PEL-8000 Series Electronic Load

User Manual

MATRIX TECHNOLOGY INC.

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Contents

Chapter One Introduction

The PEL-8000 series is a new generation of DC electronic load. It adopts high performance chip, high speed and high precision design. It can provide the resolution of 0.1mV and 0.01mA (the basic accuracy is 0.05% and the basic current rising speed is 2.5A /us) Novel, rigorous scientific production process, compared to similar products, more cost-effective.　Widely used in production lines (cell phone charger, cell phone batteries, electric car batteries, switching power supply, linear power), research institutions, automotive electronics, aerospace, shipbuilding, solar cells, fuel cells and other industries.

Main features

Constant current, constant resistance, constant voltage, constant power, constant current + constant voltage, constant resistance + constant voltage, six kinds of high-speed action mode;

Overcurrent, overvoltage, over power, overheating, reverse polarity protection

High brightness, vacuum, VFD screen, double row, four simultaneous display;

According to temperature change, stepless servo, intelligent fan system;

LOAD ON time setting, LOAD ON voltage setting;

Battery test and short circuit function;

Provide dynamic testing, rising and falling slope setting;

Provide arbitrary waveform editing capabilities (LIST function);

Support automatic test function

Support external trigger input, output;

Provide external current waveform monitoring terminal;

Support remote voltage compensation, multiple data storage;

POST, standard instrument rack design;

Support GPIB, RS232, RS485, USB communication.

Chapter II Technical Specifications

2.1 The main technical specifications

Model		PEL-8150		PEL-8300	
Input Rating	Power	150W		300W	
	Current	0-30A		0-60A	
	Voltage	0-150V			
CC mode	Range	0-3A	0-30A	0-6A	0-60A
	Resolution	0.1mA	1mA	0.1mA	1mA
	Accuracy	0.03%-0.05%FS			
CV mode	Range	0.1-19.999V	0.1-150V	0.1-19.999V	0.1-150V
	Resolution	0.1mV	1mV	0.1mV	1mV
	Accuracy	0.03%+0.02%FS			
CR mode	Range	0.03Ω-10kΩ	0.03Ω-5kΩ	0.03Ω-10kΩ	0.03Ω-5kΩ
	Resolution	16 bits			
	Accuracy	0.1%+0.1%FS		0.1%+0.1%FS	
CW mode	Range	0-60W	0-150W	0-60W	0-300W
	Resolution	0.1mW	10mW	0.1mW	10mW
	Accuracy	0.1%+0.1%FS		0.1%+0.1%FS	
V Measurement	Voltage	0-19.999V	0-150V	0-19.999V	0-150V
	Resolution	0.1mV	1mV	0.1mV	1mV
	Accuracy	0.015%+0.03%FS	0.015%+0.03%FS	0.015%+0.03%FS	0.015%+0.03%FS
C Measurement	Current	0-3A	0-30A	0-6A	0-60A
	Resolution	0.1mA	1mA	0.1mA	1mA
	Accuracy	0.03%+0.05%FS	0.03%+0.08%FS	0.03%+0.05%FS	0.03%+0.08%FS
W Measurement	Watt	60W	150W	60W	300W
	Resolution	0.1mW	10mW	0.1mW	10mW
	Accuracy	0.1%+0.1%FS		0.1%+0.1%FS	
Battery Measurement Battery Input：0.1-150V Max. measurement capacity=999AH; Resolution=0.1mA; Test time=1S-16HS					
Dynamic measurement function: dynamic programming:0-25KHz;2.5A/uS; T1&T2:60uS-999S; Accuracy:±15%, offset+10%FS					

Current soft start time: 1mS;2mS;5mS;10mS;20mS;50mS;100mS;200mS;500mS;1000mS; Accuracy: ± 15%, offset+10%FS					
Short Circuit	Current(CC)	≈3A	≈33A	≈6.6A	≈66A
	Valtge(CV)	0V			
	Resistance（CR）	≈55mΩ		≈25mΩ	
Temperature	Operating	0-40℃			
	Storage	（-10℃~70℃）			
Dimension	W*H*D(mm)	214*108*365			
Weight	Kg	3.5		3.5	

Chapter III Quick Start

3.1 POST

First of all, the user needs to connect the power cord correctly and power on. The following are the specific steps of self-test.

step	VFD display	details
When the electronic load power is turned on	SYSTEM SELF TEST Vx.x	System self-test, and display the product model and software version number
After about 1S	EPROM ERROR	If the EEPROM is damaged or there is a loss of the last load in the EEPROM, the VFD displays a message (about 2S)
	ERROR CAL.DATA	If calibration data stored in the EEPROM is lost, the VFD displays a message (about 2S) as follows
If you have an error message, then about 2 seconds later	xxxxxxxV xxxxxxxA xxxxxxxW xxxxxxxX	VFD shows the actual input voltage, current, power, set parameter value and current status.

3.2 If the load can not be started

Use the following method to help solve the problems you may encounter when opening the load.

1) Check the power cord is connected,Should first check the power cord is connected, the load has been powered, the power switch is turned on.

2) Check load power supply voltage setting,The working voltage of the load is 110V or 220V two ways, check your load voltage settings and supply voltage to match.

3) Check the load fuse is burned out, if the fuse burned, please use the fuse specifications in the table below to be replaced.

Model	Fuse Specifications (110VAC)	Fuse Specifications (220VAC)
PEL-8150	T0.5A 250V	T0.3A 250V
PEL-8300	T0.5A 250V	T0.3A 250V

4) Fuse replacement method

Use a flat-blade screwdriver to open the small plastic cover under the power input socket on the rear panel of the load to see the fuses. Use fuses of the above specifications.   (Fuse position as shown below) Figure

3.1 fuse position
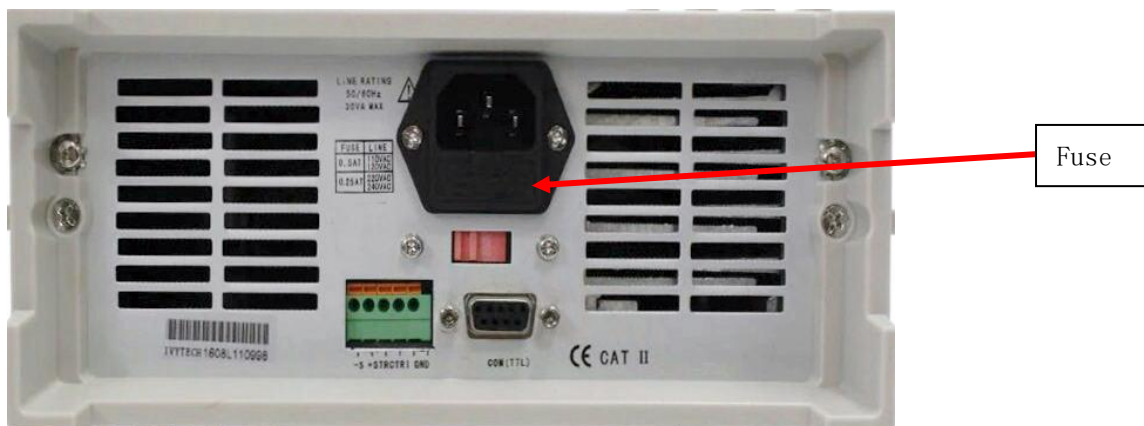
3.3 front and rear panel introduction

PEL-8000 series electronic load front panel as shown below

Figure 3.2 Front panel

① The top half of the panel is the black VFD display and knob

② The lower part of the panel from left to right are 0-9 numeric keys and ESC exit key, function key, up and down move key and Enter key, input and output terminals.

PEL-8000 series electronic load rear panel as shown below
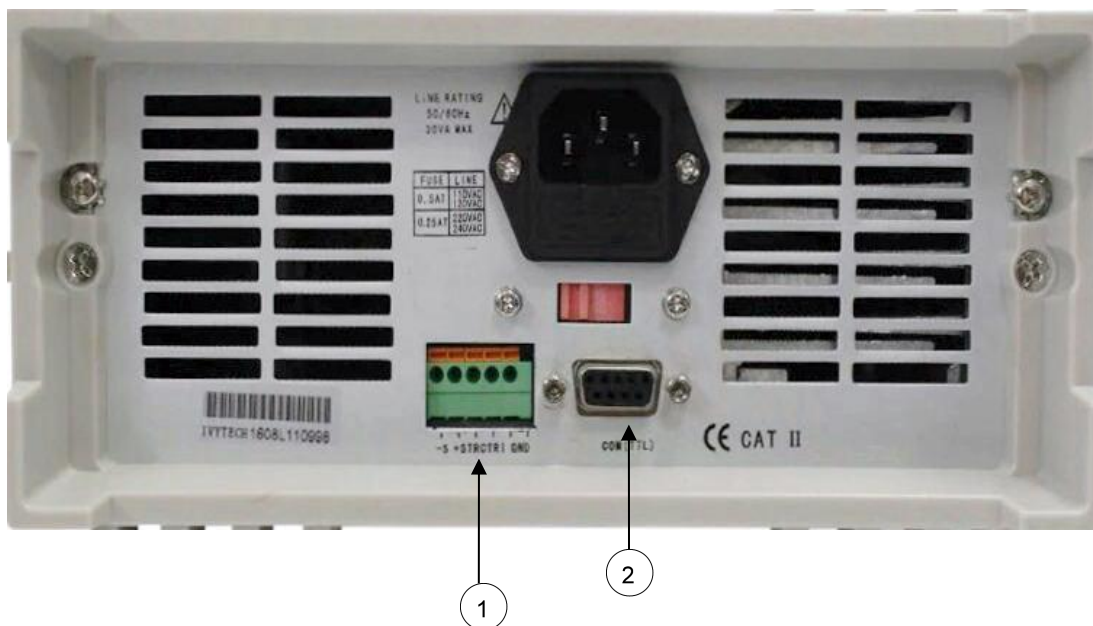
① Remote measurement terminal, trigger input and output interface

② Multi-function communication interface, GPIB, RS232, RS425, USB transfer

3.4 keyboard instructions

1 ~ **9**	0 ~ 9 for the number of input keys
Esc	Cancel button, you can exit in any working state
CC	Select constant current mode, set current output value
CV	Select the constant voltage mode, set the voltage output value
CP	Select the constant power mode, set the power output value
CR	Select the constant resistance mode, set the resistance output value
Shift	Shift composite key
On/Off	Load on / off
▲	Move the key and select menu item in menu operation
▼	Move the key to select the menu item in the menu operation
Enter	Enter

3.5 menu operation

Press Shift + Menu key to enter into menu function. At this time VFD displays selectable menus. Use up / down operation keys ▽ and △ or knob to turn VFD screen, the following functions will appear in sequence.   Press the Enter key at this time and you will be taken to the function selection where the cursor is. You can use the up / down keys ▽ and △ or the knob to turn the VFD screen. Press the Enter key to enter the next submenu.   Press Esc to return to the previous menu.

MENU		
CONFIG		
	INPUT RECALL	Set the input state at load power-on as the state at the last shutdown or OFF state
	ON	When the load is turned on, it will be restored to the state before shutdown.
	OFF	When the load is turned on, the input status is OFF and the working mode is CC.
	KEY SOUND SET	Keyboard sound settings
	ON	Keyboard sound
	OFF	Keyboard no sound
	CONNECT MODE	Connection mode
	MAXTIDLEXING	Multiple units
	SEPARATE	Single
	BAUDRATE SET	Set the communication baud rate
	2400	
	9600	
	14400	
	28800	
	57600	
	115200	

	COMM.PARITY	Set communication verification method
	NONE	No calibration
	EVEN	Even parity
	ODD	Odd parity
	ADDRESS SET	Set the load communication address
	1~200	
	KEY LOCK SET	Set the keyboard to unlock the password (null or 0 means no password)
	EXIT	
SYSTEM SET		
	MAX CURRENT SET	Set the software current limit, if the current limit is greater than 1/10 of the maximum current, the current is high range, otherwise low range (such as 120A machine, 12A following low range)
	MAX VOLTAGE SET	Set the voltage limit, if the voltage limit is greater than 20V, the voltage is high range, or low range
	MAX POWER SET	Set the power cap
	TERMINAL SEL	Input terminal selection
	FRONT	Select front panel terminal input
	BACK	Select the rear panel terminal input
	EXIT	
LIST		
	LOAD LIST	Select LIST file, 1 ~ 8
	EDIT LIST	Edit LIST file
	MINIMUM TIME	Editing the minimum time fineness (0.02 ~ 1310.7mS)
	LIST MODE	LIST output mode
	CONTINOUS	Continuous output
	END HOLD	The end of the output holds the last output level
	END RESET	End of output to maintain no-load output
	STEP LENGTH	Total steps (1 ~ 200)
	STEP n	1 ~ total step
	CURRENT	Set the current
	TIME	duration
	EXIT	
AUTO TEST		
	LOAD AUTO TEST	Select automatic test file 1 ~ 8
	EDIT AUTO TEST	Edit automatic test files
	STEP LENGTH	Set the total step size
	STEP n	
	WORK MODE	
	LOAD OFF MODE	No-load mode
	CC MODE	Constant current mode
	CV MODE	Constant voltage mode
	CP MODE	Constant power mode
	CR MODE	Constant resistance mode
	SHORT MODE	Short circuit mode
	TEST MODE	Conformity test mode

	TEST CURRENT	Test current
	TEST VOLTAGE	Test voltage
	TEST POWER	Test the power
	TEST RESI	Test resistance
	DELAY TIME	Test delay time (0.2 ~ 25.5S)
	INPUT xxxx	Enter the setting parameters, such as CC mode 1A
	MINIMUM xxxx	Enter the lower limit of the test parameter
	MAXIMUM xxxx	Enter the test parameter limit
	SETUP AUTO TEST	
	TRIGGER	Trigger output selection
	WHEN PASS	When the test is passed, the trigger output is activated
	WHEN FAIL	When the test fails, the trigger output is activated
	WHEN TEST END	When the test is completed, the trigger output is activated
	DISABLE	Prohibit triggering output
	OUTPUT	Output electrical characteristics of choice
	PULSE	Pulse output
	LEVEL	Level output
	EXIT	
EXIT		

Chapter IV Panel Operation

4.1 Basic operation mode

Electronic load can work in the following four modes:
1. Constant current mode of operation (CC).
2. Constant voltage operation mode (CV).
3. Constant resistance operation mode (CR).
4. Constant power operation mode (CW)

4.1.1 Constant current mode of operation (CC)

In constant current mode, the electronic load consumes a constant current, regardless of the input voltage, as shown in the following figure.   Please note that if the source can output the maximum current value is less than the set constant current value, the load will not be guaranteed to adjust the set current value, the source voltage may be pulled down test.
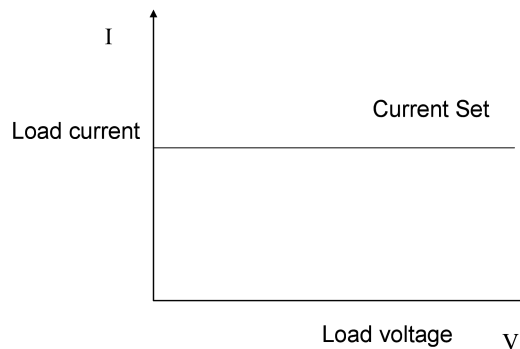

Figure 4.1 Constant current mode

4.1.1.1 Standard constant current mode

Press the CC button, the load shows "STANDARD CURR = xxxxxxxxA", the current value of the current prompt, then press the number keys and decimal point keys on the panel, enter the desired constant current value from high to low, and press the Enter key to confirm , The load into the standard constant current mode.

In this case, if the input status is OFF, the upper right corner of the display panel will display "OFF". To change the input status to ON, press the On / Off button. The "CC" or "Unreg" "CC" indicates that the expected constant current value is reached. If "Unreg" indicates that the load can not be adjusted to the preset current value correctly, check whether the source under test is properly connected and turned on, or whether the source under test can output the preset current value.

In this case, if you want to fine-tune the set current value, you can use the rotary encoder in the upper right corner, clockwise to increase, counterclockwise to reduce, please note that if the set current value has reached the maximum current set load, The current value can not be adjusted upwards.   At this time, the lower right of the display panel to set the current value indication, one digit under the cursor prompt, said the current fine-tuning the current position of a unit, if you want to change the adjustment fineness, you can press Rotary encoder, rotary encoder contains a button, each time the button is pressed, the prompt cursor will move a grid, in order to achieve fine adjustment adjustment.

4.1.1.2 Load unload constant current mode

Loading and unloading mode is a protection of the source under test. When the source voltage to be measured is just starting to climb, the load is automatically adjusted to be open. The source voltage does not start to load until the source voltage climbs to the ONSET voltage. The load is adjusted to set Set the current value. When the source voltage to be measured begins to drop and drops to the OFFSET unload voltage, the load is

automatically adjusted to the open state.   If the ONSET load voltage is greater than the OFFSET unload voltage, the load may avoid frequent unloading of the load near the critical point of the unloading voltage, which may better protect the source under test.
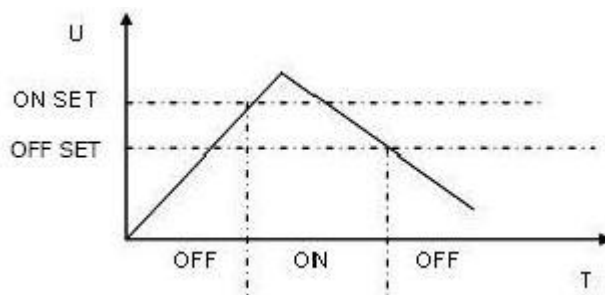

Figure 4.2 load uninstall mode

In the standard constant current mode, press the Shift + 1 (V_Level) key in order to enter the load unload constant current mode, the load display "ONSET VOLT = xxxxxxxxV" prompt current load voltage, then press the number keys on the panel and the decimal point Key, enter the required load voltage value from high to low, and press Enter key to confirm. At this moment, the load shows "OFFSET VOLT = xxxxxxxxV" to prompt the current unloading voltage. At this time, press the numeric keys and decimal point key on the panel, Enter the desired unload voltage value in order from high to low, and press Enter key to confirm, the load enters the unload constant current mode.

At this time, if the input status is OFF, the upper right corner of the display panel will display "OFF". To change the input status to ON, press the On / Off button. The "CC_UN" or "Unreg" "CC_UN" indicates that the expected constant current value is reached. If "Unreg" indicates that the load can not be adjusted to the preset current value correctly, check whether the source to be measured is correctly connected and turned on, whether the voltage is within the normal range, or whether the source to be measured Output the preset current value.

At this point, in the load and unload constant current mode, press Shift + 1 (V_Level) key, the load will return to the standard constant current mode.

4.1.1.3 Soft-start constant current mode

Soft-start constant current mode, equivalent to an inductive load, the analog inductance is proportional to the size of the soft-start rise time, in this mode, the test source will likely avoid large current transient impact.
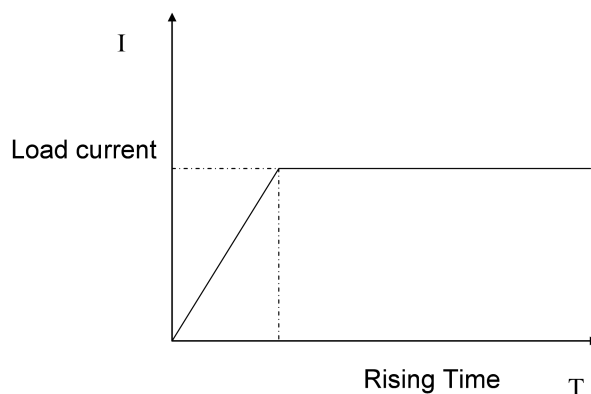

Figure 4.3 Soft Start Current Mode

In the standard constant current mode, press the Shift + 2 (S_Start) key in order to enter the soft start constant current mode, the load display "RISING TM = xxxxxxxxvmS" prompt the current rising edge time, Enter the desired rising edge time from high to low and press Enter key to confirm, the load will enter the soft start constant current

mode.

In this case, if the input status is OFF, the upper right corner of the display panel will display "OFF". To change the input status to ON, press the On / Off button. The "CC_S" or "Unreg" "CC_S" indicates that the expected constant current value is reached. If "Unreg" indicates that the load can not be adjusted to the preset current value correctly, check whether the source to be measured is correctly connected and turned on or whether the source under test can output the preset current value.

At this point, in the load and unload constant current mode, press Shift + 2 (S_Start) key, the load will return to the standard constant current mode.

Please note that the set rising edge time will be automatically adjusted to an integer multiple of 20uS.

4.1.1.4 constant current transfer voltage mode

Constant current transfer voltage mode, you can better protect the test source is not over-discharge damage.
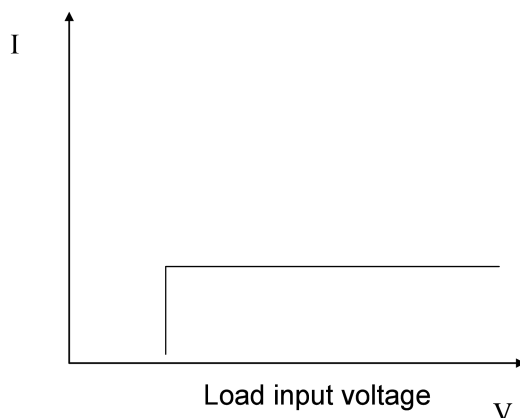
Figure 4.4 constant current conversion constant voltage

In the standard constant current mode, press the Shift + 4 (CC + CV) key to enter the constant current transfer voltage mode, then the load display "CC TO CV VOLT = xxxxxxxxV" prompts the current voltage value, then you can press the panel On the number keys and decimal point keys, enter the desired constant voltage value from high to low, and press Enter key to confirm, then the load into the constant current transfer voltage mode.

In this case, if the input status is OFF, the upper right corner of the display panel will display "OFF". To change the input status to ON, press the On / Off button. The "CC + CV" or "Unreg" , "CC + CV" indicates that the expected constant current value is displayed. If "Unreg" indicates that the load can not be adjusted to the preset current value correctly, check whether the source under test is properly connected and turned on and the voltage is within the normal range.

At this point, in the load and unload constant current mode, press the Shift + 4 (CC + CV) key, the load will return to the standard constant current mode.

4.1.2 Constant resistance operation mode (CR)

In the fixed resistance mode, the electronic load is equivalent to a constant resistance, as shown in the figure below, the electronic load will consume current that changes linearly as the input voltage changes. Please note that when the source voltage to be tested is too high and the set resistance is too small, the current consumed by the source is larger than the maximum output current of the source under test or the maximum absorption current of the load, it will not be equivalent to a constant resistance or even May cause load shock.
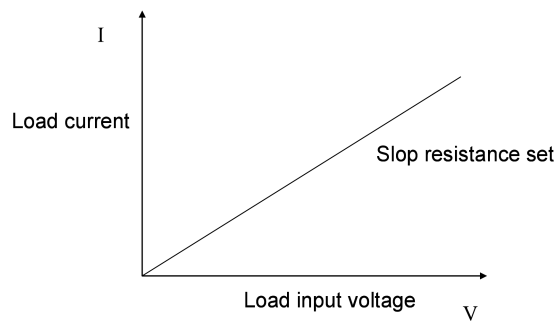
Figure 4.5 Constant resistance mode

4.1.2.1 Standard fixed resistance mode

Press the CR button, the load shows "STANDARD RESI = xxxxxxxxΩ", prompts the current set resistance, then press the numeric keys and decimal point keys on the panel, enter the desired constant resistance value from high to low, and press the Enter key to confirm , Load into the standard resistance mode.

In this case, if the input status is OFF, the upper right corner of the display panel will display "OFF". To change the input status bit, press the On / Off button. The "CR" or "Unreg" "CR" means that the expected resistance value is reached. If "Unreg" means the load can not be adjusted to the preset resistance value correctly, check whether the source under test is properly connected and turned on or whether the source under test can output the preset resistance Current.

At this time, if you want to fine-tune the set resistance, you can use the upper right corner of the rotary encoder, clockwise to increase, counterclockwise to reduce.　The bottom right of the display panel is for setting the resistance value indication. One digit indicates the cursor, indicating that the current fine adjustment fineness is 1 unit in the current position. If the user wants to change the fine adjustment, the rotary encoder can be pressed down , Rotary encoder contains a button, each button is pressed, the prompt cursor will move a grid, in order to achieve the adjustment fineness adjustment.

4.1.2.2 Loading and unloading fixed resistance mode

The principle of loading and unloading mode, please refer to 4.1.1.2 instructions

In the standard constant resistance mode, press Shift + 1 (V_Level) key to enter the load and unload constant resistance mode, the load display "ONSET VOLT = xxxxxxxxV" prompts the current load voltage, at this time you can press the number keys and decimal point keys on the panel, Enter the required load voltage value from high to low, and press Enter key to confirm, the load display "OFFSET VOLT = xxxxxxxxV" prompt the current unloading voltage, at this time you can press the number keys and decimal point keys on the panel, from high to low order Enter the desired unload voltage value and press Enter to confirm, the load enters the load unload constant resistance mode.

If the input status is OFF, the upper right corner of the display panel will display "OFF". To change the input status bit, press the On / Off button. In the upper right corner of the display panel, "CR_UN" or "Unreg" is displayed and "CR_UN "Indicates that the desired resistance value has been reached. If" Unreg "indicates that the load can not be adjusted to the preset resistance value correctly, check whether the source to be measured is correctly connected and turned on, whether the voltage is within the normal range, or whether the source under test can output the pre- Set the resistance to absorb the current value.

Pressing Shift + 1 (V_Level) while loading / unloading resistor mode, the load will return to the standard constant resistance mode.

4.1.2.3 fixed resistance switch voltage mode
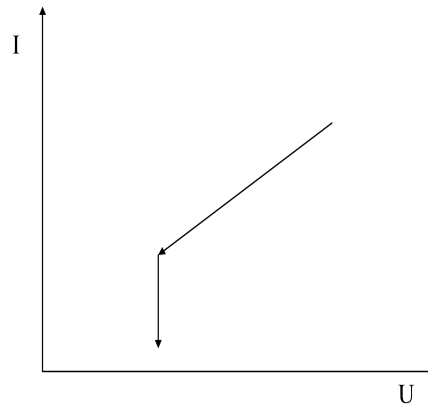
Figure 4.6 Constant resistance conversion constant voltage mode

Constant resistance to switch voltage mode, you can better protect the test source is not over-discharge damage.

In the standard constant resistance mode, press Shift + 5 (CR + CV) key to enter the constant resistance voltage mode, the load display "CR TO CV VOLT = xxxxxxxV" prompts the current voltage value, then press the panel number Key and decimal point key, enter the desired constant voltage value from high to low, and press Enter key to confirm, the load enters the constant resistance transfer voltage mode.

If the input status is OFF, the upper right corner of the display panel will display "OFF". To change the input status to ON, press the On / Off button. The "CR + CV" or "Unreg" "CR + CV" means that the expected resistance value is reached. If "Unreg" means the load can not be adjusted to the preset resistance value correctly, please check whether the source under test is properly connected and turned on and the voltage is within the normal range.

Pressing Shift + 5 (CR + CV) while loading / unloading resistor mode, the load will return to the standard constant resistance mode.

4.1.3 Constant voltage operation mode (CV)

In constant voltage mode, the electronic load will consume enough current to maintain the input voltage at the set voltage.   Please note that the load may not be able to stabilize the voltage at the set value when the source under test voltage is below the set voltage or when the maximum output current exceeds the maximum current that the load can absorb.
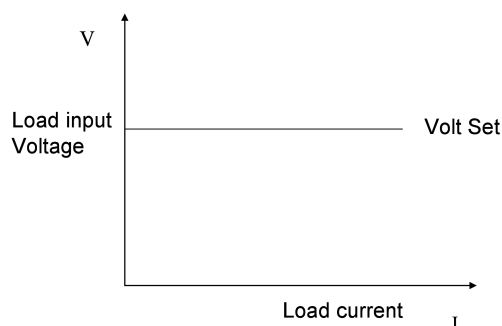
Figure 4.7 Constant Voltage Mode

4.1.3.1 Standard constant voltage mode

Press the CV button, the load displays "STANDARD VOLT = xxxxxxxV", prompts the current voltage value, then press the numeric keys and decimal point key on the panel, enter the desired constant voltage value from high to low, and press the Enter key to confirm , Load at this time into the standard constant voltage mode.

If the input status is OFF, the upper right corner of the display panel will display "OFF". To change the input

status bit, press the On / Off button. The upper right corner of the display panel displays "CV" or "Unreg" "Indicates that the voltage reaches the expected value," Unreg "means that the load can not be correctly adjusted to the preset voltage, please check the source is connected correctly and turned on, or the source voltage is too low to be measured, or the output current capacity exceeds the load Maximum load current.

If you want to fine-tune the set voltage value, you can use the rotary encoder in the upper right corner, clockwise to increase, counterclockwise to reduce, please note that if the set voltage value has reached the maximum voltage set by the load, Adjust the voltage value.   At this time, the lower right side of the display panel is for setting the voltage value indication. One of the digits under the cursor indicates that the current fine adjustment fineness is a unit of the current position. If the user wants to change the fine adjustment, he can press down Rotary encoder, rotary encoder contains a button, each time the button is pressed, the prompt cursor will move a grid, in order to achieve fine adjustment adjustment.

4.1.3.2 load unload constant voltage mode

The principle of loading and unloading mode, please refer to 4.1.1.2 instructions

In the standard constant voltage mode, press Shift + 1 (V_Level) key to enter the load unload constant voltage mode, then the load display "ONSET VOLT = xxxxxxxxV" prompts the current load voltage, then press the panel number keys and decimal point Key, enter the required load voltage value from high to low, and press Enter key to confirm, the load display "OFFSET VOLT = xxxxxxxxV" prompts the current unloading voltage, at this time you can press the number keys and decimal point keys on the panel, from high to Low enter the desired unloading voltage value in turn, and press the Enter key to confirm, the load into the load unload resistance mode.

If the input status is OFF, the upper right corner of the display panel will display "OFF". To change the input status bit, press the On / Off button. In the upper right corner of the display panel, "CV_UN" or "Unreg" is displayed and "CV_UN "Indicates that the voltage reaches the expected value," Unreg "means the load can not be correctly adjusted to the preset voltage, please check the source is connected correctly and turned on, the voltage is within the normal range, or the source can be measured output maximum Whether the current exceeds the load maximum absorption current.

In loading and unloading constant voltage mode, press Shift + 1 (V_Level) key, the load will return to the standard constant voltage mode.

4.1.3.3 Soft start constant voltage mode

Soft-start constant voltage mode, equivalent to a capacitive load, the analog capacitance is proportional to the length of the soft-start rise time, in this mode, the source under test may be subjected to high current moment
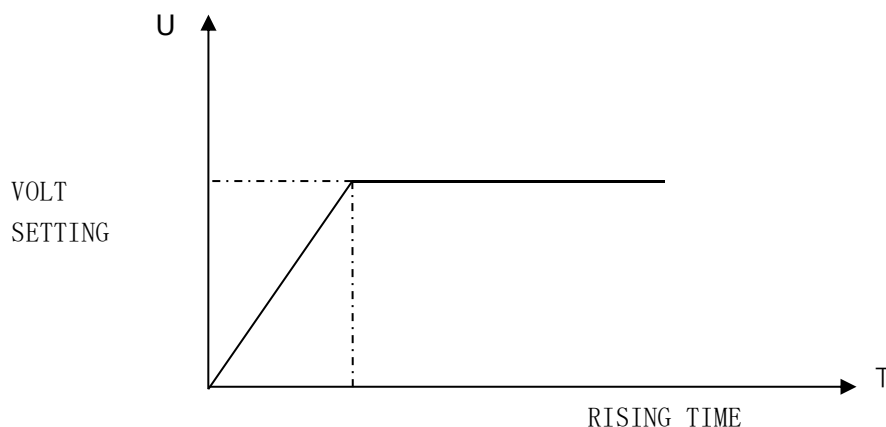
Figure 4.8 Soft Start Constant Voltage Mode

In the standard constant voltage mode, press the Shift + 2 (S_Start) key in order to enter the soft start constant voltage mode, the load display "RISING TM = xxxxxxxxvmS" prompts the current rising edge time, press the number keys and the decimal point key , Enter the desired rising edge time from high to low, and press Enter key to confirm, the load enters the soft start constant voltage mode.

If the input status is OFF, the upper right corner of the display panel will display "OFF". To change the input status bit to ON, press the On / Off button. The upper right corner of the display panel displays "CV_S" or "Unreg" "Indicates that the voltage reaches the expected value," Unreg "means the load can not be correctly adjusted to the preset voltage, please check the source is connected correctly and turned on, the voltage is within the normal range, or the source can be measured output maximum Whether the current exceeds the load maximum absorption current.

In the load unload constant voltage mode, press Shift + 2 (S_Start) key, the load will return to the standard constant voltage mode.

Please note that the set rising edge time will be automatically adjusted to an integer multiple of 20uS.

4.1.4 Constant power operation mode (CP)

In constant power mode, the electronic load consumes a constant power. As shown in the diagram below, if the input voltage increases, the input current will decrease and the power P (= V * I) will remain at the set power.
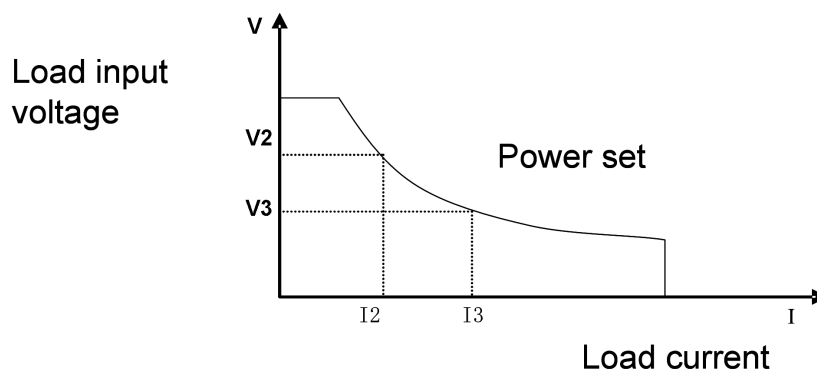
Figure 4.9 Constant Power Mode

4.1.4.1 Standard fixed power mode

Press the CP button, the load displays "STANDARD POWR = xxxxxxxxW", prompts the current constant power value, at this time you can press the number keys and decimal point keys on the panel, enter the desired constant power value from high to low, and press the Enter key to confirm At this point the load into the standard constant power mode.

If the input status is OFF, the upper right corner of the display panel will display "OFF". To change the input status to ON, press the On / Off button. The upper right corner of the display panel displays "CW" or "Unreg" Indicates that the expected power value has been reached. If "Unreg" indicates that the load can not be adjusted to the preset power value correctly, check whether the power source is properly connected and turned on, or if the power supply voltage is too low or the maximum output of the power source under test Is the current insufficient?

If you want to fine-tune the set power value, you can use the upper right corner of the rotary encoder, clockwise to increase, counterclockwise to adjust to reduce, please note that if the set power value has reached the load set the maximum power value, Adjust the power value.   At this time, the lower right side of the display panel is for setting the power value indication. One of the digits has a cursor indicating that the current fine adjustment is a unit of the current position. If the user wants to change the adjustment fineness, he can press down Rotary encoder, rotary encoder contains a button, each time the button is pressed, the prompt cursor will move a grid, in order to achieve fine adjustment adjustment.

4.1.4.2 Load / Unload Constant power mode

The principle of loading and unloading mode, please refer to 3.1.1.2 instructions

In standard constant power mode, press Shift + 1 (V_Level) key to enter load unload constant power mode, the load display "ONSET VOLT = xxxxxxxxV" prompts the current load voltage, at this time you can press the number keys and decimal point keys on the panel, Enter the required load voltage value from high to low, and press Enter

key to confirm, the load display "OFFSET VOLT = xxxxxxxxV" prompts the current unloading voltage, at this time you can press the number keys and decimal point keys on the panel, from high to low order Enter the required unloading voltage value, and press Enter key to confirm, the load into the loading and unloading constant power mode.

If the input status is OFF, "OFF" is displayed in the upper right corner of the display panel. To change the input status to ON, press the On / Off button. In the upper right corner of the display panel, "CW_UN" or "Unreg" is displayed and "CW_UN "Indicates that the expected constant power value has been reached. If" Unreg "indicates that the load can not be adjusted to the preset power value correctly, check whether the source to be measured is correctly connected and turned on, whether the voltage is within the normal range, or whether the source to be measured can output the pre- Set the current absorbed by the power.

In load unload constant power mode, press Shift + 1 (V_Level) key, the load will return to standard constant power mode.

4.2 dynamic test operation

Dynamic test operation enables the load to repeatedly switch between the two load currents or voltages. This function can be used to test the dynamic characteristics of the power supply.　Dynamic test operations can be enabled or disabled using the Shift + Tran key. Prior to a dynamic test operation, the relevant parameters of the dynamic test operation (Shift + S-Tran) should be set first.　These parameters include: A Value, A Pulse Width Time, A Rise Time to B Rise Time, B Value, B Value Pulse Width Time, B Fall Time to A Fall Time, and Dynamic Test Mode. Dynamic test mode can be divided into continuous mode, pulse mode and trigger mode.

4.2.1 Continuous mode (CONTINUOUS)

In continuous mode, the load continuously switches between the A and B values　　after the dynamic test operation is enabled.
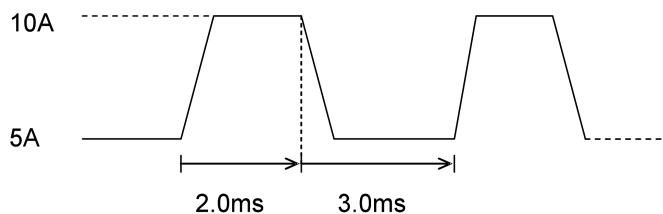
Figure 4.10 Continuous Operation Mode

4.2.2 Pulse mode (PULSE)

In pulse mode, after the dynamic test operation is enabled, each time a trigger is received, the load will switch to the value of B, and will switch back to the value of A after the pulse width of B is maintained.
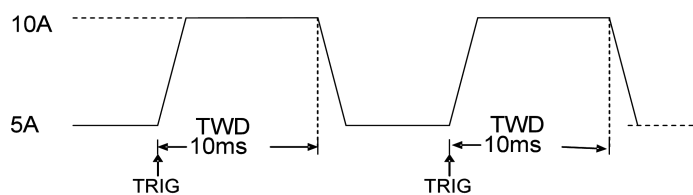

Figure 4.11 Pulse Operation Mode

4.2.3 Trigger Mode (TRIGGER)

In trigger mode, after a dynamic test operation is enabled, the load switches between the A and B values

for each trigger received.

Figure 4.12 Trigger mode of operation

4.2.4 Dynamic test parameter settings

Press the Shift + 6 (S_Tran) button, the load displays "LEVEL A CURR = xxxxxxxxA", prompts the current set A current value, then press the numeric keys and decimal point key on the panel, enter the desired Value and press Enter to confirm.

At this moment, the load displays "WIDTH A TM = xxxxxxxxmS" to indicate the current setting A duration. At this time, you can press the numeric keys and decimal point key on the panel to enter the desired value from high to low and press Enter key to confirm.

At this time, the load displays "RISING TM = xxxxxxxxmS" to indicate the current setting rising time from A to B. At this time, you can press the numeric keys and decimal point key on the panel to enter the desired value from high to low sequentially and press Enter to confirm.

At this time, the load displays "LEVEL B CURR = xxxxxxxxA" to indicate the current setting B current value. At this time, you can press the numeric keys and decimal point key on the panel to enter the desired value from high to low and press Enter key to confirm.

At this time, the load displays "WIDTH B TM = xxxxxxxxmS" to indicate the current setting B duration. At this time, you can press the numeric keys and decimal point key on the panel to enter the desired value from high to low and press Enter key to confirm.

At this time, the load displays "FALLING TM = xxxxxxxxmS" to indicate the falling time of the current setting from B to A. Press the numeric keys and decimal point keys on the panel to enter the desired value from high to low sequentially and press Enter to confirm.

At this time, the load displays "TRANMODE CONTINUOUS" / "TRANMODE PULSE" / "TRANMODE TRIGGER" to indicate the currently set dynamic test mode. Press ∧ or ∨ key to select the mode you want to set and press Enter key to confirm.

4.2.5 Waveform control

4.2.5.1 Square wave

If both the rising edge time and the falling edge time are set to 0 and the test mode is set to continuous mode, the output is a square wave. The output frequency is the reciprocal of the sum of the duration of current A and current B. Since the minimum fineness is set to 20uS for all times, the load can edit a square wave with a 50% duty cycle at a maximum frequency of 25KHz.

4.2.5.2 Triangle wave

If the current A and current B duration are set to 0, the test mode is set to continuous mode, the output is a triangular wave. The output frequency is the reciprocal of the sum of the rising and falling times, so the load can edit the triangular wave with a maximum frequency of 25KHz, since the minimum fineness set for all times is 20uS. Since the rising and falling edges of the triangular wave are all staircase waves based on the output frequency of 20uS, the ideal degree of the triangular wave is inversely proportional to the output frequency and may be equivalent to a square wave in extreme conditions. The rising and falling edges depend on the set time , There are differences in fineness from 0 to 100 points.

4.2.5.3 Trapezoidal wave

If the required four time parameters are set greater than 0, the test mode is continuous output In normal mode, the load output is trapezoidal wave.   The frequency characteristics of its description with the triangular wave.

4.2.6 Trigger control

When dynamic test mode is set to pulse mode or trigger mode, trigger control is activated.   Trigger in three ways:

a、　　　Key trigger

　　　Press Shift + Trigger button in sequence, the trigger

b、　　　External hardware input trigger

　　　When the load terminal TRIG_IN terminal level is continuously low 5mS or more, a trigger.

c、　　　PC control software trigger

4.2.7 LIST function

The load can perform sequential operation (LIST function), up to 8 groups of data can be edited, each group can be edited 200 steps, each step can edit the execution time, the user can define different minimum time unit in each data, the minimum time unit is 0.02 mS, the minimum time unit setting range is 0.02 ~ 1310.7mS, each single-step executable time range is related to the setting of the minimum time unit. If the minimum time unit is set to 0.02mS, each step can be executed Of the time range is 0.02 to 1310.7 mS, and if the minimum time unit is set to 2 mS, the time range for each single-step execution is 2 to 131,070 mS.

4.2.7.1. Edit list

1) Press Shift + 0 to enter the menu setting, press ▲ or ▼ key until the load prompts "MENU LIST", press Enter key to enter, press ▲ or ▼ key until the load prompts "EDIT LIST", press Enter key to enter, press ▲ Or ▼ key to select the serial number to be set and press Enter key to enter LIST edit menu.

2) At this time, the load prompt "MINIMUM TM = xxxxxx mS", which is prompted to enter the minimum time unit to be set.   This value affects the fineness and operational length of arbitrary waveforms. Please choose your own parameters carefully.   After entering the data and pressing Enter, the load prompts the following three output modes. The user can select with ▲ or ▼ and confirm with Enter.

"LIST   CONTINOUS"   Expressed as a continuous output.

"LIST   END HOLD"   Indicates that after all points have been output, the last value remains unchanged.

"LIST   END RESET" After all points have been output, the load is reset to no load.

3) Press Enter key to confirm. The load prompt "STEP LENG = xxx" indicates the total step length to be edited. The total step must be an integer from 1 to 200. Press number key to confirm.

4) Press the number key to confirm, the load will display "STEP 1 CURR = xxxxxA", prompting the user to enter the current needed for the first step, press number keys to edit and press Enter key to confirm, then the load will display "STEP 1 TM = xxxxx mS ", prompting the user to enter the duration of the first step constant current, press number keys to edit and press Enter key to confirm.

5) Press the Enter key to confirm, if you have edited all the set total step, then display "EDIT LIST", that return to LIST function main menu.   If you have not yet edited the entire set step, return 4) "STEP n CURR = xxxxxA" is displayed, indicating that you are editing step n data.

6) Since LIST function and automatic test function share a piece of storage space, it is necessary to pay attention when editing the serial number selected by LIST function. If this serial number was originally used for automatic test function, after editing LIST function, the same serial number of automatic The test list will be deleted and can not be recovered.

4.2.7.2 Perform LIST function

Press Shift + 0 to enter menu setting, press ▲ or ▼ key until the load prompts "MENU LIST", press Enter key to enter, press ▲ or ▼ key until the load prompts "LOAD LIST", press Enter key to enter, press ▲ or ▼ Key to select the serial number to be executed and press Enter to finish.

Since LIST function and automatic test function share a piece of storage space, if some of the serial number identification list is defined as automatic test function, when pressing ▲ or ▼ key to select serial number, the corresponding serial number will be masked.

4.2.8 Automatic test function

Load can perform automatic test function, you can edit up to 8 groups of data, each group can be edited 50 steps, each step can be edited to no-load, constant current, constant voltage, constant power, constant resistance, short circuit 6 working modes, you can edit the test Compare the current, voltage, power, resistance 4 kinds of parameter types, you can edit the delay test time parameters, the delay time is 0.1 ~ 25.5S taking into account the speed and accuracy of the test. The load will indicate whether the pass or fail is completed after an automatic test is completed. If the load fails, an audible alarm will be generated. At the same time, the keypad supports triggering of the front panel and the TRIGER IN hardware level on the rear panel, and triggers from the TRIGER OUT port on the rear panel User can edit two trigger modes, level trigger or pulse trigger, which can be edited to trigger by trigger, fail trigger, test trigger, and trigger trigger.

4.2.8.1 Edit automatic test list

1) Press Shift + 0 to enter the menu setting, press ▲ or ▼ key until the load prompts "MENU AUTO TEST", press Enter key to enter, press ▲ or ▼ key until the load prompts "EDIT AUTO TEST", press Enter key to enter, Press ▲ or ▼ key to select the serial number to be set and press Enter to enter the automatic test list edit menu.

2) The load shows "STEP LENG = XX" at this time, prompting you to enter the total test step size. Press the numeric keys to enter the total step size, and press the Enter key to confirm, the total step should be an integer from 1 ~ 50.

3) At this moment, the load will display "STEP 1 xxxxx MODE", prompting the working mode selected in the first step. There are 6 working modes available below. Press ▲ or ▼ to select and press Enter to confirm.

Operating mode	Prompt information	Description
No load	LOAD OFF MODE"	Compare no-load voltage
Constant current	"CC MODE"	Can choose to compare the current, voltage, power, resistance, one of four parameters
Constant voltage	"CV MODE"	Can choose to compare the current, voltage, power, resistance, one of four parameters
Constant power	"CP MODE"	Can choose to compare the current, voltage, power, resistance, one of four parameters
Set resistance	"CR MODE"	Can choose to compare the current, voltage, power, resistance, one of four parameters
Short circuit	"SHORT MODE"	Compare short-circuit current

4) At this moment, the load shows "STEP 1 TEST xxxx". It prompts to select the data types for comparison. There are 4 options for current, voltage, power and resistance. Press ▲ or ▼ to select and press Enter to confirm. If 3) is selected as no-load or short-circuit mode, skip this selection.

5) At this moment, the load display "DELAY TM = xx.xS", prompting the delay time for test and comparison,

the valid range of this delay time is 0.1 ~ 25.5S, the smaller the setting value, the shorter the time required for the test, However, under certain conditions, too small parameters may affect the test result because the power supply is not stable. Please carefully choose this parameter. The recommended data is 0.5S.   Press number keys to edit and press Enter key to confirm.

6) At this moment, the load shows "INPUT xxxx = xxxxxx" to input the set current / voltage / resistance or power value corresponding to the working mode. If 3) the working mode is set to no-load or short-circuit mode, this setting is skipped.   Press number keys to edit and press Enter key to confirm.

7) At this moment, the load shows "MINIMUM xxxx = xxxxxx" to input the lower limit of the eligibility comparison, press number key to edit and press Enter key to confirm.   Then the load display "MAXIMUM xxxx = xxxxxx" prompt enter the upper limit of eligibility comparison, press number keys to edit and press Enter key to confirm.

Press Enter to confirm, if you have edited all the set total step, then display "EDIT AUTO TEST", that returned to the automatic test function main menu.   If you have not edited the complete set step, then return to 3) process, but this time is displayed "STEP n xxxxx MODE", said the editing is the n-step data.

4.2.8.2 Set automatic trigger mode

Press Shift + 0 to enter the menu setting, press ▲ or ▼ key until the load prompts "MENU AUTO TEST", press Enter key to enter, press ▲ or ▼ key until the load prompts "SETUP AUTO TEST", press Enter key to enter automatic test trigger Output mode edit menu.

At this moment, the load prompts the following four trigger output timing options, press ▲ or ▼ key to select and press Enter key to confirm.

Prompt information	significance
"TRIGGER WHEN PASS"	When the test is qualified when the start trigger output
"TRIGGER WHEN FAIL"	When the test fails to start a trigger output
"TRIGGER WHEN TEST END"	When the test is completed, trigger the output once
"TRIGGER DISABLE"	Prohibit triggering output

At this point the load prompts the following two trigger output electrical characteristics

Prompt information	significance
"OUTPUT LEVEL"	When the output is triggered, the level goes from low to high and only lowers when there is a key or trigger input
"OUTPUT PLUSE"	When the output is triggered, the level goes from low to high and automatically lowers after about 5mS

4.2.8.3 Perform automatic test function

Press Shift + 0 to enter menu setting, press ▲ or ▼ key until load prompts "MENU AUTO TEST", press Enter key to enter, press ▲ or ▼ key until the load prompts "LOAD AUTO TEST", press Enter key to enter, press ▲ Or ▼ key to select the serial number to be set, and press Enter to finish.

In this case, "AUT n" is displayed in the upper right corner of the load, indicating that the current status bit is in automatic test mode, the nth automatic test file is executed, and "OFF" is displayed in the lower right corner, indicating that the user is currently waiting to start the automatic test triggering.   If the user is ready, press the On / Off key to start an automatic test, or you can start an automatic test by pulling the TRIG IN port on the rear panel lower than 5 mS.   At this moment, the load will gradually execute the automatic test file, and "STPxx" will be displayed in the upper right corner to indicate the number of steps currently being executed.   The lower right corner will display "WAIT", "PASS", or "FAIL" to indicate the status and result of the single-step test.   When all the test steps have been completed, the middle position below the load will indicate "ATEST PASS" or "ATEST FAIL" indicating the result of the entire automated test.   When the test fails, the buzzer will sound a short alarm, when the test is passed, the buzzer will intermittently audible prompt test is completed.   At this point press any key to lift the alarm sound, and wait for triggering the next automatic test.

After completing a test, the user can press the ▲ or ▼ key to start the single-step test mode, the load will be single-step load, each press ▲ or ▼ key, perform the previous step or the next load test, the user You can observe the actual state of each step.   When the user has the trigger signal input (1 & 4 or 3 & 4 of the signal input terminal on the back of the instrument receives the short circuit signal) or the ON / OFF button is pressed, the load will automatically exit the manual test mode and perform an automatic test again.

4.3 input control

4.3.1 Short circuit operation (SHORT)

The load simulates a short circuit on the input.   In the panel operation, you can press the Shift + 9 (Short) key to switch short-circuit status.   Short circuit operation does not affect the current set value, when the short circuit operation is switched back to the OFF state, the load returns to the original setting state.

The actual current consumed when the load is short-circuited depends on the operating mode and current range of the current load. The maximum short-circuit current is 120% of the current range in CC, CW and CR modes. In CV mode, the short circuit is equivalent to setting the load The constant voltage is 0V.

4.3.2 Input switch operation

When the input status is ON, press the On / OFF button, the input status will turn OFF, the upper right corner prompts "OFF".   On the contrary, when the input status is OFF, press the On / OFF button, the input status will turn ON, the upper right corner prompts the current working status.

4.4 Electronic load operating range

Electronic load in the rated current, rated voltage and rated power range, as shown in the shaded area
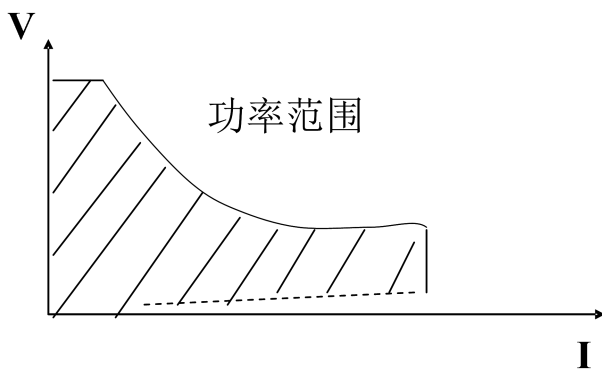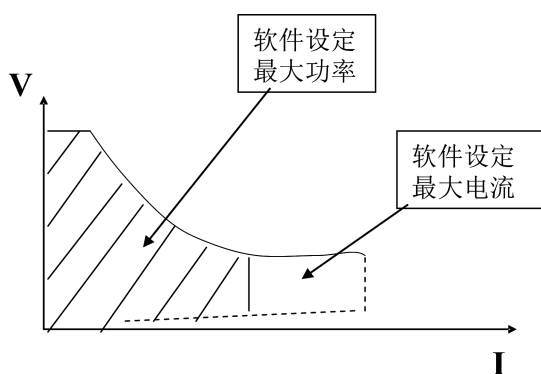

Figure 4-13 Load Power Range

Load mode changes

Figure 4-14 Software Settings Max

4.5 protection function

The load includes several protection features described below

4.5.1 Over-voltage protection (OVP)

When the input voltage is greater than the maximum voltage, the load over-voltage protection, input OFF, buzzer beep, VFD display the following information "OVER VOLT".

Users can set the maximum voltage in MENU and press Shift + 0 (Menu), then press ▼ to load "MENU SYSTEM SET" and press "Enter" to enter "SYSTEM IMAX = xxxxxxxxA" Press Up and Down keys to adjust until the load shows "SYSTEM UMAX = xxxxxxxxV". This is the current voltage maximum value. At this time, users can input the maximum current value required by numeric key and decimal point key, and press Enter key to confirm. The user can press the Esc key to exit the MENU main menu.

Please note that the maximum voltage of type PEL-8150 load is 150V maximum, setting above 150V will be automatically adjusted to 150V.

In addition, the setting of the maximum voltage will affect the resolution of the voltage display. The voltage resolution of the load is 0.1 mV when the maximum voltage is set to 20 V or less, and the voltage resolution is set when the maximum voltage is set to 20 V or more Rate is only 1mV.

4.5.2 Overcurrent protection (OCP)

When the load input current increases to the current upper limit, the load will be adjusted to the maximum protection current input, the buzzer will sound and VFD will display the following message "OVER CUR"

Users can set the maximum voltage in MENU and press Shift + 0 (Menu), then press ▼ to load "MENU SYSTEM SET" and press "Enter" to enter "SYSTEM IMAX = xxxxxxxxA" This is the current maximum current value. At this time, users can input the maximum current value required by numeric keys and decimal point, and press Enter key to confirm. At this point the user can press the Esc key to exit the MENU main menu.

Please note that the maximum current for the PEL-8150 load is 30 A maximum and settings in excess of 30 A will be automatically adjusted to 30 A.

In addition, the setting of the current maximum will affect the resolution of the current display. The voltage resolution of the load is 0.01 mA when the maximum current value is set to 3 A or below, and the voltage resolution when the maximum voltage is set to 3 A or more Rate is only 0.1mA.

4.5.3 Over Power Protection (OPP)

When the power consumption increases to the power upper limit, the load over-voltage protection, input OFF, buzzer sounding, VFD display the following information "OVER POW", user needs to press any key to restore, pay attention to the input state is OFF, When the selected key is ON / OFF, the load will be loaded again. If the over power condition is not cleared, the load will prompt "OVER POW" again.

The user can set the power maximum value in the MENU and press Shift + 0 (Menu), then press the ▼ key to display "MENU SYSTEM SET" and press Enter to enter the display, "SYSTEM IMAX = xxxxxxxxA" Press up and down keys to adjust until the system prompts "SYSTEM PMAX = xxxxxxxxW". This is the current power maximum value. At this time, users can input the required maximum power value by pressing numeric keys and decimal point key, and press Enter key to confirm. At this point the user can press the Esc key to exit the MENU main menu.

Please note that the maximum power of PEL-8150 type load is 300W maximum, and the setting exceeding 300W will be automatically adjusted to 300W.

4.5.4 Reverse input polarity

When the input polarity is reversed, the buzzer sounds and the VFD displays the following message "REVERSE".

4.5.5 Over Temperature Protection (OTP)

When the load of internal power devices over 80 ℃, the load temperature protection. In this case, the input is OFF, the buzzer sounds and VFD displays the following message "OVERHEAT"

4.6 remote test function

In CV, CR, CP mode, when the load consumes large current, a voltage drop will be generated on the connecting line between the instrument under test and the load terminal. In order to ensure the measurement accuracy, the load provides a remote measuring terminal (S +, S-) on the rear panel, which can be used by the user to measure the output terminal voltage of the DUT.

Users can set the remote measurement option in the MENU and press Shift + 0 (Menu), then press ▼ to load "MENU SYSTEM SET" and press Enter to enter "Load" and "SYSTEM IMAX = xxxxxxxxA ", Press the up and down keys to adjust, until the load appears" SYSTEM TERMINAL SEL "prompt, which is prompted to set the current remote test function parameters, the user continues to press the Enter key to enter the load display" TERMINAL SELECT FRONT "or" TERMINAL SELECT BACK " In this case, the user can adjust and select the remote test function parameters by pressing the up and down keys and press Enter key to confirm. "TERMINAL SELECT FRONT" means that the input source of the selected source is on the front panel and the remote test function of the rear panel is disabled. "TERMINAL SELECT BACK" means that the input source of the selected source is on the rear panel and the front panel's input is disabled. At this time, Press Esc to exit the MENU main menu.

Please note that the input terminals of the front panel and the rear panel can only be valid at any time. If the user finds that the load display voltage is near zero without any change of signal, please check whether the connection mode is in phase with the remote test function match.

4.7 battery discharge test operation

Experiments show that the best way to determine whether the battery is working with a load test. Only by performing the correct load test can you determine if the battery is at the expected life curve position. The PEL-8150 series of electronic loads can test any type of battery used today.

For any protective equipment or non-interruptible service system used by the battery system, the load test is essential. Because in a system, the battery is almost the lowest reliability components, it must be regularly carried out load test to ensure the reliability of the battery

Capacity test

The PEL-8000 Series electronic load uses constant current mode for capacity testing. Programmable shutdown level, when the battery voltage is too low, the system determines the battery reaches the set threshold or non-safety eve, automatically interrupt the test during the test can be observed battery voltage, discharge current, load power and battery Discharge capacity. If used with PC supporting software, you can observe the battery discharge curve in the discharge process. This test can reflect the reliability of the battery and its remaining life, it is very necessary to replace the battery prior to such tests.

Operation method
1) In the standard constant current mode, adjust the battery discharge current value required
2) Press Shift + 8 (Battery) key, VFD displays END TEST VOLT = xxxxxxxxV, set the turn-off voltage, press Enter to start the capacity test, the load will turn off automatically when the battery voltage drops to turn-off voltage.
3) At this point you can press the On / Off button to start or pause the battery capacity test.
4) Press Shift + 8 (Battery) button, you can exit the battery capacity test status.
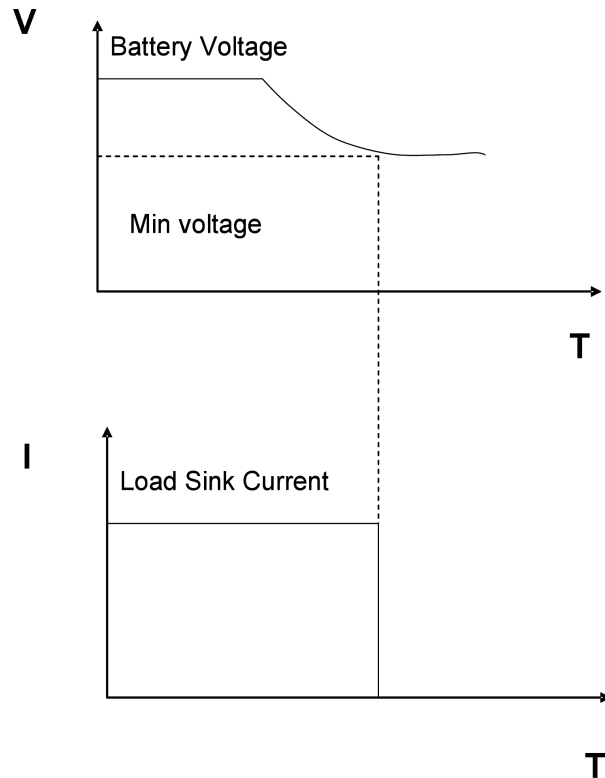
Figure 4-16 Battery capacity calculation diagram

4.8 Communication Protocol

4.8.1 Overview

PEL-8000 series of electronic load, support Modbus application protocol. The data frame structure contains four parts:

Additional address	function code	data	Error checking

To ensure the reliability of communication, you should ensure that the data interval of each frame should be greater than 3.5x single-byte transmission time. If the baud rate is 9600, the time interval between frames must be greater than 11 * 3.5 / 9600 = 0.004 second.

Load using two-way asynchronous communication, a fixed start bit, 8 data bits, a stop bit. Support no parity, odd parity, even parity three verification methods. Support 2400,9600,14400,28800,57600,115,200 total of 6 baud rate options.

1) Additional address and communication parameter setting

The additional address is single-byte hexadecimal data, and the load only responds to the request data frame whose additional address is the same as the local additional address.

2) Set the additional address

Press Shift + 0 to enter the main menu, the load will display "MENU CONFIG" and press Enter key to confirm, then the load will enter the config configuration menu, press up and down key until the load shows "CONFIG ADDRESS SET", prompt for additional address setting, press Enter Enter, then the load display "ADDRESS ADDR = xxx", prompt the current additional address, if the user needs to modify this address, press the number keys to edit, and press Enter to confirm. Please note that this address should be an integer between 1 and 200.

3) Choose the verification method

Press Shift + 0 to enter the main menu, the load will display "MENU CONFIG", press Enter to confirm, then the load will enter the config configuration menu, press up and down until the load shows "CONFIG COMM.PARITY" Enter to enter, the load display "COMM.PAR xxxxx" prompts the current calibration mode, the user can use the up and down keys to select the appropriate calibration method, and press Enter to confirm. The current load only supports no parity, odd parity, even parity, a total of three kinds of calibration options.

4.8.2 Select the communication baud rate

Press Shift + 0 to enter the main menu, the load will display "MENU CONFIG" and press Enter to confirm. At this moment, the load will enter the config configuration menu, press the up and down keys until the load shows "CONFIG BAUDRATE SET", prompt to select baud rate and press Enter Enter, at this moment the load shows "BUADRATE xxxxx", prompting the current baud rate, the user can use the up and down keys to select the baud rate for your own, and press Enter to confirm. The current load only supports 2400,9600,14400,28800,57600,115,200 total of 6 baud rate options.

4.8.3 Data

In some command frames, the data is fixed-length, but in some other frames, the data is indefinitely long. Following the Modbus protocol, the hexadecimal data in the data field, as well as the floating-point numbers, are high byte first and low byte last. In addition, in the write coil output value, the data must be 0x0000 and 0xFF00, where 0x0000 means the position is zero and 0xFF00 means the position 1.

4.8.4 Function Code

Function code is single-byte hexadecimal data, currently only open the following four kinds of functional modes

function code	Description
0x01	Read coil, read data bit by bit
0x05	Write coil, write data bit by bit
0x03	Read register, read data by word addressing
0x10	Write register, write data by word address

4.8.5 Error checking

Load using cyclic redundancy check (CRC), CRC results for the word, the low byte first, high byte in the back. Its generation rules are as follows.

a) Set a 16-bit CRC register and assign 0xFFFF.

b) The first byte in the data frame, that is, the additional address, is bitwise XOR'ed with the lower 8 bits of the CRC register and stored in the CRC register.

c) Moves the CRC register to the right by 1 bit and detects if the least significant bit is shifted out. If the least significant bit is 1, the CRC register is XOR'd with the fixed value 0xA001.

d) Repeat step c for 8 times.

e) Repeat steps b, c, d for the next byte of the data frame up to the last data in the data field.

f) The contents of the last CRC register, the last check value, are appended to the last data in the data frame, keeping the lower 8 bits first and the upper 8 bits later.

4.8.6 Complete command frame parsing

Read the coil

Request frame	Byte length	value
Additional address	1	1~200
function code	1	0x01
initial address	2	0~0xFFFF
Number of coils	2	1~16
Check code	2	

Reply frame	Byte length	value
Additional address	1	1~200
function code	1	0x01
Byte count	1	1~2
Coil status	n	
Check code	2	

Abnormal frame	Byte length	value
Additional address	1	1~200
function code	1	0x81
Abnormal code	1	1~4
Check code	2	

Example: Load communication address is 1, read load input state ISTATE

Table 4.8.7 Table ISTAT address known as 0x0510

Send request: 0x01 0x01 0x05 0x10 0x00 0x01 0xFC 0xC3

Get normal reply 0x01 0x01 0x01 0x48 0x51 0xBE

Wherein, 0x48 is the data that is read back, and the lowest bit is 0, then the input status ISTATE of the load is OFF.

2. Write the coil:

Request frame	Byte length	value
Additional address	1	1~200
function code	1	0x05
initial address	2	0~0xFFFF
output value	2	0x0000 or 0xFF00
Check code	2	

Reply frame	Byte length	value
Additional address	1	1~200
function code	1	0x01
Output address	2	0~0xFFFF
output value	2	0x0000 or 0xFF00
Check code	2	

Abnormal frame	Byte length	value
Additional address	1	1~200
function code	1	0x85
Abnormal code	1	1~4
Check code	2	

Example: Load communication address is 1, control load is remote control

Table 4.8.7 Table 1 to know the remote control PC1 address is 0x0500, a 2-word floating-point number

Send request: 0x01 0x05 0x05 0x00 0xFF 0x00 0x8C 0xF6

Get the normal reply   0x01 0x05 0x05 0x00 0xFF 0x00 0x8C 0xF6

3 Read register:

Request frame	Byte length	value
Additional address	1	1~200
function code	1	0x03
initial address	2	0~0xFFFF
Number of registers	2	n=1~32
Check code	2	
Reply frame	Byte length	value
Additional address	1	1~200
function code	1	0x03
Number of bytes	1	2*n
Register value	2*n	
Check code	2	
Abnormal frame	Byte length	value
Additional address	1	1~200
function code	1	0x83
Abnormal code	1	1~4
Check code	2	

Example: Load communication address is 1, read the current voltage value U

Table 4.8.7 Table 2 shows the current voltage value U register address 0x0B00

Send request: 0x01 0x03 0x0B 0x00 0x00 0x02 0xC6 0x2F

Get the normal reply   0x01 0x03 0x04 0x41 0x20 0x00 0x2A 0x6E 0x1A

One 0x41 0x20 0x00 0x2A is read back the voltage value, said the floating-point 10V.

4 Write register:

Request frame	Byte length	value
Additional address	1	1~200
function code	1	0x10
initial address	2	0~0xFFFF
Number of registers	2	n=1~32
Byte count	1	2*n
Register value	2*n	
Check code	2	
Reply frame	Byte length	value
Additional address	1	1~200
function code	1	0x10
initial address	2	0~xFFFF
Number of registers	2	N

Check code	2	
Abnormal frame	Byte length	value
Additional address	1	1~200
function code	1	0x90
Abnormal code	1	1~4
Check code	2	

Example: When the load address is 1, set the constant current value IFIX to 2.3

Table 4.8.7 Table .2 to know the current value IFIX register address is 0x0A01, a 2-word floating-point number

Send request: 0x01 0x10 0x0A 0x01 0x00 0x02 0x04 0x40 0x13 0x33 0x33 0xFC 0x23

Get the normal reply   0x01 0x10 0x0A 0x01 0x00 0x02 0x13 0xD0

4.8.7 Coil and register address assignment

Table 1 coil bit definition:

name	address	Bit	Attributes	Description
PC1	0x0500	1	W/R	Remote control status bit: When 1, the front button panel is invalid.
PC2	0x0501	1	W/R	Local Prohibit bit: 1, prohibit the use of "Shift + 7" key to regain control of the front panel.
TRIG	0x0502	1	W/R	Trigger marker bit, software can be set to complete a trigger.
REMOTE	0x0503	1	W/R	1: Voltage remote input,
ISTATE	0x0510	1	R	Enter the state, 1 for the input ON, 0 for the input OFF
TRACK	0x0511	1	R	Tracking status, 1 for voltage tracking, 0 for current tracking
MEMORY	0x0512	1	R	1 is the input status memory
VOICEEN	0x0513	1	R	1 for key sound enable
CONNECT	0x0514	1	R	1 is multi-machine, 0 is single work mode
ATEST	0x0515	1	R	1 is the automatic test mode of operation
ATESTUN	0x0516	1	R	1 Awaiting trigger for automatic test mode of operation
ATESTPASS	0x0517	1	R	1 for automatic test passed, 0 failed
IOVER	0x0520	1	R	1 is the overcurrent flag
UOVER	0x0521	1	R	1 is over-voltage mark
POVER	0x0522	1	R	1 is over power mark
HEAT	0x0523	1	R	1 is overheating mark
REVERSE	0x0524	1	R	1 for the reverse tag
UNREG	0x0525	1	R	1 is a fixed parameter failure flag
ERREP	0x0526	1	R	1 is the EPPROM error flag
ERRCAL	0x0527	1	R	1 is the calibration data error flag

Table 2 registers XRAM area definition:

name	address	word	Attributes	Description
CMD	0x0A00	1	W/R	Command register: low 8 effective, read and write high 8 meaningless.
IFIX	0x0A01	2	W/R	Constant current register, double type
UFIX	0x0A03	2	W/R	Constant voltage register, double type
PFIX	0x0A05	2	W/R	Constant power register, double type
RFIX	0x0A07	2	W/R	Constant resistance register, double type
TMCCS	0x0A09	2	W/R	Current Soft-Start Rising Time Register, double type
TMCVS	0x0A0B	2	W/R	Voltage Soft-Start Rising Time Register, double type
UCCONSET	0x0A0D	2	W/R	Constant current load voltage register, double type
UCCOFFSET	0x0A0F	2	W/R	Constant current unload voltage register, double type
UCVONSET	0x0A11	2	W/R	Constant voltage load voltage register, double type
UCVOFFSET	0x0A13	2	W/R	Constant voltage unload voltage register, double type
UCPONSET	0x0A15	2	W/R	Constant power load voltage register, double type
UCPOFFSET	0x0A17	2	W/R	Constant power unload voltage register, double type
UCRONSET	0x0A19	2	W/R	Constant resistance load voltage register, double type
UCROFFSET	0x0A1B	2	W/R	Constant resistance unload voltage register, double type
UCCCV	0x0A1D	2	W/R	Constant current transfer voltage and voltage registers, double type
UCRCV	0x0A1F	2	W/R	Constant resistance switch voltage and voltage registers, double type
IA	0x0A21	2	W/R	Dynamic mode A phase current register, double type
IB	0x0A23	2	W/R	Dynamic mode B phase current register, double type
TMAWD	0x0A25	2	W/R	Dynamic mode A phase pulse width register, double type
TMBWD	0x0A27	2	W/R	Dynamic mode B phase pulse width register, double type
TMTRANRIS	0x0A29	2	W/R	Dynamic mode rising edge time register, double type
TMTRANFAL	0x0A2B	2	W/R	Dynamic mode falling edge time register, double type
MODETRAN	0x0A2D	1	W/R	Dynamic operating mode register, u16 type

UBATTEND	0x0A2E	2	W/R	Battery test termination voltage register, double type
BATT	0x0A30	2	W/R	Battery capacity register, double type
SERLIST	0x0A32	1	W/R	LIST serial number register, u16 type
SERATEST	0x0A33	1	W/R	Automatic test sequence register, u16 type
IMAX	0x0A34	2	W/R	Current maximum register, double type
UMAX	0x0A36	2	W/R	Voltage maximum register, double type
PMAX	0x0A38	2	W/R	Maximum power register, double type
ILCAL	0x0A3A	2	W/R	Calibration current low-end target value, double type
IHCAL	0x0A3C	2	W/R	High-end target current calibration, double type
ULCAL	0x0A3E	2	W/R	Low voltage target value of calibration, double type
UHCAL	0x0A40	2	W/R	High-end target voltage, double type
TAGSCAL	0x0A42	1	W/R	Calibration status mark, u16 type
U	0x0B00	2	R	Voltage register, double type
I	0x0B02	2	R	Current register, double type
SETMODE	0x0B04	1	R	Operating mode register, u16e type
INPUTMODE	0x0B05	1	R	Input status register, u16 type
MODEL	0x0B06	1	R	Model register, u16 type
EDITION	0x0B07	1	R	Software version number register, u16 type

4.8.8 Command Register CMD Definition

definition	CMD value	Description
Constant current	1	
Constant voltage	2	
Constant power	3	
Set resistance	4	
Constant current soft start	20	
Dynamic mode	25	
Short circuit mode	26	
LIST mode	27	
Constant current load uninstall mode	30	
Constant voltage loading and unloading mode	31	
Constant power loading and unloading mode	32	
Constant resistance load unload mode	33	
Constant current transfer voltage mode	34	
Constant resistance switch	36	

voltage mode			
Battery test mode	38		
Constant voltage soft-start mode	39		
Change system parameters	41		
Enter ON	42		
Enter OFF	43		

4.8.9 Common operation function description

Table 1 Remote Control Operation:

operating	register	value	Description
Write coil	PC1	1	required

Table 2 Cancel remote control operation:

operating	register	value	Description
Write coil	PC1	0	required

Table 3 local ban control operation:

operating	register	value	Description
Write coil	PC2	1	required

Table 4 Locally allowed operations:

operating	register	value	Description
Write coil	PC2	0	required

Table 5 Input ON Operation:

operating	register	value	Description
Write register	CMD	42	required

Table 6 Input OFF Operation:

operating	register	value	Description
Write register	CMD	43	required

Table 7 Short circuit operation:

operating	register	value	Description
Write register	CMD	26	required

Table 8 constant current operation:

operating	register	value	Description
Write register	IFIX	Double	Optional
Write register	CMD	1	required

Table 9 constant voltage operation:

operating	register	value	Description
Write register	UFIX	Double	Optional

Write register	CMD	2	required

Table 10 Constant Power Operation:

operating	register	value	Description
Write register	PFIX	Double	Optional
Write register	CMD	3	required

Table 11 resistor operation:

operating	register	value	Description
Write register	RFIX	Double	Optional
Write register	CMD	4	required

Table 12 constant current soft-start:

operating	register	value	Description
Write register	IFIX	Double	Optional
Write register	TMCCS	Double	Optional
Write register	CMD	20	required

Table 13 constant voltage soft-start:

operating	register	value	Description
Write register	UFIX	Double	Optional
Write register	TMCVS	Double	Optional
Write register	CMD	39	required

Table 14 Constant Current Load Unload Mode:

operating	register	value	Description
Write register	IFIX	Double	Optional
Write register	UCCONSET	Double	Optional
Write register	UCCOFFSET	Double	Optional
Write register	CMD	30	required

Table 15 constant voltage loading and unloading mode:

operating	register	value	Description
Write register	UFIX	Double	Optional
Write register	UCVONSET	Double	Optional
Write register	UCVOFFSET	Double	Optional
Write register	CMD	31	required

Table 16 Constant power loading and unloading mode:

operating	register	value	Description
Write register	PFIX	Double	Optional
Write register	UCPONSET	Double	Optional
Write register	UCPOFFSET	Double	Optional
Write register	CMD	32	required

Table 17 resistance load unloading mode:

operating	register	value	Description
Write register	RFIX	Double	Optional
Write register	UCRONSET	Double	Optional
Write register	UCROFFSET	Double	Optional
Write register	CMD	33	required

Table 18 constant current transfer voltage mode:

operating	register	value	Description
Write register	IFIX	Double	Optional
Write register	UCCCV	Double	Optional
Write register	CMD	34	required

Table 19 resistor transfer voltage mode:

operating	register	value	Description
Write register	RFIX	Double	Optional
Write register	UCRCV	Double	Optional
Write register	CMD	35	required

Table 20 Battery Test Modes:

operating	register	value	Description
Write register	IFIX	Double	Optional
Write register	UBATTEND	Double	Optional
Write register	CMD	38	Optional

Table 21 Dynamic test mode:

operating	register	value	Description
Write register	IA	Double	Optional
Write register	IB	Double	Optional
Write register	TMAWD	Double	Optional
Write register	TMBWD	Double	Optional
Write register	TMTRANRIS	Double	Optional
Write register	TMTRANFAL	Double	Optional
Write register	MODETRAN	0~2	Optional
Write register	CMD	22	Optional

Table 22 System parameters Test mode:

operating	register	value	Description
Write register	IMAX	Double	Optional
Write register	UMAX	Double	Optional
Write register	PMAX	Double	Optional
Write coil	REMOTE	0xFF00/0x0000	Optional
Write register	CMD	41	Optional

Safety

Do not install replacement parts on the instrument yourself or perform any unauthorized modifications. Please send the instrument to the company's maintenance department for repair to ensure its safe use.

Refer to the specific warnings or cautions in this manual to avoid personal injury or equipment damage.

Safety signs

caveat

It reminds the user to pay attention to certain operational procedures, practices, conditions and other matters that may cause personal injury.

Ground point

High voltage danger. (Non-professionals can not open the machine)

Refer to the warnings in the relevant document for caution. (High voltage, wear gloves when operating, beware of electric shock Do not use the machine in the safety of the occasion).

Certification and quality assurance

IV87 series of programmable DC electronic load fully meet the manual in the nominal technical indicators.

Quality assurance

The Company of the product materials and manufacturing, from the date of shipment, give one year quality assurance.

Maintenance service

If this product is for repair, please send the product back to our designated maintenance organization. Customer shall bear the repair products will be sent to the maintenance department of the one-way freight, the company will be responsible for the return shipping costs. Products from other countries back to factory maintenance, all shipping, customs duties and other taxes must be borne by the customer.

Quality assurance limits

The above guarantee does not apply to damage caused by the following circumstances:

Customer incorrect or inappropriate repair product;

Customer uses other software or interface;

Unauthorized modification or misuse;

Operate this product outside the specified environment or at a non-designated service point for configuration and service.

Customer self-installed circuit caused damage.

notice

The contents of this manual are subject to change without notice, the interpretation of the company.