DC Programmable Electronic Loads

Series IT8500plus User's Manual

Model:IT8511+/IT8511A+/IT8511B+/IT8512+/IT8512A+/IT8512B+/IT8512C+/IT8512H+/IT8513A+/IT8513C+/IT8514C+/IT8514B+/IT8516C+
Version:2.0

Notices

Manual Part Number

IT8500+-402008

Revision

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2017

Itech Electronic, Co., Ltd.

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Safety Notices

CAUTION

A CAUTION sign denotes a hazard. It calls attention to an operating procedure or practice that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

WARNING

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

NOTE

A NOTE sign denotes important hint. It calls attention to tips or supplementary information that is essential for users to refer to.

Quality Certification and Assurance

We certify that series IT8500+ electronic load meets all the published specifications at time of shipment from the factory.

Warranty

ITECH warrants that the product will be free from defects in material and workmanship under normal use for a period of one (1) year from the date of delivery (except those described in the Limitation of Warranty below).

For warranty service or repair, the product must be returned to a service center designated by ITECH.

- The product returned to ITECH for warranty service must be shipped PREPAID. And ITECH will pay for return of the product to customer.
- If the product is returned to ITECH for warranty service from overseas, all the freights, duties and other taxes shall be on the account of customer.

Limitation of Warranty

This Warranty will be rendered invalid in case of the following:

- Damage caused by circuit installed by customer or using customer own products or accessories;
- Modified or repaired by customer without authorization;
- Damage caused by circuit installed by customer or not operating our products under designated environment;
- The product model or serial number is altered, deleted, removed or made illegible by customer;
- Damaged as a result of accidents, including but not limited to lightning, moisture, fire, improper use or negligence.

Safety Symbols

⎓	Direct current	|	ON (power on)
~	Alternating current	○	OFF (power off)
⎓ ~	Both direct and alternating current	⎍	Power-on state
⏚	Protective conductor terminal	⎍	Power-off state
⏚	Earth (ground) terminal	⊥	Reference terminal
⚠	Caution, risk of electric shock	+	Positive terminal
⚠	Warning, risk of danger (refer to this manual for specific Warning or Caution information)	−	Negative terminal
⏚	Frame or chassis terminal	-	-

Safety Precautions

The following safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or specific warnings elsewhere in this manual will constitute a default under safety standards of design, manufacture and intended use of the instrument. ITECH assumes no liability for the customer's failure to comply with these precautions.

WARNING

- Series IT8500+ electronic load supports 110V/220VAC input and need to switch the input voltage before operation.
- Do not use the instrument if it is damaged. Before operation, check the casing to see whether it cracks. Do not operate the instrument in the presence of inflammable gasses, vapors or dusts.
- The electronic load is provided with a three-core power line during delivery and should be connected to a three-core junction box. Before operation, be sure that the instrument is well grounded.
- Make sure to use the power cord supplied by ITECH.
- Check all marks on the instrument before connecting the instrument to power supply.
- Use electric wires of appropriate load. All loading wires should be capable of bearing maximum short-circuit current of electronic load without overheating. If there are multiple electronic loads, each pair of the power cord must be capable of bearing the full-loaded rated short-circuit output current
- Ensure the voltage fluctuation of mains supply is less than 10% of the working voltage range in order to reduce risks of fire and electric shock.
- Do not install alternative parts on the instrument or perform any unauthorized modification.
- Do not use the instrument if the detachable cover is removed or loosen.
- To prevent the possibility of accidental injuries, be sure to use the power adapter supplied by the manufacturer only.
- Never use the instrument with a life-support system or any other equipment subject to safety requirements.

CAUTION

- Failure to use the instrument as directed by the manufacturer may render its protective features void.
- Always clean the casing with a dry cloth. Do not clean the internals.
- Make sure the vent hole is always unblocked.

Environmental Conditions

The instrument is designed for indoor use and an area with low condensation. The table below shows the general environmental requirements for the instrument. The speed of fan will change intelligently by the temperature of radiator. When the temperature is up to 40°C, the fan will be on and adjust intelligently when temperature changes.

Environmental Conditions	Requirements
Operating temperature	0°C to 40°C
Operating humidity	20%-80% (non-condensation)
Storage temperature	-20°C to 70 °C
Altitude	Operating up to 2,000 meters
Pollution degree	Pollution degree 2
Installation category	II

Note

To make accurate measurements, allow the instrument to warm up for 30 min before operation.

Regulatory Markings

CE	The CE mark indicates that the product complies with all the relevant European legal directives. The specific year (if any) affixed refers to the year when the design was approved.
	The instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard the electrical/electronic product in domestic household waste.
	This symbol indicates the time period during which no hazardous or toxic substances are expected to leak or deteriorate during normal use. The expected service life of the product is 10 years. The product can be used safely during the 10-year Environment Friendly Use Period (EFUP). Upon expiration of the EFUP, the product must be immediately recycled.

Waste Electrical and Electronic Equiment (WEEE) Directive

2002/96/EC Waste Electrical and Electronic Equipment (WEEE) Directive

This product complies with the WEEE Directive (2002/96/EC) marking requirement. This affix product label indicates that you must not discard the electrical/electronic product in domestic household waste.

Product Category

With reference to the equipment classifications described in the Annex I of the WEEE Directive, this instrument is classified as a "Monitoring and Control Instrument".
To return this unwanted instrument, contact your nearest ITECH office.

Compliance Information

Complies with the essential requirements of the following applicable European Directives, and carries the CE marking accordingly:

- Electromagnetic Compatibility (EMC) Directive 2014/30/EU
- Low-Voltage Directive (Safety) 2014/35/EU

Conforms with the following product standards:

EMC Standard

IEC 61326-1:2012/ EN 61326-1:2013 [1][2][3]

Reference Standards

CISPR 11:2009+A1:2010/ EN 55011:2009+A1:2010 (Group 1, Class A)
IEC 61000-4-2:2008/ EN 61000-4-2:2009
IEC 61000-4-3:2006+A1:2007+A2:2010/ EN 61000-4-3:2006+A1:2008+A2:2010
IEC 61000-4-4:2004+A1:2010/ EN 61000-4-4:2004+A1:2010
IEC 61000-4-5:2005/ EN 61000-4-5:2006
IEC 61000-4-6:2008/ EN 61000-4-6:2009
IEC 61000-4-11:2004/ EN 61000-4-11:2004

1. The product is intended for use in non-residential/non-domestic environments. Use of the product in residential/domestic environments may cause electromagnetic interference.
2. Connection of the instrument to a test object may produce radiations beyond the specified limit.
3. Use high-performance shielded interface cable to ensure conformity with the EMC standards listed above.

Safety Standard

IEC 61010-1:2010/ EN 61010-1:2010

Content

Chapter1 Inspection and Installation

1.1 Verifying the Shipment

Unpack the box and check the contents before operating the instrument. If wrong items have been delivered, if items are missing, or if there is a defect with the appearance of the items, contact the dealer from which you purchased the instrument immediately. The package contents include:

Checklist of Package Contents

Item	Qty.	Model	Remarks
Electronic Loads	x1	IT8500+ series	The IT8500+ series include: IT8511+/IT8511A+/IT8511B+/IT8512+/IT8512A+/IT8512B+/IT8512C+/IT8512H+/IT8513A+/IT8513C+/IT8514C+/IT8514B+/IT8516C+
Power cord	x1	IT-E171/IT-E172/IT-E173/IT-E174	User may select an appropriate power cord that matches the specifications of power socket used in the area. See the Section **Connecting the Power Cord** for details.
CD	x1	-	It contains IT8500+ electronic load User's Manual, Programming Guide and other user documentations.
Ex-factory Test Report	x1	-	It is the test report of the instrument before delivery.

NOTE

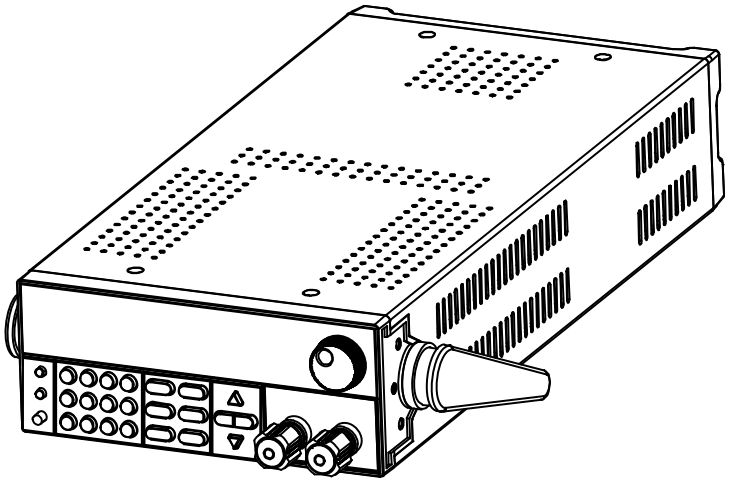
Upon verification of the shipment, keep the package and relevant contents thereof in a safe place. When returning the instrument for warranty service or repair, the specified packing requirements shall be met.

1.2 Instrument Size Introduction

The instrument should be installed at well-ventilated and rational-sized space. Please select appropriate space for installation based on the electronic load size.

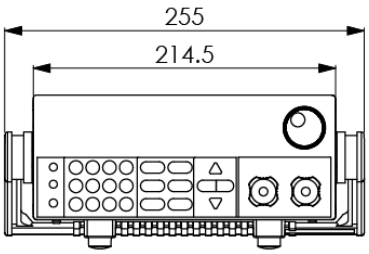
IT8500+ series electronic load different models are not the same size, the detail size of the electronic load are shown as below.

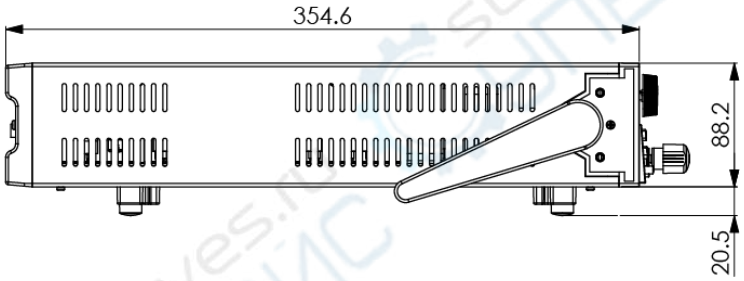
IT8511+/IT8511A+/IT8511B+/IT8512+/IT8512B+/IT8512C+/IT8512H+ Model



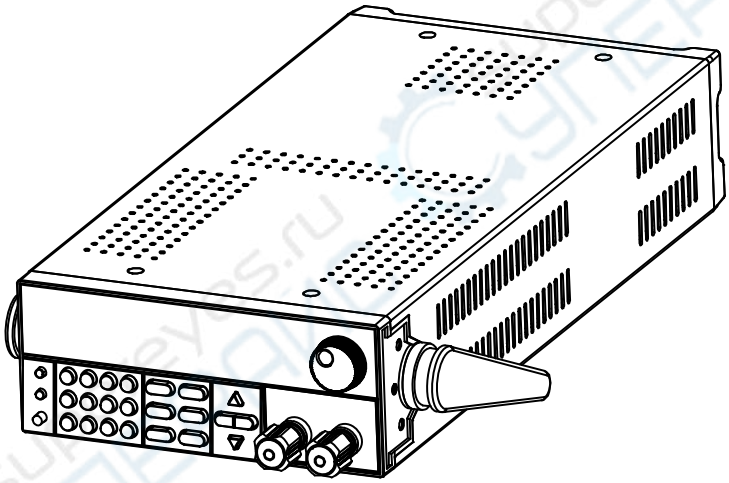
Dimension:
Width: 214.5mm
Height: 88.2mm
Depth: 354.6mm

Detialed Dimension Drawing



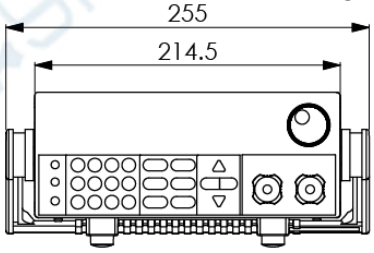


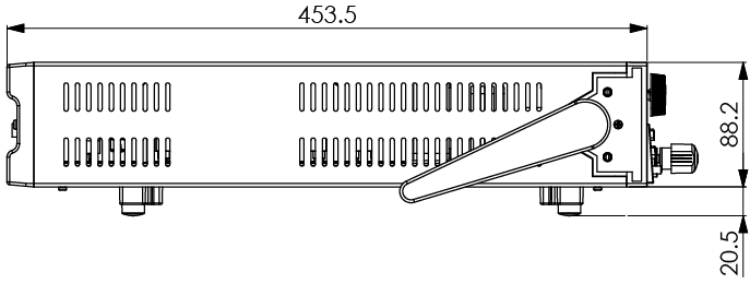
IT8513A+/IT8513C+ Model



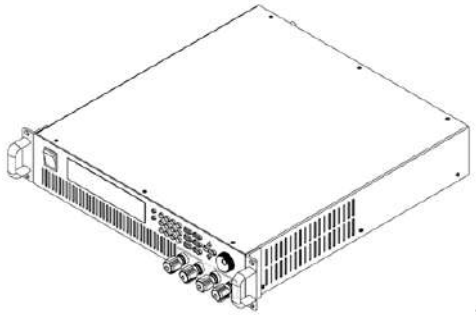
Dimension:
Width: 214.5mm
Height: 88.2mm
Depth: 453.5mm

Detailed Demension Drawing



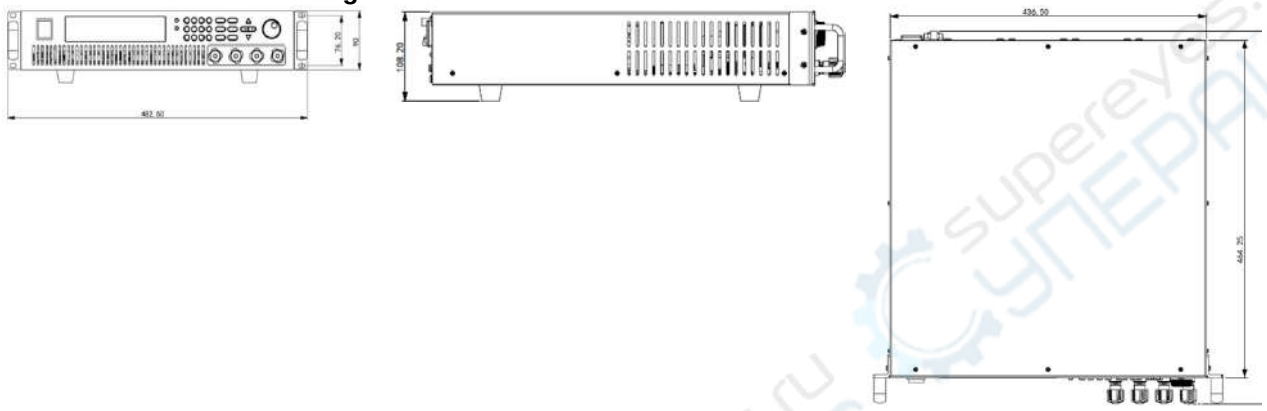


IT8514B+/ IT8514C+ Model

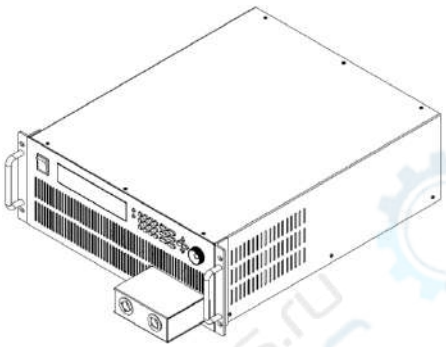


Dimension:
Width: 436.5.5mm
Height: 88.2mm
Depth: 463.5mm

Detialed Dimension Drawing

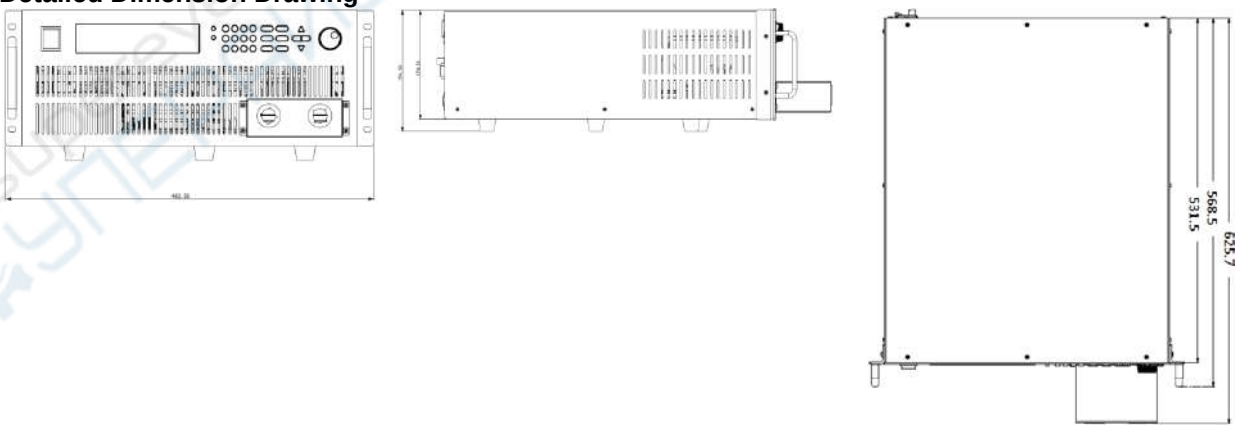


IT8516C+ Model



Dimension:
Width: 482.5mm
Height: 174.5mm
Depth: 531.5mm

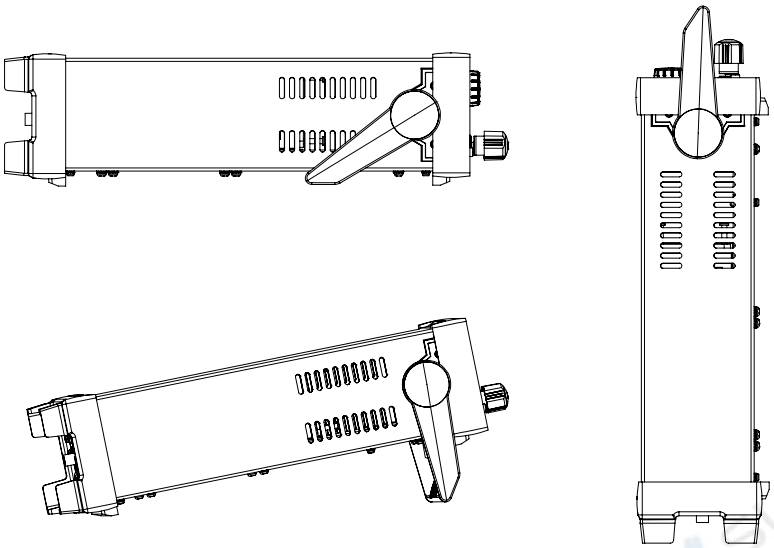
Detailed Dimension Drawing



1.3 Adjustment of Load Handle

IT8511+/IT8511A+/IT8511B+/IT8512+/IT8512A+/IT8512B+/IT8512C+/IT8512H /IT8513A+/IT8513C+ series loads are equipped with a handle for user to easily carry and place it.

The load handle may be adjusted based on three methods (as shown in icons below). Be sure that appropriate force is applied to adjust the load handle to appropriate position.

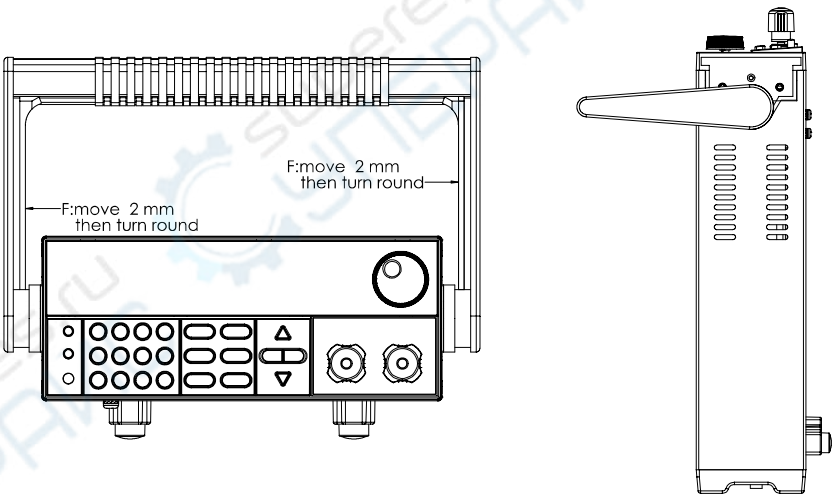


1.4 Disassembly of Load Handle

Please disassemble the load handle before installing equipment on the support.

Disassembly steps:

1. Adjust the handle to the position as shown in the figure below.



NOTE

To easily disassemble handle, align the locking mouth and locking device, which is between the handle and the instrument.

2. Align the locking mouth, and pull out the handle towards two sides.

NOTE

Do not use too much force and mind your hands during disassembly of load handle.

1.5 Rack Mounting

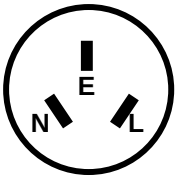
IT8511+/IT8511A+/IT8511B+/IT8512+/IT8512A+/IT8512B+/IT8512C+/IT8512H+/IT8513A+/IT8513C+ loads can be installed on standard 19-inch rack. ITECH provides user with IT-E151/IT-E151A rack, as an optional mount kit. The detailed operation please refer to the User Manual of your mount kit.

IT8514B+/IT8514C+/IT8516C+ need not mount on rack, they can installed on cabinet directly by screw.

1.6 Connecting the Power Cord

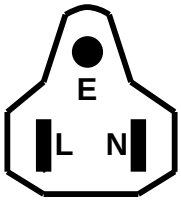
Connect the power cord after checking that the power switch of the instrument is turned OFF. Only use the power cord supplied as a standard accessory.

Select from the following Schedule of Power Cord Specifications an appropriate power cord that matches the voltage for the area in which you use the instrument. If the power cord included in the instrument you purchased does not match the voltage, contact the dealer or manufacturer for change.



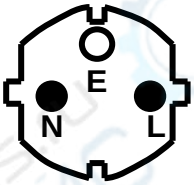
China

IT-E171



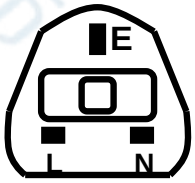
United States & Canada

IT-E172



Europe

IT-E173



England

IT-E174

Chapter2 Quick Start

This chapter introduces the front panel, the rear panel, key functions and VFD display function of the electronic load, make sure that you can quickly know the appearance, instruction and the key function before you operate the load, Help you make better use of this series of electronic load.

2.1 Brief Introduction

IT8500plus series DC electronic loads are single channel programmable electronic load which can provide multiple solutions according to the requirements of your design and test. This series have international advanced functions and features.

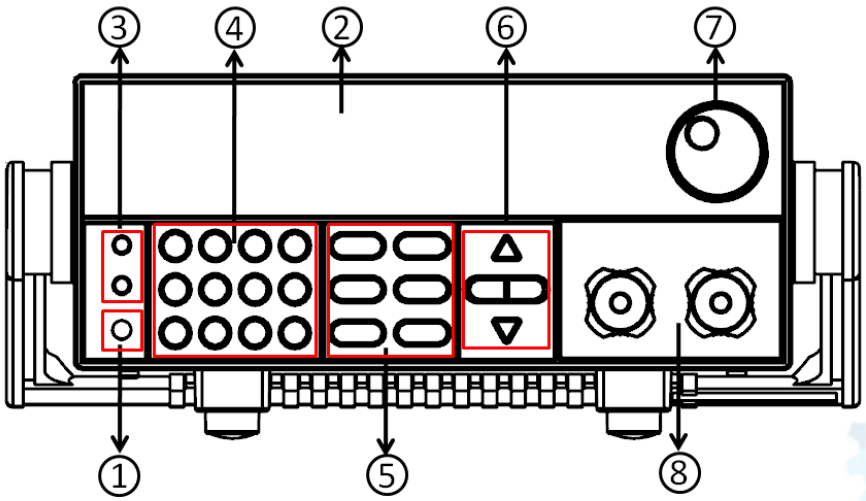
- High-visibility vacuum fluorescent display (VFD)
- Measurement resolution: 0.1mV,0.1mA
- Voltage and current Measurement speed: up to 40KHZ
- Four operation modes:CV(Constant Voltage),CC,CR,CW
- Battery test function
- OCP test , OVP test
- Auto test function:
- Short circuit function
- Remote Sense function
- Memory capacity to save/recall setting parameters: 100 registers
- Intelligent fans
- Build-in Buzzer as alarm signal
- Power off memory function
- Rotary knob, making the operation more convenient
- Measure test function,test the rising/dropping time of the voltage
- List modes

Model	Voltage	Current	Power	Communication Interface
IT8511+	120V	30A	150W	DB9(TTL)
IT8511A+	150V	30A	150W	DB9(TTL)
IT8511B+	500V	10A	150W	DB9(TTL)
IT8512+	120V	30A	300W	DB9(TTL)
IT8512A+	150V	30A	300W	DB9(TTL)
IT8512B+	500V	15A	300W	DB9(TTL)
IT8512C+	120V	60A	300W	DB9(TTL)
IT8512H+	800V	5A	300W	DB9(TTL)
IT8513A+	150V	60A	400W	DB9(TTL)
IT8513C+	120V	120A	600W	DB9(TTL)
IT8514B+	500V	60A	1500W	USB/RS232
IT8514C+	120V	240A	1500W	standard USB/RS232
IT8516C+	120V	240A	3000W	Standard USB/RS232

2.2 Front Pannel Introduction

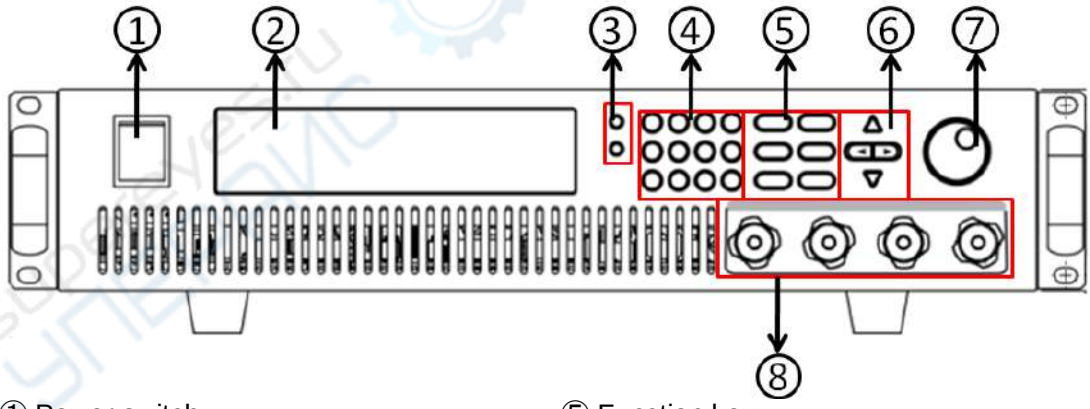
IT8500+ series electronic load different models have different front pannels, the front panels and keyboards of different models are shown as below.

IT8511+/IT8511A+/IT8511B+/IT8512+/IT8512A+/IT8512B+/IT8512C+/IT8512H+/IT8513A+/IT8513C+ Model



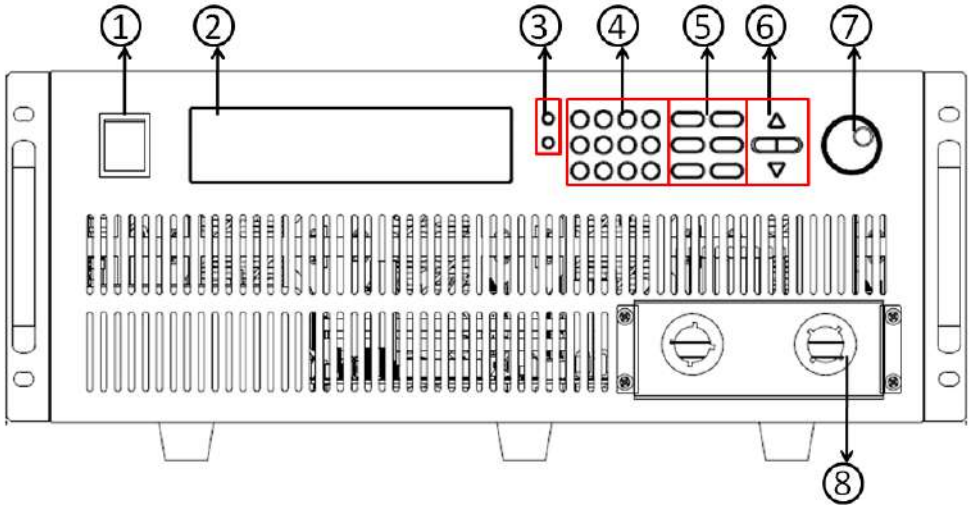
① Power switch
② vacuum fluorescent display (VFD)
③ Compound key and the local switch key
④ Number key:
Set the parameters value,
achieve the menu's function by key combination
⑤ Function key:
Set the operation mode
Control the input state: On/Off
⑥ Direction function
⑦ Rotary knob
⑧ Input terminal

IT8514B+/IT8514C+ Model



① Power switch
② vacuum fluorescent display (VFD)
③ Compound key and the local switch key
④ Number key:
Set the parameters value,
achieve the menu's function by key combination
⑤ Function key:
Set the operation mode
Control the input state: On/Off
⑥ Direction function
⑦ Rotary knob
⑧ Input terminal

IT8516C + Model

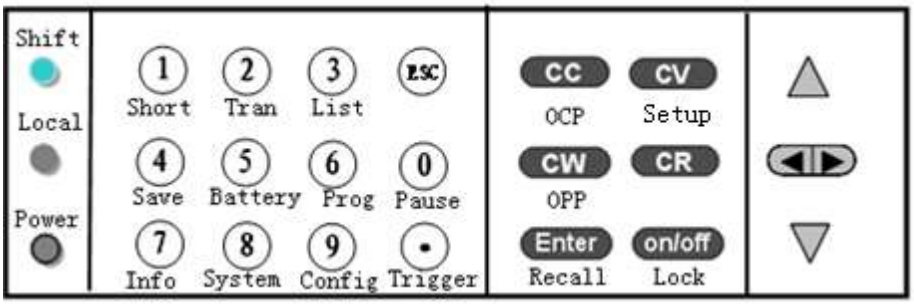


① Power switch
② vacuum fluorescent display (VFD)
③ Compound key and the local switch key
④ Number key:
Set the parameters value,
achieve the menu's function by key combination
⑤ Function key:
Set the operation mode
Control the input state: On/Off
⑥ Direction function
⑦ Rotary knob
⑧ Input terminal

2.3 VFD Display Annunciators

OFF	The load is off.	Error	An error has occurred.
CC	Constant current mode	Trig	Waiting for the trigger signal
CV	Constant voltage mode	Sense	Remote sensing is on.
CR	Constant resistance mode	Prot	OCP function is on.
CW	Constant power mode	Auto	Voltage range automatically seleted function is open
Rmt	Instrument is in the remote state.	Lock	The keyboard is locked.
Timer	LOAN ON is on.	Shift	Shift button has been pressed.

2.4 Front Panel Keys



(Blue-green)	Shift button is a composite key.

(Gray)	Local button is used to switch local and remote mode.
(Gray-white)	Power on button
0~9	Enter the digits 0 to 9.
•	Decimal point
ESC	The escape key
CC	Choose constant current mode.
CV	Choose constant voltage mode.
CR	Choose constant resistance mode.
CW	Choose constant power mode.
Enter	Enter the selected value or setting.
on/off	Turns DC Load ON or OFF (OFF is high impedance state).
	Scroll up key
	Scroll down key
	Scroll left and right key

2.5 Combination Keys

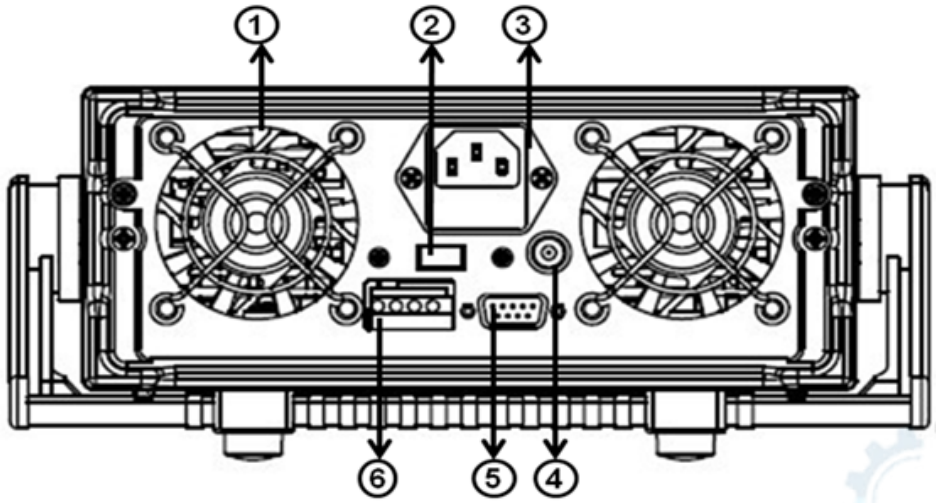
Press **[Shift]** button first and then other keys to achieve all kinds functions in the following table.

[Shift]+ [1] (Short)	Turn short circuit on or off.
[Shift]+ [2] (Tran)	Start or stop transient condition.
[Shift] + [3] (List)	Set LIST operation parameters.
[Shift] + [4] (Save)	Store the DC Load state in non-volatile memory.
[Shift] + [5] (Battery)	Turn on or off battery testing function.
[Shift] + [6] (Prog)	Enter auto test function.
[Shift] + [7] (Info)	Display product's Model/SN/Version.
[Shift] + [8] (System)	System menu setting
[Shift] + [9] (Config)	Configure menu setting
[Shift] + [0] (Pause)	Press this button if you need a pause when runing an auto test file.
[Shift] + [•] (Trigger)	Cause an immediate trigger.
[Shift] + [CC] (OCP)	Enter OCP test function.
[Shift] + [CV] (Setup)	Set detailed parameters in CC/CV/CW/CRmode.
[Shift] + [CW] (OPP)	Enter OPP test function.
[Shift] + [Enter] (Recall)	Recall the DC Load state from non-volatile memory.
[Shift] + [On/Off] (Lock)	Key lock function

2.6 Rear Pannel Introduction

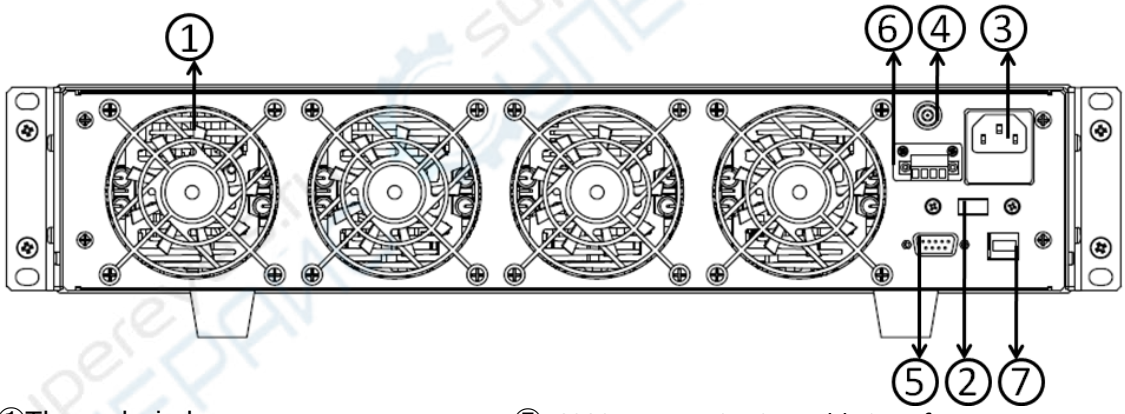
IT8500+ series electronic load different models have different rear pannels, the rear panels and keyboards of different models are shown as below.

IT8511+/IT8511A+/ IT8511B+/IT8512+/ IT8512B+/IT8512C+/IT8512H/IT8513A+/IT8513C+ Model



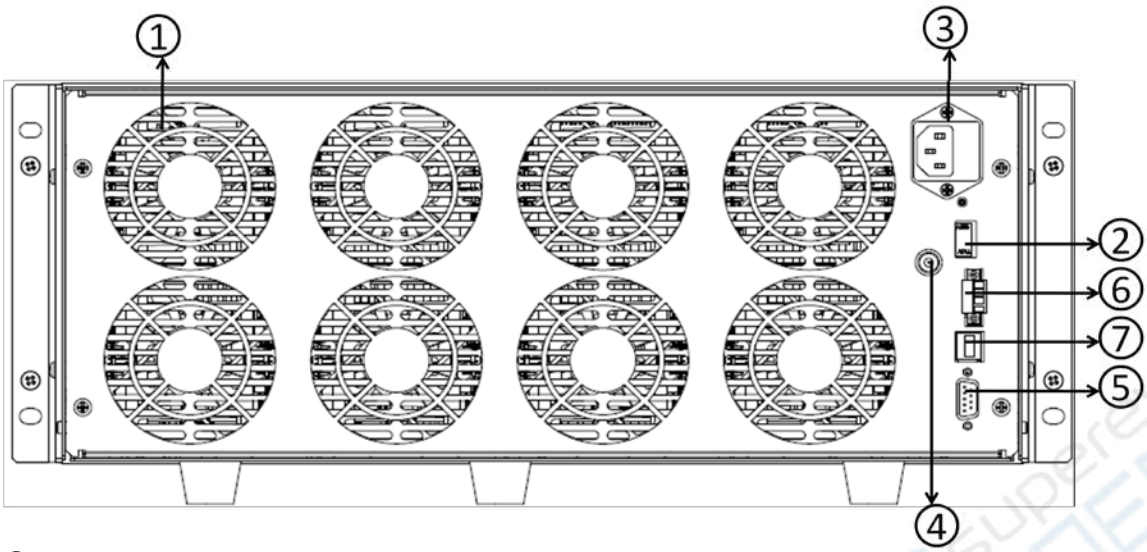
①Thermal window
②Line voltage selection switch(110V/220V)
③3 pin IEC320 AC input connector
④Current monitoring Terminal
⑤9-Pin serial port interface connector
⑥4 pin trigger and remote sensing connector

IT8514B+/IT8514C+Model



①Thermal window
②Line voltage selection switch(110V/220V)
③3 pin IEC320 AC input connector
④Current monitoring Terminal
⑤RS232 communication cable interface
⑥4 pin trigger and remote sensing connector
⑦USB communication cable interface

IT8516C+Model



①Thermal window
②Line voltage selection switch(110V/220V)
③3 pin IEC320 AC input connector
④Current monitoring Terminal
⑤RS232 communication cable interface
⑥4 pin trigger and remote sensing connector
⑦USB communication cable interface

2.7 Power-on Selftest

A successful test process indicates that the instrucment meets the factory specifications and can be operated well.

Before operation, please confirm that you have fully understood the safety instructions.

WARNING

- To avoid burning out, be sure to confirm that power voltage matches with supply voltage.
- Be sure to connect the main power socket to the power outlet of protective grounding. Do not use terminal board without protective grounding. Before operation, be sure that the power supply is well grounded.
- To avoid burning out, pay attention to marks of positive and negative polarities before wiring.

Selftest steps

Normal selftest procedures:

1. Correctly connect the power cord. Press **[Power]** key to start up.
2. After selftest, VFD display information below.

0.0000V	**0.0000A**
0.00W	**CC=0.000A**
OFF CC	**Auto**

Information description:

- The first line display actual voltage and current value.
- The second line display the actual power value and the setting current/voltage/power/resistance value

- The third line display the input state/operation mode.

3. Press **[Shift] + [7]**, VFD display products information. You can press direction buttons to examine product's model/SN/software version.

Error Information References

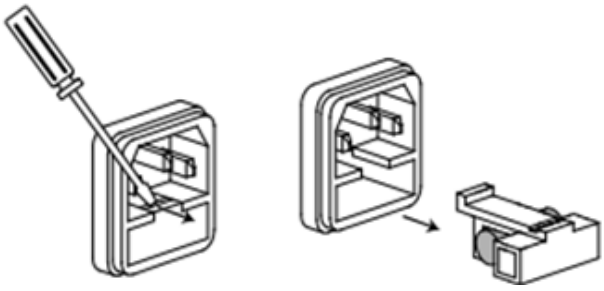
The following error information may occur when an error occurs during Power On self-test:

- If the EEPROM was damaged, the VFD will display "Eeprom Fail".
- If the lastest operation data in EEPROM is lost, then VFD will display "Config Data Lost".
- If the calibration data in EEPROM is lost, then VFD will display "Cal data lost".
- If the system setting data in EEPROM is lost, the VFD will display "Eeprom data lost".Please press **[Shift] + [4]** and **[0]** to save after setting parameters.

Exception handling

If the electronic load cannot start normally, please check and take measures by reference to steps below.

1. Check whether the power line is correctly connected and confirm whether the electronic load is powered.
   Correct wiring of power line => 2
   Incorrect wiring of power line => Re-connect the power line and check whether the exception is removed.
2. Check whether the power in On.**[Power]** key is under "  " On status.
   Yes => 3
   No => Please check the **[Power]** key to start power and check whether the exception is removed.
3. Check whether set power voltage of electronic load is larger than the power supply voltage. If set power voltage is 220 V and the supply voltage is 110V, the electronic load cannot start.
4. Check whether the fuse of electronic fuse is burned out.
   If yes, change fuse. Detailed steps:
   - Pull out power line and take out the fuse box at power line jack with a small screw driver. As shown below.

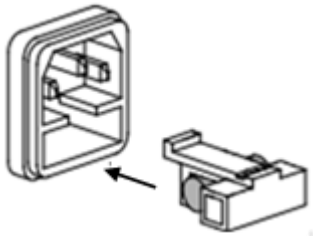


   - If the fuse is fused, please change fuse of same specification based on machine model. See the table blow for matching information of fuse and machine model.

Model	Fuse specification (220VAC)	Fuse specification (110VAC)
IT8511+	T0.5A 250V	T1.25A 250V
IT8511A+	T0.5A 250V	T1.25A 250V
IT8511B+	T0.5A 250V	T1.25A 250V

Model	Fuse specification (220VAC)	Fuse specification (110VAC)
IT8512A+	T0.5A 250V	T1.25A 250V
IT8512A+	T0.5A 250V	T1.25A 250V
IT8512B+	T0.5A 250V	T1.25A 250V
IT8512C+	T0.5A 250V	T1.25A 250V
IT8512H+	T0.5A 250V	T1.25A 250V
IT8513A+	T1.25A 250V	T2.5A 250V
IT8513C+	T1.25A 250V	T2.5A 250V
IT8514B+	T1.25A 250V	T2.5A 250V
IT8514C+	T1.25A 250V	T2.5A 250V
IT8516C+	T2.5A 250V	T5A 250V

- After replacement, install the fuse box back to original position, as shown below.



Chapter3 Functions and Characteristics

This chapter elaborates on the functions and characteristics of electronic loads.Contents following sections:

- Switching of local/remote operation modes
- Constant-status operation mode
- Input On/Off function
- Keyboard locking function
- Short -circuit analog function
- System setup function
- Triggering function
- List mode
- Test function
- Save/Recall
- VON function
- Full protection function,OCP,OVP,OTP,OPP,Reverse voltage
- Remote Sense function
- Current monitoring function
- Ripple function

3.1 Local Mode/Remote Mode

There are two types of control modes for IT8500+ series products:**Local mode and Remote mode.**

In remote mode, you can operate the electronic loads through PC via communication cable(optional). While After power on electronic loads, it defaults in local mode and all buttons are avaiable in this mode.In remote control mode, the keys on the front pannel can not work except local key.Customers could through **[Local]** key to switch the control mode.

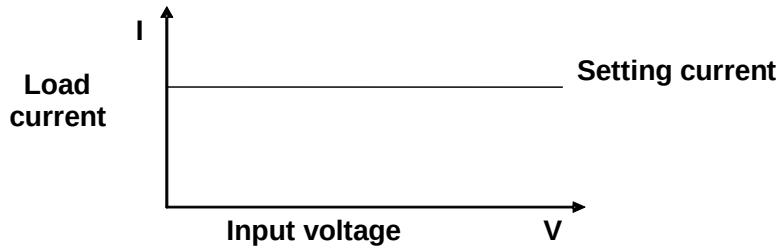
3.2 Operation Mode

There are four operation modes of IT8500+ series products:

- Constant current mode (CC)
- Constant voltage mode (CV)
- Constant resistance mode (CR)
- Constant power mode(CW)

3.2.1 Constant Current Mode (CC)

In constant current mode, the DC load will comsume a constant current, regardless of the voltage at its terminals.

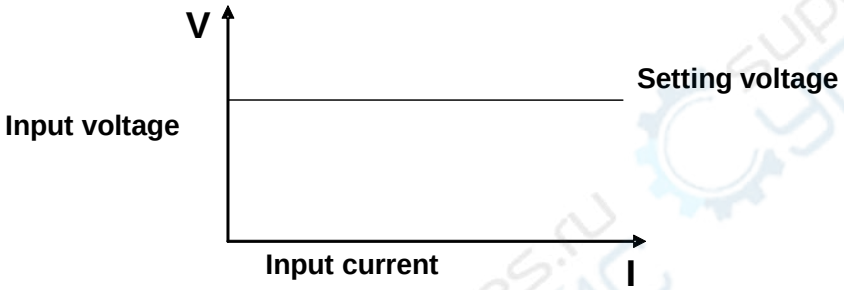


CC mode

Diagram 3-1 I-V curve in CC mode

3.2.2 Constant Voltage Mode (CV)

In constant voltage mode, the DC load will cause a constant voltage to appear at its terminals.

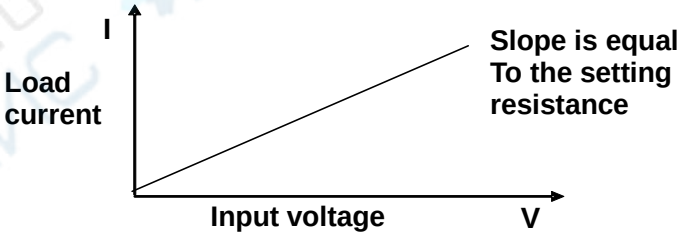


CV mode

Diagram 3-2 I-V curve in CV mode

3.2.3 Constant Resistance Mode (CR)

In constant resistance mode, the DC load will behave as a fixed resistance value.As shown below,the load linearly changes the current value with the rising of input voltage.



CR mode

Diagram 3-3 I-V curve in CR mode

3.2.4 Constant Power Mode (CW)

In constant power mode,the DC load will cause a constant power to be dissipated in the load.As shown below,the load current is decreasing with the rising of input voltage,while power always maintain the setting value.

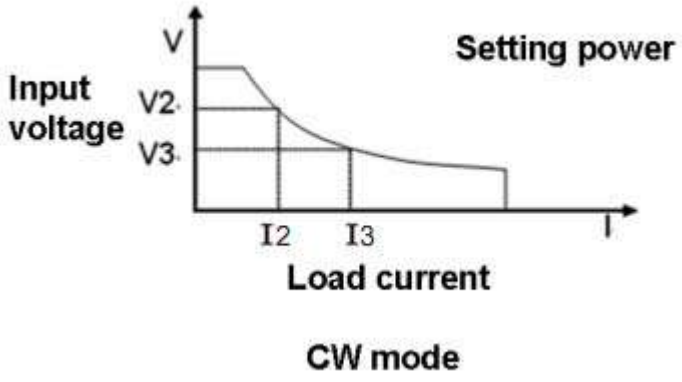


Diagram 3-4 I-V curve in CP mode

3.3 Input On/Off Control

[On/Off] button on the front panel is used to manually toggle the instrument between its set mode and an infinite impedance state, i.e control input on and off. **[On/Off]** button lighted indicates the load input is on, meanwhile the **[** OFF indicator will disappear.

3.4 Short-circuit Analog Function

Short circuit simulation and short circuit current measurement:you may press **[Shift] + [1]** botton to emulate a short state.It can be used to check whether the tested instrument's short protection is avaiable.

In short mode,the DC load will draw maximum current from the DC supply in any of the four operation modes(CC,CV,CW or CR).In CC,CV,or CR mode,you may press **[Shift] + [1]** to stop short.The DC load will return to its previous operation.However,in CW mode,the short current will continue to be drawn.To stop the short,you must press the **[On/Off]** key after you press **[Shift] + [1]**.

When emulating a Short in CC, CW or CR mode, the maximum allowable short current is equal to the 110% of current range. Under CV mode, short circuit current is equivalent to that constant voltage value of load is 0 V.

3.5 System Menu (System)

Press **[Shift] + [8]** (system) to enter the system menu.

POWER-ON	POWER-ON	Power on state of instrument
	RST(default)	Do not remember state in SAVE 0.Customer can save a often used data in SAVE 0 to recall when power on the DC load next time.
	SAV0	Remember state in SAVE 0
BUZZER	BUZZER	
	ON(default)	Enable audible beep when key is pressed
	OFF	No sound when key is pressed
KNOB	KNOB	

	UPDATE(default)	The value modified with knob during operation will be saved after load is off.For example; the DC load is set to 1A by press **[CC]** and turned on the input.Then increase the setting value to 2A with knob.When customer turn off load and trun on again, the setting value changes to 2A.
	OLD	As explained above, after the DC load is turned on again,the setting value is 1A instead of 2A changed with knob.
TRIGGER	SOURCE	Set trigger mode
	MANUAL(Def)	Triggered from the **[Shift] + [⊙]** key
	EXTERNAL	Triggered from a TTL high signal at the trigger connector on rear panel
	BUS	Triggered from a serial bus command 5AH
	HOLD	Receving a command 9DH
MEMORY	MEMORY	Recall the prestored datas
	GROUP= 0	**0:**indicates1-10 group;**1**:indicates 11-20group, by parity of reasoning
DISPLAY	DISP-TIMER	Timer function
	ON	Enable timer function
	OFF(default)	Disable timer function
RS-232	RS-232	
	4800_8N 1	Baudrate 4800, data bit 8, none parity, stop bit 1
	9600_8N 1	Baudrate 9600, data bit 8, none parity, stop bit 1
	19200_8N 1	Baudrate 19200, data bit 8, none parity, stop bit 1
	38400_8N 1	Baudrate 38400, data bit 8, none parity, stop bit 1
PROTOCOL	SCPI	Select SCPI protocol
	FRAME	Select FRAME protocol
ADDRESS	ADDRESS= 0	Set the instrument's address(0~31)
RUNMODE	RUN	Runing mode at power on
	NORMAL	Normal mode
	BATTERY	Default in battery test mode at power on
	PROG_TEST	Default in autotest mode at power on
	OCP_TEST	Default in OCP test mode at power on
	OPP_TEST	Default in OPP test mode at power on
DEFAULT	DEFAULT	
	NO	Do not return instrument to factory default settings.
	YES	Retrun instrument to factory default settings

3.6 Config Menu (Config)

Press **[Shift]+ [9]** (Config) to enter the menus.

PROTECT	Max-P	Set hardware power protection
	MAX POWER=150.00W	Set hardware OPP value

	A-LIMIT	Set software current protecting state
	A-LIMIT	
	ON	Enable software over current protection function
	A-LIM POIN=30.000A	Set the software OCP level
	A-LIM DELAY=3S	Set the OCP delay time
	OFF	Disable the software OCP funtion
	P- LIMIT	Set software power protecting state.
	P-LIM POIN=150.00W	Set the software OPP level.
	P-LIM DELAY=3S	Set the OPP delay time.
	TIMER	Set load on timer
	LOAD-TIMER	
	ON	Enable load-on timer
	LOAD-TIMER=10.0S	Set the load on time(0.1S~9999.9S)
	OFF	Disable load on timer
MEASURE	V-RANGE	Voltage auto-rangefuntion
	V-RANGE	
	ON	Enable voltage auto range function
	OFF	Disable voltage auto range function
	FILTER	Set the filter parameter
	FILTER COUNT = 2^14	Filter count set, range 2~16
	TIME-V1	
	TIME-VOLT1=0.000V	Set the start time, to measure the voltage rise/fall time.
	TIME-V2	
	TIME-VOLT2=120.00V	Set the end time, to measure the voltage rise/fall time
CR-LED	CR-LED	Imitate LED (in CR mode)
	ON	Open the function(in CR mode,press **[Shift]+ [CV]** to set Vd value)
	OFF	Disenable the function
SENSE	REM- SENSE	Remote sense function
	ON	Enable remote sense function
	OFF	Disable remote sense function
VON	VON	Set the load's VON point
	LIVING	VON point living state
	VON POINT = 0.10V	Set the VON value
	LATCH	VON point latch state, ON /OFF
	VON POINT = 0.10V	Set the VON value
RESET	RESET	Reset the config menu
	NO	Do not reset
	YES	Reset

3.7 Trigger Function

Triggering is used with the transient operation; list operation and test function.There are four types of triggers you can use for IT8500+ products.

Manual: An immediate trigger is created by pressing **[Shift]+ [⊙] (**Trigger) on the front panel.

External(TTL signal): An external trigger is a TTL low signal applied to the trigger connection on the rear panel.This TTl signal must last for more than 10us.

Bus: The instrument will be triggered if command 5AH is sent via the communication interface.

Hold: The instrument will be triggered if command 9DH is sent via the communication interface.

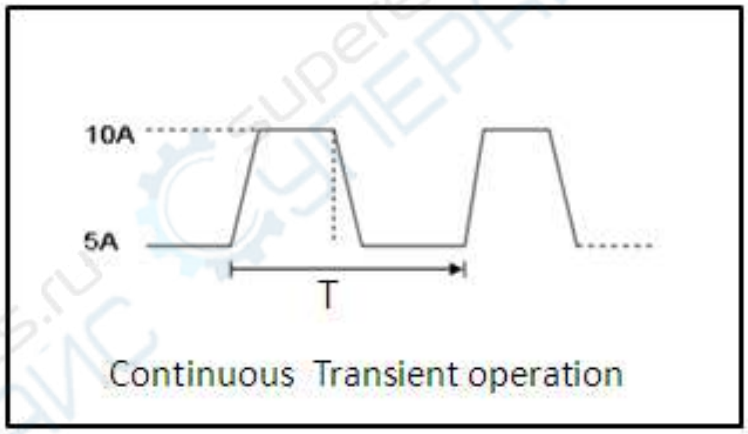
3.8 Transient Function

The transient test allows switching between two different load values.A common application is to test the dynamic characteristics of DC source.

There are three different types of transient operation: **continuous, pulse, toggled.**

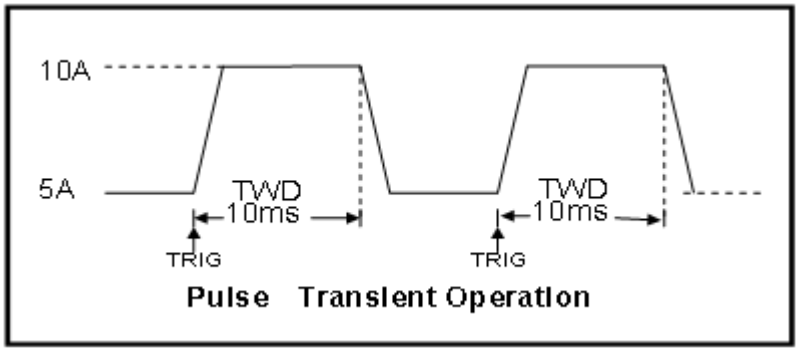
3.8.1 Continuous Mode

In continuous transient operation, the load is continuously switched between two load values.An example is shown in the following figure:



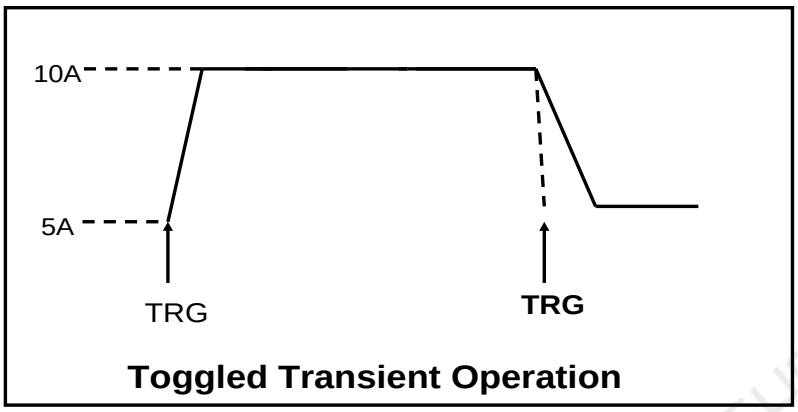
3.8.2 Pulse Mode

In pulse operatrion,the load operates at the A value that has been entered until a trigger is received.At the trigger,the load switches to the B value and stays at that level for the B timing value.Then the load switches back to the A value and stays there until another trigger is received.



3.8.3 Toggled Mode

In toggled transient operation,the load starts at the stored parameters for the mode.When a trigger is received,the load switches to B value.When another trigger is received,the load switches to the A level.It stays at the A value until another trigger is received,at which point it switches to the B value.Here's an example:



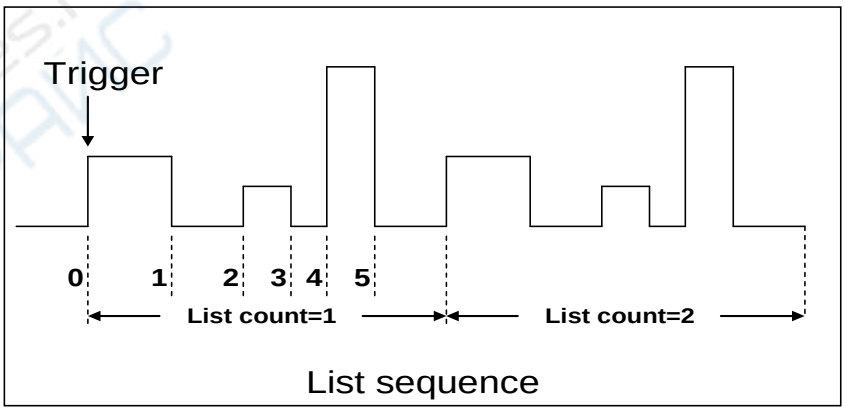
Toggled Transient Operation

3.9 LIST Operation

List mode allows you to generate a complex current sequence. Moreover, the mode.

change can be synchronized with an internal or external signal, to accomplish dynamic and precise test A list file includes following parameters: **file name, step counts (range 2-84), time width of single step(0.00005s~3600s),step value and slope**.The edited list file can be saved in nonvolatile memory, can be recalled easily.The DC load provides 7 nonvolatile registers to save list files for recall later.

In list mode,the DC load start to run the list file once receiving a trigger signal, continue to run once receiving another trigger signal.To illustrate the use of a list,we'll create a list that runs the following constant current profile on a power supply:



List sequence

3.10 Saving and Recalling Settings

We can save some often-used parameters in the non volatile memory, including working mode, voltage/current value and so on.IT8500plus series provide 100 non-volatile registers.

They are divided into 10 Memory groups: Group0-9.You can set it in the system menu.Group0 means you can save and recall parameters in 0-10 registers.

Group1 means you can save and recall parameters in 11-20 registers. Group2-Group9 can be concluded in the same manner.

Save and Recall operation

For example: the instrucment works in CC mode, setting value is 1A,

Memory Group is 6. Save “CC 1A” in the 61th register and then recall.

1. Set the parameters ok. To save the instrument's settings to a register, press **[Shift]+ [4]** (Save). Enter number **[6]** and **[1].**
2. Then press **[Enter]**, The setting is saved.
3. To recall the instrument's settings from a register, press **[Shift]+ [Enter]** (Recall).
4. Enter **[1]**.Then the setting is recalled.

NOTE

Saving operation will overwrite any values previously saved in that register.

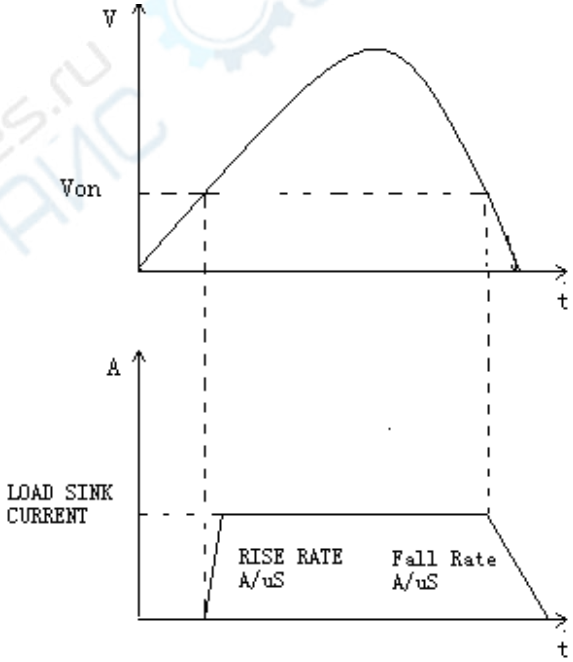
Recalling operation will light the Enter . You should press **[ESC]** to escape the recalling state before setting other parameters.

3.11 VON Function

The DC load can be set to only turn on if the voltage is above a set value(VON set) under configure menu by pressing **[Shift]+ [9].**There are two types of VON function:**Living** and **Latch**.The following will have detailed description for the two types.

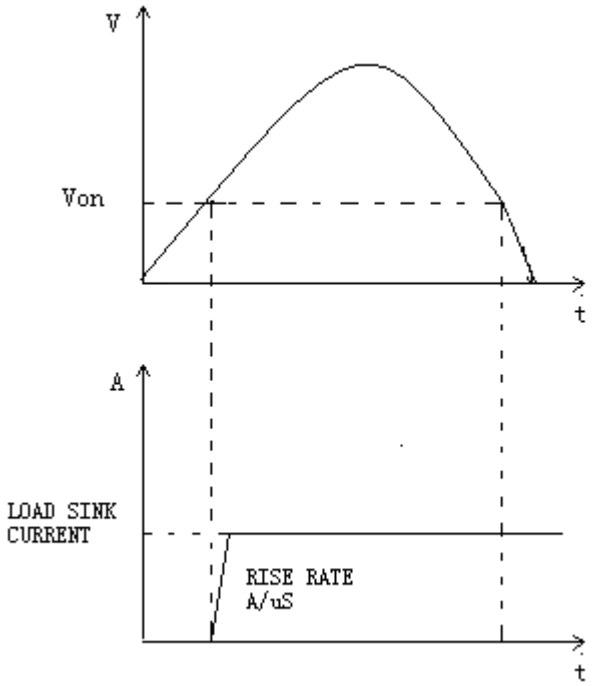
NOTE

VON set is used to ensure an electronic system under test will not have power applied unless the supply voltage is above a certain value.If you have no such testing request, do not set this value arbitrarily.If your instrument can not work normally, for example, set CC=1A, after turn on the input while the current is still 0A instead of setting value 1A, then you should check VON set firstly.If VON set is not 0V, then please modify to 0V.



VON LIVING MODE

In Living mode, when power is applied to the DC load, the voltage must rise above VON setting before the load draws current from the source.If the voltge below VON setting on the load’s terminals, the load will turn off input.



VON LATCH MODE

In Latch mode,as before,the load will turn on only when the voltage exceed VON setting,but once on,it will now stay on,even if the voltage drops to zero.

3.12 OCP Operation

OCP test process: After input voltage reaches VON point,the DC load start to draw a current from the source after a delay time.The current value will increase by a certain step size at regular intervals.Simultaneously,the DC load will judge whether the input voltage is lower than OCP voltage you've set.If it is,then the present current value will be compared to see if it is in the current range you've set,in this range,the OCP test will Pass or fail.On the contrary,the DC load will continue to increase drawing current and compare the voltage.

To start an OCP test,press **[Shift]+ [⊙]** (Trigger).

Press **[Shift]+ [CC]** (OCP) to enter OCP operation.

EDIT	OCP TEST	
	1.VON LEVEL=0.000V	Set Voltage threshold
	2.VON DELAY=0.00S	After delay certain time,the DC load starts to draw current.
	3.RANGE=3.000A	Set current range
	4.START=0.1000A	Set start current
	5.STEP=0.1000A	Set step current
	6.STEP DEL=0.20S	Set delay time of each step
	7.END=2.0000A	Set end current
	8.OCP VOLT=2.000V	Set OVP value
	9.MAX TRIP =1.5000A	Upper limit of OCP value
	10.MIN TRIP=0.9000A	Lower limit of OCP value
	SAVE OCP FILE=1	Save OCP test file (1-10)

Set the power on mode to be OCP test mode:

Operation	Display on front pannel
1.Press **[Shift]+ [8]** (system) enter into sysmtem menu	0.0000V 0.000A POWER-ON BUZZER

2.Press right key,select RUNMODE and confirm with **[Enter]** button	0.0000V 0.000A RUN <NORMAL
3.Press direction key to select OCP_TEST,Press **[Enter]** to confirm.	0.0000V 0.000A RUN <OCP_TEST
4,Press **[Esc]** button to quit the set.	0.0000V 0.000A STOP 0.000A

After above steps,press **[⊙] (**Trigger) button to run ocp test file.

Recall OCP File:

1. Press **[Shift]+ [Enter]** button to select programe file,the panel displays "CALL OCP FILE= 1.Enter the file name(1-10),press **[Enter]** button to confirm.
2. According to the following steps to escape OCP mode:press **[Shift]+ [8]** (system)------"RUNMODE"-----**[Enter]**-------select "NORMAL"mode----**[Enter]**.

3.13 OPP Operation

OPP 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,the DC load 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 in the current range you've set,in this range,the OPP test will Pass or fail.On the contrary,the power will continue to increase within the cut-off current range.And then compare OPP voltage with input voltage too.

To start a OPP test, press **[Shift]+ [⊙]** (Trigger).

Press **[Shift]+ [CW]** (OPP) to enter OPP test operation.

OPP TEST	RUN	OPP TEST	
		STOP	Run OPP test file
	CALL	OPP TEST	
		Recall OPP File=1	Recall OPP test file(range file1-file10)
	EDIT	OPP TEST	
		1.VON LEVEL=0.000V	Set Voltage on value
		2.VON DELAY=0.01S	Set Voltage on delay time
		3.RANGE=5A	Set working current range
		4.START =0.1W	Set start power value
		5.STEP =1W	Set step power value
		6.STEP DEL=1S	Set step delay time
		7.END =12W	Set cut-off power value
		8.OPP VOLT=7V	Set OPP value
		9.MAX TRIP =6.5W	Upper limit of OPP value
		10.MIN TRIP =5.6W	Lower limit of OPP value
		SAVE OPP FILE=1	Save OPP test file

Set the power on mode to be OPP test mode

Operation	Display on front pannel
1.Press **[Shift]+ [8]** (system) enter into sysmtem menu	0.0000V 0.000A POWER-ON BUZZER
2.Press right key,select RUNMODE and confirm with **[Enter]** button	0.0000V 0.000A RUN <NORMAL

3.Press direction key to select OCP_TEST,Press **[Enter]** to confirm.	0.0000V 0.000A RUN <OPP_TEST
4,Press **[Esc]** button to quit the set.	0.0000V 0.000A STOP 0.000A

After above steps,press **[⊙] (**Trigger) button to run OPP test file.

Recall OPP File

1. Press **[Shift]+ [Enter]** button to select programe file,the panel displays "CALL OPP FILE= 1.Enter the file name(1-10),press **[Enter]** button to confirm.
2. According to the following steps to escape OPP mode:press **[Shift]+ [8]** (system)------"RUNMODE"----**[Enter]**------select"NORMAL"mode----**[Enter]**.

3.14 Battery Test

IT8500plus series products test the battery capability in CC/CW/CR mode.

The test mode should be set first, and then the discharge stop conditions. There are three discharge stop conditions to be set for IT8500 plus series products. When user only need to do battery testing in one or two stop conditions, the other conditions should be set to the specified value (STOP VOLT:0V;STOP CAP:999.999AH;STOP TIMER:99999S). When the system checks the discharging time or battery voltage or capacity is equal to the setting stop value or under an insecurity state, the battery test will stop, and the E-Load will turn off. The battery voltage, discharge current, discharge time and discharged capability are displayed on the VFD while testing.

Take CC mode for example, the operations are as below:

(1)Voltage-threshold Cut Off

Step	Operation	Display
1	Press **[Shift]+ [5]** (Battery),set current range	0.0000V 0.000A RANGE = 0.00A
2	Set discharge current,for example 2A	CURRENT = 2.000A
3	Set the stop voltage,for example 2V, then press **[Enter]** to confirm.	STOP VOLT=2V
4	Set the stop capability to maximum 999.999AH, press**[Enter]** to confirm.	STOP CAP=999.999AH
5	Set the stop timer to maximum 99999S, press **[Enter]** to confirm.	STOP TIMER=99999S
6	Save the battery test to specified file	0.0000V 0.000A SAVE BATT FILE 1(1-10)
6	Press **[Enter]** to confirm	0.0000V 0.000A 0.00W I = 2.00A Off cc

(2)Capacity-threshold Cut Off

Step	Operation	Display
1	Press **[Shift]+ [5]** (Battery),set current range	0.0000V 0.000A RANGE = 0.00A
2	Set discharge current,for example 2A	CURRENT = 2.000A
3	Set the stop voltage to 0V, then press **[Enter]** to confirm.	STOP VOLT=0V
4	Set the stop capability, for example,7AH,then press **[Enter]** to confirm.	STOP CAP=7AH
5	Set the stop timer to maximum 99999S, press	STOP TIMER=99999S

	[Enter] to confirm.	
6	Save the battery test to specified file	0.0000V 0.000A SAVE BATT FILE 1(1-10)
7	Press [Enter] to confirm	0.0000V 0.000A 0.00W I = 2.00A Off cc

(3)Time-out Cut Off

Step	Operation	Display
1	Press [Shift]+ [5] (Battery),set current range	0.0000V 0.000A RANGE = 0.00A
2	Set discharge current,for example 2A	CURRENT = 2.000A
3	Set the stop voltage to 0V, then press [Enter] to confirm.	STOP VOLT=0V
4	Set the stop capability to maximum 999.999AH, press [Enter] to confirm.	STOP CAP=999.999AH
5	Set the stop timer, for example, 3800S, press [Enter] to confirm.	STOP TIMER=3800S
6	Save the battery test to specified file	0.0000V 0.000A SAVE BATT FILE 1(1-10)
7	Press [Enter] to confirm	0.0000V 0.000A 0.00W I = 2.00A Off cc

(4) Any of the Three Conditions Cut Off

Step	Operation	Display
1	Press [Shift]+ [5] (Battery),set current range	0.0000V 0.000A RANGE = 0.00A
2	Set discharge current,for example 2A	CURRENT = 2.000A
3	Set the stop voltage as needed,for example,2V,then press [Enter] to confirm.	STOP VOLT=2V
4	Set the stop capbility as needed,for example,7AH,then press [Enter] to confirm.	STOP CAP=7AH
5	Set the stop timer as needed,for example,3800S,then press [Enter] to confirm.	STOP TIMER=3800S
6	Save the battery test to specified file	0.0000V 0.000A SAVE BATT FILE 1(1-10)
7	Press [Enter] to confirm	0.0000V 0.000A 0.00W I = 2.00A Off cc

(5)Go into Battery Test Mode

Operation	Display on front pannel
1.Press [Shift]+ [8] (system) enter into sysmtem menu	0.0000V 0.000A POWER-ON BUZZER
2.Press right key,select RUNMODE and confirm with [Enter] button	0.0000V 0.000A RUN <NORMAL
3.Press direction key to select OCP_TEST,Press [Enter] to confirm.	0.0000V 0.000A RUN <BATTERY
4,Press [ESC] button to quit menu set	0.0000V 0.000A 0S 0.000AH

(6)Start Battery Test

Press [⊙] (trigger) to provide a signal to start battery test.The discharing process will be auto terminated when stop conditions are reached.

(7)Recall Battery File

Press **[Shift] + [Enter]** button to select programe file,the panel displays "RECALL BATTERY 1.Enter the file name(1-10),press **[Enter]** button to

confirm.

(8)Pannel Locked in case of Error Operations

Press **[Shift]+ [On/Off]** (Lock) button to lock the panel.In this mode,only **[Shift]** and **[On/Off]** button is enabled.

According to the following steps to escape OPP mode:

Press **[Shift]+ [8]** (system)---"RUNMODE"---**[Enter]**----select "NORMAL" mode---**[Enter]**

3.15 CR-LED Test Function

With adding of diode break-over voltage setting in the IT8500+ series electronic load under conventional CR mode, the electronic load only works when voltage applied at its both ends is higher than the diode break-over voltage to give a real simulation of diode working principle, i.e., the ripple current at real LED test.

Detailed steps of LED power test:

1. Start CR-LED Function

   Press **[Shift] + [9]** keys to enter configuration menu. Press Right Key and select "CR-LED". Press **[Enter]** key for entry. Select "on" and press **[Enter]** key. Press **[ESC]** key to exit.

2. Set CR Mode and Resistance Value

   Press **[CR]** key and set corresponding constant resistance (as R calculated below).

3. Set Vd Value

   Press **[Shift] + [CV]** keys for a series of related setting: range=7500.0, high=130V, low=0V, which may remain the original values. Vd will be set based on the calculation below.

   Calculation method of Vd and R:
   Vd=V*0.8 R=0.2V/I
   Where:
   - V: constant working voltage of load LED of LED constant current source;
   - I: output current of LED constant current source;
   - Vd: break-over voltage of diode (string);
   - R: constant resistance;

3.16 Measurement of Voltage Rise Time

The IT8500+ series electronic load is provided with special voltage rise/drop time measurement function. This function gives a simple analog of voltage rise/drop speed of oscilloscope test power.

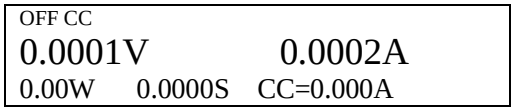
Operation methods:

Set initial Voltage and Final Voltage

1. Press **[Shift] + [9]** keys to enter configuration menu. Press Right key. Select "Measure" and press **[Enter]** key.
2. Press **[**  **]** to select "TimeV1". Press **[Enter]** key. Press numeric keys to set initial voltage value and press **[Enter]** key.
3. Press **[**  **]** to select "TimeV2". Press **[Enter]** key. Press numeric keys to set final voltage value and press **[Enter]** key.
4. Press **[ESC]** to exit setting.

Start timer function

5. Press **[Shift]** +**[8]** keys to enter system menu. Press Right key till “Displ” flicks and press **[Enter]** key.
6. Press **[**  **]** key to select “On”. Start timer function and press **[Enter]** key.
7. Press **[ESC]** to exit setting.
8. VFD second line will display time 0.0000S between power value and set value.



Measurement of Rise Time

9. Connect DC power to be tested to the input terminal of the electronic load. The power is set with a value that is higher than the set final voltage value. Keep power output in OFF status.
10. Set a constant current value on the load and open the load input.
11. Open power output.
12. The electronic load timer starts timing. After ending, time will keep stable, which is rise time of voltage.
13. Close the power output. The electronic load VFD will display voltage drop time.

3.17 Protection Features

DC load protection features include: OVP, OCP, OPP, OTP, reverse voltageprotection(LRV/RRV).

3.17.1 Over Voltage Protection (OVP)

If input voltage exceeds the voltage limit set by the user, the DC load will turn the input OFF and the buzzer will sound. The display will show **OVP.**

Operations to clear the OVP state

Disconnect the instrument under test. Press any key on the front panel, the OVP on the VFD will disappear, then the DC load exits OVP protection state.

3.17.2 Over Current Protection (OCP)

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

Hardware OCP: maximum input current of the DC load will be limited at about 110% of the current range, once the hardware OCP is activated, 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 change the DC load’s On/Off state.

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

[Shift] +**[9]** > Protect > Alimit set ON, Apoint set OCP current value, Adelay set delay time before alarm. When the software OCP function is actived, the DC load will automatically turn off, VFD displays OCP.

Operations to clear the OCP state

Disconnect the instrument under test. Press any key on the front panel, the OCP displayed on the VFD will disappear, the DC load exits OCP protection state.

3.17.3 Over Power Protection (OPP)

The DC load includes both hardware and software OPP features.

Hardware OPP: the DC load allows user to set a power protection limit in hardware which will limit the power in the range you set when the OPP occur. The hardware OPP protection will not change the ON/OFF state of the the DC load.

Software OPP: users can set the DC load's software OPP value, steps: **[Shift]** +**[9]** > **Protect > P-LIMIT > P-LIM POIN** set OPP power value, **P-LIM DELAY** set alarm delay. If the the DC load's power value reach OPP limit and after the delay time, the DC load will automatically turned off, VFD will display **OPP**.

Operations to Clear the OPP State

Disconnect the instrument under test. Press any key on the front panel, the **OPP** displayed on the VFD will disappear, the DC load exits OPP protection state.

3.17.4 Over Temperature Protection (OTP)

If internal temperature exceeds safety limits(85℃ ;185 °F), the Over temperature circuitry will be activated. The DC Load will turn off the input, the buzzer will sound, and the display will show **OTP**.

Operations to Clear the OTP State

When the DC load temperature drops to the protecting point, press any key on the front panel, the **OTP** displayed on the front panel will disappear, the DC load exits OTP protection state.

3.17.5 Reverse Voltage Protection (LRV)

This feature protects the DC load in case the DC input terminals are connected to a power source with reversed polarity. If a reverse voltage condition is detected, the buzzer will sound and will be displayed on the VFD.

Operations to Clear the Reverse Voltage State

Check whether the connection is reversed; if so disconnect the power source.

3.18 Key Lock Function

Press **[Shift]** +**[On/Off]** (Lock)key to lock the front panel keys,VFD will display a **Lock** label.In this state,setting values can not be modified,woriking mode can not be changed.Press **[Shift]** +**[On/Off]** (Lock)again will disable this function.

3.19 The Terminals on the Rear Panel

3.19.1 Remote Sensing

Remote sensing is used to counteract the effect of lead resistance. For example, if you connect a power supply to the DC Load, the voltage at the power supply's terminals will not be the same as the voltage at the DC Load's terminals if there is a current flowing because of the finite resistance from the wires. Using remote sensing, you can sense the voltage at the power supply's terminals, effectively removing the effect of the voltage drop in the connection wire.

When using remote sensing, the power displayed by the instrument includes both the power dissipated inside the instrument and the power dissipated in the

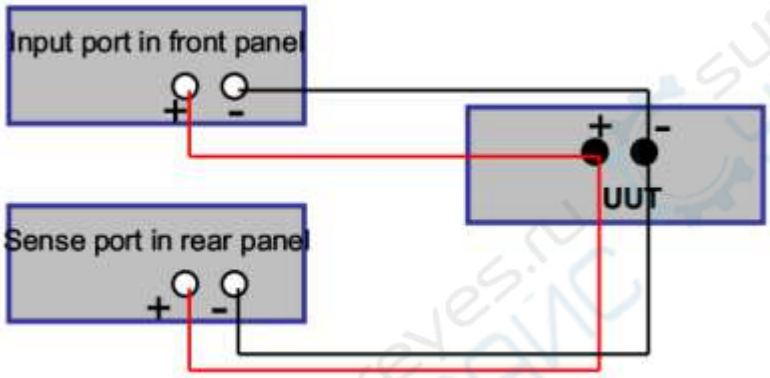
leads from the power supply to the DC Load's input terminals.

- Steps to enable remote sensing in the menu:

1. Press **[Shift]** +**[9]** key into the menu
2. VFD displays **>** , press **[Enter]** key to confirm
3. Press **[** ◀▮▶ **]** to choose **>** , press **[Enter]** key to confirm
4. Press **[** ◀▮▶ **]** to choose **>**, press **[Enter]** key to confirm, then remote sense function has been set, and VFD display indicator.

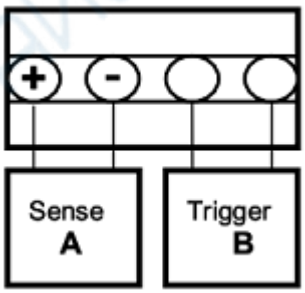
Remote Sensing: SENSE (+) and **SENSE (–)** are the remote sensing inputs**.** By eliminating the effect of the inevitable voltage drop in the DC load leads, remote sensing provides greater accuracy by allowing the DC load to regulate directly at the source's output terminals.

Wiring Diagram for Remote Sensing:



3.19.2 External Triggering

EXTERNAL:An external trigger is a TTL low signal applied to the Trigger connection on the back panel. This TTL signal must last for more than 5 ms. A trigger applied to this input can be used to change settings (voltage, current , resistance), toggle between settings in transient-toggle mode, or generate a pulse in pulse mode.



Operation to select the trigger source as external:

[Shift] +**[8]** (system)to enter the menu,use **[** ◀▮▶ **]** to select ,press **[Enter]**,and then select .Press **[ESC]** to exit the menu.

3.19.3 Current Monitoring (I Monitor)

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

3.19.4Ripple Function

IT8500plus series DC electronic loads have test ripple function.You can read ripple voltage and ripple current by sending instructions.See in ***IT8500+ programming guide***.

Chapter4 Basic Operation

4.1 Constant Current Operation

(Set the current from 0 to the current limit)

There are three ways to set the current value:

1. In CC mode, rotate Rotary knob.
2. In CC mode, input value through number keys directly , press **[Enter]** to confirm.
3. In CC mode, move the cursor to change the step value by pressing the **[** ◀▶ **]**, and then adjust the current by pressing the **[** △ ▽ **].**

To set current range, follow the steps:

Step	Operation	VFD Display
1	Press **[CC]**, and then **[Shift] +[CV]** (Setup).	RANGE=30.000A
2	Set the current range,press **[Enter]** to confirm	RANGE =10.000A
3	Press **[Esc]** to escape.	HIGH=120.00V

Note: when you set the current range to low range(within 3A),the resolution of current will rise.

4.2 Constant Voltage Operation

(Set the voltage from 0.1V to the setting voltage limit)

There are three ways to change the voltage:

1. In CV mode, rotate Rotary knob.
2. In CV mode,input value through number key boards directly,press **[Enter]** to confirm
3. In CV mode, move the stepping cursor by pressing **[** ◀▶ **]**, and then adjust the voltage by pressing **[** △ ▽ **]**.

To set voltage range, follow the steps:

Steps	Operation	VFD Display
1	Press **[CV]**, then **[Shift]** +**[CV]**.	RANGE=120.00V
2	Set the voltage range, press **[Enter]** to confirm	RANGE=10.00V
3	Press **[Esc]** to escape.	HIGH=30.000A

Note: When you set the voltage range to low range,the resolution of voltage will rise.

4.3 Constant Power Operation

(Set a value from 0 to upper limit of power)

There are three ways to set the power value:

1. In CW mode, rotate Rotary konb.
2. In CW mode, input value through number key boards directly,press **[Enter]** to confirm
3. In CW mode, move the stepping cursor by pressing **[** ◀▮▶ **]**, and then adjust the power by pressing **[** △ ▽ **]**.

To set power range, follow the steps:

Steps	Operation	VFD Display
1	Press **[CW]**, then **[Shift] +[CV]**.	RANGE=150.00W
2	Set the power range,press **[Enter]** to confirm	RANGE =100.00W
3	Press **[Esc]** to escape.	HIGH=120.00V

4.4 Constant Resistance Operation

(Allowed setting range is 0.05Ω to 7500Ω)

There are three ways to set the resistance value:

1. In CR mode, rotate Rotary knob.
2. In CR mode, input value through number key boards directly,press **[Enter]** to confirm
3. In CR mode, move the stepping cursor by pressing **[** ◀▮▶ **]**, and then adjust the resistance by pressing **[** △ ▽ **]**

To set resistance range, follow the steps:

Steps	Operation	VFD Display
1	Press **[CR],** then ● **[Shift] +[CV]** (Setup).	RANGE=7500.0Ω
2	Set the resistance range,press **[Enter]** to confirm	RANGE =2000Ω
3	Press **[Esc]** to escape.	HIGH=120.0V

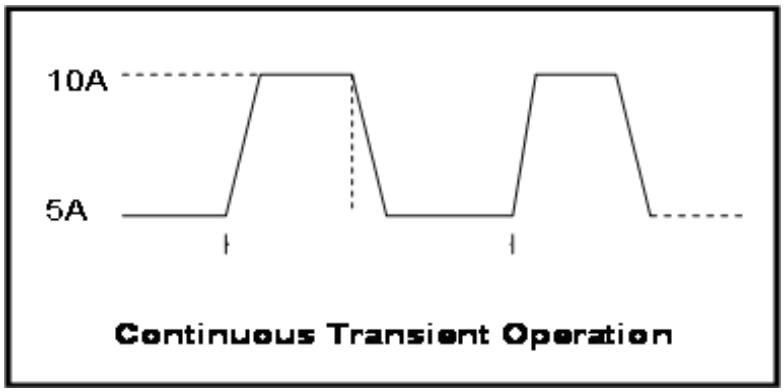
4.5 Transient Test Operation

Transient operation enables the DC load to periodically switch between two levels.

To edit a transient test file, related parameters need to be set: A level, B level, time width (only in pulse mode), frequency, duty and running mode (Continuous/Pulse/Toggled). If in CC dynamic mode, user can set current rising and falling slope additionally.

Following is an example to illustrate the three transient operations.

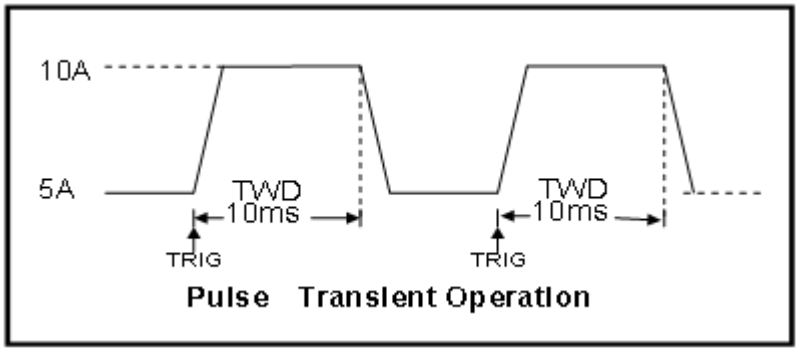
4.5.1 Continuous Transient Operation



Press **[Shift] +[2]** (Tran) to enter the transient operation setup menu:

Steps	Operation	VFD Display
1	Press **[Shift]+[2]** (Tran), move [◀▶] key to select **ON.**, press **[Enter]** to confirm.	TRAN ON OFF
2	Preess [◀▶] to select transient operation mode as CONTINUOUS (the indicator lamp Trig will be lighted)	MODE CONTINUOUS >
3	Set the rising slope,press **[Enter]** to confirm	UP=1A/uS
4	Set the descending slope,press **[Enter]** to confirm	DOWN=2/uS
5	Set level **A**,press **[Enter]** to confirm	LEVEL A=5A
6	Set level **B**,press **[Enter]** to confirm	LEVEL B=10A
7	Set the frequency,press **[Enter]** to confirm	FREQUNCE=50HZ(0.01-10000HZ)
8	Set the dutyfactor,press **[Enter]** to confirm	DUTY=98%(%0.1-99.9%)
9	Open the transient test function, mentain on the “on”selection, press **[Enter]** to confirm.	TRAN ON OFF
10	Then the VFD will display TRAN and Trig	10.0000V 0.0000A 0.00W TRAN. 0 Trig
11	Turn on the load, press **[Shift]+[⊙]** (Trigger) to trigger	
12	Press anyone of **[CC/CV/CW/CR]** button can quit the transient test,if you want to continue the test again, please repeat 1-11 steps	

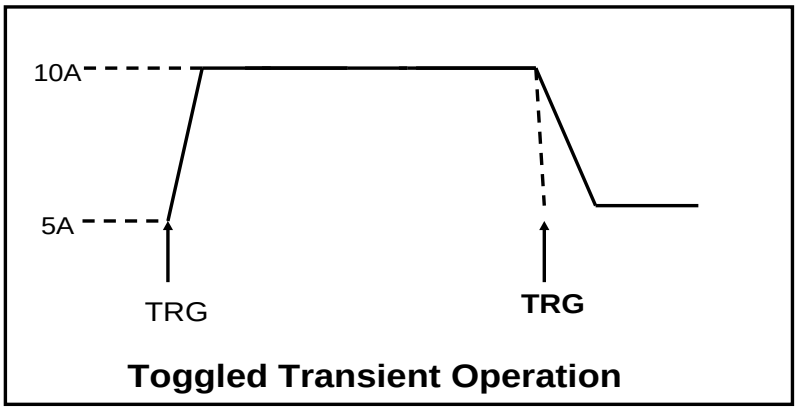
4.5.2 Pulse Transient Operation



Press **[Shift]+[2]** (Tran) enter the transient operation setup menu:

Steps	Operation	VFD Display
1	Press **[Shift]+[2]** (Tran), move **[◀▮▶]** key to select **ON**, press **[Enter]** to confirm.	**TRAN ON OFF**
2	Press **[◀▮▶]** to select transient operation mode as **PULSE**(the indicator lamp Trig will be lighted)	**MODE CONTINUOUS >**
3	Set the rising slope, press **[Enter]** to confirm	**UP=1A/US**
4	Set the descending slope,press **[Enter]** to confirm	**DOWN=2A/US**
5	Set level A,press **[Enter]** to confirm	**Level A=5.000A**
6	Set level B,press **[Enter]** to confirm	**Level B=10.000A**
7	Set the time width,press **[Enter]** to confirm	**WIDTH=5S(0.00005-3600S)**
8	Open the transient test function, mentain on the "on"selection , press **[Enter]** to confirm	**TRAN ON OFF**
9	Then the VFD will display **TRAN** and Trig	**10.0000V 0.0000A 0.00W TRAN. 0 Trig**
10	Turn on the load, press **[Shift]+[⊙]** (Trigger) to trigger	
11	Press anyone of **[CC/CV/CW/CR]** button will quit the transient test,if you want to continue the test again,please repeat 1-10 steps.	

4.5.3 Toggle Transient Operation



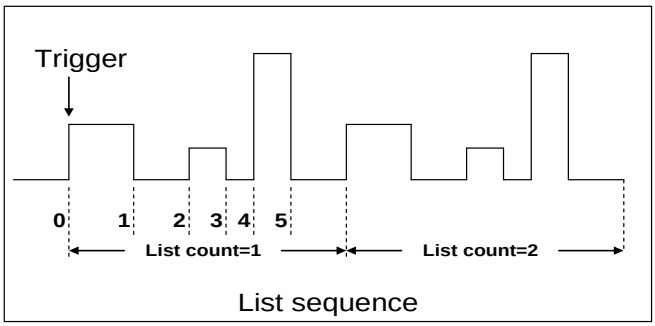
Toggled Transient Operation

Press **[Shift]+[2]** (Tran) to enter the transient operation setup menu

Steps	Operation	VFD Display
1	Press **[Shift]+[2]** (Tran), move **[◀▶]** key to select **on**, press **[Enter]** to confirm.	**TRAN On Off**
2	Set transient operation mode as **TOGGLE**(the indicator lamp Trig will be lighted)	**MODE CONTINUOUS >**
3	Set the rising slope, press **[Enter]** to confirm.	**UP=1A/US**
4	Set the descending slope,press **[Enter]** to confirm	**DOWN=2A/US**
5	Set level A, press **[Enter]** to confirm	**LEVEL A=5A**
6	Set level B, press **[Enter]** to confirm	**LEVEL B=10A**
7	Open the transient test function, function,press **[Enter]** to confirm	**TRAN ON OFF**
8	Then the VFD will display **TRAN** and Trig	**10.0000V 0.0000A 0.00W TRAN. 0 Trig**
9	Turn on the load, press **[Shift]+[⊙]** (Trigger) to trigger	
10	Press anyone of **[CC/CV/CW/CR]** button will quit the transient test,if you want to continue the test again,please repeat 1-9 steps.	

4.6 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.In the example, the output voltage and current are 10V and 3A,and the DC load is in CC mode.



Steps	Operation	VFD Display
1	Press **[Shift]+[3]** (List), make sure the ON is flashing,if not,press **[Enter]** to select ON,then press [◀▶] key to select EDIT,press **[Enter]** to confirm.	LIST ON CALL EDIT
2	Set the current range.	LIST RANGE=3A
3	Set list step count by number keys, and press **[Enter]** to confirm.	LIST STEP=2(2-84)
4	Set the first step's current, press **[Enter]** to confirm.	STEP 01 =1A
5	Set the first step's rise slope, press **[Enter]**to confirm.	STEP 01 =0.1A/US
6	Set the first step's time, such as 5S. Press **Enter** to confirm.	STEP 01 =5S
7	Set the second step's current, such as 1A, press **[Enter]** to confirm.	STEP 01 =2A
8	Set the second step's rise slope, such as 1A/uS press **[Enter]** to confirm.	STEP 01 =0.1A/US
9	Set the second step's time, such as 5S. Press **[Enter]** to confirm.	STEP 01 =5S
10	Set repeat times, press **[Enter]** to confirm.	REAPEAT =3
11	Select the position to save file, such as 1, press **[Enter]** to confirm.	SAVE LIST =1(1-7)
12	Press [◀▶] to select ON, press **[Enter]** to confirm (the Trig indicator will be light now),press **[Esc].**	LIST ON CALL EDIT
13	Turn on the DC load, press **[Shift]+[⊙]** (Trigger) to trigger.	
14	Press any function ksys if you want to quit list mode	

If you want to run a list file you've saved, please recall it first.The steps is:

Steps	Operation	VFD Display

1	Press **[Shift]+[3]** (List), make sure the **ON** is flashing,if not,press **[Enter]** to select **ON**,then press [◀▶] to select **CALL**,press **[Enter]** to confirm.	**LIST ON CALL EDIT**
2	Select the list file.Press **[Enter]** to confirm.	**RECALL LIST =1**
3	-	**LIST ON CALL EDIT**

4.7 Test Files

Test files are a generalization of lists—they let you generate a sequence of tests using different modes, mode parameters, and durations. They are useful for executing a set of tests on a device, then displaying whether the tests passed or failed. We will illustrate how to use test files by a short example.

You can edit up to 10 groups of testing files, each file has 10 steps, it can edit up to 100 steps which can be saved in EEPROM (address).

Suppose we have a small AC to DC power supply (a "wall-wart") and we want to set up an acceptance test for a number of these devices. Our test will consist of two steps:

1. Set the DC load to constant current mode to draw the rated current of 1.2A from the device. The output voltage of the device at the rated current must be between 4.4V and 4.6V.
2. Set the DC load to constant voltage 3V. The output current of the device is between 2A and 3A.
3. When the device operates into a short, the supplied current must be larger than 3.0 A.

Steps	Operation	VFD Display
1	Press **[Shift]+[6]** (Prog),	**ACTIVE =0987654321**
2	Press **[1]** ,**[2]** and **[3]**, Press **[Enter]** to confirm.	**ACTIVE =0987654YYY**
3	Select the step that needs to pause during the test. When it is paused,press **[** ▽ **]** can continue the test.	**PAUSE =NNNNNNN32Y**
4	Step 3 short circuit testing, press **[3]**. And press **[Enter]** to confirm.	**SHORT =NNNNNNNY21**
5	Set Ton for the first step, if you want to load on 2S, press **[2]**, and then press **[Enter]** to confirm. Ton range 0~60S	**SEQ01 ON =2S**
6	Set Toff for the first step, if you want to load off 2S, press **[2]**, then press **[Enter]** to confirm Toff range 0~60S	**SEQ01 OFF =2S**
7	Set testing delay time, range 0~60S e.g. 1S, press **[1].**	**SEQ01 P/F =1S**

Steps	Operation	VFD Display
8	Set Ton for the second step, if you want to load 2S, press **[2]**, then press **[Enter]** to confirm	SEQ02 ON =2S
9	Set Toff of the second step, if you need 2S, press **[2]**, and then press **[Enter]** to confirm.	SEQ02 OFF =2S
10	Set testing delay time of the second step, e.g. 1S, press **[1]**	SEQ02 P/F =1S
11	Set Ton for the third step, if you want to load on 3S, press **[3]**, then press **[Enter]**to confirm	SEQ03 ON =3S
12	Set Toff of the third step, if you need 2S, press **[2]**, then press **[Enter]** to confirm.	SEQ03 OFF =2S
13	Set testing delay time of the third step, e.g. 2S, press **[2]**.	SEQ03 P/F =2S
14	set start voltage.Please refer to “function of auto start voltage”.	AUTO START=0.000V
15	Set stop condition	STOP COMP FAILURE

Function of Auto Start Voltage:

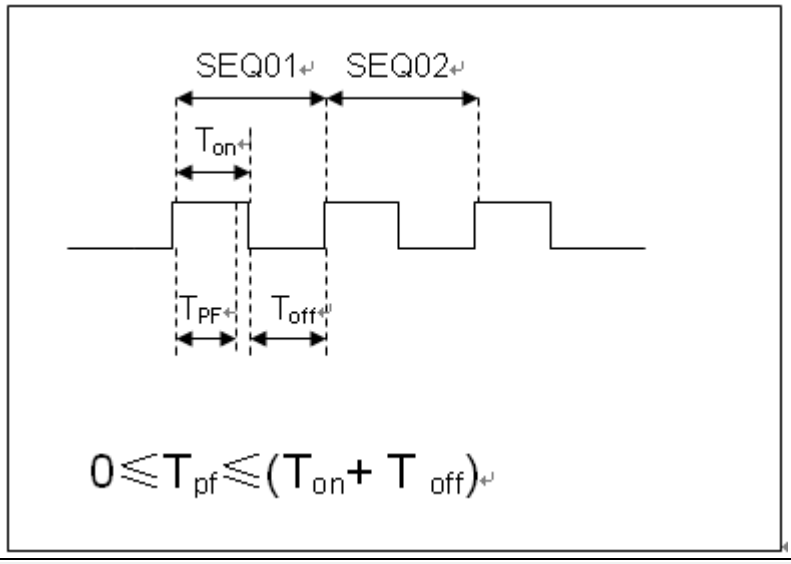
1. Auto start=0V.

Auto test file start to run when receive a trigger signal by pressing **[shift]+[trigge]**r or providing a external trigger signal.

2. Auto start is not equal to 0V(Take 2V as an example)

In this condition,user only need to connect the charger to input termianls of E-load.The unit can auto start to run test file when detect a rising edge from 0-2V.Auto start voltage is not suggested to be a big value.2V is suitable.

Ton, Toff and Tpf (P/F) Relation:



Tpf is the delay time for a step

15	Set stop conditions: **COMP** means stop test when all the steps are completed, **FAILURE** means stop test when the testing fails. Press **[Enter]** key to confirm.	**STOP COMP FAILURE**
16	Select the test file to link if you'd like to. The linked file must be saved before. 0 stands for not linking to other files. Press **[Enter]** key to confirm.	**CHAIN PROGRAM =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 Sequence	1	2	3	4	5	6	7	8	9	10
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

17	Save the edited files in EEPROM, you can save up to 10 groups of files, e.g please press **[1]** to save the edited file in group 1, and then press **[Enter]** to confirm.	**SAVE PROGRAM =1(1-10)**
18	Select a operation mode and then press **[Shift]+[CV]** to set related parameters	**10.0000V 0.0000A 0.00W CC=1.000A**
19	Edit the three steps of the test file, details refer to below procedure. After all the steps are set , Press **[ESC]** to exit setup, and then press **[Shift]+[4]** to save.	
	You need to recall the test file before runing it	

Set the steps of a test file in the example

CC Mode, 1.2A, Voltage Range 4.4V~4.6V

Step	Operation	VFD Display
1	Press **[CC]** button,and then **[Shift)+[CV]** (Setup) to enter the setting interface	**RANGE=30.000A CC**
2	Set the current range,press **[Enter]** to confirm	**RANGE =1.2A CC**
3	set the upper limit of voltage, press **[Enter]** to confirm	**HIGH=4.6V CC**
4	Set the lower limit of voltage, press **[Enter]** to confirm	**LOW=4.4V CC**
5	Set the rise speed of current, press **[Enter]** to confirm	**UP=1A/uS CC**
6	Set the fall speed of current, press **[Enter]** to confirm	**DOWN=1A/uS CC**
7	Finish the setup	**10.0000V 0.000A 0.00W CC=0.000A**

CV Mode, 3V, Current Range 2A~3A

Steps	Operation	VFD Display
1	Press **[CV]** button,press **[Shift]+[CV]** to set related parameters	RANGE=120.00V
2	Set the voltage range,press **[Enter]** to confirm	RANGE=3.00V
3	set the upper limit of current,press **[Enter]** to confirm	HIGH=3A
4	Set the lower limit of current,press [**Enter]** to confirm	LOW=2A
5	Finish the setup	10.0000V 0.000A 0.00W CV=10V

The CW and CR is set as the same way:

- CW Mode

Steps	Operation	VFD Display
1	Press **[CW]** button,press **[Shift]+[CV]** to set related parameters	RANGE=150.00W
2	Set the power range,press **[Enter]** to confirm	RANGE =1.00W
3	Set the upper limit of voltage,press **[Enter]** to confirm	HIGH=120.00V
4	Set the lower limit of voltage,press **[Enter]** to confirm	LOW=0.000V
5	Finish the setup	10.0000V 0.000A 0.00W CW=1.00W

- CR Mode

Steps	Operation	VFD Display
1	Press **[CR]** button,press **[Shift]+[CV]**(Setup) to set related parameters	RANGE=7500.0Ω
2	Set the resistance range,press **[Enter]** to confirm	RANGE =2Ω
3	set the upper limit of voltage,press **[Enter]** to confirm	HIGH=120.0V
4	Set the lower limit of voltage,press **[Enter]** to confirm	LOW=0.000V
5	Finish the setup	10.0000V 0.000A 0.00W CR=2.000Ω

- Go into Autotest Mode

Operation	Display on Front Pannel
1.Press **[Shift]+[8]** (system) enter into sysmtem menu	0.0000V 0.000A POWER-ON BUZZER
2.Press right key,select RUNMODE and confirm with **[Enter]** button	0.0000V 0.000A RUN <NORMAL

3.Press direction key to select OCP_TEST,Press **[Enter]** to confirm.	0.0000V 0.000A RUN <PROG_TEST
4,Press **[Esc]** button to quit menu set	0.0000V 0.000A P01

According to the following steps to escape OPP mode:

Press **[Shift]+[8]** (system)---"RUNMODE"---**[Eneter]**----select "NORMAL" mode---**[Enter].**

(6)Start Auto Test File

Press **[⊙]**(trigger) to provide a signal to start auto test file.The discharing process will be auto terminated when stop conditions are reached.

(7)Recall Test File

Press **[Shift]+[Enter]** button to select programe file,the panel displays "RECALL PROGRAM= 1.Enter the file name(1-10),press [**Enter]** button to confirm.

If you need a pause, please press **[Shift]+[0]** (pause).Press **[▽]** can continue the test.

Chapter5 Communication Interfaces

DB9 in the rear panel of the DC load could connect with RS-232 through on TTL connector. The following description may help you to know how to control the output of the DC load through PC.

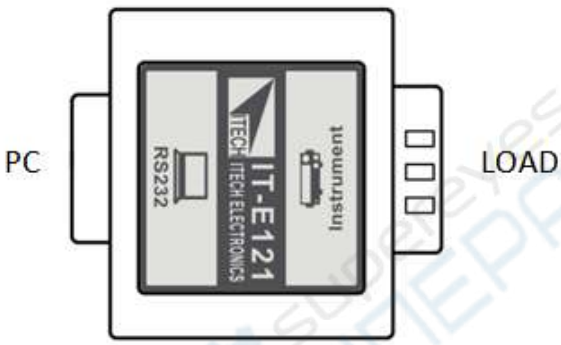
WARNING: Don't connect the DC load's DB9 connector to a standard RS232 instrument; doing so may damage the instrument.

5.1Communication Modules Intruduction

IT-E121 Communication Module

The DB9 interface connector on the rear panel of the DC load is TTL voltage level; you can use the communication module IT-E121 and an a standard RS232 extension cable to connect the DB9 interface connector of the DC load and the RS-232 interface connector of computer for the communication.

IT-E121 communication cable

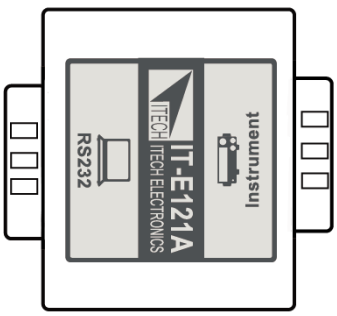


IT-E121A Communication Module

The DB9 interface connector on the rear panel of the DC load is TTL voltage level; you can use the communication module IT-E121A and an a standard RS232 extension cable to connect the DB9 interface connector of the DC load and the RS-232 interface connector of computer for the communication.

IT-E121A is derived on the basis of IT-E121,the main difference between them is that the DB9 interface connector of the RS232 changes from female to male ,so that can be directly connected to the standard LAN interface.

IT-E121A communication cable

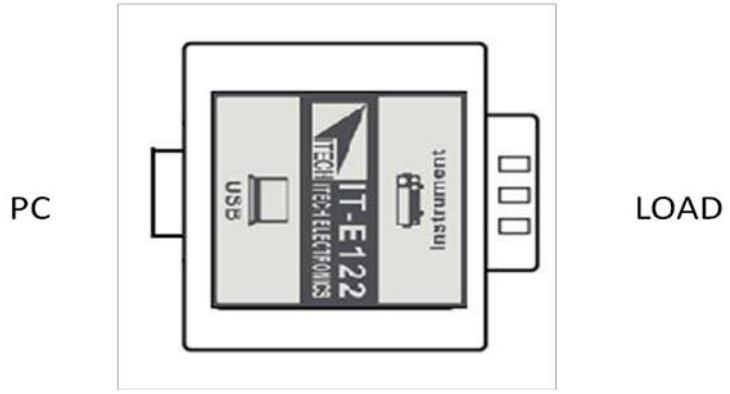


IT-E122 Communication Module

The DB9 interface connector on the rear panel of the DC load is TTL voltage level;

IT-E122 has a USB interface on one end,you can use IT-E122 and an a standard USB extension cable to connect the DB9 interface connector of the DC load and the USB interface connector of computer for the communication.

IT-E122 communication cable



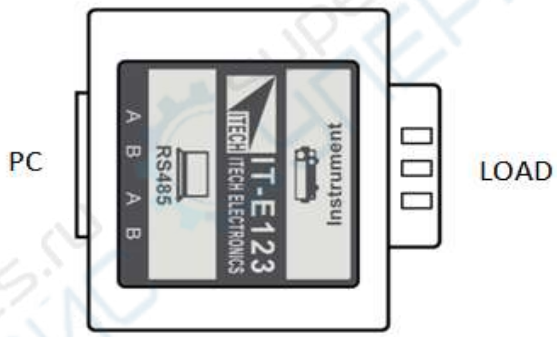
IT-E123 Communication Module

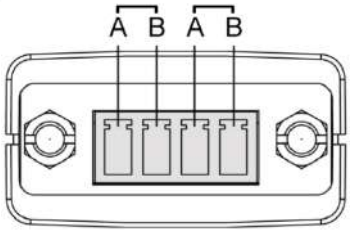
The DB9 interface connector on the rear panel of the DC load is TTL voltage level;

The interface on both side port of IT-E123 are DB9 interface and RS485 interface, you

can use the communication module IT-E123 and an a standard RS485-RS232 conversion cable to connect the DB9 interface connector of the DC load and the RS-232 interface connector of computer for the communication.

IT-E123 communication cable





RS485 pins

5.2 Communication with PC

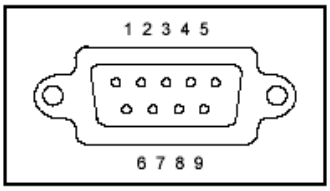
Before using the remote operation mode, please make sure that the baud rate and communication address in the DC load are the same as in the computer software, otherwise, the communication will fail, you can change the baud rate and communication address from the front panel or from computer.

DB9 Serial Port

In order for the computer to communicate with the DC load, both must be set to the same RS-232 settings. These communication settings are:

1. Address: the range is from 0 to 31, default setting is 0
2. Baud rate: 4800,9600,19200 and 38400 are selectable, default setting is 9600. Refer to chaptor 1.7.
3. Data bit: 8 bit
4. Stop bit: 1
5. Parity: None,Even, Odd, default is None, refer to chaptor1.7.

Parity=None	Start Bit	8 Data Bits	Stop Bit



RS-232

IT8514B+/IT8514C+/IT8516C+ series electronic load have a DB9 interface on rear panel. Connect E-load and computer by cable of COM ends (DB9). Composite key **[Shift]+[8]** on front board can be used to enter system menu for activation.

- RS-232 Interface

In RS-232 interface, all SCPI commands can be used for programming. If RS-232 interface is selected, in accordance with internal connection of data terminal equipment (DTE) and data communication equipment (DCE) as defined in EIA RS-232, the load is connected to another DTE (e.g., PC COM interface) with direct-connected Modem cable.

RS232 Pins of Plug

Base Pin Number	Description
1	No conjunction
2	TXD, data transmission
3	RXD, data receiving
4	No conjunction
5	GND, grounding
6	No conjunction
7	CTS, clear to send
8	RTS, request to send
9	No conjunction

- Communication Setup

Please ensure the PC and the load have the same configuration in the following items.

Baudrate: 9600(4800、9600、19200、38400).You could enter the system menu

to set the baudrate.

Data bit: 8

Stop bit: 1

Parity bit: (none,even,odd)

EVEN 8 data bits have even parity

ODD 8 data bits have odd parity

NONE 8 data bits have no parity

Native machine address: (0 ~31, factory default is 0)

Start Bit	8 Data Bits	Parity=None	Stop Bit

5.3USB Interface

Connect the load and the computer using a cable with two USB interfaces (each end). All functions of the load can be programmed via USB.

After connecting the load and computer by USB, you need to install IT-E122 driver or IT-E132 driver (see in ITECH CD or contact ITECH agent). The device manager of PC will display 'Prolific USB-to-Serial COM Port' after installing.

Notes: Only IT8514B+/8514C+/IT8516C+ models have the USB commucation interface. Just use USB line to connect in commucation. (Please don't connect DB9 interface at the same time). Don't need to set the menu.

Chapter6 Specifications

Specifications

Model		IT8511+		IT8512+	
Rated value (0~40 ℃)	input voltage	0~120V		0~120V	
	input current	0~3A	0~30A	0~3A	0~30A
	input power	150W		300W	
	Minimum operation value	0.14V at 3A	1.4V at 30A	0.12V at 3A	1.2V at 30A
CV mode	range	0.1~18V	0.1~120V	0.1~18V	0.1~120V
	resolution	1mV	10mV	1mV	10mV
	accuracy	±(0.05%+0.02%FS)	±(0.05%+0.025%FS)	±(0.05%+0.02%FS)	±(0.05%+0.025%FS)
CC mode	range	0~3A	0~30A	0~3A	0~30A
	resolution	0.1mA	1mA	0.1mA	1mA
	accuracy	±(0.05%+0.05%FS)			
CR mode *1	range	0.05Ω~10Ω	10Ω~7.5KΩ	0.05Ω~10Ω	10Ω~7.5KΩ
	resolution	16bit		16bit	
	accuracy	0.01%+0.08S *2	0.01%+0.0008S	0.01%+0.08S *2	0.01%+0.0008S
CP mode *3	range	150W		300W	
	resolution	10mW		10mW	
	accuracy	±(0.1%+0.1%FS)		±(0.1%+0.1%FS)	
Dynamic mode					
CC					
T1&T2		20uS~3600S /Res:1 uS		20uS~3600S /Res:1 uS	
accuracy		2uS±100ppm		2uS±100ppm	
Rising/Falling slope *4		0.0001~0.2A/uS	0.001~1.5A/uS	0.0001~0.2A/uS	0.001~1.5A/uS
minimum rise time *5		≒10uS	≒10uS	≒10uS	≒10uS
Measuring range					
Readback voltage	range	0~18V	0~120V	0~18V	0~120V
	resolution	0.1 mV	1 mV	0.1 mV	1 mV
	accuracy	±(0.025%+0.025%FS)			
Readback current	range	0~3A	0~30A	0~3A	0~30A
	resolution	0.1mA	1mA	0.1mA	1mA
	accuracy	±(0.05%+0.05%FS)		±(0.05%+0.05%FS)	
Readback power	range	150W		300W	
	resolution	10mW		10mW	
	accuracy	±(0.1%+0.1%FS)		±(0.1%+0.1%FS)	
Protection range					
OPP Protection		≒160W		≒320W	
OCP Protection		≒3.3A	≒33A	≒3.3A	≒33A
OVP Protection		≒125V		≒125V	
OTP Protection		≒85℃		≒85℃	
Specification					
Short	current(CC)	≒3.3/3A	≒33/30A	≒3.3/3A	≒33/30A
	voltage(CV)	0V	0V	0V	0V

	resistance(CR)	≒45mΩ	≒45mΩ	≒40mΩ	≒40mΩ
input Impendance	150KΩ			150KΩ	
Dimension	214.5mm*88.2mm*354.6mm			214.5mm*88.2mm*354.6mm	

Model		**IT8511A+**		**IT8512A+**	
Rated value (0~40 ℃)	input voltage	0~150V		0~150V	
	input current	0~3A	0~30A	0~3A	0~30A
	input power	150W		300W	
	Minimum operation value	0.25V at 3A	2.5V at 30A	0.14V at 3A	1.4V at 30A
CV mode	range	0.1~18V	0.1~150V	0.1~18V	0.1~150V
	resolution	1mV	10mV	1mV	10mV
	accuracy	±(0.05%+0.02%FS)	±(0.05%+0.025%FS)	±(0.05%+0.02%FS)	±(0.05%+0.025%FS)
CC mode	range	0~3A	0~30A	0~3A	0~30A
	resolution	0.1mA	1mA	0.1mA	1mA
	accuracy	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)
CR mode *1	range	0.05Ω~10Ω	10Ω~7.5KΩ	0.05Ω~10Ω	10Ω~7.5KΩ
	resolution	16bit		16bit	
	accuracy	0.01%+0.08S *2	0.01%+0.0008S	0.01%+0.08S *2	0.01%+0.0008S
CP mode *3	range	150W		300W	
	resolution	10mW		10mW	
	accuracy	±(0.1%+0.1%FS)		±(0.1%+0.1%FS)	
Dynamic mode(CC mode)					
T1&T2		20uS~3600S /Res:1 uS		20uS~3600S /Res:1 uS	
accuracy		2uS±100ppm		2uS±100ppm	
Rising/Falling slope *4		0.0001~0.2A/uS	0.001~1.5A/uS	0.0001~0.2A/uS	0.001~1.5A/uS
minimum rise time *5		≒10uS	≒10uS	≒10uS	≒10uS
Measuring range					
Readback voltage	range	0~18V	0~150V	0~18V	0~150V
	resolution	0.1 mV	1 mV	0.1 mV	1 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	0~3A	0~30A	0~3A	0~30A
	resolution	0.1mA	1mA	0.1mA	1mA
	accuracy	±(0.05%+0.05%FS)		±(0.05%+0.05%FS)	
Readback power	range	150W		300W	
	resolution	10mW		10mW	
	accuracy	±(0.1%+0.1%FS)		±(0.1%+0.1%FS)	
Protection range					
OPP Protection		≒160W		≒320W	
OCP Protection		≒3.3A	≒33A	≒3.3A	≒33A
OVP Protection		≒160V		≒160V	
OTP Protection		≒85℃		≒85℃	

Specification					
Short	current(CC)	≒3.3/3A	≒33/30A	≒3.3/3A	≒33/30A
	voltage(CV)	0V	0V	0V	0V
	resistance(CR)	≒80mΩ	≒80mΩ	≒40mΩ	≒40mΩ
input Impendance		150KΩ		150KΩ	
Dimension		214.5mm*88.2mm*354.6mm		214.5mm*88.2mm*354.6mm	

Model		IT8511B+	
Rated value (0~40 ℃)	input voltage	0~500V	
	input current	0~3A	0~10A
	input power	150W	
	Minimum operation value	1.2V at 3A	4V at 10A
CV mode	range	0.1~50V	0.1~500V
	resolution	1mV	10mV
	accuracy	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)
CC mode	range	0~3A	0~10A
	resolution	0.1mA	1mA
	accuracy	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)
CR mode*1	range	0.5Ω~10Ω	10Ω~7.5KΩ
	resolution	16bit	
	accuracy	0.01%+0.08S *2	0.01%+0.0008S
CP mode *3	range	150W	
	resolution	10mW	
	accuracy	0.1%+0.2%FS	
Dynamic mode			
Dynamic mode		CC mode	
	T1&T2	20uS~3600S /Res:1 uS	
	accuracy	2uS±100ppm	
	Rising/Falling slope*4	0.0001~0.2A/uS	0.001~0.8A/uS
	minimum rise time *5	10uS	10uS
Measuring range			
Readback voltage	range	0~50V	0~500V
	resolution	1 mV	10 mV
	accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Readback current	range	0~3A	0~10A
	resolution	0.1mA	1mA
	accuracy	±(0.05%+0.05%FS)	
Readback power	range	150W	
	resolution	10mW	
	accuracy	±(0.1%+0.2%FS)	
Protection range			
OPP Protection		≒160W	
OCP Protection		≒3.3A	11A
OVP Protection		530V	
OTP Protection		85℃	

Specification			
Short	current(CC)	3.3/3A	11/10A
	voltage(CV)	0V	0V
	resistance(CR)	400mΩ	400mΩ
input Impendance	1MΩ		
Dimension	214.5mm*88.2mm*354.6mm		

Model		IT8512B+		IT8512C+	
Rated value (0~40 ℃)	input voltage	0~500V		0~120V	
	input current	0~3A	0~15A	0~6A	0~60A
	input power	300 W		300 W	
	Minimum operation value	0.6V at 3A	3V at 15A	0.25V at 6A	2.5V at 60A
CV mode	range	0.1~50V	0.1~500V	0.1~18V	0.1~120V
	resolution	1mV	10mV	1mV	10mV
	accuracy	±(0.05%+0.02%FS)	±(0.05%+0.025%FS)	±(0.05%+0.02%FS)	±(0.05%+0.025%FS)
CC mode	range	0~3A	0~15A	0~6A	0~60A
	resolution	0.1mA	1mA	0.1mA	1mA
	accuracy	±(0.05%+0.05%FS)			
CR mode *1	range	0.3Ω~10Ω	10Ω~7.5KΩ	0.3Ω~10Ω	10Ω~7.5KΩ
	resolution	16bit		16bit	
	accuracy	0.01%+0.08S *2	0.01%+0.0008S	0.01%+0.08S *2	0.01%+0.0008S
CP mode *3	range	300W		300W	
	resolution	10mW		10mW	
	accuracy	±(0.1%+0.1%FS)		±(0.1%+0.1%FS)	
Dynamic mode					
CC mode					
T1&T2		20uS~3600S /Res:1 uS		20uS~3600S /Res:1 uS	
accuracy		2uS±100ppm		2uS±100ppm	
Rising/Falling slope *4		0.0001~0.2A/uS	0.001~0.8A/uS	0.0001~0.3A/uS	0.001~3A/uS
minimum rise time *5		≒10uS	≒10uS	≒10uS	≒10uS
Measuring range					
Readback voltage	range	0~50V	0~500V	0~18V	0~120V
	resolution	1 mV	10mV	1 mV	10mV
	accuracy	±(0.025%+0.025%FS)			
Readback current	range	0~3A	0~15A	0~6A	0~60A
	resolution	0.1mA	1mA	0.1mA	1mA
	accuracy	±(0.05%+0.05%FS)		±(0.05%+0.05%FS)	
Readback power	range	300W		300W	
	resolution	10mW		10mW	
	accuracy	±(0.1%+0.1%FS)		±(0.1%+0.1%FS)	
Protection range					
OPP Protection		≒320W		≒320W	
OCP Protection		≒3.3A	≒16A	≒6.5A	≒65A
OVP Protection		≒530V		≒125V	

OTP Protection	≒85℃			≒85℃	
Specification					
Short	current(CC)	≒3.3/3A	≒16/15A	≒6.5/6A	≒65/60A
	voltage(CV)	0V	0V	0V	0V
	resistance(CR)	≒180mΩ	≒180mΩ	≒40mΩ	≒40mΩ
input Impendance	1MΩ			150KΩ	
Dimension	214.5mm*88.2mm*354.6mm			214.5mm*88.2mm*354.6mm	

Model		**IT8512H+**	
Rated value (0~40 ℃)	input voltage	0~800V	
	input current	0~1A	0~5A
	input power	300W	
	Minimum operation value	1.4V at 1A	7V at 5A
CV mode	range	0.1~80V	0.1~800V
	resolution	1mV	10mV
	accuracy	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)
CC mode	range	0~1A	0~5A
	resolution	0.1mA	1mA
	accuracy	±(0.05%+0.1%FS)	±(0.05%+0.05%FS)
CR mode*1	range	2Ω~10Ω	10Ω~7.5KΩ
	resolution	16bit	
	accuracy	0.01%+0.08S *2	0.01%+0.0008S
CP mode *3	range	300W	
	resolution	10mW	
	accuracy	0.2%+0.2%FS	
Dynamic mode			
Dynamic mode		CC mode	
	T1＆T2	20uS~3600S /Res:1 uS	
	accuracy	2uS±100ppm	
	Rising/Falling slope*4	0.0001~0.04A/uS	0.001~0.2A/uS
	minimum rise time *5	≒20uS	≒20uS
Measuring range			
Readback voltage	range	0~80V	0~800V
	resolution	1 mV	10 mV
	accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Readback current	range	0~1A	0~5A
	resolution	0.1mA	1mA
	accuracy	±(0.05%+0.05%FS)	
Readback power	range	300W	
	resolution	10mW	
	accuracy	±(0.2%+0.2%FS)	
Protection range			
OPP Protection	≒320W		
OCP Protection	≒1.1A		≒5.5A

OVP Protection	≒850V		
OTP Protection	≒85℃		
Specification			
Short	current(CC)	≒1.1/1A	≒5.5/5A
	voltage(CV)	0V	0V
	resistance(CR)	≒1.4Ω	
input Impendance	2MΩ		
Dimension	214.5mm*88.2mm*354.6mm		

Model		**IT8513A+**	
Rated value (0~40 ℃)	input voltage	0~150V	
	input current	0~6A	0~60A
	input power	400W	
	Minimum operation value	0.25V at 6A	2.5V at 60A
CV mode	range	0.1~18V	0.1~150V
	resolution	1mV	10mV
	accuracy	±(0.05%+0.02%FS)	±(0.05%+0.025%FS)
CC mode	range	0~6A	0~60A
	resolution	0.1mA	1mA
	accuracy	±(0.05%+0.05%FS)	±(0.05%+0.05%FS)
CR mode*1	range	0.1Ω~10Ω	10Ω~7.5KΩ
	resolution	16bit	
	accuracy	0.01%+0.08S *2	0.01%+0.0008S
CP mode *3	range	400W	
	resolution	10mW	
	accuracy	±(0.2%+0.2%FS)	
Dynamic mode			
Dynamic mode		CC mode	
	T1＆T2	20uS~3600S /Res:1 uS	
	accuracy	2Us+100ppm	
	Rising/Falling slope*4	0.001~0.15A/uS	0.01~1 A/uS
	minimum rise time *5	50uS	60uS
Measuring range			
Readback voltage	range	0~18V	0~150V
	resolution	0.1 mV	1mV
	accuracy	±(0.025%+0.025%FS)	±(0.025%+0.025%FS)
Readback current	range	0~6A	0~60A
	resolution	0.1mA	1mA
	accuracy	±(0.05%+0.05%FS)	
Readback power	range	400W	
	resolution	10mW	
	accuracy	±(0.2%+0.2%FS)	
Protection range			
OPP	≒420W		

Protection			
OCP Protection	≒6.6A		66A
OVP Protection	165V		
OTP Protection	85℃		
Specification			
Short	current(CC)	6.6/6A	66/60A
	voltage(CV)	0V	
	resistance(CR)	30mΩ	
input Impendance	280KΩ		
Dimension	214.5mm*88.2mm*453.5mm		

Model		**IT8513C+**		**IT8514C+**	
Rated value (0~40 ℃)	input voltage	0~120V		0~120V	
	input current	0~12A	0~120A	0~24A	0~240A
	input power	600 W		1500W	
	Minimum operation value	0.2V at 12A	2V at 120A	0.25V at 24A	2.5V at 240A
CV mode	range	0.1~18V	0.1~120V	0.1~18V	0.1~120V
	resolution	1mV	10mV	1mV	10mV
	accuracy	±(0.05%+0.02%FS)	±(0.05%+0.025%FS)	±(0.05%+0.02%FS)	±(0.05%+0.025%FS)
CC mode	range	0~12A	0~120A	0~24A	0~240A
	resolution	1mA	10mA	1mA	10mA
	accuracy	±(0.05%+0.05%FS)		±(0.1%+0.1%FS)	
CR mode *1	range	0.05Ω~10Ω	10Ω~7.5KΩ	0.05Ω~10Ω	10Ω~7.5KΩ
	resolution	16bit		16bit	
	accuracy	0.01%+0.08S *2	0.01%+0.0008S	0.02%+0.08S *2	0.02%+0.0008S
CP mode *3	range	600W		1500W	
	resolution	10mW		10mW	
	accuracy	±(0.2%+0.2%FS)		±(0.2%+0.2%FS)	
Dynamic mode					
CC mode					
T1&T2		100uS~3600S /Res:1 uS		100uS~3600S /Res:1 uS	
accuracy		10uS±100ppm		10uS±100ppm	
Rising/Falling slope *4		0.001~0.2A/uS	0.01~1.6A/uS	0.001~0.3A/uS	0.01~3.2A/uS
minimum rise time *5		≒60uS	≒60uS	≒60uS	≒60uS
Measuring range					
Readback voltage	range	0~18V	0~120V	0~18V	0~120V
	resolution	0.1 mV	1mV	0.1 mV	1mV
	accuracy	±(0.025%+0.025%FS)			
Readback current	range	0~12A	0~120A	0~24A	0~240A
	resolution	1mA	10mA	1mA	10mA
	accuracy	±(0.05%+0.05%FS)		±(0.05%+0.05%FS)	
Readback power	range	600W		1500W	
	resolution	10mW		10mW	

	accuracy	±(0.2%+0.2%FS)		±(0.2%+0.2%FS)	
Protection range					
OPP Protection	≒620W			≒1550W	
OCP Protection	≒13A	≒130A		≒26.7A	≒267A
OVP Protection	≒125V			≒125V	
OTP Protection	≒95℃			≒85℃	
Specification					
Short	current(CC)	≒13/12A	≒130/120A	≒26.7/24A	≒267/240A
	voltage(CV)	0V	0V	0V	0V
	resistance(CR)	≒15mΩ	≒15mΩ	≒8mΩ	≒8mΩ
input Impendance	150KΩ			150KΩ	
Dimension	214.5mm*88.2mm*453.5mm			436.5mm*88.2mm*463.5mm	

Model		**IT8514B+**		**IT8516C+**	
Rated value (0~40 ℃)	input voltage	0~500V		0~120V	
	input current	0~6A	0~60A	0~24A	0~240A
	input power	1500 W		3000W	
	Minimum operation value	0.25V at 6A	2.5V at 60A	0.15V at 24A	1.5V at 240A
CV mode	range	0.1~50V	0.1~500V	0.1~18V	0.1~120V
	resolution	1mV	10mV	1mV	10mV
	accuracy	±(0.05%+0.02%FS)	±(0.05%+0.025%FS)	±(0.05%+0.02%FS)	±(0.05%+0.025%FS)
CC mode	range	0~6A	0~60A	0~24A	0~240A
	resolution	1mA	10mA	1mA	10mA
	accuracy	±(0.05%+0.05%FS)		±(0.1%+0.1%FS)	
CR mode *1	range	0.05Ω~10Ω	10Ω~7.5KΩ	0.05Ω~10Ω	10Ω~7.5KΩ
	resolution	16bit		16bit	
	accuracy	0.02%+0.08S *2	0.02%+0.0008S	0.02%+0.08S *2	0.02%+0.0008S
CP mode *3	range	1500W		3000W	
	resolution	10mW		10mW	
	accuracy	±(0.2%+0.2%FS)		±(0.2%+0.2%FS)	
Dynamic mode					
CC mode					
T1&T2		100uS~3600S /Res:1 uS		120uS~3600S /Res:1 uS	
accuracy		10uS±100ppm		10uS±100ppm	
Rising/Falling slope *4		0.001~0.15A/uS	0.01~0.8A/uS	0.001~0.3A/uS	0.01~2.8A/uS
minimum rise time *5		≒60uS	≒60uS	≒70uS	≒70uS
Measuring range					
Readback voltage	range	0~50V	0~500V	0~18V	0~120V
	resolution	0.1 mV	1mV	0.1 mV	1mV
	accuracy	±(0.025%+0.025%FS)			
Readback current	range	0~6A	0~60A	0~24A	0~240A
	resolution	1mA	10mA	1mA	10mA
	accuracy	±(0.05%+0.05%FS)		±(0.1%+0.1%FS)	
Readback power	range	1500W		3000W	
	resolution	10mW		10mW	
	accuracy	±(0.2%+0.2%FS)		±(0.2%+0.2%FS)	

Protection range					
OPP Protection	≒1550W			≒3050W	
OCP Protection	≒6.7A	≒67A		≒26A	≒260A
OVP Protection	≒530V			≒125V	
OTP Protection	≒85℃			≒85℃	
Specification					
Short	current(CC)	≒6.7/6A	≒67/60A	≒26/24A	≒260/240A
	voltage(CV)	0V	0V	0V	0V
	resistance(CR)	≒30mΩ	≒30mΩ	≒5mΩ	≒5mΩ
input Impendance	150KΩ			150KΩ	
Dimension	436.5mm*88.2mm*463.5mm			436.5mm*176mm*463.5mm	

***1** The voltage/current input is no less than 10% FS

***2** The scope of read-back resistance is**:(1/(1/R+(1/R)*0.01%+0.08),1/(1/R-(1/R)*0.01%-0.08))**
IT8514B+/14C+/16C+: (1/(1/R+(1/R)*0.02%+0.08),1/(1/R-(1/R)*0.02%-0.08))

***3** The voltage/current input is no less than 10% FS

***4 .Ascending/descending slope: 10%-90% current ascending slope from 0 to maximum current**

***5 Minimum rise time: 10%-90% current rise time**

* The above specifications may be subject to change without prior notice.

Supplementary Characteristics

- Memory capacity:100 registeres
  Suggested calibration frequency:Once a year
- AC input level(A transfer switch is selectable on the rear panel)
  Option Opt.1: 220V ±10% 50Hz/60Hz
  Option Opt.2: 110V ±10% 50Hz/60Hz
- Cooling type
  Intelligent fans
- Fans working principle:
  Fans running speed is determined by radiator temperature.When temperature reaches 40℃,fans start to work and intelligently adjust its speed with temperature variation.

Appendix

Specifications of Red and Black Test Lines

ITECH provides you with optional red and black test lines, which individual sales and you can select for test. For specifications of ITECH test lines and maximum current values, refer to the table below.

Model	Specification	Cross Section	Length
IT-E301/10A	10A	-	1m
IT-E301/30A	30A	6mm^2	1.2m
IT-E301/30A	30A	6mm^2	2m
IT-E301/60A	60A	20mm^2	1.5m
IT-E301/120A	120A	50mm^2	2m
IT-E301/240A	240A	70mm^2	1m
IT-E301/240A	240A	70mm^2	2m
IT-E301/360A	360A	95mm^2	2m

For maximum current of AWG copper wire, refer to table blow.

AWG	10	12	14	16	18	20	22	24	26	28
The Maximum Current Value(A)	40	25	20	13	10	7	5	3.5	2.5	1.7

Note: AWG (American Wire Gage), it means X wire (marked on the wire). The table above lists current capacity of single wire at working temperature of 30°C. For reference only.

Contact Us

Thanks for purchasing ITECH products. In case of any doubts, please contact us as follows:

1. Refer to accompanying data disk and relevant manual.
2. Visit ITECH website: www.itechate.com.
3. Select the most convenient contact method for further information.