

USER'S GUIDE

Programmable DC power supplier

Models M88XX Series

(Including M8811/M8812/M8813/M8851/M8852/M8853)

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Chapter 1 Introduction

M88XX Series power suppliers are high performance single-output programmable DC power suppliers with communication interface, possessing the character of fast rise time speed (The rise speed of M8811 power supplier can be less than 10mS and that of M8851 can be less than 20mS) The combination of bench-top and system features in these power suppliers provides versatile solutions for your design and test requirements. The M88XX Series can not only be programmed through the keyboard on the panel, but also be functioned as voltmeter and milliohm meter, which will bring great convenience to the users. As a regeneration product of ordinary programmable power suppliers, M88XX Series power suppliers are more cost-effective.

M88XX Series power suppliers' features

- Low Periodic And Random Deviation (PARD) and noise
- High resolution and accuracy (0.1mV/0.01mA)
- Installing a high-accuracy 5 1/2 voltmeter and milliohm meter
- Supporting high-accuracy and dynamic programming output
- High –luminance VFD screen and two lines& four ways display
- Smart fan will be automatically initiated according to the temperature.
- Supporting remote voltage compensation and multidata storage
- Supporting external trigger input and output.
- Power-on-self-test, software calibration and standard designed instrument stand
- Supporting GPIB/RS232/RS485/USB application

Chapter2 Technical Specifications

2.1 Main Technical Specification

M881X Series power suppliers technical specification table

Model		M8811	M8812	M8813
Input Rating	Voltage	0-30V	0-75V	0-150V
	Current	0-5A	0-2A	0-1A
Load Regulation	Voltage	<0.01%+0.5mV	<0.01%+0.5mV	<0.01%+0.5mV
	Current	<0.01%+0.1mA	<0.01%+0.1mA	<0.01%+0.1mA
Setting Value Resolution	Voltage	0.5mV	1mV	2mV
	Current	0.1mA	0.05mA	0.01mA
Readback Value Resolution	Voltage	0.1mV	0.1mV	1mV
	Current	0.01mA	0.01mA	0.01mA
Setting Value Accuracy	Voltage	0.01%+2mV	0.01%+5mV	0.01%+15mV
	Current	0.05%+1mA	0.05%+0.5mA	0.05%+0.1mA
Readback Value Accuracy	Voltage	0.02%+5mV	0.02%+12mV	0.02%+25mV
	Current	0.1%+5mA	0.05%+2mA	0.05%+1mA
Periodic And Random Deviation	Voltage	3mvp-p	5mvp-p	10mvp-p
	Current	2mA rms	1mA rms	0.5mA rms
Voltmeter Accuracy	0-12V Accuracy: 0.02%+2mV; 0-50V Accuracy: 0.02%+5mV			
Milliohmmeter Accuracy	10W. 0-1000mΩ Accuracy: 0.2%+3 mΩ; 1000-10000 mΩ Accuracy: 0.2%+6 mΩ			
Working Condition	0-40℃; 0-90% RH			
Power Required	AC 110V/220V+10%; 50/60 HZ			
Weight	9Kg			
Dimension	108X214X365mm			

M885X Series power suppliers technical specification table

Model	M8851	M8852	M8853
Input Rating	0-6V	0-30V	0-75V
	0-60A	0-20A	0-8A
Load Regulation	<0.01%+1mV	<0.01%+1mV	<0.01%+1mV
	<0.01%+0.1mA	<0.01%+0.1mA	<0.01%+0.1mA
Setting Value Resolution	0.1mV	0.5mV	1mV
	1mA	0.5mA	0.2mA
Readback Value Resolution	0.1mV	0.1mV	0.1mV
	0.1mA	0.1mA	0.1mA
Setting Value Accuracy	0.01%+1mV	0.01%+5mV	0.01%+10mV
	0.05%+6mA	0.05%+2mA	0.05%+1mA
Readback Value Accuracy	0.02%+2mV	0.02%+5mV	0.02%+12mV
	0.05%+30mA	0.05%+15mA	0.05%+8mA
Periodic And Random Deviation	3mvp-p	5mvp-p	7mvp-p
	15mA rms	7mA rms	4mA rms
Voltmeter Accuracy	0-12V Accuracy: 0.02%+2mV;		0-50V Accuracy: 0.02%+5mV
Milliohmmeter Accuracy	10W. 0-1000mΩ Accuracy: 0.2%+3 mΩ; 1000-10000 mΩ Accuracy: 0.2%+6 mΩ		
Working Condition	0-40°C; 0-90% RH		
Power Required	AC 110V/220V+10%; 50/60 HZ		
Weight	28Kg		
Dimension	428X103.5X453.5mm		

2.2 Supplemental Characteristics

State Storage Memory: 50 user-configurable stored states

Recommended Calibration Interval: Once/ Year

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

Option 01: 220VAC ± 10%, 47 to 63 Hz

Option.02: 110 VAC ± 10%, 47 to 63 Hz

Cooling: forced cooling

Operating Temperature: 0 to 40 °C

Storage Temperature: -20 to 70 °C.

Environmental Conditions: Designed for indoor use with pollution degree 2 environment. Designed to operate at maximum relative humidity of 95%.

2.3 M88XX Power Suppliers Dimension

The dimension of M881X Series is 256mmW x 108mm H x 365mm L. Please refer to the following figure:

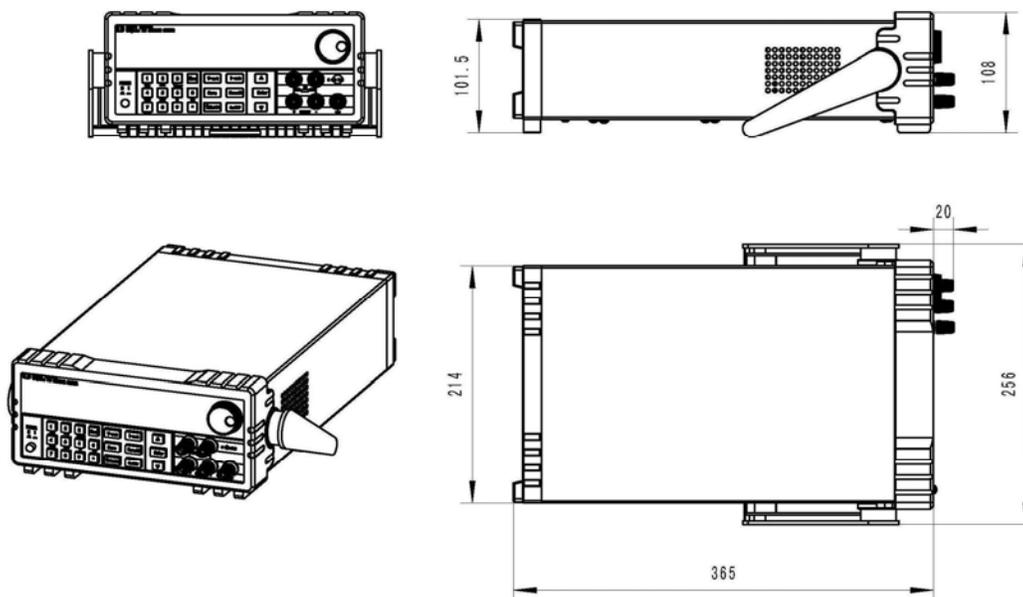


Figure 2.1: M881X Power Suppliers Dimension Figure

The dimension of M885X Series is 428mmW×103.5mmH×453.5mmL, Please refer to the following figure:

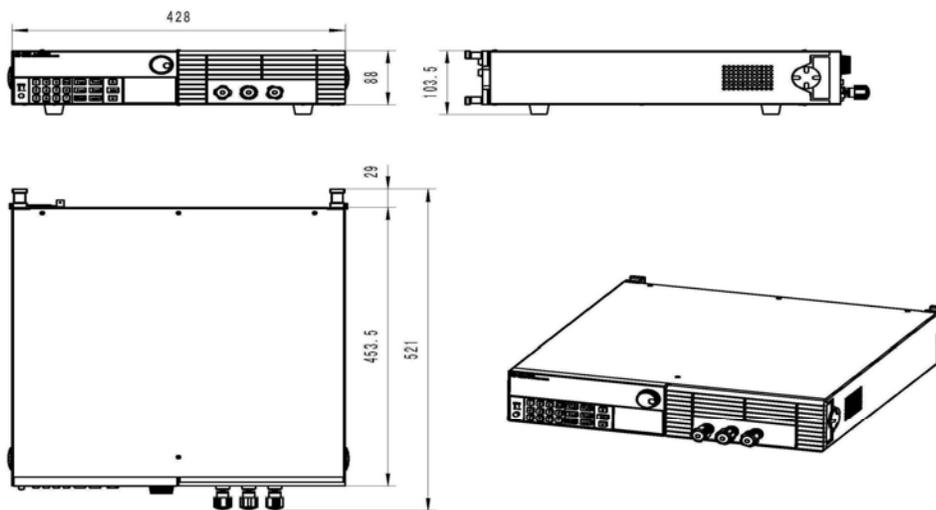


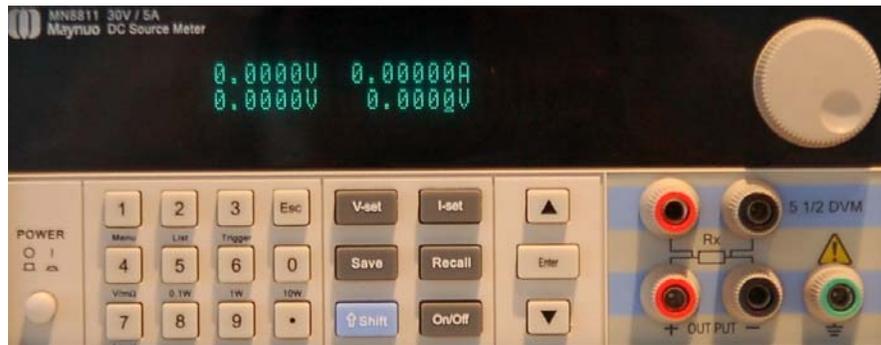
Figure 2.2: M885X Power Suppliers Dimension Figure

Chapter 3 Quick Start

This chapter mainly focuses on the brief introduction of the surface appearance and basic functions of M88XX Series power suppliers so that both experienced and inexperienced users can be acquainted with the new products quickly. Meanwhile, the chapter also clarifies some preliminary checkout that should be made prior to operation to make sure the normal running of the products.

3.1 Front-panel and Rear-panel

The front panel layout of M881X Series power supplier is as follows:



Picture 3.1: The Front Panel of M881X Series Power Suppliers

The upper half is black VFD display screen and knob

The bottom half, left side to right side, is Numeric keys 0-9, ESC key, Function keys, Up-Down keys, Enter key, Input terminal and Output terminal.

The rear-panel layout of M881X is as follows:



Picture 3.2: The Rear Panel of M881X Series Power Suppliers

① Cooling Window

② Multifunction Interface Connector

- ③ 9 Pin COM Interface
- ④ Power Switch Key (110V / 220V)
- ⑤ Power Socket

3.2 Preliminary Checkout

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

1. Check the list of supplied items

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

- One power cord for your location
- The user's manual
- One CD
- One certification of approval
- One communication cable (only when you have bought communication accessories)
- One testing line

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

When you turn on the power supplier, the VFD display screen will light up briefly and the power supplier performs its power-on self-test. Please check if there is any stroke loss on VFD display.



Warning: The power supplier is shipped from the factory with a power-line cord that has a plug appropriate for your location. Your power supplier is equipped with a 3-wire grounding type power cord. The power supplier is grounded only when the power-line cord is plugged into an appropriate receptacle. Do not operate your power supplier without adequate cabinet ground connection.◦

3.3 If the Power supplier 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 supplier.

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

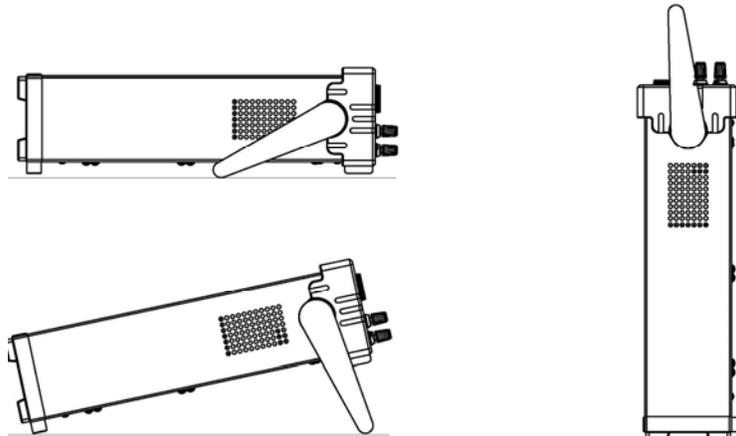
Model	Fuse Description (110VAC)	Fuse Description (220VAC)
M8811	T5A 250V	T3.15A 250V
M8812	T5A 250V	T3.15A 250V
M8813	T5A 250V	T3.15A 250V
M8851	T10A 250V	T6.3A 250V
M8852	T10A 250V	T6.3A 250V
M8853	T10A 250V	T6.3A 250V

4. How to replace the power-line fuse

Open the plastic cover which locates at below the power input socket in the rear panel of the power suppliers by screwdriver, then you will see the fuse. Please replace the damaged fuse with the matched fuse.

3.4 How 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. There are following three positions for you to choose:

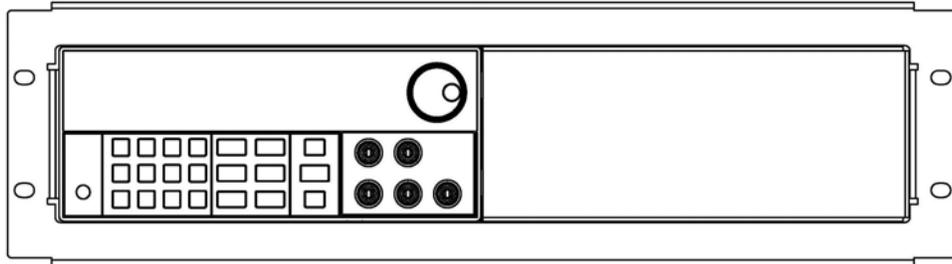


Picture 3.3 M88XX Series Power Suppliers Viewing Positions

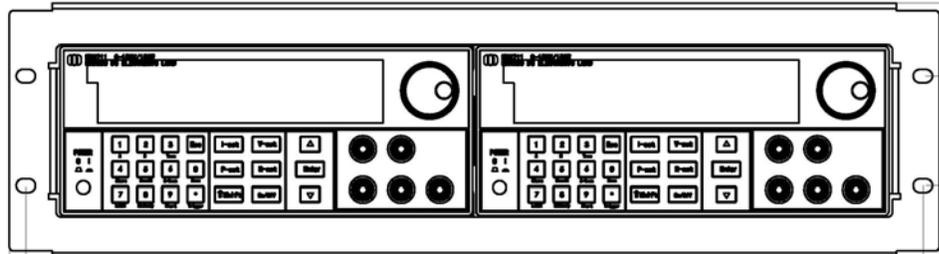
3.5 How to Rackmount the Instrument

The power supplier can be mounted in a standard 19-inch rack cabinet and be easily applied to your testing system. If you want to rackmount the M88XX Series, please buy MR01 rack kit.

Note: Remove the carrying handle, the rubber coating, and the foot on the rear panel before rackmounting the instrument.



Picture 3.4: To Rackmount a Single Instrument



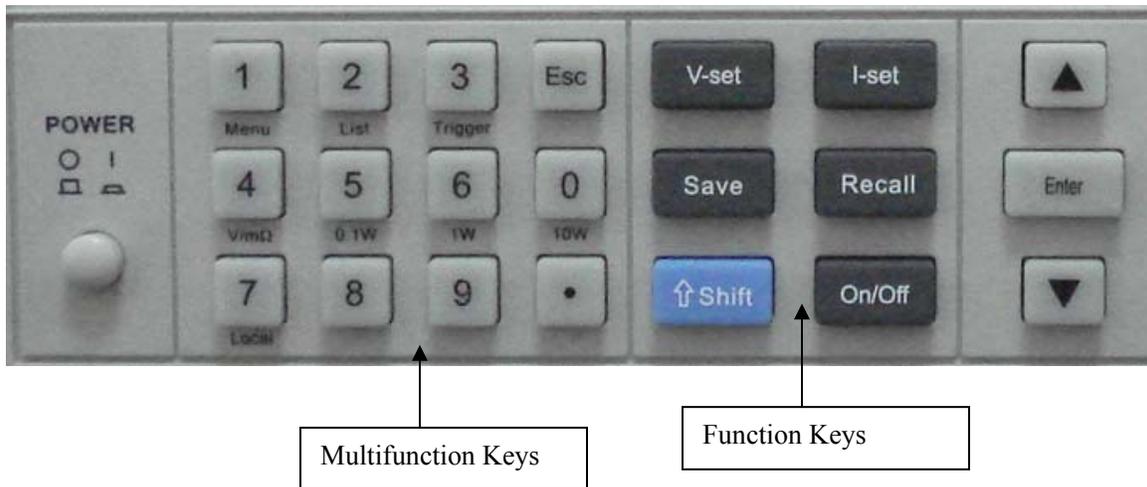
Picture 3.5 To Rackmount Two Instruments Side by Side

Chapter 4 Panel Operation

This chapter mainly introduces the front-panel operation in detail from the following parts:

- Voltage Set Operation
- Current Set Operation
- Saving and Recalling Operation
- Menu Operation
- Output ON/OFF Operation
- Remote Measurement Function
- Milliohmmeter Function
- Voltmeter Function

4.1 Key Layout



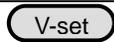
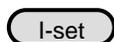
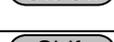
Picture 4.1 Operation Panel Picture

Multifunction Keys Directions

0~9	Numeric keyss
Menu	Menu operation key
List	List output operation
Trigger	Trigger key
V/mΩ	Voltmeter and milliohmmeter switch button
0.1W	Choosing 0.1W power output operation when the instrument is used as

	milliohmmeter
1W	Choosing 1W power output when the instrument is used as milliohmmeter
10W	Choosing 10W power output when the instrument is used as milliohmmeter
Local	Local operation
Esc	Esc key (can be exited from any working condition)

Function Keys Direction

	Setting the voltage value
	Setting the maximum current value
	Saving the current settings to a particular storage locations
	Recalling the saved settings
	Menu operation: setting the parameter
	Control the output state
	Used together with multifunction key to perform diversity functions and applications(for example: <i>shift+Menu</i> can perform menu function)
	Up-key: choosing menu item in menu operation or to increase the output voltage
	Down-key: choosing menu item in menu operation or to reduce the output voltage
	Confirm key

4.2 Front-panel Operation Overview

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

The power supplier is shipped from the factory configured in the front-panel operation mode. At power-on, the power supplier 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 supplier 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 PC.

The output of the power supplier can be enabled or disabled from the front panel by pressing

the key **On/Off**.

The VFD display shows the current operating status of the power supplier with annunciators. When it is powered on, the VFD will display two lines of data. The first line shows the actual voltage value, actual current value and power supplier's status while the second line shows the voltage value that can be measured by voltmeter and output setting value of the M88XX Series power suppliers.

4.3 Constant Voltage Operation

The constant voltage range is from 0V to the maximum voltage value of each model. It is very easy for you to set the constant voltage output.

Solution One: Press the ▲ and ▼ keys to change the value when the M88XX Series power suppliers are powered on.

Solution Two: Step1. Power on the M88XX series instrument.

Step2. Press **V-Set** key.

Step3. Press the numeric keys **0** to **9** to enter the voltage value you wanted.

Step4. Press **Enter** to confirm the value

Close knob lock function when you in config menu,also can use following two operations:

- 1) Use upper revolving encoder directly to adjust voltage;
- 2) Press V-set button then use upper revolving encoder to adjust voltage

4.4 Constant Current Operation

The constant current output range is from 0A to the maximum current value of each type. It is very easy for you to set the constant current output.

Step1. Power on the M88XX series instrument

Step2. Press **I-Set** key

Step3. Use the numeric keys **0** to **9** to enter the voltage value you wanted.

Step4. Press **Enter** key to confirm the value

IF you close knob lock function in config menu,can use following operation:

Press V-set button then use upper revolving encoder to adjust voltage

4.5 Saving and Recalling Operation

You can store up to 50 different output states in storage register locations so that you can recall the saved settings quickly. This kind of store operation can be performed by the keys **Save** and

Recall located in the front panel. When the fast recalling is activated, you can press the numeric keys **0** to **9** to invoke the corresponding data.

Each output state includes 1. Constant voltage value, 2.Constant current value, 3.Maximum voltage setting value, 4.Maximum output voltage value.

Step1. After you setting an output state (CV value, CC value and Maximum voltage), press the key **Save**

Step2. Use the numeric keys **0** to **9** or **▲** and **▼** keys to select the memory location (the range is 1 to 50) which you want to store in.

Step3. Press **Enter** to confirm the memory location.

Step4. Press **Recall** key.

Step5. Use numeric keys **0** to **9** or **▲** and **▼** keys to select the states which you want to recall.

Step6. Press **Enter** key to confirm. Then the saved settings will come out

4.6 Menu Operation

4.6.1 Menu Description

Press the key **MENU** to access to the menu function and at the moment the VFD display screen shows the menu items. You can select the menu items by pressing the **▲** and **▼** keys or by rotating the knob, and then press the key **ENTER** to enter in the menu item you wanted. Or you can press the key **Esc** to get back to the higher level menu.

The first level menu includes:

Config

System set

List Set

Auto test

Output Timer

When accessing to **Config** item, the following menu items will be displayed on the VFD display screen by pressing the keys **▲** and **▼**.

Init:All set for factory value

Output Recall:

On	Setting the output to OFF state when the power supplier is powered on.
Off(Default)	Setting the same state as last time you turned off the power supplier.

Key Sound Set:	On (Default)	The buzzer will sound when any key was pressed.
	Off	the buzzer will not sound when any key was pressed

Knob Lock Set:	On	The knob is locked and rotating the knob will not cause any change of the setting value.
	Off (Default)	The knob is unlocked and rotating the knob will cause change of the setting value.

Fremote Meas.:	On	Activating the remote meas. mode (Rear-panel meas. mode)
	Off (Default)	Activating the front-panel meas. mode

Current Unit Set:	mA	Current unit mA
	A(Default)	Curren unit A (Default)

Match Power:	50HZ	Match 50HZ (50HZ Default)
	Off(Default)	Match 50HZ

Baudrate Set:	4800	Setting the baudrate as 4800bps
	9600(Default)	Setting the baudrate as 9600bps
	19200	Setting the baudrate as 19200bps
	38400	Setting the baudrate as 38400bps

Comm. Parity:	None(Default)	Setting no parity bit
	Even	Setting comm. parity as even parity bit
	Odd	Setting comm. parity as odd parity bit

Port Mode:	Trigger(Def)	Trigger mode
	RI/DFI	
	Digital I/O	Digit port

Key Lock Set:	Password=	Entering password and then pressing the key Enter to unlock the password
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Exit:

When accessing to **System Set** item, the following menu items will be displayed on the VFD display screen by pressing the keys ▲ and ▼.

Max Volt. Set:	Max=	Setting the maximum output voltage
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Step Volt Set:

Step=	Inputting the voltage step value and pressing up-down keys to change it
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Exit

When accessing to the **List Set** item, the following menu items will be displayed on the VFD display screen by pressing the keys ▲ and ▼.

Load List File: Read list

Edit List File:

Continuous	Continuous mode: once; repeat
Step	Single-step mode, once: repeat:

Edit File Format:

8X25 Steps	Setting list file as 8X25step
4X50 Steps	Setting list file as 4X50step
2X100 Steps	Setting list file as 2X100 step
1X200 Steps	Setting list file as 1X200 step

Exit:

When accessing to the **List Set** item, the following menu items will be displayed on the VFD display screen by pressing the keys ▲ and ▼.

Load Atest File:

Edit Atest File:

Exit:

Timer State

ON	Activating output timer
Off(Default)	Closing output timer

Timer Set

Timer=	Inputting the time
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Note: When accessing to the menu item, you can press **Esc** to exit the menu operation.

No matter which function the instrument is performing, you can exit the function operation status by pressing the key **Esc**.

4.6.2 Menu Function

Initiating the Output State (>Output Setup)

This instruction can initiate the output state when the power supplier is powered on. If you select the item **On**, the power supplier will initiate the output to OFF state when the power supplier is powered on. If you select the item **Off**, the output will remain the same state as last time you turned off the power supplier

Setting the Key Sound (Key Sound Set)

This instruction can switch on/off the buzzing sound when you press any key, If you select the item **On**, the buzzer will sound when any key was pressed. If you select **Off**, the buzzer will not sound when the keys were pressed. Default setting is the item **On**; the buzzer will sound when you press any key.

Fast Recalling Function (>Fast Recall)

This instruction can help you recall the saved data very fast when it is set as **On** condition. The detailed operations are as follows: first you need to save several often used voltage value and current value, then use the **Recall** key to recall those data.

Press the keys **Shift** and **MENU** to access to the menu function. When VFD display screen shows the item **Config**, press the key **ENTER** to confirm.

Press the keys **▲** and **▼** to select the item **Fast Recall**, and then confirm by pressing the key **ENTER**.

Press the keys **▲** and **▼** to select the item **On**.

Press the key **ESC** twice to exit the menu operation.

Press the keys **V-set** and **I-set** to set your favored voltage value and current value. After you setting an output state (CV value, CC value and Maximum voltage), press the key **Save**

Use the numeric keys **0** to **9** or **▲** and **▼** keys to select the memory location (the range is 1 to 50) which you want to store in.

. Press **Enter** key to confirm the memory location.

. Press **Recall** key.

Use numeric keys **0** to **9** or **▲** and **▼** keys to select the states which you want to recall.

. Press **Enter** key to confirm. Then the saved settings will come out

Overcurrent Protection (>OCP Set)

M8811, M8812, M8813, M8851, M8852, M8853 are not available of this function for while.

Setting the Baudrate (>Baudrate Set)

This instruction can change the communication baud rate of the power supplier; the baud rate range is 4800bps, 9600bps, 19200bps, 38400bps. Before the communication, you must make sure that there is same baud rate between the power supplier and the host computer. Default baud rate is 9600bps.

Setting Address (>Sour. Address)

This instruction can set the communication address of each power supplier. The address range is from 0 to 30. Before the communication, you must make sure that there is same address between the power supplier and the host computer. Default address is 0.

Operation steps:

Press the keys **Shift** and **MENU** to access to the menu function. When the VFD display screen shows the item *Config.*, press the key **ENTER** to confirm.

Press the keys **▲** and **▼** to get the item *Sour. Address*, then press the key **ENTER** to confirm.

When the VFD display screen shows *Address= * **, choose the number keys from **0** to **9** to set the address, followed by pressing the key **ENTER** to confirm.

Press the key **ESC** twice to exit the menu operation.

Port Mode (>Port Mode):

M8811, M8812, M8813, M8851, M8852, M8853 are not available of this function for while.

Trigger Operation (Shift+Trigger)

Just as described above, the trigger operation can also be applied to the list output operation.

There are three trigger modes for the power supplier. Before performing the trigger function, users need to select one trigger mode.

Trigger by keyboard (pressing the keys **Shift** and **Trigger**): The trigger operation will be initiated once when pressing the keys **Shift** and **Trigger** under the condition that the trigger by keyboard is effective.

Remote Control Function (>Output Contr.)

There are three modes under the remote control function: *LATCHED*, *FOLLOW*, *OFF*.

LITCHED Mode: The output of power supplier will be turned off when testing out the change in voltage level from high to low from TRQ port.

FOLLOW Mode: M88XX series power suppliers are not available of this function for while.

OFF Mode: The output status of M88XX series power suppliers are not affected by RI input level.

Fault Indication Function (>DFI Status)

DFI results from following five sources: Quest, OPER, StEV, Requ., Off.

Setting Password for Function Keys (>Key Lock Set)

This instruction can set a password (1 through 4 digits) to lock the function keys operation. After setting the password, all the function keys on the front panel will be locked except the key **On/Off**. You must enter the correct password to unlock them, and then you can continue to do the function key operation. If you don't want to lock the function keys, please don't press any number key when you enter the **Key Lock Set** item, just press **Enter** key to unlock it.

Note: When shipped from factory, there is no password and function keys. The start bit of your desired password shouldn't be 0.

List Operation (>List Set)

You can set every single-step value and duration time by new list operation so as to get different output list. The parameters of the list operation include the name of the list file which are input, input single-step numbers (200steps at most), single-step duration time (1mS at least) and the setting value of every single-step.

When list operation is under **continuous** mode, the power supplier will begin the list operation until the list operation is finished or until receiving the next trigger signal.

Before editing the list, if you want to change the file storage format, please operate as the following steps:

- 1) Press the keys **Shift** and **Menu** to access to the menu function.
- 2) When VFD display screen shows the item **Config**, press the key **▼** to select the item **List Set**, press the key **Enter** to confirm.
- 3) When VFD display screen shows the item **Load ListFile**, Press the key **▼** twice, select the item

Edit File Format, press the key **Enter** to confirm.

4) When VFD display screen shows *8*25 Steps*, Press the key ▼ twice, select a list mode you want from *1*200 Steps, 2*100 Steps, 4*50 Steps*.

2*100 Steps means to set a two100 steps of list file.

1*200 Steps means to set a one 200steps of list lie..

8*25 Steps means to set an eight 25 steps of list file.

4*50 Steps means to set a four 50 steps of list file.

5) Press ▼ to select the item *Edit List File*, press the key **Enter** to confirm.

6) When VFD display screen show the item *Edit List File 1*, press the key ▲ and ▼ to select sequential number you want to edit, press the key **Enter** to confirm.

7) When VFD display screen show the item List x Steps= xxx, press numeric keys to set the total list steps(x). Press the key **Enter** to confirm.

8) When VFD display screen show the item *List File x Loop Mode*, press the key ▲ and ▼ to select operation mode:

Loop Mode means to looping execute list file

Continuous means to execute all steps in the list file once a triggle

Step Mode means one triggle one step

9) When VFD display screen show the item *Step 1 Time= xxxxx mS*, press numeric keys to set time for step 1, press the key **Enter** to confirm.

10) When VFD display screen show the item *Step 1 Volt= xxxxx V*, press numeric keys to set voltage, press the key **Enter** to confirm.

11) When VFD display screen show the item *Step 1 Curr= xxxxx A*, press numeric keys to set current, press the key **Enter** to confirm.

12) Repeat step 9, 10, 11 to complete all steps in list file

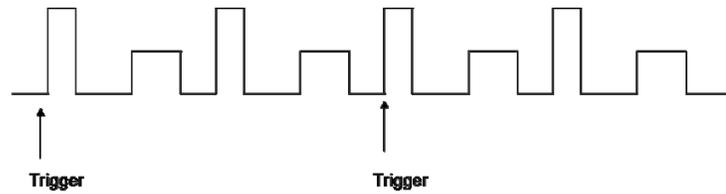
13) Repeat step 5 to 15 to edit other list files if needed

14) Press ▼ to select *Load List File*, press the key **Enter** to confirm.

15) Electronic load is in the LIST MODE. VFD display screen shows OFF in the right when output is on. VFD display screen shows List1 in the right when output is off. Press key *On/Off* to execute. Press key *Shift+2* or *Esc* to exit. Press key *Shift+2 direct to excute the last list file*.

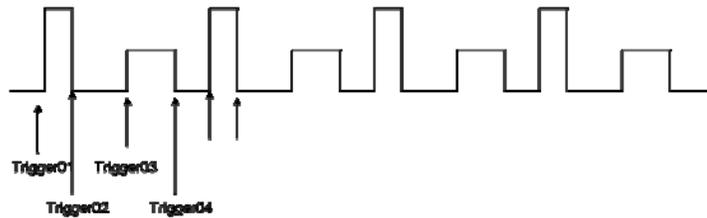
16) Under loop mode, electronic load looping executes automatically. Please find the following table

at Continuous Mode and Step Mode.



Picture 4.2 Repeat Trigger with 2 Times Cyclical Pattern

When the list operation is under the single step mode, the power supplier will not be changed to next step until receiving a trigger signal. Please refer to the following picture



Picture 4.3 Single-Step Trigger

Automatic Test (>Atest Set)

You can check if the equipment is qualified by editing the automatic test files, such as the value set, comparison parameters, delay time, inputting the step No.(50 steps at most). 4 data of automatic test files can be edited.

How to edit automatic test files

17) When the VFD display shows the item **Menu Config**, press the key ▼ to select the item **Atest Set**, followed by pressing the key **Enter** to confirm.

18) When the VFD display shows the item **Load Atest File**, press the key ▼ twice and choose the item **Edit List File**, followed by pressing the key **Enter** to confirm.

19) When the VFD display shows the item **Edit Atest File 1**, press the key ▲ and ▼ and select the sequential number that need to be edited, followed by pressing the key **Enter** to confirm.

20) When the VFD display shows **Atestx Steps= xxx**, press the numeric keys to set the steps of list files, followed by pressing the key **Enter** to confirm.

21) When the VFD display shows **Step 1 Test Curr**, press the keys ▲ and ▼ to select one of the following testing types:

- a) Curr means to test the current.
- b) Volt means to test the output voltage.
- c) DVM means to test voltmeter input.

22) When the VFD display shows **Step 1 Time= xxxxx S**, press the numeric keys to set the test delay time, followed by pressing the key **Enter** to confirm. Please note that the delay time range is 0.2S-25.5S. If delay time is set as 25.5S, the power supplier will be automatically in the pause mode and go on testing only when another trigger is input.

- 23) When the VFD display shows **Step 1 Volt= xxxxx V**, press the numeric keys to set the voltage, followed by pressing the key **Enter** to confirm.
- 24) When the VFD display shows **Step 1 Curr= xxxxx A**, press the numeric keys to set the current, followed by pressing the key **Enter** to confirm.
- 25) When the VFD display shows **Step 1 Max= xxxxx X**, press the numeric keys to set the maximum value for the qualified test, followed by pressing the key **Enter** to confirm.
- 26) When the VFD display shows **Step 1 Min= xxxxx X**, press the numeric keys to set the minimum value for the qualified test, followed by pressing the key **Enter** to confirm.
- 27) Repeat from step 21 to step 26 to set all the other steps.
- 28) Repeat from step 18 to step 27 to edit other automatic test files according to your need.
- 29) Press the key **▼** to select the item **Load Atest File**, followed by pressing the key **Enter** to confirm.
- 30) Then the electronic load enter into the automatic test mode, showing **AUTO1** at the right upper corner of the VFD display and **OFF** at the right lower corner of the VFD display. That means to wait for a trigger.
- 31) There are three trigger modes for automatic test
- d) Press the key **On/Off** to trigger.
 - e) Press the key **Shift+3** to trigger.
 - f) Become the high voltage level to the low voltage level by **Trig_in** at the rear panel and last more than 5mS.
- 32) When the power supplier is having the automatic test, the word **Wait** will be showed at the right lower corner of the VFD display. When in pause mode, the word **Stay** will be showed at the right lower corner of the VFD display. When one test is finished, the test result Pass or Fail will be showed at the right lower corner of the VFD display.
- 33) When one test is finished, users can press the up-down keys to make one single step worked manually. At the moment, **step n** will be showed on the VFD display, indicating the step which is working; then **Han** is showed, indicating that the load is in hand-operated single step test state, followed by the test results being showed at the right lower corner of the VFD display.

4.7 Output On-Off Operation

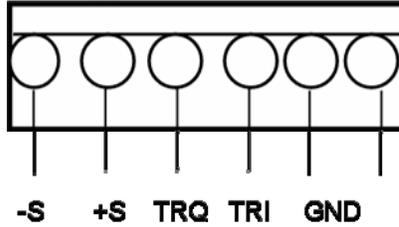
When in front-panel operation, you can press the key **On/Off** to control the output on-off state. When in remote control, you can send SCPI order (Output: ON | OFF) to control the output sate. The current setting values will not be changed because of the output on-off operation.

4.8 Remote Measurement Function

When the load consumes high current, the power supplier will produce voltage drop in the connecting wire between power supplier and load terminals. In order to guarantee the measurement accuracy, remote measurement terminals is installed at the rear-panel of the power supplier. Users can measure the output terminals voltage of the instrument under test by these terminals.

Before performing the remote measurement function, you need to set the power supplier as the remote measurement mode.

Please refer to the picture 4.4 for the trigger terminals and measurement terminals.



Picture4.4 Remote Measurement Terminals

-S and +S are remote measurement terminals; TRQ and TRI are trigger terminals, the last two terminals are ground terminals.

The output of power supplier will be turned off when testing out the change in voltage level from high to low from TRQ port which is under the latched mode of the remote control function. As a multifunction extended port, TRI port is designed for future expanded.

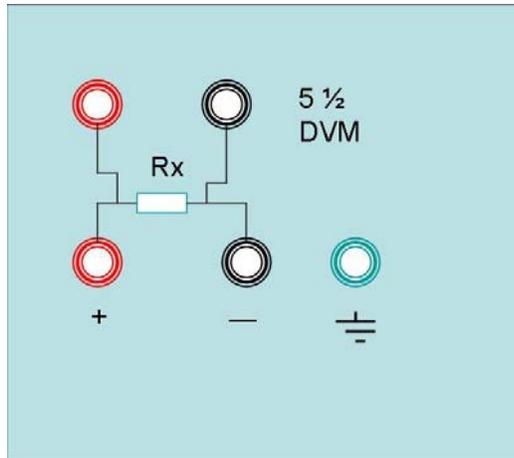
4.9 Milliohmmeter Function

Source Meter provides the four-line electrical resistance measurement, just as showed in following picture 4.5, which can measure accurately the low resistance and the maximum measurement resistance is 10Ω. In order to avoid the damage of the resistance under test, please make sure the resistance under test is within the measurement rang.

Three measurement ranges can be optional: 0.1W、1W、10W。

Operation Method

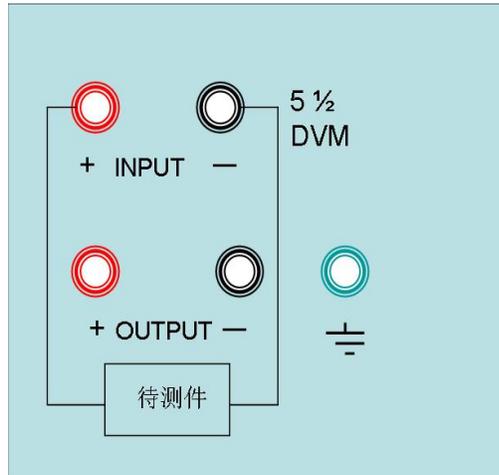
- 1) Press the keys **Shift** and **V/mΩ** (VFD display screen shows----, --mΩ, Range:0.1W) to measure the resistance.
- 2) Press the keys **Shift** and **0.1W** or **1W** or **10W** to set different measurement range of Milliohmmeter.



Picture 4.5 Milliohmmeter Measuring Electrical Resistance

4.10 Voltmeter Function

The voltage of the instrument under test can be measured if the wires are connected together just as the picture 4.6.



Picture 4.6 Measuring the Voltage of the Instrument under Test

Chapter 5 Remote Operation Mode

The DB9 interface connector on the rear panel of the power supplier can be transferred to RS232 interface through the voltage level shift cable (M-131), the following information will tell you how to use the computer to control the output of the power supplier. Before carrying out the remote operation mode, please use the voltage level shift cable (M-131) provided by our company, for M-131 can not only transform TTL voltage level into RS232 signal, but also connect the DB9 interface connector with computer's serial interface..

5.1 M-131 Communication Cable

The DB9 interface connector on the rear panel of power supplier is TTL voltage level; you can use the communication cable (M-131) to connect the DB9 interface connector of the power supplier and the RS-232 interface connector of computer for the communication. Please refer to the following picture for M-131.



Picture 5.1 M-131

Note: It will not work if you connect the DB9 interface connector of the power supplier to the RS232 interface connector of computer directly by a standard RS232 cable. Please use IT-E131 to connect them.

5.2. Communication between Power Supplier and PC

The DB9 interface connector on the rear panel of the power supplier can be transferred to RS232 interface through the voltage level shift cable (M-131). The following instructions can help you understand how to control the output of power supplier by PC.

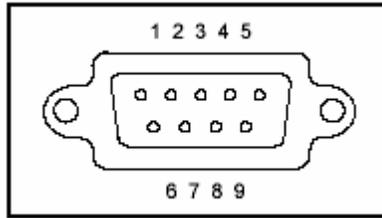
1. Communication Setting

Before using the remote operation mode, please make sure that the baudrate and

communication address in power supplier are the same as that 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) Baud rate: 9600(4800, 9600, 19200, 38400, which are selectable from the menu on the front-panel.)
- (2) Data bit: 8
- (3) Stop bit: 1
- (4) Parity: (none, even, odd)

2. DB9 Serial Interface



DB9 Serial Interface

The output of DB9 interface on the rear-panel of the power supplier is TTL voltage level, so the voltage level shift cable (M-131) must be applied before connecting the DB9 interface with the serial interface on PC.

Power Supplier	M-131 Voltage Level Shift Cable	PC
VCC	1	1 VCC
RXD	2	2 RXD
TXD	3	3 TXD
NC	4	4 DTR
GND	5	5 GND
NC	6	6 NC
NC	7	7 RTS
NC	8	8 NC
NC	9	9 NC

Note: It will not work if you connect the DB9 interface connector of the power supplier to the RS232 interface connector of computer directly by a standard RS232 cable. Please use IT-E131 to connect them.

Chapter 6 SCPI Communication Protocol

6.1 Communication command introduction

M88 series programmable DC power supply support SCPI communication protocol. SCPI communication protocol is a standard commands for programmable instruments, which defines a standard set of communication commands. Command for M88 series power supply can be divided into two categories: basic commands (IEEE-488.2 Common Command Set) and command specified by M8800 software. SCPI is case-insensitive, namely commands are not case sensitive and each command has an EOI end: Instruction end <LF> (that ASCII code character 'n', that is, line breaks decimal ASCII code 10, hex 0x0A).

Note: All of the following commands to send back all require add <LF>. The following statement appears in [:] represents a semi-colon (:), the character can be written in commands, or you can not write.

6.2 Commonly used relevant command description

6.2.1 Basic command (IEEE-488.2 Common Command Set)

Basic command includes all IEEE-488.2 includes all general functions in IEEE-488.2. These functions are usually applied to support the IEEE488.2 standard measuring instruments. The group command with an asterisk (*) started and no hierarchy.

Command * IDN?

Command * IDN is used for read the relative information of power supply, including manufacture, product model number, serial number, and version number.

Return command: return parameter contains four fields separated by commas.

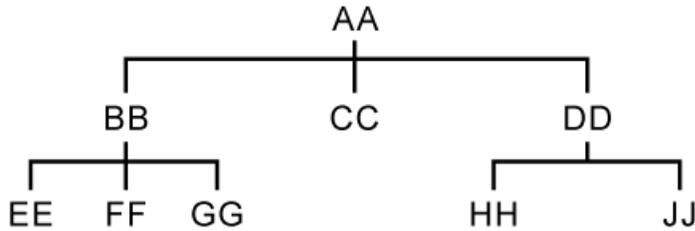
Example: Send command * IDN? <LF>, the corresponding expressed as a hexadecimal is 0x2A 0x49 0x44 0x4E 0x3F 0x0A. meanwhile, return command for power supply is MAYNUO, M8812, 881201096006118000, V1.0
And

MAYNUO	manufacture
M8812	product model number
881201096006118000	product serial number
V1.0	software version number

6.2.2 Command specified by M8800 software

This command is ordered arrangements of tree constructs. Each command contains a number of strings (mnemonic) . Layers separated by a colon (:). At the top of the command in the command tree known as the "root shell" or simply "root." Access to the next command, you must specify a

path. Ordered tree is structured as follows:



In the above table: AA represents the root path; BB, CC, DD represents the root path of the direct sub-path. EE, FF, GG said that the path is a sub-sub-path under the BB. HH, JJ said that the path is a sub-sub-path under DD.

Command description:

- 1) [:] AA: CC means the current root path for the AA, visit the AA under the CC.
- 2) [:] AA: BB: FF means the current root path for the AA, visit the AA path to the root path of the sub-BB under the FF.
- 3) [:] AA: DD: HH means the current root path for the AA, visit the AA path to the root path of the sub-DD under the HH.

Command specified by M8800 software also can send more than one order in a message and use a semicolon (;) between each order.

Example: [:]AA:BB:EE;FF;GG+<LF> means access to BB under the EE, FF, GG.

[:]AA:BB:FF;:AA:DD:HH+<LF> means access to BB under the FF and DD under the HH.

SCPI language mnemonic or keywords has a long format and short format. Short format is actually short for long format. It uses the following rules:

Short format mnemonic is the first four characters of long format mnemonic. If the length of the long-form mnemonic characters less than or equal 4, then the length of the mnemonic the same.

If the length is greater than the length of 4 mnemonic, and the fourth character is a vowel, short mnemonic will discard the fourth vowel characters and become the third characters.

Example: short-type mnemonic of ERRor is ERR, rather than rather than the ERRO

Some command needs parameters. Setting command, for example. There is a space (ASCII code is 32) between the command and the first parameter.

Example: setting voltage value [:] VOLT 12.000<LF>

There is a space (ASCII code is 32) between 12.00 and VOLT

System command

Commands described in this section are [:] SYSTem commands under the root path. The following Commands are used short-type mnemonic format.

Command [:]SYSTem: ERRor?

Command [:]SYSTem: ERRor is used to read the power of the error code and error message

Return command: Error Code, error message.

Example:

Send command [:] SYST: ERR? <LF>

Power supply return command: "0, 'No Error'", or "50, 'Error Para Count'", or "70, 'Invalid Command'" etc..

Command [:] SYSTem: REM

Command [:] SYSTem: REM is used to set remote control mode, that is the PC control mode.

Return command: None

After sending successful, the power has been in the remote control mode when “REM” appears in the right corner front panel. Otherwise the previous operation is not valid. Please switch to the power supply front panel controls by pressing Shift + the number 7 key, or send the command [:] SYST: LOC <LF>.

Command [:] SYSTem: LOC

Command [:] SYSTem: LOC is used to set the power control mode for the panel.

Return command: None

Example:

In the remote control (PC) mode, Send command [:] SYST: LOC <LF> ,
After sending successful, the power has been in the front panel control mode when “REM” disappears from the right corner of front panel.

Command [:] SYSTem: SENSE <bool>

Command [:] SYSTem: SENSE <bool> is used to check the power is under remote measurements.

Return command: None

Parameters: bool-type parameters, (0-OFF, 1-ON)

Example:

Send command [:] SYST: SENS 1 <LF>. If successful, Power supply is in the remote measurement.

6.2.3 Measurement Command

Commands described in this section are [:] MEASure commands under the root path. The following Commands are used short-type mnemonic format.

Command [:] MEASure: VOLTage

Command [:] MEASure: VOLTage is used to read output voltage

Return command: Numerical

Return parameters Unit: V

Example:

Send command [:] MEAS: VOLT? <LF>, if return command is 12.560, it means the current voltage value is 12.560V.

Command [:] MEASure: CURRent?

Command [:] MEASure: CURRent is used to read output current

Return command: Numerical

Return parameters Unit: A

Example:

Send command [:] MEAS: CURR? <LF>, if return command is 1.245, it means the current current value is 1.245A.

Command [:] MEASure: DVM?

Command [:] MEASure: DVM? is used to read input voltage of the voltmeter in the power supply

Return command: Numerical

Return parameters Unit: V

Example:

Send command [:]MEAS:DVM? <LF>, if return command is 12.560, it means the current current value is 12.560V.

6.2.4 Setting Command

Command [:] OUTPut <bool>

0. Command [:] OUTPut <bool> is used to set the output of the power to open or not

Return command: None

Parameters: bool-type parameters, (0-OFF, 1-ON)

Example:

Send command [:] OUTP 1<LF>, Power output is set to open if successful.

1. Related command: Query power output status. Return command parameter is <bool>.

Command [:] MODE <mode>

1. Command [:] MODE <mode> is used to select the power operating mode. That is command set mode or sequential list mode, or milliohmmeter mode.

Parameter: mode has three following modes,

FIXed	command set mode
LIST	sequential list mode
DRM	milliohmmeter mode

Return command: None

Send command [:] MODE LIST<LF>, the power mode is sequential list mode.

2. Related command: Query power working mode:] MODE?

. Return command parameter: <mode>

Command [:]VOLTage <Value>

1、 This command is used to set the voltage value of power suppliers.

Parameters: numerical value|MAX|MIN

Unit: V

Return Command: None

For Example:

1) Command sent [:]VOLT 30<LF>

means the current voltage value of the power supplier is 30V.

2) Command sent [:]VOLT MAX

If the current maximum voltage value of the power supplier is 76.000V, then the current voltage value is the maximum voltage value, 76.000V.

3) Command sent [:]VOLT MIN

If the current minimum voltage value is 0.000V, then the current voltage value is the minimum voltage value, 0.000V.

2、 Related Command: the command used to query the voltage value set, the maximum value set or the minimum value set[:]**VOLT? MAX|MIN**

Return command parameters: numerical value

For example:

1) If you want to query the voltage value set, then the command sent is [:]VOLT?+<LF>

If the return command of a power supplier is: 10.0000, then the voltage value set of the power supplier is 10.0000V.

2) If you want to query the maximum voltage value set, then the command sent is: VOLT? MAX+<LF>

If the return command of a power supplier is: 76.0000, then the maximum voltage value set of the power supplier is 76.0000V.

3) If you want to query the minimum voltage value set, then the command sent is: VOLT? MIN+<LF>

If the return command of a power supplier is: 0.0000, then the minimum voltage value set of the power supplier is 0.0000V.

Command [:]CURRent <Value>

1、 This command is used to set the current value of the power supplier.

Parameters: numerical value|MAX|MIN

Unit: A

Return command: none

For example:

1) Command sent[:]CURR 3<LF>

means the current current value of the power supplier is 3A.

2) Command sent [:]CURR MAX<LF>

If the current maximum current value of the power supplier is 2.0000A, then the current current value is the maximum current value, 2.0000A.

3) Command sent [:]CURR MIN<LF>

If the current minimum current value is 0.000V, then the current current value is the minimum current value, 0.000V.

2、 Related Command: the command used to query the current value set, the maximum value set or the minimum value set **[:]CURR? MAX|MIN**

Return command parameters: numerical value

For example:

1) If you want to query the current value set, then the command sent is **[:]CURR?<LF>**.

If the return command of a power supplier is: 1.0000, then the current value set of the power supplier is 1.0000A.

2) If you want to query the maximum current value set, then the command sent is: **[:]CURR? MAX<LF>**.

If the return command of a power supplier is: 2.0000, then the maximum current value set of the power supplier is 2.0000A .

3) If you want to query the minimum current value set, then the command sent is: **[:]CURR? MIN<LF>**.

If the return command of a power supplier is: 0.0000, then the minimum current value set of the power supplier is 0.0000A.

Command: [:]VOLTage:PROTection <Value>

1、 This command is used to set the upper limit of the power suppliers, that is the maximum voltage value.

Parameters: numerical value |MAX|MIN

Unit: V

Return command: none

For example:

1) Command sent **[:]VOLT:PROT 30<LF>**

means the upper limit of the current voltage value of the power supplier is 30.000V.

2) Command sent **[:]VOLT:PROT MAX<LF>**

means the maximum voltage value of the power supplier is set as the upper limit of the current voltage value of the power supplier.

3) Command sent **[:]VOLT:PROT MIN<LF>**

means the minimum voltage value of the power supplier is set as the lower limit of the current voltage value of the power supplier.

2 、 Related command : query the upper limit of the current voltage of the power

supplier[:]VOLTage:PROTection?** [MAX]**

Return command parameters: numerical value

For example:

1) Command sent[:]**VOLT:PROT?**<LF>

If the return command of the power supplier is 20.000, then the upper limit of the current voltage is set as 20.000V.

2) Command sent[:]**VOLT:PROT? MAX**<LF>

If the return command of the power supplier is 76.000, then the maximum voltage value of the power supplier which can be set is 76.000V.

6.2.5 List Operation (LIST) Related Command**Command[:]**LIST:AREA** <num>**

1、 This command is used to set the list location division mode.

Parameter: 1|2|4|8

1. Set the list operation as 1*200 steps;
2. Set the list operation as 2*100 steps;
3. Set the list operation as 4*50 steps;
4. Set the list operation as 8*25 steps.

For Example:

Command sent[:]**LIST:AREA 8**<LF>

means the list operation is set as 8*25 steps.

2. Related command : query the location division mode of the list operation
[:]LIST:AREA?****

Return parameters: <num>

Command[:]LIST:RCL** <num>**

This command is used to recall the saved files from a certain location so as to make them executed in the list.

Parameter: 1~8

Return command: none

For example:

Command sent[:]**LIST:RCI 2**<LF>

Means to recall the list file from the storage register location2 and make the file executed.

Command[:]LIST:COUNT** <count>**

1、 This command is used to set the single step count of list operation files.

Parameter: the range of count is: 1~200。

Return command: none

For example:

Command sent[:]**LIST:COUN 20**<LF>

Means the single step count of the list operation file is set as 20.

2、 Related command: query the single step count of the current list files[:]**LIST: COUNT?**

Return parameter: <count>

Command [:]LIST:MODE <mode>

1、 This command is used to set the working mode of the list operation files.

Parameters: there are three modes:

CONTInuous: continuous mode

STEP: single step mode

LOOP: loop mode

Return command: none

For example:

Command sent [:]LIST:MODE CONT<LF>

means the working mode of list files are set as continuous mode.

2、 Related command: query the setting mode in the current list files[:]**LIST:MODE?**

Return parameters: <mode>

Command [:]LIST:VOLTage <count>,<value>

1、 This command is used to set one appointed single step voltage value of a list operation file.

Parameter: count is appointed single step count; value is the voltage value set.

Unit: V

Return command: none

For example:

command sent [:]LIST:VOLT 1,5<LF>

means to set the voltage value of the first step of the list file as 5.000V.

2、 Related command: query the voltage value of the appointed step of the current list file

[:]LIST:VOLTage? <count>

Return parameters: <value>

For example:

Command sent [:]LIST:VOLT? 1<LF>

means to query the voltage value set of the first step of the current list file.

Command [:]LIST:CURRent <count>,<value>

1、 This command is used to set the current value of the appointed single step of list operation files.

Parameters: count is the appointed single step count; value is the current value set.

Unit: A

Return command: none

For example: command sent [:]LIST:CURR 1,2<LF>

means to set the current value of the first step of the list file as 2.000A.

2、 Related command: query the current value of the appointed single step of the current list file

[:]LIST:CURRent? <count>

Return parameter: <value>

For example:

Command sent[:]**LIST:CURR?** 1<LF>

Means to query the current value set of the first step of the current list file.

Command [:]LIST:WIDTh** <count>,<time>**

1、 This command is used to set the delay time of the appointed single step of the operation files.

Parameters: count is the appointed single step count; time is the delay time set.

Unit: mS

Return command: none

For example: command sent[:]**LIST:WIDT** 1,2000<LF>

means to set the delay time of the first single step of the list file as 2000mS.

2、 Related command: query the delay time of the single step of the current list files

[:]LIST:WIDTh? <count>

Return parameters: <time>

Command [:]TRIGger****

When the trigger source is set as communication command trigger mode, this command will give out a trigger signal, which function can also be realized by pressing the keys **Shift+3** located in the front panel. Return command: None

For example: command sent [:]**TRIG**<LF>

Command [:]TRIGger:SOURce** <mode>**

This command is used to set the trigger mode of the power supplier.

Parameter: there are three trigger modes.

IMMEDIATE: means the trigger mode is keyboard trigger mode.

EXTERNAL: means the trigger mode is external signal(TTL voltage level) mode

BUS: means the trigger mode is communication command trigger mode.

Return command: none

For example: command sent [:]**TRIG:SOUR IMM**<LF>

means the power supplier is set as triggering by the keyboard located in the front panel.

Quick Reference

Safety

Please donot install any spare or repair the instrument without permission. In order to make sure the normal work of the instrument, please have it mended in the maintenance department designated by our company.

Pease review the following safety precautions before operating our equipment.

Safety Symbols

Please keep in mind the following items which may result in injuries on your body.



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



High voltage danger (Non-professionals are forbidden to open the instrument)



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

Certification and Warranty

M881X Series power suppliers meet 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.

Maintenance Service

This product must be returned to maintenance department designated by our company for repairing. Customer shall prepay shipping charges (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

1. Defects resulting from improper or inadequate maintenance by the Customer,
2. Customer-supplied software or interfacing,
3. Unauthorized modification or misuse,
4. Operation outside of the environmental specifications for the product, or improper site preparation and maintenance.
5. Defects resulting from the circuit installed by clients themselves

Attention

No inform will be given for any changes in the content of the user's guide.