User's Manual

DC programmable electronic load

Model IT8817/IT8817B/IT8817C
IT8818/IT8818B/IT8818C

Ver1.2 /Oct, 2013/ IT8800-701

DIRECTOTRY

Warranty Information

Certification

We certify that this product met its published specifications at time of shipment from the factory.

Warranty

This hardware product is warranted against defects in material and workmanship for a period of ONE year from date of delivery. IT8800 series electronic load for use with a hardware product and when properly installed on that hardware product, are warranted not to fail to execute their programming instructions due to defects in material and workmanship for a period of 90 days from date of delivery. During the warranty period our company will either repair or replace products which prove to be defective. Our company does not warranty that the operation for the software firmware or hardware shall be uninterrupted or error free.

For warranty service, with the exception of warranty options, this product must be returned to a service facility designated by our company. Customer shall prepay shipping charges by (and shall pay all duty and taxes) for products returned to our place for warranty service. Our company shall pay for return of products to Customer.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by the Customer, Customer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation and maintenance.

Assistance

The above statements apply only to the standard product warranty. Warranty options product maintenance agreements and customer assistance agreements are also available.

Safety Summary

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument .We assumes no liability for the customer’s failure to comply with these requirements.

Environmental Conditions

This instrument is intended for indoor use. Pollution degree 2 environments. It is designed to operate at a maximum relative humidity of 95% and at altitudes of up to 2000 meters. Refer to the specifications tables for the ac mains voltage requirements and ambient operating temperature range.

Before Applying Power

Verify that all safety precautions are taken. Note the instrument's external markings described under "Safety Symbols".

Ground the Instrument

This product is a Safety Class 1 instrument (provided with a protective earth terminal). To minimize shock hazard, the instrument chassis and cover must be connected to an electrical ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Note: Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of fumes or flammable gases.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must not remove instrument covers except as instructed in this Guide for installing or removing electronic load modules. Component replacement and internal adjustments must be made only by qualified service personnel. Do not replace components with power cable connected. Under certain conditions dangerous voltages may exist even with the power cable removed. To avoid injuries always disconnect power, discharge circuits, and remove external voltage sources before touching components.

DO NOT SERVICE OR ADJUST ALONE

Do not try to do some internal service or adjustment unless another person capable of rendering first aid resuscitation is present.

Safety Symbols


Direct current


Alternating current


Both direct and alternating current


Protective earth (ground) terminal


Caution (refer to accompanying documents)

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the products. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

Introduction

IT8800 series DC electronic loads are singel-channel programmable electronic loads. With RS232 /GPIB /USB communication interfaces. The series DC electronic loads can provide multiple solutions according to the requirements of your design and test.

Feature:

- Highlight VFD display
- Measurement resolution: 0.1mV,0.01mA
- Measurement speed: up to 50KHZ
- Four operation mode:CV(Constant Voltage),CC,CR,CW
- Rotary knob, making the operation more easier
- Remote Sense function
- Battery test function
- Memory capacity to save/recall setting parameters:100 sets
- Short circuit function
- With skid-resistant tripod and portable firm chassis
- Controlled by intelligent fans
- Build-in Buzzer as alarm signal
- Power off memory function

Model	Voltage	Current	Power
IT8817	120V	360A	4500W
IT8817B	500V	120A	3600W
IT8817C	120V	600A	4500W
IT8818	120V	480A	6000W
IT8818B	500V	150A	5000W
IT8818C	120V	720A	6000W

Chapter1 Inspection and Installation

1.1 Inspection

Make sure you have received the following compontents along with unit.If anyone has been lost,please contact with your franchiser.

Item	Part Number	Description
Power cord	IT-E171	you can choose difference power line according to region
	IT-E172	
	IT-E173	
	IT-E174	
User's manual		including installation ,operation,self-test information
Test report		test report before ex-factory

1.2 cleaning

Do not clean any internal parts of units casually.If you want to clean the outside cover,please use a dry cloth or moistish cloth to wipe.

Caution:Cut the power source before do the cleaning

1.3 Accessory

Standard Accessories

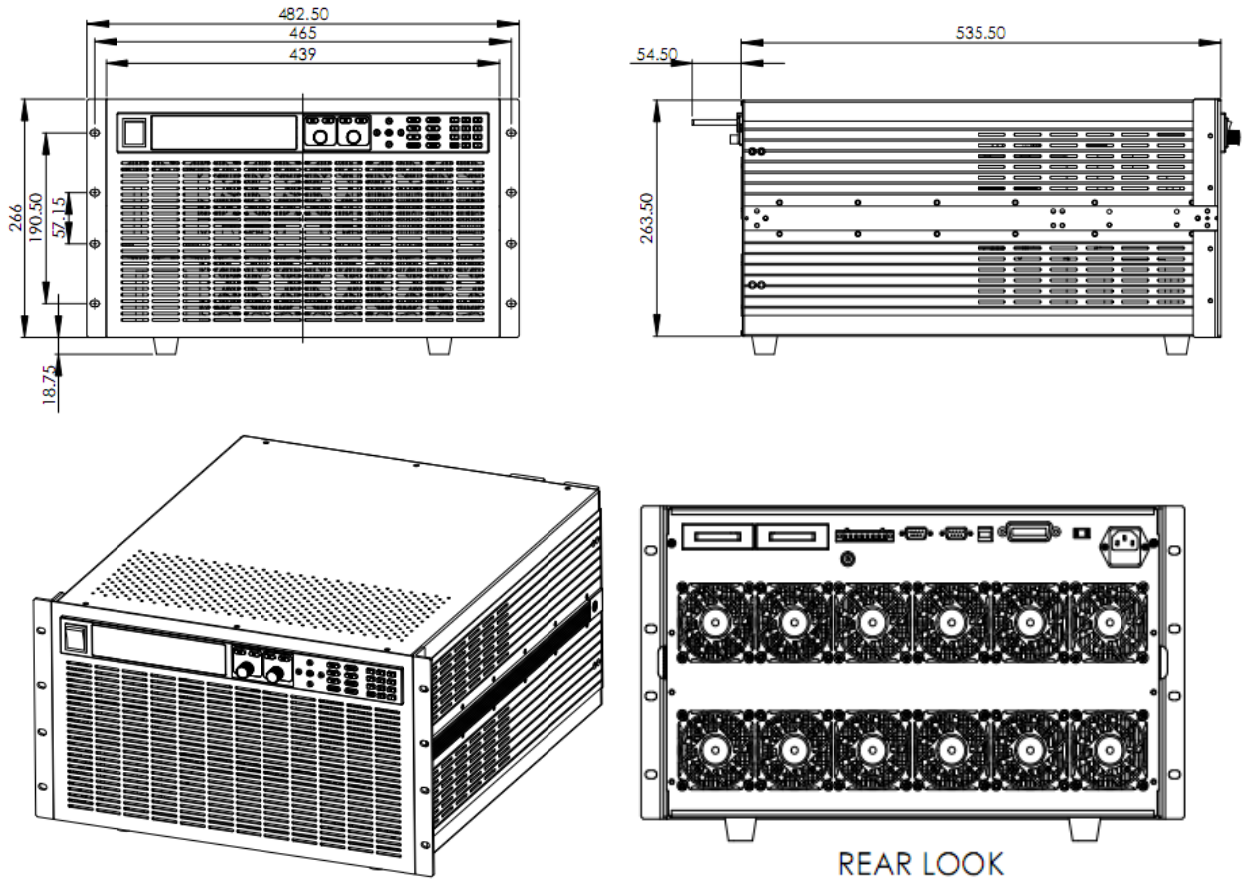
Power cord
User's manual
Calibration testing report

1.4 Installationsite

The following outside drawing has marked the dimension information.Unit should be fixed in a reasonable size of space and make sure proper ventilation conditions.

1.4.1 Mounting Dimensions

dimension: 465 mmW x 263.5mm H x 535.5mm D
Refer to the following dimension drawing:

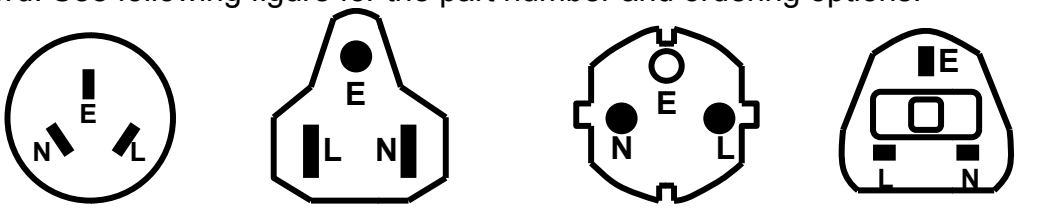


Unit: minimeter(mm）

1.4.2 Input connections

Power Cord

Connect the power cord to the IEC 320 connector on the rear of the unit. If the wrong power cord was shipped with your unit, contact your nearest Agent to obtain the correct cord. See following figure for the part number and ordering options.



China IT-E171

United States ,Canada IT-E172

Europe IT-E173

United Kingdom IT-E174

Chapter 2 Quick Start

2.1 Power-on selftest

2.1.1 Introduction

A successful test process indicates that units meet the factory specifications and can be operated well.

2.1.2 Selftest steps

Power cord should be connected correctly.Following is the detailed selftest steps.

Steps	VFD display	Explanations
After turn on the unit	**BOIS Ver 1.10**	display software version
About 1S later	**System Selftest….**	System self check
About 1S later	**0.0000V 0.0000A** **0.00W CC=0.000A**	VFD:the first line display actual voltage and current value VFD:the second line display the actual power value and the setting current/voltage/power/resistance/impedance value
Press Shift + number 7	**Model: IT88XX** **Ver: 1.XX-1.XX** **SN:XXXXXXXXXXXXXXXXX**	Display products's information.You can press direction buttons to check product's model/SN/software version

WARNING: The electronic load is shipped from factory with a power cord that has a plug appropriate for your location. Your electronic load is equipped with 3-wire grounding type power cord; the third conductor being grounded. The electronic load is grounded only when the power-line cord is plugged into an appropriate receptacle. Do not operate your power supply without adequate cabinet ground connection.

2.1.3 If the electronic load can't power-on

The following means could help you solve some problems you may meet when you turn on the units:

1) Verify that there is AC power to the power supply.

First, verify that the power cord is firmly plugged into the power receptacle on the rear panel of the electronic load. You should also make sure that power source you plugged the electronic load into is energized. Then, verify that the electronic load is turned on.

2) **Verify the power-line voltage setting**

The line voltage is set to the proper value for your country(110VAC or 220VAC) when the electronic load is shipped from facory. Change the line voltage setting if it's not correct.

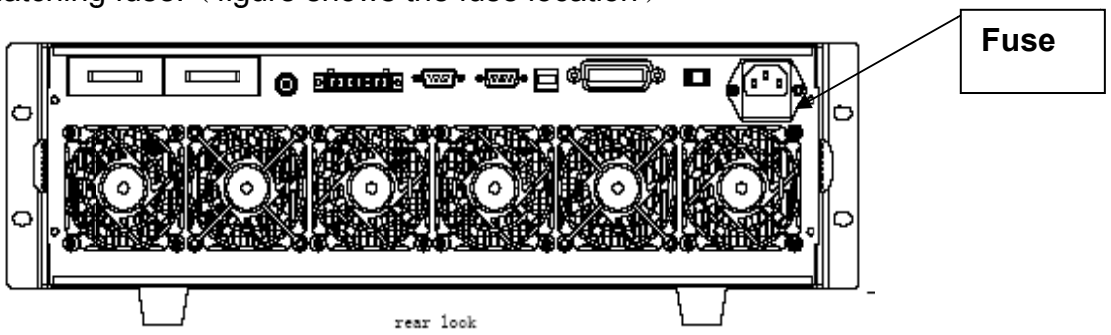
3) **Verify that the correct power-line fuse is installed.**

If fuse is blowout, please replace it according to the following specification.

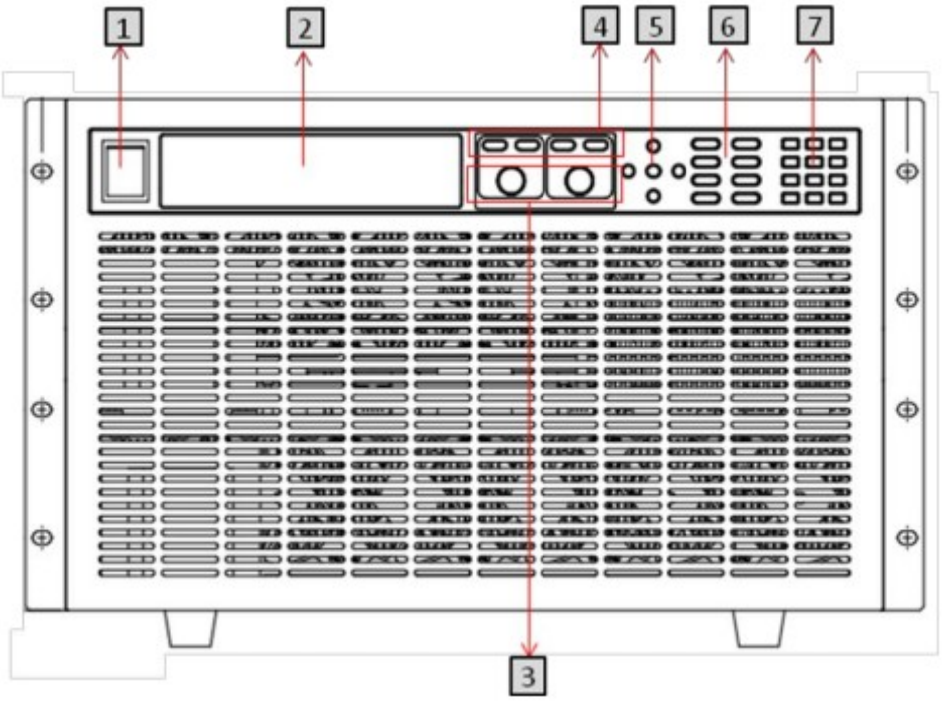
Model	Fuse specification(110AC)	Fuse specification(220AC)
IT8817	T 5A 250VAC	T 2.5A 250VAC
IT8817B	T 5A 250VAC	T 2.5A 250VAC
IT8817C	T 5A 250VAC	T 2.5A 250VAC
IT8818	T 5A 250VAC	T 2.5A 250VAC
IT8818B	T 5A 250VAC	T 2.5A 250VAC
IT8818C	T 5A 250VAC	T 2.5A 250VAC

4) **The method to replace fuse**

Use a flat-bladed screwdriver to open the small plastic cover under the AC input connector on the rear panel of the load ,then you can see the fuse. Please use the matching fuse.（figure shows the fuse location）

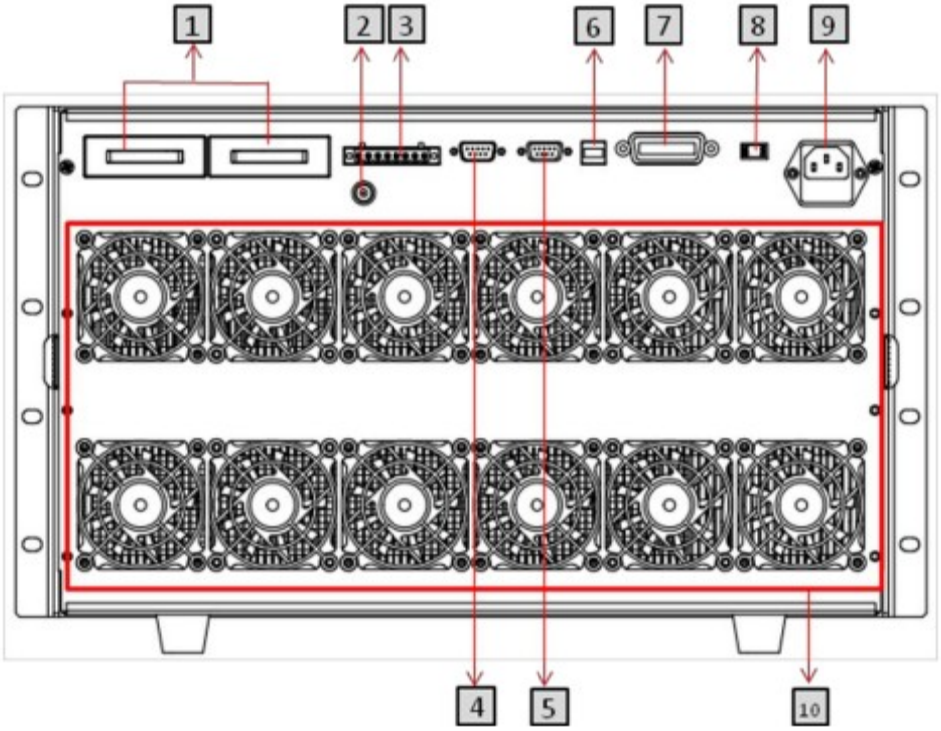


2.2 Front panel introduction



1 The power switch
2 VFD display
3 Rotary knob
4 Operation mode(CC,CV,CR,CW) keys
5 Direction buttons
6 Function keys
7 Number keys/ Composite function keys

2.3 Rear panel introduction

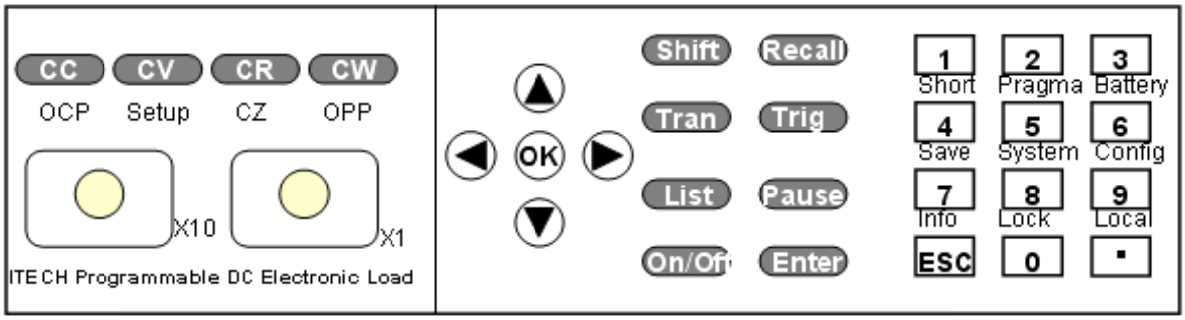


1 Input terminal
2 Current detection terminal
3 Remote sense terminal, external trigger terminals, 0-10V anolog control interfaces
4 External signal control interface
5 RS232 communication interface
6 USB communication interface
7 GPIB communication interface
8 AC power switching（110V/220V）
9 AC power input socket （with fuse in it）
10 Fans

2.4 VFD status indicator lamp description

OFF	The load is in OFF state	**Error**	Something wrong happened
CC	Constant current mode	**Trig**	Waiting for the trigger signal
CV	Constant voltage mode	**Sense**	Remote sense function is enabled
CR	Constant resistance mode	**Prot**	Software OCP state
CW	Constant power mode	**Rear**	External analog control function is open
Rmt	Remote control mode	**Auto**	Voltage range automatically seleting function is open
Addr	Send command in remote control mode	*	The key lock function is open
SRQ	Serial request enquire	**shift**	Shift has been pressed

2.5 Key board description



Shift	Shift(composite key)
Recall	Recall parameters that have been saved,such as current setting value
Tran	Set the dynamic test parameters
Trig	Trigger button,open trigger function
List	Set the parameters of List test file
Pause	Pause if needed during auto-test
CC	Select constant current mdoe,set current level
CV	Select constant voltage mode,set the voltage level
CR	Select constant resistance mode，set the resistance value
CW	Select constant power mode，set the power value
Enter	Ensure button
on/off	Control the input mode：on/off
△	Up arrow button,move upwords in menu/increase the set

	value
▽	Down arrow,move downwords in menu/decrease the set value
▷	Right arrow,move the cursor to the right when in set mode
◁	Left arrow,move the cursor to the right when in set mode
OK	Confirm button
0 ~ 9	number keys
•	radix point key
ESC	Exit key，exit from any operation condition
×10	Rotary knob to adjust the setups by 10 stepping
×1	Rotary knob to adjust the setups by 1 stepping

2.6 Combination keys

Shift + number1（Short）	start or stop short test function
Shift + number 2(pragma)	Auto test function
Shift + number 3(Battery)	Battery test function
Shift + number 4（Save）	Save the current setting value,such as current setting value
Shift + number 5（System）	System menu setting
Shift + number 6（Config）	Configure menu setting
Shift + number 7（Info）	Display product's Model/SN/Version
Shift + number 8（Lock）	Key lock function
Shift + number 9（Local）	LOCAL key，used to switch local and remote mode
Shift +CC（OCP）	OCP test function
Shift +CV(Setup）	Set detailed parameters in CC/CV/CW/CR mode
Shift +CW（OPP）	OPP test function

Chapter3 Technical Specification

3.1 Main technical specification

Model		IT8817		IT8818	
Rated value (0 ~ 40 ℃)	Voltage	0~120V		0~120V	
	Current	0~36A	0~360A	0~48A	0~480A
	power	4500W		6KW	
	Minimum setting voltage	0.15V/36A	1.5V/360A	0.15V/48A	1.5V/480A
CV mode	range	0~18V	0~120V	0~18V	0~120V
	resolution	1mV	10mV	1mV	10mV
	accuracy	±(0.025%+0.05%FS)	±(0.025%+0.05%FS)	±(0.025%+0.05%FS)	±(0.025%+0.05%FS)
CC mode	range	0~36A	0~360A	0~48A	0~480A
	resolution	1mA	10mA	1mA	10mA
	accuracy	±(0.05%+0.1%FS)	±(0.05%+0.1%FS)	±(0.05%+0.1%FS)	±(0.05%+0.1%FS)
CR mode	range	0.01Ω~10Ω	10Ω~7.5KΩ	0.005Ω~10Ω	10Ω~7.5KΩ
	resolution	16bit		16bit	
	accuracy	0.01%+0.08S	0.01%+0.0008S	0.01%+0.08S	0.01%+0.0008S
CW mode	range	4500W		6KW	
	resolution	100mW		100mW	
	accuracy	0.2%+0.2%FS		0.2%+0.2%FS	
Measurement range					
Readback voltage	Range	0~18V	0~120V	0~18V	0~120V
	Resolution	1 mV	10mV	1 mV	1 0mV
	Accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Readback current	Range	0~36A	0~360A	0~48A	0~480A
	Resolution	1mA	10mA	1mA	10mA
	Accuracy	±(0.05%+0.05%FS)		±(0.05%+0.05%FS)	
Readback power	Range	4500W		6KW	
	Resolution	100mW		100mW	
	Accuracy	±(0.2%+0.2%FS)		±(0.2%+0.2%FS)	
Protection range					
OPP		≒4550W		≒6050W	
OCP		≒39.6A	≒396A	≒52.8A	≒528A
OVP		≒130V		≒130V	
OTP		≒85℃		≒85℃	
specification					
Short	current（CC）	≒39.6A	≒396A	≒52.8A	≒528A
	voltage（CV）	0V	0V	0V	0V
	resistance（CR）	≒4mΩ	≒4mΩ	≒3mΩ	≒3mΩ
Input		300KΩ		300KΩ	

terminal impedence		

Model		**IT8817B**		**IT8818B**	
Rated value (0 ~ 40 ℃)	Voltage	0~500V		0~500V	
	Current	0~12A	0~120A	0~15A	0~150A
	power	3.6KW		5KW	
	Minimum setting voltage	0.3V/12A	3V/120A	0.3V/15A	3V/150A
CV mode	range	0~50V	0~500V	0~50V	0~500V
	resolution	1mV	10mV	1mV	10mV
	accuracy	±(0.025%+0.05%FS)	±(0.025%+0.05%FS)	±(0.025%+0.05%FS)	±(0.025%+0.05%FS)
CC mode	range	0~12A	0~120A	0~15A	0~150A
	resolution	1mA	10mA	1mA	10mA
	accuracy	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)
CR mode	range	0.03Ω~10Ω	10Ω~7.5KΩ	0.03Ω~10Ω	10Ω~7.5KΩ
	resolution	16bit		16bit	
	accuracy	0.01%+0.08S	0.01%+0.0008S	0.01%+0.08S	0.01%+0.0008S
CW mode	range	3.6KW		5KW	
	resolution	100mW		100mW	
	accuracy	0.2%+0.2%FS		0.2%+0.2%FS	
Measurement range					
Readback voltage	Range	0~50V	0~500V	0~50V	0~500V
	Resolution	1 mV	10 mV	1 mV	10 mV
	Accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Readback current	Range	0~12A	0~120A	0~15A	0~150A
	Resolution	1mA	10mA	1mA	10mA
	Accuracy	±(0.05%+0.05%FS)		±(0.05%+0.05%FS)	
Readback power	Range	3.6KW		5KW	
	Resolution	100mW		100W	
	Accuracy	±(0.2%+0.2%FS)		±(0.2%+0.2%FS)	
Protection range					
OPP		≒3650W		≒5050W	
OCP		≒13.2A	≒132A	≒16.5A	≒165A
OVP		≒530V		≒530V	
OTP		≒85℃		≒85℃	
specification					
Short	current（CC）	≒13.2A	≒132A	≒16.5A	≒165A
	voltage（CV）	0V	0V	0V	0V
	resistance（CR）	≒25mΩ	≒25mΩ	≒20mΩ	≒20mΩ
Input terminal impedence		1MΩ		1MΩ	

Model		IT8817C		IT8818C	
Rated value (0 ~ 40 ℃)	Voltage	0~120V		0~120V	
	Current	0~600A	0~600A	0~72A	0~720A
	power	4500W		6KW	
	Minimum setting voltage	0.18V/60A	1.8V/600A	0.18V/72A	1.8V/720A
CV mode	range	0~18V	0~120V	0~18V	0~120V
	resolution	1mV	10mV	1mV	10mV
	accuracy	±(0.025%+0.05%FS)	±(0.025%+0.05%FS)	±(0.025%+0.05% FS)	±(0.025%+0.05%FS)
CC mode	range	0~60A	0~600A	0~72A	0~720A
	resolution	1mA	10mA	1mA	10mA
	accuracy	±(0.1 %+0.1%FS)	±(0.1%+0.1%FS)	±(0.1%+0.1%FS)	±(0.1%+0.1%FS)
CR mode	range	0.01Ω~10Ω	10Ω~7.5KΩ	0.005Ω~10Ω	10Ω~7.5KΩ
	resolution	16bit		16bit	
	accuracy	0.01%+0.08S	0.01%+0.0008S	0.01%+0.08S	0.01%+0.0008S
CW mode	range	4500W		6KW	
	resolution	100mW		100mW	
	accuracy	0.2%+0.2%FS		0.2%+0.2%FS	
Measurement range					
Readback voltage	Range	0~18V	0~120V	0~18V	0~120V
	Resolution	0.1 mV	1 mV	1 mV	10mV
	Accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Readback current	Range	0~60A	0~600A	0~72A	0~720A
	Resolution	1mA	10mA	1mA	10mA
	Accuracy	±(0.05%+0.1%FS)		±(0.05%+0.1%FS)	
Readback power	Range	4500W		6KW	
	Resolution	100mW		100mW	
	Accuracy	±(0.2%+0.2%FS)		±(0.2%+0.2%FS)	
Protection range					
OPP		≒4550W		≒6050W	
OCP		≒66A	≒66A	≒79.2A	≒792A
OVP		≒130V		≒130V	
OTP		≒85℃		≒85℃	
specification					
Short	current（CC）	≒66A	≒660A	≒79.2A	≒792A
	voltage（CV）	0V	0V	0V	0V
	resistance（CR）	≒3mΩ	≒3mΩ	≒2.5mΩ	≒2.5mΩ
Input terminal impedence		300KΩ		300KΩ	

3.2 Supplementary characteristic

Memory capacity: 100 groups

Suggested calibration frequency: 1time/year

AC power input scale(selectable by switch on the rear panel)
Option Opt.1: 220V ±10% 50Hz/60Hz
Option Opt.2: 110V ±10% 50Hz/60Hz

Cooling method
Fans

Fan-control temperature

Temperature	35°C	50°C	70°C	80°C
Fan state	Scale 1	scale 2	Scale 3	OTP.load off

Operating temperature
0 to 40 °C
Storage temperature
-20 to 70 °C

Humidity
Indoor use，humidity≤ 80%

Chapter4 Function and Characteristic

We will introduce the functions and characteristics of EL completly in this chapter from several parts.

- Local/remote operation mode switching
- Constant operation modes
- Input control
- System menu
- Config menu
- Trigger function
- Dynamic test function
- List operation
- Save/Recall function
- VON function
- OCP test function
- OPP test function
- Battery test function
- Protection function
- Key lock function
- Terminal on rear panel

4.1Local/Remote operation mode

The electronic load provides two control mode: Local mode and remote mode, which can be switched by Local key on the front panel or SCPI command.

Local operation means control the electronic load via the keys on the front panel and the menu operation. Remote operation means control the electronic load through computer via the GPIB、RS232、USB or Ether Net interface.in local mode, all the buttons on front panel can be used, In remote control mode,the keys can not work.

4.2 Operation modes

The electronic load can be operated in the following five modes:

1: constant current mode (CC)
2: constant voltage mode(CV)
3: constant resistance mode(CR)
4: constant power mode(CW)

4.2.1Constant current mode（CC）

In this mode, the electronic load will sink a constant current in accordance with the programmed value regardless of the input voltage. See figure4-1.

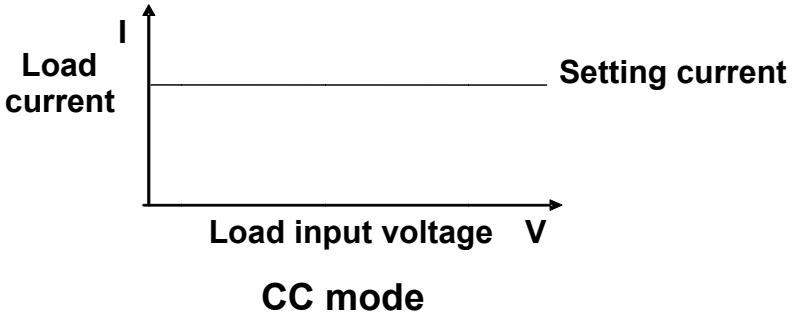


Figure 4-1 CC mode

4.2.2 Constant voltage mode（CV）

In this mode, the electronic load will attempt to sink enough current to control the source voltage to the programmed value. See figure 4-2.

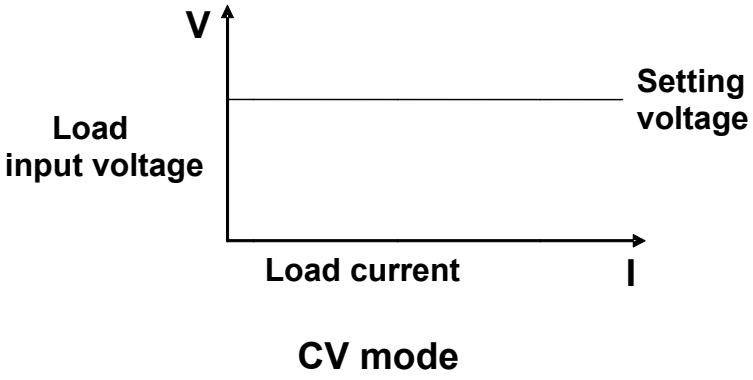


Figure 4-2 CV mode

4.2.3 Constant resistance mode（CR）

In this mode, the electronic load was equivalent to a constant resistance, as shown below, the electronic load will linearly change the current according to the input voltage. See figure 4-3.

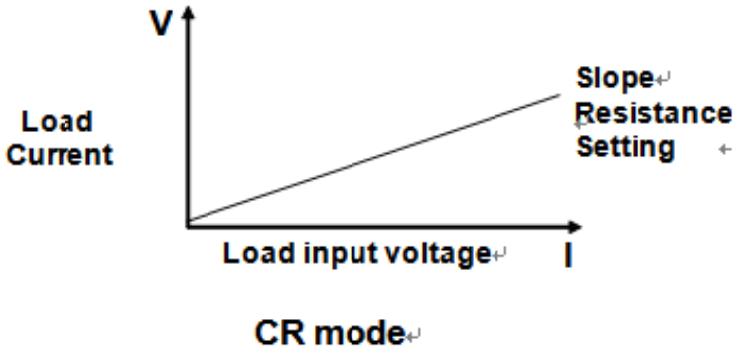


Figure 4-3 CR mode

4.2.4 Constant power mode（CW）

In this mode, the electronic load was equivalent to a constant power, as shown below. As the input voltage increase,the current value will decrease,See figure 4-4.

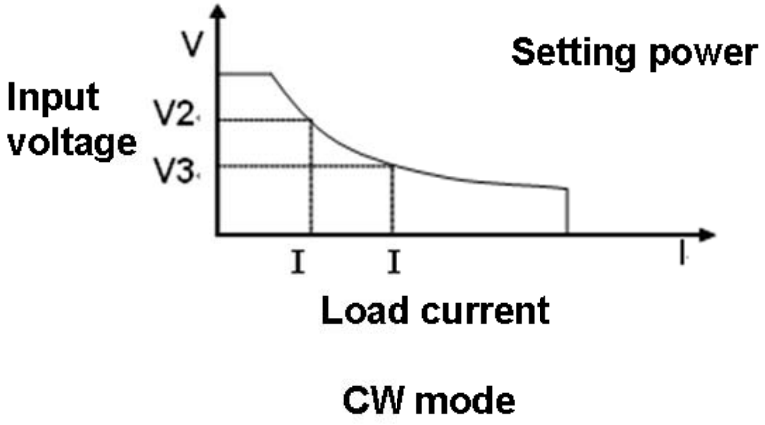


Figure4-4 CW mode

4.3 Input Control

4.3.1 Input switch operation

You can control the On/Off state via pressing the on/off button，when on/off buttonis lit，that means the input is opened，when on/off button is lighted,the input is off. If input have been opened,indicator lamp “off” on the VFD display would be dark.

4.3.2 Short operation

The load can simulate a short circuit at its input. You can press Shift + number 1 to switch to short state in local operation mode(operate with pront panel). Short operation won’t affect the present setting. When turn off the short state, the load returns to the original set state.

The actual current of the electronic in short operation depend on the mode and range active when the short is turned on. In CC,CR or CW mode, the maximum short current is 120% of the current range. In CV mode, short means setting the load’s constant voltage to be 0V

4.4 System menu（System）

Press Shift +number 5 to enter the system menu

SYSTEM MENU	Initialize	INITIALIZE SYSTEM?	
		NO	Keep the current configure
		YES	Reset all configuration to default
	Power-ON	POWER-ON PARAMENT	
		RST(default)	Set the load’s input state to be the default state when power on
		SAV0	Set the load’s input state to be that of

			SAVE 0 set when power on
	Buzzer	BUZZER STATE	Set the buzzer state
		On(default)	Enable the buzzer function
		Off	Disable the buzzer function
	Knob	LOAD ON KNOB MODE	Set the knob function
		Update(default)	Set to real-time update
		Old	No update
	Trigger	TRIGGER SOURCE	Set the trigger source
		Manual（Def）	Manual trigger
		External	Trigger by external signal
		Hold	Trig: IMM available
		Bus	GPIB BUS trigger mode
		Timer	Trigger by timer
	Memory	MEMORY	Operated with Recall button to recall 100 groups memories
		Group=（0-9）	0: represent group 1-10; 1: represent group 11-20, and so on
	Displ	DISPLAY ON TIMER	Display the loading time
		On	Enable the function
		Off（default）	Disable the function
		COMMUNICATION	Select the communication interface when communicate with PC
		RS232	4800, 8, N (no parity), 1 , NONE
	Communication	Move the direction keys to select the comunication interface	9600 O (odd) CTS/RTS
			19200 E(even) XON/XOFF
			38400
			57600
			115200
		USBTMC	
		GPIB	Address（0-31）
	Protocol	PROTOCOL	
		SCPI（Default）	SCPI protocol
		Extend-Table	Extended SCPI protocol, compatible with other units

*Knob function: real-time update means after you adjust the parameter by knob and then put the load to OFF state, the settings keep for the latest setup. If you choose “no update”, when you turn the load to OFF state, the settings will keep the old settings.

4.5 Config menu（Config）

Press Shift +number 6 key to enter the config menu.

CONFIG MENU	Von	**VOLTAGE ON**	Set the load’s von point
		Living	Von point living state, ON /OFF
		Point= 2V	set the Von value

		Latch	Von point latch state, ON /OFF
		Point= 2V set the Von value	
	Protect	**PROTECT MENU**	
		Max-P	Setup hardware power protection
		MAX POWER	
		Point=149.99W set hardware OPP value	
		A-Limit	Setup software current protecting state
		CURRENT LIMIT	
		On enable the function	
		Point=30A set the software OCP level	
		Delay=3S set the software OCP delay	
		Off disable the function	
		P- Limit	Set the software power protection level
		POWER LIMIT	
		Point=150W set the soft power protection level	
		Delay= 3S set the soft power protection delay	
		Time	Set LOAD ON timer
		ON-TIMER	
		On enable the function	
		Delay=10S set LOAD ON timer value	
		Off disable the function	
	Measure	**MEASURE MENU**	
		V-Range	Voltage auto range function
		VOLTAGE AUTO RANGE	
		On voltage auto range function on	
		Off voltage auto range function off	
		TimeV1	Test the voltage rise/fall time
		TIMER VOLTAGE1 set the start voltage level	
		Point=0.000V	
		TimeV2	Test the voltage rise/fall time
		TIMER VOLTAGE2 set the end voltage level	
		Point=120.00V	
		FILTER	Filter function
		Average Count=2^(2~16) the everage number set	
	CR-LED	CR LED MODE	Imitate the LED in CR mode
		On	Enable the function（in CR mode，press Shift +CV to set Vd）
		Off	Disable this function
	Remote-Sense	REMOTE SENSE STATE	Remote sense function
		On	Enable this function
		Off	Disable the function
	Ext-Program	EXTNAL PROGRAM	Extenal analog signal function
		On	Enable external 0-10V analog signal control function
		Off	Disale external 0-10V analog signal control function

4.6 Trigger function

4.6.1 Trigger function

Trigger operation can be used in the following operations: transient pulse output, triggered output and list output. The electronic load have 5 kinds of trigger modes to Synchronously trigger the tested instrument, before enable the trigger function, users should first select trigger source.

4.6.2 Trigger source

keyboard(Trig key)trigger: when the keyboard trigger mode is active, press Trig, will enable a trigger operation.

External trigger signal(TTL level): the 1st pin of the 8 pins connector on the rear panel of the main frame is trigger input terminal, when external trigger signal is available, input a low pulse（>10uS）to the internal, the load will enable a trigger operation.

Bus trigger: when bus trigger is available, as soon as the load receive a trigger command（GET or *TRG）from the GPIB port, the load will enable a trigger operation.

Timer trigger: when timer trigger is available, the electronic load will enable a trigger operation periodly.

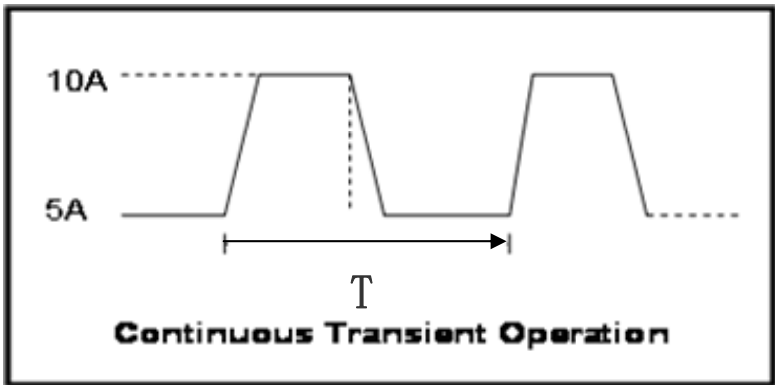
Trigger maintenance: when trigger maintenance is available, only when the load receive the trigger command（TRIG:IMM）from the communication port, the load will enable a trigger operation.

4.7 A/B transient operations

Transient operation enables the module to periodically switch between two load levels, as might be required for testing power supplies dynamic property. We can enter the transient operation menu from the front panel (by key Tran), before you turn on the operation, you should set the parameters associated with transient operation. The parameters include: A level, A width, B level, B width, and transient testing modes. The transient testing modes have 3 kinds: continuous, pulsed, or toggled.

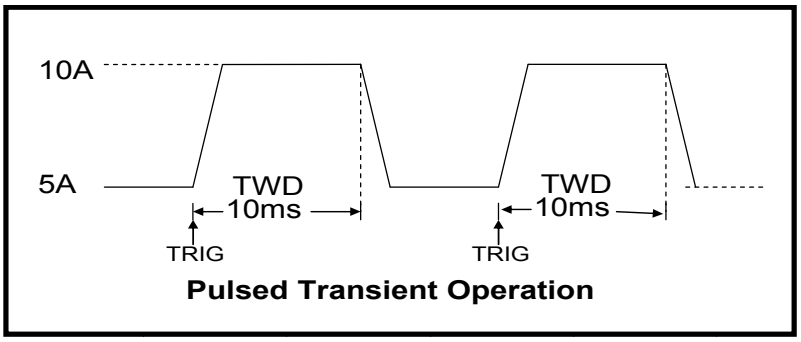
4.7.1 Continuous mode（Continuous）

Under the continuous mode, when the transient test is turned on, the load will continuously switch between the A/B levels preset



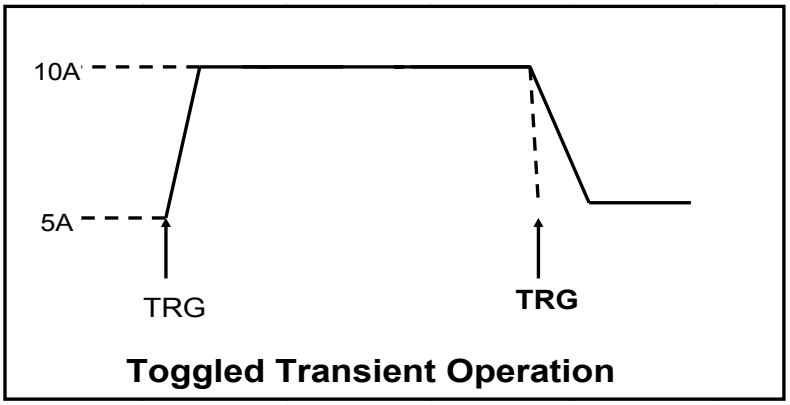
4.7.2 Pulse mode（Pulse）

In pulsed mode, you can set A/B level, A/B width and A/B slew rate via mainframe keyboard. The electronic load will automatically switch to A level, after maintaining A width time, then it will switch to B level, it won't swith to A level until the the instrument receive the pulse signal. The following picture show the current waveform in pulse transient operation



4.7.3 Toggled mode (Toggled)

In toggle mode, the electronic load will switch between A level/B level when receiving a triggering signal after the transient operation is enabled. The following picture show the current waveform in toggle transient operation.

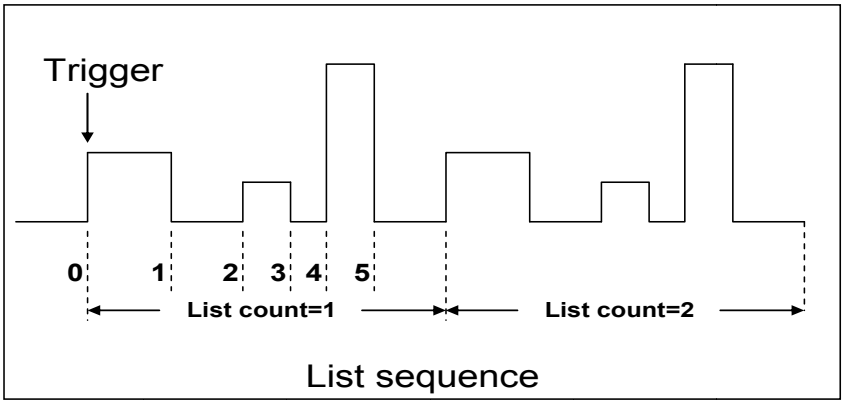


4.8 List operation (LIST)

List mode lets you generate complex sequences of input changes with rapid, precise timing, which may be synchronized with internal or external signals. This is useful when running test sequences with a minimum amount of overhead.

Generate complex sequences to complete complex tests by editing LIST: Select different trigger resource, editing the step value , width time and slew rate of every step. The parameters of List operation include the name, number of steps(max 2-84), single step width time(0.00002s~3600s) and every step's set value and slew rate. The list file can be saved in non-volatile memory, used to fast recall. Users can edit up to 7 groups list file.

In list operation mode, the load begin to enable the list operation once receive the trigger signal, until the list operation is completed or the instrument receive another trigger signal.



4.9 Save and recall function

We can save some often-used parameters in the non volatile memory,the parameters includes working mode,voltage/current value and so on.The memory capacity is 100 groups. You can use **SAVE** key to save parameters, press Recall key to fast recall.

Save and recall operation:

For example: the voltage provided is 6V and the load works in CC 1A

Operation	VFD display
SAVE	
1、set all the parameter，press Shift + number 4 and then 9 to save data to file 9	5.8949V 0.99994A 5.89W SAVE 9
2、Press key Enter to confirm	5.8949V 0.99994A 5.89W cc=1.000A
RECALL	
1、Press key Recall，press number 9（recall from 9th file），to recall the data that is saved in the memory	5.8949V 0.99994A 5.89W cc=1.000A

Note: You should combine the Memory function(in the system menu) with Recall function to help you recall the saved parameters.

Memory function:

When you want to recall the data saved in the memory, you should set the memory group in the system menu first.

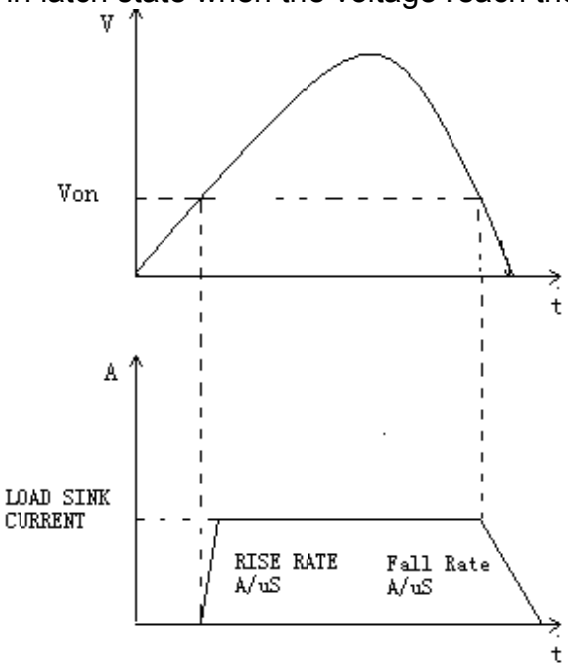
Group0 means you can recall datas saved in 0-10 groups. Group1 means you can recall datas saved in 11-20 groups. Group2-Group9 can be concluded in the same manner.

4.10 VON function

Press Shift +number 9 to enter configure menu ,you can set voltage value Von/Voff to control the input state on/off for electronic load. When the input voltage reaches the Von value, the load's input state is on. When the input voltage reaches the Voff value, the load's input state is off.

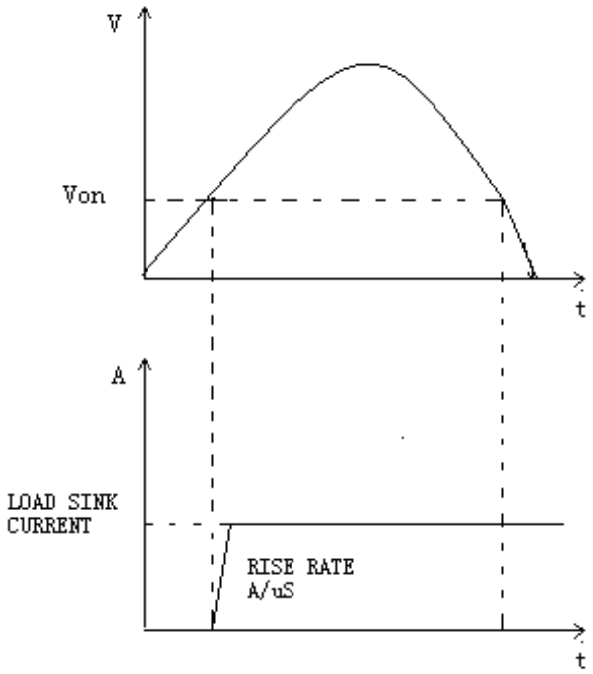
There is two types of Von working modes: Living and Latch.

When you select Living，that means working in living state; when you select Latch，it means working in latch state when the voltage reach the Von point.



VON LIVING state load working mode

When enable LIVING mode，as voltage rise and is higher than the Von loading voltage, input of electronic load is turned on. When the power supply's voltage fall and is lower than Von unload value, input is turned off.



VON LATCH state load working mode

When enable Von LATCH, voltage rise and is higher than the Von loading voltage, input of electronic load is turned on. When the power supply's voltage fall and is lower than Von unload value, input won't be turned off.

4.11 OCP test function

OCP test process:When the input voltage has reached Von point, current will begin to work after a delay time.The current value will increase by a step size at regular intervals.Simultaneously,unit will judge whether the input voltage is lower than OCP voltage(you need to set).If it is,then the present current value will be compared to see if it is in the current range you've set.Within this range,the test will Pass or will Fault.On the contrary,the current will continue to increase within the cut-off current range.And then compare OCP voltage with input voltage too.

Press key Trig to start OCP

Press key Shift +CC（OCP）to enter OCP test function setup interface

OCP TEST	Run	OCP TEST	
			Run OCP test file
	Recall	OCP TEST	
		Recall OCP File=1	Recall OCP test file（1-5）
		OCP TEST	
		1: Voltage on level=0.000V	Set Von value
		2: Voltage on Delay=0.00S	Set voltage on delay time
		3: Current Range=0.000A	Set current range
	Edit	4: Start Current=0.000A	Set start current value
		5: Step Current=0.000A	Set step current value
		6: Step Delay=0.00S	Set the step delay time
		7: End Current=0.000A	Set cut-off current
		8: OCP Voltage=0.000V	Set OCP value
		9: Max Trip Current=0.000A	upper limit of OCP value
		10: Min Trip Current=0.000A	Lower limit of OCP value
		Save OCP File=1（1-5）	Save OCP test file

4.12 OPP test function

OCP test process:When the input voltage has reached Von point, power will begin to work after a delay time.The power value will increase by a step size at regular intervals.Simultaneously,unit will judge wether the input voltage is lower than OPP voltage(you need to set).**If it is**,then the present current value will be compared to see if it is within the current range you've set.Within this range,the test will Pass or will Fault.**On the contrary**,the current will continue to increase within the cut-off current range.And then compare OPP voltage with input voltage too.

Press key Trig **to start** OPP test.

Press key Shift +CW（OPP）to enter the OPP function test setup interface.

OPP TEST	Run	OPP TEST	
			Run OPP test file
	Recall	OPP TEST	
		Recall OPP File=1	Recall OPP test file（1-5）
	Edit	OPP TEST	
		1: Voltage on level=0.000V	Set Voltage on value
		2: Voltage on Delay=0.00S	Set Voltage on delay time
		3: Current Range=0.000A	Set the working current range
		4: Start Power=0.000W	Set the start power value
		5: Step Power=0.000W	Set the step power value
		6: Step Delay=0.00S	Set the step delay time
		7: End Power=0.000A	Set the cut-off power value
		8: OPP Voltage=0.000V	Set the OPP value
		9: Max Trip Power =0.000W	Upper limit of OPP value
		10: Min Trip Power =0.000W	Lower limit of OPP value
		Save OPP File=1（1-5）	Save OPP test file

4.13 Battery discharging test

Capacity test

Electronic load uses CC mode to do the capability test. Make a program to set the voltage in off state. The accumulator have too low voltage, electronic load intermits test if system checks the accumulator which is near to one rating or in insecurity state. In testing procedure, you could see the accumulator voltage, discharge current, discharge time and spare capability of accumulator. If connecting with PC software, discharge curve could be displayed in window. This test can reflect the reliability and using time of accumulator. So, it's necessary to do the test before you change another new accumulator.

Press key Shift +number 3

STOP CONDITION	Voltage	STOP Condition	
		Stop Voltage	Set the cut-off voltage
	Capability	STOP Condition	
		Stop Capability	Set the cut-off capacity
	Timer	STOP Condition	
		Stop Timer	Set the discharge time

Operation ：

1）Press key on/off to turn off the load, connect the battery to be tested,press Shift +number 3 in CC mode to enter the battery discharging function menu, select one of the 3 testing means according to your test demands.

2）For the first means: press key Shift + number 3，select Capability，Press key Enter，VFD display "Stop Capability = Ah"，set the cut-off capacity,press key Enter to confirm,when the capacity falls to the value set, the load will auto turn to input off state.

3）For the second means: press key Shift +number 3，select Voltage，press key Enter， VFD will display”Stop Voltage= V”， set the cut-off voltage,press key Enter to start the battery test. When the battery voltage falls to the cut-off voltage, the load will auto turn off the input.

4） For the third means: press Shift +number 3，select Timer，press Enter key，VFD display ”Stop Timer= S”，set the discharging time, the load will automatically turn off after the setting time.

5）Press key Trig to start to test

6）Press “ESC”, quit the battery test mode.

4.14 Protection Functions

Load has the following protection functions: over voltage protection（OVP）,over current protection（OCP）, over power protection(OPP), over temperature protection (OTP), reverse voltage protection(LRV/RRV.

The mainframe will act appropriatly once any of the above protection is actived. you can press any button on front panel to restore the protection function. For example, the electronic load come into over temperature protection, the buzzer will alarm, the input will automatically shut down and VFD will display OTP.

4.14.1 Over Voltage Protection（OVP）

If the OVP circuit has been triggered, input will be shut down, buzzer alarm, the status register’s (OV) and (VF) bit is set, the main frame screen will display(OVP), the condition will remain until they are reset. Once over voltage protection occur, the 8 pins connector’s VF pin on the rear panel will output TTL high voltage level, you can control the output state of the power supply under test via this pin.

Operations to clear the OVP state

Check whether the input voltage is in the load’s rated voltage or the programmed protecting voltage ranges, if it is outside the range, please disconnect the instrument under test. Press any key on the front panel (or send commandPROTection:CLEar), the (OVP) displayed on the front panel will disappear, load exits OVP protection state.

4.14.2 Over Current Protection（OCP）

The electronic load includes both hardware and software over current protection features.

Hardware OVP: load’s maximum input current will be limited at about 110% of the current range, once the hardware OCP is triggered, the status register’s OC bit will be set; when the hardware OCP is removed, the status register’s OC bit will be reset. Hardware over current protection won’t affect load’s on/off state.

Software OCP: users can set load’s software OCP value, steps:

Shift + number 5 >Protect>Alimit’ set ON, “Apoint” set OCP current value,” Adelay” set delay time before alarm. When the software OCP function is actived, if the load current value is over the over current protection set value, load will automatically off, VFD

displays OCP. At the same time, the OC and PS bits in the status register will be set, they will remain until they are reset.

Operations to clear the OCP state
Check whether the input current is within the load's rated current or the programmed protecting current ranges, if it is outside the range, please disconnect the instrument under test. Press any key on the front panel(or send command PROTection:CLEar), the (OCP) displayed on the front panel will disappear, load exits OCP protection state.

4.14.3 Over Power Protection（OPP）

The electronic load includes both hardware and software OPP features.

Hardware OPP: the electronic load allows user to set a power protection limit in hardware which will limit the power in the range you set when the OPP condition occur.

Software OPP: users can set load's software OPP value, steps: Shift + number 5 >Protect>Point set OPP power value, Plimit set alarm delay. If the load power value is OPP delay time, load will automatically turned off, VFD will display OPP. At the same time, the OP and PS bits in the status register will be set, they will remain until they are reset.

Operations to clear the OPP state
Check whether the input power is in the rated power range or the programmed protecting ranges, if it is outside the range, please disconnect the instrument under test. Press any key on the front panel(or send commandPROTection:CLEar), the (OPP) displayed on the front panel will disappear, load exits OPP protection state.

4.14.4 Over Temperature Protection（OTP）

Each module has an over temperature protection circuit, which will turn off the input if the internal temperature exceeds safe limits. When load's internal circuit temperature is over 85℃, load will enable OTP. Input will automatically turned off, VFD display OTP. At the same time the OT and PS bits in the status register will be set, they will remain until they are reset.

Operations to clear the OTP state
when load temperature dropped to the protecting point, press any key on the front panel(or send command PROTection:CLEar), the (OTP) displayed on the front panel will disappear, load exits OTP protection state.

4.14.5 Reverse voltage protection（LRV）

This function protects the load module in case the input DC voltage lines are connected with wrong polarity. Once in reverse connection condition, input will be immediately turned off, buzzer alarm, status register's （LRV/RRV）and （VF）bits will be set, main frame screen displays（LRV/RRV）,they will remain until they are reset.
In this condition, the 8 pins connector's VF pin will output a high level, you can disconnect the power supply via this signal.

Operations to clear the reverse voltage state
Check whether the connection is reversed, if so disconnect the object to be meaured.

4.15 Key Lock Function

Press Shift +number 8 key to lock the front panel keys, VFD will display "*" lable. In this state, setting values can not be modified,woriking mode can not be changed.press Shift +number 8 key again will disable this function.

4.16 rear panel interfaces introduction

4.16.1 Remote sense function

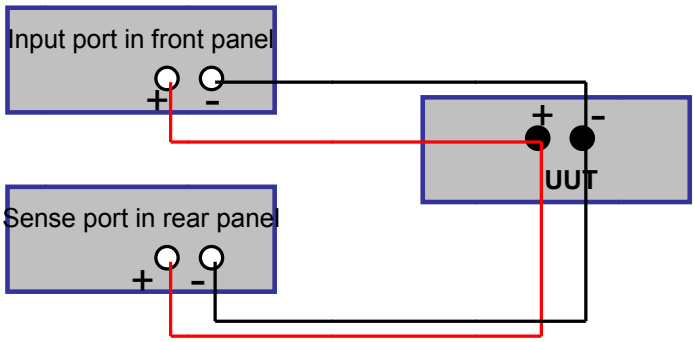
When work in CC, CV, CR and CP mode, if load consumes biggish current, it will cause one depressed voltage in the connection line between tested machine and terminals of Load. In order to assure testing precision, Load provides one remote testing terminals in the rear panel, Users could test the output terminals voltage of tested machine through it. Users should set the Load in REMOTE mode before using the function.

Remote Sensing: SENSE (+) and **SENSE (–)** are the remote sensing inputs. By eliminating the effect of the inevitable voltage drop in the load leads, remote sensing provides greater accuracy by allowing the load to regulate directly at the source's output terminals.

Before you use this function, you should first enable this function in the menu,the operation is :

（1） Press Shift +number 6 into the menu
（2） VFD displays **>CONFIG, press** Enter key to confirm
（3） Press direction key to choose**>REMOTE SENSE, press** Enter key to confirm
（4） Press direction key to choose**>ON**, press Enter key to confirm. And the remote sense function has been set.

Wiring diagram for remote sense:



4.16.2 External trigger operation

Before take the rear panel trigger way,please set the trigger source as **EXTERNAL** first,trigger signal will input from the TRIG pin of the rear panel.

When you choose external trigger mode,trigger signal should be connected to +TRIG and ground pins.

4.16.3 External Analogue Control

You can control the voltage and current setting of the electronic load by the analogue terminals: EXT and PRG . 0-10V adjustable analogue simulate the 0-fullscale to regulate the input voltage and current of the electronic load（10V indicate the full range of load voltage or current value）

4.16.4 Voltage Failure Indication

When the load is under OVP or reverse protection condition, pin 2 VF will output high level signal.

4.16.5 Current monitoring（I Monitor）

◎ Current monitoring terminal will output 0-10V analog signal to accordingly on behalf of 0 - full range of input current. You can connect an external voltmeter or an oscilloscope to display the input current's changing.

Chapter5 Operation introductions

5.1 Operation modes

5.1.1 Constant current CC

set a value from 0 to upper limit of current

There are 3 means to change the current value:

1.In CC mode, rotate Rotary SW

2.In CC mode, press number to set the current directly,press Enter key to confirm

3.In CC mode, press Shift +CV（Setup）, to set according to the steps below:

Steps	Operation details	VFD display
1	In CC mode，press Shift +CV(setup)，to enter the parameter setup interface	**Constant Current Range=0.000A**
2	Set the max working current,press Enter to confirm	**Constant Current Range =1.000A**
3	set the upper limit of voltage,press Enter button to confirm	**Constant Current High=0.00V**
4	set the lower limit of voltage,press Enter button to confirm	**Constant Current Low=0.000V**
5	Set the high /low rate，press Enter to confirm	**Constant Current High-Rate Low-Rate**
6	Set the current rise slope,press Enter to confirm	**Constant Current Rise up=0.000A/uS**
7	Set the fall slope,press Enter to confirm	**Constant Current Rise down=0.000A/uS**
8	The parameters are set OK	**10.0000V 0.0000A 0.00W CC=1.000A**

5.1.2 Constant voltage CV

set a value from minimum setting voltage to upper limit of voltage

There are three means to change the voltage value:

1.In CV mode,rotate Rotary SW

2.In CV mode,press numeric keys directly to set the current value,press Enter to confirm

3.In CV mode,press Shift +CV（Setup）, to set according to the steps below:

Steps	Operation details	VFD display
1	Press CV button，then press Shift +CV(setup)，enter the parameter setup interface	**Constant Voltage Range=120.00V**
2	Set the max working voltage,press Enter to confirm	**Constant Voltage Range=2.33V**
3	Set the upper limit of current, presss Enter to confirm	**Constant Voltage High=66.000A**
4	Set the lower limit of the current, press Enter to confirm	**Constant Voltage Low=0.0000A**
5	All finished	**10.0000V 0.0000A 0.00W CV=2.33V**

5.1.3 Constant power CW

There are three means to change the power:

1.In constant power mode,rotate Rotary SW

2.In contant power mode,press numeric keys to set the power directly,press Enter key to confirm

3.In constant power mode,press Shift +CV（Setup）to set according to the steps below:

Steps	Operation details	VFD display
1	Press CW key，press Shift +CV，to enter the parameter setup interface	**Constant Power Range=400.00W**
2	Set the max working power,press Enter to confirm	**Constant Power Range =1.00W**
3	Set the upper voltage level, press Enter to confirm	**Constant Power High=130.00V**
4	Set the lower limit of voltage,press Enter to confirm	**Constant Power Low=0.000V**
5	All finished	**10.0000V 0.0000A 0.00W CW=1.00W**

5.1.4 Constant resistance CR

allowed setting range refer to the Technical Specification

There are three means to change the resistance:

1.In constant resistance mode,rotate Rotary SW

2.In contant resistance mode,press numeric keys to set the resistance directly,press Enter key to confirm

3.In constant resistance mode,press Shift +CV(Setup)to set according to the steps below:

Steps	Operation details	VFD display
1	Press CR key，press Shift +CV，to enter the parameter setup interface	**Constant Resistance Range=7500.0Ω**
2	Set the max working resistance,press Enter to confirm	**Constant Resistance Range =2Ω**
3	Set the upper voltage level, press Enter to confirm	**Constant Resistance High=130.0V**
4	Set the lower limit of voltage,press Enter to confirm	**Constant Resistance Low=0.000V**
5	All finished	**10.0000V 0.0000A 0.00W CC=2.000Ω**

5.2 Transient test operation

Transient operation enables the load to periodically switch between two levels.Here we take the example of CC mode.For example,A/B setting value is 1A and 2A.The output voltage of power supply is 10V/3A.

5.2.1 Transient test operation in continuous mode

We can set the transient operation parameters and then run transient test.

Steps	Operation details	VFD display
1	press Tran	**TRANSITION On Off**
2	Use direction key to move to "On",and select "Continuous", press Enter to confirm.（the "Trig" indicater lamp on VFD will then be lit	**TRANSITION Continuous Pulse Toggle**
3	Use direction key to select high/low rate, move to "High-Rate", press Enter to confirm	**TRANSITION High-Rate Low-Rate**
4	Set the current rise slope,press Enter to confirm	**TRANSITION Rise up=30.000A/uS**
5	Set the current fall slope,press Enter to confirm	**TRANSITION Rise down=30.000A/uS**
6	Set the A leval,press Enter to confirm	**TRANSITION Level A=1A**
7	Set the B level,press Enter to confirm	**TRANSITION Level B=2A**
8	Set the frenquency,press Enter to confirm	**TRANSITION Frequnce=50Hz （0.01-25000Hz）**
9	Set the **dutyfactor** ,press Enter to confirm	**TRANSITION Duty=98%（%0.1-99.9%）**
10	Enable the transient test function, use direction key to move to "On", press Enter to confirm	**TRANSITION On Off**
11	Then the VFD will display "TRAN"	**10.0000V 0.0000A 0.00W 0 TRAN**
12	Press "On/Off" button to "On",then press Trig	**A/B value will switch continuously,the running time will display at the lower right corner**
13	press **"Esc"** button will quit the transient test,if you want to continue the test again,please repeat 1-12 steps	

5.2.2 Transient test operation in pulse mode

We can press Tran **to set the transient test parameter and run the test.**

Steps	Operation details	VFD display
1	Press Tran	**TRANSITION On Off**
2	Use direction key to move to "Pulse", press Enter to confirm（the "Trig" indicator lamp on the VFD will be lit）	**TRANSITION Continuous Pulse Toggle**
3	Use direction key to move,and to select the high/low Rate, move to "High-Rate",press Enter to confirm	**TRANSITION High-Rate Low-Rate**
4	Set the rising slope, press Enter to confirm	**TRANSITION Rise up=30.000A/uS**

5	Set the fall slope, press Enter to confirm	**TRANSITION Rise down=30.000A/uS**
6	Set A level,press Enter to confirm	**TRANSITION Level A=1A**
7	Set B level, press Enter to confirm	**TRANSITION Level B=2A**
8	Set the time width, press Enter to confirm	**TRANSITION Pulse Width=5S （0.00002-3600S）**
9	Enable transient test, use direction key to move to “On” press Enter to confirm	**TRANSITION On Off**
10	Then the VFD will display “TRAN”	**10.0000V 0.0000A 0.00W 0 TRAN**
11	Press “On/Off” button to “On”,then press Trig	**A/B value will switch every time when there is trigger signal received, the running time will display at the lower right corner**
12	press **“Esc”** button will quit the transient test,if you want to continue the test again,please repeat 1-11 steps	

5.2.3 Transient test operation in Toggled mode

We can press Tran to set the transient test parameter and run the test.

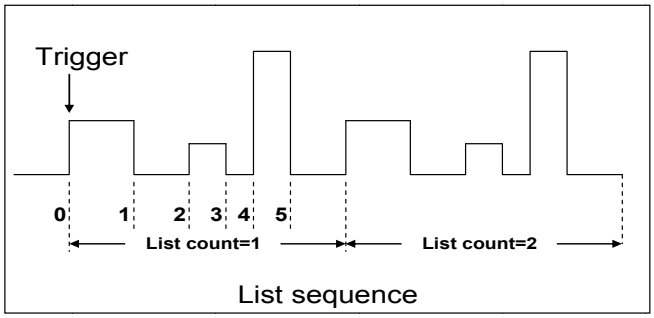
Steps	Operation details	VFD display
1	press Tran	**TRANSITION On Off**
2	Use direction key to move to Toggle，press Enter to confirm（the “Trig” indicator lamp on the VFD will be lit）	**TRANSITION Continuous Pulse Toggle**
3	Use direction key to move,and to select the high/low Rate, move to “High-Rate”,press Enter to confirm	**TRANSITION High-Rate Low-Rate**
4	Set the rising slope, press Enter to confirm	**TRANSITION Rise up=30.000A/uS**
5	Set the fall slope, press Enter to confirm	**TRANSITION Rise down=30.000A/uS**
6	Set A level,press Enter to confirm	**TRANSITION Level A=1A**
7	Set B level, press Enter to confirm	**TRANSITION Level B=2A**
8	Enable transient test, use direction key to move to “On” press Enter to confirm	**TRANSITION On Off**
9	Then the VFD will display “TRAN”	**10.0000V 0.0000A 0.00W 0 TRAN**
10	Press “On/Off” button to “On”,then press Trig	**A/B value will switch to B/A every time when**

		there is trigger signal received,the running time will display at the lower right corner
11	press **"Esc"** button will quit the transient test,if you want to continue the test again,please repeat 1-10 steps	

5.3 List operation

Before run a list file,you should edit the list file firstly and save it in a non-volatile memory.The following examples will help you understand the function well.

Example, the supply output to be tested is 10V, current 3A,and the load is in CC mode.



The steps:

Steps	Operation details	VFD display
1	Press List	**LIST** **On Recall Edit**
2	Use direction key to move to "Edit",press Enter to confirm	**EDIT LIST** **High-Rate Low-Rate**
3	Use direction key to move to "High-Rate", press Enter to confirm	**EDIT LIST** **Current Range=3A**
4	Set the list step by pressing the numeric key,for example,if you just want 2 steps, just press key"2" , press Enter to confirm	**EDIT LIST** **File Step=2（2-84）**
5	Edit the current of the first step, press Enter to confirm	**EDIT LIST** **Step 001 Level=1A**
6	Edit the slope of the first step,press Enter to confirm	**EDIT LIST** **Step 001** **Rate=0.1A/uS**
7	Edit the time width for the first step,press Enter to confirm	**EDIT LIST** **Step 001 Width=5S**
8	Edit the current of the second step,press Enter to confirm	**EDIT LIST** **Step 002 Level=2A**
9	Edit the slope of the second step,press Enter to confirm	**EDIT LIST** **Step 002** **Rate=0.1A/uS**

10	Edit the time width of the second step,press Enter to confirm	**EDIT LIST** **Step 002 Width=5S**
11	Edit the repeat count, press Enter to confirm	**EDIT LIST** **Reapeat Count=3**
12	Save the file edited to memory(1-9) by pressing numeric key,press Enter to confirm	**EDIT LIST** **Save List File=1（1-9）**
13	Use direction key to move to “On”， press Enter to confirm（then the “Trig” indicator lamp on the VFD will be lit）, press “Esc”key will exit the settings	**LIST** **On Recall Edit**
14	Enable “On/Off” to “On”, press Trig **to trigger**	**List test will run**
15	Press “Esc” to exit the test if you need to exit the list test	

Note:if you want to run a list file you’ve saved,please recall it firstly.The steps is to press List,after you enter the List menu,move the direction key to select “Recall”.Press Enter button to confirm.

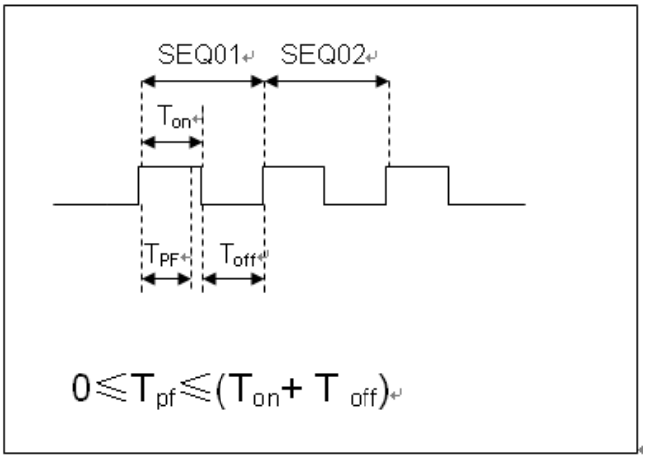
5.4 Automatic Testing Function

Automatic test function of IT8800 series electronic load is very powerful, it can simulate various test. It can edit up to 10 groups of testing files, each file has 10 steps, it can edit up to 100 files which can be saved in EEPROM (address).

Edit a automatical test file

steps	Operations	VFD display
1	Press Shift + number 2	**PROGRAM** **Run Recall Edit**
2	Press direction key to move menu to > EDIT PROGRAM to edit testing files	**EDIT PROGRAM** **Active Sequence=0987654321**
3	Select the steps needed to test, if you want to test 4 steps, please press in order 1/2/3/4, 0 stands for the tenth step. If you want to cancel a step, press again the numeric keys you want to cancel. Press Enter to confirm	**EDIT PROGRAM** **Active Sequence=09876543XX**
4	In the 4 steps, if you want to suspend, e.g. you want to suspend step 2, press numeric key 2, press Enter to confirm	**EDIT PROGRAM** **Pause Sequence=□□□□□□□□XX**
5	Edit the 1st step of the 2 steps: determine whether need short circuit testing for example, if step2 needs short circuit testing, press number 2. press Enter to confirm	**EDIT PROGRAM** **Short Sequence=□□□□□□□□XX**

6	Set with-load time, if you want to load 2S, press numeric key 2, then press Enter to confirm	**EDIT PROGRAM SEQ01 On Time=2S**
7	Set unloading time, if you need 2S, press numeric key 2, then press Enter to confirm	**EDIT PROGRAM SEQ01 Off Time=2S**
8	Set testing delay time, e.g. 1S, press numeric key 1. Tpf is testing delay time.	**EDIT PROGRAM SEQ01 P/F Delay Time=1S**
9	Set with-load time of the second step, if you want to load 2S, press numeric key 2, then press Enter to confirm	**EDIT PROGRAM SEQ02 On Time=2S**
10	Set unloading time of the second step, if you need 2S, press numeric key 2, then press Enter to confirm	**EDIT PROGRAM SEQ02 Off Time=2S**
11	Set testing delay time of the second step, e.g. 1S, press numeric key 1. Tpf is testing delay time.	**EDIT PROGRAM SEQ02 P/F Delay Time=1S**



Tpf is test delay time

12	Set the condition when stop testing, COMPLETE mean stop test When all the steps are completed, FAILURE mean stop test when the testing fails. press Enter key to confirm.	**PROGRAM Complete-Stop Failure-Stop**
13	Whether you need to link to the next file to be tested, if you need to link to group 2, press number key 2, 0 stands for not linking to other files. Press Enter key to confirm.	**PROGRAM Chain Program File=0（0-10）**

PROGRAM 1 Sequence	1	2	3	4	5	6	7	8	9	10
Save Group	1	2	3	4	5	6	7	8	9	10
PROGRAM 2	1	2	3	4	5	6	7	8	9	10

Sequence										
Save Group	11	12	13	14	15	16	17	18	19	20
:										
:										
PROGRAM 10 Sequence	1	2	3	4	5	6	7	8	9	10
Save Group	91	92	93	94	95	96	97	98	99	100

14	Save the edited files in EEPROM, you can save up to 10 groups of files, e.g please press numeric key 1 to save the edited file in group 1, and then press Enter to confirm.	**PROGRAM** **Save Program File=1（1-10）**
15	Press “ESC” key to exit.	
16	Select a operation mode and then press Shift +CV(setup) to set related parameters	**10.0000V 0.0000A** **0.00W CC=1.000A**
17	for example,the first step functions in CC mode,current setting value is 2A,the upper voltage limitation is 10V,the lower limitation is 2V,the second step works in CV mode,setting voltage value is 3V,and the upper current limitation is 5A,and the lower current limitation is 0A. After all the steps are set OK, Press “ESC” key to exit setup,and then press Shift + number key 4 to save.	
	You need to recall the auto-test file before runing it	

Recall testing files

The following way can make you fast recall the edited testing files from EEPROM after re-powering.

Steps	operations	VFD display
1	press Shift + number 2	**PROGRAM** **Run Recall Edit**
2	Press direction keys to move to <RECALL PROGRAM> to recall the saved testing files.press Enter to confirm	**RECALL PROGRAM** **Recall Program File=1**
3	Press direction keys to move to <RUN PROGRAM> and then confirm	**PROGRAM** **Run Recall Edit**
4	Display PRG01	**PRG01 STOP**
5	Press Trig If you need a pause, please press Pause. Push the down arrow can continue the testing file	

Chapter 6 communication interfaces

There are three kinds of communication interfaces for IT8800: GPIB、USB、RS232. You can choose any one of them to communicate with PC.

6.1 RS232 interface

use a cable with two COM interface（DB9）to connect load and PC. It can be activated by Shift + number 5. Note: There're two COM interfaces on the rear panel of IT8800: the above 9-pin COM interface is RS232 communication interface; the below 9-pin COM is serial port connection（extended keyboard interface）. All SCPI commands are available through RS-232 programming. The EIA RS-232 standard defines the interconnections between data terminal equeipment（DTE）and data communications equipment（DCE). The electronic load is designed to be a DTE. It can be connected to another DTE such as a PC COM port through a null modem cable

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Note: The RS-232 settings in your program must match the settings specified in the front panel system menu. Press Shift + number 5, if you need to change the settings. You can break data transmissions by sending a ^C or ^X character string to the multimeter. This clears any pending operation and discards any pending output.

RS-232 data format

The RS-232 data is a 10-bit word with one start bit and one stop bit. The number of start and stop bits is not programmable. However ,the following parity options are selectable in the menu using the frongt panel Shift + number 5.
Parity options are stored in non-volatile memory.

Baudrate

The front panel Shift + number 5 lets you select one of the following baud rates, which is stored in non-volatile memory:
4800 9600 19200 38400 57600 115200

RS-232 flow control

The RS-232 interface supports the following flow control options that are selected using the front panel Shift + number 5. For each case, the electronic load will send a maximum of five characters after hold-off is asserted by the controller. The electronic load is capable of receiving as many as fifteen additional characters after it asserts hold-off.

- The electronic load asserts its Request to Send (RTS)line to signal hold-off when its input buffer is almost full,and it interprets its Clear to Send (CTS)line as a hold-off signal from the controller.
- When the input queue of the electronic load becomes more than 3/4full,the instrument issues an X-OFFcommand. The control program should respond to this and stop sending characters until the electronic load issues the X-ON,which

it will do once its input buffer has dropped below half-full. The electronic load recognizes X_ON and X_OFF sent from the controller. An X-OFF will cause the electronic load to stop outputting characters until it sees an X-ON.

- NONE There's no flow control.

Flow control options are stored in non-volatile memory.

RS-232 connections

The RS-232 serial port can be connected to the serial port of a controller (i.e., personal computer) using a straight through RS-232 cable terminated with DB-9 connectiors. Do not use a null modem cable. Table 2－2 shows the pinout for the connector.

If your computer uses a DB-25connector for the RS-232interface,you will need a cable or adapter with a DB-25 connector on one end and a DB-9 connector on the other,wired straight through(not null modem).

RS-232 connector pinout

pin number	description
1	no connection
2	TXD,transmit data
3	RXD,receive data
4	no connection
5	GND,signal ground
6	no connection
7	CTS, clear to send
8	RTS, ready to send
9	no connection

RS-232 trouble shooting:

If you are having trouble communicating over the RS-232 interface,check the following:

- The computer and the electronic load must be configured for the same baudrate, parity, number of data bits,and flow control options. Note that the eledtronic load is configured for 1 start bit and 1stop bit (these values are fixed).
- The correct interface cables or adapters must be used, as described under RS-232 connector. Note that even if the cable has the proper connectors for your system,the internal wiring may be incorrect.
- The interface cable must be connected to the correct serial port on your computer (COM1, COM2,etc.).

Communication setting

Before communication operation, please make sure that the following parameters of electronic load match that of PC.

Baud rate ： 9600(4800、9600、19200、38400、57600、115200). You can enter system menu through panel to set communication baud rate.

1. **Data bit** ： 8
2. **Stop bit** ： 1
3. **Parity** ： (none,even,odd)
   EVEN eight data bits with even parity
   ODD eight data bits with odd parity
   NONE eight data bits without parity
4. **Local address** ： （0 ~ 31，default setting is 0）

Parity=None	Start Bit	8 Data Bits	Stop Bit

6.2 USB interface

use cables with double USB interface to connect load and PC. All electronic load functions are programmable over the USB.

The USB488 interface capabilities of the electronic load are described below:

- The interface is 488.2 USB488 interface
- The interface accepts REN_CONTROL, GO_TO_LOCAL, and LOCAL_LOCKOUT requests.
- The interface accepts MsgID = TRIGGER USBTMC command message and forwards TRIGGER requests to the function layer.

The USB488device capabilities of the electronic load are described below:

- The device understands all mandatory SCPI commands.
- The device is SR1 capable.
- The device is RL1 capable.
- The debice is DT1 capable.

6.3 GPIB interface

First conncet GPIB port of load to GPIB card of PC with IEEE488 BUS. They must be sufficient contact and tighten the screws. And then set address. The address can be set from 0 to 31. Press Shift +number 5 to enter system menu, press ▼ key to find “Communication”, select GPIB, and then set the GPIB address ,and use Enter to confirm. The electronic load operates from a GPIB address set from the front panel. The GPIB address is stored in non-volatile memory.

When communicating with PC, you can just select one method of all the communication methods above.

Support process

If you have a problem, follow these steps:

1 Check the documentation that come with the product

2 Visit the ITECH online service Web site is www.itechate.com , ITECH is avaliable to all ITECH customers. It is the fastest source for up-to-date product information and expert assistance and includes the following features:

Fast access to email AE

Software and driver updates for the product

Call ITECH support line 4006-025-000