USER'S GUIDE

Programmable DC Electronic Load

Model IT8514F

Ver1.1/APR, 2006/ IT8500-401

Warranty Information

Certification

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

Warranty

This hardware product is warranted against defects in material and workmanship for a period of ONE year from date of delivery. IT8500 series electronic load for use with a hardware product and when properly installed on that hardware product, are warranted not to fail to execute their programming instructions due to defects in material and workmanship for a period of 90 days from date of delivery. During the warranty period our company will either repair or replace products which prove to be defective. Our company does not warranty that the operation for the software firmware or hardware shall be uninterrupted or error free.

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

Limitation of Warranty

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

Assistance

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

Safety Summary

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

Environmental Conditions

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

Before Applying Power

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

Ground the Instrument

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

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

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

KEEP AWAY FROM LIVE CIRCUITS

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

DO NOT SERVICE OR ADJUST ALONE

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

Safety Symbols

 Direct current

 Alternating current

 Both direct and alternating current

 Protective earth (ground) terminal

 Caution (refer to accompanying documents)

WARNING

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

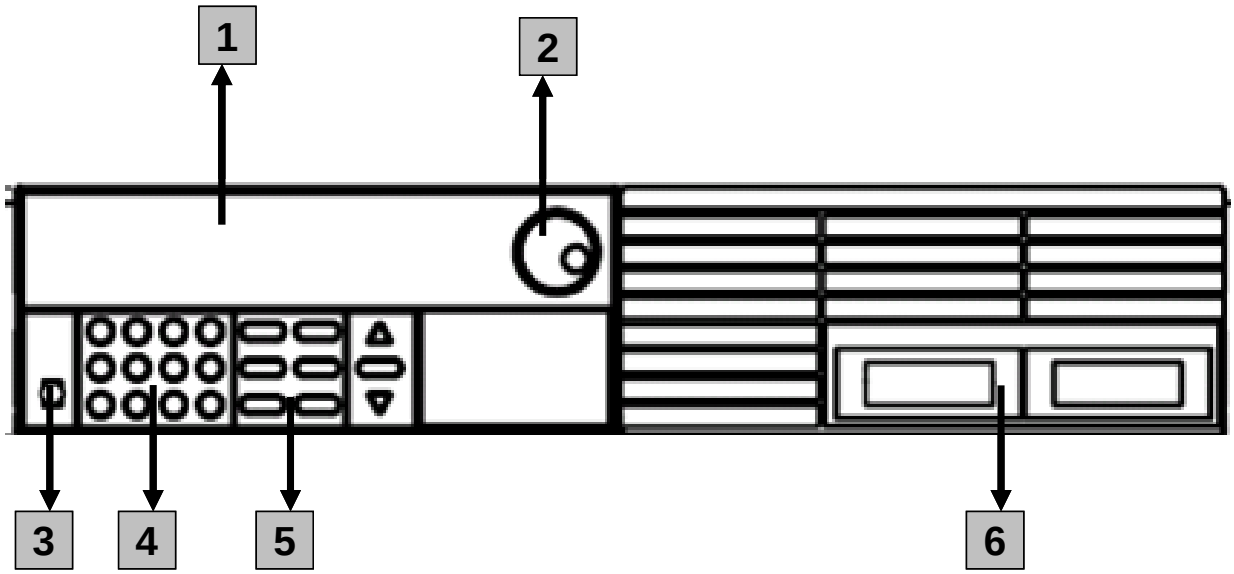
CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the

products. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

Quick Reference

The Front Panel

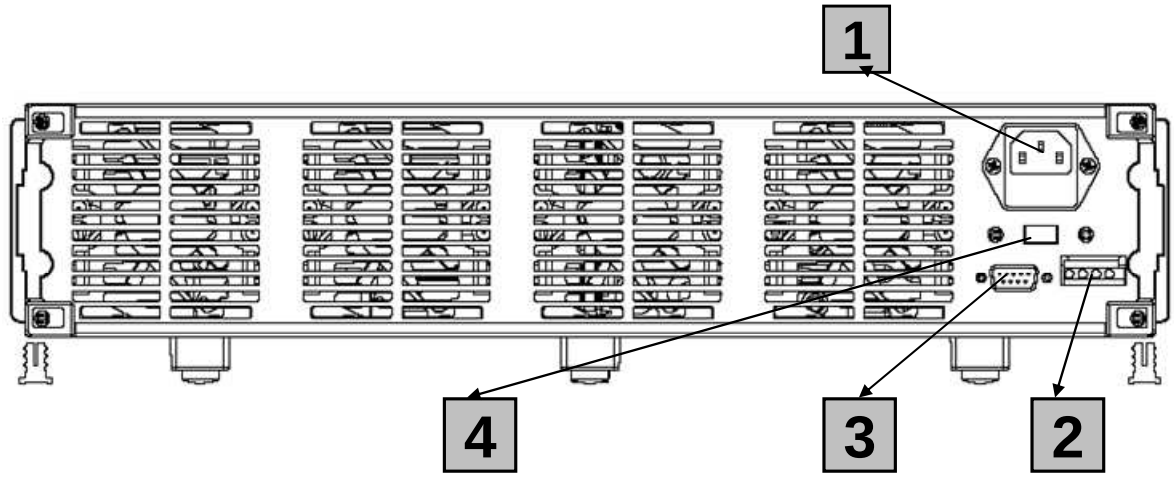


1. **16-character display shows voltage and current measurements**
2. **Rotary knob**
3. **Power switch On/Off**
4. **Entry keys:（numeric keys）**

   Enter values
   Increasing or decreasing the setup values
   Menu commands
5. **Keypad:**

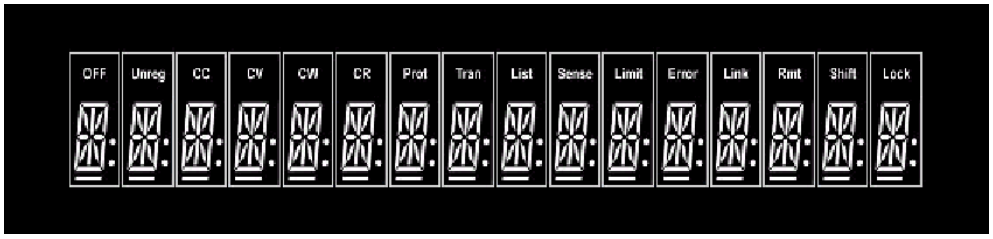
   Enable/disable input.
   Setup the current, resistance and voltage modes.
   Set and reset protection functions.
   Scroll through front panel.
6. **Input terminals.**

The Rear Panel



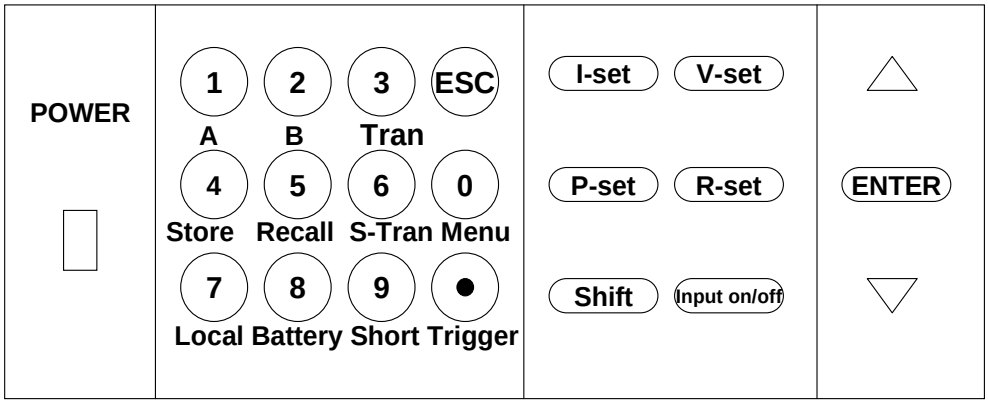
1. **3 Pin IEC320 ac input connector (Power code requires ground conductor).**
2. **4 Pin Trigger and Remote sensing connectors.**
3. **9-Pin COM port interface connector.**
4. **Power switch (110V / 220V)**

Front Panel Annunciators



OFF	input off	**Trigger**	Indicates that the electronic load is waiting an initiate and trigger to occur.
CC	Constant current (CC) mode.	**Sense**	Indicates that the electronic load is in Remote sensing state
CV	Constant voltage (CV) mode.	**Error**	A errors have occurred
CW	Constant power (CW) mode.	**Link**	In the communication state
CR	Resistance (CR) mode.	**Rmt**	Indicates that the electronic load is in remote state (RS-232). In the remote state, only the active key is the Local key.
Tran	The input channel is enabled for transient operation.	**Shift**	Indicates that the shift key has been pressed.
List	List mode is initiated or running.	**Lock**	keyboard is locked by password
Unreg	The input is unregulated.		

Key Pad



0 ~ 9	0 through 9 are used for entering numeric values.
•	Decimal point.
ESC	The escape key. It may used to exit any working state.
I-set	Choosing CC mode and setup the input current of regulation current mode.
V-set	Choosing CV mode and setup the input voltage of regulation voltage mode.
P-set	Choosing CW mode and setup the input watt of regulation power mode.
R-set	Choosing CR mode and setup the input resistor of regulation resistance mode.
Shift	Shift keys.
On/Off	Power ON/OFF
△	Scrolling keys let you move through the commands in the presently Select function menu, bring up the next command in the list. Function menus are circular; you can return to the starting position by continuous pressing the key.
▽	Go back to the previous command in the list .Function menus are circular; you can return to the starting position by continuous pressing the key.
Enter	Confirmation key.

Immediate Action Keys

Shift + A	Switch to A setting value
Shift + B	Switch to B setting value
Shift + Tran	Start /Stop transition operation
Shift + Store	Press to store an existing electronic load state in non-volatile Memory.
Shift + Recall	Press to recall an existing electronic load state in non-volatile Memory.
Shift + S-Tran	Set the transition operation parameter
Shift + Menu	Enter operation Menu.
Shift + Local	When the load is controlled by PC, press these keys to enable the front panel key
Shift + Battery	Battery discharge electronic operation
Shift + Short	Turn on or turn off short circuit Test.
Shift + Trigger	Causes a trigger to occur. Change the trigger source is IMMIDIATE

Menu Operation

Press Menu to indicate operation mode .View the menu in VFD and using ▽ and △ to scroll through the completely menu list as following. If press Enter key, you could get the selected menu function. Press ESC back to the previous menu selection page.

MENU			
CONFIG			
	INITIAL CONFIG		Return to the factory default setup value.
	POWER-ON RECALL		Setting Power-on state of Load.
		ON	When users turn on the electronic load; the electronic load setup value will keep the state of last time when users turn off the electronic load.
		OFF<DEFAULT>	Disable this function.
	INPUT RECALL		Setup the electronic load input state in Power on.
		ON	When users turn on the electronic load; the electronic load input state will keep as the last time state when users turn off the electronic load.
		OFF<DEFAULT>	When users turn on the electronic load, the electronic load input will keep the state off.
	KEY SOUND SET		Keypad sound setting.
		ON<DEFAULT>	Enable key sound.
		OFF	Disable key sound.
	KNOB LOCK SET		Setup rotary knob lock state.
		ON	Lock Rotary knob.
		OFF<DEFAULT>	Unlock Rotary knob.
	SHORT CUT RECALL		Fast recall the data stored before
		ON	
		OFF＞	
	RANG SELECT		Change the measure precision of voltage and current
		ON	
		OFF＞	
	REMOTE SENSE		Setup voltage measurement Mode.
		ON	The electronic load will measure input voltage from the remote sense connector.
		OFF<DEFAULT>	The electronic load will measure input voltage from the front panel connector.
	ADC UPDATE RATE		
		HIGH	
		LOW<DEFAULT>	
	TRIGGER SOURCE		Choosing the trigger signals source.
		IMMEDIATE<DEF>	Trigger signals from Shift + Trigger key
		EXTERNAL	Trigger signals from the TRIG connector in the rear panel.
		BUS	Communication command trigger mode.

	CONNECT MODE		
		MAXTIDLEXING	
		SEPARATE<DEF>	
	BAUDRATE SET	Setting baud rate.	
		9600<DEFAULT>	
		9600	
		19200	
		38400	
	COMM. PARITY SET	Command parity setting.	
		NONE<DEFAULT>	
		EVEN	
		ODD	
	ADDRESS SET	Setting communication Flow mode	
	KEY LOCK SET	Setting keypad password.	
	EXIT		
SYSTTEM SET			
	MAX CURRENT SET	Setup the maximum current.	
	MAX POWER SET	Setup the maximum power.	
	MAX VOLTAGE SET	Setup the maximum voltage.	
	VOLTAGE ONSET		
	VOLTAGE OFFSET		
	EXIT		
LIST SET			
	MODE SET	Setting operation mode.	
		FIXED MODE	Fixed mode.
		LIST MODE	Choosing List mode.
	CALL LIST FILE	Recall list operation file.	
	EDIT LIST FILE	Edit list operation file.	
	LIST STORE MODE	Users can choose 4 kind of memory space to save the list file.	
		8 X 120 STEPS	Total 8 files and each file have120 list steps.
		4 X 250 STEPS	Total 4 files and each file have250 list steps.
		2 X 500 STEPS	Total 2 files and each file have500 list steps.
		1 X 1000 STEPS	Total 1 file and each file have1000 list steps.
	EXIT		
LOAD ON TIMER			
	TIMER STATE	Setting LOAD ON timer state	
		ON	When users choose ON, and then turn on the electronic load input, the LOAD ON TIMER will start working. When the LOAD ON TIMER is reach the setup time, the electronic load input will turn off automatically.
		OFF<DEFAULT>	
	TIMER SET	Setting time of LOAD ON timer.	
	EXIT		
EXIT			

General Information

Document Orientation

This manual describes the operation of the IT8514F electronic loads. Unless otherwise noted, all units will be referred to by the description "electronic load" throughout this User's manual. The following documents and software are shipped with your electronic load. This User's Guide (this document), contains installation, checkout, front panel information and detailed programming information.

The Getting Started Map will help you find the information you need to complete the specific task that you want to accomplish. Refer to the table of contents or index of each guide for a complete list of the information contained within.

Getting Started Map

Task	Where to find information
Checking out the unit Verifying proper operation Using the front panel Calibrating the unit	User's Guide
Using the front panel Front panel keys Front panel examples	User's Guide
Using the programming interface RS-232 interface	User's Guide
Remote operation mode Protocol information	User's Guide
Controller Program and Software driver: Power View PV8500 software Calibration PC8500 software Active driver PD8500 OCX software	CD-ROM (If you've purchased the communication cable, you will get it for free)

Options and Accessories

Options

IT-E151 Rack mounts kit: for install one or two IT8514F load on the 19 inch rack.

IT-E131 isolated communication cable: This cable converts the electronic load's series port (TTL 5V level) to PC RS232 interface.

IT-E132 isolated communication cable: This cable converts the electronic load's series port (TTL 5V level) to PC USB interface.

IT-E134 isolated communication cable: This cable converts the electronic load's series port (TTL 5V level) to PC GPIB interface.

Accessories

Power cord
User’s manual
Software CD-Rom (if you buy the communication cable, you’ll get it for free)
Calibration testing report

Description

The IT8514F electronic load is used for design, manufacturing, and evaluation of DC power supplies, batteries, and power components and so on. The electronic load contains a processor, serial port connector, front-panel keypad and VFD, and other circuits common to the other entire load module. IT8514F electronic load could work in constant current (CC) mode, constant voltage (CV) mode, or constant resistance (CR) mode and constant power (CW) mode.

Features and Capabilities

• High accuracy and high resolution
• Capable to work with constant current (CC), constant voltage (CV), constant resistance (CR) mode and constant power (CW) operation.
• Serial port interface-DB9-RS232 port.
• Triggered input and measurement functions.
• Within the controlled keypad in the front panel
• Built-in pulse generator for continuous, pulsed, and toggled transient mode operation.
• Over voltage, over current, overpower, and over temperature protection.
• Electronic load calibrate by Software.
• Fan speed control by temperature.
• VFD display
• Short circuit test
• Battery testing function.

Front Panel Controls

The front panel has keyboard controls for setting the input voltage, current and resistance. The panel display provides digital readouts of a number of functions including the inputs. Annunciators display the operating status of the electronic load.

Remote Programming

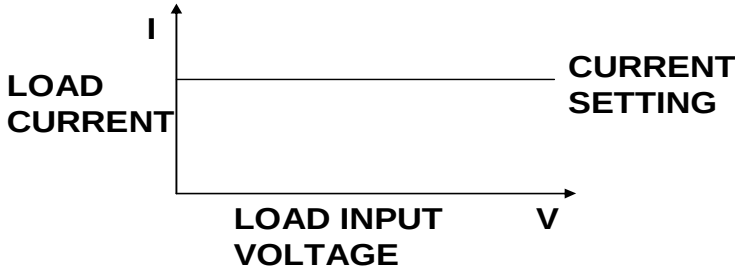
The electronic load may be remotely programmed from the computer via the IT-E131 isolated communication cable.

Operating Modes

The four modes of operation are:
1: Constant current (CC)
2: Constant voltage (CV)
3: Constant resistance (CR)
4: Constant power (CW)

Constant Current（CC）Mode

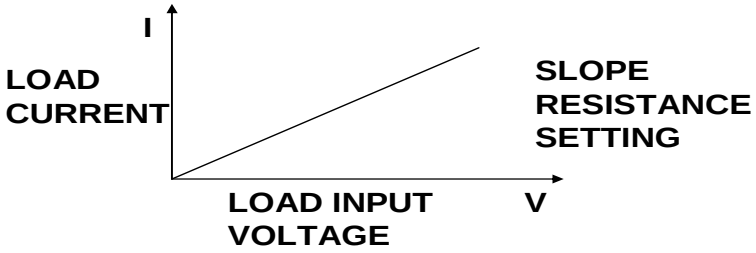
In this mode, the electronic load will sink a current in accordance with the programmed value regardless of the input voltage. CC mode can be set with front panel keys. The CC mode parameters are discussed in the following paragraphs.



CONSTANTCURRENT MODE

Constant Resistance (CR) Mode

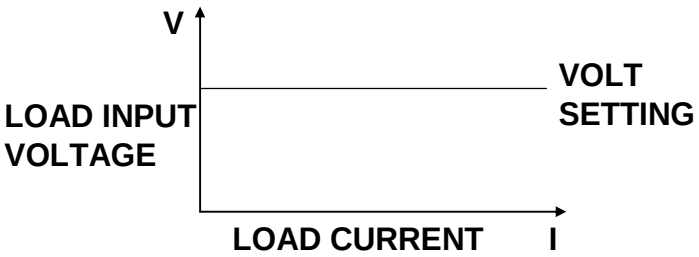
In this mode, the module will sink a current linearly proportional to the input voltage in accordance with the programmed resistance. The CR mode can be set at the front panel. The CR mode parameters are described in the following paragraph.



CONSTANT RESISTANCE MODE

Constant Voltage (CV) Mode

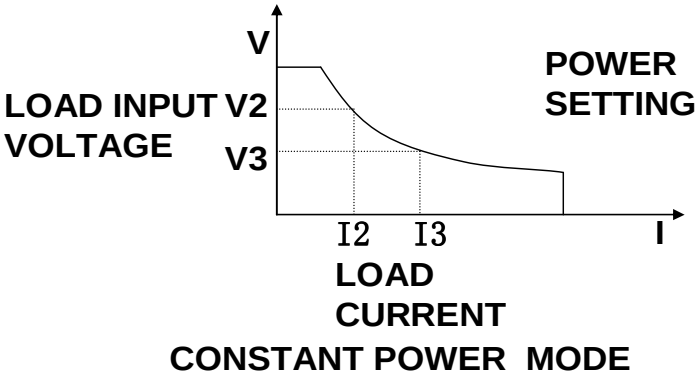
In this mode, the electronic load will attempt to sink enough current to control the source voltage to the programmed value. The module acts as a shunt voltage regulator when operating in the CV mode. The CV mode can be set at the front panel. The CV mode parameters are described in the following paragraphs.



CONSTANT VOLTAGE MODE

Constant Power (CW) Mode

In this mode, the electronic loads will consumption power accordance with the programmed value regardless of the input voltage. The CW mode can be set with front panel keys. The CW mode parameters are discussed in the following paragraphs.



CONSTANT POWER MODE

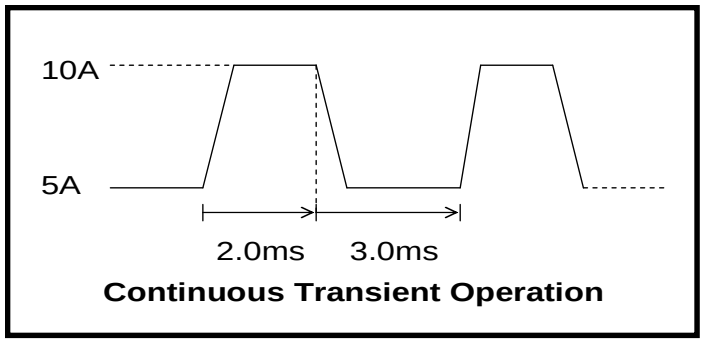
Transient Operation

Transient operation enables the electronic load to periodically switch between two load levels, as might be required for testing power supplies. A power supply's regulation and transient characteristics can be evaluated by monitoring the supply's output voltage under varying combinations of load levels, frequency, and duty cycle.

Transient operation can be turned on and off at the front panel or PC via the IT-E131 isolated communication cable. Before you turn on transient operation, you should set the desired mode of operation as well as all of the parameters associated with transient operation. Transient operation may be used in the CC, CR, or CV or CW modes and can be setup in continuous, pulsed, or toggled operation mode.

Continuous

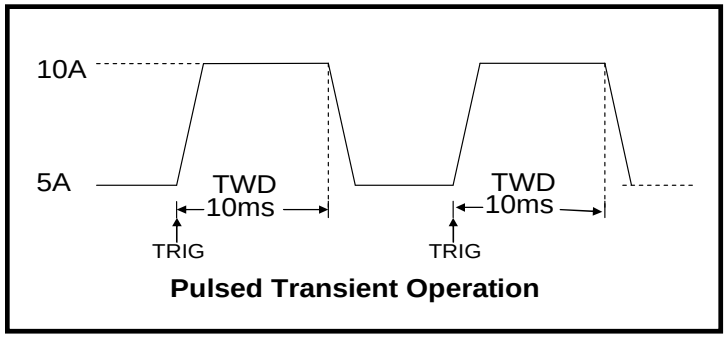
Generates a repetitive pulse stream the toggles between two load levels and change the state between value A and value B.



Continuous Transient Operation

Pulse

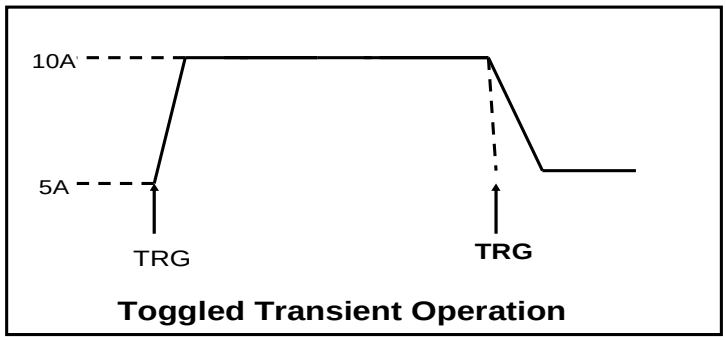
Switch to value B as receiving one trigger signal , taking the pulse time(TWD) of value B , Load will return to Value A .



Pulsed Transient Operation

Trigger Mode

Switching the state between value A and value B once receiving a triggering signal



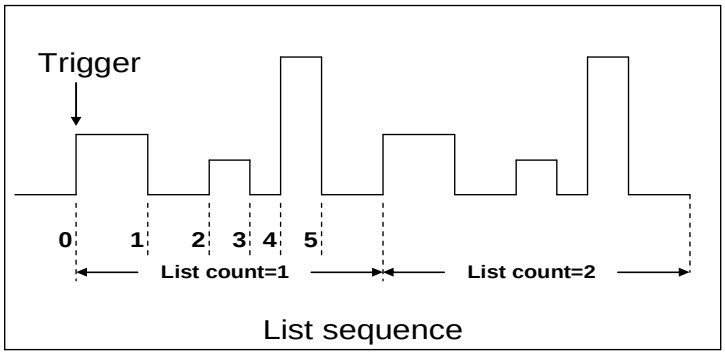
Toggled Transient Operation

List Operation

List mode lets you generate complex sequences of input changes with rapid, precise timing, which may be synchronized with internal or external signals. List operation can be changed by edit every step value and time in list operation. The parameter of list operation include the group file name, input step setting (the max steps is 1000 steps),time of one step（1ms~1h）and setting value of one step. In CC mode, dwell time range is 1ms to 6S, which also have an associated value. Note that lists data can only be saved in total 1000 steps memory of 4 situations.

GROUP	Total = 1000 steps							
1	1000 steps							
2	500 steps				500 steps			
4	250 steps		250 steps		250 steps		250 steps	
8	120 steps	120 steps	120 steps	120 steps	120 steps	120steps	120 steps	120 steps

When receiving one trigger signal, it will start the list operation until receiving another trigger signal or finish the List operation.



List sequence

Triggered Operation

The electronic load has various triggering modes to allow synchronization with other test equipment or events. Such as:

Keypad triggering mode: Press Shift + Trigger to trigger the electronic load.

TTL triggering mode: Send a high pulse with a constant time more than 5m Sec to the trigger terminals in rear panel to trigger the electronic load.

Command triggering mode: Send triggering command to the electronic load via the serial port.

Input Control

Short On/Off

Load can simulate a short circuit at its input by turning the load on with full-scale current. The short circuit can be toggled on/off at the front panel using the Shift + Short **.**Short operation is not influence the operation setting current value , When short operation is on OFF state , Load back to the original setting state.

The actual value of the electronic short is dependent on the mode and current range that are active when the short is turned on.

In CC, CW and CR mode, the max short-circuit current value is 1.2 times of the current range. In CV mode, short-circuit operation is same as the operation of setting CV to 0V.

NOTE

Turning the Short Test on in CV mode may cause the load to draw so much current that the software current limit operates, which may turn the input off. Turning the short circuit on does not affect the programmed settings, and the load input will return to the previously programmed values when the short is turned off.

Input On/Off

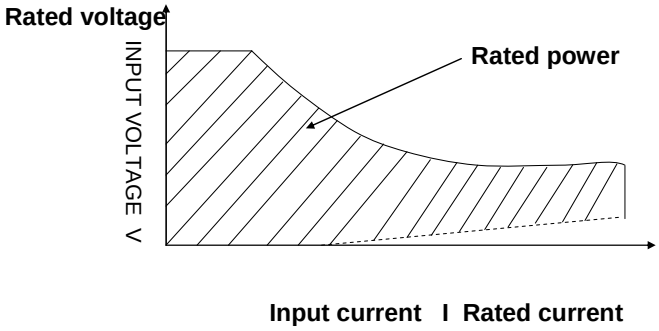
Electronic load's input can be toggled on/off at the front panel. Turning the input off (zero current) does not affect the programmed settings. The input will return to the previously programmed values when the input is turned on again.

NOTE

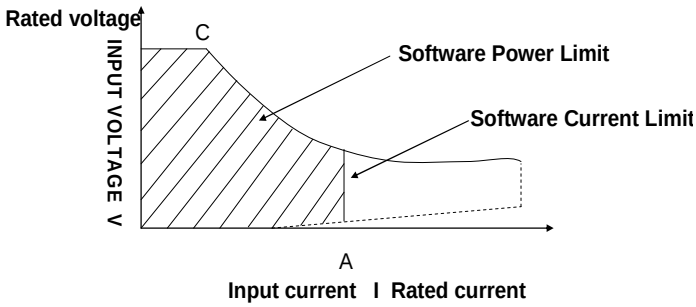
The Input On/Off command supersedes the mode commands and Short Test On/Off command.

Operation Range

Work in the range of Rated Current, Rated voltage and Rated Power, The figure is as following:



Operation mode change state



Protection Features

Electronic load includes the following protection features:

Over Voltage

If input voltage exceeds the voltage limit, Load will turn OFF the input, Buzzer is mooing. VFD display as following:

OVER VOLTAGE

Over Current

When work in the CR or CC and CP mode, input current is ascending continuously, the load current will be limited by a current limit circuit, Load will work in the over current protection state , VFD display the information as CC.

When work in CV mode and transition mode and List mode, Input current exceeds the current limit, Buzzer is mooing, VFD display the flashing current value.

Over Power

If the input power exceeds the power limit in the normal operation mode, Load will work in the over power protection state. VFD displays the information as CW.

When work in transition mode and list mode, if the input power exceeds the power limit. Buzzer is mooing, VFD display the flashing current value and voltage value.

Reverse Voltage

This feature protects the load module in case the input DC voltage lines are connected with wrong polarity, if a reverse voltage condition is detected, Buzzer is mooing. VFD display as following:

REVERSE VOLTAGE

Over Temperature

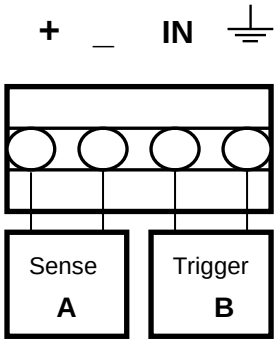
If internal power component‘s temperature exceeds safe limits (80℃), Over temperature protection is on work . Load will turn off the input and Buzzer is mooing, VFD display as following:

OVER HEAT

Remote Sense Function

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

4 Pin trigger and remote sensing connectors:



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

TRIG: A TTL-compatible input that responds to external edge trigger signal. A trigger applied to this input can be used to change settings (voltage, current, resistance, etc.), toggle between settings in transient-toggle mode, or generate a pulse in transient-pulse mode.

You must set the remote sense mode in the menu before using the remote sense function.

Action:

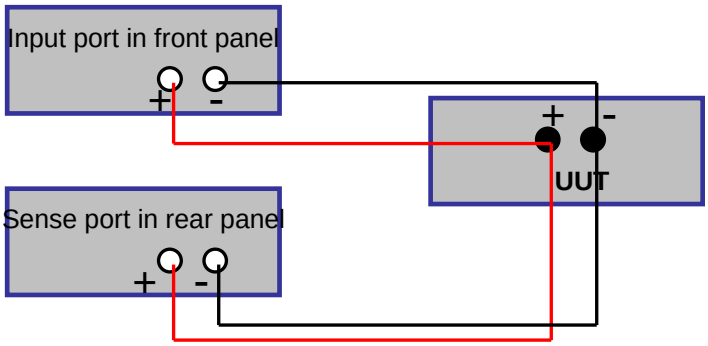
（1） Press Shift + Menu key into the menu

（2） VFD displays **>CONFIG, press** Enter key to confirm

（3） Press ▽ key to choose**>REMOTE SENSE, press** Enter key to confirm

（4） Press △ / ▽ to choose**>ON**, press Enter key to confirm. And the remote sense function has been set.

Wiring diagram for remote sense



Saving and Recalling Settings

The electronic load has internal registers in which settings (mode, current, voltage, resistance, transient level, etc.).Users could use Shift+Store and Shift+Recall to save and recall the relative data as following:

CC value /CW value /CR value /CV value

Transition current A value /Transition current B value /Transition voltage A value /Transition voltage B value / Transition power A value /Transition power B value /Transition Resistance A value /Transition Resistance B value

Current A pulse width time/ Current B pulse width time/Voltage A pulse width time/ Voltage B pulse width time /Power A pulse width time/Power B pulse width time /Resistance A pulse width time /Resistance B width time

Transition current testing mode/Transition voltage testing mode/Transition power testing mode /Transition resistance testing mode

Max current value / Max voltage value / Max power value

Action

1) Press I-set, set a value of current or voltage, press Enter to confirm.
2) Press Shift+Store set a store code at random, press Enter to confirm.
3) Press Shift+Recall, set the store code that you set before, press Enter to confirm, then you can get the number stored.

Battery Testing

Experiment proves the test with load is the best method to ensure the battery whether work well or not. Only with the correct load testing, the battery can be confirmed if it was being the expectant life curve location. The electronic loads can be used to test any type of the battery nowadays.

As the accumulator is used by any sheltered equipment or the uninterrupted service system, it is necessary to use the load testing. Because the battery nearly is the lowest reliability component, so it must use the load testing periodic ensure the security of the battery.

Capability test

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

Operation:

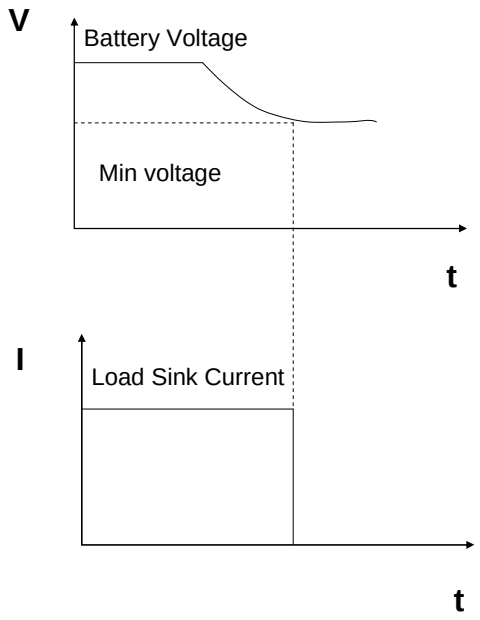
(1) Turn off the input of electronic load, then connect the load with battery.

(2) Press I-set on the panel, VFD displays "CURRENT= A", set discharge current value and press Enter to confirm.

Note: the discharge current should not be more than the current that the battery can supply.

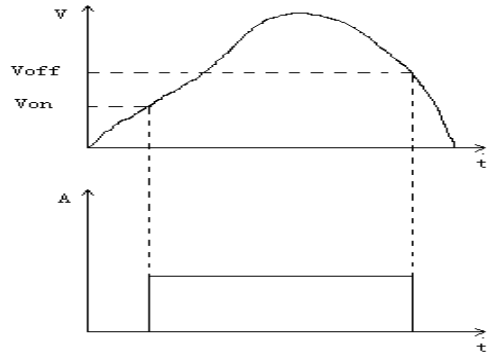
(3) Press Shift + Battery, VFD displays "MIN VOLT= V", set the min voltage value, press Enter to start the test. When the battery voltage reaches as the min voltage, the battery test will stop. During the testing, press down key▼and up key▲ to observe the voltage, current and discharge capacity of the battery, and the power of load.

(4) Press Shift + Battery to stop battery test.



Von/Voff Operation

You can set voltage value Von/Voff to control the input state on/off for electronic load. When the input voltage reaches the Von value, the load's input state is on. When the input voltage reaches the Voff value, the load's input state is off.



Action for set Von/Voff value:

（1）Press Shift + Menu into menu

（2）VFD displays >CONFIG, press ▽ key to choose >SYSTEM SET, press Enter to confirm

（3）VFD displays >MAX CURRENT SET, press ▽ key to choose>VOLTAGE ON SET, press Enter key to confirm

（4）VFD displays **>VOLT.ON=0.00V, press numeric keys to set Von value** (0.1V to max voltage value), press Enter to confirm

（5）Press ▽ key to choose **>VOLTAGE OFF SET, press** Enter to confirm

（6）VFD displays **>VOLT.OFF=0.00V, press numeric keys to set Voff value** (0V to max voltage value), press Enter to confirm

Installation

Inspection

Damage

When you receive your electronic load, inspect it for any obvious damage that may have occurred during shipment. If there is damage, notify the shipping carrier and nearest Agent office and Support Office immediately.

Items Supplied

The following user replaceable items are included with your electronic load.

Item	Part Number	Description
Power Cord	IT-E171	Users will get one of the power cords appropriate for your location.
	IT-E172	
	IT-E173	

	IT-E174	
User's Guide		Contains installation, checkout, and front panel information and
Software CD-Rom		Programming information
Calibration Report		The Instrument calibration report.

Cleaning

Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.

WARNING

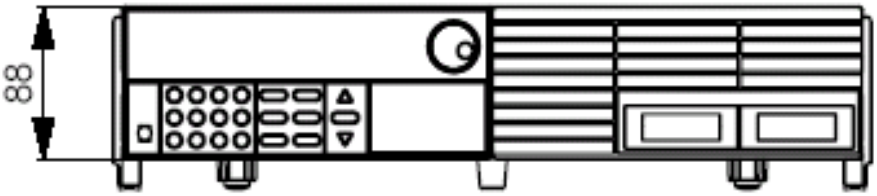
To prevent electric shock, unplug unit before cleaning.

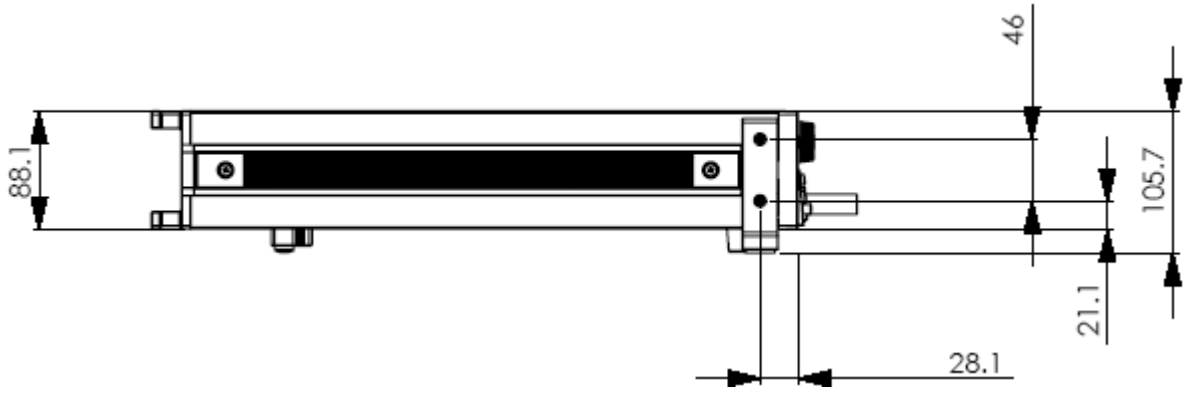
Location

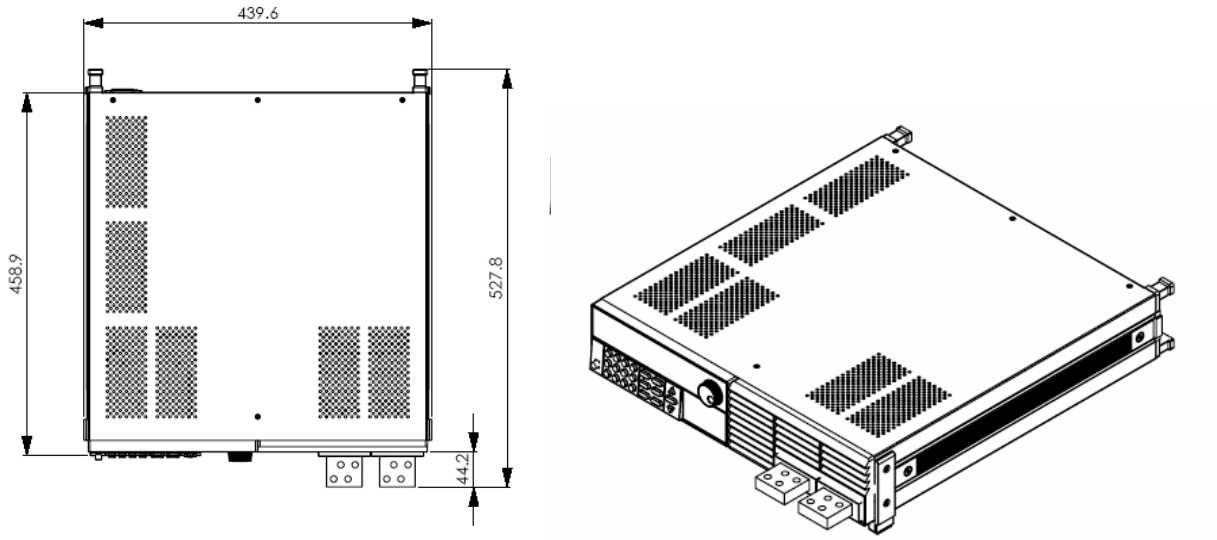
The outline diagram in following figure gives the dimensions of your electronic load. The electronic load must be installed in a location that allows sufficient space at the sides and back of the unit for adequate air circulation.

Installation

Dimension :429mmW x88.2mm H x 354.6mm D







Outline Diagram **Unit (mm)**

Bench Operation

A fan cools the electronic load by drawing air through the button and sides and exhausting it out the back.

Minimum clearances for bench operation are 25 mm along the sides.

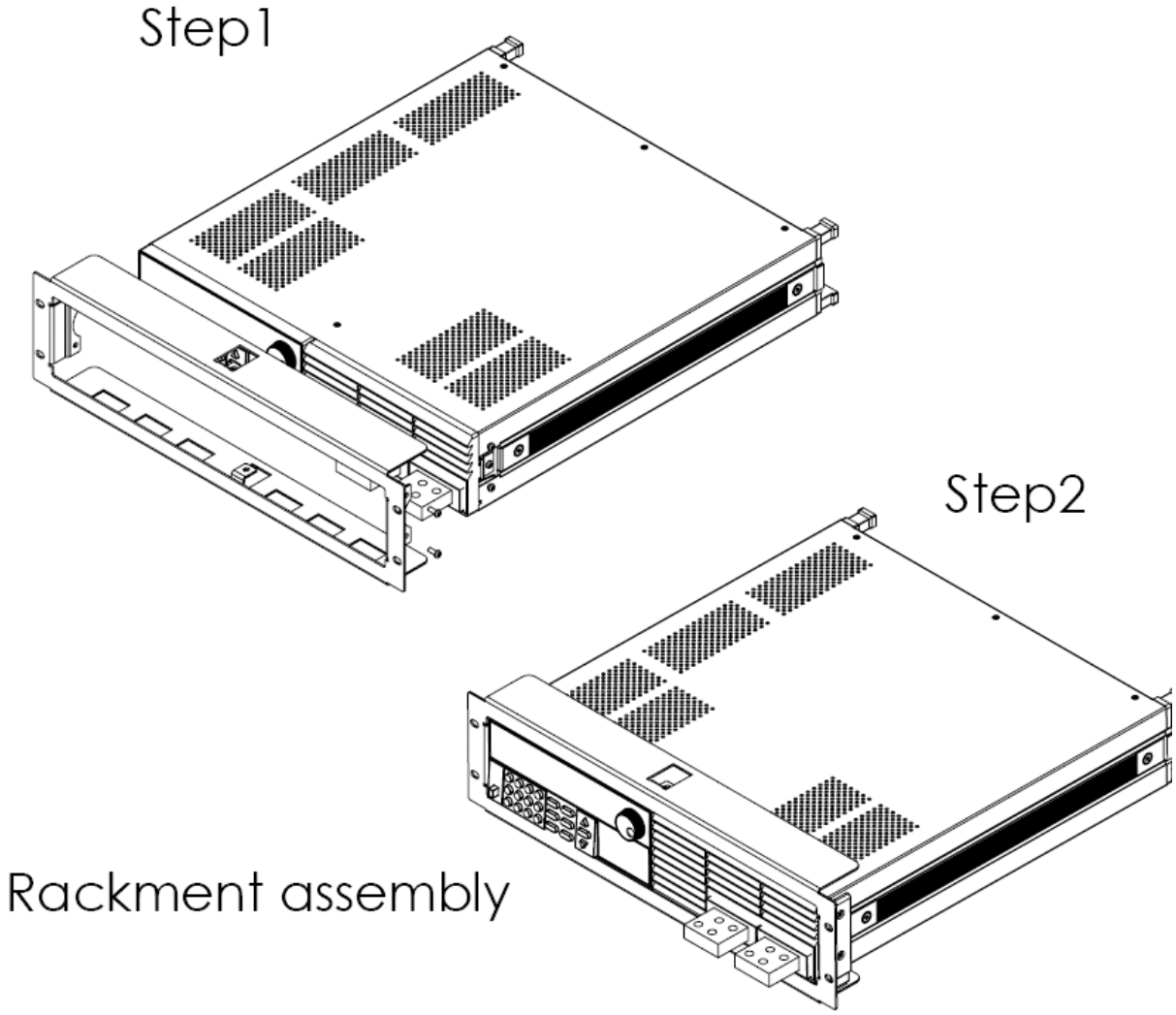
CAUTION

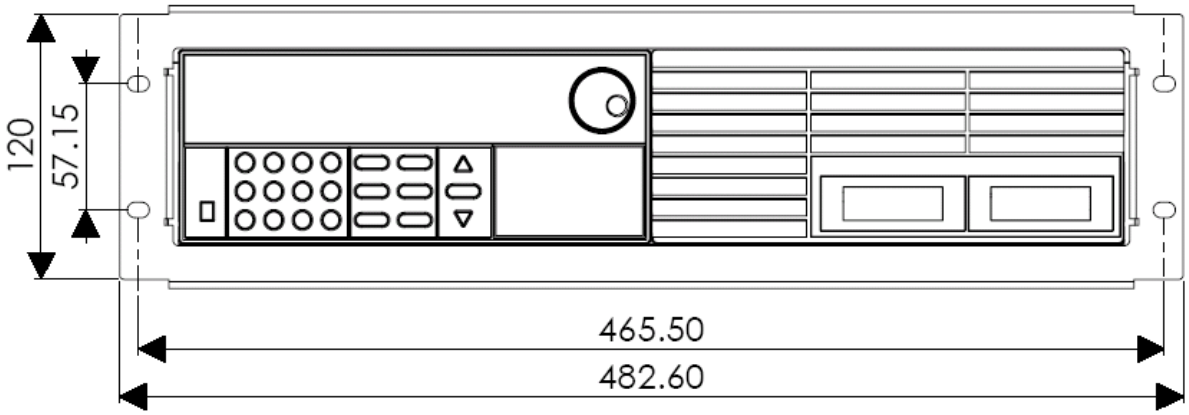
Do not block the fan exhaust at the rear of the Load.

Rack Mounting

The IT8514F electronic load can be mounted in a standard 19-inch rack. Rack mount kits are available as Option IT-E151. The electronic load can be mounted in a standard 19-inch rack panel or enclosures using an Option IT-E151 rack mount kit.

Rack Installation





(Unit: mm)

Elevation for Installation one electronic load in a standard 19-inch rack

NOTE

You need to use a screwdriver remove the two plastic ears on the two front side before rack-mounting the instrument.

Input Connections

Power Cord

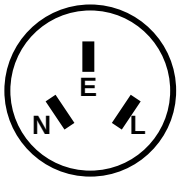
Connect the power cord to the IEC 320 connector on the rear of the unit. If the wrong power cord was shipped with your unit, contact your nearest Agent to obtain the correct cord. See following figure for the part number and ordering options.

WARNING

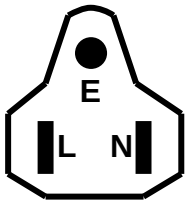
SHOCK HAZARD: the power cord provides a chassis ground through a third conductor. Be certain that your power outlet is of the three-conductor type with the correct pin connected to earth ground.

NOTE

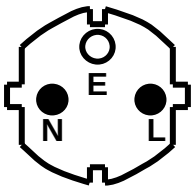
The detachable power cord may be used as an emergency disconnecting device. Removing the power cord from the ac input connector will disconnect ac input power to the unit.



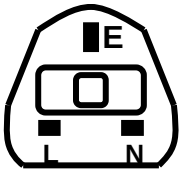
China
IT-E171



United States, Canada
IT-E172



Europe
IT-E173



United Kingdom
IT-E174

Turn-On Checkout

Introduction

Successful tests in this chapter provide a high degree of confidence that the electronic load is operating properly.

Checkout Procedure

The test in this section checks for proper operation of the electronic load. If you have not already done so, connect the power cord to the unit and plug it in.

Procedure	Display	Explanation

1. Turn the unit on. The electronic Load undergoes a self-test when you First turn it on.		During self test, all segments are briefly lit
2. Wait for 1s after turn on electronic load.	EPROM ERROR	EEPROM damage or Lost data of last power off Run well if no such display, system will go to the step 3 directly.
3. Wait for another 2S.	ERROR CAL.DATA	EEPROM Lost calibration data Run well if no such display, system will go to the step 4 directly.
4. Press Shift button and △▽keys .	LOAD MODEL:IT85XX SN：XXX-XXX-XXX VER x.xx	Display the information of the product Type, series number version of software.
5. Press (ESC) button	0.000V 0.000A	Display the actual input voltage and current value.
6.Press △▽	0.000W I: 0.000A	Display the actual power value and setting value.

In Case of Trouble

Electronic load failure to run during power-on operation. The test of following in this section help you to solve the possible problem when you turn on the power of electronic load. Make sure if you have connected the power cord to the unit and plug it in. Power switch have been pressed.

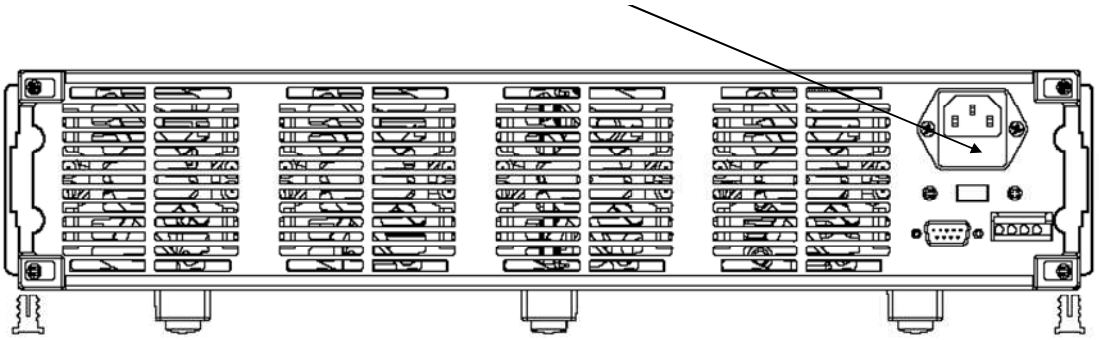
1) Check the power voltage setting.
   Work voltage of load have two type 110V or 220V , Please make sure it is right voltage accordance to the voltage in your area. You could change the voltage setting through dial the switch in the rear panel.
2) Check the fuse of load.

If fuse is blowout, please change it as following specification.

Model	Fuse specification (110VAC)	Fuse specification (220VAC)
IT8514F	**T0.5A 250V**	**T0.3A 250V**

3) Location of Fuse

Fuse



Front Panel Operation

Example

I-set (set up a constant current from 0 to Max current)

Set up a constant DC current input is the first main function of programmable DC electronic load, IT8514F electronic load provides two methods to set up the constant DC current input by using the number keyboard and the rotary button. Please see the following operation procedure.

Procedure	Operation details	VFD display
Step 1	Press I-set	**CURRENT=0.000A**
Step 2	Enter the password or jump the step 4 if your password for reentering	**PASSWORD:**
Step 3	Enter the original value which displayed in the LCD or enter a new value by using number keys or Rotary knob to adjust the voltage value	**CURRENT=*.***A**
Step 4	Press Enter to confirm	**0.00V 0.000A**

Setup the input current at 4.33A.

Method 1: To set up by using number keyboard

Step1. Press I-set button.

Step2. Press numeric button to enter the current value 4.33.

Step3. Press Enter button to confirm the current value.

Method 2: To set up I-set by using Rotary SW

If the key board is unlocked by password, directly adjust the Rotary SW button, and voltage will be continually changed from the previews value according the rotation. At the beginning, the cursor will be shown on the last number of the value which is indicated on the VFD, you can move the cursor to the first number, second number etc by using number buttons, and then adjust the Rotary SW to change each number, and let it stay at *.** A. Please see the following description. Then press I-set to confirm the value.

0.00A 0.00V
0.0W 4.33A

Procedure:

Step1. Press I-set button,

Step2. Adjust the Rotary knob to change the value, the operation is as the same as item (1)
Step5. Press Enter button to confirm the current value.

P-set (set up a constant power from 0 to Max power)

IT8514F electronic load can be set up for a constant power.
Constant power setup procedure is as following:

Procedure	Operation details	VFD display
Step 1	Press P-set	**POWER =0.0W**
Step 2	Enter a new value by using numeric keys or Rotary knob to adjust the voltage value	**POWER=*.***W**
Step 3	Press Enter to confirm.	**0.000W P:*.000W**

R-set (set up a constant resistance from 0.1Ω to 4000Ω)

IT8514F electronic load can be setup for a constant resistance.
Constant resistance setup procedure is as following:

Procedure	Operation details	VFD display
Step 1	Press R-set	**RESISTANCE =0.0R**
Step 2	enter a new value by using numeric keys or Rotary knob to adjust the resistance value	**RESISTANCE=*****R**
Step 3	Press Enter to confirm.	**0.000W R:0000R**

V-set (set up a constant voltage from 0.1V to Max voltage)

IT8514F electronic load can be setup for a constant voltage.
Constant voltage setup procedure is as following:

Procedure	Operation details	VFD display
Step 1	Press V-set	**VOLTAGE=1.500V**
Step 2	enter a new value by using numeric keys or Rotary knob to adjust the resistance value	**VOLTAGE=*.***V**
Step 3	Press Enter to confirm.	**0.000W V:3.000V**

Shift + Store

Procedure	Operation details	VFD display
Step 1	Press Shift and Store	**STORE 1**
Step 2	Press Enter to confirm.	Store the relative data

Shift + Recall

Procedure	Operation details	VFD display
Step 1	Press Shift and Recall	**RECALL 1**
Step 2	Press Enter to confirm	Recall the saving data

In On/Off input setting

Use On/Off to change the state of electronic load. Switch on to off state by press On/Off.

Transition Testing Operation

Users could switch between the two different current and voltage in the transition mode; it could test the transition specialty of power supply. Users could use front panel or communication interface （TRAN ON AND TRAN OFF）to make it work or not, please setting parameters before transition operation. Include Transition setting value, Constant pulse width setting and Transition Pulse width setting and Transition testing mode. The mix pulse width is 500uS.The Max pulse width is 6S. Transition Operation only could work in CC and CV mode.
Users can choose one of the three operation modes: Continuous, Pulse and Toggling mode.

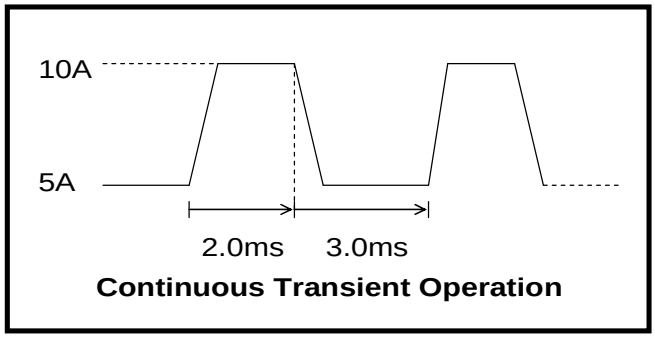
Transition Parameter Setting

Users could press Shift + S-Tran to set the transition parameter.

Shift + S-Tran	**LEVEL A =0.000A**	Setup value A
Enter	**WIDTH A = 0.5ms**	Setup time width of value A
Enter	**LEVEL B=0.000A**	Setup value B
Enter	**WIDTH B= 0.5ms**	Setup time width of value B
Enter	**>CONTINUOUS** **>PULSE** **>TOGGLED**	Choose one of the three transition modes
Enter		Finish transition setting

Continuous Transient Operation

In this mode, electronic load will generates a repetitive pulse stream that toggles between two load levels. ; Load could switch the state between two setting value (value A and value B).
In this following example, assume that the CC mode is active; the applicable transient operation parameters have been set as follows.
For example:
Continuous mode, current level A =5A, width = 2ms. Current level B =10A, width = 3ms. Testing machine input voltage is 12V.



Continuous Transient Operation

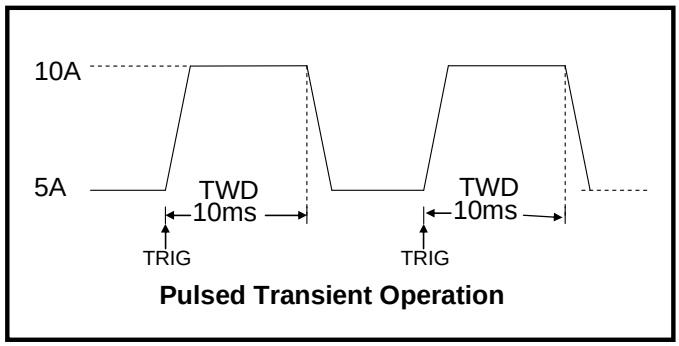
Action

1. Select the operation mode (**CC,CV,CR or CP**), and set a proper value, press On/Off to turn off the load input.
2. Press Shift + S-Tran, set LEVEL A=5A, press Enter, set WIDTH A=3mS, press Enter, set LEVER B=10A, press Enter, set WIDTH B=2mS, press Enter to confirm.
3. Transition mode now is **CONTINOUS**, press Enter to confirm.
4. Press Shift + Tran to activate the transient mode.
5. Press Shift + Tran again to stop the transient operation.
6. Press On/Off, the input of load is powered on.

Pulse Transient Operation

In this mode, generates a transient pulse of programmable width when pulsed transient operation is in effect.

For example: When load receiving one trigger signal, it will switch to 10A current value, and taking 10ms to return the current value of 5A.



Pulsed Transient Operation

Action

1. Select the operation mode (**CC,CV,CR or CP**), and set a proper value, press On/Off to turn off the load input.
2. Press Shift + S-Tran, set LEVER A=5A, LEVER B=10A, WIDTH B=10ms. Transition mode now is **CONTINOUS**.
3. Press ▼ till **>PULSE**.
4. Press Enter, set transient mode is **PULSE**.
5. Press Shift + Tran to activate the transient mode.
6. Press Shift + Trigger to start another pulse. Press Shift + Trigger, get more pulse.
7. Press Shift + Tran again to stop the transient operation.
8. Press On/Off, the input of load is powered on.

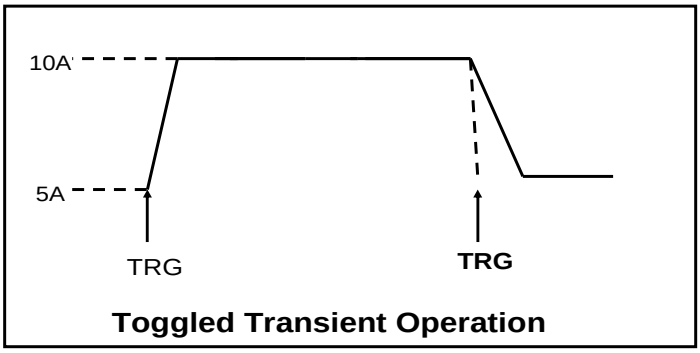
.

Toggled Transient Operation

In this mode, after transition operation start, Load could change the input between the main level and the transient level when toggled transient operation is in effect.

For example:

When Load receives one trigger signal, Load current will switch between 5A and 10A.



Toggled Transient Operation

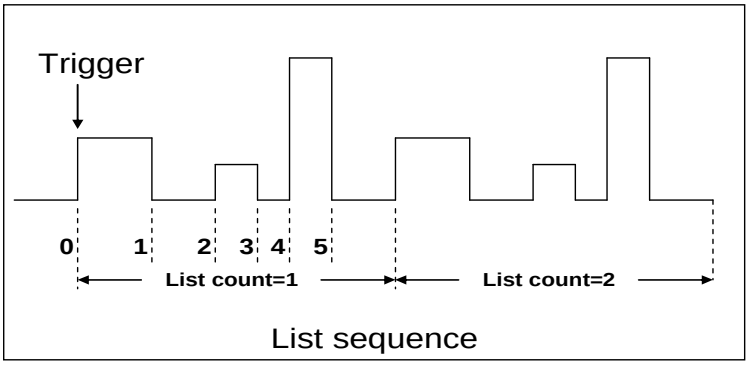
Action

1. Press Shift + S-Tran, Setting LEVER A=5A, LEVER B=10A, transition mode is PULSE.
2. Press Shift + Tran to activate the transient mode.
3. Press Shift + Trigger switch to the current value of 10A.
4. Press Shift + Trigger, switch between 5A and 10A.
5. Press Shift + Tran again to stop the transient operation.

List Operation

Users can use the front panel keypad or Power View 8500(PV8500) software to programming the list sequence. Please refer to the software user's guide.

The following example will help you how to do the list operation in front panel.



List sequence

Action

1) Press the button of On/Off, execute the input of Load I in **OFF** state.
2) Press Shift + Menu, move cursor to the option of menu of **CONFIG**, Press Enter into the next step menu, move cursor to **TRIGGER SOURCE**. Press Enter and move cursor to **IMMEDIATE <DEF>,** setting trigger source mode is panel **IMMEDIATE** mode.
3) Press Enter to confirm.
4) Press Esc to the previous menu, move cursor to **LIST SET**.
5) Press Enter into the next step menu .move cursor to **EDIT LIST FILE.**

6) Press Enter into the next step menu, move cursor to **CURRENT LIST,** select **CURRENT MODE**.
7) Press Enter, move cursor to REPEAT. Setup LIST is in cycle mode.
8) Press Enter to confirm, setup the list steps = 5.
9) Press Enter to confirm, setup step 1 current =3A.
10) Press Enter to confirm, setup step 1 width=6ms.
11) Repeat 7) and 8) operation , set current and width of one step 0A, 5ms;2A, 4ms;6A,2ms;0A,5ms.
12) Press Enter to confirm, Menu STORE LIST FILE 1. save file in group1.
13) Move cursor to Mode Set , press Enter to enter into the next step menu to set mode is **<LIST MODE >**
14) Press Enter to confirm
15) Press Esc, Press On/Off, make Load in ON state. Press Shift+Trigger, make list operation run or stop.
16) Stop the list operation mode. Move cursor to **LIST SET**, press Enter**,** move cursor to **Mode Set** in option menu, press Enter, enter into next step menu. Select mode is **<FIXED MODE>**.
17) Press Enter to confirm.

Fast Recall Function

You recall 10 groups numbers very conveniently which were stored before.
Action

1) Press Shift +Menu
2) Press▼to **CONFIG**, press Enter into submenu, press▼ to **SHORTCURT RECALL**
3) Press Enter, select **> ON** and press Enter to confirm.
4) Press Esc two times and quit the menu.
5) Press 1 and you can get the first group number. Press 2, you can get the second group number. Press 0, you can get the tenth group number. And if there is not stored number, VFD will show **NO EEPROM DATA**.

Automatic Testing Function of Electronic Load

You test various parameters of power supplies at different loads. Now we take a kind of charger as an example to explain the usage of the automatic testing of the electronic load.

The test proceeding of R35 charger					
process	Test Method				
	Mode	Voltage(V)	Current(mA)	Power(W)	Ripple counter
1st step	CC	5.8～6.15	210	≤4(input175VAC)	≤50mVpp
2nd step	None	5.9～6.4	0	≤1.2(input175VAC)	
3rd step	CC	5	205～245		
4th step	CV	3	205～245		
5th step	CV	2	205～245		
6th step	Short circuit	0	≤245		

Edit the Testing File

1) Press Shift + Menu into menu, VFD displays **＞CONFIG**
2) Press▼ to **＞LIST SET**.
3) Press Enter into submenu, press▼ to**＞EDIT LIST FILE**.
4) Press Enter and begin to edit the automatic testing file, VFD shows **MAX CURR= 20.00A**, which means setting the maximum of voltage. The maximum is bigger than **3A**, which means **CC** mode is in high range, here, the maximum is **3A**. Press 3 and press Enter to confirm.
5) VFD displays **MAX VOLT=120.00V**, which means setting the maximum of voltage, the maximum is bigger than **18V**, which means **CV** is in high range, here, the maximum is **18V**. Press 1 + 8 to set **MAX VOLT=18V**, press Enter to confirm.
6) VFD displays **MAX POWER=200.00W**, which means setting the maximum of power, here, it is150W, Press 1 + 5 + 0 to set **MAX POWER=150W**, press Enter to confirm.
7) VFD displays **TEST COUNT=2**, which means setting steps of testing, 20 steps are permitted at most, here, they are 6 steps. Press 6 to set **TEST COUNT=6**, press Enter to confirm.
8) Setting the mode of current procedure, press ▲、▼to choose one mode in **CONST CURRENT**、**CONST VOLTAGE**、**CONST POWER**、**CONST RESIS**. Here, the first step is **CC** mode, press ▲、▼to **>CONST CURRENT**, press Enter to confirm.
9) VFD shows **SET 1=20.00A**, which means setting the current procedure. Here, the first sis **0.21A**, press 0 + • + 2 + 1, then press Enter to confirm.
10) Setting whether the current procedure is short circuit or not, press ▲、▼to choose one in **SHORT ON** or **SHORT OFF**. Here the first step is **SHORT OFF**. Press **SHORT OFF**, press Enter to confirm.
11) Select the test number of this step, press▲、▼ to choose **>READBACK V**, PRESS Enter to confirm.
12) VFD displays **MIN 1=120.00V**, which means setting the lower limit. Here, the first step is 5.8V. Press 5 + • + 8, press Enter to confirm.
13) VFD displays **MAX 1=120.00V**, which requests setting the upper limit. Here, the first step is 6.15V, press 6 + • + 1 + 5 ,then press Enter to confirm.
14) VFD shows **DELAY 1= 1.0〈S〉**, which means setting the prolong time, that is how long we can read the testing value after inputting the value we settled. To wait for testing after the input stable, the range of prolong time is 0 ~ 25.5 seconds, when the setting is 25.5 seconds, automatic testing will be pause, only the user press Shift + Trigger ,the testing will continue. Here, the first step is 1 second, press 1 and then press Enter to confirm.
15) Repeat 9) ~ 14), and set the other process step by step as follows:
    A. CONST CURRENT,0A,SHORT OFF, READ BACK V, 5.9V, 6.4V,1S
    B. CONST VOLTAGE, 5V, SHORT OFF,READ BACK A, 0.205A, 0.245A,1S
    C. CONST VOLTAGE, 3V, SHORT OFF, READ BACK A, 0.205A,0.245A,1S
    D. CONST VOLTAGE, 2V,SHORT OFF, READ BACK A, 0.205A,0.245A, 1S
    E. CONST CURRENT, 0A, SHORT ON, READ BACK A,0A,0.245A, 1S
16) VFD displays **SHORT TEST FILE*,** which requests saving the files edited to **EEPROM,** automatically testing files and **LIST** files use a common memory area, and the area can

contain 8 groups of automatic testing files for next usage. Here, the testing file could be saved in the first group, press 1 and press Enter to confirm.

17) When the edition of automatic testing file is finished, press Enter two times to back the menu.

Fast Recall the Test File

1) Press Shift + Menu to enter into menu, VFD displays **>CONFIG**
2) Press ▼ and move the menu to **>LIST SET**
3) Press Enter to enter into submenu, VFD displays **>MODE SET**
4) Press ▼ and move the menu to **>CALL TEST FILE**
5) Press Enter and recall the file edited

Automatic Testing

After editing the automatic testing file, the automatic testing could be carried out by the below steps.

1) Press Shift + I-set to enter into automatic testing, VFD displays the name of current file:

NAME: TEST FILE1

2) Press Enter to observe the voltage and current we inputted, and also can observe the step number of testing.
3) Press Shift + Trigger and begin to operate, when the automatic testing is pause (the current prolong time of one step is 25.5s), press Shift + Trigger also can make the testing continue.
4) When the automatic testing is finished, the buzzer will hint by tweet (buzzer), VFD reads the result of testing. If the testing passed, VFD reads PASS, or reads FAULT. Press ▲、▼ also to observe the numerical value and result of every step.
5) Press ESC to back the automatic testing.

Select the Resolution between Low Range and High Range

You can adjust the resolution by selecting the low and high range. The first step you should do is to enable this function in the menu.

Action

1) Press Shift + Menu to enter into menu, VFD displays **>CONFIG**
2) Press Enter into the submenu, VFD displays **>INITIAL CONFIG**
3) Press ▼ to make VFD display **RANGE SELECT**
4) Press Enter to confirm, and press ▼ to choose **ON**
5) Press Enter to confirm
6) Press Esc to exit menu

Then you can press Shift + ▲ to change the voltage range (maximum voltage). If the former maximum voltage value is 120V and the resoulution is 10mV, it will become 18V when you press Shift + ▲ , and you will get 3 decimal points (xx.xxx) compared to 2 decimal points before. Wheras if the former maximum voltage is 18V, you can press Shift + ▼ to make it become 120V, also the resolution will become as 10mV.

On the other hand, you can press Shift +▼ to change the currnet range (maximum current). If the former maximum current value is 12A and the resolution is 1mA, it will become 120A when you press Shift +▼, and you will get 2 decimal points (xx.xx) compared to 3 decimal points before. wheras if the fromer maximum current is 120A, you can press Shift +▼ to make it become 12A, and the resolution will become as 1mA.

Specifications

Parameter		IT8514F	
Input rating (0 ~ 40 ℃)	Voltage	0 to 60V	
	Current	1mA to240A	
	Power	1200 W	
Load Regulation	Range	Accuracy	Resolution
	0~18V	±(0.05%+0.02%FS)	1mV
	0~60V	±(0.05%+0.025%FS)	10mV
	0~24A	±(0.1%+0.1%FS)	1mA
	0~240A	±(0.2%+0.15%FS)	10mA
CV Mode Regulation	0.1~18V	±(0.05%+0.02%FS)	1mV
	0.1~60V	±(0.05%+0.025%FS)	10mV
CC Mode Regulation	0~24A	±(0.1%+0.1%FS)	1mA
	0~240A	±(0.2%+0.15%FS)	10mA
CR Mode Regulation Input current ≥FS 10% Input Voltage≥FS 10%	0.1~10Ω	±(1%+0.3%FS)	0.001Ω
	10~99Ω	±(1%+0.3%FS)	0.01Ω
	100~999Ω	±(1%+0.3%FS)	0. 1Ω
	1K~4KΩ	±(1%+0.8%FS)	1Ω
CW Mode Regulation Input current ≥FS 10% Input Voltage≥FS 10%）	0~100W	±(1%+0.1%FS)	1mW
	100~1200W	±(1%+0.1%FS)	100mW
Current Measurement	0~24A	±(0.1% + 0.1%FS)	1mA
	0~240A	±(0.2%+0.15%FS)	10mA
Voltage Measuremen	0~18V	±(0.02% + 0.02%FS)	1mV
	0~60V	±(0.02% + 0.025%FS)	10mV
Power Measurement Input current≥FS 10% Input Voltage≥FS 10%）	0~100W	±(1%+0.1%FS)	1mW
	100~1200W	±(1%+0.1%FS)	100mW
Battery testing function	Input=0.1-60V Max measurement capacity= 999AH Resolution =10mA Timer range=1~60000sec		

Transition Mode	Range o Frequency 0.1Hz-1kHz Frequency error rate＜0.5%
Inner Resistance	≤ 0.0055Ω

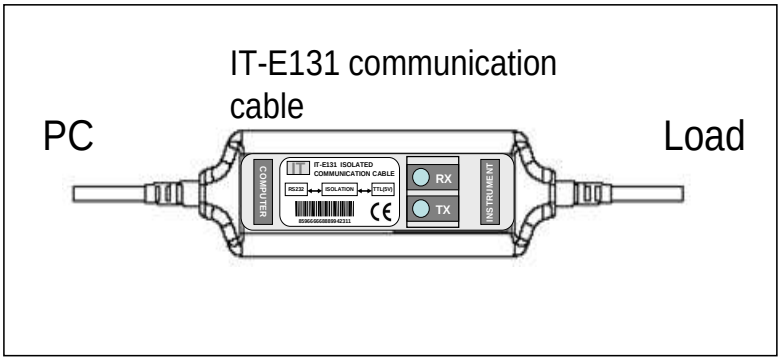
Remote Operation Mode

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

1 Communication cable

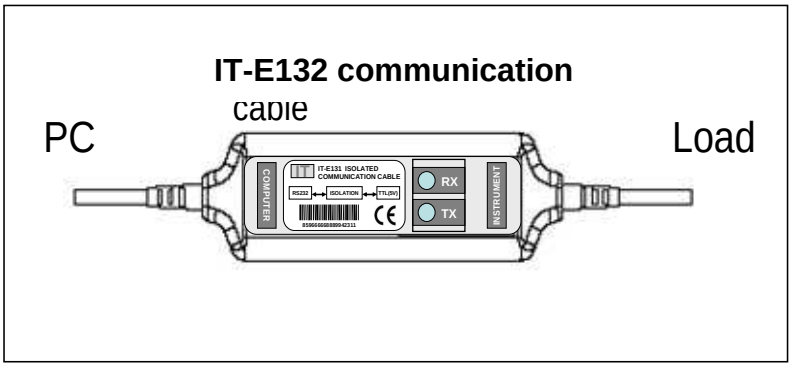
IT-E131 RS232 Communication cable

The DB9 interface connector on the rear panel of electronic load is TTL voltage level; you can use the communication cable (IT-E131) to connect the DB9 interface connector of the electronic load and the RS-232 interface connector of computer for the communication.



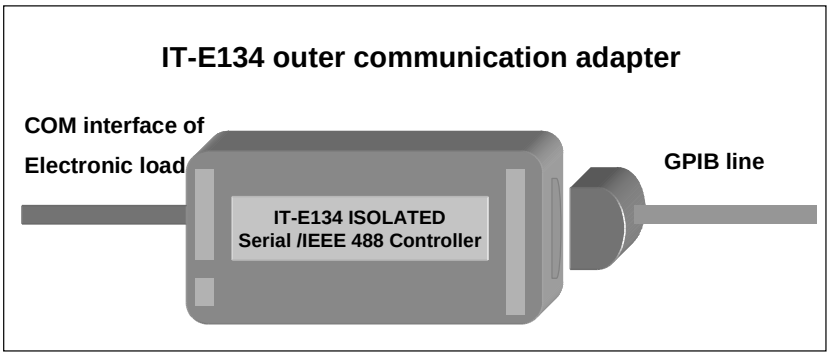
IT-E132 USB Communication cable

The DB9 interface connector on the rear panel of electronic load is TTL voltage level; you can use the communication cable (IT-E132) to connect the DB9 interface connector of the electronic load and the USB interface connector of computer for the communication.



IT-E134 GPIB Communication Cable

The DB9 interface connector on the rear panel of electronic load is TTL voltage level; you can use the communication cable (IT-E134) to connect the DB9 interface connector of the electronic load, and then connect GPIB interface connector of IT-E134 cable and computer with GPIB/IEEE 4888 line for the communication.



Note: Forbidden to connect DB9 connector in electronic load directly with PC or other RS232 port.

2 Communication between electronic load and PC

Before using the remote operation mode, please make sure that the baud rate and communication address in electronic 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.

1. Address: the range is from 0 to 254,default setting is 0
2. Baud rate: 4800,9600,19200 and 38400 are selectable, default setting is 4800
3. Data bit：8 bit
4. Stop bit：1
5. Parity：None

Parity=None	Start Bit	8 Data Bits	Stop Bit

3. Frame Format

Frame length is 26 bytes. Details as following:

AAH	Address	Command	4—25bytes are information content	Parity code

Description ：

1. Start bit is AAH，occupies one byte.
2. Address range from 0 to FE, occupies one byte.
3. Each command occupies one byte. Following is the command details.

20H	Selecting the Remote control mode

21H	Selecting the input on/off state
22H	Setting the max input voltage
23H	Reading the max setup input voltage.
24H	Setting max input current
25H	Reading the max setup input current.
26H	Setting max input power.
27H	Reading the max setup input power.
28H	Selecting CC/CV/CW/CR operation mode of electronic load.
29H	Reading the operation mode.
2AH	Setting CC mode current value
2BH	Reading CC mode current value
2CH	Setting CV mode voltage value
2DH	Reading CV mode voltage value
2EH	Setting CW mode watt value
2FH	Reading CW mode watt value
30H	Setting CR mode resistance value
31H	Reading CR mode resistance value
32H	Setting CC mode transient current and timer parameter.
33H	Reading CC mode transient parameter
34H	Setting CV mode transient voltage and timer parameter.
35H	Reading CV mode transient parameter
36H	Setting CW mode transient watt and timer parameter
37H	Reading CW mode transient parameter
38H	Setting CR mode transient resistance and timer parameter
39H	Reading CR mode transient parameter
3AH	Selecting the list operation mode (CC/CV/CW/CR)
3BH	Reading the list operation mode.
3CH	Setting the list repeat mode (ONCE / REPEAT)
3DH	Reading the list repeat mode.
3EH	Setting the number of list steps.
3FH	Reading the number of list steps
40H	Setting one of the step’s current and time values.
41H	Reading one of the step’s current and time values.
42H	Setting one of the step’s voltage and time values.
43H	Reading one of the step’s voltage and time values
44H	Setting one of the step’s power and time values
45H	Setting one of the step’s power and time values.
46H	Setting one of the step’s resistance and time values
47H	Reading one of the step’s resistance and time values
48H	Setting list file name.
49H	Reading list file name.
4AH	Selection the memory space mode for storing list steps.
4BH	Reading the memory space mode for storing list steps.

4CH	Save list file in appointed area.
4DH	Get the list file from the appointed area.
4EH	Setting min voltage value in battery testing mode.
4FH	Reading min voltage value in battery testing mode
50H	Setting timer value of FOR LOAD ON
51H	Reading timer value of FOR LOAD ON
52H	Disable/Enable timer of FOR LOAD ON
53H	Reading timer state of FOR LOAD ON
54H	Setting communication address
55H	Enable/Disable LOCAL control mode.
56H	Enable/Disable remote sense mode.
57H	Reading the state of remote sense mode.
58H	Selecting trigger source.
59H	Reading trigger source.
5AH	Sending a trigger signal to trigging the electronic load.
5BH	Saving user's setting value in appointed memory area for recall.
5CH	Recall user's setting value in appointed memory area.
5DH	Selecting FIXED/SHORT/TRAN/LIST/BATTERY function mode.
5EH	Getting function mode state.
5FH	Reading input voltage, current, power and relative state
60H	Enter the calibration mode
61H	Getting the calibration mode state.
62H	Calibrate voltage value.
63H	Sending the actual input voltage to calibration program.
64H	Calibrate current value.
65H	Sending the actual input current to calibration program.
66H	Store the calibration data to EEPROM.
67H	Setting calibration information.
68H	Reading calibration information.
69H	Restore the factory default calibration data.
6AH	Reading product's model, series number and version information.
6BH	Reading the information of bar code.
6CH	Setting information of bar code
12H	The return information of command operation in electronic load.

NOTE

If control output of electronic through PC, please setting electronic load is on PC control state. Command is 20H. Make a calibration on input of electronic load, ensure the calibration protection mode is OFF state when setting calibration information. If electronic load in calibration mode, user's can't change the input and operation mode of electronic load

4. From 4^{th} byte to 25^{th} byte are information contents.
5. 26^{th} is sum code, is the sum of the former 25 bytes.

4. Communication Protocol

1. Selecting the Remote control mode（20H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（20H）
4th .byte	Operation mode（0 is front panel operation mode ， 1 is remote operation mode ）
5th to 25th byte	System reserve
26th byte	Sum code

NOTE

Front panel operation state is not in effect if electronic load is in calibration mode.

2. Selecting the input on/off state （21H）

1st byte	Start bit (AAH)
2nd byte	Address(0—0XFE)
3rd byte	Command（21H）
4th byte	Input state（0 is OFF，1is ON）
5th to 25th byte	System reserve
From 26th byte	Sum code

3. Setting / Reading max input voltage（22H/23H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（22H/23H）
4th byte	The Lowest byte of max voltage value
5th byte	The lower byte of max voltage value.
6th byte	The higher byte of max voltage value.
7th byte	The highest byte of max voltage value.
8th to 25th byte	System reserve.
26th byte	Sum code.

NOTE

Represent a voltage upper limit value by 4 bytes of Hex. Lower bytes are in the front location, higher bytes are in the later location. 1 represent 1mV.For Example : The voltage upper limit is 16.000V，the hex code is 0X00003EB0，then the 4th byte is 0XB0，5th byte is 0X3E，6th byte is 0X00，7TH byte is 0X00.

4. Setting / Reading the max input current .（24H/25H）

1st byte	Start bit (AAH)
2nd byte	Address(0—0XFE)

3rd byte	Command（24H/25H）
4th byte	The Lowest byte of max current value
5th byte	The Lowest byte of max current value
6th byte	The higher byte of max current value
7th byte	The highest byte of max current value
8th to 25th byte	System reserve
26th bye	Sum code

NOTE

Represent an current value by 4 bytes of Hex .Lower bytes are in the front location, higher bytes are in the later location.1 represent 0.1mA,If setting upper limit is **3.0000**A，the hex code is **0X00007530**，then the 4th byte is **0X30**，5th is **0X75**，6th is 0X00，7th is **0X00**。

5. Setting / Reading max input power（26H/27H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（26H/27H）
4th byte	The lowest byte of max power value.
5th byte	The lower byte of max power value
6th byte	The higher byte of max power value.
7th byte	The highest byte of max power value.
8th to 25th byte	System reserve
26th byte	Sum code

NOTE

Represent power value by 4 bytes of Hex. Lower bytes are in the front location, higher bytes are in the later location. 1 represents 1mW. If setting upper value is **200.000W**，the hex code is **0X00030d40**，then the 4th byte is **0X40**，5th is **0X0d**，6th is 0X03，7th is **0X00**.

6. Selecting / Reading CC/CV/CW/CR operation mode of electronic load.（28H/29H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（28H/29H）
4th byte	Mode（0 is CC mode, 1 is CV mode , 2 is CW mode , 3 is CR mode ）
5th to 25th byte	System reserve
26th byte	Sum code

7. Setting / Reading CC mode current value（2AH/2BH）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command （2AH/2BH）
4th byte	The lowest byte of current value

5th byte	The lower byte of current value.
6th byte	The higher byte of current value.
7th byte	The highest byte of current value.
8th To 25th byte	System reserve
27th byte	Sum code

NOTE

Represent current by 4 bytes of Hex. Lower bytes are in the front location, higher bytes are in the later location. For example: current is **3.0000**A，Hex code is **0X00007530**，NO. 4 bye is **0X30**，NO. 5 bye is **0X75**，NO. 6 bye is 0X00，NO. 7 bye is **0X00**。

8. Setting / Reading CV mode voltage value.（2CH/2DH）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（2CH/2DH）
4th byte	The lowest byte of voltage value.
5th byte	The lower byte of voltage value.
6th byte	The higher byte of voltage value.
7th byte	The highest byte of voltage value.
8th to 25th byte	System reserve
26th byte	Sum code

NOTE

Represent voltage by 4 bytes of Hex. Lower bytes are in the front location, higher bytes are in the later location. For example :voltage is **16.000**V，Hex code is **0X00003EB0**，4th byte **0XB0**，5TH byte is **0X3E**，6th byte is 0X00，7th bytes **0X00**。

9. Setting / Reading CW mode watt value（2EH/2FH）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（2EH/2FH）
4th byte	The lowest byte of max power value
5th byte	The lower byte of max power value
6th byte	The higher byte of max power value
7th byte	The highest byte of max power value
8th to 25th byte	System reserve
26th byte	Sum code

NOTE

Represent power by 4 bytes of Hex. Lower bytes are in the front location, higher bytes are in the later location. For example :power is **200.000W**，Hex is **0X00030d40**，4th byte is **0X40**，5th byte is **0X0d**，6th byte is 0X03，7th byte is **0X00**。

10. Setting / Reading CR mode resistance value（30H/31H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（30H/31H）
4th byte	The lowest byte of resistance value.
5th byte	The lower byte of resistance value.
6th byte	The higher byte of resistance value.
7th byte	The highest byte of resistance value.
8th to 25th byte	System reserve
26th byte	Sum code

NOTE

Represent resistance value by 4 bytes of Hex. Lower bytes are in the front location, higher bytes are in the later location. If resistance value is **200.000R**，Hex code is **0X00030d40**，4TH byte is **0X40**，5TH byte is **0X0d**，6th byte is 0X03，7th byte is **0X00**。

11. Setting /Reading CC mode transient current and timer parameter. （32H/33H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（32H/33H）
4th byte to 7th byte	Setting value of current A (Lower bytes are in the front location, higher bytes are in the later location.)
8th to 9th byte.	Time value of timer A ((Lower bytes are in the front location, higher bytes are in the later location) (1 represent 0.1ms)
10th to 13th byte	Setting value of current B (Lower bytes are in the front location, higher bytes are in the later location)
14th to 15th byte	Time value of timer B (Lower bytes are in the front location, higher bytes are in the later location) (1 represent 0.1ms)
16th byte	Transition operation mode (0 is CONTINUES, 1 is PULSE, 2 is TOGGLED)
17th to 25th byte	System reserve
26th byte	Sum code

12. Setting /Reading CV mode transient voltage and timer parameter.（34H/35H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（34H/35H）
4th to 7th byte.	Setting value of voltage A (Lower bytes are in the front location, higher bytes are in the later location)

8th to 9th byte.	Time value of timer A (Lower bytes are in the front location, higher bytes are in the later location) (1represent 0.1ms)
10th to 13th byte	Setting value of voltage B(Lower bytes are in the front location, higher bytes are in the later location)
14th to 15th byte	Time value of timer B (Lower bytes are in the front location, higher bytes are in the later location) (1represent 0.1ms)
16th byte	Transient operation mode (0 is CONTINUES,1 is PULSE,2 is TOGGLED)
17th to 25th byte	System reserve
26th byte	Sum code

13. Setting /Reading CW mode transient watt and timer parameter（36H/37H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（36H/37H）
4th to 7th byte	Setting value of power A (Lower bytes are in the front location, higher bytes are in the later location)
8th to 9th byte	Time value of timer A (Lower bytes are in the front location, higher bytes are in the later location) (1 represent 0.1ms)
10th to 13th byte	Setting value of power B(Lower bytes are in the front location, higher bytes are in the later location)
14th to 15th byte	Time value of timer B (Lower bytes are in the front location, higher bytes are in the later location) (1 represent 0.1ms)
16th byte	Transition operation mode (0 is CONTINUES,1is PULSE,2 is TOGGLED)
17th to 25th byte	System reserve
26th byte	Sum code

14. Setting /Reading CR mode transient resistance and timer parameter（38H/39H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（38H/39H）
4th to 7th byte	Setting value of resistance A (Lower bytes are in the front location, higher bytes are in the later location)
8th to 9th byte.	Time value of timer A (Lower bytes are in the front location, higher bytes are in the later location) (1 represent 0.1ms)
10th to 13th byte	Setting value of resistance B (Lower bytes are in the front location, higher bytes are in the later location)
14th to 15th byte	Time value of timer B (Lower bytes are in the front location, higher bytes are in the later location) (1 represent 0.1ms)
16th byte	Transition operation mode (0 is CONTINUES,1 is PULSE,2 is TOGGLED)
17th to 25th byte	System reserve
26th byte	Sum code

15. Selecting /Reading the list operation mode (CC/CV/CW/CR)（3AH/3BH）

1st byte	Start bit (AAH)

2nd byte	Address (0—0XFE)
3rd byte	Command（3AH/3BH）
4th byte	LIST operation mode（0is CC mode，1 is CV mode ,2 is CW mode,3 is CR mode）
5th to 25 byte	System reserve
26th byte	Sum code

16. Setting /Reading the list repeat mode. (3CH/3DH)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（3CH/3DH）
4th byte	LIST repeat operation mode(0 is ONCE, 1 is REPEAT)
5th to 25th byte	System reserve
26th byte	Sum code

17. Setting / Reading the number of list steps. (3EH/3FH)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（3EH/3FH）
4thto 5th byte	LIST steps
6th to 25th byte	System reserve
26th byte	Sum code

18. Setting / Reading one of the step's current and time values. (40H/41H)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（40H/41H）
4th to 5th byte	Appointed one step
6th to 9th byte	Current value of current step (Lower bytes are in the front location, higher bytes are in the later location)
10th to 11th byte	Time value of current step (Lower bytes are in the front location, higher bytes are in the later location) (1 represent 0.1ms)
12th to 25th byte	System reserve
26th byte	Sum code

19. Setting / Reading one of the step's voltage and time values. (42H/43H)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（42H/43H）
4th to 5th byte	Appointed one step
6th to 9th byte	Voltage value of current step (Lower bytes are in the front location, higher bytes are in the later location)

10th to 11th byte	Time value of current step (Lower bytes are in the front location, higher bytes are in the later location) (1 represent 0.1ms)
12th to 25th byte	System reserve
26th byte	Sum code

20. Setting / Reading one of the step's power and time values. (44H/45H)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（44H/45H）
4th byte	Appointed one step
5th to 8th byte	Power value of current step (Lower bytes are in the front location, higher bytes are in the later location)
9th to 10th byte	Time value of current step (Lower bytes are in the front location, higher bytes are in the later location) (1 represent 0.1ms)
11th to 25th byte	System reserve
26th byte	Sum code

21. Setting / Reading one of the step's power and time values. (46H/47H)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command （46H/47H）
4th to 5th byte	Appointed one step
6th to 9th byte	Resistance value of current step (Lower bytes are in the front location, higher bytes are in the later location)
10th to 11th byte	Time value of current step (Lower bytes are in the front location, higher bytes are in the later location) (1 represent 0.1ms)
12th to 25th byte	System reserve
26th byte	Sum code

22. Setting / Reading List file name (48H/49H)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command （48H/49H）
4th to 13th byte	LIST file name (ASSIC code)
14th to 25th byte	System reserve
26th byte	Sum code

23. Selection / Reading the memory space mode for storing list steps. (4AH/4BH)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（4AH/4BH）
4th byte	partition mode (1 | 2 | 4 | 8)
5th to 25th byte	System reserve
26th byte	Sum code

24. Save / Get list file in appointed area.. (4CH/4DH)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（4CH/4DH）
4th byte	Storing area 1 ~ 8)
5th to 25th byte	System reserve
26th byte	Sum code

25. Setting / Reading min voltage value in battery testing mode.（4EH/4FH）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（4EH/4FH）
4th byte	The lowest byte of voltage value.
5th byte	The lower byte of voltage value.
6th byte	The higher byte of voltage value.
7th byte	The highest byte of voltage value.
8th to 25th byte	System reserve
26th byte	Sum code

26. Setting / Reading timer value of FOR LOAD ON (50H/51H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（50H/51H）
4th byte	The lowest byte of time value in timer. (1 represent 1S)
5th byte	The highest byte of time value in timer.
8th to 25th byte	System reserve
26th byte	Sum code

Time unit in Timer is S, 1S is represented by 1.

27. Disable / Enable timer of FOR LOAD ON (52H); Reading timer state of FOR LOAD ON (53H)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（52H/53H）
4th byte	Timer state (0 is disable ,1 is enable)
5th to 25th byte	System reserve
26th byte	Sum code

28. Setting communication address (54H)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command （54H）
4th byte	New communication address (0~0XFE)

5th to 25th byte	System reserve
26th byte	Sum code

29. Enable/Disable LOCAL control mode. (55H)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command （55H）
4th byte	State of LOCAL button(0:disable,1:enable “)
5th to 25th byte	System reserve
26th byte	Sum code

30. Enable / Disable remote sense mode. (56H)
Reading the state of remote sense mode. (57H)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（56H/57H）
4th byte	Remote mode state (0:disable,1:enable)
5th to 25th byte	System reserve
26th byte	Sum code

31. Selecting / Reading trigger source. (58H/59H)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command （58H/59H）
4th byte	**Trigger mode** (0:Keypad,1 External,2.command)
5th to 25th byte	System reserve
26th byte	Sum code

32. Sending a trigger signal to trigging the electronic load. (5AH)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（5AH）
4th to 25th byte	System reserve
26th byte	Sum code

33. Saving / Recall user’s setting value in appointed memory area for recall. (5BH/5CH)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（5BH/5CH）
4th byte	Storing area ( )
5th to 25th byte	System reserve
26th byte	Sum code

34. Selecting / Getting FIXED/SHORT/TRAN/LIST/ BATTERY function mode. (5DH/5EH)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（5DH/5EH）
4th byte	Work mode (0:FIXED,1:SHORT, 2:TRANSITION,3:LIST,4: BATTERY)
5th to 25th byte	System reserve
26th byte	Sum code

35. Reading input voltage, current, power and relative state. (5FH)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command （5FH）
4th to 7th byte	Actual input voltage value (Lower bytes are in the front location, higher bytes are in the later location)
8th to 11th byte	Actual input current value (Lower bytes are in the front location, higher bytes are in the later location)
12th to 15th byte	Actual input power value (Lower bytes are in the front location, higher bytes are in the later location)
16th byte	Operation state register
17th to 18th byte	Demand state register
19th to 25th byte	System reserve
26th byte	Sum code

BIT	Signal	Meaning
		Operation state register
0	CAL	Calculate the new demarcate coefficient
1	WTG	Wait for trigger signal
2	REM	Remote control mode
3	OUT	Output state
4	LOCAL	LOCAL button state (0 is represent “not in effect “,1 is represent ‘in effect “)
5	SENSE	Remote testing mode
6	LOT	FOR LOAD ON timer state
		Demand state register
0	RV	Input reverse voltage
1	OV	Over voltage
2	OC	Over current
3	OP	Over power
4	OT	Over temperature
5	SV	Not connect remote terminal
6	CC	Constant current
7	CV	Constant voltage
8	CP	Constant power
9	CR	Constant resistance

36. Enter the calibration mode（60H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（60H）
4th byte	Calibration mode select(0:disable;1:enable)
5th byte	Calibration password（0X85H）
6th byte	Calibration password（0X11H or 0X12H）
7th to 25th byte	System reserve
26th byte	Sum code

NOTE

If Load is not in protection state, users could do the calibration operation.

37. Getting the calibration mode state（61H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（61H）
4th byte	Calibration protection state
5th to 25th byte	System
26th byte	Sum code

NOTE

Represent calibration protection state by one byte. Each byte is defined as:

From high to low

7	6	5	4	3	2	1	0

0 byte：protection state，0 represent not in the protection state ，1 represent in protection state.

38. Calibrate voltage value（62H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（62H）
4th byte	Voltage calibration point（1~4）
5th to 25th byte	System reserve
26th byte	Sum code

NOTE

Current calibration standard points have four: 1, 2, 3,4.

39. Sending the actual input voltage to calibration program（63H）

1st byte	Start bit (AAH)

2nd byte	Address (0—0XFE)
3rd byte	Command（63H）
4th byte	The lowest byte of actual voltage
5th byte	The lower byte of actual voltage
6th byte	The higher byte of actual voltage.
7th byte	The highest byte of actual voltage.
8th to 25th byte	System reserve
26th byte	Sum code

40. Calibrate current value（64H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（64H）
4th byte	Current calibration point （1~4）
5th to 25th byte	System reserve
26th byte	Sum code

NOTE

Current calibration standard points have four: 1,2,3,4

41. Sending the actual input current to calibration program (65H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（65H）
4th byte	The lowest byte of actual current
5th byte	The lower byte of actual current
6th byte	The higher byte of actual current
7th byte	The highest byte of actual current
8th to 25th byte	System reserve
26th byte	Sum code

42. Store the calibration data to EEPROM（66H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command （66H）
4th to 25th byte	System reserve
26th byte	Sum code

NOTE

Finish the calibration operation, users should save the calibration parameter in EEPROM with this command; users could use these data in next power on.

43. Setting / Reading calibration information（67H/68H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（67H/68H）
4th to 23rd byte	Demarcate information（ASIC code）
24th byte	System reserve
25th byte	System reserve
26th byte	Sum code

44. Restore the factory default calibration data（69H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（69H）
4th to 25th byte	System reserve
26th byte	Sum code

NOTE

User could use the initial calibration data of factory with this command.

45. Reading product's model, series number and version information（6AH）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（6AH）
From 4th to 8th byte	Mode information （ASIC code）
9th byte	The lowest byte of software version number(BCD code)
10th byte	The highest byte of software version number(BCD code)
11th to 20th byte	Product series number （ASIC code）
21st to 25th byte	System reserve
26th byte	Sum code

For example：

Product's series number is 000045，product mode is 8511,software version number is V2.03，data as following

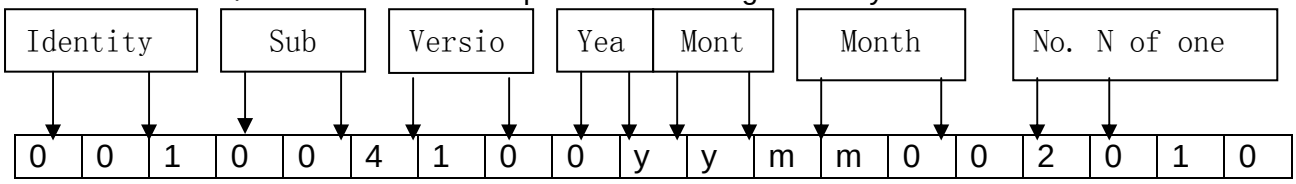
AA	00	31	38	35	31	31	00	03	02	ZZ	ZZ	ZZ	ZZ	ZZ	ZZ	ZZ	ZZ	ZZ	ZZ	XX	XX	XX	XX	XX	57

46. Reading information in bar code (6BH)

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command （6BH）
4th to 22nd byte	Information in bar code（ASICmode）
23rd to 25th byte	System reserve

26th byte	Sum code

Bar code rule ： All of bar cod of our products is distinguished by the former three characters.



47. Setting information of bar code（6CH）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（6CH）
4th to 22nd byte	Product series number（ASIC code）
24th byte	System reserve
25th byte	System reserve
26th byte	Sum code

48. The return information of command operation in electronic load（12H）

1st byte	Start bit (AAH)
2nd byte	Address (0—0XFE)
3rd byte	Command（12H）
4th byte	Command calibration result
5th to 25th byte	System reserve
26th byte	Sum code

NOTE

Receiving one frame command and verify them
If verify sum is wrong, return the parameter 90H
If setting parameter is wrong or over brim, return parameter A0H.
If command is not enforce, return to parameter B0H
If command is invalid, return to parameter C0H
Otherwise, return to parameter 80H

NOTE

Receiving one frame command and verify them
If verify sum is correct, return the relative reading data
If verify sum is wrong, return the verify command (90H)