

Bi-directional Programmable DC Power Supply

IT6000C Series User Manual



Model: IT6000C Series Version: V1.0/01,2019



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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.



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 series instrument 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 PRE-PAID. 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 in case of the following:

- Damage caused by circuit installed by customer or using customer own products or accessories;
- Modified or repaired by customer without authorization;
- Damage caused by circuit installed by customer or not operating our products under designated environment;
- 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)
\sim	Alternating current	0	OFF (power)
$\overline{}$	Both direct and alternating current	ф	Power-on state
	Chassis (earth ground) symbol.	ф	Power-off state
Ţ	Earth (ground) terminal	#	Reference terminal
	Caution	+	Positive terminal
<u> </u>	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.
- Please always use the provided cable to connect the instrument.
- Check all marks on the instrument before connecting the instrument to power supply.
- 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 output the
 dangerous voltage that can cause personal injury, and the operator must
 always be protected from electric shock. Ensure that the output 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



Environmental Conditions	Requirements
Altitude	Operating up to 2,000 meters
Installation category	II
Pollution degree	Pollution degree 2



In order to ensure the accuracy of measurement, it is recommended to operate the instrument half an hour after start-up.

Regulation Tag

(6	The CE tag shows that the product complies with the provisions of all relevant European laws (if the year is shown, it indicates that the year when the design is approved).
	This instrument complies with the WEEE directive (2002/96/EC) tag requirements. This attached product tag shows that the electrical/electronic product cannot be discarded in household waste.
10	This symbol indicates that no danger will happen or toxic substances will not leak or cause damage in normal use within the specified period. The service life of the product is 10 years. The product can be used safely within the environmental protection period; otherwise, the product should be put into the recycling system.



Waste Electrical and Electronic Equipment (WEEE) Directive



Waste electrical and electronic equipment (WEEE) directive, 2002/96/EC
The product complies with tag requirements of the WEEE directive (2002/96/EC). This tag indicates that the electronic equipment cannot be disposed of as ordinary household waste. Product Category
According to the equipment classification in Annex I of the WEEE directive, this instrument belongs to the "Monitoring" product.

If you want to return the unnecessary instrument, please contact the nearest sales office of ITECH.



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 123

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
- 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



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- Verifying the Shipment
- ◆ Instrument Size Introduction
- ◆ Connecting the Power Cord
- ◆ Connecting the Device Under Test (DUT)

1.1 Verifying the Shipment

Unpack the box and check the contents before operating the instrument. If wrong items have been delivered, if items are missing, or if there is a defect with the appearance of the items, contact the dealer from which you purchased the instrument immediately.

The package contents include:

Item	Qty.	Model	Remarks
Bi-directional Pro- grammable DC Power Supply	x1	IT6000C Series	For the specific models included in this series, refer to 2.1 Brief Introduction.
Power cord	x1	-	Depending on the instrument model. The power cord is adapted to the power outlet specifications in this area. For details, see 1.3 Connecting the Power Cord.
USB communication cable	x1	-	This accessory is selected when the USB interface is used for starting up remote operation.



Item	Qty.	Model	Remarks
CD	x1	-	It contains User Manual, Programming Guide and other user documentations.
Ex-factory Test Report	x1	-	It contains the test report and calibration report of the instrument before delivery.



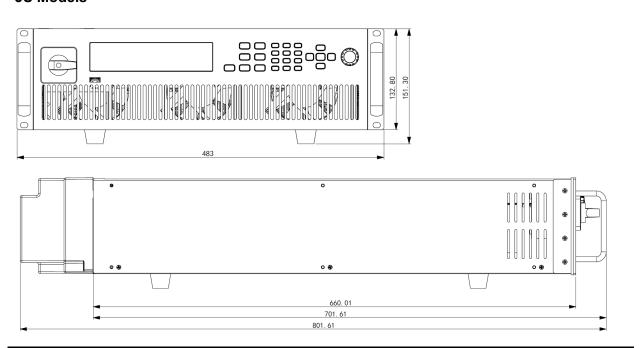
Upon verification of the shipment, keep the package and relevant contents thereof in a safe place. When returning the instrument for warranty service or repair, the specified packing requirements shall be met.

1.2 Instrument Size Introduction

The instrument should be installed at well-ventilated and rational-sized space. Please select appropriate space for installation based on the instrument size.

The detailed dimension drawings of the IT6000C series are as follows:

3U Models





1.3 Connecting the Power Cord

Precautions

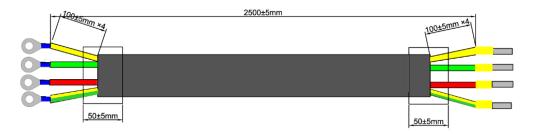
To prevent electric shock and damage to the instrument, observe the following precautions.

WARNING

- Before connecting power cord, be sure to confirm that the power voltage matches with the rated input voltage of the instrument.
- Before connecting power cord, be sure to switch off the instrument. Verify that there is no dangerous voltage on the connection terminals.
- To avoid fire or electric shock, make sure to use the power cord supplied by ITECH.
- Be sure to connect the power cord to the AC distribution box with protective grounding. Do not use terminal board without protective grounding.
- Do not use an extended power cord without protective grounding, otherwise the protection function will fail.
- Be sure to perform related operations and connections to feed energy back to grid in accordance with related regulations, and meet all necessary conditions.
- Ensure that the power cord connection terminals are either insulated or covered by the supplied protective cover so that no accidental contact with lethal voltage can occur.

Categories of Power Cords

The power cord specifications of this series of instruments are as follows:



The red, green and yellow wires are live wires, which are correspondingly connected to the L1, L2 and L3 terminals of power input on the rear panel of the instrument; the yellow-green wire is grounding wire, which is connected to the PE terminal of power input on the rear panel.



AC Power Input Level

The input of this series is a three-phase AC power of 380V. (Line voltage: such as the voltage between L1 and L2).

Voltage: 380V±10% (Three-phase four-wire)

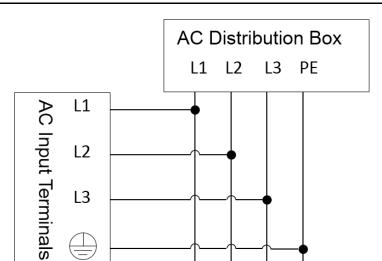
Frequency: 47Hz to 63Hz

Connecting the Power Cord

- For 3U model, see the steps below to connect the power cable.
- For units already assembled into a cabinet during ex-factory, if one end of the power cable is connected, the user needs to connect the other end of the power cable to the distribution box. The connection method is same as that for the 3U model;
- For models to be assembled in parallel by the user, see contents related to power cable connection in Cabinet Assembly Guide.
- 1. Confirm that the switch of the AC power distribution box is off.
- 2. Confirm that the power switch is in the OFF position and verify that there is no dangerous voltage on the connection terminals.
- 3. Remove the protective cover outside the AC input terminal on the rear panel.
- 4. Connect one end of the power cable's round terminal to the AC power input terminal on the instrument's rear panel.
 - a. You only need to connect the red, green and yellow live wires to the terminals on the rear panel, which are not required to correspond to L1, L2 and L3 terminals one by one.
 - b. The yellow-green wire is grounding wire, which is connected to the protective grounding terminal (PE).
- 5. Mount the protective cover back to its original position.
- 6. Connect the other end of the power cable to the required AC distribution box.

The schematic is shown below.





1.4 Connecting the Device Under Test (DUT)

This section describes how to connect the test cables between the instrument and DUT.

Precautions

To prevent electric shock and damage to the instrument, observe the following precautions.



WARNING

- Before connecting test cables, be sure to switch off the instrument.
 Power switch is in Off position, otherwise touching the output terminals on the rear panel may result in personal injury or death due to electric shock.
- To avoid electrical shock, before testing, please make sure the rating values of the testing cables, and do not measure the current that higher than the rating value. All test cables shall be capable of withstanding the maximum short circuit current of the instrument without causing overheat.
- If several loads are provided, each pair of load wires shall safely withstand the rated short circuit output current of the power supply under full load.
- Do not short the battery when connecting or disconnecting the battery testing circuit. Short circuit may cause severe accident.
- Because the instrument can be used to sink current, hazardous voltages from an external energy source such as a battery may be present on the output terminals even with the instrument power off. Provision must be made to disconnect the external energy source before touching the output or sense terminals.
- Always use test cables provided by ITECH to connect the equipment. If test cables from other factories are used, please confirm the maximum current that the test cables can withstand.
- During wiring, check that the positive and negative poles of the test cables are properly and tightly connected. Do not connect the positive pole and disconnect the negative pole.
- Ensure that the output terminals are either insulated or covered using the safety covers provided, so that no accidental contact with lethal voltages can occur.

Specification for Test Cables

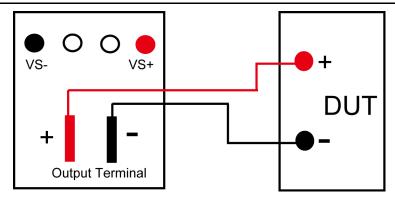
Test cables are not standard accessories for the instrument. Please select optional red and black test cables for individual sales based on the maximum current value. For specifications of test cables and maximum current values, refer to A.1 Appendix—Specifications of Red and Black Test Lines.

Connecting the DUT (Local Measurement)

The instrument supports two kinds of wiring methods with the DUT: local measurement and remote measurement (SENSE). The default test mode is local measurement.

The connection diagram and steps of local measurement are as follows:





- 1. Confirm that the power switch is in the OFF position and verify that there is no dangerous voltage on the connection terminals.
- 2. Remove the output terminals cover of the power supply.
- 3. Loosen the screws of the output terminals and connect the red and black test cables to the output terminals. Re-tighten the screws.

When maximum current that one test cable can withstand fails to meet the rated current, use multiple pieces of red and black test cables. For example, the maximum current is 1,200A, then 4 pieces of 360A red and black cables are required.

- 4. Thread the red and black test cables through the output terminals cover of the power supply and install the cover.
- 5. (Optional) According to the actual situation of DUT, connect the grounding terminal on the rear panel of the instrument to the DUT to ensure the safe grounding.
 - For the location information, see 2.3 Rear Panel Introduction.
- 6. Connect the other end of the red and black cables to the DUT. The positive and negative poles must be properly connected and fastened when wiring.

Connecting the DUT (Remote Sensing)

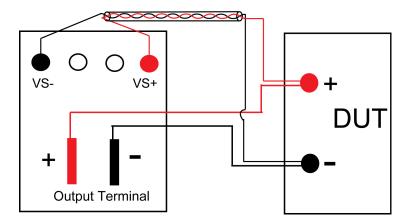
Remote measurement is available for the following scenarios:

When the DUT consumes large current or the wires are too long, there is a voltage drop on the wires between DUT and output terminals of the power supply. To maximize measurement accuracy, the power supply provides the remote measurement terminals VS+ and VS- on the rear panel, which can be used to measure the terminal voltage of the DUT.

When the power supply is used for battery testing in actual applications, the voltage drop of the wire will lead to voltage inconsistency of both ends and inconsistency of the cutoff voltage of power supply and the actual voltage of battery, resulting in inaccurate measurement.

The connection diagram and steps of remote measurement are as follows:





- 1. Confirm that the power switch is in the OFF position and verify that there is no dangerous voltage on the connection terminals.
- 2. Refer to the wiring diagram and connect the Vs+ and Vs- with armored twisted-pair cables.



To ensure the stability of the system, use armored twisted-pair cables between the remote sense terminals and the DUT. Pay attention to the positive and negative poles when wiring, otherwise it will damage the instrument.

- 3. Remove the output terminals cover of the power supply.
- 4. Loosen the screws of the output terminals and connect the red and black test cables to the output terminals. Re-tighten the screws.

When maximum current that one test cable can withstand fails to meet the rated current, use multiple pieces of red and black test cables. For example, the maximum current is 1,200A, then 4 pieces of 360A red and black cables are required.

- 5. Thread the red and black test cables through the output terminals cover of the power supply and install the cover.
- 6. (Optional) According to the actual situation of DUT, connect the grounding terminal on the rear panel of the instrument to the DUT to ensure the safe grounding.

For the location information, see 2.3 Rear Panel Introduction.

- 7. Connect the other end of the remote sense cables to the DUT.
- 8. Connect the other end of the red and black cables to the DUT. The positive and negative poles must be properly connected and fastened when wiring.
- 9. Power on the instrument and turn on the Sense function of the instrument. For details, see 3.6.3 Sense Function (Sense).

WARNING

Never touch cables or connections immediately after turning off the instrument at the end of the test. Lethal voltages may remain at the output terminals after turn-off. Verify that there is no dangerous voltage on the output or sense terminals before touching them.



2 Quick Start

This Chapter will introduce power-on check steps of this series to ensure normal start-up and usage under initialization status of the power. Besides, to facilitate usage, this part also displays the functions of front board, rear board and keyboard keys as well as display functions to a quick view of power appearance, structure and key usage functions before operation.

- ◆ Brief Introduction
- ♦ Front-Panel Overview
- ♦ Rear Panel Introduction
- ♦ Power-on Self-Test

2.1 Brief Introduction

The IT6000C series Bi-directional Programmable DC Power Supply is designed with the module concept. The voltage class of each module is 80V/200V/360V/500V/800V. A single module can realize up to 800V/20A/6kW DC output capacity, and modules can be run in series or in parallel. At most of three modules can be connected in series or in parallel for a single unit (3U) with input of three-phase 380V AC power supply. The 3U model on sales supports 500V/90A/18kW and 1500V/30A/18kW output to satisfy different test requirement such as high current and low voltage or high voltage and low current. Meanwhile, units can be run in parallel to deliver stronger output capacity.

In addition to the above powerful and diverse output capability, based on conventional features (such as List function, comprehensive protection and other functions), the IT6000C series Bi-directional Programmable DC Power Supply also supports a variety of unique features, such as digital I/O, data logging, energy regeneration, and the selective upgrade of system files. More functions, technical indicators and technical innovations are described below:

- The standard 3U chassis of the IT6000C series instruments can accommodate up to 3 modules.
- Internal modules can be run in series or in parallel for voltage sharing or current sharing.
- Single module output voltage ranges from 80V to 800V, and current ranges from 20A to 170A.
- For the whole instrument, the output voltage ranges from 80V to 2250V, and current ranges from 20A to 2040A.



- The instrument supports bi-directional energy transmission and feeds electric energy back to the grid in a pollution-free manner, thus cutting electricity and heat dissipation costs and meeting energy-saving and environmental protection demands;
- It supports optional system file upgrade and one-click check of such information as system version, module version and system configuration;
- Support List, battery test, comprehensive protection and parallel function.
- During the test, the instrument can record specific data type (such as voltage value) and save it in the USB memory device;
- The front panel can be inserted with the USB memory device to support such functions as system file upgrade, import/export of List files and data record;
- Strong Digital I/O Function: In addition to general digital signal I/O functions, it can also be customized by supporting the wiring through different pins to meet different special needs through different pin wirings;
- Select CC loop priority or CV loop priority. If voltage and current parameters
 are to be changed frequently during test, the user can directly set related parameters through [V-set] and [I-set] on the front panel, which is very
 convenient;
- Built-in voltage curves comply with multiple automotive standards for quick user recall.
- Built-in maximum power point tracking (MPPT) mechanism to provide solar photovoltaic curve simulation.
- High visible vacuum fluorescent display (VFD)
- Support optical fiber communication, which is applicable for loop control between units under parallel mode.
- Built-in USB/CAN/LAN communication interface
- Optional GPIB/RS–232 communication interface
- Optional external analog interface, and share an interface position with RS-232.
- Strong trigger system;
- Use a virtual resistor to realize paralleled current sharing and series voltage sharing between units;
- Enable a true seamless switch between positive current and negative current while avoiding overshoot current and overshoot voltage;
- When the Sense function is turned on, it can ensure that the DUT is safe in case of reverse connection or open circuit of the Sense line.



The models included in the IT6000C series are as follows:

500V	1,500V	Height (with bare machines overlapped)	Height (constituting cabinet)
IT6006C-500-30	_		
IT6012C-500-60	_	3U	
IT6018C-500-90	IT6018C-1500-30		_
IT6036C-500- 180	IT6036C-1500-60	6U	
IT6054C-500- 270	IT6054C-1500-90	9U	15U
IT6072C-500- 360	IT6072C-1500- 120	12U	
IT6090C-500- 450	IT6090C-1500- 150	15U	27U
IT6108C-500- 540	IT6108C-1500- 180	18U	
IT6126C-500- 630	IT6126C-1500- 210	21U	
IT6144C-500- 720	IT6144C-1500- 240	24U	



Naming rules for each series of model are as follows: IT 6XXXC-YYY-ZZZ, wherein, XXX means rated power; YYY means rated voltage; and ZZZ means rated current.

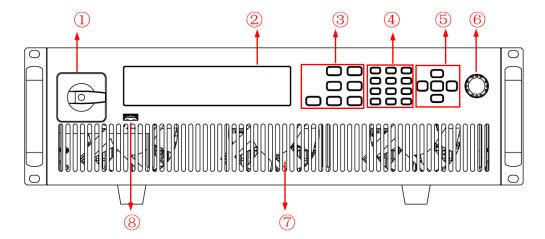
As a bipolar power supply, this series can output and absorb electric energy. The current and power input capacity is same as the output capacity. For example, the maximum rated value of the output power of the IT6018C-500-90 model is 18,000W, and the maximum rated value of input power is also 18,000W.

2.2 Front-Panel Overview

For the IT6000C series Bi-directional Programmable DC Power Supply, all front panels of the 3U model are the same, and the operation panels of other models are the same as those of the 3U model. The following is the front panel schematic of the 3U model.



3U Model



- 1 Power On/Off switch
- 2 Vacuum fluorescent display (VFD)
- 3 Function and composite keys
- 4 Numeric and composite keys
- 5 Up, down, left, and right cursor navigation
- keys and Enter key
- 6 Push-on knob
- 7 Vent hole
- 8 USB storage device connection port

2.2.1 Keyboard Introduction

The keyboard introduction of IT6000C series Bi-directional Programmable DC Power Supply is shown as follows.

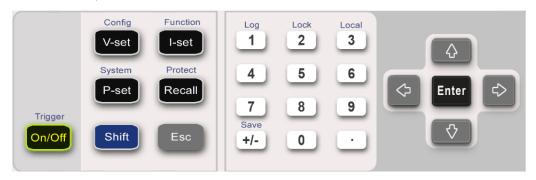


Table 2-1 Keys Description

Keys	Description	
[Esc]	Press this key to exit the current operation interface.	
[V-set] / Config	Set the output voltage value / Enter the Config menu of the power supply	



Keys	Description		
	Note In CV priority (default) mode, press [V-set], the interface displays "Vs=0.00V" (Setting value of voltage). In CC priority mode, press [V-set], the interface displays "Vh=0.00V" (Upper limit of voltage), and press [V-set] again, the interface displays "VI=0.00V" (Lower limit of voltage).		
[I-set] / Function	Set the output current value / Enter the Function menu of the power supply Note In CV priority (default) mode, press [I-set], the interface displays "I+=0.00A" (Upper limit of current), and press [I-set] again, the interface displays "I-= 0.00 A" (Lower limit of current). In CC priority mode, press [I-set], the interface displays "Is=0.00A" (Setting value of current).		
[P-set] / System	Set the output power value / Enter the System menu Note Press [P-set], the interface displays "P+=0.00W" (Upper limit of power), and press [P-set] again, the interface displays "P- = - 0.00W" (Lower limit of power).		
[Recall] / Protect	Returns the instrument to the specified setup. / Enter the Protect menu of the power supply		
[Shift]	Composite key, combined with other keys to realize functions marked above keys.		
[On/Off] / Trigger	 Turn the power supply output on or off. When lit, indicates that the output is enabled or on. Generate a local trigger signal. 		
[0]-[9]	Numeric keys		
[Shift]+[1] (Log)	Enter the data logging function menu.		
[Shift]+[2] (Lock)	Turn the keyboard lock on or off.		
[Shift]+[3] (Local)	Switch remote control mode to local control mode.		



Keys	Description	
[Shift]+[+/-] (Save)	Save the common parameter settings.	
+/-	Positive and negative signs	
	Decimal point	
Left / Right navi- gation keys	The left and right navigation keys are used to adjust the cursor to the specified position or scrolls pages to view menu items.	
Up / Down navi- gation keys	The up and down navigation keys are used to scroll page up and down to view menu items.	
[Enter]	Operation confirmation key	

2.2.2 Push-on Knob

The IT6000C series Bi-directional Programmable DC Power Supply provides a knob 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
- Select menu item
- Confirm the set value or the selected menu item

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.

2.2.3 VFD Indicator Lamps Description

The IT6000C series Bi-directional Programmable DC Power Supply VFD indicator lamps description is as follows:

Table 2-2 VFD Indicator Lamps Description

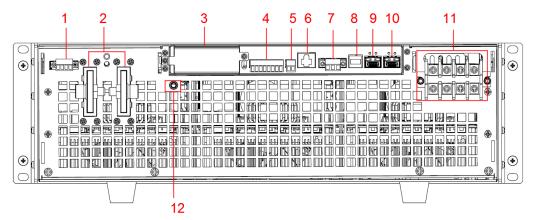
Flag	Function Description	Flag	Function Description
OFF	The output of the power supply is turned off.	Auto	None
CV	The power supply is in a state of constant voltage output.	Sense	Sense function of the power supply is enabled.
CC	The power supply is in a state of constant current output.	Rear	Analog function begin to work.
*	The keyboard lock is turned on.	Addr	When received command successfully, the flag will display 3 seconds.
CR	None	Rmt	Indicates that the instrument is working in remote control mode.
Shift	Using composite function key	Error	Error occur
SRQ	Indicates that the internal status request event occurs.	Prot	The instrument enters the protection state.
CW	The power supply is in a state of constant power output.	Trig	The instrument is in a state of waiting for a trigger.



2.3 Rear Panel Introduction

The rear panel of the 3U model of the IT6000C series Bi-directional Programmable DC Power Supply (after removing the protective cover) is shown below.

3U Models



- 1. Sense terminals (Vs+, Vs-)
- 2. DC output terminals of the power supply
- 3. Optional communication interface: RS-232 or GPIB
- 4. Digital I/O interface: P-IO
- 5. CAN communication interface
- 6. LAN communication interface
- 7. External control interface CTRL



This interface is used for cabinet self-assembling scenarios. Connect the interface on the rear panel of each unit to be connected in parallel, and the master can offer synchronous control over the power-on/off of the slave.

- 8. USB communication interface
- 9. Communication interface of inner ring optical fiber (F-TX and F-RX)



This interface is used for cabinet self-assembling scenarios for realizing communication of units in parallel.

10. Communication interface of outer ring optical fiber (TX and RX)





This interface is used for parallel scenarios of common units for the communication of units in parallel.

- 11. AC power input terminals (L1, L2, L3, and PE)
- 12. Chassis ground terminal

2.4 Power-on Self-Test

A successful self-test indicates that the purchased product meets delivery standards and it is available for normal usage.

Before operation, please confirm that you have fully understood the safety instructions.

WARNING

- Before connecting power cord, be sure to confirm that the power voltage matches with the rated input voltage of the instrument.
- Before connecting power cord, be sure to switch off the instrument. Verify that there is no dangerous voltage on the connection terminals.
- To avoid fire or electric shock, make sure to use the power cord supplied by ITECH.
- Be sure to connect the power cord to the AC distribution box with protective grounding. Do not use terminal board without protective grounding.
- Do not use an extended power cord without protective grounding, otherwise the protection function will fail.
- Be sure to perform related operations and connections to feed energy back to grid in accordance with related regulations, and meet all necessary conditions.
- Ensure that the power cord connection terminals are either insulated or covered by the supplied protective cover so that no accidental contact with lethal voltage can occur.

Power Switch Introduction

User can adjust the power switch directly to turn on or turn off the instrument.

The status of Power switch is as follows.





If the instrument is the cabinet type, the rear panel of the cabinet provides a master power switch. The relationships between the device status and switch status are listed in the following table.

Master switch status	Desperate switch status	Device status
On	On	On
On	Off	Off
Off	On	Off
Off	Off	Off

Self-Test Procedures

Normal self-test procedures:

- 1. Correctly connect the power cord and power on the instrument.
 - The instrument starts the self-test.
- 2. After the instrument is self-tested normally, the VFD shows the output voltage, current, power and other information (CV mode).

If an error occurs during the self-test, an error message is displayed. The following table lists the error messages you might see.

Error message	Error Description
Eeprom Failure	The EEPROM is damaged.
Main FrameInitializeLost	The system setting data is lost.
Calibration Data Lost	The factory calibration data in EE-PROM is lost.
Config Data Lost	The latest operation state of the instrument is lost.
NETWORKING	The parallel operations are abnormal and cannot finish the networking.



Exception Handling

If the instrument cannot start normally, please check and take measures by reference to steps below.

- 1. Check whether the power cord is correctly connected and confirm whether the instrument is powered.
- 2. Check whether the power in On. The power switch is under "|" On status.
- 3. Check whether the power voltage matches with the supply voltage. Please refer to 1.3 Connecting the Power Cord to select proper AC input.
- 4. If you need additional assistance, contact ITECH technical support engineer.

3 Basic Operation

This chapter describes the basic functions and features of the instrument. Divided into the following sections:

- ♦ On/Off Control
- ◆ Local/Remote Mode Switch
- ♦ Key Lock Function
- ◆ Save and Recall Operations
- ◆ Data Logging Function
- ♦ System Menu Function
- System Upgrade

3.1 On/Off Control

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. If the **[On/Off]** key light is off, indicates that the output is turned off. When the output of the power supply is on, the operating status flag (CV/CC/CW) on the VFD will be illuminated.



It is recommended that you turn on the **[On/Off]** after the power supply is connected to the DUT. If the power supply has no output after the output is turned on, check the voltage and current setting value, set the voltage and current to a non-zero value, and then turn on the output.

3.2 Local/Remote Mode Switch

The power supply provides both local and remote operation modes. The default mode of the power supply is local operation mode.

- Local operation mode: Use the front panel keys to control the power supply.
- Remote operation mode: The power supply is connected to PC, and the user uses the software in PC to control the power supply remotely.
 - During remote control operation, the remote symbol "Rmt" is displayed.
 All panel keys, except the [On/Off] and [Shift]+[3] (Local) keys, are locked.



 You can press [Shift]+[3] (Local) to switch the remote control to local control. The mode modification will not affect the output parameters of the power supply.

3.3 Key Lock Function

This function can prevent the power supply from the panel keys misoperation during usage. Press the composite keys [Shift]+[2] (Lock) to lock front panel keys and the lock symbol "*" is shown on the front panel display. All panel keys, except the [On/Off] and [Shift]+[2] (Lock) keys, are locked. You can repress [Shift]+[2] (Lock) to unlock the front panel.

3.4 Save and Recall Operations

The power supply can save up to 10 common parameters in nonvolatile memory (No. 1 to No. 10) for user to recall conveniently. The saved settings include the following parameters.

Category	Parameter	
Main interface	Voltage setting: Vs	
	Current setting: Is	
	Upper limit of voltage: Vh, and lower limit of voltage: VI	
	Upper limit of current: I+, and lower limit of current: I-	
	Upper limit of power: P+, and lower limit of power: P-	
	The output status of the instrument: [On/Off]	
Config menu	CC/CV loop priority mode: Mode	
	CC/CV loop speed: Speed	
	Voltage/Current rise time: V-Rise Time/I-Rise Time	
	Voltage/Current fall time: V-Fall Time/I-Fall Time	
	On/Off switch delay: On Delay/Off Delay	
	Internal resistance of the power supply: Output Res	
Protect menu	OCP/OVP/OPP/UCP/UVP switch status: On/Off	
	OCP/OVP/OPP/UCP/UVP limit setting: Level	



Category	Parameter	
	OCP/OVP/OPP/UCP/UVP delay time: Delay	
	UCP/UVP warm-up time: Warm-up	

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

- Press the composite keys [Shift]+[+/-] (Save) to save the parameters. Press
 the [Recall] key to recall the parameters.
- SCPI commands: *SAV and *RCL

3.4.1 Save Operation

The save operation procedures are as follows:

- 1. Press the composite keys [Shift]+[+/-] (Save) to enter the parameter save interface.
- 2. Set the storage location.

Enter a number in the "Save data to bank=0" to set the storage location in non-volatile memory.

3. Press [Enter] to save the parameters.

3.4.2 Recall Operation

You can recall the parameters you saved in the specified memory location as the setting values.

- 1. Press the [Recall] key to enter the parameter recall interface.
- 2. Set the storage location.

Enter a number in the "Recall data from bank=0" to set the storage location in non-volatile memory.

3. Press [Enter] to recall the parameters.

3.5 Data Logging Function

The IT6000C series Bi-directional Programmable DC Power Supply supports the recording and saving of test data. This Chapter introduces how to use this function in details.



The user can select the following data sources for recording:

Voltage

Only records voltage data during the data acquisition period.

Current

Only records current data during the data acquisition period.

Voltage and current

Records current and voltage data during the data acquisition period.

Configure the Function Menu

1. Press the composite button [Shift]+[1] (Log) on the front panel to enter the configuration menu of the data logging function.

The parameters are described as follows:

Menu Item	Description	Setting	
Sample Period	This parameter indicates the data sampling interval (unit: s), that is, the test data is recorded once every <i>X</i> seconds. The input range supported by the instrument is: 0 - 9	Set the value by inputting the value through the number key or rotating the knob.	
Duration	This parameter indicates the time for data recording (unit: s), namely, the data recording will be completed in Y seconds and be ready for the next data record. The input range supported by the instrument is: 0 - 3600		
Source	This parameter indicates the source of recorded data, including voltage (V), current (I), voltage and current (V/I).	Use the Left and Right arrow key or the rotation knob to select.	



Menu Item	Description	Setting
Data Type	This parameter indicates the type of recorded data, including: • Average: This is the default selected data type, namely, the average of all data acquired in the data recording period as indicated in the table of saved data.	
	Max/Min: If this option is selected, it means the maximum value and minimum value of data acquired in the data recording period as indicated in the data saving table.	

- 2. Set the value of Sample Period and press [Enter].
- 3. Set the value of **Duration** and press [Enter].
- 4. Set the value of **Source** and press [Enter].
- 5. Set the value of **Data Type** and press [Enter].

At this point, the VFD screen returns to the main interface of the system.

Select the Trigger Method

See the steps in the 3.6.4 Select Trigger Source (Trig Source) section to set how the data logging is triggered.



This setting result is only valid for data recording function. When List function is used, the method for triggering the running of List files needs to be additionally set (by default, triggered by the panel).



Start Data Logging

CAUTION

Before this operation, make sure to connect the USB memory device to the memory port on the front panel (The USB interface on the rear panel can only be used for connecting the PC) so that the recorded data can be stored in the external storage device. Otherwise, the Data Recording function is not available for usage.

Manual

Press the composite button **[Shift] + [On/Off]** (Trigger) on the front panel to trigger.

• Bus

Triggered by the SCPI instruction, for example, when the instrument receives the trigger command *TRG, a trigger operation is performed.

External

Connect to pin 4 of the digital I/O interface (P-IO) and set pin 4 to Ext-Trig→-Trig-In→Dlog to trigger.

For details, see 3.6.7.4 IO-4. Ext-Trig, Not-Invert.

After the data recording function is started, the lower right corner of the main interface displays **Logging**, indicating that the data is recorded. The recorded data is saved in USB memory device in .csv format. The user can get access to these files for analysis based on needs.

3.6 System Menu Function

This Chapter offers a general introduction of system menus, allowing users to have a preliminary understanding of system functions of this IT6000C series.

The steps of the system menu function are as follows:

Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.

At this point, the VFD screen displays the system menu items. Each menu item has a numbering identifier. The user can press Up and Down buttons or use the knob for scrolling display of other menu items.

2. Press [Enter] on a menu interface to enter the setting interface.



3. After the menu items are set, press **[Enter]** again to save the modified contents.



You can press [Esc] to return to the previous menu.

The description of the menu items is shown in the table below.

System	System Menu			
	Веер	Set the bee	per state.	
		On	Turn the beeper on.	
		Off	Turn the beeper off.	
	PowerOn	Select the p	ower-on state.	
		Reset	When the instrument is powered on, the instrument will initialize some settings and [On/Off] state.	
		Last	When the instrument is powered on, the instrument will remain the same settings and [On/Off] state as last time you turned off the instrument.	
		Last+Off	When the instrument is powered on, the instrument will remain the same settings as last time you turned off the instrument, but the [On/Off] is OFF state.	
	Sense	Set the sense function state.		
		Off	Turn the sense function off.	
		On	Turn the sense function on.	
	ListTrig Source	Set the trigger method for the List files running.		
		Manual	Manual trigger	
		Bus	Bus trigger	
		External	External trigger	
	DataLogger Trig Source	Set the trigg	per method for the data logging.	
		Manual	Manual trigger	
		Bus	Bus trigger	
		External	External trigger	
	I/O Con	Set the communication information between instrumen PC.		
		USB	USB communication interface	
		LAN	LAN communication interface	



		-	1
		Info	View the LAN information.
			LAN Status: Down IP Mode: Disconnect IP Addr: 0.0.0.0 SubNet: 0.0.0.0 Gateway: 0.0.0.0 DNS1: 0.0.0.0 DNS2: 0.0.0.0 MAC: 8C:C8:F4:40:01:E1 MDNS Status: HostName: HostDesc: Domain: TCPIP::INSTR: Socket Port: 30000
		IP-Conf	Configure LAN IP information.
			Auto: automatically configure the address of the instrument.
			Manual: manually configure the address of the instrument. • IP Addr: 0.0.0.0
			Set the IP address.
			• SubNet: 0.0.0.0
			Set the subnet mask.
			• Gateway: 0.0.0.0
			Set the gateway address.
			• DNS1: 0.0.0.0
			Set the preferred address of the DNS server. If it is not involved, there is no need to set it.
			• DNS2: 0.0.0.0
			Set the DNS server alternate address. If it is not involved, there is no need to set it.
			Socket Port: 30000
			Set the port number.
		Serv- Conf	Configure the LAN services.
			MDNS: MDNS service state.
			• On
			Off DINC: DINC populse state
			PING: PING service state. • On
<u> </u>	<u> </u>	<u> </u>	



			• Off
			Telnet-scpi: telnet-scpi service state.
			• Off
			Web: Web service state. • On
			• Off
			VX-11: VX-11 service state.
			• On
			• Off
			Raw-socket: Raw-socket service state. • On
			• Off
		Reset	Select whether to confirm the LAN setting or not.
	CAN	CAN comr	munication interface.
		Baudrate	Select the baud rate from the following options: 20k, 40k, 50k, 80k, 100k, 125k, 150k, 200k, 250k, 400k, 500k, 1000k.
		Address	Set the instrument address to a number from 1 to 65535.
		Prescal- er	Prescale
		BS1 Value	PTS
		BS2 Value	PBS
	VCP	Select virt	ual serial communication interface.
		Baudrate	Baud rate: 4800/9600/19200/ 38400/57600/115200
		Databit	Data bit: 5/6/7/8
		Parity	Parity bit: N (No parity) / E (Even parity) / O (Odd parity)
		Stopbit	Stop bit: 1/2
Display RS232	RS232	Select RS	-232 communication interface.
or GPIB accord- ing to optional in- terface. In		Baudrate	Baud rate: 4800/9600/19200/ 38400/57600/115200
addition, RS232		Databit	Data bit: 5/6/7/8



interface and the analog interface		Parity	Parity bit: N (No parity) / E (Even parity) / O (Odd parity)	
share an inter- face position.		Stopbit	Stop bit: 1/2	
·	GPIB	Select GP	IB communication interface.	
		Address	Set the communication address (1 to 30).	
Parallel	Set the instr	uments to p	parallel operation mode.	
	Single	Set the instrument to single mode, i.e., disable the parallel operation mode.		
	Master	Set the ins	strument to master mode.	
		Total: Num	nber of parallel instruments.	
	Slave	Set the ins	strument to slave mode.	
Digital Port	parameters for each opti corresponding change to diately. When re-entering the changed option. For		em displays 7 options. You can set option respectively. After setting, the to each option becomes valid immeng DigPort , the interface can display or detailed introduction of menus and optial I/O Function (Digital Port).	
	IO-1. Ps-Cle Invert	ear, Not-	Function setting of pin 1	
	IO-2. Ps, No	ot-Invert	Function setting of pin 2	
	IO-3. Off-Sta Invert	atus, Not-	Function setting of pin 3	
	IO-4. Ext-Tr Invert	ig, Not-	Function setting of pin 4	
	IO-5. INH-Li Invert	iving, Not-	Function setting of pin 5	
	IO-6. Sync-0	On, Not-	Function setting of pin 6	
	IO-7. Sync-0 Invert	Off, Not-	Function setting of pin 7	
Ext-Program	menu can only display		tion. This function is optional. The y when corresponding board card is innenu settings, see 3.6.8 (Optional) ext-Program).	
System Reset	Select whet	her to resto	re the factory default settings or not.	
System Info	View the sys	stem inform	ation.	
Model		Display the	e instrument model.	
	MAC Addr Display the address.		Display the MAC address, that is, the physical address.	
	SN	Display the	e serial number.	



Main-Ver	Display the system version information.
Ctrl-Ver	Display the version information for a single module.
FPGA-Ver	Display the FPGA version information.
INV-Ver	Display the control board version information.
2017/6/22 00:00:00	Display the system time.



Press the composite button [Shift]+[P-set] (System) to enter the system menu, and press [Esc] to exit the menu.

3.6.1 Set the Beeper Status (Beep)

The user can turn the instrument beeper sound on or off base on personal requirement.

The beeper sound works in the following scenarios:

- A beeper sound produced when the front panel key is pressed.
- When an error is generated inside the instrument, such as when the instrument receives an unprocessable command in the remote state. At this time, the instrument produces a beeper sound, and the flag "Error" appears on the VFD.
- When the instrument is under protection status, such as over-temperature protection. At this time, the instrument produces the beeper sound.

The setting procedures are as follows:

1. Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.

The first displayed menu item **Beep** is used to set the beeper status.

- 2. Press [Enter] key to enter the parameter setting interface.
- 3. Press the Left / Right key or turn the knob to adjust the value of this parameter.
 - On: Default value, indicates the beeper is on.
 - Off: Indicates the beeper is off.
- 4. After the parameter settings are complete, press [Enter].

At this point, the beeper status takes effect immediately.



3.6.2 Set the Power-on State (PowerOn)

This menu item is used to control the settings and output state when the power supply is powered on.

The detailed power-on parameters and output state are as follows.

- The voltage, current, power setting values displayed on the main interface when the instrument is powered on.
- Parameter setting values in the Config and Protect menus.
- The output state of the power supply, i.e., the **[On/Off]** key state.

The procedures to set the menu item are as follows.

- 1. Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.
- 2. Press the Up/Down key or turn the knob to select the [PowerOn] and press [Enter].
- 3. Press the Left / Right key or turn the knob to adjust the value of this parameter.
 - Reset: Default value, indicates when the instrument is powered on, the instrument will initialize some parameter settings or state.

The affected parameters and the reset information are as shown in Table 3–1 Initial value of the parameter.

Table 3–1 Initial value of the parameter

Category	Parameter	Initial Value
Main interface	Voltage setting: Vs	One percent of the rated voltage of the instrument
	Current setting: Is	One percent of the rated current of the instrument
	Upper limit of voltage: Vh, and lower limit of voltage: VI	Upper limit value: One percent of the rated voltage of the instrument Lower limit value: 0
	Upper limit of current: I+, and lower limit of current: I-	One percent of the rated current of the instrument



Category	Parameter	Initial Value
	Upper limit of power: P+, and lower limit of power: P-	Rated power value of the instrument
	[On/Off] status	Off
Config menu	Mode	CV
	Speed	High
	V-Rise Time/I-Rise Time	0.1s
	V-Fall Time/I-Fall Time	
	Output Res	1000
	On Delay/Off Delay	0

- Last: Indicates when powered on, the instrument will remain the same parameter settings (i.e., the parameters controlled by the *SAV 0 command, see 3.4 Save and Recall Operations) as last time you turned off the instrument.
- Last+Off: Indicates when powered on, the instrument will remain the same settings as last time you turned off the instrument, but the output state is Off.



Under the condition of **Last+Off**, the output switch state is not constrained by the ***SAV 0** instruction.

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

For example, **Last** is selected, and the voltage value is set to 20V. After the instrument is powered off and then powered on, the voltage displayed on the interface is 20V.

3.6.3 Sense Function (Sense)

This menu item is used to switch the power supply to local measurement or remote sensing.

The IT6000C series power supply supports two connection methods: Local measurement and Remote sensing. The remote sensing is used for maximizing measurement accuracy. (Refer to 1.4 Connecting the Device Under Test (DUT))

The procedures to set the menu item are as follows.



- 1. Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.
- Press the Up/Down key or turn the knob to select the Sense and press [Enter].
- 3. Press the Left / Right key or turn the knob to adjust the value of this parameter.
 - Off: Default value, indicates turn the sense function off.
 - On: Indicates turn the sense function on.
- 4. After the parameter settings are complete, press [Enter].

3.6.4 Select Trigger Source (Trig Source)

For the IT6000C series power supply, the List and data logging functions can be triggered for running by the following methods:

- Manual: Default value, indicates the trigger occurs when the [Shift]+[On/Off] (Trigger) keys are pressed from the front panel.
- Bus: Indicates the trigger occurs via the communication cables. When the trigger command *TRG is received, the IT6000C instrument generates a trigger.
- External: Indicates the trigger occurs via the pin 4 of the digital I/O interface (P-IO).

For details, see 3.6.7.4 IO-4. Ext-Trig, Not-Invert.

The List function and the data logging function have the same steps for selecting the trigger source. They need to be set separately in different menu items (**ListTrig Source** and **DataLogger Trig Source**). Therefore, this section takes the List trigger source setting as an example to introduce the operation steps.

- Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.
- 2. Press the Up/Down key or turn the knob to select the **ListTrig Source** and press [Enter].



- When setting the trigger source for data logging, select the
 DataLogger Trig Source menu item.
- The List trigger source set here is also valid for triggering other functions in the **Function** menu.



- 3. Press the Left / Right key or turn the knob to adjust the value of this parameter.
- 4. After the parameter settings are complete, press [Enter].

3.6.5 Set the Communication Information (I/O Con)

This menu item is used to set the communication information between instrument and PC. The standard communication interfaces for IT6000C series power supply are USB, LAN, CAN and VCP. You can also select the non-standard interface GPIB or RS-232 based on personal requirement.

The procedures to set the menu item are as follows.

- Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.
- 2. Press the Up/Down key or turn the knob to select the **I/O Con** and press **[Enter]**.
- 3. Press the Left / Right key or turn the knob to adjust the value of this parameter.
- 4. After the parameter settings are complete, press [Enter].



- The default communication method is USB. If other communication method is selected, the related parameters need to be set. For detailed parameter description, refer to 5 Remote Interface Connection.
- The instrument supports the non-standard RS-232 and GPIB interfaces, and the configuration items in the menu are dynamically displayed according to the interface user selected.

3.6.6 Set Parallel Operation Mode (Parallel)

This menu item is used to control whether the instrument is working in single mode or in parallel mode. This chapter takes three instruments as an example to describe how to parallelize the single units and how to return from parallel mode to single mode.

The IT6000C series power supply supports multiple instruments to work in parallel mode to provide more power and current output capability.

Configure the Menu Item

Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.



- 2. Press the Up/Down key or turn the knob to select the **Parallel** and press **[Enter]**.
- 3. Press the Left / Right key or turn the knob to adjust the value of this parameter.
 - Single: Default value, indicates that the instrument is in single mode.
 - Master: Indicates that the current single unit is set to master in parallel mode. When set to Master, you also need to set the number of slaves to be mounted for the master, so you need to set the value of the Total parameter. For example, setting Total = 3 means that the total number of units in the parallel relationship is 3.



In the parallel mode, you only need to operate the master. Synchronous operations on other slaves are implemented by operating the master

- Slave: Indicates that the instrument is set to the slave in parallel mode.
- 4. After the parameter settings are complete, press [Enter].

Set the Parallel Mode

CAUTION

Before connecting the system bus, you must ensure that each instrument is in single mode (Single).

WARNING

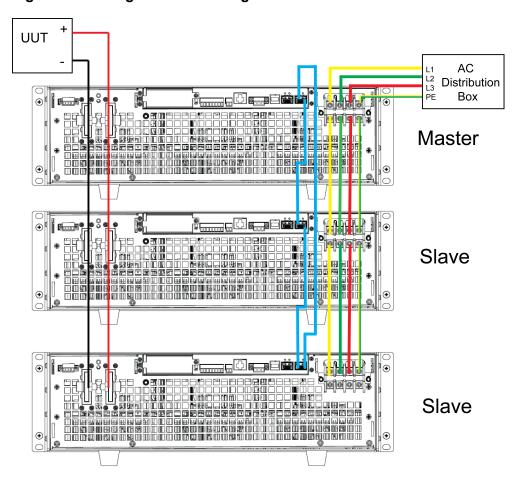
Before connecting the cables, ensure that the instrument power switch is off and the main of the AC power input (380V distribution box) is off.

For 3U models, up to 8 units of the same model can be connected in parallel. Taking three 3U single instruments as an example, the steps for parallel operation are as follows.

- 1. Ensure that the power switches of the three units and the main switch of the AC power distribution box are off.
- 2. Refer Figure 3–1 Wiring connection diagram to connect three units.



Figure 3-1 Wiring connection diagram



- a. Connect the AC input terminals of the three units in parallel and connect them to the AC distribution box.
- b. Connect the DC output terminals of the three units in parallel and connect them to the DUT.
- c. Refer to the blue wiring legend in the figure, connect the System Bus (i. e., the fiber outer loop interfaces TX and RX) for fiber-optic communication between the master and slaves.
- 3. Turn on the main switch of the AC distribution box and power on each of the three units.
- 4. Set three units in parallel mode with one master and two slaves.
 - a. Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.
 - b. Set Parallel to Master or Slave and press [Enter].
 - c. After setting the **Master**, you need to set **Total** to 3.

For details, see Configure the Menu Item.

5. After the parallel menu of the three units are set, restart the instrument separately.

After the instrument is restarted, the VFD shows that the instrument is working in parallel mode.



Revert to Single Mode

- Power off the three instruments and turn off the main switch of the AC distribution box.
- 2. Remove the cables connection of the System Bus and DC output terminals between three units.
- 3. Power on the three instruments separately.
- 4. Set each of the three instruments to single mode.
 - a. Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.
 - b. Set the Parallel to Single.

For details, see Configure the Menu Item.

5. Restart the three instruments separately.

After the instrument is restarted, the VFD shows that the instrument is working in single mode.

3.6.7 Digital I/O Function (Digital Port)

The IT6000C series power supply 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, namely general digital signal I/O function. In addition to general digital I/O functions, this series can be customized to meet different special needs through different pin wirings. For example, you can connect a pin to an external instrument, and set a fixed pulse or level signal for the external instrument. Once the external instrument fails, output this pulse or level signal. After the instrument identifies this signal, it controls whether the power supply output is reduced to 0 or whether the **[On/Off]** is switched off based on related settings.

The rear panel of the instrument has a green 8-pin terminal (For position, see 2.3 Rear Panel Introduction). The terminal is a wiring terminal with digital I/O function. These pins are bi-directional I/O interfaces. For hardware index information, see Table 3–2 Hardware parameters of the I/O interface. The pins support the input or output of pulse and high and low level. Different pins can achieve different functions.

Table 3-2 Hardware parameters of the I/O interface

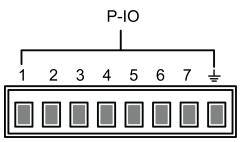
Voltage range	-5V to +15V		
Maximum low level output	Low Level (V)	Maximum current (mA)	
voltage	0.65	10	
	0.9	50	



	1	100
Maximum low level input voltage	0.8V	
Typical high level output voltage	5V	
Typical low level current	0V	0.5mA
Minimum high level input voltage	1.6V	
Level rise slope	10us	
Level fall slope	2us	

Pins Introduction

The appearance of the terminals are shown below.



Pin	Description	Properties (Default function)	Properties (General I/O function)
1	Corresponds to the function set in the System→Digital Port→IO-1. Ps-Clear, Not-Invert menu item. For parameter introduction, see 3.6.7.1 IO-1. Ps-Clear, Not-Invert.	Pulse signal	Level or PWM signal
2	Corresponds to the function set in the System→Digital Port→IO–2. Ps, Not-Invert menu item. For parameter introduction, see 3.6.7.2 IO–2. Ps, Not-Invert.	Level signal	Level or PWM signal
3	Corresponds to the function set in the System→Digital Port→IO–3. Off- Status, Not-Invert menu item. For	Level signal	Level or PWM signal



Pin	Description	Properties (Default function)	Properties (General I/O function)
	parameter introduction, see 3.6.7.3 IO–3. Off-Status, Not-Invert.		
4	Corresponds to the function set in the System→Digital Port→IO-4. Ext-Trig, Not-Invert menu item. For parameter introduction, see 3.6.7.4 IO-4. Ext-Trig, Not-Invert.	Pulse signal	Level or PWM signal
5	Corresponds to the function set in the System→Digital Port→IO–5. INH-Living, Not-Invert menu item. For parameter introduction, see 3.6.7.5 IO–5. INH-Living, Not-Invert.	Pulse signal	Level or PWM signal
6	Corresponds to the function set in the System→Digital Port→IO–6. Sync-On, Not-Invert menu item. For parameter introduction, see 3.6.7.6 IO–6. Sync-On, Not-Invert.	Pulse signal	Level or PWM signal
7	Corresponds to the function set in the System→Digital Port→IO-7. Sync-Off, Not-Invert menu item. For parameter introduction, see 3.6.7.7 IO-7. Sync-Off, Not-Invert.	Pulse signal	Level or PWM signal
GND	Ground terminal, that is, the negative terminal corresponding to each of the above 7 pins.	Level signal	



In this chapter, all the pulse signals involved in the digital I/O function are switched from high level to low level.

Taking pin 1 as an example, **IO–1. Ps-Clear, Not-Invert** contains three function options, the first option **Ps-Clear** is the default function, and this function is also a special custom function unique to this pin (the seven pins each have a different custom function). The second and third options (**Input** and **Output**) are the general digital I/O function, and the parameter settings and functions of the seven pins are the same.



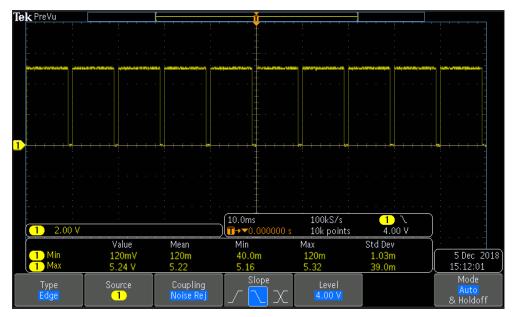
General Digital I/O Function

• Under the default condition (**Not-Invert**), when the pin (1 to 7) is configured as **Output**, it can output the high level (False) or low level (True).



If the corresponding pin is configured as **Invert**, it means that the digital signal is inverted and will output low level or high level.

Under the default condition (Not-Invert), when the pin (1 to 7) is configured
as Output—PWM, the user needs to set the frequency (PWM Freq) and duty cycle (PWM Duty) values. For example, if the PWM Freq is set to 100Hz
and the PWM Duty is set to 10%, the output waveform is as follows:





In the above figure, the peak voltage (minimum value) is 5.16V and the cycle is 10ms. The high level duration is 9ms and the low level duration is 1ms in one cycle.

Under the default condition (Not-Invert), when the pin (1 to 7) is configured as Input, it means the instrument can detect the level status of the external input. By default (i.e., the pin is not connected), it can be detected as high level, and the front panel will display input(0). If the pin is configured as Invert, it can be detected as low level, and the front panel will display input (1).



3.6.7.1 IO-1. Ps-Clear, Not-Invert

Parameter Description

IO-1. Ps-Clear, Not-Invert	Parameter setting for pin 1.					
	Not- Invert	Indicates whether to invert the input/output pulse or level signal. Invert: Yes Not-Invert: No				
		Ps- Clear This default function means that when the instrument generates protection, the protection state can be cleared via this pin.				
		Input Pin 1 receives the level signal from the outside.				
		Output Pin 1 sends the digital signal (1, 0, PWM) to the outside.				
			True By default (Not-Invert), the output digital signal is 1 (i.e. low level), and in the case of Invert, the output is high level.			
			False	False By default (Not-Invert), the output digital signal is 0 (i.e. high level), and in the case of Invert , the output is low level.		
		PWM Digital signal of PWM.				
			PWM Freq Frequency			
				PWM Duty	Duty cycle	

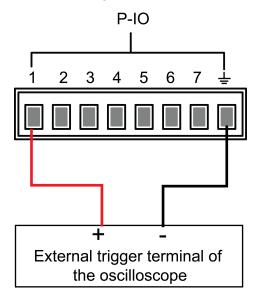
How to Use

When pin 1 is set to default **Ps-Clear** function, pin 1 has bi-directional I/O function, which can receive pulse signal input from the external instrument and also can output pulse signal to external instrument. Pulse signal parameter requirements are as follows:



Level rise slope	10us
Level fall slope	2us
Minimum time width for low level keep	30us

- Pulse input: When the instrument is under protection, the instrument will clear protection after receiving the pulse signal from external input.
 - 1. Refer to the figure below to connect pin 1 to the external oscilloscope.



- 2. Confirm that pin 1 function is set to the default option, namely IO-1. Ps-Clear, Not-Invert.
- 3. Taking OVP as an example, set the protection point of OVP.
- 4. Build the test environment to enable the instrument to enter the OVP state.
- 5. Send pulse signal to pin 1.
- 6. Check whether the protection state of this instrument is cleared.
- Pulse output: When the instrument's protection state is released, and [On/Off] is from Off to On, pin 1 will send a pulse signal to the external instrument.
 - 1. After confirming that the instrument's OVP protection is cleared, manually turn on **[On/Off]**.
 - 2. Check the oscilloscope and confirm whether pin 1 has pulse output.



3.6.7.2 IO-2. Ps, Not-Invert

Parameter Description

IO-2. Ps, Not- Invert	Parameter setting for pin 2.				
	Not- Invert	pulse or • Inver	s whethe level sig rt: Yes Invert: N		input/output
		Ps	level fro	om pin 2, whice the instrume	means the output h displays that nt is under pro-
		Input	Pin 2 re		vel signal from
		Output		ends the digitate to the outside.	
			True	output digital	lot-Invert), the signal is 1 (i.e. and in the case of utput is high
			False	output digital high level), a	lot-Invert), the signal is 0 (i.e. nd in the case of utput is low level.
		PWM Digital signal of PWM.			of PWM.
				PWM Freq	Frequency
				PWM Duty	Duty cycle

How to Use

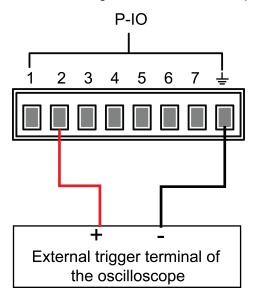
When pin 2 is set to default **Ps** function, pin 2 will output high or low level based on whether the instrument is under protection or not. Under normal conditions (Not under protection), and when pin 2 is under default setting (**Not-Invert**), pin 2 outputs high level; when the instrument is under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





When pin 2 is set to **Invert**, the output level is completely opposite.

1. Refer to the figure below to connect pin 2 to the external oscilloscope.



- 2. Confirm that pin 2 function is set to the default option, namely IO-2. Ps, Not-Invert.
- 3. Taking OVP as an example, set the protection point of OVP.
- 4. Build the test environment to enable the instrument to enter the OVP state.
- 5. Check the oscilloscope and confirm that pin 2 outputs low level.

3.6.7.3 IO-3. Off-Status, Not-Invert

Parameter Description

IO-3. Off-Sta- tus, Not-Invert	Parameter setting for pin 3.		
	Not- Invert	or level s	s whether to invert the input/output pulse signal. t: Yes nvert: No
		Off- Status	This default function indicates the existing [On/Off] state of the instrument.
		Input Pin 3 receives the level signal from the outside.	



		Output	Pin 3 se	J	signal (1, 0, PWM)	
			True	put digital sign	t-Invert), the out- al is 1 (i.e. low lev- case of Invert, the evel.	
				False	put digital sign	t-Invert), the out- al is 0 (i.e. high ne case of Invert , w level.
			PWM	Digital signal o	f PWM.	
				PWM Freq	Frequency	
				PWM Duty	Duty cycle	

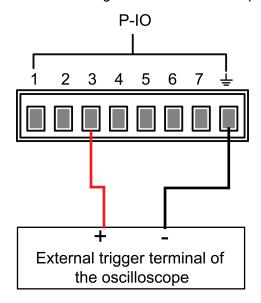
How to Use

When pin 3 is set to default **Off-Status** function, pin 3 will trigger level output based on the **[On/Off]** state of the instrument. When it is set to **(Not-Invert)**, the **[On/Off]** is turned off, and pin 3 outputs high level; the **[On/Off]** is turned on, and pin 3 outputs low level.



When pin 3 is set to **Invert**, the output level is completely opposite.

1. Refer to the figure below to connect pin 3 to the external oscilloscope.





- 2. Confirm that pin 3 function is set to the default option, namely IO-3. Off-Status, Not-Invert.
- 3. Turn on [On/Off].
- 4. Check the oscilloscope and confirm that pin 3 outputs low level.

3.6.7.4 IO-4. Ext-Trig, Not-Invert

Parameter Description

IO-4. Ext- Trig, Not- Invert	Parameter setting for pin 4.				
	Not- Invert	Indicates whether to invert the input/output pulse or level signal. Invert: Yes Not-Invert: No			
		Ext-Trig	the P-IO p		ans that pin 4 of ection control over function.
			Trig–Out	ment general triggers the M ta Recording	t when the instru- tes a signal (which Meter function, Da- function and List unning), pin 4 will e signal.
		Trig-In Indicates that the instrumen will trigger the running of one the functions below after recing the external pulse signal			e running of one of below after receiv-
				Meter	Triggers the running of Meter function. This function needs to be triggered at the upper computer side through SCPI instruction. For details, refer to



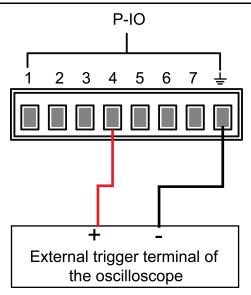
			instructions re- lated to ACQuire in the Trigger subsystem of the Instruction Manual.
		Dlog	Triggers the run- ning of data re- cording function.
		List	Triggers the run- ning of List files.
Input	Pin 4 rece	eives the level	signal from the
Output	Pin 4 send	ds the digital s	ignal (1, 0, PWM)
	to the outs	side.	,
	to the outs	By default (N put digital sig	lot-Invert), the out- inal is 1 (i.e. low the case of Invert, high level.
		By default (No put digital signered), and in the output is By default (No put digital signered)	the case of Invert, high level. lot-Invert), the out- gnal is 0 (i.e. high the case of Invert,
	True	By default (No put digital signerel), and in the output is By default (No put digital signerel), and in	the case of Invert, high level. lot-Invert), the outmal is 0 (i.e. high the case of Invert, low level.
	True False	By default (No put digital signerel), and in the output is By default (No put digital signerel), and in the output is	the case of Invert, high level. lot-Invert), the outmal is 0 (i.e. high the case of Invert, low level.

How to Use

Taking the triggering of List function as an example, the text below will introduce how to use pin 4's default function **Ext-Trig**.

- Trig-Out
 - 1. Refer to the figure below to connect pin 4 to the external oscilloscope.





- 2. Set pin 4's function to Not-Invert and Trig-Out.
- 3. Recall the edited List file for trigger running.
- 4. Press [Shift]+[On/Off] (Trigger) on the front panel to trigger the running of List files.



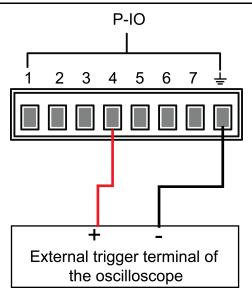
ListTrig Source is set to Manual.

5. Check the oscilloscope and confirm whether pin 4 has following pulse signal output.

Level rise slope	10us
Level fall slope	2us
Minimum time width for low level keep	30us

- Trig-In
 - 1. Refer to the figure below to connect pin 4 to the external oscilloscope.





- 2. Set pin 4's function to **Not-Invert** and **Trig-In→List**.
- 3. Recall the edited List file for trigger running.
- 4. Set ListTrig Source to External.
- 5. Send pulse signals as per the following requirements from the external oscilloscope to pin 4.

Level rise slope	10us
Level fall slope	2us
Minimum time width for low level keep	30us

6. Observe the VFD screen on the instrument's front panel to confirm whether the List file is running or not.

3.6.7.5 IO-5. INH-Living, Not-Invert

Parameter Description

IO–5. Living, Not-Invert	Parameter setting for pin 5.		
	Not- Invert	Indicates whether to invert the input/output pulse or level signal.	
	Invert	Invert: Yes	
		Not-Invert: No	



		Inhibit		ontrols the op	eans that pin 5 of eration of the
			Living	•	, and power supply ted in the mode of
			Latch		, and power supply ted in the mode of
		Input	Pin 5 rece outside.	ives the level	signal from the
		Output	Pin 5 sends the digital signal (1, 0, PV to the outside.		ignal (1, 0, PWM)
			True	put digital sig	lot-Invert), the out- gnal is 1 (i.e. low the case of Invert, high level.
		False	put digital sig	lot-Invert), the out- gnal is 0 (i.e. high the case of Invert, low level.	
PWM Dig		Digital signal of PWM.			
				PWM Freq	Frequency
				PWM Duty	Duty cycle

How to Use

- When pin 5 is set to Inhibit-Living (Not-Invert), pin 5 can control the instrument's output state based on the level signal from external input.
 - Under default conditions (namely, pin 5 is not connected), the input is high level, and it will not impact the instrument's output state.
 - When the [On/Off] is in On state, input low level to pin 5, and it will impact the output state: The [On/Off] button light is lighted on and VFD still displays On, but the actual output is 0; when pin 5 receives high level signal again, the output state is recovered.



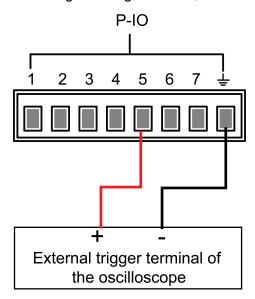
ООО "Техэнком"

Basic Operation



If pin 5 is set to Invert, input high level to pin 5, and it will impact the output state.

1. Referring to the figure below, connect pin 5 to the external oscilloscope.



- 2. Set pin 5's function to **Not-Invert** and **Inhibit**→**Living**.
- 3. Set voltage to 10V and turn on [On/Off].
- 4. Input low level to pin 5.

At this point, the **[On/Off]** button light is lighted on, and VFD indicator light on the front panel displays **On**, while voltage/current Meter value gradually decreases to 0, the output function is prohibited. In addition, the VFD screen on the front panel displays INH.

5. Input high level to pin 5.

At this point, [On/Off] button light is lighted on, and VFD indicator light on the front panel displays On, and voltage/current Meter value gradually recovers to 10V, and the output function is re-initiated.

When pin 5 is set to **Inhibit-Latch** (**Not-Invert**), pin 5 can control the instrument's output state based on the pulse signal from external input. The parameter requirements of this pulse signal are as follows:

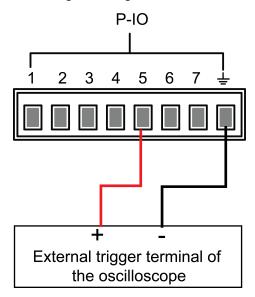
Level rise slope	10us
Level fall slope	2us
Minimum time width for low level keep	30us



- Under default conditions (pin 5 is not connected), it will not effect the instrument's output state.
- If [On/Off] is in On state, when pin 5 receives pulse signal, [On/Off] will be turned off: The [On/Off] button light is lighted off, and the VFD indicator light displays Off.

After confirming that the **[On/Off]** can be turned on again, the user needs to manually turn on **[On/Off]**.

1. Referring to the figure below, connect pin 5 to the external oscilloscope.



- 2. Set pin 5's function to **Not-Invert** and **Inhibit**→**Latch**.
- 3. Set voltage to 10V and turn on [On/Off].
- 4. Input pulse signal to pin 5.

At this point, the **[On/Off]** button light is lighted off, and the VFD indicator light on the front panel displays **Off**, and the output function is switched off. In addition, the VFD screen on the front panel displays **Inhibit-Ps**. When the protection state is cleared, manually turn on **[On/Off]** again.

3.6.7.6 IO-6. Sync-On, Not-Invert

Parameter Description

IO-6. Sync- On, Not- Invert	Parameter setting for pin 6.		
	Not- Invert	Indicates whether to invert the input/output pulse or level signal. • Invert: Yes	



Invert	Not-Invert: No			
	Sync-On	ync-On This default function means that pin 6 forms bi-directional and synchronous trol over the turn-on of [On/Off] under parallel connection.		nd synchronous con-
	Input Pin 6 receives the level signal from outside.		el signal from the	
	Output	Pin 6 sends the digital signal (1, 0, to the outside.		l signal (1, 0, PWM)
		True	put digital sig	Not-Invert), the out- gnal is 1 (i.e. low lev- e case of Invert, the h level.
		False	put digital sig	Not-Invert), the out- gnal is 0 (i.e. high lev- e case of Invert, the level.
		PWM	Digital signa	l of PWM.
			PWM Freq	Frequency
			PWM Duty	Duty cycle

How to Use

When pin 6 is set to default **Sync-On** function, pin 6 has bi-directional I/O function, which can receive pulse signal input from the external instrument and also can output pulse signal to external instrument. The parameter requirements of this pulse signal are as follows:

Level rise slope	10us
Level fall slope	2us
Minimum time width for low level keep	30us

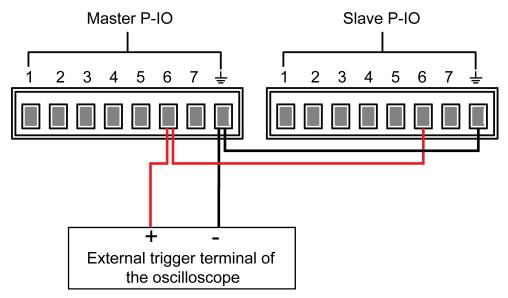
The bi-direction I/O functions are introduced as below:



- Press [On/Off] on the instrument's front panel, the instrument's output is changed from Off to On. At this point, the pulse signal output from pin 6 can be detected.
- When the instrument's [On/Off] is in On state, input pulse signal to pin 6, and it will not impact the [On/Off] state.
- When the instrument's **[On/Off]** is in Off state, when pulse signal is input to pin 6, the **[On/Off]** will be changed from Off to ON.

Taking two instruments in parallel as an example, the operation is as below:

1. Referring to the figure below, connect pin 6 of two instruments to the external oscilloscope.



- 2. Set pin 6's function of two instruments to **Not-Invert** and **Sync-On**.
- 3. Set voltage to 10V on the master's front panel and turn on the master's [On/Off].

At this time, check the oscilloscope. The master's pin 6 outputs pulse signal and the slave's output function is synchronously switched on.

3.6.7.7 IO-7. Sync-Off, Not-Invert

Parameter Description

IO-7. Sync-Off, Not-Invert	Parameter setting for pin 7.		
	Not- Invert	Indicates whether to invert the input/output pulse or level signal. • Invert: Yes	



	Not-Invert: No			
	Sync- Off	performs	s bi-directiona	means that pin 7 al and synchronous off of [On/Off] ction.
	Input	Pin 7 receives the level signal from the outside.		el signal from the
	Output	Pin 7 sends the digital signal (1, 0, PWM) to the outside.		ıl signal (1, 0,
		True	put digital si level), and ir	Not-Invert), the out- gnal is 1 (i.e. low n the case of output is high level.
		False	put digital si level), and ir	Not-Invert), the outgnal is 0 (i.e. high the case of butput is low level.
		PWM	Digital signa	l of PWM.
			PWM Freq	Frequency
			PWM Duty	Duty cycle

How to Use

When pin 7 is set to default **Sync-Off** function, pin 7 has bi-directional I/O function, which can receive pulse signal input from the external instrument and also can output pulse signal to external instrument. The parameter requirements of this pulse signal are as follows:

Level rise slope	10us
Level fall slope	2us
Minimum time width for low level keep	30us

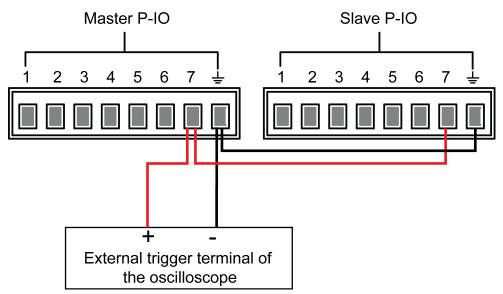
The bi-direction I/O functions are introduced as below:



- Press [On/Off] on the instrument's front panel, the instrument's output is changed from On to Off. At this point, the pulse signal output from pin 7 can be detected.
- When the instrument's **[On/Off]** is in Off state, input pulse signal to pin 7, and it will not impact the **[On/Off]** state.
- When the instrument's **[On/Off]** is in On state, input pulse signal to pin 7, and **[On/Off]** will be changed from On to Off.

Taking two instruments in parallel as an example, the operation is as below:

1. Referring to the figure below, connect pin 7 of two instruments to the external oscilloscope.



- 2. Set pin 7's function of two instruments to Not-Invert and Sync-Off.
- 3. Confirm that the master and the salve's [On/Off] are both in On State.
- 4. Press **[On/Off]** on the master's front panel, and turn off the master's output function.

At this time, check the oscilloscope. The master's pin 7 outputs pulse signal and the slave's output function is synchronously switched off.

3.6.8 (Optional) Analogue Function (Ext-Program)

This menu item is used to control whether the external analog function is turned on. This function is not standard with the instrument and is optional for users. If the user does not select this function, this menu item will not be displayed.

The detailed parameter description is as below.

Ext-Program	External analog function menu		
	On / Off	Function switch:	



	On: Turns on the external analog function. In this state, the channel parameters cannot be set.	
	Off: Turns off the external analog function. In this state, the channel parameters can be set.	
Ch1	Set the	parameters of channel 1.
	M1	Indicates the slope factor of channel 1.
	Mb	Indicates the offset of channel 1.
Ch2	Set the parameters of channel 2.	
	M2 Indicates the slope factor of channel	
	Mb	Indicates the offset of channel 2.
Ch3	Set the parameters of channel 3.	
	МЗ	Indicates the slope factor of channel 3.
	Mb	Indicates the offset of channel 3.

3.6.9 Restored to Factory Setting (System Reset)

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

The procedures to set the menu item are as follows.

- 1. Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.
- 2. Press the Up/Down key or turn the knob to select the **System Reset** and press [Enter].
- 3. Press the Left / Right key or turn the knob to adjust the value of this parameter.
 - No: Default value, indicates the instrument cancels this menu setting.
 - Yes: Indicates the instrument restores the factory default settings.
- 4. After the parameter settings are complete, press [Enter].

The parameters affected by **System Reset** and the parameter values after reset are shown in Table 3–3 Initial value of the parameter.



Table 3-3 Initial value of the parameter

Category	Parameter	Initial Value
Main interface	Voltage setting: Vs	One percent of the rated voltage of the instrument
	Current setting: Is	One percent of the rated current of the instrument
	Upper limit of voltage: Vh, and lower limit of voltage: VI	Upper limit value: One percent of the rated voltage of the instrument Lower limit value: 0
	Upper limit of current: I+, and lower limit of current: I-	One percent of the rated current of the instrument
	Upper limit of power: P+, and lower limit of power: P-	Rated power value of the instrument
	[On/Off] status	Off
System	Веер	On
menu	PowerOn	Reset
	Sense	Off
	ListTrig Source	Manual
	DataLogger Trig Source	Manual
	I/O Con	 LAN→IP-Conf IP Addr: 192.168.0.1 SubNet: 255.255.255.0 Gateway: 192.168.0.1 DNS1/DNS2: 0.0.0.0 Socket Port: 30000
		LAN→Serv-Conf



Category	Parameter	Initial Value
		MDNS/PING/Telnet- scpi/Web/VX-11/ Raw-socket: On
		• VCP: 9600,8,N,1
		• (Optional) RS232: 9600,8,N,1
		(Optional) External analog: Off
		(Optional) GPIB: Address=1
	Digital Port	• IO-1: Ps-Clear
		• IO–2: Ps
		IO–3: Off-Status
		• IO-4: Ext-Trig
		• IO–5: INH-Living
		IO-6: Sync-On
		IO–7: Sync-Off
	Parallel	Single
Config menu	Mode	CV
	Speed	High
	V-Rise Time/I-Rise Time	0.1s
	V-Fall Time/I-Fall Time	
	Output Res	1000
	On Delay/Off Delay	0
Protect menu	OVP/OCP/OPP/UCP/UVP Status switch	Off
	OVP/OCP/OPP Protection point: Level	Rated voltage / current / power value of the instrument
	UCP/UVP Protection point: Level	0



Category	Parameter	Initial Value
	OVP/OCP/OPP/UCP/UVP Delay time: Delay	60s
	UCP/UVP Warm time: Warm-up	

3.6.10 View the System Information (System Info)

This menu item is used to view the system information of the instrument.

The procedures to view the system information are as follows.

- 1. Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.
- 2. Press the Up/Down key or turn the knob to select the **System Info** and press **[Enter]**.

You can use Up/Down key or knob to view the following system information.

Parameter	Description
Model	Display the instrument model.
MAC Addr	Display the MAC address, that is, the physical address.
SN	Display the serial number.
Main-Ver	Display the system version information.
Ctrl-Ver	Display the version information for a single module.
FPGA-Ver	Display the FPGA version information.
INV-Ver	Display the control board version information.
2017/6/22 0:00	Display the system time.

3.7 System Upgrade

The IT6000C series power supply supports the upgrade of the system version. System upgrade includes the following two methods:



- During the start-up period after the instrument is powered on, through the USB interface on the front panel, select the system upgrading files in the memory device (U key) for upgrading.
- The user can access to the Web service programs in the instrument by the Web browser on PC for upgrading operation.

This Chapter introduces in detail how to upgrade the system with the USB interface on the front panel. For the upgrading method of Web, see 5.6 Web Server.

Before You Upgrade

Before upgrading, you need to note the following points:

1. Description about system upgrading files.

Before upgrading, please contact ITECH technical staff to obtain the following two upgrading files, and put them under the root directory of the U key.

- itech_6000_P.itechSystem upgrading package postfixed with .itech.
- ItechConfig.txt

System upgrading package in text format.

- 2. The upgrading methods for single unit or units in parallel are slightly different: Under the parallel mode, the user can select to upgrade all units or a single unit only by operating the master. Therefore, the user needs to get access to SN numbers of all instruments in the parallel network (To obtain the unique ID for identifying instrument, see 3.6.10 View the System Information (System Info)) for selective upgrading based on the SN number in subsequent upgrades.
- If the upgrade fails, the interface will prompt Update fail. At this point, you
 cannot use the instrument. Please contact ITECH technical staff for
 treatment.

Upgrade Operation

- System Upgrade under Single-unit Mode
 - Insert the U key into the USB interface on the front panel of the instrument.
 - 2. Power on the instrument. At this point, press **Shift** for several times till the instrument can detect the system upgrading files in the U key.

After the system upgrading files are detected, the interface displays as follows:



Basic Operation

Update Select(01/01)

SN: ALL



If the U key is not detected, select **Yes** to detect again; if **No** is selected, it means to exit upgrading, and the system will directly enter into the main interface.

3. Select ALL, and press [Enter].

The system interface displays as follows:

Update ? (01/01)
No Yes

4. Select Yes, and press [Enter].

The system will automatically perform upgrading.



If **No** is selected, it means to exit upgrading, and the system will directly enter into the main interface.

- 5. After the upgrading is completed, you need to restart the instrument manually.
- System Upgrade under Parallel Mode (Only Need to Operate the Master)
 - Insert the U key into the USB interface on the front panel of the instrument.
 - 2. Power on the instrument. At this point, press **Shift** for several times till the instrument can detect the system upgrading files in the U key.

After the system upgrading files are detected, the interface displays as follows:

Update Select(xx/yy)
SN: ALL

xx means the number of selected instruments to be upgraded, and yy means the number of instruments in the parallel network.

- 3. Select upgrade in whole or in part based on actual needs. Then, press **[Enter]**.
 - SN: ALL

Indicates to upgrade all.



Basic Operation

Indicates to upgrade the selected instrument. Press Up/Down to check the SNs of all instruments in the parallel network; press Right to select the instrument; and press Right again to deselect the instrument.

4. Select Yes, and press [Enter].

The system will automatically perform upgrading.



If **No** is selected, it means to exit upgrading, and the system will directly enter into the main interface.

5. After the upgrading is completed, you need to restart the instrument manually.



4

Power Supply Function

This chapter describes the functions and features of the power supply. Divided into the following sections:

- ◆ Set the Output Voltage
- ◆ Set the Output Current
- ♦ Set the Output Power
- ◆ Configuration Menu Function for Power Supply
- ◆ Protection Function for Power Supply
- ◆ Function Menu for Power Supply

4.1 Set the Output Voltage

In CV priority (default) mode, press **[V-set]**, the interface displays "Vs=0.00V" (Setting value of voltage). In CC priority mode, press **[V-set]**, the interface displays "Vh=0.00V" (Upper limit of voltage), and press **[V-set]** again, the interface displays "VI=0.00V" (Lower limit of voltage).

The voltage setting range is from 0V to the maximum rated output voltage. When **[V-set]** key is pressed, the key light is lit and the output voltage value can be set. Press numeric keys or rotate the knob to adjust the value in the voltage setting area indicated by the cursor. This value takes effect when you press **[Enter]**.

4.2 Set the Output Current

In CV priority (default) mode, press **[I-set]**, the interface displays "I+=0.00A" (Upper limit of current), and press **[I-set]** again, the interface displays "I-= 0.00 A" (Lower limit of current). In CC priority mode, press **[I-set]**, the interface displays "Is=0.00A" (Setting value of current).

The range of current settings is between the data ranges defined in the specifications. When **[I-set]** key is pressed, the key light is lit and the output current value can be set. Press numeric keys or rotate the knob to adjust the value in the current setting area indicated by the cursor. This value takes effect when you press **[Enter]**.





For the bi-directional power supply, you can set the direction of the current (output / input), that is, control the positive or negative current value by pressing the [+/-] key.

4.3 Set the Output Power

Press [P-set], the interface displays "P+=0.00W" (Upper limit of power) , and press [P-set] again, the interface displays "P- = -0.00W" (Lower limit of power)

The range of power settings is between the data ranges defined in the specifications. When **[P-set]** key is pressed, the key light is lit and the output power value can be set. Press numeric keys or rotate the knob to adjust the value in the power setting area indicated by the cursor. This value takes effect when you press **[Enter]**.



For the bi-directional power supply, you can set the direction of the power (output / input), that is, control the positive or negative power value by pressing the [+/-] key.

4.4 Configuration Menu Function for Power Supply

This section gives an overview of the configuration menu of the IT6000C series power supply.

The procedures to operate the configuration menu are as follows.

 Press the composite keys [Shift]+[V-set] (Config) on the front panel to enter the configuration menu.

The VFD shows configuration menu items and each menu item is marked with a number. The user can use up and down keys or knob to scroll pages to view the other menu items.

2. Press [Enter] to select the desired menu item.

Enter the parameter setting interface of this menu item.

3. After finishing the menu setting, press [Enter] key to save the setting.





Press [Esc] key to return to the previous menu level.

The descriptions of configuration menu are listed in the table below.

Config	Configuration menu of the power supply				
	Mode	CC/CV priorit	ty mode setting		
		CV	Constant voltage loop priority mode		
			Speed= High/Low	Loop response speed setting: high speed / low speed	
		СС	Constant current loop p	oriority mode	
			Speed= High/Low	Loop response speed setting: high speed / low speed	
	V-Rise Time = 0.001s	/I-Rise Time	Displays the voltage or current rise time setting according to the selected priority mode. If CC priority mode is selected, the parameter setting of I-Rise Time will be displayed here.		
	V-Fall Time/l 0.001s	I-Fall Time =	Displays the voltage or current fall time setting according to the selected priority mode. If CC priority mode is selected, the parameter setting of I-Fall Time will be displayed here.		
	Output Res		Set the internal resistance of the power supply. This parameter needs to be set only when Mode is set to CV .		
	On Delay		Set the delay time to turn on the output.		
	Off Delay		Set the delay time to turn off the output.		

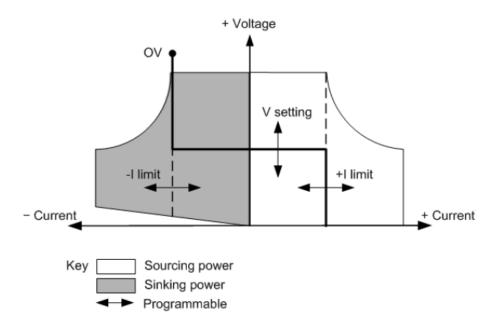


4.4.1 Set the CC/CV Priority Mode

CV Priority

In CV priority mode, 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. CV priority mode is best suited for use with resistive or high impedance loads, and loads that are sensitive to voltage overshoots. Do not use CV priority mode with low-impedance sources such as batteries, power supplies, or large charged capacitors.

In CV priority mode, the output voltage should be programmed to the desired value. A positive and negative current limit value should also be set. The current limit should always be set to a value that is greater than the actual input current requirement of the external load. The following figure shows the CV priority operating locus of the output. The area in the white quadrants shows the output as a source (sourcing power). The area in the shaded quadrants shows the output as a load (sinking power).



The heavy solid line illustrates the locus of possible operating points as a function of output. As shown by the horizontal portion of the line, the output voltage remains regulated at its programmed setting as long as the load current remains within the positive or negative current limit setting. A CV status flag indicates that the output voltage is being regulated and the output current is within its limit settings.

Note that when the output current reaches either the positive or negative current limit, the unit no longer operates in constant voltage mode and the output



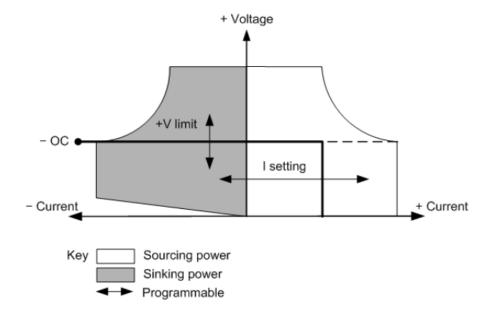
voltage is no longer held constant. Instead, the unit will now regulate the output current at its current limit setting.

As shown by the vertical portions of the shaded quadrants, the output voltage may continue to increase in the positive direction or decrease in the negative direction as current is forced into or pulled out of the unit. When the output voltage exceeds the over-voltage protection setting, the output will shut down.

CC Priority

In CC priority mode, the output is controlled by a bi-polar constant current feed-back loop, which maintains the output source or sink current at its programmed setting. The output current remains at its programmed setting, provided the load voltage remains within the voltage limit setting. CC priority mode is best suited for use with batteries, power supplies, large charged capacitors, and loads that are sensitive to current overshoots. It minimizes current overshoots during programming, turn-on, and turn-off transitions and seamlessly transitions between positive and negative currents.

In CC priority mode, the output current should be programmed to the desired positive or negative value. A positive voltage limit range should also be set. The voltage upper limit should always be set to a value that is greater than the actual input voltage requirement of the external load. The following figure shows the CC priority operating locus of the output. The area in the white quadrants shows the output as a source (sourcing power). The area in the shaded quadrants shows the output as a load (sinking power).



The heavy solid line illustrates the locus of possible operating points as a function of output. As shown by the vertical portion of the line, the output current remains regulated at its programmed setting as long as the output voltage



remains within its limit setting. A CC (constant current) status flag indicates that the output current is being regulated and the output voltage is within its limit settings.

Note that when the output voltage reaches the upper limit, the unit no longer operates in constant current mode and the output current is no longer held constant. Instead, the unit will now regulate the output voltage at its voltage limit setting.

As shown by the horizontal portion of the shaded quadrants, when the unit is sinking power, the output current may continue to increase in the negative direction as more current is forced into the unit. This can happen when the instrument is connected to an external device such as a battery, and its output voltage is higher than the voltage limit setting of the instrument. Once the current exceeds the built-in negative over-current limit, the output will shut down. In such a case, it is important to set the voltage limit properly in order prevent this protection shutdown.

How to Set

The procedures to set the output priority mode are as follows.

- Press the composite keys [Shift]+[V-set] (Config) on the front panel to enter the configuration menu.
- 2. Select **Mode** and press **[Enter]** to enter into the setting interface.
- 3. Select **CC** or **CV**, and press [Enter].
 - Enter the setting interface of the loop response speed.
- 4. Select **High** or **Low**, and press **[Enter]**.
 - At this point, return to the Config menu settings interface.
- 5. Press the down arrow key to set the voltage/current rise time. When finished, press [Enter].
- 6. Set the other Config menu items in the same way.
- 7. Set the output voltage and current value.
 - CV priority
 - a. Press the [V-set] key on the front panel to set the output voltage value Vs.
 - b. Press the [I-set] key on the front panel to set the current upper limit I +. Press [I-set] again to set the current lower limit I-, i.e. the negative current limit value.
 - CC priority
 - a. Press the [I-set] key on the front panel to set the output current value
 - b. Press the **[V-set]** key on the front panel to set the voltage upper limit **Vh**, and press **[V-set]** again to set the voltage lower limit **VI**.



4.4.2 Set the Internal Resistance

The IT6000C series power supply provides internal resistance setting (CV priority mode only). The procedures are shown as below.

- 1. Press the composite keys [Shift]+[V-set] (Config) on the front panel to enter the configuration menu.
- 2. Press the up/down key or rotate the knob to select **Output Res** and press **[Enter]** to confirm.
- 3. Set the internal resistance value and press [Enter] to confirm.

4.4.3 Set the Output-On/Output-Off Delay

You can set the output-on/output-off delay time within the range from 0 seconds to 60 seconds.

- On Delay: Indicates from the time that a command to turn on the output is received until the output actually turns on.
- Off Delay: Indicates from the time that a command to turn off the output is received until the output actually turns off.

The procedures to set the output delay time are as follows.

- Press the composite keys [Shift]+[V-set] (Config) on the front panel to enter the configuration menu.
- 2. Press the up/down key or rotate the knob to select **On Delay** or **Off Delay**, and press **[Enter]** to confirm.
- 3. Set the output-on/output-off delay time and press [Enter] to confirm.

4.5 Protection Function for Power Supply

The IT6000C series power supply provides the general protection functions such as overvoltage, overcurrent, overpower, undercurrent and undervoltage protection. The corresponding protection parameters can be configured in the Protect menu. In addition, the power supply also provides over temperature protection and Sense reverse connection protection.

The descriptions of Protect menu are listed in the table below.

Protect	Protection function menu for the power supply			
	OVP	Overvoltage protection		
		Off Turn the OVP function off. (Def)		
		On Turn the OVP function on.		



		Level	OVP limit	
		Level		
		Delay	Protection delay time, see Protection Delay.	
OCP	Overcurrent pr	protection		
	Off	Turn the OCP function off. (Def)		
	On	Turn the OC	CP function on.	
		Level	OCP limit	
		Delay	Protection delay time, see Protection Delay.	
OPP	Overpower pro	tection		
	Off	Turn the OF	PP function off. (Def)	
	On	Turn the OF	PP function on.	
		Level	OPP limit	
		Delay	Protection delay time, see Protection Delay.	
UCP	Undercurrent p	nt protection		
	Off	Turn the UCP function off. (D		
	On	Turn the UC	P function on.	
		Warm-up War		
		Level	UCP limit	
		Delay	Protection delay time, see Protection Delay.	
UVP	Undervoltage p	protection		



	Off	Turn the UV	P function off. (Def)
	On	Turn the UV	P function on.
		Warm-up	Indicates the instrument warm-up time. This time is set to prevent the instrument from triggering protection when the voltage is rising. Because this transient condition should not be considered as an undervoltage fault and there is no need to trigger protection.
		Level	UVP limit
		Delay	Protection delay time, see Protection Delay.

Protection Delay

You can specify an OCP/OVP/OPP/UCP/UVP delay to prevent momentary output settings and status changes from tripping the protection. In most cases these momentary conditions would not be considered an protection fault, and having an OCP/OVP/OPP/UCP/UVP condition disable the output when they occur would be a nuisance. Specifying an protection delay (**Delay**) can ignore these momentary changes during the specified delay period. Once the delay time has expired and the protection limit condition persists, the output will shut down.

Fault Prompt

When the instrument enters the protection state, the buzzer sounds (if **Beep** menu item is set as default state **On**), the VFD status indicators **Prot** and **Off** are lit, and **[On/Off]** is turned off.

WARNING

Although **[On/Off]** is turned off, there may be dangerous voltage at the output electrodes. Do not touch the wiring cable or the electrode terminals.



When protection is generated, the VFD screen displays the following information:

- The first row shows the meter voltage and the meter current value.
- The second row shows specific fault information, such as OVP.

Clear the Protection

After the instrument triggers protection and generates a fault message, you need to troubleshoot the possible cause. When the fault is resolved, the VFD will still prompt the fault information. You can manually clear the fault information record through the following methods.

 Input a pulse signal to pin 1 of the rear panel P-IO to clear the fault information.

For details, see 3.6.7.1 IO-1. Ps-Clear, Not-Invert.

- Press the **[Esc]** or **[Enter]** key on the front panel to manually clear the fault information.
- Connected to the host computer, the PC sends a PROTection:CLEar command to the instrument to clear the fault information.

After the protection fault is cleared, you need to press the **[On/Off]** key on the front panel or send the **OUTPut ON** command to the instrument to reopen **[On/Off]**.

4.5.1 Set Over-Voltage Protection (OVP)

Users can enable the OVP function and set the protection limit **Level** and protection delay time **Delay**. 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.
- Input too high external voltage.
- The power supply outputs a high voltage due to a fault.



CAUTION

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

How to Set

The operation steps to set OVP are as follows.

- 1. Press the composite keys **[Shift]+[Recall]** (Protect) on the front panel to enter the protection menu.
- 2. Press the up/down key or rotate the knob to select **1. OVP (Off)** and press **[Enter]**.
- 3. Press the left/right key or rotate the knob to select **On** and press **[Enter]** to enter the setting interface.
- 4. Set the protection limit **Level** and the delay time **Delay** in sequence, and press **[Enter]** to confirm.

The VFD screen returns to the Protect menu and the OVP setting (take 150V, 1S as an example) is displayed as follows:

```
PROTECT
1.0VP 150V, 1S
```

4.5.2 Set Over-Current Protection (OCP)

Users can enable the OCP function and set the protection limit **Level** and protection delay time **Delay**. 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.
- Input too high external 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 the composite keys [Shift]+[Recall] (Protect) on the front panel to enter the protection menu.
- 2. Press the up/down key or rotate the knob to select **2. OCP (Off)** and press **[Enter]**.
- 3. Press the left/right key or rotate the knob to select **On** and press **[Enter]** to enter the setting interface.
- 4. 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.

The VFD screen returns to the Protect menu and the OCP setting (take 10A, 1S as an example) is displayed as follows:

PROTECT
2.OCP 10A, 1.000S

4.5.3 Set Over-Power Protection (OPP)

Users can enable the OPP function and set the protection limit **Level** and protection delay time **Delay**. 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.
- Input too high external power.
- The power supply outputs a high power due to a fault.

How to Set

The operation steps to set OPP are as follows.

- 1. Press the composite keys **[Shift]+[Recall]** (Protect) on the front panel to enter the protection menu.
- 2. Press the up/down key or rotate the knob to select **3. OPP (Off)** and press **[Enter]**.



- 3. Press the left/right key or rotate the knob to select **On** and press **[Enter]** to enter the setting interface.
- 4. 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.

The VFD screen returns to the Protect menu and the OPP setting (take 150W, 1S as an example) is displayed as follows:

PROTECT
3.0PP 150W, 1.000S

4.5.4 Set Under-Current Protection (UCP)

Users can enable the UCP function and set the instrument warm-up time **Warm-up**, protection limit **Level** and protection delay time **Delay**. When the current (i.e., the Meter value) is lower than this protection limit and the warm-up 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.
- Input too low external current.
- The power supply outputs a low current due to a fault.

How to Set

The operation steps to set UCP are as follows.

- 1. Press the composite keys [Shift]+[Recall] (Protect) on the front panel to enter the protection menu.
- 2. Press the up/down key or rotate the knob to select **4. UCP (Off)** and press **[Enter]**.
- 3. Press the left/right key or rotate the knob to select **On** and press **[Enter]** to enter the setting interface.
- 4. Set the warm-up time **Warm-up**, protection limit **Level** and delay time **Delay** 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.

The VFD screen returns to the Protect menu and the UCP setting (take 10S, 0.1A, 1S as an example) is displayed as follows:

```
PROTECT
4.UCP 10S, 0.1A, 1.000S
```

4.5.5 Set Under-Voltage Protection (UVP)

Users can enable the UVP function and set the instrument warm-up time **Warm-up**, protection limit **Level** and protection delay time **Delay**. When the voltage (i.e., the Meter value) is lower than this protection limit and the warm-up 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.
- Input too low external voltage.
- The power supply outputs a low voltage due to a fault.

How to Set

The operation steps to set UVP are as follows.

- 1. Press the composite keys [Shift]+[Recall] (Protect) on the front panel to enter the protection menu.
- 2. Press the up/down key or rotate the knob to select **5. UVP (Off)** and press **[Enter]**.
- 3. Press the left/right key or rotate the knob to select **On** and press **[Enter]** to enter the setting interface.
- 4. Set the warm-up time **Warm-up**, protection limit **Level** and delay time **Delay** in sequence, and then press **[Enter]** to confirm.

The VFD screen returns to the Protect menu and the UVP setting (take 10S, 1V, 1S as an example) is displayed as follows:

```
PROTECT
5.UVP 10S, 1V, 1.000S
```



4.5.6 Over-Temperature Protection (OTP)

When internal temperature of instrument is higher than about 90 °C, the instrument is under temperature protection. At this time, the instrument will automatically be **OFF** and VFD status indicator **Prot** lights up 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.

4.5.7 Sense Reverse Protection

The instrument defaults to provide sense reverse protection. When the output state is ON and the difference between output terminal voltage and sense remote voltage exceeds the specified voltage, sense reverse protection will be enabled after 500ms. The instrument output will be immediately switched to Off and the display screen will display **Sense Reverse Prot** if the sense terminals are reversed.



When the instrument is in Sense Reverse Protection state, you should check whether the polarities are connected reversely or not firstly. If yes, you can reopen the output after the polarities connect correctly.

The voltage difference between output terminal and remote sense terminal of each model is not the same. When the remote sense terminal is connected reversely, the maximum voltage will not exceed the sum of output terminal voltage and the difference voltage.

4.6 Function Menu for Power Supply

The Function menu of the power supply includes the following:

Function	Function Menu for Power Supply		
	LIST	LIST program editing, file import/export, program running (see 4.6.1 LIST Function).	
	BATTERY	Battery charging and discharging testing function (see 4.6.2 Battery Charging/Discharging Test Function).	
Road-Vehicles		Built-in waveform function (see 4.6.3 Built-in Waveform Function).	
	SAS	PV simulation function (see 4.6.4 Solar Photovoltaic Curve Simulation Function (SAS)).	

4.6.1 LIST Function

The IT6000C series power supply supports a total of 10 List files (List01 to List10), each of which can be set up to 200 steps. You need to edit the voltage/current value, slope and time width of each step, or you can set repeat times (1 to 65535) for each List file. After the file is edited completely, you can trigger the selected List file to run according to the selected trigger mode.

The descriptions of list function menu are listed in the table below.

LIST	List menu				
	Run	Indicates to enter the List run mode, waiting for the trigger to run the currently selected List file.			
	Open	Select the List file to open.			



	USB	Open the List	file in the external USB flash disk.	
		Load	Import the List file from the external USB flash disk into the instrument.	
		Not-Load	Cancel the import operation.	
	Internal	Open the List	file stored inside the instrument.	
		Recall Inner File	Set the name of the recalled List file.	
Export	Export the		le of the instrument to an external	
	File Name	The name of the exported list file. The default suffix is .csv, and the file name can only be a string of numbers.		
Edit	Edit list pr	ogram.		
	CC / CV	Set the operation mode for list program: CC priority or CV priority.		
	Step Count	The total number of steps included in the List program.		
	Step 1 Value	Current value or voltage value setting for Step1. (The voltage appears when CV priority is selected; the current appears when CC priority is selected.)		
	Step 1 Slope	Slope value s	etting for Step1.	
	Step 1 Width	Dwell time se	tting for Step1.	
	Repeat	Set the numb	er of list file repetitions.	
	End State	Set the running state after the list program is running over.		
		Last After the List program finishe ning, the output is kept as the ting in the last step, and the working mode remains as the ting in the List file.		



		Normal	After the List program finishes running, the working mode and voltage/current output return to the settings before the List running.	
	Trig Out	Function switch that triggers the signal output. It is applicable to the scenario of synchronously controlling multiple units, that is, by connecting the outer loop interfaces TX and RX of the fiber realize List synchronization triggering between multiple units.		
		None Turn off (default)		
		Tout	Turn on	
	Save to group	Save the edited List program.		

Edit List Program

The following takes CC priority mode as an example to introduce the operation of editing two test steps.

- 1. Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.
- 2. Select 1. LIST: Off and press [Enter].
- 3. Press the Left/Right key to select **Edit** and press **[Enter]** to enter the editing interface.
- 4. Select **CC** and press [Enter] to confirm.
- 5. Set the total number of steps in the List program and press **[Enter]** to confirm.
- 6. Set the current, slope and time width of step 1 in turn, and press **[Enter]** to confirm.
- 7. Set the parameters of step 2 in the same method.
- 8. Set the number of list repetitions **Repeat**, and press **[Enter]** to confirm.
- 9. Set the **End State** as **Normal**, and press **[Enter]** to confirm.
- 10. Depending on the test requirement, choose whether to turn on the function switch that triggers synchronization.
- 11. Set the currently edited List program name.



If you choose not to save, press [Esc] to exit the editing interface.

Import List Program

If you need to run the List program on the external USB flash drive, you need to import the List program from the USB flash drive into the instrument.



The format of the List file in the USB flash drive must be in .csv format and saved in the root directory of the USB flash drive. You can refer to Export List Program to customize editing according to the List file template exported to the USB flash drive.

The procedures are as follows:

- 1. Insert the USB flash drive into the front panel USB connector.
- 2. Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.
- 3. Select 1. LIST: Off and press [Enter].
- 4. Press the Left/Right key to select **Open** and press **[Enter]**.
- 5. Select **USB** and press **[Enter]**.

At this point, the system will automatically read all the List files in the root directory of the USB flash drive. The interface is displayed as follows:

```
XXX.csv
Not-Load Load YY/ZZ
```

XXX indicates the name of the List file; YY indicates the serial number of the current List file; ZZ indicates the total number of the List file.

- 6. Press the Up/Down key to select the List file.
- 7. Press the Left/Right key to select **Load**, press **[Enter]** to complete the import, and wait for the trigger to run this List file.

At this point, the interface returns to the main interface of the system and **LIST RUN** is displayed in the lower right corner.

Select Internal List Program

You can select a List file saved inside the instrument to be in the **Open** state and wait for subsequent triggers to run. The procedures are as follows:

- 1. Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.
- 2. Select 1. LIST: Off and press [Enter].



- 3. Press the Left/Right key to select **Open** and press **[Enter]**.
- 4. Press the Left/Right key to select Internal and press [Enter].
- 5. Set the name of the List file to be recalled (that is, the file name set in **Edit**), and press **[Enter]**.

The interface returns to the main interface of the LIST function, which is displayed as follows:

```
FUNCTION LIST
Run Edit Open Export
```

If you select **Run** and press **[Enter]**, the instrument will enter LIST mode and wait for the trigger to run.

Export List Program

Supports exporting the internal List file to an external USB flash drive. The exported List file is saved in **.csv** format.

- 1. Insert the USB flash drive into the front panel USB connector.
- 2. Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.
- 3. Select 1. LIST: Off and press [Enter].
- 4. Press the Left/Right key to select **Open** and press **[Enter]**.
- 5. Press the Left/Right key to select Internal and press [Enter].
- 6. Set the name of the List file to be recalled (that is, the file name set in **Edit**), and press **[Enter]**.

The interface returns to the main interface of the LIST function, which is displayed as follows:

```
FUNCTION LIST
Run Edit Open Export
```

- 7. Press the Left/Right key to select **Export** and press **[Enter]**.
- 8. Press the Left/Right key to select **Yes** and press **[Enter]**.

Indicates that the selected List file in **Open** is exported to the USB flash drive.

Run the List Program

You can select a List file to execute according to your needs, so that the power supply outputs the corresponding waveform sequence. Take the List file in **Internal** as an example. The steps are as follows:



- 1. Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.
- 2. Select 1. LIST: Off and press [Enter].
- 3. Press the Left/Right key to select **Open** and press **[Enter]**.
- 4. Press the Left/Right key to select Internal and press [Enter].
- 5. Set the name of the List file to be recalled (that is, the file name set in **Edit**), and press **[Enter]**.

The interface returns to the main interface of the LIST function, which is displayed as follows:

```
FUNCTION LIST
Run Edit Open Export
```

6. Press the Left/Right key to select Run and press [Enter].

At this point, the interface returns to the main interface of the system and **LIST RUN** is displayed in the lower right corner.

- 7. Turn on the [On/Off].
- 8. Based on the selected trigger method, perform the trigger operation.

Take the manual trigger as an example. Press [Shift]+[On/Off](Trigger) on the front panel to run the selected List file. For details about the List trigger method, see 3.6.4 Select Trigger Source (Trig Source).



- The system will adjust the working mode of the power supply according to the CC or CV priority mode set in the List file. For example, if the current power supply is in the CV priority mode, and the list file to be run is set to the CC priority mode, then the power supply will work in the CC priority mode after the List file is triggered to run.
- After the List file finishes running, the system determines whether to return
 to the working mode before the List is run according to the Normal or Last
 option you selected.

Stop Running the List Program

When the List program is running, if you need to stop running, you can do the following: Press the composite keys **[Shift]+[I-set]** (Function) on the front panel to enter the function menu.

At this point, the interface will prompt whether to stop the running of the Function (**FUNCTION STOP?**), you can press the Left/Right key to select **Yes**, then the current running will be stopped, and the Function menu item will be displayed, you can re-enter the Function menu for editing; if **No** is selected, it means that the current running will not be stopped, and the main interface of the system is displayed.



4.6.2 Battery Charging/Discharging Test Function

The IT6000C series power supply provides the battery charging/discharging test function based on its unique bipolar power supply properties. Suitable for charging/discharging tests on all types of portable batteries.

BATTERY	Battery charging/discharging test function				
	Run	Indicates that the battery test mode is entered and waits to trigger the running of the currently edited battery test file.			
	Edit	Edit the battery charging/discharging test file.			
				Battery charging	
		Charge / Discharge	 Discharge discharge 	•	
			_	the test require- se one to set.	
			Charge / Discharge V	Set the voltage value for charging or discharging according to the selected test mode.	
			Charge / Discharg I Set the current value for charging or discharging according to the selected test mode.		
			Charge / Discharg Time	Set the charging or discharging time according to the selected test mode.	
		Cut Off Voltage	Battery test cut-off voltage Battery test cut-off current Battery test cut-off capacity		
		Cut Off Current			
		Cut Off Capacity			

1. Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.



2. Use knob or Up/Down key to select 2.BATTERY: Off and press [Enter].

The interface is displayed as follows:

FUNCTION BATTERY
Run Edit

- 3. Press the Left/Right key to select **Edit** and press **[Enter]**.
- 4. Press the Left/Right key to select Charge or Discharge and press [Enter].
- 5. Set the charging voltage (**Charge V**) or discharging voltage (**Discharge V**), charging current (**Charge I**) or discharging current (**Discharge I**) and the other parameters, and then press [**Enter**] to confirm.

After the parameter setting is completed, the interface returns to the Battery function main interface and displays as follows:

FUNCTION BATTERY Run Edit

6. Press the Left/Right key to select Run and press [Enter].

The instrument will enter the battery test mode and wait for the battery test to be triggered.

- 7. Turn on the [On/Off].
- 8. Based on the selected trigger method, perform the trigger operation.



The trigger method of the battery test is consistent with the trigger method of the List function, that is, the List trigger source is also effective for the Battery function.

If you want to stop running during the battery test, you can do the following: Press the composite keys **[Shift]+[I-set]** (Function) on the front panel to enter the function menu.

At this point, the interface will prompt whether to stop the running of the Function (**FUNCTION STOP?**), you can press the Left/Right key to select **Yes**, then the current running will be stopped, and the Function menu item will be displayed, you can re-enter the Function menu for editing; if **No** is selected, it means that the current running will not be stopped, and the main interface of the system is displayed.

4.6.3 Built-in Waveform Function

The IT6000C series power supply supports built-in waveforms for user to execute the test directly. The protocols/standards involved in the built-in waveforms include the following:



- DIN40839
- ISO16750-2
- ISO21848
- SAEJ1113-11
- LV124

The following is a general overview of this function menu, and the detailed parameters of the waveform corresponding to each protocol/standard can be found in the corresponding chapter.

Road- Vehicles	Vehicle waveform function menu			
	DIN40839	Evaluation of automotive starting waveform		
	ISO16750-2	Simulate the waveform to verify the anti-interference performance of the automotive electronics' products.		
	ISO21848	42V Road vehicles — Electrical and electronic equipment for a supply voltage of 42 V — Electrical loads		
	SAEJ1113-11	SAEJ1113-11 Waveform protocol		
	LV124	LV124 Waveform protocol		

Recall the Vehicle Waveform

Select any of the above five kinds of vehicle waveforms, after completing the waveform parameter setting (see the subsequent introduction for each parameter), the system will automatically enter the waveform recalling mode and wait for the triggering operation. At this time, the VFD screen is displayed as the main interface of the system, and the corresponding waveform name is displayed in the lower right corner.

Run the Vehicle Waveform

After turning on **[On/Off]**, the output of the vehicle waveform is triggered according to the selected trigger method.





The trigger method of the vehicle waveform is consistent with the trigger method of the List function, that is, the List trigger source is also effective for the vehicle waveform.

Stop the Vehicle Waveform Running

If you want to stop during the vehicle waveform output, you can do the following: Press the composite keys **[Shift]+[I-set]** (Function) on the front panel to enter the function menu.

At this point, the interface will prompt whether to stop the running of the Function (**FUNCTION STOP?**), you can press the Left/Right key to select **Yes**, then the current running will be stopped, and the Function menu item will be displayed, you can re-enter the Function menu for editing; if **No** is selected, it means that the current running will not be stopped, and the main interface of the system is displayed.

4.6.3.1 Automotive Starting Waveform

The IT6000C series power supply has built-in 12V or 24V DIN40839 waveform. This test verifies the behavior of a DUT during and after cranking. This waveform can reproduce the voltage curve for automotive power network confirms to DIN40839 standard, thus facilitating quick call by customers.

For automotive startup voltage waveform, the startup voltage can also be set based on customers' requirements. In this way, the user can create waveform between 8V to 32V.

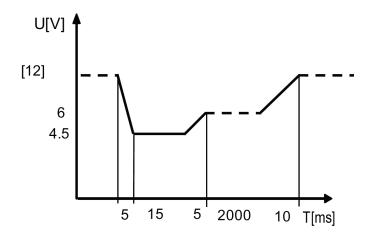
DIN40839	Evaluation of automotive starting waveform		
	12V	Select the automotive starting waveform with a starting voltage of 12V.	
	24V	Select the automotive starting waveform with a starting voltage of 24V.	
	User-defined	The user customizes the starting voltage of the automotive starting waveform.	



		User-de-
	V=8.00V	fined volt-
		age value

DIN40839 for 12V System

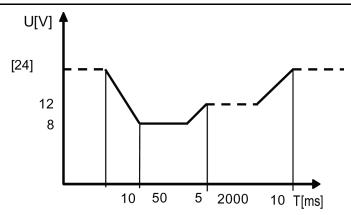
Steps	Voltage (V)	Current(A)	Width(mS)	Slope(mS)
1	4.5	60	15	5
2	6	60	2000	5
3	12	60	Т	10



DIN40839 for 24V System

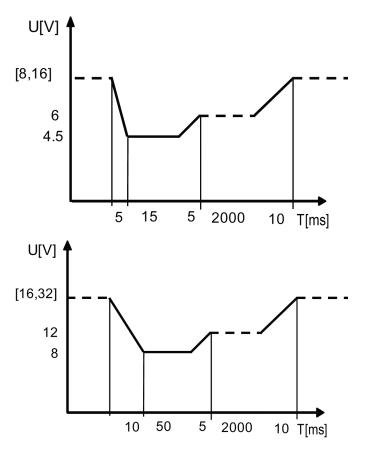
Steps	Voltage (V)	Current(A)	Width(mS)	Slope(mS)
1	8V	60	50	10
2	12V	60	2000	5
3	24V	60	Т	10





User-defined Startup Voltage Waveform System

The user can define the startup voltage, ranging from 8V to 32V. When the waveform program is divided into 8V-16V, the waveform is consistent with standard 12V; when the waveform program is divided into 16V-32V, the waveform is consistent with the standard 24V waveform. The waveform diagram is shown below.



How to Use

Recall the self-defined DIN waveform operation (taking 12.5V voltage waveform as an example):



- 1. Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.
- 2. Use the knob or press the Up/Down key to select **3.Road-Vehicles = Off** and press **[Enter]**.
- 3. Press the Left/Right key to select **DIN40839** and press [Enter].
- 4. Press the Left/Right key to select **User-defined** and press **[Enter]**.
- Set the startup voltage as V=12.5V and press [Enter].
 The interface returns to the main interface of the system and displays DIN40839.
- 6. Press [On/Off] on the front panel to turn on the output.
- 7. According to the selected trigger method (same as the trigger method of the LIST function), for example, press [Shift]+[On/Off](Trigger) to trigger the output of the waveform.

4.6.3.2 Simulate the Waveform to Verify the Anti-interference Performance of the Automotive Electronics' Products

To verify the anti-interference performance of the automotive electronics' products. Output pulse waveform completely meets the International Standard ISO-16750-2, convenient for quick recall by the user.

ISO16750-2	Simulate the waveform to verify the anti-interference performance of the automotive electronics' products.			
	Short-Drop	Automotive short-time voltage drop waveform		
		Select the 12V automotive s time voltage drop waveform		
		Select the 24V automotive stime voltage drop waveform		
	Reset-Test	This test is applicable to equipment with rest set function.		
		The minimum supply voltage min (Usmin≤80V)		
	Starting- Profile	This test verifies the behavior of a DUT of ing and after cranking. 12V Select the 12V test system.		



		1	of 12V s	ne voltage/duration starting profile cor- ling to Level 1.
		2	of 12V s	ne voltage/duration starting profile cor- ling to Level 2.
		3	of 12V s	ne voltage/duration starting profile cor- ling to Level 3.
		4	of 12V s	ne voltage/duration starting profile cor- ling to Level 4.
	24V	Selec	ct the 24V	test system.
		1	of 24V s	ne voltage/duration starting profile cor- ling to Level 1.
		2	of 24V s	ne voltage/duration starting profile cor- ling to Level 2.
		3	of 24V s	ne voltage/duration starting profile cor- ling to Level 3.
Load-Dump	Load dum	p curv	е	
	Test A		elect centralized load dump	
		12V	Select to	ne 12V voltage
			Td	Pulse width
			Un	Peak voltage
		24V	Select to	ne 24V voltage
			Td	Pulse width
			Un	Peak voltage
	Test B		ct centrali ression	zed load dump

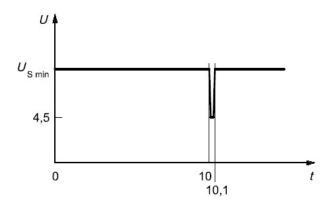


	12V	Select to	ne 12V voltage
		Td	Pulse width
		Un	Peak voltage
	24V	Select the 24V voltage system	
		Td	Pulse width
		Un	Peak voltage
		Us	Clamping voltage

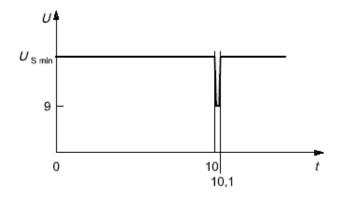
Automotive Short-time Voltage Drop Waveform

This waveform simulates an instantaneous drop in the supply voltage when the car is started. This test simulates the effect when a conventional fuse element melts in another circuit.

12V system



• 24V system



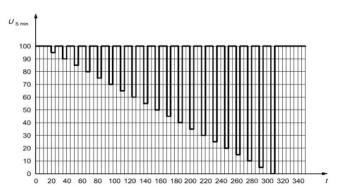
How to recall this waveform from menu (take 12V system as an example):



- 1. Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.
- 2. Use the knob or press the Up/Down key to select **3.Road-Vehicles = Off** and press [Enter].
- 3. Press the Left/Right key to select ISO16750-2 and press [Enter] to confirm.
- 4. Press the Left/Right key to select **Short-Drop** and press **[Enter]** to confirm.
- Press the Left/Right key to select 12V and press [Enter] to confirm.
 The interface returns to the main interface of the system and displays SHORT-DROP.
- 6. Press [On/Off] on the front panel to turn on the output.
- 7. According to the selected trigger method (same as the trigger method of the LIST function), for example, press [Shift]+[On/Off](Trigger) to trigger the output of the waveform.

Reset-Test

This test verifies the reset behavior of the DUT at different voltage drops. This test is applicable to equipment with reset function, e.g. equipment containing microcontroller. Apply the test pulse simultaneously in figure below to all relevant inputs (connections) and check the reset behavior of the DUT. Decrease the supply voltage by 5 % from the minimum supply voltage, Us min, to 0.95 Us min. Hold this voltage for 5 s. Raise the voltage to Us min. Hold Us min for at least 10 s and perform a functional test. Then decrease the voltage to 0.95 Us min. Continue with steps of 5 % of Us min, as shown in figure below, until the lower value has reached 0 V. Then raise the voltage to Us min again.



How to recall this waveform from menu is as below:

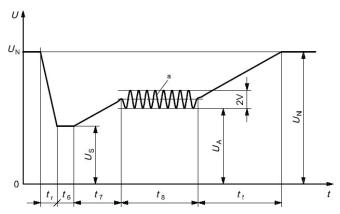
- 1. Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.
- 2. Use the knob or press the Up/Down key to select **3.Road-Vehicles = Off** and press **[Enter]**.
- 3. Press the Left/Right key to select **ISO16750-2** and press **[Enter]** to confirm.



- 4. Press the Left/Right key to select **Reset-Test**, and press **[Enter]** to confirm.
- Press the numeric keys to set the **Usmin**, and press [Enter] to confirm.
 The interface returns to the main interface of the system and displays **VRESET-TEST**.
- 6. Press [On/Off] on the front panel to turn on the output.
- 7. According to the selected trigger method (same as the trigger method of the LIST function), for example, press [Shift]+[On/Off](Trigger) to trigger the output of the waveform.

Starting Waveform

Simulates the effects of rippled DC voltage on DC power when the car is started. From the constant voltage line in the original standard DIN40839 voltage waveform, the voltage curve in t8 duration is upgraded to a curve containing a 2Hz AC voltage waveform.



Standards for 12V system:

Curve should be selected based on actual test requirements. To create waveform within 12V, follow the set standards as below:

Levels/voltages/duration of starting profile					
I	I II III IV				
U _S = 8 V	U _S = 8 V U _S = 4,5 V U _S = 3 V U _S = 6 V				
U _A = 9,5 V	U _A = 6,5 V	U _A = 5 V	U _A = 6,5 V	+ 0,2 V	
	± 10 %				
t ₈ = 1 s	t ₈ = 1 s t ₈ = 10 s t ₈ = 1 s t ₈ = 10 s				
t _f = 40 ms	$t_{\rm f} = 40 \; {\rm ms}$ $t_{\rm f} = 100 \; {\rm ms}$ $t_{\rm f} = 100 \; {\rm ms}$ $t_{\rm f} = 100 \; {\rm ms}$				





I, II, III, and IV defined in the above standard correspond to levels 1, 2, 3, and 4 in the setup menu.

Standards for 24V system:

Levels/voltages/duration of starting profile				
I	1 11 111			
U _S = 10 V	U _S = 10 V U _S = 8 V U _S = 6 V			
<i>U</i> _A = 20 ∨	$U_{\rm A} = 20 \text{V}$ $U_{\rm A} = 15 \text{V}$ $U_{\rm A} = 10 \text{V}$			
	± 10 %			
t ₈ = 1 s				
$t_{\rm f} = 40 \; {\rm ms}$ $t_{\rm f} = 100 \; {\rm ms}$ $t_{\rm f} = 40 \; {\rm ms}$				

How to recall this waveform from menu (take 12V system as an example):

- 1. Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.
- 2. Use the knob or press the Up/Down key to select **3.Road-Vehicles = Off** and press **[Enter]**.
- 3. Press the Left/Right key to select **ISO16750-2** and press **[Enter]** to confirm.
- 4. Press the Left/Right key to select **Starting-Profile**, and press **[Enter]** to confirm.
- 5. Press the Left/Right key to select **12V**, and press **[Enter]** to confirm.
- 6. Press the Left/Right key to select the Level (i.e. **4**), and press **[Enter]** to confirm.

The interface returns to the main interface of the system and displays **STARTING-PROFILE**.

- 7. Press [On/Off] on the front panel to turn on the output.
- 8. According to the selected trigger method (same as the trigger method of the LIST function), for example, press [Shift]+[On/Off](Trigger) to trigger the output of the waveform.

Load Dump Dynamic Behavior

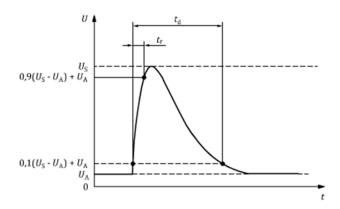
This test is a simulation of load dump transient occurring in the event of a discharged battery being disconnected while the alternator is generating charging current with other loads remaining on the alternator circuit at this moment.



- The amplitude of load dump is determined by the rotational speed of alternator and the strength of magnetic field in the case of disconnection of the battery.
- The pulse duration of load dump is mainly determined by the time constant and pulse amplitude of the excitation circuit.

Inside most novel alternator, the amplitude of load dump is decreased by increasing the limiter diode (clamping diode). The load dump may be caused by cable corrosion, poor cable contact or disconnecting the battery intentionly when the engine is running.

The pulse shape and parameters for an alternator without centralized load dump suppression (Test A) are given in follow.



- t: Time
- U: Test voltage
- t_d: Duration of pulse
- t_r: Rising Slope
- U_A: Supply Voltage for generator in operation (see ISO 16750-1)
- U_S: Peak voltage

Downwater	Type of system		Minimum test
Parameter	12V	24V	requirements

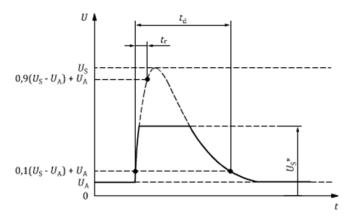


U _S a(V)	79≤U _S ≤101	151≤U _S ≤202	
Ria(Ω)	0.5≤Ri≤4	1≤Ri≤8	40 miles es et 4 mais intermisle
t _d (ms)	40≤t _d ≤400	100≤t _d ≤350	10 pulses at 1 min intervals
t _r (ms)	_	_	



alf not otherwise agreed, use the upper voltage level with the upper value for internal resistance or use the lower voltage level with the lower value for internal resistance.

The pulse shape and parameters for an alternator with centralized load dump suppression (Test B) are given in follow.



- t: Time
- U: Test voltage
- t_d: Duration of pulse
- t_r: Rising Slope
- U_A: Supply Voltage for generator in operation (see ISO 16750-1)
- U_S: Peak voltage
- U_S*: Supply voltage with load dump suppression (i.e. clamping voltage)

Davamatav	Туре	of system	Minimum test
Parameter	12V	24V	requirements
U _S a(V)	79≤U _S ≤101	151≤U _S ≤202	
U _S *(V)	It is fixed at 35V here and cannot be set.	As specified by customer (typical value 58)	5 pulses at 1 minute intervals



Ria(Ω)	0.5≤Ri≤4	1≤Ri≤8
t _d (ms)	40≤t _d ≤400	100≤t _d ≤350
t _r (ms)	1	-



alf not otherwise agreed, use the upper voltage level with the upper value for internal resistance or use the lower voltage level with the lower value for internal resistance.

The following general considerations of the dynamic behavior of alternators during load dump apply:

- The internal resistance of an alternator, in the case of load dump, is mainly a function of alternator rotational speed and excitation current.
- The internal resistance, Ri, of the load dump test pulse generator shall be obtained from the following relationship.

$$R_{i} = \frac{10 \times U_{nom} \times N_{act}}{0.8 \times I_{rated} \times 12000 min^{-1}}$$

- U_{nom}: The specified voltage of the alternator
- I_{rated}: The specified current at an alternator speed of 6000r/min
- N_{act}: The actual alternator speed, unit: round per minute (r/min)
- The pulse is determined by the peak voltage U_n, the clamping voltage U_S, the internal resistance R_i, and the pulse duration t_d; in all cases small values of U_n are correlated with small values of R_i and t_d, and high values of U_n with high values of R_i and t_d. For the test voltage U_A please refer to ISO16750-1.

How to recall this waveform from menu (take Test A 12V as an example):

- 1. Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.
- 2. Use the knob or press the Up/Down key to select **3.Road-Vehicles = Off** and press **[Enter]**.
- 3. Press the Left/Right key to select **ISO16750-2** and press **[Enter]** to confirm.
- Press the Left/Right key to select Load-Dump, and press [Enter] to confirm.
- 5. Press the Left/Right key to select **Test A**, and press **[Enter]** to confirm.
- 6. Press the Left/Right key to select **12V**, and press **[Enter]** to confirm.



7. Set the **Td** and **Un** in turns, and press **[Enter]** to confirm.

The interface returns to the main interface of the system and displays **LOAD-DUMP**.

- 8. Press [On/Off] on the front panel to turn on the output.
- According to the selected trigger method (same as the trigger method of the LIST function), for example, press [Shift]+[On/Off](Trigger) to trigger the output of the waveform.

4.6.3.3 42V Road Vehicles — Electrical and Electronic Equipment for a Supply Voltage of 42 V — Electrical loads

A test wave completely conforming to International Standard ISO21848 is built inside the device, which can be used for the test of Electrical and electronic equipment for a supply voltage of 42V - Electrical loads. The user can directly and quickly recall this function during test.

ISO21848	Simulate the curve of "Electrical and electronic equipment for a supply voltage of 42 V — Electrical loads"			
	U _{max,dyn}	U _{max,dyn} Test pulse		
	Momentary-Drop	Transit voltage drop		
	Reset	Reset test supply voltage		
		Ulow Set supply voltage		
	Start	Startup pulse		

Recall the Waveform

Take **Momentary-Drop** as an example to introduce the procedures as follows:

- 1. Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.
- Use the knob or press the Up/Down key to select 3.Road-Vehicles = Off and press [Enter].
- 3. Press the Left/Right key to select **ISO21848**, and press **[Enter]** to confirm.
- 4. Press the Left/Right key to select **Momentary-Drop**, and press **[Enter]** to confirm.

The interface returns to the main interface of the system and displays **MOMENTARY-DROP**.

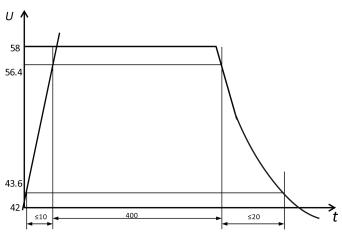


- 5. Press [On/Off] on the front panel to turn on the output.
- 6. According to the selected trigger method (same as the trigger method of the LIST function), for example, press [Shift]+[On/Off](Trigger) to trigger the output of the waveform.

U_{max,dyn} Test Pulse

Detect the function when the DUT is under maximum dynamic Voltage $U_{max,dyn}$, and simulate the maximum dynamic Voltage of high-energy pulse raised from throw load in 42V electrical system, where the upper limit is the protection voltage of throw load.

After turning on **[On/Off]** and triggering the waveform output, the instrument will apply a test pulse to the DUT, as shown below:

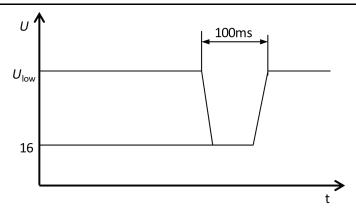


- t: Time (in ms)
- U: Voltage (in V)

Supply Voltage Transient Drop

Simulate the affect from short circuit when fuse element of another circuit is melt. Detect the function status of the DUT at transient drop of Voltage.

After turning on **[On/Off]** and triggering the waveform output, when the given test pulse is applied at all input terminals of the DUT, the rise and fall time between U_{low} and 16V level shall not be longer than 100ms.



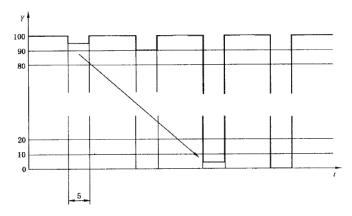
- t: Time (in ms)
- U: Voltage (in V)

Reset Performance at Transient Drop of Voltage

Detect the reset performance of the DUT at different Voltage drops. Applicable for devices with reset function (for example, device installed with one or several micro controllers).

After turning on **[On/Off]** and triggering the waveform output, the instrument will apply test pulse and detect the reset performance of the DUT, as shown in the figure below.

The supply voltage drops from U_{low} to $0.95U_{low}$ by 5% and keeps for 5s, and then rise to U_{low} and keep for at least 10s for function test. Then, drop Voltage to $0.9U_{low}$, and so on. As shown in the figure below, drop the voltage from U_{low} to 0V by 5% and raise the voltage to U_{low} . The Rise and Fall time shall be between 10ms and 1s.



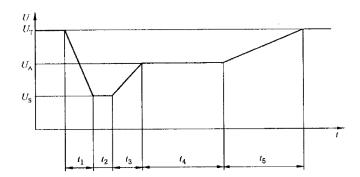
- t: Time (in s)
- Y: U_{low}, %

Start-up Characteristics

Detect DUT characteristics before and after vehicle startup.



After turning on **[On/Off]** and triggering the waveform output, the instrument will apply the startup characteristic parameters as shown in the figure and table below to related input terminals of the DUT simultaneously.



• t: Time time (in ms)

t1: 5ms

• U: Voltage (in V)

t2: 15ms

• U_s: 18V

t3: 50ms

U_A: 21V

t4: 10000ms

U_T: 42V

t5: 100ms

4.6.3.4 SAEJ1113-11 Waveform Protocol

SAEJ1113-11 Waveform protocol related parameters are described as follows:

SAEJ1113-11	SAEJ1113-11 Waveform protocol				
	Test-2B		ient from DC motors acting as genera- fter ignition switch OFF		
		12V	Select the	12V voltage system	
			Td	Test pulse width	
		24V	Select the	24V voltage system	
			Td	Test pulse width	
	Test-4	Starter mo	motor engagement disturbance		
		12V	Select the	12V voltage system	
			Vs	For details, see Table	
			Va	4–1 Parameter Description	
			Т7	Description	
			Т9		
			T11		



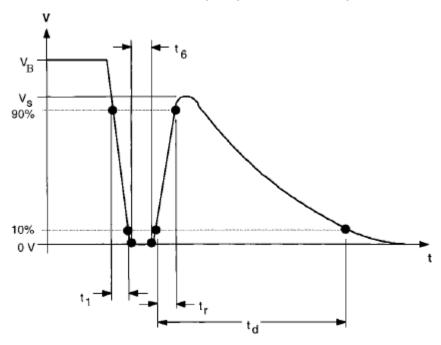
	24V	Select the	24V vol	tage system
		Vs		tails, see Table
		Va	4–1 Pa	arameter Intion
		T7		paon
		Т9		
		T11		
Test-5	Load dum	np waveform	1	
	Test A	Select cen unsuppres		load dump
		12V	Select age sy	the 12V volt- stem
			Td	Test pulse width
			Un	Peak voltage
			Us	Clamping voltage
		24V	Select	the 24V volt-
			Td	Test pulse width
			Un	Peak voltage
			Us	Clamping voltage
	Test B	Select cen suppression		load dump
		12V	Select	the 12V volt-
			Td	Test pulse width
			Un	Peak voltage
			Us	Clamping voltage



	24V	Select age sy	the 24V volt- stem
		Td	Test pulse width
		Un	Peak voltage
		Us	Clamping voltage

Test-2B

Transient from DC motors acting as generators after ignition switch OFF:



Parameters	12V	24V
Vs	10V	20V
R_i	≤0.05Ω	≤0.05Ω
t_d	0.2–2s	0.2–2s
t ₁	1ms±50%	1ms±50%
t_r	1ms±50%	1ms±50%
t ₆	1ms±50%	1ms±50%



Test-4

Starter motor engagement disturbance pulse.

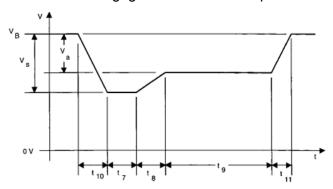


Table 4–1 Parameter Description

Parameters	12V	24V
V_S (From V_B)	-4V to -7V	-5V to -16V
V_a (From V_B)	-2.5 to -6V with V _a ≤ V _S	-5 to -12V with V _a ≤ V _S
R_{i}	0Ω to 0.02Ω	0Ω to 0.02Ω
t ₇	15 to 40ms ⁽¹⁾	50 to 100ms ⁽¹⁾
t ₈	≤50ms	≤50ms
t 9	0.5 to 20s ⁽¹⁾	0.5 to 20s ⁽¹⁾
t ₁₀	5ms	10ms
t ₁₁	5 to 100ms ⁽²⁾	10 to 100 ms ⁽³⁾

- (1). The value used should be agreed between the vehicle manufacturer and the equipment supplier to suit the proposed application.
- (2). t_{11} =5 ms is typical of the case when engine starts at the end of the cranking period, while t_{11} =100 ms is typical of the case when the engine does not start.
- (3). t_{11} =10 ms is typical of the case when engine starts at the end of the cranking period, while t_{11} =100 ms is typical of the case when the engine does not start.

Test-5

For the details, please refer to the Load Dump Dynamic Behavior.



4.6.3.5 LV124

The built-in curves LV124 can meet general requirements, test conditions and tests of electrical and electronic components in motor vehicles up to 3.5 t. Related parameters are as below:

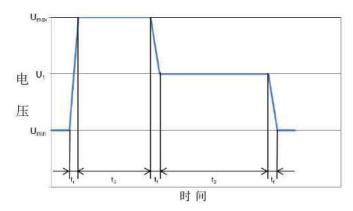
LV124	LV124 waveform protocol				
	E-02	Transient ove	ervoltage te	est waveform	
	E-04	Jump start test waveform			
	E-05	Load dump test waveform			
	E-07	Slow decreas		ease of the supply	
		Ubmax	Start volta	age	
		Ubmin	Holding vo	oltage	
		Ubmin Holding Time	Voltage ho	olding time at	
	E-08	Slow decrease, quick increase of the supply voltage test waveform			
		Ubmax Start voltage			
		Ubmin	nin Holding voltage		
		Ubmin Holding Time	Voltage he Ubmin	olding time at	
	E-09	Reset behav	ior test way	veform	
		Ubmin	Holding vo	oltage	
	E-11	Start pulses			
		Cold-Start	Cold start		
			Normal	Standard experi- mental pulse	
			Server	Enhanced experi- mental pulse	
		Warm-Start Warm start			
	E-12	Voltage curve with intelligent generator control			



	U	Voltage drop between DUT
		and battery terminals

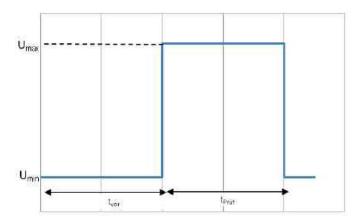
E-02 Transient Overvoltage Pulse

Transient overvoltages may occur in the electric system due to the switching off of loads and due to short accelerator tip-ins. These overvoltages are simulated by means of this test. This test may be used for the electrical life test. The test pulse of E-02 Transient overvoltage is shown in the figure below:



E-04 Jump Start

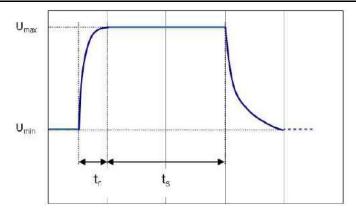
External starting of the vehicle is simulated. The maximum test voltage results from commercial vehicle systems and their increased power supply voltage. The test pulse of E-04 Jump start is shown in the figure below:



E-05 Load Dump

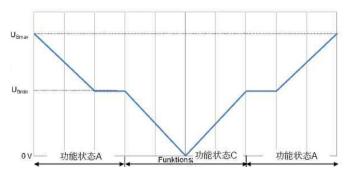
Dumping of an electric load, in combination with a battery with reduced buffering ability, results in an energy-rich overvoltage pulse due to the generator characteristics. The test pulse of E-05 Load Dump is shown in the figure below:





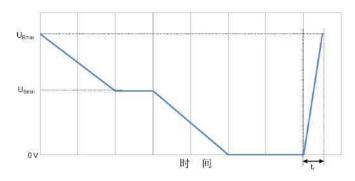
E-07 Slow Decrease and Slow Increase of the Supply Voltage

The slow decrease and increase of the supply voltage is simulated as it occurs during the slow decharging and charging procedure of the vehicle battery. The waveform is as follows.



E-08 Slow Decrease and Quick Increase of the Supply Voltage

This test simulates the slow decrease of the battery voltage to 0 V and the sudden reconnection of the battery voltage e.g. by means of applying a jump start source. The waveform is as follows.

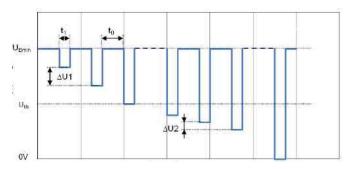


E-09 Reset Behavior

The reset behavior of a component in its environment is simulated and tested. Test boundary conditions (e.g. assembly, terminal, system) must be described in detail.



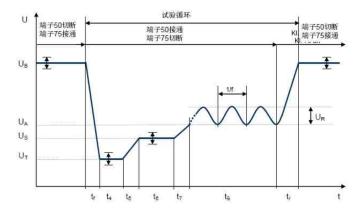
During operation, an arbitrary sequence of repeated switching-on/off procedures occurs; this must not lead to an undefined behavior of the component. The reset behavior is represented by a voltage variance and a time variance. Two different test sequences are required to simulate different switchoff times. A component must always undergo both sequences.



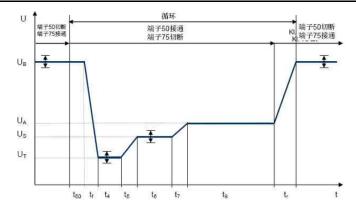
E-11 Start Pulses

When starting the engine, the battery voltage drops to a low value for a short period and then slightly rises again. Most components are activated directly before starting for a short period, then deactivated during starting and activated again after starting when the engine is running. This test serves to verify normal operation under these conditions. The starting process may be performed under different vehicle starting conditions, cold start and warm start. In order to cover both cases, two different test sequences are required. A component must always undergo both sequences.

Cold Start Test Pulse

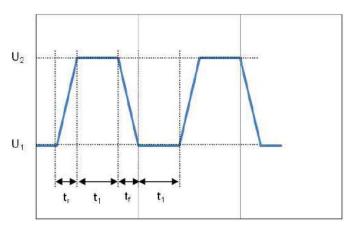


Warm Start Test Pulse



E-12 Voltage Curve with Intelligent Generator Control

The behavior of the electric system when intelligent generator controls are used is simulated.



4.6.4 Solar Photovoltaic Curve Simulation Function (SAS)

The IT6000C series power supply provides the maximum power point tracking (MPPT) mechanism built-in, and it is very important to test the efficiency of this MPPT. The PV array/module/cell is a device that converts from light energy to electric energy. It is made by a simple semiconductor PN junction that the major output characteristic is that there's only one maximum power point (MPP) at certain sunlight intensity. The PV inverter is designed to track this point to harvest maximum energy that is generated by the PV array. SAS function menu is as follows:

SAS	SAS function menu		
	Run	Indicates to enter the SAS function mode and wait for the trigger to run the currently selected PV curve file.	
	Vmax	Used to limit the maximum value of the output voltage. Even if the output voltage is set in the PV curve, the output is still limited by the settings here.	



Static	Static P	V curve	setting.		
	Curve	Open o	or edit a fixe	ed format P	V curve.
		Open	Select a fix	xed format	PV curve.
			Recall Inner Sas File	file and re	ame of the PV curve ecall the PV file side the instrument.
		Edit	Edit a fixe	d format P\	/ curve.
			Pmp	Set the m	aximum power.
			Vmp	Set the m voltage.	aximum power
			Formula	choice of	ry settings. The solar panel materi- different regulations it.
				SANDIA	• TF: Thin-Film
					SCMC: Stand- ard Crystalline or Multi- crystalline
					HEC: High-efficiency Crystalline
				E- N50530	TF: Thin-Film cSi
			Save To		aved file name. Pa- etting ranges from 1
	User- de- fined	User-d	efinable PV	/ curves	
		Voc	Set the op	en-circuit v	oltage value.
		Imp	Set the ma	aximum po	wer current value.
		Vmp	Set the ma	aximum po	wer voltage value.
		Isc	Set the sh	ort-circuit c	current value.



Table	Indicates a user-defined 4096-point I-V data table. This menu item is reserved and can only be used in PV SAS software sold separately. This function cannot be used in the VFD screen.	
Filter	Filter the input voltage of the instrument to reduce interference.	
	Low The filtering speed is low speed.	
	Mid The filtering speed is medium speed. Fast The filtering speed is high speed.	

Edit Static PV Curve

You can edit the static PV curve and save it inside the instrument (up to 100 curve records can be saved), or you can customize the editing of the PV curve (up to 1 can be saved).

Curve

The steps to edit a static curve locally on the instrument are as follows:

- 1. Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.
- 2. Use knob or Up/Down key to select 4. SAS: Off and press [Enter].
- 3. Press the Left/Right key to select **Static** and press **[Enter]**.
- 4. Press the Left/Right key to select **Curve** and press **[Enter]**.
- 5. Press the Left/Right key to select **Edit** and press **[Enter]**.
- 6. Set the Pmp, Vmp and Formula in turns, and press [Enter].
- 7. Set the saved file name and press [Enter].
 - Also you can set the filter speed in SAS→Filter according to the actual test needs.
 - After the above Curve parameters are set completely, you can press
 [Esc] until you return to the SAS main interface and select Run to
 trigger the current edited Curve file to run.

User-defined

The steps to edit a custom curve are as follows:

1. Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.



- 2. Use knob or Up/Down key to select 4. SAS: Off and press [Enter].
- 3. Press the Left/Right key to select **Static** and press **[Enter]**.
- 4. Press the Left/Right key to select **User-defined** and press **[Enter]**.
- 5. Set the **Voc**, **Imp** and the other parameters, and press **[Enter]**.

After the setting is completed, the system returns to the main interface of the SAS function, and the currently edited custom curve is to be run. The interface is displayed as follows:

```
FUNCTION SAS
Run Vmax Static Table Filter
```

Select Curve file

You can select the Curve file saved in the instrument to be in the Open state for later running.

- 1. Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.
- 2. Use knob or Up/Down key to select 4. SAS: Off and press [Enter].
- 3. Press the Left/Right key to select **Static** and press **[Enter]**.
- 4. Press the Left/Right key to select **Curve** and press **[Enter]**.
- 5. Press the Left/Right key to select **Open** and press **[Enter]**.
- 6. Set the name of the Curve file to be recalled (i.e. the file name set in **Edit**) and press **[Enter]**.

At this point, the system returns to the main interface of the SAS function, and the currently selected Curve file is to be run. The interface is displayed as follows:

```
FUNCTION SAS
Run Vmax Static Table Filter
```

Run the Static PV Curve

Curve

- Refer to Select Curve file to select the Curve file to be run.
- 2. Set the Vmax and Filter as the actual test needs.
- 3. Press the Left/Right key on the SAS main interface to select **Run** and press [Enter].

At this point, the instrument enters the SAS mode, and the VFD screen is displayed as the main interface of the system, waiting to trigger the Curve file to run.

4. Turn on the [On/Off].



5. Based on the selected trigger method, perform the trigger operation.



The trigger method of the SAS function is consistent with the trigger method of the List function, that is, the List trigger source is also effective for the SAS function.

User-defined

- 1. Refer to the **User-defined** related contents in the Edit Static PV Curve to finish editing the custom curve.
- 2. Set the Vmax and Filter as the actual test needs.
- 3. Press the Left/Right key on the SAS main interface to select **Run** and press [**Enter**].

At this point, the instrument enters the SAS mode, and the VFD screen is displayed as the main interface of the system, waiting to trigger the **User-defined** curve to run.

- 4. Turn on the [On/Off].
- 5. Based on the selected trigger method, perform the trigger operation.



The trigger method of the SAS function is consistent with the trigger method of the List function, that is, the List trigger source is also effective for the SAS function.

Stop Running the Static PV Curve

If you want to stop running during the SAS test, you can do the following: Press the composite keys [Shift]+[I-set] (Function) on the front panel to enter the function menu.

At this point, the interface will prompt whether to stop the running of the Function (**FUNCTION STOP?**), you can press the Left/Right key to select **Yes**, then the current running will be stopped, and the Function menu item will be displayed, you can re-enter the Function menu for editing; if **No** is selected, it means that the current running will not be stopped, and the main interface of the system is displayed.



This series power supply comes standard with four communication interfaces: USB, LAN, VCP and CAN, and supports two optional communication interfaces: GPIB, RS-232. You can choose one of them to communicate with your computer.

- ♦ USB Interface
- ◆ LAN Interface
- ◆ CAN Interface
- ◆ GPIB Interface (Optional)
- ♦ RS-232 Interface (Optional)
- Web Server



When you use the remote interface to send SCPI instructions, if you use the programming commands that involve modifying the instrument settings, such as modifying the output voltage value, after completing the communication connection between the instrument and the host computer, and after the communication settings are completed, you must execute the **SYST:REM** command firstly.

5.1 USB Interface

The USB interface is located on the rear panel of the instrument. You can connect the instrument to the computer via a cable with a USB interface on both ends (USB A-type connector on one end and USB B-type connector on the other).

The user needs to select the USB interface type in the System menu before using the USB interface. The following two types are optional.

- USB: USB TMC interface;
- VCP: Virtual serial port. Select this type, you need to install the corresponding driver. The device manager of PC will display 'Prolific USB-to-Serial COM Port' after installing.

The driver is available in two ways:

Access the official website address below to download.

http://www.itech.sh/support/Down-3.htm?model=IT-E122%20%E5%85%89%E9%9A%94%E7%A6%BB%E9%80%9A%E8%AE%AF%E6%8E%A5%E5%8F%A3%E9%A9%B1%E5%8A%A8

Contact the ITECH agent for access.



The operation steps to change the USB interface type in System Menu are as follows.

- 1. Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.
- 2. Rotate the knob or press the Up/Down key to select **6. I/O Con** and press **[Enter]**.
- 3. Rotate the knob or press the Left/Right key to select the communication method, and press [Enter].

If you select **VCP**, you also need to set the baud rate and other parameters of the virtual serial port, and the baud rate must be the same as the configuration on the computer side.

5.2 LAN Interface

Connect Interface

Use the following steps to quickly connect your instrument to your LAN and configure it. Two typical LAN interface systems are described below: private LAN and site LAN.

Connect to the private LAN

A private LAN is a network in which LAN-enabled instruments and computers are directly connected. They are typically small, with no centrally-managed resources. When connected to a computer, a crossover cable can be used to connect directly to the computer via the LAN interface.

Connect to the site LAN

A site LAN is a local area network in which LAN-enabled instruments and computers are connected to the network through routers, hubs, and/or switches. They are typically large, centrally-managed networks with services such as DHCP and DNS servers. When connected to a computer, a direct-attached network cable can be used to connect to the router, and the computer is also connected to the router.



- When using one crossover cable to connect PC directly, the gateway address of the instrument should be consistent with that of the PC, and the IP address should be at the same network segment with the PC's IP address.
- When the instrument and computer are connected to the router, an independent IP address must be assigned for the instrument.



View LAN Interface Information

The operation steps to view the LAN interface information in the System Menu are as follows.

- Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.
- 2. Rotate the knob or press the Up/Down key to select **6. I/O Con** and press **[Enter]**.
- 3. Press the Left/Right key to select **LAN** and press **[Enter]**.
- 4. Press the Left/Right key to select **Info** and press **[Enter]**.
- 5. Press the Up/Down key or rotate the knob to view the LAN parameters. See the information in 3.6 System Menu Function for details.

Configure LAN Interface Information

The configurable parameters of the IT6000C series power supply are described as follows.

IP-Conf

- IP Addr: This value is the Internet Protocol (IP) address of the instrument. An IP address is required for all IP and TCP/IP communications with the instrument. An IP Address consists of 4 decimal numbers separated by periods. Each decimal number ranges from 0 through 255 with no leading zeros (for example, 169.254.2.20).
- Sub Net: This value is used to enable the instrument to determine if a client IP address is on the same local subnet. The same numbering notation applies as for the IP Address. When a client IP address is on a different subnet, all packets must be sent to the Default Gateway.
- Gateway: This value is the IP Address of the default gateway that allows the
 instrument to communicate with systems that are not on the local subnet, as
 determined by the subnet mask setting. The same numbering notation applies as for the IP Address. A value of 0.0.0.0 indicates that no default gateway is defined.
- DNS1: This field enters the primary address of the server. Contact your LAN administrator for server details. The same numbering notation applies as for the IP Address. A value of 0.0.0.0 indicates that no default server is defined.
 - DNS is an internet service that translates domain names into IP addresses. It is also needed for the instrument to find and display its hostname assigned by the network. Normally, DHCP discovers the DNS address information; you only need to change this if DHCP is unused or not functional.
- DNS2: This field enters the secondary address of the server. Contact your LAN administrator for server details. The same numbering notation applies



as for the IP Address. A value of 0.0.0.0 indicates that no default server is defined.

 Socket Port: This value indicates the port number corresponding to the service.

Serv-Conf

Configurable services include: MDNS, PING, Telnet-scpi, Web, VXI-11, and Raw Socket.

How to Configure

IP-Conf

Take manual configuration as an example. The steps are as follows:

- Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.
- 2. Rotate the knob or press the Up/Down key to select **6. I/O Con** and press **[Enter]**.
- 3. Press the Left/Right key to select LAN and press [Enter].
- 4. Press the Left/Right key to select **IP-Conf** and press **[Enter]**.
- 5. Press the Left/Right key to select **Manual** and press **[Enter]**.
- 6. Set the **IP Addr**, **SubNet** and the other parameters in turns, and press **[Enter]**.

After the last parameter **Socket Port** is set, the system will return to the LAN setting interface shown as below:

```
SYSTEM I/O CONF LAN
Info IP-Conf Serv-Conf Reset
```

Press the Left/Right key to select **Reset** to confirm the settings of IP-Conf.

Serv-Conf

- 1. Press the composite keys **[Shift]+[P-set]** (System) on the front panel to enter the system menu.
- 2. Rotate the knob or press the Up/Down key to select **6. I/O Con** and press **[Enter]**.
- 3. Press the Left/Right key to select LAN and press [Enter].
- 4. Press the Left/Right key to select **Serv-Conf** and press [Enter].
- 5. Rotate the knob to select the service you want to enable and press **[Enter]**.



- 6. Rotate the knob to select whether to enable the service and press **[Enter]**.
 - On: Indicates that the service is enabled.
 - Off: Indicates that the service is disabled.

5.3 CAN Interface

The CAN interface is located on the rear panel of the instrument and is connected to the computer using a CAN communication cable.

Definition of CAN Pins

The definition of CAN pins are as follows.

Pins	Description
Н	CAN_H
L	CAN_L

CAN Configuration

The user needs to configure the CAN interface parameters in the system menu before using the remote control. The CAN interface parameters are as follows.

Name	Description
Baud rate	Select the baud rate from the following options: 20k/40k/50k/80k/100k/125k/150k/200k/250k/400k/500k/1000k
Instrument Address	Range: 1 – 65535

The operation steps are as follows.

- 1. Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.
- 2. Rotate the knob or press the Up/Down key to select **6. I/O Con** and press **[Enter]**.
- 3. Press the Left/Right key to select CAN and press [Enter].
- 4. Set the baud rate, address and other parameters, press [Enter].



CAN Troubleshooting

If you meet some problems when communicating with PC by CAN interface, please check the following items:

- PC and the instrument must have the same baud rate.
- Ensure you have used the correct communication cable (CAN_H, CAN_L).
 Please pay attention that some cable may not have a correct internal wiring even it is with an appropriate plug.

5.4 GPIB Interface (Optional)

The GPIB (IEEE-488) interface is assembled in the IT-E1205 communication board. Use an IEEE488 bus to connect GPIB interfaces of the instrument and PC. Please ensure that the screws have been screwed down in order to have a full connection.

GPIB Configuration

Each device on the GPIB (IEEE-488) interface must have a unique whole number address between 1 and 30. Your computer's GPIB interface card address must not conflict with any instrument on the interface bus. This setting is nonvolatile; it will not be changed by *RST.

When you purchase the interface accessory and successfully insert it into the corresponding position on the rear panel of the instrument, the menu item for changing the GPIB address appears in the System menu. The specific steps are as follows:

- 1. Ensure that the instrument's power switch is off, that is, the instrument is in Power Off state.
- 2. Insert the separately purchased GPIB interface card into the card slot on the rear panel of the instrument.
- 3. Connect the instrument with the computer via the IEEE488 bus. After the connection is successful, turn on the power switch of the instrument.
- 4. Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.
- 5. Rotate the knob or press the Up/Down key to select **6. I/O Con** and press **[Enter]**.
- 6. Press the Left/Right key to select **GPIB** and press **[Enter]**.
- 7. Press the numeric keys to set the GPIB address and press [Enter].

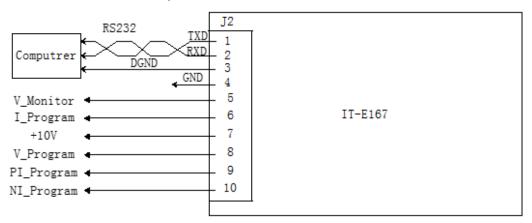


5.5 RS-232 Interface (Optional)

The RS-232 interface shares the same communication card with the analog function.

Definition of RS-232 Pins

The definition of RS-232 pins are as follows.



Pins	Description
1	TXD, transmit data
2	RXD, receive data
3	DGND, ground
4	GND, ground

RS-232 Configuration

When you purchase the interface accessory and successfully insert it into the corresponding position on the rear panel of the instrument, the RS–232 menu item will appear in the System menu. The specific steps are as follows:

- 1. Ensure that the instrument's power switch is off, that is, the instrument is in Power Off state.
- 2. Insert the separately purchased RS–232 interface card into the card slot on the rear panel of the instrument.
- 3. Connect the instrument to the computer via an RS–232 cable. After the connection is successful, turn on the power switch of the instrument.
- 4. Press the composite keys [Shift]+[P-set] (System) on the front panel to enter the system menu.



- 5. Rotate the knob or press the Up/Down key to select **6. I/O Con** and press **[Enter]**.
- 6. Press the Left/Right key to select **RS232** and press **[Enter]**.
- 7. Set the relevant communication parameters in turn, and press [Enter].

The RS–232 interface parameters are as follows.

Name	Description
Baud rate	Select the baud rate from the following options: 4800/9600/ 19200/38400/57600/115200
Data Bit	The options are: 5/6/7/8
Parity bit	The options are: N (no parity), O (odd parity), E (even parity).
Stop bit	The options are: 1/2

RS-232 Troubleshooting

If you meet some problems when communicating with PC by RS-232 interface, please check the following items:

- Check that whether the baud rate of the computer and instrument are the same;
- Make sure the correct cable and adapter are connected. Note that internal wiring may not be correct even if the cable has a suitable plug;
- The cable must be connected to the correct serial ports (COM1, COM2, etc) of PC.

5.6 Web Server

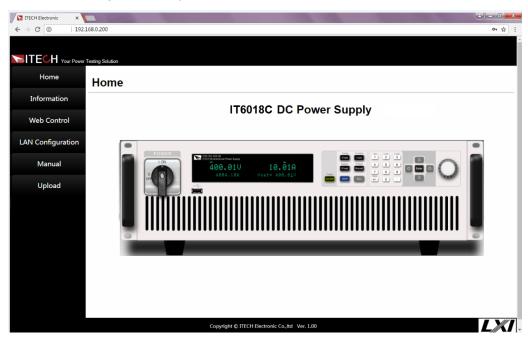
The instrument has a built-in Web server for monitoring and controlling the instrument via a Web browser in PC. To use the Web server, connect the instrument and PC over LAN interface and enter the instrument's IP address into the address bar at the top of your PC's Web browser, you can access the front panel control functions including the LAN configuration parameters.





- If you want to remotely control the instrument using the built-in web server, you
 must enable the web service. See 5.2 LAN Interface for details.
- The format of the address entered in the address bar of the browser is http:// 192.168.0.100. The specific IP address is subject to the actual instrument settings.

The opened page 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, itech_6000_P.itech), and then click **UPLOAD** performs the upgrade operation. After the upgrade is complete, the instrument needs to be restarted.



6

Technical Specification

This chapter will introduce the main technical parameters of thispower, such as rated voltage/current/power and so on. Besides, we will introduce the working environment and storage temperature.

- ◆ Main Specification
- ◆ Supplemental Characteristics

6.1 Main Specification



6.1.1 IT6006C-500-30

Paramete	ers	IT6006C-500-30
Output Rating	Output Voltage	0 to 500V
(0 °C-40 °C)	Output Current	-30 to 30A
	Output Power	-6000 to 6000W
	Output Resistance	0 to 1Ω
Line regulation	Voltage	≤0.01%FS
±(%of Output+Offset)	Current	≤0.05%FS
Load regulation	Voltage	≤0.02%FS
±(%of Output+Offset)	Current	≤0.05%FS
	Voltage	0.01V
Catus Dagalutian	Current	0.001A
Setup Resolution	Power	0.001kW
	Resistance	0.01mΩ
	Voltage	0.01V
Read Back Resolution	Current	0.001A
Read back Resolution	Power	0.001kW
	Resistance	0. 0.01mΩ
Setup Accuracy	Voltage	≤0.02% + 0.02%FS
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS
	Resistance	≤1% + 1%FS
Read Back Accuracy	Voltage	≤0.02% + 0.02%FS
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS
	Resistance	≤1% + 1%FS
Ripple	Voltage	≤200mVpp(MAX:≤500mVpp)
(20Hz -20MHz)	Current	≤0.1%FS RMS
Setup Temperature Coefficient	Voltage	≤50PPM/°C
(%of Output/°C+Offset)	Current	≤200PPM/°C
Read Back Temperature Coefficient	Voltage	≤50PPM/°C



(%of Output/°C+Offset)	Current	≤200PPM/°C	
Rise time(no load)	Voltage	≤15ms	
Rise time(full load)	Voltage	≤30ms	
Fall time(no load)	Voltage	≤30ms	
Fall time(full load)	Voltage	≤15ms	
Transient Response Time	Voltage	≤2ms	
AC Input	Voltage	198V to 264V (Derating 50%) 342V to 528V(Three-phase four-wire)	
	Frequency	47Hz to 63Hz	
Setup stability-30min	Voltage	≤0.02%+0.02%FS	
(%of Output +Offset)	Current	≤0.1% + 0.1%FS	
Setup stability-8h	Voltage	≤0.02%+0.02%FS	
(%of Output +Offset)	Current	≤0.1% + 0.1%FS	
Readback stability-30min	Voltage	≤0.02%+0.02%FS	
(%of Output +Offset)	Current	≤0.1% + 0.1%FS	
Readback stability-8h	Voltage	≤0.02%+0.02%FS	
(%of Output +Offset)	Current	≤0.1% + 0.1%FS	
Efficiency		~ 92%	
Remote Sense Compensation		≤5V (2Vmin)	
Command Response Time		2mS	
Power Factor	0.99		
Maximum input current	19.27A		
Maximum input apparent power	6.6kVA		
Storage temperature	-10°C to 70°C		
Protective function	OVP, OCP, OPP, OTP and Vsense reversed protection		
Communication interface	Standard: USB, CAN, LAN; optional: GPIB, analog card, fiber optic socket		
Isolation (output to ground)	1000V		
Working temperature	0 to 50°C		
Number of series and parallel units	≤1		
Dimension (mm)	483W*801.61D*151.3H		
Weight(net)		28KG	



6.1.2 IT6012C-500-60

Paramete	ers	IT6012C-500-60
Output Rating	Output Voltage	0 to 500V
(0 °C-40 °C)	Output Current	-60 to 60A
	Output Power	-12000 to 12000W
	Output Resistance	0 to 1Ω
Line regulation	Voltage	≤0.01%FS
±(%of Output+Offset)	Current	≤0.05%FS
Load regulation	Voltage	≤0.02%FS
±(%of Output+Offset)	Current	≤0.05%FS
	Voltage	0.01V
Sotup Bosolution	Current	0.001A
Setup Resolution	Power	0.001kW
	Resistance	0.01mΩ
	Voltage	0.01V
Dood Dook Doodution	Current	0.001A
Read Back Resolution	Power	0.001kW
	Resistance	0.01mΩ
Setup Accuracy	Voltage	≤0.02% + 0.02%FS
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS
	Resistance	≤1% + 1%FS
Read Back Accuracy	Voltage	≤0.02% + 0.02%FS
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS
	Resistance	≤1% + 1%FS
Ripple	Voltage	≤200mVpp(MAX:≤500mVpp)
(20Hz -20MHz)	Current	≤0.1%FS RMS
Setup Temperature Coefficient	Voltage	≤50PPM/°C
(%of Output/°C+Offset)	Current	≤200PPM/°C



Read Back Temperature Coefficient	Voltage	≤50PPM/°C	
(%of Output/°C+Offset)	Current	≤200PPM/°C	
Rise time(no load)	Voltage	≤15ms	
Rise time(full load)	Voltage	≤30ms	
Fall time(no load)	Voltage	≤30ms	
Fall time(full load)	Voltage	≤15ms	
Transient Response Time	Voltage	≤2ms	
AC Input	Voltage	198V to 264V (Derating 50%) 342V to 528V(Three-phase four-wire)	
	Frequency	47Hz to 63Hz	
Setup stability-30min	Voltage	≤0.02% + 0.02%FS	
(%of Output +Offset)	Current	≤0.1% + 0.1%FS	
Setup stability-8h	Voltage	≤0.02% + 0.02%FS	
(%of Output +Offset)	Current	≤0.1% + 0.1%FS	
Readback stability-30min	Voltage	≤0.02% + 0.02%FS	
(%of Output +Offset)	Current	≤0.1% + 0.1%FS	
Readback stability-8h	Voltage	≤0.02% + 0.02%FS	
(%of Output +Offset)	Current	≤0.1% + 0.1%FS	
Efficiency		~ 92%	
Remote Sense Compensation	≤5V (2Vmin)		
Command Response Time	2mS		
Power Factor	0.99		
Maximum input current		22.25A	
Maximum input apparent		13.2kVA	
Storage temperature	-10°C to 70°C		
Protective function	OVP, OCP, OPP, OTP and Vsense reversed protection		
Communication interface	Standard: USB, CA	N, LAN; optional: GPIB, analog card, fiber optic socket	
Isolation (output to ground)		1000V	
Number of series and parallel units	≤1		
Working temperature		0 to 50°C	



Dimension (mm)	483W*801.61D*151.3H
Weight(net)	34KG

6.1.3 IT6018C-500-90

Paramete	ers	IT6018C-500-90
Output Rating	Output Voltage	0 to 500V
(0 °C-40 °C)	Output Current	-90 to 90A
	Output Power	-18000 to 18000W
	Output Resistance	0 to 1Ω
Line regulation	Voltage	≤0.01%FS
Line regulation	Current	≤0.05%FS
Load regulation	Voltage	≤0.02%FS
Load regulation	Current	≤0.05%FS
	Voltage	0.01V
Setup Resolution	Current	0.001A
Octup (Coolution	Power	0.001kW
	Resistance	0.01mΩ
	Voltage	0.01V
Read Back Resolution	Current	0.001A
Tread Back Tresolution	Power	0.001kW
	Resistance	$0.01 m\Omega$
Setup Accuracy	Voltage	≤0.02% + 0.02%FS
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS
	Resistance	≤1% + 1%FS
Read Back Accuracy	Voltage	≤0.02% + 0.02%FS
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS
	Resistance	≤1% + 1%FS
Ripple	Voltage	≤200mVpp(MAX:500mVpp)
(20Hz -20MHz)	Current	≤0.1%FS RMS



Setup Temperature Coefficient	Voltage	≤50PPM/°C	
(%of Output/°C+Offset)	Current	≤200PPM/°C	
Read Back Temperature Coefficient	Voltage	≤50PPM/°C	
(%of Output/°C+Offset)	Current	≤200PPM/°C	
Rise time(no load)	Voltage	≤15ms	
Rise time(full load)	Voltage	≤30ms	
Fall time(no load)	Voltage	≤30ms	
Fall time(full load)	Voltage	≤15ms	
Transient Response Time	Voltage	≤2ms	
	Voltage	198V to 264V(降额50%)	
AC Input		342V to 528V(Three-phase four-wire)	
	Frequency	47Hz to 63Hz	
Setup stability-30min	Voltage	≤0.02% + 0.02%FS	
(%of Output +Offset)	Current	≤0.1% + 0.1%FS	
Setup stability-8h	Voltage	≤0.02% + 0.02%FS	
(%of Output +Offset)	Current	≤0.1% + 0.1%FS	
Readback stability-30min	Voltage	≤0.02% + 0.02%FS	
(%of Output +Offset)	Current	≤0.1% + 0.1%FS	
Readback stability-8h	Voltage	≤0.02% + 0.02%FS	
(%of Output +Offset)	Current	≤0.1% + 0.1%FS	
Efficiency	~ 92%		
Remote Sense Compensation	≤5V (2Vmin)		
Command Response Time	2mS		
Power Factor	0.99		
Maximum input current	33.37A		
Maximum input apparent	19.8kVA		
Storage temperature	-10°C to 70°C		
Protective function	OVP, OCP, OPP, OTP and Vsense reversed protection		
Communication interface	Standard: USB, CAN, LAN; optional: GPIB, analog card, fiber optic socket		
Isolation (output to ground)	1000V		



Working temperature	0 to 50°C
Number of parallel units	≤8
Dimension (mm)	483W*801.61D*151.3H
Weight(net)	40KG

6.1.4 IT6018C-1500-30

Parameters		IT6018C-1500-30
Output Rating	Output Voltage	0 to 1500V
(0 °C-40 °C)	Output Current	-30 to 30A
	Output Power	-18000 to 18000W
	Output Resistance	0 to 1Ω
Line regulation	Voltage	≤0.01%FS
Line regulation	Current	≤0.05%FS
Load regulation	Voltage	≤0.02%FS
Load regulation	Current	≤0.05%FS
	Voltage	0.1V
Setup Resolution	Current	0.001A
Getup Nesolution	Power	0.001kW
	Resistance	0.1mΩ
Read Back Resolution	Voltage	0.1V
	Current	0.001A
	Power	0.001kW
	Resistance	$0.1 m\Omega$
Setup Accuracy	Voltage	≤0.02% + 0.02%FS
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS
	Resistance	≤1% + 1%FS
Read Back Accuracy	Voltage	≤0.02% + 0.02%FS
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS
	Resistance	≤1% + 1%FS



Ripple	Voltage	≤600mVpp(MAX: ≤1500mVpp)		
(20Hz -20MHz)	Current	≤0.1%FS RMS		
Setup Temperature Coefficient	Voltage	≤50PPM/°C		
(%of Output/°C+Offset)	Current	≤200PPM/°C		
Read Back Temperature Coefficient	Voltage	≤50PPM/°C		
(%of Output/°C+Offset)	Current	≤200PPM/°C		
Rise time(no load)	Voltage	≤15ms		
Rise time(full load)	Voltage	≤30ms		
Fall time(no load)	Voltage	≤30ms		
Fall time(full load)	Voltage	≤15ms		
Transient Response Time	Voltage	≤2ms		
	\ / II	198V to 264V(降额50%)		
AC Input	Voltage	342V to 528V(Three-phase four-wire)		
	Frequency	47Hz to 63Hz		
Setup stability-30min	Voltage	≤0.02% + 0.02%FS		
(%of Output +Offset)	Current	≤0.1% + 0.1%FS		
Setup stability-8h	Voltage	≤0.02% + 0.02%FS		
(%of Output +Offset)	Current	≤0.1% + 0.1%FS		
Readback stability-30min	Voltage	≤0.02% + 0.02%FS		
(%of Output +Offset)	Current	≤0.1% + 0.1%FS		
Readback stability-8h	Voltage	≤0.02% + 0.02%FS		
(%of Output +Offset)	Current	≤0.1% + 0.1%FS		
Efficiency	~ 92%			
Remote Sense Compensation	≤15V (2Vmin)			
Command Response Time	2mS			
Power Factor		0.99		
Maximum input current	33.37A			
Maximum input apparent	19.8kVA			
Storage temperature	-10°C to 70°C			
Protective function	OVP, OCP, OPP, OTP and Vsense reversed protection			
Communication interface	Standard: USB, CAN, LAN; optional: GPIB, analog card, fiber optic socket			



Isolation (output to ground)	1800V
Working temperature	0 to 50°C
Number of parallel units	≤8
Dimension (mm)	483W*801.61D*151.3H
Weight(net)	40KG

6.1.5 IT6006C-800-20

Paramete	ers	IT6006C-800-20
Output Rating	Output Voltage	0 to 800V
(0 °C-40 °C)	Output Current	-20 to 20A
	Output Power	-6000 to 6000W
	Output Resistance	0 to 1Ω
Line regulation	Voltage	≤0.01%FS
±(%of Output+Offset)	Current	≤0.05%FS
Load regulation	Voltage	≤0.02%FS
±(%of Output+Offset)	Current	≤0.05%FS
	Voltage	0.01V
Setup Resolution	Current	0.001A
Setup Resolution	Power	0.001kW
	Resistance	0.1mΩ
	Voltage	0.01V
Read Back Resolution	Current	0.001A
Read Back Resolution	Power	0.001kW
	Resistance	0.1mΩ
Setup Accuracy	Voltage	≤0.02% + 0.02%FS
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS
	Resistance	≤1% + 1%FS
Read Back Accuracy	Voltage	≤0.02% + 0.02%FS
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS



	Resistance	≤1% + 1%FS
Ripple	Voltage	≤320mVpp(MAX:≤800mVpp)
(20Hz -20MHz)	Current	≤0.1%FS RMS
Setup Temperature Coefficient	Voltage	≤50PPM/°C
(%of Output/°C+Offset)	Current	≤200PPM/°C
Read Back Temperature Coefficient	Voltage	≤50PPM/°C
(%of Output/°C+Offset)	Current	≤200PPM/°C
Rise time(no load)	Voltage	≤15ms
Rise time(full load)	Voltage	≤30ms
Fall time(no load)	Voltage	≤30ms
Fall time(full load)	Voltage	≤15ms
Transient Response Time	Voltage	≤2ms
AC Input	Voltage	198V to 264V (Derating 50%) 342V to 528V(Three-phase four-wire)
·	Frequency	47Hz to 63Hz
Setup stability-30min	Voltage	≤0.02%+0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Setup stability-8h	Voltage	≤0.02%+0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Readback stability-30min	Voltage	≤0.02%+0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Readback stability-8h	Voltage	≤0.02%+0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Efficiency	~ 92%	
Remote Sense Compensation	≤8V (2Vmin)	
Command Response Time	2mS	
Power Factor		0.99
Maximum input current	19.27A	
Maximum input apparent	6.6kVA	
Storage temperature	-10°C to 70°C	
Protective function	OVP, OCP, OPP, OTP and Vsense reversed protection	



Communication interface	Standard: USB, CAN, LAN; optional: GPIB, analog card, fiber optic socket
Isolation (output to ground)	1000V
Number of series and parallel units	≤1
Working temperature	0 to 50°C
Dimension (mm)	483W*801.61D*151.3H
Weight(net)	28KG

6.1.6 IT6012C-800-40

Parameters		IT6012C-800-40
Output Rating	Output Voltage	0 to 800V
(0 °C-40 °C)	Output Current	-40 to 40A
	Output Power	-12000 to 12000W
	Output Resistance	0 to 1Ω
Line regulation	Voltage	≤0.01%FS
±(%of Output+Offset)	Current	≤0.05%FS
Load regulation	Voltage	≤0.02%S
±(%of Output+Offset)	Current	≤0.05%FS
	Voltage	0.01V
Setup Resolution	Current	0.001A
Octup (Coolution	Power	0.001kW
	Resistance	$0.01 m\Omega$
	Voltage	0.01V
Read Back Resolution	Current	0.001A
Read Back Resolution	Power	0.001kW
	Resistance	0.01mΩ
Setup Accuracy	Voltage	≤0.02% + 0.02%FS
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS
	Resistance	≤1% + 1%FS
Read Back Accuracy	Voltage	≤0.02% + 0.02%FS



(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS
	Resistance	≤1% + 1%FS
Ripple	Voltage	≤200mVpp(MAX:≤500mVpp)
(20Hz -20MHz)	Current	≤0.1%FS RMS
Setup Temperature Coefficient	Voltage	≤50PPM/°C
(%of Output/°C+Offset)	Current	≤200PPM/°C
Read Back Temperature Coefficient	Voltage	≤50PPM/°C
(%of Output/°C+Offset)	Current	≤200PPM/°C
Rise time(no load)	Voltage	≤15ms
Rise time(full load)	Voltage	≤30ms
Fall time(no load)	Voltage	≤30ms
Fall time(full load)	Voltage	≤15ms
Transient Response Time	Voltage	≤2ms
AC Input	Voltage	198V to 264V (Derating 50%) 342V to 528V(Three-phase four-wire)
	Frequency	47Hz to 63Hz
Setup stability-30min	Voltage	≤0.02% + 0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Setup stability-8h	Voltage	≤0.02% + 0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Readback stability-30min	Voltage	≤0.02% + 0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Readback stability-8h	Voltage	≤0.02% + 0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Efficiency	~ 92%	
Remote Sense Compensation	≤8V (2Vmin)	
Command Response Time	2mS	
Power Factor	0.99	
Maximum input current	22.25A	
Maximum input apparent	13.2kVA	



Storage temperature	-10°C to 70°C
Protective function	OVP, OCP, OPP, OTP and Vsense reversed protection
Communication interface	Standard: USB, CAN, LAN; optional: GPIB, analog card, fiber optic socket
Isolation (output to ground)	1500V
Number of series and parallel units	≤1
Working temperature	0 to 50°C
Dimension (mm)	483W*801.61D*151.3H
Weight(net)	34KG

6.1.7 IT6018C-800-60

Parameters		IT6018C-800-60
Output Rating	Output Voltage	0 to 800V
(0 °C-40 °C)	Output Current	-60 to 60A
	Output Power	-18000 to 18000W
	Output Resistance	0 to 1Ω
Line regulation	Voltage	≤0.01%FS
Line regulation	Current	≤0.05%FS
Load regulation	Voltage	≤0.02%FS
Load regulation	Current	≤0.05%FS
	Voltage	0.01V
Setup Resolution	Current	0.001A
Octup (Coolution	Power	0.001kW
	Resistance	0.01mΩ
	Voltage	0.01V
Read Back Resolution	Current	0.001A
Read Back Resolution	Power	0.001kW
	Resistance	0.01mΩ
Setup Accuracy	Voltage	≤0.02% + 0.02%FS
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS



	Resistance	≤1% + 1%FS
Read Back Accuracy	Voltage	≤0.02% + 0.02%FS
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS
	Resistance	≤1% + 1%FS
Ripple	Voltage	≤320mVpp(MAX: ≤800mVpp)
(20Hz -20MHz)	Current	≤0.1%FS RMS
Setup Temperature Coefficient	Voltage	≤50PPM/°C
(%of Output/°C+Offset)	Current	≤200PPM/°C
Read Back Temperature Coefficient	Voltage	≤50PPM/°C
(%of Output/°C+Offset)	Current	≤200PPM/°C
Rise time(no load)	Voltage	≤15ms
Rise time(full load)	Voltage	≤30ms
Fall time(no load)	Voltage	≤30ms
Fall time(full load)	Voltage	≤15ms
Transient Response Time	Voltage	≤2ms
	Voltago	198V to 264V(降额50%)
AC Input	Voltage	342V to 528V(Three-phase four-wire)
	Frequency	47Hz to 63Hz
Setup stability-30min	Voltage	≤0.02% + 0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Setup stability-8h	Voltage	≤0.02% + 0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Readback stability-30min	Voltage	≤0.02% + 0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Readback stability-8h	Voltage	≤0.02% + 0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Efficiency	~ 92%	
Remote Sense Compensation	≤8V(2Vmin)	
Command Response Time	2mS	



Power Factor	0.99
Maximum input current	33.37A
Maximum input apparent	19.8kVA
Storage temperature	-10°C to 70°C
Protective function	OVP, OCP, OPP, OTP and Vsense reversed protection
Communication interface	Standard: USB, CAN, LAN; optional: GPIB, analog card, fiber optic socket
Isolation (output to ground)	1500V
Working temperature	0 to 50°C
Number of parallel units	≤8
Dimension (mm)	483W*801.61D*151.3H
Weight(net)	40kg

6.1.8 IT6036C-800-120

Parameters		IT6036C-800-120
Output Rating	Output Voltage	0 to 800V
(0 °C-40 °C)	Output Current	-120 to 120A
	Output Power	-36000 to 36000W
	Output Resistance	0 to 1Ω
Line regulation	Voltage	≤0.01%FS
Line regulation	Current	≤0.05%FS
Load regulation	Voltage	≤0.02%FS
Load regulation	Current	≤0.05%FS
	Voltage	0.01V
Setup Resolution	Current	0.01A
Octup (Cooldiio)	Power	0.001kW
	Resistance	$0.01 m\Omega$
Read Back Resolution	Voltage	0.01V
	Current	0.01A
TOOL DOOK NOSOIULION	Power	0.001kW
	Resistance	0.01mΩ
Setup Accuracy	Voltage	≤0.02% + 0.02%FS



(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS
	Resistance	≤1% + 1%FS
Read Back Accuracy	Voltage	≤0.02% + 0.02%FS
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS
	Resistance	≤1% + 1%FS
Ripple	Voltage	≤320mVpp(MAX: ≤800mVpp)
(20Hz -20MHz)	Current	≤0.1%FS RMS
Setup Temperature Coefficient	Voltage	≤50PPM/°C
(%of Output/°C+Offset)	Current	≤200PPM/°C
Read Back Temperature Coefficient	Voltage	≤50PPM/°C
(%of Output/°C+Offset)	Current	≤200PPM/°C
Rise time(no load)	Voltage	≤15ms
Rise time(full load)	Voltage	≤30ms
Fall time(no load)	Voltage	≤30ms
Fall time(full load)	Voltage	≤15ms
Transient Response Time	Voltage	≤2ms
	Voltago	198V to 264V(降额50%)
AC Input	Voltage	342V to 528V(Three-phase four-wire)
	Frequency	47Hz to 63Hz
Setup stability-30min	Voltage	≤0.02% + 0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Setup stability-8h	Voltage	≤0.02% + 0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Readback stability-30min	Voltage	≤0.02% + 0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Readback stability-8h	Voltage	≤0.02% + 0.02%FS
(%of Output +Offset)	Current	≤0.1% + 0.1%FS
Efficiency		~ 92%



Remote Sense Compensation	≤8V(2Vmin)			
Command Response Time	2mS			
Power Factor	0.99			
Maximum input current	66.73A			
Maximum input apparent	39.5kVA			
Storage temperature	-10°C to 70°C			
Protective function	OVP, OCP, OPP, OTP and Vsense reversed protection			
Communication interface	Standard: USB, CAN, LAN; optional: GPIB, analog card, fiber optic socket			
Isolation (output to ground)	1500V			
Working temperature	0 to 50°C			
Number of parallel units	≤8			
Dimension (mm)	483W*801.61D*302.6H			
Weight(net)	80kg			

6.1.9 IT6018C-2250-20

Paramete	ers	IT6018C-2250-20		
Output Rating	Output Voltage	0 to 2250V		
(0 °C-40 °C)	Output Current	-20 to 20A		
	Output Power	-18000 to 18000W		
	Output Resistance	0 to 1Ω		
Line regulation	Voltage	≤0.01%FS		
±(%of Output+Offset)	Current	≤0.05%FS		
Load regulation	Voltage	≤0.02%FS		
±(%of Output+Offset)	Current	≤0.05%FS		
	Voltage	0.1V		
Setup Resolution	Current	0.01A		
Octop (Coolation	Power	0.001kW		
	Resistance	0.1mΩ		
	Voltage	0.1V		
Read Back Resolution	Current	0.01A		
	Power	0.001kW		



	Resistance	0.1mΩ		
Setup Accuracy	Voltage	≤0.02% + 0.02%FS		
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS		
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS		
	Resistance	≤1% + 1%FS		
Read Back Accuracy	Voltage	≤0.02% + 0.02%FS		
(within 12 months, 25°C ±5°C)	Current	≤0.1% + 0.1%FS		
±(%of Output+Offset)	Power	≤0.5% + 0.5%FS		
	Resistance	≤1% + 1%FS		
Ripple	Voltage	≤900mVpp(MAX:≤2250mVpp)		
(20Hz -20MHz)	Current	≤0.1%FS RMS		
Setup Temperature Coefficient	Voltage	≤50PPM/°C		
(%of Output/°C+Offset)	Current	≤200PPM/°C		
Read Back Temperature Coefficient	Voltage	≤50PPM/°C		
(%of Output/°C+Offset)	Current	≤200PPM/°C		
Rise time(no load)	Voltage	≤15ms		
Rise time(full load)	Voltage	≤30ms		
Fall time(no load)	Voltage	≤30ms		
Fall time(full load)	Voltage	≤15ms		
Transient Response Time	Voltage	≤2ms		
AC Input	Voltage	198V to 264V (Derating 50%) 342V to 528V(Three-phase four-wire)		
·	Frequency	47Hz to 63Hz		
Setup stability-30min	Voltage	≤0.02% + 0.02%FS		
(%of Output +Offset)	Current	≤0.1% +0.1%FS		
Setup stability-8h	Voltage	≤0.02% + 0.02%FS		
(%of Output +Offset)	Current	≤0.1% +0.1%FS		
Readback stability-30min	Voltage	≤0.02% + 0.02%FS		
(%of Output +Offset)	Current	≤0.1% +0.1%FS		
Readback stability-8h	Voltage	≤0.02% + 0.02%FS		
(%of Output +Offset)	Current	≤0.1% +0.1%FS		



Efficiency	~ 92%		
Remote Sense Compensation	≤22.5V (2Vmin)		
Command Response Time	2mS		
Power Factor	0.99		
Maximum input current	33.37A		
Maximum input apparent 19.8kVA			
Storage temperature	-10°C to 70°C		
Protective function	OVP, OCP, OPP, OTP and Vsense reversed protection		
Communication interface	Standard: USB, CAN, LAN; optional: GPIB, analog card, fiber optic socket		
Isolation (output to ground)	3000V		
Working temperature	0 to 50°C		
Number of parallel units	≤8		
Dimension (mm)	483W*801.61D*151.3H		
Weight(net)	40KG		



6.2 Supplemental Characteristics

State storage capacity: 100 sets

Recommended calibration frequency: once a year

Cooling style: fans

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- ◆ Specifications of Red and Black Test Lines
- ◆ Fuse Replacement

A.1 Specifications of Red and Black Test Lines

ITECH provides you with optional red and black test lines, which are sold individually and you can select for test. For specifications of ITECH test lines and maximum current values, refer to the table below.

Model	Specification	Cross Section	Length
IT-E301/10A	10A	-	1m
IT-E301/30A	30A	6mm ²	1.2m
IT-E301/30A	30A	6mm ²	2m
IT-E301/60A	60A	20mm ²	1.5m
IT-E301/120A	120A	50mm ²	2m
IT-E301/240A	240A	70mm ²	1m
IT-E301/240A	240A	70mm ²	2m
IT-E301/360A	360A	95mm²	2m

For maximum current of AWG copper wire, refer to table blow.

AWG	10	12	14	16	18	20	22	24	26	28
The Maxi- mum Current Value(A)	40	25	20	13	10	7	5	3.5	2.5	1.7



AWG (American Wire Gage), it means X wire (marked on the wire). The table above lists current capacity of single wire at working temperature of 30° C. For reference only.



Appendix

A.2 Fuse Replacement

Different models of our company product are supplied with different fuse assembly. The way to replace the fuse changes accordingly. The common ways are as follows. Please choose the corresponding way of disassembly and replacement based on the fuse assembly of the actual instrument.



If there are no fuse assembly on the instrument rear panel, it means that you can't replace the fuse by yourself. Please contact the ITECH engineer on the condition of the same malfunction.



Appendix

The type of the fuse The way to replace 1. Use a screwdriver to push and turn the fuse box anti-clockwise. When turned to 90 degrees, release the screwdriver. Refer to the picture below. 2. The fuse box will bounce up, then you can see the fuse in it. Take out the blown fuse. 3. Please replace with a fuse of the same specification. Refer to the technical specification of the corresponding instrument. 4. When install, put into the fuse box as the picture below. Then use a screwdriver to push and turn the fuse box to 90 degrees clockwise. Refer to the picture below. The power cord jack of the instrument includes the fuse. Please refer to the rear panel introduction of the corresponding instrument for the detailed position. The replacement steps for this type of the fuse are as follows. 1. First pull out the power cord, and then take out the fuse block from the power cord jack with a small screwdriver, as shown below. 2. Have a visual inspection of the fuse to see whether it is burnt out; if yes, replace it with another fuse of the same specification. Refer to the corresponding technical specifications for fuse rating.



Appendix

The type of the fuse	The way to replace
	After replacement, mount the fuse block to the original position, as illustrated below.
	 Push and turn the fuse box anti-clockwise by hand. When turned to 90 degrees, release the screwdriver. The fuse box will bounce up, then you can see the fuse in it. Take out the blown fuse. Please replace with a fuse of the same specification. Refer to the technical specification of the corresponding instrument. When install, put into the fuse box firstly. Then Push and turn the fuse box to 90 degrees clockwise.

Contact Us

Thanks for purchasing ITECH products. In case of any doubts, please contact us as follows:

- 1. Refer to accompanying data disk and relevant manual.
- 2. Visit ITECH website: www.itechate.com.
- 3. Select the most convenient contact method, for further information.