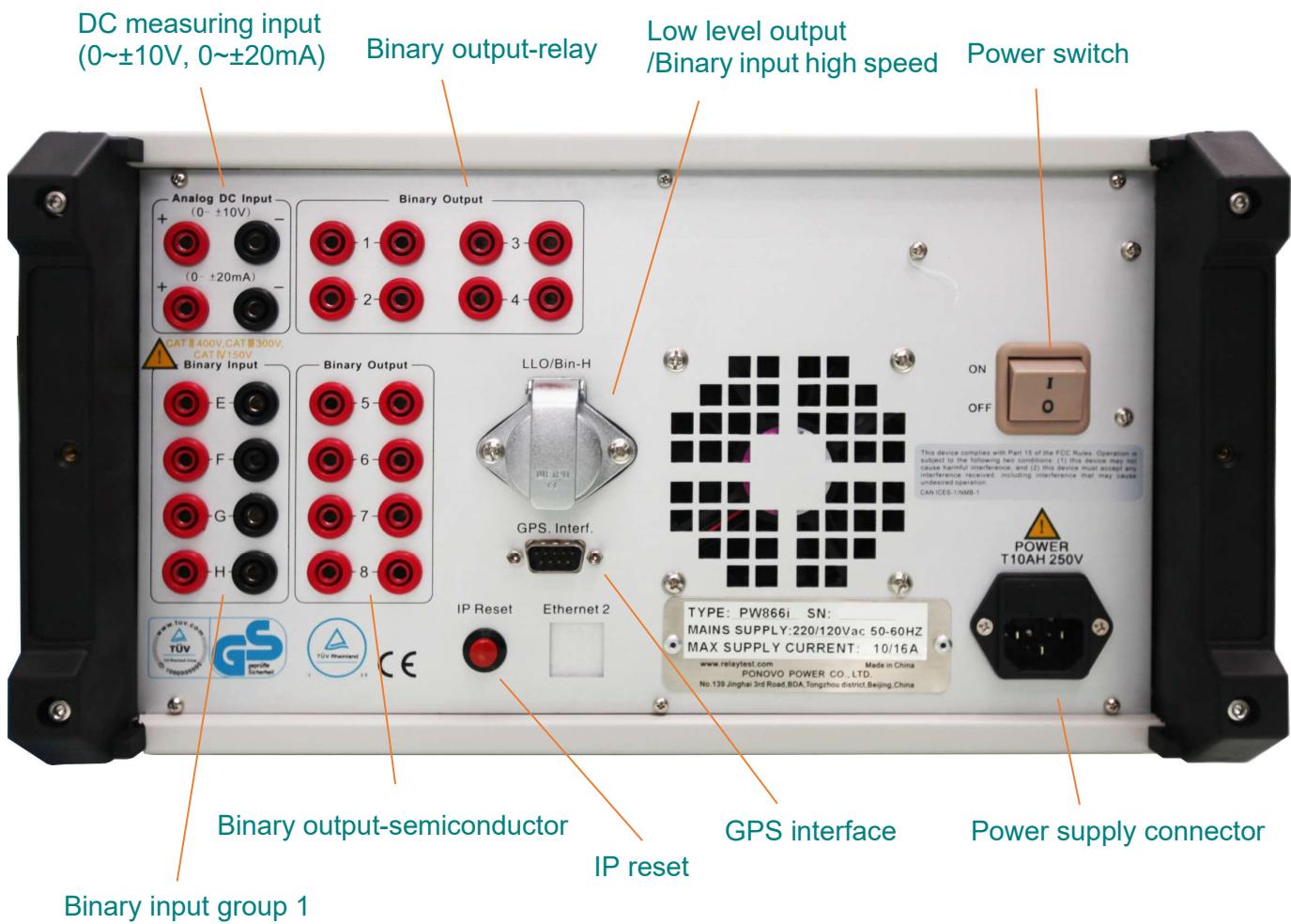


▪ Top Panel



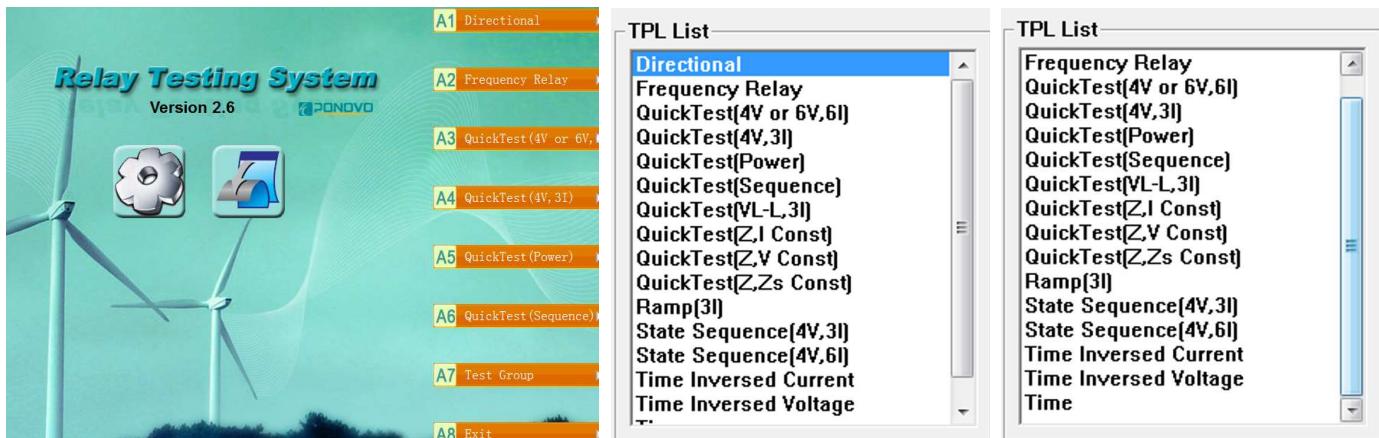
PW866i Protection Relay Tester

▪ Rear Panel



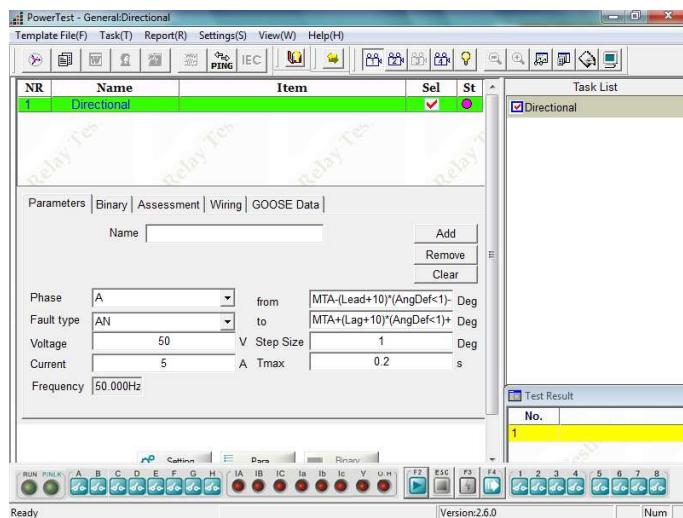
PW866i Local Relay Test Software

Local control system with colored touch screen makes PW866i portable and easy to use. The local software embedded in PW866i is called **PowerTestCut**. There are 16 test modules in the software, including **Directional, Frequency, QuickTest, Ramp, State Sequence, Time Inversed Current, Time Inversed Voltage** and **Time** test modules.



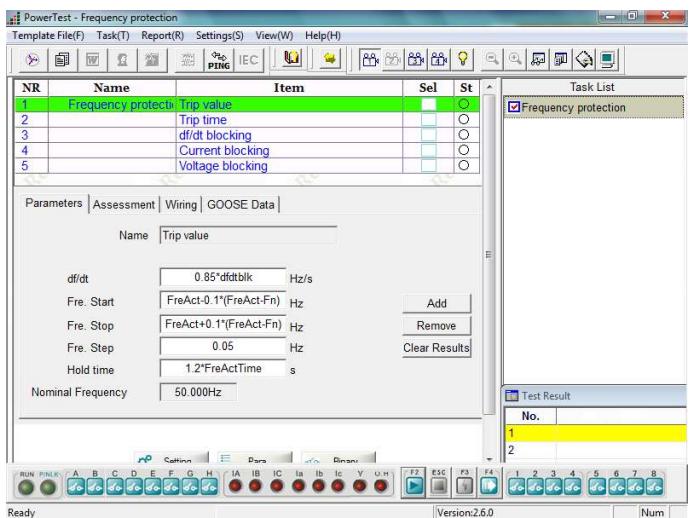
➤ Directional

- ❖ 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, singe phase, phase-phase or three phase fault



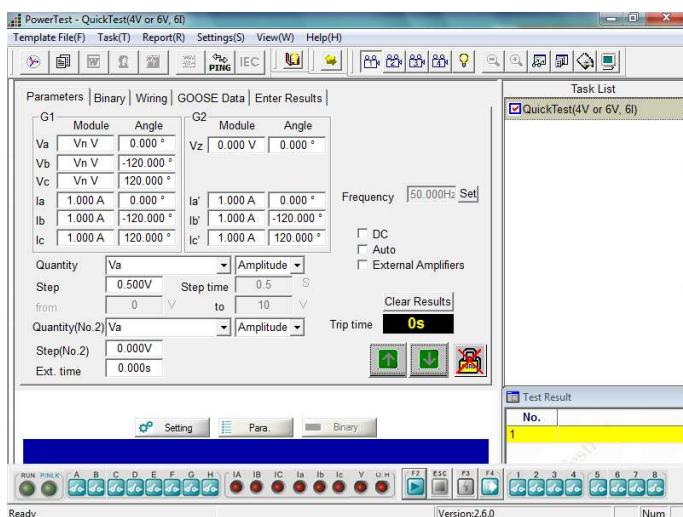
➤ Frequency Relay

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



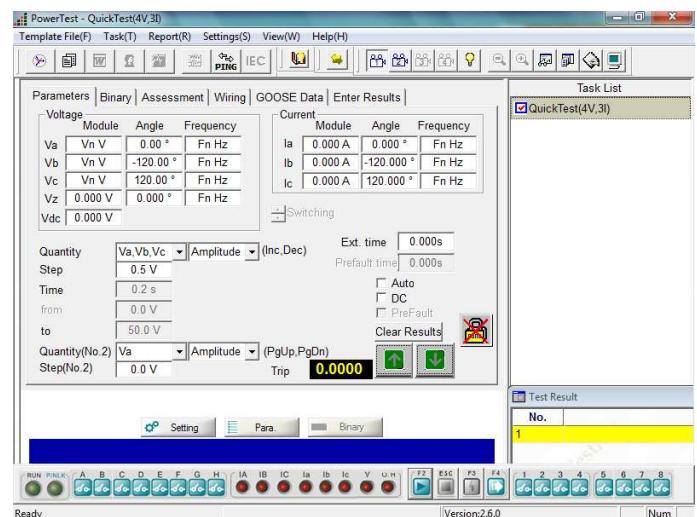
➤ QuickTest (4V,6I)

- ❖ 4 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



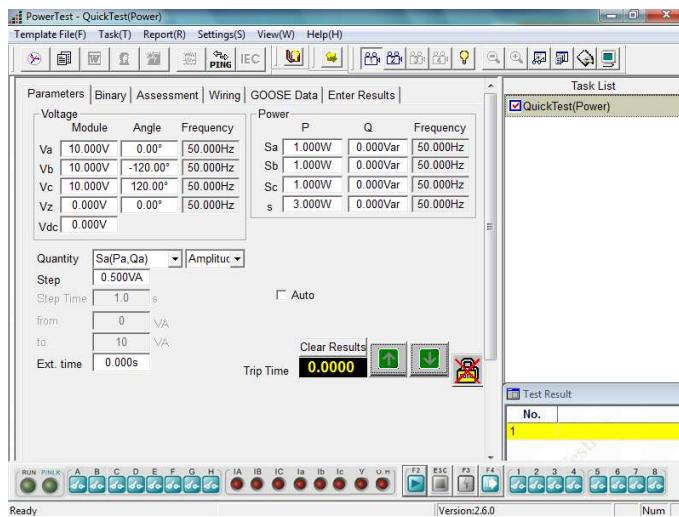
➤ QuickTest (4V,3I)

- ❖ 4 voltage / 3 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



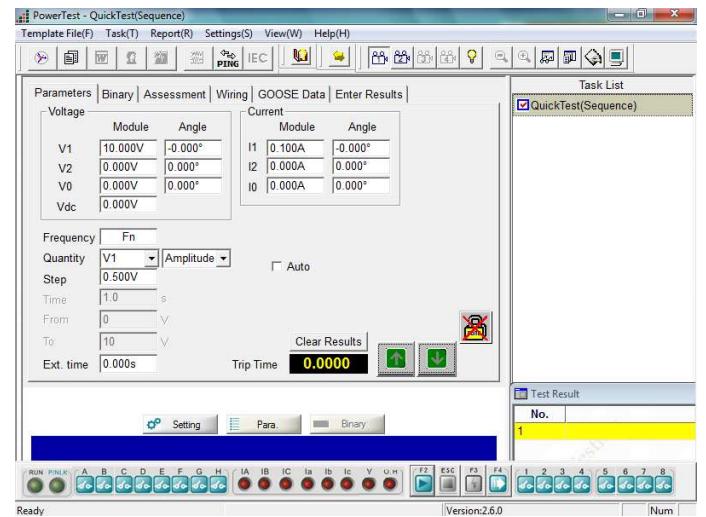
➤ QuickTest (Power)

- ❖ 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
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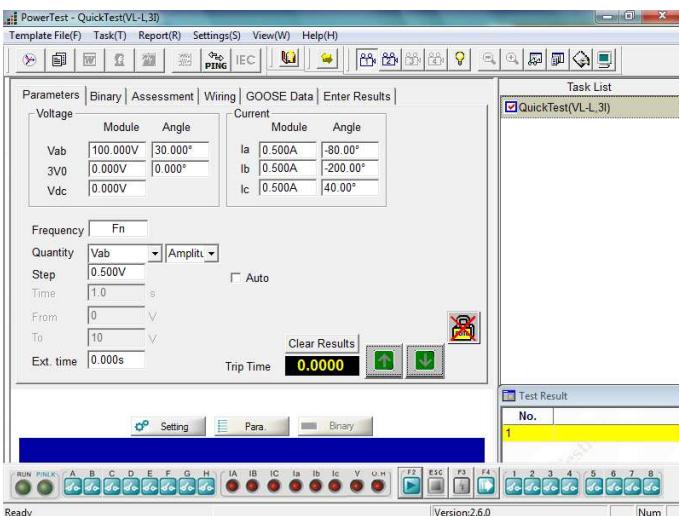
➤ QuickTest (Sequence)

- ❖ 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



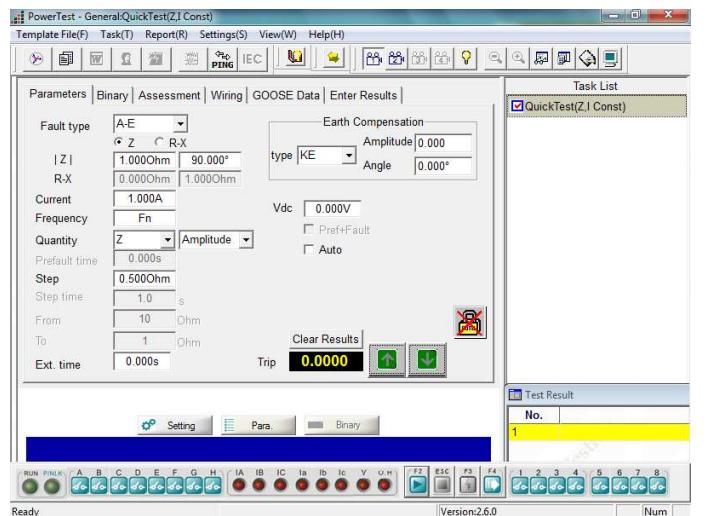
➤ QuickTest (VL-L, 3I)

- ❖ 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



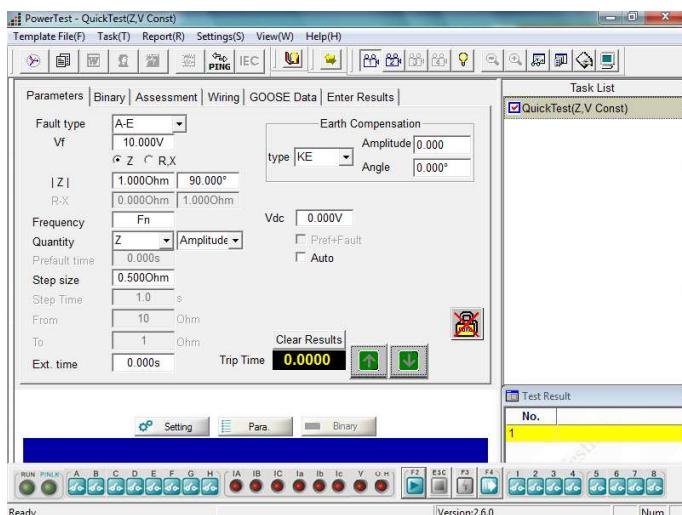
➤ QuickTest (Z, I Const)

- ❖ 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



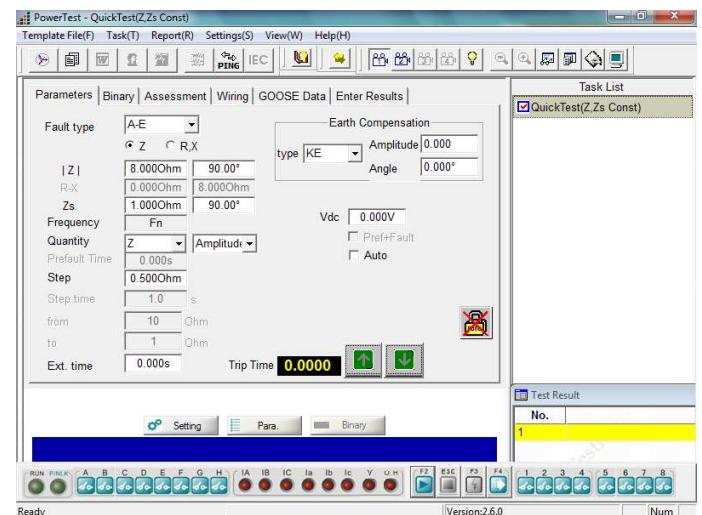
➤ QuickTest (Z, V Const)

- ❖ 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



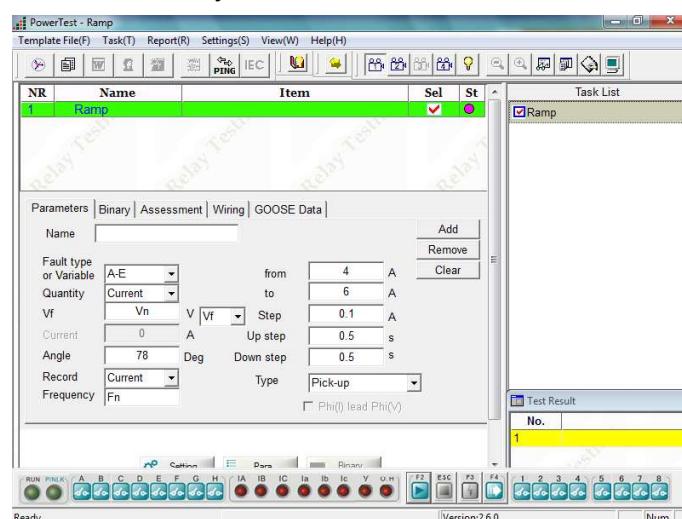
➤ QuickTest (Z, Zs Const)

- ❖ 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



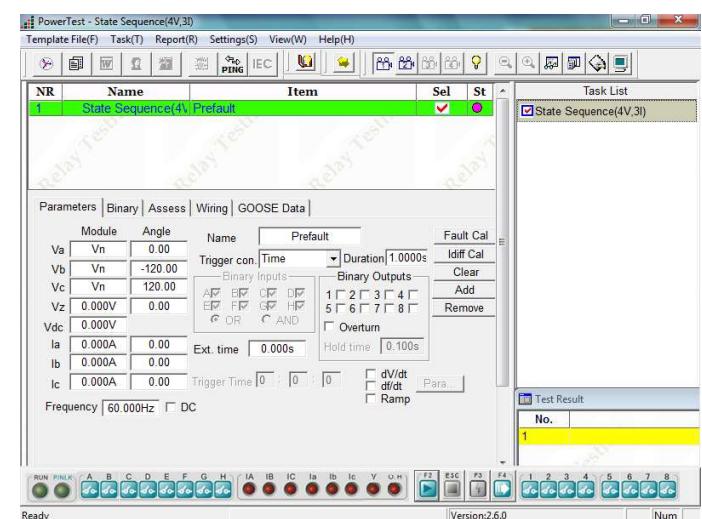
➤ Ramp (3I)

- ❖ 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



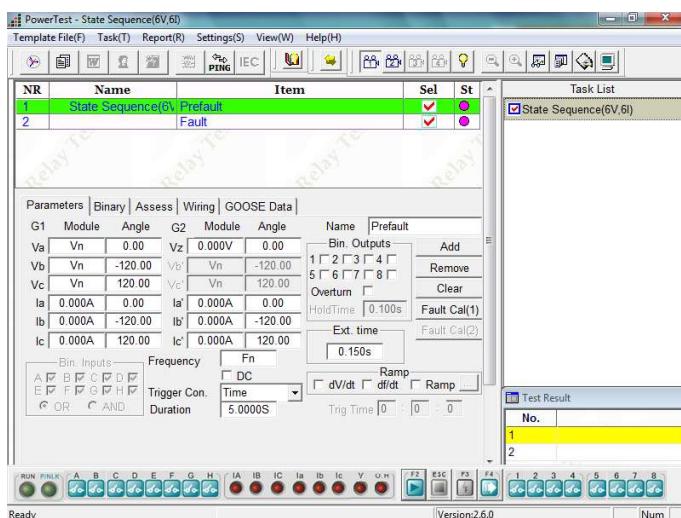
➤ State Sequence (4V, 3I)

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



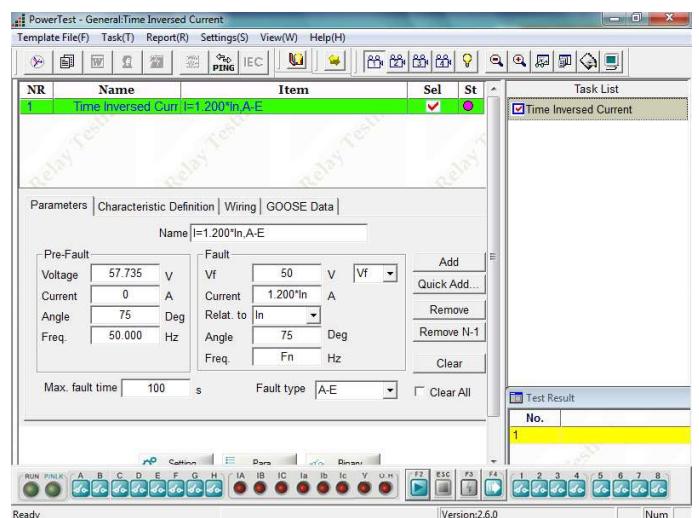
➤ State Sequence (4V, 6I)

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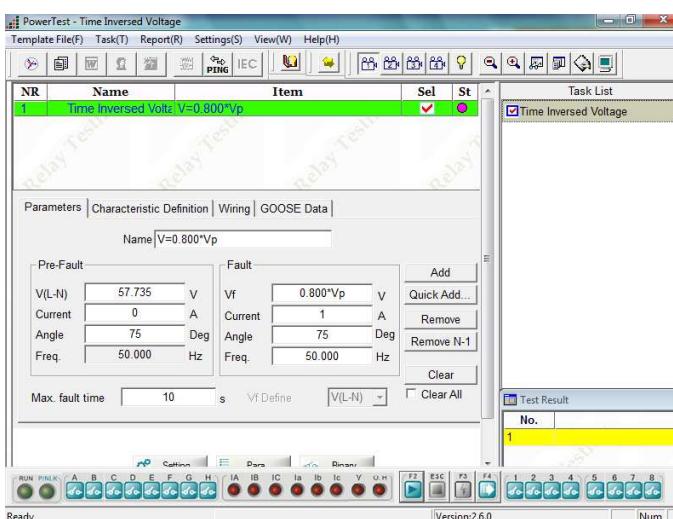
➤ Time Inversed Current

- ❖ 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



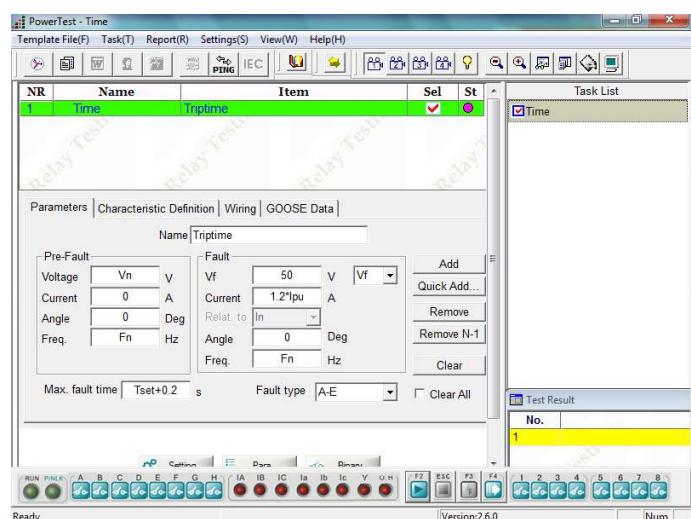
➤ Time Inversed Voltage

- ❖ Can test time inversed 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



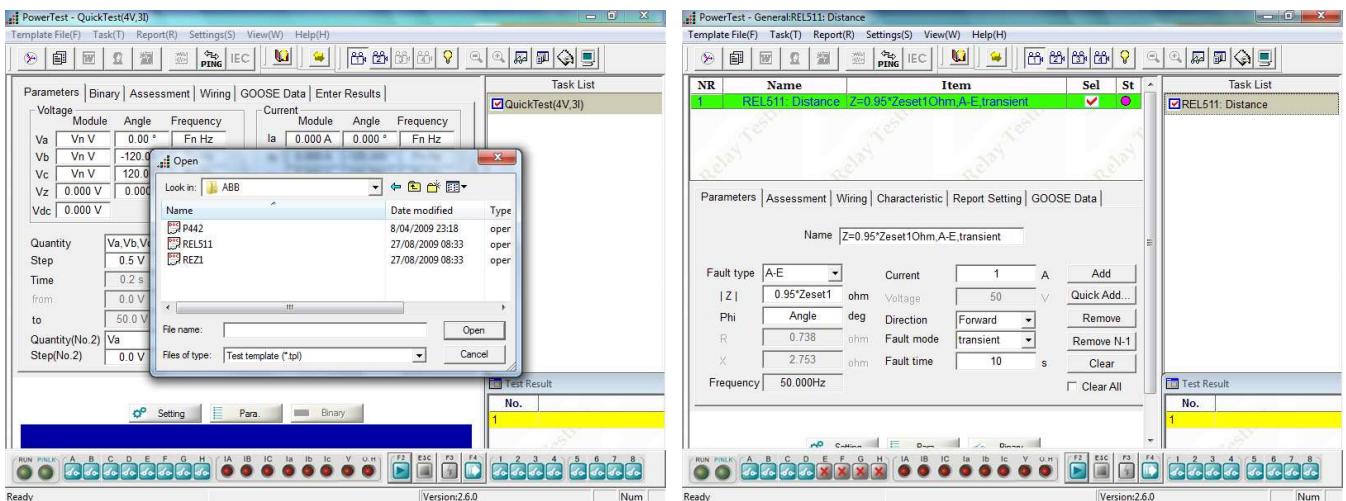
➤ Time

- ❖ Used to test trip time of protection relay
- ❖ Various value can be set separately, such as fault types, fault time, the voltage and current at pre-fault and fault state, etc.



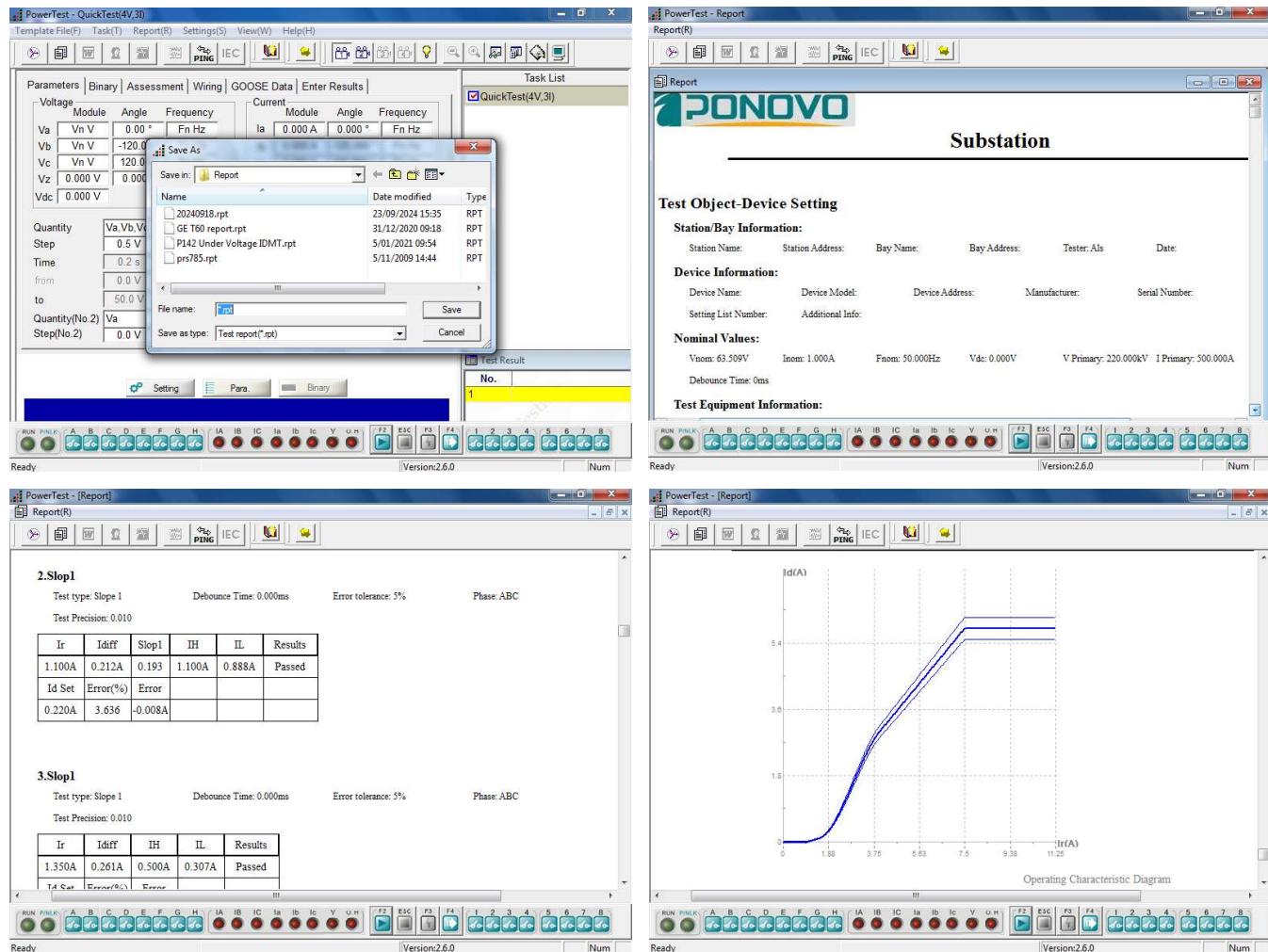
About templates

PW866i supports using relay templates in its local system for testings, which includes more than 400 available relay types for engineer's use for their testings. Register on our website to download the available relay templates for your testing use.



Local Reports

After testing, each test items can be saved report in .rpt format and open it locally. Test object information, test equipment information, system parameters, characteristic curve, binary setting, test setting value, test result (including testing data, operating characteristic diagram, test result assessing), ect.





PowerTest - Relay Test Set Software



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 different kinds of relay testing, and it also has the special package for more testing application, such as transducer, energy meter, etc.

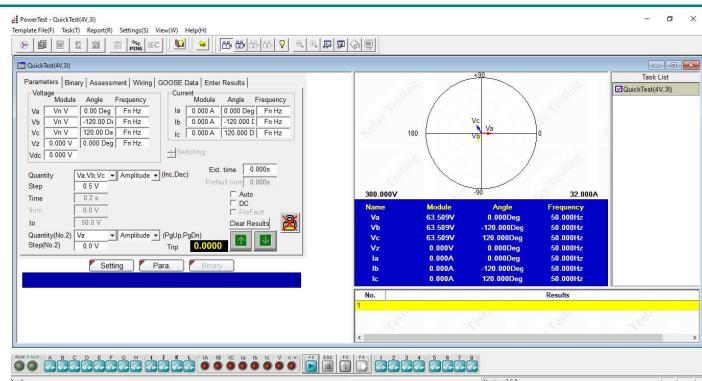
➤ Basic Package

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.



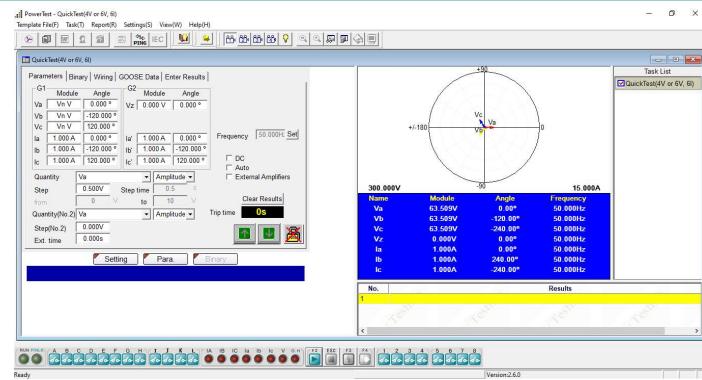
QuickTest (4V, 3I)

- ❖ 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



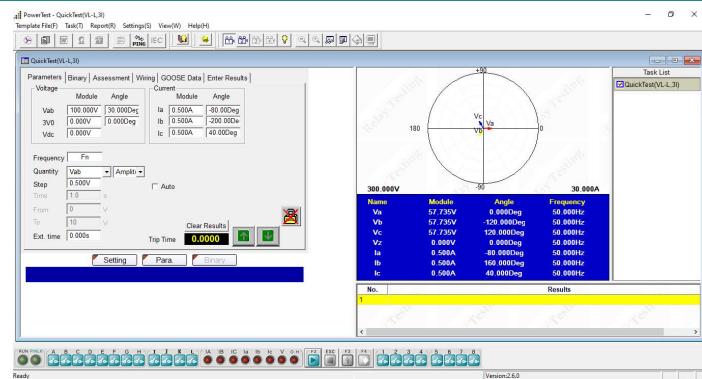
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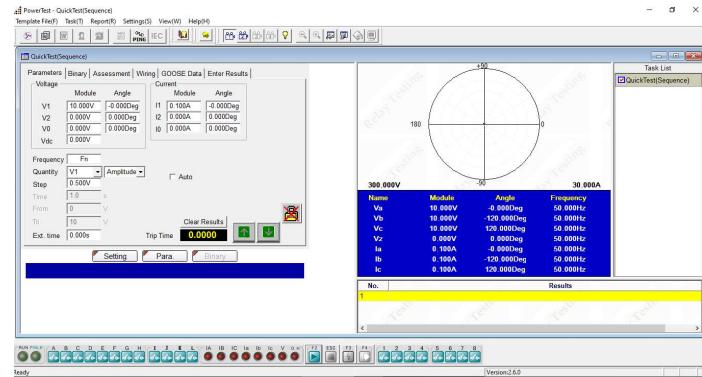
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- ❖ Easy to control the phase-phase voltage, 3V0 (zero sequence voltage) and 3 currents
- ❖ Amplitude, phase angle and frequency of current sources and phase-phase voltage, zero sequence voltage can be controlled independently
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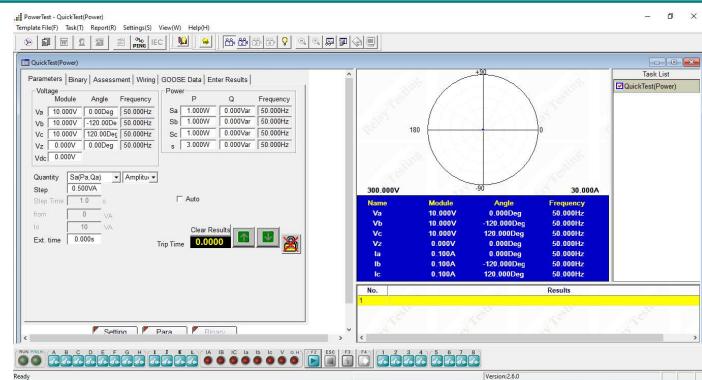
QuickTest (Sequence)

- ❖ 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
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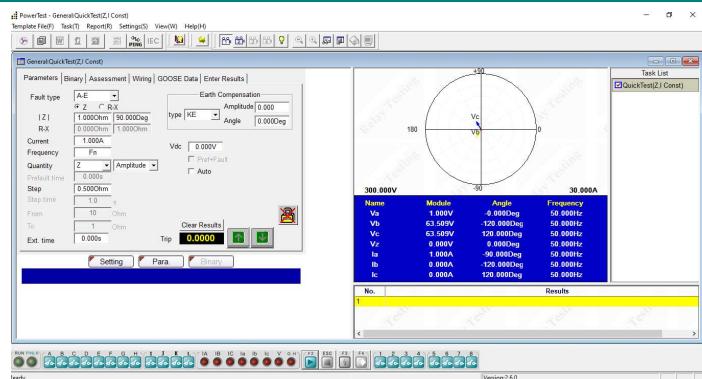
QuickTest (Power)

- ❖ 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)

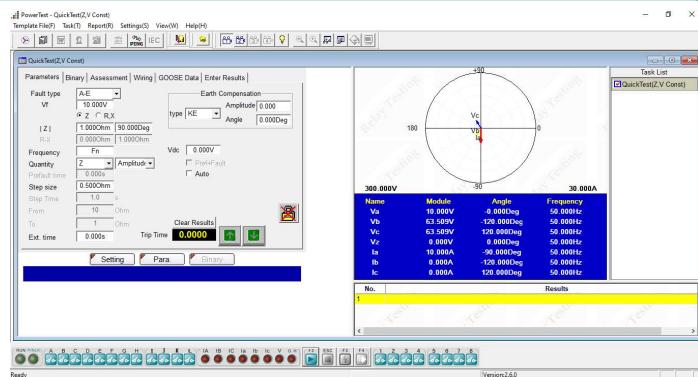
- ❖ Easy to test impedance relay with constant current
- ❖ Set the fault impedance and fault current, obtain the amplitude and phase angle of each phase voltage and current according to the fault type
- ❖ Can manually or automatic search the relay operation value



PowerTest - Relay Test Set Software

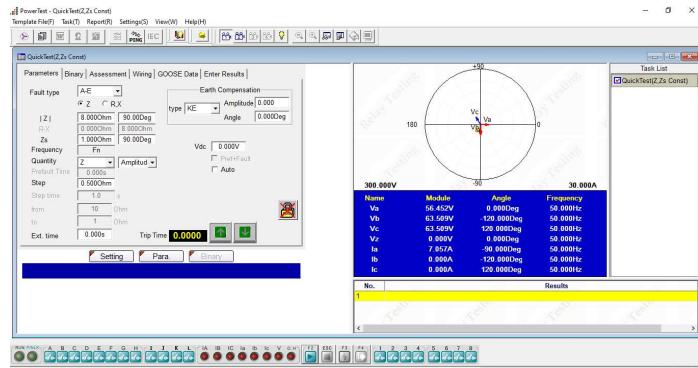
QuickTest (Z, V Const)

- ❖ 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



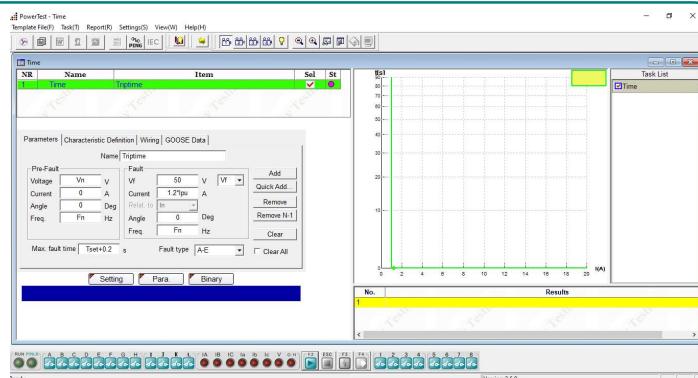
QuickTest (Z, Zs Const)

- ❖ 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



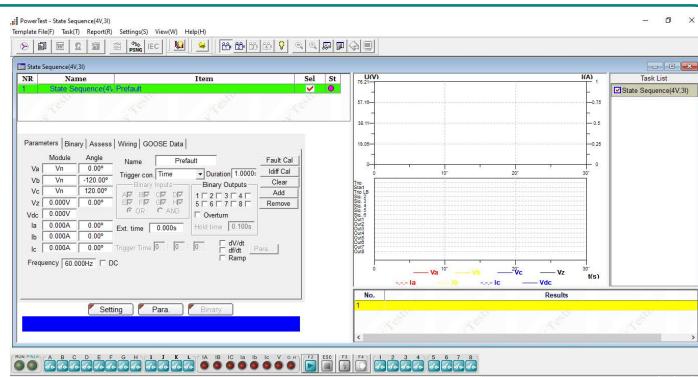
Time

- ❖ Time module is used to test trip delay time of protection relay
- ❖ Various value can be set separately, such as fault types, fault time, the voltage and current at pre-fault and fault state, etc.



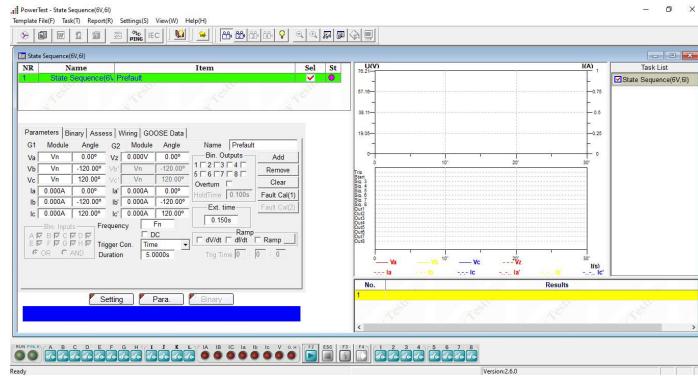
State Sequence (4V, 3I)

- ❖ Used to define multiple continuous 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 in each state can be set separately



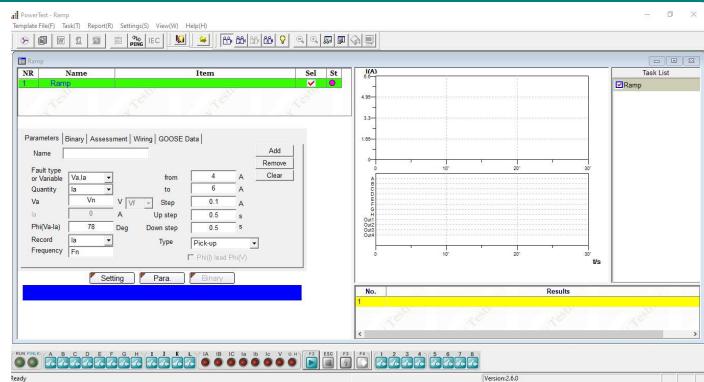
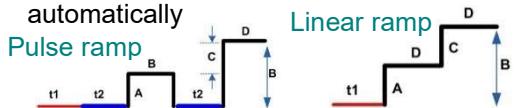
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- ❖ 4 voltage and 6 current sources available for each state
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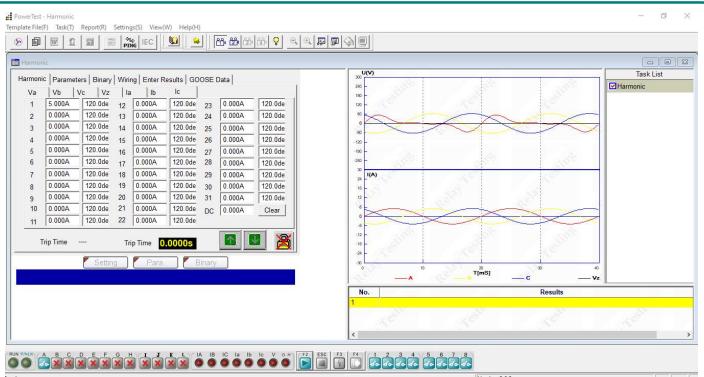
Ramp (3I)

- ❖ 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



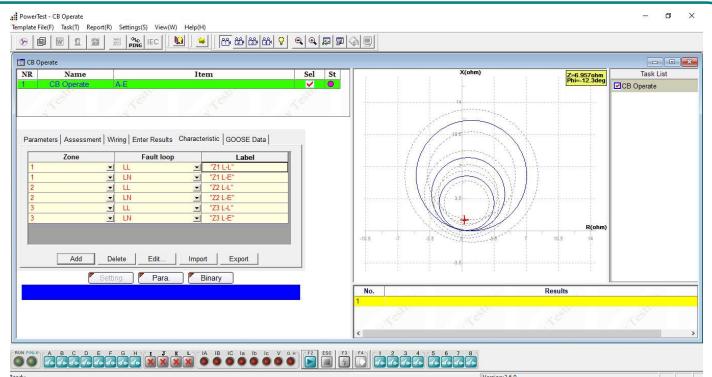
Harmonic

- ❖ 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



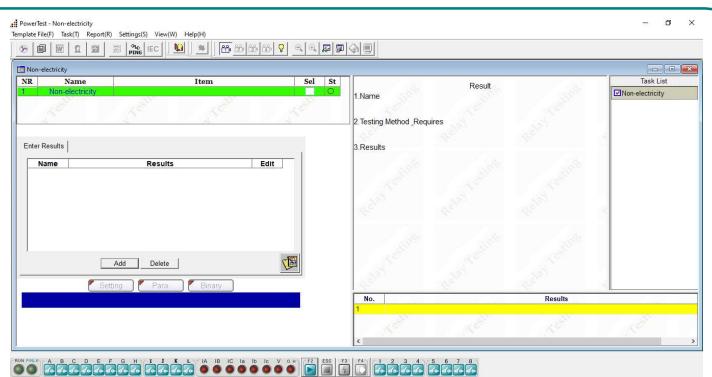
CB Operate

- ❖ 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



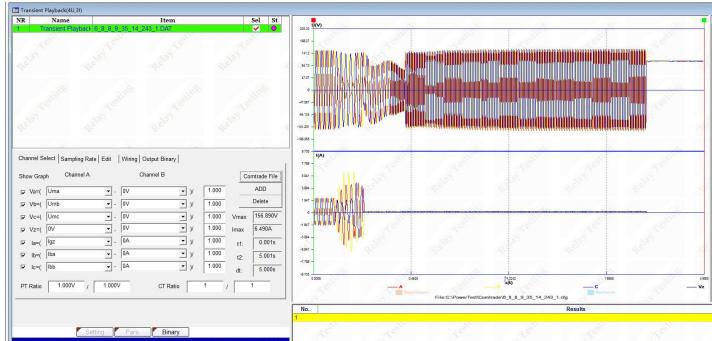
Non-electricity

- ❖ 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



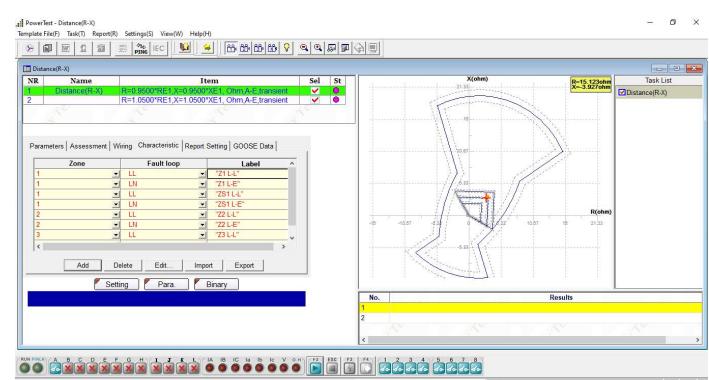
➤ Protection Package

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



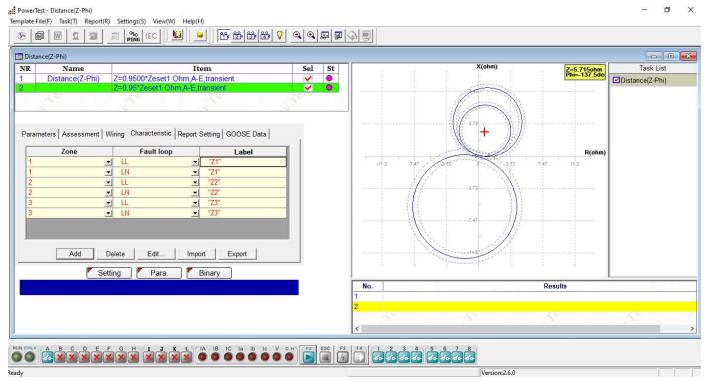
Distance (R-X)

- ❖ 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)

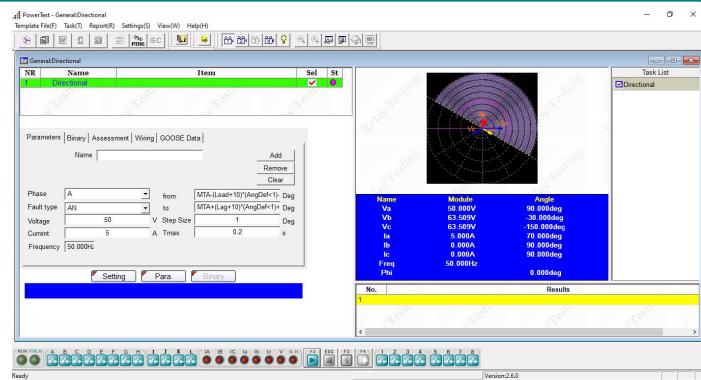
- ❖ Can test impedance relay with Z-Phi setting in different ways
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PowerTest - Relay Test Set Software

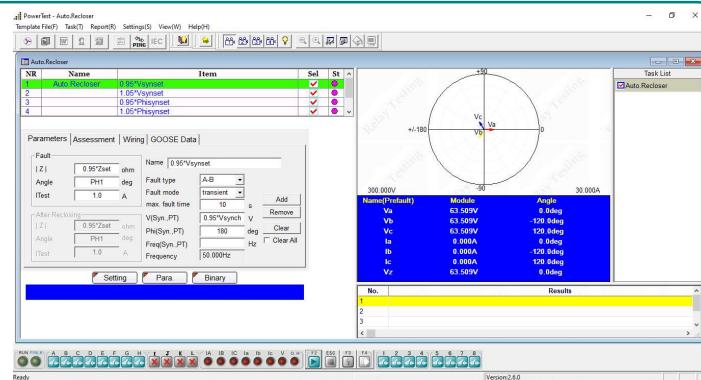
Directional

- ❖ 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, singe phase, phase-phase or three phase fault



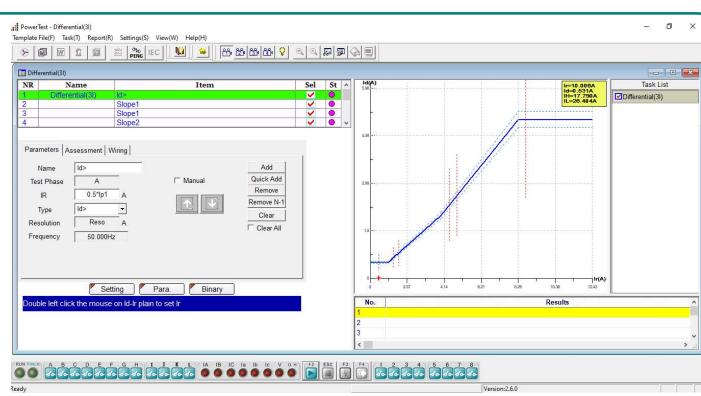
Auto-Reclosing

- ❖ 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.



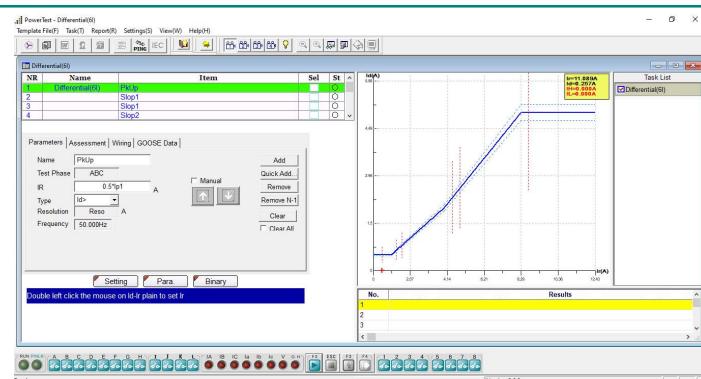
Differential (3I)

- ❖ 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



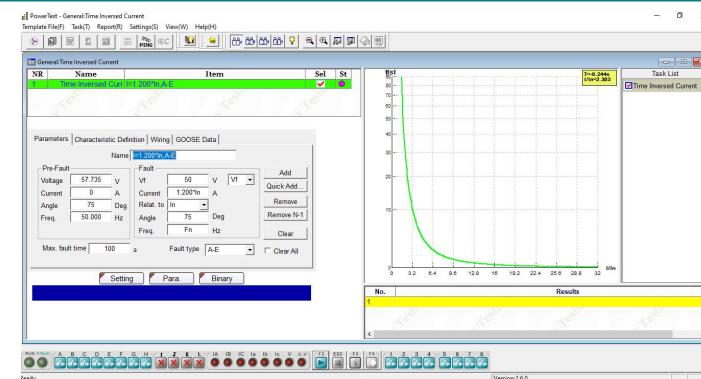
Differential (6I)

- ❖ Suitable for 6 output current channels' relay tester, such as transformer, generator and bus bar etc. differential protection equipment test
- ❖ Realize 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

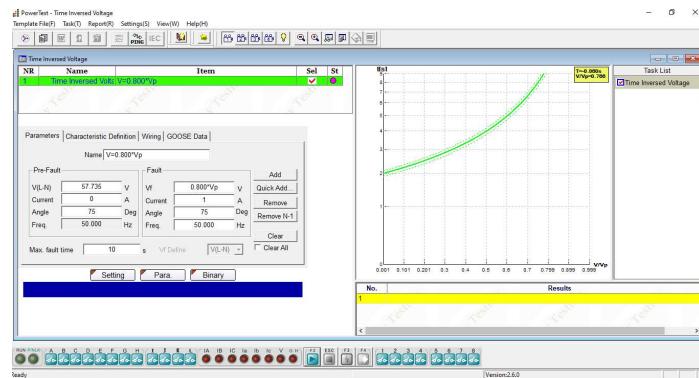
- ❖ Realize the directional over-current test and non-directional over-current test
- ❖ Include testing positive sequence, negative sequence and zero sequence inverse-time over-current, definite-time over-current, over-heat protection.
- ❖ Can import the IEC and IEEE standard curve or user defined curve



PowerTest - Relay Test Set Software

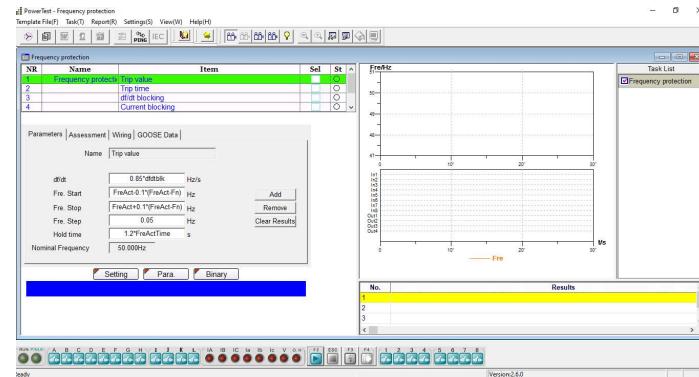
Time Inversed Voltage

- ❖ Can test time inverted 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



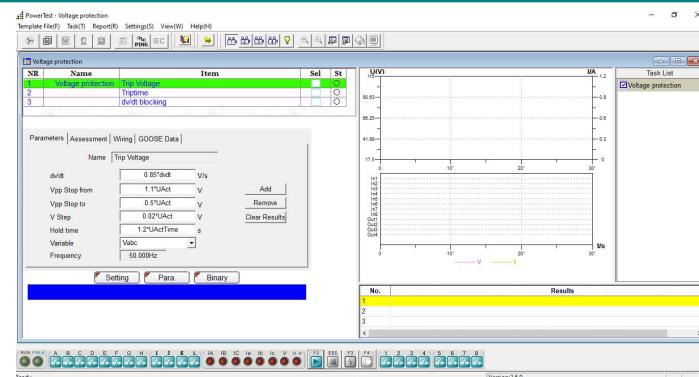
Frequency Relay

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



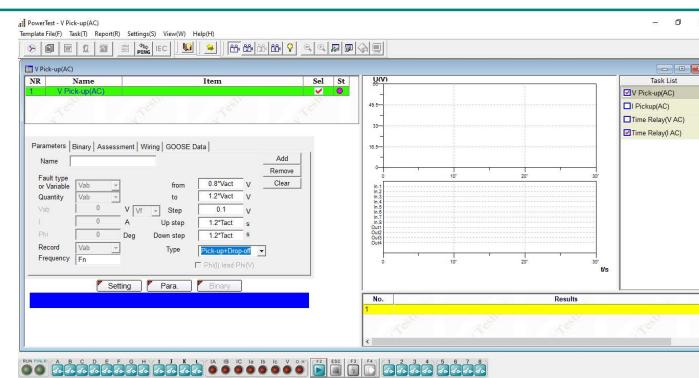
Voltage Relay

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



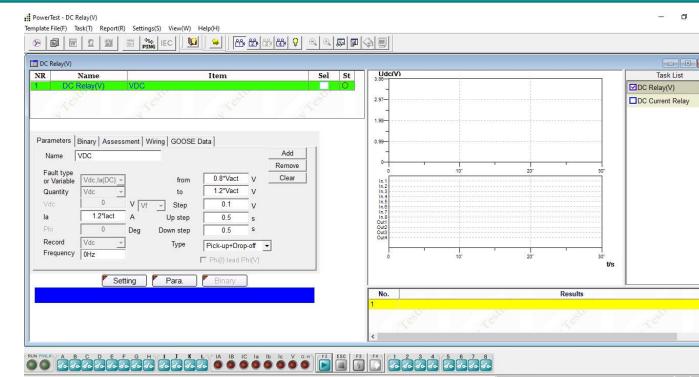
U. I. T Relay (AC)

- ❖ 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.



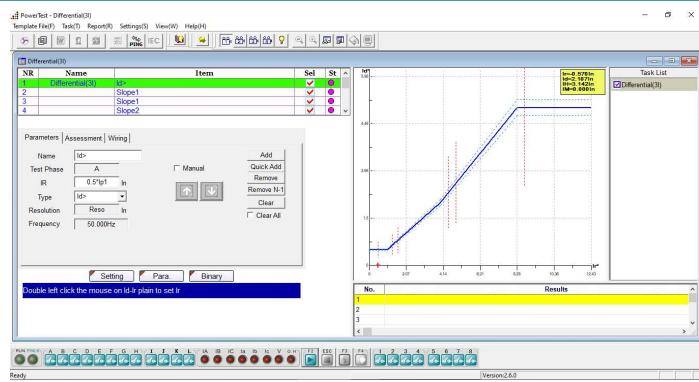
➤ Advanced Package

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



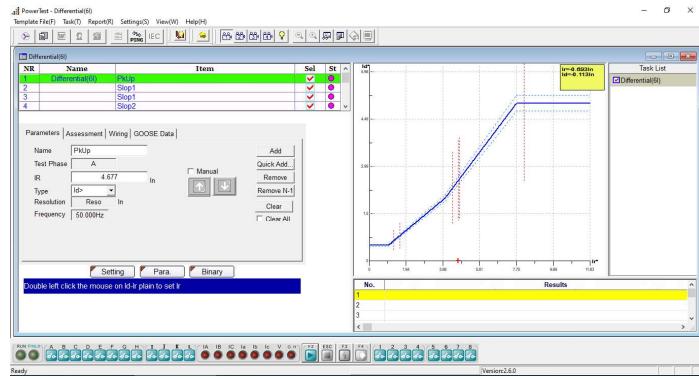
Advanced Differential (3I)

- ❖ 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



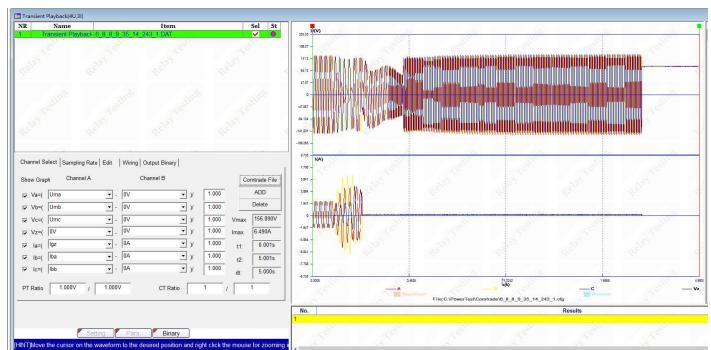
Advanced Differential (6I)

- ❖ 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



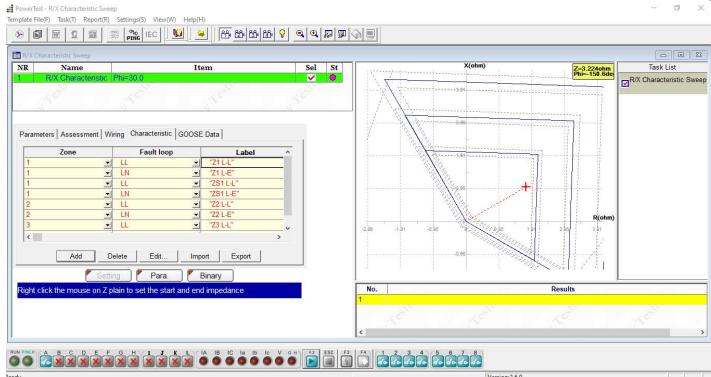
Advanced TransPlay(4V,3I)

- ❖ 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



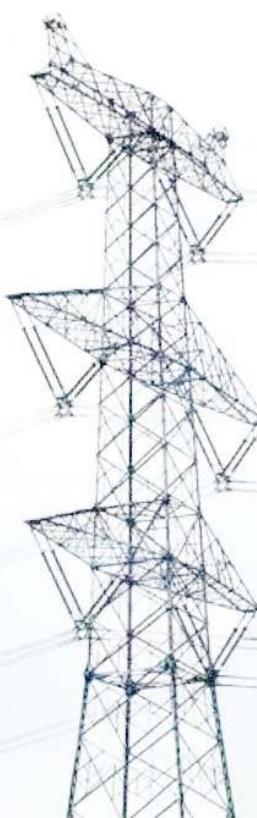
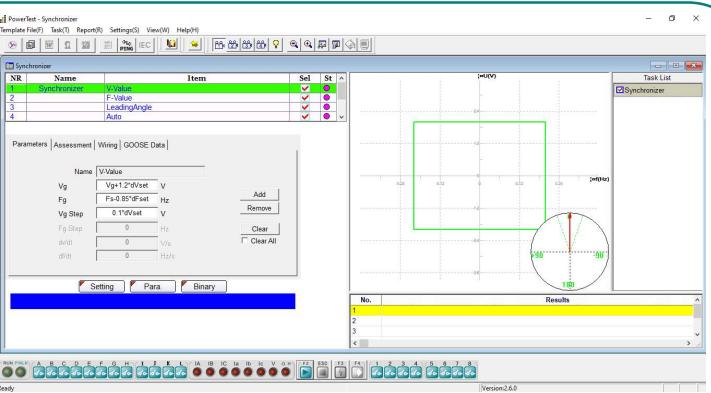
RX Characteristic Sweep

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



Synchronizer

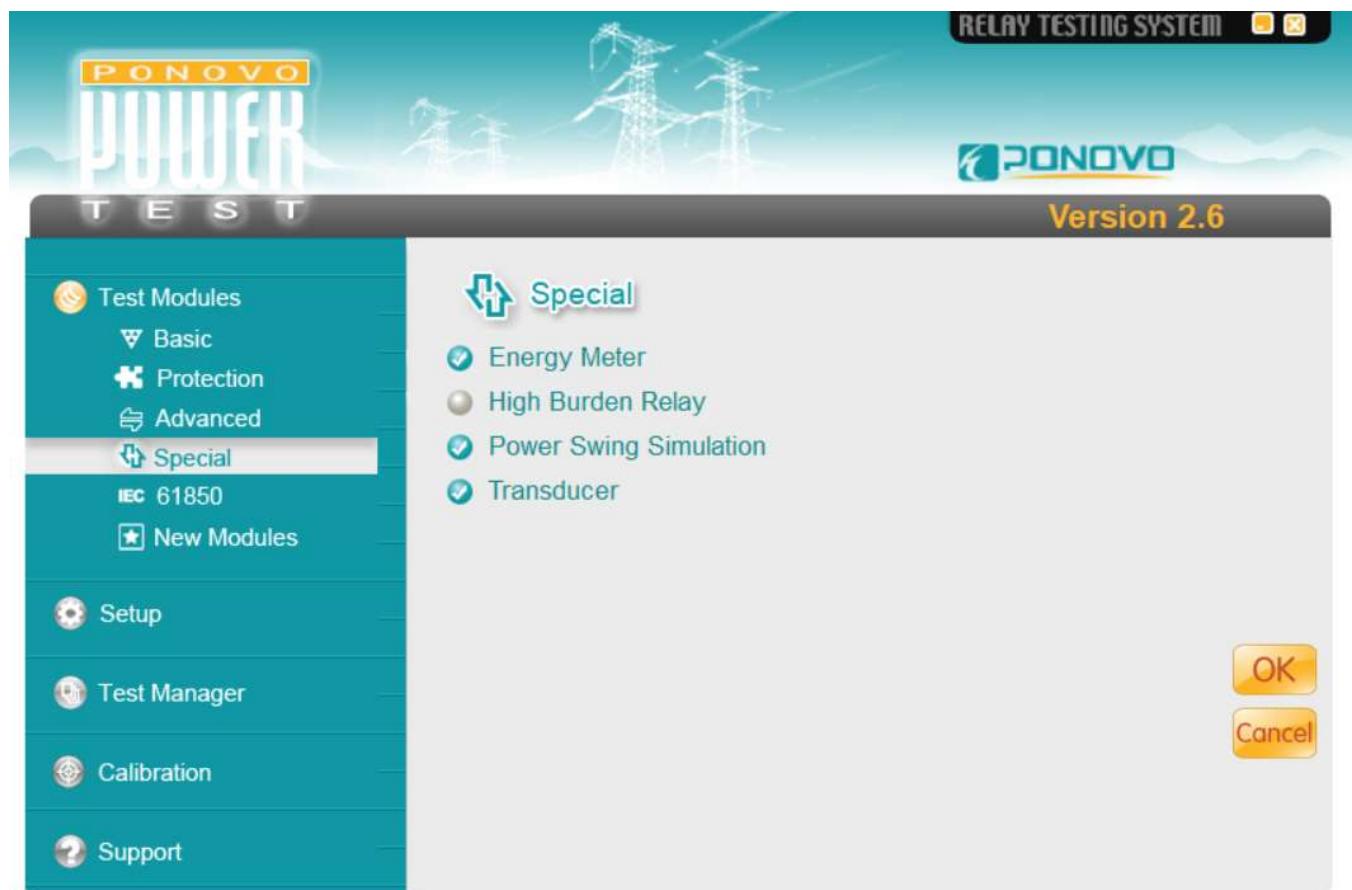
- ❖ Can check synchronizing relay
- ❖ Can check voltage difference
- ❖ Can check frequency difference
- ❖ Can check leading time and leading angle
- ❖ Can check pulse width for frequency adjustment
- ❖ Can check pulse width for voltage adjustment
- ❖ Can check auto-adjusting function with both voltage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



PowerTest - Relay Test Set Software

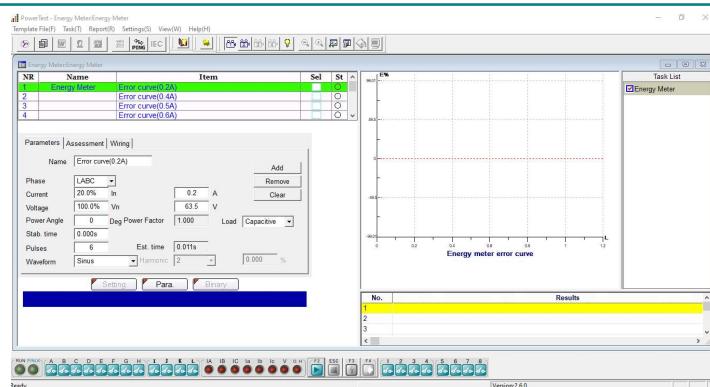
➤ Special Package

In the special package, there are Energy Meter, Power Swing Simulation and Transducer test modules can be used by PW866i.



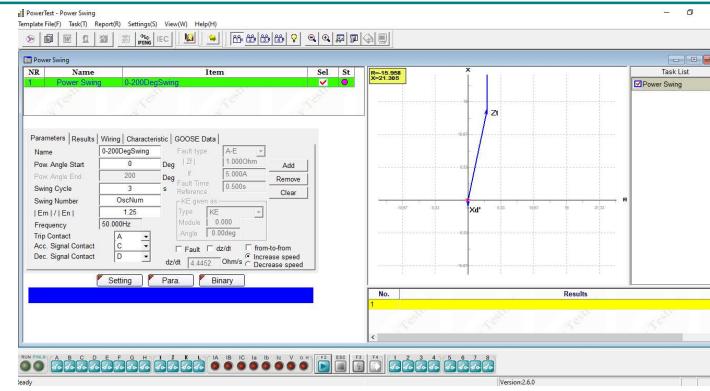
Energy Meter

- ❖ 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



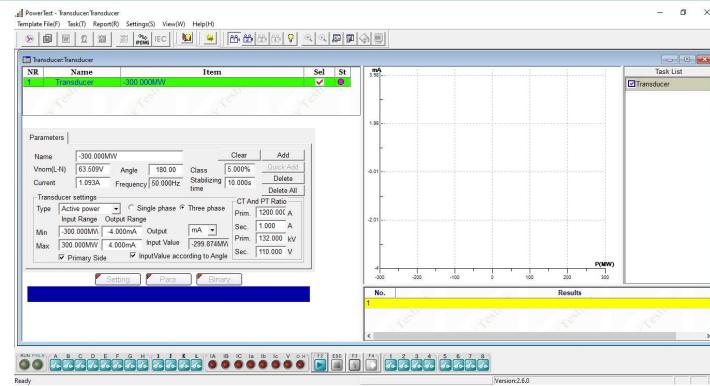
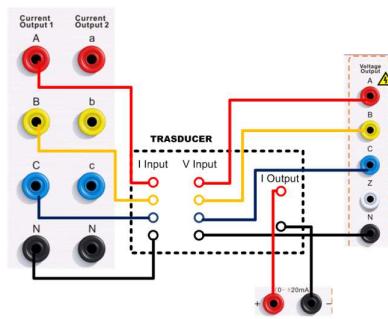
Power Swing Simulation

- ❖ 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.



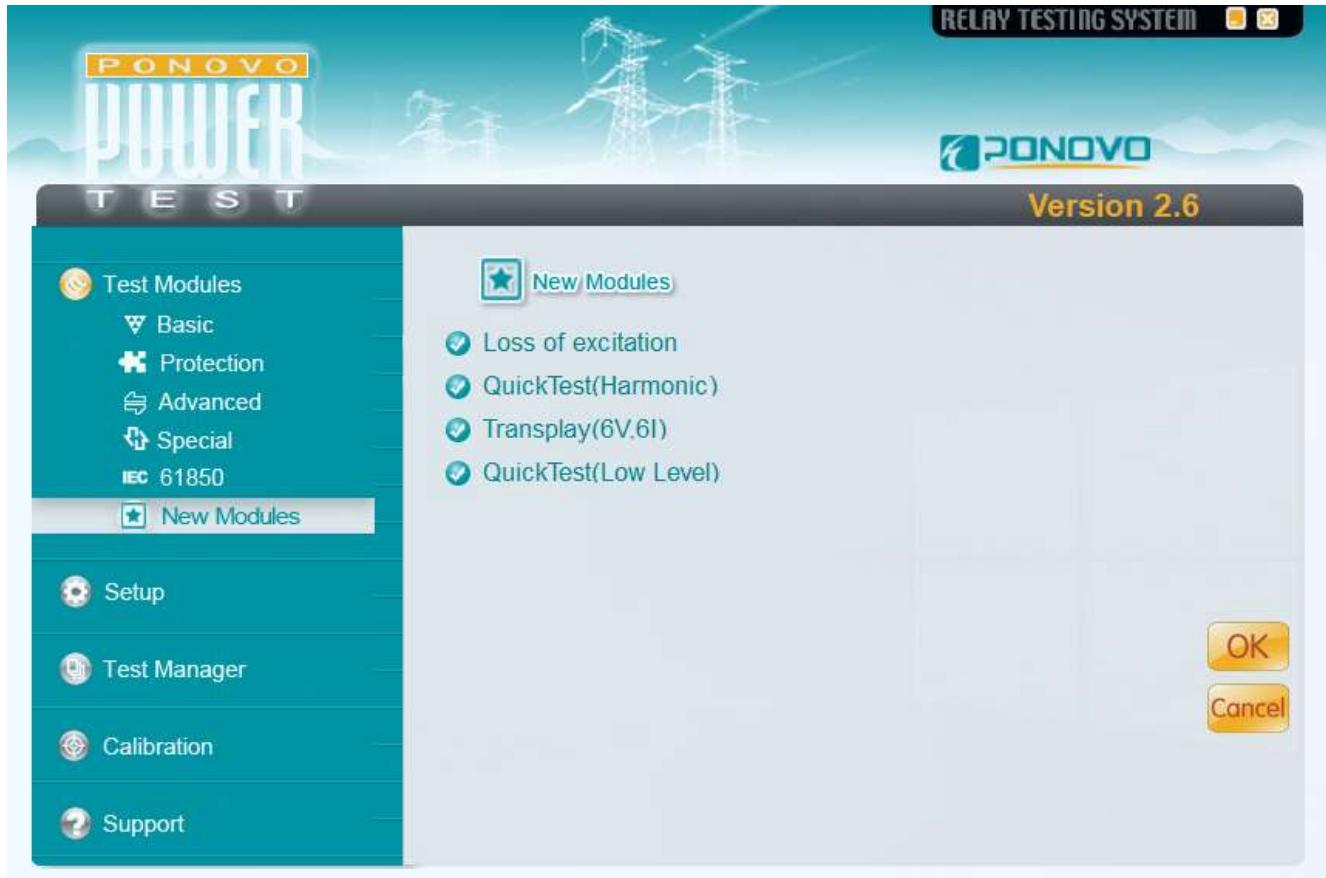
Transducer

- ❖ Can check accuracy of transducer



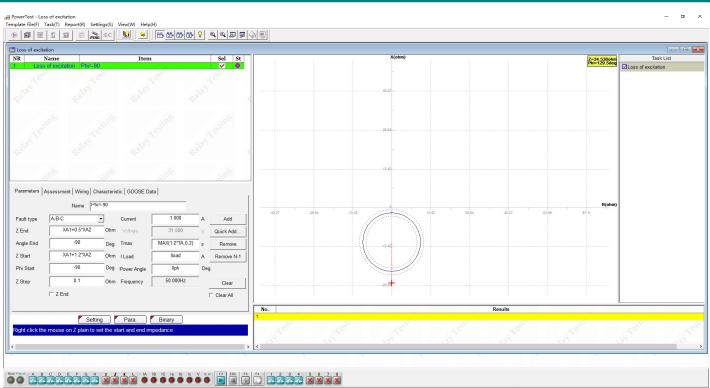
➤ New Modules Package

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



Loss of excitation

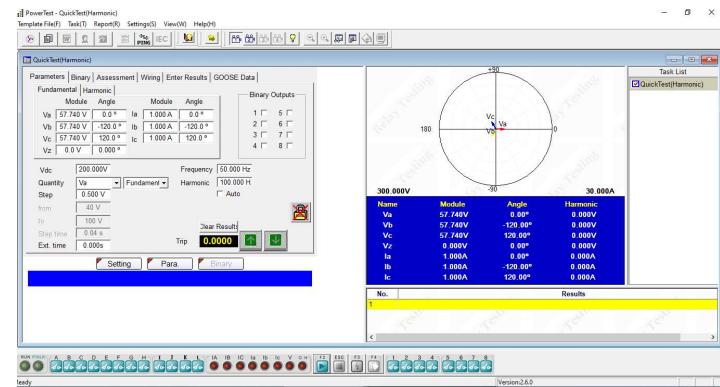
- ❖ Can search for two different excitation loss characteristics
- ❖ During the test process a series of shots will be generated to search out the boundary along this shot line. Then next shot at a different angle will be generated. In this way we can then find out the boundary at different angles.



PowerTest - Relay Test Set Software

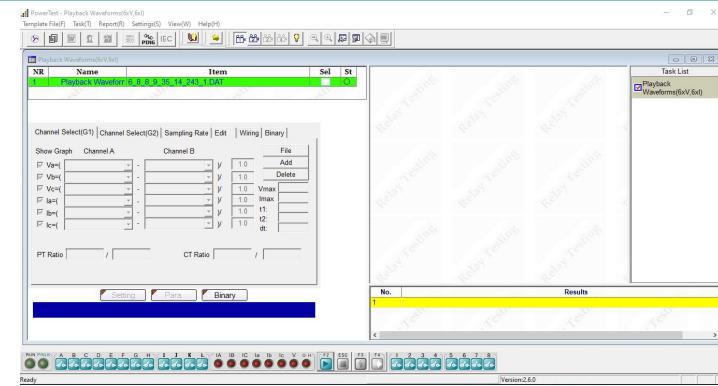
QuickTest (Harmonic)

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



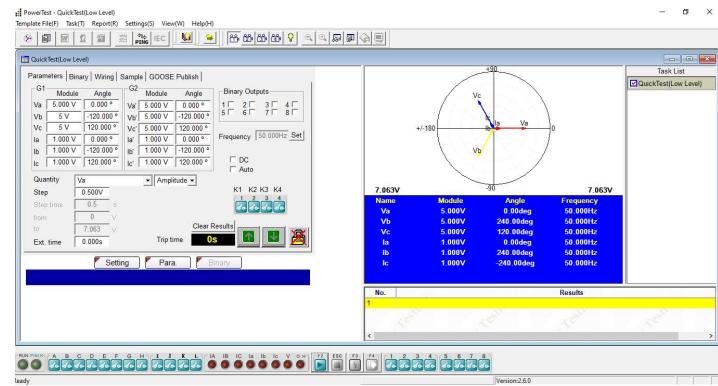
Transplay (6V, 6I)

- ❖ Can play back the COMTRADE format file which records 4 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



Test Report generated by PowerTest software

After testing, each test can be saved report in .rpt format and word format on PC.

Test result in both format displays the same content, including test object information, test equipment information, system parameters, characteristic curve, binary setting, test setting value, test result (testing data, operating characteristic diagram, test result assessing), ect.



Substation

Test Object-Device Setting
Test Object-Device Setting

Station/Bay Information
Test Result

Station Name : Bay Name : Tester : Address :
Station Address : Bay Address :

1. Test Object - Phase OverCurrent
Test Setting

Ip : 10.0.0.1 Date : 10/09/2018 Td : 1.000
Test Result

1.1-1.200VInA-E
Test Result

Refault Voltage : 0.550V
Refault Frequency : 50.000Hz
Angle : 75.000deg

Refault Current : 0.000A
Refault Power : 0.000W
Refault Frequency : 50.000Hz

Refault Angle : 75.000deg
Refault Current : 1.200A
Refault Frequency : 50.000Hz

Settings
Top Range
Bottom Range
Results

30.500V
30.645V
0.025V
Passed

1.2-1.200VInA-E
Test Result

Refault Voltage : 0.550V
Refault Frequency : 50.000Hz
Angle : 75.000deg

Refault Current : 0.000A
Refault Power : 0.000W
Refault Frequency : 50.000Hz

Refault Angle : 75.000deg
Refault Current : 2.000A
Refault Frequency : 50.000Hz

Settings
Top Range
Bottom Range
Results

30.500V
30.645V
0.025V
Passed

3.4-3.000VInA-E
Test Result

Refault Voltage : 0.000V
Refault Frequency : 50.000Hz
Angle : 75.000deg

Refault Current : 0.000A
Refault Power : 0.000W
Refault Frequency : 50.000Hz

Refault Angle : 75.000deg
Refault Current : 3.000A
Refault Frequency : 50.000Hz

Settings
Top Range
Bottom Range
Results

3.005V
3.095V
-0.005V
Passed

✓ word format

4.1-4.0001#A-E:

| | | |
|--------------------------|-----------------------------|---------------------------|
| Refault Voltage: 63.000V | Refault Frequency: 50.000Hz | Angle: 75.000Deg |
| Refault Current: 0.000A | Peak Voltage: 0.000V | Fault Frequency: 50.000Hz |
| Refault Angle: 75.000Deg | Peak Current: 0.000A | |

| | | | |
|-------------|----------------|------------|------------|
| Settings: 1 | Trip Time: 0ms | Start: 0ms | Results: 1 |
| 0.000s | 4.095s | 0.000s | Resets: 1 |

5.1-5.0001#A-E:

| | | |
|--------------------------|-----------------------------|---------------------------|
| Refault Voltage: 63.000V | Refault Frequency: 50.000Hz | Angle: 75.000Deg |
| Refault Current: 0.000A | Peak Voltage: 0.000V | Fault Frequency: 50.000Hz |
| Refault Angle: 75.000Deg | Peak Current: 0.000A | |

| | | | |
|-------------|----------------|------------|------------|
| Settings: 1 | Trip Time: 0ms | Start: 0ms | Results: 1 |
| 0.000s | 4.275s | -0.000s | Resets: 1 |

6.1-6.0001#A-E:

| | | |
|--------------------------|-----------------------------|---------------------------|
| Refault Voltage: 63.000V | Refault Frequency: 50.000Hz | Angle: 75.000Deg |
| Refault Current: 0.000A | Peak Voltage: 0.000V | Fault Frequency: 50.000Hz |
| Refault Angle: 75.000Deg | Peak Current: 0.000A | |

| | | | |
|-------------|----------------|------------|------------|
| Settings: 1 | Trip Time: 0ms | Start: 0ms | Results: 1 |
| 0.000s | 3.842s | 0.000s | Resets: 1 |

7.1-7.0001#A-E:

| | | |
|--------------------------|-----------------------------|---------------------------|
| Refault Voltage: 63.000V | Refault Frequency: 50.000Hz | Angle: 75.000Deg |
| Refault Current: 0.000A | Peak Voltage: 0.000V | Fault Frequency: 50.000Hz |
| Refault Angle: 75.000Deg | Peak Current: 0.000A | |

| | | | |
|-------------|----------------|------------|------------|
| Settings: 1 | Trip Time: 0ms | Start: 0ms | Results: 1 |
| 1.038s | 3.026s | 0.000s | Resets: 1 |

Test Result Assessing:

The test points are all successful.

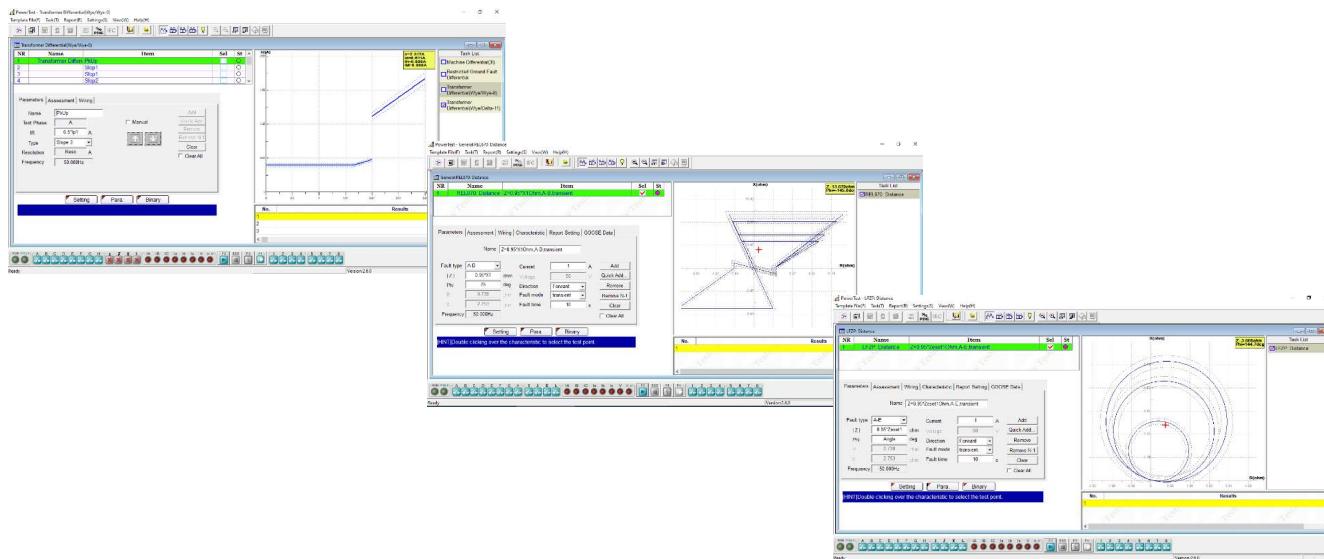
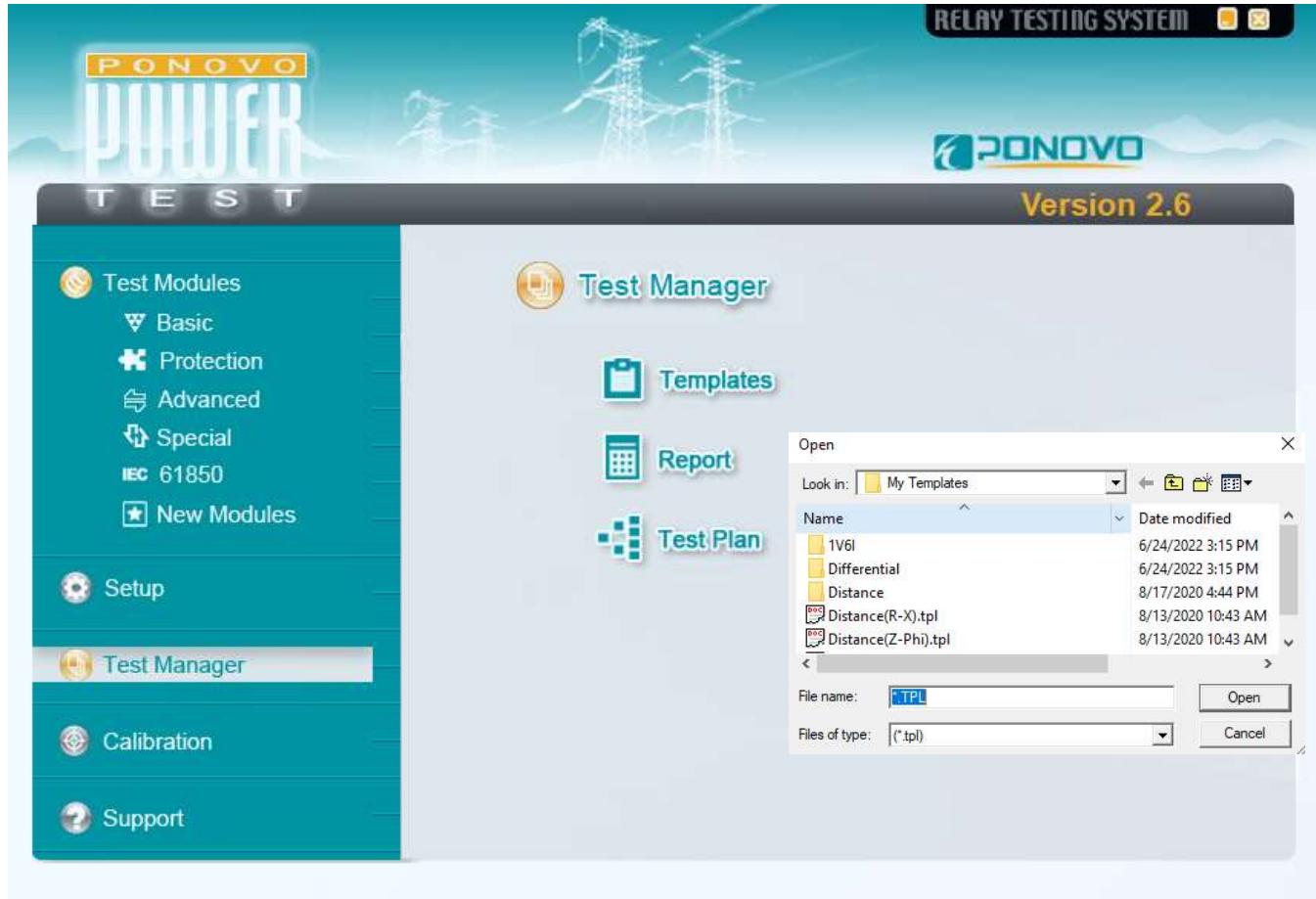
Test By: _____ Approve By: _____

PONOVO Template Service

Besides the above standard test modules, the relay templates are provided for the automatic testing purposes. Every relay template is created based on each relay model and its function from different relay manufacturers, and the setting names in the templates are the same as what they are in the relay, so it is easy for the engineer to conduct the site testing and simplify the works greatly. There are more than 500 different relay templates available for customers to download from the website for free.

The CSV/RIO/XIRO files can be imported into the templates by PowerTest.

The optional service such as offering the customized templates and reports is provided by PONOVO.



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 |
| • CTMFM | • 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 |
| • • • • • • • • | | | | | | | |



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

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

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



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

| | |
|---------|---------|
| • SR489 | • D60 |
| • SR745 | • DLPD |
| • 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 |
| • • • |

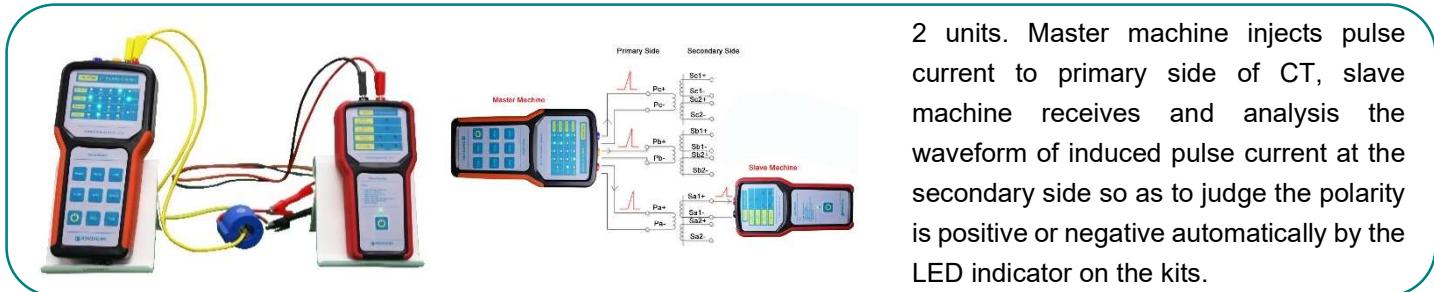
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|----------|
| • PCT210 |
| • • • |



PW866i Protection Relay Tester

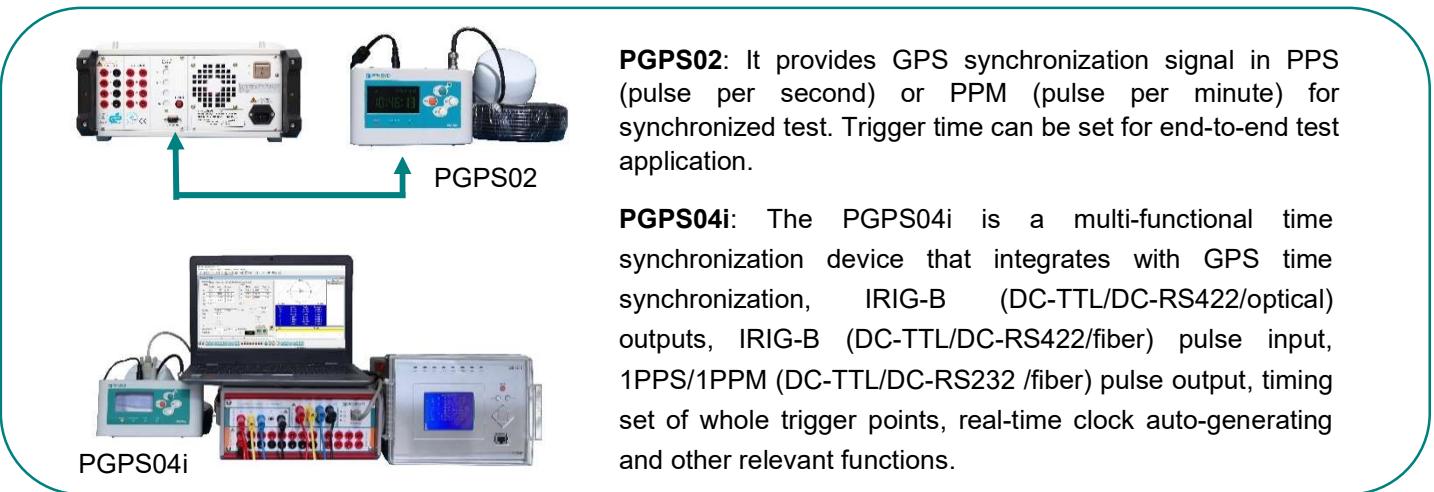
Optional Accessories

- PW-VP50 CT Polarity checker



2 units. Master machine injects pulse current to primary side of CT, slave machine receives and analysis the waveform of induced pulse current at the secondary side so as to judge the polarity is positive or negative automatically by the LED indicator on the kits.

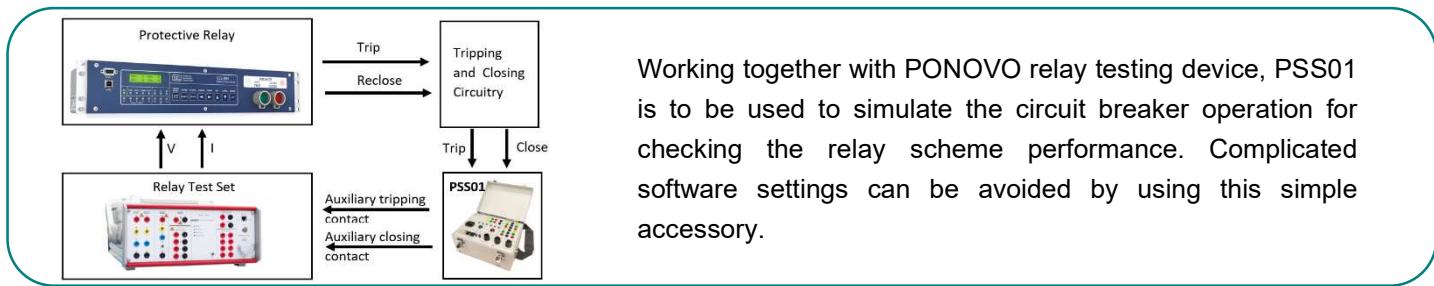
- GPS synchronization (PGPS02/PGPS04i)



PGPS02: It provides GPS synchronization signal in PPS (pulse per second) or PPM (pulse per minute) for synchronized test. Trigger time can be set for end-to-end test application.

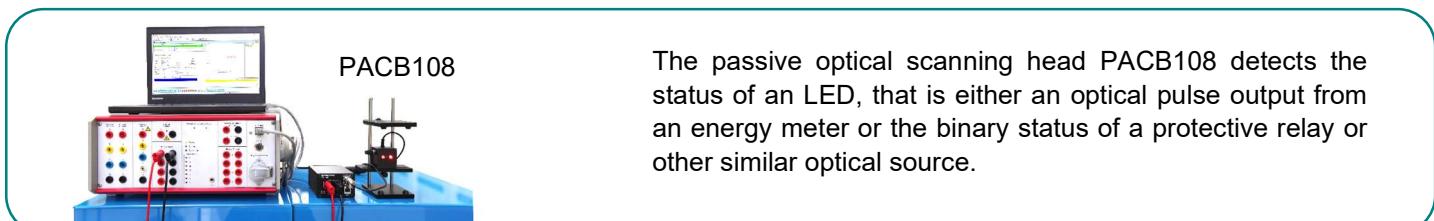
PGPS04i: The PPGS04i is a multi-functional time synchronization device that integrates with GPS time synchronization, IRIG-B (DC-TTL/DC-RS422/optical) outputs, IRIG-B (DC-TTL/DC-RS422/fiber) pulse input, 1PPS/1PPM (DC-TTL/DC-RS232 /fiber) pulse output, timing set of whole trigger points, real-time clock auto-generating and other relevant functions.

- Circuit breaker simulator (PSS01)



Working together with PONOVO relay testing device, PSS01 is to be used to simulate the circuit breaker operation for checking the relay scheme performance. Complicated software settings can be avoided by using this simple accessory.

- Scanning Head (PACB108)



The passive optical scanning head PACB108 detects the status of an LED, that is either an optical pulse output from an energy meter or the binary status of a protective relay or other similar optical source.



PW866i

Protection Relay Tester



Specifications

| Voltage generators | | Accuracy | error<0.15% rd.+0.05% rg. guar., at 0~32A |
|--------------------|---|-----------------------|--|
| Setting range | | Ranges | 32A |
| 4-phase ac(L-N) | 4×0~300V | Resolution | 1mA |
| 1-phase ac(L-L) | 1×0~600V | Distortion | <0.05% typ., < 0.1% guar. |
| dc (L-N) | 4×±0~300V | General | |
| dc (L-L) | 1×±0~600V | Frequency | |
| Power | | Sine signal | DC, 0.001Hz~1000Hz |
| 4-phase ac(L-N) | 4×75VA typ., at 300V 4×50VA guar., at 300V | Transient signal | DC~10.0kHz |
| 3-phase ac(L-N) | 3×100VA typ., at 300V 3×85VA guar., at 300V | Accuracy | ±0.3ppm |
| 1-phase ac(L-L) | 1×200VA typ., at 600V 1×170VA guar., at 600V | Resolution | 0.001Hz |
| dc (L-N) | 4×100W at ±300V | Phase | |
| Accuracy | error<0.08% rd.+0.02% rg. guar. at 0~300V error<0.03% rd.+0.01% rg. typ. at 0~300V | Angle range | -360°~+360° |
| Ranges | 300V | Accuracy | <0.05° typ., <0.1° guar. at 50/60Hz |
| Resolution | 10mV for 300Vac | Resolution | ±0.001° |
| Distortion | <0.05% typ., <0.1% guar. | Auxiliary dc supply | |
| Current generators | | Voltage range | 0~300V |
| Setting range | | Power | 88W at 110V, 176W at 220V, 90W at 300V |
| 6-phase ac(L-N) | 6×0~32A | Accuracy | error<0.1% rg. typ. <0.5% rg. guar. |
| 3-phase ac(2L-N) | 3×0~64A | Power supply | |
| 1-phase ac(6L-N) | 1×0~180A | Nominal input voltage | 110~240Vac |
| dc (6L-N) | 1×±0~180A | Permissible tolerance | 90~260Vac |
| Power | | Nominal frequency | 50/60Hz |
| 6-phase ac(L-N) | 6×450VA typ. at 32A 6×400VA guar. at 32A | Permissible frequency | 45~65Hz |
| 3-phase ac(2L-N) | 3×800VA typ. at 64A 3×700VA guar. at 64A | Binary inputs group 1 | |
| 1-phase ac(6L-N) | 1×1200VA typ. at 180A 1×1000VA guar. at 180A | Number | 8 |
| 1-phase dc(6L-N) | 1×1400W typ. at 180A 1×1000W guar. at 180A | Input characteristics | 0~400Vdc/ac peak threshold or potential free |
| Max compliance | | Sample rate | 20kHz |
| Voltage(L-N) (L-L) | 21Vpk/42Vpk | Time resolution | 50μs |

PW866i Protection Relay Tester

| | |
|------------------------------|-----------------------------|
| Max. measuring time | Infinite |
| Debounce/deglitch time | 0~25ms |
| Counting function | <3kHz at pulse width >150μs |
| Galvanic isolation | 8 galvanically isolated |
| Binary inputs group 2 | |
| Number | 4 |
| Input characteristics | 0~+5Vdc or dry contact |
| Sample rate | 25kHz |
| Time resolution | 40μs |
| Max. measuring time | Infinite |
| Debounce/deglitch time | 0~25ms |
| Max. counting frequency | 25kHz |
| Pulse width | >3μs |
| Threshold voltage | 2V |
| Voltage hysteresis | 0.8V |
| Max. input voltage | +5V |

| | |
|--------------------------------------|--|
| Binary outputs, semiconductor | |
| Number | 4 |
| Type | semiconductor |
| Break capacity dc | Vmax: 300Vdc /Imax:0.5A/Pmax: 150W |
| Update rate | 100μs |
| Imax | 0.5A |
| Binary outputs, relay | |
| Number | 4 |
| Type | Potential free relay contacts, software controlled |
| Break capacity ac | Vmax: 300Vac /Imax: 8A/Pmax: 2000VA |
| Break capacity dc | Vmax: 300Vdc /Imax:8A/Pmax: 150W |

| | |
|--|--|
| DC voltage measuring inputs(optional) | |
| Measuring range | 0~±10V |
| Accuracy | error<0.02% rg. typ. <0.05% rg. guar. |
| Input impedance | 100KΩ |
| DC current measuring inputs(optional) | |
| Measuring range | 0~±20mA |
| Accuracy | error<0.02% rg. typ. <0.05% rg. guar. |
| Input impedance | 50Ω |

| | |
|--|---|
| In-built monitoring and recording | |
| Monitoring | currents and voltage outputs |
| Recording | analog outputs, binary inputs /outputs status |
| Mode | real time monitoring, no external wiring is required |
| Recording length | 16s |
| Low level outputs | |
| Setting range | 12×0~10Vpk |
| Max. output current | 1mA |
| Accuracy | error <0.025% typ. <0.07% guar. at 1~10Vpk |
| Resolution | 250μV |
| Distortion (THD+N) | < 0.05% typ., <0.1% guar. |
| Connection | 19 pins combination socket (rear side) |
| IEC61850 Goose function (optional) | |
| Interpretation hardware is in-built. Please contact the supplier for options to activate the IEC61850 software support Goose function. | |
| Environmental conditions | |
| Operation temperature | 0~+50°C |
| Storage temperature | -25~+70°C |
| Relative humidity | 5~95% non-condensing |
| EMC(E&I) | EN/IEC 61326-1 EN/IEC 61000-3-2/3 EN/IEC61000-4-2/3/4/5/6/8/11/18 |
| Environment | EN/IEC 60068-2-1/2/3/6/27 |
| Safety | EN/IEC 61010-1/1-12/2-030 EN/IEC 60255-25/27 |
| Others | FCC Part 15: Sub B ECS-001:2006 LVD EU |
| Developed and manufactured under an ISO 9001: 2015 registered system | |
| Others | |
| Control mode | PC, Local |
| 2 USB Ports | USB-disk, mouse, keyboard |
| GPS interface | DB9/TTL |
| Ground Socket(earth) | 4mm banana socket, top side |
| Weight | 24kg |
| Dimensions (WxHxD) | 364mm ×200mm×475mm |

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