Highpowered and Programmable Switching Power supply

Series IT6500 User's Manual

Notices

Manual Part Number

IT6500-402006

Revision

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Itech Electronic, Co., Ltd.

Trademarks

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Warranty

Technology Licenses

Restricted Rights Legend

Safety Notices

CAUTION

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

WARNING

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

NOTE

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

Quality Certification and Assurance

We certify that IT6500 series power supply meets all the published specifications at time of shipment from the factory.

Warranty

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

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

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

Limitation of Warranty

This Warranty will be rendered invalid if the product is:

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

Safety Symbols

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

Safety Precautions

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

WARNING

- **Do not use the instrument if it is damaged. Before operation, check the casing to see whether it cracks. Do not operate the instrument in the presence of inflammable gasses, vapors or dusts.**
- **The power supply is provided with a three-core power line during delivery and should be connected to a three-core junction box. Before operation, be sure that the power supply is well grounded. Make sure to use the power cord supplied by ITECH.**
- **Check all marks on the instrument before connecting the instrument to power supply.**
- **Use electric wires of appropriate load. All loading wires should be capable of bearing maximum short-circuit of electronic load without overheating. If there are multiple loads, each pair of the load power cord must be carry out the full rated short-circuit output current of the power securely.**
- **Ensure the voltage fluctuation of mains supply is less than 10% of the working voltage range in order to reduce risks of fire and electric shock.**
- **Do not install alternative parts on the instrument or perform any unauthorized modification.**
- **Do not use the instrument if the detachable cover is removed or loosen.**
- **To prevent the possibility of accidental injuries, be sure to use the power adapter supplied by the manufacturer only.**
- **Never use the instrument with a life-support system or any other equipment subject to safety requirements.**

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

📖 **Note**

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

Regulatory Markings

CE	The CE mark indicates that the product complies with all the relevant European legal directives. The specific year (if any) affixed refers to the year when the design was approved.
(crossed-out wheeled bin symbol)	The instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affix product label indicates that you must not discard the electrical/electronic product in domestic household waste.
(10 EFUP symbol)	This symbol indicates the time period during which no hazardous or toxic substances are expected to leak or deteriorate during normal use. The expected useful life of the product is 10 years. The product can be used safely during the 10-year Environment Friendly Use Period (EFUP). Upon expiration of the EFUP, the product must be immediately recycled.

Waste Electrical and Electronic Equiment (WEEE) Directive

2002/96/EC Waste Electrical and Electronic Equipment (WEEE) Directive
This product complies with the WEEE Directive (2002/96/EC) marking requirement. This affix product label indicates that you must not discard the electrical/electronic product in domestic household waste.
Product Category
With reference to the equipment classifications described in the Annex 1 of the WEEE Directive, this instrument is classified as a "Monitoring and Control Instrument".
To return this unwanted instrument, contact your nearest ITECH office.

Compliance Information

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

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

Conforms with the following product standards:

EMC Standard

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

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

Safety Standard

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

Content

Chapter1 **Inspection and Installation**

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:

Checklist of Package Contents

Item	Qty.	Model	Remarks
IT6500 power supply	x1	IT6500 series	The IT6500 series include: IT6512/IT6513/IT6512A/IT6513A/IT6502D
Power cord	x1	IT-E171/IT-E172/ IT-E173/IT-E174	User may select an appropriate power cord that matches the specifications of power socket used in the area. See the Section **Connecting the Power Cord** for details.
USB cable	x1	-	-
Ex-factory Test Report	x1	-	It is the test report of the instrument before delivery.

📖 NOTE

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. Refer to IT6500 User's Manual for detailed requirements on returns.

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 power supply size.

IT6500 series power supply different models are not the same size, the detail size of the power supply are shown as below.

414. 50

481. 50

54. 45

438

499. 21
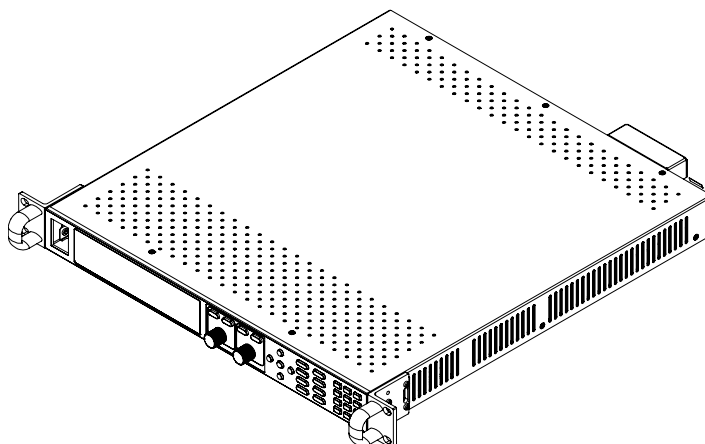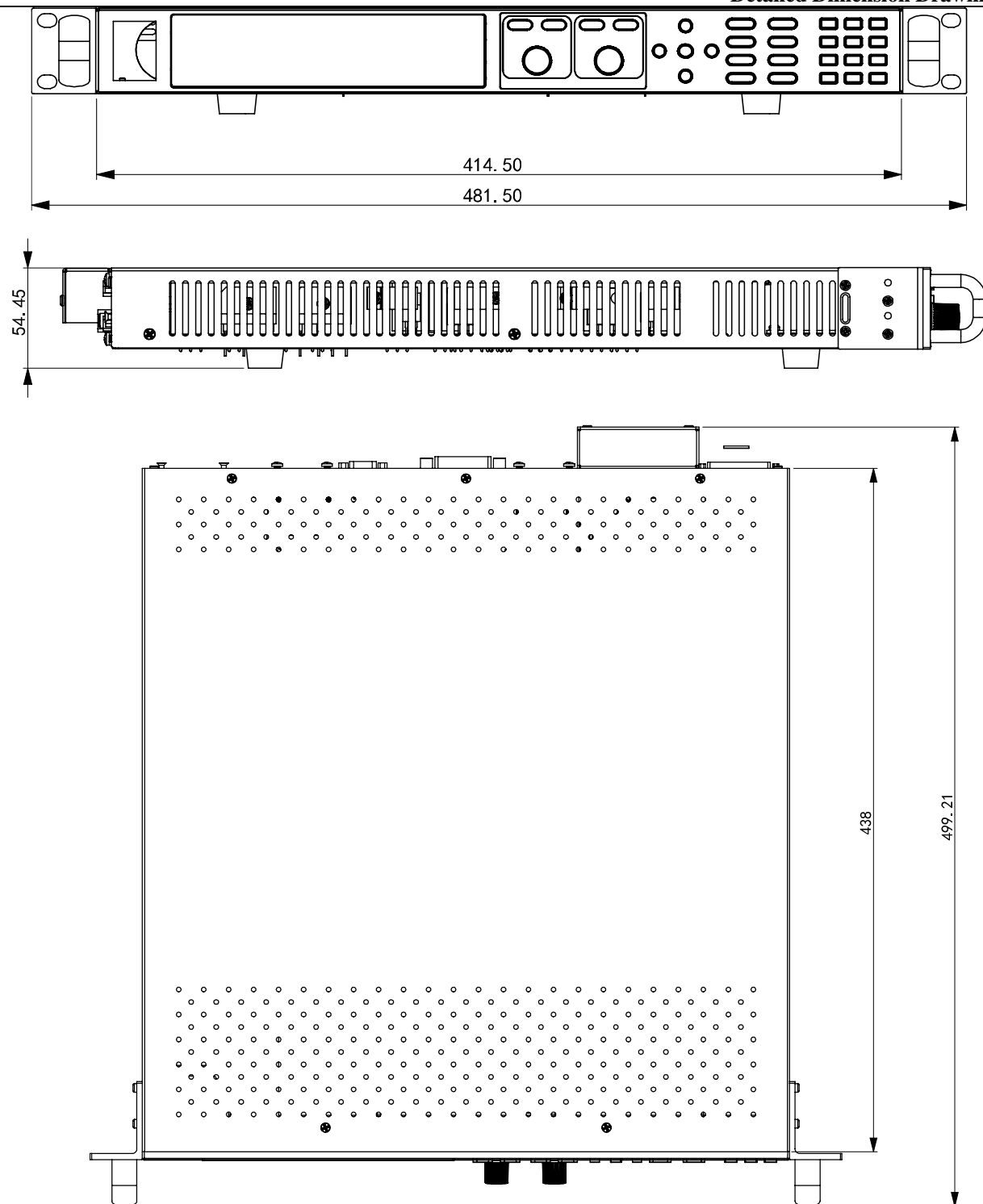
1.3 Connecting the Power Cord

Before connecting the power cord, please ensure the power switch of the instrument is turned OFF. Only use the power cord supplied as a standard accessory. A summary of connection procedures is given below.

AC power input level

Support two kinds of AC input voltage:110VAC and 220VAC.There is no need to switch the input mode.

AC input grade:

- Option Opt.01: 220VAC ± 10%, 47 to 63 Hz
- Option Opt.02: 110 VAC ± 10%, 47 to 63 Hz

Categories of power cords

IT6500 series power supply provides the standard power cords as below.

Please select appropriate power cords appropriate to local voltage based on the specifications of power cords below. If purchased model fails to meet local voltage requirements, please contact distributor or factory for change.
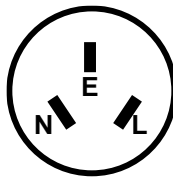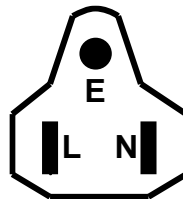
China	America, Canada,Japan	Europe	Britain
IT-E171	IT-E172	IT-E173	IT-E174
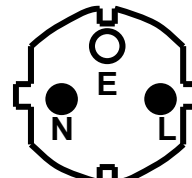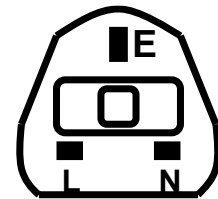
CAUTION

The power cords supplied with this product is certified for safety. In case the supplied lines assembly needs to be replaced, or an extension lines must be added, be sure that it can meet the required power ratings of this product. Any misuse voids the warranty of this product.

Chapter2 **Quick Start**

This chapter introduces power-on check steps of IT6500D series to ensure normal start-up and usage under initialization status. This part also introduces the front panel, the rear panel, key functions and VFD display function of the power supply, make sure that you can quickly know the appearance, instruction and the key function before you operate the power supply, Help you make better use of this series of power supply.

2.1 Brief Introduction

IT6500 series is a flexiable range single output high power supply.With wide power ranges from 800W to1200W.Standard RS232,USB,RS485 and LAN interfaces included on the rear board provide flexibility for remote operation of the power supply.Its compact 1U(1200W) size form factor makes it ideal for use in a standard 19-inch rack.IT6500 series is specially designed for automobile electronic industry.It provides built-in DIN40839 and ISO16750-2 waveforms to test the anti-jamming performance of products,such as DVD and sound equipment.

Convenient bench-top features:

- Auto-Range function
- High Resolution Display (1mV/1mA)
- Small size of 1U and 2U
- RS232/USB/GPIB/RS485 standard interfaces
- Analog Control Interface
- Master/Slave Mode for Series/Parallel connectivity
- Adjustable voltage slope (rise and fall time)
- Sequence programming (List mode)
- Built-in DIN40839 and ISO16750-2 waveform(IT6512/IT6513 characteristic)
- OVP and OPP protection
- Low ripple and low noise
- Intelligent fans control

* XXX(G) is the model with built-in GPIB, the function is the same as standard model, for more information please check with ITECH for availability.

Model	Voltage	Current	Power
IT6502D(G)	80V	60A	800W
IT6512(G)	80V	60A	1200W
IT6513(G)	150V	30A	1200W
IT6512A(G)	80V	60A	1200W
IT6513A(G)	150V	30A	1200W

2.2 Front Panel Introduction

IT6500 series power supply different models are not the same front board. the detail front board and key function schematic graph of the power supply are shown as below.
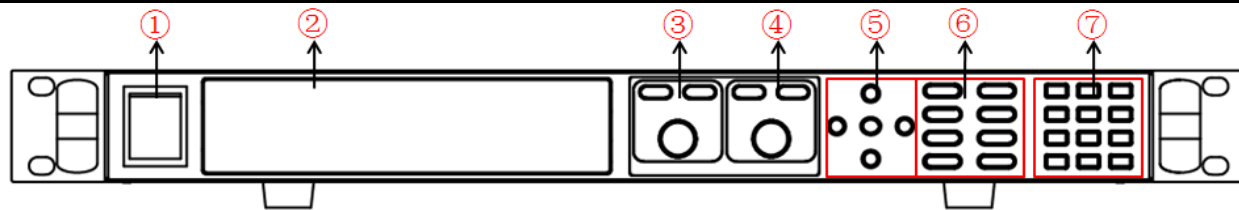
①Power Switch
②VFD Screen
③pulsating knob to control voltage,coarse button,fine botton
④pulsating knob to control current,coarse button,fine botton

⑤ directioin key and (OK) key
⑥function keys and composite key
⑦ numeric key and ESC key
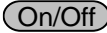
2.3 keyboard introduction

IT6500 series power supply different models are same the key function in front board, schematic graph as follow.
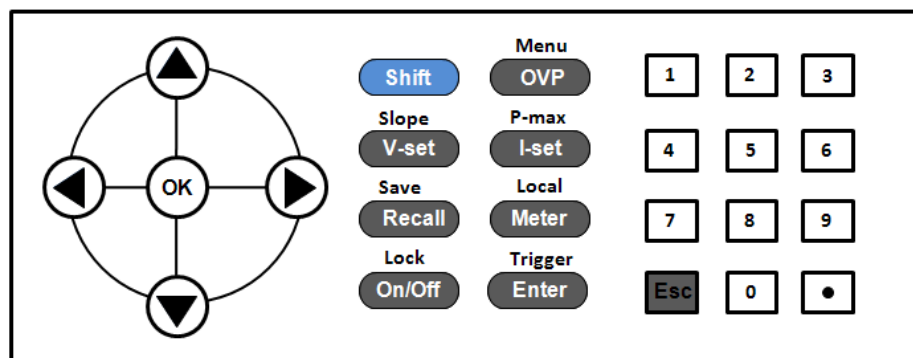
Detailed description of keys:

keys	Name and functions
0-9	Numeric button
Shift	Composite key
OVP Menu	OVP setting button,the button used to set the ovp value/menu function button which used to set the related parameters of power supply
V-set Slope	Voltage setting button,used to set the ouput voltage value/set the rising time and fall time of voltage
I-set Pmax	Current setting button,used to set the output current value/set the maximum power value
Recall Save	Callback button,used to recall a saved setting parameter/save button,used to save a setting parameter
Meter Local	Meter button,used to switch the display between actual value and setting value /switch to the loacl mode
Enter Trigger	Confirm button,to confirm the setting numbers or functions/trigger button,used to provide a trigger single for list operation

keys	Name and functions
On/Off Lock	Ouput on/off button,used to control the output status of power supply/kelock function button,used to lock the front board buttons
◀ ▶	Left and right direction button,used to adjust the location of the cursor
△ ▽	Up and down direction button,used to select the items of the menu or increase(decrease) the output voltage and current value
(OK)	Confirm button
ESC	Quit button
•	Dot

2.4 VFD Indicator Lamps Description

As follows:

Flag	Function Description	chart	function description
OFF	Power supply in off mode	Timer	none
CV	Power supply in CV mode	Sense	none
CC	Power supply in CC mode	Ext	none
*	Open the keylock function	Adrs	Displayed for 3s when remote operation is connected successfully.
Meter	"Meter" button in on mode	Rmt	Remote control mode
Shift	using composite function	Error	Error occur
Rear	Start external analog quantity function	Prot	Protections for OV or OT
SRQ	Serial request query	Trig	waiting for triggering signal

2.5 Rear Panel Introduction

IT6500 series power supply different models are not the same rear board. the detail rear board schematic graph of the power supply are shown as below.
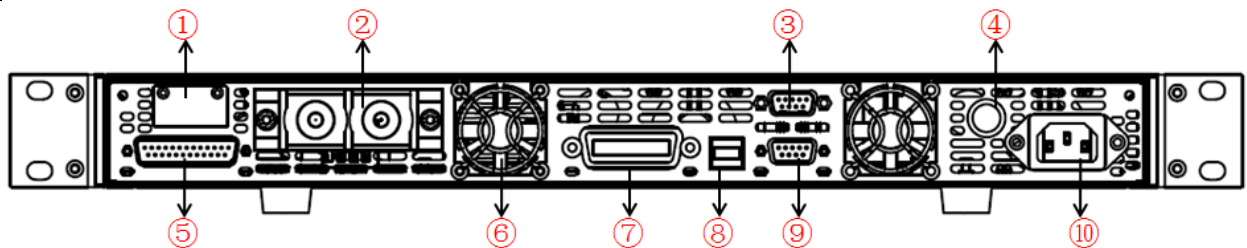
①remote sense and ouput terminals
②Output terminal
③RS485 communication interface
④Fuses
⑤Analog control interface
⑥Cooling fans

⑦GPIB communication interface(Only for IT6500G series)
⑧USB communication interface
⑨RS232 communication interface
⑩AC power input socket

2.6 Power-on selftest

A successful selftest indicates that the purchased power product meets delivery standards and is available for normal usage.

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

WARNING

- To avoid burning out, be sure to confirm that power voltage matches with supply voltage.
- Be sure to connect the main power socket to the power outlet of protective grounding. Do not use terminal board without protective grounding. Before operation, be sure that the power supply is well grounded.
- To avoid burning out, pay attention to marks of positive and negative polarities before wiring.

Selftest steps

Normal selftest procedures:

1. Correctly connect the power cord. Press **Power** key to start up.
2. After selftest, VFD display the output voltage and current status as below:

```
OFF

0.000V      0.000A
0.0W
```

Error Information References

The following error information may occur when an error occurs during Power On

self-test:

- If the EEPROM was damaged, the VFD will display "EEPROM FAILURE".
- If the lastest operation data in EEPROM is lost, then VFD will display "Config Data Lost".
- If the calibration data in EEPROM is lost, then VFD will display "Calibration Data Lost".
- If the factory calibration data in EEPROM is lost, and then the VFD will display "FactoryCal.Data Lost".
- If the system setting data in EEPROM is lost,the VFD will display "MainframeInitializeLost".

Exception handling

If the power supply can not 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 power supply is powered.

    Correct wiring of power cord $=>2$

    Incorrect wiring of power cord $=>$ Re-connect the power cord and check whether the exception is removed.

2. Check whether the power in On. Power key is under " | " On status.

    Yes $=>3$

    No $=>$ Please check the Power key to start power and check whether the exception is removed.

3. Check whether the fuse of power supply is burned out.

    If yes, change fuse. Detailed steps:

    1. Use a screwdriver to push and turn the fuse box on the rear board of the power supply, refer to the below picture. After the fuse box is opened, you can see the fuse in it. Please replace with a fuse of the same specification.
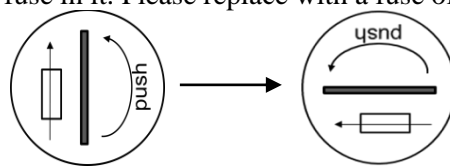
    2. If the fuse is fused, please change fuse of same specification based on machine model. See the table blow for matching information of fuse and machine model.

    Fuse specification list

Model	Fuse Sepcification (110/220VAC)	
IT6512	15A	250V
IT6513	15A	250V
IT6512A	15A	250V
IT6513A	15A	250V
IT6502D	15A	250V

3. When install, use a screwdriver to push and turn the fuse box. Refer to the picture below.
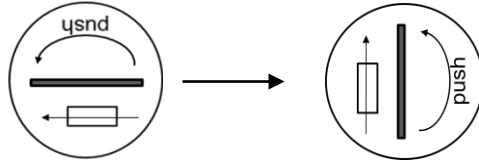
2.7 Output Checkout

The following procedures check to ensure that the power supply develops its rated outputs and properly responds to operation from the front board.

Voltage Output Checkout

The following steps verify basic voltage functions without load.

1. Turn on the power supply
2. Set the ouput current (≥0.1A)
3. Open the ouput

    Press on/off button,the CV indicator lamp will be lit.
4. Open the Meter button
5. Set the ouput voltage

    Set different voltage and check whether the VFD display voltage is approximate to the setting voltage.
6. Ensure the output voltage can be adjusted from 0V to full rated value

Output current checkout

The following steps check basic current functions with a short across the power supply's output

1. Turn on the power supply.
2. Disable the output

    Press On/Off key to ensure that the output is disabled.
3. Connect a short across (+) and (-) output terminals with an insulated test lead.

    Use a wire size sufficient to handle the maximum current.
4. Enable the output and open the Meter function button

    To ensure the CC indicator lamp is lit
5. Adjust the current

    Set different current values and check whether the voltage display is approximate to 0V,the display current value is approximate to the setting value
6. Ensure that the current can be adjusted from zero to the full rated value.
7. Turn off the power supply and remove the short wire from the output terminals.

    The wires with closure discharge over 10 A should be used.
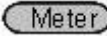
Chapter3 **Function and Features**

This chapter describes in detail the use of the front-panel keys and shows how they are used to accomplish power supply operation.

This chapter is divided into the following sections:
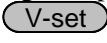
- Local mode/Remote mode
- Setting voltage
- Setting current
- On/off
- Actual value display/setting value dislay
- Adjustment of current/voltage/power
- Save operation
- Trigger operation
- Menu operation
- Protection function
- Setting rising time and fall time of voltage
- Keylock function
- Functions of rear terminals
- Anolog interfaces

3.1 Local/Remote

You can switch from remote mode to local mode by press (Shift) + (Meter) buttons.

When you turn on the unit,it will default in local mode and all buttons are available.That's to say,in remote mode,the front board buttons can not be used.The two operating mode can be switched through PC.When the operating mode is changed,all the output parameters will not be effected.
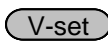
3.2 Setting voltage

The constant voltage range is from 0V to the maximum voltage value. It is very easy for you to set the constant voltage output. You have 3 solutions to set the constant voltage value.And when you press (V-set) ,this button will be lit.
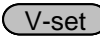
- directly input through number keys

  Input the value you want to set and then please press (Enter) or (OK) button to confirm.

- using knob to set value

  Press (V-set) button

  Press (Coarse) button(coarse adjustment,change the value in integer bit) or (Fine) button(fine adjustment,change the value in decimal bit),and then rotate the knob to set the value

- using left and right direction key to set value

Press V-set button

Press Coarse button(coarse adjustment,change the value in integer bit) or Fine button(fine adjustment,change the value in decimal bit),and then through left and right keys to adjust the cursor location,press ▲ and ▼ to set the voltage value
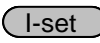
3.3 Setting current

The constant current range is from 0A to the maximum current value. It is very easy for you to set the constant current output. You have 3 solutions to set the constant current value.And when you press I-set ,this button will be lit.
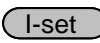
- directly input through number keys

Input the value you want to set and then please press Enter or OK button to confirm.

- using knob to set value

Press I-set button

Press Coarse button (coarse adjustment,change the value in integer bit) or Fine button(fine adjustment,change the value in decimal bit),and then rotate the knob to set the value

- using left and right direction key to set value

Press I-set button

Press Coarse button (coarse adjustment,change the value in integer bit) or Fine button(fine adjustment,change the value in decimal bit),and then through left and right keys to adjust the cursor location,press ▲ and ▼ to set the current value

3.4 On/off button

On/Off button is used to control the output state of power supply. If On/Off button is lit,this represents output is open.And in on mode,the indicator lamp(CC/CV) will be lit.

Note:please ensure that the DC source and product under test have been connected well before you press On/Off button.

NOTE

Make sure you have connected power supply and the test unit well, then press On/Off button. If there is no voltage output, you should first check the voltage and current set.

3.5 Setting value/Actual value

Meter button is used to switch the display between actual value and setting value.When Meter button is lit,this represents that VFD board display is actual value.Reversely,if Meter button is dark,VFD board display is corresponding to setting value.

3.6 Voltage and current adjustment

Power supply's output voltage and Electronic load's resistance determine the output

current.Only when the actual current value is lower than the setting current value,can the power supply works in CV mode.And the CV indicator lamp will be lit.

If the actual current value is limited by the setting current value or rated current,then IT6512 will change to CC mode.And the CC indicator lamp will be lit.

3.7 Save operation

IT6512 can enable you to save some often used parameters in nonvolatile memory up to 100sets.So that you can recall the parameters quickly.The following ways can help you achieve the save and recall operations:by pressing composite button (Shift) + (Recall) (Save) button or through command *SAV,*RCL.Save operation should work in with GROUP.Each GROUP can save 10sets,IT6512 includes 10 GROUP from 0-9.

Save parameters include setting voltage and setting current

Save method:

Using composite button (Shift) + (Recall) +number keys 1…9,and then pressing (Enter) button to save the preset value into specified memory region.

Using (Recall) button +number keys 1-9,and then pressing (Enter) button to recall the saved parameters from specified memory region.

3.8 Trigger operation

Please select the trigger mode in the menu setup before you start a trigger operation.

Before you want to run a list sequence file,please provide a trigger signal by press composited button (Shift) + (Enter) (trigger).During the list file running,the button (Enter) (trigger) will be alight.

3.9 Menu Operation

Press (Shift) + (OVP) (Menu) to enter the menu function.View the meun in VFD,and use right and left direction key or knob to scroll through the complete menu list as following.If press (Enter) button,you could get the selected menu function.Press (Esc) back to the previous menu selection page.

Menu of IT6512 and IT6513

SYSTEM	SYSTEM MENU	System menu	
	Initialize	Initialize the system	
	Power On	POWER-ON PARAMENT	Set power on parameters
		Rst(Def)	Restore to factory defaults
		Sav0	Remain last shutdown parameters
	Trigger	TRIGGER SOURCE	Set the trigger mode
		Manual(Def)	Manual trigger
		Bus	Bus trigger
	Memory	MEMORY	Work with recall button to recall 100sets saved parameters

		Group = 0	0:represents 1-10sets; 1:represents:11-20sets, by parity of reasoning
	Buzzer	BUZZER STATE	Set the buzzer function
		On(Def)	enable the buzzer function
		Off	disable the buzzer function
	Communication	COMMUNICATION	Select the communication interface
		RS232(Def)	Select RS232 communication interface
		4800, 8, None parity 1 , Addr...	
		9600 Odd parity (0~31)	
		19200 Even parity	
		38400	
		57600	
		115200	
		USB	Select USB communication interface
		GPIB(Only for IT6500G series)	Select GPIB communication interface
		Addr= 0 set the communication address	
		RS485	Select RS485 communication interface
		4800, 8, None parity, 1 , Addr...	
		9600 Odd parity (0~31)	
		19200 Even parity	
		38400	
		57600	
		115200	
	ReturnMeter	RETURN METER	Enables automatic delay to switch display from setting to measured value (meter).
		Off(Def)	Automatically Return Meter function disabled.
		Delay	The function of Automatically return meter after 5s enabled.
	P-Out	P-On Output	Set the output status of power supply power on
		Off(Def)	After power on, the power supply output status will be Off.
		Last	The output status of power supply will be same as last output status before power off.
	Sense-Protect	Sense Protect	Enable sense protection function
		Enable	Disable sense protection function
		Disable(Def)	Enables dummy load to increase speed of voltage fall time.

		CONFIG MENU	Configuration Menu	
CONFIG	Load	Load Setup	Enables the dummy load.	
		Off	Automatically Return Meter function disabled.	
		On	The function of Automatically return meter after 5s enabled.	
	Ext-Ctrl	Ext-Ctrl Setup	Ext-Ctrl mode and related parameter setting	
		10v-M	10V/5V monitoring mode options	
		5v-M		
		10V/10K-P	10V/10K or 5V/5K setting mode selection	
		5V/5K-P		
		V-P	Voltage(resistance)setting mode selection	
		R-P		
		Off		
		On	Disable this function	
	Limit	Voltage Range	Set the range of voltage.	
		Vmin= 1.000V	Minimum voltage setting	
		Vmax= 80.000V	Maximum voltage setting	
	Online	Online Setup	Online connection mode	
		Parallel	Parallel/Series connection, press up/down key to select.	
		Series		
		Master	Act as master/slave, press up/down key to select.	
		Slave		
		Mount…	When as master, it will display "Mount…" (need to set the count of slave) ; when as slave, it will display "Addr…"(need to set the address of instrument, range is 0 to 31)	
		Addr…		
		Off	Disable/Enable this function	
		On		
	OCP	OCP Setup	Set the status of OCP	
		Off	Disable over current protection function	
		On	Enable over current protection function	
Func.	LIST	LIST MENU	List Menu	
		Off	Quit list mode	
		Recall	RECALL LIST	Recall the list file
			Recall List File= 1	Select the list file number
		EditList	Edit list operation	
		EditSeq	Edit sequence operation	
	DIN40839	DIN40839	Evaluation of automobile starting waveform	
		12V	Select the 12V or 24V system	
		24V		
		Off	Enable/Disable DIN40839 function	

		On		
	ISO16750-2	ISO16750-2 profile	simulate the waveform to verify the anti-interference performance of the automotive electronics' products.	
		Short voltage drop	Short voltage drop	This test simulates the effect when a conventional fuse element melts in another circuit
			12V	Select 12V or 24V waveform
			24V	
			Off	Enable or Disable the Short voltage drop function.
			On	
		Profile for the reset test	Profile for the reset test	This test verifies the reset behaviour of the DUT at different voltage drops. This test is applicable to equipment with reset function
			Usmin…	The minmum supply voltage Usmin
			Off	
			On	Enable/Disable this function
		Starting profile	This test verifies the behaviour of a DUT during and after cranking.	
			12V	Select 12V or 24V test system
			24V	
			1	Set the levels/voltages/duration of starting profile
			Repeat	Set the cycle times(1-100)
			Delay	Set the delay time (0.01s-100.00s)
			Off	
			On	Enable/Disable this function
INFO	Power Info…	Product information		
	Model:IT65XX Ver:1.00-1.00 SN:0123456789AF	model, software version, SN		
	No Information	Reserved for calibration information		
	Exit Menu	Quit menu operation		

IT6512A/IT6513A/IT6502D

		System menu		
DEVICE MENU	SYSTEM	Initialize		Initialize the system
		Power On		Set power on parameters
			Rst(Def)	Restore to factory defaults
			Sav0	Remian last shutdown parameters
		Trigger	Manual(Def)	Manual trigger
			Bus	Bus trigger
		Memory	Memory	Work with recall button to recall 100sets saved parameters

			Group = 0	0:represents 1-10sets; 1:represents:11-20sets, by parity of reasoning
		Buzzer	**On(Def)**	enable the buzzer function
			Off	disable the buzzer function
		Communication		Select the communication interface
			RS232(Def)	Select RS232 communication interface
				4800, 8, None parity 1 , Addr... 9600 Odd parity (0~31) 19200 Even parity 38400 57600 115200
			USB	Select USB communication interface
			GPIB(Only for IT6500G series)	Select GPIB communication interface
				Addr= 0 set the communication address
			RS485	Select RS485 communication interface
				4800, 8, None parity, 1 , Addr... 9600 Odd parity (0~31) 19200 Even parity 38400 57600 115200
		ReturnMeter		Enables automatic delay to switch display from setting to measured value (meter).
			OFF	Return Meter function disabled.
			Delay	Enables return meter function
		P-Out	**P-On output**	Power whether power supply was on
			Off(def)	After power on,the instrument will be in the off state.
			Last	If output was on prior to turning the power off,the ON state will be resumed after power on.
		Sense-Protect	**Enable(Def)**	Enable sense protection function
			Disable	Disable sense protection function
	Config	**Load**	**Load setup**	Enables dummy load to increase speed of voltage fall time.
			Off	Disables the dummy load (default).

		On	Enables the dummy load.
	Ext-Ctrl mode and related parameter setting	**10v-M**	10V/5V monitoring mode options
		10V/10K-P	10V/10K or 5V/5K setting mode selection
		V-P	Voltage(resistance)setting mode selection
		Off	Disable this function
	Limit	**Vmin= 1.000V**	Minmum voltage setting
		Vmax= 80.000V	Maximum voltage setting
	Online connection mode	**Parallel**	Parallel connection
		Series	Series connection
		Master	Act as a master
		Slave	Act as a slave
		Addr…	Address
		Off	Disable this function
		On	Enable this function
	OCP	**Off**	Disable over current protection function
		On	Enable over current protection function
INFO information about this machine	**Model:IT6512 Ver:1.00-1.00 SN:0123456789AF**		model,software version,SN
	No Information		Reserved for calibration information
	Exit Menu		Quit menu operation

📖 **Note**

press ⬚Shift + ⬚OVP (Menu) to view the menu items,press ⬚Esc to quit menu operation.Besides,press ⬚Esc button can enable you quit the function operation state.

Output voltage set (>Vmax,Vmin)

The voltage can be set between 0A and rated voltage.Pressing ⬚Shift + ⬚OVP (Menu) to entry into Config item,and then using knob or direction keys to select Vmin option under Limit item.Press ⬚Enter button,then set the minmum voltage.After pressing ⬚Enter button,you could set the maximum voltage.After the setting operation,the voltage can only be adjusted within the limitation of Vmin and Vmax.

Default Vmax value is the rated voltage,and Vmin is 0V.

Communication Set(>Communication)

Under this item,you can set the concrete communication mode.This unit has provided multiple communication interfaces:RS232/USB/RS485.Of which, the baudrate options of RS232 are 4800,9600,19200,38400,57600,11.52K. Data bit is 8bits. Parity bit has three options:NONE,ODD,EVEN.Please ensure the configuration consistency between our instrument and PC,so that you could have a successful communication.

Key Sound Set(>Buzzer)

This item can set the buzzer state.**On** option indicates that when you push buttons,the

buzzer will sound.**OFF** option indicates that the buzzer function is disabled.Factory default is **On** option**.**

Trigger Mode (>Trigger)

This item is used to set the trigger source,to be Manual tigger mode or Bus trigger mode.It often be used to provide a trigger signal for a list operation.In Manual option,press (Shift) + (Enter) (Trigger) could generate a trigger signal.If in BUS option,this indicates in BUS trigger mode.**Factory default is Manual option.**

Save Group Operation (Memory)

Power source can save 100sets parameters in nonvolatile memory by the save group setting.This operation provides the customer with a convenient and quick save/recall using condition.

GRP0:save(recall) power source parameters in 0-9 sets.Press (Shift) + (Recall) (Save)+0-9 numeric keys((Recall) +0-9 numeric keys to recall the parameters)

GRP1:save(recall) parameters in 10th -19th sets.Press (Shift) + (Recall) (save)+numbers1-9 to save the parameters((Recall) +numbers1-9 to recall parameters).Under this condition,number "1" represents to save or recall the 10th parameters.Number "2" represents to save or recall the eleventh parameter.GRP2-GRP9 can be understood in the same manner.

Initialize setting (> Initialize)

This item can enable all setup of the menu to factory default.Press (Enter) to confirm.

Configure Power-On State(>Power-on)

The initial power-On state of the power supply can be configured by following the steps below:

1. From the **SYSTEM** menu, select **Power-On** and press enter.

2. There are two options:

    Rst(Def) – Factory Default.

    Sav0 – Settings before last power up.

3. Select the settings you want during power up, and press enter to save changes.

4. To exit the menu at any time, press esc button twice.

Return to Meter state(> Return Meter)

This option allows users to enable an internal fixed timer delay (5 seconds) for the power supply to automatically switch from setting display to measured display. When enabled, if the power supply output state is ON (enabled) and if the display shows setting voltage and current, it will automatically switch to measured voltage and current display after 5 seconds. The backlight of the Meter button will also be lit. In this state, pushing Meter button again to toggle back to setting display will reset the 5-second timer again before the supply changes back to measured display.

Load Setup Option (<Load)

The power supply has an internal dummy load that can be enabled to increase the speed of the voltage fall time for high speed test applications. The effectiveness of this function is dependent on the DUT (device under test) and may or may not be useful for some applications.

This feature should only be used with caution, as it is not designed for all applications.

DO NOT enable this function for applications such as connecting devices for battery charging or powering electric motors. All other applications that may behave similarly as a load should NOT use this function. This function is disabled by default.

List Operation(>List)

Please preset the trigger mode before you run a list file.

Press **Shift** + **OVP** (Menu) to enter the menu setup.Then press up and down buttons to select item >**System**,press **Enter** to confirm.After that,press up and down buttons to select >**Trigger** item to set the trigger mode,and press enter to confirm.

Operation steps

1. Press **Shift** + **OVP** (Menu) to enter the menu setup

2. VFD display **SYSTEM**,press ▽ to select **LIST**,press **Enter** to confirm

3. VFD display **OFF**,press ▽ to select **EDITLIST** item,press **Enter** to confirm

4. VFD display **File Name xx---**,input the sequence file name(1---10) to be edited

5. VFD display **List Power = xxxxxW----**,input the maximum power value

6. VFD display **List Repeat = xxxxx----**,input the repeat running times(1---65535) of LIST file

7. VFD display **Active Seq:0987654321** ----select the sequence name to be linked in one LIST file.After you select the sequence number,then according number will change to "Y"

8. VFD display Seq n Repeat:xxxxx----,set the repeat runing times of the linked sequence n(1---65535)

9. Save list to File?----,press **Enter** or **OK** to finish the edit operation

Sequence Operation(>Seq)

Please preset the trigger mode before you edit a sequence file

Press **Shift** + **OVP** (Menu) to enter the menu setup.Then press up and down buttons to select item >**System**,press **Enter** to confirm.After that,press up and down buttons to select >**Trigger** item to set the trigger mode,and press enter to confirm.

You could edit various kinds of sequence with variable ouput by setting up every step's parameters.The parameters includes step-voltage,step-current,step-time and time unit.Besides the fomer parameters,you should also edit whether continue to the next step,repeat times and whether to save the file.After you finish the sequence file edition,if the instrument receives a trigger signal,the sequence file will begin to run until finishing the sequence, or receive another trigger signal.The following will take a three sequence file to be an example:

Operation Steps:

1. Press (Shift) + (OVP) (Menu) to enter the menu setup

2. VFD display **SYSTEM,**press ▽ to select **LIST**,press (Enter) to confirm

3. VFD display **OFF**,press ▽ to select **EDITSeq**,press (Enter) to confirm.

4. VFD display **Seq Name: xx**,input the sequence name to be edited (1-10)

5. VFD display **Active Step:0987654321**, activate the sequence steps,when step is activated, according number will change to "Y"(for example:select step 1)

6. VFD display **Seq Step n Voltage = xxxxxV**,set the voltage of activated sequence step(for example:3V)

7. VFD display **Seq Seq n Current = xxxxxA**,set the current of activated sequence step(for example:1A)

8. VFD display **Seq Step n Width = xxxxxms**,set the duration of time of the activated step(0.1s--24h),(for example:3000ms)

9. VFD display **Seq Step n Slope= xxxxxms**.Set the voltage rising time of the activated step(0-65535),for example:30ms

10. VFD display **Active Step:0987654321**,input step number,for example:2

11. VFD display Seq Step n Voltage= xxxxxV,set the voltage of activated sequence step(for example:5V)

12. VFD display **Seq Step n Current= xxxxxA**, set the current of activated sequence step n(for example:4A)

13. VFD display **Seq Step n Width= xxxxxms**.for example 3000ms

14. VFD display **Seq Step n Slope= xxxxxms**,for example 30ms

15. VFD display **Active Step:0987654321**,for example 3

16. VFD display **Seq Step n Voltage= xxxxxV**,for example 7V

17. VFD display **Seq Step n Current= xxxxxA**,for example 8A

18. VFD display **Seq Step n Width= xxxxxms**,for example 3000ms

19. VFD display **Seq Step n Slope= xxxxxms**,for example 30ms

20. VFD display **Save Seq To File?----**Press (Enter) or (OK) button to finish the edition

Trigger the sequence file:

1. Press (Shift) + (OVP) (Menu) to enter the menu setup

2. VFD display **SYSTEM**,press ▽ to select **LIST**,press (Enter) to confirm

3. VFD display **OFF**,press ▽ to select **CALLSeq**,press (Enter) to confirm

4. Press (Shift) + (Enter) (Trigger) button to give a trigger signal
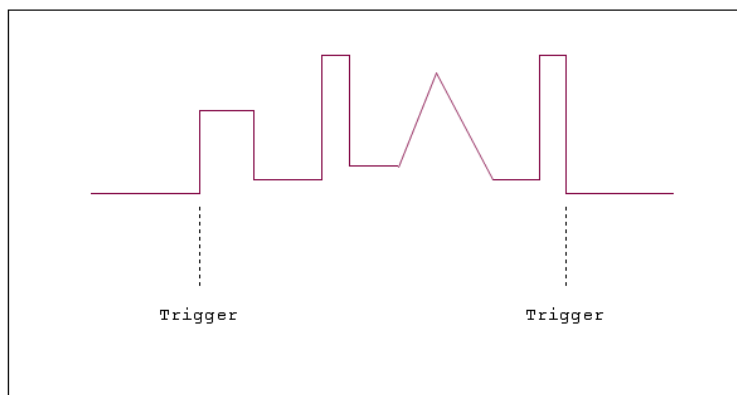
DIN40839 (Specialized function for model IT6512/6513)

IT6512/IT6513 models have built in DIN40839 waveform.This test verifies the behaviour of a DUT during and after cranking.

📖 **Note**

When recall the DIN40839 waveform, user need to enable the internal dummy load function at first. To ensure the DIN40839 waveform is excellent.

DIN40839 for 12V system:

Step	Voltage (V)	Current(A)	Width(mS)	Slope(mS)
1	4.5	60	15	5
2	6	60	2000	5
3	12	60		10
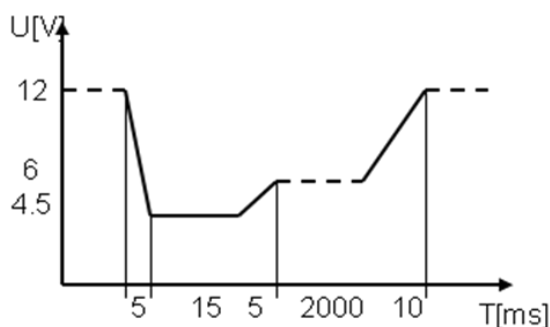
DIN40839 for 24V system:

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

How to recall "DIN40839 waveform" from menu (take 12V system as a example):

1. Press (Shift) + (OVP) (Menu) to enter the menu operation

2. VFD displays **SYSTEM CONFIG FUNC. INFO**, Press ▷ to select **FUNC.** Press (Enter) to confirm,then select DIN40839,press (Enter) to confirm

3. Press △ or ▽ to select 12V system,press ⬭Enter⬭ to confirm.

4. Press ▷ to select Off/On,press △ or ▽ to select On,press ⬭Enter⬭ to confirm.The Trig indicator lamp will be lit and display on the VFD.

5. Press ESC to quit menu operation

6. VFD will display DIN40839 in the lower right corner

7. Press ⬭On/Off⬭ ,turn on the output

8. press ⬭Shift⬭ + ⬭Enter⬭ (Trigger)to generate a trigger signal.The DC source will output DIN40839 waveform.

ISO16750-2 (Specialized function for model IT6512/6513**)**

IT6512/IT6513 models has built-in ISO16720-2 waveforms.To verify the anti-interference performance of the automotive electronics' products.

1* Short voltage drop

This test simulates the effect when a conventional fuse element melts in another circuit.

Apply the test pulse (see Figures below) simultaneously to all relevant inputs (connections) of the DUT. The rise time and fall time shall be not more than 10 ms.

12V system:
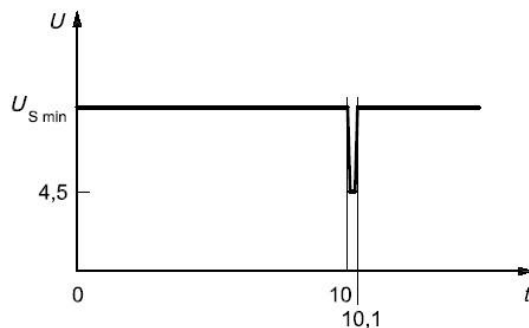
24V system:
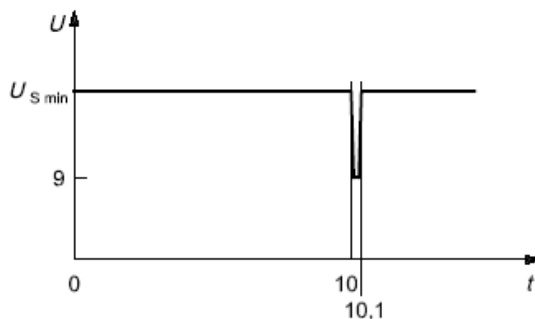
How to recall "Short voltage drop" waveform from menu (take 12V system as a example):

1. Press ⬭Shift⬭ + ⬭OVP⬭ (Menu) to enter the menu operation

2. VFD displays **SYSTEM CONFIG FUNC. INFO**, Press ▷ to select **FUNC.** Press

Enter to confirm,then select ISO16750-2,press Enter to confirm

3. Press △ or ▽ to select Short voltage drop,press Enter to confirm.

4. Press △ or ▽ to select 12V system,press Enter to confirm.

5. Press ▷ to select Off/On,press △ or ▽ to select On,press Enter to confirm.The Trig indicating lamp will be lit and display on the VFD.

6. Press ESC to quit menu operation

7. VFD will display Short voltage drop in the lower right corner

8. Press On/Off ,turn on the output

9. press Shift + Enter (Trigger)to generate a trigger signal.The DC source will output Short voltage drop waveform.

📖 **Note**

Please make sure the trigger source is selected in MANUAL item in above operations(refer to step 9th).And user need to turn on the internal dummy load to speed up the falling time during ISO16750-2/DIN40839 waveform operations.

2* Profile for the reset test

This test verifies the reset behaviour 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 behaviour of the DUT.Decrease the supply voltage by 5 % from the minimum supply voltage, USmin, to 0,95USmin. Hold this voltage for 5 s. Raise the voltage to USmin. Hold USmin for at least 10 s and perform a functional test. Then decrease the voltage to 0,9USmin. Continue with steps of 5 % of USmin, as shown in Figure 6, until the lower value has reached 0 V. Then raise the voltage to USmin again.
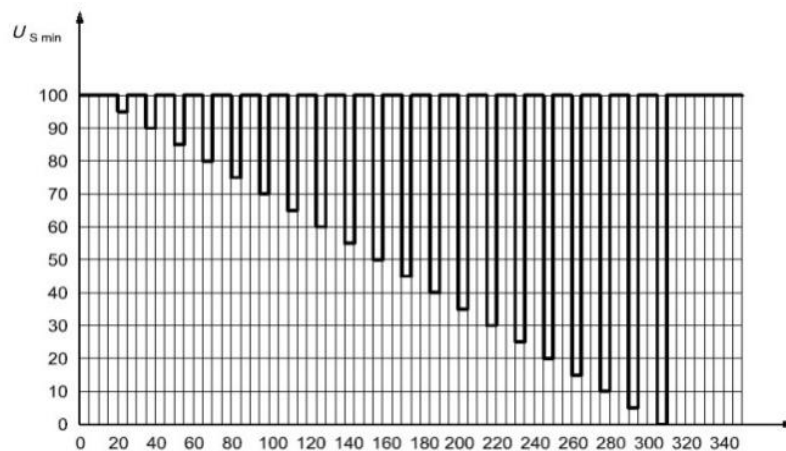
How to recall "Profile for the reset test" waveform from menu (take 12V system as a example):

1. Press Shift + OVP (Menu) to enter the menu operation

2. VFD displays **SYSTEM CONFIG FUNC. INFO**, Press ▷ to select **FUNC.** Press Enter to confirm,then select ISO16750-2,press Enter to confirm

3. Press △ or ▽ to select Profile for the reset test,press (Enter) to confirm.

4. VFD display **Usmin…**,press (Enter) to confirm.VFD will display Usmin= 12.000V,user can select the Usmin level.

5. Press ▷ to select Off/On,press △ or ▽ to select On,press (Enter) to confirm.The Trig indicating lamp will be lit and display on the VFD.

6. Press [ESC] to quit menu operation

7. VFD will display Profile for the reset in the lower right corner

8. Press (On/Off),turn on the output

9. press (Shift) + (Enter) (Trigger)to generate a trigger signal.The DC source will output Short voltage drop waveform.

3* Starting profile

This test verifies the behaviour of a DUT during and after cranking.

Apply the starting profile ten times, as specified in Figure and Table below simultaneously to all relevant inputs (connections) of the DUT. A break of 1 s to 2 s between the starting cycles is recommended.One or more profiles as described in Tables 3 and 4 shall be chosen in accordance with the application.

af= 2HZ
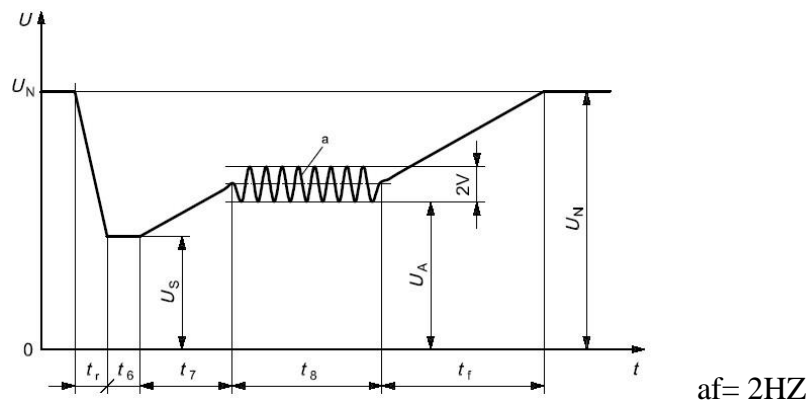
Standards for 12V system:

Levels/voltages/duration of starting profile				
I	II	III	IV	Tolerances
$U_S = 8$ V	$U_S = 4,5$ V	$U_S = 3$ V	$U_S = 6$ V	+ 0,2 V
$U_A = 9,5$ V	$U_A = 6,5$ V	$U_A = 5$ V	$U_A = 6,5$ V	
$t_r = 5$ ms				± 10 %
$t_6 = 15$ ms				
$t_7 = 50$ ms				
$t_8 = 1$ s	$t_8 = 10$ s	$t_8 = 1$ s	$t_8 = 10$ s	
$t_f = 40$ ms	$t_f = 100$ ms	$t_f = 100$ ms	$t_f = 100$ ms	

Standards for 24V system:

Levels/voltages/duration of starting profile			
I	II	III	Tolerances
$U_S = 10$ V	$U_S = 8$ V	$U_S = 6$ V	+ 0,2 V
$U_A = 20$ V	$U_A = 15$ V	$U_A = 10$ V	
$t_r = 10$ ms			
$t_6 = 50$ ms			± 10 %
$t_7 = 50$ ms			
$t_8 = 1$ s	$t_8 = 10$ s	$t_8 = 1$ s	
$t_f = 40$ ms	$t_f = 100$ ms	$t_f = 40$ ms	

How to recall "Starting Profile" waveform from menu (take 12V system as a example):

1. Press (Shift) + (OVP) (Menu) to enter the menu operations

2. VFD displays **SYSTEM CONFIG FUNC. INFO**,Press▷ to select **FUNC.**Press (Enter) to confirm,then press▷ to select ISO16750-2,press (Enter) to confirm.

3. press △ or ▽ to select Starting profile,press (Enter) to confirm.

4. Press △ or ▽ to select 12V/24V；

5. Press ▷ to select level (12V: 1-4) / (24V:1-3)；

6. Press▷ to select Repeat,press (Enter) to confirm,"Count= 1" item is used to set the cycle times (1-100) ,press (Enter) to confirm.

7. Press ▷ to select Delay,set delay time,press (Enter) to confirm,Delay= 0.01.Adjustable delay time range is 0.01s-100.00s.

8. Press▷ to select ON,press (Enter) to confirm.The Trig indicator lamp will be lit and display on the VFD.

9. Press ESC to quit menu operations.

10. VFD will display Starting profile in the lower right corner.

11. Press (On/Off) button to turn on the output.

12. Press (Shift)+(Enter) (Trigger)to generate a trigger signal.The Starting profile will output as standard.

3.10 Protection Function

IT6500 has provided with OVP, OCP, OPP, OTP functions.

You could set the over voltage protection value by press (OVP) button.Many reasons could cause a over voltage error.For example, caused by internal defect,misoperation,or too high

external voltage.Once the power supply is over voltage protected,will the output be shut down at once,and "OVP" indicator lamp will be lit.

One superior function of IT6512 is that it can enable you to set the protection delay time(**Tovpdly**) within the range of 1~600ms.

Please avoid inputing a external voltage higher than 120% rated value of IT6512,or the instrument will be damaged.

When the power source is in OVP state,you should check the external cause firstly.When the external factors are excluded,please press ON/OFF button.Then the unit could have a output voltage again.If in remote control mode,you should clear the OVP state,then could you open the output by OUTP ON command.

About OPP:IT6512 will be over power protected if the actual power is higher than Pmax which we set in the menu.

3.11 Rising time and Fall time setup

Press $\boxed{\text{Shift}}$ + $\boxed{\text{V-set}}$ (Slope),VFD will display Trise = xxxms.Set the rising time through numeric keys,knob or ▲▼buttons.Press $\boxed{\text{Enter}}$ or $\boxed{\text{OK}}$ button to confirm,simultaneously it will enter the fall time setup page Tfall= xxxms.Setting way are the same with rising time.The time range is 1ms---24h.

3.12 Key Lock Function

$\boxed{\text{Shift}}$ + (Lock) button can enable you to lock the front board buttons,then VFD will display "*".In keylock mode,all buttons will not work except ON/OFF,Meter and $\boxed{\text{Shift}}$ buttons.Re-press $\boxed{\text{Shift}}$ + $\boxed{\text{On/Off}}$ (Lock) button will release the keylock function.

3.13 Connection and Setup

Connecting multiple power supplies in parallel or in series can increase the overall current output or voltage output respectively. For this configuration to function properly, there are several items that must be set up first. Follow the instructions in this section carefully for setup.

Connection

Determine the total number of power supplies that you want to connect in parallel or series. Disable the output of the power supplies and power OFF the power supplies.

WARNING

● For safety, always turn OFF the power supplies before connecting or disconnecting wires to the output terminal.

● In this solution, up to 3 instruments can be connected in parallel or in series.

● For parallel connection:

Connect each power supplies' positive (+) terminals together. Do the same for the negative (-) terminals.

● For series connection:

Connect one power supply's positive (+) terminal to the negative (-) terminal of another. Do the same for all the power supplies.

Then, connect all of the power supplies' **Pin 1** of the RS-485 interface together. Do the same for **Pin 5**.

Below illustrates the connection diagram for parallel connection.

📖 Note

Be sure to use wires that can support the amount of output current that you want to output from the power supplies. Refer to "2.2 Output Connetction" for details.
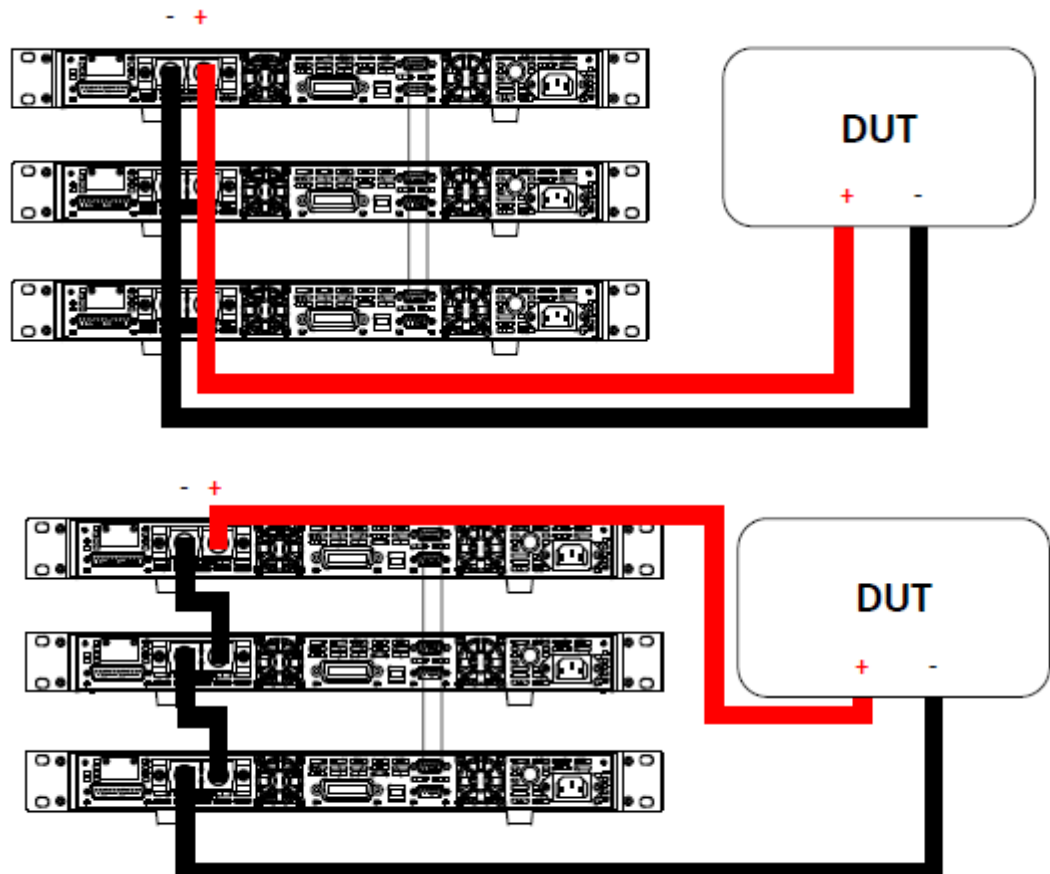
Master/Slave Setup

Only one power supply has to be configured as a **Master**. The rest must be configured as **Slave**. Up to 3 units can be configured in total.

📖 Note

Configure Slave power supplies FIRST, and configure the Master power supply LAST. For remote or front board operation, only control the Master power supply.

Master/Slave Configuration

After physically connecting the power supplies for parallel or series operation, power ON the power supplies and follow the steps below to configure a power supply as a **master** or

slave.

1. From the CONFIG menu, select Online and press enter.The following will display:

Online Setup
Parallel   Slave   Addr…   Off

2. While Parallel or Series is flashing, use keys to toggle between the two options. Set to Parallel for parallel connection and Series for series connection.

3. Press the key to select Slave or Master. Use the keys to select between the two options. Select Master to set the power supply as a master, or select Slave to set the power supply as a slave. Always set the Slave supplies first and Master supply last.

4. Press the key to select **Addr…**. Press Enter button and the display will prompt to enter an address. Use the numeric keypad to enter an **Address**, which must be different than all other power supplies that you want to connect together in parallel. Enter any number between 0 – 31.

5. Press Enter button to save the changes.

6. Exit the menu by pressing Esc button several times.

3.14 Rear terminal functions

If the tested instrument consumes large current, a large voltage drop will be detected in connection line between tested instrument and power supply terminal. To ensure measurement accuracy, a remote sense measurement terminal is provided at load rear board to compensate voltage drop lost in wire.
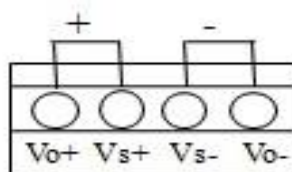
V_{o+},Vo-: output terminals,the same with the rear board output terminals

Vs+,Vs-: remote sense terminal,when using the remote sense function,please cut off the connection between Vo+ and Vs+,so will the line between Vo- and Vs- terminals.Then extending lines from Vs+ to the positive terminal of undertested product and line from Vs- to the negative terminal of undertested product.

Use local sense:

Local sense doesn't compensate the voltage drop on the connection wire, the operation is:

1. Connect the Vo+ and Vs+ , Vo- and Vs- for short circuit using the short clips on the back panel of the instrument or electric wire,   illustrated below.
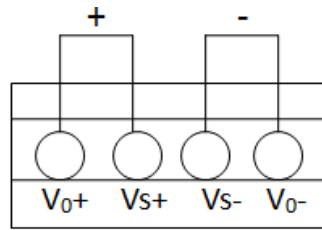
📖 **Note**

> DO not disconnect the wires if remote sense is not used. Doing so will cause erratic behavior and may damage the power supply under certain conditions

2. Connect the the positive and negative terminals of the front board to the device under test.

Use remote sense:

Disconnect the wires between "+, -"pins if you want to use remote sense function.Then lead a wire from S+, S- pins and connect to the under test objects.

1. Disconnect the wires/short clips between Vo+ and Vs+, Vo- and Vs-.
2. Connect the **S+** to the DUT's positive (+) terminal, and connect the **S-** to the DUT's negative (-) terminal.
3. Connect wires from Vo+ , Vo- to the device under test.
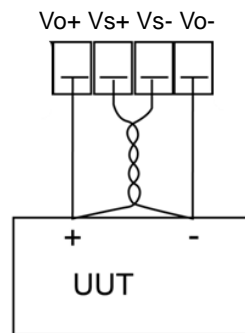
📖 NOTE

> In order to ensure the stability of the system, using armored twisted pair cable between the remote sense terminal of IT6500 and load.
>
> Please note that the positive and negative polarity when wiring, otherwise it will damage the instrument!

3.15 Analogue Interface

IT6500 series power supply have a DB25 analog interface.It can enable you to control 0-100% voltage and 0-100% current with a adjustable voltage or resistance. Besides, you could also monitor the output voltage and current with a 0-10V or 0-5V voltage.

This function has several modes:

- 10v-M   5v-M,   used for selecting the 10V/5V monitoring mode
- 10v/10k-P   5v/5k-P, used for selecting the 10V/10K or 5V/5K setting mode
- V-P   R-P, used for selecting the voltage/resistance setting mode
- On   Off, used for switching on/off the analog quantity interface function

The above parameters can be selected through the configuration menu. Press the $\boxed{\text{Shift}}$ + $\boxed{\text{OVP}}$ (Menu) to enter the menu. Press the Right Key to select CONFIG and press $\boxed{\text{Enter}}$ to enter the configuration menu; press the Right Key to select the Ext-Ctrl and press $\boxed{\text{Enter}}$ to enter the configuration of external analog quantity parameters. When setting every item, please coordinate the Up/Down Key for selection.

For example, if 0-10V external analog is applied for control and internal 5V voltage is adopted for monitoring the front board output, slections will be made as below:

5v-M   10v/10k-P   V-P   On

After selecting the Ext-Ctrl as "On", exit the Menu. At this time, the Rear indicator on the VFD status bar will be lighted on and the right corner will display "Analog".

DB-25

Pin	Name	Instruction
Pin 1 and Pin 14	DGND EXT ON	Used for controlling the ON/OFF of the power supply. When Pin 1 is connected to Pin 14, the power supply supports the output disable function; in case of high level, the output is controlled by On/Off; in case of low level, the output is disabled. This function is invalid under on-line status.
Pin 15	Shut Off	Used for switching off the function under emergency status (in normal circumstances, the pin is not used).
Pin 16	Power OK	Used for indicating whether the power output is normal; if so, output 5V; in case of power supply failure, output 0V.
Pin 18 and Pin 19	CV_CC+ CV_CC-	The output between these two pins is used for indicating the working status of power supply; under CV mode, the output between these two pins is 5V; and under CC mode, - 5V.
Pin 20	Voltage Program (Voltage setting)	Output voltage of analog quantity control: In setting the V-PRG and 10v/10k-P, the input analog quantity range should be 0-10V voltage, and the regulated output voltage should be from 0 to full range; In setting the V-PRG and 5v/5k-P, the input analog quantity range should be 0-5V voltage, and the regulated output voltage should be from 0 to full range; In setting the R-PRG and 10v/10k-P, the input analog quantity range should be 0-10K resistance, and the regulated output voltage should be from 0 to full range; In setting the R-PRG and 5v/5k-P, the input analog quantity range should be 0-5K resistance, and the regulated output voltage should be from 0 to full range;

Pin 21	REF_10V	The 10V reference voltage output by the power supply can be connected to a resistance subdivision for analog quantity control.
Pin 22	Current Program (Current Setting)	Output current of analog quantity control: In setting the V-PRG and 10v/10k-P, the input analog quantity range should be 0-10V voltage, and the regulated output current should be from 0 to full range; In setting the V-PRG and 5v/5k-P, the input analog quantity range should be 0-5V voltage, and the regulated output current should be from 0 to full range; In setting the R-PRG and 10v/10k-P, the input analog quantity range should be 0-10K resistance, and the regulated output current should be from 0 to full range; In setting the R-PRG and 5v/5k-P, the input analog quantity range should be 0-5K resistance, and the regulated output current should be from 0 to full range;
Pin 23	Voltage Monitor (Voltage monitoring)	The actual value from monitoring is the corresponding monitor voltage value. For example, when the analog quantity voltage is 10V, IT6512A control voltage 0~80V and the IT6512A output voltage 20V, this pin will output 2.5V voltage. Similarly, when the analog quantity voltage is 5V, control voltage 0~80V and the IT6512A output voltage 20V, this pin will output 1.25V voltage.
Pin 24	Current Monitor (Current monitoring)	The actual value from monitoring is the corresponding monitor voltage value. For example, when the analog quantity voltage is 10V, IT6512A control current 0~60A and the IT6512A output current 6A, this pin will output 1V voltage. Similarly, when the analog quantity voltage is 5V, control current 0~60A and the IT6512A output voltage 6A, this pin will output 0.5V voltage.
Pins 8, 9, 10, 11, 12 and 13	Connection to AGND	Ground wires for analog quantity interfaces (including Pin 20 VPRG, Pin 21 REF_10V, Pin 22 IPRG, Pin 23 VMON, Pin 24 IMON).
Pins 1, 2, 3, 4	Internal connection to DGND	Ground wires for Pin 14 EXT ON, Pin 15 SHUT OFF and Pin 16 POWER OK.

Voltage setting (Voltage Program)

This function enables change of voltage output through external analog signal by connecting external DC voltage (under voltage mode) or an external resistor (under resistor mode) to Pin 20. To enable this function, the output control should be under the external analog control mode. Used for controlling the external voltage range of full-scale output voltage or the resistor can be selected from 0~10V/0~10KΩ or 0~5V/0~5KΩ. To switch on the voltage setting, open the MENU (Menu) → CONFIG (Configure) → Ext-Ctrl (External Analog Control). Press the Right Key to select V-P (or R-P). Press the Up/Down Key to select the voltage mode or resistor mode.

● Voltage Mode

```
 OFF
 Ext-Ctrl   Setup
 5v-M   5v/5k-P   V-P   off
```

Under voltage mode, the user can set the voltage output value of power supply through Pin 20.

- Resistor Mode

```
OFF
Ext-Ctrl   Setup
5v-M   5v/5k-P   R-P   off
```

Pin 20 and Pin 13 (GND wire) can be connected to a resistor for setting the output voltage value of the power supply.

To set the 10V/10KΩ or 5V/5KΩ external analog setting range, open the MENU (Menu) → CONFIG (Configure) → Ext-Ctrl (External Analog Control).

```
OFF
Ext-Ctrl   Setup
5v-M   5v/5k-P   R-P   off
```
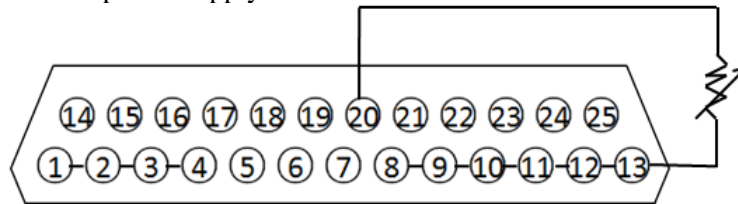
Press the Right Key to select 5v/5k-P (or 10v/10k-P). Press the Up/Down Key to select within the full scale scope under 10V/10KΩ or 5V/5KΩ program.

Current Setting (Current Program)

This function enables change of current output through external analog signal by connecting external DC voltage (under voltage mode) or an external resistor (under resistor mode) to Pin 22. To enable this function, the output control should be under the external analog control mode. Used for controlling the external voltage range of full-scale output voltage or the resistor can be selected from 0~10V/0~10KΩ or 0~5V/0~5KΩ. To switch on the current setting, open the MENU (Menu) → CONFIG (Configure) → Ext-Ctrl (External Analog Control). Press the Right Key to select V-P (or R-P). Press the Up/Down Key to select the voltage mode or resistor mode.
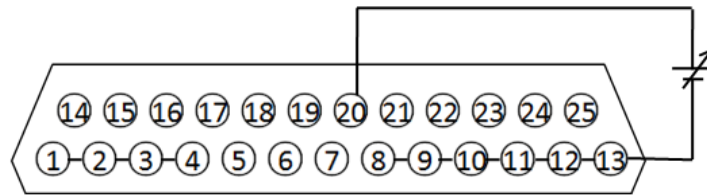
- Voltage Mode

```
OFF
Ext-Ctrl   Setup
5v-M   5v/5k-P   V-P   off
```

Under the voltage mode, the user can set the voltage output value of the power supply through Pin 22.
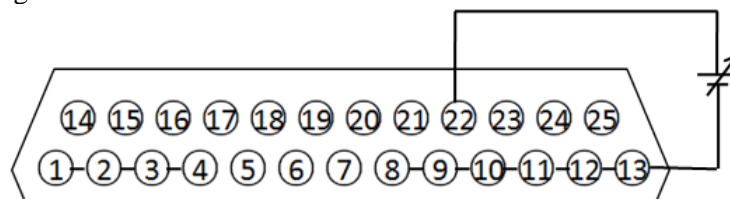
- Resistor Mode
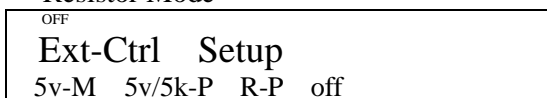
```
OFF
Ext-Ctrl   Setup
5v-M   5v/5k-P   R-P   off
```

Pin 22 and Pin 13 (GND wire) can be connected to a resistor for setting the output voltage value of the power supply.

To set the 10V/10KΩ or 5V/5KΩ external analog setting range, open the MENU (Menu) → CONFIG (Configure) → Ext-Ctrl (External Analog Control).

```
OFF
Ext-Ctrl   Setup
5v-M   5v/5k-P   R-P   off
```
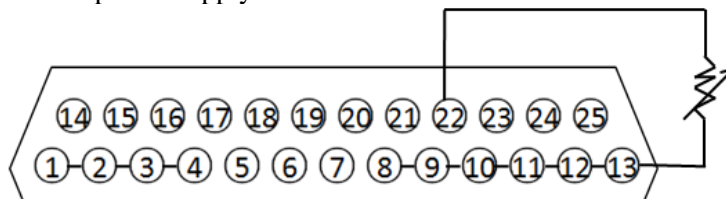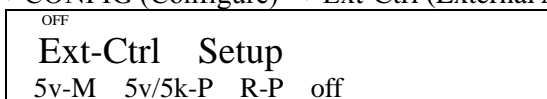
Press the Right Key to select 5v/5k-P (or 10v/10k-P). Press the Up/Down Key to select within the full scale scope under 10V/10KΩ or 5V/5KΩ program.

Voltage monitoring

This function enables monitoring of voltage output via Pin 23 or the GND pin (i.e., Pin 13), which can be connected to a digital voltmeter (DVM). To use this function, the output control should be under the external analog control mode. The output voltage monitoring range (which reflects the power supply output voltage from zero to full scale) can be selected from 0-10V or 0-5V. To switch on the monitoring range setting, open the MENU (Menu) → CONFIG (Configure) → Ext-Ctrl (External Analog Control). Press the Right Key to select 10v-M (or 10v-M). Press the Up/Down Key to select the output voltage monitoring range (0~10V or 0~5V).

```
OFF
Ext-Ctrl   Setup
5v-M   5v/5k-P   R-P   off
```
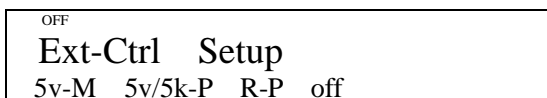
The connection setting of digital voltmeter is shown below.
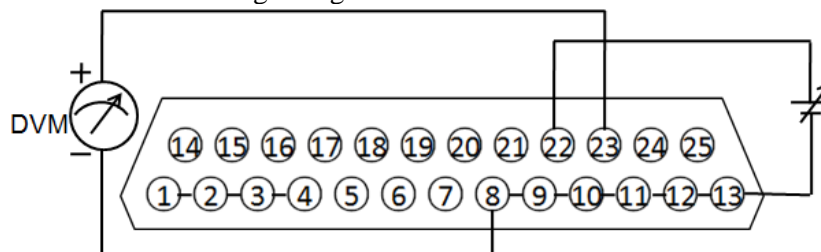
Current monitoring

This function enables monitoring of current output via Pin 24 or the GND pin (i.e., Pin 13), which can be connected to a digital voltmeter (DVM). To use this function, the output control should be under the external analog control mode. The output current monitoring range (which reflects the power supply output current from zero to full scale) can be

selected from 0-10V or 0-5V. To switch on the monitoring range setting, open the MENU (Menu) → CONFIG (Configure) → Ext-Ctrl (External Analog Control). Press the Right Key to select 10v-M (or 10v-M). Press the Up/Down Key to select the output current monitoring range (0~10V or 0~5V).

```
OFF
Ext-Ctrl    Setup
5v-M   5v/5k-P   R-P   off
```

The connection setting of digital voltmeter is shown below.
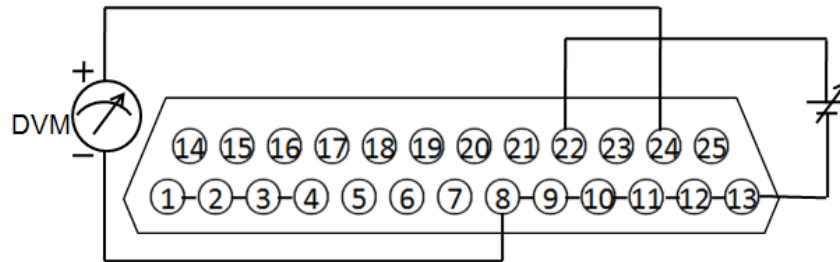
Chapter4 **Remote Control**

IT600 serise power supply have four standard communication interfaces:RS232,USB,GPIB,RS485. The customer can choose any one according to his demands.

4.1 RS232 Interface

Using a cable with two COM ports to connect power supply and PC.Then please press (Shift) + (OVP) (Menu) button to enter the menu to configure the communication parameters.You could do the secondary development with all SCPI commands.

📖 **Note**

The setup about RS232 in the program should agree with the configuration in the system set.If you want to change the communication parameters,please press (Shift) + (OVP) (Menu) button to enter the system set.

RS-232 Data style

RS232 is a 10-bit data with start bit and stop bit.The start bit and stop bit can not be edited.While you could select the odd parity or even parity under the system set.

Odd or EVEN options have been saved in the nonvolatile memory.

Baudrate

Edit baudrate:press (Shift) + (OVP) (Menu) to enter the menu setup,you could select the baudrate among the following options:

 4800 9600 19200 38400 57600 115200

RS-232 connection

Please use a straight-through RS232 cable with DB-9 interface and connect the RS232 serial port with the controller's serial port(for example.PC). Form 2-2 give a detailed description for each pin.

RS-232 pins description

Pin	description
1	connectionless
2	TXD,transmit data
3	RXD,receive data
4	connectionless
5	GND
6	connectionless
7	connectionless
8	connectionless
9	connectionless
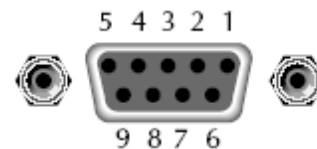
RS-232 Troubleshooting:

If you meet some problems when communicating with PC by RS232 interface,please check the following items:

- Please check the parameters setting

  PC and power supply must have the same configuration in the following items: baudrate, parity bit,data bit and flow control.Please note that power supply has been configured with a start bit and stop bit(the two values are fixed).

- Check the cable

  Ensure you have used the correct communication cable.Please pay attention that some cable may not have a correct internal wiring even it is with a appropriate DB9 interface.
  The RS232 communication cable should have been connected to a correct serial port of the PC.

Communication Setup

Please ensure the PC and power supply have the same configuration in the following items.

baudrate: 9600(4800, 9600, 19200, 38400, 57600, 115200).You could enter the system menu to set the baudrate.

Data bit: 8

Stop bit: 1

Parity bit: (none, even, odd)

EVEN   **8 data bits have even parity**

ODD   **8 data bits have odd parity**

NONE   **8 data bits have no parity**

Native machine address: (0 ~31, factory default is 0)

Parity= None	Start Bit	8 Data Bits	Stop Bit

4.2 USB Interface

Use a cable with two USB ports to connect power supply and PC.You can program through USB interface to achieve all functions of power supply.

The functions of USB488 interface are as follows:

- Interface is 488.2 USB488 interface
- Receive the following request: REN_CONTROL, GO_TO_LOCAL, and LOCAL_LOCKOUT
- When the interface receives MsgID = TRIGGER USBTMC command,it will transmit the TRIGGER command to the function layer

The functions of power supply's USB488 are as follows:

- receive all SCPI commands
- device is SR1 enabled
- device is RL1 enabled
- device is DT1 enabled

4.3 GPIB Interface (Only for IT6500G series)

Use a IEEE488 bus to connect GPIB interfaces of power supply and PC.Please ensure that the screws have been screwed down in order to have a full connection.Then press (Shift) + (OVP) (Menu) to enter the system menu to set the address.The address range of power supply is 0-31.After you set the address,please press (Enter) button to confirm.GPIB address is saved in nonvolatile memory.

4.4 RS485 Interface

Use a straight-through cable with two RS485 ports to connect power supply and PC.

Press (Shift) + (OVP) (Menu) button to enter the system set.Please set the following parmeters:baudrate,data bit,stop bit,parity bit,native machine address.The setting way is the same with RS232 setting.

The definition for each pins of RS485:

1. Pin1 is B line of RS485 interface

2. Pin5 is A line of RS485 interface

3. The other pins are suspended

Chapter5 **Specification**

This chapter will introduce the rated voltage, current, power and many other main parameters of IT6500 series.

4.1 Main technical parameters

Parameter		IT6512
Rate (0 °C - 40 °C)	Voltage	0~80V
	Current	0~60A
	Power	0~1200W
(Remote Sense mode) **Load regulation** ±(%of output+offset)	Voltage	<0.01%+5mV
	Current	≤0.1%+10mA
Line regulation ±(%of output+offset)	Voltage	<0.02%+1mV
	Current	<0.02%+1mA
Setting resolution	Voltage	1mV
	Current	1mA
Readback resolution	Voltage	1mV
	Current	1mA
Setting accuracy (within twelve months) (25 °C ± 5 °C) ±(%of output+offset)	Voltage	≤0.02%+30mV
	Current	≤0.1%+0.1%FS
Readback accuracy (25 °C ± 5 °C) ±(%of output+offset)	Voltage	0.02%+30mV
	Current	≤0.1%+0.1%FS
Ripple (20Hz ~20MHz)	Voltage	≤40mVp-p
	Current	10mArms
Tem coefficient (0 °C ~ 40 °C) ±(%of output+offset)	Voltage	0.02%+30mV
	Current	≤0.05%+10mA
Readback Tem coefficient ±(%of output+offset)	Voltage	0.02%+30mV
	Current	≤0.05%+5mA
Voltage rise time (0-42V)		≤5ms
Voltage Fall time (80-0V)		≤12ms
Command Response Time		≤25ms
dimension（mm）		415mmW×44mmH×500mmD
weight		8.5Kg

Parameter		IT6513
Rate (0 °C - 40 °C)	Voltage	0~150V
	Current	0~30A
	Power	0~1200W
(Remote Sense mode) **Load regulation** ±(%of output+offset)	Voltage	<0.05%+30mV
	Current	≤0.1%+30mA
Line regulation ±(%of output+offset)	Voltage	<0.02%+20mV
	Current	<0.02%+10mA
Setting resolution	Voltage	3mV
	Current	1mA
Readback resolution	Voltage	3mV

	Current	1mA
Setting accuracy (within twelve months) (25 °C ± 5 °C) ±(%of output+offset)	Voltage	≤0.05%+30mV
	Current	≤0.2%+0.1%FS
Readback accuracy (25 °C ± 5 °C) ±(%of output+offset)	Voltage	<0.05%+30mV
	Current	≤0.2%+0.1%FS
Ripple (20Hz ~20MHz)	Voltage	≤60mVp-p
	Current	40mArms
Tem coefficient (0 °C ~ 40 °C) ±(%of output+offset)	Voltage	<0.02%+30mV
	Current	≤0.05%+10mA
Readback Tem coefficient ±(%of output+offset)	Voltage	<0.02%+30mV
	Current	≤0.05%+5mA
Voltage rise time（0-60V）	≤8ms	
Voltage Fall time (60-0V)	≤8ms	
Command Response Time	≤25ms	
Transient response time (Return to 90%)	≤2ms	
dimension（mm）	415mmW×44mmH×500mmD	
Weight	8.5Kg	

Parameter		IT6512A
Rate (0 °C - 40 °C)	Voltage	0~80V
	Current	0~60A
	Power	0~1200W
Load regulation ±(%of output+offset)	Voltage	<0.01%+5mV
	Current	≤0.1%+10mA
Line regulation ±(%of output+offset)	Voltage	<0.02%+1mV
	Current	<0.02%+1mA
Setting resolution	Voltage	1mV
	Current	1mA
Readback resolution	Voltage	1mV
	Current	1mA
Setting accuracy (within twelve months) (25 °C ± 5 °C) ±(%of output+offset)	Voltage	≤0.02%+30mV
	Current	≤0.1%+0.1%FS
Readback accuracy (25 °C ± 5 °C) ±(%of output+offset)	Voltage	0.02%+30mV
	Current	≤0.1%+0.1%FS

Ripple (20Hz ~20MHz)	Voltage	≤40mVp-p
	Current	10mArms
Tem coefficient (0 °C ~ 40 °C) ±(%of output+offset)	Voltage	0.02%+30mV
	Current	≤0.05%+10mA
Readback Tem coefficient ±(%of output+offset)	Voltage	0.02%+30mV
	Current	≤0.05%+5mA
Voltage rise time（0-80V）（Current set to maximum value）	No load	≤20ms
	Full load	≤2.3s
Voltage rise time（0-20V）（Current set to maximum value）	No load	≤2.5ms
	Full load	≤110ms
Voltage Fall time (80-0V)（Current set to maximum value and load-off）	No load	≤2.3s
	Full load	≤20ms
Voltage Fall time (20-0V)（Current set to maximum value and load-off）	No load	≤500ms
	Full load	≤2ms
Voltage Fall time (80-0V)（Current set to maximum value and load-on）	No load	≤16ms
	Full load	≤8ms
Voltage Fall time (20-0V)（Current set to maximum value and load-on）	No load	≤3ms
	Full load	≤2ms
Command Response Time		≤25ms
Transient response time (Return to 90%)		≤2ms
dimension（mm）		415mmW×44mmH×500mmD
Weight		8.5Kg

Parameter		IT6513A
Rate (0 °C - 40 °C)	Voltage	0~150V
	Current	0~30A
	Power	0~1200W
(Remote Sense mode) Load regulation ±(%of output+offset)	Voltage	<0.05%+30mV
	Current	≤0.1%+30mA
Line regulation ±(%of output+offset)	Voltage	<0.02%+20mV
	Current	<0.02%+10mA
Setting resolution	Voltage	3mV
	Current	1mA
Readback resolution	Voltage	3mV
	Current	1mA
Setting accuracy (within twelve months) (25 °C ± 5 °C) ±(%of output+offset)	Voltage	≤0.05%+30mV
	Current	≤0.2%+0.1%FS

Readback accuracy (25 °C ± 5 °C) ±(%of output+offset)	Voltage	<0.05%+30mV
	Current	≤0.2%+0.1%FS
Ripple (20Hz ~20MHz)	Voltage	≤60mVp-p
	Current	40mArms
Tem coefficient (0 °C ~ 40 °C) ±(%of output+offset)	Voltage	<0.02%+30mV
	Current	≤0.05%+10mA
Readback Tem coefficient ±(%of output+offset)	Voltage	<0.02%+30mV
	Current	≤0.05%+5mA
Voltage rise time（0-60V）		≤8ms
Voltage Fall time (60-0V)		≤8ms
Command Response Time		≤25ms
Transient response time (return to 90%)		≤2ms
dimension（mm）		415mmW×44mmH×500mmD
Weight		8.5Kg

Parameter		IT6502D
Rate (0 °C - 40 °C)	Voltage	0~80V
	Current	0~60A
	Power	0~800W
(Remote Sense mode) Load regulation ±(%of output+offset)	Voltage	<0.01%+5mV
	Current	≤0.1%+10mA
Line regulation ±(%of output+offset)	Voltage	<0.02%+1mV
	Current	<0.02%+1mA
Setting resolution	Voltage	1mV
	Current	1mA
Readback resolution	Voltage	1mV
	Current	1mA
Setting accuracy (within twelve months) (25 °C ± 5 °C) ±(%of output+offset)	Voltage	≤0.02%+30mV
	Current	≤0.1%+0.1%FS
Readback accuracy (25 °C ± 5 °C) ±(%of output+offset)	Voltage	0.02%+30mV
	Current	≤0.1%+0.1%FS
Ripple (20Hz ~20MHz)	Voltage	≤40mVp-p
	Current	10mArms
Tem coefficient (0 °C ~ 40 °C) ±(%of output+offset)	Voltage	0.02%+30mV
	Current	≤0.05%+10mA
Readback Tem coefficient ±(%of output+offset)	Voltage	0.02%+30mV
	Current	≤0.05%+5mA
Voltage rise time（0-42V）		≤7.5ms
Voltage Fall time (80-0V)		≤15ms
Command Response Time		≤25ms
dimension（mm）		415mmW×44mmH×500mmD
Weight		8.5Kg

4.2 Supplemental characteristics

- State storage capacity

  100 sets

- Recommended calibration frequency

  once a year

- Cooling style

  fans

- Operation Temperature

  0 to 40 °C

- Storage Temperature

  -20 to 70 °C.

- Environmental Conditions

  Designed for indoor use and operated at maximum relative humidity of 95%

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