

OPERATION MANUAL

TH8101
Program-controlled DC Load

Changzhou Tonghui Electronic Co., Ltd.

(VER1.0)

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Declaration:

The descriptions contained in this manual may not cover all information about this instrument. Introductions to the improvements of the instrument in performance, function, internal structure, outer appearance, accessories, packing material, etc. are subject to change without notice. If you find any inconformity of this manual with our instruments, please contact us for further consultation by the address listed on the cover.

Chapter 1 General Information

1.1 Brief introduction

TH8101 program-controlled DC electronic load is designed based on a wide range of user feedback and long-term professional experiences in electronic load area. The new design of the circuit uses fast AD and DA to ensure high-speed and high-precision measurement. With resolution of 0.1mV / 0.1mA, TH8101 can make it more effective to monitor the voltage and current changes in detail, so that the application area becomes wider and the test results better. Highlight VFD displays clear and intuitive and menu & show context is easy to understand and operate. Button is equipped with operating status indicator and the working status is very clear. Completed test functions are very user-friendly, greatly improve production efficiency. Standard isolated RS232 interface can be easily used in computer communication or system integration applications.

CR-LED test mode can be an actual simulation of the characteristics of LED lights, fully simulate the working principle of the diode by increasing break-over voltage settings of the diode, making the test voltage and current achieve a normal stable value and avoiding the situation of unstable voltage and current or generating oscillations under traditional constant resistance mode. It reflects the actual load situation of LED driving power supply.

The new generation of electronic load can be widely used in production line test and research area of LED driving power, switch power, power transformer, charger, storage battery industries, etc.

Features

- CR-LED test mode, fully simulate LED power load characteristics
- Highlight vacuum fluorescent VFD display
- High display resolution: 0.1mV of Voltage and 0.1mA of current
- OCP, OPP measurement functions to accurately capture the critical parameters
- Complete CC, CV, CR, CP mode
- Battery test mode can automatically record the discharge time and capacity
- The fastest dynamic switching time of 0.025ms can effectively check the dynamic response of the power supply
- List test can flexibly combine the test mode and time to determine the test results
- Remote measurement function, multiple sets of data storage
- Intelligent fan control and a variety of protection measures
- Standard case dimension, easy for racking

1.2 Specifications

1.2.1 Main specifications:

Model		TH8101	TH8103	TH8101A	TH8103A	TH8103B	
Rated value	Input voltage	0~150V		0~500V		0~120V	
	Input current	0.1mA~30A		0.1mA~15A		0.1mA~60A	
	Input power	150W	300W	150W	300W	300W	
	Range	Accuracy	Resolution	Accuracy	Resolution	Accuracy	Resolution
Load accuracy	0-9.9999V	$\pm (0.05\%+0.03\%FS)$	0.1mV	$\pm (0.05\%+0.03\%FS)$	0.1mV	$\pm (0.05\%+0.03\%FS)$	0.1mV
	10.000V-99.999V	$\pm (0.05\%+0.03\%FS)$	1mV	$\pm (0.05\%+0.03\%FS)$	1 mV	$\pm (0.05\%+0.03\%FS)$	1mV
	100.00V-500.00V	$\pm (0.05\%+0.03\%FS)$	10mV	$\pm (0.05\%+0.03\%FS)$	10mV	$\pm (0.05\%+0.03\%FS)$	10mV
	0-3A	$\pm (0.05\%+0.05\%FS)$	0.1 mA	$\pm (0.05\%+0.05\%FS)$	0.1 mA	$\pm (0.05\%+0.05\%FS)$	0.1 mA
	0-30A/60A	$\pm (0.05\%+0.05\%FS)$	1 mA	$\pm (0.05\%+0.05\%FS)$	1 mA	$\pm (0.05\%+0.05\%FS)$	1 mA
Constant-voltage mode	1.5V-20V	$\pm (0.05\%+0.03\%FS)$	1mV	$\pm (0.05\%+0.03\%FS)$	1mV	$\pm (0.05\%+0.03\%FS)$	1mV
	1.5V-150V/500V	$\pm (0.05\%+0.03\%FS)$	10mV	$\pm (0.05\%+0.03\%FS)$	10mV	$\pm (0.05\%+0.03\%FS)$	10mV
Constant-current mode	0-3A	$\pm (0.05\%+0.05\%FS)$	0.1 mA	$\pm (0.05\%+0.05\%FS)$	0.1 mA	$\pm (0.05\%+0.05\%FS)$	0.1 mA
	0-30A/60A	$\pm (0.05\%+0.05\%FS)$	1 mA	$\pm (0.05\%+0.05\%FS)$	1mA	$\pm (0.05\%+0.05\%FS)$	1mA
Constant-resistance mode (when the input voltage and current value $\geq 10\%FS$)	0.05 Ω -5 Ω	$\pm (0.2\%+0.2\%FS)$	0.001 Ω	$\pm (0.2\%+0.2\%FS)$	0.001 Ω	$\pm (0.2\%+0.2\%FS)$	0.001 Ω
	0.5 Ω -50 Ω	$\pm (0.1\%+0.1\%FS)$	0.01 Ω	$\pm (0.1\%+0.1\%FS)$	0.01 Ω	$\pm (0.1\%+0.1\%FS)$	0.01 Ω
	5 Ω -500 Ω	$\pm (0.1\%+0.2\%FS)$	0.1 Ω	$\pm (0.1\%+0.1\%FS)$	0.1 Ω	$\pm (0.1\%+0.1\%FS)$	0.1 Ω
	500 Ω -5K Ω	$\pm (1\%+1\%FS)$	1 Ω	$\pm (1\%+1\%FS)$	1 Ω	$\pm (1\%+1\%FS)$	1 Ω
Constant-power mode (when the input voltage and current value $\geq 10\%FS$)	0-50W	$\pm (0.1\%+0.1\%FS)$	1 mW	$\pm (0.1\%+0.1\%FS)$	1 mW	$\pm (0.1\%+0.1\%FS)$	1 mW
	0-150W	$\pm (0.1\%+0.15\%FS)$	10mW	$\pm (0.1\%+0.1\%FS)$	10 mW	$\pm (0.1\%+0.1\%FS)$	10mW
	0-300W	$\pm (0.1\%+0.1\%FS)$	0.1W	$\pm (0.1\%+0.1\%FS)$	0.1 W	$\pm (0.1\%+0.1\%FS)$	0.1 W
Voltage test accuracy	0-9.9999V	$\pm (0.05\%+0.03\%FS)$	0.1mV	$\pm (0.05\%+0.03\%FS)$	0.1mV	$\pm (0.05\%+0.03\%FS)$	0.1mV
	10.000-99.999V	$\pm (0.05\%+0.03\%FS)$	1mV	$\pm (0.05\%+0.03\%FS)$	1mV	$\pm (0.05\%+0.03\%FS)$	1mV
	100.00-150.00V/500.00V	$\pm (0.05\%+0.03\%FS)$	10mV	$\pm (0.05\%+0.03\%FS)$	10mV	$\pm (0.05\%+0.03\%FS)$	10mV
Current test accuracy	0-9.9999A	$\pm (0.05\%+0.05\%FS)$	0.1 mA	$\pm (0.05\%+0.05\%FS)$	0.1 mA	$\pm (0.05\%+0.05\%FS)$	0.1 mA
	10.000-30.000/60.000A	$\pm (0.05\%+0.05\%FS)$	1 mA	$\pm (0.05\%+0.05\%FS)$	1mA	$\pm (0.05\%+0.05\%FS)$	1mA
Battery test	Input voltage= 0.8-150V/500V Max measurement capacity = 999A/H Resolution=0.1mA Discharge time =1~60000sec						

Dynamic test	T1&T2 (test time of A value or B value): 0.025mS-999S Deviation<2.5% + 0.01mS
Protective range	>Rated condition 5%
Impedance of input terminal	$\geq 200K\Omega$
Dimension	W*H*D 230mm*100mm*350mm
Weight	Power 150W:5.5 Kg Power 300W:6.5Kg

1.2.2 Working environment

Temperature: 0°C ~ 40°C

Humidity: $\leq 90\%RH$

Air pressure: 86 ~ 104Pa

1.2.3 Working power supply \swarrow

220/110(1 \pm 10%)V AC, 50Hz (1 \pm 5%)

1.2.4 Dimensions

330mm \times 215mm \times 88mm

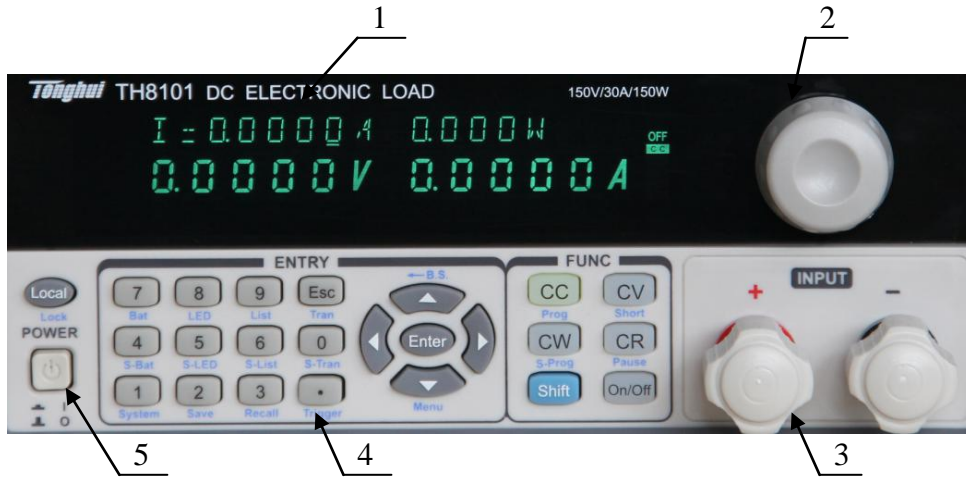
1.2.5 Weight

Approx. 5.5kg (150W)

6.5kg (300W)

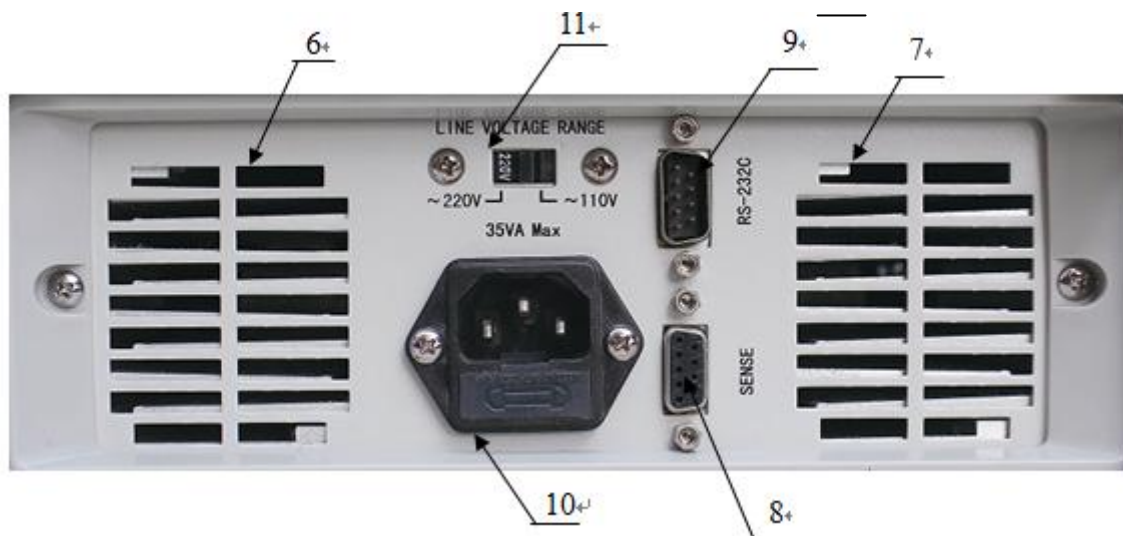
Chapter 2 Panel Description

2.1 Front panel



No.	Name	Description
1	Display	Refer to 2.4
2	Knob	
3	Input port: Red for positive pole, and black for negative pole	Voltage polarity in reverse may result in large current
4	Keys	Refer to 2.3
5	Power switch	

2.2 Rear panel



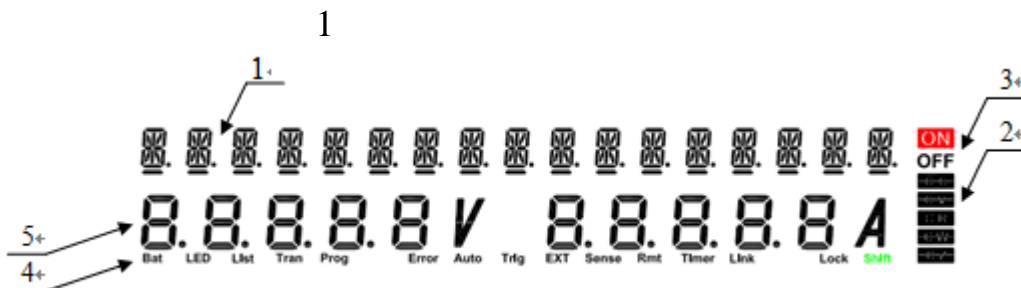
No.	Name	Description
6, 7	Cooling window	Don't block and keep good ventilation.
8	Remote measurement and trigger input interface	Refer to Index A for port configuration
9	RS232C communication interface	
10	AC 220V power input ⚡	⚡ Fuse of 1A inside
11	110V/220V AC input switch ⚡	⚡ Please confirm the consistency of switch position and input power.

2.3Keys



Number keys	1, 2, 3, 4, 5, 6, 7, 8, 9, 0
Load basic mode key	CC, CV, CW, CR
Start/Stop key	ON/OFF
Menu selection key	ESC, ENT, ▲, ▼, ►, ◀
The 2 nd function key	Bat, LED, List, Tran, Prog, Short, Pause, S-Bat, S-Tran, S-List, S-LED, S-Prog, System, Save, Recall, Menu, Local, Lock, ← (B.S.), Trigger
The shift key	SHIFT

2.4Basic information



No.	District description	Description	Note
1	Load setup parameters	I=: Constant current setup value	
		V=: Constant voltage setup value	
		P=: Constant power setup value	
		R=: Constant resistance setup value	
		W: Real-time power display	
2	Load status information	CC: Constant-current working of load	
		CV: Constant-voltage working of load	
		CP: Constant-power working of load	
		CR: Constant-resistance working of load	
3	Load operation function	ON: Load running	
		OFF: Load off	
4	Load function indication	Indicate the current working mode of load	
5	Real-time voltage and current	Display the real-time voltage and current parameters of load	
Other	Important alarm information	Reverse Voltage!!! : connection of voltage pole in reverse	At the time of polarity connection in reverse, load lost of control. Danger!
		Exceed Voltage!!!: Input voltage beyond the range	Load off automatically at the time of over-voltage
		Over Hot!!!: Over-heat	Load off automatically at the time of over-heat

Chapter 3 Menu

3.1 General information

The menu includes all the contents of setup of instrument and parameters with the same entry (Shift + MENU), or enter submenu directly in shortcut mode.

In waiting status, press **【Shift】 + 【▼】** (Menu) key to menu function, and the available menus are displayed. Use **【▲】** and **【▼】** keys or knob to select the menu, and press **【ENT】** key to the next-level menu, or **【ESC】** key to exit.

3.2 Menu description

Main menu	1 st submenu	Content or 2 nd submenu
LOAD SETUP	MAX CURRENT	Input the current value and press 【Ent】 key to confirm
	MAX VOLTAGE	Input the voltage value and press 【Ent】 key to confirm
	MAX POWER	Input the power value and press 【Ent】 key to confirm
	ON VOLTAGE	OFF Input the voltage value and press 【Ent】 key to confirm
	OFF VOLTAGE	OFF Input the voltage value and press 【Ent】 key to confirm
	RISE RATE	Input the data and press 【Ent】 key to confirm
	FALL RATE	Input the data and press 【Ent】 key to confirm
	LOAD AUTO OFF	OFF Input the data and press 【Ent】 key to confirm
	REMOTE SENSE	ON OFF
	EXIT	Back to LOAD SETUP

SYSTEM CONFIG	POWER ON CALL	OFF
		Number 0 ~ 9 for file No.
	KEY BEEP	ON
		OFF
	KEY LOCK	ON
		OFF
	KNOB LOCK	ON
		OFF
	TRIGGER SOURCE	MAN
		EXT
		BUS
	RS-232 MODE	Single
		Multiple
LOCAL ADDRESS	000 ~ 127	
BAUD RATE	8 baud rates: 4800 9600 11520 12800 14400 19200 28800 38400	
RESET SETTINGS	Esc	
	Enter	
RESTORE CAL DATE	Esc	
	Enter	
EXIT	Back to System Config	
BATTERY TEST SET	DISCHARGE CURRENT	Input the current value and press 【Ent】 key to confirm
	MIN VOLTAGE	Input the voltage value and press 【Ent】 key to confirm
	METERING MODE	Press 【Ent】 key and then use 【▲】 【▼】 to select AH or WH
	EXIT	Back to Battery Test Set
TRAN TEST SET	LEVEL A	Press 【Ent】 key to input the load value (only in current mode)
	WIDTH A	Press 【Ent】 key to input the time (ms)
	LEVEL B	Press 【Ent】 key to input the load value (only in current mode)

	WIDTH B	Press 【Ent】 key to input the time (ms)
	RISE RATE	Press 【Ent】 key to input the data
	FALL RATE	Press 【Ent】 key to input the data
	Tran Mode (MODE SELECT)	CONT PULS TRIG
	EXIT	Back to Tran Test Set
PROG TEST SET	PROG MODE	CONST-CURR CONST-VOLT
	START VALUE	Press 【Ent】 key to input the set value
	END VALUE	Press 【Ent】 key to input the set value
	STEP VALUE	Press 【Ent】 key to input the set value
	STEP DELAY	Press 【Ent】 key to input the time (ms)
	THRESHOLD TYPE	Drop
		Break over voltage (ΔV)
		Minimum voltage (V_{th})
	THRESHOLD SET	Press 【Ent】 key to input the set value
	COMPARE TYPE	OFF
		InVolt
		InCurr
		InPower
LOW LIMIT	Press 【Ent】 key to input the set value	
HIGH LIMIT	Press 【Ent】 key to input the set value	
EXIT	Back to Scan Test Set	
LED TEST SET	LED Vd	Press 【Ent】 key to input the set value
	LED Rd	Press 【Ent】 key to input the set value
	EXIT	Back to Led Test Set
LIST TEST SET	STEP NUMBER	OFF, number 01 ~ 15
	STEP MODE	AUTO
		TRIG
REPEAT	ON	

		OFF	
	STEP 01~15 (press 【Ent】 key to enter into the secondary submenu)	LIST LOAD	CONST-CURR
			CONST-VOLT
			CONST-POWER
			CONST-RES
			SHORT
			OPEN
		LEVEL	Press 【Ent】 key to input the set value
		DELAY	Press 【Ent】 key to input the time
		COMPARE	OFF
			INVOLT
			INCURR
			INPOWER
LIMIT LOW	Press 【Ent】 key to input the set value		
LIMIT HIGH	Press 【Ent】 key to input the set value		
COPY TO NEST	Esc		
	Enter		
EXIT	Back to step		
CLEAR All File	Esc		
	Enter		
SAVE FILE	Number 0 ~ 9 Press 【Ent】 key to save the setup file		
RECALL FILE	Number 0 ~ 9 Press 【Ent】 key to load the setup file		
EXIT	Press 【Ent】 key to exit the menu		

3.3 Shortcut menu

In waiting status, press SHIFT and then press the 2nd function corresponding to number key, to enter 1st submenu:

SHIFT + CONFIG	To enter submenu of system configuration
SHIFT + SETUP	To enter submenu of load setup
SHIFT + CALL	To enter submenu of file recall
SHIFT + SAVE	To enter submenu of file save
SHIFT+S-LIST	To enter submenu of list setup
SHIFT + S-BAT	To enter submenu of battery discharge test setup
SHIFT + S-TRAN	To enter submenu of dynamic test setup
SHIFT + S-PROG	To enter submenu of prog test setup
SHIFT + S-LED	To enter LED setup menu
SHIFT + Lock	Lock key, long press Lock key to unlock

3.4 Menu setup

The main menu includes submenus of system configuration, dynamic parameter setup, file save/recall, etc, as shown:



3.4.1 Load Setup

Load setup includes common parameters of electric load which decide the whole working characteristics of electric load. Maximum power, maximum voltage and maximum current decide not only the maximum protection limit of electric load, but also the working range of load.

Different load should be set in different operations.

If you want the modification of load setup to be still valid next time, press ESC key to quit after change the setup.

◆ Max Current

Maximum load current should be set before the test in order to ensure the safety of the test and accuracy of current test.

Max. load current has three main functions:

- a) To limit the constant current to be set less than the max. current;
- b) In CV, CP, CR and short-circuit test modes, when load current is over max. current, the instrument alarms and displays over-current protection (OC), and the over-current lasting for long time will result in the automatic turning off of load.
- c) When the set max. current is less than 3A (30A system) or 6A (60A system), load will work

in the range of low current. Otherwise, it will work in the range of high current.

☰ Example: If actual working current is less than 2.5A, select menu to Max Current, and press **【Ent】** key to enter, then press **【Ent】** key again to input numbers. Press **【2】【.】【5】** . Afterwards, press **【Ent】** key to enter, and the default unit is A.

◆ Max Voltage

It has three main functions to set max. input voltage:

- a) To limit the constant voltage to be set less than the max. voltage;
- b) When input voltage is over max. voltage, electric load will alarm and displays “Exceed Voltage!!!”, and the load will automatically turn off.
- c) When the set max. voltage is less than 20V (150V system) or 50V (500V system), load will work in the range of low voltage. Otherwise, it will work in the range of high voltage.

☰ Note: The set of max. voltage has the same method as that of max. current, and the default unit is V.

◆ Max Power

If the actual consumed power is over the max. power, the instrument will alarm and displays power protection (OP) and the load will be probably automatically turned off.

☰ Note: The set of max. power has the same method as that of max. current, and the default unit is W.

◆ On Voltage

Min. start voltage can be used in constant voltage, constant current, constant power and constant resistance modes. It can also be used as the start voltage of automatic test in list mode and the input voltage should be greater than 1.2 times the Min. start voltage. If minimum start voltage is turned on, the load will be off when input voltage is less than 1.2 times the Min. start voltage. Once the input voltage is over 1.2 times the Min. start voltage, load will automatically start.

☰ Example: If the set min. start voltage is 1.25V, select menu to On Voltage, and press **【Ent】** key to enter. And the original set value will be displayed (or in OFF status); then press **【Ent】** key to input numbers. Press **【1】【.】【2】【5】** . Afterwards, press **【Ent】** key to enter and the default unit is V.

☰ Note: If the set value is 0 or close to 0, “OFF” will be displayed, that is, the function is turned off.

◆ Off Voltage

Min. off voltage can be used in constant voltage, constant current, constant power and constant resistance modes. If min. off voltage is turned on, after the load is started, when input voltage is less than Off Voltage, the load will automatically turn off.

☰ Note: The set of Off Voltage has the same method as On Voltage.

☰ Note: If the set value is 0 or close to 0, “OFF” will be displayed, that is, the function is turned off.

◆ Rise Rate

To control the rise speed of load current, avoiding the measured power supply protection or damage caused by excessive current rise. The unit is us and you can set the current range between 0.0001A-1.5A / us.

◆ Fall rate

To control the fall speed of load current, the unit is us and you can set the current range between 0.0001A-1.5A / us.

◆ Load Auto Off

Auto delay off can be used in constant voltage, constant current, constant power and constant resistance modes. If auto delay off is turned on, the time will be counted in the unit of second after the load starts. When the delay time reaches the set value of Auto Off, the load will automatically turn off.

☰ Note: The set of Auto Off has the same method as On Voltage, and the unit is second (s). It ranges from 0 to 60000s.

☰ Note: If the set value is 0 or close to 0, “OFF” will be displayed, that is, the function is turned off.

◆ Remote Sense

In CV, CR, CP modes, voltage sampling accuracy will affect working accuracy of electric load. When load consumes larger current, voltage fall will come into being on the connection line of power to be tested and load. In order to make the test accurate, there is a remote measurement terminal on the rear panel, through which user can measure the voltage of output terminal of the instrument to be tested.

RomoetSense = ON : Remote test is turned on, and the instrument samples voltage through remote measurement terminal on the rear panel.

RomoetSense = OFF : Remote test is turned off, and the instrument samples voltage through load input terminal on the front panel.

Press **【▲】** and **【▼】** keys or knob to turn on or off remote measurement function.

☰ Note: Please refer to Index A for pin configuration of Sense interface on the rear panel.

◆ Exit

In this menu, **【Ent】** key is pressed to exit back to main menu, as pressing **【Esc】** key.

3.4.2 System Config

The System Config menu includes some system parameters, such as private setup of the instrument, communication function setup, etc. The menu modified is automatically saved and it will be valid in next boot.

POWER ON CALL

All the submenus in System Config can be selected through **【▲】** and **【▼】** keys or knob.

◆ Power-on Call

At the time of Power-on Call = OFF, the function is off. When number 0 to 9 is selected, the corresponding file will be automatically loaded when the instrument is turned on. If the corresponding file record is not saved (not existing), then the default parameters will be used.

 **Note** : Please refer to “Save File” menu for how to save files.

◆ Key Beep

The function is to set the beep at the time of pressing keys.

KeyBeep = ON: The sound of “DI” will be heard when keys are pressed.

KeyBeep = OFF: No sound will be heard when keys are pressed.

◆ Key Lock

The function is to lock the keys. When the key is locked, only ON/OFF key and SHIFT key could be used.

KeyLock = ON: “Lock” will be displayed on the bottom of the screen.

KeyLock = OFF: The keys are usable.

◆ Knob Lock

The function is to select the knob function.

KnobLock = ON : Knob is locked and it could not be turned.

KnobLock = OFF : Knob lock is off, and knob is available.


◆ Trigger Source

At the time of dynamic test and list test, trigger may be needed to select the next load. There are three types of trigger: MAU, EXT and BUS.

TriggerSource = MAN: manual trigger, triggered by pressing the “TRIG” key on the panel;

TriggerSource = BUS : BUS trigger, triggered through program command on RS232C interface.

TriggerSource = EXT : exterior trigger, triggered through Sense terminal on the rear panel;

 **Note** : Refer to Index A for pin configuration of Sense interface on the rear panel.

 **Note** : Refer to Index C for programmed communication command.

◆ RS-232 Mode

The RS232C communication interface can be used for the communication of multi units. One PC can communicate with multi electric loads, which can be used for parallel of loads.

8-bit digit mode is applied for either multi-unit communication or single-unit communication. However, multi-unit communication will recognize software address, and the single-unit communication is not related to address.

Communication Mode = Single: Single-unit communication mode


Communication Mode = Multiple: Multi-unit communication mode

 **Note:** Please refer to Index B fro RS232C interface communication.

◆ Local Address

When multi units are communicating, different addresses must be distributed to each instrument in the system. PC will exchange information with instruments according to their addresses. And in single-unit communication mode, address is invalid.

The address ranges from 0 to 127 (hex 00H ~ 7FH).

 **Note:** 【Ent】 key can be pressed to enter numbers.

 **Note:** There could not be the same address repeated in one system.


◆ Baud Rate

The communication rate of data on RS232C interface should be consistent with the setup on PC.

The instrument has 8 baud rates: 4800 9600 11520 12800 14400 19200 28800 38400

◆ Reset Settings

This operation is used to instrument the user settings (system configuration the Config and user settings Setup) back to factory original state. Avoid lead instrument does not work properly due to the user's settings reason in this menu, press 【Ent】 key recovery, then shut down and reboot, the system will re-initialize.

 **Note:** Do not do this instrument does not appear abnormal.

◆ Restore Cal Data

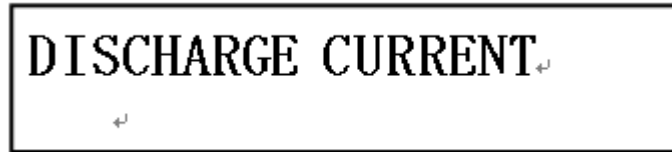
This operation is used to restore the calibration data of the instrument to the factory default settings. It is possible to return the instrument calibration data to the correct value when the instrument has a measurement data deviation due to a strong interference or other impact of the outside. In this menu, press the [Ent] key to restore, and then shut down and then reboot.

◆ Exit

In this menu, 【Ent】 key is pressed to exit back to main menu, as pressing 【Esc】 key.

3.4.3 Battery Test Set

Please set parameters of battery test before starting the test.



◆ Discharge Current

Battery discharge test works in constant current mode and the current is determined by the discharge current settings.

Setting: After entering the submenu of Discharge Current, press the data and press **【Ent】** key to confirm with unit of A and press **【ESC】** key to quit.

◆ Min Voltage

At the time of discharging, when input voltage is less than off voltage, the discharge test stops, and discharge time and battery capacity will be displayed.

Setting: After entering the submenu of MinVoltage, press the data and press **【Ent】** key to confirm with unit of V.

☰ Note :MinVoltage must be set, which could not be turned off as OffVoltage in load setup. If the set value is too small or close to 0, battery test probably could not automatically ends.

◆ Metering Mode

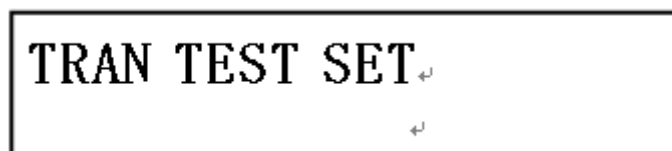
Press **【Ent】** key to enter into the metering mode, use **【▲】【▼】** keys to select AH or WH display.

◆ Exit

In this menu, **【Ent】** key is pressed to exit back to main menu, as pressing **【Esc】** key.

3.4.4 Tran Test Set

Please set parameters of dynamic test before starting the dynamic test.



◆ Level A

It is to set value of point A. After entering Level A menu, input the value and the unit is A or V which depends on the load type. Press **【Esc】** key to quit after finishing inputting.

◆ Width A

It is to set width of point A. After entering Width A menu, input the value and press **【Ent】** key to confirm with the unit of ms.

◆ Level B

It is to set value of point B. After entering Level B menu, input the value and press **【Ent】** key to confirm with the unit of A or V which depends on the load type.

◆ Width B

It is to set width of point B. After entering Width B menu, input the value and press **【Ent】** key to confirm with the unit of ms.

◆ Rise Rate

Input the value and press **【Ent】** key to confirm. To control the rise speed of load current, avoiding the measured power supply protection or damage caused by excessive current rise. The unit is us and you can set the current range between 0.0001A-1.5A / us.

◆ Fall rate

Input the value and press **【Ent】** key to confirm. To control the fall speed of load current, the unit is us and you can set the current range between 0.0001A-1.5A / us.

◆ Mode Selection

In dynamic test mode, load has three control modes in the switch of point A and point B:

CONT (continuous mode): Load will automatically switch after delaying corresponding time;

TRIG (trigger mode): The width doesn't work, and load switches in the effect of trigger signal.

PULS (pulse mode): Load works with A value. After the trigger, it switches to value B, and switches to value A again after delaying width B;

Please press **【▲】** and **【▼】** keys or knob to select dynamic mode.

☰ Note: Please refer to 4.7 for dynamic modes.

◆ Exit

In this menu, **【Ent】** key is pressed to exit back to main menu, as pressing **【Esc】** key.

3.4.5 Prog Test Set

You can set the start and end value of the scan and the step value to observe the working situation of products in a certain range in the process of scanning. Also, the critical value of the parameters can be captured at a sudden- changeable signal, such as protective current, break-over voltage and so on.

Please set the list test parameters before using the scan test function.

◆ **PROG Mode**

Select the load type of the scan test, press **【Ent】** key to enter and use **【▲】** or **【▼】** key to select the load type, press **【Esc】** key to return.

Constant Current Mode (CC): ConstCurr

Constant Voltage mode (CV): ConstVolt

◆ **Start Value**

Set the initial value of the scan range, input the data directly and press **【Ent】** key to confirm, press **【Esc】** key to return.

◆ **End Value**

Set the end value of the scan range, press the numeric keys to input the value and press the **【Ent】** key to confirm.

◆ **Step Value**

Set the increase size of the scan value for each time, press the number keys to input the value and press **【Ent】** key to confirm.

◆ **Step Delay**

Set the time used for each step when scanning. Select fast scan or slow scan according to the actual needs. Press the number keys to enter the value and press **【Ent】** key to confirm. The unit is ms.

◆ **Threshold Type**

Judge to capture the signal value under what conditions. There are three selectable threshold types:

Drop (Drop): refers to the compared parameter instantaneously jump down to 0 or close to 0 (such as the measured power to reach the protection state)

Break-over Voltage (ΔV): the voltage breaks over in the test process, the transition amplitude can be set by the threshold value. When the voltage transition is greater than the set value, the compared parameter is locked.

Minimum voltage (Vth): the voltage drops below the specified voltage, compare lock parameter.

Use **【▲】** or **【▼】** keys to select the threshold type.

◆ **Threshold Set**

After selecting the threshold type, set the value of transition amplitude, or the minimum voltage in this menu. In the drop type, the threshold setting is invalid.

◆ **Compare Type**

After capturing the above threshold parameters, you can set the compare type. The instrument helps determine whether the captured parameters within the qualified range. The comparable types have the

following options:

OFF

InPower

InCurr

InVolt

◆ **Low Limit**

Set the lower limit of the compare range. Press the number keys to input the value and press **【Ent】** key to confirm.

◆ **High Limit**

Set the lower limit of the compare range. Press the number keys to input the value and press **【Ent】** key to confirm.

◆ **Exit**

In this menu, **【Ent】** key is pressed to exit back to list selection, as pressing **【Esc】** key.

3.4.6 LED Test Set

CR-LED test mode can be an actual simulation of the characteristics of LED lights, fully simulate the working principle of the diode by increasing break-over voltage settings of the diode, making the test voltage and current achieve a normal stable value and avoiding the situation of unstable voltage and current or generating oscillations under traditional constant resistance mode. It reflects the actual load situation of LED driving power supply. LED mode is only applicable to constant resistance working mode. When the LED mode is turned on, after setting the Vd parameter, press the R-SET key to enter the constant resistance test mode.



◆ **LED Vd (break-over voltage)**

Calculation method of Vd and R:

$$V_d = V * 0.8 \quad R = 0.2V / I$$

V: the voltage value after the LED power supply loaded with LED lamp beads and in steady operation

I: the LED power supply rated output current

Vd: the conduction voltage of the diode (lamp beads)

R: the resistance value

◆ **LED Rd (Resistance value setting)**

Press the number keys to input the value and press **【Ent】** key to confirm.

3.4.7 List Test Set

Please set parameters of list test before using list test function.



3.4.7.1 Step Number

It is to set steps of list test, reaching to maximum 15 steps. The set value ranges from 01 to 15 and 01 means the first step.

Press **【▲】** and **【▼】** keys to modify the step number.

3.4.7.2 Step Mode

Step mode: the mode of switching from step N to step N+1.

AUTO : The load automatically switches after the set delay time;

TRIG : The load waits for trigger signal to switch after the set delay time.

☰ Note: The trigger has three modes: MAN, EXT, and BUS, referring to “System Configuration”.

3.4.7.3 Repeat

It is to set the automatic repeat of list test. When Repeat is turned on, after the load switches from step 1 to step N, it will go back to step 1 for continuous test.

ON : Repeat test is turned on.

OFF : Repeat test is turned off.

3.4.7.4 Step XX

XX here is the step number from 01 to 15. Press **【Ent】** key to submenu.

■ List Load

It is to set current load type:

Constant Current (CC): ConstCurr

Open circuit: Open

Short circuit: Short

Constant Resistance (CR): ConstRes


Constant Power (CW): ConstPower

Constant Voltage (CV): ConstVolt

■ Level

It is to set the current load. If load is set to be short or open, the value is invalid.

After entering Level menu, press numeric key to input the value and press **【Ent】** key to confirm.

 Note: The unit will be automatically selected by the instrument according to the load type (A, V, W, Ω) .

■ Delay

It is to set the current test time with unit of 100ms (0.1s).

After entering Delay menu, press numeric key to input the value and press **【Ent】** key to confirm.

■ Compare

It is to set the current status of comparator, to judge the test result.

OFF : The comparator is off and no judgment for the result.

InPower : Compare according to the power consumed by the load

InCurr : Compare according to the current consumed by the load

InVolt : Compare according to the input voltage

■ Limit Low

It is to set low limit of comparator. After entering Limit Low menu, press numeric key to input the value and press **【Ent】** key to confirm.

 **Note: The values don't display units which are decided by the set comparison type.**

■ Limit High

It is to set high limit of comparator. After entering Limit High menu, press numeric key to input the value and press **【Ent】** key to confirm.

 **Note: The values don't display units which are decided by the set comparison type.**

■ Copy To Next

It is to copy the current setups of parameters to next step.

■ Exit

In this menu, **【Ent】** key is pressed to exit back to list menu, as pressing **【Esc】** key.

3.4.8 Clear File

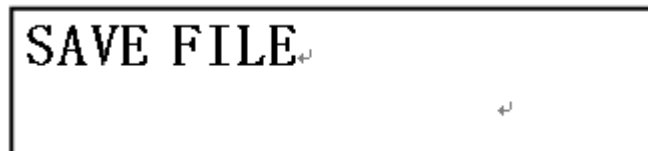
Performing this operation will clear all test sequence files saved inside the instrument.
Please operate prudently.

3.4.9 Save File

It is to save test parameters, including current load mode, set load (constant current, constant voltage, constant power and constant resistance), battery test parameters, dynamic test parameters and list test parameters. 10 files can be saved.

Saved file can be recalled manually (refer to the Recall File), or automatically recalled by setting Power-on Call in system configuration.

SystemConfig and LoadSetup can be separately saved in their menu.



After entering Save File page, file No. and file status are displayed in the second line. “Y” means the file has existed, and “N” means the file hasn’t been saved.

Press **【▲】** and **【▼】** keys to select the file No. to be saved, then press **【Ent】** key to save. “Saving.....” is displayed.

ⓘ Note: Saved file will be covered when it is saved again.

3.4.10 Recall File

It is to manually recall saved file.



After entering Recall File page, file No. and file status are displayed in the second line. “Y” means the file has existed, and “N” means the file hasn’t been saved.

Press **【▲】** and **【▼】** keys to select the file No. to be saved, then press **【Ent】** key to save. “Saving.....” is displayed. Only file with “Y” status can be recalled. Otherwise, “File Not Exit” will be displayed, meaning the file doesn’t exist.

3.4.11 Exit

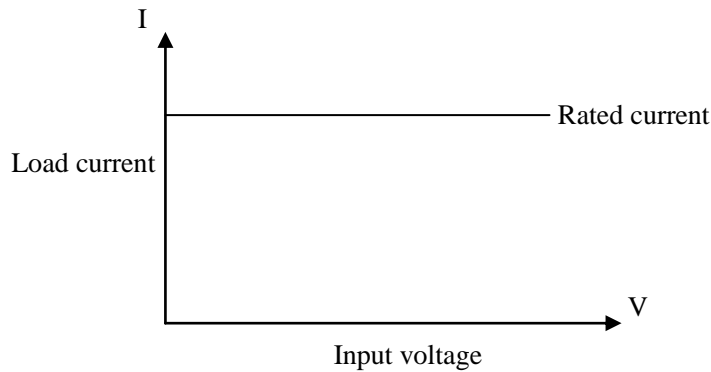
In this menu, **【Ent】** key is pressed to exit back, as pressing **【Esc】** key.

Chapter 4 Test Operation

The chapter mainly introduces how to make load operation and different test modes.

4.1 Mode of constant current (CC)

In the mode of constant current, a constant current is consumed, in spite of the change of input voltage.



In other load modes, press **【I-SET】** key to enter constant current mode. Press **【ON/OFF】** key to start or stop working.

When load has not been started, use **【<】** **【>】** key or the knob to change the position of the cursor. The knob can be operated to change set value, or press **【CC】** key again to use numeric key to input new values.

Example: set 1.2345A as the input value.

In constant current mode, use **【<】** **【>】** key or the knob to change the position of the cursor and then rotate the knob to adjust to 1.2345A.

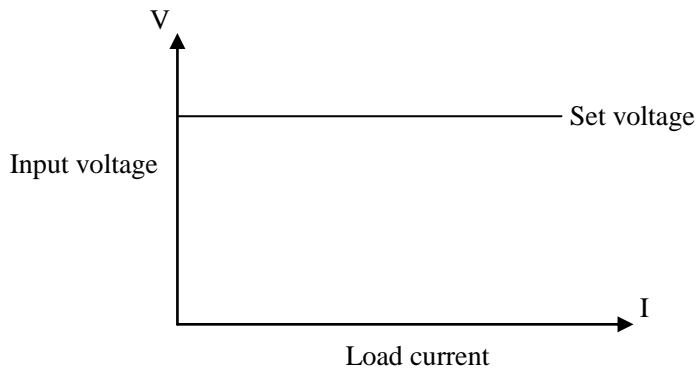
Press **【CC】** key and $I_s=$ will be displayed on the screen. Press number keys **【1】** **【.】** **【2】** **【3】** **【4】** **【5】** to input (if keys are not locked), and then press **【Ent】** key to confirm, or **【Esc】** key to quit.

In the load start state, you can change the setting parameters by moving the cursor and rotating the knob, or by pressing the **【I-SET】** key to reset the parameters. The load will automatically follow the changed value.


When the load mode is ON, Press **【Ent】** key can directly make short-circuit (SHORT) test for tested power supply.

4.2 Constant Voltage Mode (CV)

In the mode of constant voltage, electric load will consume enough current to make input voltage constant in set value.



In other load modes, press **【CV】** key to enter constant voltage mode. Press **【ON/OFF】** key to start or stop working.

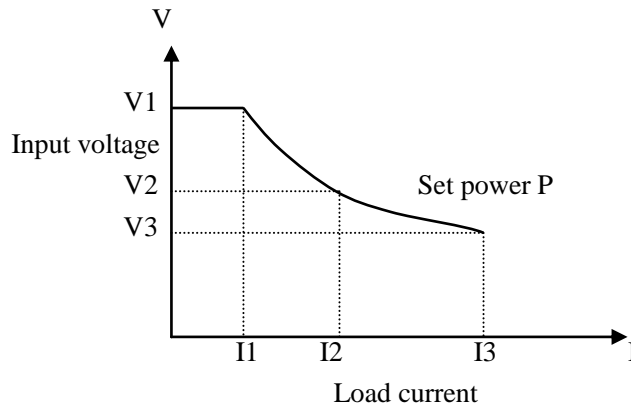
 Note: Refer to 4.1 to change set voltage value.

① Note: Source voltage is less than set voltage value, the load will not work in constant voltage.


② Note: Difference between source voltage and set voltage will fall on source resistance and lead resistance. If difference is large but resistance small, load will probably consume large current.

4.3 Constant Power Mode (CP)

In constant power mode, load consumes a constant power. When input voltage changes, load will adjust current to keep the consumed power.



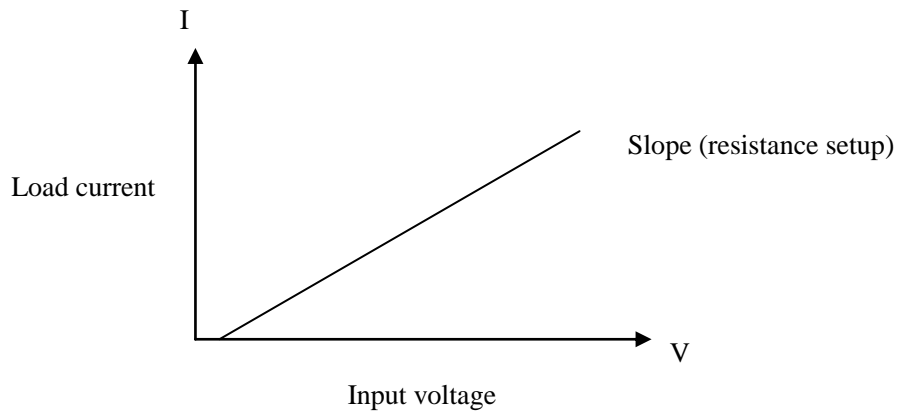
In other load modes, press **【CP】** key to enter constant power mode. Press **【ON/OFF】** key to start or stop working.

 Note: Refer 4.1 to change set power.

4.4 Constant Resistance Mode (CR)

In constant resistance mode, load will equal to be a constant resistance. Load will consume current changing with input voltage.

The load has two kinds of constant resistance modes: common CR mode and CR-LED mode.



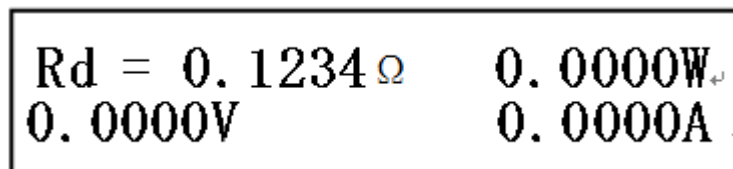
Common CR mode:

In other load modes, press **【CR】** key to enter constant resistance mode. Press **【ON/OFF】** key to start or stop working.

Resistance setting range: 0.1Ω ~ 4000Ω

CR-LED constant resistance mode:

Set the LED Rd resistance value and the Led Vd (conduction voltage) in the Led Test Set in the main menu and then select the test mode to LED mode.



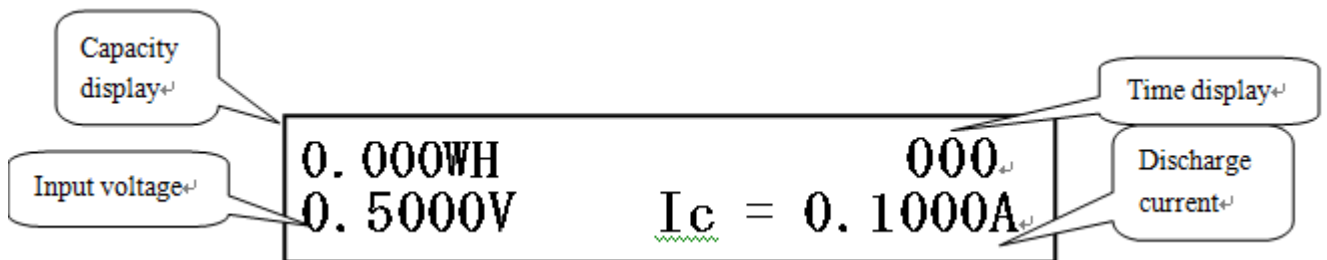
Note: Refer 4.1 to change set resistance.

Note: CR-LED test mode can be applied only in that case parameters have been set in the menu. The Vd voltage take the value of the actual measured power parameters.

4.5 Battery test mode

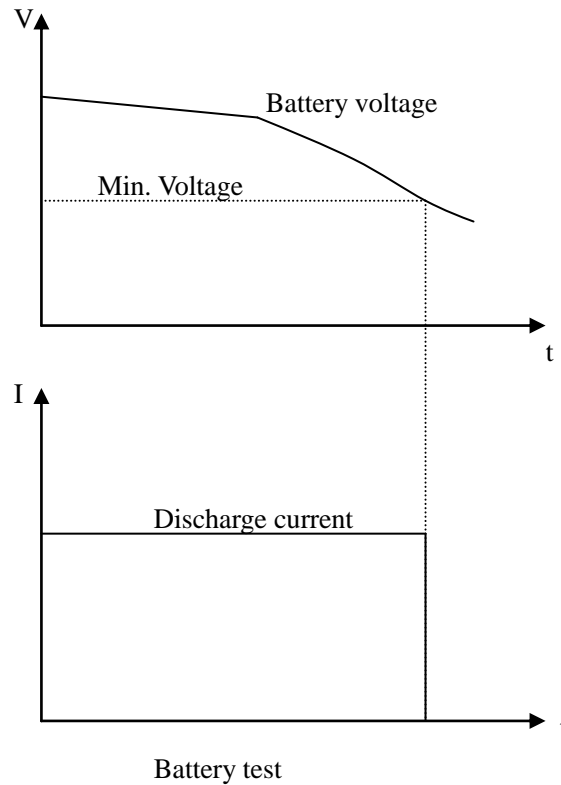
Discharge test works in the mode of consuming constant current to test discharge time and capacity of battery source. During the process of continuous discharge, battery voltage continually falls. When input voltage of load is less than set value, discharge test automatically stops, and discharge time and battery capacity are displayed.

Battery discharge test is shown as follows:



In other load modes, press **【SHIFT】+【BAT】** key to enter discharge test mode; press **【ON/OFF】** key to start discharge test, and press it again to stop test. After discharge, count will be restarted.

Before discharge test starts, discharge parameters should be set first. Press **【SHIFT】+【S_BAT】** key to enter discharge parameter setup menu, including Discharge Current, Minimum Voltage. Please refer to 3.4.3 for setup of discharge test.



4.6 Short-circuit Test Mode

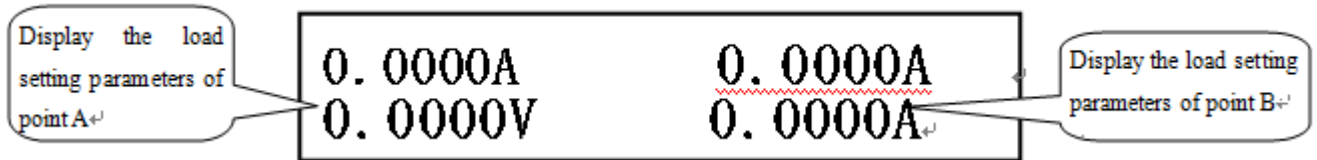
In short-circuit test, load works with current as maximum as possible, in order to simulate a short circuit between input terminals.

In other load modes, press **【SHIFT】+【CV】** key to enter short test mode. Press **【ON/OFF】** key to start or stop short-circuit.

In short-circuit test, no parameters need to be set.

4.7 Dynamic test mode

In dynamic test, load can be switched between two voltages or currents. The function can be used to test dynamic characteristics of power source.



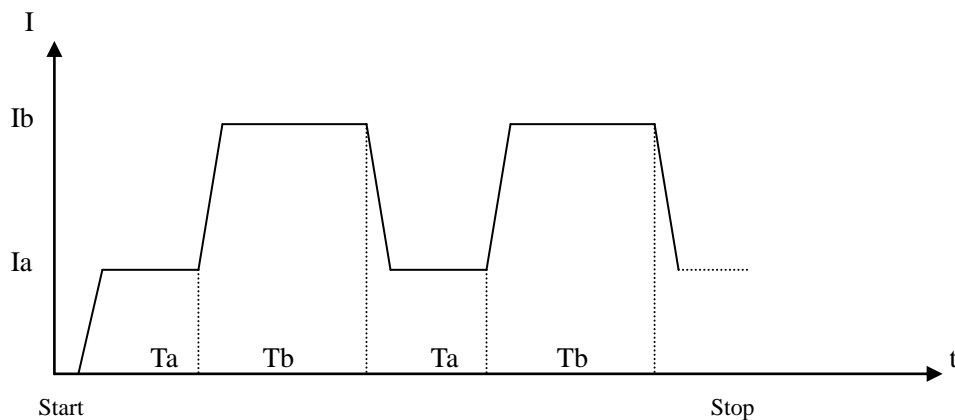
In other modes, press **【SHIFT】 + 【TRAN】** key to enter dynamic test mode. Press **【ON/OFF】** key to start or stop the test.

Before the dynamic test starts, related parameters of dynamic test should be set first. Press **【SHIFT】 + 【S_TRAN】** key to enter parameter setup menu, including Level A, Width A, Level B, Width B, Rise rate, Fall rate and dynamic mode. Refer to 3.4.4 for detailed setting.

Dynamic mode has continuous, pulse and trigger modes.

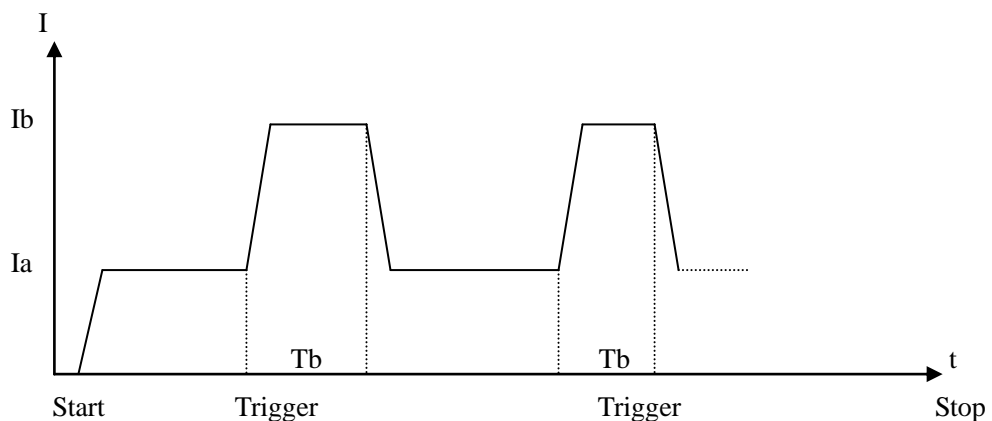
4.7.1 Continuous Mode (CONT)

After dynamic test starts, load can continuously switch between Level A and Level B, respectively keeping width A and width B.



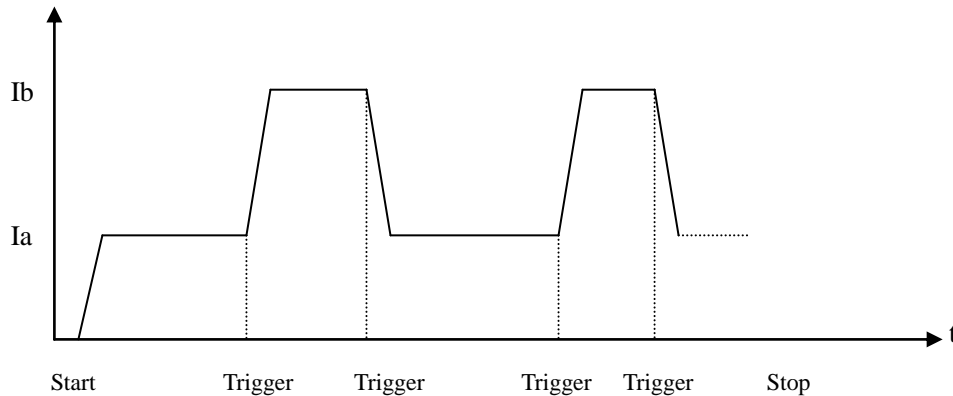
4.7.2 Pulse Mode (PULS)

After dynamic test starts, load works in Level A first. After receiving a trigger signal, it switches to Level B, keeping width B and then switches to Level A. The Width A is invalid in this mode.



4.7.3 Trigger Mode (TRIG)

After the dynamic test starts, load works in Level A or B. Once receiving a trigger signal, the load switches between Level A and B. Width A and B are invalid in this mode.



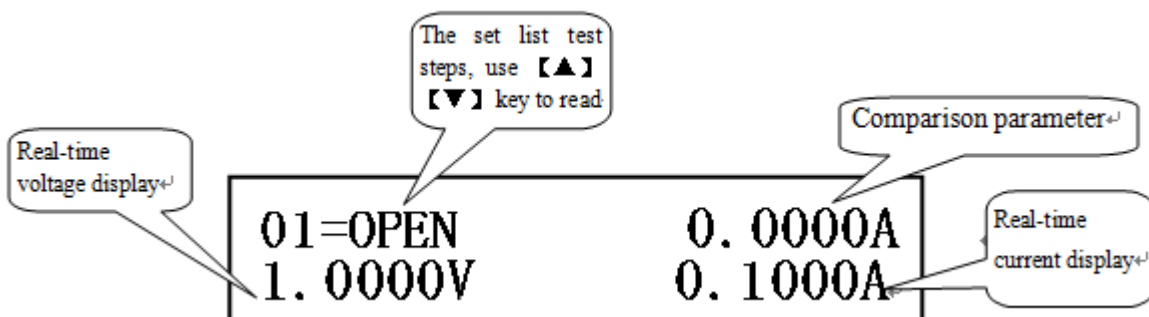
4.8 List test mode

List test function can realize automatically switching according to the set time in different load modes.

For the power products and charger devices, you can more fully understand the operating characteristics of measured products in a variety of application occasions through the multi-parameter hybrid test.

The instrument can set up to 15 steps of different kinds of loads and single-step automatic test time is 1 ~ 60000s. The current, voltage or power parameters of each step in the test process can be compared to determine pass or fail. After the set steps are tested, the overall result of the determination (PASS/FAIL) will be given in the status information area. PASS is displayed if all the test steps are successful, or FAIL is displayed if any step is failed.

List test display interface:



Before starting the list test, set the relevant parameters first. Press **【SHIFT】** + **【S-LIST】** to enter the list parameter setting menu. For details, refer to 3.4.7 List Test Set.

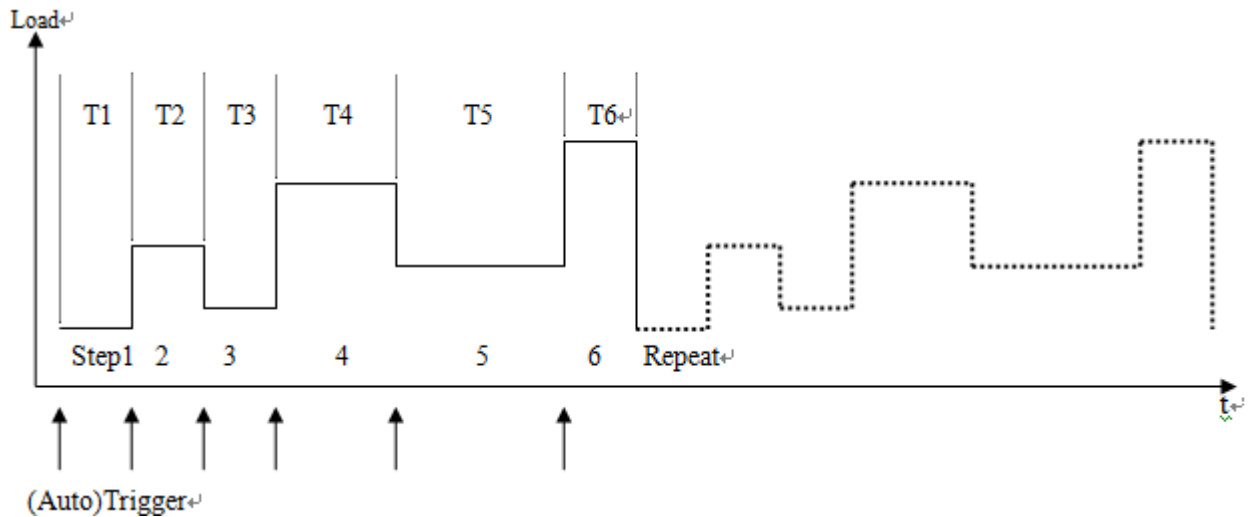
In other load modes, press **【SHIFT】** + **【LIST】** key to enter list test mode.

Press **【ON / OFF】** to start or stop the list test. If you set the list step mode to trigger, wait for the trigger signal after starting.

☰ Note: In the trigger mode, it will accept the trigger to the next load after the test delay.

Hint: Before test, press **【ENT】** key to switch to display single-step test time; during test, press **【ENT】** key to switch between current load current value and the comparison result of the current test step. After the test is finished, if the judgment result is FAIL, press **【▲】** and **【▼】** key to turn over the judgment result of each step.

List test process as shown below:



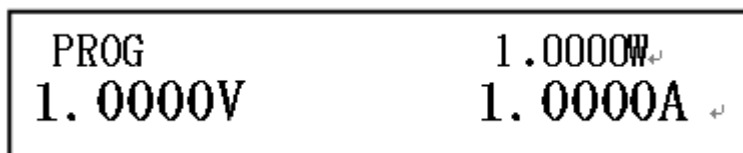
4.9 OCP, OVP test

Scanning test can be used to test the value of some range in sequence, observing the working condition of products in a certain range. It can also be used to capture a sudden mutational signal, such as the protection current and break-over voltage.

For some chargers and constant current sources, through the scan test, it can intuitively reflect the product's protection voltage or protection current, so as to better test the product.

Scanning parameters can be set according to actual needs, such as the amount of steps and display time of each step. The data captured will be compared according to current, voltage or power parameters when scanning is finished to make PASS/FAIL judgment.

Scan test display interface:



Before starting the scan test, set the relevant parameters first, and then press **【SHIFT】** + **【S-PROG】** to enter the scan parameter setting menu. For details, refer to 3.4.5 Prog Test Set.

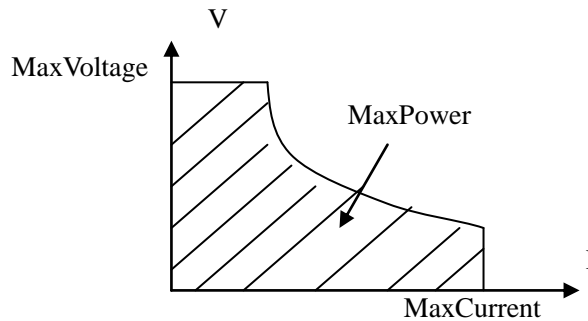
In other load mode, press **【SHIFT】** + **【PROG】** key to enter the scan test mode, press **【ON / OFF】** to start

or stop the scan test.

4.10 Protection Function

The electric load only works in the range of nominal voltage, current and power which differ with different models. Please refer to 1.2.2 for detailed specifications.

User-level voltage, current and power protection can be set by user, referring to 3.4.2 for load setup, including Max Voltage, Max Current, Max Power. Load protection is based on the set range by user, as shown below:



Electric load also has protection function of reverse polarity and over-heat.

ⓘ Note: In dynamic test mode, protection function is invalid!

4.10.1 Over-voltage protection

When input voltage is over maximum voltage, load will be off because of over-voltage protection and the beeper alarms. The following information is displayed:

Exceed Voltage!!!

4.10.2 Over-current protection

When load current is over maximum current, it alarms and “OC” is displayed because of over-current protection. If over-current lasts for long time and it exceeds 110% of maximum current, load will automatically be off.

4.10.3 Over-power protection

When consumed power of load is over maximum power, it alarms and “OP” is displayed because of over-power protection. If over-power lasts for long time and it exceeds 110% of maximum power, load will automatically be off.

4.10.4 Alarm of input polarity in reverse

Warning: At the time of polarity connection in reverse, load loses of control. And electric load is in short circuit status. Caution !

At the time of polarity connection in reverse, load stops working and alarms. The following information is displayed:

Reverse Voltage!!!

4.10.5 Over-heat protection

When temperature of internal power devices of electric load is over 80°C, load will be off because of over-heat protection, and the beeper alarms. The following information will be displayed:

Over Hot!!!

Chapter 5 Examples

The chapter introduces examples in battery test, dynamic test and list test.

5.1 Battery test

5.1.1 Parameter

Battery rated voltage —6V
 Discharge current —500mA
 Min. voltage —3V

5.1.2 Setting

No.	Operation	Display
1	In waiting status, press 【SHIFT】+【MENU】 key to enter menu, then press 【▼】 key to select Battery Test Set, press 【Ent】 key to enter setting menu, or press 【SHIFT】+【S-BAT】 key to enter Battery Test Set menu.	BATTERY TEST SET
2	Press 【Ent】 key to enter discharge current setup.	DISCHARGE CURRENT
3	Input 【0】【.】【5】 and then press 【Ent】 key to confirm with unit of A.	0.5000A
4	Press 【ESC】 key to exit back to step 1, then press 【▼】 key to select Min Voltage.	Min Voltage
5	Press 【Ent】 key to enter.	0.0000V
6	Input 【3】 and then press 【Ent】 key to confirm with unit of V.	3.000V
7	Press 【ESC】 key to quit, press 【▼】 key to select METER MODE.	METER MODE
8	Press 【Ent】 key to enter and use 【▲】【▼】 key to select WH or AH display mode.	WH

9	Press 【ESC】 key to quit, press 【Ent】 key to confirm. Press 【SHIFT】 + 【BAT】 to enter into Battery test interface.	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>0.000WH ↵</p> <p>6.1200V <u>I_c</u> = 0.5000A[↵]</p> </div>

5.1.3 Test

No.	Operation	Display
1	Connect battery to be tested with electric load in right polarity.	
2	Press 【ON/OFF】 key to start test. After consumed current is constant, the accumulated time will be displayed in the upper right corner of the display area.	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>0.000AH 12[↵]</p> <p>6.0200V <u>I_c</u>=0.5000A[↵]</p> </div>
3	When battery input voltage is less than 3V, test automatically ends, or press 【ON/OFF】 key to stop test and the total discharge capacity will be displayed.	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>1.501AH 10808[↵]</p> <p>3.000V 0.0000A[↵]</p> </div>



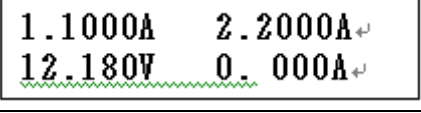
5.2 Dynamic test

5.2.1 Parameters

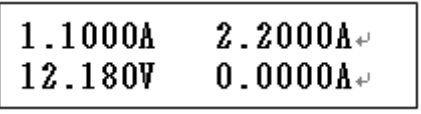
- Voltage of power to be tested ——12V
- Dynamic test A ——1.1A
- Dynamic time A ——100ms
- Dynamic current B ——2.2A
- Dynamic time B ——200ms
- Rise time ——0.1A/us
- Fall time ——0.5A/us
- Dynamic mode ——Continuous

5.2.2 Setup

No.	Operation	Display
1	In waiting status, press 【SHIFT】 + 【MENU】 key to enter menu, then press 【▼】 key to select Tran Test Set, press 【Ent】 key to enter setting menu, or press 【SHIFT】 + 【S-TRAN】 key to enter Tran Test Set menu.	<div style="border: 1px solid black; padding: 5px; text-align: center;">TRAN TEST SET</div>
2	Press 【Ent】 key to enter into Level A (dynamic current) setup.	<div style="border: 1px solid black; padding: 5px; text-align: center;">LEVEL A ↵ ↵</div>
3	Press 【Ent】 key to set.	<div style="border: 1px solid black; padding: 5px; text-align: center;">0.0000A ↵</div>
4	Input 【1】【.】【1】 and then press 【Ent】 key to enter.	<div style="border: 1px solid black; padding: 5px; text-align: center;">1.1000A ↵ ↵</div>
5	Press 【ESC】 key to exit back to previous menu, then press 【▼】 key to select Width A.	<div style="border: 1px solid black; padding: 5px; text-align: center;">Width A ↵</div>
6	Press 【Ent】 key to enter width setup of Level A, then press 【Ent】 key to input 【1】【0】【0】 , press 【Ent】 key to enter with unit of ms.	<div style="border: 1px solid black; padding: 5px; text-align: center;">100.000MS</div>
7	Press 【ESC】 key to exit back to previous menu to respectively select Level B and Width B to set current and width of dynamic B, referring to step 3, 4, 5, 6.	<div style="border: 1px solid black; padding: 5px; text-align: center;">2.2000A</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">200.000MS</div>
8	Press 【ESC】 key to exit back to previous menu, then press 【▼】 key to select RISE RATE.	<div style="border: 1px solid black; padding: 5px; text-align: center;">RISE RATE</div>
9	Press 【Ent】 key to enter and input 0.1. Press 【Ent】 key to confirm, indicating the current rise 0.1A/us.	<div style="border: 1px solid black; padding: 5px; text-align: center;">0.1000 ↵</div>
10	Press 【ESC】 key to exit back to previous menu, then press 【▼】 key to select FALL RATE. The setup method is the same as the RISE RATE. Set it as 0.5A.	<div style="border: 1px solid black; padding: 5px; text-align: center;">0.5000 ↵</div>

11	Press 【ESC】 key to exit back to previous menu, then press 【▼】 key to select MODE SELECT.	
12	Press 【Ent】 key to enter and use 【▲】 【▼】 key to select CONT.	
13	Press 【ESC】 key till exiting menu, then press 【SHIFT】+【TRAN】 to enter dynamic test page.	

5.2.3 Test

No.	Operation	Display
1	Connect battery to be tested with electric load in right polarity.	
2	Press 【ON/OFF】 key to start test, and load switches between two status with voltage monitor not being displayed. Protection function could not be used in dynamic test.	
3	If dynamic mode is pulse or trigger, TRIG key (【▼】 key) on panel can be pressed, or external and BUS trigger.	
4	Press 【ON/OFF】 key to end dynamic test.	

5.3 List test

5.3.1 Parameters




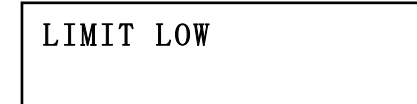

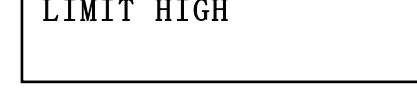
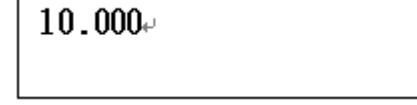

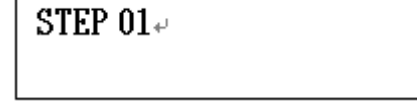

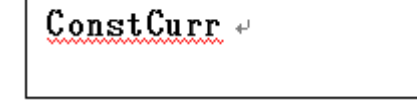
Charger test is required as follows:

Test step	Mode	Voltage range	Current range	Test time
Step one	Open	9.1V ~ 10V	0	2s
Step two	CC	8.7V ~ 9.5V	230mA	5s
Step three	CV	9V	220 ~ 260 mA	3s
Step four	CV	8V	220 ~ 260 mA	1s
Step five	Short-circuit	0	≤260 mA	1s

Parameters in shadow need to be judged in the test.

5.3.2 Setup

No.	Operation	Display
1	In waiting status, press 【SHIFT】+【MENU】 key to enter menu, then press 【▼】 key to select List Test Set, press 【Ent】 key to enter setting menu, or press 【SHIFT】+【S-LIST】 to enter List Test Set.	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">LIST TEST SET↵</div> <div style="border: 1px solid black; padding: 5px;">STEP NUMBER↵</div>
2	Press 【Ent】 key to enter list step setup. Press 【▲】【▼】 key to select step Number. We (01 is the first step).	<div style="border: 1px solid black; padding: 5px; text-align: right;">05↵</div>
3	Press 【ESC】 key to exit back to list test menu, then press 【▼】 key to select StepMode.	<div style="border: 1px solid black; padding: 5px; text-align: right;">STEP MODE↵</div>
4	Press 【Ent】 key to enter, selecting step mode to AUTO. (use 【▲】 and 【▼】 key to select other modes)	<div style="border: 1px solid black; padding: 5px; text-align: right;">AUTO↵</div>
5	Press 【ESC】 key to exit back to list test menu, then press 【▼】 key to select Repeat. Press 【Ent】 key to select OFF, and the example will not be repeated.	<div style="border: 1px solid black; padding: 5px; text-align: right;">REPEAT</div>
6	Press 【ESC】 key to exit back to list test menu, then press 【▼】 key to select Step 01.	<div style="border: 1px solid black; padding: 5px; text-align: right;">STEP01↵</div>
6a	Press 【Ent】 key to enter Step 01for detailed settings.	<div style="border: 1px solid black; padding: 5px; text-align: right;">LIST LOAD↵</div>
6b	Set load type of step 01, press 【Ent】 key to enter List Load, then press 【▲】【▼】 key to select Open.	<div style="border: 1px solid black; padding: 5px; text-align: right;">OPEN↵</div>
6c	Press 【ESC】 key to exit back to setting menu of step 01, then press 【▼】 key to select Level. In this example, it is open, so load value could not be set.	<div style="border: 1px solid black; padding: 5px; text-align: right;">LEVEL</div>
6d	Press 【▼】 key to select Delay (delay time of Step 01).	<div style="border: 1px solid black; padding: 5px; text-align: right;">DELAY↵</div>
6e	Press 【Ent】 key to enter, input 【20】 and then press 【Ent】 key to confirm with unit of 0.1s.	

		
6f	Press 【ESC】 key to exit back to setting menu of step 01, then press 【▼】 key to select Compare.	
6g	Press 【Ent】 key to enter and use 【▲】 【▼】 key to select INVOLT.	
6h	Press 【ESC】 key to exit back to setting menu of step 01, then press 【▼】 key to select LIMITLOW.	
6i	Press 【Ent】 key to enter, input 【9】 【.】 【1】 then press 【Ent】 key to confirm.	
6j	Press 【ESC】 key to exit back to setting menu of step 01, then press 【▼】 key to select LIMITHIGH.	
6k	Press 【Ent】 key to enter, input 【1】 【0】 and then press 【Ent】 key to confirm.	
6l	Press 【ESC】 key to exit back to setting menu of step 01, then press 【▼】 key to select COPE TO NEXT (use this function when the parameters of two steps are similar), we do not select cope to next in this step.	
6m	Press 【▼】 key to select EXIT and press 【Ent】 key to turn back to STEP01.	
7	Press 【▼】 key to select Step02.	
7a-f	Respectively set parameters of step 02: Load type	

	<p>Load value</p> <p>Delay time</p> <p>Comparator</p> <p>Low limit</p> <p>High limit</p>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">0.2300A↵</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">5s↵</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">InVolt ↵</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">8.7000↵</div> <div style="border: 1px solid black; padding: 5px;">9.5000↵</div>
8	Respectively set parameters of step 03 (CV), step 04 (CV), step 05 (SHORT) .	If parameters of step 03 and step 04 are similar, Copy To Next can be used.
9	Press 【ESC】 key till exiting from all menus.	

5.3.3 Test

No.	Operation	Display
1	Press 【SHIFT】 + 【LIST】 to enter list test mode. The test mode for each step will be displayed on the left in the first line of the display and the corresponding compare parameter on the right. The second line shows real-time parameters.	<div style="border: 1px solid black; padding: 5px;"> 01=OPEN 0.0000V ↵ 9.6500V 0.0000A↵ </div>
2	Press 【Ent】 key to switch to display the test time of the step.	<div style="border: 1px solid black; padding: 5px;"> 01=2.0 S 0.0000V ↵ 9.6500V 0.0000A↵ </div>
3	Press 【▲】 【▼】 key to check load values and types of other steps, then press 【Ent】 key to check test time. In this example, total number of step is 5, so S05 is max.	<div style="border: 1px solid black; padding: 5px;"> 05=SHORT 0.0000A ↵ 9.6500V 0.0000A↵ </div>
4	Press 【ON/OFF】 key to start list test, and load scans from S01 to S05 step by step.	<div style="border: 1px solid black; padding: 5px;"> 01=OPEN 9.6500V ↵ 9.6500V 0.0000A↵ </div>

5	<p>During the test, 【ON/OFF】 key can be pressed any time to stop test..</p> <p>After the normal test, whole judgment result will be displayed in status information area (if comparator is turned on in any step).</p>	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>01=OPEN 0.0000V ✓↵</p> <p>9.6500V 0.0000A↵</p> </div>

5.4 PROG Test

5.4.1 Parameter

Supply voltage	45V
Load mode	CC
Protection current range	1450mA-1520mA

5.4.2 Setting

No.	Operation	Display
1	In waiting status, press 【SHIFT】+【MENU】 key to enter menu, then press 【▼】 key to select PROG TEST SET, press 【Ent】 key to enter setting menu, or press 【SHIFT】+【S-PROG】 to enter PROG TEST SET.	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>PROG TEST SET↵</p> </div>
2	Press 【Ent】 key to enter prog type setup and select CC mode.	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>PROG MODE↵</p> </div>
3	Press 【Ent】 key to enter and press 【▼】 key to select CC mode.	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>CONST-CURR↵</p> </div>
4	Press 【ESC】 key to exit back to the first display and then press 【▼】 key to select START VALUE.	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>START VALUE↵</p> </div>
5	Press 【Ent】 key to input the start value and press 【Ent】 key to confirm.	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>1.4000A↵</p> </div>
6	Press 【ESC】 key to exit back to the first display and then press 【▼】 key to select END VALUE. Press 【Ent】 key to input the end value and press 【Ent】 key to confirm.	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>1.5500A↵</p> </div>

7	Press 【ESC】 key to exit back to the first display and then press 【▼】 key to select STEP VALUE. Press 【Ent】 key to input the step value and press 【Ent】 key to confirm.	0.0020A ↵
8	Press 【ESC】 key to exit back to the first display and then press 【▼】 key to select STEP DELAY. Press 【Ent】 key to input the step delay and press 【Ent】 key to confirm.	20ms ↵
9	Press 【ESC】 key to exit back to the first display and then press 【▼】 key to select THRESHOLD TYPE. Press 【Ent】 key to enter and press 【▼】 key to select Drop.	Drop ↵
10	Press 【ESC】 key to exit back to the first display and then press 【▼】 key to select THRESHOLD VALUE. There is no need to set the threshold value, because Drop is selected.	Threshold Value ↵
11	Press 【▼】 key to select COMPARE TYPE. Press 【Ent】 key to enter and press 【▼】 key to select INCURR.	INCURR ↵
12	Press 【ESC】 key to exit back to the first display and then press 【▼】 key to select LIMIT LOW. Press 【Ent】 key to enter, input 1.45A and press 【Ent】 key to confirm.	1.4500A ↵
13	Press 【ESC】 key to exit back to the first display and then press 【▼】 key to select LIMIT HIGH. Press 【Ent】 key to enter, input 1.52A and press 【Ent】 key to confirm.	1.5200A ↵
14	Press 【ESC】 key till exiting from all menus.	

5.4.3 Test

No.	Operation	Display				
1	Connect product to be tested with electric load in right polarity.					
2	Press 【SHIFT】 + 【PROG】 to enter PROG TEST. The display interface is similar to the normal CV and CC interface. It will be displayed as Prog Test.	<table border="1"> <tr> <td>PROG:</td> <td>0.000W ↵</td> </tr> <tr> <td>45.521V</td> <td>0.0000A ↵</td> </tr> </table>	PROG:	0.000W ↵	45.521V	0.0000A ↵
PROG:	0.000W ↵					
45.521V	0.0000A ↵					

3	Press 【ON/OFF】 key to start prog test.	<table border="1"> <tr> <td>PROG:</td> <td>58.841W↵</td> </tr> <tr> <td>41.350V</td> <td>1.4230A↵</td> </tr> </table>	PROG:	58.841W↵	41.350V	1.4230A↵
PROG:	58.841W↵					
41.350V	1.4230A↵					
4	When the test reach the protection current and voltage drop occurs, the prog test ends and the current will be captured and displayed.	<table border="1"> <tr> <td>PROG:</td> <td>61.404W↵</td> </tr> <tr> <td>41.350V</td> <td>1.4850A↵</td> </tr> </table>	PROG:	61.404W↵	41.350V	1.4850A↵
PROG:	61.404W↵					
41.350V	1.4850A↵					

Appendix A Remote measurement and external trigger

A1 Remote measurement

When the load consumes large current, voltage drop will be occurred in the connecting line between the measured power and the load thus affecting the voltage measurement accuracy. In CV, CR, CP mode, voltage sampling accuracy will affect the working accuracy of the electronic load.

The purpose of remote measurement is not measuring voltage from the input terminal of the load, but directly measure the voltage from the tested power supply through the other two test leads.

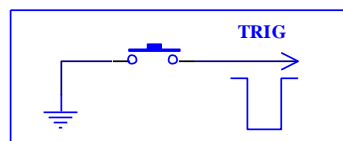
The two voltage sampling lines for remote measurement are in Sense interface on the rear panel.

Before using remote measurement, set REMOTE SENSE to ON in load setup, see Section 3.4.1.

A2 External trigger

In Dynamic and List test, it may be necessary to "trigger" to start the next load conversion. There are three kinds of trigger modes: manual, external and bus. External trigger is in Sense interface on the rear panel.

Input a low level with width not less than 100us in the trigger input terminal to form an effective trigger.



It is necessary to consider that the switch jitter may produce false triggering.

A3 Pin Configuration

Sense interface uses DB9 pin type connector. The pin functions are as shown below:



- | | |
|---|---|
| 1: PASS signal output | 6: Import positive pole of Remote measurement |
| 2: FAIL signal output | 7: Import negative pole of Remote measurement |
| 3: PASS/FAIL signal output reference ground | 8: System reserved |
| 4: ON trigger pin | 9: ON, TRIG trigger signal reference ground |
| 5: TRIG trigger pin | |
- ① 4-pin, 5-pin used as a trigger input, do not apply any external voltage and current source
 - ① 6-pin, 7-pin used as voltage measurement terminal, mind the input polarity
 - ① 5-pin, 9-pin used as a trigger input, do not apply any external voltage and current source

Appendix B RS232C communication interface

RS232C interface can be used to communicate with PC and PLC for build an automatic test system, or multi-sets test system through RS485. The instrument provides multiple commands and almost all functions in instrument panel can be operated in PC through RS232 interface.

B1 Interface

RS-232 standard, also called as asynchronous serial communication standard, has already been widely used for data communication between computers, computer and external equipment. RS is the English abbreviation of Recommended Standard; 232, the standard number. This standard is issued by EIA in 1969, which rules to send one bit in a data line every time.

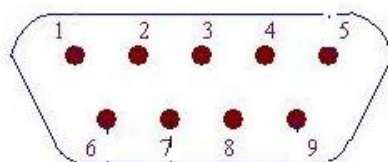
Standard RS-232C interface uses a 25 pin connector or a 9 pin connector). The most frequently-used RS-232 signals are as follows:

Signal	Code	Pin number of 25-pin connector	Pin number of 9-pin connector
Request to send	RTS	4	7
Clear to send	CTS	5	8
Data set ready	DSR	6	6
Data carrier detect	DCD	8	1
Data terminal ready	DTR	20	4
Transmitted data	TXD	2	3
Received data	RXD	3	2
Signal ground common	GND	7	5

The serial interface of our instrument is not strictly based on RS-232 standard, but only uses the smallest subset of this standard.

The RS232C of this instrument uses standard 9-pin DB connector. The pin definitions are listed in the following table and figure:

Signal	Code	Connector pin number
Transmitted data	TXD	2
Received data	RXD	3
Signal ground common	GND	5



(Side view)

⚠ **Warning:** Before connecting or disconnecting the connector, please power off the instrument to avoid electrical shock hazard.

⚠ **Warning:** Do not short the output terminal or case so as to avoid damage to the DUT.

B2 Communication

The connection of the instrument with PC is shown:

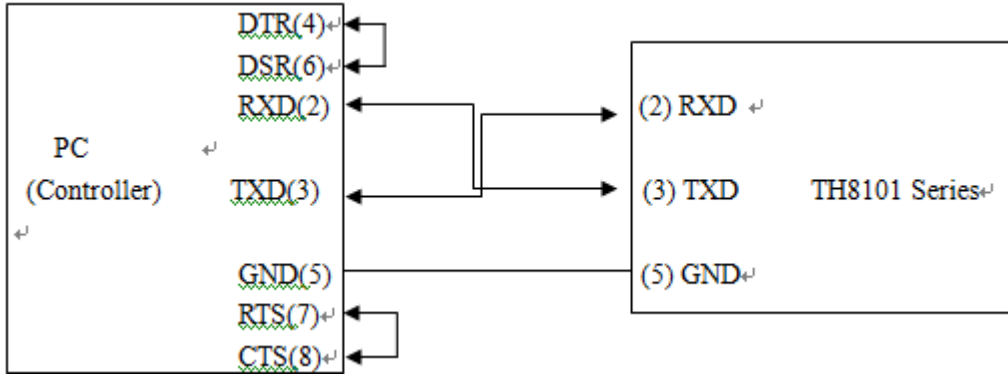


Figure above shows that the serial interface pin definition of this instrument is different from that of 9 pin connector used in IMB AT compatible computer. User can make three-wire connection cable (length is less than 1.5m) by using double-core shielding lines or purchase the serial interface cable from our company.

⚠ **Warning:** After connecting with RS232, negative input terminal is grounded, if negative terminal can't be grounded, then RS232 can't be used unless connect ungrounded isolator.

When connecting with PC, firstly, set up the interface including communication mode, baud rate, and local address, Details in 3.4.2 System setting.

The main parameter of serial port

Transmitted mode	Asynchronous serial communication including start and stop bits
Baud rate	4800 bps, 9600 bps, 11520 bps, 12800 bps, 14400 bps, 19200 bps, 28800 bps, 38400 bps
Data bits	8 BIT
Stop bits	1 BIT
Calibration	None
End code	CR, LF, CR+LF
Contact mode	None
Connector	DB9 core

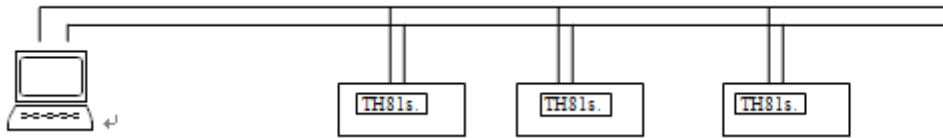
Command and data between instrument and PC is transmitted by, instrument can explain and operate the command string only after receiving a complete one which is ended as CR or LF or CR+LF. Where,

- CR Carriage return
- LF Line feed

B3 RS485 multi-set communication

If building a multi-set communication system, RS485 bus needs expanding and RS232-RS485 converter can be used to connect multiple sets to RS485 bus, which can realize that one PC controls multiple sets (127 sets at most) of electronic load.

Set the device in RS485 bus to multi-set communication mode, the called device can operate the command string by *ADR.



RS485 bus

One kind of RS485 converter is as below:

