

# BK PRECISION®

Model: 9120A, 9121A, 9122A, 9123A, 9124, 9150, 9151, 9152, 9153

## Single Output Programmable DC Power Supply

### USER MANUAL



## Safety information

Please review the following safety precautions before operating our equipment.

### General information

The following safety precautions should be observed before using this product and any associated instrumentations.

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.

Under these circumstances personnel 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.

This product should only be used as intended. Users must be trained in electrical safety procedures and proper use of the instrument. Users must be protected from electric shock and contact with hazardous live circuits.

Service is only to be performed by qualified service personnel.

### Safety symbols and terms



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



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

### Certification

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

# TABLE OF CONTENTS

<b>1. Introduction.....</b>	<b>4</b>
Description .....	4
Features .....	4
<b>2. Quick Reference.....</b>	<b>5</b>
2.1 The Front Panel .....	5
<b>2.2 The Rear Panel .....</b>	<b>6</b>
2.3 Preliminary Checkout.....	7
1. Check the list of supplied items.....	7
2. Connect the power cord and turn on the power supply .....	7
3. Checkout Procedure .....	7
1.4 Output Verification .....	8
Voltage Output Check.....	8
Current Output Check .....	9
1.5 If the power supply does not turn On .....	9
1.5.1 Fuse Replacement.....	9
1.6 Adjusting the Carrying Handle.....	10
1.7 Rack Mounting the Instrument.....	11
<b>3. Front-panel Operation .....</b>	<b>12</b>
3.1 Front Panel Keys .....	12
Numerical Keys/Secondary Shift Functions.....	13
Shift Functions .....	13
Primary Function Keys.....	13
Up/Down and Entry key.....	13
3.2 Front-panel Operation Overview.....	13
3.3 Setting the Voltage.....	13
3.4 Setting the Current.....	14
3.5 Save and Recall Operation .....	14
3.6 Menu Operation.....	14
3.7 Output Operation.....	14
3.8 Remote Sense and digital port functions .....	14
3.9 Digital Volt Meter (DVM).....	14
3.10 Milliohm Meter .....	15
<b>4. Remote Operation.....</b>	<b>16</b>
4.1 Serial adapter connector .....	16
4.2 Communication between Power Supply and PC.....	17
4.3 SCPI Command Overview .....	18
Common IEEE488.2 Commands .....	18
Essential SCPI Commands .....	19
Port Configuration Commands.....	21
Trigger Command .....	21
SCPI Condition Register .....	21
4.4 SCPI Command Description .....	22
Common IEEE488.2 Commands .....	22
Essential SCPI Commands .....	25
Output Commands.....	28
List File Commands .....	29
Interface Configuration Commands .....	33
Trigger commands.....	34
<b>5. Specifications.....</b>	<b>36</b>
5.1 Specifications .....	36
5.2 Supplemental Characteristics .....	39

# **1. Introduction**

## **Description**

Models 9120A, 9121A, 9122A, 9123A, 9124, 9150, 9151, 9152, and 9153 are fully programmable, linear DC Power Supplies that provide you with clean and reliable power, high resolution and accuracy combined with fast transient response times and excellent temperature stability. The front panel keys and the control knob provide a convenient interface for adjusting Voltage and Current, storing and recalling operating states or enabling/disabling the output. This power supply is suitable for either bench or rack mounted operation. The 912xA is a compact, laboratory grade power supply well suited for applications in design, production or use in university labs.

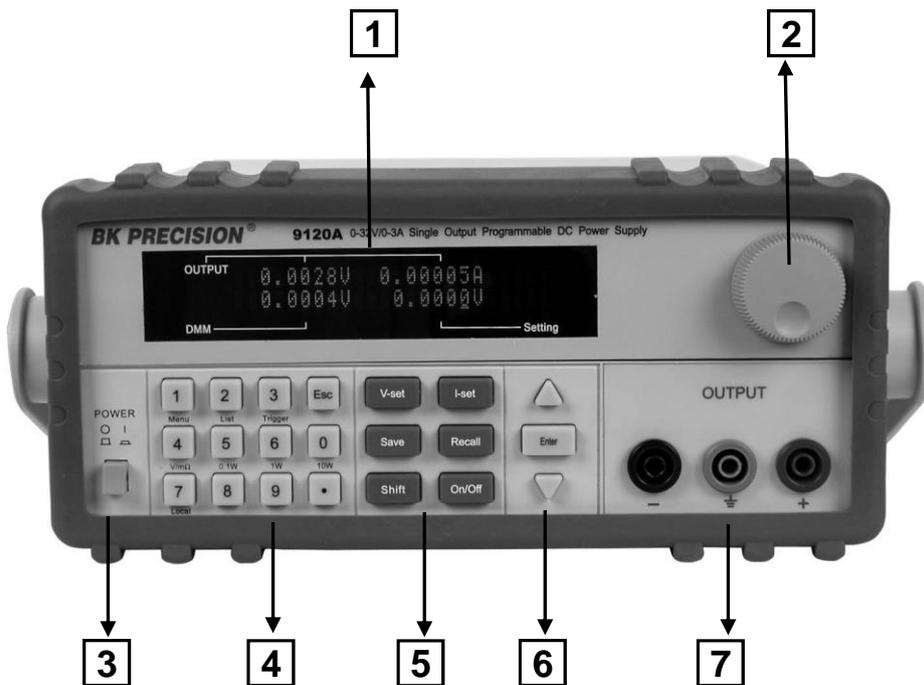
## **Features**

- Very high accuracy and resolution: 0.1 mV, 0.1 mA
- Low ripple and low noise
- Fast settling time of <150  $\mu$ s
- 5  $\frac{1}{2}$  digit digital voltage meter and m $\Omega$  meter
- Convenient data entry via knob or numerical key pad
- Over Temperature (OTP) protection
- Bright and easy to read display (VFD technology)
- Excellent temperature stability
- Output on/off control
- SCPI compatible command set. Communicate via USB or GPIB (model 9123A only) interface
- Application Software for front panel emulation and simple test sequence generation
- Rack mount kit available
- Closed case calibration
- Remote Sense Function
- Discrete Fault Indicator/Remote Inhibit (DFI/RI). Can be used to turn off power supplies simultaneously. (DFI available for models 9120A, 9121A, 9122A, 9123A, 9124 only)
- List Mode: Generate, store and execute test sequences without the need for an external computer

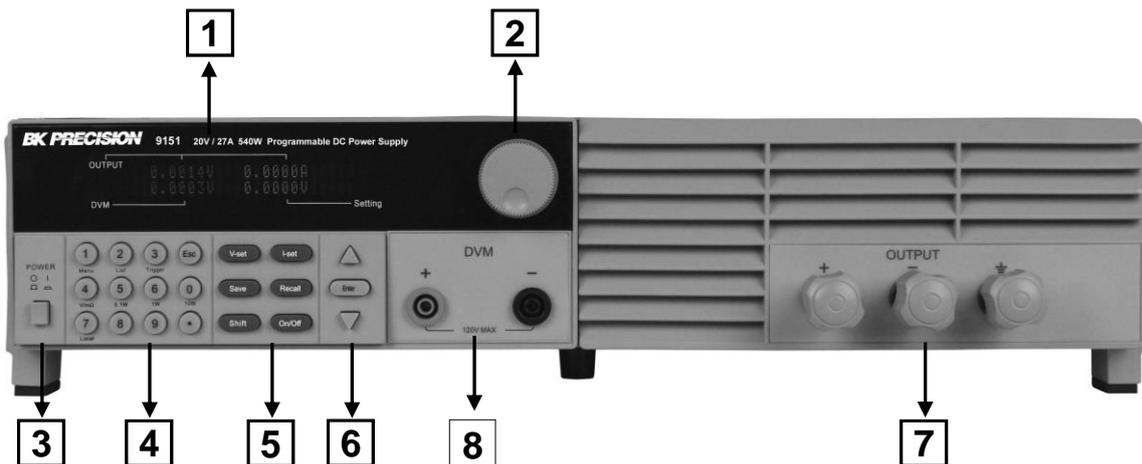
## 2. Quick Reference

### 2.1 The Front Panel

**For Models:** 9120A, 9121A, 9122A, 9123A, 9124



**For Models:** 9150, 9151, 9152, 9153

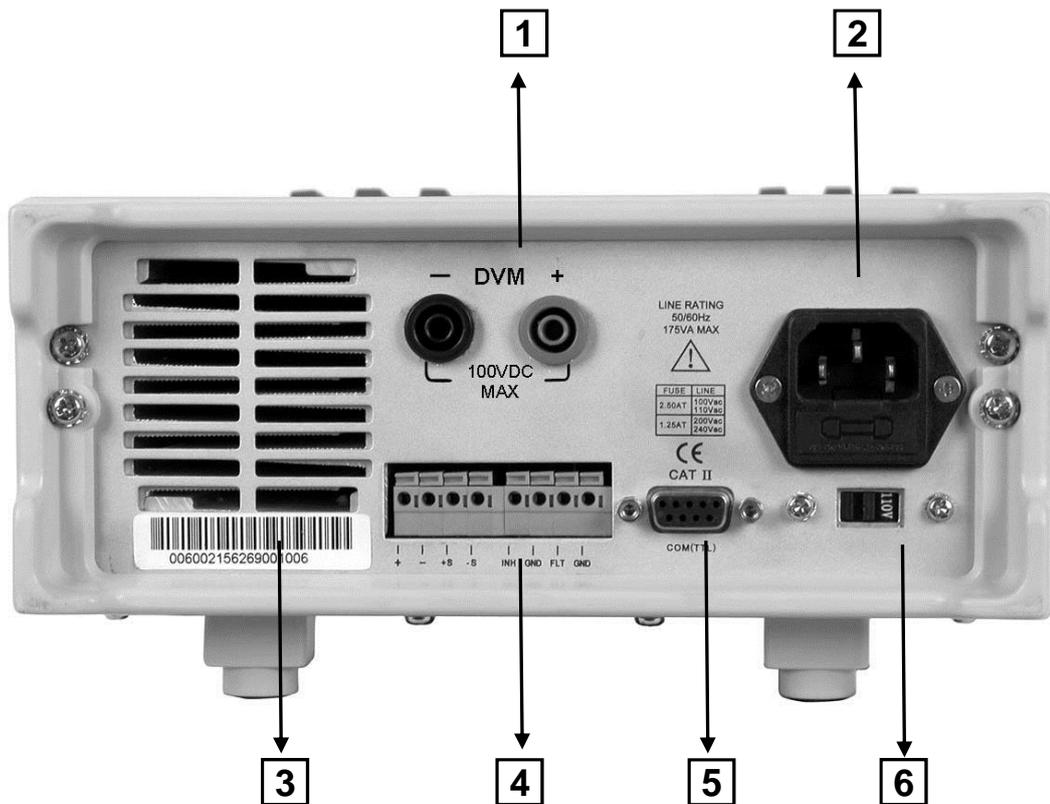


- 1** VFD display
- 2** Rotary knob
- 3** Power switch
- 4** Numeric keys, auxiliary. functions

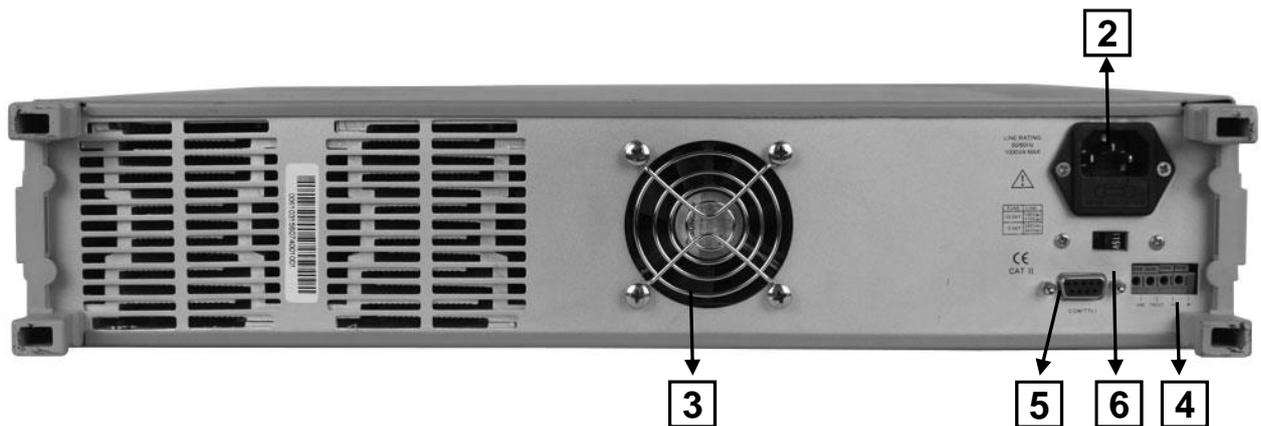
- 5** Function keys
- 6** Up/Down keys and “Enter” key
- 7** Output terminals
- 8** Digital Voltmeter terminals (For Model 9150, 9151, 9152, 9153)

## 2.2 The Rear Panel

**For Models:** 9120A, 9121A, 9122A, 9123A, 9124



**For Models:** 9150, 9151, 9152, 9153



- |          |  |
|----------|--|
| <b>1</b> | Digital Voltmeter terminals. (For models 9150, 9151, 9152, and 9153, these terminals are in the front panel) |
| <b>2</b> | AC power inlet and fuse compartment  |
| <b>3</b> | Ventilation holes  |
| <b>4</b> | Quick connect terminal for Remote sensing and digital port functions (digital I/O, DFI/RI and ext. trigger)  |
| <b>5</b> | TTL interface connector for remote control   |
| <b>6</b> | AC Power selection switch (110 V / 220 V)  |

## 2.3 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 authorized B&K Precision distributor.

- Power cord
- Instruction manual
- Calibration Report
- Communication cable(s)
- Software Installation disk

### 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 turn on at once. Check for any missing display segments. Refer to section 1.5 in this chapter if the power supply does not turn on.

### 3. Checkout Procedure

At power up, the instrument will automatically perform a self test routine. During this time, the following should be displayed:

System Test, Please wait!



followed by

<b>0.000V</b>	<b>0.0000A</b>
<b>0.000V</b>	<b>0.00<u>0</u>V</b>

The first row displays the actual output voltage value and current and the state of power supply. The second row displays the voltage measured by the DVM (on left) and the Set Value for the voltage of the power supply.

To obtain additional information about the instrument, press and hold the SHIFT button during Power Up. On the display you will see the following:

First row: V/A rating and DVM voltage range

second row: Firmware version and serial number

**Sourc: XXV XA Meas: XXV**  
**Ver: 1.67 SN:5975002002**

Press “Esc” to exit the display.

**In case the self test routine is not successful, you may see one of the following:**

If the EEPROM was damaged or the latest operation data is lost, the VFD will display:

**ERR EEPROM**

If the calibration data stored in the EEPROM is lost, the VFD will display

**ERROR CAL**

If the latest operating state of the power supply in EEPROM is lost, the VFD will display:

**Error Config Data**



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

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## 1.4 Output Verification

The following procedures verify that the power supply outputs the correct voltage and current levels and properly responds to entries from the front panel.

### Voltage Output Check

The following steps verify basic voltage functions without load.

1) Turn on the power supply.

2) Enable the outputs

Press the  key. Notice the CV annunciator turning on.

3) Set the voltage value

Set a different voltage value. Make sure that the set value and output value are the same. Also check if the output current value is zero or close to zero A.

4) Ensure that the voltage can be adjusted from zero to the maximum rated value.

### Current Output Check

The following steps check the basic current functionality by shorting the power supply's output.

- 1) Turn on the power supply.
- 2) Disable the output by pressing the **Out on/off**. The ON annunciator is turned off.
- 3) Connect a short across the (+) and (-) output terminals with an insulated test lead. Use a wire size sufficient to handle the maximum current.
- 4) Enable the output.
- 5) Adjust the voltage value to 1.0 volt. Ensure that the CC annunciator is lit (power supply is in CC operation mode)
- 6) Adjust the current value. Set a different Current value and check if the actual Current value is the same as the set Current value. Also verify that the output voltage value is nearly zero.
- 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.

### 1.5 If the power supply does not turn On

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

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

Verify that the power cord is firmly plugged into the power receptacle on the rear panel of the power supply. Make sure the power outlet you are using is working properly and verify that the power supply is turned on.

2. Verify the power-line voltage setting.

Make sure the voltage selector switch is set according to the present line voltage (110 VAC or 220 VAC). Change the voltage setting if it's not correct.

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

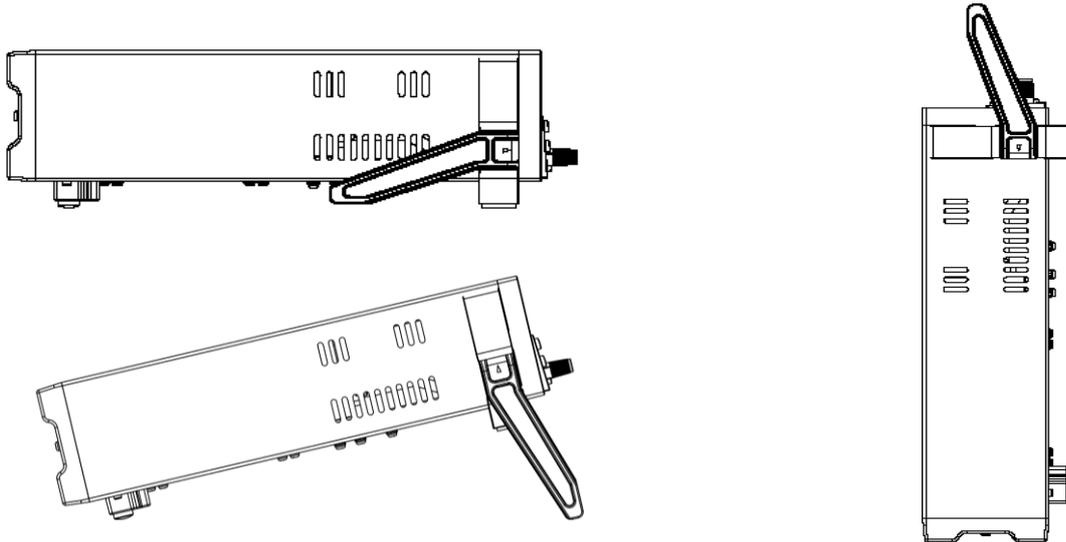
#### 1.5.1 Fuse Replacement

Model	Fuse Description (110 VAC)	Fuse Description (220 VAC)
9120A	T2.5A 250V	T1.25A 250V
9121A	T2.5A 250V	T1.25A 250V
9124	T2.5A 250V	T1.25A 250V
9122A	T3.15A 250V	T1.5A 250V
9123A	T3.15A 250V	T1.5A 250V
9150	T10A 250V	T5A 250V
9151	T10A 250V	T5A 250V
9152	T10A 250V	T5A 250V
9153	T10A 250V	T5A 250V

Replace blown fuses according to the table above.

## 1.6 Adjusting the Carrying Handle

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

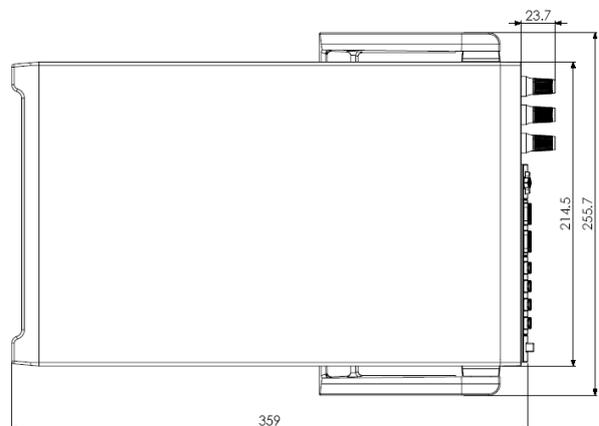
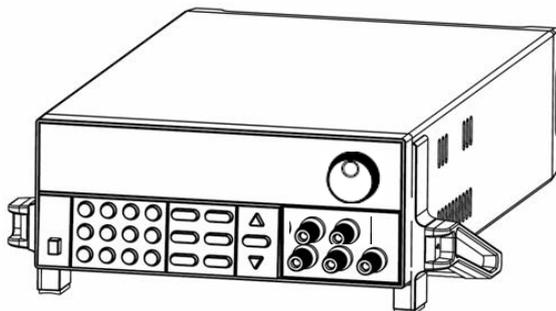
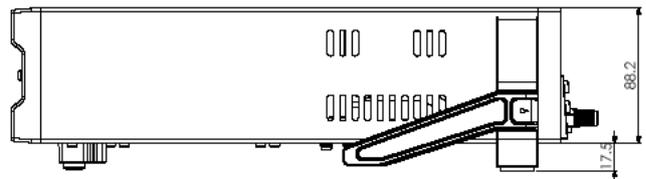
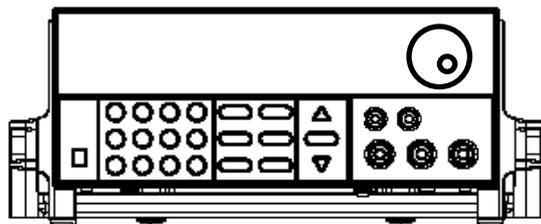


### Dimensions:

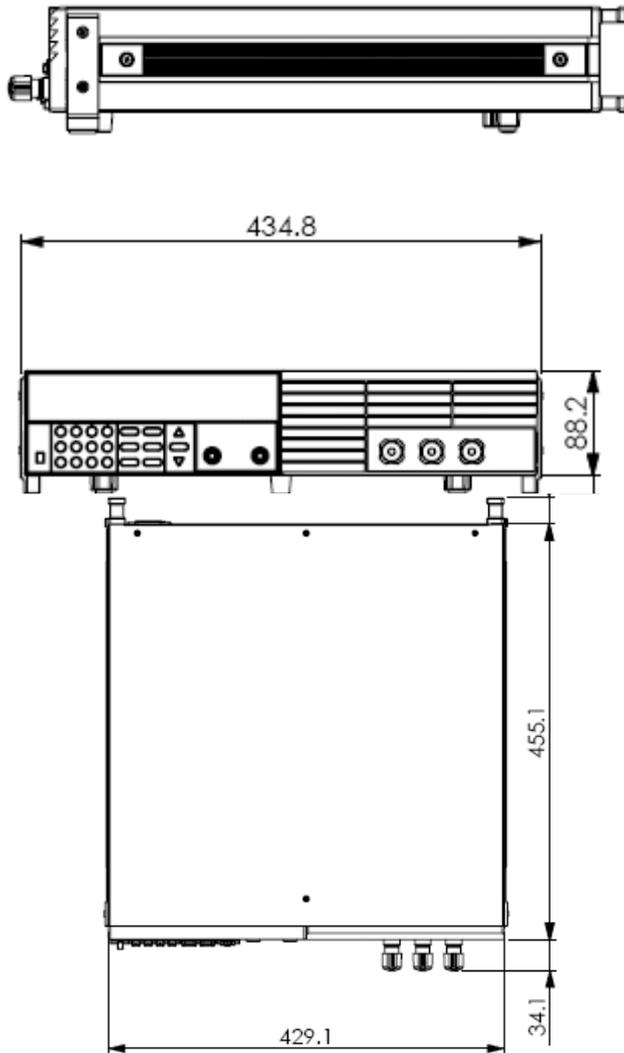
214.5 mm (W) x 88.2 mm (H) x 354.6 mm (D)

all units in mm

**For Models:** 9120A, 9121A, 9122A, 9123A, 9124



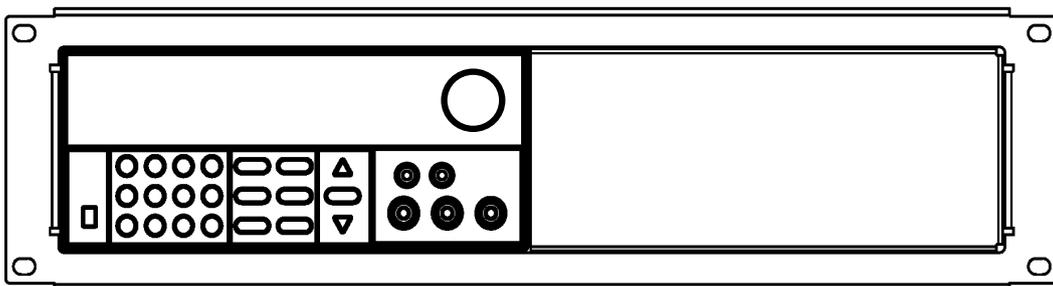
**For Models:** 9150, 9151, 9152, 9153



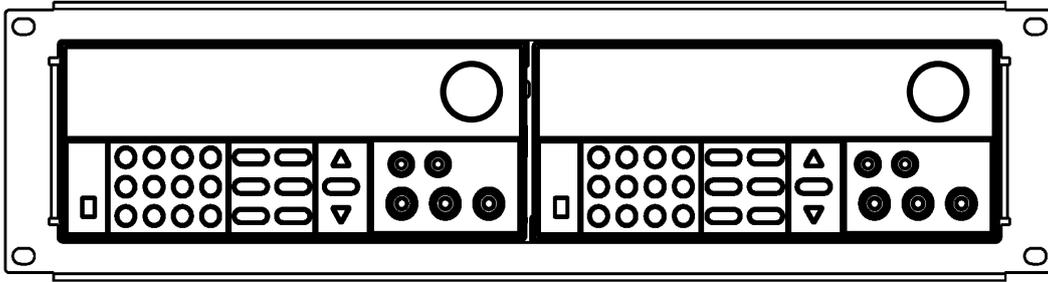
### 1.7 Rack Mounting the Instrument

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 on the side, pull outwards and rotate it to a special position where the arrow on the handle and the arrow on the plastic ears are in opposite directions. Now you can pull the handle outwards. After removing the handle, you can remove the two plastic ears with a screw driver.



To rack mount a single instrument, order rack mount kit IT-E151



To rack mount two instruments (models 9120A, 9121A, 9122A, 9123A, 9124 only) side-by-side, order rack mount kit IT-E151, In this case you don't need to use the front cover panel.

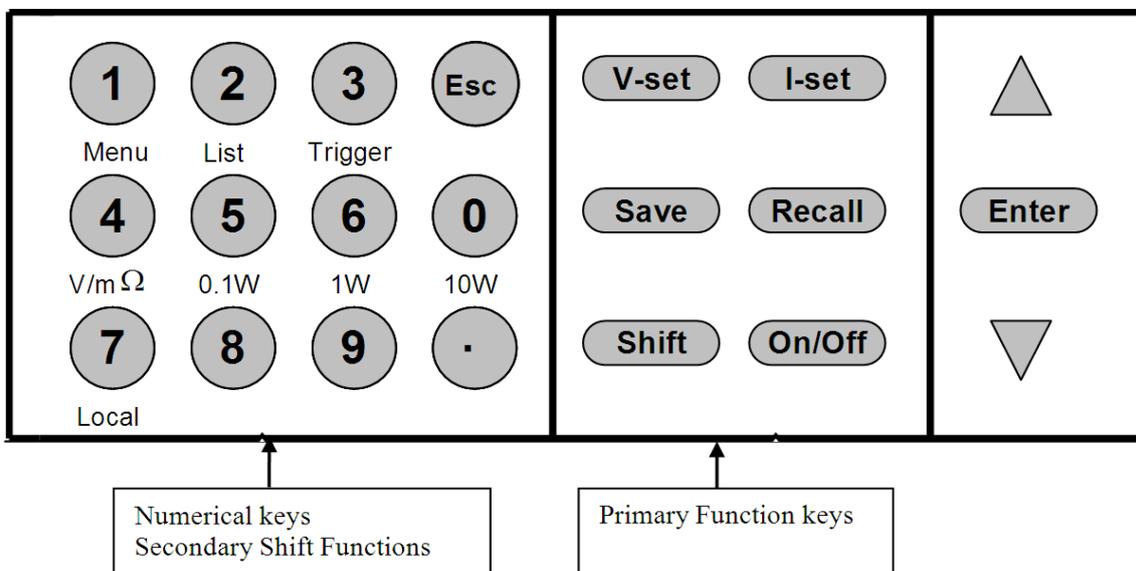
### 3. Front-panel Operation

So far we have covered the quick start chapter which briefly introduced the front panel operation and how to check basic voltage and current functionality. This chapter describes in detail how to operate the instrument manually via the front-panel keys.

This chapter is divided into the following sections:

- Front-Panel Operation Overview
- Setting the Voltage
- Setting the Current
- Save/Recall Operation
- Menu Operation
- On/Off Operation
- Remote Sense and digital port functions
- mΩ Meter
- Digital Voltage Meter

#### 3.1 Front Panel Keys



## Numerical Keys/Secondary Shift Functions

### Shift Functions

V/mΩ:	Toggle between DVM and mΩ Meter mode
0.1 W:	Set the range of the mΩ Meter to 0.1 W
1 W:	Set the range of the mΩ Meter to 1 W
10 W:	Set the range of the mΩ Meter to 10 W
Menu	Set the parameters of the power Supply
List	Generate programs in List Mode
Trigger	Generate a single trigger pulse (when configured for Immediate mode)
Local	Enable front panel operation when in remote mode
0 – 9	Numerical keys for direct entry of values

## Primary Function Keys

### Up/Down and Entry key

▲: Up key

▼: Down key

**Enter:** Press to confirm numerical entries

## 3.2 Front-panel Operation Overview

- 1) The power supply at shipment is preconfigured for front-panel operation. At power-on, the power supply will automatically start up in front panel operation mode.
- 2) When the power supply is in remote operation mode, the front-panel is disabled. You can revert to Local mode, by pressing the Local button or by sending the appropriate SCPI command. Toggling between front-panel and remote operation modes will not result in any change of the output parameters.
- 3) The output of the power supply can be enabled or disabled from the front panel by pressing the  key. When the output is on, the CV or CC annunciator will turn on.
- 4) The VFD annunciators display the present operating status of the power supply. At power up, the following is displayed: The top row shows the actual output voltage and output current value and the state of the power supply. The second line shows the voltage value as measured by the DVM and the Set value of the Voltage. The bottom right field is also used to display the Current Set Value, the Menu parameters and the Ohm meter range.

## 3.3 Setting the Voltage

The Voltage can be adjusted from 0V to the maximum rated voltage of each model. There are 2 ways to set the constant voltage value.

Solution1:

Press the ▲ and ▼ keys or the knob to change the value of the least significant digit

Solution2:

1. Press 

2. Use the numeric keys  to  and confirm your entry by pressing 

### 3.4 Setting the Current

The Current output is adjustable from 0A to the maximum current value of each model.

1. Press **I-Set**
2. Enter a numerical value or use the **▲** and **▼** keys to change the current value
3. Press **Enter** to confirm the value

### 3.5 Save and Recall Operation

You can store up to 50 different operating states in memory locations 1 through 50. Each operating state includes a constant voltage value, constant current value, maximum output voltage value and voltage step value.

To save a setting:

Set the desired Voltage and Current value

Press the save **Save** key. Use the knob to scroll to one of the memory locations 1 – 50. Press **ENTER** to assign and store the current settings to the selected memory location

To recall a setting:

Press the Recall key. Use the knob to scroll to the memory location where the settings you want to recall are stored. Press **ENTER** to recall and activate those settings

You can also use the SCPI command: \*SAV \*RCL to save and recall respectively.

### 3.6 Menu Operation

### 3.7 Output Operation

For front panel operation, press **On/Off** to enable/disable the output. If the power supply is in remote control mode, you can send SCPI command (OUTPut ON|OFF) to change the state of output.

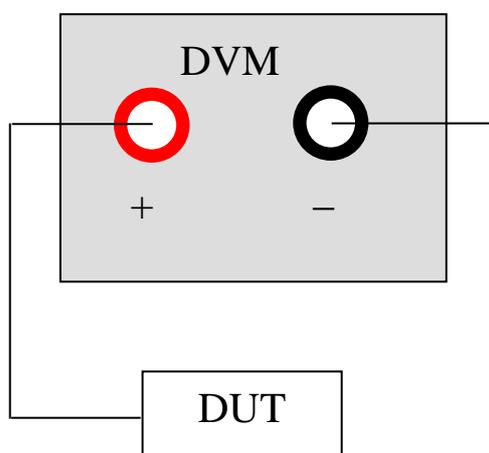
### 3.8 Remote Sense and digital port functions

### 3.9 Digital Volt Meter (DVM)

The power supply provides a built-in Digital Volt meter which can measure DC volts in a range from 0 - 40V.

The connectors are in the rear panel. The voltage value is displayed on the bottom left field of the display.

To measure voltages, connect the leads as shown here:



By default, the power supply is in DVM mode. Press **Shift** followed by V/mΩ to toggle between Voltmeter and mΩ Meter mode.

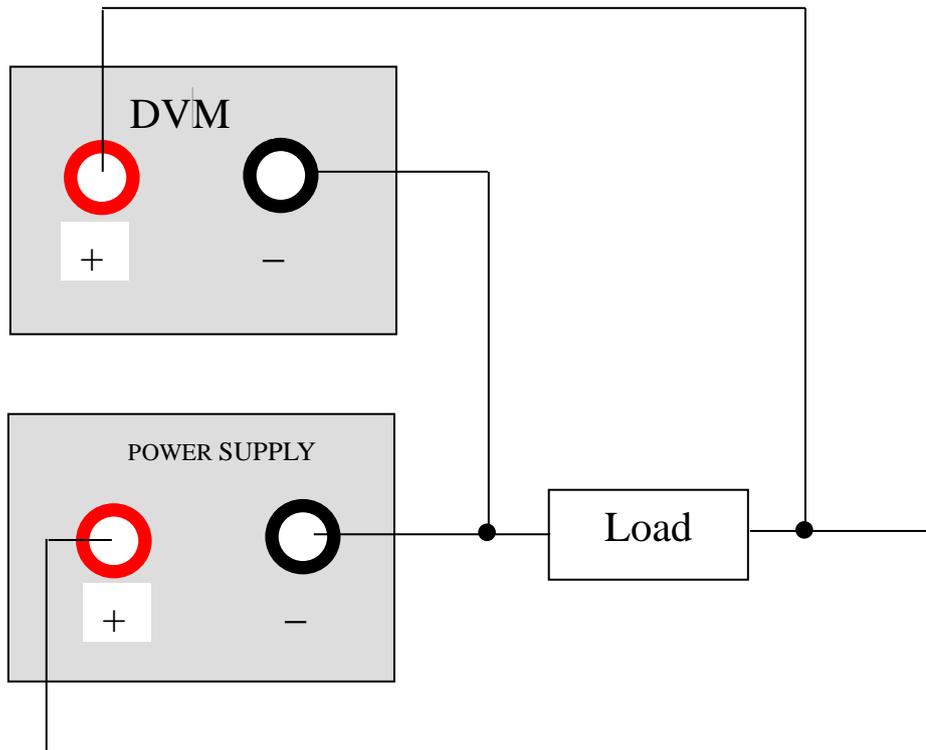
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**NOTE:** The DVM **integrated inside** these power supplies is an added feature for the convenience of monitoring voltages of a setup being powered by the same power supply with the DVM. It is not meant to be used as a standalone measuring unit. Due to the input of the DVM being partially integrated to the internal circuitry of the power supply, and the DVM not having a floating reference, there are limitations on the applications it can be used for. For example, it cannot be used to measure negative voltages (only positive voltage, 0-40VDC), it cannot measure a dry cell battery, and it cannot measure a voltage source with isolated GND.

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### 3.10 Milliohm Meter

The instrument is also equipped with a Milliohm Meter which can accurately measure resistance up to 10 Ω. To protect the resistor, make sure to select an appropriate power range before connecting it to the power supply. To measure resistance, connect the resistor as shown below:



To measure resistance:

- 1) Enable Ohmmeter mode: Press **Shift** followed by V/mΩ (Display will show ---.---mΩ Range 0.1 W)
- 2) Press **Shift** followed by 0.1 W /1 W /10 W to select an appropriate range for the resistor you are measuring.

Measurement range	0.1 W	1 W	10 W
Test voltage (Output)	1 V	3.3 V	10 V

## **4. Remote Operation**

The DB9 TTL interface connector on the rear panel of the power supply can be connected to a USB (virtual com) or GPIB (model 9123A only) interface via a serial converter cable. This chapter describes how to use a computer to control the output of the power supply.

### **4.1 Serial adapter connector**

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**Note:** It is **not possible** to connect the DB9 TTL connector on the power supply's rear panel supply via a standard RS232 cable to a PC's RS232 port.

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#### **USB to TTL serial Converter cable IT-E132B**

The DB9 interface connector on the rear panel of the power supply provides a TTL level interface. Use the communication cable (IT-E132B) to connect the DB9 interface connector of the power supply to the USB interface connector of the computer.

#### **IT-E132B communication**

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**Note:** Before you can use the USB communication cable, you must install the USB driver which can be found on the included installation disk. The driver can also be downloaded at [www.bkprecision.com](http://www.bkprecision.com)

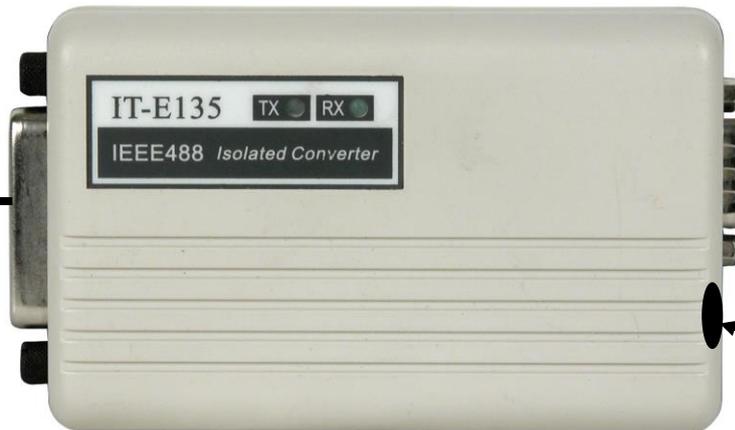
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#### **GPIB to TTL adapter IT-E135 (Model 9123A only)**

The DB9 interface connector on the rear panel of the power supply provides a TTL voltage level interface. Use the communication adapter IT-E135 to communicate via GPIB

## PC

Connect this side to your computer's GPIB interface (GPIB cable not included)



## Power Supply

Connect this connector to DB9 TTL connector of power supply (serial cable included)

Connect external AC power adapter (included)

Recommended power up sequence:

Connect the IT-E135 adapter to your computer and to the power supply as indicated in the above figure. Connect the external power adapter. Both TX and RX LED should be lit (provided the power supply is turned off). Turn on power supply. The TX and RX LEDs will turn off. For maximum throughput, set the baudrate to 38400. Set parity to NONE (default setting). Set address to the desired GPIB instrument address.

Note: The RX LED and TX LEDs will flicker to indicate activity on the GPIB bus. The RX LED indicates a write command (from controller's perspective), the TX LED will indicate data transmission from power supply to GPIB controller.

## 4.2 Communication between Power Supply and PC

Before putting the instrument into remote operation, make sure that the baud rate, parity bit and communication address settings on the power supply and computer side are identical, otherwise communication will not be possible.

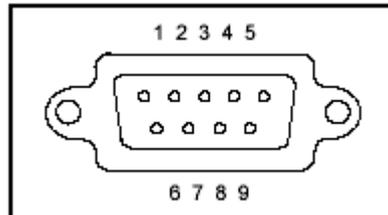
1. Address            Range is 0 to 30. Default setting is 0.
2. Baud rate:        4800,9600,19200 and 38400 are selectable, default setting is 9600
3. Parity and Data bits:    None/8 bits (default setting)  
                                  Even/8 bits  
                                  Odd/8 bits
4. Stop bits: 1 (fixed)
5. Start Bits: 1 (fixed)

### Data Frame Format

Parity=None	Start Bit	8 Data Bits	Stop Bit	
Parity=Odd, Even	Start Bit	8 Data Bits	Parity Bit	Stop Bit

**End of String character is '\n' (0x0a)**

### DB9 Interface Details



The DB9 connector in the rear panel of the power supply provides a TTL level signal. It can be connected to a standard PC interface via the IT-E132B isolated converter/adaptor.

### Flow Control

There are no hardware flow controls for sending and receiving commands to the power supply. The average time it takes to both send and receive every command is approximately 200ms. In the case of more complex commands, more time may be required to complete transmission.

**Note:** Configuration of address parameter

Communication via USB (virtual com): Setting of the address is optional. It is not required to communicate with the instrument. The address can be set from the front panel and is stored in non volatile memory. This feature is useful when communicating via USB, and connecting several instruments, e.g. via a USB hub. In this scenario, Windows assigns a virtual COM port to each device which is unknown prior to establishing communications with the instrument (could be different each time). In this case, the user can correlate each virtual COM port randomly assigned by Windows with a user defined address.

Communication via GPIB: Setting of the address value is mandatory and corresponds to GPIB instrument address according to GPIB/IEEE-488 conventions. Valid values are 0 – 30.

## 4.3 SCPI Command Overview

### Common IEEE488.2 Commands

\*CLS  
 \*ESE  
 \*ESE?  
 \*ESR?  
 \*IDN?  
 \*OPC  
 \*OPC?  
 \*PSC  
 \*PSC?  
 \*RST  
 \*SRE  
 \*SRE?  
 \*STB?  
 \*TRG  
 \*SAV  
 \*RCL

## Essential SCPI Commands

### SYSTem

:ERRor[:NEXT]?  
 :VERSion?,  
 :ADDRes?  
 :REMote  
 :LOCal  
 :RWLock

### STATus

:QUEStionable  
     [:EVENT]?  
     :CONDition?  
     :ENABle <VALUE>  
     :ENABle?  
 :OPERation  
     [:EVENT]?  
     : CONDition?  
     :ENABle <VALUE>  
     :ENABle?

## Calibration Command

### CALibration

:SECure  
     [:STATe] {<ON|OFF>,<quoted code>}  
     [:STATe]?  
 :VOLTage  
     :LEVel {<level>}  
     [:DATA] {<numeric value>}  
 :CURRent  
     :LEVel {<level>}  
     [:DATA] {<numeric value>}  
 :DVM  
     :LEVel {<level>}  
     [:DATA] {<numeric value>}  
 :SAVe  
 :INITial

## Output Commands

### OUTPut

[[:STATe] {<bool>}  
[:STATe]?  
:TIMer  
[:STATe] {<bool>}  
[:STATe]?  
:DATA {<timer>}  
:DATA?

### [SOURce:]

MODE {<FIXed|LIST|DRM>}  
MODE?  
VOLTage  
[:LEVel] {<n>}  
[:LEVel]?  
:PROTection  
:STATe {<bool>}  
:STATe?  
[:LEVel] {<n>}  
[:LEVel]?

### CURRent

[:LEVel] {<n>}  
[:LEVel]?

### LIST

:MODE {<mode>}  
:MODE?  
:STEP {<step>}  
:STEP?  
:COUNt {<n>}  
:COUNt?  
:CURRent  
[:LEVel] {<n>,<n>}  
[:LEVel]? {<n>}  
:VOLTage  
[:LEVel] {<n>,<n>}  
[:LEVel]? {<n>}  
:WIDth {<n>,<n>}  
:WIDth? {<n>}  
:NAME {<string code>}  
:NAME?  
:AREA {1|2|4|8}  
:AREA?  
:SAVe {1|2|3|4|5|6|7|8}  
:RCL {1|2|3|4|5|6|7|8}  
:UNIT {SECOND, MSECOND}

## Input Measure Command

### MEASure

[[:SCALar]  
:VOLTage[:DC]?  
:CURRent[:DC]?  
:POWer[:DC]?  
:DVM[:DC]?  
:RESistance[DC]?

## Port Configuration Commands

```
[SOURce:]
  SYSTem
    : SENSE [:STATe] {<bool>}
      [:STATe]?
  PORT
    :FUNCTion {<TRIGger|RIDFi|DIGital>}
    : FUNCTion?
  RI
    :MODE {<OFF|LATChing|LIVE>}
    :MODE?
  DFI
    :SOURce {<OFF|QUES|OPER|ESB|RQS>}
    :SOURce?
  DIGital
    :OUTPut[:STATe] {<bool>}
    :INPut[:STATe]?

SENSE
  :RESistance:
    :RANGe {LOW | MIDdle | HIGH>}
    :RANGe?
```

## Trigger Command

```
TRIGger
  [:IMMediate]
  :SOURce {<source>}
```

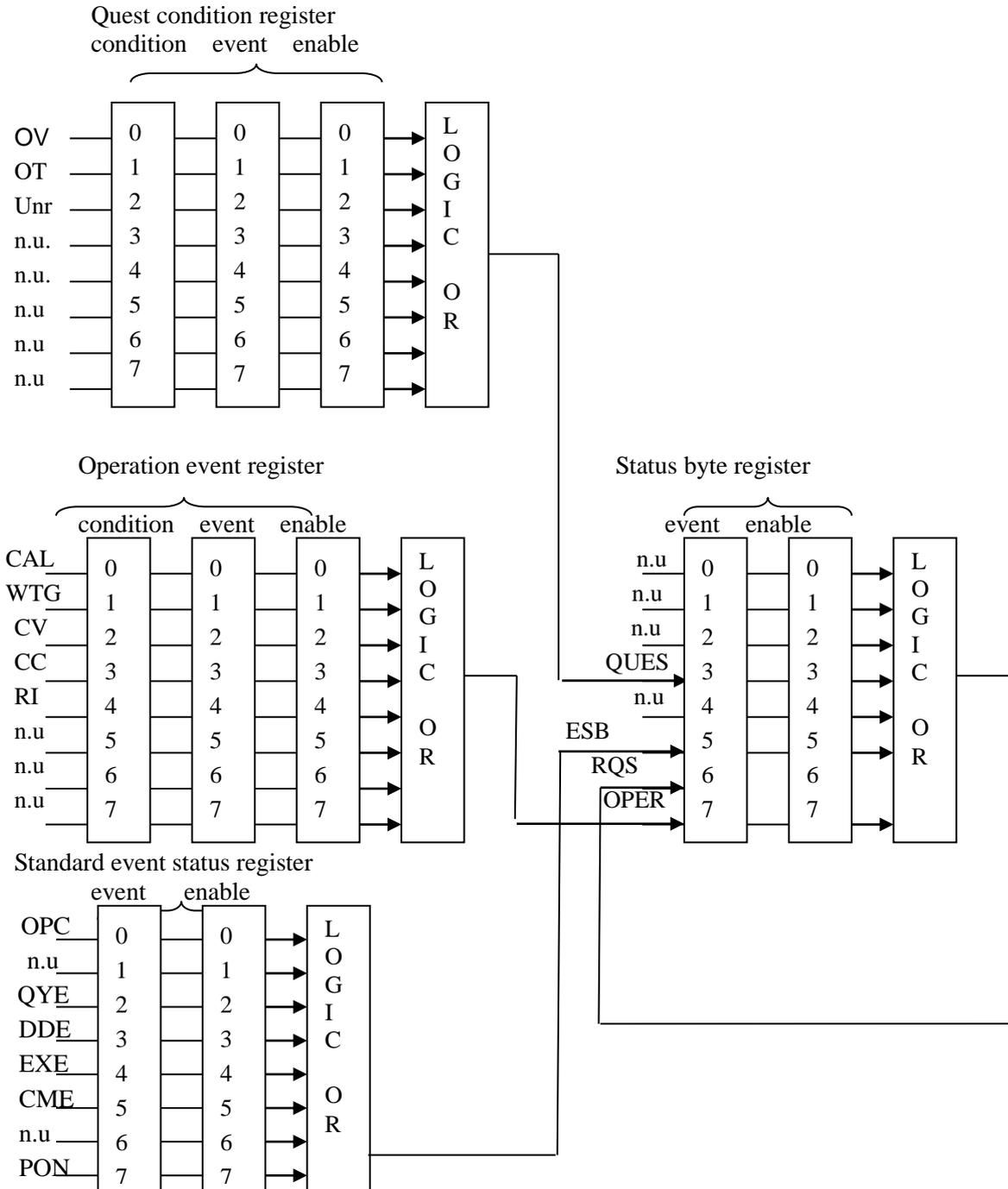
## SCPI Condition Register

You can obtain the state of the power supply and read parameters from the operation register. The different states of the power supply can be read from 7 condition registers. These registers are status byte register, standard event register, quest condition register and operation status register. The status byte register stores the information of 3 other registers. The following table provides the details on each register's meaning.

BIT	Signal	Meaning
0	CAL	Operation status register The power supply is calculating new calibration parameter.
1	WTG	The power supply is waiting for a trigger signal.
2	CV	The power supply is in constant voltage condition.
3	CC	The power supply is in constant current condition.
4	RI	Show the input level condition of RI
0	OV	Quest condition register Over voltage
1	OT	Over temperature
2	UNR	The output of the power supply is unregulated.
0	OPC	Standard event status register Operation of power supply is completed.
2	QYE	Query error. Data of output array is missing.
3	DDE	Device-dependent error. Data stored in register is missing or error occurs in preliminary checkout.
4	EXE	Execution error. Command parameter overflows or the condition is not right.
5	CME	Command error. Syntax or semantic error occurs when receiving information.
7	PON	Power on. It is 1 when power supply is reset.
3	QUES	Status byte register If a quest enable condition changes, QUES is 1.

5	ESB	If a standard event status enable register changes, ESB is 1.
6	MSS RQS	
7	OPER	

Structure of condition register:



**4.4 SCPI Command Description**

Common IEEE488.2 Commands

**\*CLS**

This command clears the following registers:

- ◆ Standard event status register
- ◆ Quest condition register
- ◆ Operation event register
- ◆ Status byte register
- ◆ Error code

Command syntax: \*CLS  
 Parameter: None

**\*ESE**

This command sets the parameter of the standard event enable register. The value determines which bit value of the standard event register is set to 1. The ESB bit in of status byte register will change to 1 to reflect the changes.

Command syntax: \*ESE <NRf>  
 Parameter: 0~255  
 Reset value: Consult \*PSC command  
 Example: \*ESE 128  
 Query syntax: \*ESE?

Return parameter: <NR1>  
 Reference command: \*ESR? \*PSC \*STB?

Bit map of standard event status enable register

Bit position	7	6	5	4	3	2	1	0
Bit Name	PON	Not used	CME	EXE	DDE	QYE	Not used	OPC
Bit Weight	128		32	16	8	4		
PON	Power-on			DDE	Device-dependent error			
CME	Command error			QYE	Query error			
EXE	Execution error			OPC	Operation complete			

**\*ESR?**

This command queries the standard event status register. After executing this command, the standard event status register is reset. The bit definition of the standard event status register is identical to the standard event status enable register

Query syntax: \*ESR?  
 Parameter: None  
 Return parameter: <NR1>  
 Reference command: \*CLS \*ESE \*ESE? \*OPC

**\*IDN?**

This command reads information about the power supply. The return value contains 4 segments divided by a comma.

Query syntax: \*IDN?  
 Parameter: None  
 Return parameter: <AARD>      segment                      description  
    BK Precision                      manufacturer  
    XXXX                                      product mode  
    XXXXXX                                    product serial number  
    VX. XX                                      software version number

For example: BK PRECISION, 9120A, 000004, V1.01

## **\*OPC**

When all commands sent to the instrument prior to this command have been executed, OPC of the standard event status register will be set to 1.

Command syntax: \*OPC

Parameter: None

Query syntax: \*OPC?

Return parameter: <NR1>

## **\*PSC**

This command controls whether or not the power supply sends when it is reset.

1 OR ON: When power supply is reset, operation event enable register, query event enable register and standard event status register are all reset.

0 OR OFF: The data of status byte register, operation event enable register, quest event enable register and standard event status enable register is stored in nonvolatile register, and is recalled when power supply is reset.

Command syntax: \*PSC <bool>

Parameter: 0|1|ON|OFF

Query syntax: \*PSC?

Return parameter: 0|1

Reference command: \*ESE \*SRE STAT:OPER:ENAB STAT:QUES:ENAB

## **\*RST**

This command resets the power supply to its default setting.

CAL:SEC:STAT OFF

OUTP OFF, CURR MAX

VOLT:PROT:MAX

VOLT: MIN

TRIG:SOUR BUS

SYST:SENS OFF

PORT:MODE TRIG

RI:MODE OFF

DFI:SOUR OFF

VOLT:PROT:STAT OFF

Command syntax: \*RST

Parameter: None

## **\*SRE**

This command can set the parameter of the status byte enable register. The value of this parameter determines which bit value of the status byte register is 1 and the byte will enable RQS of status byte register is 1. The bit definition of the status byte enable register is the same as the status byte register.

Command syntax: \*SRE <NRf>

Parameter: 0~255

Reset value: Consult \*PSC command

Example: \*SRE 128

Query syntax: \*SRE?

Return parameter: <NR1>

Reference Command: \*ESE \*ESR? \*PSC \*STB?

## **\*STB?**

This command reads data from the status byte register. After executing this command, the status byte register is reset.

Query syntax: \*STB?

Parameter: None  
 Return parameter: <NR1>  
 Reference command: \*CLS \*ESE \*ESR

Bit map of the standard event status enable register

Bit Position	7	6	5	4	3	2	1	0
Bit Name	OPER	RQS	ESB	no use	QUES	no use	no use	no use
Bit Value	128	64	32		8			

### \*TRG

When the power supply's trigger source is set to Bus command, this command will generate a trigger signal. Its function is identical to the [SYSTem:]TRIGger command.

Command syntax: \*TRG

Parameter: None

Reference command: TRIG TRIG:SOUR

### \*SAV

This command saves the operating parameters of the power supply to non volatile memory. The parameters include constant current, constant voltage, maximum voltage value and step voltage values.

Command syntax: \*SAV<NRf>

Parameter: 1~50

Example: \*SAV 3

Reference command: \*RCL

### \*RCL

This command recalls the parameter saved with the \*SAV command.

Command syntax: \*RCL<NRf>

Parameter: 1~50

Example: \*RCL 3

Reference command: \*SAV

## Essential SCPI Commands

### **SYSTem:ERRor[:NEXT]?**

This command queries the error code and error information of the power supply.

- (0) No error
- (1) Too many numeric suffices in Command Spec
- (10) No Input Command to parse
- (14) Numeric suffix is invalid value
- (16) Invalid value in numeric or channel list, e.g. out of range
- (17) Invalid number of dimensions in a channel list
- (20) Parameter of type Numeric Value overflowed its storage
- (30) Wrong units for parameter
- (40) Wrong type of parameter(s)
- (50) Wrong number of parameters
- (60) Unmatched quotation mark (single/double) in parameters
- (65) Unmatched bracket
- (70) Command keywords were not recognized
- (80) No entry in list to retrieve (number list or channel list)
- (90) Too many dimensions in entry to be returned in parameters
- (101) Command Execution error
- (100) Too many command

- |       |                        |
|-------|------------------------|
| (110) | Rxd error Parity       |
| 1.    | Error EEPROM           |
| 2.    | Config data error      |
| 3.    | Error Calibration data |
| 4.    | Factory Data error     |

Command syntax: SYST:ERR?

Parameter: None

Return parameter: <NR1>, <SRD>

### **SYSTem:VERSion?**

This command queries the software version.

Command syntax: SYST:VERS?

Parameter: None

Return parameter: <NR2>

### **SYSTem:ADDRess?**

This command queries the address of the power supply

Command syntax: SYST:ADDR?

Parameter: None

Return parameter: <NR2>

### **SYSTem:REMote**

This command puts the power supply in remote control mode.

Command syntax: SYST:REM

Parameter: None

Query syntax: None

### **SYSTem:LOCal**

This command configures the instrument for front panel operation

Command syntax: SYST:LOC

Parameter: None

Query syntax: None

### **SYSTem:RWLock[:STATe]**

This command also sets the instrument to remote control mode. When using this command, it is not possible to press LOCAL key on the front panel to revert back to manual mode.

Command syntax: SYST:RWL

### **STATus:QUEStionable[:EVENT]?**

This command queries the parameters of the quest event register. After execution, the quest event register is reset.

Query syntax: STATus:QUEStionable[:EVENT]?

Parameter: None

Return parameter: <NR1>

Reference command: STATus:QUEStionable:ENABLE

Bit map of standard event status enable register

Bit Position	7	6	5	4	3	2	1	0
Bit name	no use	unr	OT	OV				
Bit Value						4	2	1

### **STATus:QUEStionable:CONDition?**

This command queries the parameters of the quest condition register. When a bit of the quest condition changes, the corresponding bit value in the quest event register will be set to 1.

Query syntax: STATus:QUEStionable:CONDition?

Parameter: None

Return parameter: <NR1>

### **STATus:QUEStionable:ENABle**

This command sets the parameter of the quest event enable register. This parameter determines which bit of the quest event register is set to 1. If a QUES condition changes, the QUES bit of status byte register will be set to 1.

Command syntax: STATus:QUEStionable:ENABle <NRf>

Parameter: 0~255

Reset value: Consult \*PSC command

Example: STATus:QUEStionable:ENABle 128

Query syntax: STATus:QUEStionable:ENABle?

Return parameter: <NR1>

Reference command: \*PSC

### **STATus:OPERation[:EVENT]?**

This command queries the parameters of the operation event register. After executing this command the operation event register is reset.

Query syntax: STATus:OPERation [:EVENT]?

Parameter: None

Return parameter: <NR1>

Reference command: STATus:OPERation:ENABle

Bit map of standard event status enable register

Bit Position	7	6	5	4	3	2	1	0
Bit Name	no use	no use	no use	RI	CC	CV	WTG	CAL
Bit value				16	8	4	2	1

### **STATus:OPERation:CONDition?**

This command queries the parameters of the operation condition. When a parameter of the operation condition register changes, the corresponding bit in the operation event register will be set to 1.

Query syntax: STATus:OPERation:CONDition?

Parameter: None

Return parameter: <NR1>

### **STATus:OPERation:ENABle**

This command sets the parameter of the operation event enable register. The parameter determines which bit value of quest event register is set to 1. If a OPER condition changes, the OPER bit of the status byte register will be set to 1.

Command syntax: STATus:OPERation:ENABle <NRf>

Parameter: 0~255

Reset value: Consult \*PSC command

Example: STATus:OPERation:ENABle 128

Query syntax: STATus:OPERation:ENABle?

Return parameter: <NR1>

Reference command: \*PSC

## Output Commands

### **OUTPut[:STATe]**

This command sets the power supply output on or off.

Command syntax: OUTPut[:STATe] <bool>

Parameter: 0|1|ON|OFF

\*RST value: OFF

Query syntax: OUTPut:STATe?

Return parameter: 0|1

#### *Usage:*

If output timer is required, send command OUTPUT:TIMER ON first, then set OUTPUT ON. These two commands must be set in this order to function properly.

### **OUTPut:TIMer[:STATe]**

This command sets the output timer state of the power supply.

Command syntax: OUTPut:TIMer[:STATe] <bool>

Parameter: 0|1|ON|OFF

\*RST value: OFF

Query syntax: OUTPut:TIMer[:STATe]?

Return parameter: 0|1

#### *Usage:*

##### **To start Timer**

- First, set OUTPUT:TIMER ON, then set OUTPUT ON.

##### **To end Timer**

- Set OUTPUT:TIMER OFF to turn timer off.

##### **To check timer status**

- Send command OUTPUT:TIMER?

### **OUTPut:TIMer:DATA**

This command sets the time of the output timer. The unit is in SECOND and decimal fractions cannot be used for this command.

Command syntax: ONPut:TIMer:DATA <NR1>

Parameter: <NR1>

\*RST value: 1

Query syntax: OUPut:TIMer:DATA?

Return parameter: <NR1>

### **[SOURce:]MODE**

This command configures the power supply for command fixed mode, list mode or DVM mode.

FIXed Command fixed mode

LIST List mode

DRM Digital milliohm meter

Command syntax: [SOURce:]MODE <mode>

Parameter: FIXed|LIST|DRM

\*RST value: FIXed

Example: MODE FIX

Query syntax: [SOURce:] MODE?

Return parameter: <CRD>

#### *Usage:*

**MODE FIX** command can also be used to stop a list execution.

### **[SOURCE:]CURRENT[:LEVEL]**

This command sets the current value of the power supply.

Command syntax: [SOURCE:]CURRENT[:LEVEL] <NRf>

Parameter: MIN TO MAX|MIN|MAX

Unit: A mA

\*RST value: MIN

Example: CURR 3A, CURR 30mA, CURR MAX, CURR MIN

Query syntax: [SOURCE:]CURRENT[:LEVEL]?

Parameter: [MIN|MAX]

Example: CURR?, CURR? MAX, CURR? MIN

Return parameter: <NR2>

### **[SOURCE:]VOLTAGE[:LEVEL]**

This command sets the voltage value of the power supply.

Command syntax: [SOURCE:]VOLTAGE[:LEVEL] <NRf>

Parameter: MIN TO MAX|MIN|MAX

Unit: V mV kV

\*RST value: MAX

Query syntax: [SOURCE:]VOLTAGE[:LEVEL]?

Parameter: [MIN|MAX]

Return parameter: <NR2>

### List File Commands

List file operations can be executed using standard SCPI commands. The commands must be executed in a certain order to successfully complete a list file.

Below is an example that demonstrates how to set a list in continuous mode with correct command order.

```
LIST:MODE CONT
LIST:STEP ONCE
LIST:COUNT 2
LIST:VOLT 1,2
LIST:VOLT 2,4
LIST:UNIT SECOND
LIST:WID 1,1
LIST:WID 2,2
LIST:NAME 'TEST'
LIST:SAVE 1
MODE LIST
```

*Note: Be sure to specify LIST:AREA prior to using a set of list commands similar to above. For details on setting values for each commands, refer to the descriptions below.*

### **[SOURCE:]LIST:MODE**

This command sets the trigger condition for executing the list file

CONTinuous List operation is continuous mode.

STEP List operation is step mode.

Command syntax: [SOURCE:]LIST:MODE <CRD>

Parameter: CONTinuous|STEP

Query syntax: [SOURCE:]LIST:MODE?

Return parameter: <CRD>

## **[SOURCE:]LIST:STEP**

This command sets the operation mode of the list file.

ONCE List operate once

REPEAT Repeat list operation

Command syntax: [SOURCE:]LIST:STEP <SRD>

Parameter: ONCE|REPEAT

Query syntax: [SOURCE:]LIST:STEP?

Return parameter: <CRD>

### *Note to usage:*

When setting to LIST:STEP REPEAT, the list would run repeatedly for an indefinite amount of time. Below is an example set of commands to setup a repeated list properly:

```
*IDN?  
PORT:FUNCTION TRIGGER  
OUTPUT:TIMER OFF  
OUTPUT OFF  
LIST AREA 4  
LIST:COUNT 2  
LIST:UNIT SECOND  
TRIGGER:SOURCE BUS  
LIST:VOLTAGE 1,5  
LIST:VOLTAGE 2,1  
LIST:WIDTH 1,4  
LIST:WIDTH 2,2  
LIST:MODE CONT  
LIST:STEP REPEAT  
LIST:NAME 'MX'  
LIST:SAVE 1  
MODE LIST  
OUTPUT ON  
TRIGGER
```

## **[SOURCE:]LIST:COUNT**

This command sets the number of steps for the list operation.

Command syntax: [SOURCE:]LIST:COUNT <NRf>

Parameter: 2~400

Query syntax: [SOURCE:]LIST:COUNT?

Parameter: None

Return parameter: <NR1>

## **[SOURCE:]LIST :CURRENT[:LEVEL]**

This command sets the current step.

Command syntax: [SOURCE:]LIST:CURRENT[:LEVEL]

Parameter: 0~30A

Unit: A mA

Example: LIST:CURR 1,3A;

Query syntax: [SOURCE:]LIST:CURRENT[:LEVEL]?

Parameter: None

Example: LIST:CURR? 1;

Return parameter: <NR2>

## **[SOURCE:]LIST :VOLTage[:LEVEL]**

This command sets the voltage step.

Command syntax: [SOURCE:]LIST:VOLTage [:LEVel] <NRf>

Parameter: 0~360V

Unit: V mV

Example: LIST:VOLT 1,3V;

Query syntax: [SOURCE:]TRANsition: VOLTage:TLEVel?

Parameter: None

Example: LIST:VOLT? ;

Return parameter: <NR2>

### **[SOURCE:]LIST:WIDth**

This command sets the minimum step time. Decimal fractions are not allowed for this command. Units are in seconds or milliseconds, which are set using LIST:UNIT command (see LIST:UNIT). Set units first before using this command.

Command syntax: [SOURCE:]LIST:WIDth <NR1>

Parameter: MIN TO MAX|MIN|MAX

Unit: S mS

Example: LIST:WID 1, 100;

Query syntax: [SOURCE:]LIST:WIDth?

Parameter: None

Example: LIST:WID? 1;

Return parameter: <NR1>

### **[SOURCE:]LIST:NAME**

This command sets the name for the list file. Make sure the file name does not exceed 8 characters.

Command syntax: [SOURCE:]LIST:NAME <name>

Parameter: <SRD>

Example: LIST:NAME 'TEST';

Query syntax: [SOURCE:]LIST:NAME?

Return parameter: <SRD>

### **[SOURCE:]LIST:AREA**

This command divides up the storage area for the list file in one of the 4 ways listed below.

1. 1 group per store area, 400 steps
2. 2 groups per storage area, each group contains 200 steps.
4. 4 groups per storage area, each group has 100 steps.
8. 8 groups of storage area, each group has 50 steps.

Command syntax: [SOURCE:]LIST:AREA <NR1>

Parameter: 1|2|4|8

Example: LIST:AREA 1

Query syntax: [SOURCE:]LIST:AREA?

Return parameter: <NR1>

### **[SOURCE:]LIST:SAVe**

This command saves the list file to a register (non volatile memory). The memory can be written approximately 0.1 million times.

Command syntx: [SOURCE:]LIST:SAVe <NR1>

Parameter: 1~8

Example: LIST:SAV 1

### **[SOURCE:]LIST:RCL**

This command can recall the list file saved before from the register.

Command syntax: [SOURCE:]LIST:SAV <NR1>

Parameter: 1~8

Example: LIST:SAV 1

### **[SOURce:]LIST:UNIT**

This command sets the unit for the list width in either seconds (SECOND) or milliseconds (MSECOND).

Command syntax: [SOURce:]LIST:UNIT <second>

Parameter: SECOND or MSECOND

Example: LIST:UNIT SECOND

Measurement commands

Note: All measurement commands have units in Volts (V), Ampere (A), or Watts (W). Decimal fractions are allowed.

### **MEASure[:SCALar]:VOLTage[:DC]?**

This command queries the input voltage of the power supply.

Command syntax: MEASure[:SCALar]:VOLTage[:DC]?

Parameter: None

Return parameter: <NR2>

Return parameter unit: V

Example: MEAS:VOLT?

### **MEASure[:SCALar]:CURRent[:DC]?**

This command queries the input current of the power supply.

Command syntax: MEASure[:SCALar]:CURRent[:DC]?

Parameter: None

Return parameter: <NR2>

Return parameter unit: A

Example: MEAS:CURR?

### **MEASure[:SCALar]:POWER[:DC]?**

This command queries the input power of the power supply.

Command syntax: MEASure[:SCALar]:POWER?

Parameter: None

Return parameter: <NR2>

Return parameter unit: W

Example: MEAS:POW?

### **MEASure[:SCALar]:DVM[:DC]?**

This command queries the voltage reading of the digital volt meter.

Command syntax: MEASure[:SCALar]:DVM?

Parameter: None

Return parameter: <NR2>

Return parameter unit: V

Example: MEAS:DVM?

### **SENSe:RESistance:RANGe**

This command sets the range of the milliohm meter.

LOW: 0.01W resistance range

MIDDLE: 0.1W resistance range

HIGH: 1W resistance range

Command syntax: SENSe:RESistance:RANGe

Parameter: LOW | MIDDLE | HIGH

Example: RES:RANG LOW

Query syntax: SENSe:RESistance:RANGe?

Return parameter: <SRD>

### **MEASure[:SCALar]:RESistance[:DC]?**

This command queries the resistance reading of the milliohm meter.

Command syntax: MEASure[:SCALar]: RESistance?

Parameter: None

Return parameter: <NR2>

Return parameter unit: Ohm

Example: MEAS:RES?

### Interface Configuration Commands

#### **[SOURce:]SYSTEM:SENSe [:STATe]{<bool>}**

This command enables/disables the power supply's remote sense function.

Command syntax: SYSTem: SENSe [:STATe] <bool>

Parameter: 0|1|ON|OFF

Query syntax: SYSTem:SENSe [:STATe]?

\*RST value: 0

#### **[SOURce:]PORT:FUNCtion**

This command sets the mode of the port in the rear panel.

TRIGGER function: Pin1, pin2 are configured as external trigger source for the power supply and to control the list operation.

RI/DFI function: Inhibit Input controls the output state of the power supply. The Fault Output can indicate the reason for internal failure.

DIGITAL I/O function: Read and control the state of the digital port

Command syntax: SOURce:PORT:FUNCtion

Parameter: TRIGger|RIDFi|DIGital

Query syntax: SOURce:PORT:FUNCtion?

\*RST value: TRIGger

#### **[SOURce:]RI:MODE**

This command sets the input mode of the RI input pin

Command syntax: SOURce:RI:MODE

Parameter: OFF|LATChing|LIVE

Query syntax: SOURce:RI:MODE?

\*RST value: OFF

#### **[SOURce:]DFI:SOURce**

This command sets output source of the DFI output pin. (Not available for models 9150, 9151, 9152, and 9153)

Command syntax: SOURce:DFI:SOURce

Parameter: OFF|QUES|OPER|ESB|RQS

Query syntax: SOURce:DFI:SOURce?

\*RST value: OFF

#### **[SOURce:]DIGital:OUTPut[:STATe]**

This command sets the output state of the digital port. This command can be used when the mode of the port is set to DIGITAL. (Not available for models 9150, 9151, 9152, and 9153)

Command syntax: SOURce:OUTPut[:STATe]

Parameter: OFF|ON|0|1

## **[SOURCE:]DIGital:INPut[:STATe]?**

This command sets the input state of port. This command can be used when the mode of the port is set to DIGITAL.

Command syntax: SOURCE:DIG:INPut[:STATe] ?

### Trigger commands

## **TRIGger[:IMMediate]**

When trigger source is command mode, this command will give a trigger signal. Its function is as the same as \*TRG command.

Order syntax: \* TRIGger[:IMMediate]

Parameter: None

Reference order: TRIG TRIG:SOUR

## **TRIGger:SOURce**

This command sets the trigger mode of the power supply.

- **IMMediate:**  
When this function is enabled, you can generate an immediate trigger pulse by pressing  plus Trigger.
- **EXTernal trigger signal (TTL):**  
When this function is enabled, the power supply can be triggered with a TTL pulse applied to pin 1 of the terminal connector in the rear. The TTL on pulse width should be at least 5 ms.
- **BUS Command**  
When this function is enabled, you can trigger the power supply by sending a \*TRG or TRIGger command to the power supply

Command syntax: TRIGger:SOURce <mode>

Parameter: IMMediate|EXTernal|BUS

\*RST value: KEY

### ***Note on usage:***

When using the trigger command to initiate a list, commands have to be set in a particular order in order to complete the trigger.

Example: Below shows how to initiate a list in continuous mode using trigger under bus command mode:

```
*IDN?  
PORT:FUNCTION TRIGGER  
TRIGGER:SOURCE BUS  
LIST:MODE CONT  
LIST:STEP ONCE  
LIST:COUNT 2  
LIST:VOLT 1,2  
LIST:VOLT 2,4  
LIST:UNIT SECOND  
LIST:WID 1,1  
LIST:WID 2,2  
LIST:NAME 'TEST'  
LIST:SAVE 1  
MODE LIST
```

TRIGGER

## 5. Specifications

### 5.1 Specifications

#### Models 9120A, 9121A and 9124

Parameter		9120A	9121A	9124
Output Ratings (0 °C~40 °C)	Voltage	0 - 32 V	0 - 20 V	0 - 72 V
	Current	0 - 3 A	0 - 5 A	0 - 1.2 A
	LVP*	0 - 33 V	0 - 21 V	0 - 73 V
Load Regulation ±(% of output+offset)	Voltage	<0.01%+2 mV <sup>1</sup>		<0.01%+2 mV <sup>1</sup>
	Current	<0.05%+2 mA		<0.05%+3 mA
Line Regulation ±(% of output+offset)	Voltage	<0.01%+1 mV <sup>1</sup>		<0.01%+1 mV <sup>1</sup>
	Current	<0.05%+0.1 mA		≤0.05%+0.05 mA
Programming resolution	Voltage	0.5 mV		2 mV
	Current	0.1 mA		0.02 mA
Readback/Meter resolution	Voltage	0.1 mV	0.1 mV	0.5 mV
	Current	0.01 mA	0.05 mA	0.01 mA
Front Panel setting resolution	Voltage	0.5 mV		2 mV
	Current	0.1 mA		0.02 mA
Programming accuracy, 12 months (25 °C ± 5 °C) ±(% of output+offset)	Voltage	<0.03%+3 mV		≤0.03%+6 mV
	Current	<0.05%+2 mA		≤0.05%+1 mA
Readback / Meter accuracy 12months (25 °C ± 5 °C) ±(% of output+offset)	Voltage	<0.02%+3 mV		≤0.02%+5 mV
	Current	<0.05%+2 mA		≤0.05%+1 mA
Ripple & Noise (20 Hz ~20 MHz)	Voltage	≤ 4 mV <sub>p-p</sub>	≤ 3 mV <sub>p-p</sub>	≤ 5 mV <sub>p-p</sub>
	Current	≤ 3 mArms	≤ 3 mArms	≤ 3 mArms
Temperature coefficient, (0 °C~40 °C) ±(% of output+offset)	Voltage	<0.02%+3 mV		≤0.02%+5 mV
	Current	<0.05%+2 mA		<0.05%+0.5 mA
Readback temperature, coefficient, ±(% of output+offset)	Voltage	<0.02%+3 mV		≤0.02%+5 mV
	Current	<0.05%+2 mA		≤0.05%+0.5 mA
Transient response	μs	< 150 μs for output to recover to within 75 mV following a change from 100 mA to 1 A		
DVM Accuracy	Voltage	0 - 12 V range: 0.02%+2 mV 0 - 40 V range: 0.02%+3 mV		
DVM Resolution	Voltage	0 - 12 V range: 0.1 mV 0 - 40 V range: 1 mV		
Ohm meter	mΩ	Accuracy: 0.1%, for Voltage and Current ≥ 10% of FS (full scale) Accuracy: 0.3% for Voltage and Current = 3 to 10% of FS		
Weight	net	19.8 lbs, (9 kg)		
Dimensions	WxHxD	214.5 mm × 88.2 mm × 354.6 mm 8.45(W) x 3.47(H) x 13.9(D) inch		

\* = LVP: Limit Voltage Protection. Limits the voltage than can be set either via the front panel or remote control command.  
<sup>1</sup> = While using Remote Sense

**NOTE:** Specifications and information are subject to change without notice. Please visit [www.bkprecision.com](http://www.bkprecision.com) for the most current product information.

## Models 9122A, 9123A

Parameter		9122A	9123A
Output Ratings (0 °C~40 °C)	Voltage	0 - 60 V	0 - 30 V
	Current	0 - 2.5 A	0 - 5 A
	LVP*	0 - 61 V	0 - 31 V
Load Regulation ±(% of output+offset)	Voltage	<0.01%+2 mV <sup>1</sup>	
	Current	<0.05%+2 mA	<0.05%+3 mA
Line Regulation ±(% of output+offset)	Voltage	<0.01%+2 mV <sup>1</sup>	<0.01%+1 mV <sup>1</sup>
	Current	<0.05%+0.05 mA	<0.05%+0.1 mA
Programming resolution	Voltage	1 mV	0.5 mV
	Current	0.1 mA	
Readback/Meter resolution	Voltage	0.5 mV	0.1 mV
	Current	0.05 mA	
Front Panel setting resolution	Voltage	1 mV	0.5 mV
	Current	0.1 mA	
Programming accuracy, 12 months (25 °C ± 5 °C) ±(% of output+offset)	Voltage	<0.03%+6 mV	<0.03%+3 mV
	Current	<0.05%+1.5 mA	<0.05%+2.5 mA
Readback / Meter accuracy 12months (25 °C ± 5 °C) ±(% of output+offset)	Voltage	<0.02%+6 mV	<0.02%+2.5 mV
	Current	<0.05%+1.5 mA	<0.05%+2.5 mA
Ripple & Noise (20 Hz ~20 MHz)	Voltage	≤ 5 mV <sub>p-p</sub>	≤ 4 mV <sub>p-p</sub>
	Current	≤ 3 mA rms	≤ 4 mA rms
Temperature coefficient, (0 °C~40 °C) ±(% of output+offset)	Voltage	<0.02%+6 mV	<0.02%+3 mV
	Current	<0.05%+1 mA	<0.05%+2 mA
Readback temperature, coefficient, ±(% of output+offset)	Voltage	<0.02%+6 mV	<0.02%+3 mV
	Current	<0.05%+1 mA	<0.05%+2 mA
Transient response	μs	< 150 μs for output to recover to within 75 mV following a change from 100 mA to 1 A	
DVM Accuracy	Voltage	0 - 12 V range: 0.02%+2 mV 0 - 40 V range: 0.02%+3 mV	
DVM Resolution	Voltage	0 - 12 V range: 0.1 mV 0 - 40 V range: 1 mV	
Ohm meter	mΩ	Accuracy: 0.1%, for Voltage and Current ≥ 10% of FS (full scale) Accuracy: 0.3% for Voltage and Current = 3 to 10% of FS	
Weight	net	21.2 lbs, (9.6 kg)	
Dimensions	WxHxD	214.5 mm × 88.2 mm × 354.6 mm 8.45(W) x 3.47(H) x 13.9(D) inch	

\* = LVP: Limit Voltage Protection. Limits the voltage than can be set either via the front panel or remote control command.

<sup>1</sup> = While using Remote Sense

**NOTE:** Specifications and information are subject to change without notice. Please visit [www.bkprecision.com](http://www.bkprecision.com) for the most current product information.

**Models 9150, 9151, 9152, 9153**

Parameter		9150	9151	9152	9153
Output Ratings (0 °C - 40 °C)	Voltage	0 - 5.2 V	0 - 20 V	0 - 30 V	0 - 60 V
	Current	0 - 60 A	0 - 27 A	0 - 18 A	0 - 9 A
	LVP*	0 - 5.5 V	0 - 21 V	0 - 31 V	0 - 61 V
Load Regulation ±(% of output+offset)	Voltage	<0.01% + 2 mV	<0.01% + 1 mV	<0.01% + 1 mV	<0.01% + 1 mV
	Current	<0.1% + 10 mA	<0.1% + 5 mA	<0.1% + 2 mA	<0.1% + 2 mA
Line Regulation ±(% of output+offset)	Voltage	<0.02% + 0.1 mV	<0.02% + 1 mV	<0.02% + 1 mV	<0.02% + 1 mV
	Current	<0.1% + 1 mA	<0.01% + 1 mA	<0.01% + 0.1 mA	<0.01% + 0.1 mA
Programming resolution	Voltage	0.1 mV	1 mV	1 mV	1 mV
	Current	1 mA	1 mA	0.1 mA	0.1 mA
Readback/Meter resolution	Voltage	0.1 mV	0.1 mV	0.1 mV	0.1 mV
	Current	1 mA	0.1 mA	0.1 mA	0.1 mA
Front Panel setting resolution	Voltage	0.1 mV	0.5 mV	0.5 mV	0.5 mV
	Current	1 mA	1 mA	1 mA	1 mA
Programming accuracy, 12 months (25 °C ± 5 °C) ±(% of output+offset)	Voltage	<0.02%+2 mV	<0.02%+6 mV	<0.02%+12 mV	<0.02%+12 mV
	Current	<0.1%+30 mA	<0.1%+15 mA	<0.05%+10 mA	<0.05%+10 mA
Readback / Meter accuracy 12months (25 °C ± 5 °C) ±(% of output+offset)	Voltage	<0.02%+1.5 mV	<0.02%+3 mV	<0.02%+6 mV	<0.02%+6 mV
	Current	<0.05%+15 mA	<0.05%+10 mA	<0.05%+5 mA	<0.05%+5 mA
Ripple & Noise (20 Hz ~20 MHz)	Voltage	≤0.005%+3 mVp-p	≤0.005%+3 mVp-p	≤0.005%+4 mVp-p	≤0.005%+4 mVp-p
	Current	15 mArms	5 mArms	3 mArms	3 mArms
Temperature coefficient, (0 °C~40 °C) ±(% of output+offset)	Voltage	<0.02%+2 mV	<0.02%+5 mV	<0.02%+10 mV	<0.02%+10 mV
	Current	<0.1 %+30 mA	<0.1 %+15 mA	<0.05 %+5 mA	<0.05 %+5 mA
Readback temperature, coefficient, ±(% of output+offset)	Voltage	<0.02%+2 mV	<0.02%+5 mV	<0.02%+10 mV	<0.02%+10 mV
	Current	<0.1 %+20 mA	≤0.05%+10 mA	≤0.05%+5 mA	≤0.05%+5 mA
DVM Accuracy	Voltage	0~12 V range: 0.02%+2 mV 0~40 V range: 0.02%+3 mV			
DVM Resolution	Voltage	0~12 V range: 0.1 mV 0~40 V range: 1 mV			
Ohm meter	mΩ	Accuracy: 0.1%, for Voltage and Current ≥= 10% of FS (full scale) Accuracy: 0.3% for Voltage and Current = 3 to 10% of FS			
Weight	net	63.9 lbs (29 kg)			
Dimensions	WxHxD	429 mm × 88.2 mm × 458.9 mm 16.88(W) x 3.47(H) x 18.06(D) inch			

\*) LVP: Limit Voltage Protection. Limits the voltage than can be set either via the front panel or remote control command.

**NOTE:** Specifications and information are subject to change without notice. Please visit [www.bkprecision.com](http://www.bkprecision.com) for the most current product information.

## 5.2 Supplemental Characteristics

### State Storage Memory

50 user-configurable stored states

### Recommended Calibration Interval

1 year

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

220 AV±10%, 47~63 Hz

110 AV±10%, 47~63 Hz

### Maximum output power

9120A	9121A	9124	9122A	9123A	9150	9151	9152	9153
96 W	100 W	86 W	150 W	150 W	312 W	540 W	540 W	540 W

### Cooling

Fan cooled

### Operating Temperature

0 to 40 °C

### Storage Temperature

-20 to 70 °C.

### Environmental Conditions

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

## SERVICE INFORMATION

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**Warranty Service:** Please go the support and service section on our website [www.bkprecision.com](http://www.bkprecision.com) to obtain a RMA #. Return the product in the original packaging with proof of purchase to the address below. Clearly state on the RMA the performance problem and return any leads, probes, connectors and accessories that you are using with the device.

**Non-Warranty Service:** Please go the support and service section on our website [www.bkprecision.com](http://www.bkprecision.com) to obtain a RMA #. Return the product in the original packaging to the address below. Clearly state on the RMA the performance problem and return any leads, probes, connectors and accessories that you are using with the device. Customers not on an open account must include payment in the form of a money order or credit card. For the most current repair charges please refer to the service and support section on our website.

Return all merchandise to B&K Precision Corp. with pre-paid shipping. The flat-rate repair charge for Non-Warranty Service does not include return shipping. Return shipping to locations in North America is included for Warranty Service. For overnight shipments and non-North American shipping fees please contact B&K Precision Corp.

B&K Precision Corp.  
22820 Savi Ranch Parkway  
Yorba Linda, CA 92887  
[www.bkprecision.com](http://www.bkprecision.com)  
714-921-9095

**Include with the returned instrument your complete return shipping address, contact name, phone number and description of problem.**

## LIMITED THREE-YEAR WARRANTY

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B&K Precision Corp. warrants to the original purchaser that its products and the component parts thereof, will be free from defects in workmanship and materials for a period of three years from date of purchase.

B&K Precision Corp. will, without charge, repair or replace, at its option, defective product or component parts. Returned product must be accompanied by proof of the purchase date in the form of a sales receipt.

To help us better serve you, please complete the warranty registration for your new instrument via our website [www.bkprecision.com](http://www.bkprecision.com)

**Exclusions: This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. The warranty is void if the serial number is altered, defaced or removed.**

B&K Precision Corp. shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitations of incidental or consequential damages. So the above limitation or exclusion may not apply to you.

This warranty gives you specific rights and you may have other rights, which vary from state-to-state.

B&K Precision Corp.  
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# **B<sup>+</sup>K PRECISION<sup>®</sup>**

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