

OPERATION MANUAL

CH9720 Series

Programmable DC Electronic Load

BEICH

CHANGZHOU BEICH Electronic Technology Co., Ltd

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The descriptions in this manual may not be all the contents of the instrument.BEICH Electronics has the right to improve and improve the performance,function,internal structure, appearance, accessories, packaging, etc. of this product without further explanation!The resulting specification is inconsistent with the instrument.Confused,can contact my company.

Safety warning:

 **Electric shock hazard**

Be careful not to get an electric shock during operation, testing and maintenance of the instrument.

Non-professionals should not open the case without authorization. If the professional needs to replace the fuse or perform other maintenance, be sure to unplug the power plug and carry it with someone.

Even if the power plug has been removed, there may be dangerous voltage on the capacitor. It should be discharged after a few minutes.

Do not replace or adjust the internal circuits and components of the instrument without authorization!

 **Input power**

Please use the power supply according to the power supply parameters specified in this instrument. Power input that does not meet the specifications may damage the instrument.

Please use the same specifications when replacing the fuse

 **Keep away from explosive gas environment**

Electronic instruments should not be used in flammable or explosive atmospheres or in corrosive gases or soot environments to avoid danger.

 **Other safety matters**

Do not apply an external voltage source or current source to the test terminals of this instrument and other input and output terminals.

Do not input AC voltage at the input.

Always observe all safety precautions in any process that uses the equipment for operation and maintenance. Neglecting and not complying with these safety measures and the warnings in this manual will not only affect the performance of the instrument, but may also cause direct damage to the instrument and may endanger personal safety. BEICH Electronic Technology Co., Ltd. does not bear any consequences for the consequences of not complying with these safety precautions.

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Chapter I Ready to use

Thank you for purchasing and using our products. Please check and check according to the random packing list before using this instrument. If there is any discrepancy, please contact our company as soon as possible to protect your rights.

1.1 Check shipment

After receiving this product, please carefully unpack and check according to the following procedure:

WARNING: If the appearance of the electronic load (such as the enclosure, front/rear panel, LCD screen, power switch, and port connector) is damaged during transport, do not connect the power supply and turn the power switch on, as this may result in a risk of electric shock.

1. Inspect the package or shock absorbing material used to package the electronic load for damage.
2. Check the packing items attached to the electronic load in the box for damage or defects.
3. Check that all of the packing items included with the electronic load are the specified accessories or options.

Standard configuration	Quantity	Remarks
CH9720B/BU;CH9720C/CU HOST	1 set	Model according to the order form
Test connection board	1 set	
Power cable	1 set	Different from country to region
User's manual	1 serving	
Inspection report / certificate	1 serving	

If you have any questions about the above checks, please contact our company or the relevant distributor.

1.2 Check the power supply

Check that the power supply to the electronic load meets the following requirements:

	Claim
Voltage	220/110(1±10%)V AC
Frequency	47~ 63Hz
Max power consumption	30VA

1.3 Installation fuse

Fuse specifications: 250V / 1A slow-blow (Slow-Blow), 5×20mm small fuse

The instrument has a fuse installed at the factory. Replacement fuses are included with the accessories, please replace them with the specified size fuses!

To check and replace the fuse, unplug the power cord and pull out the fuse holder.

1.4 Connecting the power cord

Check the three-core power cord, one of which is the grounding wire. When connected to a grounded power socket, the electronic load body can be grounded to protect the user and avoid electric shock.

After confirming that the power cord is intact, connect the electronic load to a properly grounded electrical outlet.

WARNING: Do not use a power cord with any signs of damage to avoid electric shock.

WARNING: Use the supplied three-wire power cord with a grounding wire to ensure that the instrument is reliably grounded.

1.5 Environmental requirements

1. Please do not use it in dusty, vibrating, direct sunlight or corrosive gases.
2. When the instrument is working normally, the temperature should be 0°C~40°C, relative humidity $\leq 75\%$, please use the instrument under these conditions as much as possible to ensure the accuracy of the measurement.
3. This instrument has been carefully designed to reduce clutter on the power supply. However, it should be used in a low noise environment. If it is unavoidable, install a power filter.
4. If the instrument is not used for a long time, please store it in the original box or similar box in a ventilated room with a temperature of 5°C~40°C and a relative humidity of not more than 85% RH. The air should not contain harmful impurities of the corrosion measuring instrument. And avoid direct sunlight.
5. The instrument, especially the test leads connected to the device under test, should be kept away from strong electromagnetic fields to avoid interference with the measurement.
6. Keep the proper ventilation space of the instrument to ensure the ventilation and cooling environment of the instrument to prevent the temperature rise inside the machine.
Moderate minimum space requirements: back $\geq 180\text{mm}$, sides $\geq 60\text{mm}$
7. Electrostatic protection ESD: Although the instrument has been carefully designed to enhance the antistatic impact capability, it should be equipped with a suitable working area to avoid electrostatic discharge.
8. Provide enough space around the instrument to quickly cut off the power cord in an emergency.

1.6 Start the instrument

Press the power switch key in the lower left corner of the instrument to make it in the retracted position, then turn on the power, the instrument self-test, load the configuration information, load the initialization information and initialize the test conditions. After all the normal, complete the boot process.

If the instrument is no longer used for a longer period of time, disconnect the power cord from the power outlet or turn off the main switch.

Chapter II Overview

The main contents of this chapter: basic product parameters and function introduction, front and rear panel introduction and LCD display summary, and basic operation methods.

2.1 Product Introduction

CH9720X series electronic load is the new generation high performance multi-function DC electronic load based on the professional accumulation in the field of electronic load and wide users. The high performance ARM processor with high speed sampling AD is adopted, so it can simulate the load feature of different power supply. 4.3 inch TFT display supports Chinese&English operation, matched with guided menu, make the operation easier. The displayed information is rich and direct. With the resolution of 0.0001, the voltage and current details can be monitored more accurate.USBHOST(available for 9720BU/9720CU) can be used to save data,also for firmware update. The comparator function with HANDLER interface can ensure the batch test and systemization test. The load function is rich: CC, CV, CP, CR, CR-LED(Simulate the characteristic of driver),battery discharge function(Display the real-time discharge curve), transient test(Test the dynamic output performance of power supply) , list test(Test the performance of the power supply under different condition). The flexible soft and hard frame can meet the demand of group test so that to improve the test efficiency. The smart fan control and excellent dispersion performance with the protection alarm steps like over voltage, over current, over power, over heat and reverse voltage polarity can make the instrument more reliable and safer. It is easier to connect with computer for real time sampling collection and control with SCPI. The electronic load can be widely applied for the production line of power transformer, charger, switch power and battery, and the research field like lab.

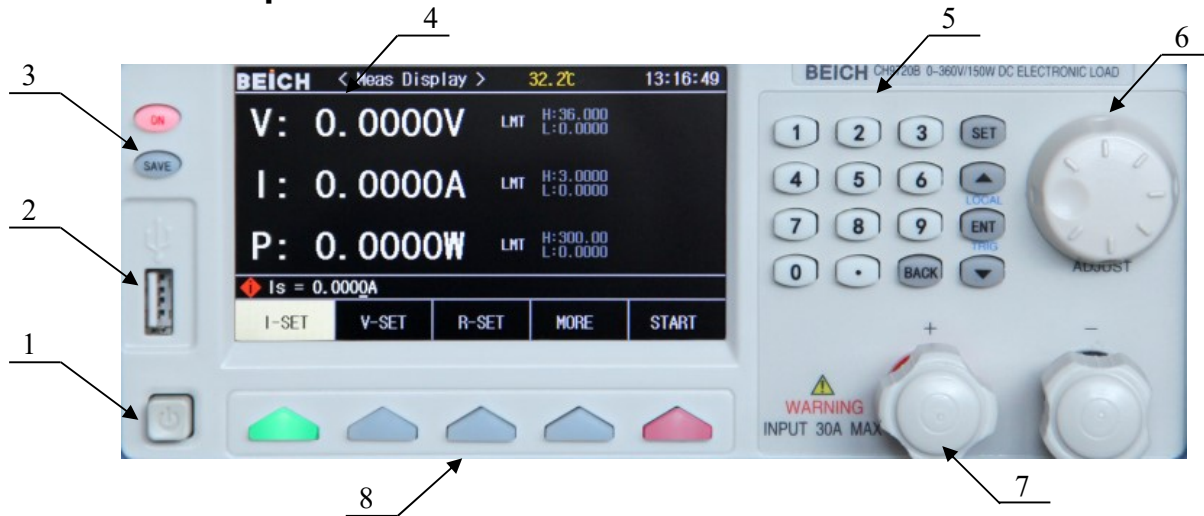
Main Feature

1. 4.3 inch TFT LCD display, Chinese and English operation interface optional
2. Dual ARM MCU control, test and operation display completely independent, the system runs more stable
3. Maximum 360V test voltage, easy to deal with non-isolated power supply test or other high voltage output power supply
4. High-speed sampling AD, stable and accurate testing
5. Voltage 0.1mV, Current 0.1mA High Display Resolution
6. The slope of current rise and fall can be set, up to 0.6A/uS
7. List test can flexibly combine test mode and time to judge test results
8. Battery test mode can automatically record discharge time and capacity with curve drawing function
9. The dynamic conversion time of 0.1mS can effectively inspect the dynamic response of power supply
10. U disk software upgrade function,keep the latest operating version at all times
11. Standardized RS232 interface, easy access to test data
12. One-button Copy Screen and U-disk Data Storage Function
(CH9720BU/CH9720CU)

2.2 Technical parameters

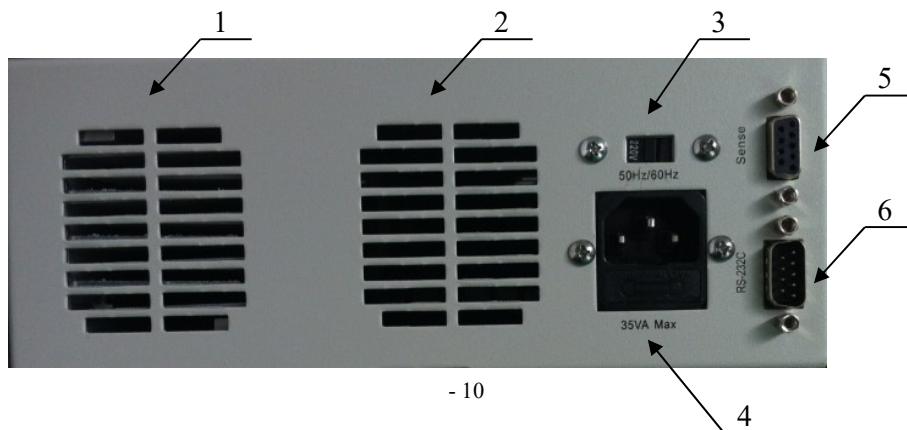
Model		CH9720B	CH9720C	CH9720BU	CH9720CU
Rated value	Input voltage	0~360V			
	Input current	0.1mA~30A			
	Input power	150W	300W	150W	300W
	Range	Accuracy		Resolution	
Load accuracy	0-36V	$\pm(0.05\%+0.03\%FS)$		1mV	
	0-360V	$\pm(0.05\%+0.03\%FS)$		10mV	
	0-3A	$\pm(0.05\%+0.05\%FS)$		0.1mA	
	0-30A	$\pm(0.05\%+0.05\%FS)$		1mA	
Rated voltage mode	1.5V-36V	$\pm(0.05\%+0.03\%FS)$		1mV	
	1.5V-360V	$\pm(0.05\%+0.03\%FS)$		10mV	
Rated current mode	0-3A	$\pm(0.05\%+0.05\%FS)$		0.1mA	
	0-30A	$\pm(0.05\%+0.05\%FS)$		1mA	
Rated resistance mode	0.05 Ω -5 Ω	$\pm(0.2\%+0.2\%FS)$		0.001 Ω	
	0.5 Ω -50 Ω	$\pm(0.1\%+0.1\%FS)$		0.01 Ω	
	5 Ω -500 Ω	$\pm(0.1\%+0.1\%FS)$		0.1 Ω	
	500 Ω -5K Ω	$\pm(1\%+1\%FS)$		1 Ω	
Rated power mode	0-50W	$\pm(0.1\%+0.1\%FS)$		1mW	
	0-150W	$\pm(0.1\%+0.1\%FS)$		10mW	
	0-300W	$\pm(0.1\%+0.1\%FS)$		0.1 W	
Voltage measurement accuracy	0-9.9999V	$\pm(0.05\%+0.03\%FS)$		0.1mV	
	10.000-99.999V	$\pm(0.05\%+0.03\%FS)$		1mV	
	100.00-360.00V	$\pm(0.05\%+0.03\%FS)$		10mV	
Current measurement accuracy	0-9.9999A	$\pm(0.05\%+0.05\%FS)$		0.1mA	
	10.000-30.000	$\pm(0.05\%+0.05\%FS)$		1mA	
Battery test function	Input= 0.8-360V Resolution=0.1mA		Max measurement capacity= 999A/H Timer range=1~60000sec		
Dynamic test mode	A or B test time:0.05mS-999S Error<2.5% + 0.05mS				
U disk storage	>Rating condition 5%				
Impedance in the input terminal	$\geq 200K\Omega$				
Dimensions	W*H*D		215mm*88mm*350mm		
Weight		5.5Kg	6.5Kg	5.5Kg	6.5Kg

2.3 Front panel introduction



Order	Name	Description
1	Switch	Turn on and off the load.
2	USB HOST interface	Connect USB disk. Support FAT16 and FAT 32.Firmware update, data storage and load, save screen imagine(Only available for CH9720BU/9720CU)
3	Operating function key	ON: Start up the load test. SAVE: Save the data to U disk, the light is blinding when data is recording (Only available for CH9720BU/9720CU)
4	LCD Display Screen	Display test result, condition and system information.
5	Input key	Full-functional numerical keyboard, used to input data, or character for file name.
6	Knob	Right-left adjustment for setting data and menu operation
7	Input terminal: Red is positive and Black is negative	⚠ Reversed polarity input will cause big current, dangerous
8	Function softkey	The function of 5 keys is changed as function page, which is not fixed. In different menu, there is different function. The function is displayed on the top of the key .

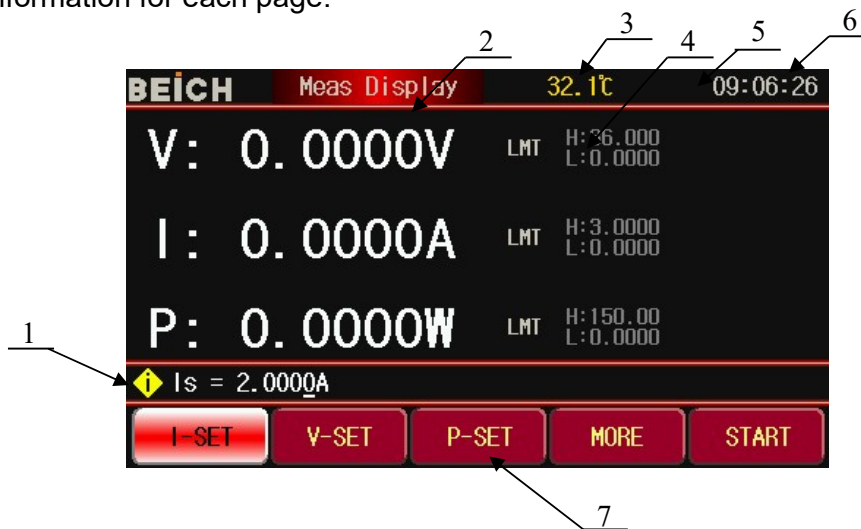
2.4 Rear Panel Introduction



Order	Name	Description
1,2	Cooling vent	ⓘ Do not block, keep well ventilated
3	Voltage switch	For 110V voltage and 220V voltage switching, please pay attention to the correct choice
4	AC power input \swarrow	\swarrow includes fuse, size 1A (Customizable special voltage)
5	Remote test and trigger input interface	See Appendix A for terminal pin configuration
6	RS232C serial interface	The serial communication interface, parameter settings, commands, etc. of the instrument and the external device can be set and obtained by the computer to realize remote control of the instrumentless panel.

2.5 Display area introduction

The LCD display is divided into relatively fixed areas to display specific information for each page.



Order	Name	Description
1	Setting parameters and status bar	Parameter setting with load and help hints in menu setting
2	Main parameter display	Display real-time voltage, current and power
3	Machine internal temperature	Display the monitored internal temperature
4	Limit alarm setting value	Set the high and low limit in normal test model, alarm when over the limit, more details in 3.2.2
5	System icon display	Display system information by means of icon U disk is available; remote control;
6	Clock display area	Display real-time clock, change the date and time in system interface or turn off the display.
7	Load mode	Select load mode

Chapter III Menu Operation

The main content of this chapter: Describes the display information and operation of all menu display pages of electronic load.

3.1 Load Page

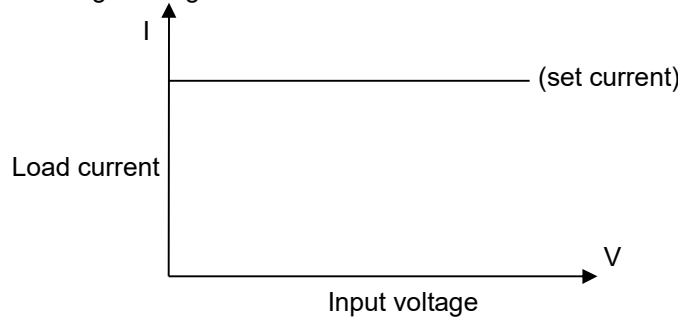


Field Name	Brief
Constant current CC (fixed)	The electronic load consumes a constant current regardless of whether the input voltage changes
Constant voltage CV (fixed)	The electronic load consumes enough current to keep the input voltage constant at the set value
Flexible definition key	This field is a flexible definition menu, determined by the options of more menus.
More	Press this button will pop up the optional function page, the menu content has fixed resistance fixed CR, power CP, CC+CV, CR+CV, short circuit, battery test, dynamic test, list test, led mode, can pass cursor selection or directly type the corresponding number selection. After selection, this option will appear in the flexible definition key position.
Start up	Used to turn load input on and off

3.1.1 Normal page test operation

Constant current mode of operation (CC)

In constant current mode, the electronic load consumes a constant current regardless of whether the input voltage changes.



Press the【Constant Current】key to enter the constant current mode. The button light will be on. Enter the current value to be set by the numeric keypad. The entered number will be displayed $I_s = 0.0000A$ in the status bar. Press【ENT】to confirm.Press the【Start】key or the 【ON】 key to start the load measurement.

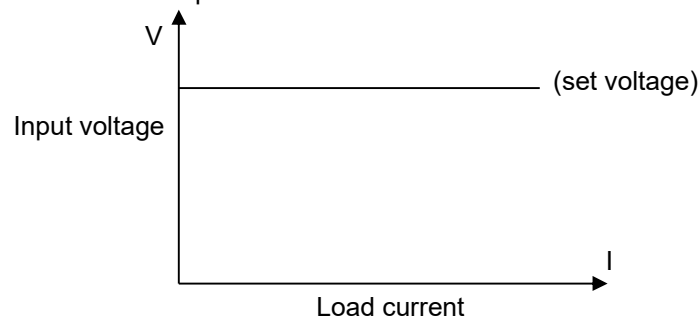
☰Example: Set the constant current to 1.2345A

In the constant current mode,input 1.2345 through the numeric keypad, press 【ENT】 to confirm

In the load start state,you can use the 【▲】 or 【▼】 key to move the cursor, rotate the knob to change the setting parameters,or reset the parameters by the numeric keys,and the load will automatically follow the changed value.

Constant voltage mode of operation (CV)

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



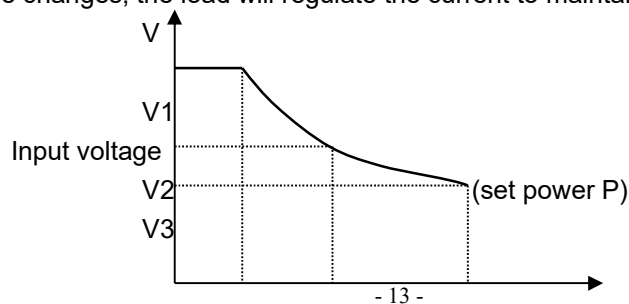
☰Hint: Please refer to the constant current setting method for setting and changing the voltage setting value.

ⓘ**Note: When the source voltage is less than the set value, the load will not work at constant voltage.**

ⓘ**Note: The difference between the source voltage and the set voltage will fall on the source resistance and lead resistance. If the difference is large and the internal resistance is small, the load may consume a large current!**

Constant power mode of operation (CP)


In constant power mode, the load consumes a constant amount of power.When the input voltage changes, the load will regulate the current to maintain the power consumed.



I1 I2 I3 I
Load current

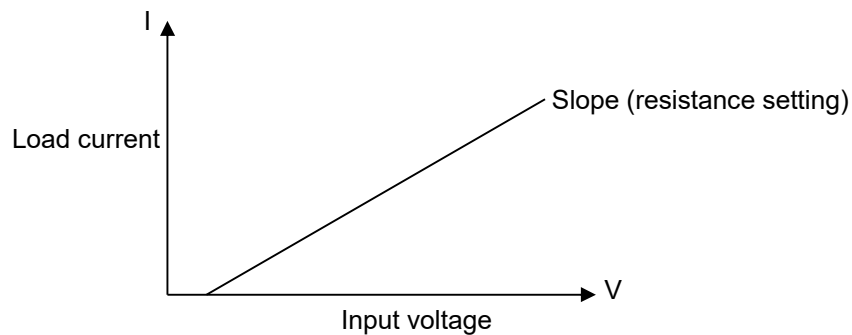
In other load modes, press the **【More】** key to enter the menu to select the constant power mode, and use the **【Start】** key to start or stop the work.


When the load is not activated, you can change the set value with the cursor and knob, or press the **【Fix Power】** key to enter the new value with the numeric keys.

 Hint: Please refer to the constant current method for changing the power setting value.

Constant resistance mode of operation (CR)

In constant resistance mode, the load is equivalent to a constant resistance, and the load consumes current that changes as the input voltage changes.



 Hint: Please refer to the constant current method to change the resistance setting value.

CC+CV mode

The CC+CV mode is a constant current plus voltage mode. The main function is to prevent damage caused by overcurrent discharge of the tested power supply. Setup and test methods:

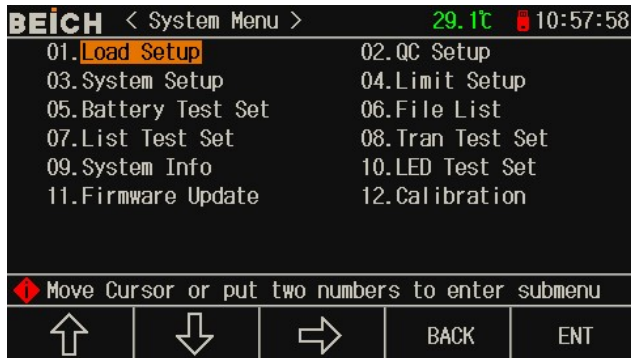
1. In the more measurement mode, the cursor is selected to CC+CV and then press **【ENT】** to confirm. Press **【Constant Current】** to set the constant current parameter, and press **【Constant Voltage】** to set the load constant voltage working parameter.
2. Press the start button to start the measurement. If the load meter determines that the constant current can be loaded to the set value, the load works in the constant current mode. If the load meter determines that the power supply current cannot be output to the set value, it will switch to the constant voltage working mode. The max output current.

CR+CV mode

The CR+CV mode is consistent with the CC+CV mode function. The setting method and test method refer to the CC+CV mode.

3.2 Settings Page

Press the **【Set】** key to enter the main menu page. Use the arrow keys to turn the knob to move the cursor or directly enter the first two digits of the menu to select the menu you want to enter.



3.2.1 Load Settings Page

Select the cursor to load setting option under the main menu, press **【ENT】** to enter or directly press the number 01 to enter




Remote measurement

In CV, CR, CP mode, the voltage sampling accuracy will affect the working accuracy of the electronic load. When the load consumes a large current, a voltage drop will be generated on the connection line of the tested power supply to the load. To ensure measurement accuracy, the load provides a remote measurement end on the rear panel, and the user can use the terminal to measure the output of the instrument under test terminal voltage.

Use the **【ENT】** key to change the menu settings. Each press of the **【ENT】** key will switch between on and off.

Voltage remote measurement = On: Turn on the remote test, the instrument samples the voltage from the remote measurement terminal on the rear panel


Voltage remote measurement = Off: Turn off the remote test and the instrument samples the voltage from the front panel load input.


Hint: Please refer to Appendix A for the rear panel Sense interface pin configuration.

Delayed shutdown

Automatic delay shutdown can be applied to four basic load modes: constant voltage, constant current, constant power, and fixed resistance. If automatic delay shutdown is turned on, the load will be timed in seconds after the load is started. After the break, the load will automatically turn off.

Type the number key directly, press the **【ENT】** key to confirm, and enter 0 to turn it off.

Hint: the unit is seconds (s), the setting range is 1 ~ 99999s.

Hint: If the setting value is 0 or close to 0, the automatic shutdown display is “Off”, which means the function is turned off.

Electric flow range


This model is fixed to a low current range and cannot be switched.

Maximum current

The maximum load current has two main functions:

1. The settable constant current value (I_s) will be limited to below this maximum current;

2. In the case of CV, CP, CR and short-circuit test, when the load current exceeds the maximum current, the instrument will alarm and display over-current protection (OC). If it exceeds a large value, the load will automatically shut down.

Hint: Enter the number directly when setting the maximum current, press **【ENT】** to confirm.

Voltage range


This model is fixed to a low voltage range and cannot be switched.

Maximum voltage

Setting the maximum input voltage has two main functions:


1. The settable constant voltage value (V_s) will be limited to below this maximum voltage;

2. When the input voltage exceeds the maximum voltage, the electronic load will alarm and display “**Exceed Voltage!!!**” and the load will be turned off;

Hint: Enter the number directly when setting the maximum voltage, press **【ENT】** to confirm.


Maximum power


Used to declare the maximum power that the load is allowed to consume. Once the actual power consumption exceeds this value, the instrument will alarm and display power protection (OP), which may cause the load to automatically shut down.


Hint: Enter the number directly when setting the maximum power, press **【ENT】** to confirm.

Starting voltage

The minimum starting voltage can be applied to four basic load modes: constant voltage, constant current, constant power, and fixed resistance. If the minimum starting voltage is turned on, after the load is started, when the input voltage is less than the minimum starting voltage, the load will be in the waiting process. The status information area is displayed as “.....” and the load is automatically started once the input voltage exceeds the minimum start up voltage.

 Example: If the minimum starting voltage is set to 1.25V, select menu to minimum starting voltage, type **[1][.][2][5]**, press **[ENT]** to confirm, the default unit is V.


 Hint: If the set value is 0 or close to 0, the minimum start voltage is displayed as “Off”, which means the function is turned off.

 Hint: After the start up voltage is set in the list test mode, the power-on self-start function will be turned on. When the instrument judges that the input voltage is higher than the set voltage, the list test starts, and the test sequence is stopped after the completion of the test.

Shutdown voltage

The minimum shutdown voltage can be applied to four basic load modes: constant voltage, constant current, constant power, and fixed resistance. If the auto-shutdown voltage is turned on, after the load is started, after the input voltage is less than the auto-shutdown voltage, the load will be Automatically shut down.

 Hint: The setting method is the same as the minimum starting voltage.


 Hint: If the set value is 0 or close to 0, the auto-shutdown voltage is displayed as “Off”, which turns off this function.

Rising rate

Used to set the load climb rate to reduce the overcurrent surge caused by sudden load in some cases. After inputting the data, press **[ENT]** to confirm, the maximum settable current is 0.600A/uS.

Rate of decline


Used to set the time from normal working state to no load. After inputting the data, press **[ENT]** to confirm, the maximum settable current is 0.600A/uS.

 Hint: After all menu settings are completed, you can press **[Enter Test]** to enter the main test page directly, or press the **[Back]** key to return to the main menu.

3.2.2 Limit Settings Page



The voltage, current, and power judgment parameters can be set under this page, and the judgment result is displayed in the display area of the main test interface. If the value exceeds the set value, the indication will be highlighted in red.

 Hint: Move the cursor to the position you want to set, press the **【ENT】** key to confirm the number directly. The limit judgment can be turned on or off by pressing the **【ENT】** key. After the setting is completed, press the **【Enter Test】** key to directly enter the main test page, or Press the **【Back】** key to return to the main menu.

3.2.3 System Settings Page



In this interface, you can set and change the instrument system style and application. Press **【ENT】** to switch the menu content at the cursor. Press the number key and press the **【ENT】** key to confirm the date and time.

Menu name	Secondary menu content
Display style	Simple gray
	Green grass green
	Cool black
	Elegant blue
Trigger source	Manual: Triggered by the “TRIG” key on the instrument panel
	External: External trigger, triggered by Sense on the rear panel
	Bus: Triggered by programmable commands on RS232C interface
Language	Chinese
	English
Communication mode	RS232C
	USB-CDC
	USB-TMC
Boot settings	Defaults
	Last value
Local address	After entering the number, press 【ENT】 to confirm
Touch-tone	Turn on
	Shut down

Baud rate	4800 9600 19200 38400 57600
Keyboard lock	Lock 0-9 numeric keypad when open
	Shut down
Multi-machine mode	Stand-alone
	Multi-machine
Knob lock	Turn on
	Shut down
Factory settings	After the recovery is confirmed, all settings will be restored to the factory values. Please operate with caution.
Acquisition frequency	Used to set the data acquisition time when u disk data is saved.
Date	Press the number key directly and press the 【ENT】 key to confirm and move the cursor to the next item.
Time	Press the number key directly and press the 【ENT】 key to confirm and move the cursor to the next item.

3.2.4 File List Page

The screenshot shows the BEICH File List page. At the top, it displays 'BEICH < File List >' on the left, '29.1t' in green in the center, and '10:59:29' on the right. Below this is a table with three columns: 'No.', 'NAME', and 'DATE'. The first two rows are highlighted in orange: row 1 with 'QC' and '2019-05-23 09:21', and row 2 with 'QC30' and '2019-05-23 09:53'. Rows 3 through 10 are empty. At the bottom of the screen, there is a status bar that says 'Use number keys to input No.' and 'Memory:ROM'. Below the status bar is a navigation menu with five buttons: 'LOAD', 'SAVE', 'DELETE', 'EXIT', and an empty space.

No.	NAME	DATE
1	QC	2019-05-23 09:21
2	QC30	2019-05-23 09:53
3	.	.
4	.	.
5	.	.
6	.	.
7	.	.
8	.	.
9	.	.
10	.	.

Use number keys to input No. Memory:ROM

LOAD	SAVE	DELETE	EXIT	
------	------	--------	------	--

Storage and call

Through the store and recall functions, parameters can be saved instantly, measurement settings saved to an internal ROM or external USB memory, and save the measurement node or screen snapshot to the external USB memory.

Storage function

The following save functions can be implemented through the instrument's storage system:

- Instantly save user correction data and settings;
- Instantly save measurement setup parameters, system configuration parameters;
- Save the measurement setup parameters as a file in the internal ROM memory or external USB memory;
- Save the screenshot file to USB memory (screen capture function);
- Save the measurement results to the USB memory (data logging function).

Call function


After storage, the following call functions can be implemented:

- Automatically call user correction data and settings in real time;
- Instantaneously call the measurement setup parameters automatically;
- Automatically call system configuration parameters in real time;
- Loading the measurement settings file in the internal ROM or external USB memory through the file management function;

Storage media type

The instrument uses the following media to save information:

Media type	Use
Internal RAM (battery powered)	Instantly save measurement parameters and system configuration
Internal FLASH ROM	User correction data and its settings, measurement settings file
External USB memory (U disk)	Measurement setup file, screenshot file, data log file

 Hint: On the file list page, type the number directly, 0-100 for RAM storage, 100 or more for U disk storage, the memory type will be displayed on the right side of the operation bar, then enter the file code and press the save button to confirm the save.

U disk file structure

After connecting the USB memory to the instrument, the instrument organizes and uses the folders and files on the memory according to a predetermined structural scheme.

As shown in the following table:

File type	Extension name	Max number of files*1	File path*2
Measurement setup file	EST	500	\CH9720\SETUP
Data Record File	CSV	200	\CH9720\DATA
Screen snapshot file	GIF, BMP, PNG	200	\CH9720\IMAGE
Upgrade file	36U	10	Root directory

Note *1. Refers to the maximum number of extensions using the same extension;

Note *2. Folders differ according to different instrument models

Note: The folder is automatically created by the instrument. In addition to the upgrade file, the file name is also automatically generated by the instrument.

The USB memory should conform to the FAT16 or FAT32 file system and be formatted using FAT16 or FAT32.

If there is a U disk that the instrument can't recognize, please use another formatted U disk.

Note: BEICH Electronics is not responsible for the loss of U disk data caused by the use of USB storage devices on this instrument.

Save the file to the U disk

After connecting the USB memory (U disk) to the instrument's USB (HOST), you can use the **【SAVE】** key on the panel to save the test results or screenshots to the U disk.

Save the measurement results to the U disk

Press **【SAVE】** on any page. The **【Graphics】【Data】** prompt button will be displayed under the instrument display. Press the **【Data】** button on any measurement page to save the measurement result to the U disk in CSV format, and press the **【Graphics】** button. You can save the current display interface screenshot, the **【SAVE】** key will flash during data saving, press **【SAVE】** key again to finish saving, **【Graph】** save **【SAVE】** key is always on, after the save is finished, it can be downloaded to PC after saving. Open and use these files on your machine.

A single CSV or TXT file can store up to 65536 rows of test data. After this maximum data is reached, the instrument automatically stops data logging.

Warning: During the process of writing data to the U disk , it is forbidden to pull out the U disk. Otherwise, the U disk or U disk file system may be damaged.

Note: The data record files are numbered in the order of BEICH000~BEICH199. The user cannot specify and modify the stored file name. The data is written to the U disk for some time. During this process, the measurement may stop responding for a short time.

The following conditions automatically end the data record in an abnormal way:

- Failed to write data to U disk
- The data line written to a file is out of range

Save the screenshot to the U disk

In any display page, you can save the current screen display content to the U disk according to the BMP format. After saving, you can download and use these files on the PC.

☞ **Press the following procedure to save the screenshot:**

Step 1: Connect the U disk and confirm that the instrument has successfully installed the U disk. The U disk graphic is displayed in the upper right corner of the display

Step 2: Select the page that requires a screenshot;

Step 3: Press the **【SAVE】** key and the **【Graphics】【Data】** prompt button is displayed at the bottom of the screen. Press the **【Graphics】** key to start saving. The **【SAVE】** key is always on, and the display is off after the save is completed. The screenshot is in the specified image format. The file is saved to the U disk.

Note: The screen shot files are numbered in the order of BEICH000~BEICH199. The user cannot specify and modify the stored file name.

File List

Measurement setup file summary

Test settings are measurement-related setup parameters, including: the current page (or the page before entering the file list); all settings for the measurement settings page; all settings for the limit settings page.

The instrument organizes the above settings into a file that can be saved and recalled as a whole; it can also assign a name (remark information) to the saved file, and the name is saved with the file.

The measurement settings file can be saved in the following media by number:

Media	Storage serial number	Use
Internal RAM (battery powered)	0	File not visible, instant save, automatic call
Internal FLASH	1~100	Store and call through file list
External USB memory	101~550	Store and call through file list storage location: \CH9720\SETUP *1 File name: 51.EST~550.EST

Store/call measurement settings

No.	NAME	DATE
1	QC	2019-05-23 09:21
2	QC30	2019-05-23 09:53
3	.	.
4	.	.
5	.	.
6	.	.
7	.	.
8	.	.
9	.	.
10	.	.

Use number keys to input No. Memory:ROM

LOAD SAVE DELETE EXIT

Field information for the file list page:

Field	Description
Serial number (No.)	The stored setup file serial number is displayed, 1~100 is the internal ROM memory, and 101~550 is the external USB memory. Select the file serial number to be operated by using the cursor keys or directly typing an array: 【SAVE】 key storage media selection
Name	Displays the comment information of the stored settings file for naming the measurement setup parameters, not the file name stored on the U disk.
Date	Displays the system time when saving.

Memory	Displays the currently valid storage media and automatically converts it according to the file number.
--------	--

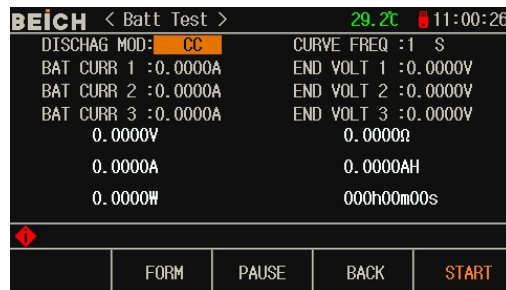
☞ Use the cursor keys to move the field, select the file number to be operated, press the function soft key to operate:

Function softkey	Operational function
Load	Available when the file exists, calling the specified settings file There is a confirmation action when loading.
Save	Save the current measurement setup parameters, ask for the input file name before saving, you can directly confirm the default <Unnamed>

Note: The file name required to be entered here is actually the remark information of the measurement settings file!

Delete	Available when the file exists, delete the specified settings file There is a confirmation action when deleting.
Exit	Exit the file list and return to the page before the file list.

3.2.5 Battery Test Page




The discharge test can be operated in constant current or constant resistance to determine the discharge time and capacity of the battery-type power supply; during continuous discharge, the battery voltage continuously drops. When the load input voltage is lower than the set value, the discharge test is automatically stopped. It can display the discharge time and battery capacity. The instrument can set up to three discharge currents and cut-off voltages to better simulate the actual battery state under different current applications. The discharge current 1 will automatically change to 2 to 3 after reaching the condition, so when setting the cutoff voltage To follow the voltage drop gradient, the cutoff voltage 3 cannot be higher than 2 and cannot be higher than 1.


The battery test is set up and tested as follows:

Step 1: Select the discharge mode, press the **【ENT】** key to select constant current or constant resistance;

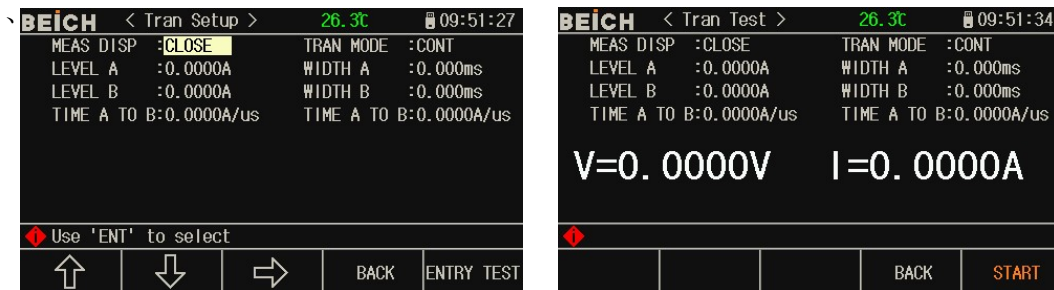
Step 2: Set the discharge current and cutoff voltage, press the number directly and press the **【ENT】** key to confirm;

Step 3: Press the button to enter the test. At this time, the load enters the discharge mode. Press the start button to start the operation. The screen displays the discharge voltage, current, power, resistance, capacity, and discharge time parameters. Press the icon button after the discharge to display the battery real-time discharge curve.

 Hint: The discharge parameter can be saved into the U disk in real time. Insert the U disk in the test state, press the **【SAVE】** key to select the data. At this time, all the discharge data will be recorded into the U disk, and the discharge curve can be saved in the image storage mode.

 Hint: The chart can only be displayed after the discharge is finished. At this time, you can press the chart key to enter the entire discharge curve.

3.2.6 Dynamic Test Page



Dynamic testing allows the load to be switched between two voltages or currents. This feature can be used to test the dynamics of the power supply.

Dynamic testing is set up and tested as follows:

Step 1: Select the load type for dynamic test, press **【ENT】** to select constant current or constant voltage

Step 2: Select the load dynamic mode, press the number directly and press the **【ENT】** key to confirm;

Continuous: The load is automatically converted after a delay of the corresponding time;

Trigger: The pulse width does not work and the load switches under the action of the trigger signal.

Pulsation: The load works with A value. After triggering, it converts to B value, delays B pulse width and then converts to A value;

Step 3: Set the value of point A. After entering the load A menu, type the number directly and press **【ENT】** to confirm. The unit depends on the load type as A or V.

Step 4: Set the pulse width of point A. After entering the pulse width A menu, type the number directly and press **【ENT】** to confirm, the unit is 1ms.

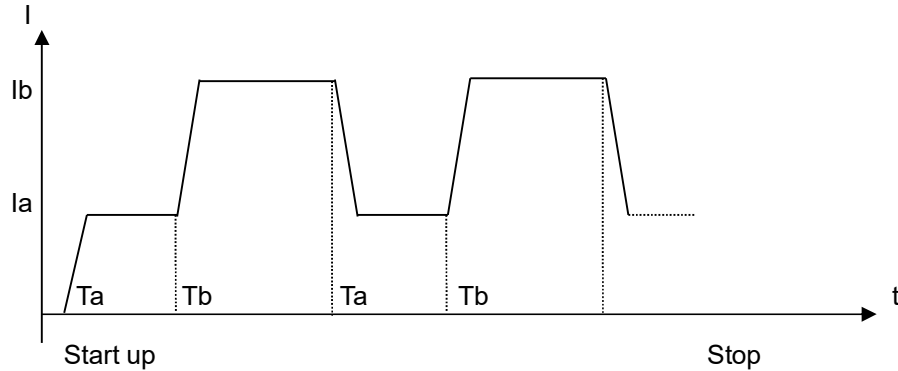
Step 5: Set the B point value and the B point pulse width in turn.

Step 6: Set the edges AB and BA, set the time from the load value of point A to the load

value of point B. After typing the array, press **【ENT】** to confirm, the unit is ms.

Step 7: After the setting is completed, press to enter the test and enter the test page directly. Press the start button to start the measurement.

After the dynamic test is started, the load will continuously switch between the A value and the B value, maintaining the width A and the width B, respectively.



3.2.7 List Test Page



The list test function can be automatically converted at a set time in different load modes.


For power products and chargers, through multi-parameter hybrid testing, you can more fully understand the working characteristics of the tested products in various applications.

The instrument can set up up to 15 different types or sizes of loads, single-step automatic test time 1 ~ 60000s, and can compare the current, voltage or power parameters in each step of the test, make a pass or fail judgment, all set After the determined number of steps is completed, the overall discrimination result (PASS/FAIL) is given in the status information area. All the test steps are PASS, and any step is FAIL.

In the list test mode, after setting the minimum starting voltage in the load setting menu, the whole process can be automatically measured without key operation. When the load is judged to be higher than the minimum starting voltage input, the measurement is automatically started, and the measurement sequence is stopped after completion.

Menu name	Secondary menu content
-----------	------------------------

List steps	Press the number keys to enter the total number of steps in the list. Press 【ENT】 to confirm, up to 15 steps.
Step Mode (Press 【ENT】 to switch)	Continuous: automatically switches to the next step after the set delay time Trigger: Wait for the trigger signal to switch to the next step after the set delay time
Cyclic test (Press 【ENT】 to switch)	Open: Cycle test until you press the stop button Close: stop after the test is completed according to the set number of steps
List alarm (Press 【ENT】 to switch)	Qualified: buzzer alarm prompt when qualified Failed: Buzzer alarm prompt when unqualified
Starting voltage	Press the numeric keys to input the voltage value. The system will automatically start the measurement when it is judged that there is higher than this voltage input, generally set to 80% of the no-load input voltage.
Load type Press 【ENT】 to select	Open circuit Short circuit Constant current Constant voltage Constant resistance Constant power
Load value	Press the number key to enter and press the 【ENT】 key to confirm
Delay	Input number and press 【ENT】 to confirm,unit is 0.1s
Comparison item	Close: test data is not compared Press voltage: test data is compared by voltage By current: test data is compared by current By power: test data is compared by power
Lower limit	Press the number key to enter and press the 【ENT】 key to confirm
Upper limit	Press the number key to enter and press the 【ENT】 key to confirm

 Hint: Move the cursor to press all the data and press the test button to enter the test page



- ☰ Hint: Enter the test page to start the measurement, the page displays the measurement and judgment results of the current test step.

BEICH		List Result	32.7C	09:44:40	
ListNum	: 05	StepMode	: Auto	LoopTest	: OFF
ListAlarm	: Pass	ListVolt	: OFF	FailStop	: OFF
Step	LoadType	Volt	Curr	Powr	Result
Step01	Open	5.2824	0.0029	0.0154	PASS
Step02	CC	5.1095	0.9992	5.1054	PASS
Step03	Open	5.2881	0.0028	0.0150	PASS
Step04	CC	5.1098	0.9994	5.1066	PASS
Step05	Open	5.2887	0.0028	0.0150	PASS

☰

↑ ↓ BACK

- ☰ Hint: Enter the test results page, you can see the test data and judgment results for each step

3.2.8 LED Test Page

BEICH		< LED Test >	29.6C	11:15:20	
LED Vo	: 0.0000V	LED Io	: 0.0000A		
LED Coeff	: 0.0000				
5.0927V	Vpp:0.0306V				
0.0000A	Ipp:0.0019A				
0.0000W					

☰ Use number keys to input data

↑ ↓ → BACK START

The CR-LED test mode can realistically simulate the characteristics of the LED lamp. By increasing the on-voltage setting of the diode, the working principle of the diode is completely simulated, so that the test voltage and current reach a normal stable value, and the voltage in the conventional constant resistance mode is avoided. The current is unstable or oscillating, which truly reflects the actual loading of the LED driver.

Parameter	Description
LED Vo	LED power supply voltage output reference value
LED Io	LED rated output current
Rd Coeff	Rd coefficient, generally set to 0.1-0.3

After all the parameters are set, press the start button to start the test. The display interface will display the voltage, current, resistance and power value of the current power supply under test.

3.2.9 System Information Page

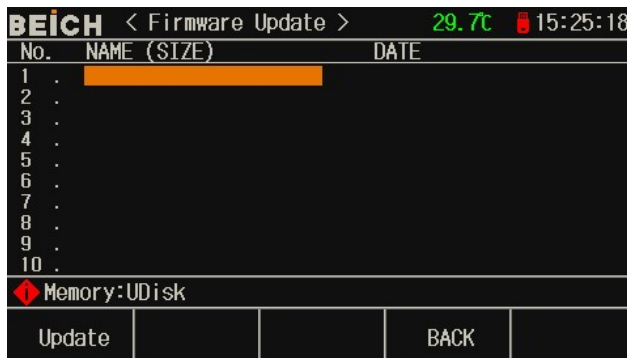
BEICH		System Info	32.7C	09:45:01	
Model	: CH9720BU				
Name	: Programmable DC Electronic Load				
SerialNo.	: 12345678				
Hardware	: V1.02				
Firmware	: V2.19.0515				
Copyright	: BEICH Electronic Technology Co., Ltd				
Installed	: RS232C, USB HOST				

All information about the system of the machine and the installed modules are displayed. No changes can be made to this page.

3.2.10 Data Correction Page

This page is the load data correction page. It is mainly used for data verification before the load is shipped from the factory. It requires password support to enter.

3.2.11 Firmware Upgrade Page



The upgrade function can only be enabled after the U disk connected to USB (HOST) is effectively recognized.

The instrument can be easily upgraded to the firmware. If there are software problems during the process, you can contact BEICH Electronics Co., Ltd. at any time.

☞ Upgrade the firmware as follows:

- Step 1:** Download the upgrade file provided by the company. The file name generally includes the instrument model and the extension is 97F. If it is a compressed package, please decompress it;
- Step 2:** Copy it to the root directory of the formatted FAT32 or FAT16 U disk;
- Step 3:** When the instrument is to be upgraded, insert the U disk into the USB-HOST interface on the front panel.
- Step 4:** After the U disk is successfully installed, select the "Firmware Upgrade" menu to enter the firmware upgrade display page, and display the list of upgrade files on the U disk (up to 10). The file name is displayed by the instrument model and update time.

Note: *The instrument only displays up to 10 upgrade files. You can use the PC file manager to delete some invalid files.*

Note: Files that match the upgrade file format can be displayed, but will only be installed by the instrument after verification by the upgrade.

Step 5: Use the cursor keys to select the upgrade file suitable for this machine, and press the “Upgrade” function soft key;

Step 6: After confirming the upgrade operation, the instrument verifies the upgrade file. If the verification is correct, the upgrade file is installed into the FLASH ROM and automatically restarted after the installation is completed.

You can check the latest upgraded firmware version on the System Information page.

Note: You cannot power off during the upgrade process. Otherwise, the instrument firmware may be damaged and cannot work. You need to return to the factory for repair.

Appendix A Remote measurement and external trigger

A1 Remote measurement

When the load consumes a large current, a voltage drop will be generated on the connection line of the tested power supply to the load, thereby affecting the voltage measurement accuracy. In CV, CR, CP mode, the voltage sampling accuracy will affect the working accuracy of the electronic load.

The purpose of the remote measurement is to not measure the voltage from the load input terminal, but to measure the voltage directly from the power supply under test through two other test leads.

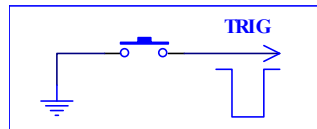
The two voltage sampling lines measured at the far end are on the rear panel Sense interface.

To use remote measurements, the remote measurement switch must be turned on in the load settings.

A2 External trigger

In the dynamic and list test, it may be necessary to start the next load conversion by “trigger”. The trigger has three types: manual, external and bus, which are triggered externally on the rear panel Sense interface.

Inputting a low level with a width of not less than 100us at the trigger input forms a valid trigger.



It must be considered that switching jitter can cause false triggering.

A3 Pin configuration

The Sense interface uses the DB9 core pin connector. The pin functions are as follows:



- ① **Pin 6 and 7** are used as remote inputs. 6 feet are the positive end of the voltage, 7 feet are the negative end, please do not reverse!
- ① **Pin 5 and 9** are used as trigger inputs. Do not apply any external voltage and current sources!
- ① **Pin 4 and 9** for external start, do not apply any external voltage and current source!
- ① **Pin 1 and 3** are used as the pass signal output. Do not apply any external voltage and current source!
- ① **Pin 2 and 3** are used as the fail signal output. Do not apply any external voltage and current source!

Appendix B Remote Control

The main content of this chapter: the instrument can use RS232C serial interface, USB-CDC or USB-TMC for data communication and remote control without instrument panel, but can not be used at the same time; they share the standard SCPI instruction set of the instrument, but use different hardware configurations. And communication protocols. This chapter describes how to use the interface. For details on the use of interface commands, see the "CH97 Programming Protocol."

B1 RS232C Remote control system

The standard RS232C interface of the instrument can be used to communicate with computers and PLC, providing the cheapest and convenient conditions for data acquisition and statistical analysis. The instrument provides a wealth of program control commands, through the RS232C interface, the computer can perform almost all functions on the instrument panel.

RS232C Bus

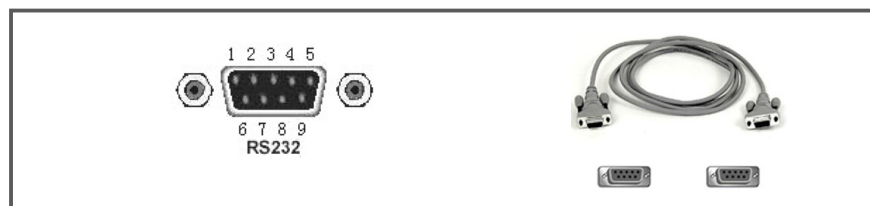
Although RS-232C can be completely replaced by USB communication scheme, some industrial applications and plc control are still in use, and have a very wide application base. The standard RS-232C interface uses a 25-pin connector (basic elimination) and a 9-pin connector.

Like most serial ports in the world, the serial interface of this instrument is not strictly based on the RS-232 standard, but only provides a minimal subset. The following table:

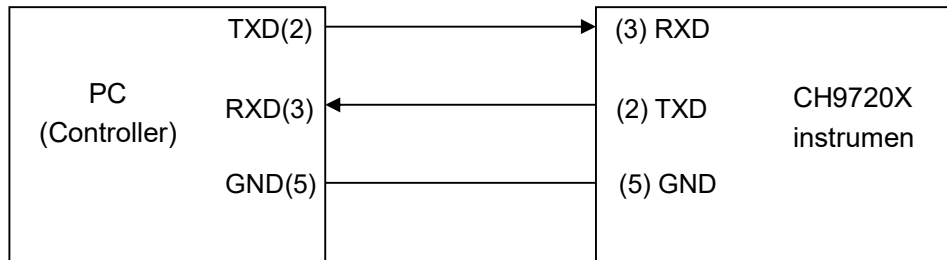
Signal	Symbol	Connector pin number
Send data	TXD	3
Receive data	RXD	2
Ground	GND	5

RS232C Configuration

The instrument uses a standard 9-pin pin DB connector, the right picture shows the connection cable:



Connect to the HOST computer using the RS232C serial communication cable. The most basic connection scheme is as follows:



RS232C Parameter

Transfer method	Full-duplex asynchronous communication with start and stop bits
Baud rate	1200bps, 9600bps, 19200bps, 38400bps, 115200bps
Data bit	8 BIT
Stop bit	1 BIT
Check	No
Terminator	CR, LF, CR+LF optional
Contact method	Software contact
Connector	DB9 core

B2 USB remote control system

USB communication is one of widely-used way.

USB Bus

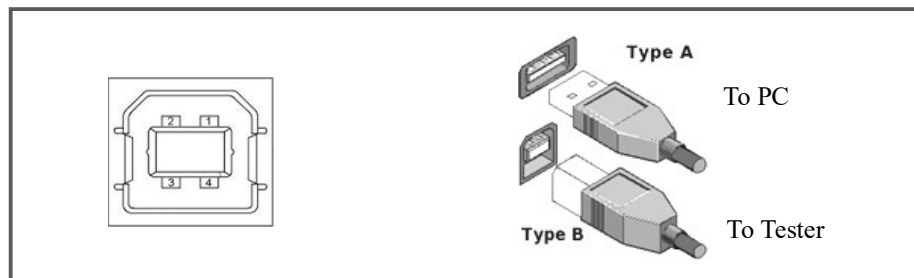
USB (Universal Serial Bus) remote control system controls the instrument through the USB interface. This connection conforms to USBTMC-USB488 and USB2.0 protocols.

USB-CDC(Communication), the tester is considered as COM (Vcom), which can realize the same communication way as RS232C

USB-TMC(Test&measurement), the protocol is based on USB to realize the communication with USB device by means of GPIB.

USB Configuration

USB-DEVICE adopts USB-B type connector, USB cable is USB A-B type:



After connecting the instrument to PC through USB, according to the USB communication mode, different drivers need to be installed on the PC before using it.

USB-CDC

After USB-CDC is selected, the procedure is as below:

- First connection, the PC identifies the new hardware, and select “No, not now”
- Click “Next”, Select “From a list, or specify the location to install”:
- Then click “Next”, select the routine of BEICH Vcom and usbser.sys driver then click “Next” the installation is finished;
- Then you can check the USB CDC device and terminal No.:



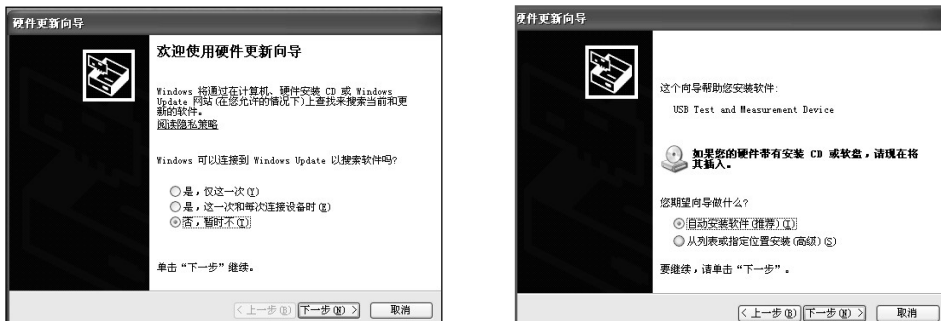
Note: the driver of USB-CDC can be downloaded from www.beich.com.cn

When the installation is succeed, you can use RS232 to visit and control the tester, no need to install every time, but the computer may dynamically allocate serial passwords, please go to the Device Manager to see!

USB-TMC

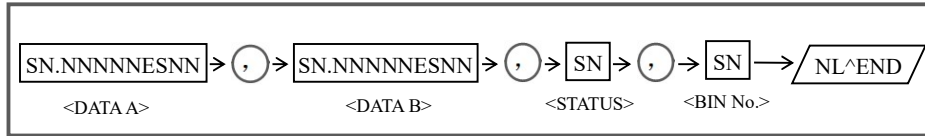
If you want to use USB-TMC, please download and install NI-VISA from <http://www.ni.com/china>, which the USB TMC driver is included.

When connecting to PC by USB cable, the PC identifies the new hardware, and dialog box is jumped: Select “No, not now”, and click next, if NI-VISA is installed, then “USB Test and Measurement Device” can be searched and displayed: Select “Install the software automatically”, and click next, then “USB Test and Measurement Device” driver is installed. You can check the device in the device manager:



B3 Data format

The tester transmits the test result to bus by means of ASCII code.
 On the test, sorting, and test pass page, the output data is:



In the table above, “,” is the isolation code, NL is end character (0x0A), means the character is end; ^END is the signal of EOI in IEEE-488, the EOI signal is drove when sending end character by GPIB.

There is no such signal by RS232C、USB-CDC、USB-TMC.

<DATA A>, <DATA B>, <STATUS>, <BIN No.> format is as below:

- <DATA A> and <DATA B> output test result:
 <DATA A> is test result of primary parameter, <DATA B> test result of secondary parameter, displayed in the format of index, and composed by 12 ASCII codes: SN.NNNNESNN (S: +/-, N: 0 to 9, E: index)
- <STATUS> means test status, the normal return is 0, other is error
- <BIN No.> outputs the sorting result, as below:

Value	Result
0	No compare
1~3	BIN1~3
10	OUT
11	AUX
Other	Illegal output

If there is data query on the invalid test pate, the invalid result is output:
 +9.90000E+37,+9.90000E+37,-1,

BEICH

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