Multi-channel Modular Power System

IT2700 Web Control Manual

Model: IT2700

Version: V1.0/04,2026

Notices

Manual Part Number

IT2700

Revision

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Itech Electronic, Co., Ltd.

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CAUTION

A CAUTION sign denotes a hazard. It calls attention to an operating procedure or practice that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

WARNING

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

NOTE

A NOTE sign denotes important hint. It calls attention to tips or supplementary information that is essential for users to refer to.

Quality Certification and Assurance

We certify that IT2700 series power supply meets all the published specifications at time of shipment from the factory.

Warranty

ITECH warrants that the product will be free from defects in material and workmanship under normal use for a period of one (1) year from the date of delivery (except those described in the Limitation of Warranty below).

For warranty service or repair, the product must be returned to a service center designated by ITECH.

- The product returned to ITECH for warranty service must be shipped PREPAID. And ITECH will pay for return of the product to customer.
- If the product is returned to ITECH for warranty service from overseas, all the freights, duties and other taxes shall be on the account of customer.

Limitation of Warranty

This Warranty will be rendered invalid if the product is:

- Damaged resulting from customer-wired circuits or customer-supplied parts or accessories;
- Modified or repaired by customer without authorization;
- Damaged resulting from customer-wired circuits or use in an environment not designated by us;
- The product model or serial number is altered, deleted, removed or made illegible by customer;
- Damaged as a result of accidents, including but not limited to lightning, moisture, fire, improper use or negligence.

Safety Symbols

⎓	Direct current	|	ON (power)
∼	Alternating current	○	OFF (power)
⎓ ∼	Both direct and alternating current	⎍	Power-on state
⏚	Chassis (earth ground) symbol.	⎍	Power-off state
⏚	Earth (ground) terminal	⊥	Reference terminal
⚠	Caution	+	Positive terminal
⚠	Warning (refer to this manual for specific Warning or Caution information)	—	Negative terminal

⏚	A chassis terminal	-	-

Safety Precautions

The following safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or specific warnings elsewhere in this manual will constitute a default under safety standards of design, manufacture and intended use of the instrument. ITECH assumes no liability for the customer's failure to comply with these precautions.

WARNING

- **Do not use the instrument if it is damaged. Before operation, check the casing to see whether it cracks. Do not operate the instrument in the presence of inflammable gasses, vapors or dusts.**
- **The instrument is provided with a power cord during delivery and should be connected to a socket with a protective earth terminal, a junction box or a three-phase distribution box. Before operation, be sure that the instrument is well grounded.**
- **Check all marks on the instrument before connecting the instrument to power supply.**
- **Use electric wires of appropriate load. All loading wires should be capable of bearing maximum short-circuit of electronic load without overheating. If there are multiple loads, each pair of the load power cord must be carry out the full rated short-circuit output current of the power securely.**
- **Ensure the voltage fluctuation of mains supply is less than 10% of the working voltage range in order to reduce risks of fire and electric shock.**
- **Do not install alternative parts on the instrument or perform any unauthorized modification.**
- **Do not use the instrument if the detachable cover is removed or loosen.**
- **To prevent the possibility of accidental injuries, be sure to use the power adapter supplied by the manufacturer only.**
- **We do not accept responsibility for any direct or indirect financial damage or loss of profit that might occur when using the instrument.**
- **This instrument is used for industrial purposes, do not apply this product to IT power supply system.**
- **Never use the instrument with a life-support system or any other equipment subject to safety requirements.**

WARNING

- SHOCK HAZARD Ground the Instrument. This product is provided with a protective earth terminal. To minimize shock hazard, the instrument must be connected to the AC mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet or distribution box. Any interruption of the protective

(grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in injury or death.

- Before applying power, verify that all safety precautions are taken. All connections must be made with the instrument turned off, and must be performed by qualified personnel who are aware of the hazards involved. Improper actions can cause fatal injury as well as equipment damage.
- SHOCK HAZARD, LETHAL VOLTAGES This product can input the dangerous voltage that can cause personal injury, and the operator must always be protected from electric shock. Ensure that the input electrodes are either insulated or covered using the safety covers provided, so that no accidental contact with lethal voltages can occur.
- Never touch cables or connections immediately after turning off the instrument. Verify that there is no dangerous voltage on the electrodes or sense terminals before touching them.

CAUTION

- **Failure to use the instrument as directed by the manufacturer may render its protective features void.**
- **Always clean the casing with a dry cloth. Do not clean the internals.**
- **Make sure the vent hole is always unblocked.**

Environmental Conditions

The instrument is designed for indoor use and an area with low condensation. The table below shows the general environmental requirements for the instrument.

Environmental Conditions	Requirements
Operating temperature	0°C～40°C
Operating humidity	20%～80%(non-condensation)
Storage temperature	-10°C～70 °C
Altitude	Operating up to 2,000 meters
Installation category	II
Pollution degree	Pollution degree 2

Note

To make accurate measurements, allow the instrument to warm up for 30 min.

Regulatory Markings

CE	The CE mark indicates that the product complies with all the relevant European legal directives. The specific year (if any) affixed refers to the year when the design was approved.
	The instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affix product label indicates that you must not discard the electrical/electronic product in domestic household waste.

	This symbol indicates the time period during which no hazardous or toxic substances are expected to leak or deteriorate during normal use. The expected useful life of the product is 10 years. The product can be used safely during the 10-year Environment Friendly Use Period (EFUP). Upon expiration of the EFUP, the product must be immediately recycled.

Waste Electrical and Electronic Equipment (WEEE) Directive

2002/96/EC Waste Electrical and Electronic Equipment (WEEE) Directive

This product complies with the WEEE Directive (2002/96/EC) marking requirement. This affix product label indicates that you must not discard the electrical/electronic product in domestic household waste.

Product Category

With reference to the equipment classifications described in the Annex 1 of the WEEE Directive, this instrument is classified as a “Monitoring and Control Instrument”.

To return this unwanted instrument, contact your nearest ITECH office.

Compliance Information

Complies with the essential requirements of the following applicable European Directives, and carries the CE marking accordingly:

- Electromagnetic Compatibility (EMC) Directive 2014/30/EU
- Low-Voltage Directive (Safety) 2014/35/EU

Conforms with the following product standards:

EMC Standard

IEC 61326-1:2012/ EN 61326-1:2013 [1][2][3]
Reference Standards
CISPR 11:2009+A1:2010/ EN 55011:2009+A1:2010 (Group 1, Class A)
IEC 61000-4-2:2008/ EN 61000-4-2:2009
IEC 61000-4-3:2006+A1:2007+A2:2010/ EN 61000-4-3:2006+A1:2008+A2:2010
IEC 61000-4-4:2004+A1:2010/ EN 61000-4-4:2004+A1:2010
IEC 61000-4-5:2005/ EN 61000-4-5:2006
IEC 61000-4-6:2008/ EN 61000-4-6:2009
IEC 61000-4-11:2004/ EN 61000-4-11:2004

1. The product is intended for use in non-residential/non-domestic environments. Use of the product in residential/domestic environments may cause electromagnetic interference.
2. Connection of the instrument to a test object may produce radiations beyond the specified limit.
3. Use high-performance shielded interface cable to ensure conformity with the EMC standards listed above.

Safety Standard

IEC 61010-1:2010/ EN 61010-1:2010

Content

Chapter1 Web Control Introduction

This chapter provides a brief introduction to the IT2700 series Web control method, hardware connection, configuration, and interface introduction.

IT2702/IT2704 series instruments are 1U height models without panels, the user can only use PC computer control, there are two ways of computer control, the PV2700 software or use a browser to log on to the Web server control.

The IT2700 series instruments come with a built-in web server that you can control directly from your computer's Internet browser. A maximum of two simultaneous connections are allowed. If more connections are made, performance will be reduced. Using this web server, you can access front panel controls including LAN configuration parameters. This is a convenient way to communicate directly with the DC Power system without using I/O libraries or drivers.

The built-in web server can only be run on the LAN interface. Browser support Chrome 64, Firefox 79, Safari 13.4, Opera 51, Edge 79.

1.1 Connecting LAN Interface

When using the LAN interface to communicate with the PC, users refer to the following to connect and configure the LAN interface.

Use a standard LAN cable to connect the LAN interface on the rear panel of the instrument to the computer's network port, or you can connect it through a Switch.

The default IP address of the machine is 192.168.200.100, for the first time, users can use the default IP address.

The IP address of the instrument needs to be in the same network segment as the IP address of the computer. For the first time, it is recommended that use USB communication to modify the IP address of the instrument by sending commands. You can also directly modify the IP address of the computer and the instrument in the same network segment.

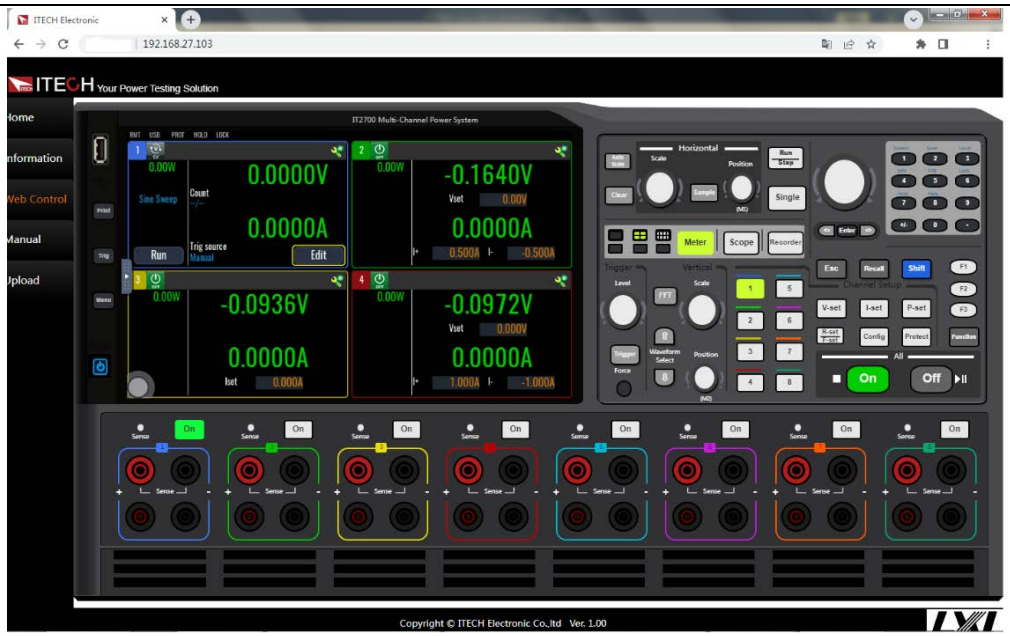
1.2 Logging the Web server

The instrument has a built-in web server that allows you to log in and control the instrument directly from your computer's web browser.

1. Enter the address *http://192.168.200.100* in the address bar of the browser, the initial IP address is 192.168.200.100. The specific IP address is based on the actual instrument settings.

   If the IP address has been changed before, you can press the LAN-Reset button on the rear panel to reset it.

   The page that opens is displayed as follows:



You can select different pages by clicking the buttons shown in the navigation bar on the left side of the window. The detailed descriptions are as follows.

- Home: Web home interface, displays the model and appearance of the instrument;
- Information: Displays the serial number of the instrument and more system information as well as LAN configuration parameters;
- Web Control: Enables the Web control to begin controlling the instrument. This page allows you to monitor and control the instrument;
- LAN Configuration: Reconfigure the LAN parameters;
- Manual: Go to the ITECH official website and view or download the relevant documents.
- Upload: Performs a system upgrade.

  Click **CONNECT** to connect the PC with the instrument, then click

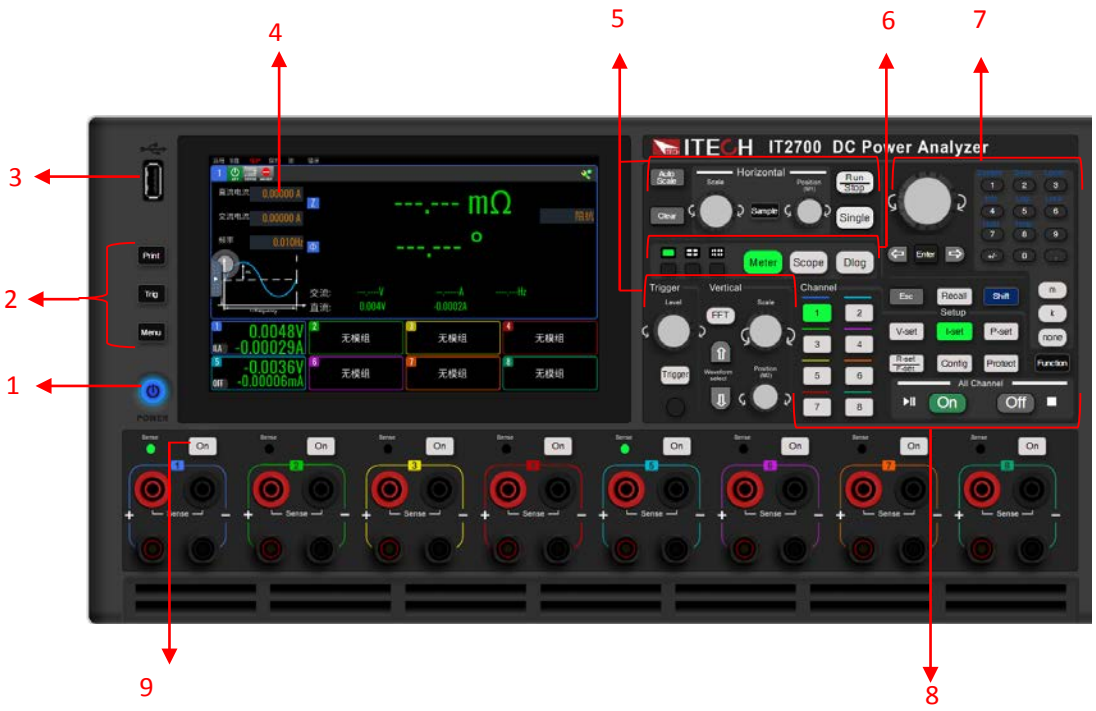
  Select File to select the system upgrade installation package (for example, IT2700-U-V000.000.175all.itech), and then click **UPLOAD** performs the upgrade operation. After the upgrade is complete, the instrument needs to be restarted.

Chapter2 Getting Start

This chapter describes the Web control interface and the corresponding menu introduction.

2.1 Front Panel Overview

The instrument panel schematic is shown below.



No.	Name	Description
1	Power Switch	Turns the instrument power on or power off. This key is reserved and temporarily unavailable.
2	Print	Use the Print key to take a picture of the interface.
	Trig	Use the Trig key to provide a panel trigger signal.
	Menu	Use the Menu key to access the menu page to display all function modules.
3	Memory port	USB Memory device connector
4	Display	Displays all instrument functions - information changes based on selected function.
5	Waveform Display controls	Controls the scope and data logging views.
6	Measure keys	Selects the measurement function - Meter View, Scope View, or Data Logger.
7	Numeric/ direction keys	Used to set parameters and move menu, cursor, and other directional buttons.

8	Function keys	This area of the keypad is used to set the corresponding parameters and selection functions for each channel.
9	On keys	The output switch key of channel

2.2 Keyboard Introduction

2.2.1 Function Keys

The keys for Channel Setup part is used to set the corresponding parameters of the channel, including switching the channel number, setting the voltage, current, power and other parameters. The detailed description of the keys is as follows:

Name	Description
1~8	Switch channel button, channel not online is grayed out.
Esc	Exit Key. Press this key to cancel or exit the present operation.
Recall	Callback key to recall a stored system parameter setting.
Shift	Composite key, combined with other keys to realize functions marked above keys.
V-set	Voltage setting key to set the output voltage value of the instrument.
I-set	Current setting key to set the output current value of the instrument
P-set	Power setting key to set the output power value of the instrument
R-set F-set	Resistance setting key or frequency setting key with different functions for different function.
Config	Enter the config menu interface
Protect	Enter the Protect menu interface
On/Off	Turn on or off the outputs of all channels
m/k/none	m: Unit: mA or mV, set the unit when using mA or mV. k: Unit: Thousand. When using kW, set the unit.

	None: Default present unit.
Function	Access to the Advanced Functions menu interface

2.2.2 Push-on Knob

The IT2700 series Power system provides several knobs on the front panel as shown in the next figure.

The functions of the posh-on knob is described as follows.

- Adjust the Value Setting

  In the value setting interface, rotate the knob clockwise to increase the set value and anticlockwise to decrease the set value.

- Select Menu Item

  The knob can also be used to view menu items. In the menu item display interface, turning the knob clockwise indicates that the next menu item is selected, and turning the knob anticlockwise indicates that the previous menu item is selected.

- Confirm settings

  After completing the value setting or selecting a menu item, pushing the knob acts like pressing **[Enter]** key to confirm the operation.

Left and right arrow keys: Used to adjust the cursor to a specified position or to page left and right to display setting items.

Enter: confirm setting

2.2.3 Composite key

Composite key **[Shift]**, combined with other keys to realize functions marked above keys. In this manual, composite key is displayed as **[Shift]+[Esc]**. Firstly, press **[shift]** and the shift key will be lighted, and then press the function key, the detailed functions are listed as follows.

Name	Description
[0]-[9]	Number key. Enter the number directly
+/–	Positive and negative signs
.	Decimal point
[Shift]+[1](System)	Enter the System setting menu. Used to set the system parameters.
[Shift]+ [2] (Save)	Save the common parameter settings.
[Shift]+[3] (Local)	Switch remote control mode to local control mode.
[Shift]+[4] (Info)	View instrument information
[Shift]+ [5] (Log)	Enter the system log interface.
[Shift]+ [6] (Lock)	Turn the keyboard lock on or off.
[Shift]+ [7] (hold)	Pressing this key holds the currently measured parameter.
[Shift]+ [8] (Help)	Get help information.

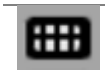
2.2.4 Oscilloscope Adjustment Keys

Name	Description
Auto Scale	When using the oscilloscope function, press Auto Scale to set the display scale automatically.
Clear	Clears the sampling data.
Scale	Turn this knob to adjust the horizontal scale or vertical scale. Pressing this button has no other function.
Position	Rotating the knob corresponding to Horizontal adjusts the horizontal reference. In the initial state, the reference is centered. Rotate the knob corresponding to Vertical to adjust the vertical position of the waveform. Press the Position button to zero out the position.
Sample	Press this button to set the sampling mode and adjust the recording length.

Run/Stop	Start or stop data sampling.
Single	Sampling once
Level	Turn this knob to adjust the trigger level. Press this button to zero the trigger level.
Trigger	Press this knob to set trigger-related options.
Force	This button enforces an immediate trigger event.
FFT	Reserved
Waveform Select	To switch the waveform of each channel of the oscilloscope, switch the buttons of each channel below the oscilloscope interface.

2.2.5 Setting Display Layout

The IT2705 series instruments support up to 8 channels of simultaneous output, each output has its own measurement capability. When the Meter view is displayed, the measurement system continuously measures the output voltage and current.

Name	Description
	The selected channel is enlarged and displayed in the main window. A small window of 8 channels (for 8 channles) or 4 channels (for 4 channels) is displayed below.
	The screen display is 4+4 for 8 channels, with four large window displays and other four channels in small windows. Display 4 large window for 4 channels.
	The screen is divided into 8 small window displays.
Meter	Press this button to switch to the Meter measurement interface.
Scope	Press this button to switch to the scope interface.
Dlog	Press this button to switch to the data recorder interface.

2.3 Meter View

2.3.1 View Introduction

Press the **Meter** button in the instrument panel to enter the Meter View. Under Meter View, users can click the corresponding screen display button to select Single Channel View and Multi-Channel View.

single-output View

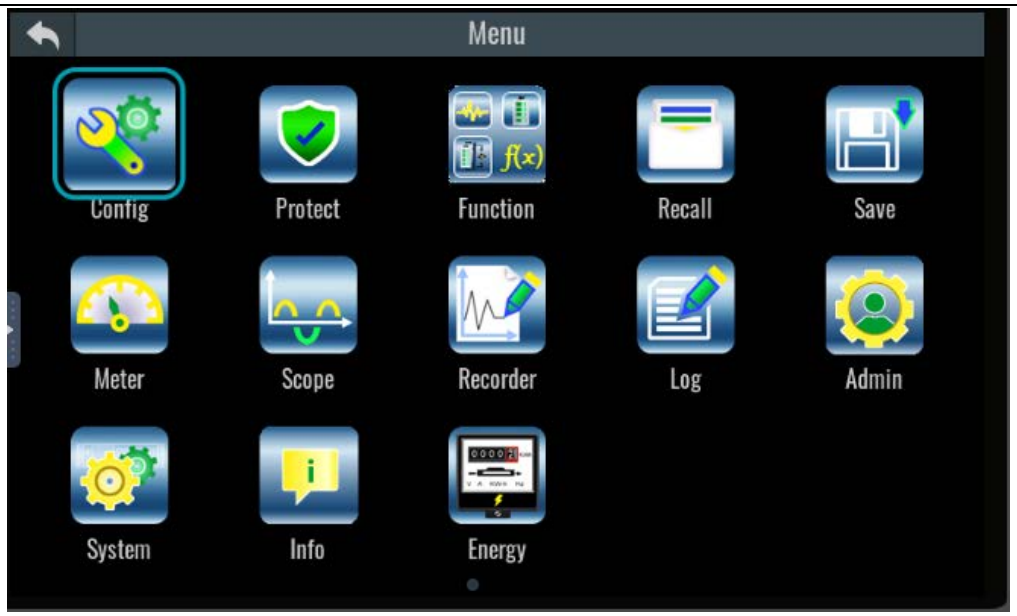
No.	Description
1	channel number and output status
2	Slope value, power limit value, protection function
3	Status bar
4	Outputs set values and readback values, which can be set by clicking on the corresponding area or click V-set.
5	Vpk values, Apk values, Wh and Ah value.
6	Configuration icon, click to quickly enter the general configuration interface of the current channel
7	Reduced window for multiple channels, clicking on the small window switches the present channel to large display.

Multichannel-output View

No.	Description
1	channel number and output status
2	Voltage and current measurements
3	Configuration icon, click to quickly enter the general configuration interface
4	Power measurement
5	Voltage /current setting value

2.3.2 Menu Interface

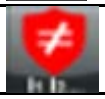
Press the [**Menu**] key to enter the menu setting interface. This interface contains all the function option icons, which can be selected by using the arrow keys or knobs, or you can directly touch and click the icons to enter the corresponding function setting page.



2.3.3 Introduction to Interface Symbols

The interface of IT2700 power supply will display the following symbols. All the symbols and description are listed in the table below.

Symbol	Function description	Symbol	Function description
	Enter config menu	OFF	Output is off
Delay	Output delay	CR	CR mode
CV	CV mode	CP	CP mode
CC	CC mode	BATTERY	Bettery mode
BCH	Bettery charge mode	BDIS	Bettery discharge mode
BEM	Bettery simulation mode	EIS	EIS mode
SENSE	Remote Sense	IMP	Zero Calibration of Impedance
SHORT	Short circuit	UVI	Load Undervoltage alarm
CAL	Equipment Calibration Mode	LOG	Record log
LIST	LIST running	LIST	LIST idle state
LIST	LIST is waiting for trigger signal	LIST	LIST is ending
INHIBIT	Inhibit-living	INHIBIT	Inhibit-latch
UC	Under current protection	UV	Under voltage alarm

Symbol	Function description	Symbol	Function description
	Loop Oscillation Protection		Over current protection
	Positive and negative are reversed		Sense protection
	Voltage Peak Protection		Current Peak Protection
	OVP		OTP
	Under Voltage protection		OPP
	Foldback protection		Asymmetric Current Protection
	Command error	-	-

2.4 Config Menu

click the button  or press the button  to enter the configuration menu interface, in which you can set the electrical performance parameters, sampling-related settings and trigger settings.

2.4.1 Source Config Menu

Source	Priority	The instrument run mode		
		Voltage	Voltage priority mode	
		Current	Current priority mode	
	Voltage/Current Setting	Sets the voltage value/current value, which varies depending on the selected Priority.		
	Voltage/Current Slew Settings	Voltage Slew Settings /Current Slew Settings		
		MAX/V_Rise	Voltage rise slope setting, checking the checkbox before MAX means that the slope is set to maximum. (Displayed when Priority is selected as Voltage)	
		MAX/V_Fall	Voltage fall slope setting, checking the checkbox before MAX means that the slope is set to maximum. (Displayed when Priority is selected as Voltage)	
		MAX/I_Rise	Current rise slope setting, checking the checkbox before MAX means that the slope is set to maximum. (Displayed when Priority is selected as Current)	
		MAX/I_Fall	Current fall slope setting, checking the checkbox before MAX means	

			that the slope is set to maximum. (Displayed when Priority is selected as Current)
	Tracking Slew	Rising and Falling Slope Tracking, checked to synchronize the setting of the rising and falling slope values.	
	Current limit	When the Priority selection is Voltage, the current limit need to set.	
		+I limit	Positive current limit
		-I limit	Negative current limit
		Tracking limits	Limit Setting Tracking, checked to synchronize the setting of +I and -I.
	Voltage limit	When the Priority selection is Current, the voltage limit is set.	
		V High	Voltage upper limit
		V Low	Voltage lower limit
		Tracking limits	Limit Setting Tracking, checked to synchronize the setting of V High and V Low.
	Power limits	Power limit setting.	
		+P limit	Positive power limit
		-P limit	Negative power limit
		Tracking limits	Limit Setting Tracking, checked to synchronize the setting of +P limit and -P limit.
	Internal Resistance	When the Priority selection is Voltage, the Internal Resistance is set.	
	Sink Resistance	When the Priority selection is Current, the Sink Resistance is set.	
Measure	Measurement-related configurations.		
	Remote Sense	Remote: remote sense state. On: enable the remote sense Off: disable the remote sense	
	Measurement		
		Aperture	Sampling frequency mode selection.
			NPLC: Number Power Line Cycles Duration: Duration, only when NPLC mode is displayed
			Time: time sampling mode
	Whour & Ahour	Measurement of watt-hour and amp-hour parameters.	
		Auto clear after output on Clear Whour,Ahour	
Output	Output configurations.		
	Power Relay Lock	Whether or not the output is isolated in the Off state.	
		On: Relay isolation when output is off	
		Off: When the output is off, it is not isolated.	
	Output off Return to 0V	Used to control whether the voltage is quickly zeroed when the output is turned off.	
		On	
		Off	
	Regulation Speed	Regulation speed	
		High1: High speed	
		Low: Low speed	

Trigger	Trigger configurations	
	DC Setting	DC value setting Digital IO is PIN1~PIN7
	Transient Trigger source	Transient system trigger Selectable trigger sources are Immediate Trigger, Bus, Manual Trigger and PIN1~PIN7 Digital IO Trigger.
	Transient Trigger Out	When the transient selection outputs a trigger signal, the IO pin mapped to the class selection is pin 1 to pin 7.
	Tout at the beginning of transient	When selecting a transient waveform, output a trigger signal externally at the start.
	Tout at the end of transient	When the transient waveform ends, a trigger signal is output externally.

2.4.2 Load Config Menu

Source	Const Mode	Setting the mode of instrument operation	
		CV	CV mode
		CC	CC mode
		CR	CR mode
		CP	CP mode
		CC+CV	CC+CV mode
		CC+CR	CC+CR mode
		CR+CV	CR+CV mode
		CP+CV	CP+CV mode
		CC+CP+CR+CV	CC+CP+CR+CV mode
		BSIM	Battery simulation mode
	Voltage/Current/Resistance/Power Setting	The settings of the load parameter in different modes vary depending on the Const Mode selected.	
	Voltage/Current/Resistance/Power Slew Settings	Slope setting	
		MAX V/R/P/I_Rise	Rising slope setting, checking the checkbox before MAX means that the slope is set to the maximum.
		MAX V/R/P/I_Fall	falling slope setting, checking the checkbox before MAX means that the slope is set to the maximum.
		Tracking Slew	Rising and Falling Slope Tracking, checked to synchronize the setting of the rising and falling slope values.
	Other limit		
		When Const Mode is selected as CV/ CC+CV/ CC+CR/CR+CV/CP+CV/ CC+CP+CR+CV /BSIM, the composite parameter limit value is set, and the parameter displayed in different modes is	

		different.	
	Under Voltage Inhibit	When Const Mode is selected as CC/CR/CP, set the on-load voltage limit.	
		Mode	Off: disable this function Living: Changes the load status in real time following the voltage change. When the voltage reaches the value of Voltage on, it starts to carry the load, and when the voltage reaches the value of Voltage off, it stops to carry the load. Latch: The load state does not follow the voltage change and starts to load when the voltage reaches the Voltage on value.
	Enable Short	Check to enable the short circuit simulation state.	
Measure	Measurement-related configurations.		
	Remote Sense	Remote: remote sense state. On: enable the remote sense Off: disable the remote sense	
	Measurement		
		Aperture	Sampling frequency mode selection.
			NPLC: Number Power Line Cycles Duration: Duration, only when NPLC mode is displayed
			Time: time sampling mode
	Whour & Ahour	Measurement of watt-hour and amp-hour parameters.	
		Auto clear after output on Clear Whour,Ahour	
Output	Power Relay Lock	Whether or not the output is isolated in the Off state.	
		On: Relay isolation when output is off	
		Off: When the output is off, it is not isolated.	
	Regulation Speed	Regulation speed	
		High1: High speed	
		Low: Low speed	
Trigger	Trigger configurations		
	DC Setting	DC value setting Digital IO is PIN1~PIN7	
	Transient Trigger source	Transient system trigger Selectable trigger sources are Immediate Trigger, Bus, Manual Trigger and PIN1~PIN7 Digital IO Trigger.	
	Arb Step Trigger Out	Arb single step trigger source Digital IO is PIN1~PIN7	

2.4.3 SMU Config Menu

Source	Emulation	Set instrument role	
		4Q Power Supply	4Q Power Supply
		2Q Power Supply	2Q Power Supply
		1Q Power Supply	1Q Power Supply
		CC Load	CC Load
		CV Load	CV Load
		CR Load	CR Load
		Voltage Measure	Voltage Measure
		Current Measure	Current Measure
		Battery Emulator	Battery Emulator
		Battery Charge	Battery Charge
		Esc	Exit this interface
	Operating in Priority	Operation mode	
		Voltage	CV mode priority
		Current	CC mode priority
	Voltage/Current Range	Select voltage or current range in different modes.	
	Voltage/Current/Resistance Setting	The display parameters vary depending on the selected operating mode.	
	Voltage/Current Slew Settings	Bandwidth Ramp Setting	
		MAX V/I Rise	Voltage/Current rise slope setting, checking the checkbox in front of MAX means that the slope is set to maximum.
		MAX V/I Fall	Voltage/Current Fall slope setting, checking the checkbox in front of MAX means that the slope is set to maximum.
		Tracking Slew	Rising and Falling Slope Tracking, checked to synchronize the setting of the rising and falling slope values.
	Voltage/Current Limits	Voltage/Current Limit. When **Operating in Priority** is selected differently, different parameters are displayed.	
		+I-Limit/-I-Limit: Current positive and negative limit values.	
		+V-Limit/-V-Limit?: Voltage positive and negative limit values.	
		Tracking Limits: Positive and negative limit tracking: Select this option to synchronize the positive and negative limits.	

	Internal Resistance	When selecting the **Operating in Priority** as voltage, set the power supply internal resistance value.	
Measure	Measurement-related configurations.		
	Remote Sense	Remote: remote sense state. On: enable the remote sense Off: disable the remote sense	
	Meter I Range	Current meter range	
	Measurement		
		NPLC	Number Power Line Cycles
		Aperture	Sampling frequency mode selection.
		Time Interval	Time sampling mode
		Line Frequency	AC power supply frequency
		Points	Sampling points
		Reset	Reset parameters
	Whour & Ahour	Measurement of watt-hour and amp-hour parameters.	
		Auto clear after output on Clear	
Output	Voltage Bandwidth Range		
		Low	
		High1/ High2/ High3	
	Output turn off mode	Output status when output is disabled.	
		Highz	
		Lowz	
Trigger	Trigger configurations		
	DC Setting	DC value setting Digital IO is PIN1~PIN7	
	Transient Trigger source	Transient system trigger Selectable trigger sources are Immediate Trigger, Bus, Manual Trigger and PIN1~PIN7 Digital IO Trigger.	
	Transient Trigger Out	When the transient selection outputs a trigger signal, the IO pin mapped to the class selection is pin 1 to pin 7.	
	Tout at the beginning of transient	When selecting a transient waveform, output a trigger signal externally at the start.	
	Tout at the end of transient	When the transient waveform ends, a trigger signal is output externally.	
Z-φ Measure	impedance testing		
	Impedance measurement Aperture	Impedance measurement aperture period.	
		Cycles: Measure the minimum cycle	

		Time(Min): Measure minimum time
	Impedance measurement Delay	Impedance measurement delay period
		Cycles: Measure the minimum cycle
		Time(Min): Measure the minimum cycle
	Impedance Function	Used to set the current measurement model to display the corresponding parameters on the meter interface.
Z-φ0Adjust	Zero adjustment during impedance testing.	
	Start	Start zeroing.
	Clear	Clear zeroing action.
	Open	Open the zeroing file
	Save	Save calibration files
	Delete	Delete zeroing files

2.5 System Menu

Press [**Shift**] + [**1**] (System) to enter the system menu, at this time the LCD shows the selectable function, use the up, down, left and right keys or touch to select and edit, the menu items are shown below.

Output		
	Output On Delays	Voltage rise delay time setting when the output switch is turned on. Different channels can be set separately.
	Output Off Delays	Voltage drop delay time setting when the output switch is closed, different channels can be set separately.
Coupling		
	Output Coupling	Mode: Outputs are synchronized between channels. When Auto is selected, each channel is synchronized identically with the lowest delay time, and when

		Manual is selected, each channel output is synchronized according to the set value. Delay Offset: Output delay time between channels.
	Protect Coupling	
	Inhibit Coupling	Select the channel on which the IO inhibit function takes effect.
		Mode: Latch: The output cannot be automatically restored after the IO signal disables the output. Living: After the IO signal disables the output, it automatically restores the output as the signal changes. Off: disable this function
Group	Setting up parallel systems between channels	
	Group A With	Select the maseter. If the ch3 is select to be master, the CH4-CH8 can be select to parallel.
	Group B With	Select the maseter. If the ch3 is select to be master, the CH4-CH8 can be select to parallel.
General	General configurations	
	Power-on setup	the state of the AC source after power up
		Reset: he instrument will initialize some parameter settings or state
		Last: the instrument will remain the same parameter settings and output status as last time you powered off
		Last-off: the instrument will remain the same settings as last time you powered off the instrument, but the output status is **Off**.
	Source Slope Type	The type of slope setting, you can choose the slope value or the slew time.
	Factory Default Settings	Restore factory values. Click Reset to confirm.
	Load Current Symbol	Display symbol for current in load mode. Positive or negative can be selected.
	System Reboot	System reboot.
Comm	USB Settings	USB type.
		Type: ● Device: The USB device is the communication interface. ● Host: USB devices are used for storage.
		Device Mode ● VCP ● TMC

	Lan Settings	Lan setting
		Mode: ● DHCP ● Manual
		IP Address
		Subnet Mask
		Socket Port
		MAC Address
		Gateway
		Apply
		Restore
	CAN Settings	CAN communication configuration
		Baud rate: Baud rate selection
		Address: Address settings
	Modbus	Modbus
		布局*通道： ● 子项 整体

IO Config Menu:

IO	Digital IO1:Remote Inhibit Input	Function setting of PIN1	
		Inverse	On/Off, Select Inverse or not If setting to ON, it means the valid signal is reversed.
		Function	● Inhibit ● Digital-In ● Digital-Out ● Trig-in/Trig-out
	Digital IO2: PS	Function setting of PIN 2	
		Inverse	On/Off, Select Inverse or not If setting to ON, it means the valid signal is reversed.
		Function	● PS ● Digital-In ● Digital-Out ● Trig-in/Trig-out
	Digital IO3: PS Clear	Function setting of PIN3	
		Inverse	On/Off, Select Inverse or not If setting to ON, it means the valid signal is reversed.
		Function	● PS Clear ● Digital-In ● Digital-Out ● Trig-in/Trig-out
	Digital IO4: ON/OFF Status	Function setting of PIN4	
		Inverse	On/Off, Select Inverse or not If setting to ON, it means the valid signal is reversed.
		Function	● ON/OFF Status

			● Digital-In ● Digital-Out ● Trig-in/Trig-out
	Digital IO5: SYNC	Function setting of PIN5	
		Inverse	On/Off, Select Inverse or not If setting to ON, it means the valid signal is reversed.
		Function	● Sync-in ● Sync-out ● Digital-In ● Digital-Out ● Trig-in/Trig-out
	Digital IO6: On-Couple	Function setting of PIN6	
		Inverse	On/Off, Select Inverse or not If setting to ON, it means the valid signal is reversed.
		Function	● On-Couple ● Digital-In ● Digital-Out ● Trig-in/Trig-out
	Digital IO7: Off-Couple	Function setting of PIN7	
		Inverse	On/Off, Select Inverse or not If setting to ON, it means the valid signal is reversed.
		Function	● Off-Couple ● Digital-In ● Digital-Out ● Trig-in/Trig-out
	Pulse Width	Range: 5us-500us, Input signal range: ＞5us	
	Digital IO: Status	IO port status and direction	
Preference	Buzzer	Set the keyboard sound.	
		Key	Buzzer on/off for key
		Alarm	Buzzer on/off for protect
	Brightness	Set the screen brightness.	
		1-10	Set the screen brightness level
	Touch Screen	Lock the touch screen function	
		Status	Set the ON/OFF state
	Knob immediately effective	Knob setting will take effect immediately. If set to ON, the Knob setting will take effect immediately. If set to OFF, press ENTER to confirm the effect after the Knob setting is completed.	
	Language	Set the language of display	
		English	English
	Soft Panel	Set the soft keyboard	
		On	Turn on the soft keyboard.
		Off	Turn off the soft keyboard.
	Default Meter View	Meter1: Single view Meter4: 4 channel view Meter8: 8 channel view	
Date&Time	Date	Click Edit to reset the system date.	
	Time	Click Edit to reset the system time.	

2.6 Using the Front Panel Menu

The front panel of this instrument provides several menu buttons, users can use the front panel buttons to access the instrument menu, including Config menu, System menu, Protect menu and advanced function menu. You can also set the system related settings in the menus. Each menu is described as follows:

- **Config:** The menu allows you to set parameters related to the electrical performance of the instrument, including the operating mode, slope, output delay time, and power supply internal resistance.
- **System**: The menu allows you to set the system-related function switches, including key sound, Sense switch, power-on status, trigger mode, communication mode, data logging mode, digital I/O function setting, parallel connection setting, viewing instrument-related information, restoring the factory value, and voltage quick-zero setting.
- **Protect:** The menu allows you to set instrument protection-related parameters, including OCP/OVP/OPP/UCP/UVP.
- **Function:** Functions such as Output Sequence, Custom Waveforms, or Battery Charge Test can be set in the Advanced Functions menu.

2.7 Select the Channel

This series of instruments support multiple channels, and different channels can be inserted into different modules. Setting parameters and other operations can only be done for the active channel, if you need to operate other channels, you can directly press the channel key in the panel or click the corresponding channel's display window in the screen.

2.8 Set Parameters

In CV mode, when you press the [**V-set**] key, voltage setting operation can be performed. In the voltage setting area, use the numeric keys or the adjustment knob to input the voltage value, and press [**Enter**] to make this value effective.

The voltage setting ranges from 0V to the maximum output voltage value.

In CC mode, when you press the [**I-set**] key, the current setting operation can be performed. In the current setting area, use the numeric keys or the adjustment knob to input the current value, and press [**Enter**] to make this value effective.

Different modes use different setting buttons, please refer to the button introduction for detailed button functions.

Power output parameters or load carry parameters can be set directly in the Meter interface or in the Config menu.

2.9 On/Off Control

WARNING

- The **[On/Off]** key is used to turn the output on or off under normal circumstances. Even if the instrument is in control by PC or the keyboard is locked, the **[On/Off]** is still valid for turn off output.
- The [On/Off] key light is off and turning the output off does not place the instrument in a safe state. Hazardous voltages may be present on all output and guard terminals. Putting the equipment into an output-off state does not guarantee that the outputs are powered off if a hardware or software fault

occurs. See the cautions about connecting the test lines before connecting test lines.

On/Off keyboard control output

You can press the **[On/Off]** key on the front panel to control the output status of the power supply. If the **[On/Off]** key light is on, indicates that the output is turned on. The VFD displays the meter value such as voltage, current, power and so on. If the **[On/Off]** key light is off, indicates that the output is turned off. The VFD displays that the power supply state is OFF.

Note

After the instrument is connected to the DUT, turn on the output. If there is no output voltage, please check the setting value of voltage and current, set both voltage and current to non-zero values, and then turn on the output.

Command control output

When remote status, the corresponding SCPI command can be used to control the On/Off switch of the power supply or load, the command refer to the describe in the Programming Guide.

Digital IO control output

The Digital IO pin, which comes standard with this series of instruments, supports the external level/pulse signal control output, in combination with external circuits, enables the input/output to be turned on and off. Refer to the Digital IO function introduction for details.

Chapter3 Operation and Application

3.1 Select Source Operation Mode

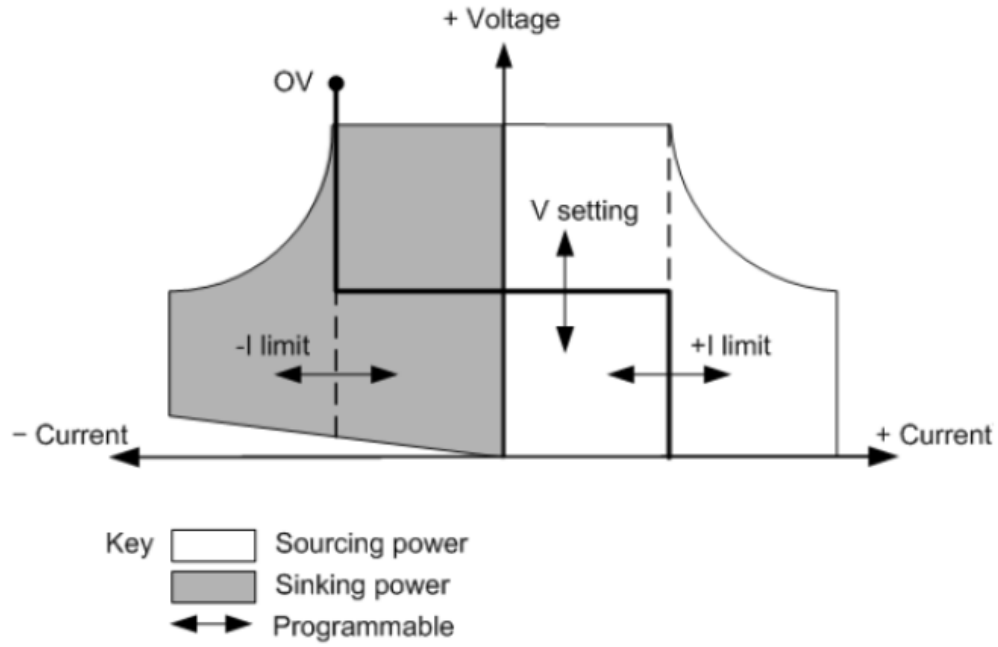
The IT2705 series power system can realize different functions by installing different modules. The module can be a power supply module or a load module, and when used as a DC power supply or Bidirectional power supply module, the operation mode can be selected as CV priority mode and CC priority mode:

CV priority mode

In CV priority mode, the output voltage should be set to the desired value. In addition, positive and negative current limit values should be set. The output is controlled by a constant-voltage feedback loop, which maintains the output voltage at its programmed setting as long as the load current remains within the positive or negative current limit settings.

If you want the output voltage to remain constant, select voltage priority. In voltage priority mode, set the output voltage to the desired value. Additionally, set the positive and negative current limit values. In voltage priority mode, the output is controlled by a constant voltage feedback loop, so as long as the current of the device under test remains within the positive/negative current limit settings, the output voltage can be maintained at its programmed setting.

The figure below shows the output operating trajectory in voltage priority mode. When in power supply mode, the output is in the white quadrant area. When the bidirectional power supply is in load mode, the output is in the shaded quadrant area.

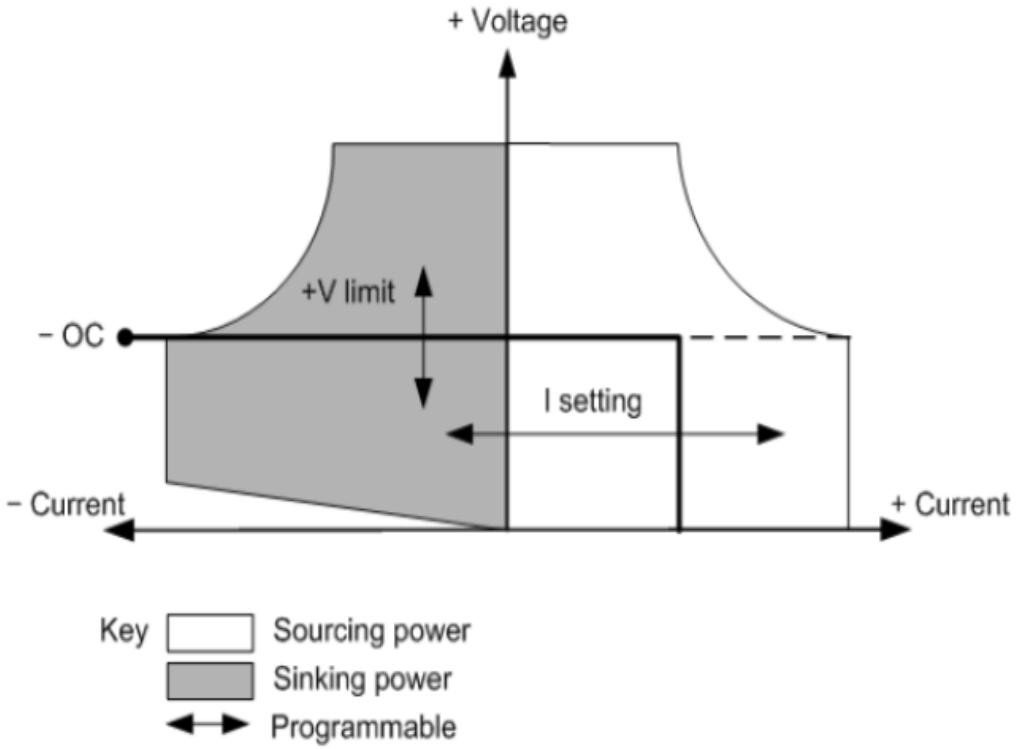


CC priority mode

If you want the output current to remain constant, select current priority. In current priority mode, you should set the output current to the desired positive or negative value and also set the voltage limit value. The voltage limit should

always be set higher than the actual input voltage requirement of the external device under test. In current priority mode, the output is controlled by a bipolar constant current feedback loop, which can maintain the output power supply or absorb the current output according to its preset settings. As long as the voltage of the device under test remains within the voltage limit setting range, the output current can be maintained at its programmed setting.

The figure below shows the output operating trajectory in current priority mode. When in power supply mode, the output is in the white quadrant area. When the bidirectional power supply is in load mode, the output is in the shaded quadrant area.



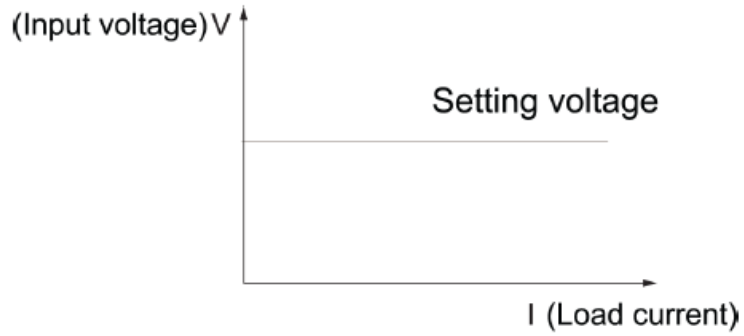
3.2 Select Load Operation Mode

The IT2705 series power system can realize different functions by installing different modules. The module can be a power module or a load module, and when used as a load, the operation modes include the following:

Basic Operation Mode

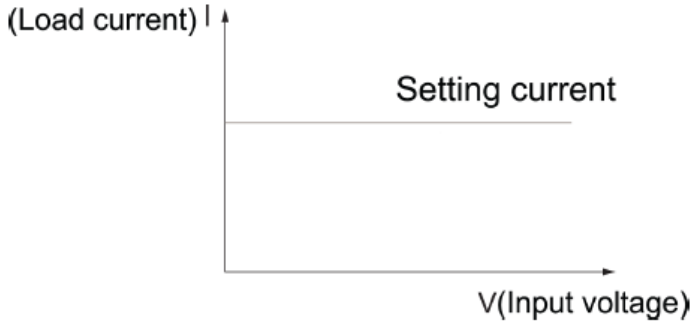
- CV: Constant Voltage Mode

Under CV mode, the electronic load will consume sufficient current to maintain the input voltage at setting voltage. As shown in the following figure. For battery chargers or charging stations, CV mode can change their output voltage to ensure the precision of the charging current.



- CC: Constant Current Mode

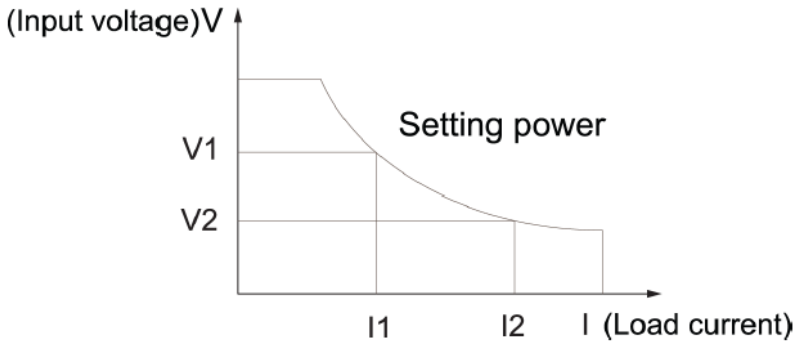
Under CC mode, the electronic load will consume constant current in regardless of whether the input voltage changes or not, as shown in the following figure. The CC mode ensures that the UUT voltage outputs remain stable when the load varies.



- CP: Constant Power Mode

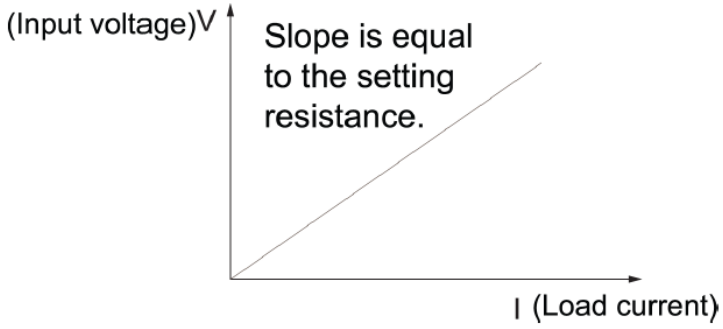
Under CW mode, the electronic load will consume a constant power. If input voltage rises, the input current decreases and power P (= V * I) will maintain at setting power. As shown in the following figure.

When the UUT is a battery, the electronic load changes to simulate device loading behavior. Many battery discharge applications and power consumption profiles can be simulated for analysis, making the CW mode the best choice for simulating electronic device loads.



- CR: Constant Resistance Mode

Under CR mode, the electronic load is equivalent to a constant resistance and will give linear change of current with input voltage change. As shown in following figure. The CR mode ensures that the UUT voltage outputs remain stable when the load varies.



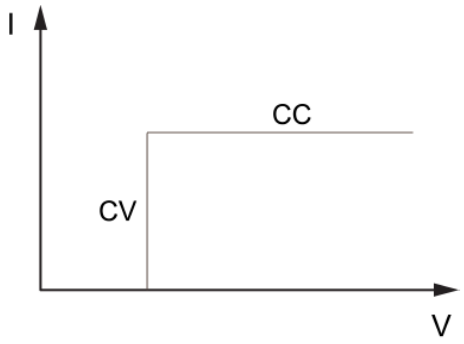
Complex Operation Mode

IT2700 series complex operating modes include CC+CV, CC+CR, CR+CV, CP+CV and CC+CP+CR+CV modes, which can satisfy a wide range of test requirements.

- CC+CV Mode

In CC+CV mode, it has to program the constant voltage and constant current first and then start the UUT for output. When the UUT voltage starts to output, the Load will sink in CV mode according to the programmed voltage.

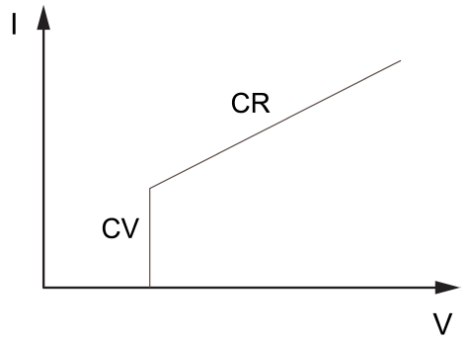
When the voltage rises to exceed the set constant current for sinking, it will switch to CC mode for sinking. The CC+CV mode can be applied to the load simulation battery and test the charging station or the car charger. When the CV is working, the maximum loading current is limited.



- CR+CV Mode

In CR+CV mode, it has to program the constant voltage and constant resistance first and then start the UUT for output. When the UUT voltage starts to output, the Load will sink in CV mode according to the programmed constant voltage. When the voltage rises to exceed the set constant resistance for sinking, it will switch to CR mode for sinking.

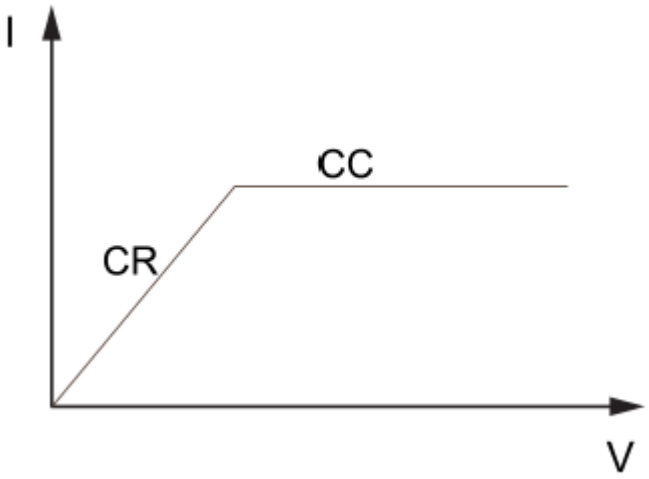
The CR+CV mode can be applied to the LED simulation and test the LED power supply to get the LED current ripple parameters.



- CC+CR Mode

In CC+CR mode, it has to program the constant resistance and constant current first and then start the UUT for output. When the UUT voltage starts to output, the Load will sink in CR mode according to the programmed resistance.

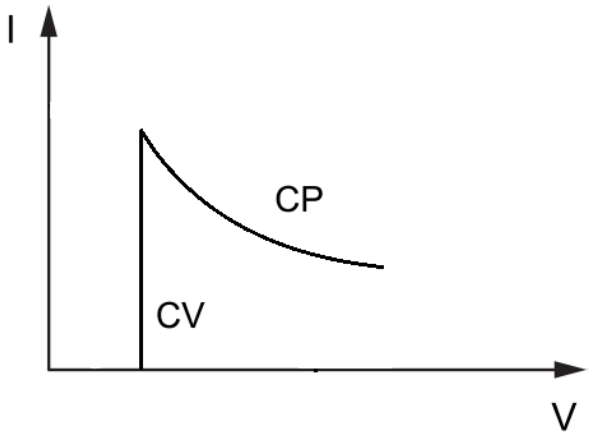
When the voltage rises to exceed the set constant current for sinking, it will switch to CR mode for sinking. The CC+CR mode is commonly used in the testing of voltage limiting, current limiting characteristics, constant voltage accuracy, and constant current accuracy of on-board chargers, which prevents over-current protection of on-board chargers.



- CP+CV Mode

In CP+CV mode, it has to program the constant power and constant voltage first and then start the UUT for output. When the UUT voltage starts to output, the Load will sink in CV mode according to the programmed voltage. When the voltage rises to exceed the set constant power for sinking, it will switch to CP mode for sinking.

The CP+CV mode is often used to UPS battery test, simulate the current change when the battery voltage is decaying. It can also be used to simulate the characteristics of the inputs of DC-DC converters and inverters.

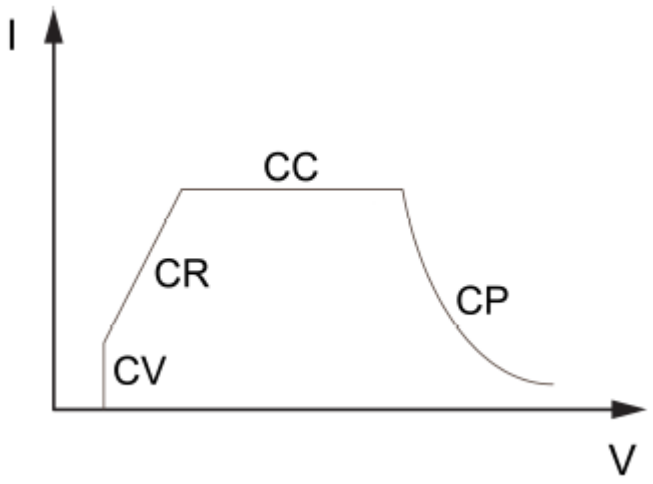


- CC+CR+CP+CV

constant current and constant power, and then start the UUT for output. When the UUT voltage starts to output, the Load will sink according to the programmed

constant voltage in CV mode. When the voltage rises, it will automatically switch to CR mode and to the CC mode at last for sinking. It will switch to CW mode for sinking if the UUT outputs high voltage abnormally.

Under this mode, the load can automatically switch among CV, CR, CC and CP modes. It is suitable for lithium ion battery charger testing to get a complete V-I charging curve. Moreover, the auto mode can avoid damaging the UUT when the protection circuit is damaged.



Battery simulation mode（BSIM）

This series load comes with a battery simulation mode, which is applicable todischarge function test for the charger. The user can directly select this mode in the configuration menu. In the charging principle of charger, after the charger is connected to the battery, monitor the battery voltage at first. If the battery connection is reliable and correct, the charger enters the charging state. When the instrument is under the battery simulation mode of load, an simulate battery voltage can be set, which has weak output capacity capable of outputting small current for simulating battery state. Thus, the charger's working requirements can be met.

In the configuration menu, if **Const Mode** is selected as **BSIM**, the load enters the battery simulation state. Press **Esc** to return to the main interface. At this moment, the [**V-set**] keys lights up. The user can set the voltage value and the upper limit of input current.

The load is in battery simulation mode and the current limit is the maximum current value for that model.

3.3 Selecting SMU Operation Mode

When the IT2705 Series Modular DC Power Analyzer is used in conjunction with the Source Measure Unit (SMU) module, select the SMU operating mode from the drop-down emulation list in the Config menu.

3.3.1 Multi-Quadrant Power Supply

When the multi-quadrant power supply mode is selected, the instrument output operates within the supported quadrant regions.

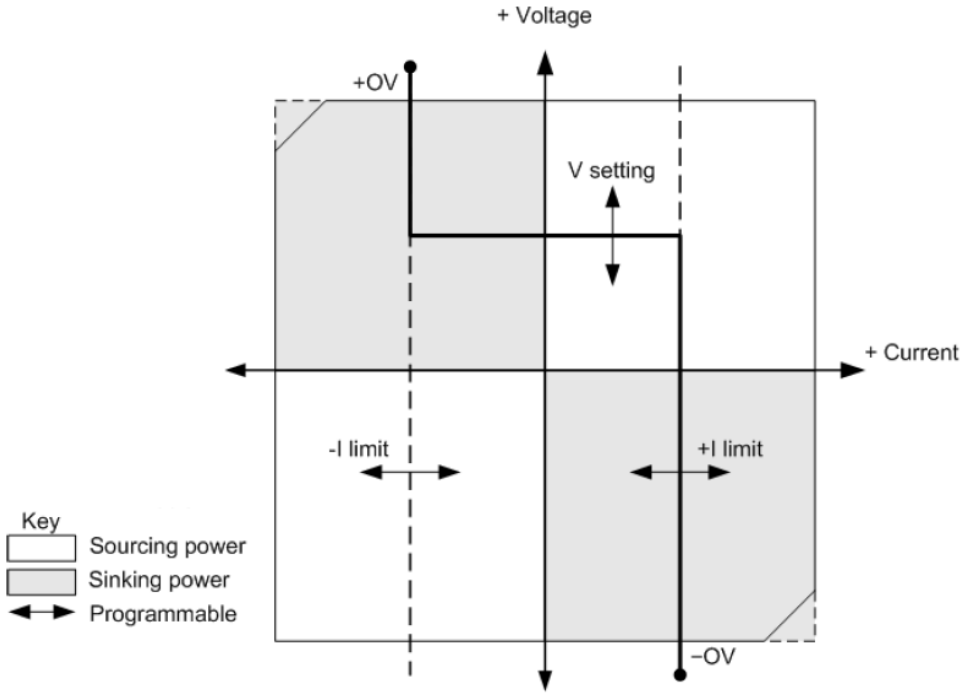
- 1Q Power Supply: Output operates in the first quadrant only. The instrument functions solely as a unidirectional power source.
- 2Q Power Supply: Output operates in the first and second quadrants. The instrument can function both as a power source and as an electronic load.

- 4Q Power Supply: The instrument output simulates a four-quadrant power supply, enabling bidirectional energy flow as well as AC output operation.

Voltage Priority Mode

In voltage priority mode, set the output voltage to the desired positive or negative value first. Then set both the positive and negative current limit values. The current limit should be set higher than the actual output current requirement of the external load. When Tracking is enabled, the negative current limit will follow the positive current limit setting. When Tracking is disabled, you can set different positive and negative current limits.

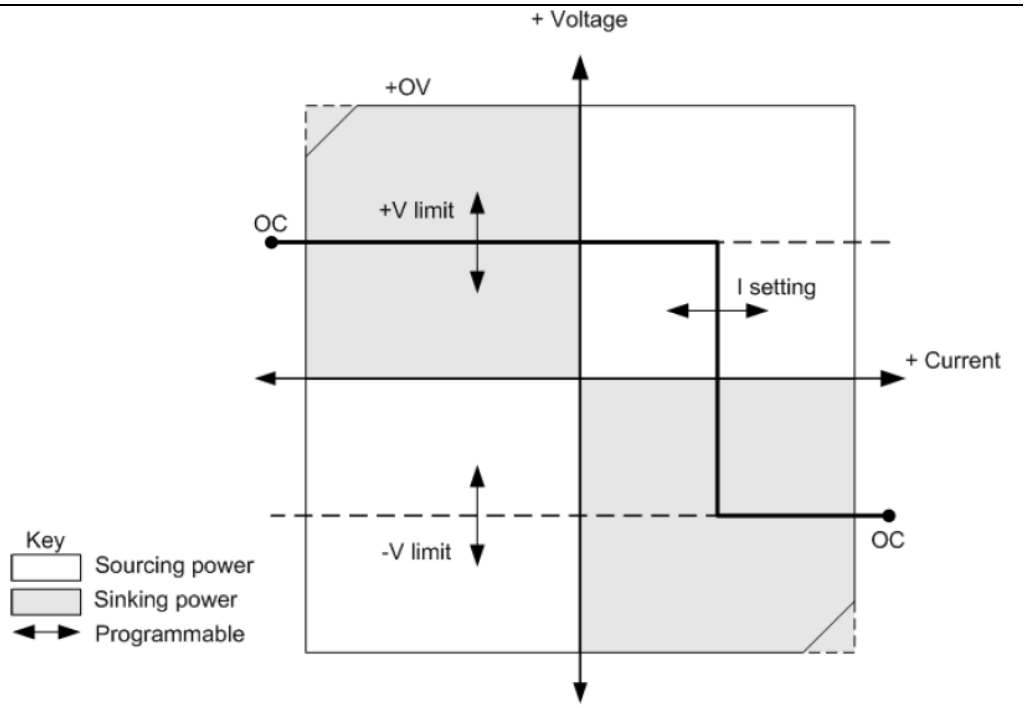
The diagram below shows the voltage-priority operating trajectory. When functioning as a source, the output lies in the white quadrant areas. When functioning as a load, the output lies in the shaded quadrant areas.



Current Priority Mode

In current priority mode, set the output current to the desired positive or negative value. Then set the positive voltage limit. The voltage limit should be set higher than the actual output voltage requirement of the external load. When Tracking is enabled, the negative voltage limit follows the positive voltage limit setting. When Tracking is disabled, you can set different positive and negative voltage limits.

The diagram below shows the current-priority operating trajectory for the power module. When functioning as a source, the output lies in the white quadrant areas. When functioning as a load, the output lies in the shaded quadrant areas.



3.3.2 Range Selection

The SMU module supports multiple range settings. Different ranges affect the output accuracy. In the Config menu, highlight the Range field using the navigation keys, press Enter to access the drop-down range list, and select the desired output range with the navigation keys.

Once the desired range is selected, the set value will be restricted within that range.

3.3.3 Output Bandwidth

The source-load module offers several voltage bandwidth settings to optimize output response time according to the characteristics of capacitive loads. The Low bandwidth setting provides high stability over a wide capacitive load range. Other settings can deliver faster output response when the capacitive load is limited to smaller values.

Press the Config key to access the output window. Navigate and select the voltage bandwidth range.

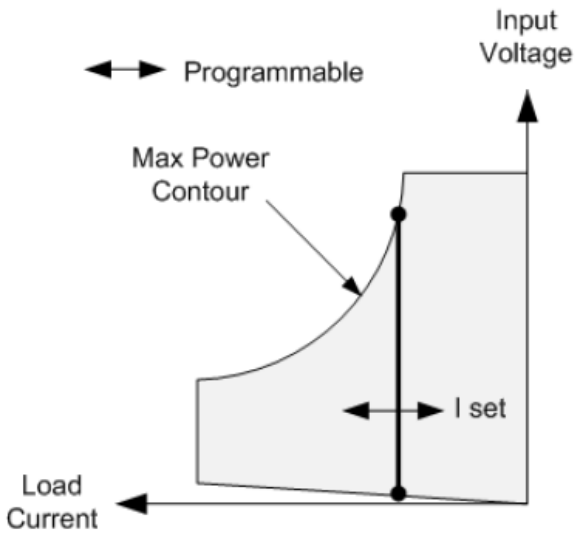
Different gears are suitable for different capacitance parameters:

- 0–150 μF: Low
- 0–1 μF: High1
- 1–7 μF: High2
- 7–150 μF: High3

3.3.4 Load Modes

- Constant Current (CC) Load

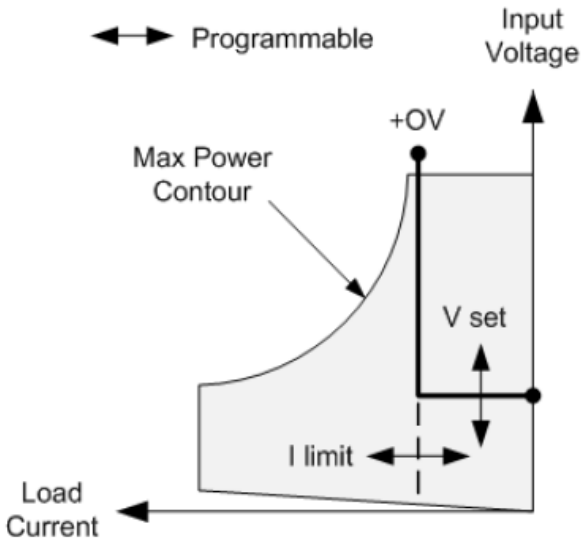
  Regardless of the input voltage, the load module sinks current according to the set value.



The heavy solid vertical line illustrates the locus of possible operating points as a function of the load current. A CC (constant current) status flag indicates that the load current is at the specified setting. In this mode, the current range can be selected, with a smaller range providing better setting resolution. A positive voltage limit can also be set.

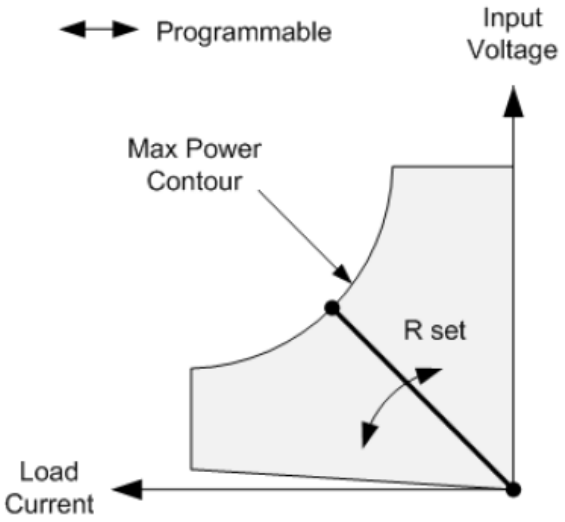
- Constant Voltage (CV) Load

  The load module sinks sufficient current to maintain the input voltage at the programmed value.



The heavy solid line illustrates the locus of possible operating points as a function of the load voltage.
Note that in voltage priority mode, a current limit can be imposed. As shown by the horizontal portion of the line, the input voltage remains regulated at its programmed setting as long as the input current remains within the current limit setting. In this mode, the current range can be selected, with a smaller range providing better setting resolution.

- Constant Resistance (CR) Load



The heavy solid line illustrates the locus of possible operating points as a function of the resistance.
the load selects the range with the highest resolution for the resistance value.

- Voltmeter Mode

  The SMU module operates as a voltmeter, measuring voltage and current parameters.

- Ammeter Mode

  The SMU module operates as an ammeter, measuring voltage and current parameters.

- Battery Emulator

  The SMU module operates as a battery simulator.

- Battery Charger

  The SMU module operates as a battery charger.

3.4 Config Menu Function

IT2700 series power system install different modules can realize different functions, different modules, config menu setup items are different, please refer to the Config menu introduction content for specific parameter introduction.

3.4.1 Setting Output Rise Time/Fall Time

Rise/fall time is the time taken for one voltage point to rise/fall to the other point under the output status is ON. The slope in source mode can be set as a ramp value or as a time value. Only the ramp value can be set in load mode.

The slope can be set in the Config menu or in the slope display on the left side of the screen in the Meter interface.The logic of the setting in the Meter interface is the same as that of the setting in the Config menu.

This power supply supports setting the rising and falling slopes in all modes.

1. Select " **Config**" > "**Source**" > "**Voltage/Current/Resistance/Power slew Rate Settings**".
2. Each setting item can be selected by using the up and down arrow keys. The setting value can be adjusted by using the numeric keys or the knob,

and confirmed by pressing [**Enter**] or the knob key when the input is finished.

If you need to modify the type of slope value of the power supply, please refer to the following way to enter the system menu to modify.

1. Press [**Shift**]+ [**1**](System) and enter to system menu.
2. Select "**General**" > "**Source Slope Type**".

- Time: Indicates that the slope setting value is a time value. Unit: s.
- Slew: Indicates that the slope setting value is the change value per unit of time, and the unit is V/ms or A/ms depending on the mode.

3.4.2 Set the Internal Resistance (Source module)

The IT2700 series power system provides internal resistance setting under CV priority mode. The procedures are shown as below.

1. Press the **[Config]** keys to enter the configuration menu.
2. Select **Internal Resistance** and check the box.
3. Use the numeric keys to enter the value of the internal resistance, then press the [**Enter**] key to confirm.

3.4.3 CR Function in Sink Mode (Bi-directional power module)

This series instrument supports CR testing in sink mode, and the sink current capability of CR is controlled by the Is setting value in CC priority mode.

The usage of this function is as follows:

1. Press [**Config**] enter the configuration menu.
2. Set **Priority** to Current.
3. Check Sink Resistance box, enable the CR mode in Sink.
4. Set the Sink Res value and press [**Enter**].

The following takes the setting of 10Ω as an example to introduce the actual test results.

3. Set the voltage and current.

   a. Press the [I-set] key on the front panel to set the output current value Is.

   Take 5A as an example.

   b. Set V-High=20V and V-Low=0V under configuration menu.

   c. Set the DUT (power supply) to output 80V, 10A.

At this time, 10Ω in sink mode (according to the formula I=U/R, sink current is 80÷10=8A), due to the limitation of Is=5A in CC priority mode, the actual sink current is 5A, and the instrument is working In CC mode. If Sink Res is set to 20Ω, the sink current is 4A, which is within the limit of Iset, so the instrument works in CR mode at this time.

3.4.4 Under Voltage Inhibit (Load Module Support)

When testing some power products with slow voltage rise speed, if the electronic load input is opened before power, the power may latch protection.

In this way, the user may set Voltage on value and Voltage off value. The electronic load only latches when power voltage is higher than this value and when the power voltage is less the value of Voltage off, it stops to carry the load.

- Off: disable this function

- Living: Changes the load status in real time following the voltage change. When the voltage reaches the value of Voltage on, it starts to carry the load, and when the voltage reaches the value of Voltage off, it stops to carry the load.
- Latch: The load state does not follow the voltage change and starts to load when the voltage reaches the Voltage on value.

3.4.5 Short-circuit Analog Function(Load Module Support)

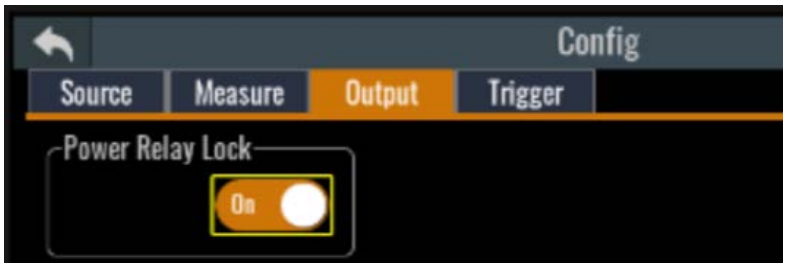
The electronic load can analog a short circuit. On the config menu check the box front of **Enable Short** to switch to the short circuit mode. The short circuit mode does not influence the existing settings. When the short-circuit analog is turned off, the instrument returns to the previous setting status.

In the short circuit mode, the current value is determined by the operation mode and the current range. Under CC, CP and CR modes, maximum short-circuit current is 110% of the current range. Under CV mode, short-circuit current equals to current when constant voltage is 0 V.

3.4.6 Setting the Power Relay Lock Status (Source Module and Load Module Support)

The IT2700 output is installed with a power relay, this power relay supports the function of DUT reverse connection judgment before closing, this function can realize anti-reverse connection and anti-surge.

The different states are described below, and users can choose according to their needs.



- On state

In this state, the power relay is in constant closed state, and there is no precharge and reverse connection judgment when the output is turn on (On/Off lights up), and the power supply output speed will be faster.

When the output is turn off (On/Off lights out), the power relay is also closed, and the internal circuit of the IT2700 series instrument and the DUT circuit are not completely disconnected. In this case, the energy storage DUT will be discharged.

- Off state

In this state, the power relay state is switched with the On/Off key, and when the output is turn on (On/Off lights up), it first performs precharge and reverse connection judgment, and if the DUT is reversed, reverse connection protection is reported and the output cannot be turn on.

If no reverse connection condition is detected, the power relay is closed to start output. When the output is turn off (On/Off lights out), the power relay is opened, and internal circuit of the IT2700 series instrument and the DUT circuit are completely disconnected. The power supply output will be 100ms slower in this state.

3.5 Protection Function

The IT2700 series power system has different protection menus when using different modules.

Press [**Protect**] button or click **Protect** function in Menu to enter Protect Configuration interface, the menu list and introduction of Protect function are shown below.

Source mode

Over Voltage Protection		
	Voltage	OVP point
	Delay	OVP delay time, range: 0.000s-10s.
Over Current Protection		
	±Current	OCP point
	Delay	OCP delay time ,range: 0.000s-10s.
Over Power Protection		
	±Power	OPP Point
	Delay	OPP delay time, range: 0.000s-10s.
Under Voltage Protection		
	Voltage	UVP point
	Warm	UVP Warm time,range:0.000s-30s.
	Delay	UVP delay time, range:0.000s-10s.
Under Current Protection		
	+Current	Positive UCP point
	-Current	Negative UCP point
	Warm	UCP Warm time,range: 0.000s-30s.
	Delay	UCP delay time, range:0.000s-10s.
Foldback		
	Mode	OFF: foldback function is turned off. CV to CCCP: it indicates that the instrument triggers protection when the CV mode is switched to CC /CP mode. CC to CVCP: it indicates that the instrument triggers protection when the CC mode is switched to CV /CP mode.
	Delay	Foldback protection delay time.

Load Mode:

Over Current Protection		
	Current	OCP point
	Delay	OCP delay time, range:0.000s-10s.
Over Power Protection		
	Power	OPP point
	Delay	OPP delay time, range:0.000s-10s.

3.5.1 Over Voltage Protection (OVP)

Users can enable the OVP function and set the protection limit Level and protection delay time. When the voltage (i.e., the Meter value) is greater than this protection limit and the delay time is exceeded, the power supply will enter the OVP state.

Possible Cause

Many reasons can cause OVP, the details are as follows:

- The set protection limit Level is lower than the voltage Meter value.
- The external (AC input) inputs a higher voltage.
- The power supply outputs a high voltage due to a fault.

WARNING

Please avoid inputting a external voltage higher than 120% rated value, or the instrument will be damaged.

How to Set

1. Press **[Protect]** to enter the Protect function setup interface.
2. Set the protection limit Level and the delay time Delay in sequence, and press [**Enter**] to confirm.

3.5.2 Over Current Protection (OCP)

Users can enable the OCP function and set the protection limit Level and protection delay time. When the current (i.e., the Meter value) is greater than this protection limit and the delay time is exceeded, the power supply will enter the OCP state.

Possible Cause

Many reasons can cause OCP, the details are as follows:

- The set protection limit Level is lower than the current Meter value.
- The external (AC input) inputs a higher current.
- The power supply outputs a high current due to a fault.

How to Set

The operation steps to set OCP are as follows.

1. Press **[Protect]** to enter the Protect function setup interface.
2. Set the protection limit Level and the delay time Delay in sequence, and press [**Enter**] to confirm.

For bi-directional power supplies, Level can be set to a positive or negative value, i.e. the same protection limit is set for the output or input current.

3.5.3 Over Power Protection (OPP)

Users can enable the OPP function and set the protection limit Level and protection delay time. When the power (i.e., the Meter value) is greater than this protection limit and the delay time is exceeded, the power supply will enter the OPP state.

Possible Cause

Many reasons can cause OPP, the details are as follows:

- The set protection limit Level is lower than the power Meter value.
- The power supply outputs a high power due to a fault.

How to Set

The operation steps to set OCP are as follows.

1. Press **[Protect]** to enter the Protect function setup interface.
2. Set the protection limit Level and the delay time Delay in sequence, and press [**Enter**] to confirm.

For bi-directional power supplies, Level can be set to a positive or negative value, i.e. the same protection limit is set for the output or input power.

3.5.4 Under Current Protection (UCP)

Users can enable the UCP function and set the instrument warm-up time, protection limit Level and protection delay time. When the current (i.e., the Meter value) is lower than this protection limit and the warm time, delay time are exceeded, the power supply will enter the UCP state.

Possible Cause

Many reasons can cause UCP, the details are as follows:

- The set protection limit Level is greater than the current Meter value.
- The external (AC input) inputs a lower current.
- The power supply outputs a low current due to a fault.

How to Set

1. Press **[Protect]** to enter the Protect function setup interface.
2. Set the warm time, protection limit point and delay time in sequence, and then press [**Enter**] to confirm.

For bi-directional power supplies, Level can be set to a positive or negative value, i.e. the same protection limit is set for the output or input current.

3.5.5 Under Voltage Protection (UVP)

Users can enable the UVP function and set the instrument warm time, protection limit Level and protection delay time. When the voltage (i.e., the Meter value) is lower than this protection limit and the warm time, delay time are exceeded, the power supply will enter the UVP state.

Possible Cause

Many reasons can cause UVP, the details are as follows:

- The set protection limit Level is greater than the voltage Meter value.
- The external (AC input) inputs a lower voltage.
- The power supply outputs a low voltage due to a fault.

How to Set

1. Press **[Protect]** to enter the Protect function setup interface.
2. Set the warm time, protection limit point and delay time in sequence, and then press [**Enter**] to confirm.

3.5.6 Over Temperature Protection (OTP)

When internal temperature of instrument is higher than about 90 ℃, the instrument enters temperature protection state. At this time, the instrument will automatically be OFF and the screen prompts OTP.

Possible Cause

To prevent damaging heat build-up and ensure specified performance, make sure there is adequate ventilation and air flow around the instrument to ensure proper cooling. Do not cover the ventilation holes on the rear panel, sides, or bottom of the instrument. Even with proper ventilation, the instrument can overheat in the following situations.

- If the ambient temperature is too high.
- If you use the instrument to test for long periods.

How to Set

The OTP limit does not need to be set, and the internal device of the instrument automatically detects and determines whether to enter the OTP state. If an over-temperature condition occurs, power off the instrument and allow it to cool for at least 30 minutes. After the internal temperature of the instrument has cooled down, power it on again.

CAUTION

When you return power to the instrument, verify that the cooling fan is running. If not, please contact ITECH Technical Support. Leaving the instrument powered on with an inoperative cooling fan may result in damage to the instrument.

3.5.7 FOLDBACK Portection

This series instrument comes with Foldback protection function for turning off the output during CV/CC switch of the power supply to protect DUT sensitive to voltage overshoot or current overshoot. Foldback protection allows users to specify a working mode and set protection delay time. If there is any switch between existing working modes, the protection is triggered and the output is turned off from the time when the working loop switches to trigger protection and the delay time depletes.

- Enable FOLDBACK function;
- The existing loop is switched to set working mode, and the duration is longer than the set protection delay time;

Possible Cause

Changes in the load voltage and current cause the instrument's operating mode to switch automatically.

Delay Time

You can specify a delay time for FOLDBACK, allowing the instrument to ignore transient changes in the operating mode during the delay interval. In most cases, such transient conditions are not considered state transitions, making it unnecessary to trigger the foldback function and disable the output. Once the foldback delay time expires, the output is turned off.

3.6 Timing Output Function

Up to 8 modules can be installed in the IT2700 series power system. On delay or Off delay can be set for different channels, through which timing outputs between multiple channels can be realized.

The user enters the System menu, selects the Output menu, and the output delay times for the channels are displayed at the bottom of the interface. Users

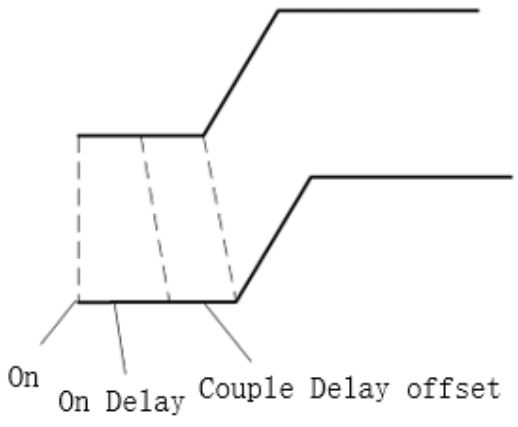
can enter the corresponding On/Off delays as shown in the figure below.

This function can be used to control the output delay of independent channels. It can also be used in combination with the ALL ON or ALL OFF key to realize the timing output between channels.

3.7 Channel Synchronized Output Function

Output synchronization can be selected between multiple channels of the IT2700 series power system, and channels 1-8 can be selected to be fully synchronized or partially synchronized, which can be ticked by the user.

When Auto is selected as the mode, the instrument adjusts the delay time between the channels by itself. when Manual is selected, the user needs to set the delay Offset. This delay offset is superimposed with the On Delay and Off delay of each channel, and the final output schematic is shown below.



3.8 Parallel of Channels in the Main Frame

The modules in the IT2700 mainframe support parallel connection between

them, which is used to extend the output power of the instrument, and the parallel connection requires that the module models are exactly the same. Up to 8 modules can be connected in parallel.

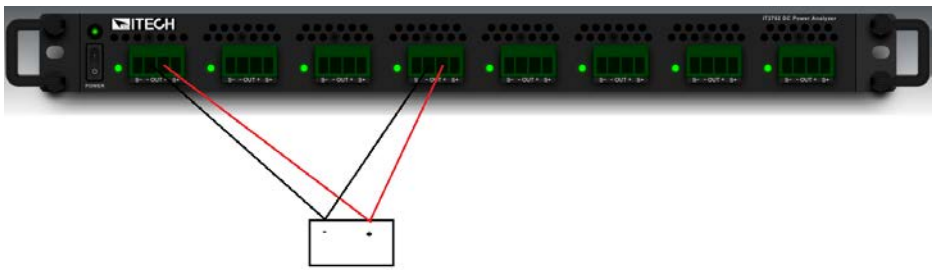
Different host frames do not support master-slave parallel connection.

Two sets of parallel relationships can exist in the mainframe, and each channel can choose to join parallel groupA or groupB. If it is not joined, it will be used as an independent channel.

Take CH1 and CH4 in parallel as an example to introduce how to set up the parallel group and use the parallel function.

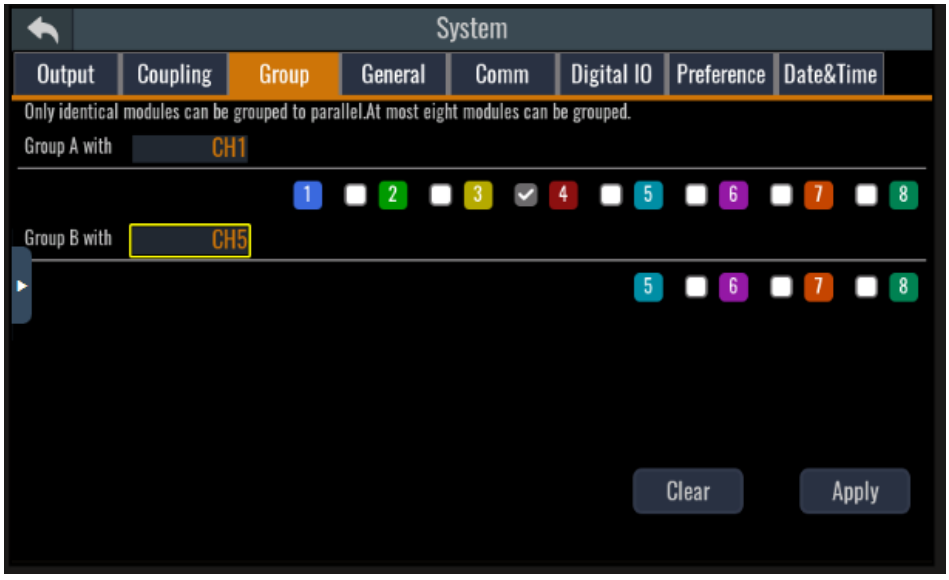
Connecting Parallel Outputs

Determine the channel outputs that need to be connected in parallel, and connect that channel's output wires in parallel to DUT connect terminals.



Setting Parallel Relationship

1. The user enters the System menu, selects the Group menu, and the parallel system configuration interface as shown in the following figure:



2. Click Group with corresponding input box, select the host role in the pop-up dialog box.

   the host role selects the small channel number. CH1 and CH4 are paralleled, CH1 is selected as the host, and after the host role is selected, the instrument automatically filters the channel numbers in CH2-CH8 for paralleling. If CH4 is the host, the instrument automatically filters the channel numbers in CH5-CH8 for paralleling.

3. Check the box in front of CH4, click Apply.
4. Return to the main screen, CH4 will be displayed as a slave, and the output settings will operate only CH1.

Chapter4 Generating Arbitrary Waveforms

This chapter will introduce the List, ARB, Sequence, CDARB, Sweep, Battery Simulation, Battery Charge, Battery Discharge and transient(Load mode) functions of the IT2700 series instruments.

4.1 LIST

The IT2705 series module DC power analyzer's list function allows you to set up to 1024 steps per file. You need to edit the voltage/current value, slope, and duration of each step, and you can also set the number of times each list file is to be executed in a loop (0 to 65535). After completing the list file editing, you can trigger the selected list file to run according to the set trigger method.

4.1.1 Create a New List file

Users can create a new List file to output a list of waveforms with different amplitudes. The specific operation steps are as follows:

1. Press the [**Function**] key on the front panel to enter the advanced function selection interface, and click the List function icon to enter the list configuration interface.

Parameter	Discription
Trig source	The trigger source for list file running can be set to Immediate, Manual, Bus, PIN1~PIN7.
Repeat	The number of times the List file loops, 0 means infinite loops, the maximum number of loops is 65535.
Step	The number of steps present running.
Run	Run the List file.
Open	Open an existing List file
New	Create a new list file
Edit	Edit the list file.
Delete	Delete the List file. After deletion, the file name will be deleted and the display parameters will be retained.

2. Press [**New**] icon and create a list file.

Parameter	Discription
Priority	Select the voltage or current attribute of the list.
Repeat	The number of times the List file loops, 0 means infinite loops, the maximum number of loops is 65535.
End	The output state at the end of List file. It can be set to Normal, Last, Off. Normal: jumps to the output state in Fix mode, Last: keeps the last step parameter output, Off: closes the output.
Pacing	Method of step jumps to next step. Auto: when the time is out, jumps to next step Trig: receive a trigger signal, jumps to next step.
Insert	Insert a step after the last step.
Delete	Delete the step.
Clear	Clear all step
Open	Open an existing List file
New	Create a new list file
Save	Save an existing list file.
Save as	Name and save the newly edited List file.
Delete	Delete the list file.
No.	List step number
Voltage	Step value
Slew	Rise slope
Times	width time for the step.
BOStep	Output a trigger signal before the step
EOStep	Output a trigger signal after the step

3. Click **[Save]** and Save list file.

4. Press Return and return to the main screen, ready to run the List file.

4.1.2 Open /Run List

If you have already edited the List file, you can directly recall the List file and execute the test as follows:

1. Press the [Function] key on the front panel to enter the advanced function selection interface, and click the List function icon to enter the list configuration interface.
2. Press the [**Open**] key to select the file storage location, click Local or USB.
3. Select the channel and check the List file saved under that channel, and press the [**Open**] key to confirm the recall.
4. Press the front panel [**On/Off**] key to turn on that channel output.
5. Click Run in the list screen.

   on screen displays the runtime and the list indicator.

4.1.3 Import/Export List File

Import List file

IT2700 series support import list file function, The user can finish the editing of List file in Excel and import it into the software. This function simplifies the List file edit and facilitates user operation.

To help user define an Excel file format, please export a CSV template from the List interface.

Detailed operation steps are as below:

1. Create a new Excel document on local PC and name it List02.
2. Open the Excel document and save it as in “other formats” i.e. “(*.csv)”.
3. Open the List02.csv document and edit the List. Set every step of the List and corresponding parameters and save the document in the USB disk.
4. Insert the USB disk into the USB interface of the front panel.
5. Press the [**Function**] key on the front panel to enter the advanced function selection interface, then click the List function icon to enter the list configuration interface.
6. Press [**Open**] to enter the List function configuration interface.
7. Select the List02.csv file and open it. The List file will be imported.

Export List file

After editing the List file, the user can directly save it into the device or export and save it into the peripheral memory disc. The exported List is saved in the format of. (*.csv). Detailed operation steps are as below

1. Insert the U disk into the USB interface of the front panel.
2. Press [**Function**] on the front panel to enter the List function configuration interface.
3. Select [**New**], enter to list file edit interface.
4. Press [**Save as**]. This file will be exported into the USB disk.

4.2 Generating Arbitrary Waveforms (ARB)

Each output on the power system can be modulated by the built-in arbitrary waveform generator function. This allows the output to act as a DC bias transient generator or an arbitrary waveform generator.

4.2.1 Run the Arb Waveform

1. Press the [**Function**] icon on the menu to enter the advanced function selection interface, and click the Arb function icon to enter the arbitrary waveform configuration interface.

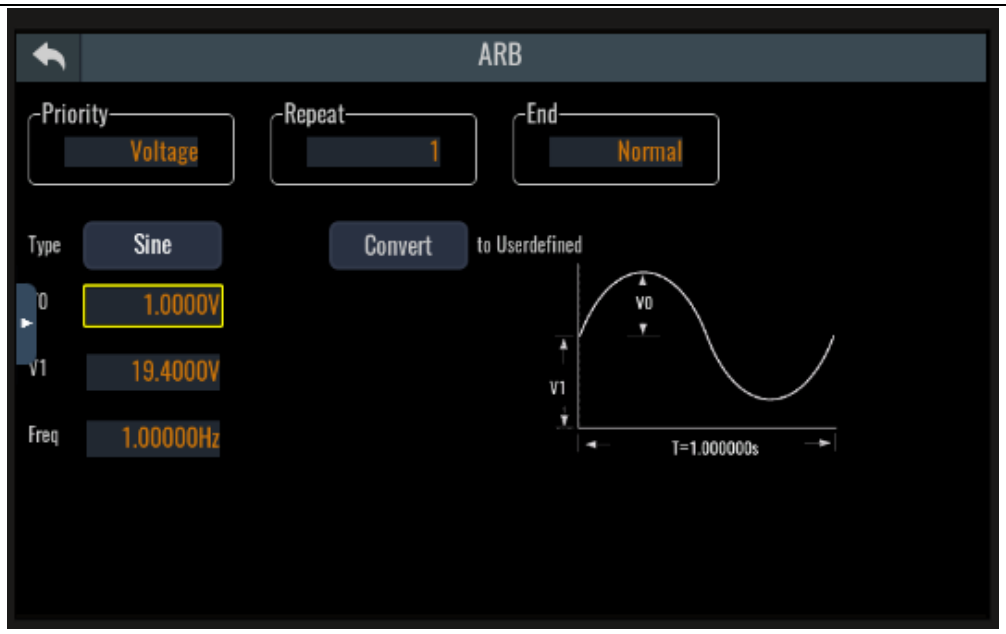
2. In this interface, the user can directly click Run, and the machine will output according to the waveform parameters displayed at the left of the interface.

   If you need to run it in trigger mode, select the trigger mode in the trigger source on the left.

4.2.2 Setting the Arb Waveform Common Parameters

Under the Arb function, click the [**Edit]** button in the interface to enter the arbitrary waveform editing interface.

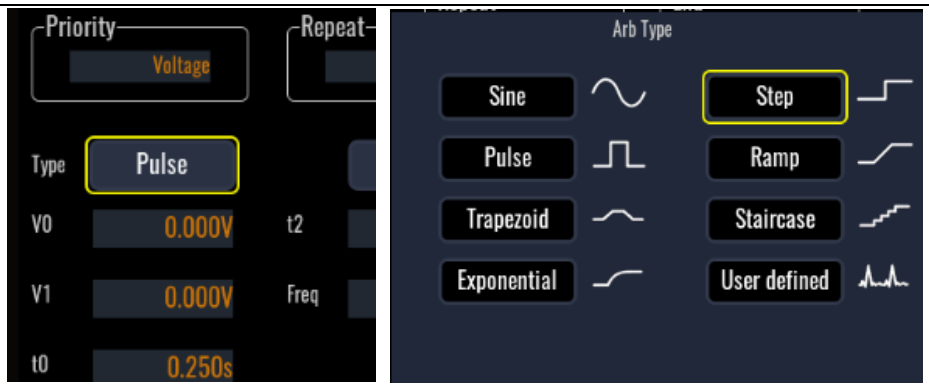
Select the corresponding waveform type and edit the parameters directly in the instrument interface to realize the output of different waveform shapes. This method does not need to save, but can be run directly after modification.



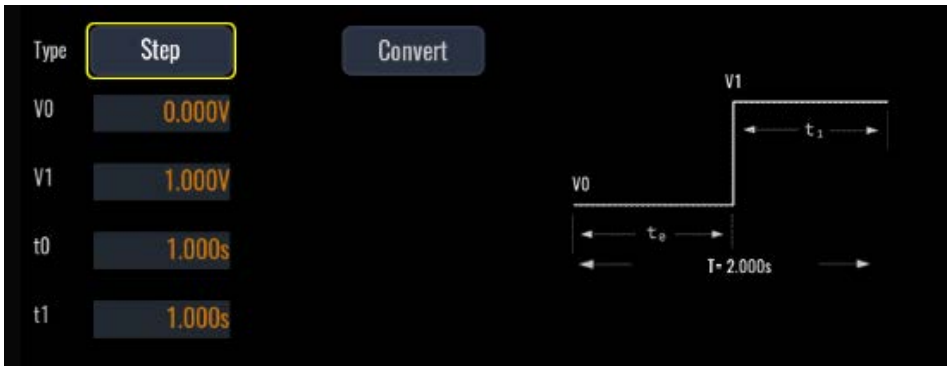
Parameter	Description
Priority	Select the voltage or current attribute of the Arb, when different output attributes are selected, the waveform definition parameters are different, for example, when Voltage is selected, V0 and V1 are set, if Current is selected, I0 and I1 are set.
Repeat	The number of times the Arb file loops, 0 means infinite loops, the maximum number of loops is 65535.
End	The output state at the end of List file. It can be set to Normal, Last, Off. Normal: jumps to the output state in Fix mode, Last: keeps the last step parameter output, Off: closes the output.
Type	Arb waveform type: Sine, Step, Pulse, Ramp, Trapezoid, Staircase, Exponential, Userdefined.

4.2.3 Configuring Step Arbs

1. Press the [**Function**] icon on the menu to enter the advanced function selection interface, and click the Arb function icon to enter the arbitrary waveform configuration interface.
2. Select the Priority attribute.
3. Click the button corresponding to Type, select Arb type in the pop-up box to Step.



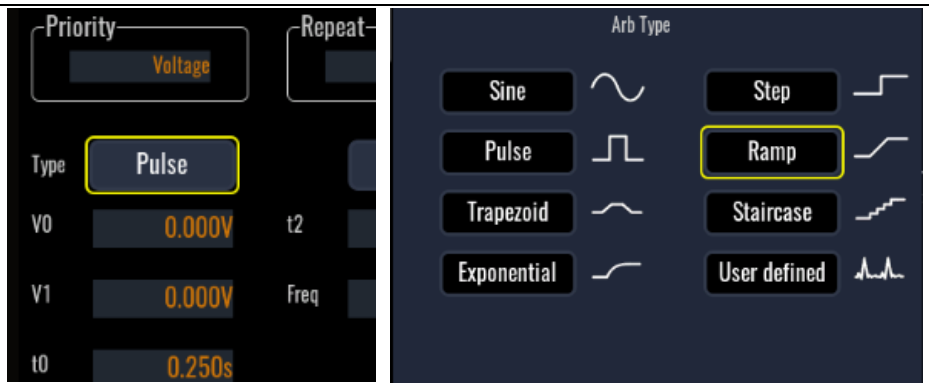
4. Configure the Step Properties.



Parameter	Description
V0/ I0	The setting before the step.
V1/ I1	The setting after the step.
t0	The delay after the trigger is received but before the step occurs.
t1	The time the output remains at the end setting after the step occurs.

4.2.4 Configuring Ramp Arbs

1. Press the [**Function**] icon on the menu to enter the advanced function selection interface, and click the Arb function icon to enter the arbitrary waveform configuration interface.
2. Select the Priority attribute.
3. Click the button corresponding to Type, select Arb type in the pop-up box to Ramp.

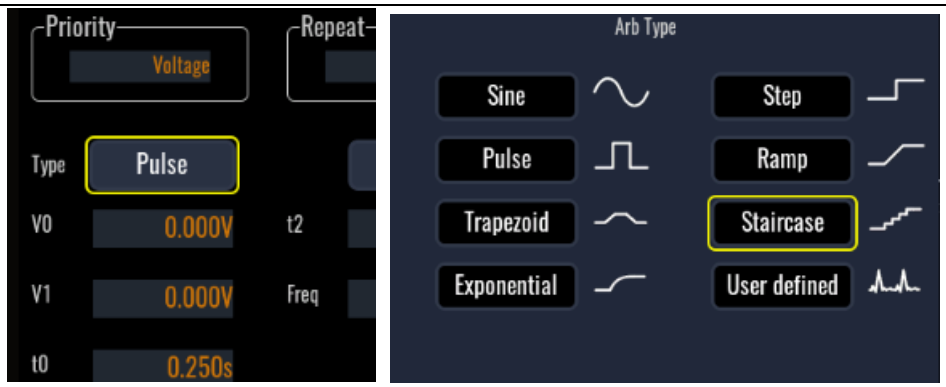


4. Configure the Ramp Properties.

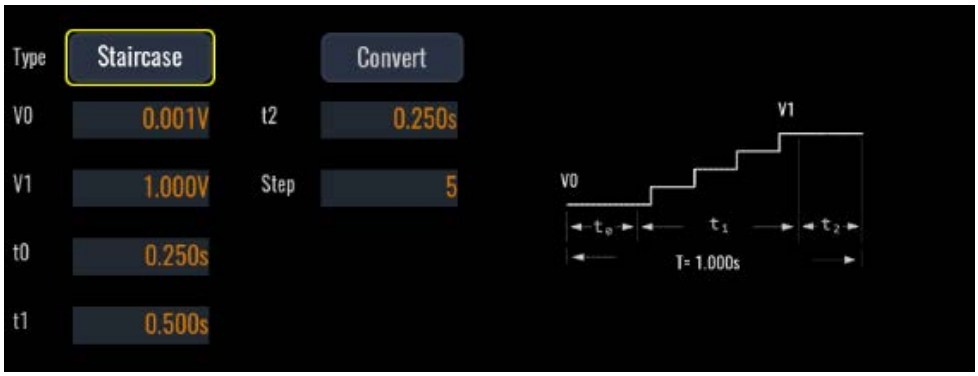
Parameter	Description
V0/ I0	The setting before the ramp.
V1/ I1	The setting after the ramp.
t0	The delay after the trigger is received but before the ramp starts.
t1	The time that the output ramps up.
t2	The time the output remains at the end setting after the ramp completes.

4.2.5 Configuring Staircase Arbs

1. Press the [**Function**] icon on the menu to enter the advanced function selection interface, and click the Arb function icon to enter the arbitrary waveform configuration interface.
2. Select the Priority attribute.
3. Click the button corresponding to Type, select Arb type in the pop-up box to Staircase.



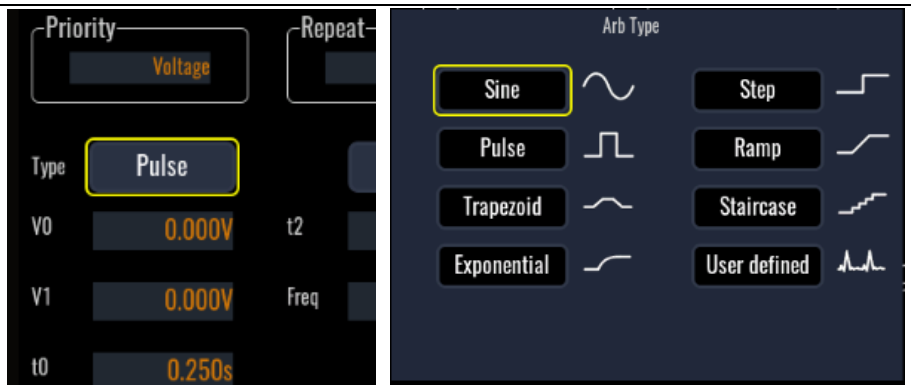
4. Configure the Staircase Properties.



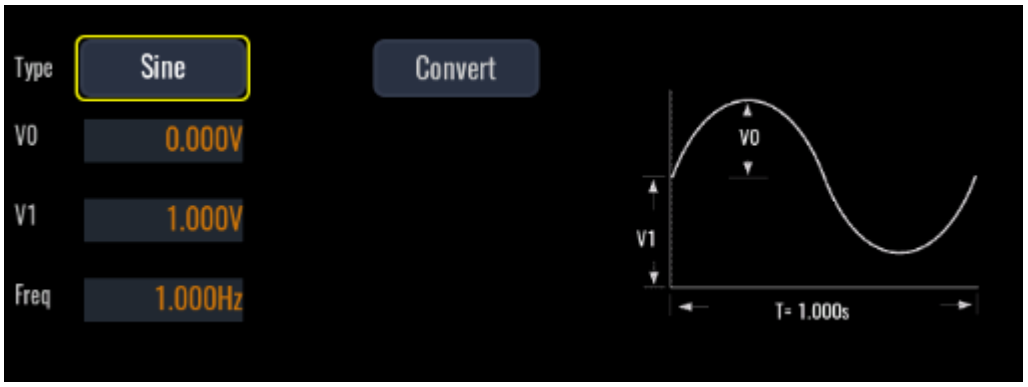
Parameter	Description
V0/ I0	The setting before the staircase.
V1/ I1	The setting after the final step. The difference between the start and end setting is divided equally between steps.
t0	The delay after the trigger is received but before the staircase starts.
t1	The time to complete all staircase steps.
t2	The time the output remains at the end setting after the staircase completes.
Step	The total number of staircase steps.

4.2.6 Configuring Sine Arbs

1. Press the [**Function**] icon on the menu to enter the advanced function selection interface, and click the Arb function icon to enter the arbitrary waveform configuration interface.
2. Select the Priority attribute.
3. Click the button corresponding to Type, select Arb type in the pop-up box to Sine.



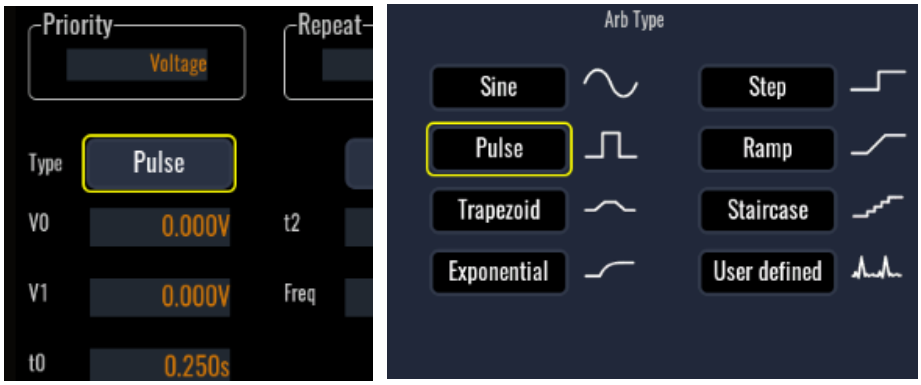
4. Configure the Sine Properties.



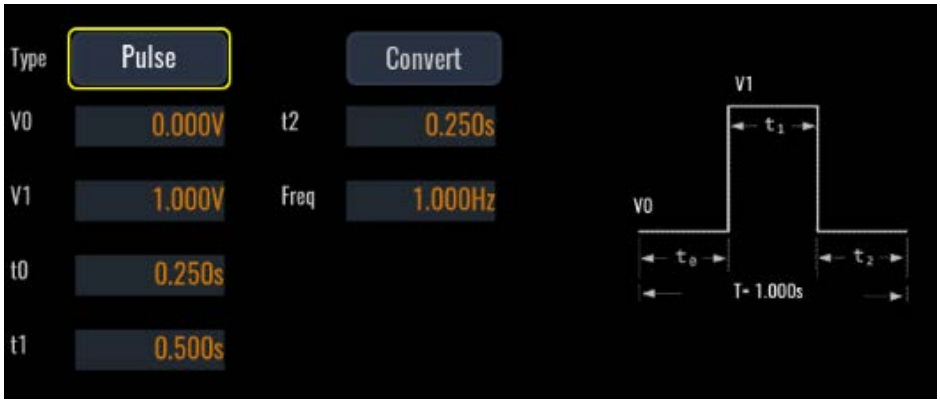
Parameter	Description
V0/ I0	The amplitude or peak value.
V1/ I1	The offset from zero. For power modules that do not generate negative values, the offset must be ≥ Amplitude.
Freq	The frequency of the sine wave.

4.2.7 Configuring Pulse Arbs

1. Press the [**Function**] icon on the menu to enter the advanced function selection interface, and click the Arb function icon to enter the arbitrary waveform configuration interface.
2. Select the Priority attribute.
3. Click the button corresponding to Type, select Arb type in the pop-up box to Pulse.



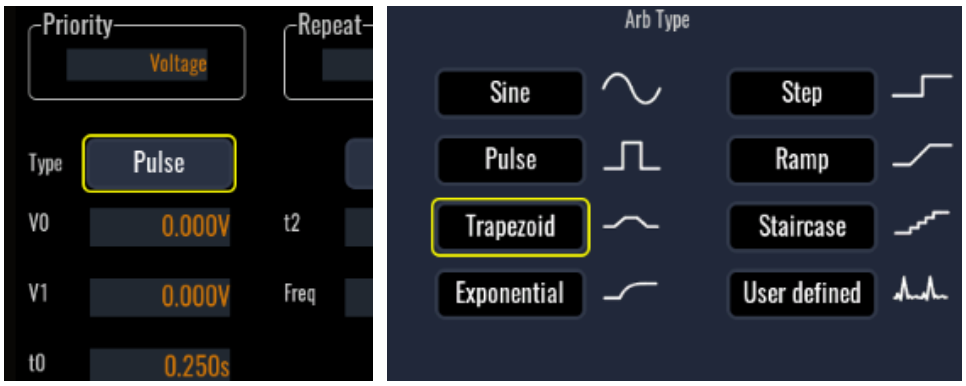
4. Configure the Pulse Properties.



Parameter	Description
V0/ I0	The setting before and after the pulse.
V1/ I1	The amplitude of the pulse.
t0	The delay after the trigger is received but before the pulse starts.
t1	The width of the pulse.
t2	The time the output remains at the end setting after the pulse completes.
Freq	Enter a frequency value directly. this will change the (T0), (T1), (T2) parameters

4.2.8 Configuring Trapezoid Arbs

1. Press the [**Function**] icon on the menu to enter the advanced function selection interface, and click the Arb function icon to enter the arbitrary waveform configuration interface.
2. Select the Priority attribute.
3. Click the button corresponding to Type, select Arb type in the pop-up box to Trapezoid.

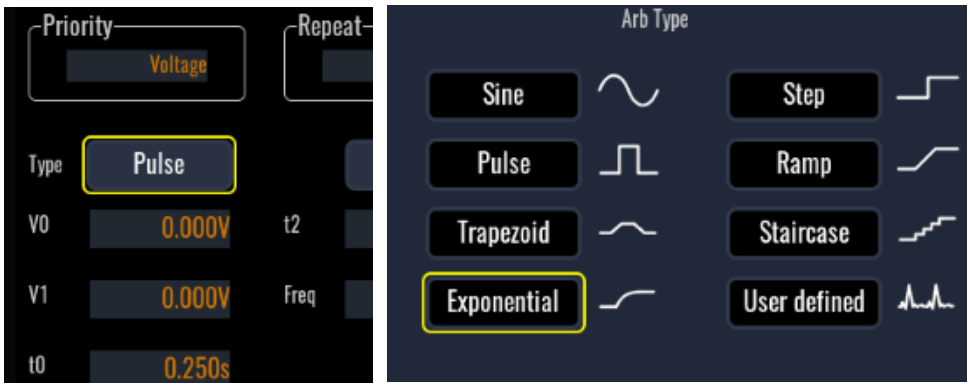


4. Configure the Trapezoid Properties.

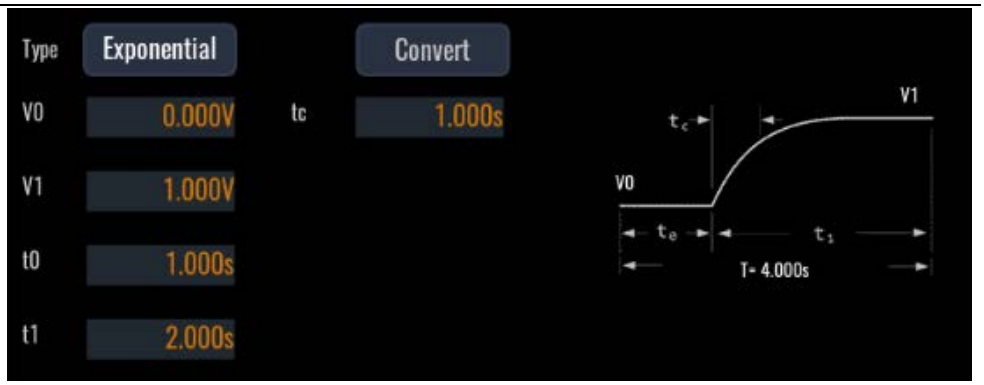
Parameter	Description
V0/ I0	The setting before and after the trapezoid.
V1/ I1	The peak setting.
t0	The delay after the trigger is received but before the trapezoid starts.
t1	The time that the trapezoid ramps up.
t2	The width of the peak.
t3	The time that the trapezoid ramps down.
t4	The time the output remains at the end setting after the trapezoid completes.

4.2.9 Configuring Exponential Arbs

1. Press the [**Function**] icon on the menu to enter the advanced function selection interface, and click the Arb function icon to enter the arbitrary waveform configuration interface.
2. Select the Priority attribute.
3. Click the button corresponding to Type, select Arb type in the pop-up box to Exponential.



4. Configure the Exponential Properties.

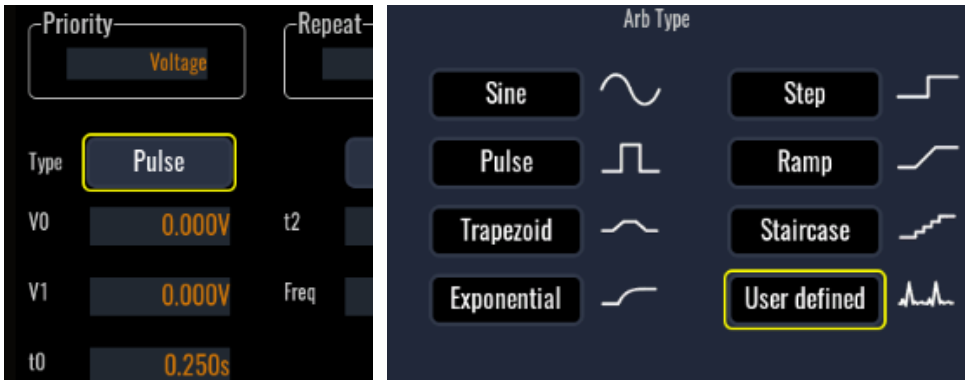


Parameter	Description
V0/ I0	The setting before the waveform.
V1/ I1	The end setting of the waveform.
t0	The delay after the trigger is received but before the waveform starts.
t1	Time for the amplitude to go from the start setting to the end setting.
tc	The time constant of the curve.

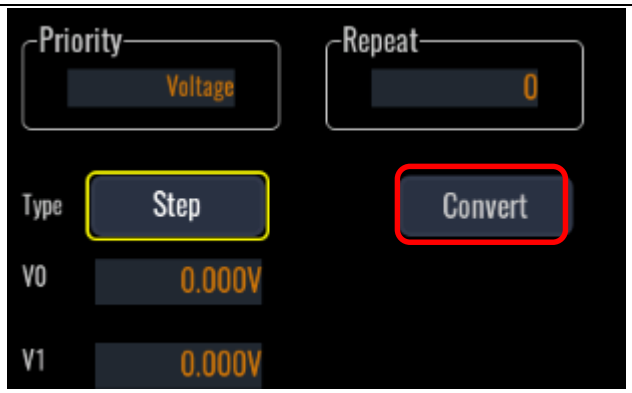
4.2.10 Configuring User-Defined Arbs

User-defined Arb waveforms can be used to edit waveforms via Demo software or imported via USB storage devices. Panel operation does not support editing.

1. Press the [**Function**] icon on the menu to enter the advanced function selection interface, and click the Arb function icon to enter the arbitrary waveform configuration interface.
2. Select the Priority attribute.
3. Click the button corresponding to Type, select Arb type in the pop-up box to User defined.

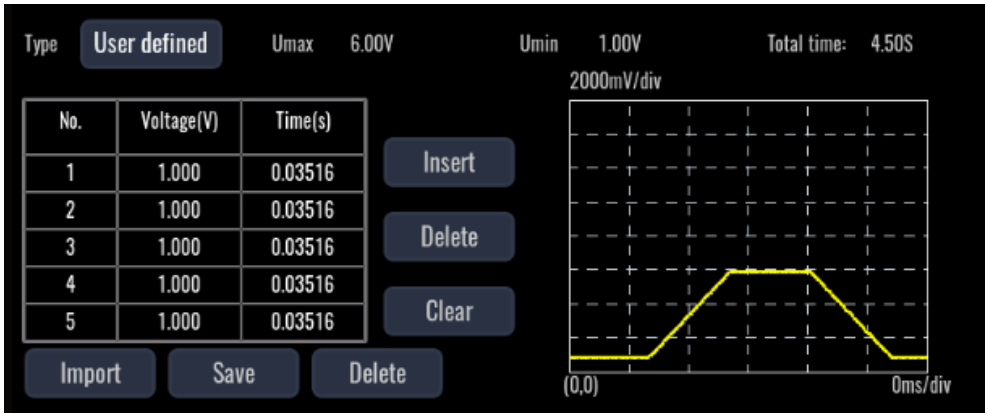


The user can also use the configured "standard" Arb to convert directly to a customized waveform by populating the user-defined Arb with the values from the standard waveform, and then editing those values in the User-defined window.



Convert: Convert the selected waveform type into a customized waveform. Convenient for users to modify waveform parameters directly based on the present waveform.

4. Edit a custom waveform by clicking Voltage and Time in the list on the left. The edited waveform shape is displayed on the right side of the window.



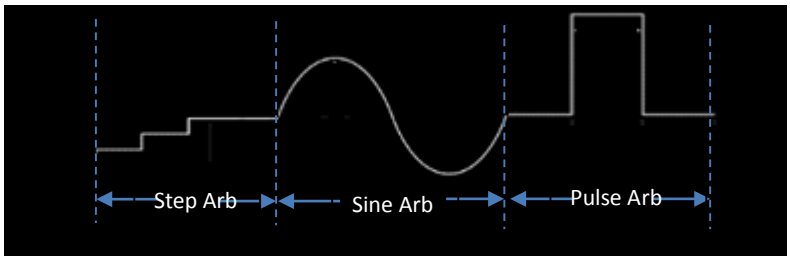
Parameter	Description
Insert	Insert a piece of data
Delete	Delete current data
Clear	Clear all data
Import	Importing waveform data
Save	Save the current customized waveform in the machine or in a USB flash drive. When saved in a USB flash drive, it is saved in the form of a CSV format file, which supports secondary import.
Delete	Deleting custom waveform files

4.3 Configuring an Arb Sequence (ARB Sequence)

The Arb Sequence allows multiple and different Arbs to run one after another is succession. Any of the standard Arb types, except for constant-dwell Arbs, can be included in the Arb sequence. All Arbs in the sequence must be of the same type; either voltage, current, resistance, or power.

As with single Arbs, each Arb in the sequence has its own repeat count, can be set for dwell or trigger pacing, and can be set to repeat continuously. Note also that a repeat count can be set for the entire sequence, and it can also be set to repeat continuously.

The following figure illustrates a sequence comprised of a step Arb, a sine Arb, and a pulse Arb. The repeat count value indicates how many times each Arb repeats before moving to the next type.



1. Press the [**Function**] icon on the menu to enter the advanced function selection interface, and click the Sequence function icon to enter the Sequence waveform configuration interface.

In this interface, the user can select the trigger method for sequence file execution, and then click **[Run]** to output according to the waveform sequence parameters displayed in the window.

Parameter	Description
Trig source	The trigger source for list file running can be set to Immediate, Manual, Bus, PIN1~PIN7.
Repeat	The number of times the file loops
Step	The running step number of sequency
Run	Running the sequency file.
Open	Open the sequency file.
New	Create a new sequency file.
Edit	Edit the sequency file.
Delete	Delete the sequency file.

2. Press the New button to create a new arbitrary waveform sequence.

Parameter	Discription
Priority	Select the voltage or current attribute of the Arb.
Repeat	The number of times the Arb file loops, 0 means infinite loops, the maximum number of loops is 65535.
End	The output state at the end of List file. It can be set to Normal, Last, Off. Normal: jumps to the output state in Fix mode, Last: keeps the last step parameter output, Off: closes the output.
Tout Position	Select whether the trigger signal is generated before or after the step.
Insert	Insert a step after the last step.
Delete	Delete the step.
Clear	Clear all step.
Edit	Edit the selected wave curve information.
Open	Open an existing Arb file.
New	Create a new Arb file.
Save	Save an existing Arb file.
Save as	Name and save the newly edited Arb file.
Apply	Commit the parameter to make the parameter effective immediately.
Delete	Delete the Arb file.
No.	Arb step number
Type	Arb type.
properties	Arb parameter value
Pacing	Method of step jumps to next step.

	Auto: when the time is out, jumps to next step Trig: receive a trigger signal, jumps to next step.
Repeat	Repeat number of Arb waveform
Trigout	Output a trigger signal after the step

3. Select the voltage or current attribute of the Arb.
4. Click Insert icon and insert one Arb waveform.
5. Click and select the waveform, then click Edit to enter the waveform edit interface.

The meaning of Arb waveform parameters and how to edit them refer to chapter 5.2.

In this interface, you can click Add to add a new step, Delete to delete the current step, and click the forward and backward arrow keys to select the step to be edited. It is convenient for users to edit the whole sequence.

6. When you are finished editing, click Esc or  to return to the Sequence File screen.
7. Press **[Save]** and save the sequence file.
8. Press **[Esc]** to return the Arb Sequence run interface.
9. Press **[On/Off]** enble the output, and click the Run icon.

   It displays the step and the Arb Sequence run indicator. Pressing the Meter key displays the output data.

4.4 Configuring Constant-Dwell Arbs

The CDARB constant dwell waveforms are different from other Arb in that they do not have separate dwell values for each point, and the dwell time is set uniformly, and a single dwell value applies to all points. And the minimum dwell time of CD Arb is 0.000005s.

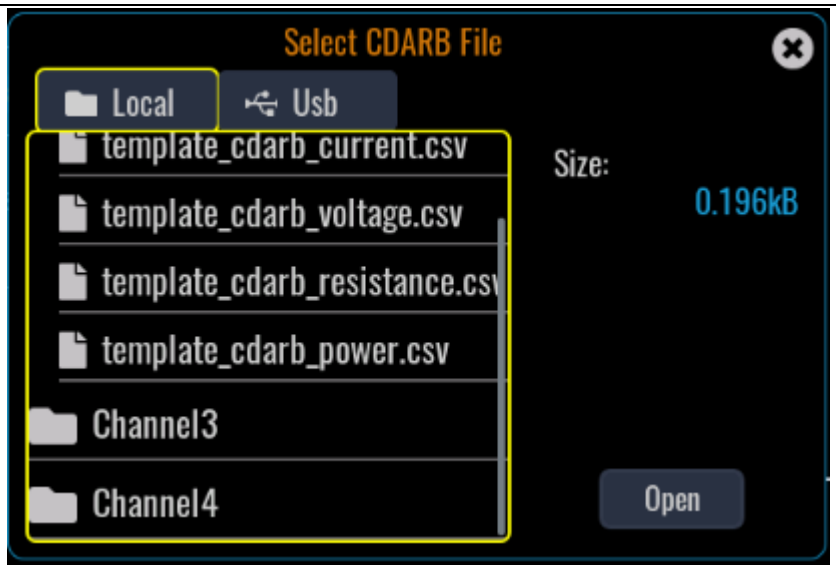
Since CD Arb has many data points, users can edit waveforms by Demo software or web control, front panel operation does not support editing waveforms, only importing csv files.

1. Press the [**Function**] icon on the menu to enter the advanced function selection interface, and click the CDARB function icon to enter the Constant-Dwell Arb waveform configuration interface. Then press the [Edit] button on the interface to enter the main interface for editing the constant dwell wave.

This screen sets the voltage and current attributes, the number of repetitions, the running status at the end, and the residence time maintained by a single step.

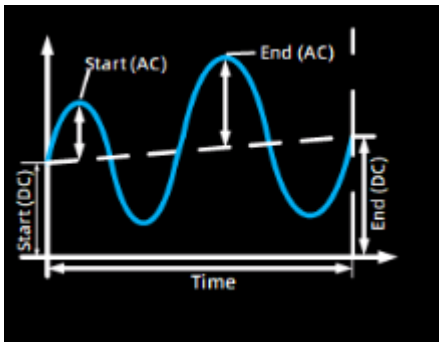
Parameter	Description
Priority	Select the voltage or current attribute of the list, when different output attributes are selected, the waveform definition parameters are different.
Repeat	The number of times the file has been looped, 0 means infinite loops, and the maximum number of loops is 65535.
End	The output state at the end of List file. It can be set to Normal, Last, Off. Normal: jumps to the output state in Fix mode, Last: keeps the last step parameter output, Off: closes the output.
Interpolation	When linear interpolation is enabled, the system automatically performs linear interpolation calculations between discrete data points to generate continuous transition values. The slope between two adjacent points is determined based on the single-step residence time. When linear interpolation is disabled, the system skips the interpolation process and directly outputs the original discrete data points. The slope between two points is determined slope setting.
Dwell per Steps	The width of time that each data point resides. Range from 0.000005s to 10000s.

2. Click the [**Import**] button and select Import Waveform Data.



4.5 Sine Sweep Waveform

The sine sweep function allows you to set the start voltage value, end voltage value, start DC, start frequency, end frequency, and other parameters to depict a sinusoidal scan waveform.



Operation Step

1. Press the [**Function**] icon on the menu to enter the advanced function selection interface, and click the Sine Sweep function icon to enter the Sine sweep waveform configuration interface.

2. Complete the setting of voltage and frequency related parameter values.

Parameter	Description
Priority	Select the voltage or current attribute of the list, when different output attributes are selected, the waveform definition parameters are different.
Repeat	The number of times the file has been looped, 0 means infinite loops, and the maximum number of loops is 65535.
End	The output state at the end of List file. It can be set to Normal, Last, Off. Normal: jumps to the output state in Fix mode, Last: keeps the last step parameter output, Off: closes the output.
AC Start/End	Start/Stop AC Amplitude
DC Start/End	Start/Stop DC offset
Freq Start/End	Start/Stop frequency
Angle	The waveform start angle.
Time	Total waveform duration.

3. Return and press the [**On/Off**] key at the front panel to turn on the power output.
4. Click the [**Run**] key to start running the sine scan waveform. The interface shows the running status.

4.6 Battery Simulation Function

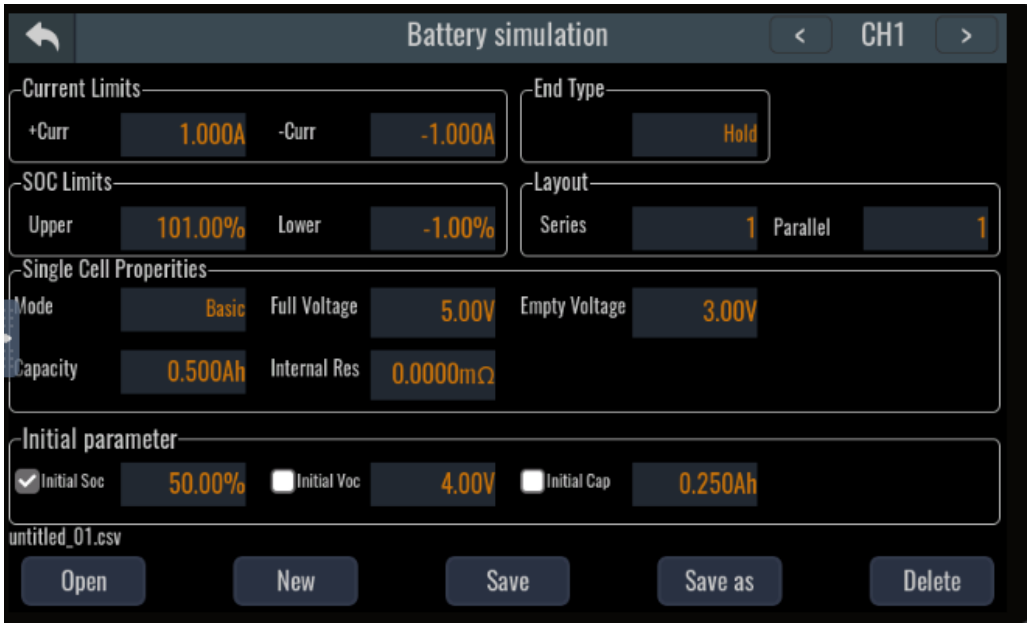
This series power system can simulate battery characteristics in practical applications based on its unique bidirectional properties and the variable output impedance. You can set battery-related parameters to simulate the charge and discharge characteristics of the battery to assist with other tests.

1. Press the [**Function**] icon on the menu to enter the advanced function selection interface, and click the Battery Simulation icon to enter the configuration interface.

Parameter	Description
Set SOC	Sets the current pack SOC state.

Open	Open or select a battery simulation file.
New	Create a battery simulation file.
Edit	the battery simulation file.
Delete	Delete the battery simulation file.
Run	Running the battery simulation test
ESR	equivalent series resistance
Full voltage	Simulates the voltage value when the cell battery is fully charged.
Empty voltage	Simulates the voltage value when the cell battery is in the empty state.
+Curr	Positive current limit value
-Curr	Negative current limit value
Capacity	Simulates the capacity of a cell battery.

2. Click [**New]** or [**Edit]** to create a new battery simulation file or edit the current battery simulation file. The interface is shown below.



Parameter	Description
Current Limits	+Curr: Positive current limit value -Curr: Negative current limit value
SOC Limits	Upper: SOC upper limit Lower: SOC upper limit
End Type	The output state at the end of List file. It can be set to Normal, Last, Off. Normal: jumps to the output state in Fix mode, Last: keeps the last step parameter output, Off: closes the output.
Layout	Series: Number of batteries in series

	Parallel: Number of batteries in parallel
Single cell properties	Parameter settings related to single cell batteries.
	Mode: Battery type, you can choose the Basic or custom Curve.
	Capacity: Simulates the capacity of a cell battery.
	Initial para: Initial battery parameter selection: Initial soc/Initial CAP/Initial VOC
	Sets the initial state of charge of the battery. Check the box before setting the SOC value.
	Full Voltage: full voltage of battery
	Empty Voltage: empty voltage of battery.
	Internal Resistance: internal resistance of battery
Initial parameter	Battery initial state parameter selection.
	Initial Soc: Select the runtime based on the initial charge and fill in the initial charge status value.
	Initial Voc: Select the runtime based on the initial voltage and enter the initial voltage value.
	Initial Cap: Select the runtime based on the initial capacity and fill in the initial capacity value.
Open	Open or select a battery simulation file.
New	Create a battery simulation file.
Save	Save an existing battery simulation file.
Save as	Name and save the newly edited battery simulation file.
Delete	Delete the battery simulation file

3. Press **[Save]** to save.
4. Return and press the [**On/Off**] key to turn on the power output.

Click the [**Run**] key to start running the battery simulation test. The interface shows the running status.

4.7 Battery Charging Test Function

This series of power systems supports the battery charging function. Users edit the test file in the interface and call the battery test file to execute the test as needed.

Precautions

Please confirm that you have understood the general safety precautions before connection. Please pay special attention to the following safety precautions when connecting the battery.

WARNING

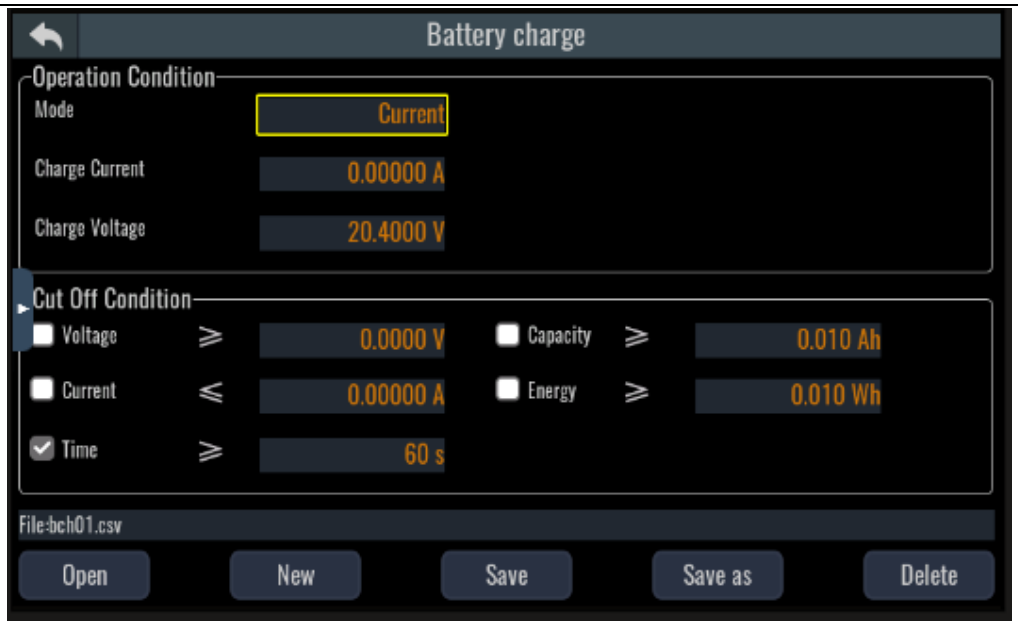
- When connecting the DUT (battery/capacitor), do not short-circuit the battery.
- To avoid battery short circuit, be sure to check that the test line end is not connected when connecting or disassembling the test line. When the test line end is connected with battery, short circuit may cause severe accident.
- To avoid the damage of the instrument, please make sure the positive and negative electrodes of the electrode when connecting the battery and other energy storage equipment.
- Hazardous voltages may still be present on the positive and negative electrodes after the unit is turned off; never touch the cables or electrodes immediately. Make sure that no dangerous voltage is present on the electrodes or sense terminals before they are touched.

1. Press the [**Function**] icon on the menu to enter the advanced function selection interface, and click the Battery Charge icon to enter the configuration interface.

The left side displays the battery charge file parameters, refer to the parameter introduction in the battery charge file editing function for details.

Parameter	Description
Open	Open or select a battery charge test file.
New	Create a battery charge test file.
Edit	Edit the battery charge test file.
Delete	Save as the battery charge test file.
Run	Run the test

2. Click **[New]** or **[Edit]** to create a new battery charge file or edit the current battery charge file. The interface is shown below.



Parameter	Description
Mode	Select the charge mode for battery charge.
Charge Current	Set the current value for charging
Charge Voltage	Set the voltage value for charging
Cut Off Condition	Battery charge test cut off condition
	Voltage: Charging ends when the voltage is greater than or equal to this setting.
	Current: Charging ends when the current is less than or equal to this setting.
	Time: Charging ends when the time is greater than or equal to this setting.
	Capacity: Charging ends when the capacity is greater than or equal to this setting.
	Energy: Charging ends when the energy is greater than or equal to this setting.
Open	Open or select a battery charge test file.
New	Create a battery charge test file.
Save	Save the battery charge test file.
Save as	Save as the battery charge test file.
Delete	Delete the battery charge test file.

3. Press **[Save]** save the file.
4. Return and press the [**On/Off**] key at the front panel to turn on the power output.
5. Click the [**Run**] key to start running the waveform. The interface shows the running status.

4.8 Battery Discharging Test Function

This series of power system supports battery discharge function in bidirectional source mode or load mode. Users edit the test file in the interface and call the battery test file to execute the test as needed.

Precautions

Please confirm that you have understood the general safety precautions before connection. Please pay special attention to the following safety precautions when connecting the battery.

WARNING

- When connecting the DUT (battery/capacitor), do not short-circuit the battery.
- To avoid battery short circuit, be sure to check that the test line end is not connected when connecting or disassembling the test line. When the test line end is connected with battery, short circuit may cause severe accident.
- To avoid the damage of the instrument, please make sure the positive and negative electrodes of the electrode when connecting the battery and other energy storage equipment.
- Hazardous voltages may still be present on the positive and negative electrodes after the unit is turned off; never touch the cables or electrodes immediately. Make sure that no dangerous voltage is present on the electrodes or sense terminals before they are touched.

1. Press the [**Function**] icon on the menu to enter the advanced function selection interface, and click the Battery Discharge icon to enter the configuration interface.

The left side displays the battery discharge file setting parameters, refer to the parameter introduction in the battery discharge file editing function for details.

Parameter	Description
Open	Open or select a battery charge test file.
New	Create a battery charge test file.
Edit	Edit the battery charge test file.

Delete	Save as the battery charge test file.
Run	Run the test

2. Click **[New]** or **[Edit]** to create a new battery discharge file or edit the current battery discharge file. The interface is shown below.

Parameter	Description
Discharge Mode	Set the discharge mode for Discharging
Discharge Current	Set the current value for Discharging
Discharge Voltage	Set the voltage value for Discharging
Cut Off Condition	Battery charge test cut off condition
	Voltage: Discharging ends when the voltage is less than or equal to this setting.
	Current: Discharging ends when the current is less than or equal to this setting.
	Time: Charging ends when the time is greater than or equal to this setting.
	Capacity: Charging ends when the capacity is greater than or equal to this setting.
	Energy: Charging ends when the energy is greater than or equal to this setting.
Open	Open or select a battery charge test file.
New	Create a battery charge test file.
Save	Save the battery charge test file.
Save as	Save as the battery charge test file.

Delete	Delete the battery charge test file.

3. Press [**Save**] save the file.
4. Return and press the [**On/Off**] key at the front panel to turn on the power output.
5. Click the [**Run**] key to start running the waveform. The interface shows the running status.

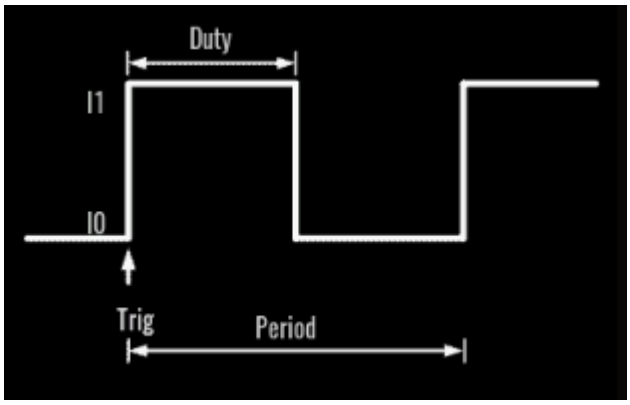
4.9 Dynamic Functions (Load module support)

Through dynamic test operation, the electronic load can be switched between two setting parameters based on setting rules. This function can be used to test dynamic performances of power supply.

The dynamic test mode can be divided into continuous mode, pulse mode and toggle mode.

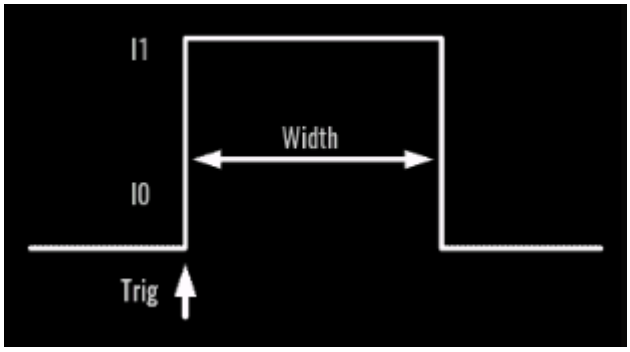
Continuous mode

Under continuous mode, after enabling dynamic test operation, the load will be switched continuously between I0 value and I1 value. The following picture shows the current waveform in continuous transient operation.



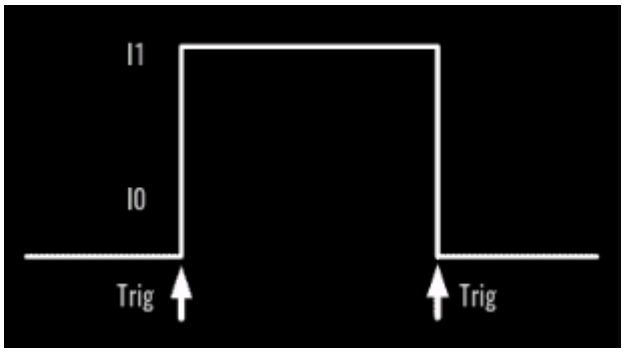
Pulse mode

Under pulse mode, after enabling dynamic test operation, the load will switch to I1 value after receiving of a trigger signal. Then the load will switch back to I0 value and be constant at I0 value after maintaining I1 for pulse width time. The following picture shows the current waveform in pulse transient operation.



Toggle mode

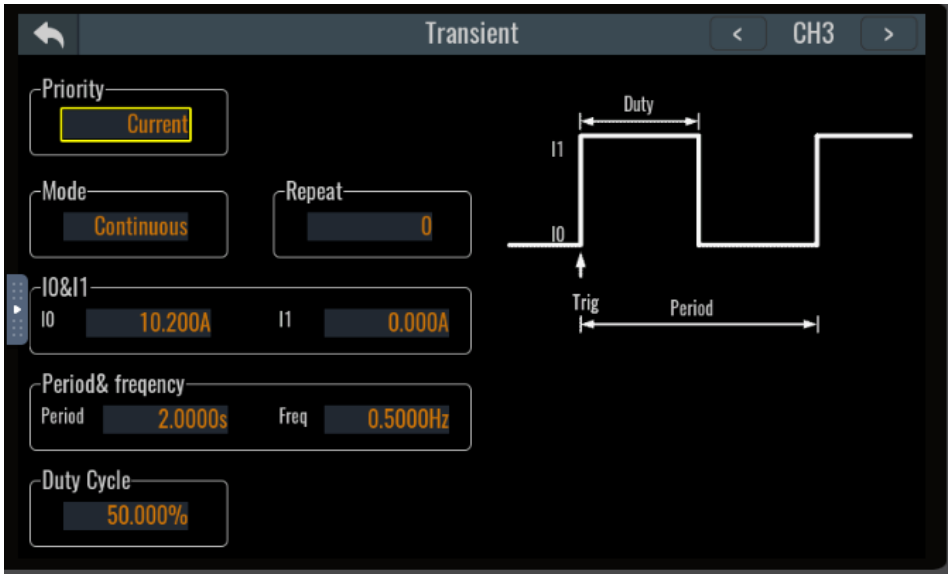
Under toggle mode with dynamic test function enabled, the load switches between I0 value and I1 value upon receiving a trigger signal, as shown in the following figure. The following picture shows the current waveform in toggle transient operation.



Operation Step

1. Press the [**Function**] key on the front panel to enter the advanced function selection interface, and click the **Transient** function icon to enter the dynamic function configuration interface. Then press the **Edit** button in the interface to edit.

   Take continuous mode as an example to introduce the operation procedure, please refer to the actual display for other modes:



2. In the edit screen, complete the setting of the relevant parameter values.

Parameter	Description
Priority	Select dynamic attributes,voltage/current/power /resistance
Mode	Dynamic mode
Repeat	The number of times the dynamic test file loops, 0 represents infinite loops, and the maximum number of loops is 65535.
I0/I1	Two state values that are dynamically switched. Depending on the Priority, the value attributes are set

	differently. Take CC mode as an example, set two current values.
Period&frequency	Set the period or frequency to set the period duration of the waveform.
Duty Cycle	The waveform duty cycle, which controls the length of time the I1 state is maintained.

3. Press the [**On/Off**] key at the front panel to turn on the instrument output.
4. Click the [**Run**] key to start running the dynamic waveform. The interface shows the running status.

Chapter5 Using the Measurement Function

This series power system has a powerful measurement function, a variety of measurement modes to meet the user's various needs, the measurement function includes: Meter function, oscilloscope function

5.1 Meter Function

Each output has its own measurement capability. When the Meter view is displayed, the measurement system continuously measures the output voltage and current.

The measurement system acquires as many points as needed based on the number of power line cycles (NPLC) and the time interval, and averages the samples.

As shown below, The single-output view, the four output view and 8 output view.

Press the Meter and View key 

to toggle between the views.

- Single-output view

In this view, the user can select the channel number displayed in the main screen by clicking on the channel number. The main screen can display the current output setting status of the instrument, slope status, power limit, protection setting and output voltage and current power measurement information.

Only the output status and voltage and current measurements are displayed in the other small screens.

- Four output view

In this view, the default four channels CH1, CH2, CH3 and CH4 are shown in large display. The user can click the channel number to select the channel displayed in the main screen. The main screen can display the current output setting status of the instrument and the output voltage, current and power measurement information.

Only the output status and voltage and current measurements are displayed in the other small screens.

- Eight output view

This view displays the output setting status, the output voltage and power measurement information of the eight channels.

5.2 Instrument measurement settings

Measurement parameters can be configured for all power/load modules, including sampling mode selection, measurement parameter adjustment, and more.

5.2.1 Remote Measurement Function

The IT2705 series instruments support both local and remote measurements, of which remote measurements are suitable for scenarios that require high measurement accuracy (see the IT2705 user user manual for more information).

The procedures to set the menu item are as follows.

1. Press the **[Config]** keys to enter the configuration menu.
2. Press the up/down key or rotate the knob to select **Source** and press [**Enter**].
3. Select **Remote Sense** and set the status.

- Off: Default value, indicates turn the sense function off.
- On: Indicates turn the sense function on.

After the parameter settings are complete, press [**Enter**].

5.2.2 Setting sampling mode

Select the Measure tab in the Config menu to set the parameters related to the measurement.

- NPLC: Number Power Line Cycles
- Aperture: Sampling frequency mode selection.
- Time Interval: Time sampling mode
- Line frequency: AC power supply frequency
- Points: Sampling points

5.2.3 Whour & Ahour measurement

The instrument can measure the energy parameter ampere-hour and watt-hour data. In the Config menu you can choose whether or not to auto zero before output.

5.2.4 Select measurement range (SMU module support)

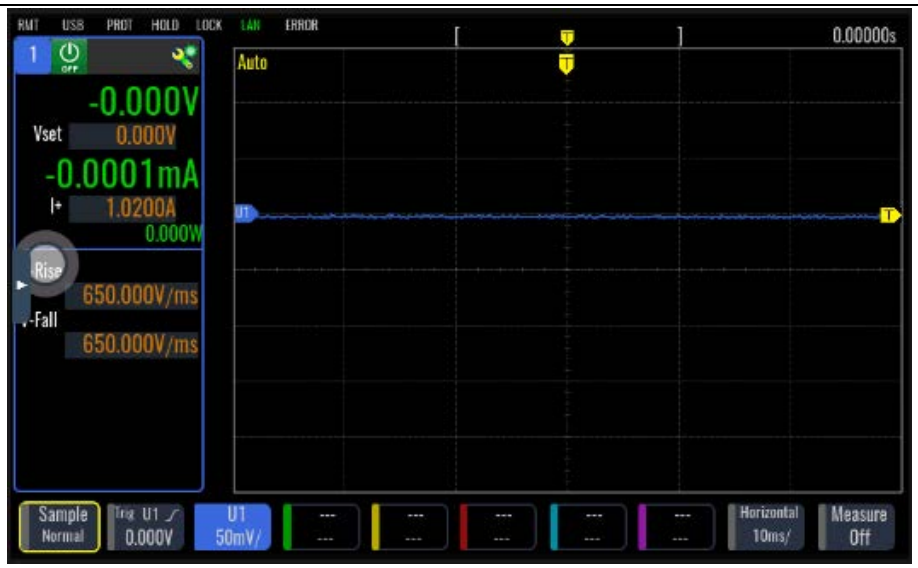
The SMU module supports voltage and current range settings, with different ranges offering more suitable resolution and measurement accuracy.

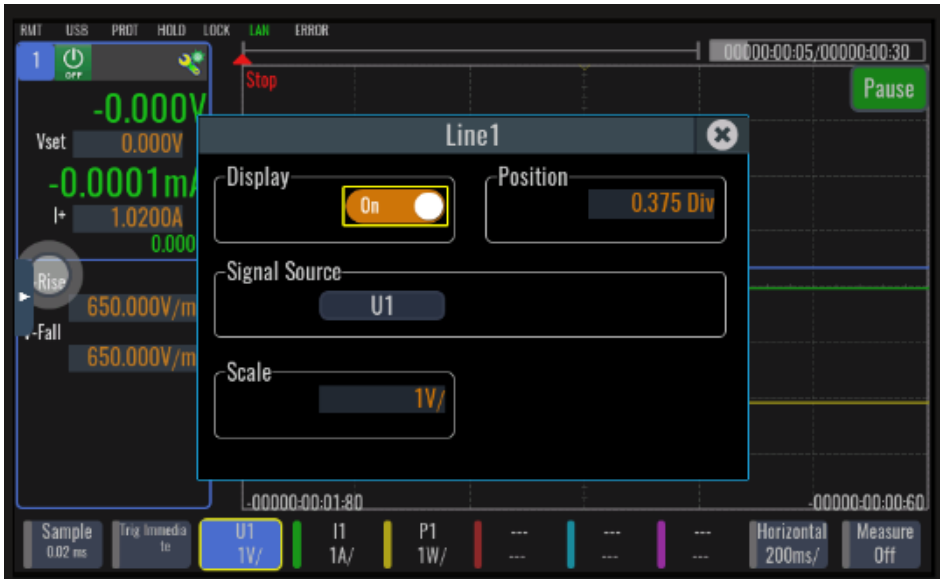
- After selecting the priority in the Config menu, set the range for voltage or current. When setting, the voltage and current values are controlled by the range.
- In the Config menu, select the Measurement tab. Select the current measurement range. Users can select the current measurement range. Different ranges have different current measurement resolutions and accuracies.

5.3 Scope Function

The power system's scope function is similar to a bench oscilloscope, displaying output voltage and current signals as a function of time. It has controls that select which outputs and functions to display, front panel knobs that adjust gain and offset, and configurable triggers and markers.

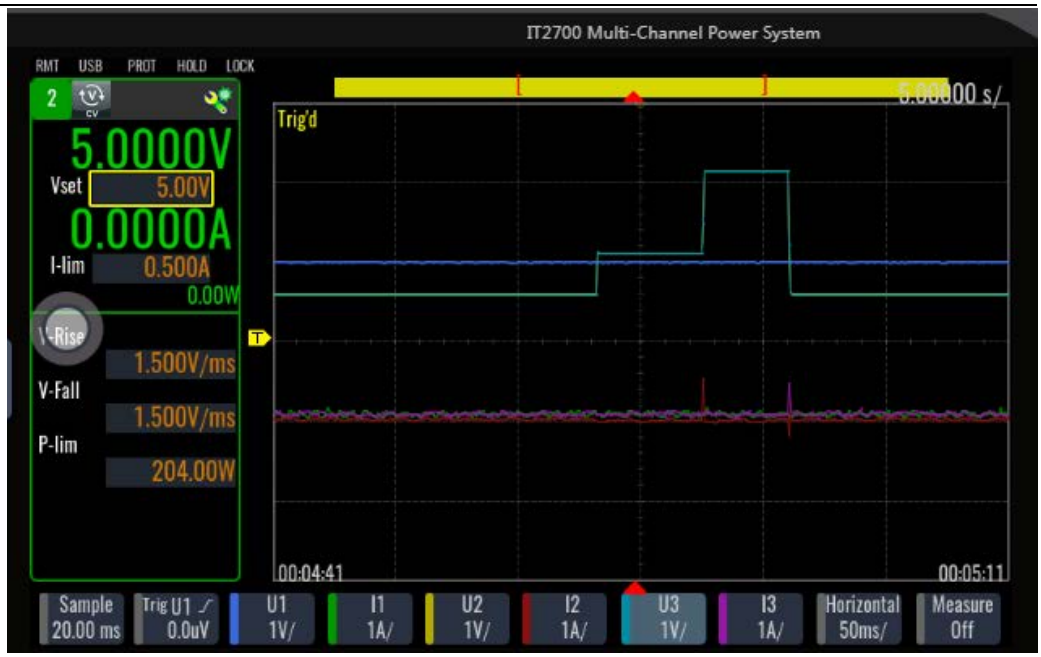
You can configure the Scope View to display voltage or current waveforms for all outputs. As explained under Horizontal Properties, the maximum sampling rate of the scope varies, depending on the number of waveforms that are displayed. Note that in the Scope View there is only one time-base and trigger configuration for all outputs.





5.4 Data logging function

The Data Logger is similar to the Scope View function, you can configure the Data Logger View to display voltage or current waveforms for all outputs. The display functions like a strip chart recorder. Use the Waveform Display knobs to scroll through the data. Unless specified otherwise, data is automatically stored to a file named *default.dlog*.



Configure the data logger properties:

Press the **Sample** key to configure the data logger properties.

Parameter	Description
Run/Stop	Start/stop sampling data.
Default	Restores the initial value setting.
Duration	Sampling duration
Sample Period	Sample Period
Log Min/Max	Whether to sample the maximum and minimum values.
Signal source	Data source
Continuous	Check this box to enable the task to run on a recurring

	schedule.
Store Area	The storage location to be saved can be either local or USB drive.
File Type	You can select the format of the saved data file. Csv and Tdms can be selected
File Name	Setting the name of the saved data file
Export to Udisk	Export to a USB flash drive.

5.5 Electrochemical Impedance Spectroscopy (SMU module support)

Electrochemical Impedance Spectroscopy (EIS) is a technique used to investigate the characteristics of electrochemical systems by applying a small-amplitude AC perturbation and measuring the system response. It supports impedance spectroscopy analysis of samples such as batteries, corrosion systems, sensors, and supercapacitors, providing complex impedance data in the frequency domain for evaluating electrode interface properties, reaction kinetics, and material performance.

When configured with the Source Measure Unit (SMU) module, the IT2705 supports Electrochemical Impedance Spectroscopy (EIS) testing.

Note

After switching to the EIS function, the instrument will automatically switch to sense remote measurement mode. Before performing the test, please ensure that the sense measurement lead is connected; otherwise, the instrument will trigger a sense protection error.

1. Press the [**Function**] key on the front panel to enter the Advanced Function Selection interface. Tap the **EIS** icon to access the main interface of the **EIS** function. The display style varies depending on the selected display mode; the following description uses the default interface as an example.

Parameter	Description
Normal	Select data analysis mode, include Numeric, Bode Plots, Nyquist, Table.
Start	Start to EIS test.
Edit	Edit the mode and parameters of EIS.
Z	Impedance value
Φ	Angle value
AC	Display AC voltage, AC current, and frequency values
DC	Display DC voltage, DC current

2. Click [**Edit**] to enter the EIS Function Edit interface. In this interface, you can configure source-related parameters for EIS, set chart display parameters, and perform pre-measurement zeroing operations. All parameters and zeroing results can be saved into a file for convenient recall in subsequent tests.

Parameter		Description
DC/AC	Mode	Select the signal setting mode. Sweep: Scan based on step values Fixed: Output fixed at the set value
	Edit	The mode selection is displayed only during scanning. Edit the point list data for DC/AC.
	DC	Offset of waveform
	AC	Amplitude of waveform
Frequency	Mode	Signal Frequency Value Setting Mode

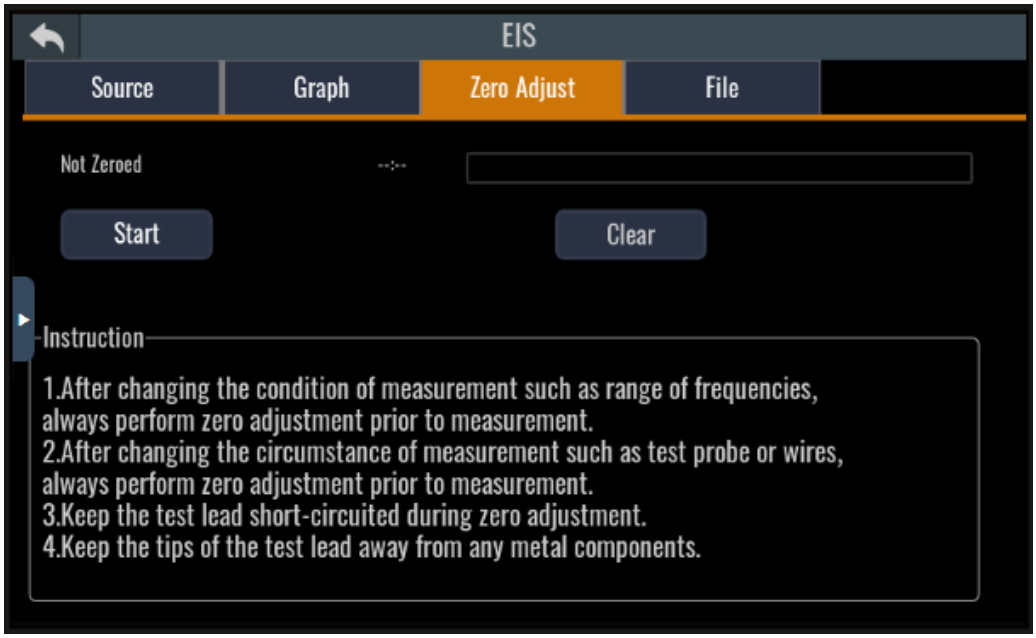
	Sweep: Scan based on step values Fixed: Output fixed at the set value
Sweep Type	When the frequency mode is set to scan, select the type of frequency scan: linear, logarithmic, or list.
Start Freq	When the frequency mode is set to scan, the starting frequency of the scan is displayed, with a range of 0.01 Hz to 20000 Hz.
Stop Freq	When the frequency mode is set to scan, the stop frequency of the scan is displayed, with a range of 0.01 Hz to 20000 Hz.
Step Freq	Scanning single-step frequency.
Step count	The number of steps scanned and the step frequency influence each other.
Convert	Convert the current linear or logarithmic data into a list format and perform editing within the list. In this mode, linear or logarithmic data is directly switched to the list mode.

Description	Description
Cursors	When selecting a Bode plot or Nyquist plot, the interface displays the M1 and M2 cursors.
Bode Plits Display Item	The impedance parameters displayed on the interface when selecting a Bode plot or Nyquist plot.

3. Press the [**Return**] key to go back to the main interface.

4. Press the [**Start**] key to execute the measurement. Before starting, you can perform a zeroing operation in the Edit interface to eliminate environmental background noise and improve measurement accuracy.

   When performing this step, follow the on-screen instructions to short-circuit the sense lead and the output lead.



Chapter6 System-Related Functions

6.1 Setting System General Parameters

Select System -> General to setting system general parameters.

Set the Power-on State

This parameter determines the state of the instrument after power on.

1. Press the **General** under the system menu.
2. Turn the knob to select the **Power on settings**.

- Reset: Default value, indicates when the instrument is powered on, the instrument will initialize some parameter settings or state, such as output voltage and output current.
- Last: Indicates when powered on, the instrument will remain the same parameter settings and output status as last time you powered off the instrument.
- Last+Off: Indicates when powered on, the instrument will remain the same settings as last time you powered off the instrument, but the output status is **Off**.

Restored to Factory Setting

This menu item is used to restore some parameter settings to factory setting values.

1. Select the **General** under system menu.
2. Press **Reset** in **Factory default settings.**

Setting Current Display Symbol for Load

This option is used to set the symbol of the load current display. Selecting Positive+, the load current displays positive current value. Selecting Negative-, the load current displays a negative current value.

Set Slope Type for Source mode

This option is used to set the type of power supply slope setting. Selecting Rate indicates that the set slope is a speed value. Selecting Time indicates that the set slope is a time value.

System Reboot

This option is used to reboot the system.

6.2 Setting Instrument General Function

Select System -> Preference to setting instrument general parameters.

Set the keyboard sound

This item can set the key sound state.

- If **Key Click Buzzer** is set to ON mode, then when you press a button, the instrument will beep. If it is OFF mode, the beeper will not make a sound.

The default set is in ON mode.

- If **Alarm Buzzer** is set to ON mode, the buzzer sounds when protection occurs; if it is OFF, the buzzer does not sound.

Set the screen brightness

This item can set the screen brightness. Set the screen brightness within the range 1 to 10 by pressing number keys on the front panel. The larger the number is, the higher the screen brightness is. You can also set the screen brightness by rotating the knob on the front panel.

Set the Soft Keyboard

The user can open the soft panel in the menu. When the parameter is set to ON, the soft keyboard is enabled. And when setting parameters on the screen, the soft keyboard appears. Convenient users directly touch screen to select the number.

Set the Knob Function

Set the **Knob immediately Effective** function. If set to ON, the Knob setting will take effect immediately. If set to OFF, press Enter to confirm the effect after the Knob setting is completed.

Default Meter View Settings

This menu item allows you to set the default display of the screen, for example, select Meter3 and the meter interface displays 3 channel screens after power on. The user can select Meter1, Meter3, Meter6 in the menu.

Select Language

Users can select the instrument language type from the menu.

Set Touch Screen

The user can turn off or turn on the touch screen function.

If set to on, the touch screen is effective, if set to off, the touch screen is invalid.

6.3 Setting Communication

This menu item is used to set the communication method between the instrument and the PC. IT2700 series instruments are equipped with USB and LAN interfaces as standard.

The user selects the used communication interface in the menu, and the user only needs to set the communication parameters and keep them consistent with the PC settings.

- To select the USB communication method, the USB type must be select to DEVICE.
- To select the LAN communication method, you need to configure the gateway address, IP address, mask address and socket port.

6.4 Screen Lock Function

Click **[Shift] + [6]**（Lock） on the front panel to lock the instrument screen. In the screen lock state, click any position of the screen, the interface will prompt

"Do you really want to unlock it?". Users can choose ok to release the screen lock status.

6.5 Switching Local/Remote Mode

When the instrument is in RMT remote control mode, the user can switch the instrument from remote mode to local mode by clicking **[Shift] +[3]**(Local).

After the instrument is powered on, the default is the local operation mode. In local operation mode, the touch screen can be operated normally, and the screen is not available when the power is in remote operation mode.

Switching from local to remote operation mode can be controlled by command from PC. The change of operation mode does not affect the set parameters of the instrument.

6.6 Save and Recall Operations

The power system can save common parameters in nonvolatile memory for user to recall conveniently.

The saved parameters include:

- Power supply mode
- Present output mode
- Config menu settings

You can do the save and recall operations by the following two methods.

- In the menu interface, press the [**Shift**]+[2](Save) button to save the parameters. Press the **Recall** to recall the parameters.
- SCPI commands: *SAV and *RCL

Saving the parameters

The save parameter operates as follows:

1. Press [**Shift**]+[2](Save).
2. Select the save data location.
3. Press [**Enter**].

When saving is completed, the interface will display the saved detailed parameters.

Recalling the Parameters

Recalling the data in the memory and used as the present setting value.

1. Press [**Recall]** to enter the recall parameter interface.
2. Select the recalling data location.
3. Press [**Enter**].

When recalling is completed, the interface will display the saved detailed parameters.

6.7 Screen Capture Function

IT2700 series power supply has the screen capture function. Insert the USB equipment into the USB interface of the front panel, and press **[Print]** to capture and save the screen into the USB disk.

When you need the screen capture function, the USB type under the system menu needs to be set to **Host**.

6.8 Query the System Log

The IT2700 series power system provides the system operation Log query function. Click shift+5[Log] to enter the Log query interface. You can view historical system operation records on this screen.

6.9 Query the System Information

Users can click**[Shift]** + [**4**] (Info) to enter the system information interface to view all channel information, including channel module name, SN number, specifications, and firmware program version.

When the instrument requires maintenance, the user needs to check this information for confirmation.

6.10 System Management Functions

IT2700 series power system supports system management function, click Admin function in Menu to enter the system management interface and log in, in this interface you can clean up the data and change the system password.

The default password is 2700 when the instrument is shipped from the factory.

Login/Logout

Access the information and landing pages of the system administration interface.

Calibration

View the calibration records.

Sanitize

Erase system logs and information, including all functional data and files.

Firmware update

Upgrade the firmware program in the machine UI interface. This series of instruments provides three update methods. The UI update method is performed in this interface, and in addition, it can be updated via boot update or Web update.

Firmware Sync

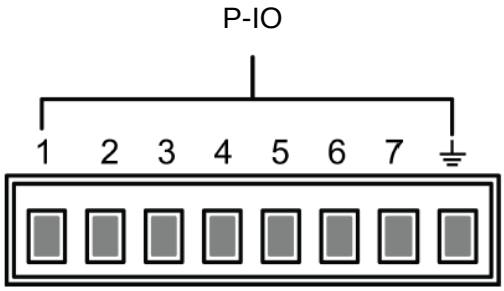
View the firmware version of module.

6.11 Digital I/O Function

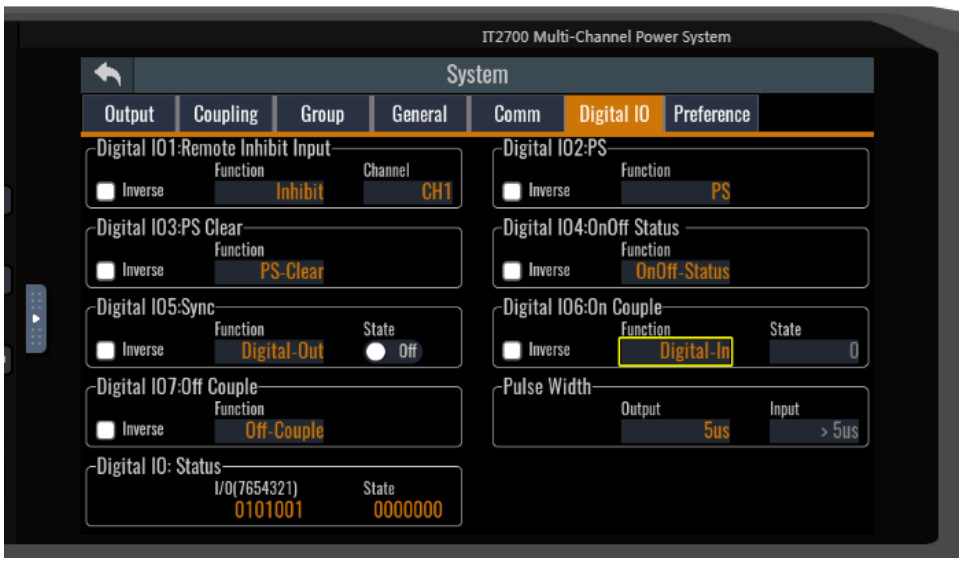
This series power system supports digital I/O function. The user can realize logic control over high and low level input or output by related configurations in the system menu.

Pins Introduction

Different I/O implements different functions. The detailed functions description are shown in the figure below:



Pin	Type	Description	Properties
Digital IO-1	Input/Output	Remote Inhibit, Turn off the output under emergency status	Level signal
Digital IO-2	Input/Output	PS, Protection state indicator	Pulse signal
Digital IO-3	Input/Output	PS Clear, Clear the protection state	Level signal
Digital IO-4	Input/Output	OnOff Status, OnOff-status indicator	Level signal
Digital IO-5	Input/Output	Sync, synchronous control	Pulse signal
Digital IO-6	Input/Output	On Couple, Turn on the output	Pulse signal
Digital IO-7	Input/Output	Off Couple, Turn off the output	Pulse signal
⏚	Ground terminal, that is, the negative terminal corresponding to each of the above 7 pins.		



General Digital I/O Function

- Signal definition

Digital I/O functions involve input and output levels and pulse signals.The input signal is the control signal provided externally to IT2703, the output signal is the level signal provided externally by IT2703, and the pulse signal is the edge signal switched between high and low levels.

Input signal	High level signal	Typical: 5V Range: 1.6V-15V Current: ≤100mA
	Low level signal	Typical: 0V Range: -5V-0.8V Current: ≤100mA
Output signal	High level signal	Voltage level: 5V Current: ≤1mA
	Low level signal	Voltage level: 0V Current: 0.5mA
Pulse	Level rise slope	10us
	Level fall slope	2us
	Width	Can be set from 5us to 500us

- Input/Output Function

  The IO-1 ~ IO-7 pins are featured default function, the user can setting the function of pin according to requirement. The Input and Output are the general digital I/O function, and the parameter settings and functions of the seven pins are the same.
  The IO-1~IO-7 pins provide default functions. Users can realize control according to the functions defined. Users can also reset the input or output properties of the present pin and customize the function use of the pin according to their needs.
  When pins 1 to 7 are configured to Output function, when send the command (IO:STATe 1/0) to instrument, the IO pin can output high level (False) or low level (True).
  When pins 1 to 7 are configured to Input function, an external signal can be Input to this pin, and the instrument can detect the state of the external signal.

- Signal Revert

  Select Invert or not under the IO Settings menu. If setting to OFF, it means the default level will be valid. If setting to ON, it means the valid signal is reversed. For example, the IO-1 pin is inhibit output by default and the high level is valid, when select revert ON, the low level is valid and the instrument output is disabled.

Digital IO-1

IO-1 pin can be set to 【Inhibit】, 【Digital-In】, 【Digital-Out】, 【Trig-In】, 【Trig-Out】

The default function is inhibit output. When the IO pin is configured for a Inhibit

function and the level signal is low, the output of the machine is forbidden. At this point, Pin 1 has a bi-directional I/O function, which can both receive the level signal input from the external instrument and output the level signal outward.default level is high, and low is valid when entering. Outgoing output also generates low level signals.

Digital IO-2

IO-2 pin can be set to 【PS】, 【Digital-In】, 【Digital-Out】, 【Trig-In】, 【Trig-Out】

The default function is protection state indicator. IO-2 pin will output high or low level based on whether the instrument is under protection or not. Under normal conditions (Not under protection), and when pin2 is under default setting (Not Invert), pin2 outputs high level; when the instrument is under protection, pin2 outputs low level. When pin2 is set to Invert, the output level is completely opposite.

Digital IO-3

IO-3 pin can be set to 【PS-clear】, 【Digital-In】, 【Digital-Out】, 【Trig-In】, 【Trig-Out】

The default function is to clear the protected state. When the protection occurs, the protection state can be cleared through this pin, so that the instrument can continue to output normally.

IO-3 is bi-directional, that is, when the power supply is in a protected state, the instrument can receive a pulse signal from an external input through IO-3 for clean protection operation, or when the power supply is in a protected state, the clean protection can generate a pulse signal from IO-3.

Digital IO-4

IO-4 can be set to 【OnOff-status】, 【Digital-In】, 【Digital-Out】, 【Trig-In】, 【Trig-Out】

The default function is to indicate the output state of the power supply, in case of output is ON, output 5V, otherwise, output 0V.

When pin4 is set to Invert, the output level is completely opposite.

Digital IO-5

IO-4 pin can be set to【Sync-in】, 【Sync-out】, 【Digital-In】, 【Digital-Out】, 【Trig-In】, 【Trig-Out】

This function can be used to simulate the six-phase output mode, in which one IT2700 outputs a synchronous signal to another IT2700, and the second power supply runs synchronously with the frequency and phase of the first power supply to realize the six-phase output function.

【Sync-in】: Synchronous input function, which is used to output frequency lock or phase lock with the external signal. At this time, the machine synchronizes the frequency or phase information input from the IO-5 pin.

【Sync-out】: Synchronous output function, the IT2700 produces synchronous signal to the outside, which is AC zero crossing pulse signal sent from the IO port.

Digital IO-6

IO-6 pin can be set to 【On-Couple】,【Digital-In】,【Digital-Out】,【Trig-In】,【Trig-Out】

Digital IO-7

IO-7 pin can be set to 【Off-Couple】,【Digital-In】,【Digital-Out】,【Trig-In】,【Trig-Out】

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