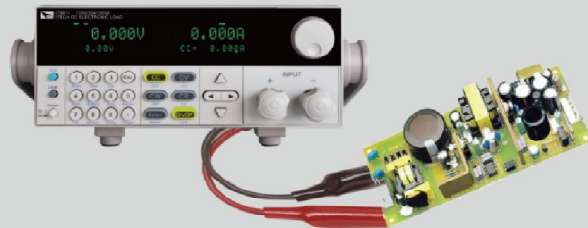


# **IT9520**

## **Power auto-test system**



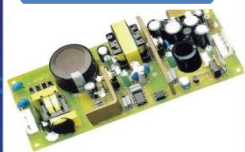
## Power supply module test



## Power system test solution



Switch power



DC-DC power supply



Portable power source



UPS power supply



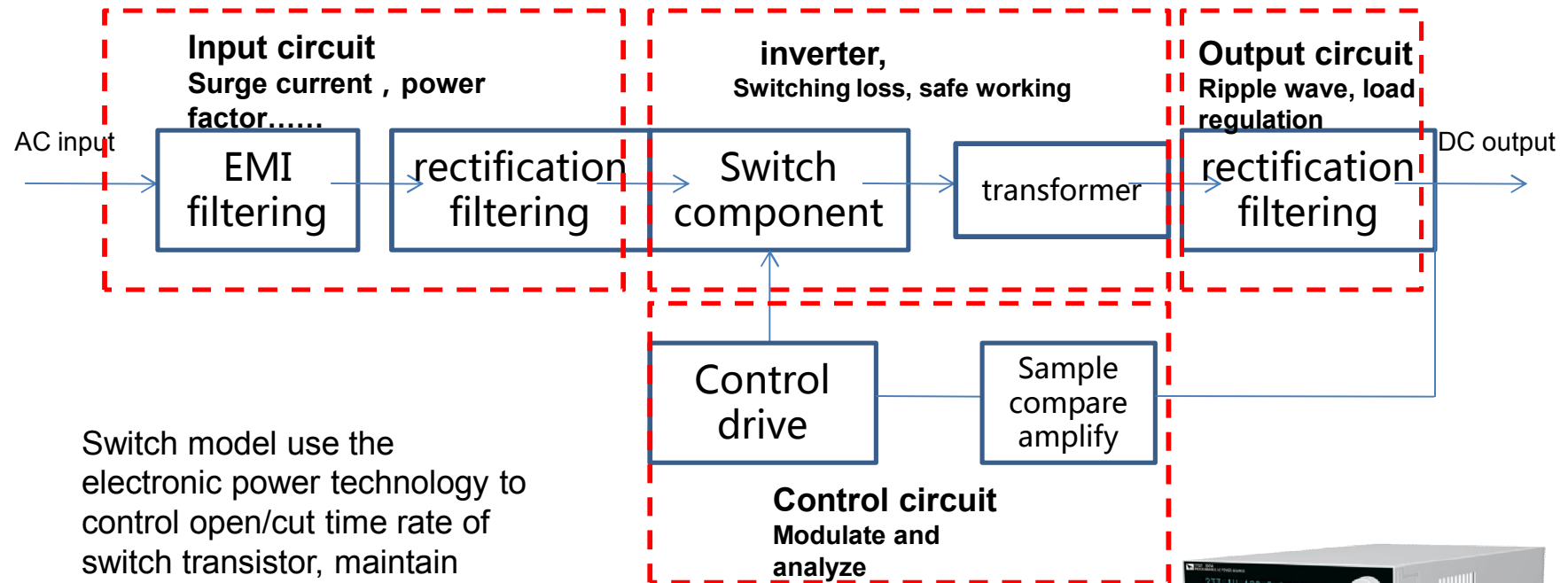
Aerospace power supply



Communication power supply



## Working principle



Switch model use the electronic power technology to control open/cut time rate of switch transistor, maintain stable voltage output .(Switch power supply is generally include PWM control IC and MOSFET.)



## Input features

## ITECH whether have

Power factor and effect	YES
Peak current	YES
Surge	YES
Power supply regulate rate	YES
Input voltage	YES
Input frequency	YES
Input disturbance test	YES

- ✓ Functions test
- ✓ Protections test
- ✓ Reliability test
- ✓ Other test



## Output features

## ITECH whether have

Output W/C/V	YES
Short-circuit current	YES
Ripple wave ,noise	YES
Protect time ( OVP/UVF/OPP)	YES
Voltage rising/falling slope	YES
Load regulation	YES
Dynamic drawing	YES
Other test items	
Outage test	YES
ON OFF Time	YES





## **IT9520 has 18 test items :**

- |                            |                                   |
|----------------------------|-----------------------------------|
| 1 Input/output test        | 10 Over power test                |
| 2 Static test              | 11 Over/under voltage test        |
| 3 Power supply effect test | 12 Input voltage limit test       |
| 4 Load effect test         | 13 Input frequency limit test     |
| 5 Mixed effect test        | 14 Input power disturbance test   |
| 6 Dynamic test             | 15 Attachment point sequence test |
| 7 Startup test             | 16 Extended measurement test      |
| 8 Power off test           | 17 Short-circuit test             |
| 9 Over load protect test   | 18 Outage test                    |



### 1、 Input/output test

Input/output test reflect the input/output terminal electrical characteristics in static loading conditions.

### 2、 Static test

Static test is the voltage characteristic of DUT when it is in static loading conditions.

### 3、 Power supply effect test

Power supply effect test reflects output voltage of DUT when input power changes.



#### 4、 Load effect test

Load effect test reflect the output voltage characteristic of DUT when load condition changes.

#### 5、 Mixed effect test

Mixed effect test reflect output voltage characteristics of DUT when the input power and load condition changes.

#### 6、 Dynamic test

Dynamic test is to test the output voltage of DUT when in auto-load conditions.





## 7、Startup test

Startup test is to test output voltage sequence characteristics of DUT in startup condition.

## 8、Power off test

Power off test is to reflect output voltage sequence characteristic of DUT in power off condition.

## 9、Over load protect test

Over load protect test is to test the output response characteristic of DUT in over load condition.



## 10、 Over power test

Over power test is to test the over power protect function of DUT.

## 11、 Over/under voltage test

Over/under voltage is to test protect function of DUT when output voltage is too high or too low .

## 12、 Input voltage limit test

Input voltage limit test is to test the maximum and minimum input voltage when DUT is in working condition.



### 13、 Input frequency limit test

Input frequency limit test is to test the maximum or minimum input frequency value of DUT when in working conditions.

### 14、 Input power disturbance test

Input power disturbance test is to test output voltage characteristic when input power is in the disturbance of voltage changes.

### 15、 Attachment point sequence test

It is to test output voltage sequence characteristic when DUT receive the signal of startup.



## 16、 Extended measurement test

This is to test multi-channel output.

## 17、 Short-circuit test

Short-circuit test is to test its output characteristics when one set of DUT is short-circuit.

## 18、 Outage test

Outage test is to test the maximum , minimum output voltage when DUT input power is power off.



power supply input/output  
electrical characteristics

Switch power supply will label the inscription brand, the output, input electrical characteristics to show its input/output performance.

开关电源						
交流输入	100-240V~,50/60Hz,6A					
直流输出	+12V1	+12V2	+5V	+3.3V	-12V	+5VSB
	17A	17A	15A	17A	0.3A	2.0A
最大输出功率	312W(26A MAX)		103W		13.6W	
额定输出功率	350W					



DELTA ELECTRONICS, INC.  
台達電子工業股份有限公司  
台達電子工業股份有限公司

MODEL NO.(型号): GPS-350CB A  
S/N: DTQD1042004782 REV(版本): 00F

台达 Smart300

SWITCHING POWER SUPPLY / 交換式電源供應器 / 开关电源

AC INPUT 交流輸入	DC OUTPUT 直流輸出					
115V~ / 8A 220V-230V~ 50Hz-60Hz	+3.3V	+5V	+12V1	+12V2	-12V	+5VSB
	14A	18A	11A	15A	0.3A	2.5A
Rated Power 額定功率 300W	110W		220W		3.0W	12.5W
	285W					

The power supply shall be connected with earth ground and built in the metal enclosure of system.  
交換式電源供應器應置於接地之金屬外殼系統內。  
开关电源應置於接地之金屬外殼系統內。

製造地: 中國 MADE IN CHINA

CAUTION ! 警告! Do not remove this cover. Trained service personnel only. 非專業人員請勿自行拆卸電源外殼。



金河田 SWITCHING POWER SUPPLY 至尊

S628 14厘米超大散熱風扇, 散熱性能好, 噪音低

交流輸入 220VAC, 5A, 50Hz

交流輸出	+5V	+3.3V	+12V1	+12V2	-12V	+5VSB	P.G
交流輸出(最大)	22A	22A	20A	20A	0.5A	2.5A	OK
	130W Max.		240W	240W	6W	12.5W	OK

ATX12V 2.31, 雙路+12V輸出

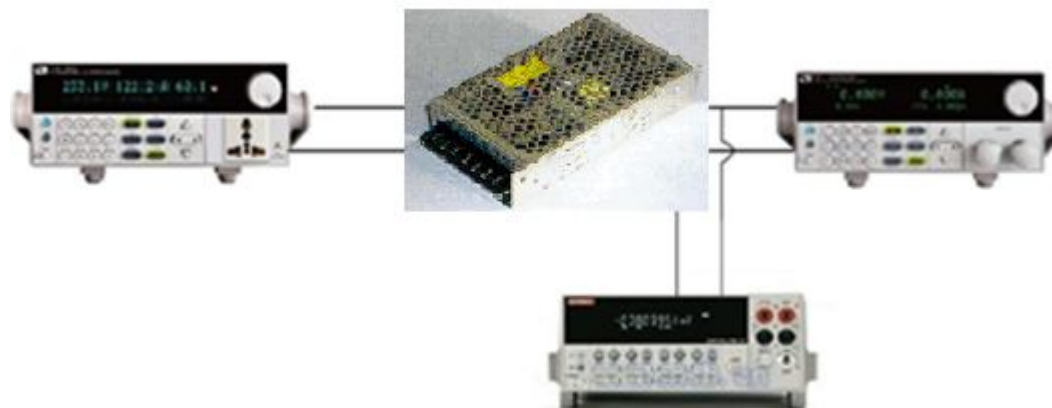
450W 550W

www.goldenriver.com.cn

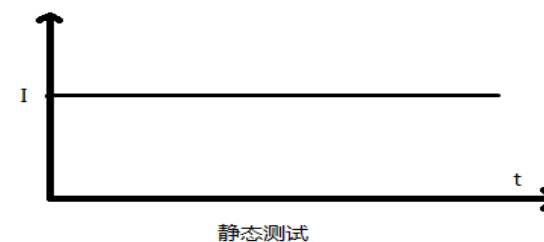
製造地: 中國 MADE IN CHINA



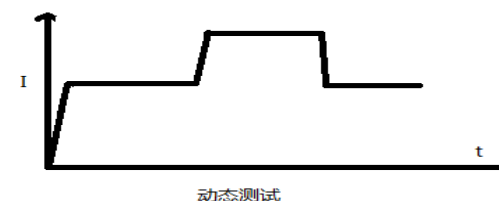
Power module input/output characteristic test: through AC or DC power supply to the products, the load tensile load , and test the DUT input/output electrical characteristics by measurement unit.



Static test: Through AC or DC power supply to products, load tensile a stable load to test the output performance of products.



Dynamic test : Through AC or DC power supply to products, load tensile a changeable load to test the output performance of products.

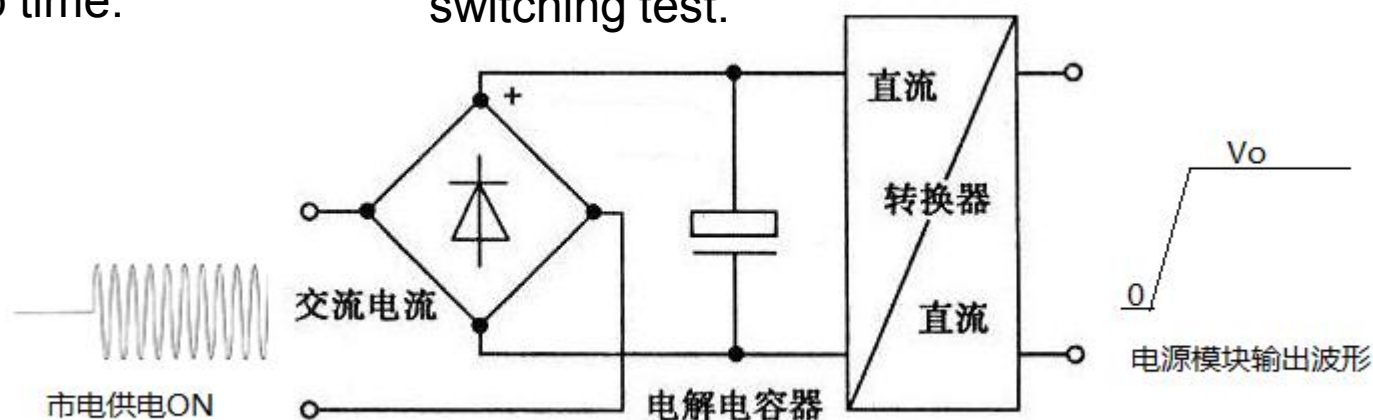




## Startup test

When power on, the power module circuit start working, finally, DC output from 0V to 90% , is the power startup time.

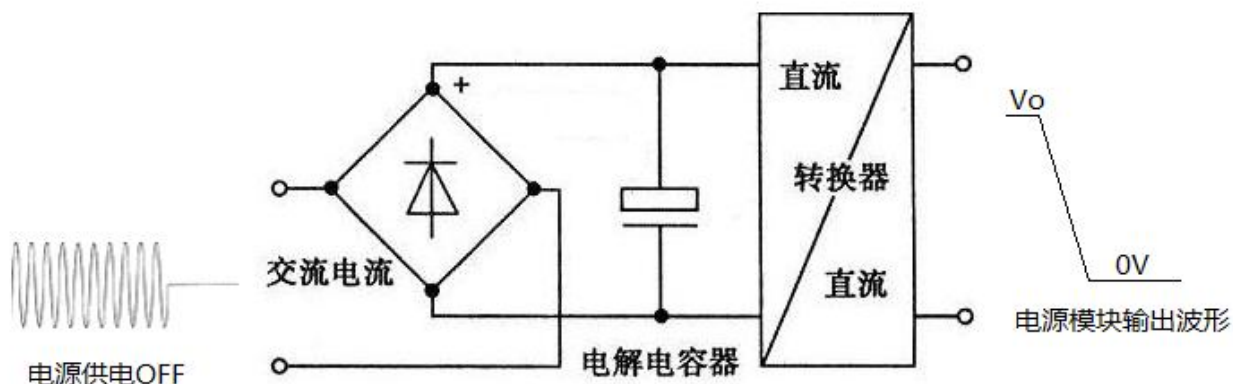
IT9520 test solution: through IT7300 AC power supply power to the DUT, the load and switching analyzer measure the output voltage change, through recording the time of on signal and 90% Voltage point, and use the software count the startup time, that's the power supply switching test.



## Switching test

When power off, power module circuit stop working. But because module internal maintaining power keep working, the output decrease step by step, that is the off time.

IT9520 test solution: supply power to module to make it work normally, then cut IT7300 output off, measure the electrical level change of power down of the DUT output, until it reach  $10\%V_o$ , the time from power down to output crash is the power off timing test.

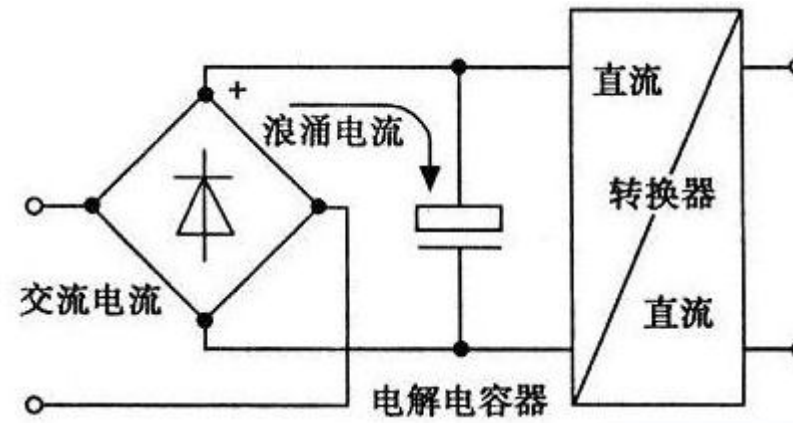


## surge current

Surge current refers to the maximum, instantaneous input current drawn by an electrical device when first turned on

✓ Peak current

✓ Surge current



## Why to test surge current?

Measuring the surge current is able to test whether the AC switch, rectifier bridge, fuse, EMI filter is more than the allowed current value. Repeatedly power on-off, AC input voltage should not damage the power supply or lead to fuse.



How to test surge current?

Traditional way:

Oscilloscope

+

Sampling resistance

(power & withstanding  
voltage is high enough)

High cost, complicated connection,  
analysis twice

New solution: only 1 set AC  
power source



Vrms、Irms、Frequency

VA、Ipeak、output time

◆IT7300 series power source can read  
current Ipeak, and Ipeak is the surge current



## Line regulation

It refers to the relative variation of output voltage for regulated power supply when the input power grid voltage plus or minus 10% by the rating value.  
Computational formula:  $V_0(\max) - V_0(\min) / V_0(\text{normal})$

220Vac(-10%) → ?A

220Vac → rated 30V

220Vac(+10%) → ?B

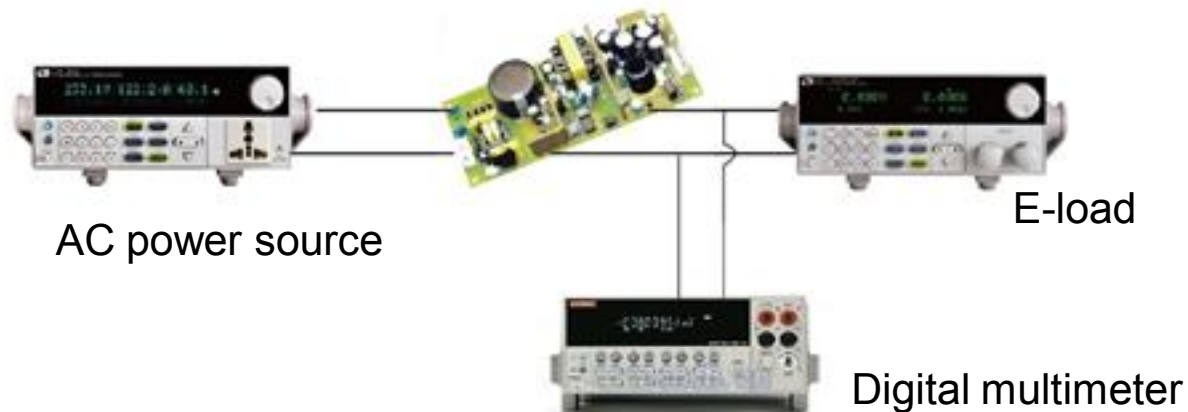
Purpose: Detect the stability of the power supply output capacity under abnormal supply voltage.

### ◆Auxiliary testing equipment:

- ◆AC power source
- ◆Digital multimeter
- ◆Adjustable e-load



## Line regulation testing method



### Testing method:

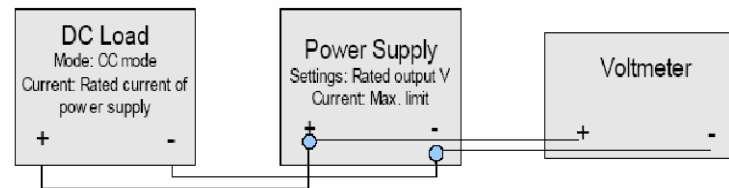
- 1) Set adjustable load device to make the output power at full load;
- 2) Adjust the AC source to a lower limit voltage, take record of the value as  $U_1$ ;
- 3) Increase the voltage to input rating, take record of the value as  $U_0$ ;
- 4) Adjust the AC source to a upper limit voltage, take record of the value as  $U_2$



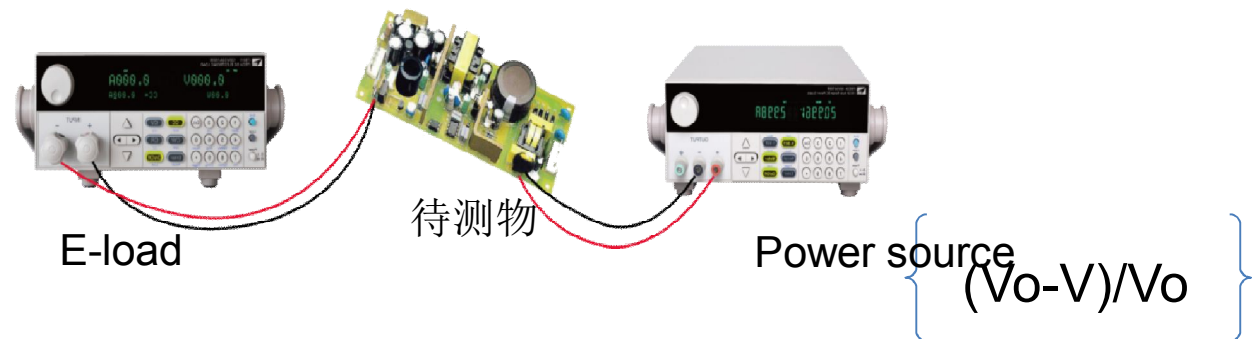


## Load regulation

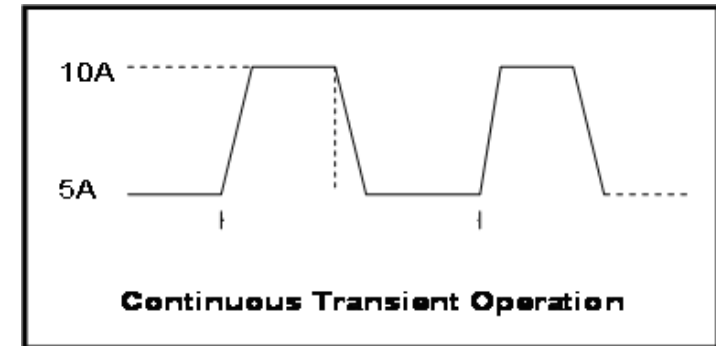
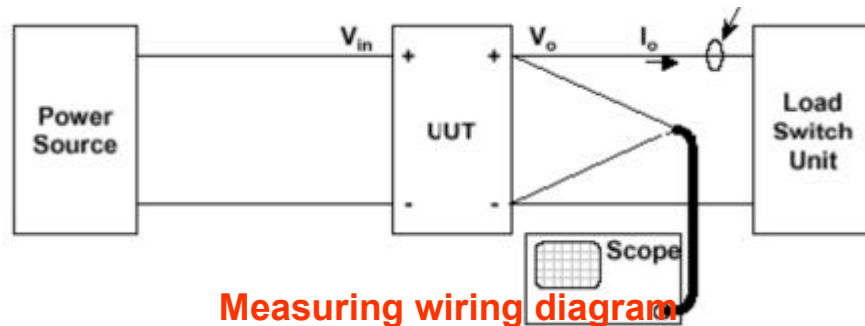
### • Load regulation →



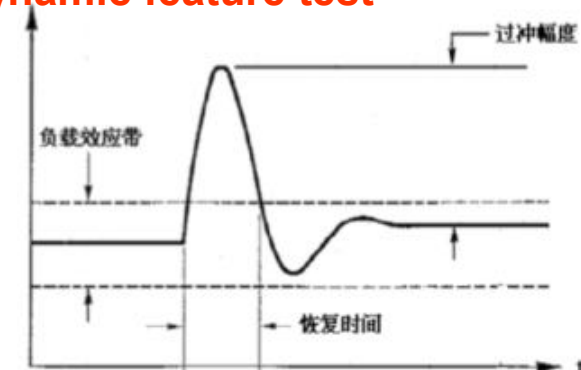
- Purpose: to test the output voltage changing under load current from 0 to full scale in order to measure index of the power source.
- Test equipment: E-load (set current value same as power source rating current), digital multimeter



## Dynamic feature



## E-load dynamic mode to realize dynamic feature test



Power source overshoot and dynamic recovery time

Transient response overshoot

Power source system stability

Rapidity (Recovery time)

Load transient disturbance—  
sudden increase or reduce the load



## Dynamic loading feature test- Key index

➤ Current rising time

➤ Dynamic frequency



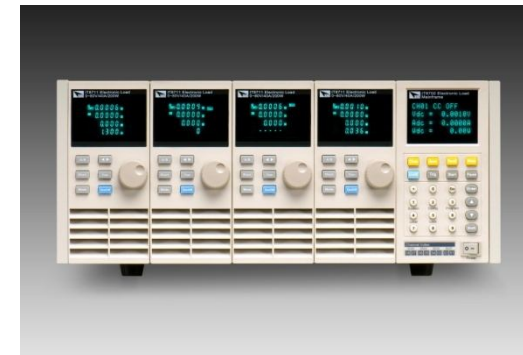
IT8500---1KHZ 1A/US



IT8500+---10KHZ 1.5A/US



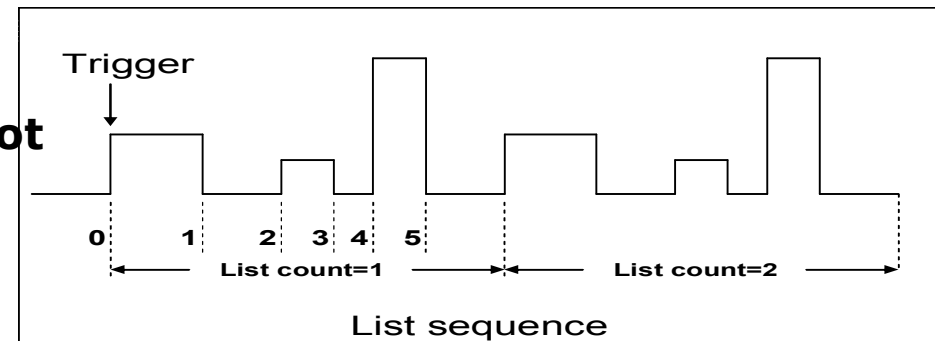
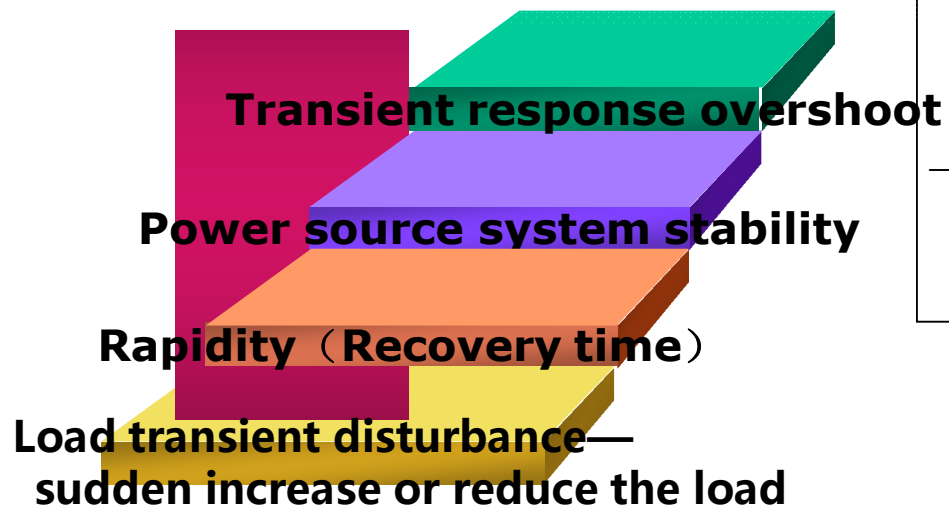
IT8800---25KHZ 2.5A/US max



IT8700---25KHZ 2.5A/US max

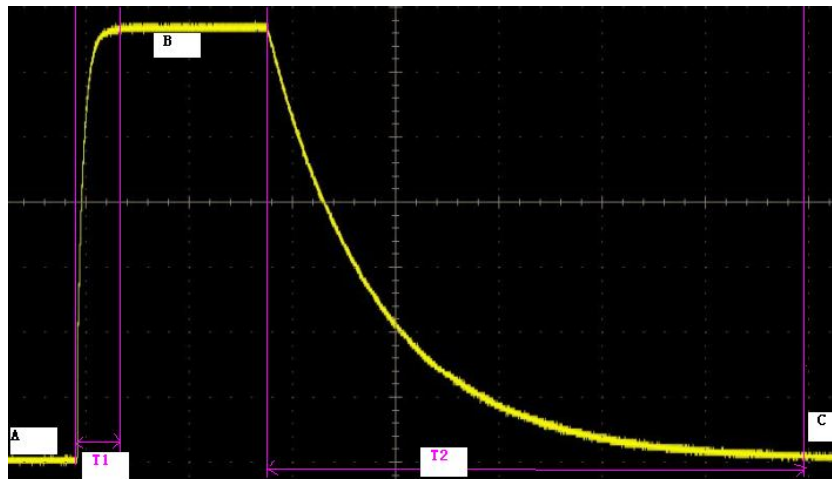


List mode allows you to accurately and quickly finish complex patterns of any current change. The changing patterns can synchronize with internal or external signal and complete precision test for more than one load.



## Voltage rise/fall time

- Purpose: to test power source voltage rise/fall time from  $V_a$  to  $V_b$ .
- ITECH e-load: IT8800 high-speed high precision e-load



**Superior:**

1 set load= Oscilloscope + ordinary load

IT8800series load with its unique measure mode and on load timer function can test the power source voltage rising/falling time with accuracy to 0.0001S



## Voltage noise test

Output noise is when the input voltage and load current are invariable, its cyclist of average output voltage and random deviation value of voltage. Output noise reflects the needless AC and noise when DC output voltage through stabilivolt and filtering. (include low frequency of 50/60Hz power multiplier signal, over 20KHz high frequency switching signal and harmonic, and other random signals, always use mVp-p peak to peak voltage to show. Generally, the model of switching power supply use within 1% of output voltage as model of output noise, its bandwidth is 20Hz to 20MHz ( or other higher bandwidth as 100MHz). If power supply working in the worst condition ( like maximum output load current, minimum input voltage), its output transient voltage of output direct voltage with noise can maintain that stable output voltage no exceed highest or lowest voltage limit, otherwise it will lead to the supply voltage exceed or under the logical circuit ( like TTL circuit) which can't bear and do the wrong step, further to cause system halted.

Test equipment: Oscilloscope





## Input power and efficiency

Nowadays, the energy source is on the decrease, one way to exploit new energy, another is to save the energy. So we need to improve the energy utilization rate of our power module.

The input power is the integral value of input voltage\*input current within fixed time. So True Power =  $\int V_i \cdot I_i \cdot dt = V_{rms} \times I_{rms} \times PF$ , the PF is power factor, always in the range of 0.6-0.7, and high power supplies have power factor calibrator, so its PF always over 0.95, when input current wave is the same as voltage wave, the PF is 1, and according to the difference, the PF is 0-1.

Efficiency is  $\sum V_{out} \times I_{out} / \text{True Power}$ . Generally, the personal computer efficiency of power supplies is 65%-80%. In order to increase the efficiency, we have to increase the PF close to 1, thus, it's possible to increase the efficiency to 100%.

Test equipment: power analyzer, multimeter, ammeter



## OVP/UVP test

Purpose: to evaluate the power source protection feature and measure whether the specific protect point value and protect time are suitable with recommendation.

### Testing method:

- (1) Connect the power source with DUT output terminal
- (2) Repeatedly rise or lower voltage to the DUT until DUT protection.
- (3) Protection time is collected by level fluctuation by related device.

### ◆Auxiliary testing equipment :

- ◆Logic analyzer (timekeeping)
- ◆Digital multimeter ?
- ◆DC power source

Judgment method: Protection time is measured through voltage changing between previous and after protection.



## Overload/Over power protection feature test

Purpose: To verify the power supply protection characteristic, and to test whether the protect value, step and time is accord with target.

### Overload protection test method :

- ( 1 ) Connect DUT to load output terminal
- ( 2 ) Chose CC mode, increase the current of two terminals of DUT by step constantly, until the DUT appear overload protection.
- ( 3 ) Get voltage change by other equipments, and count the protection time.

### OPP test method :

- ( 1 ) Connect DUT to load output terminal
- ( 2 ) chose CW mode , increase the current of two terminals of DUT by step constantly, until DUT appear overload protection.
- ( 3 ) Get voltage change by other equipments, and count the protection time.

Judge method: Judge the voltage change signal before/after protection, measure the protection time.



## Short-circuit test

Purpose: To test the short-cut protection features of power supply, avoid power supply damage by misoperation, avoid failure extension, which to ensure the safety.

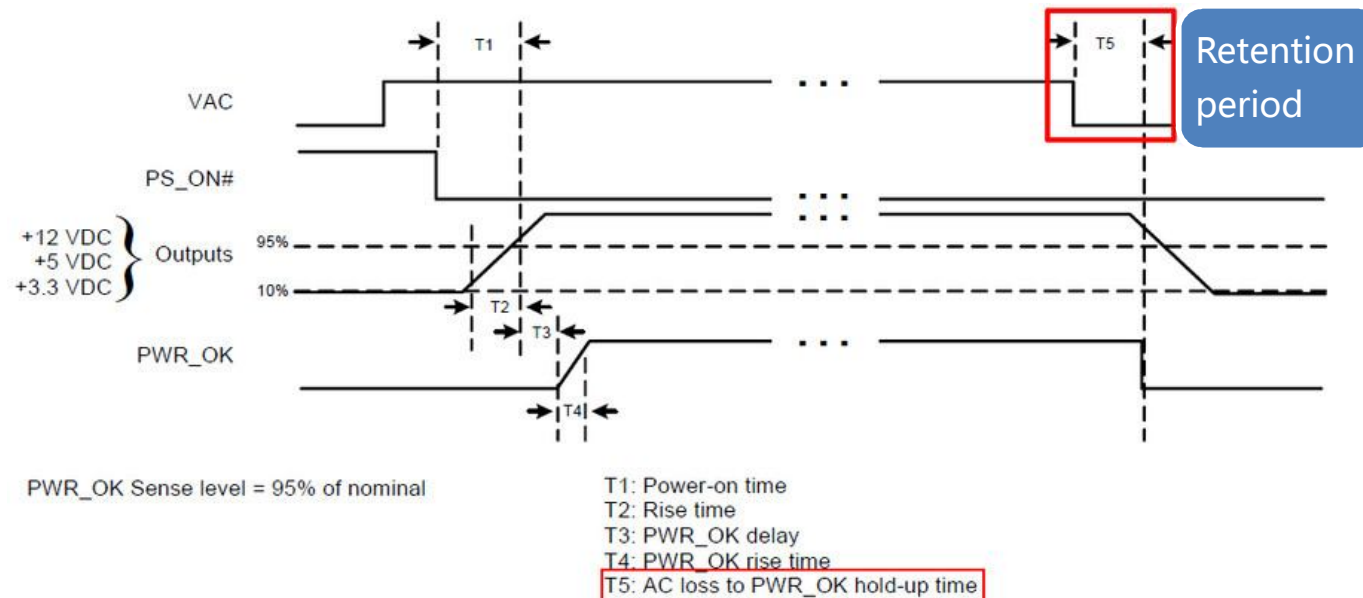
Overload protection test method :

- ( 1 ) Connect DUT to load input terminal
- ( 2 ) Chose SHORT mode, once set the time of short-circuit test , then disconnect the short-circuit.
- ( 3 ) Observe whether DUT can recover from short-circuit protection or short-circuit.



## Outage preserve time test

Application: Communication power source field



### Two influence factors:

- (1) Load capacity, when capacity higher, corresponding power lost faster.
- (2) Output energy-storage capacitor

### Test equipment:

- (1) AC source
- (2) DC E-load
- (3) Oscilloscope



## ● Brief introduction

IT9520 test system, based on opening system software environment, can integrate all instruments used in switching power supply test, which is specially designed for switching power supply. Its features as follows:

- System integration design can build a quick, easy and functional power supply test platform;
- The power supply test test in the edit, run the test, data analysis, etc.
- Provides 18 tests, 8-way power control, 8-way TTL output interface, 8-way voltage input, 2 analog output.
- Support USB connection, can be used for comprehensive analysis of switch power supply
- Software provides comprehensive and basic totally two interfaces, and easy for operation.



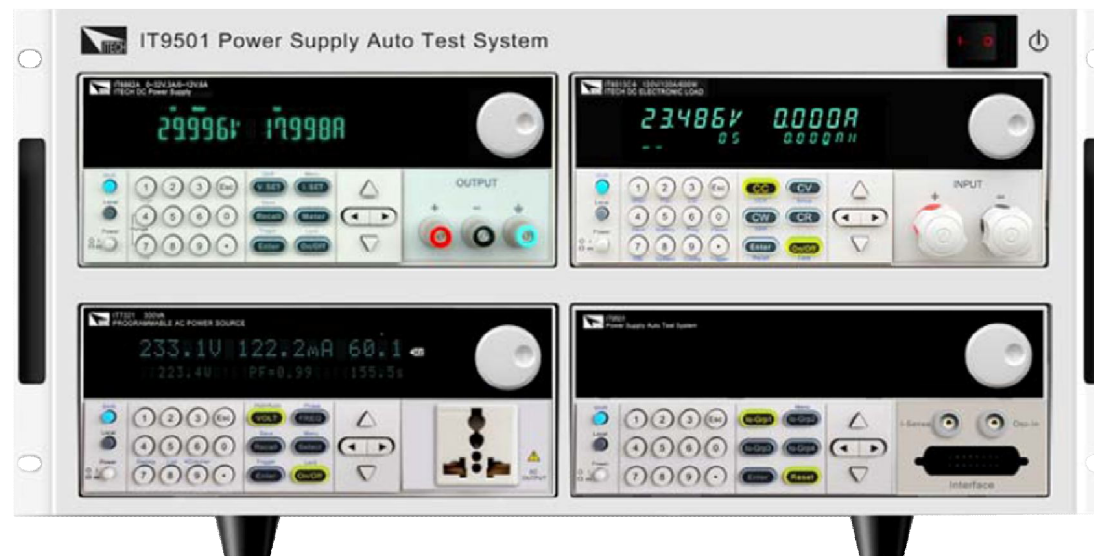
## ITECH IT9520 power supply auto-test system :

Hardware: Programmable AC power supply, programmable DC power supply, programmable DC electronic load, , on-off control.

Software : Power auto-test system software ( Windows98/2000/XP operating system)

Programmable DC power supply

Programmable DC E-load



Programmable AC power supply

On-off control



IT9520 power test system hardware equipment selection:

Programmable AC power supply: IT7300 series

Programmable DC current: IT6900A series DC power supply

IT6700H high voltage DC power supply

Programmable DC electronic load: IT8800 series

On-off control : IT9501 switch analysis meter

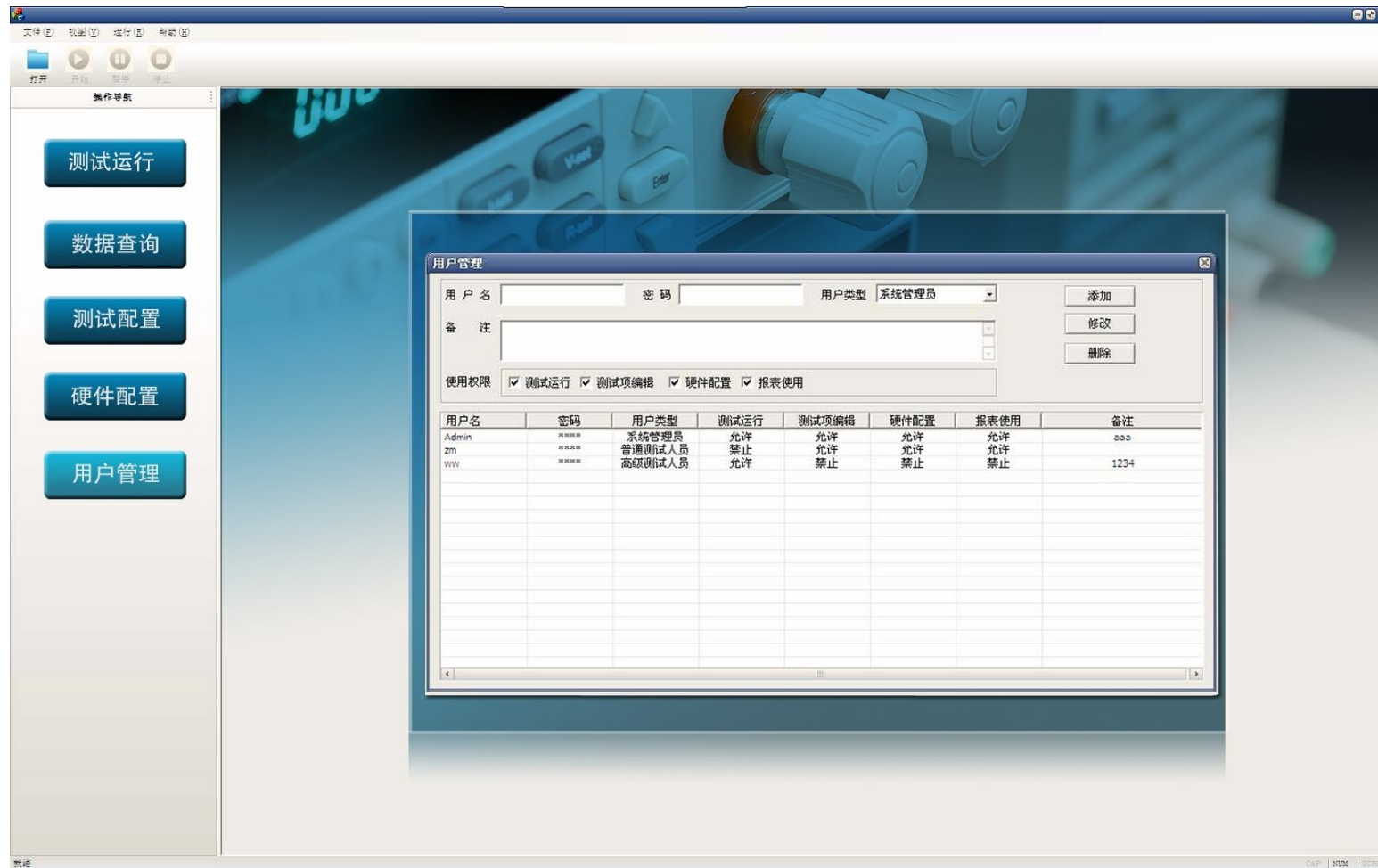




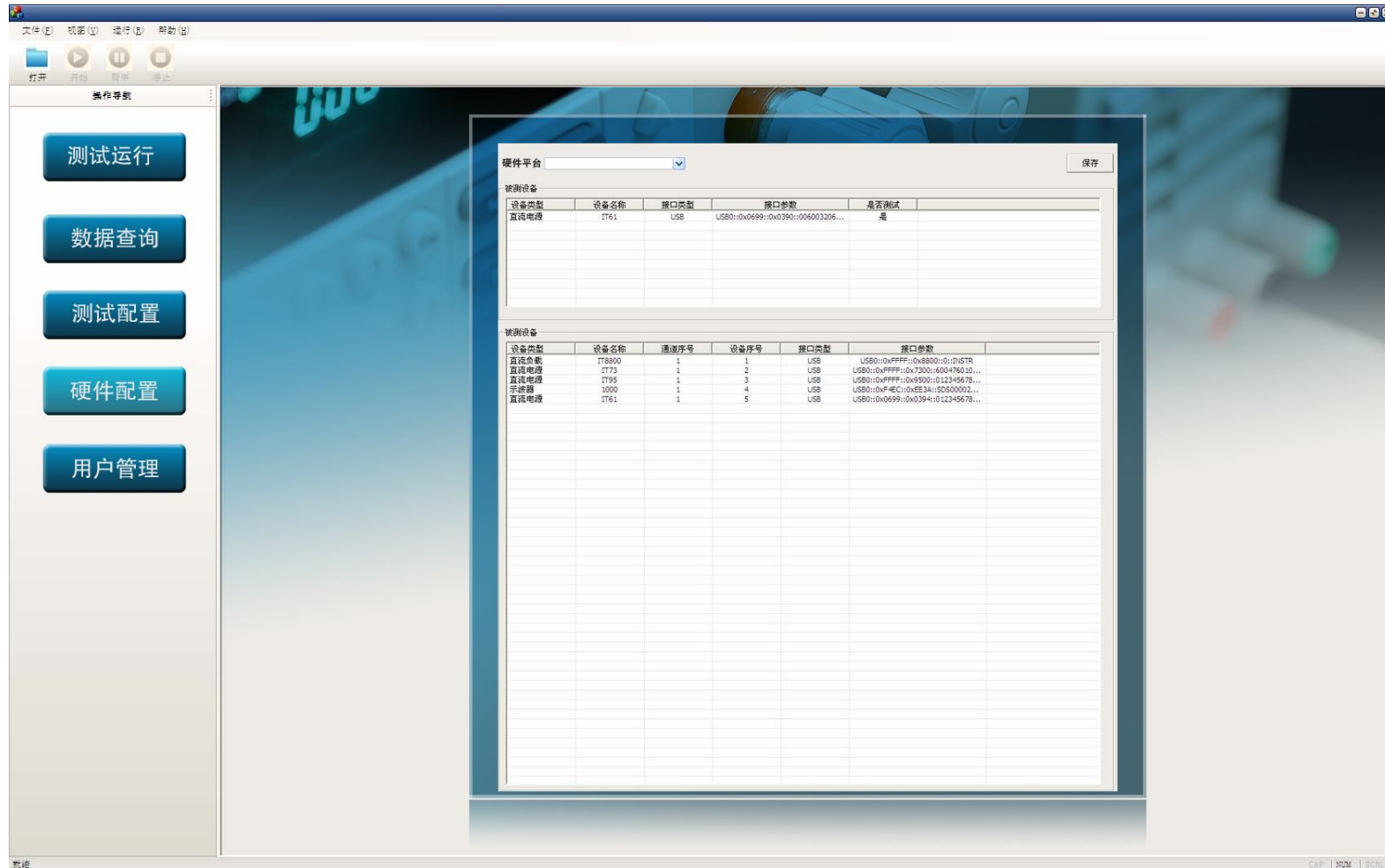
## IT9520 power test system software main interface



## IT9520 power test system software user administration rights interface



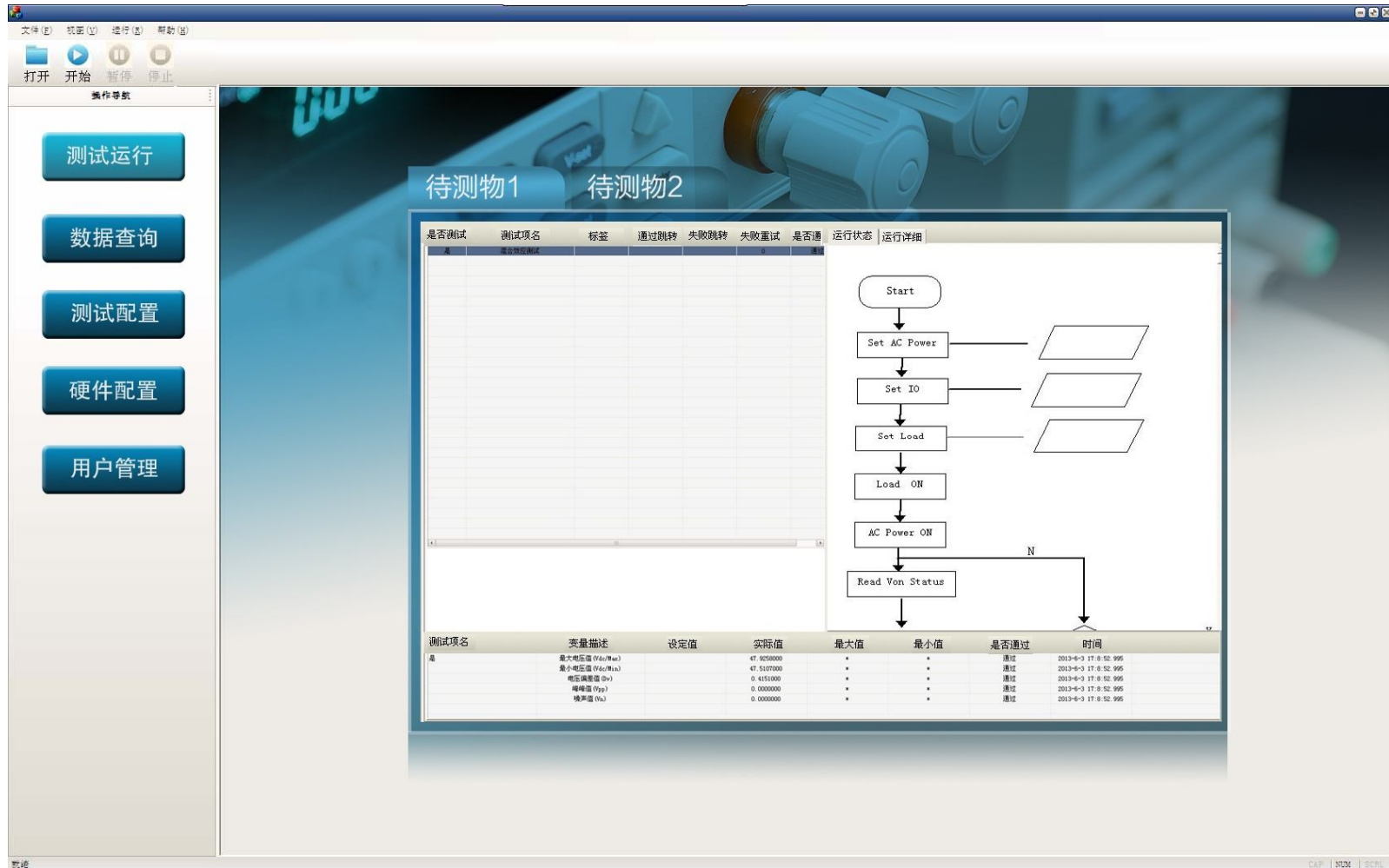
## IT9520 power test system software hardware allocation interface



## IT9520 power test system software test item allocation interface



## IT9520 power test system software item testing process interface



The interface displays the testing process for two items, 待测物1 and 待测物2. The main window shows a flowchart of the testing steps and a table of test results.

**Testing Steps:**

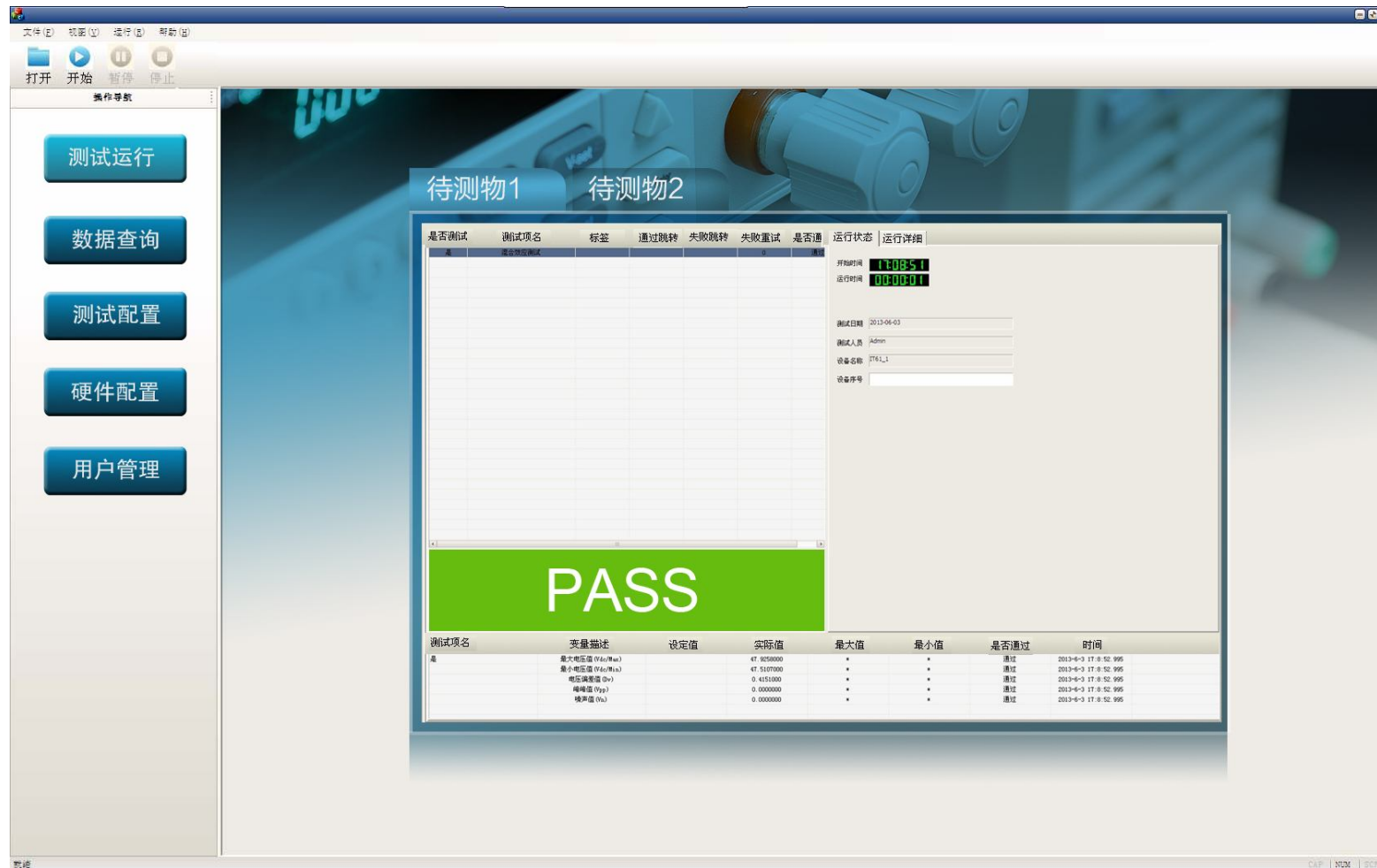
- Start
- Set AC Power
- Set IO
- Set Load
- Load ON
- AC Power ON
- Read Von Status

**Test Results Table:**

测试项名	变量描述	设定值	实际值	最大值	最小值	是否通过	时间
是	最大电压值 (V <sub>dc</sub> /V <sub>ac</sub> )	47.5250000	47.5107000	*	*	通过	2013-6-3 17:0:52.995
	最小电压值 (V <sub>dc</sub> /V <sub>ac</sub> )	0.4151000	0.4000000	*	*	通过	2013-6-3 17:0:52.995
	电压调整率 (%)	0.0000000	0.0000000	*	*	通过	2013-6-3 17:0:52.995
	纹波 (%)	0.0000000	0.0000000	*	*	通过	2013-6-3 17:0:52.995



## IT9520 power test system software test result interface



待测物1 待测物2

是否测试	测试项名	标签	通过跳转	失败跳转	失败重试	是否通过	运行状态	运行详细
是	最大电压 (Vdc/Max)					*		
是	最小电压 (Vdc/Min)					*		
是	电压调整率 (mV)					*		
是	纹波 (mV)					*		

**PASS**

测试项名	变量描述	设定值	实际值	最大值	最小值	是否通过	时间
是	最大电压 (Vdc/Max)	47.900000	47.510700	*	*	通过	2013-6-3 17:8:52 995
是	最小电压 (Vdc/Min)	0.4151000	0.0000000	*	*	通过	2013-6-3 17:8:52 995
是	电压调整率 (mV)	0.0000000	0.0000000	*	*	通过	2013-6-3 17:8:52 995
是	纹波 (mV)	0.0000000	0.0000000	*	*	通过	2013-6-3 17:8:52 995



## IT9520 power test system software test report interface

TestDatabase.mdb

111\_2013年05月08日18时06分13秒

111\_2013年05月20日18时24分53秒

输入输出特性测试\_2013年05月16日14时03分21

查询表

报表模板

待测物

测试项

查询

111

测试人员

Admin

测试时间

2013-5-8 18:06:15

测试条件

描 述

产品名称

IT61\_1

产品编号

1. 输入输出特性测试

变量描述	设定值	实际值	最大值	最小值	是否通过
电流有效值		0.3415990			成功
电压有效值		219.4768370		*	成功
输入功率		34.4005430		*	成功
电压值		12.2129000		*	成功
电流值		2.0997800		*	成功
输出功率		25.6444032		*	成功
功率因素		0.4570000		*	成功
效率		0.7454651		*	成功
噪声值		0.0240000	300	*	成功
峰峰值		0.1440000	*	*	成功

描 述:

删除表

-表名 111\_2013年05月08日18时06分13秒

-记录数共 10 条

Page 1 of 1

100%

