Three-phase relay test SET AK30 / AK31

Three-phase relay test SET AK30 / AK31

- Able to analyze and test universal relays.
- IEC 61850 test tool.
- Robust and lightweight design.
- Friendly and simple software.

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The Amperis AK30 and AK31 family are relay test equipment compatible with the IEC 61850 standard, which have 10 and 13 channels respectively and have a DC source that can be used simultaneously. The sources of voltage, current, and the power simulator for the relay are independent.

I

t has complete self-protection and alarm indicators due to: overload, overheating, short circuit, open circuit or incorrect connection. It offers us the possibility to adjust continuously and independently: amplitude, frequency and phase angle.

The AK30 and AK31 are capable of analyzing all generations and types of relays (current, voltage, frequency, power, impedance, harmonics, distance, etc.). Capable of testing high load electromechanical relays with very high power demand.

The equipment gives the possibility to carry out checks of wiring of the current transformers. They have the advanced function of the GPS trip and are controlled through the PC via RJ45 Ethernet interface. Import and export of RIO / XRIO.

Models of the AK30 and AK31 family

AK30				
MODEL	CURRENT		TENSION	
	Nº OF INJECTORS	MAXIMUN POWER	VOLTAGE	MAXIMUN POWER
AK3030i	3x30A	450VA	4x300V	120VA
AK3063i	6x30A 3x60A	450VA 850VA	4x300V	120VA
AK3066i	6x30A 3x60A	450VA 850VA	7x300V	90VA
AK31				
MODEL	CURRENT		TENSION	
	Nº OF INJECTORS	MAXIMUN POWER	VOLTAGE	MAXIMUN POWER
AK3130i	3x32A	450VA	4x310V	124VA
AK3163i	6x32A 3x64A	450VA 850VA	4x310V	124VA
AK3166i	6x32A 3x64A	450VA 850VA	7x310V	90VA

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The following table shows the available models of the AK30 family:

AK 3030i		
VOLTAGE OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 4x0…300V	120 VA max. each
	AC(L-L) 2x0…600 V	240 VA max. each
	DC(L-N) 3x0…300 V	120 W max. each
CURRENT OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 3x0…30A	450VA max. each
	AC(3L-N) 1x0…90A	1000VA max.
	DC(L-N) 3x0…20A	300W max. each

AK 3063i		
VOLTAGE OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 4x0…300V	90 VA max. each
	AC(L-L) 2x0…600 V	180 VA max each
	DC(L-N) 3x0…300 V	90 W max each
CURRENT OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 3x0…30A	450VA max. each
	AC(2L-N) 3x0…60A	850VA max. each
	AC(6L-N) 1x0…100A	1200VA max.
	DC(L-N) 3x0…20A	300W max. each

AK 3066i		
VOLTAGE OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 7x0…300V	90 VA max. each
	AC(L-L) 3x0…600 V	180 VA max each
	DC(L-N) 3x0…300 V	90 W max each
CURRENT OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 6x0…30A	450VA max. each
	AC(2L-N) 3x0…60A	850VA max. each
	AC(6L-N) 1x0…100A	1200VA max.
	DC(L-N) 3x0…20A	300W max. each

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Common technical specifications family AK30

VOLTAGE OUTPUT		
ACCURACY	± 2mV @ 0.2~2V ac <0.07% Rd.+0.03% Rg Guar. a 2~300Vac <0.03% Rd.+0.01% Rg Typ. a 2~300Vac	
	± 10mV @ 0.5~5V dc ± 0.5% @ 5~300V dc	
DISTORSION	<0,1% Guar. / <0,05% Typ.	
RESOLUTION	1mV	
CURRENT OUTPUT		
ACCURACY	± 1mA @ 0.2-0.5A ac <0.15% rd.+ 0.05% rg. a 0.5~30A ac <0.05% rd.+ 0.02% rt. a 0.5~ 30A ac	
	± 5mA @ 0.2~1A dc ± 0.5% @ 1~20A dc	
DISTORSION	<0.1% Guar./ <0.05% Typ	
RESOLUTION	1mA	
GENERAL GENERATOR		
FREQUENCY	Range	5~1000 Hz
	Resolution	0.001Hz
	Accuracy	<1ppm @ 5~65 Hz <10ppm @ 65~450 Hz <20ppm @ 450~1000 Hz
PHASE	Range	-360°~360°
	Resolution	0.001°
	Accuracy	<0.05° Typ. / <0.1° Guar.

BINARY INPUT	
QUANTITY	8 pairs
CHARACTERISTICS	0~400Vdc / Potential free
TIME RESOLUTION	<0.1ms
MAX. MEASURING TIME	Infinite
DEBOUNCE TIME	0~25ms
INSULATION	Operation: -10/+50 °C Storage: -10/+70 °C
BINARY OUTPUT	
QUANTITY	4 pairs
TYPE	Potential free relay contacts, software controlled.
BRAK CAPACITY	Vmax:300V ac / Imax:4A / Pmax:1000VA
SYNCHRONIZATION	
MODE	GPS, SMA type antenna connector.
HARMONIC	
SUPERIMPOSED NUMBERS	2~20times
AUX. DC VOLTAGE SOURCE (BATTERY SIMULATOR)	
RANGE	0~300V @ 120W max
POWER SUPPLY	
NOMINAL INPUT VOLTAGE	100~240Vac
PERMISSIBLE INPUT VOLTAGE	85~264Vac, 125~350Vdc
NOMINAL FREQUENCY	50/60 Hz
PERMISSIBLE FREQUENCY	45Hz~65Hz
POWER CONSUMPTION	1500 VA max.
CONNECTION TYPE	Standard AC socket 60320

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ENVIRONMENTAL CONDITIONS	
OPERATING TEMPERATURE	0ºC~55ºC
STORAGE TEMPERATURE	-20ºC~70ºC
HUMIDITY	<95%RH, non-condensing
OTHERS	
WEIGHT	17.5 kg
DIMENSIONS	360x450x140 (mm)
PC CONNECTION	RJ45 Ethernet, 10/100/1000M
GROUNDING TERMINAL	4 mm banana socket

ADDITIONAL INFORMATION (OPTIONAL MODULES)

DC MEASUREMENT INPUT (TRANSDUCER CALIBRATOR)		
VOLTAGE INPUT	Range	0~±10V dc
	Accuracy	<0.02% rg Typ. <0.05% rg Guar.
	Input Impedance	100 Kohm
CURRENT INPUT	Range	0~±20mA dc
	Accuracy	<0.02% rg Typ. <0.05% rg Guar.
	Input Impedance	50 ohm
AC MEASUREMENT INPUT (STANDARD METER)		
VOLTAGE RANGE	0~130V ac, <0.2%Rg	
CURRENT RANGE	0 ~ 5 A ac (Clamp CT Connection), <0.5% Rg	
FREQUENCY RANGE	45~65Hz, < 0.01Hz	
PHASE	0~360º, <0.2º	
HARMONIC	2~20 times	
ENERGY METER CALIBRATION		
SENSOR USAGE	Mechanical meters / Electronic meters.	
SENSOR OUTPUT	High Level:> 4.5V Low level: <0.2V	
PULSE INPUT	1 pulse input port.	
PULSE RANGE	500KHz pulse input Max.	
PULSE OUTPUT	1 Transistor output.	

Rd: Reading
Rg: Rage
Typ: Typical
Guar: Guaranteed

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The following table shows the available models of the AK31 family

AK 3130i		
VOLTAGE OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 4x0…310V	124 VA max. each
	AC(L-L) 2x0…620 V	248 VA max each
	DC(L-N) 3x0…350 V	140 W max each
CURRENT OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 3x0…32A	450VA max. each
	AC(2L-N) 3x0…64A	850VA max. each
	AC(6L-N) 1x0…100A	1200VA max.
	DC(L-N) 3x0…20A	300W max. each

AK 3163i		
VOLTAGE OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 4x0…310V	124 VA max. each
	AC(L-L) 2x0…620 V	248 VA max each
	DC(L-N) 3x0…350 V	140 W max each
CURRENT OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 6x0…32A	450VA max. each
	AC(2L-N) 3x0…64A	850VA max. each
	AC(6L-N) 1x0…100A	1200VA max.
	DC(L-N) 3x0…20A	300W max. each

AK 3166i		
VOLTAGE OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 7x0…310V	90 VA max. each
	AC(L-L) 3x0…620 V	180 VA max each
	DC(L-N) 3x0…350 V	140 W max each
CURRENT OUTPUT		
OUTPUT RANGE AND POWER	AC(L-N) 6x0…32A	450VA max. each
	AC(2L-N) 3x0…64A	850VA max. each
	AC(6L-N) 1x0…100A	1200VA max.
	DC(L-N) 3x0…20A	300W max. each

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Common technical specifications family AK31

VOLTAGE OUTPUT	
ACCURACY	<0.07% Rd.+0.03% Rg Guar. (AC) <0.03% Rd.+0.01% Rg Typ. (AC)
	± 10mV @ <5V (DC) ± 0.5% @ ≥5V (DC)
DISTORSION	<0,1% Guar. / <0,05% Typ.
RESOLUTION	1mV
CURRENT OUTPUT	
ACCURACY	<0.15% Rd.+ 0.05% Rg Guar. (AC) <0.05% Rd.+ 0.02% Rg Typ. (AC)
	± 5mA @ <1A (DC) ± 0.5% @ ≥1A (DC)
DISTORSION	<0.1% Guar./ <0.05% Typ
RESOLUTION	1mA
LOW LEVEL CHANNEL OUTPUTS	
QUANTITY	13 Channels, 16 pin aviation socket
VOLTAGE OUTPUTS RANGE	AC 0~8V DC 0~10V
CURRENT OUTPUTS RANGE	Nominal 2mA Transient 10 mA max.
OUTPUT POWER	≥0.5VA
ACCURACY	(0.01~0.8 Vrms):<0.05% Typ. / <0.1% Guar. (0.8~8 Vrms): <0.02% Typ. / <0.05% Guar.
RESOLUTION	0.25mV
DISTORTION (THD%)	<0.05% Typ. / <0.1% Guar.

IEC61850		
FIBER PORTS	2 x 100Base-FX Full Duplex, LC type (Optional to 10/100Mbit, Ethernet RJ45 type)	
FIBER TYPE	62.5/125μm (multiple optical fiber, Orange Red)	
WAVELENGTH	1310nm	
TRANSMIT DISTANCE	>1Km	
INDICATOR	Green light: valid connexion Yellow blinking: data exchanging	
NOTE	All hardware of this module are ready for active	
GENERAL GENERATOR		
FREQUENCY	Range	CC~1KHz, 3KHz transient
	Resolution	0.001Hz
	Accuracy	±1ppm
PHASE	Range	-360°~360°
	Resolution	0.001°
	Accuracy	<0.05° Typ. / <0.1° Guar. 50/60Hz
BINARY OUTPUT		
QUANTITY	8 pairs	
TIPE	wet/dry measurement	
THRESHOLD	10~600Vdc or potential free, programmable.	
TIME RESOLUTION	100 μs	
TIME RANGE	Infinito	
TIME ERRORS	±1ms @ 0.001~1s, ±0.1% @ >1s	
DEBOUNCE TIME	0~25ms (software controlled)	
GALVANIC ISOLATION	4 isolated with each 2 pairs.	

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BINARY OUTPUT (RELAY TYPE)	
QUANTITY	4 pairs
TYPE	Potential free relay contacts, software controlled.
BREAK CAPACITY	Vmax:400V ac / Imax:8A / Pmax:2500VA
	Vmax:300V dc / Imax:5A / Pmax:150W
BINARY OUTPUT (SEMICONDUCTOR TYPE)	
QUANTITY	4 pairs
TYPE	Open-collector, 14 pin aviation socke
BRAK CAPACITY	5~15 V cc / 5mA, 10 mA max.
	AC not permit
RESPONSE TIME	100µs
SYNCHRONIZATION	
MODE	GPS, SMA type antenna connector IRIG-B, FT3 IEEE1588
AUX. DC VOLTAGE SOURCE (BATTERY SIMULATOR)	
RANGE	0~350V @ 140W max
ACCURACY	0.5% Rg Guar.
POWER SUPPLY	
NOMINAL INPUT VOLTAGE	100~240Vac
PERMISSIBLE INPUT VOLTAGE	85~264Vac, 125~350Vdc
NOMINAL FREQUENCY	50/60 Hz
PERMISSIBLE FREQUENCY	45Hz~65Hz
POWER CONSUMPTION	1500 VA max.
CONNECTION TYPE	Standard AC socket 60320

ENVIRONMENTAL CONDITIONS	
OPERATING TEMPERATURE	-10ºC~55ºC
STORAGE TEMPERATURE	-20ºC~70ºC
HUMIDITY	<95%RH, non-condensing
OTHERS	
WEIGHT	18 kg
DIMENSIONS	368x375x164 (mm)
PC CONNECTION	RJ45 Ethernet, 10/100/1000M
GROUNDING TERMINAL	4 mm banana socket

ADDITIONAL INFORMATION (OPTIONAL MODULES)

DC MEASUREMENT INPUT (TRANSDUCER CALIBRATOR)		
VOLTAGE INPUT	Range	0~±10V dc
	Accuracy	<0.02% rg Typ. <0.05% rg Guar.
	Max Input	±11V dc
	Input Impedance	1Mohm
CURRENT INPUT	Range	0~±20mA dc
	Accuracy	<0.02% rg Typ. <0.05% rg Guar.
	Max Input	600mA
	Input Impedance	15 ohm

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AC/DC MEASUREMENT INPUT (STANDARD METER)	
INPUT QUANTITY	8 inputs (blend with binary input pairs)
VOLTAGE RANGE	0~600Vrms (Rg:0.1V, 1V, 10V, 60V, 600V
VOLTAGE ACCURACY	<0.1% Rg
CURRENT RANGE	0 ~ 5 Arms (clamp input)
CURRENT ACCURACY	<0.1% Rg
SAMPLE RATE	10KHz
INPUT IMPEDANCE	600KΩ
FREQUENCY RANGE	45~65Hz, Accuracy < 0.01Hz
PHASE ACCURACY	0~360°, <0.2° Typ.
TRANSIENT RECORDER	
QUANTITY	8 input channels (blend with binary input pairs)
RECORDER TIME	Max 50 Sec.
ENERGY METER CALIBRATION	
SENSOR USAGE	Mechanical meters / Electronic meters
SENSOR OUTPUT	High level:> 4.5V Low level:<0.2V
PULSE INPUT	1 pulse input port
PULSE RANGE	500KHz entrada de pulso max.
PULSE OUTPUT	1 transistor output Open collector 5-15V dc / 5mA

Test equipment for family relays AK30 and AK31 respectively.

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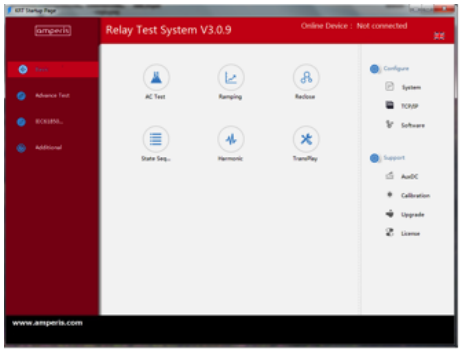
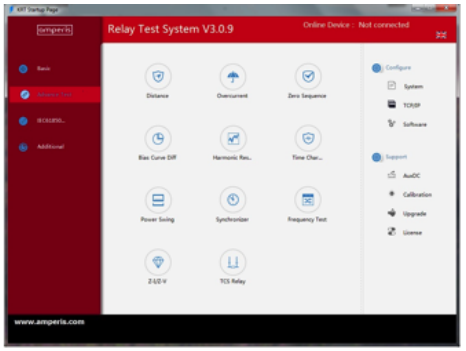
ITEMS	ANSI® No.
IEC61850 numerical IEDs relay & merge unit	
Distance protection relay	21
Synchronising or synchronism-check relays	25
Undervoltage relays	27
Directional Power relays	32
Undercurrent or underpower relays	37
Negative sequence overcurrent relays	46
Overcurrent/ground fault relays	50
Inverse time overcurrent/ground fault relays	51
Power factor relays	55
Overvoltage relays	59
Voltage or current balance relays	60
Directional overcurrent relays	67
Directional ground fault relays	67N
DC overcurrent relays	76
Phase-angle measuring or out-of-step protection relays	78
Automatic reclosing devices	79
Frequency relays	81
Motor overload protection relays	86
Differential protection relays	87
Directional voltage relays	91
Voltage and power directional relays	92
Tripping relays	94
Voltage regulating relays	
Overimpedance relays, Z>	
Underimpedance relays, Z	
Time-delay relays	

Software features:

- All-in-one software.
- Generates automatic reports.
- You can create, maintain and distribute complete test plans.
- Control of 10 or 13 sources independently.
- Power system modeling for dynamic tests.
- Automatic comparison of current and expected characteristics.
- Easy import and export of data (RIO, XRIO and COMTRADE compatibility for transient data exchange).
- Trigger, search and test by mouse-over.
- Fast, automatic and manual testing.
- Graphics modules and templates for pre-installed relay testing.





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Basic software test modules:

1. AC & DC test: This module allows to generate different values of voltage and current through the output channels in a direct way, for testing different types of relays.

2. Ramping Test: This module allows to generate different ramps in the output variables, as well as the conditions (or triggers) that activate them. Min. and max. of start currents, power, direction ... It is possible to define tolerance ranges for the final result, as well as complex time calculations.

3. Overcurrent Test: This module is a specific module to quickly and easily test overcurrent curves.

4. State Sequence: This module allows to define different states for tests of complex logic with relays, especially indicated for test like multiple auto re-closures. There are 8 controllable test states to be used for the purpose of the operator.

5. Distance Protection: This module allows you to calibrate the fixed parameters of the distance relays and an analysis of the sensitivity and reliability of the action of each section of the distance protection. The parameterization consists of three parts: Configuration of parameters in the RIO file, configuration of the test, configuration of the inputs and binary outputs.

6. Differential Rate Protection This module allows to test the reverse braking feature automatically, of a digital transformer, generator and electromotor.

7. Reclose test: This module is primarily used for distance, zero sequence and other line protection features simulating a wide variety of single phase, biphasic and three phase systems, including transient and permanent failures for whole group testing.

8. Synchronizer test: This module is mainly used to test the action on voltage and frequency, angle, time, pulse control, auto-synchronization devices ...

9. Fault Recurrence: This module is used for the reproduction of standard COMTRADE (Common Format for Transient Data Exchange) format files through the outputs of the equipment.

10. Time Features:This test module contains items to test the time characteristic of the frequency and voltage relay and to test overexcitation.

Special test modules (optional):

11. Power Swing: This module is used to test generators outside the protection range, cutting devices, relaying of distance relays ...

12. Frequency Test: This module is mainly used for frequency protections, low voltage load disconnects, low current load disconnects ...

13. Standard Meter (Medidor multifuncional): This optional module acts as a multi-function meter and allows you to collect current and voltage input values and display them on the screen. Current, voltage, phase and frequency are displayed in real time.

14. Recorder (Grabador de transitorios): This optional module acts as a recorder before and during the fault, for various changing electrical conditions. It is used to analyze the causes of a certain electrical problem and the performance of the protection devices.

15. Energy Meter Calibration: This module allows calibrating electronic or electromechanical energy meters.

16. Transmitter Calibration: This optional module allows calibrating standard and multifunction power transducers, three-phase and single-phase.

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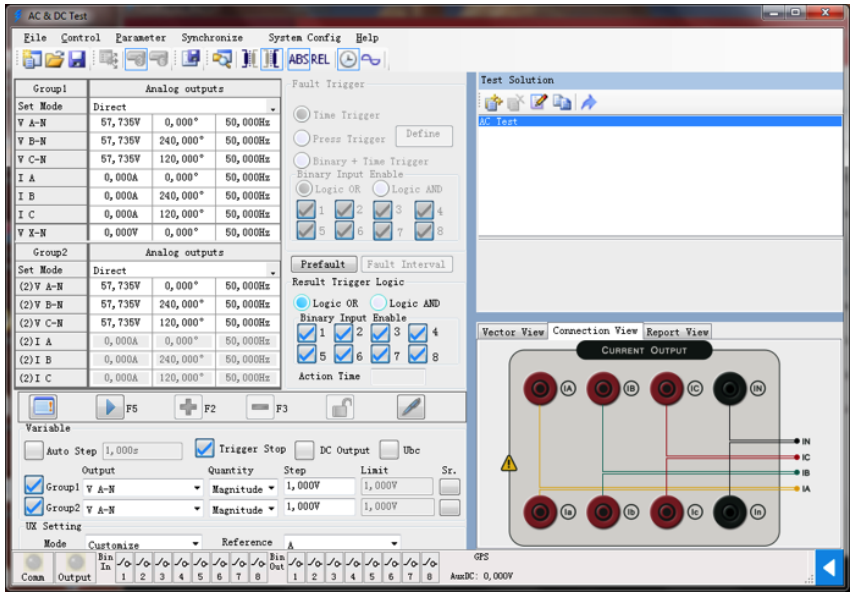
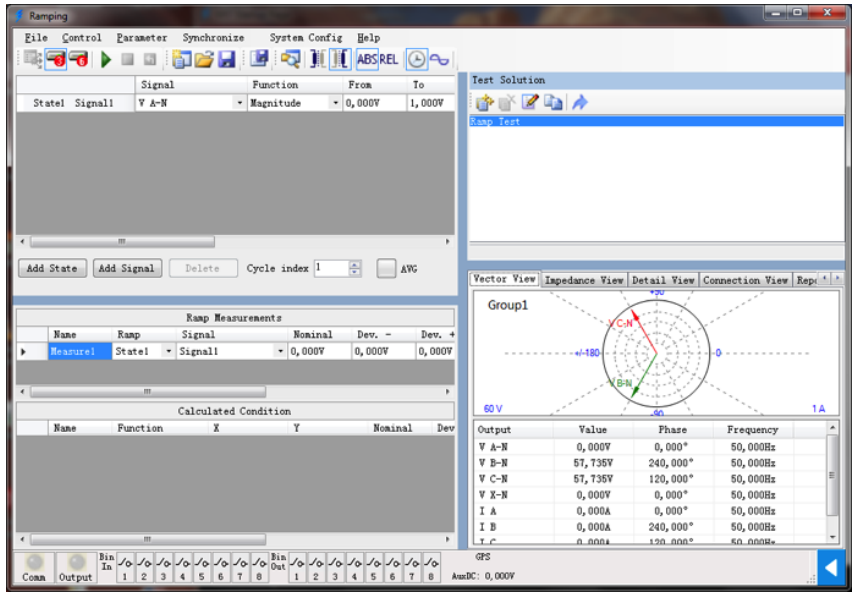
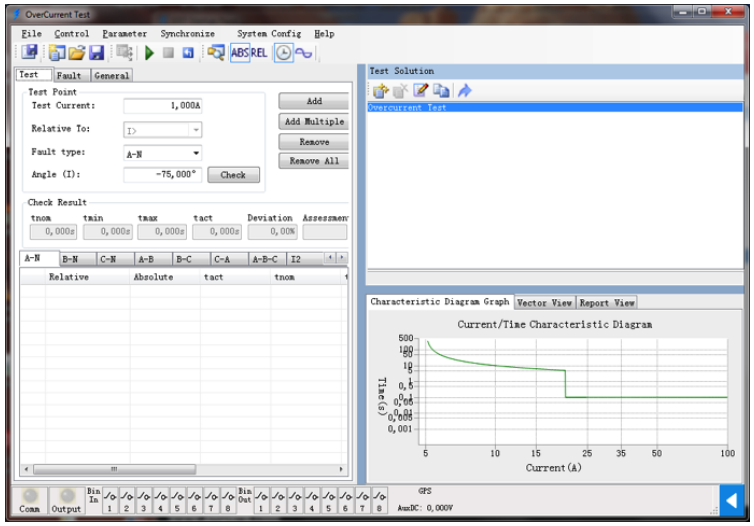


SCREENSHOT OF THE AC/CC TEST.



SCREENSHOT OF RAMPING TEST.



SCREENSHOT OF THE OVERCURRENT TEST.

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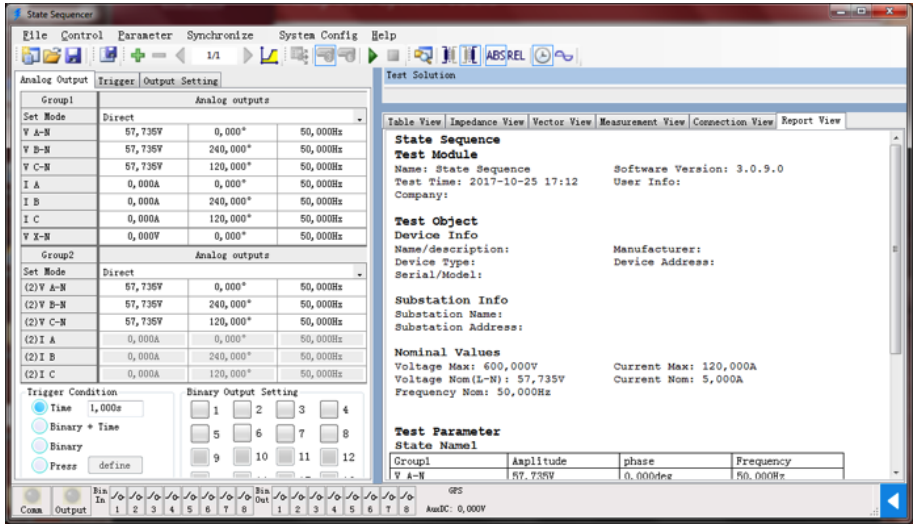
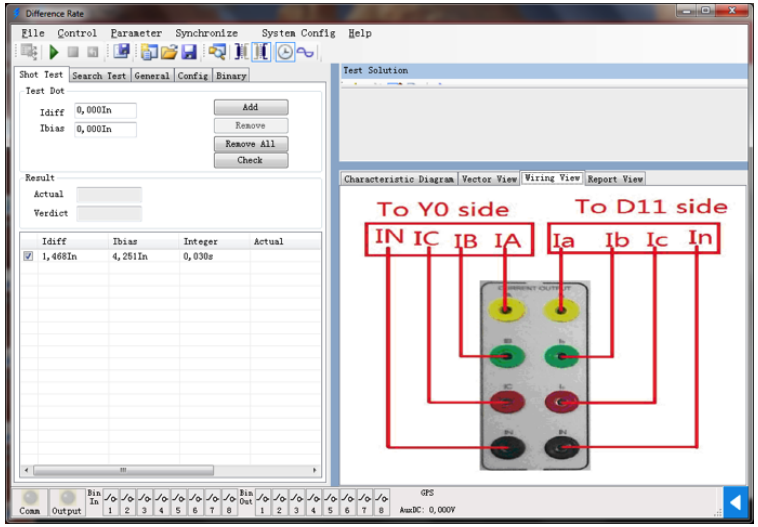
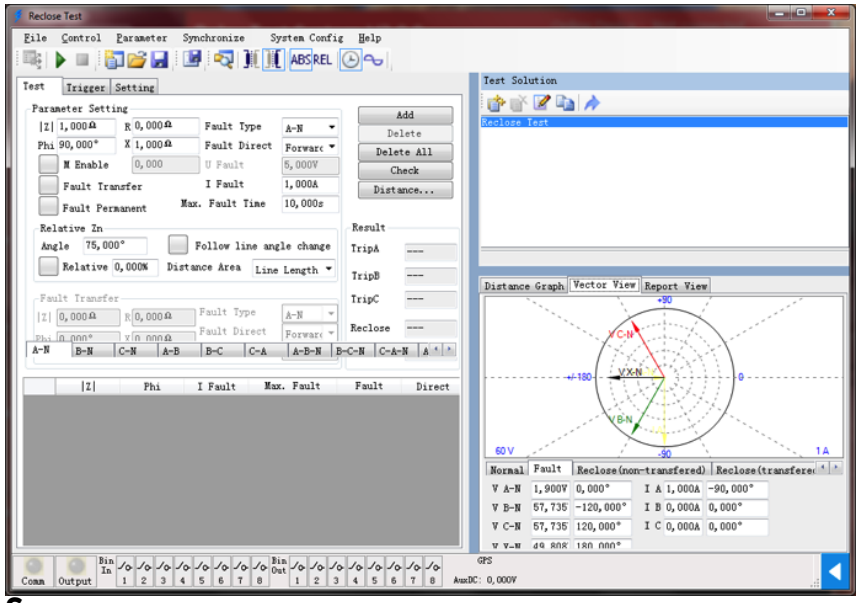


SCREENSHOT OF THE STATE SEQUENCE TEST MODULE.



SCREENSHOT OF THE DIFFERENTIAL PROTECTION MODULE.



SCREENSHOT OF THE RECLOSER TEST.

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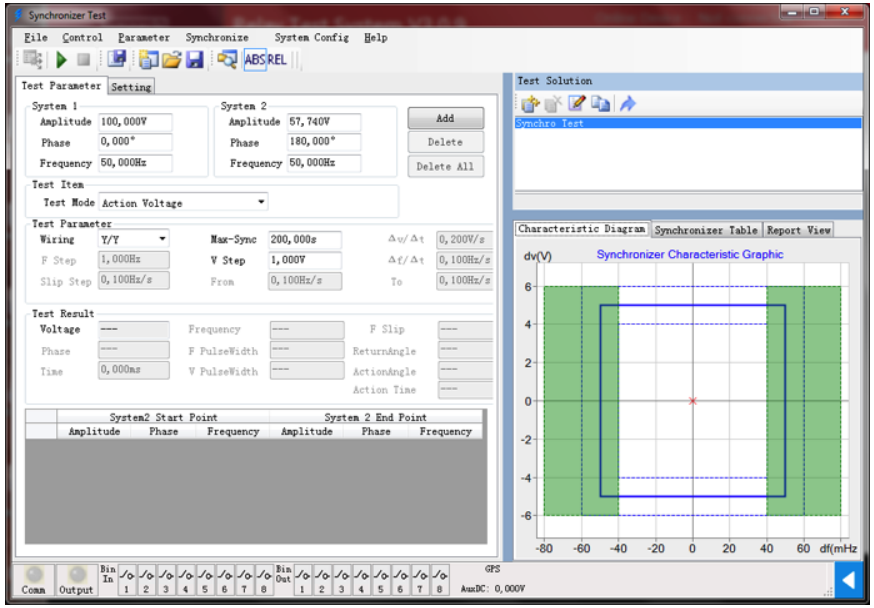
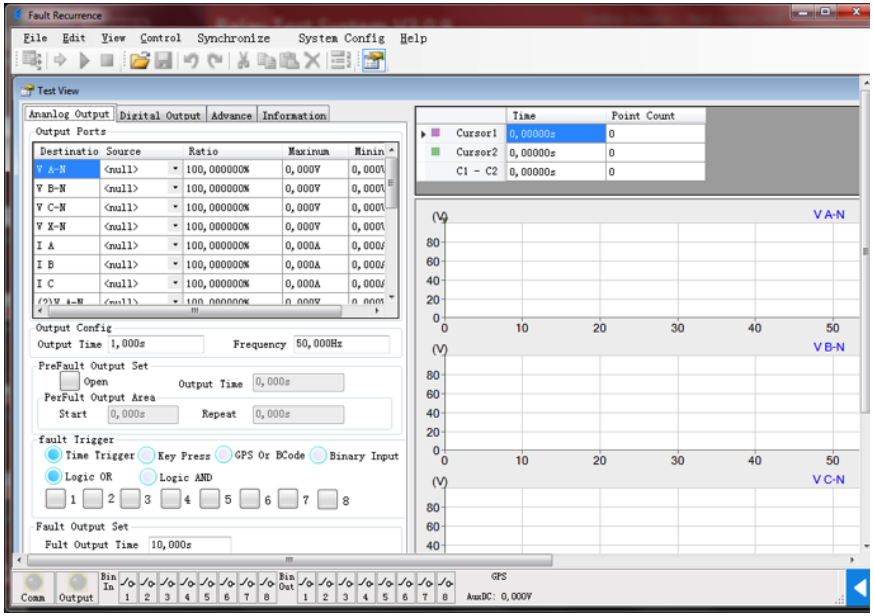


SCREENSHOT OF THE SYNCHRONIZATION TEST.



SCREENSHOT OF THE CONTRADE TRANSIENT ANALYSIS MODULE.

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