



ET5304Dual-Channel Programmable DC Electronic Load User Manual



Hangzhou Zhongchuang Electronics Co., Ltd.

Product Basic Function

ET53 series DC programmable electronic load provides 1mV/10mV, 1mA/10mA high resolution and precision with superior performance. It is equipped with 12 common modes and complete test functions, which can be widely used in charger, switching power supply, linear power supply, battery and other production line testing.

Key Features:

- User-friendly Design:
 - ◆ It adopts 3.5-inch TFT LCD screen with rich display contents;
 - ◆ The operation process is simple and convenient, and with visual interface display system, it is easy to get started.
 - ◆ Key lock function to prevent misoperation;
- High-performance load:
 - ◆ It provides CC, CV, CR, CP and CC+CV, CR+CV several basic measurement modes;
 - ◆ It provides professional battery test;
 - ◆ It provides professional LED test;
 - ◆ The Tran test mode can test the dynamic output performance of the power supply;
 - ◆ The scan test mode can test the continuity of power output within a certain range;
 - ◆ Support 4-wire measurement;
 - ◆ The list test mode can simulate a variety of loading status changes;
 - ◆ The short circuit test can be used to simulate load short circuit;
 - ◆ Support external trigger input;
 - ◆ Built-in buzzer alarm;
 - ◆ Maintain data storage in case of power failure;
 - ◆ Remote operation via USB, RS-232 or 485 (optional) interfaces;
- Multiple safety protection:
 - ◆ It provides overcurrent, overvoltage, overpower, over temperature protection. The overvoltage and overcurrent parameters can be set flexibly, so as to effectively protect the load;
 - ◆ It has intelligent fan speed control function, which can effectively reduce the fan noise when it is working.
 - ◆ With input polarity reverse prompt;

General technical specifications:

- ◆ Power supply voltage: 220Vac±10%, 110Vac±10%, 45-65Hz
- ◆ Display: 3.5-inch TFT LCD screen with resolution of 480×320
- ◆ Operating temperature: 0℃ to 40℃
- ◆ Storage temperature: -10℃ to 70℃
- ◆ Relative humidity: < 80%
- ◆ Interface: standard USB, RS232 or 485(optional)
- ◆ Size: 320mm×220mm×100mm (width × height × depth)

Standard accessories:

- ◆ Three-core power cord 1
- ◆ Power fuse 2
- ◆ User manual 1

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1. Quick Start Guide

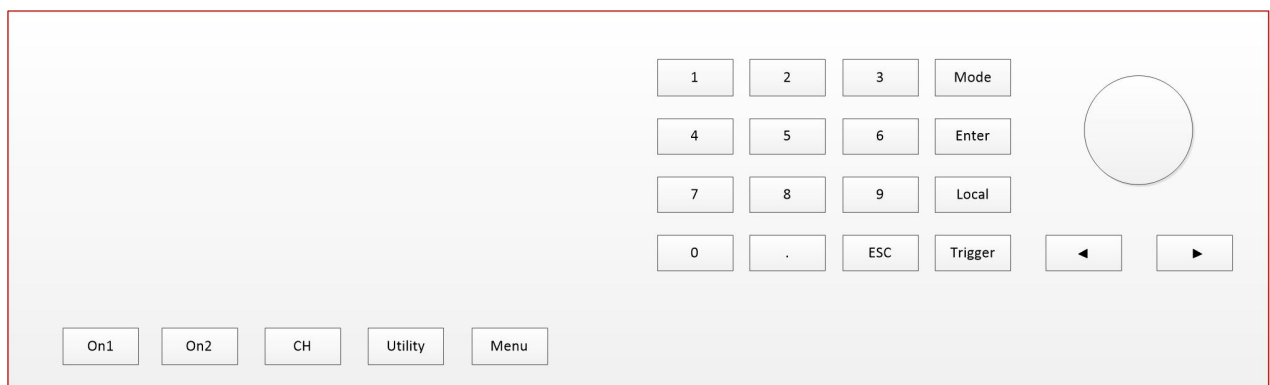
1.1 Front panel LCD display



- ◆ Icon bar: there are five types of icons on the electronic load interface

	It indicates keyboard lockout
	It indicates remote control
	It indicates fan failure
Unreg	It indicates not satisfy the set value
Sense	It indicates 4-wire measurement
PASS	It indicates PASS

1.2 Front panel key



1.3 Key Description

Key name	Function of the key
【On1】	Channel 1 switch key, which is used to control the load channel status: on/off.
【On2】	Channel 2 switch key, which is used to control the load channel status: on/off.
【CH】	Set the channel toggle button to select the currently set channel. Long press for more than 3 seconds to switch single - screen display or split - screen display
【Mode】	Set the load mode.
【Utility】	For system general settings.
【Menu】	Parameter settings for non-basic mode.
【0】 ~ 【9】	Numeric key for entering numbers.
【.】	For entering the decimal point.
【ESC】	Back key or number deletion key.
【Enter】	Enter or select key. Long press for more than 3 seconds and the keyboard will be locked. Under the locked state, some keys cannot be used.
【Local】	For switching to the local mode.
【Trigger】	Trigger key for manual trigger.
【◀】、【▶】	Keys used for moving the cursor left or right.

1.4 Numeric parameter settings

Numeric parameters can be set in two ways.

1. As shown in figure 1.4.1, ①Press **【Enter】** to enter the edit mode. ② In edit mode, press the arrow keys **【◀】**、**【▶】** to select the corresponding number of digits. ③Turn the knob to adjust the value. ④ Press **【Enter】** or **【Esc】** to exit the edit mode. Numeric parameter setting is then completed.

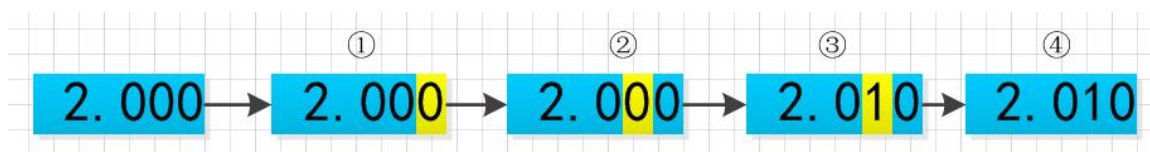


Figure 1.4.1.

2. As shown in figure 1.4.2, ①press **【Enter】** to enter the edit mode. ②Press the numeric key to enter the value. ③Press **【Enter】** to confirm and exit the edit mode. Parameter setting is then completed. When entering the value in step②: ④press **【Esc】** to delete the previous number until all the numbers are deleted. ⑤When all the numbers are deleted, press **【Esc】** again to exit the edit mode and end the parameter setting.

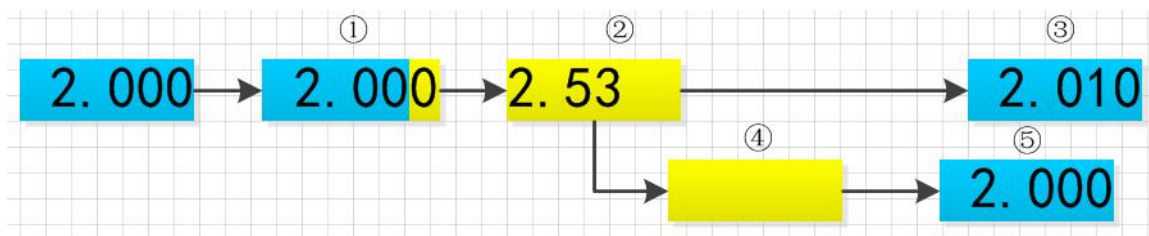


Figure 1.4.2

2. Function operation

To ensure stable and safe operation of the load and the source to be measured, make sure that the load and the source to be tested are connected in a red-positive and black-negative manner before using the load to test the source to be measured. After that, first turn on the power output, and then turn on the load.

2.1 Remote/local switching

When the load is in remote operation mode, the corresponding icon will be displayed on the top of the interface. At this time, the interface is locked, and the status and operation of the instrument can be controlled through the commands of the upper computer, or switch back to the local operation mode by pressing **【Local】** on the panel.

2.2 System Setup

Press **【Utility】** to enter the system menu interface, as shown in figure. 2.2.1. Rotate the knob to select and enter the corresponding sub-menu. The operations of language setting, restore factory setting and start settings can be completed in the system setting interface, as shown in figure 2.2.2.

Operating instructions: 1. Select the operation option by rotating the knob. 2. Press **[Enter]** to enter the sub-menu interface or switch the contents of the operation option. 3. Press **【Esc】** to return to the previous interface.



Figure. 2.2.1 System menu interface

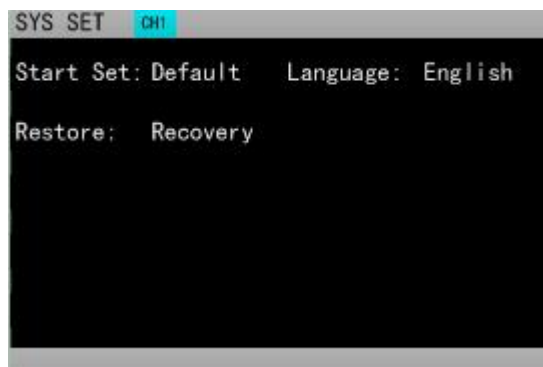


Figure 2.2.2 System setting interface

2.3 Load Setup

Load setup interface can be entered through the system menu, as shown in figure 2.3. The load range, limit value, off-delay and other related settings can be completed in this interface.

Operating instructions: 1. Select the operation option by turning the knob. 2. Press **【Enter】** to switch set options for non-numeric parameters. 3. As for the setting of numeric parameters, please refer to 1.4 Numeric Parameter Setting for details. 4. Press **【Esc】** to return to the previous interface.



Figure 2.3 Load setup interface

2.4 Basic mode

Electronic load can work in the following basic measurement modes: constant current mode (CC), constant voltage mode (CV), constant resistance mode (CR), constant power mode (CP), constant current to constant voltage mode (CC+CV), constant resistance to constant voltage mode (CC+CR). The parameter settings for the above six modes can be done in the measurement interface. In addition, press [Mode] on the main interface of any mode to enter the mode selection interface, as shown in figure 2.4.

Operating instructions: 1 Select the action item by turning the knob. 2. Press **【Enter】** to confirm the selected mode. 3. Press **【Esc】** to return to the previous interface.



Figure 2.4 Mode selection interface

2.4.1 Constant current mode

In constant current mode, the electronic load consumes a constant current regardless of whether the input voltage changes or not.

Operating instructions: 1. Press **【CH】** to select the operation channel 2. Select the operation option by turning the knob. 3. For parameter settings, please refer to 1.4 Numeric Parameter Setting for details. 4. Press the corresponding **【On1】**、**【On2】** to turn on the load.

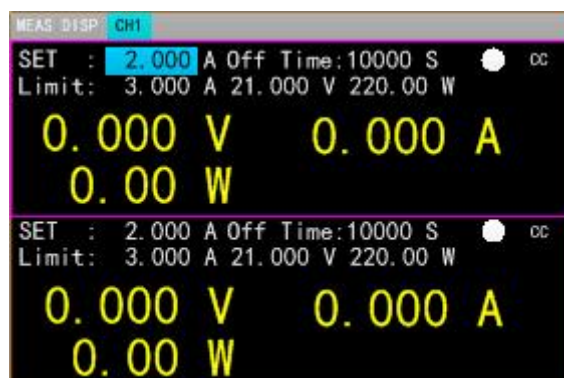


Figure 2.4.1 Constant current mode

2.4.2 Constant voltage mode

In constant voltage mode, the electronic load will consume enough current to keep the input voltage at the set voltage.

Operating instructions: 1. Press **【CH】** to select the operation channel 2. Select the operation option by turning the knob. 3. For parameter settings, please refer to 1.4 Numeric Parameter Setting for details. 4. Press the corresponding **【On1】**、**【On2】** to turn on the load.



Figure 2.4.2 Constant voltage mode

2.4.3 Constant resistance mode

In constant resistance mode, the load is equivalent to a constant resistance, and the load will consume a current that varies with the input voltage.

Operating instructions: 1. Press **【CH】** to select the operation channel 2. Select the operation option by turning the knob. 3. For parameter settings, please refer to 1.4 Numeric Parameter Setting for details. 4. Press the corresponding **【On1】**、**【On2】** to turn on the load.



Figure 2.4.3 Constant resistance mode

2.4.4 Constant power mode

In constant power mode, the load consumes a constant power. When the input voltage changes, the load will adjust the current accordingly to keep the consumed power at the set power value.

Operating instructions: 1. Press **【CH】** to select the operation channel 2. Select the operation option by turning the knob. 3. For parameter settings, please refer to 1.4 Numeric Parameter Setting for details. 4. Press the corresponding **【On1】**、**【On2】** to turn on the load.



Figure 2.4.4 Constant power mode

2.4.5 Constant current to constant voltage mode

The constant current to constant voltage mode is to prevent the source to be measured from being damaged by overcurrent discharge. In this mode, when the source to be measured cannot output the current value set by the load, it will automatically switch from constant current mode to constant voltage mode.

Operating instructions: 1. Press **【CH】** to select the operation channel 2. Select the operation option by turning the knob. 3. For parameter settings, please refer to 1.4 Numeric Parameter Setting for details. 4. Press the corresponding **【On1】**、**【On2】** to turn on the load.



Figure 2.4.5 Constant current to constant voltage mode

2.4.6 Constant resistance to constant voltage mode

The constant resistance to constant voltage mode is to prevent the source to be measured from being damaged by overcurrent discharge. In this mode, when the source to be measured cannot output enough current to maintain the set resistance, the load will switch from constant resistance mode to constant voltage mode.

Operating instructions: 1. Press **【CH】** to select the operation channel. 2. Select the operation option by turning the knob. 3. For parameter settings, please refer to 1.4 Numeric Parameter Setting for details. 4. Press the corresponding **【On1】**、**【On2】** to turn on the load.

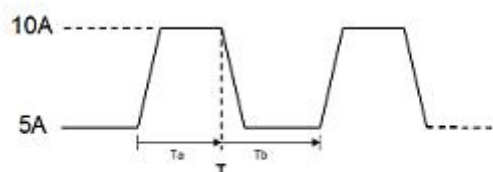


Figure 2.4.5 Constant resistance to constant voltage mode

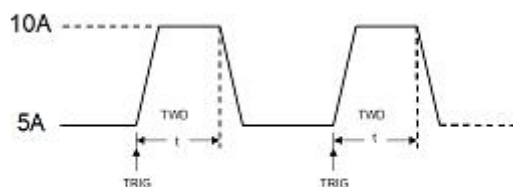
2.5 Tran Test

Tran test can be switched back and forth between two currents or voltages set by the load. This function can be used to test the dynamic characteristics of the power source. Moreover, the Tran test is divided into three modes: continuous mode, pulse mode and trigger mode, as described below:

- ◆ Continuous mode: in this mode, the load can continuously switch between level A and level B after the test is started.



- ◆ Pulse mode: in this mode, after the test is started, the load will switch from level A to level B every time it receives a trigger signal, and then switch back to level A after maintaining level B pulse width.



- ◆ Trigger mode: in this mode, after the test is started, the load will switch between level A and level B every time it receives a trigger signal. Setting the pulse width will not work in this mode.



Before starting the Tran test, relevant parameters of Tran test should be set, including: Tran state, level A, level A pulse width, level B, level B pulse width and Tran test mode. The setting interface and the testing interface are shown in figure 2.5.1 and figure 2.5.2 respectively.

Operating instructions: 1. Press **【Mode】** to enter the main interface of Tran test, and press **【Menu】** to enter the parameter setting interface of Tran test. 2. Select the action item by turning the knob. 3. Press **【Enter】** to switch set options for non-numeric parameters. 3. As for the setting of numeric parameters, please refer to 1.4 numeric parameter settings. 4. Press **【Esc】** to return to the testing interface. 6. In the testing interface, press **【On1】**、**【On2】** to turn on or off the load.

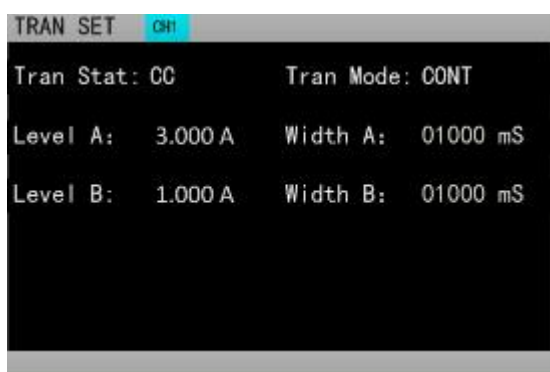


Figure 2.5.1 Tran Set interface

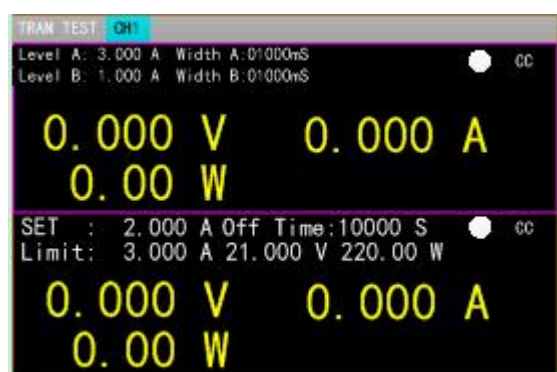


Figure 2.5.2 Tran Test interface

2.6 List Test

The list test function makes it easy to test the working conditions of the source to be measured under different loading status, which is conducive to the automated testing of production line. Preset the steps of the list test, and then edit the test steps and test parameters of the source to be measured into a list and complete a series of tests in sequence. Specific parameter settings include: number of steps, step mode,

repeat switch, and the load mode, load size, delay time, compare switch, maximum value and minimum value of each step.

The setting interface and testing interface are shown in figure 2.6.1 and 2.6.2 respectively, and the test outcome interface at the end of the test is shown in figure 2.6.3.

Operating instructions: 1. Press **【Mode】** to enter the main interface of list test, and press **【Menu】** to enter the list menu interface, as shown in figure 2.6. For interface operation, please refer to the operating instructions for list menu above the figure. 2. Enter the sub-menu interface of list test setting, as shown in figure 2.6.1. For interface operation, please refer to the operating instructions for the list test setting interface above the figure. 3. After the completion of parameter settings, press **【Esc】** to return to the list menu interface, and then press **【Esc】** to return to the main interface of list test. 4. In the testing interface, press **【On1】**、**【On2】** to turn on or off the load. 5. After the completion of the electronic load startup test, the list test outcome interface will appear, as shown in figure 2.6.3. Press **【Esc】** to return to the main interface of list test. Please refer to the operating instructions for list test outcome interface for details.

Operating instructions for list menu: Turn the knob to select the corresponding option, and press **【Enter】** to enter the corresponding sub-menu.

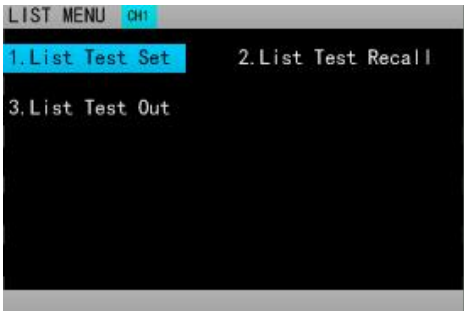


Figure 2.6 List menu interface

Operating instructions for the list test setting interface: 1. Select the action item by turning the knob; 2. Press direction keys **【◀】**、**【▶】** to switch to the edit state before any parameter can be edited. Press the direction key to select the previous or next page and then press **[Enter]** to turn the page. Press the direction key to select “save” and then press **【Enter】** to enter the list test parameters saving interface as shown in figure 2.6.4. Please refer to the operating instructions for list test parameters saving interface for more information about saving. 3. Press **【Enter】** to switch set options for non-numeric parameters in the edit state. 4. As for the setting of numeric parameters in edit state, please refer to 1.4 Numeric Parameter Settings for details. 5. Press **【Esc】** to return to the previous interface.

LIST SET CH1						
Test Step: 05 StepMode: Auto Repeat: OFF						
Num	Type	Value	Delay	Compar	Max	Min
01	CC	2.000	0005	OFF	3.000	1.000
02	CV	15.000	0005	OFF	19.999	0.100
03	CP	50.000	0005	OFF	200.00	1.00
04	CR	500.00	0005	OFF	4500	1.00
05	OPEN	—, —	0005	OFF	19.999	0.000
Pre Page Edit Save Next Page						

Figure 2.6.1 List setting interface

Operating instructions for the testing interface: press 【On1】 、 【On2】 to turn on or off the mode.

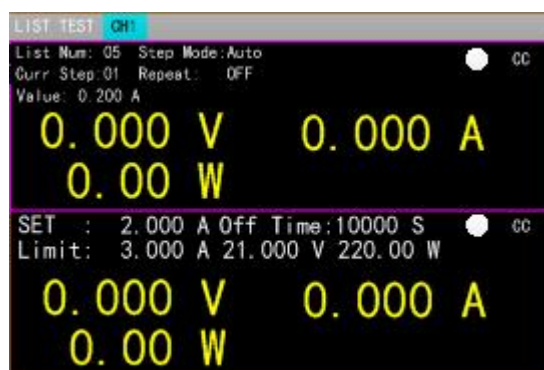


Figure 2.6.2 List test interface

Operating instructions for list test outcome interface: 1. Press the direction keys 【◀】 、 【▶】 to switch to “previous page”, “save” or “next page” options. 2. Press the direction key to select the “previous page” or “next page”, and then press [Enter] to turn the page. 3. Press the direction key to select “save” and press [Enter] to enter the list outcome saving interface, as shown in figure 2.6.5. Please refer to the operating instructions for list test results saving interface for details.

LIST OUT ON1						
Num	Type	Value	Delay	Compar	Max	Min
01	CC	2.000	0005	OFF	3.000	1.000
02	CV	15.000	0005	OFF	19.999	0.100
03	CP	50.000	0005	OFF	200.00	1.00
04	CR	500.00	0005	OFF	4500	1.00
05	OPEN	-----	0005	OFF	19.999	0.000
<div> <div>Pre Page</div> <div>Save</div> <div>Next Page</div> </div>						

Figure 2.6.3 List outcome interface

Operating instructions for list test parameters saving interface: 1. Select the file by turning the knob; 2. Press direction keys【◀】、【▶】to switch to the edit state before any file can be edited. Press the direction key to select the previous or next page and then press [Enter] to turn the page. 3. Turn the knob to select “store”, “recall”, or “delete” the file in the edit state, and press [enter] to enter the file rename interface, or to recall or delete the files. Please refer to the operating instructions for file rename interface for details. To recall the previously saved files, press [Enter] within 10S, otherwise the recall operation will be cancelled. To delete a file also needs to press [Enter] within 10S; otherwise, the delete operation will be cancelled. 4. Press [Esc] to return to the previous interface.



Figure 2.6.4 File list set parameters saving interface

Operating instructions for list test results saving interface: The operation of list test results interface is the same as that of list test parameters saving interface. Refer to the operating instructions for list test parameters saving interface.

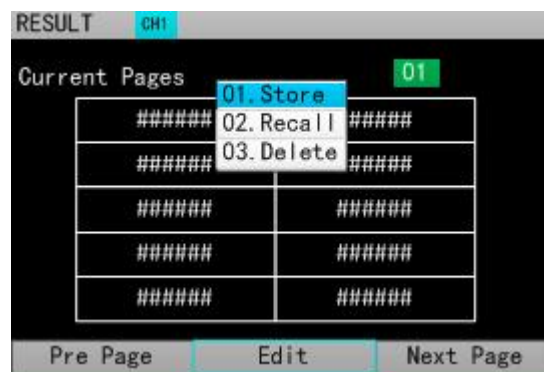


Figure 2.6.5 File list results saving interface

Operating instructions for file rename interface: 1. Press the direction key to switch to the edit state before any file can be edited. Switch to “save” and press [Enter] to save the file. If it is a null character, an error will be reported. 2. Select the character by rotating the knob in the editing state and press [Enter] to type the character; 3. Press [Esc] to return to the previous interface;



Figure 2.6.7 File rename interface

2.7 Scan Test

Scan test can be used to detect the continuous working conditions of the source to be measured within a certain range, and makes it easy to capture various critical parameters of the source to be measured, such

as protection current, break over voltage and so on. Users can set the scan start value, end value, step value, step delay, threshold type, compare type and other related parameters. After the completion of the scan test, it will show whether the test result is qualified or not.

Operating instructions: 1. Press [Menu] on the main interface of scan test to enter the scan setting interface; 2. Select the action item by rotating the knob; 3. Press [Enter] to switch set options for non-numeric parameters. 4. As for the setting of numeric parameters, please refer to 1.4 Numeric Parameter Settings for details. 5. Press 【Esc】 to return to the previous interface. 6. Press 【On1】、【On2】 to turn on or off the load.



Figure 2.7.1 Scan test setting interface



Figure 2.7.2 Scan test interface

2.8 Battery Test

Battery test is commonly used to test the discharge performance of the battery. The electronic load can work with constant current or constant resistance, which makes it easy to measure the discharge capacity of the battery.

Operating instructions: 1. Press [Menu] in the main interface of battery test to enter the battery parameters setting interface; 2. Select the action item by rotating the knob; 3. Press [Enter] to switch set options for non-numeric parameters. 4. As for the setting of numeric parameters, please refer to 1.4 Numeric Parameter Settings for details. 5. Press 【Esc】 to return to the main interface of battery test. 6. Press 【On1】、【On2】 to turn on or off the mode.

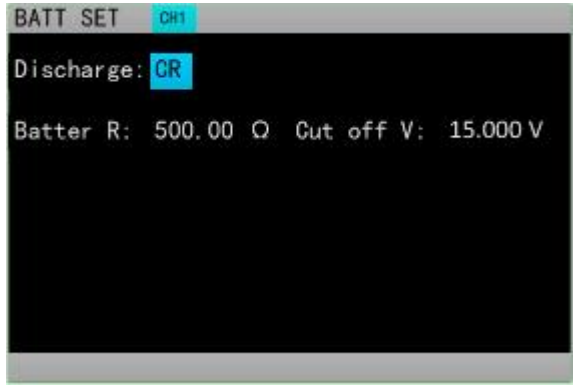
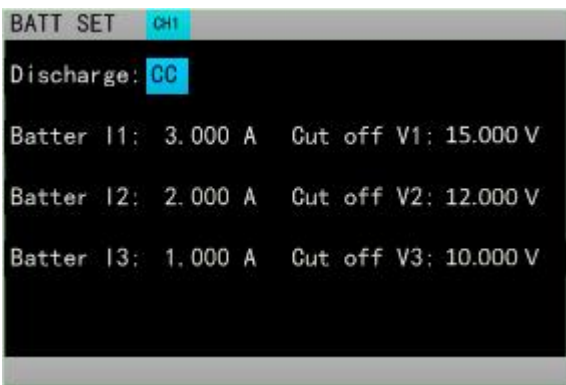


Figure 2.8.1 Battery test setting interface



Figure 2.8.2 Battery test main interface

2.9 LED Test

The LED equivalent circuit is the series connection of the LED equivalent resistance R_d and the forward voltage V_f . Users need to set three parameters, among which I_o is the output current of LED source; V_o is the sum of the voltage drop of forward voltage V_f and LED resistance R_d when LED is in the on-state; Coeff is the ratio of the LED equivalent resistance R_d and the total equivalent resistance of LED load.

Operating instructions: 1. Select the action item by rotating the knob; 2. For parameter setting, please refer to 1.4 Numeric Parameters Setting for details. 3. Press 【On1】、【On2】 to turn on or off the mode.

Option Description:

Name	content	Description
LED V_o :	0--- V_{max}	Steady working voltage of LED constant current source with LED lamp
LED I_o :	0--- I_{max}	Output current of LED constant current source
LED Coeff:	0.01—1	Ratio of LED equivalent resistance R_d and total equivalent resistance of LED load

According to the following equations (1) and (2), the LED forward voltage and LED impedance can be obtained based on the above parameters. V_f is defined as forward voltage of the diode and R_d as LED equivalent resistance.

$$R_d = (V_o / I_o) * \text{Coeff} \quad (1)$$

$$V_f = V_o * (1 - \text{Coeff}) \quad (2)$$

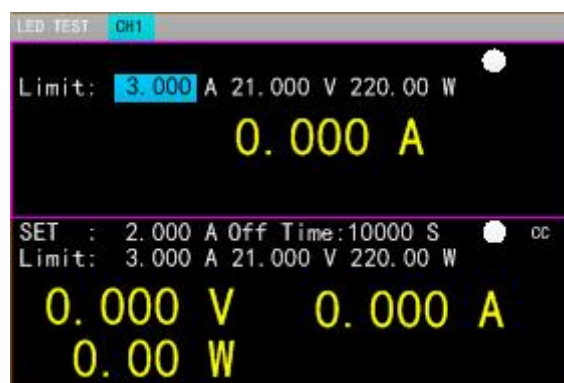
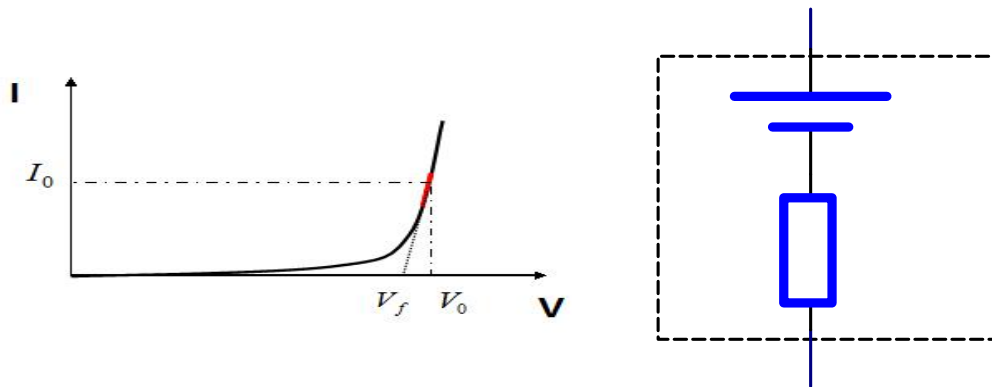


Figure 2.9 LED test interface

2.10 Short Circuit Test

The load can simulate a short circuit at the input end. Under the short circuit test, the actual current consumed by the load short circuit depends on the maximum output of the power supply.

Operating instructions: 1. Select the action item by rotating the knob; 2. For parameters setting, please refer to 1.4 Numeric Parameters Setting for details. 3. Press 【On1】、【On2】 to turn on or off the mode.

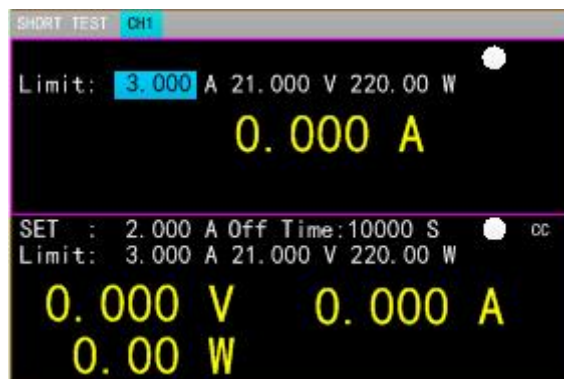


Figure 2.10 Short circuit test interface

2.12 Protection function

The load provides overcurrent, overvoltage, overpower, over temperature protection, and reverse polarity prompt (the prompt information is subject to the real picture).



2.13 Trigger function

The load has trigger function, which is mainly used in Tran test and list test to trigger the next step. The load supports three trigger modes: 1. Manual (Triggered by pressing 【Trigger】 on the front panel). 2. External (triggered through the back panel trigger port, falling edge trigger). 3. Bus (triggered by the program control commands of RS-232 or USB bus interface).

2.14 Qualification test

The qualification test is an additional function of the basic measurement modes of CC/CV/CR/CP. When the qualification test is started, it can detect in real time whether the current test is within the set limit range on the main interface of basic measurement mode and display Pass/Fail.

Operating instructions for parameter setting interface: 1. Select the action item by rotating the knob; 2. Press【Enter】to switch set options for non-numeric parameters. 3. As for the setting of numeric parameters, please refer to 1.4 Numeric Parameter Setting for details. 4. Press 【Esc】 to return to the previous interface.



Figure 2.14.1 Qualification test setting interface



Figure 2.14.2 Interface displayed when the qualification test is being started

2.15 Other system settings

2.15.1 Key-Lock Function

The load also added the lock function to prevent user misoperations. The title bar will display the lock identifier. In the lock-out state, all the other keys including the knob are locked except [On/Off], [Enter] and [Local] keys. In addition, a lock icon will appear in the icon bar in the lock-out state and disappear when unlocking. Long press [Enter] for 3s to switch between locking and unlocking state.

2.16 Communication port and External expansion port

ET53 series is equipped with USB, RS232 and optional RS485 three communication modes. The following picture shows the settings related to communication. Users can press [Utility] to enter the system menu interface and select communication settings to enter the setting interface.



Figure 2.15.2 Communication setting interface

2.16.1 Communication port



COM port	Interface	pin	Pin Definitions
RS232	DB9 female	2	TXD
		3	RXD
		5	GND
USB-Device	USB-B female		

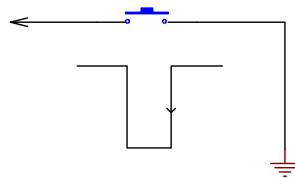
2.16.2 Expansion port



Expansion port output	S1+	Measure the positive input terminal at the far end
	S1-	Measure the negative input terminal at the far end
	R1	The list test is in progress, low effectiveness
	P1	The list test result is qualified, low effectiveness
	F1	The list test result is unqualified, low effectiveness
	G	GND
Expansion port input	N1	External trigger input

The extension port output is OC gate output. The user needs to connect the pull-up resistor and pull-up level. The range of pull-up level is 0-50V and the sink current is 0-100mA. Exceeding the above electrical range will damage the device interface.

The extension port input is the external trigger input terminal, and the falling edge is effective. The interval between two falling edges should be greater than 100mS.



2.16.3 Current monitoring terminal



This terminal is the current monitoring terminal, and the output range is 0-11V.

Technical specifications

Model		ET1304
Rated input	Power	400W (200W*2)
	Input voltage	0-150V
	Input current	0-60A(30A*2)
CV mode	Range	0.1~19.999V, 0.1~150.00V
	Resolution	1mV, 10mV
	Accuracy	$\pm(0.05\%+0.02\%FS)$
CC mode	Range	0~3.000A, 0~30.00A
	Resolution	1mA, 10mA
	Accuracy	$\pm(0.05\%+0.05\%FS)$
CR mode	Range	0.05 Ω ~1 k Ω , 1 k Ω ~4.5k Ω
	Resolution	10m Ω , 100m Ω
	Accuracy	$\pm(0.1\%+0.5\%FS)$
CP mode	Range	0~200W
	Resolution	10mW
	Accuracy	$\pm(0.1\%+0.5\%FS)$
Tran Test	Mode	CC, CV
	T1&T2	50ms~60s;
Battery Test	Accuracy	CC, CR
	Discharge mode	9999Ah
	Maximum discharge capacity	1mA, 10mA, 10m Ω , 100m Ω
Range of measurement		
Voltage read-back value	Range	0~19.999V, 0~150.00V
	Resolution	1mV, 10mV
	Accuracy	$\pm(0.05\%+0.1\%FS)$
Current read-back value	Range	0~3.000A, 0~30.00A
	Resolution	1mA, 10mA
	Accuracy	$\pm(0.05\%+0.1\%FS)$
Power read-back value	Range	200W
	Resolution	10mW
	Accuracy	$\pm(0.1\%+0.5\%FS)$
Scope of protection		
Overvoltage protection		>21V or 155V overvoltage protection
Overcurrent protection		>3.1A or 31A input cut off
Overpower protection		210W
Over-temperature protection		85℃

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