



PowerTest Int V7.0

Protection Relay Test Software

PowerTest-Int v7.0

TestFunction | MU Test | SCL file | Template | Device Manage

Basic Function Test

- QuickTest
- QuickTest Sequence
- QuickTest (VL-L, 3I)
- QuickTest (Power)
- QuickTest (Z)
- State Sequence
- Harmonic
- Ramp
- Time

Protection Function Test

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- Distance Search
- Auto-Reclosing
- Directional
- Voltage Relay
- Frequency Relay
- Time Inversed Current
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- Synchronizer
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- GOOSEAbnormal Simulation

Others

- Transducer
- Energy Meter





Introduction

For the new generation relay test set of PONOVO, such as L336EXi series, PW366Ai, PNS330i series, one universal software can be used, the name is **PowerTest Int V7.0** software. It can output analog and digital quantity at the same time, or output analog quantity or digital quantity separately which is depending on setting. PowerTest Int V7.0 is a relay test software that has different pages, **Test Function**, **MU Test**, **SCL file**, **Template** and **Device Manage**.



Test Function Page

Test function includes different test packages, the **Basic Function Test** package, **Protection Function Test** package, **Advanced Test** package, **Others** package, which packages includes different testing modules, that can be used for all kinds of relay testing, and others package for more testing application, such as transducer, energy meter, etc.

- **Basic Function Test Package**

In the Basic Function Test package, there are different Quick Test modules, QuickTest, QuickTest Sequence, QuickTest (VL-L,3I), QuickTest (Power), QuickTest (Z), State Sequence, Harmonic, Ramp and Time test modules.

Basic Function Test



QuickTest



QuickTest Sequence



QuickTest (VL-L, 3I)



QuickTest (Power)



QuickTest (Z)



State Sequence



Harmonic



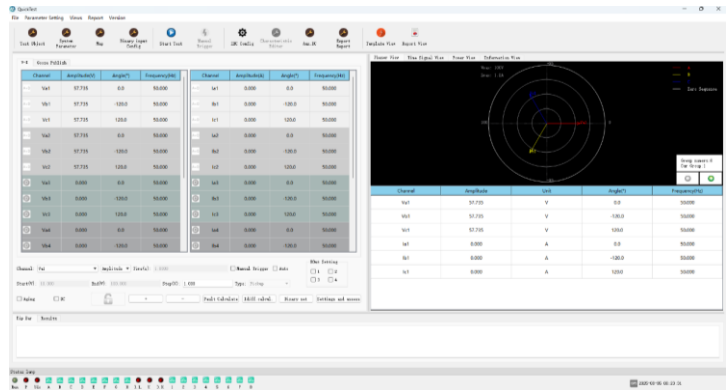
Ramp



Time

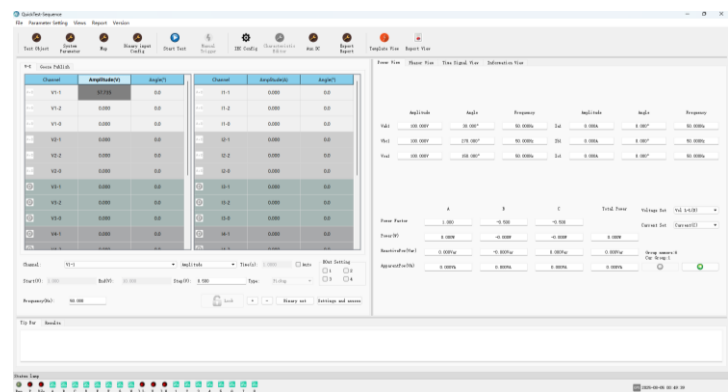
QuickTest

- ❖ All channels of voltage and current sources output available for test relay.
- ❖ Amplitude, phase angle and frequency of voltage and current sources can be controlled independently.
- ❖ Can output analog and digital quantity at the same time.
- ❖ Test can be in manual or auto mode.



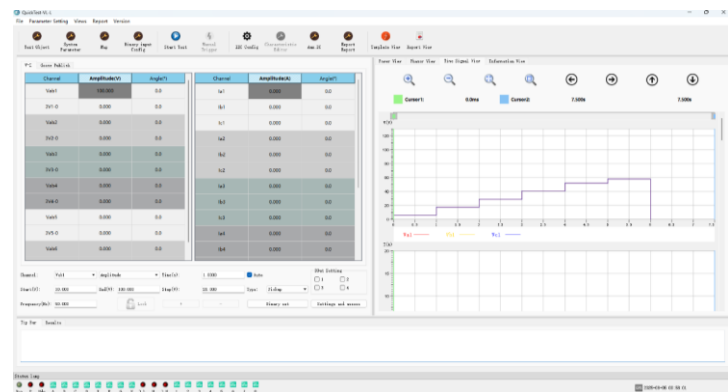
QuickTest Sequence

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



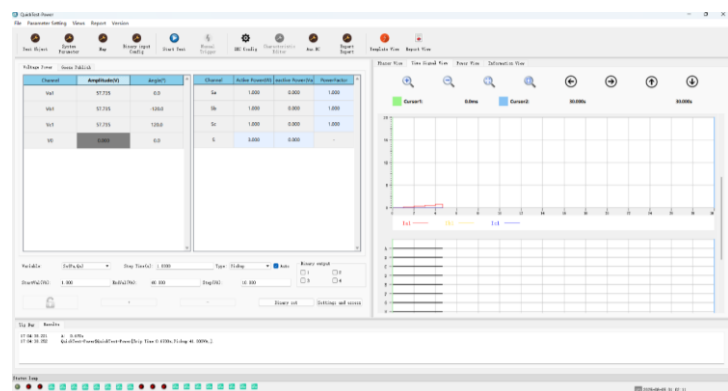
QuickTest (VL-L,3I)

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



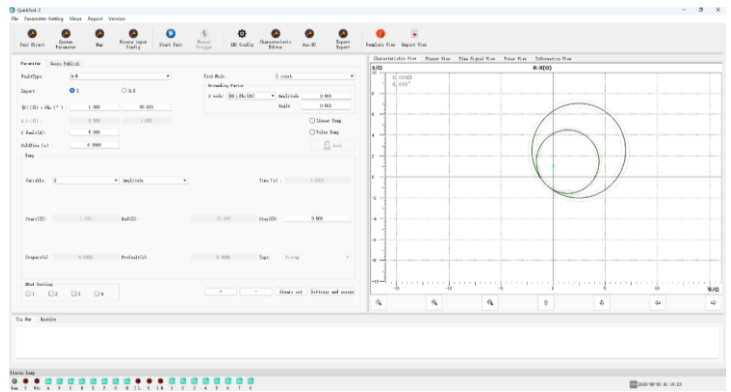
QuickTest (Power)

- ❖ 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.
- ❖ Test can be in manual or auto mode.



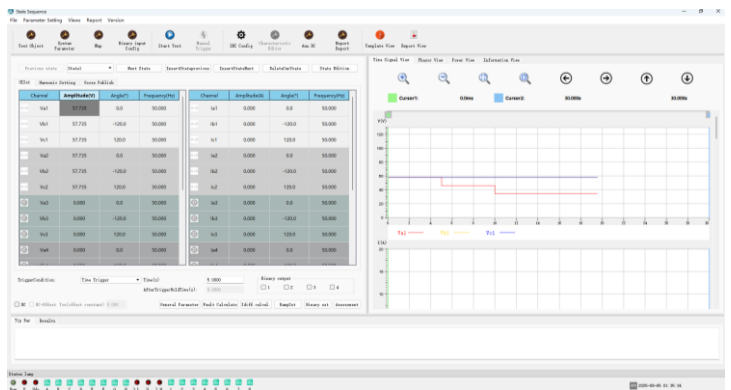
QuickTest (Z)

- ❖ Easy to test impedance relay with constant current, constant voltage and constant system impedance.
- ❖ Set the fault impedance and fault current /voltage/system impedance, obtain the amplitude and phase angle of each phase voltage and current output according to the fault type.



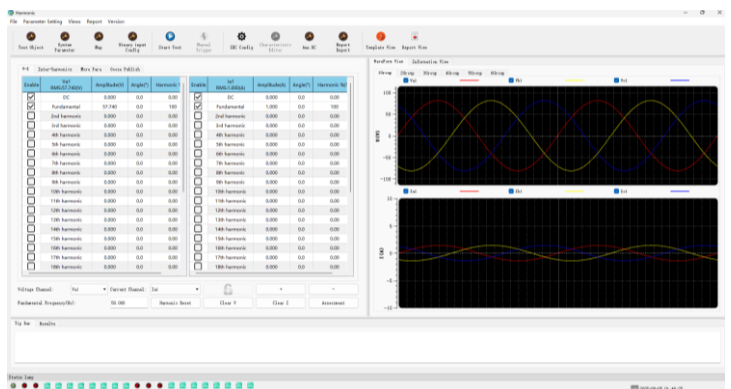
State Sequence

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



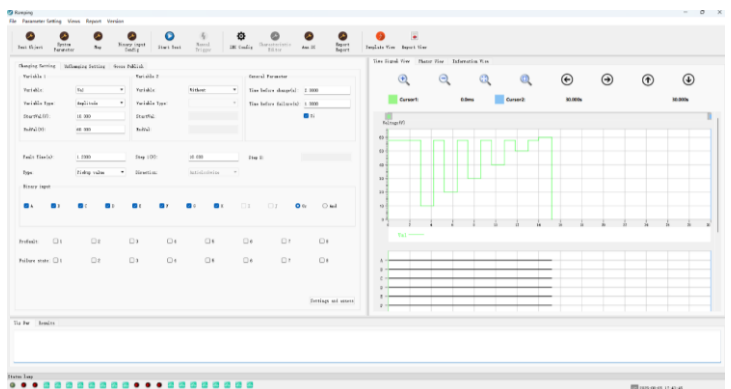
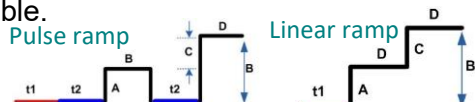
Harmonic

- ❖ Can generate harmonics for all voltage and current sources outputs.
- ❖ Can check the 2nd /3rd / 4th /5th harmonic restraint of current differential.
- ❖ Can check the harmonic measurement of the relay up to 30rd harmonic.
- ❖ Can set the harmonic for each channel separately.



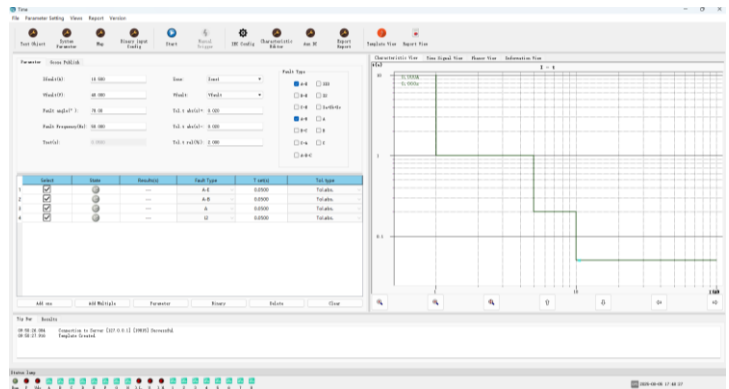
Ramp

- ❖ 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.



Time

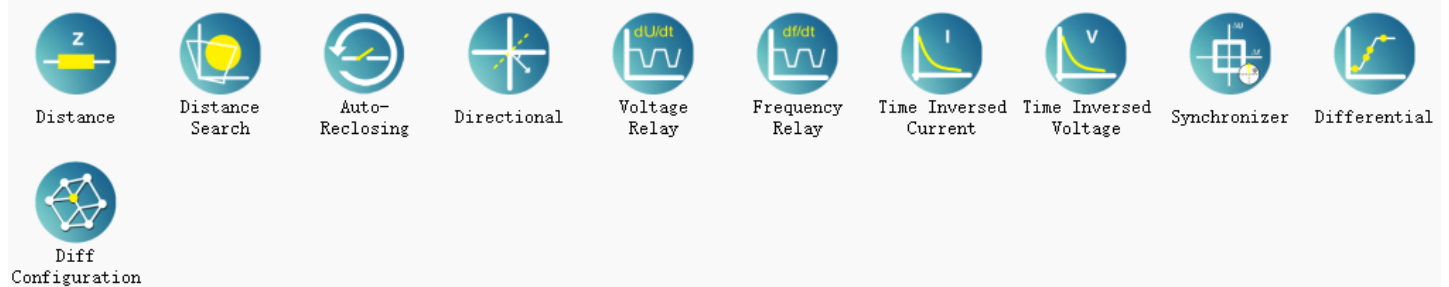
- ❖ Time module is used to test trip delay time of protection relay.
- ❖ Various value can be set separately, such as fault zone, fault type, voltage and current in fault state, different percentage of setting value, etc.
- ❖ User can make characteristic definition according to different pickup value and trip time.



Protection Function Test Package

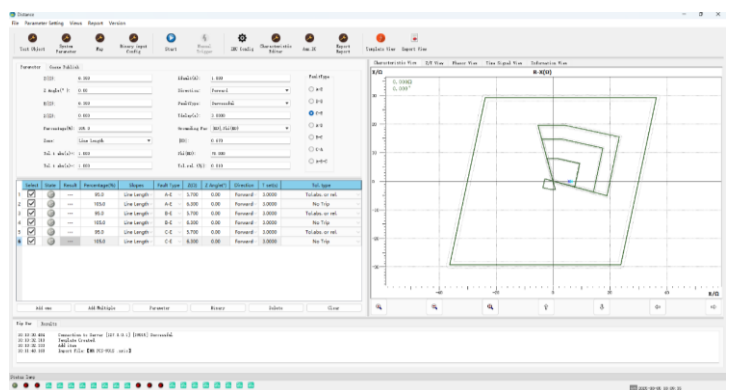
In the Protection Function Test package, there are Distance, Distance Search, Auto-Reclosing, Directional, Voltage Relay, Frequency Relay, Time Inversed Current, Time Inversed Voltage, Synchronizer, Differential and Differential Configuration test modules.

Protection Function Test



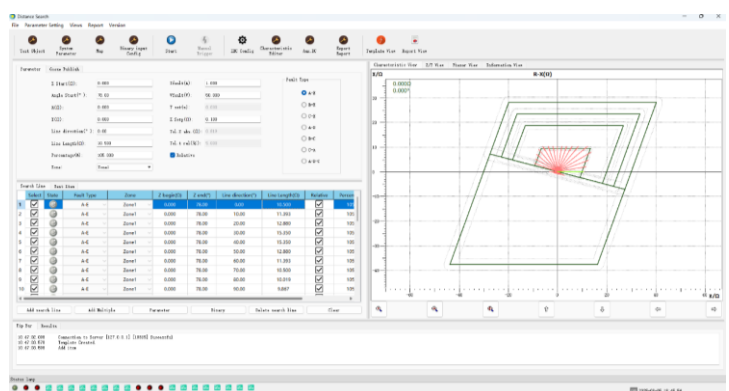
Distance

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



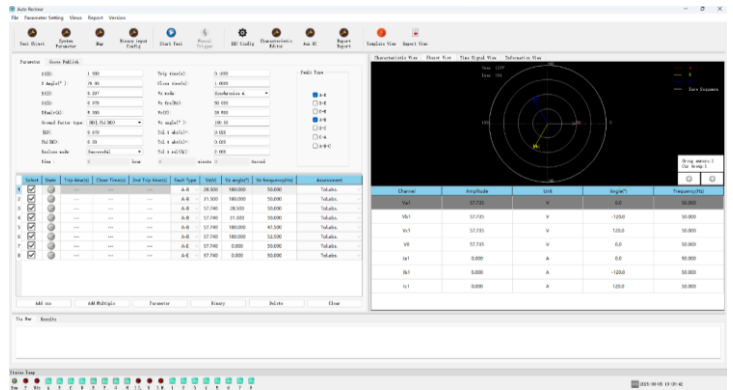
Distance Search

- ❖ Can search the characteristic boundary of the impedance relay.
- ❖ Can find out the boundary at different angles.
- ❖ Import impedance characteristic to Z plain.
- ❖ Associate the characteristic with relay settings.
- ❖ Edit new characteristic.



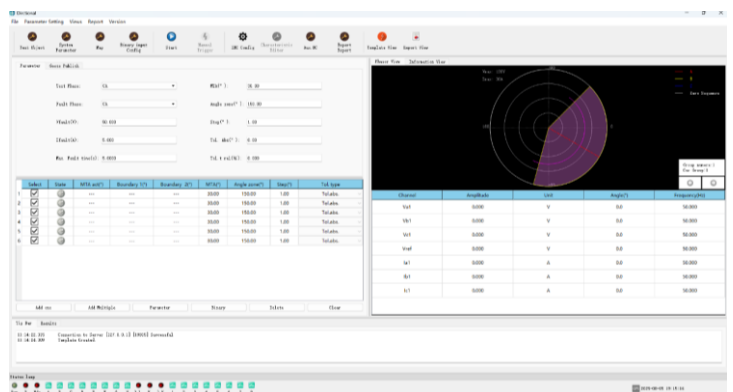
Auto-Reclosing

- ❖ Can test the reclose function.
- ❖ Realize relay automatic reclosing with checking the difference between two systems.
- ❖ Add deadline test, synchronized angle with live bus line, frequency check, auto reclose and reclose failure test easily.
- ❖ Automatic evaluating of testing results.



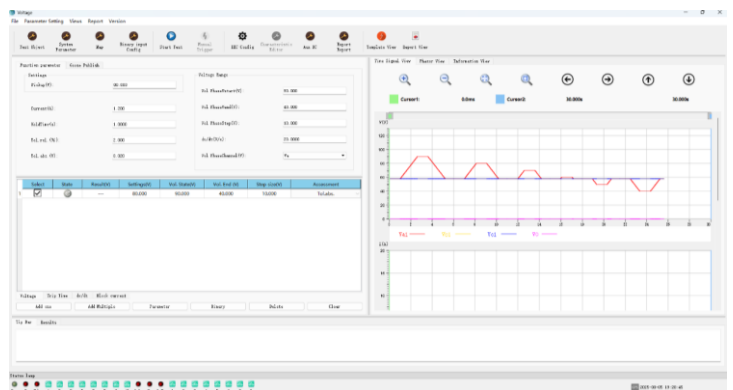
Directional

- ❖ Can search maximum torque angle and two boundary angles, including Lead angle 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.



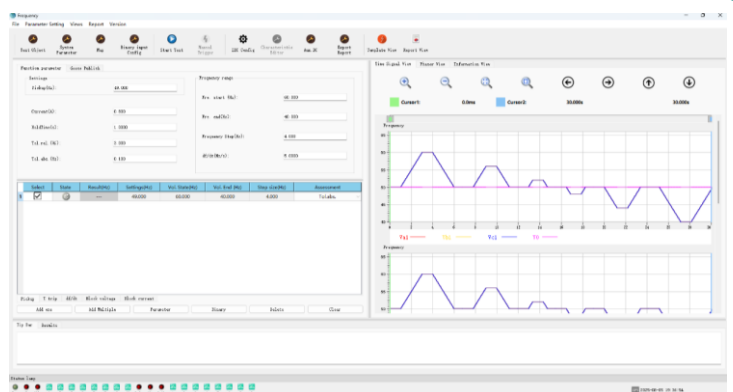
Voltage Relay

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



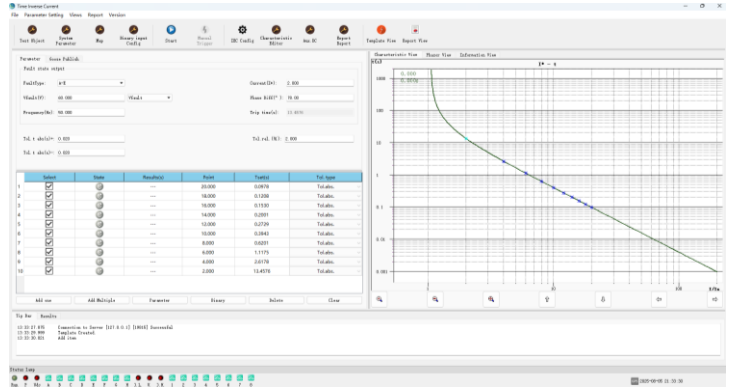
Frequency Relay

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



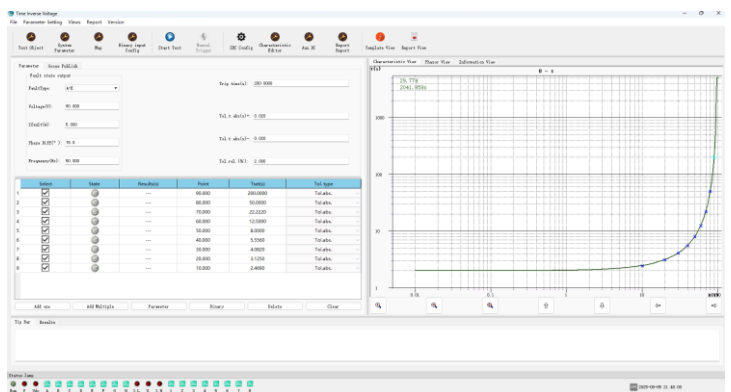
Time Inversed Current

- ❖ 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.



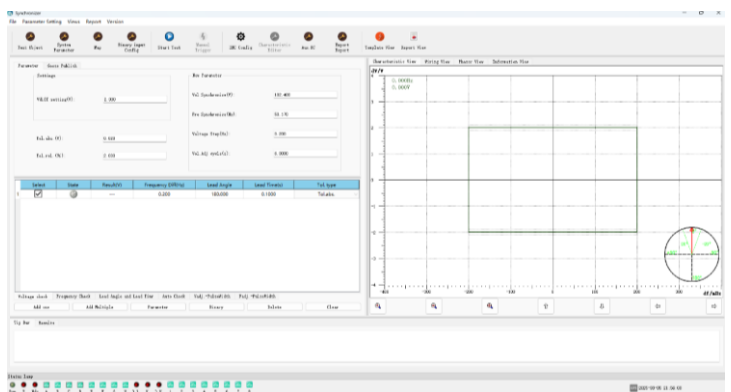
Time Inversed Voltage

- ❖ 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.
- ❖ User can define curve by fill data in IEC formula for under voltage and over voltage relay.



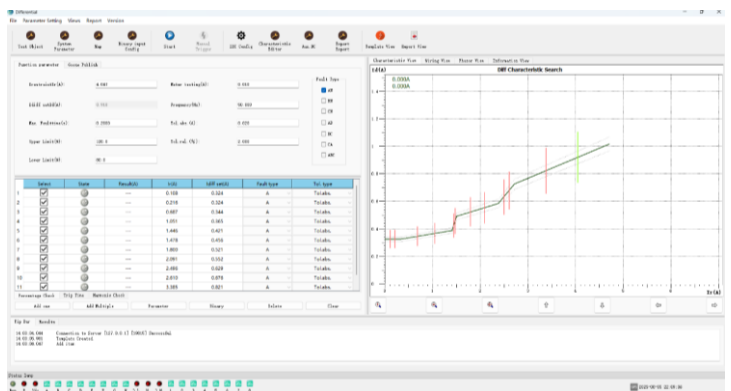
Synchronizer

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



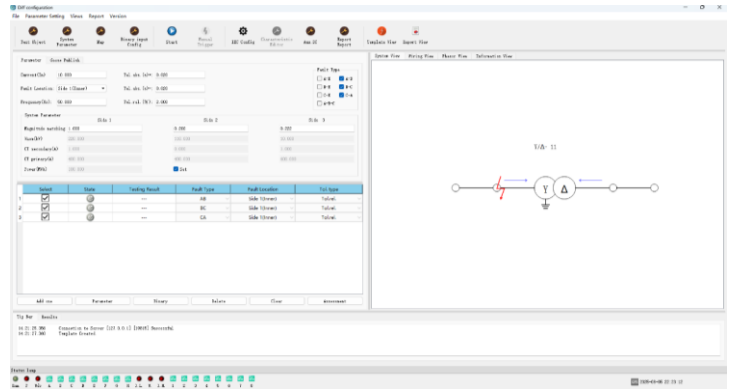
Differential

- ❖ Can search out the percentage restraint curve, harmonic restraint test and trip time.
- ❖ Can check 2nd, 3rd, 4th, 5th and 9th harmonic restraint.
- ❖ Can check tripping time of set points.
- ❖ Can import characteristic or user defined curve.



Differential Configuration

- ❖ Convenient for user set fault to trip all the group circuit breakers and test the trip time.
- ❖ Automatic to calculate the matching factor via the transformer parameter and CT/PT parameter.
- ❖ Can test differential test of 3 windings - high voltage side, middle voltage side and low voltage side in one test.



Advanced Test Package

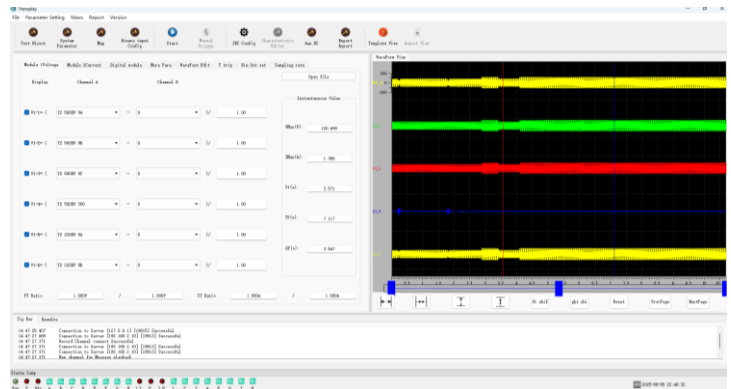
In Advanced Test Package, there are TransPlay, CB Operate, Power Swing Simulation, Ramp (Sequence), Ramp (VL-L,3I), Ramp (Fault), IEC Detect, SCD Compare, SMV Abnormal Simulation and GOOSE Abnormal Simulation test modules.

Advanced Test



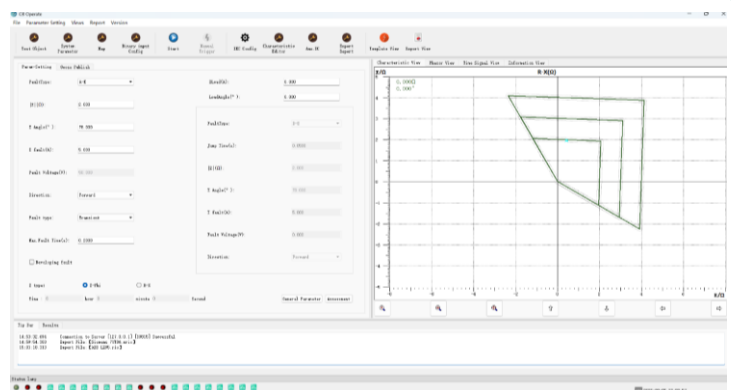
TransPlay

- ❖ Can playback 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.



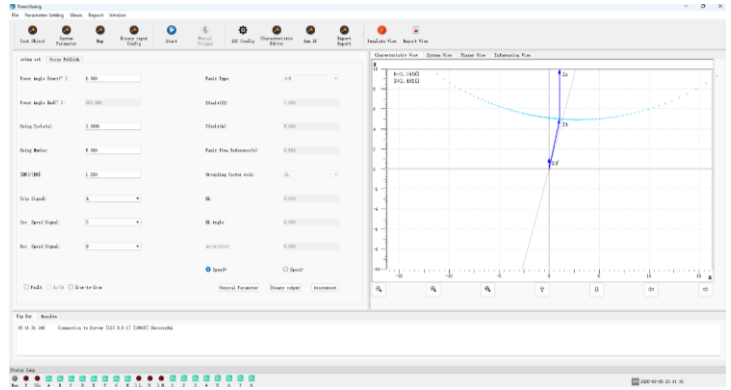
CB Operate

- ❖ 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.



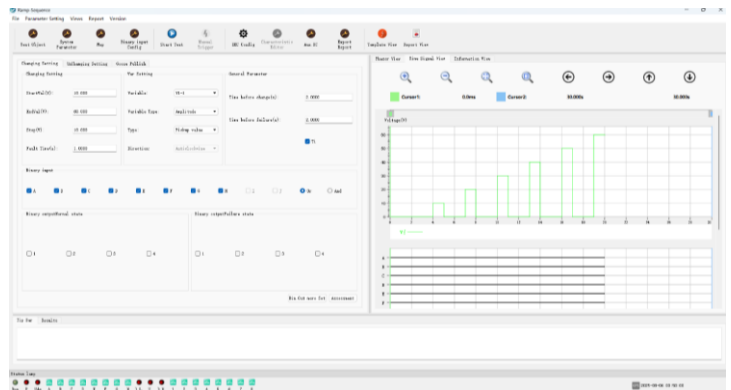
Power Swing Simulation

- ❖ 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.



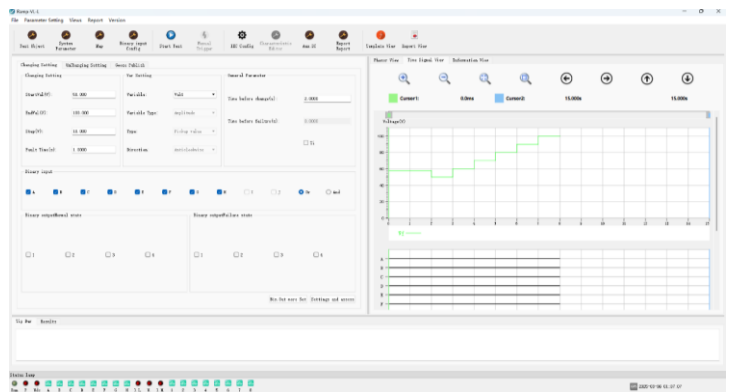
Ramp (Sequence)

- ❖ This module is specially designed to easy setting in sequence component realizing RAMP for check pickup value.
- ❖ Voltage and current of positive sequence, negative sequence and zero sequence can be controlled independently.
- ❖ Both Pulse ramp and Linear ramp available.



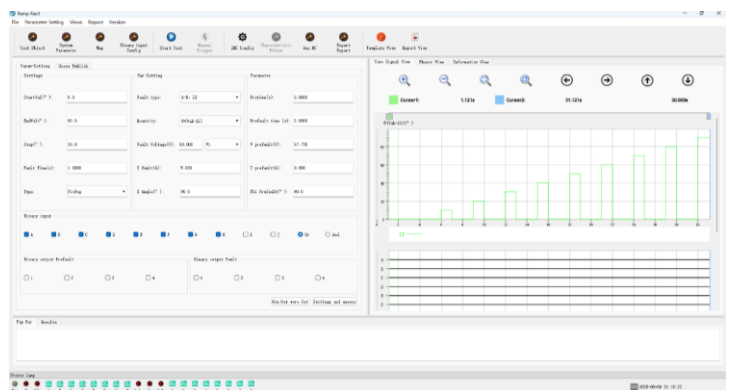
Ramp (VL-L,3I)

- ❖ This module is specially designed to easy setting in phase-to-phase voltage realizing RAMP for check pickup value.
- ❖ Phase-to-phase voltage, zero sequence voltage can be controlled independently.
- ❖ Both Pulse ramp and Linear ramp available.



Ramp (Fault)

- ❖ This module is specially designed to easy setting in fault variable realizing RAMP for check voltage /current /frequency pickup/drop off value, Z angle (°) and Z fault (Ω) value and maximum torque angle.
- ❖ Both Pulse ramp and Linear ramp available.



Test function - Advanced Package

IEC Detect

- ❖ This module is used for SMV and GOOSE detection and record.
- ❖ SMV can be displayed in format including Effective value, wave, vector, sequence, Power, harmonic, polar, and package dispersion, AD, package analyze, channel attribution and SV information.
- ❖ GOOSE can be shown RT, Turn list, package dispersion, turn spy information.

Channel	Amplitude	Angle	Frequency
1 General-DelayTime1	500.000	---	---
2 Ipa-AD1_lpa_Primary	0.994	0.000	50.000
3 Ipa-AD2_lpa_Primary	0.994	0.000	50.000
4 Ipb-AD1_lpb_Primary	1.000	-120.000	50.000
5 Ipb-AD2_lpb_Primary	1.000	-120.000	50.000
6 Ipc-AD1_lpc_Primary	1.000	120.000	50.000
7 Ipc-AD2_lpc_Primary	1.000	120.000	50.000
8 Ima-AD1_lma_Primary	0.994	0.000	50.000
9 Imb-AD1_lmb_Primary	1.000	-120.000	50.000
10 Imc-AD1_lmc_Primary	1.000	120.000	50.000
11 Upa-AD1_Lixa_Primary	57.405	0.000	50.000
12 Upa-AD2_Lixa_Primary	57.405	0.000	50.000

09:33:23.095 New channel for record.....
 09:33:23.095 connection is ready for testing.....
 09:33:43.590 File Save Successful (C:\Users\jwz\Desktop\1.png)
 09:33:56.681 Connection to Server [192.168.2.101] [19014] Successful
 09:33:56.682 New channel for record.....
 09:33:56.683 connection is ready for testing.....

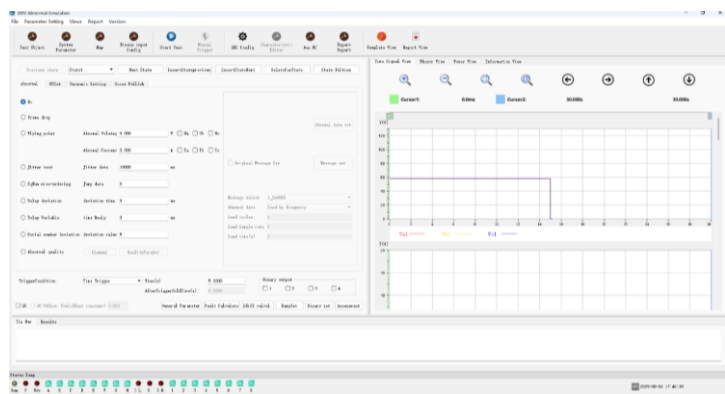
SCD Compare

- ❖ This module is used to check and compare SCD file.
- ❖ Can get schema syntax result, IEC61850 Data type check results, Project model specification check results and Virtual loop normative check results.

No.	Item	Description	Severity	Number of file	Number of items	Number of errors	Item name
1	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
2	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
3	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
4	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
5	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
6	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
7	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
8	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
9	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
10	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
11	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
12	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
13	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
14	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
15	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
16	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
17	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
18	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
19	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
20	Warning	In the I214-PCS21_PCS21 control block related to SMV in the IED, the input description L1 has name=PTSDI desc=PCS21.	Warning	1	0	0	
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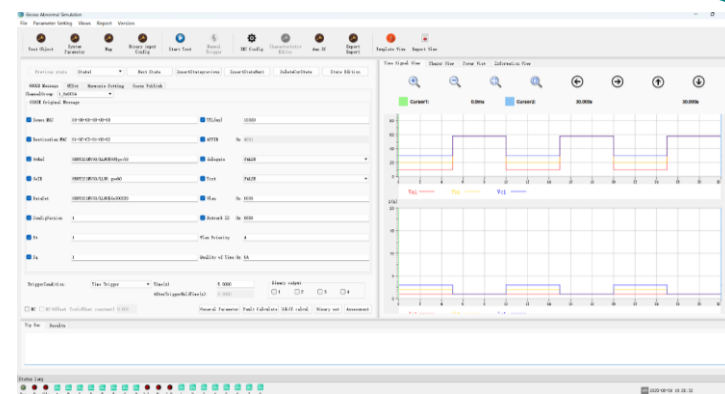
SMV Abnormal Simulation

- ❖ This module is used to do digital test functions with IEC61850-9-2 abnormal simulation.
- ❖ Can do frame drop test, flying point test, jitter test, sequence number miss-ordering test, delay deviation test, delay variable test, serial number deviation test and abnormal quality test in many continuous state.



GOOSE Abnormal Simulation

- ❖ This module is used to do digital test functions with GOOSE abnormal simulation.
- ❖ Can do GOOSE Original message abnormal simulation such as Source MAC, Destination MAC, GoRef, etc. in many continuous state.



Others Test Package

In Others Test Package, there are Transducer and Energy Meter test modules.

Others



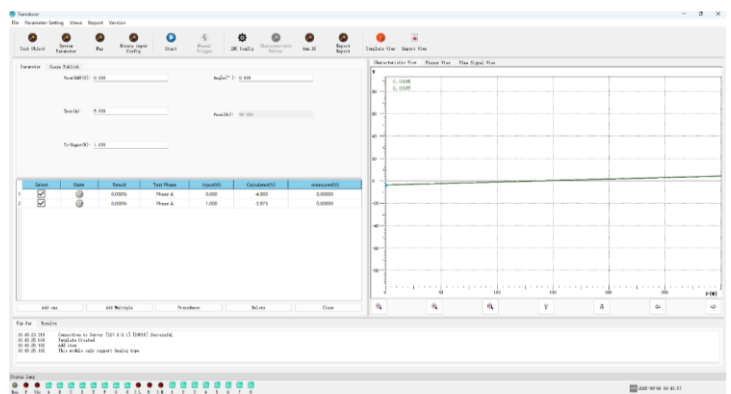
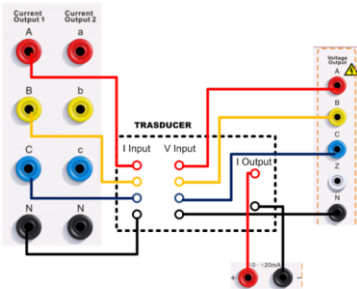
Transducer



Energy Meter

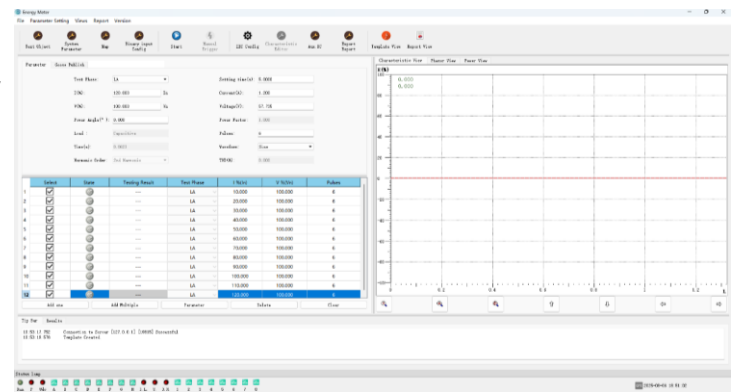
Transducer

❖ Can check accuracy of transducer.



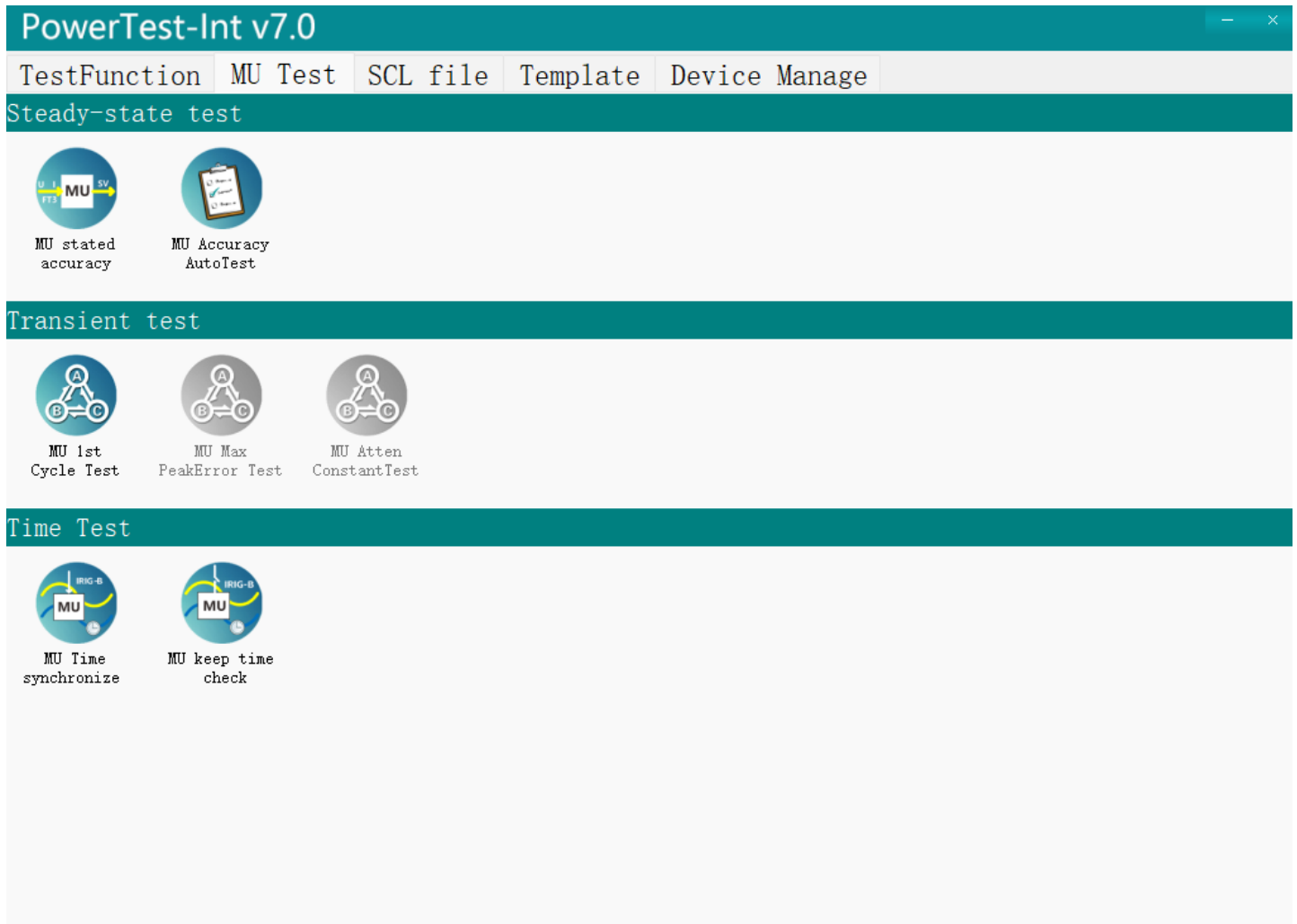
Energy Meter

- ❖ 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.



MU Test Page

MU (merging unit) Test package includes **Steady-state Test** package, **Transient Test** package and **Time Test** package.

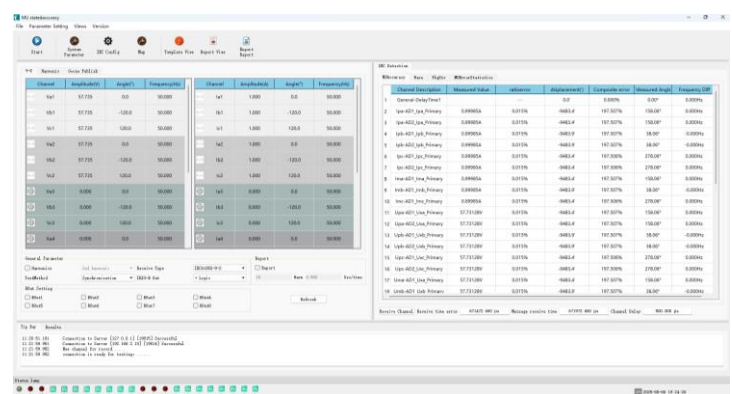


Steady-state Test Package

In the Steady-state Test package, there are MU stated accuracy and MU accuracy Auto Test modules.

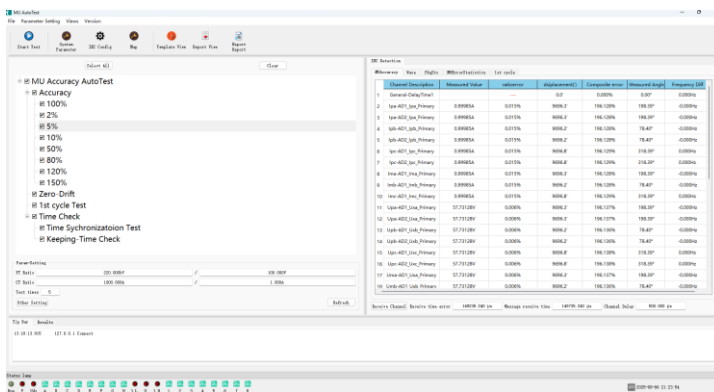
MU stated accuracy

- ❖ In this module, test set can output analog quantity and received IEC message.
- ❖ MU accuracy includes measured value, ratio error, displacement, composite error, measured angle and frequency differential of each channel can be shown in real time.
- ❖ Package statistics information can be analyzed.



MU accuracy Auto Test

- ❖ Can do ratio error test, phase displacement check and composite error test at 100%, 2%, 5%, 10%, 50%, 80%, 120%, 150% of rated value automatically.
- ❖ Can do zero-drift test, first-cycle test, time synchronous test and keep time test automatically.

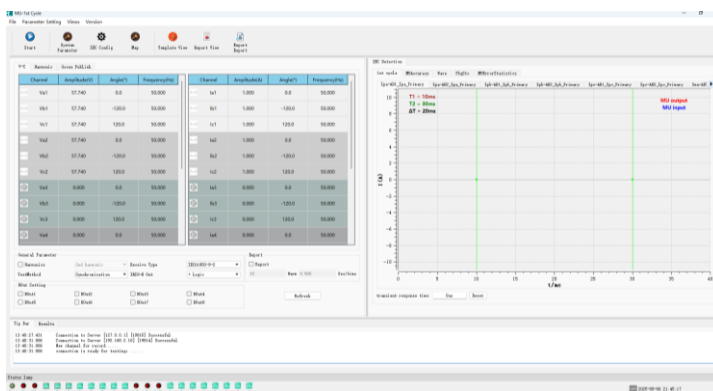


• Transient Test Package

In Transient Test Package, there are MU first cycle test module, MU peak error test module and MU attenuating constant test. MU peak error test module and MU attenuating constant test module is in making process.

MU first cycle test

- ❖ Can show current-time relationship diagram of MU output and input value for the first cycle.
- ❖ Can test MU accuracy includes measured value, ratio error, displacement, composite error, measured angle and frequency differential of each channel in real time.

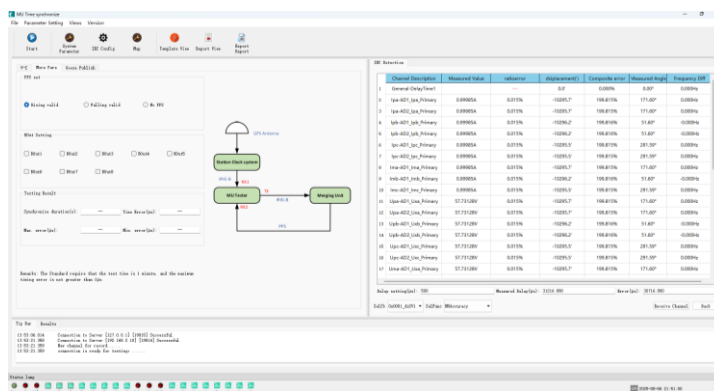
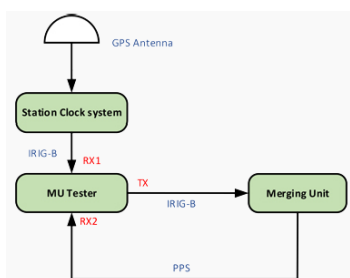


• Time Test Package

In Time Test Package, there are MU time synchronize test module and MU keep time check module.

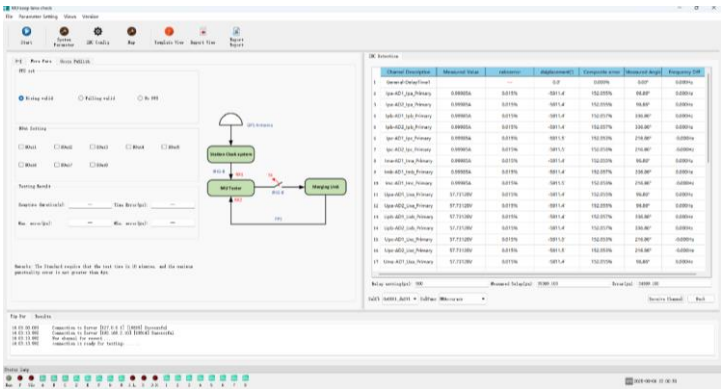
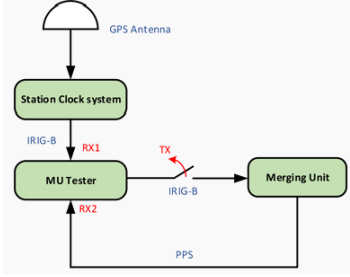
MU time synchronize

- ❖ Can do MU time synchronization test.



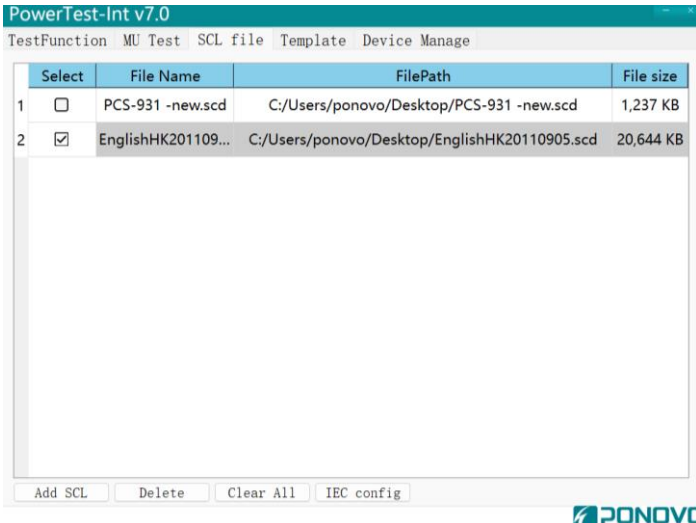
MU keep time check

Can do MU keep time by itself test.



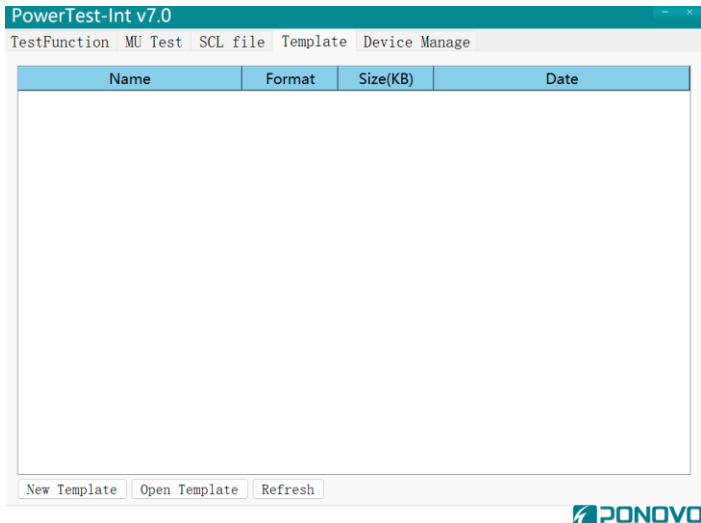
SCL file Page

SCL file interface is used to import the SCL file for IEC configuration. Here SCL file supports format in scd, icd, cid, tscd and ccd.



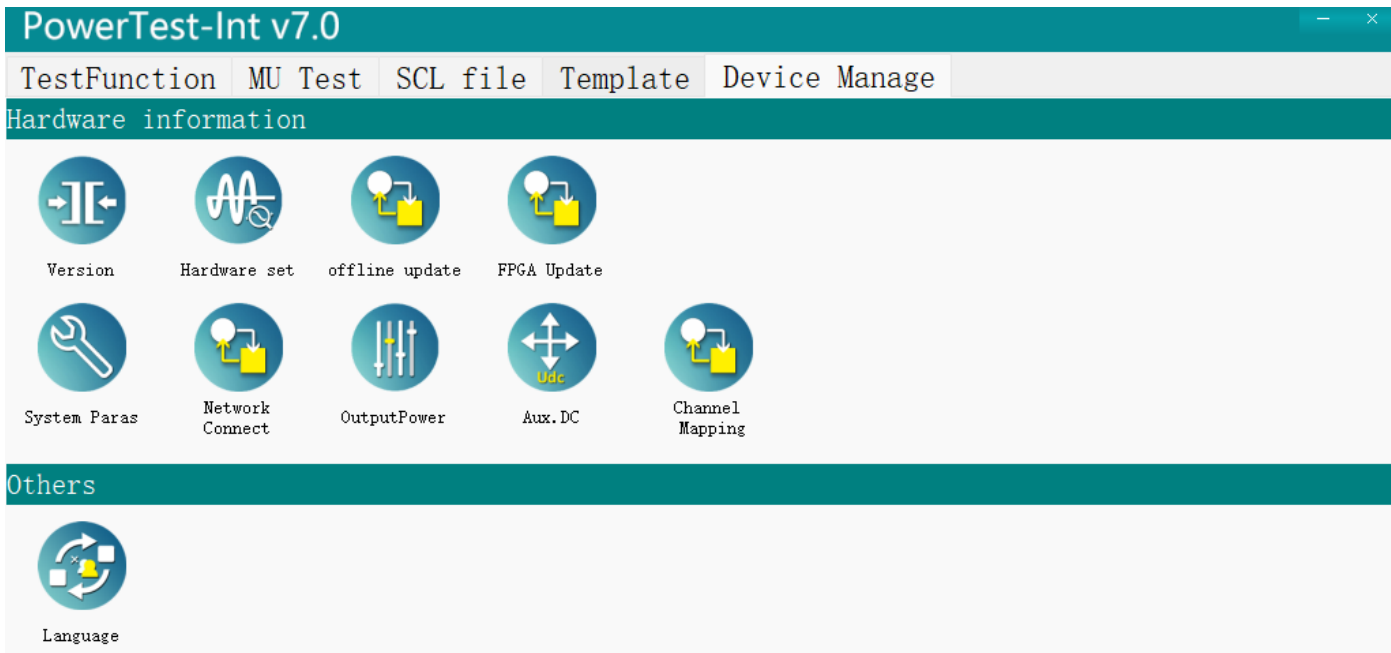
Template Page

Template interface is used to open the template file, create new template and refresh template for test.



Device Manage Page

Device Manage includes hardware information and Others information.



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