KORAD

User Manual

KEL Series DC Electronic Load

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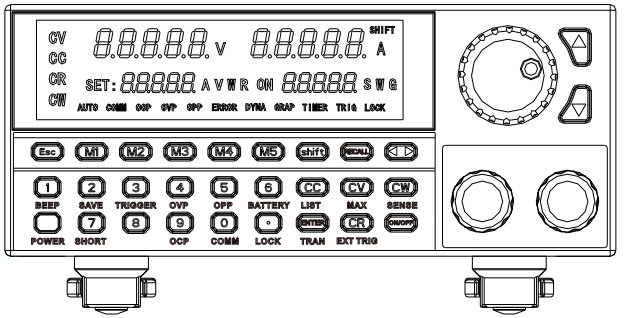

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Specifications

Note: The speci Fications below are tested under the conditions of temperature 25℃+-5℃ and the warm-up for 20 minutes.

Models		KEL102		KEL103	
Input Rating	Power Voltage Current	150W 0-120V 0-30A		300W 0-120V 0-30A	
CC Mode	Range	0-3A	0-30A	0-3A	0-30A
	Resolution	0. 1mA	1mA	0. 1mA	1mA
	Accuracy	±(0.05%of set+0.045%off.s)		±(0.05%of set+0.045%off.s)	
CV Mode	Range	0-18V	0-120V	0-18V	0-120V
	Resolution	0.1mV	1mV	0.1mV	1mV
	Accuracy	±(0.05%of set+0.025%off.s)		±(0.05%of set+0.025%off.s)	
CR Mode	Range	0.05Ω-7. 5KΩ		0.05Ω-7. 5KΩ	
	Resolution	0.1Ω		0.1Ω	
	Accuracy	±(0.05%of set+0.025%off.s)		±(0.05%of set+0.025%off.s)	
CW Mode	Range	150W		300W	
	Resolution	0. 01W		0. 01W	
	Accuracy	±(0.1%of set+0.1%off.s)		±(0.1%of set+0.1%off.s)	
Slope	Range	0-3A	0-30A	0-3A	0-30A
	Rising	0.0001-0.3A/us	0.001-1.5A/us	0.0001-0.3A/us	0.001-1.5A/us
	Falling	0.0001-0.3A/us	0.001-1.5A/us	0.0001-0.3A/us	0.001-1.5A/us
Voltage measurement	Range	0-18V	0-120V	0-18V	0-120V
	Resolution	0.1mV	1mV	0.1mV	1mV
	Accuracy	±(0.03%of set+0.025%off.s)		±(0.03%of set+0.025%off.s)	
Current measurement	Range	0-3A	0-30A	0-3A	0-30A
	Resolution	0. 1mA	1mA	0. 1mA	1mA
	Accuracy	±(0.05%of set+0.045%off.s)		±(0.05%of set+0.045%off.s)	
Power measurement	Range	150W		300W	
	Resolution	0. 01W		0. 01W	
	Accuracy	±(0.1%of set+0.1%off.s)		±(0.1%of set+0.1%off.s)	
Over power protection		160W		320W	
Over current protection		33A		33A	
Over voltage protection		125V		125V	
Over temperature protection		85℃		85℃	
Input impedance		150KΩ		150KΩ	
Dimention(W*D*H)		214mm*354mm*88.5mm			

Note: Specifications are subject to change without notice.

SAFETY INSTRUCTION

Safety Symbols

These safety symbols may appear in this manual or on the series.

WARNING

DANGER High Voltage

Earth(ground)Terminal

Safety Guidelines

- Do not block or obstruct the cooling fan vent opening
- Avoid severe impacts or rough handling that leads to damage.
- Do not discharge static electricity.
- Do not disassenble unless you are qualified as service personnel.

AC INPUT ⚠	• AC Inut Voltage: 110V / 120V / 220V / 230V , 50 / 60 Hz • Connect the protective grounding conductor of the AC power cord to an earth ground, to avoid electrical shock.
Operation Environment	• Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (note below) • Relative Humidity: < 80% • Altitude: < 2000m • Temperature: 0-40℃
Storage environment	• Location: Indoor • Relative Humidity: < 70% • Temperature: -10-70℃–

FUSE ⚠

Model	110V/120V	220V/230V
KEL102	T1.25A/250V(20X5mm)	T0.5A/250V(20x5mm)
KEL103	T1.25A/250V(20X5mm)	T0.5A/250V(20x5mm)

- To ensure fire protection, replace the fuse only with the specified type and rating.
- Disconnect the power cord before fuse replacement.
- Make sure the cause of fuse blowout is fixed before fuse replacement.

16. Buzzer ON/OFF Function
    Note: press Shift+① to switch the buzzer on and off.
    Remarks: there are memory function here.

17. Communication with PC
    Please refer to the communication protocol.

Remarks: When the keyboard is not locked, press Esc at any time to return to the steady state mode. From one mode switched to another mode, press Esc to enter the steady state mode and then switch the modes.

13. Remote Compensation Function

Note: Press Shift+CW to enter the switch of the remote compensation function.

Remarks: When there is the remote compensation, the LED COMM will light on. And there is no memory function.

14. Keyboard Lock Function

Note: Press Shift+ ⊙ Ñthe keyboard lock.

Remarks: After the keyboard is lock, there are only ON/OFF and Shift which are valid. And during the dynamic pulse mode and dynamic toggling mode, the button 3 is valid. And there is no memory function.

15. Baud Rate Setting Function

Note: Manually modify the baud rate.

Operation Description: taking changing the baud rate 57600 into 115200 as example.

Procedures	Operation Description	Device Displays
1	Press " shift + 0 " to enter the setting mode of the baud rate.	0.0000V 0.0000A Bsp-0 57600G
2	Rotate the knob or press the up and down buttons to adjust the display as 115200.	0.0000V 0.0000A Bsp-1 15200G
3	Press " ENTER " to confirm.	Returning to the steady state mode

Remarks: please modify when there are no communications.
Here there is memory function.

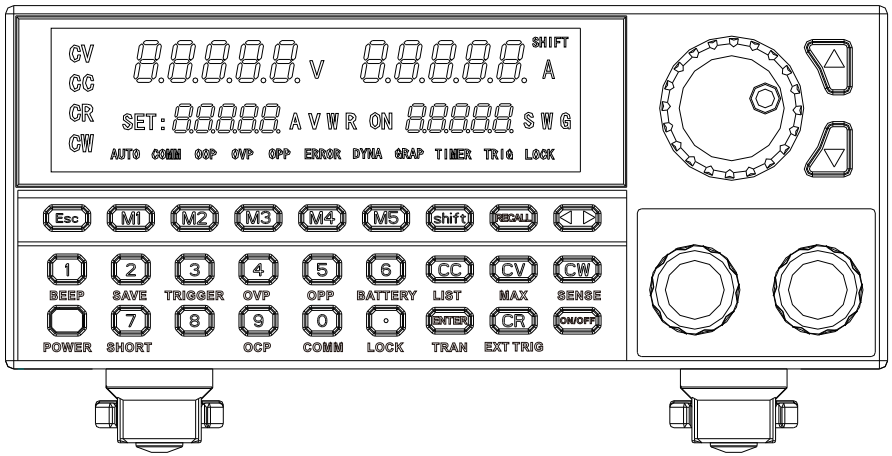
Introduction

KEL series (150W~300W), single-channel programmable DC electronic loads, are designed for middle & high-end applications. They can be offered as multiple solutions according to customer's need. The online voltage measurements and adjustments or simlate short circuit test using the simple keypad on the front panel, can be used by the end users. KEL series DC loads are a versatile instrument for static and dynamic testing of power supplies, batteries, DC - DC converters, and battery chargers, which provides users the best testing solution.

Main Features

- Highlight LED display
- 5digit displays, and accurate outputs
- Resoulution of voltage and current: 0.1 mV / 0.1 mAProtection and Overvoltage Protection
- 100 groups of memories for fast recall
- Four working modes: CV/CC/CR/CP
- Remote Compensation Function
- Battery Test Function
- Keyboard Lock
- Power off memory function
- Short-circuit function
- Remote Compensation Function
- External Trigger Function
- Setting Function of Baud Rate

Front Panel Overview



1. Keyboard Operation

1. Esc: Cancel key which can return to the initial mode.
2. M1-M5: quickly recalling the M1-M5 stored value of the steady state.
3. Recall: Recall Key, such as, recalling the steady storage with Call+2.
4. Shift: Setting or Storage Function Keys, such as storing the stationary content with Shift+2.
5. ◄► — Left-Rotating Key, moving to where needs to be adjusted and will flash.
6. Entering numbers.
7. Constant Current Mode Button.
8. Constant Voltage Mode Button.
9. Constant Power Mode Button.
10. Constant Resistance Mode Button.
11. Confirmation Button.
12. On/Off: Turning On/Off the load output.
13. ▲— Adjusting the number or selecting Add.
14. ▼— Adjusting the number or selecting subtract.
15. Knob: Adjusting the number or selecting it.

11.2 The Recall Function of OPP Test

Note: recall one group of storage and use it.

Operation Description: recall the first group of storage and use it.

Procedures	Operation Description	Device Displays
1	Press "RECALL + 5" mode of recalling the setting sequence.	0.0000V 0.0000A CALL P-001G
2	"ENTER" 1 by pressing the knob or buttons to recall.	0.0000V 0.0000A CALL P-001G
3	Press "ON/OFF" to start or repeat. When it meets one of the conditions, the load output will be closed automatically. And then press "ON/OFF" again to start.	0.0000V 0.0000A PASS 12.000W

Remarks: press ON/OFF to start and then the LED display on the left bottom is whether it passes or not; and that on the right bottom is the set power value at present.

12. External Trigger Function

Note: Press Shift+CR to switch the external trigger function. Through the remote control, the steady state mode can be opened; the test mode of the dynamic state, the sequence operation mode and the battery test mode can be triggered.

Remarks: when LED GRAP on the display lights on, it can be triggered externally. And here there is the memory function, that is, the trigger will be saved.

6	Enter the beginning power 20W by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V P0106
7	Enter the step power 1W by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V P0107
8	Enter the step reduction time 1s by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V P0108
9	Enter the ending power 10W by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V P0109
10	Enter the OPP voltage 8V by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V P0110
11	Enter the maximum power 15W by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V P0110
12	Enter the minimum power 10W by pressing the knob or buttons and then press " ENTER " to finish the settings.	Return to the steady state mode.

Remarks: During the operation, once press Esc and it will exit the mode.
If there are some wrong entering, you can rotate the knob.
When the complete value appears, enter again.

2. Setting the maximum value of load

Description: Setting low voltage (18V), low current (3A) and below them will improve the accuracy.

Method of operation: Taking the max current 3A, max voltage 18V and max power 100W as example, the max resistance is 1000ohms.

Procedures	Operation Description	Device Displays
1	Press " shift + CV "to operate	0.0000V 0.000A SET:30.000A 00000G
2	Setting the max current value and then press " ENTER "	0.0000V 0.000A SET:3.0000A 00000G
3	Press " CV " to operate	0.0000V 0.000A SET:120.00V 00000G
4	Setting the max voltage value and then press " ENTER "	0.0000V 0.000A SET:18.000V 00000G
5	Press " CV " to operate	0.0000V 0.000A SET:300.00W 00000G
6	Setting the max power value and then press " ENTER "	0.0000V 0.000A SET:100.00W 00000G
7	Press " CV " to operate	0.0000V 0.000A SET:7500.0R 00000G
8	Setting the max resistance value and then press " ENTER "	0.0000V 0.000A SET:1000.0R 00000G
9	After the setting is finished, press " Esc " to exit.	The steady-mode status is displayed.

3. The Operation Function of Steady State

Note: The electronic load can work in the following 4 steady-state mode.

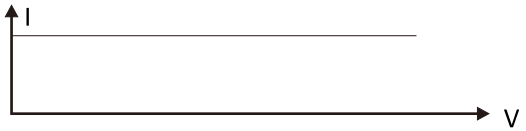
3.1 Constant Current Operation Mode CC

Note: In constant current mode, the load makes the tested equipment on the set voltage no matter how the input voltage changes.

Operation Method:

1. Press the CC button on the keyboard to enter constant current operation mode.
2. Setting the desired constant current through the keyboard.
3. Turn on the ON/OFF button to start the electronic load.

Load Current



Constant Current Operation Mode CC

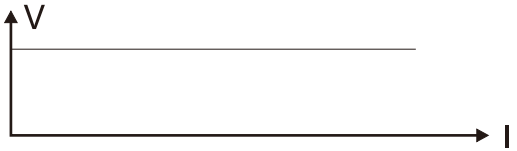
3.2 Constant Voltage Operation Mode CV

Note: In constant voltage mode, the load makes the tested equipment on the set voltage no matter how the input current changes.

Operation Method: 1. Press the CV button on the keyboard to enter constant voltage operation mode.

2. Setting the desired constant voltage through the keyboard.
3. Turn on the ON/OFF button to start the electronic load.

Load Voltage



Constant Current Operation Mode CC

3.3 Constant Resistance Operation Mode CR

Note: In constant resistance mode, the load makes the tested equipment on the set resistance no matter how the input voltage and current change.

11.1 The Setting Function of OPP Test

Note: It can set at most 10 groups of test parameters.

Operation description: taking it as example that the setting is saved in group 1, VON voltage is 10V, time delay of VON voltage is 5s, the current range is 3A, the beginning power is 20W, the step reduction value is 1W, the reduction time is 1s, the ending power is 10W, OPP voltage is 8V, the maximum power is 15W and the minimum power is 10W.

Procedures	Operation Description	Device Displays
1	Press "shift + 5 "and enter the storage mode of OPP settings.	0.0000V 0.0000A 0 P0001
2	Enter 1 by pressing the knob or buttons and then press "ENTER" to enter the storage mode of the first group.	0.0000V 0.0000A 0V P0102
3	Enter VON voltage 10V by pressing the knob or buttons and then press "ENTER" to enter the next parameter settings.	0.0000V 0.0000A 0V P0103
4	nter the VON time delay 5s by pressing the knob or buttons and then press "ENTER" to enter the next parameter settings.	0.0000V 0.0000A 0V P0104
5	Enter the current range 3A by pressing the knob or buttons and then press "ENTER" to enter the next parameter settings.	0.0000V 0.0000A 0V P0105

10.2 The Recall Function of OCP Test

Note: recall one group of storage and use it.

Operation Description: recall the first group of storage and use it.

Procedures	Operation Description	Device Displays
1	Press "RECALL + 9" and enter the mode of recalling the setting sequence.	0.0000V 0.0000A CALL C-001G
2	"ENTER" 1 by pressing the knob or buttons to recall.	0.0000V 0.0000A CALL C-001G
3	Press "ON/OFF" to start or repeat. When it meets one of the conditions, the load output will be closed automatically. And then press "ON/OFF" again to start.	0.0000V 0.0000A PASS 2.0000

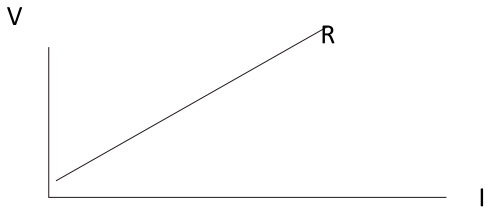
Remarks: press ON/OFF to start and then the LED display on the left bottomis whether it passes or not; and that on the right bottom is the set current value at present.

11. OPP Test Function

Note: when the voltage reaches the VON value, it will delay for some time, and the power outputs; at intervals, the step value will decrease progressively until it reaches the cutoff power, or the voltage is higher than that set by OPP, and then the output ends. After that, if the voltage is higher than the OPP voltage and meanwhile the power value is between the maximum and the minimum set powers, it passes; otherwise, it fails.

Operation Method:

1. Press the CR button on the keyboard to enter constant resistance operation mode.
2. Setting the desired constant resistance through the keyboard.
3. Turn on the ON/OFF button to start the electronic load.



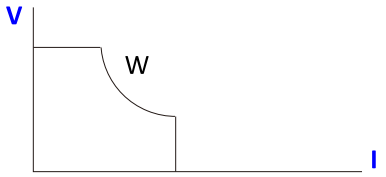
Constant Resistance Operation Mode CR

3.4 Constant Power Operation Mode CW

Note: In constant power mode, the load makes the tested equipment on the set resistance no matter how the input voltage and current change.

Operation Method: 1. Press the CW button on the keyboard to enter constant power operation mode.

2. Setting the desired constant power through the keyboard.
3. Turn on the ON/OFF button to start the electronic load.



Constant Power Operation Mode CW

4. The Storage Function of Steady State and Recalling

Note: The load can save and recall 100 sets of stationary setting values. And to set the values, the number keys, knob and up & down buttons all can be used.

4.1 Storage function

Operation Method: Taking 10.000V stored to 99 as example.

Procedures	Operation Description	Device Displays
1	Setting the steady state value to be stored(10.000V)	0.0000V 0.0000A 10.000V 00000G
2	Press " shift + 2 " to enter the memory function.	0.0000V 0.0000A 10.000V 00001G
3	Using the button input or the knob to 99 and then press ENTER to store	0.0000V 0.0000A 10.000V 00001G

4.2 Recall Function

Operation method: taking recalling the stored steady-state value in 99 As example.

Procedures	Operation Description	Device Displays
1	Press " RECALL + 2 " to enter the recall function	0.0000V 0.0000A 10.000V 00000G
2	Using the button input or the knob to 99 and then press ENTER to store	0.0000V 0.0000A 10.000V 00099G

7	Enter the step current 0.1A by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V C0107
8	Enter the reduction time 1s by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V C0108
9	Enter the ending current 1A by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V C0109
10	Enter the OCP voltage 8V by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V C01010
11	Enter the maximum current 1.9A by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V C0111
12	Enter the minimum current 1.1A by pressing the knob or buttons and then press " ENTER " to finish the settings.	Return to the steady state mode.

Remarks: During the operation, once press Esc and it will exit the mode. If there are some wrong entering, you can rotate the knob. When the complete value appears, enter again.

Operation description: taking it as example that the setting is saved in group 1, VON voltage is 10V, time delay of VON voltage is 5s, the current range is 3A, the beginning current is 2A, the step reduction value is 0.1A, the reduction time is 1s, the ending current is 1A, OCP voltage is 8V, the maximum current is 1.9A and the minimum current is 1.1A.

Procedures	Operation Description	Device Displays
1	Press " shift + 9 " and then enter the storage mode of OCP settings.	0.0000V 0.0000A 0 C0001
2	Enter 1 by pressing the knob or buttons and then press " ENTER " to enter the storage mode of the first group.	0.0000V 0.0000A 0V C0102
3	Enter VON voltage 10V by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V C0103
4	Enter the VON time delay 5s by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V C0104
5	Enter the current range 3A by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V C0105
6	Enter the beginning current 2A by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V C0106

Remarks: press ON/OFF to start and then the LED display on the right bottom is the count of triggers.

5. M1-M5 Fast Recall and Storage Function

5.1 M1-M5 Fast Recall Function

Note: By pressing M1-M5, the steady state content stored in M1-M5 can be quickly recalled.

5.2 M1-M5 Fast Storage Function

Note: You can change the content of M1-M5 by selecting M1-M5 button; and then press the currently selected M1-M5 button to fast save the value to the currently selected M key.

For example, the previous content of M1 is CV+15.001V and now needing to modify as CV+14.000V, you can press M1 to recall the content and then modify to 14.000V through rotating the knob and then pressing the number keys to select the value you want. After that, press M1 again to save it in M1.

6. Short Circuit Function

Note: the load will make the tested equipment output the max current.

Operation Method:

Procedures	Operation Description	Device Displays
1	Press " shift + 7 " to enter the short circuit testing mode	0.0000V 0.0000A 10.000V 00000G

7. Dynamic Test Function

Note: There are 6 setting functions in this mode: Dynamic CV, Dynamic CC, Dynamic CR, Dynamic CW, Dynamic Pulse and Dynamic Flip. And this mode has no storage function, so it can be only set first and then run.

7.1 Dynamic CV, Dynamic CR, & Dynamic CW

Description: used for the different duty cycle output of 2 different voltages at a certain frequency.

Operation Method:

Taking the first voltage 1V, the second voltage 2V , the cycle frequency 1HZ and the duty cycle 40% as example; as for Dynamic CR and Dynamic CW, just need to change the setting voltage into resistanceor power. And Dynamic CR selects mode 3 while Dynamic CW selects mode 4.

Procedures	Operation Description	Device Displays
1	Press the buttons "shift + ENTER" to enter the setting mode of dynamic selection	0.0000V 0.0000A 0.0000 00001 G
2	"ENTER" 1 through the knob or buttons and then press ENTER to enter the dynamic CV setting mode	0.0000V 0.0000A 0V 1-001 G
3	Using buttons or the knob to enter the first voltage 1V and then press the button "ENTER" to enter the next parameter setting	0.0000V 0.0000A 0V 1-002 G
4	Using buttons or the knob to enter the second voltage 2V and then press the button "ENTER" to enter the next parameter setting	0.0000V 0.0000A 0 1-003 G
5	Using buttons or the knob to enter the frequency 1HZ and then press the button "ENTER" to enter the next parameter setting	0.0000V 0.0000A 0 1-004 G
6	Using buttons or the knob to enter the duty cycle 40% and then press "ENTER" to finish the settings	0.0000V 0.0000A 00000 1-000 G TRIG
7	Press the button "ON/OFF" to start or pause	

Remarks: After pressing ON/OFF to start, the LED display on the right bottom is the count running once.

9.2 The Recall Function of the Battery Test

Note: Recall one group of the storage and use it.

Operation Description: Recall the first group of storage and use it.

Procedures	Operation Description	Device Displays
1	Press "RECALL + 6" and enter the recall mode of the setting sequence.	0.0000V 0.0000A CALL b-001G
2	"ENTER" 1 by pressing the knob or buttons to recall.	0.0000V 0.0000A CALL b-001G
3	Press "ON/OFF" to start or repeat. When meeting one of the conditions, the output will close automatically. And then press "ON/OFF" to start again.	0.0000V 0.0000A 1.0000 0.5000

Remarks: Press ON/OFF to start and then the LED display on the left bottom is the running time and the LED display on the right bottom is the consumption of capacity.

10. OCP Test Function

Note: when the voltage reaches the VON value, it will delay for some time, and the current outputs; at intervals, the step value will decrease progressively until it reaches the cutoff current, or the voltage is higher than that set by OCP, and then the output ends. After that, if the voltage is higher than the OCP voltage and meanwhile the current value is between the maximum and the minimum set currents, it passes; otherwise, it fails.

10.1 Function of OCP Test Settings

Note: It can set at most 10 groups of test parameters.

Procedures	Operation Description	Device Displays
1	Press " shift + 6 " and the enter the storage mode of the sequence settings.	0.0000V 0.0000A 0 b0001 G
2	Enter 1 through the knob or buttons and then press " ENTER " to enter the first group of setting mode.	0.0000V 0.0000A 0A b0102 G
3	Enter the current range 10A by pressingthe knob or buttons and then press " ENTER " to enter the next parametersettings.	0.0000V 0.0000A 0A b0103 G
4	Enter the discharging current 1A by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0V b0104 G
5	Enter the discharging end-off voltage 2V by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0 b0105 G
6	Enter the discharging end-off capacity 0.5AHby pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0 b0106 G
7	Enter the discharging end-off time 200s by pressing the knob or buttons and then press " ENTER " to finish the settings and storage.	0.0000V 0.0000A 200.00 b0106 G

Remarks: During the operation, once press Esc and it will exit the mode. If there are some wrong entering, you can rotate the knob. When the complete value appears, enter again.

7.2 Dynamic CC

Note: used for the different duty cycle output of 2 different currents at a certain frequency.

Operation Method: taking it as example that the change slope of the first current is 0.001A/Us, that of the second current is 0.002A/Us, the first current is 1A, the second current is 2A, the cycle frequency is 1HZ and the duty cycle is 40%.

Procedures	Operation Description	Device Displays
1	Press the buttons " shift + ENTER " to enter the setting mode of dynamic selection	0.0000V 0.0000A 0.0000 00001 G
2	" ENTER " 1 through the knob or buttons and then press ENTER to enter the dynamic CC setting mode	0.0000V 0.0000A 0A 2-001 G
3	Using buttons or the knob to enter the first current change rate 0.001A/us and then press the button " ENTER " to enter the next parameter setting	0.0000V 0.0000A 0A 2-002 G
4	Using buttons or the knob to enter the second current change rate 0.002A/us and then press the button " ENTER " to enter the next parameter setting	0.0000V 0.0000A 0A 2-003 G
5	Using buttons or the knob to enter the first current 1A and then press the button " ENTER " to enter the next parameter setting	0.0000V 0.0000A 0A 2-004 G
6	Using buttons or the knob to enter the second current 2A and then press the button " ENTER " to enter the next parameter setting	0.0000V 0.0000A 0A 2-005 G

7	Using buttons or the knob to enter the cycle 1HZ and then press the button “ENTER” to enter the next parameter setting	0.0000V 0.0000A 0A 2-006 G
8	Using buttons or the knob to enter the duty cycle 40% and then press the button “ENTER” to finish the settings	0.0000V 0.0000A 00000 2-000 G TRIG
9	Press the button “ON/OFF” to start or pause	0.0000V 0.0000A 00001 2-000 G TRIG

Remarks: After pressing ON/OFF to start, the LED display on the right bottom is the count running once.

7.3 Dynamic Pulse

Note: at the beginning, it is the first setting current. And every time when receiving a trigger signal, the load will switch to the second setting current. After maintaining the setting time, it will switch to the first current.

Operation method: taking it as example that the change slope of the first current is 0.001A/Us, that of the second current is 0.002A/Us, the first current is 1A, the second current is 2A, and the second current maintenance time is set as 1s.

8.2 Sequence Recall Function

Note: recall one group of storage and use it.

Operation Description: recall the first group of storage and use it.

Procedures	Operation Description	Device Displays
1	Press “RECALL + CC” and enter the mode of recalling the setting sequence.	0.0000V 0.0000A CALL L-001G
2	“ENTER” 1 by pressing the knob or buttons to recall.	0.0000V 0.0000A CALL L-001G
3	Press “ON/OFF” to start or pause. When the repetition times finish, theload output will be closed automatically. And then press “ON/OFF” again to start.	0.0000V 0.0000A 00005 L-001G

Remarks: press ON/OFF to start and then the LED display on the right bottomis the times of repetition.

9. Battery Test Function

9.1 The Setting Function of the Battery Test

Note: It can at most set 10 groups of battery test parameters. According to the set current, voltage, capacity and time, it tests the battery. And the test will be turned off automatically once it meets any one of the conditions.

Operation Description: taking it as example that the setting is saved in group 1, the current range is 10A, the discharge current is 1A, the discharging end-off voltage is 2A, the discharging end-off capacity is 0.5AH and the discharging time is 200s.

7	Enter the time 1s by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings	0.0000V 0.0000A 0A L1007 G
8	Enter the second dynamic current 2A by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0A L1008G
9	Enter the change rate 0.002A/us by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0 L1009G
10	Enter the time 2s by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0A L1010 G
11	Enter the third dynamic current 3A by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0A L1011G
12	Enter the change rate 0.003A/us by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0 L1012G
13	Enter the time 3s by pressing the knob or buttons and then press " ENTER " to enter the next parameter settings.	0.0000V 0.0000A 0 L1013G
14	Enter the times 5 by pressing the knob or buttons and then press " ENTER " to finish the settings and storage.	0.0000V 0.0000A 5 L1013G
15	Press Esc to exit the settings.	

Remarks: During the operation, one press Esc and it will exit the mode. If there are some wrong entering, you can rotate the knob. When the complete value appears, enter again.

Procedures	Operation Description	Device Displays
1	Press the buttons " shift + ENTER " to enter the setting mode of dynamic selection.	0.0000V 0.0000A 0.0000 00001 G
2	Enter 5 through the knob or buttons and then press " ENTER " to enter the setting mode of the dynamic pulse.	0.0000V 0.0000A 0A 5-001 G
3	Using buttons or the knob to enter the first current change rate 0.001A/us and then press the button " ENTER " to enter the next parameter setting.	0.0000V 0.0000A 0A 5-002 G
4	Using buttons or the knob to enter the second current change rate 0.002A/us and then press the button " ENTER " to enter the next parameter setting.	0.0000V 0.0000A 0A 5-003 G
5	Using buttons or the knob to enter the first current 1A and then press the button " ENTER " to enter the next parameter setting.	0.0000V 0.0000A 0A 5-004 G
6	Using buttons or the knob to enter the second current 2A and then pressthe button " ENTER " to enter the next parameter setting.	0.0000V 0.0000A 0 5-005 G
7	Using buttons or the knob to enter the pulse width and then press " ENTER " to finish the settings.	0.0000V 0.0000A 0 5-000 G TRIG
8	Press the button " ON/OFF " to start or pause and then press the button 3 to trigger once.	0.0000V 0.0000A 0 5-000 G TRIG

Remarks: press ON/OFF to start and then the LED display on the right bottom is the count of triggers.

7.4 Dynamic Toggle

Note: Every time when receiving a trigger signal, the load will toggle between the first and second setting current.

Operation method: taking it as example that the change slope of the first current is 0.001A/Us, that of the second current is 0.002A/Us, the first current is 1A, and the second current is 2A.

Procedures	Operation Description	Device Displays
1	Press the buttons "shift + ENTER" to enter the setting mode of dynamic selection.	0.0000V 0.0000A 0.0000 00001 G
2	Enter 6 through the knob or buttons and then press "ENTER" to enter the setting mode of the dynamic pulse.	0.0000V 0.0000A 0A 6-001 G
3	Using buttons or the knob to enter the first current change rate 0.001A/us and then press the button "ENTER" to enter the next parameter setting.	0.0000V 0.0000A 0A 6-002 G
4	Using buttons or the knob to enter the second current change rate 0.002A/us and then press the button "ENTER" to enter the next parameter setting.	0.0000V 0.0000A 0A 6-003 G
5	Using buttons or the knob to enter the first current 1A and then press the button "ENTER" to enter the next parameter setting.	0.0000V 0.0000A 0A 6-004 G
6	Using buttons or the knob to enter the second current 2A and then press the button "ENTER" to finish the settings.	0.0000V 0.0000A 0 6-000 G TRIG
7	Press the button "ON/OFF" to start or pause and then press the button 3 to trigger and toggle once.	0.0000V 0.0000A 0 5-000 G TRIG

Remarks: press ON/OFF to start and then the LED display on the right bottom is the count of triggers.

8. Sequential Operation Function

8.1 Sequential Setting Function

Note: It can save 7 groups at most and every set it can at most set 84 dynamic currents. And the set current can be toggled in sequence.

Operation description: taking it as example that the setting is saved in group 1, the max current is 4A,there are 3 dynamic currents, the first dynamic current is 1A, the change rate is 0.001A/us, the time is 1s, the second dynamic current is 2A, the change rate is 0.002A/us, the time is 2s, the first dynamic current is 3A, the change rate is 0.003A/us, the time is 3S and the repetition times is 5 times.

Procedures	Operation Description	Device Displays
1	Press the button "shift + CC" and enter the storage mode of the sequence setting.	0.0000V 0.0000A 0 L1001 G
2	Enter 1 through the knob or buttons and then press "ENTER" to enter the first group of setting mode.	0.0000V 0.0000A 0 L1002 G
3	Using buttons or the knob to enter the max current 4A and then press the button "ENTER" to enter the next parameter setting.	0.0000V 0.0000A 0 L1003 G
4	Enter 3 currents of dynamic changes by pressing the knob or buttons and then press "ENTER" to enter the next parameter settings.	0.0000V 0.0000A 0 L1004 G
5	Enter the first dynamic current 1A by pressing the knob or buttons and then press "ENTER" to enter the next parameter settings.	0.0000V 0.0000A 0 L1005 G
6	Enter the change rate 0.001A/us by pressing the knob or buttons and then press "ENTER" to enter the next parameter settings.	0.0000V 0.0000A 0 L1006 G