USER'S GUIDE

Programmable DC Power Supply

Model IT6322

Ver1.0/Aug, 2005/ IT6300-508

IT6322 Programmable DC Power Supplies

General information

The following safety precautions should be observed before using this product and any associated instrumentations. Although some instruments and accessories would be used with non-hazardous voltages, there are situations where hazardous conditions may be present.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read and follow all installation, operation, and maintenance information carefully before using the product. Refer to this manual for complete product specifications.
If the product is used in a manner not specified, the protection provided by the product may be impaired.
Before performing any maintenance, disconnect the line cord and all test cables.

Protection from electric shock

Operators of this instrument must be protected from electric shock at all times. The responsible body must ensure that operators are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product operators in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 volts, no conductive part of the circuit may be exposed.

Definition of users

Responsible body is the individual or group responsible for the use and maintenance of equipment is operated within its specifications and operating limits, and for ensuring that operators are adequately trained.
Operators use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.
Service is only to be performed by qualified service personnel.

We do not accept responsibility for any direct or indirect financial damage or loss of profit that might occur when using the electronic load.

About your safety

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

Safety symbols and terms


Connect it to safety earth ground using the wire recommended in the user manual.


The symbol on an instrument indicates that the user should refer to the operating instructions located in the manual.


High voltage danger

Certification and Warranty

Certification

We certify that this product met its published specifications at time of shipment from the factory.

Warranty

This instrument product is warranted against defects in material and workmanship for a period of one year from date of delivery. During the warranty period we will, at its option, either repair or replace products which prove to be defective. For warranty service, with the exception of warranty options, this product must be returned to a service facility designated by us. Customer shall prepay shipping charges by (and shall pay all duty and taxes) for products returned to the supplier for warranty service. Except for products returned to customer from another country, supplier shall pay for return of products to customer.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by the Customer, Customer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation and maintenance.

Introduction

IT6300 3 channels power supply has high accuracy and high stability, also has the function of the limit voltage, over current and over temperature protection. You can set the voltage and value of from 0V to the max value in every channel. This series power supply can be connected in series and in parallel connection, it could improve the output ability of the voltage and the current value to twice. It is the best choice for the quality test in the scientific research laboratory and the product line.

- All of 3 channels can output and change voltage
- Can be connected in series or parallel connection
- Voltage and current of 3 channels can be displayed at the same time
- Small size with 1/2 2U
- VFD display
- High resolution and high accuracy

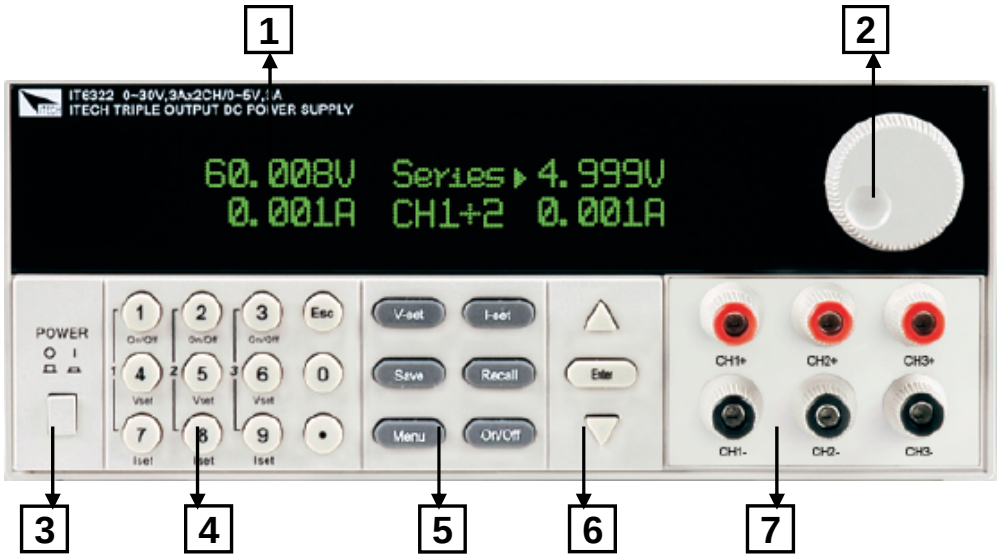
- Output on/off
- Limit voltage, over current and power protection
- Low ripple and low noise
- Communication port: USB/GPIB/RS232
- Free software for control and calibration
- Fifty operation states storage
- Set voltage and current value with rotary knob
- Set output time1~999999S

Chapter 1 Quick Start

One of the first things you will do with your power supply is to become acquainted with the front panel. The exercises in this chapter prepare the power supply for use and help you get familiar with some of its front-panel operations

1.1 Front Panel & Rear Panel

Front panel



1 VFD display

2 Rotary knob

3 Power switch

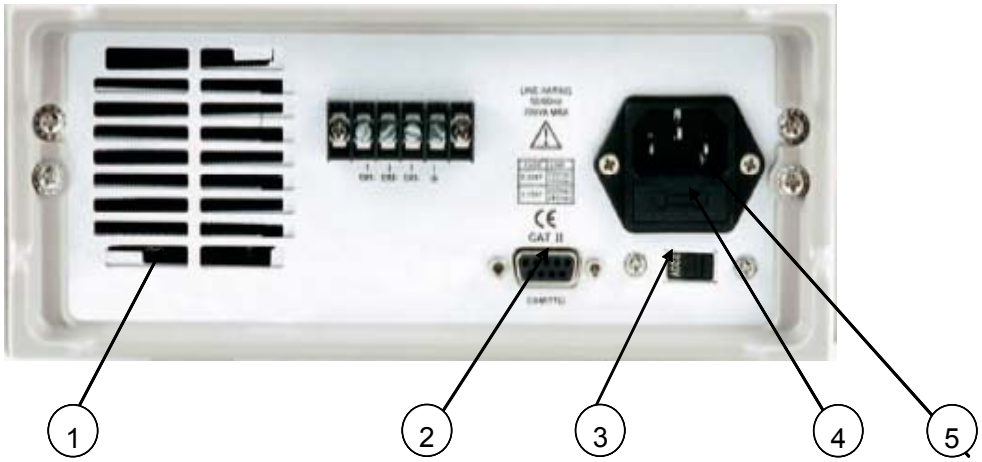
4 Number keys and “Esc” key

5 Function key

6 UP, Down key and “Enter” ket

7 Output terminals

Rear Panel



① Cooling window
② DB9 interface connector
③ 110V/220V Power switch
④ Fuse
⑤ Power socket

1.2 Preliminary Checkout

The following steps help you verify that the power supply is ready for use.

1. Check the list of supplied items

Verify that you have received the following items with your power supply. If anything is missing, contact your nearest Sales Office.

- One power cord for your location
- This User's Manual.
- Calibration Report
- Communication cable (optional)

2. Connect the power cord and turn on the power supply

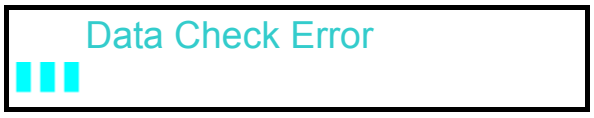
When you turn on the power supply, the front-panel display will light up briefly while the power supply performs its power-on self-test. All the VFD annunciators will light up at once. To review the display with all annunciators, you can check if there is any stroke loss on any annunciator. If there isn't any response when you power on the power supply, please see Section 5 on page 8 for some service information.

3. System Checkout

When the power supply was powered on, the system will checkout it self, and VFD will display as follows:

If EEPROM was damaged, the VFD will display as follows:

If the latest operation data in EEPROM was lost, the VFD will display as follows:



If the latest data about off-time in EEPROM was lost, the VFD will display as follows:

If the calibration data in EEPROM was lost, the VFD will display as follows:

Note: “X” denotes the channel which has lost calibration data.

If the calibration data in EEPROM was error or tthe information calibrated by factory was lost, the VFD will display as follows:

VFD displays: the first row is output voltage, the second row is the state when the power supply is on or current.

Or:

Note: there will be a “?” on the VFD if there is error when the system checkout.

---

4. Output Checkout

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

■ Voltage Output Checkout

The following steps verify basic voltage functions without load.

1) Turn on the power supply.
2) Enable the outputs
   Notice: if the voltage value flash, then the power supply is in Set mode, ‘‘Set mode’’ means that the VFD display shows the setting output voltage and current. Or the power supply is in Meter mode, ‘Meter mode” means that the VFD display shows the actual output voltage and current.
3) Check that the front-panel voltmeter properly responds to number keys
   Set some different voltage values, then wait till the Meter mode to check if the VFD displayed voltage value is the same as the set voltage value, and to check if the VFD displayed current value is nearly zero.
4) Ensure that the voltage can be adjusted from zero to the full rated value
5) Check the voltage of the other two channels as above.

■ Current Output Current

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. The ON annunciator is turned off.
3) Connect a short across (+) and (-) output terminals with an insulated test lead. Use a wire size sufficient to handle the maximum current.
4) Set voltage value with 1V
5) Enable the output
   Press On/Off key to ensure that the output is enabled.
6) Adjust the current value
   Set some different voltage values, then wait till the Meter mode to check if the VFD displayed current value is the same as the set current value.
7) Ensure that the current can be adjusted from zero to the full rated value.
8) Turn off the power supply and remove the short wire from the output terminals.
9) Check the current value of the other two channels as above.

5. If Power Supply Does Not Turn On

Use the following steps to help solve problems you might encounter when turning on the instrument.

1). Verify that there is AC power to the power supply.

First, verify that the power cord is firmly plugged into the power receptacle on the rear panel of the power supply. You should also make sure that the power source you plugged the power supply into is energized. Then, verify that the power supply is turned on.

2). Verify the power-line voltage setting.

The line voltage is set to the proper value for your country (110VAC or 220VAC) when the power supply is shipped from the factory. Change the voltage setting if it's not correct.

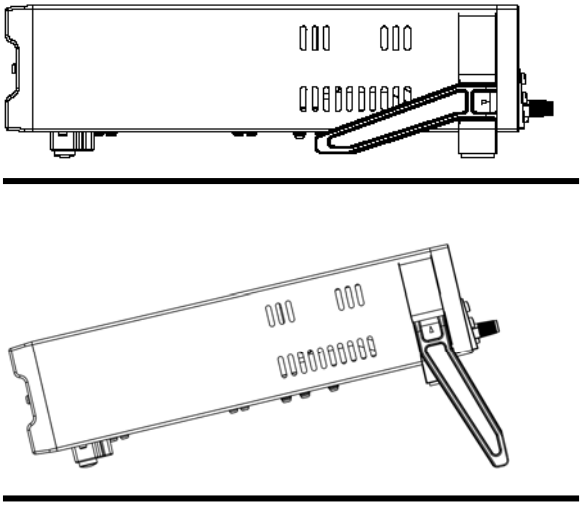
3). Verify that the correct power-line fuse is installed.

If the fuse was damaged, please see the table below to replace the fuse for your power supply.

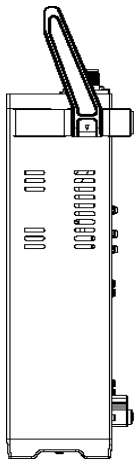
Model	Fuse Description
IT6322	Fuse 3.15A T250V(220V AC)
	Fuse 6.30A T250V(110V AC)

6. To Adjust the Carrying Handle

To adjust the position, grasp the handle by the sides and pull outward. Then, rotate the handle to the desired position.



Bench-top viewing positions



Carrying position

7. To Rack Mount the Instrument

You can mount the power supply in a standard 19-inch rack cabinet using the IT-E151 rack mount kit.

Note: Remove the carrying handle and the two plastic ears before rack-mounting the instrument. To remove the handle, grasp the handle by sides and pull outwards and rotate it to a special position to let the arrow on the handle and the arrow on the plastic ears be in opposite directions, then pull the handle outward. After removing the handle, you can use a screwdriver to remove the two plastic ears.

Chapter 2 Specifications

2.1 Specifications

Paramete		IT6322
Output ratings (0 °C - 40 °C)	Voltage	0~30V×2，0~5V×1
	Current	0~3A×2，0~3A×1
	LVP	0~31V×2，0~6V×1
The model of remote sense ±(% of output+offset)	Voltage	≤0.01%+3mV
	Current	≤0.01%+3mA
Line Regulation ±(% of output+offset)	Voltage	≤0.01%+3mV
	Current	≤0.1%+3mA
Programming Resolution	Voltage	1mV
	Current	1mA
Readback Resolution	Voltage	1mV
	Current	1mA
Programming accuracy （12 months） ±(% of output+offset)	Voltage	≤0.03%+10mV
	Current	≤0.1%+5mA
Readback accuracy (25 °C ± 5 °C) **±(% of output+offset)**	Voltage	≤0.03%+10mV
	Current	≤0.1%+5mA
Ripple & noise	Voltage	Ripple≤1mVrms/3mVp-p
		Noise≤3mVrms
Temperature coefficient (0 °C ~ 40 °C) **±(% of output+offset)**	Voltage	≤0.03%+10mV
	Current	≤0.1%+5mA
Readback accuracy ±(% of output+offset)	Voltage	≤0.03%+10mV
	Current	≤0.1%+5mA
Synchro operation in Series connection	Synchro error in series connection	≤0.05%+10mA
Synchro operation in parallel connection Programming accuracy	Voltage	≤0.02%+5mV
	Current	≤0.1%+20mA
Storage memory	Store/recall	50 user-configurable stored states
Timer	Time set	1S~999999S
	Resolution	1S
	Function	Auto Step Running

2.2 Supplemental Characteristics

State Storage Memory

9 user-configurable stored states

Recommended Calibration Interval

1 year

AC Input Ratings (selectable via switch on the rear panel)

Option Opt.01: 220AV±10%，47 ~ 63HZ

Option Opt.02: 110AV±10%，47 ~ 63HZ

Maximum input power

Model	IT6322
Power	750VA

Cooling

Fan cooled

Operating Temperature

0 to 40 °C for full rated output

Storage Temperature

-20 to 70 °C for storage environment.

Environmental Conditions

Designed for indoor use in an installation category II, pollution degree 2 environment. Designed to operate at maximum relative humidity of 95% and at altitudes of up to 2000 meters.

Chapter 3 Front-panel Operation

So far you have learned how to install your power supply and do quick start. During the quick start, you were briefly introduced to operating from the front panel as you learned how to check basic voltage and current functions. This chapter describes in detail the use of the front-panel keys and shows how they are used to accomplish power supply operation.

3.1 Front-panel Operation Overview

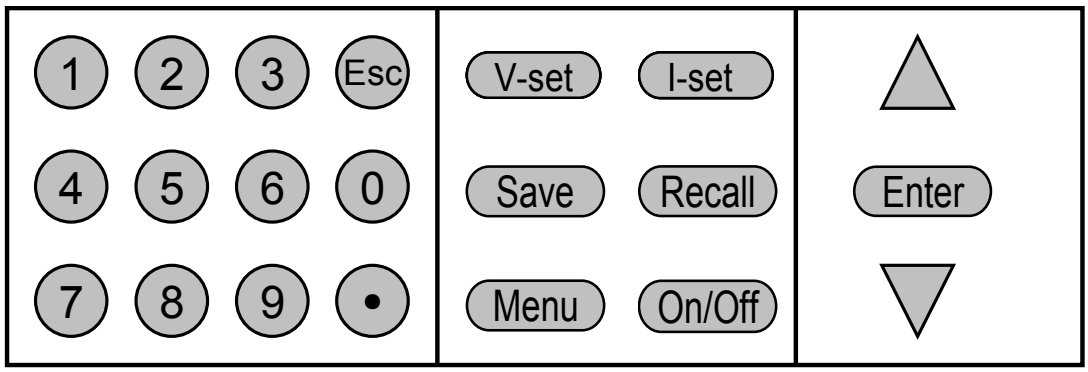
The following section describes an overview of the front-panel keys before operating your power supply.

- The power supply is shipped from the factory configured in the front-panel operation mode. At

power-on, the power supply is automatically set to operate in the front-panel operation mode. When in this mode, the front panel keys can be used.

- When the power supply is in remote operation mode, you cannot use the front-panel. A change between front-panel and remote operation modes will not result in any change in the output parameters. You can change the front-panel and remote operation modes by computer. If the power supply is in remote mode, and [LOCAL]key is enabled, you can press [LOCAL]key and the power supply will be in panel mode.
- The power supply is in Meter mode when it is powered on, and the VFD will display the actual voltage and current output value. And in the mode, And in this mode, if the knob is screwed, the power supply will changed to Set mode, and the VFD will display the adjusted voltage and current value.
- The output of the power supply can be enabled or disabled from the front panel by pressing On/Off key. When the output is on, the ON annunciator will turn on.
- VFD can display some operation state or error information. " " means the power supply is in remote. And if there is some error information,"?" will be displayed.
- If the power supply is in Set mode, you can screw the knob to change the parameter. If the power supply is in menu operation, you can screw the knob to select the menu. And if the power supply is in testing mode, you can screw the knob and set voltage value.
- If there is "?" displayed on the VFD, please consult the error information in the menu and check it.

3.2 Panel Description



0 ~ 9	Number key(1~3key can control the output state of 3channels,。4~6key can set voltage value for the channel, 7~9 can set current value for the channel.)
V-set	Set voltage value
I-set	Set current value
Save	Save the currently data of the power supply to internal register
Recall	Recall the data from the internal register
Menu	Set the parameter f power supply

On/Off	Set the output state of power supply
△	Up key, select the menu or channel
▽	Down key, select the menu or channel

3.3 VFD Description and Wiring Diagram

There are some sighs on the VFD when the power supply is on, which denotes different meaning.

OFF	**The output is off.**
	**The key panel is locked.**
	The power supply is in remote mode.
?	**There is some error or fault with the power supply.**
▶	**Channel sign**

3.4 Menu Descriptions

Press Menu to indicate operation mode. View the menu in VFD, and use △▽ or knob to scroll through the complete menu list as following. If press Enter, you could get the selected menu function, press Esc back to the previous menu selection page. If there is"↑↓" on the left of VFD, it means that this menu function is in the mid of all menu and you can press△▽key to select other menu function. If there is only"↑", it means that you can only press△ to select the menu. And if there is only"↓" on the left of VFD, it means that you can only press ▽to select the menu. If there is "▶ ◀" on the VFD, it means this menu function is selected.

Menu		
Power Config...		
	Reset Config	System reset
	Out State Set	Set the output state when power-on
	Out Parameter Set	Set whether to save the output state of last time
	Key Sound Set	
	Knob Function Set	
	Screen Brightness	
	Baud Rate Set	Set communication baud rate
	Communication Parity	
	System Wait Time	
	Local Address	Set communication address
	Key Lock Set	Set password

	Exit	
System Set…		
	Out Series Set	Set series connection
	Out Parallel Set	Set parallel connection
	Max Voltage Set…	Set max voltage for each channel
	Set First Channel	
	Set Second Channel	
	Set Third Channel	
	Out Time Set…	Set output time for each channel
	Set First Channel	
	Set Second Channel	
	Set Third Channel	
	Exit	
Power Information…		
	Power Model	
	Power SN	
	Soft Version	
	Cal Information	
	Error Information	
	Exit	
Exit Menu		

3.5 Panel Operation

Channel Operation

When the power supply is in “METER” mode, you can press△、▽key to select the channel.

OUT ON/OFF

Press On/Off to change output state of power supply. If the output state is ON, press it, the output state will be OFF. While the output state is OFF, press On/Off and the state will be ON.
When the power supply is in panel operation, you can press On/Off to control the output state of all channels. Or you can press one number key(①,②,③)to control one channel’ output state. Key ①controls the output state of the first channel, key② controls the output state of the second channel, key③ controls the output state of the third channel.

When the power supply is in remote mode, you can send SCPI order（OUTPut: ON | OFF） to set the output state. Output state operation doesn’t affect setting parameter.

Note: pressing On/Off is to control the output state of 3 channels at the same time.
If you want to control one channel’s output state, please use the single key for each

channel.

Timer Operation

If you have set output time and the power supply is in “METER” mode, you can press 0 to see the remainder time. When the time is counted down, the power supply will turn off the channel automatically.

Setting Voltage

When the knob function is enabled:

Solution 1: Press V-set +numeric key, press Enter to confirm.

Solution 2: Press V-set, then press △▽ to select cursor position and screw the knob to set voltage, press Esc or Enter to exit.

Solution 3: Press one number key which can control channel’s voltage setting (pressing number key 4 can control the first channel, pressing number key 5 can control the second channel and pressing number key 6 can control the third channel). For example, if you want to set voltage for the first channel, you can press number key 4, then press number key+ Enter to set voltage, or press △▽ to change the cursor, and then screw the knob to set voltage value, press Esc or Enter to escape.

When the knob function is disabled:

Solution 1: Press V-set +numeric key to set voltage value, press △▽ to change the value slightly, press Enter to confirm.

Solution 2: Press one number key which can control channel’s voltage setting (pressing number key 4 can control the first channel, pressing number key 5 can control the second channel and pressing number key 6 can control the third channel), then press number key or press △▽ to set voltage value, press Enter to confirm.

Setting Current

When the knob function is enabled:

Solution 1: Press I-set +numeric key, press Enter to confirm.

Solution 2: Press I-set, the press △▽ to select cursor position and screw the knob to set voltage, press Esc or Enter to exit.

Solution 3: Press one number key which can control channel's current setting (pressing number key 7 can control the first channel, pressing number key 8 can control the second channel and pressing number key 9 can control the third channel). For example, if you want to set current for the first channel, you can press number key 7, then press number key+ Enter to set voltage, or press △▽ to change the cursor, and then screw the knob to set voltage value, press Esc or Enter to escape.

When the knob function is disabled:

Solution 1: Press I-set +numeric key to set voltage value, press △▽ to change the value slightly, press Enter to confirm.

Solution 2: Press one number key which can control channel's current setting (pressing number key 4 can control the first channel, pressing number key 5 can control the second channel and pressing number key 6 can control the third channel), then press number key or press △▽ to set current value, press Enter to confirm.

Saving and Recalling Operation

You can store up to 50 different output states in storage register locations (1 to 9). Each output state includes Constant voltage value, Constant current value and Maximum output voltage value, voltage step value. Press Save +number key, and save voltage and current value into register. Pressing Recall +number key can recall the value. Or you can use SCPI order:*SAV、*RCL to save and recall.

Over Temperature Protection

If the power supply inside temperature is over 80℃, it will protect itself. And the output state is OFF, the buzzer will moo. VFD displays as following:

3.6 Menu Function

In menu operation, △▽ key and knob can be used to select the menu, Enter is used to confirm. Esc is used to exit to the menu.

■Power Config

Reset Config

If you enter into this menu and select **"YES"**, all of parameter will be as default setting.

Out State Set

This function can set output set for the power supply. If you select **"Last Set"**, the power supply will save output state as it is powered off last time. If you select **"Off"**, the output state is always **"OFF"** when the power supply is turned on. **Recommend setting is "OFF".**

Out Parameter Set

This function can decide to save the parameter or not. If you select **"Last Set"**, the power supply will save the output parameter for the last time when it is turned off, and when it is turned on next time, the output parameter is as the same as saved before. If you select **"default"**, the output parameter is the default setting. **Recommend setting is "Last Set".**

Key Sound set

This function can set sound when you press the key on the front panel if you select **ON.**

Knob Function Set

This function can make knob function enable or disable. If you select **ON**, the knob function is enable.

Baud Rate Set

This function can change the communication baud rate for the power supply, the baud rate range is 4800，9600，19200 or 38400. Before the communication, you must make sure that there is same baud rate between the power supply and the computer. **Default setting is 4800.**

Communication Parity

This function can set **NONE**, **ODD** and **EVEN**. Default setting is **NONE**.

System Wait Time

This function can set wait-time when the power supply is not in testing condition. The minimum is 4 seconds, and the maximum is 9999 seconds. Press number key+Enter or press △▽ +Enter to set wait-time. When the knob function is enabled, you can press△▽ to select the cursor, and screw

the knob to change the data, press Enter to confirm. If you don't need this function, you can set wait-time with 0S. **Default setting is 0S.**

Note: the wait-time range is 4~9999S, if you set it with 1~3S, the wait-time will be 4S automatically.

Local Address

This instruction can set the communication address for each power supply. The address range is from 0 to 31. Before the communication, you must make sure that there is same address between the power supply and the computer.

Key Lock Set

This instruction can set a password (1 through 4 digits) to lock the function keys operation. After setting the password, there is a sign ■ displayed on the VFD and all the function keys on the front panel will be locked except On/Off key (if the knob function is enabled, △ ▽ also can be used). You must enter the correct password to unlock them, then you can continue to do the function key operation. If you don't want to lock the function keys, please set the password with 0 you enter the **>SET KEYLOCK** function.

When the knob function is enabled:

You can press △ ▽ to select the cursor position, then press number key+ Enter to set password. Or press △ ▽ to select the cursor position, then screw the knob to change data to set password, press Esc or Enter to exit.

When the knob function is disabled:

Press number key+ Enter to set password, press △ ▽ to change the number slightly.

Note: the password should not be 0. If you have set password, you should press number key+ Enter to unlock . Here △ ▽ and knob are disabled.

■ System Set

Out Series Set

This function can set series connection. **None** means the power supply is not in series connection, **1+2** means that channel 1 and channel 2 are in series connection, **1+3** means that channel1 and channel 3 are in series connection.

Note: channel 2 and channel 3 are forbidden in series connection.

MaxVolt Set

The max voltage you set should be in the range of 0V to the maximum voltage. You can enter into

menu, press △▽ to select “MaxVolt Set”, then press number key+Enter to set voltage value. After you have set the max voltage value, the output voltage value should less than it. Default setting is the maximum voltage.

Out Time Set

This function can set output time for each channel. The range is 1~999999S. If you enable this function, and the output state of all channels is on, the timer will work at once. If you don’t need this function, please output time with 0S. **Default setting is 0S.**

■ Power Information

Following menus are some information about the power supply.

Power Model: the model of power supply

For example: 30V，3A*2CH 5V，3A*1CH

Power SN: the series number

For example: 001001156074001165

Soft Version: the version number of power supply

For example: Soft Version=1.00

Cal information: calibration information of power supply

For example: 2005-8-26 17:46:13

Error Information: error information of power supply

For example: 0，No Error

Exit Menu

Note: after the error information has been displayed, you can Esc or Enter to exit and the error information will not be displayed again, it will display “0 error”. But the error is still exist. You can consult following table to check the error.

0	'No Error'	There is no error.
1	'Too Many Num Suf'	The number in the ROM is too many to deal with.
10	'No Command'	The order is invalid.
14	'Num Suf Invalid'	The subscript of the number is invalid.
16	'Invalid Number'	The number is invalid.
17	'Invalid Dims'	The data dimension is invalid.
20	'Param Overflow'	Parameter is over follow.
30	'Error Para Units'	Parameter units are error.
40	'Error Para Type'	The type of parameter is error.
50	'Error Para Count'	The count of parameter is error.
60	'Unmatched Quote'	The sign quoted by parameter is unmatched.
65	'Unmatched Bracket'	The bracket is unmatched with the parameter.

70	'Invalid Command'	The command is invalid.
80	'No Entry'	It cannot find the command entry.
90	'Too Many Dims'	There is too many data dimension.
100	'Too Many Command'	There is too many command.
101	'Command Exec Err'	There is error during executing the command.
110	'Error Rxd Parity'	
120	'Error EEPROM'	There is error when check the EEPROM.
121	'Error Config Data'	Configuring data is error.
122	'Error Cal. Data'	Calibration data is error.
123	'Error Factory Data'	Calibration data supplied by factory is error.

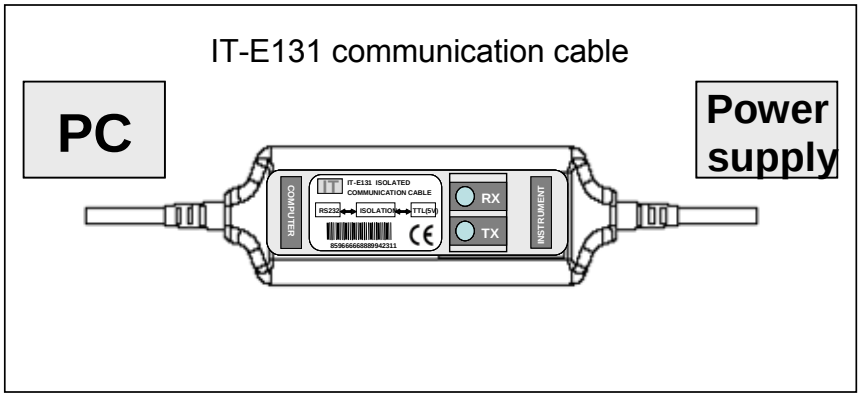
Chapter 4 Remote Operation Mode

The DB9 interface connector on the rear panel of the power supply can be transferred to RS-232 interface, the following information will tell you how to use the computer to control the output of the power supply.

4.1 Communication cable

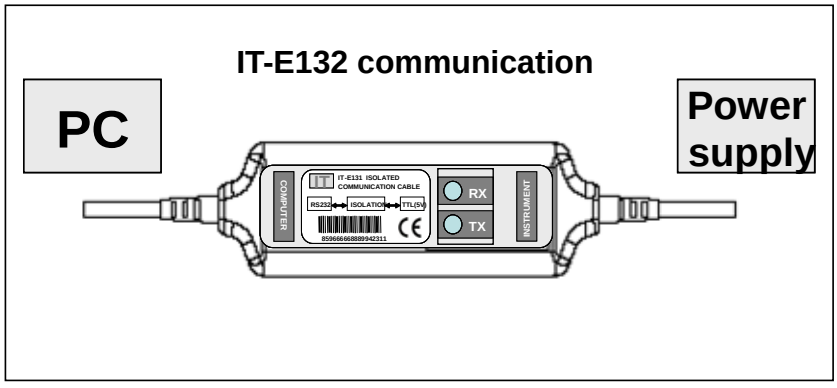
IT-E131 RS232 Communication cable

The DB9 interface connector on the rear panel of power supply is TTL voltage level; you can use the communication cable (IT-E131) to connect the DB9 interface connector of the power supply and the RS-232 interface connector of computer for the communication.



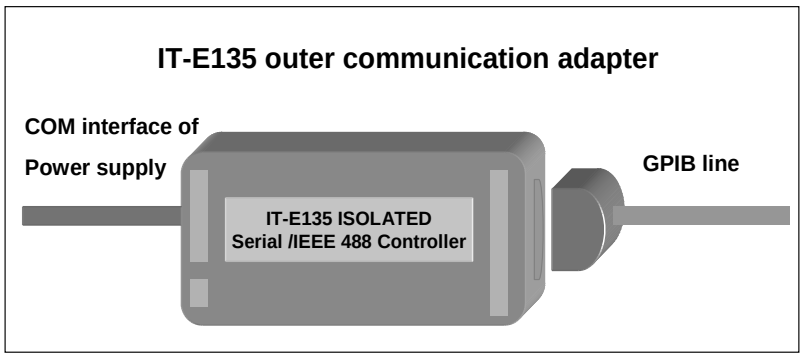
IT-E132 USB Communication cable

The DB9 interface connector on the rear panel of power supply is TTL voltage level; you can use the communication cable (IT-E132) to connect the DB9 interface connector of the power supply and the USB interface connector of computer for the communication.



IT-E135 GPIB Communication Cable

The DB9 interface connector on the rear panel of power supply is TTL voltage level; you can use the GPIB communication cable (IT-E135) to connect the DB9 interface connector of the power supply, and then connect the GPIB interface of the IT-E135 and computer with GPIB/IEEE 488 line for the communication.



Note: Forbidden to connect DB9 connector in power supply directly with PC or other RS232 port.

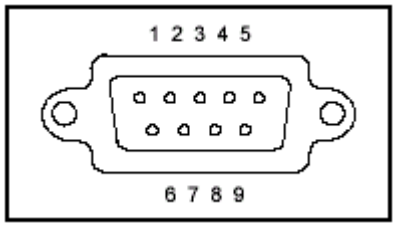
4.2 Communication between Power Supply and PC

Before using the remote operation mode, please make sure that the baud rate and communication address in power supply are the same as in the computer software, otherwise, the communication will fail, you can change the baud rate and communication address from the front panel or from computer.

1. Address: the range is from 0 to 254，default setting is 0
2. Baud rate: 4800,9600,19200 and 38400 are selectable, default setting is 4800
3. Data bit：8 bit
4. Stop bit：1
5. Parity：None

Parity=None	Start Bit	8 Data Bits	Stop Bit

1. **End of String is '\n'(0x0a)**
2. **DB9 Interface Details**



DB9 in the rear panel of power supply is TTL level signal .it can be connecting with standard PC interface through the IT-E131 isolated communication cable.